

Surgil Project ESIA – Volume II

ESIA Report - Final Draft

November 2011

Uz-Kor Gas Chemical

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Content

Abbreviations Used in Document

Abbreviation	Definition
AERMOD	IFC Approved Dispersion Model
AERMET	AERMOD Meteorological Pre-Processor
AERMAP	AERMOD Terrain Pre-Processor
ACS	Akchalak Gas Compressor Station
AERMIC	American Meteorological society and/ environmental protection agency regulatory model improvement committee
ABDM	Aral Basin Delta Management
ADB	Asian Development Bank
(OSPORB)	Basic Sanitary Procedures to ensure radiation safety
BREF	BAT Reference document
BCM / Yr	Billion cubic meters per year
BAT	Best Available Techniques
BPM	Best Practicable means
BBL / Day	Billion Barrels of Oil Per Day
BCM	Billion Cubic meters
BFW	Boiler Feed Water
CM	Cabinet of Ministers
CRTN	Calculations of Road Traffic Noise
CEET	Carbon Emissions Estimation Tool
CO	Carbon Monoxide
Cm/sec	Centimetres per second
CAREC	Central Asia Regional Economic Co-operation
CGTU	Central Gas Treatment Unit
CSES	Centre for Sanitary and Epidemiological Supervision
Uzhydromet	Centre of Hydro-Meteorological service
CDM	Clean Development Mechanism
CO_{2e}	CO_2 Equivalents
CMSL	Committee of management of the Sudoch'ye Lake
UNCEDAW	Committee on the elimination of discrimination against women
CIS	Commonwealth of Independent State
CIP	Community investment Programme
CLO	Community Liaison Officer
SNips	Construction codes and regulations
CTMP	Construction Traffic Management Plan
CITES	Convention of international trade of endangered species of flora and fauna
RAMSAR convention	Convention of Wetlands of international importance
CBD	Convention on biological diversity

Abbreviation	Definition
CMS	Convention on the conservation of migratory species of wild animals
CLS	Core Labour Standards
DEMP	Decommissioning environmental management plan
DMRB	Design Manual for Roads and Bridges
DEG	Diethylene glycol
ESCAP	Economic and Social Commission for Asia and the Pacific
EPC	Engineering Procurement and Construction
EA	Environment Audit
EAP	Environmental Action Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EPFIs	Equator Principles Financial Institutions
EL	Ethylene
EP	Ethylene Plant
EBRD	European Bank For Reconstruction and Development
FEED	Front End Engineering and Design
GCS	Gas Compressor Station
GGS	Gas Gathering Stations
GRS	Gas Rescue Squad
GSP	Gas Separation Plant
GTG	Gas Turbine Generators
GAD	Gender And Development
GRI	Global Reporting Initiative
GIIP	Good International Industry Practice
GHG's	Green House Gases
GDP	Gross Domestic Product
HAZOP	Hazard Operational Studies
HDPE	High Density Polyethylene
HV	High Voltage
HONAM	Honam Petrochemical Corporation
H.I.V	Human Immunodeficiency Virus
H_2S	Hydrogen Sulphide
IBA	Important Bird Area
ING	ING bank N.V.
IEMA	Institute of Environmental management assessment
IAIA	International Association for Impact Assessment
IEC	International Environmental Consultant
IFC	International Finance Corporation
IFSA	International Fund of Saving Aral Sea
ILO	International Labour Organization

Abbreviation	Definition
IPIECA	International Petroleum Industry Environmental Conservation Association
BVO	International River Basin Water Control Organisation
ICWC	Interstate Commission for Water Co-ordination
(ITT)	Invitation To Tender
ITB	Invitation To Bid
AIS	Irrigation Systems Department
JV	Joint Venture
JK	Jorgaky Kenes
KTA	Kilo tonnes per annum
KOGAS	Korean Gas Corporation
KSA	Kungrad Soda Ash Plant
LVIA	Landscape and Visual Impact Assessment
LI	Landscape Institute
LDAR	Leak Detection And Repair
LLDPE	Linear Low Density Polyethylene
LEC	Local Environment Consultant
LDPE	Low density Polyethylene
LTS	Low Temperature Separation
LABAIS	Lower Amu Darya Basin Administration of Irrigation Systems
NABIUS	Lower Amu Darya River Basin Management Board
MACs	Maximum Allowable Concentrations
MPC	Maximum Permissible Concentrations
MPEs	Maximum Permissible Emissions
MPEC	Maximum Permissible Explosive Concentration
MSF	Medecins San Frontier
CH_4	Methane
Mt	Metric Tonnes
mm/s	Millimetre per second
MMSCFD	Million Standard Cubic Feet Per minute
MHRUz	Ministry of Health Uzbekistan
MVD	Ministry of internal Affairs
MLSW	Ministry of Labour and Social Welfare of the Republic of Uzbekistan
M+M	Monitoring and Maintenance
MML	Mott MacDonald Limited
MSW	Municipal Solid Waste
NAPEESD	National Action Plan for Environmental protection and ecological provisions for Uzbekistan's sustainable development
NBSAP	National Biodiversity Strategy + Action Plan
NEAP	National Environmental Action Programme
NEHAP	National Environmental Health Action Programme
NIOSH	National Institute for Occupational Safety and Health

Abbreviation	Definition
NWMS	National Waste Management Strategy
NSDS	National Sustainable Development Strategy
WMAP	National Waste Management Action Plan
NORM	Naturally Occurring Radioactive Materials
NO_x	Nitrogen Oxide
N_20	Nitrous Oxide
NGO	Non- Governmental Organisation
NABF	Non-Aqueous Based Fluids
NTS	Non-Technical Summaries
NRB	Norms of Radiation Safety
OSHA	Occupational Safety and Health Administration
OM	Oliy Maijis
O+M	Operations and Maintenance
OECD	Organization for Economic Co-operation and Development
OVOS	National acronym for EIA
PPV	Peak Particle Velocity
PS	Performance Standards
PEL	Permissible Exposure Limits
PTW	Permit To Work
PPE	Personal Protective Equipment
PIGs	Pipeline Inspection Gauges
PSs	Policy and performance standards
PPP	Polluter Pay Principle
PCBs	Polychlorinated biphenyls
PP	Polypropylene
PEC	Predicted Environmental Concentrations
PC	Process Contribution
PAPs	Project affected peoples
PMG	Project Management Group
PP	Propylene
PTEO	National acronym for EIA
PCDP	Public Consultation and Disclosure Plan
PZVOS	National acronym for pre-feasibility EIA
REL	Recommended Exposure Limit
RUz	Republic of Uzbekistan
RO	Reverse Osmosis
SPS	Safeguard Policy Statement
SR	Safeguard Requirement
SR1	Safeguard Requirements - Environment
SR2	Safeguard Requirements - Involuntary Resettlement
SR3	Safeguard Requirements- Indigenous Peoples
SES	Sanitary Epidemiological Stations

Abbreviation	Definition
SPZ	Sanitary Protection Zone
sanPiN	Sanitary rules and norms
SWMP	Site Waste Management plan
SIA	Social Impact Assessment
SSCA	Social safeguards compliance audit
GOSKOMGEOLOGIA	State committee for geology and mineral resources
GOSKOMGEODEZKADASTR	State Committee for Land Resources, surveys, cartography, and the state cadastre
SCNP	State Committee for Nature Protection
SEE	State Environmental Expertise
SANOATGEOKONTEKHNAZORAT	State inspectorate for exploration supervision, operations, safety for industry, mining and utilities sector
GOST's	State Occupational Safety Standards
STX	STX energy co.ltd.
UNG	Subsidiary of Uzbekneftegaz
SO_2	Sulphur Dioxide
SCADA	Supervisory Control and Data Acquisition System
TA	Technical Assistant
TEO	National acronym for feasibility studies
TOR	Terms of Reference
T / hr	Tonnes per hour
UMD	UGCC Management Directorate
UNEP	UN Environmental Programme
UNFCCC	UN Framework Convention on Climate Change
UNEP	United Nation Environment Programme
UPP	User Pay Principle
UGCC	Ustyurt Gas Chemical Complex
UG	Ustyurtgaz
U&O	Utilities and Offsite
UzRDB	Uzbekistan Red Book Data Book
VOC	Volatile Organic Compound
VGP	Voluntary Gas Rescue Patrols
WDS	Waste Data Sheets
WDL's	Waste Disposal Limit
WEEE	Waste Electronics and Electrical Equipment
WGN	Waste Generation Norm
WHRV	Waste Heat Recovery
WWTP	Waste Water Treatment Plant
WBDF	Water Based Drilling Fluids
WSU	Water Supply Unit
WUA	Water Users Association
WIS	Welfare Improvement Strategy
WHO	World Health Organization

Abbreviation	Definition
ZEP	National acronym
ZOI	Zone of Influence
ZVL	Zone of Visual Influence

Glossary of Key Terms

Term	Definition
ADB Safeguards Requirements	In July 2009, ADB's Board of Directors approved the new Safeguard Policy Statement (SPS) governing the environmental and social safeguards of ADB's operations. The SPS aims to avoid, minimize, or mitigate harmful environmental impacts, social costs, and to help borrowers/clients strengthen their safeguard systems. The SPS builds upon ADB's previous safeguard policies on the environment, involuntary resettlement, and Indigenous Peoples, and brings them into one consolidated policy framework with enhanced consistency and coherence, and that more comprehensively addresses environmental and social impacts and risks. The SPS also provides a platform for participation by affected people and other stakeholders in project design and implementation.
Condensate	Is a mixture of hydrocarbon liquids that are present when natural gas is extracted. The condensate is formed when the temperature of the raw gas is reduced below the dew point.
Complex Gas Treatment Unit	A gas processing plant located in a gas field which processes the natural gas to remove the impurities and liquids.
Discharge	The release of liquid emissions from the process into a receiving body,
Drilling Fluids	Is a fluid which is used to help during the drilling process which helps remove the drill cuttings from the hole.
Emissions	Pollution discharged into the atmosphere from smoke- stacks, other vents, and surface areas of commercial or industrial facilities; from residential chimneys; and from motor vehicle, locomotive or aircraft exhausts.
Evaporation Ponds	These are large ponds at the CGTU where all produced water is sent from the extraction process to be disposed off via evaporation.
Exceedance	Infringement of environmental protection standards by exceeding allowable limits or levels.
Gas Field	An area consisting of a single reservoir or multiple reservoirs all grouped on or related to, the same individual geological structural feature and/or stratigraphic condition.
Gas Processing	Is the processing of natural gas that has been extracted to remove the non methane hydrocarbons and condensate so that it can be transported to the UGCC
Gas Gathering Stations	Gas gathering stations are central locations for a number gas wells. The Gas gather ring stations collect the gas before sending on to the CGTU.
IFC Performance Standards	IFC's Performance Standards define clients' roles and responsibilities for managing their projects and the requirements for receiving and retaining IFC support.
Maximum Permissible Concentration	Is the term to describe either National or International standards put in place for the protection of human health and ecological protection.
Produced Water	Gas fields have a natural layer of water mixed in with the hydrocarbons that is extracted at the same time. This water is described as produced water which requires safe disposal.

Units	
bar	bar = 105 Pa (pressure)
°C	degree Centigrade (temperature)
dB	decibel (sound pressure)
dS/m	electrical conductivity
g	gramme
hr	hour (time)
Hz	Hertz (frequency)
K	degree Kelvin (temperature)
kg	kilogram (mass)
J	Joule (energy)
l	litre
m	metre (length)
Mm^3	million cubic metres = 106 m^3
ppm	parts per million
ppb	parts per billion
Pa	Pascal (pressure)
s	second (time)
t	tonne = 1000 kg (mass)
tpy	tonne per year
V	Volt (electrical potential)
W	Watt (power)
Wh	Watt hour (energy)

Prefix Symbols and Multiples			
k	-kilo	=	x 103
h	-hecto	=	x 102
da	-deca	=	x 10
d	-deci	=	x 10-1
c	-centi	=	x 10-2
m	-milli	=	x 10-3
µ	-micro	=	x 10-6
n	-nano	=	x 10-9
p	-pico	=	x 10-12

Symbols	
CO	-Carbon Monoxide
CO_2	-Carbon Dioxide
NO_x	-Nitrogen Oxides
NO_2	-Nitrogen Dioxide
Nm^3	-Normal cubic metre
O_2	-Oxygen
PM_{10}	-Particulate Matter with a mean diameter less than 10µm
$PM_{2.5}$	-Particulate Matter with a mean diameter less than 2.5µm
pH	-A scale of relative acidity/alkalinity
SO_2	-Sulphur Dioxide

1. Introduction

1.1 Introduction

The Uzbek-Korean Joint Venture (JV) "Uz-Kor Gas Chemical" LLC (hereafter referred to as 'Uz-Kor') is undertaking the development of facilities for the production of polyethylene and polypropylene primarily utilising gas from further development of the Surgil gas field (the 'Surgil Field') in the semi-autonomous Karakalpakstan region of the Republic of Uzbekistan (the 'Project').

The Project includes among other things, the development, production and transportation of hydrocarbons from the Surgil Field, the design, construction and operation and maintenance of a gas chemical complex to be located at Akchalak on the Ustyurt Plateau and the sale (including export) of processed gas, condensate and petrochemical products.

Uz-Kor has commissioned Mott MacDonald Ltd (MML) to act as the International Environmental Consultant (IEC) to conduct an international standard environmental and social impact assessment (ESIA) and associated Environmental and Social Management Plan (ESMP) of the Project to support obtaining international finance for the Project. This work builds upon the national environmental assessment process which has been contracted separately by Uz-Kor.

1.2 Overview of the Project

The aim of the Project is to contribute to the broader development goals of the Republic of Uzbekistan through the realisation of:
- the expansion of the Surgil Field for the extraction of valuable components from natural gas; and
- gas processing with the purpose of producing gas, gas condensate and establishment of polyethylene and polypropylene production for use and export.

The development of the Surgil Field has progressed to date under the responsibility of Ustyurtgaz (UG), a subsidiary of Uzbekneftegaz (UNG), the state-owned holding company of Uzbekistan's oil and gas industry. The Surgil Field ownership will transfer from UG to Uz-Kor with the realisation of the Project. Much of the Surgil Field infrastructure, including a fully operational Central Gas Treatment Unit (CGTU) constructed in 2007, is already in existence. At March 2011, the Surgil Field included 28 operational wells, with drilling activities being undertaken at a further ten well sites.

The proposed Project intends to develop the Surgil Field to a total of 133 wells between 2007 and 2025. Gas from the Surgil Field wells will be transferred to the existing Surgil CGTU (either via the Gas Gathering Stations or routed directly) where hydrocarbon condensate and water is removed from the gas stream. The Surgil Field is anticipated to have a production life of approximately 40 years.

A new processing facility, the Ustyurt Gas Chemical Complex (UGCC) will be designed to receive natural gas and un-stabilised condensate via pipelines from the Surgil Field. The pipelines will also connect to other existing fields nearby to the Surgil Field although these other fields do not form part of the Project scope. The natural gas and un-stabilised condensate received by the UGCC will be processed to form high-density polyethylene (HDPE) and polypropylene (PP). Sales gas and light pyrolysis gasoline will also be final products from the UGCC for onward sale to third parties. The UGCC is anticipated to come into operation in late 2014 / early 2015.

The UGCC site will be located approximately 115 km away from the Surgil Field and occupy an area of undeveloped land located on the Ustyurt Plateau. The nearest settlement to the UGCC site is Kyrkkyz / Akchalak (hereafter referred to as Akchalak), located approximately 5 km to the south west. Approximately 10 km south-east of the UGCC site and adjacent to the El'abad settlement is the Kungrad Soda Plant.

The Project ESIA scope includes the construction and operation of below ground pipelines for the transfer of gas and condensate from the Surgil Field and other fields to the UGCC. An operational works settlement is planned at the Surgil Field and a new settlement will be developed at the site of the UGCC. A detailed description is provided in Chapter 2 which includes an overview of other supporting infrastructure to be developed and considered within this ESIA scope.

1.3 The Project Parties

In March 2006, a memorandum of understanding was signed between UNG and Korean Gas Corporation (‘KOGAS’) for the realization of the Project. The Project was subsequently supported by an Uzbekistan Presidential Decree in February 2008 leading to the formation of Uz-Kor in May 2008.

Uz-Kor is a joint venture between the state-owned holding company of Uzbekistan's oil and gas industry, UNG, KOGAS, Honam Petrochemical Corporation (‘Honam’), and STX Energy Co. Ltd. (‘STX’) (collectively “the Sponsors”). The Sponsors intend to own and continue the development of the Surgil Field and to develop, build and own the UGCC facility.

A number of key conceptual design and pre-feasibility studies have been undertaken on behalf of Uz-Kor leading ultimately to an issue of an ‘Invitation to Bid’ (ITB) to potential EPC bidders and issue of a Front End Engineering and Design (FEED) contract to bidders.

The Project is required to comply with the Republic of Uzbekistan national requirements for Environmental Impact Assessment (EIA) and all relevant international environmental treaties and conventions. A national EIA process is being undertaken by the Open Joint Stock Association ‘UzLITIneftgaz’ commissioned separately by Uz-Kor. UzLITIneftgaz has provided local support for the international ESIA and ESMP in its role as the Local Environmental Consultant (LEC) for the Project.

Uz-Kor appointed MML in January 2009 to act as IEC to conduct an international ESIA and develop an ESMP for the proposed development of the Project. As the first step in the ESIA process, MML produced a Scoping Report (April 2010) that set out the potential environmental and social issues associated with the Project and established the scope and methodology of the environmental and social assessment of significant impacts. MML has also assisted Uz-Kor in developing a Public Consultation and Disclosure Plan (PCDP) (May 2010) the purpose of which is to guide consultation and disclosure activities to be undertaken by the Project for the purpose of informing the ESIA process and to ensure its quality, comprehensiveness and effectiveness. To date MML teams have also conducted four visits to the Project study area.

The status of the Project in relation to the national permitting process is provided in Section 4.

1.4 Financing of the Project

The total estimated Project value for financing is approximately $US four billion.

ING Bank N.V. ('ING') has been mandated as the Financial Adviser to Uz-Kor and to assist in raising limited recourse financing.

The Asian Development Bank ('ADB'), Korean Export Credit Agencies and other commercial banks will be approached by Uz-Kor to provide assistance for (i) existing facilities and / or business activities that already exist and will form part of the future Project proposed for financing; and (ii) development of the UGCC on land or sites that has been mostly allocated prior to lender consideration of the Project.

1.5 Purpose of this Document

This ESIA and ESMP are required to demonstrate that the Project meets the requirements of both the Equator Principles 2006 and the ADB requirements for environmental and social protection in its Safeguard Policy Statement (SPS), 2009. More specifically the Project will refer to the following specific standards and guidelines;

- ADB SPS Safeguards Requirements 1 on Environment (SR1);
- ADB SPS Safeguards Requirements 2 on Involuntary Resettlement (SR2);
- ADB SPS Safeguards Requirements 2 on Indigenous Peoples (SR3);
- ADB Public Communications Policy;
- ADB Social Protection Strategy;
- ADB Gender and Development Policy;
- International Finance Corporation (IFC) Performance Standards on Social and Environmental Sustainability (2006); and
- Relevant World Bank / IFC Environment, Health and Safety (EHS) Guidelines ('the EHS Guidelines').

The requirements of these standards and guidelines are elaborated in Chapter 4. Furthermore, national legislative requirements for the Project are also provided.

Other documents produced in support of the financing requirements that should be read in conjunction with this ESIA report include:

- Surgil ESIA Scoping Report[1] - April 2010;
- Environmental Audit (EA) - scheduled for June 2011;
- PCDP[2] – May 2010; and
- ADB Social Safeguards Compliance Audit (SSCA) Report (Draft)[3] – November 2010.

[1] Project Scoping Report 254793/02/D, Mott MacDonald, 13 April 2010.

[2] Project, Public Consultation and Disclosure Plan, Mott MacDonald 254793/GRE/GEV/01/B/20 May 2010.

[3] Project, ADB Social Safeguards Compliance Audit, Mott MacDonald 254793/GRE/GEV/01 November 2010.

1.6 Structure of the Report

The ESIA is comprised of four volumes organised as follows:

- Volume I: Non Technical Summary;
- **Volume II: Environmental and Social Impact Assessment (this volume);**
  - Section 1 – Introduction;
  - Section 2 – Project Description;
  - Section 3 – Need for the Project and Analysis of Alternatives;
  - Section 4 – Policy, Legal and Institutional Framework;
  - Section 5 – Assessment Scope and EIA Process;
  - Section 6 – Information Disclosure, Consultation, and Participation;
  - Section 7 – Social Impact Assessment;
  - Section 8 – Ecology and Biodiversity;
  - Section 9 – Water Resources and Water Quality;
  - Section 10 – Materials and Waste Management;
  - Section 11 – Ground Conditions;
  - Section 12 - Noise and Vibration;
  - Section 13 – Traffic and Transportation;
  - Section 14 – Landscape and visual;
  - Section 15 – Air quality;
  - Section 16 – Carbon; and
  - Section 17 – Cultural Heritage.
- Volume III: Appendices / Supporting Documents; and
- Volume IV: Environmental and Social Management Plan.

Table 1.1 sets out the contact details for enquiries on this ESIA.

Table 1.1: Project Proponent Contact Details (Head Office)

Project Proponent	Information
Name of Company	Uz-Kor Gas Chemical LLC. ("Uz-Kor")
Address (Head Office)	12th Floor, International Business Centre, 107B Amir Temur Str., Tashkent, Uzbekistan
Telephone	(+99871) 238-92-23
Fax	(+99871) 238-92-24
Address (Registered Office)	133A, Dostnazarov street Nukus city Republic of Karakalpakstan Republic of Uzbekistan
Telephone	+998 90 727 9277
Fax	+998 61 222 21 87
E-mail	uzkorgaschemical@gmail.com
Website	www.uz-kor.com

2. Project Description

2.1 Component Scope Overview

The intention of this chapter is to summarise a description of the Project. Further technical detail is provided in Appendix A of Volume III where relevant to support the ESIA.

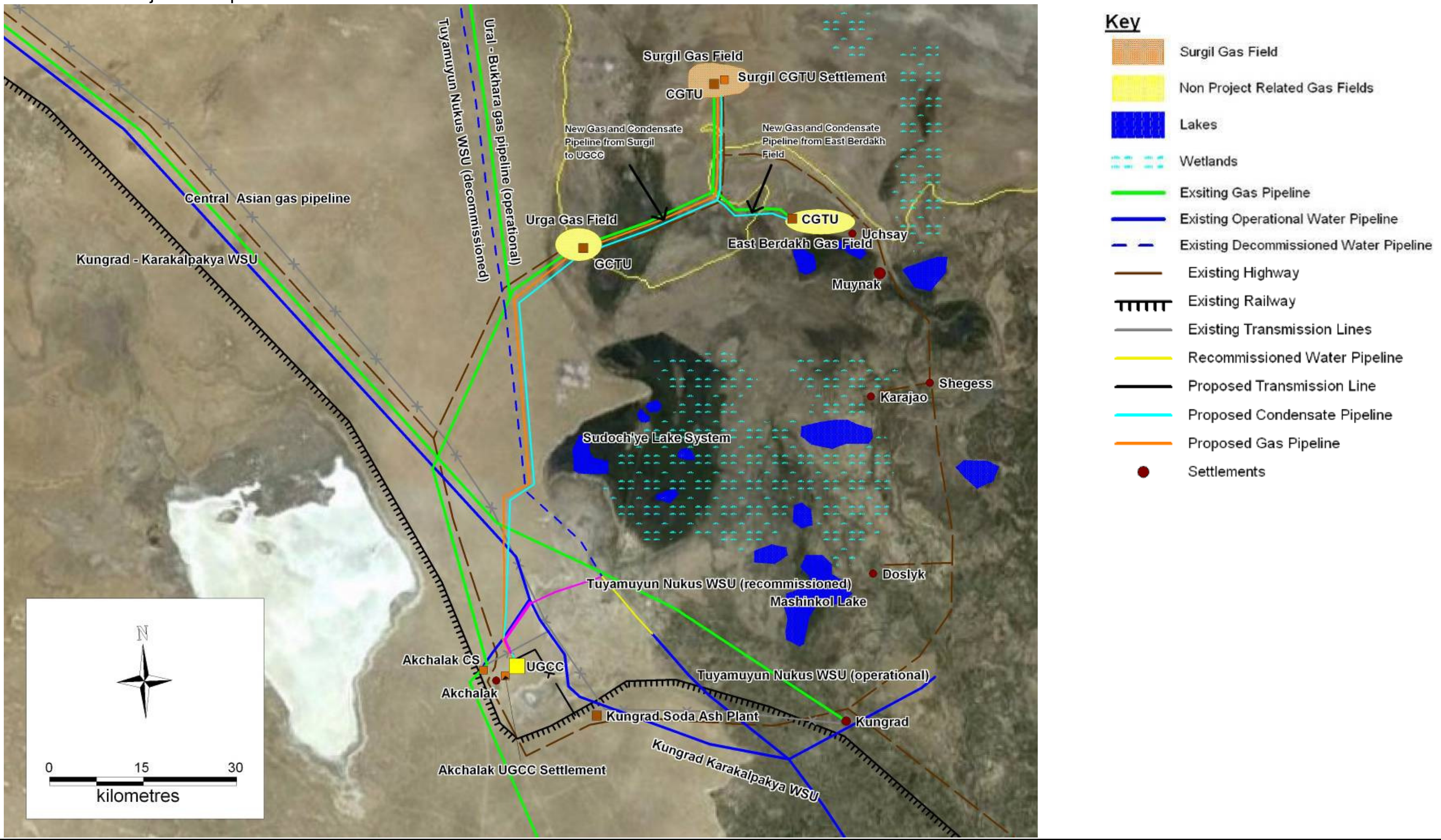
Uz-Kor is developing a petrochemical facility to utilise gas from the Surgil Field and other fields in the semi-autonomous Karakalpakstan region of the Republic of Uzbekistan for the production of industrial polymer products used in a variety of manufacturing processes.

The Project will comprise of three main components:

- **Upstream** - Drilling and development of gas production wells and associated production infrastructure at the Surgil Field including expansion of the existing complex gas treatment unit (CGTU) for the removal of hydrocarbon condensate and water from the gas.
- **Pipelines** - Construction and operation of below ground gas and condensate pipelines to connect the Surgil Field to the new Ustyurt Gas Chemical Complex (UGCC). Further connecting pipelines will be constructed to two other gas fields within the Aral Sea Basin, the East and North Berdakh Gas Fields.
- **Downstream** - Construction and operation of the UGCC and associated infrastructure (i.e. workers camp, rail connection, road connection, raw water supply line connection, sales gas line, wastewater line and electrical power line connection, etc.).

The above Project components have been assessed within the ESIA and are illustrated in Figure 2.1.

Figure 2.1: Main Project Components



Source: JV Uz-KorGasChemical LLC

2.2 Non-Project Components

The Project will also receive gas and condensate from the East and North Berdakh fields, located approximately 25 km from the Surgil Field. The East Berdakh field is currently in development and operation under UG ownership and is already commercially exporting sales gas and condensate from a fully developed CGTU. The North Berdakh Field is also scheduled for future exploitation by UG with or without the Surgil Project and will utilise the current CGTU infrastructure at the East Berdakh field. Both East and North Berdakh fields will remain under the ownership and responsibility of UG following the realisation of the Surgil Project.

The East and North Berdakh fields will be connected to the UGCC via new gas and condensate pipelines. However as development and operation of these fields is not dependent upon realisation of the Project, they are not classified as associated projects to the Project under the definition of associated projects in IFC Performance Standard 1. Only the new gas and condensate pipelines connecting the Berdakh Fields are being developed specifically as part of the Surgil Project and are therefore the only elements of the Berdakh Fields development that has been included for consideration in this ESIA.

Although not part of the scope of this ESIA, UNG has provided the following undertakings in relation to environmental management under the Investment Agreement/Supplemental Investment Agreement framework:

"3.11 Guarantees, Assurances and Indemnities of UNG - Environmental

3.11.1 (a) UNG undertakes to ensure that the Sharkiy Berdak Field and Shimoliy Berdak Field are operated in a manner which complies with the requirements of the Lenders including the Equator Principles, the OECD Environmental Guidelines, the ESAP and other environmental and social requirements of the Lenders."

This undertaking is considered to be in line with the draft IFC requirements influencing where possible interactions with Project product suppliers.

2.3 Project Location

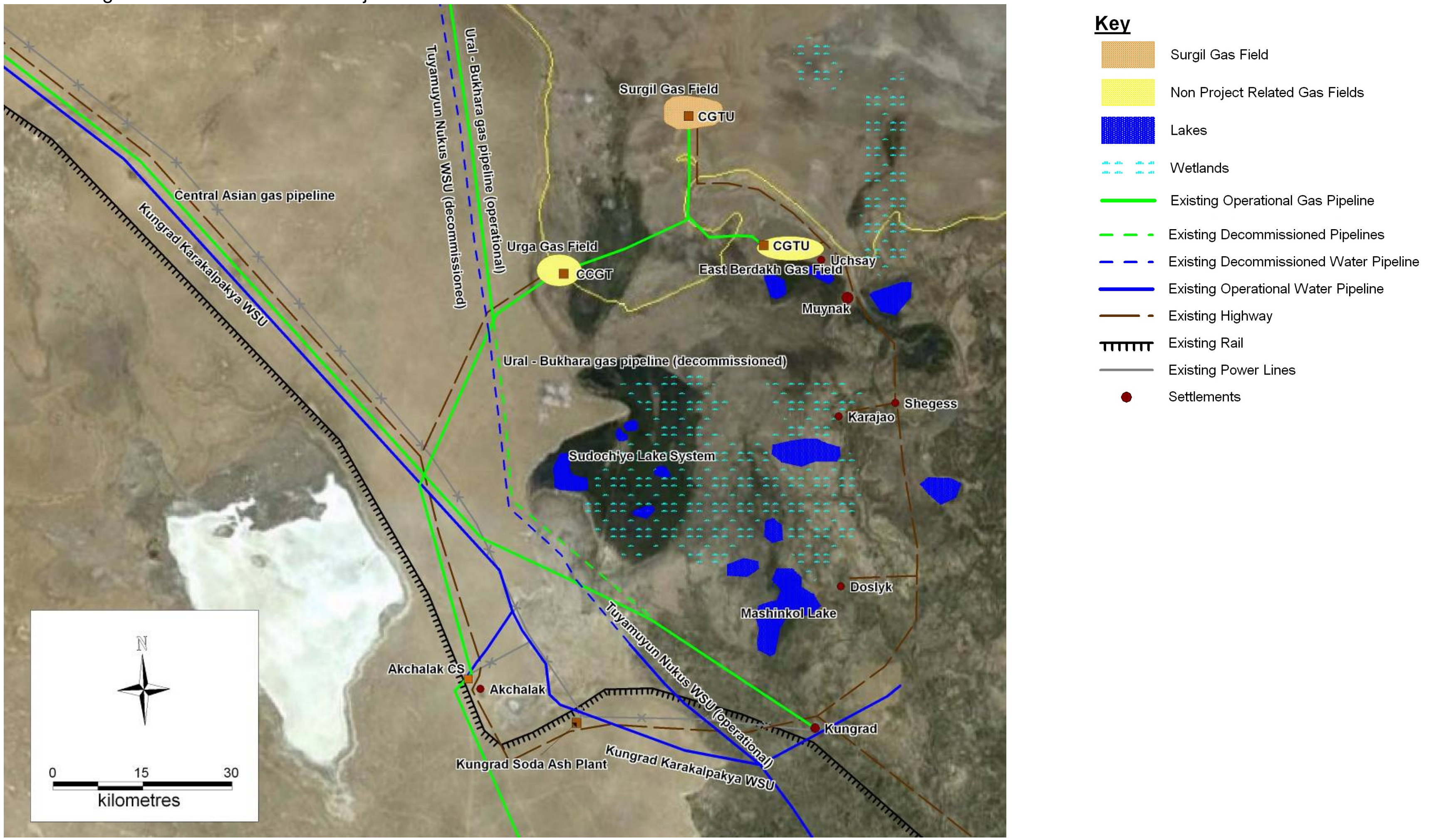
The Project is located within the Ustyurt region of the Republic of Karakalpakstan, a semi-autonomous area in the west of the Republic of Uzbekistan. Karakalpakstan borders with the Republic of Kazakhstan in the north and west, the Navoi region in the east, the Khorezm and Bukhara regions in the south-east and with Turkmenistan to the south. The location of Karakalpakstan within Uzbekistan and the wider region is illustrated within Figure 2.2.

Figure 2.2: Location of Project Within Uzbekistan

Source: Honam/Uz-Kor

The Surgil Field is located in the administrative district of Muynak. The proposed UGCC site is located in the Kungrad district. The location of key project components in relation to the wider Project area is shown in Figure 2.3.

Figure 2.3: Existing Infrastructure within the Project Area



Source: MML with Google Earth base map reproduced under licence

The northern part of the Project, comprising the upstream component of the project (Surgil Field) and the northern section of the pipeline route, is located to the south of the existing Aral Sea remnants. The Aral Sea is a landlocked basin that has reduced significantly in area and volume since the 1960s, initially as a result of poor water resource management within the former Soviet Union. The Surgil Field is located within the former footprint of the Aral Sea. The area is typically characterised by a flat, dry arid landscape and is low in vegetation cover. The plains are typically of high salinity. Further specific details are provided within the environmental baseline constituting part of the ESIA.

The nearest settlement to the Surgil Field is the small village of Uchsay, 31 km from the Surgil CGTU, with a population of approximately 1 450 people. Uchsay is the most northerly settlement within Uzbekistan and is approximately 9 km north-west of the town of Muynak.

The southern extent of the Project, comprising the UGCC and southern section of the pipeline route, is located on the Ustyurt Plateau. The Ustyurt Plateau is an area of elevated land that stretches from the Aral Sea and Amu Darya river delta in the east to the Caspian Sea in the west and spans both Uzbekistan and neighbouring Kazakhstan. In total, the plateau extends approximately 200 000 km² and has an average elevation of 150 metres. The plateau in the vicinity of the Project site consists primarily of flat, monotonous stony desert and drops sharply to the former bed of the Aral Sea, presenting a cliff-like appearance.

The nearest settlement to the UGCC site is the village of Akchalak, located approximately 5 km to the south-west with a population of approximately 950 inhabitants. Akchalak is located approximately 50 km west of the town of Kungrad.

The pipeline route area is uninhabited and completely undeveloped other than oil and gas operations. Local inhabitants of Akchalak keep livestock which is grazed on the plateau. This is small scale activity with typically a number of families combining small livestock herds with a herder hired for seasonal migration. These are generally small scale agricultural practices that have experience in traversing pipeline routes during construction and once completed.

Lake Sudoch'ye and its associated system of lakes is located approximately 30 km to the north east of the UGCC site and is the largest wetland area in the vicinity of the wider study area. The lake is located within the Amu Darya river delta, approximately 85 km to the south of the existing Aral Sea and approximately 60 km to the north-west of the town of Kungrad. The size of this lake can vary considerably depending on the level of the Amu Darya. Lake Sudoch'ye is a wetland of international importance for biodiversity and is one of the last wetlands remaining within the Amu Darya delta. The lake has been proposed for inclusion in the Ramsar List of Wetlands for International Importance.

2.4 Upstream Component - Surgil Field

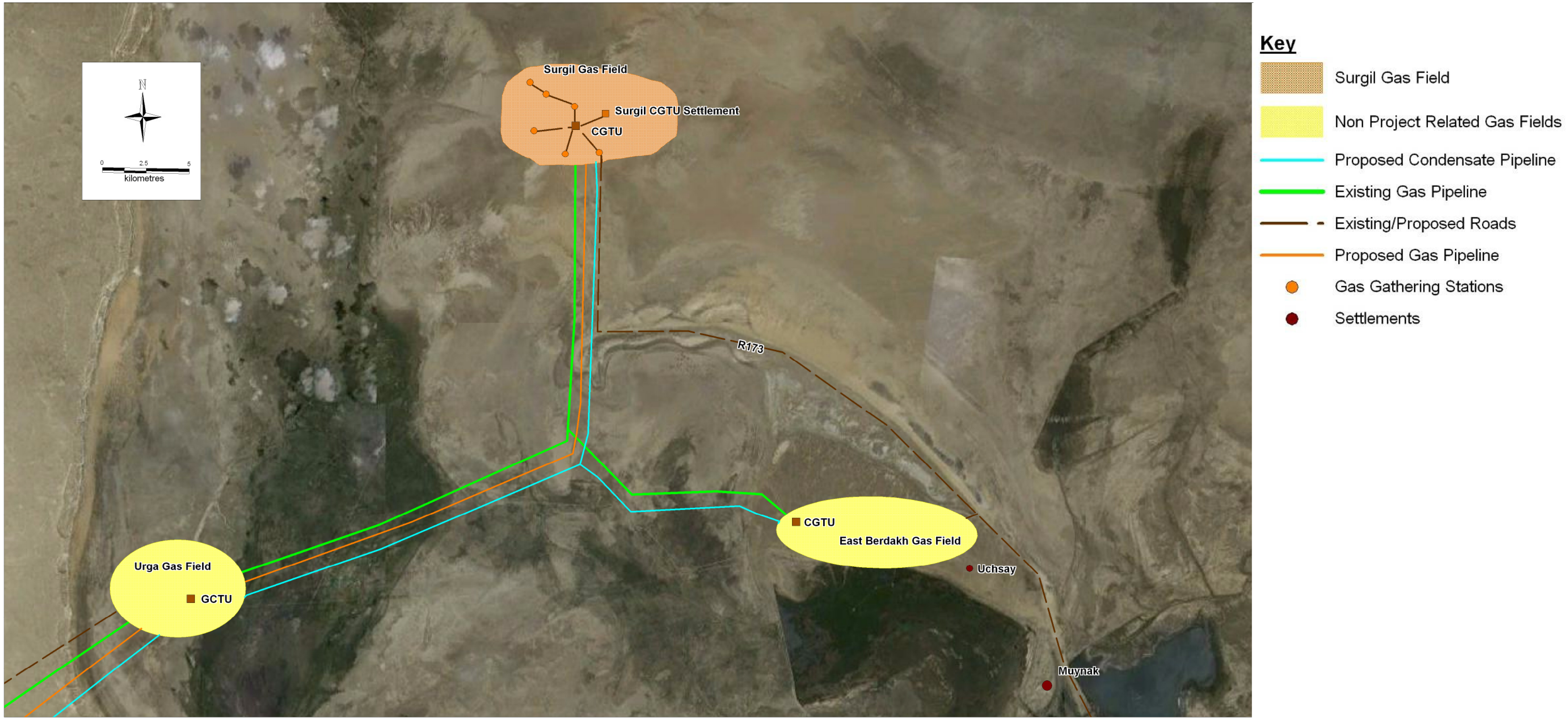
2.4.1 Overview

The Surgil Field was first identified in 1989 with exploratory drilling conducted in 1991. As a result of this drilling commercial natural gas deposits have been found in various sedimentary strata between 1 590 m and 3 006 m depth.

The development of the Surgil Field has progressed to date under the responsibility of UNG, a subsidiary of UG. The Surgil Field ownership and land allocation will transfer from UG to Uz-Kor with the realisation of the Project. Much of the Surgil Field infrastructure, including a fully operational CGTU constructed in 2007, is already in existence. At March 2011, the Surgil Field included 28 operational wells, with drilling activities being undertaken at a further 10 well sites. Gas and condensate extracted from the Surgil Field wells is transferred to the existing Surgil CGTU, either via gas gathering stations (GGSs) or routed directly to the CGTU.

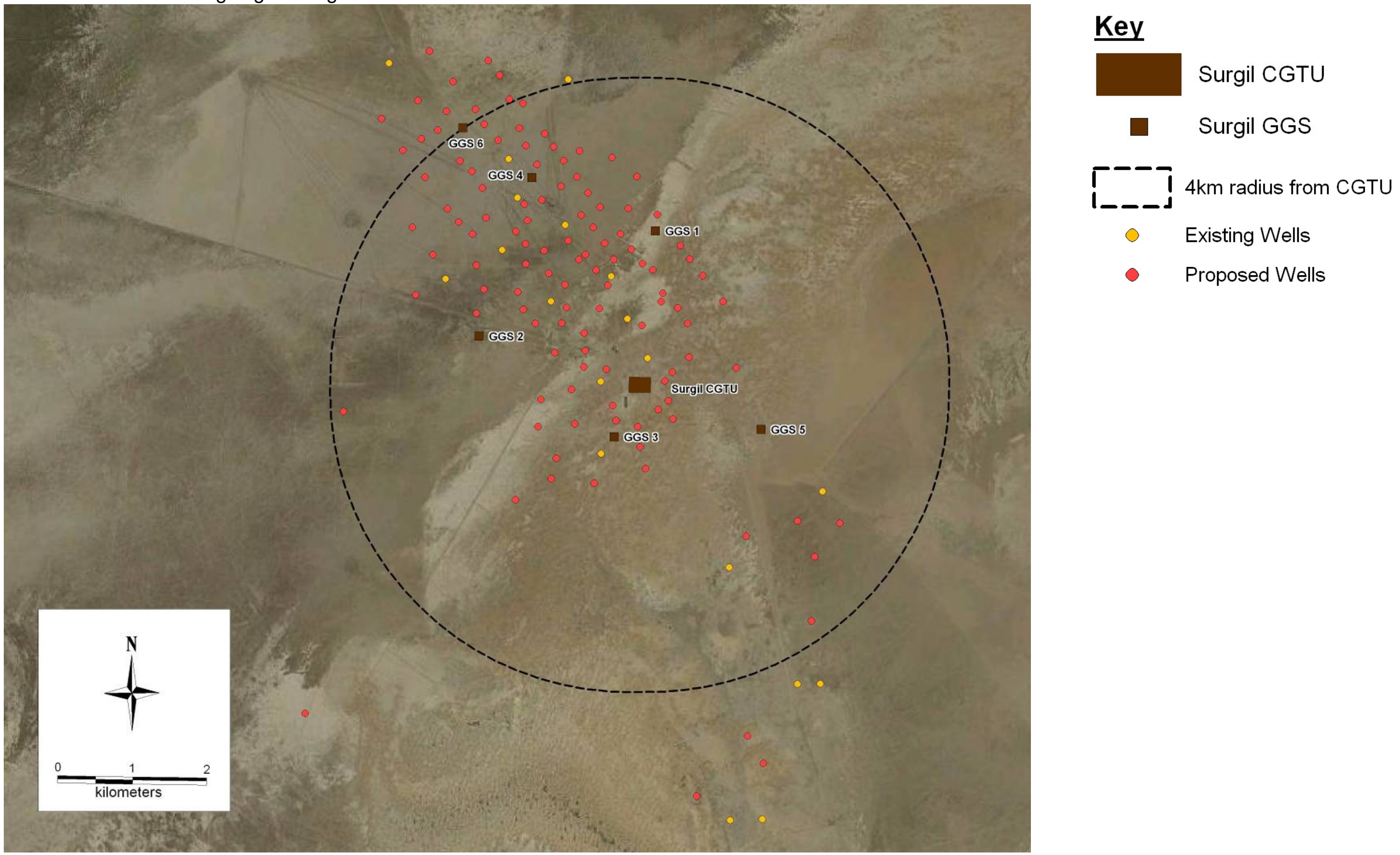
The proposed Project intends to develop the Surgil Field to an approximate total of 133 wells between 2007 and 2035, with an anticipated 50 wells drilled in the first 4 years (full breakdown shown in Table 2.2 below). Over the period of production, a total of 94.8 billion m^3 of gas and 2.3 million tons of condensate will be extracted. Figure 2.4 presents the Surgil field in relation to the surrounding infrastructure; Figure 2.5 shows the approximate location of the gas gathering stations and the wells.

Figure 2.4: Gas wells and gas gathering infrastructure



Source: Uz-Kor / Mott MacDonald

Figure 2.5: Gas wells and gas gathering infrastructure



Source: Uz-Kor / Mott MacDonald

To support this expansion, the existing CGTU will be expanded within the existing site boundary to enable it to go from handling the current 6 million m^3 per day of gas to 9 million m^3 of gas per day (approximately 3 billion m^3 per annum). The expansion of the CGTU is planned to commence in 2013. An operational works settlement (living quarters for 72 people) to support the expansion and operation of the Surgil Field is planned for 2011.

A number of other related infrastructure and facilities will also be developed or upgraded as part of the upstream components including:
- infrastructure for water supply and discharge;
- heat and electricity supply infrastructure;
- communication lines; and
- upgrade of internal site roads within the Surgil Field.

2.4.2 Description of Key Project Components

2.4.2.1 Gas Wells

Gas wells are drilled in sequence to various geological strata using vertical drilling technique to a maximum depth of 2 950 m. The minimum distance between wells extracting from the same strata will be 500 m. For this Project mobile drilling platforms will be used. The drilling of each well will take approximately two to three months. Once a gas well has been drilled, the well is completed which includes strengthening with well casing, completion and installation of the well head.

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

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

Drilled cuttings removed from the well bore and spent drilling fluids are expected to be the largest waste streams generated during drilling activities. The WBDF are classified as of low hazard wastes (Class IV) and the NADF as moderately hazardous wastes (Class III) according to Uzbek legislation on waste categorisation. The drill cuttings and drilling fluid will be treated in drill cuttings barns where the drill cuttings will be separated from the drilling fluids to allow the drilling fluids to be recycled back to the wells. Drilling cuttings will be treated in dedicated drilling waste disposal basins lined with clay or other impermeable liner constructed near the gas wells. Drilling waste will be pumped to the basins where it will be neutralised and mixed with hardening agents such as cement or proprietary hardening agent to stabilise the drilling waste and react and encapsulate hydrocarbon contaminants. Solidified material will settle creating a solid layer that will build up over the duration of operation of the disposal basin. The treated drill cuttings will be removed to a landfill in Muynak, which is operated by the local municipality and required to comply with national Uzbek standards governing waste facilities for final disposal.

Supernatant liquid effluents from the drilling waste basins will be dosed with aluminium sulphate to clarify it prior to its use for dust suppression and other suitable uses around the well site or diversion to the wastewater evaporation pond. Drilling waste residues in the disposal basins will be capped with an impermeable layer of clay to encapsulate the contents and prevent ingress of water that may mobilise contaminants.

2.4.2.2 Gas Gathering Stations (GGSs)

Following extraction, gas and condensate are piped to the GGSs. Six GGSs are planned for the Surgil Field where gas from individual wells is collected before onward transportation via pipeline to the Surgil CGTU. A further 13 wells will be connected directly to the Surgil CGTU via pipeline. The maximum distance from GGS to CGTU is 4 km.

2.4.2.3 Complex Gas Treatment Unit (CGTU)

The gas produced will contain natural gas along with a semi-liquid hydrocarbon condensate. Natural gas processing at the CGTU consists of separating gas from liquid condensate with condensate and water vapour removed from the gas stream by a low temperature separation (LTS) process. Future expansion of the CGTU capacity will be within the current site boundary and involve the addition of a further LTS train to the existing three LTS trains allowing an increase in treatment capacity from 6 million cubic meters per day (m^3/d) to 9 million m^3/d.

The LTS process uses pressure differentials to cool the wet natural gas and separate the gas and condensate. The separated condensate will be transferred to condensate storage units from where it will be transported via a new 115 km pipeline to the downstream processing plant (UGCC). The new condensate pipeline will replace existing road tanker transfer of condensate from the CGTU to its current destination (a condensate storage area adjacent to Kyrkkyz railway station near the Akchalak settlement and UGCC site). No further condensate tanker movements will occur after 2014 following development of this Project.

Water vapour is stripped out of the wet gas/condensate using diethylene glycol (DEG), a dehydrating agent. The DEG solution bearing the water stripped out of the process is then vaporised. Water is subsequently re-condensed for disposal to evaporation ponds whilst the DEG is regenerated for re-use.

2.4.2.4 Supporting Infrastructure

Table 2.1 summarises the planned works in relation to the related facilities to support the expansion and modernisation of the CGTU.

Table 2.1: Upstream Component – Related Facilities

Related facility	Existing Status	Planned Works	Comments
Auxiliary Power	Imported via 10 kV overhead lines from electricity mains supply in Muynak.	Seven 500 KWe gas fired generators resulting in an independent power complex (typically only four generators would be in use during normal operation). It will be powered on waste gas from the degassing process that is currently flared.	This modernises the existing and planned facility in-line with international best practice guidelines which require the process to 'recycle un-reacted raw materials and by-product combustible gases for use in power generation of heat recovery'. The implementation of the gas fired generators will allow regular flaring to cease.
Potable / Process water supply	Tankered to site from Muynak (40 km distant).	Use water from two new artesian wells being developed as part of existing programmed improvement works.	On-going and expected to be complete by end of 2011 – will be located outside the existing CGTU boundary, refer to Figure 2.5.
Produced water (oily mixture)	Sent to settling tanks only prior to discharge to evaporation ponds.	New water treatment system (12 $m^{3/}$/h) including primary treatment facilities.	This has already been installed at the site although is awaiting commissioning. This will be realised with implementation of the Project.
Waste water (surface run-off, domestic)	Primary treatment.		
Produced Water	Discharged to evaporation ponds.	Discharged to waste water treatment facility and onwards to evaporation ponds	Discharges to be in accordance with IFC Standards for effluent discharge.
Flare	One flare stack currently used for continuous flaring from the degassing process of both condensate and water. The flare prevents the venting of hydrocarbons direct to atmosphere.	Maintained for abnormal operation purposes only.	Waste gases from degassing will be used for on-site electricity generation (see above). Waste gas quantities will be reduced as condensate will no longer require degassing as it will be transported unstabilised via pipeline to the UGCC.
Electricity distribution (within the field)	10 kV overhead line from Muynak to the CGTU and local distribution to currently developed wells.	10 kV overhead line to expand with field well development.	10 kV overhead line from Muynak will remain for purposes of back-up power supply with introduction of on-site power generation.
Roads	Existing (un surfaced roads) accessing current wells.	New hard surface internal roads between Surgil CGTU and GGSs. Roads from GGSs to well locations will be unpaved but gravelled to minimise erosion.	-
Camp Settlement	Camp facilities located in Uchsay near East Berdakh.	Camp settlement will be built 500 metres from the Surgil CGTU to house construction workers and then future Uz-Kor operational staff	Camp at Uchsay will not be used after construction of new camp by the Project although this camp will be maintained by UNG for the purposes of supporting operations at East and North Berdakh fields.

Related facility	Existing Status	Planned Works	Comments
Gas Booster Station	Does not exist.	Development of a single gas booster station consisting of approximately seven 6 MW compressors.	A single gas booster station may be required during the latter stages of the field development (approximately 15 years time in 2026) as gas pressure from the field reduces. It will be located near the CGTU at the Surgil Field. A potential booster compressor station development has not been quantitatively considered within this ESIA but qualitative discussion of impacts is made within relevant assessment sections.

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

2.4.3 Construction

The upstream component works are proposed to be developed under a single Engineering Procurement and Construction (EPC) contract by UNG and its subsidiary engineering and construction companies. The works under the upstream EPC contract will include all infrastructure outside the downstream UGCC boundary i.e. all gas wells, extension of CGTU, gas and condensate pipelines, the new downstream settlement, road, railway spur, etc. Uz-Kor's Project Management Group (PMG) is taking a project management and co-ordination role for the upstream components.

Construction and drilling operations for the Surgil Field and pipeline components of the Project commenced in 2007. Drilling of the gas wells will occur until 2020, with GGSs also constructed periodically throughout this period as the extent and number of wells develops. The timelines for development of the wells into production is provided in Table 2.2. It is anticipated that a maximum of five drilling rigs will be operating at any one time.

Table 2.2: Anticipated Drilling schedule for Surgil Field (2011 – 2035)

	Pre 2011	2011	2012	2013	2014	2015	2016	2017	2018	2019	Project Total
Surgil Field	28	10	12	14	14	14	14	14	8	5	133

Expansion of the CGTU is expected to commence in 2011 and be completed by 2013.

The equipment and materials for all field construction projects associated with the upstream works will be delivered to the field by road vehicles from the railway station in Kungrad town. The distance between the railway station in Kungrad and the CGTU is 195 km via road.

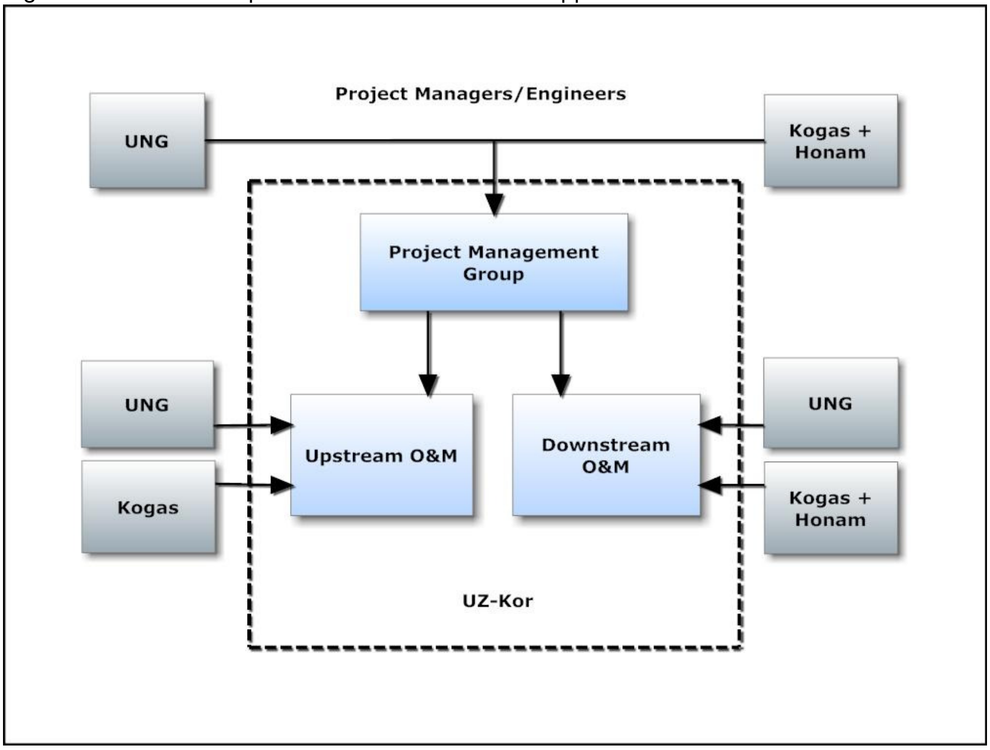
Construction and operational workers camp for the CGTU and ancillary infrastructure works will be housed in the camp settlement being developed as part of the related facilities prior to this camp being utilised for operational staff. Whilst the camp is being developed, construction and operational staff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

Separate small temporary workers camps will be provided at each well drilling site for 12 to 20 workers through out the drilling phase.

2.4.4 Operations and Maintenance

The overall operations and maintenance arrangements for the Project are illustrated in Figure 2.6.

Figure 2.6: Overall Operations and Maintenance Approach



Source: Uz-Kor

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Uz-Kor will operate and maintain the Surgil Field. It is proposed that the majority of employees will be sourced from the existing organisation or employed directly as Uz-Kor employees. It is also proposed that key operational staff will be supported by experienced employees from Honam, Kogas and UNG. A total of approximately 100 operations and maintenance staff are anticipated to be required.

Interface issues between the Upstream and Downstream elements of the Project are to be managed by the PMG, which will include the two deputy chairmen of Uz-Kor who will be in charge of Upstream and Downstream as well as both leaders of Upstream O&M and Downstream O&M.

Maintenance works, such as construction, roadways maintenance and electrical and instrumentation maintenance will be carried out by subsidiary companies of UNG. Works for the overhaul of the wells will be being carried out by Uz-Kor drilling rigs but additional contractor companies can be mobilised if required.

2.4.5 Decommissioning Philosophy

The decommissioning requirements for exploratory and/or operational wells are set out in Uzbekistan law through a number of orders including Inspection Order No. 245 issued in December 2007 for capping of well bores. All the wells in the Surgil Field will be decommissioned in accordance with Uzbek legal requirements.

A detailed well decommissioning plan will be developed by Uz-Kor taking into account all relevant site and field specific factors and will include:

- criteria for identification of wells to be decommissioned; this may include end of life or due to geological, technical or environmental issues or risks that prevent further development or operation of the well;
- decommissioning options available and setting out alternatives considered;
- details on the proposed decommissioning approach to be adopted, including materials to be used and the process for well;
- expected order of well decommissioning within a specific field or group of wells to be covered by the decommissioning plan;
- safety arrangements;
- environmental and sub-surface protection measures; and
- budget for decommissioning.

The plan must be agreed with the appropriate authority following independent expert safety and industrial review and, where appropriate, consultation with environmental protection authorities.

In general, the types of works that are expected to be undertaken as part of the permanent decommissioning process are expected to include:

- cement of wells infilling (cement bridges) to required horizon depths depending on the structure of the well followed by testing of cement bridge using hydraulic pressure testing to validate the seal; and
- fitting of non-corroding end cap onto the well at appropriate depth below the surface then covering with ground.

Details of the decommissioned wells are required to be lodged with the appropriate authority to maintain a record of the wells and to provide details should further works be required on the wells. A certificate of well abandonment will be issued by the authorities once they are satisfied that all works have been carried out in accordance with Uzbek requirements and the terms of the decommissioning plan. Annual monitoring of the abandoned well mouths is undertaken by the authorities and any remedial work required undertaken on the basis of the monitoring results.

In addition to well decommissioning, all above ground equipment will be removed from site. This will include the following:

- emptying of pipelines and storage tanks with the contents removed from site in a safe manner for appropriate reuse or disposal;
- removal of the production tree valves on each well;
- dismantling and removal from site of all equipment of the CGTU;
- removal of other ancillary infrastructure such as overhead power lines;
- neutralisation and cement stabilisation of any remaining drilling fluids in purpose built and lined drilling fluid disposal basins and removal of any treated supernatant water for reuse or disposal; and
- capping and sealing of all drilling fluid disposal basins with impermeable layer to prevent ingress of water.

Following decommissioning, the entire area of operations of the Surgil Field will be subject to a full ground investigation study. Any areas of contamination found would be subject to a remediation plan.

Following decommissioning the Surgil Field area will not represent a risk of pollution to future land uses, including in the event that the Aral Sea is reinstated.

2.5 Gas and Condensate Pipelines

2.5.1 Pipeline Component

2.5.1.1 Existing Pipelines

Gas from the Surgil and East Berdakh Fields is currently sent by pipeline to connect to the Ural Bukhara pipeline and the Central Asian pipeline. The Ural Bukhara pipeline was constructed in the Soviet era in the 1950s; its use has now largely been replaced by the Central Asia pipeline.

The existing gas pipelines (1 020 mm diameter) from the Surgil CGTU and East Berdakh CGTU currently run across the former Aral Sea basin, through the Urga gas field and onward to the Urga crossing. Here the pipelines traverse the Urga crossing at an existing utility crossing point and run for a further 20 km to a tie in point with the Ural Bukhara pipeline. From here a further pipeline section connects the Ural Bukhara pipeline to the Central Asian gas pipeline allowing operational flexibility for export should the need arise.

From the tie in point, the Ural Bukhara pipeline is operational in a northerly direction for the export of gas produced from the various Aral Sea fields up to Kazakhstan and onwards for export to further international markets. Gas is also transferred to the Central Asia pipeline for transmission. The Ural Bukhara pipeline south of the tie in point has been decommissioned, which reflects the reduced utilisation of the pipeline for large scale gas transmission following commissioning of the Central Asia pipeline. The pipeline from the decommissioned section has been fully removed and the ground reinstated. The original pipeline corridor is however still highly disturbed and re-growth of vegetation has been limited.

With realisation of the Project, the existing gas pipelines from the Surgil and East Berdakh fields to the Ural Bukhara pipeline will remain in operation as a back up in order to provide the flexibility of uninterrupted flow from the gas field during periods when the UGCC is unavailable due to maintenance requirements.

2.5.1.2 Proposed Pipelines

New gas and condensate pipelines will be constructed as part of the Project in order to connect the Surgil Field and the East Berdakh Field as illustrated in Figure 2.1. The key features of the new pipelines are shown in Table 2.3.

Table 2.3: Key features

Feature	Natural gas pipeline	Condensate Pipeline	Comments
Total new Length (km)	115	115	-
Construction trench width (m)	1.5	0.8	-
Distance between valve stations (km)	25-30	10	Safety valves - can be either manually or automatically commanded to close in the event of an emergency
Below ground minimum depth (m)	1.5	1.5	

Source: Uz-Kor

Based on the proposed routing approximately 61% of the pipelines are expected to be within Kungrad District and 39% within Muynak District.

The new 115 km gas pipeline (1 020 mm diameter) will connect the Surgil CGTU to the UGCC. Gas from the East Berdakh field will join the Surgil gas pipeline via a new 24 km gas pipeline that will join the Surgil pipeline approximately 21 km south of the Surgil CGTU.

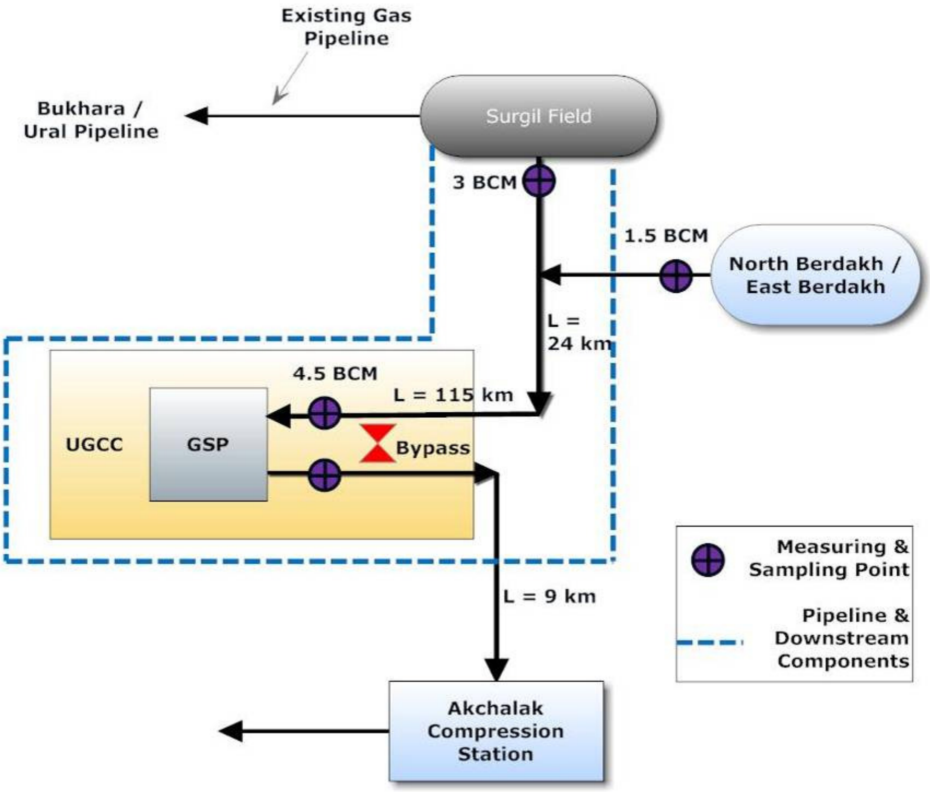
The new condensate pipeline (168 mm diameter) will be built immediately in parallel to the new gas pipeline with an equivalent new condensate pipeline also connecting the East Berdakh field to the Surgil condensate pipeline.

Both gas and condensate pipelines will run side by side, separated by a minimum distance of 28 metres, and also in parallel with the existing gas pipeline from Surgil and East Berdakh to the Ural Bukhara pipeline with a similar 28 metre separation. At the Urga crossing, the new gas and condensate pipelines will pass up the escarpment parallel to the existing Surgil and East Berdakh gas export pipelines in order to minimise the disturbance to the escarpment.

At the top of the Urga crossing of the Ustyurt Plateau escarpment, the new pipelines will continue to run parallel with the existing pipelines to the tie in point with the Ural Bukhara pipeline. At this point the new gas and condensate pipelines will be routed south for approximately 31 km following the same pipeline corridor as the former (now decommissioned) Ural Bukhara pipeline, which will minimise the requirement to disturb undeveloped land. At that point, which is within about 2 km of the top of the escarpment, the pipeline turns south west for 5 km across undeveloped ground away from the escarpment. The intention is to maintain a minimum 2 km separation between the pipelines and the edge of the escarpment along its route in order to minimise risk to the escarpment and the Sudoch'ye nature reserve at the foot of the escarpment.

The pipelines will then run south on the final 32 km part of the route to the UGCC, crossing the Central Asian pipeline after 5 km. At the UGCC, a bypass will allow gas to pass directly to the Akchalak Gas Compressor Station, and into the Central Asia pipeline should it be necessary for operational or maintenance reasons. A schematic of the pipeline system is shown in Figure 2.7 to illustrate the proposed operational arrangements.

Figure 2.7: Pipeline Arrangement – Overview



Source: Uz-Kor

2.5.2 Pipeline Component – Supporting Infrastructure

Both pipelines will have the following:

- PIG reception facilities at either end of the pipeline for pipeline maintenance activities;
- Passive protection of gas pipeline against soil corrosion provided by anti-corrosion coating;
- Protection of pipes against underground corrosion by electrochemical protection system with continuous cathodic polarisations of pipe surface;
- A 10 kV transmission line running the length of the pipeline route (115km) supported on concrete poles to provide the electrochemical protection; and
- Communication System - a fibre-optic communication system laid in parallel to the entire pipeline route. The communication network will allow automation and control of the pipeline and also facilitate communication between the UGCC and the Surgil CGTU.

2.5.3 Construction Philosophy

Uz-Kor will maintain responsibilities for overseeing the construction works but the works will actually be carried out by UNG under an EPC contract that includes for development of the CGTU as well as the pipelines. The EPC Contractor has established a “Directorate for construction of external infrastructure facilities associated with UGCC and development of Surgil Field” whose responsibilities will include:

- Managing of works being carried out by contractors: in relation to drilling and development of the Surgil Field wells;
- Managing of the construction process for the gas pipeline, condensate pipeline and Surgil CGTU;
- Managing of the construction process external infrastructure facilities associated with UGCC;
- Managing performance quality and timely implementation of the construction works; and
- Implementation of acceptance proceedings in order to facilities maintenance.

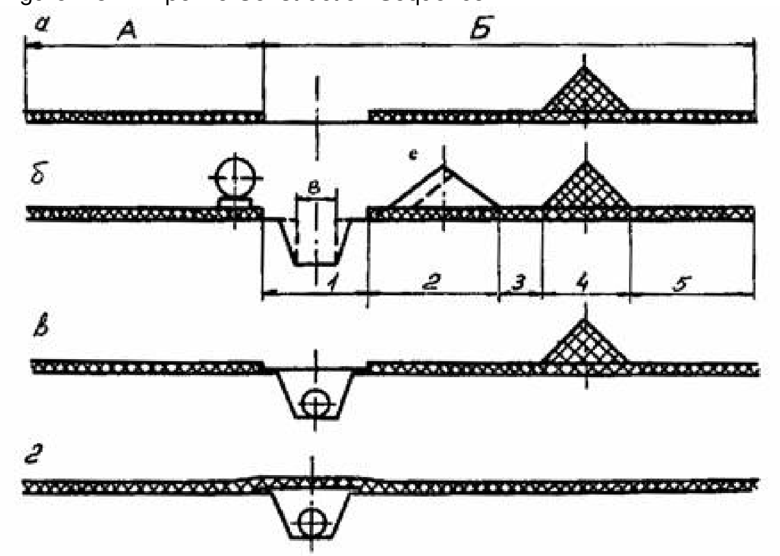
Certain engineering and design works will be undertaken for the EPC Contractor by designated Institutes as required by Uzbek law and the construction contractor for the pipelines is expected to be ‘Neftgasstroyinvest’. Construction and reinstatement will be undertaken in accordance with Uzbek requirements, including:

- Construction Codes and Regulations of Uzbekistan 3.06.08-97 – Transit Pipelines;
- Instruction for Land Reclamation after Pipelines Construction; and
- Guidelines for Reinstatement of Land Disturbed by Mining Operations, Exploration, Construction and Other Works.

The construction of the gas and condensate pipelines is programmed to be completed over a 12 month period between 2012 and 2013.

Pipelines are typically constructed in a sequential process as shown in Figure 2.8. Variations to the working width and location of the soil stockpiles within the working width are permitted under Uzbek regulations, depending on climatic conditions, pipeline size and other site specific conditions.

Figure 2.8: Pipeline Construction Sequence



Source: BCH 179-85. Instruction for land reinstatement following pipeline laying

The first stage involves clearing a path for the pipeline of all obstructions such as vegetation. Once the path has been cleared sections of the pipe are laid out along the pipeline route and then trenches of up to 1.5 m in width and at least 2.5 m in depth are dug alongside the laid pipes. Excavated soil is stored separately, with top soil segregated into separate piles and protected to prevent degradation to ensure retention of the seed back and soil quality to allow appropriate reinstatement and re-vegetation of the pipeline construction corridor. Soil and sub-soil storage arrangement will be carried out so as to minimise the risk of erosion processes (scour, wind blow) and landslides from occurring.

The pipe sections are welded together, with a coating applied to the ends of the pipe to prevent corrosion before the pipe is then lowered into the trench. Excavated soil is back filled with top soil being replaced in order to cover the trench and to facilitate reinstatement of the land to its original land use. Typically, a working corridor of between 25 m and 50 m will be required to facilitate the construction process and temporary permissions will be required to support this work which will be the responsibility of the construction contractor to obtain. Temporary works areas will also be reinstated, including biological reinstatement if appropriate, to allow resumption of their previous land use. The permanent right of way corridor along the pipeline route is likely to be about 5 m width to allow access for maintenance and inspection. The route will be re-instated post construction with all reinstatement works completed within 12 months of completion of pipeline construction.

Once a section of the pipe has been laid between valve stations, each pipeline section will be subject to hydrostatic testing. Each section of pipeline between valve stations is tested individually. This involves flushing water along the pipeline section to ensure pipeline integrity and clean any contaminants from the inner surface of the pipeline. Water for hydrostatic testing purposes will be sourced from the groundwater boreholes at the CGTU. Typical water requirements for this purpose for each section of the gas pipeline will be approximately 24 500 m^3.

Upon completion of testing, water will be routed back to the CGTU area and stored in a water reservoir to allow some reuse for the next stage of hydrostatic testing (supplemented by borehole water as required). Chemical additives (corrosion inhibitors, oxygen scavengers, and dyes) may be added to the water to prevent internal corrosion or leaks. The final disposal route of hydrostatic testing water is currently to be confirmed but is expected to be routed to the UGCC water reservoir for evaporation. Pipeline testing will be undertaken with regard to the following standards:

- VSN 011-88 - Main Flowline Pipeline Construction Bore Cleaning and Testing;
- VSN 004-88 - Construction of line pipelines. technique and organization; and
- VSN 005-88 - Construction of Field Steel Pipelines.

There is no requirement for gas compressor stations along the pipeline route and gas will be transferred under natural pressure. However, future planned activities will potentially require a gas booster station to be included at the Surgil Field. At this stage the single gas booster station is expected to be located near the CGTU and would consist of up to seven 6 MW compressor units.

The EPC Contractor is required, under the terms of its contract, to comply with the Owner's Environmental and Social Management Plan, all applicable laws relating to the environment or social management, good industry practice with respect to environmental and social matters and all other requirements of the Lenders and the Lenders' environmental and social consultant with respect to environmental or social matters (including compliance with the Equator Principles).

2.5.4 Operation and Maintenance

Uz-Kor will operate the pipelines.

During operation the pipeline will be subject to frequent inspections (ground and aerial surveillance, and facility inspection) and periodic right of way and facility maintenance. Both pipelines will be maintained at regular intervals by use of a pipeline inspection gauge (PIG) to be sent along the pipeline length. The PIG will clear the internal surfaces of the pipeline from accumulated moisture, condensate, mechanical impurities and products of any corrosion. Slug collection facilities will be installed at the end of the pipeline (UGCC) for controlled collection and disposal of condensates and sludge. The sludge and condensate will be collected and stored in appropriate containment facilities at the UGCC waste storage area prior to being removed from site and disposed of by a licensed waste contractor to a licensed facility. It is expected that sludge and condensate wastes will not exceed 0.8 tonnes per annum. The total annual volume will however be confirmed by monitoring as part of the operational phase waste inventory.

There will be no requirement for gas compressor stations along the pipeline route as gas will be transferred under natural pressure. After approximately 15 years operation (i.e. by 2026), alteration to the Project design will result in the need for the construction of a single booster compressor station consisting of up to seven 6 MW compressor units located near the CGTU at the Surgil Field.

Production and pipeline operation is usually monitored and controlled for a central location through a supervisory control and data acquisition system (SCADA). Uz-Kor will be responsible for operation and maintenance of the pipeline.

2.5.5 Decommissioning Philosophy

Pipeline decommissioning will be undertaken at the end of the working life of the gas and condensate pipelines. The decommissioning philosophy will be wholly aligned with the construction approach outlined above, including compliance with all relevant Uzbek regulations. A detailed decommissioning plan will be prepared in advance of the decommissioning works for submission and agreement with the regulatory authorities.

All pipelines will be emptied, pigged and flushed with water prior to decommissioning to remove all pipeline contents. The water used to flush the pipes will be discharged to the UGCC wastewater treatment system to allow removal of any residual hydrocarbons.

The pipeline removal process will include reinstatement of the pipeline corridor and any temporary working areas used as part of the decommissioning works in accordance with the Uzbek requirements for pipeline reinstatement and as described under the construction section above.

2.6 Downstream Component – UGCC

2.6.1 Overview

A new processing facility, the UGCC, will be designed to receive natural gas and un-stabilised condensate via pipelines from the Surgil Field, and the North and East Berdakh Fields, and via rail from other fields, which will then be processed to form high-density polyethylene (HDPE) and polypropylene (PP). A proportion of the condensate, after being stabilised in the Gas Separation Plant (GSP), will be exported by rail to other chemical facilities in the Aral Region. Sales gas and light pyrolysis gasoline will also be final products from the UGCC for onward sale.

The UGCC is anticipated to come into operation in late 2014 / early 2015 and to process up to 3 billion cubic meters (bcm) of gas per annum from the Surgil Field and 1.5 billion m^3 per year of gas from the East and North Berdakh fields. A total of 162 000 tonnes per annum of condensate will be processed within the UGCC. As the condensate reserves in the Surgil and North and East Berdakh fields reduce over field life, it will be necessary to supplement a portion of the condensate supply to the UGCC with condensate from other fields which will be transported by rail to the UGCC.

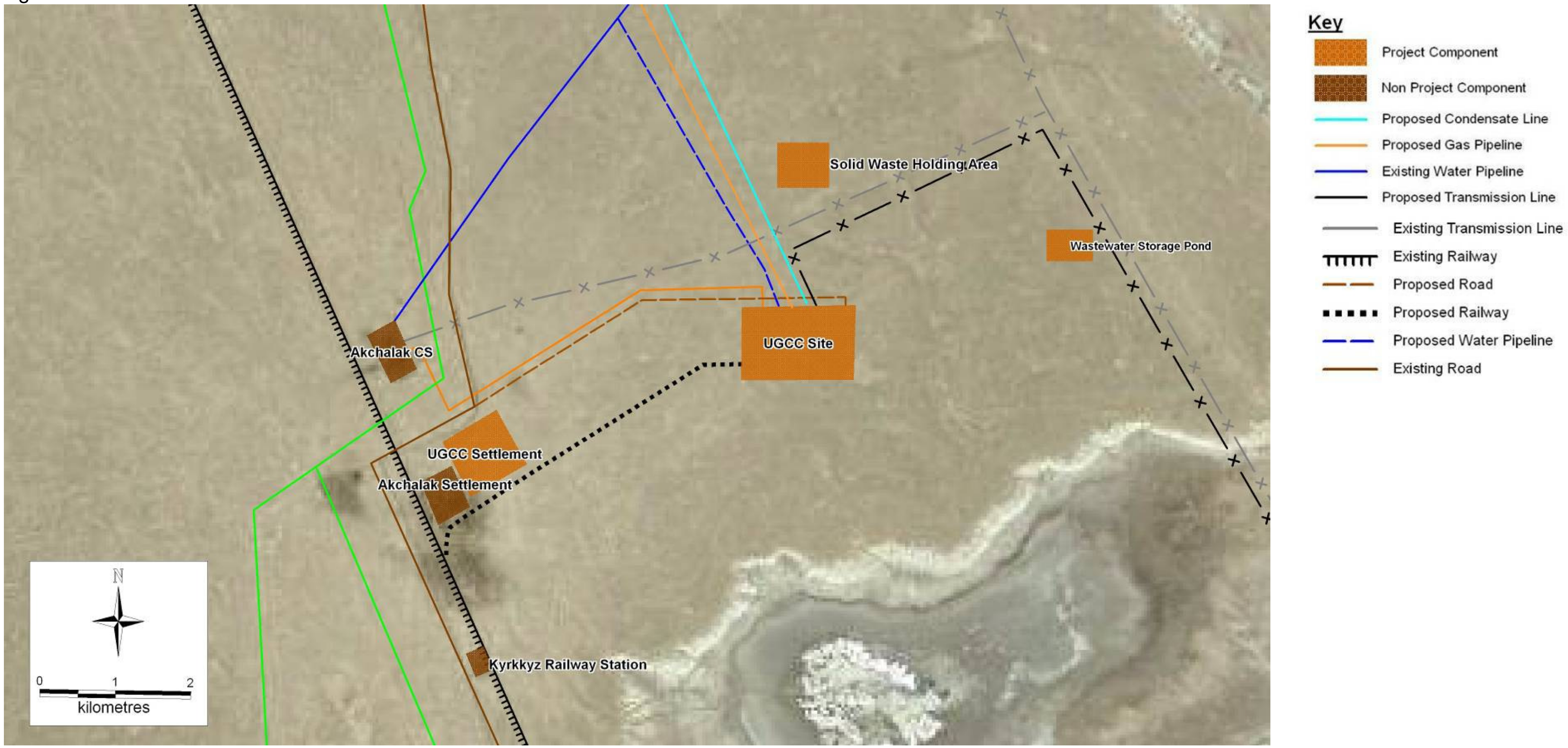
The UGCC site will be located approximately 115 km away from the Surgil Fields and occupy an area of undeveloped land located on the Ustyurt Plateau. The approximate land take of the UGCC is 1 090m x 890 m; a total of 970 100 m^2.

A number of related infrastructure and facilities will also be developed as part of the utilities and offsite facilities or external project infrastructure, including:

- Main water conduit from Kungrad - Karakalpakya water supply pipeline;
- Back-up water conduit from the Tuyamuyun - Nukus water supply pipeline;
- Wastewater treatment system and wastewater pond and pipelines for transfer of wastewater and recycled water to and from the UGCC;
- Solid and domestic waste storage area;
- Railroad approach line from Kyrkkyz station to UGCC (7km in length);
- External power supply PTL 110 kV from the Kungrad Soda Ash Plant Substation (12 km in length);
- Sales gas pipeline from UGCC to Akchalak Gas Compressor Station (9 km in length);
- Road connection to UGCC from Kungrad – Beyneu (A-380) highway (5 km in length); and
- Dwelling settlement.

The UGCC and related infrastructure is shown in Figure 2.9.

Figure 2.9: Overview of UGCC and related infrastructure



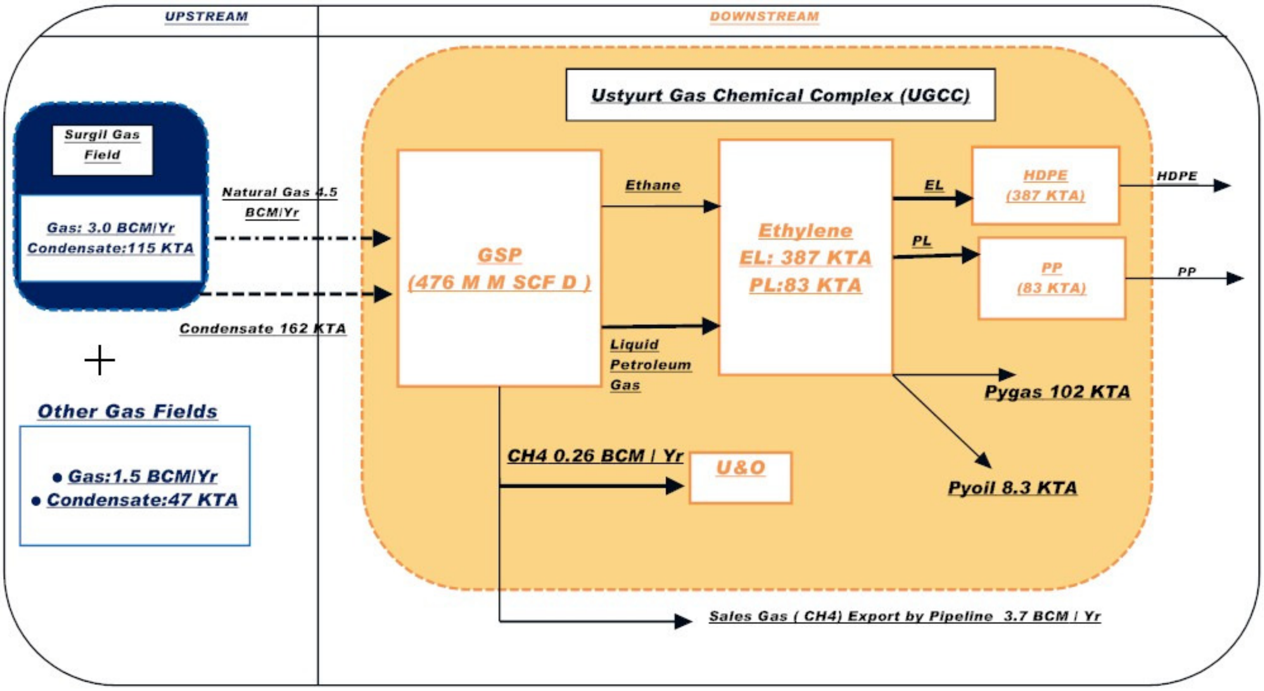
Source: MML with Google Earth basemap under license

2.6.2 UGCC

The UGCC consists of a number of process activities culminating in the production of HDPE and PP for the production of pellets. These pellets, plus any associated sales gas, will then be exported to international and national markets. The processes involved are summarised below and are illustrated in Figure 2.10;

- Gas separation plant (GSP);
- Ethylene plant;
- HDPE plant;
- PP plant; and
- Supporting utilities and offsite (U&O) infrastructure related to the above process plants.

Figure 2.10: UGCC Process Overview



Source: MM

KEY

GSP – Gas Separation Plant
EL - Ethylene
PL - Propylene
U&O – Utilities & Offsites
HDPE – High Density Polyethylene
PP - Polypropylene
bcm/yr – billion cubic metres per year
KTA – kilo tonnes per annum
MMSCFD – million standard cubic feet per minute

The production levels of the new plants of the UGCC are as follows:

- GSP: 4.5 bcm (3 345 kta) of gas and 162 000 tons per year of condensate;
- Ethylene: 387 000 tons per year of ethylene and 83 000 tons per year of propylene;
- HDPE: 387 000 tons per year (2 lines); and
- PP: 83 000 tons per year of PP.

GSP - A series of processes within the GSP will remove contaminants such as water and mercury from the feed gas prior to separation and fractionation processes which produce streams of sales gas (methane), liquid petroleum gas and ethane. Once separated from the heavy hydrocarbons, the ethane will be further treated in the Acid Gas Removal Unit to remove acid gases. The liquid petroleum gas and ethane then pass for onward processing to the ethylene plant along with a separate stabilised condensate stream. In addition to the condensate passed forward to the ethylene plant.

Ethylene - In the ethylene plant a steam cracking process is used in the production of high purity ethylene with a smaller quantity of propylene also produced. Light hydrocarbons are formed in the cracking process, further recovered as pyrolysis gasoline product. Hydrogen is also a product and remains part of the fuel gas system.

HDPE & PP - All of these products, together with butene-1, are then fed to two separate processes: the HDPE plant for the production of polyethylene pellets; and the PP plant for the production of PP pellets. HDPE is produced by catalytic polymerisation of ethylene in a plant with a guaranteed production design capacity of 48 ton/hr. A number of PP polymer products are produced from ethylene, propylene and hydrogen by a number of catalytic polymerisation processes. The PP plant is designed to produce up to 10 ton/hr of PP products. Both the HDPE and PP processes employed include a number of the techniques in-line with recommendations made in the European Union Best Available Technique Reference Note on Production of Polymers to minimize environmental impacts, specifically for the reduction of hydrocarbon emissions.

The HDPE and PP pellets, plus any associated sales gas, will be exported to international and national markets.

2.6.3 Utilities and Off-sites (U&O)

2.6.3.1 Overview

In addition to the main UGGC process plant there are a number of ancillary utilities and offsite services that support the operation of the UGGC and are set out in Table 2.4 with more detailed description of certain key facilities provided in Sections 2.6.3.2 to 2.6.3.4 below.

Table 2.4: Summary of Utilities and UGCC Supporting Facilities

Utility	Description
Raw water system	See Section 2.6.3.2.
Solid Waste Facility	See Section 2.6.3.3.
Wastewater Treatment Facility	See Section 2.6.3.4
Thermal Oxidiser	See Section 2.6.3.5
Steam Generation and Condensate Recovery Systems	Steam supply to a number of steam turbines which drive compressors and pumps, and supply steam to consumers such as reboilers and process exchangers. Condensate system will recover steam condensate during start-up, normal operation and emergency conditions for re-use in the overall process.
Boiler Feed Water System	Boiler feed water (BFW) system will consist of deaerator, BFW pumps, chemical dosing system, LP condensate drum and heat exchangers. BFW will be distributed to the cracking furnaces, HP steam boilers and waste heat recovery units.
Cooling Water System	The cooling water system will include cooling tower, cooling water basin,

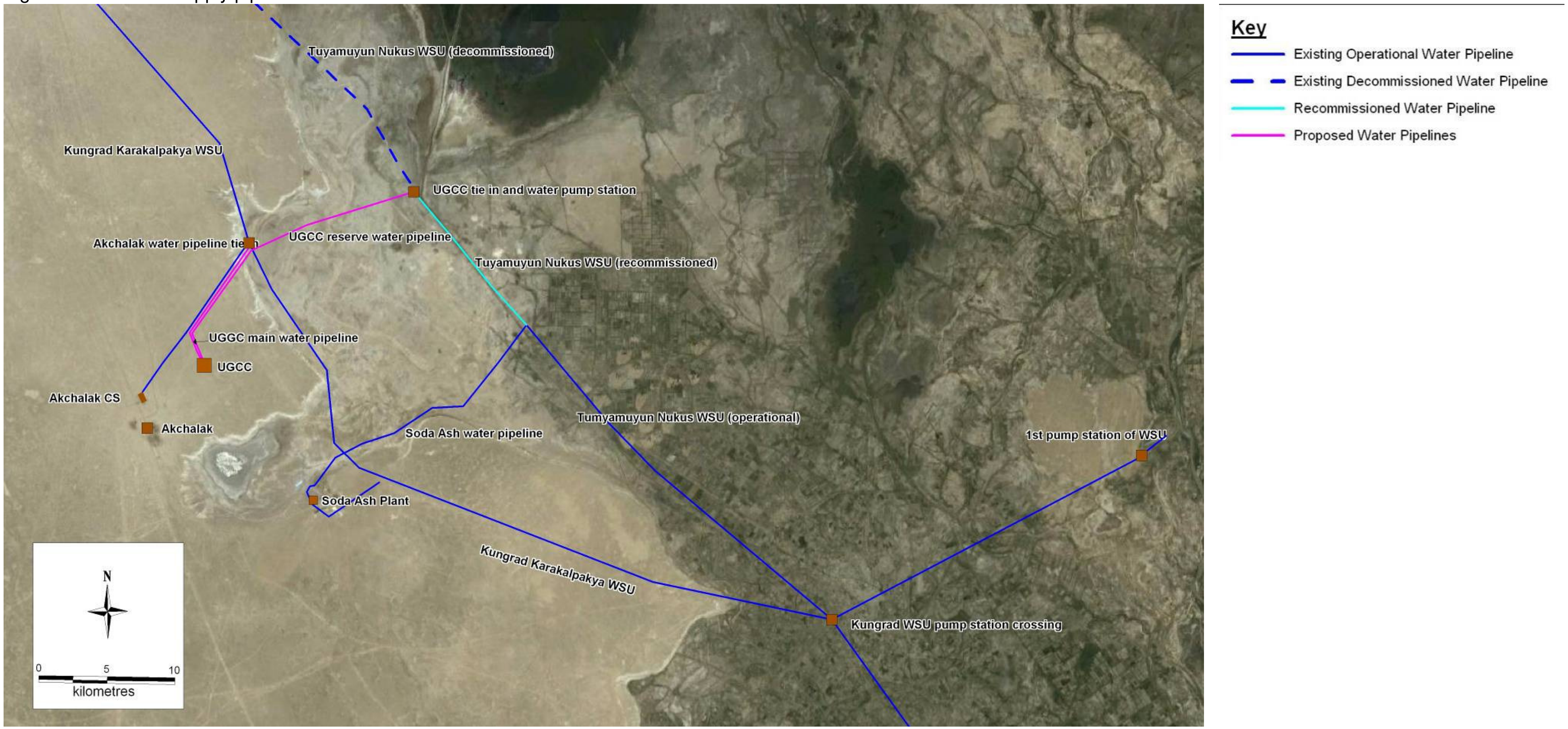
Utility	Description
	cooling water pumps, chemical dosing system and side stream filter. Heated cooling water returns from across the UGCC site are sent to the evaporative cooling towers for cool down.
Process Flare	One process flare stack is provided for cold and warm flare gas for use during abnormal operations only.
Fuel Oil and Gas System	Heavy hydrocarbon residue from the ethylene unit will be stored prior to export by rail. Sales gas will used as fuel for electrical power generation, the ethylene unit, the HP steam boilers, and the flare. Methane will be used to fire the thermal oxidiser (if required).
Electric Power Generation System	Power generator, three gas turbines (3 x 35 MWe) and waste heat recovery boilers fired on sales gas.
Raw Material Loading, Unloading and Storage	Continuous loading/unloading facilities for gasoline, ethylene, propylene and liquefied pyrolysis gas via various railway containers. Infrequent unloading facilities for other plant oil and chemical consumables.
Fuel, Intermediate and Product Storage	Fuel, intermediate and product material will be stored within a tank farm area of the UGCC. Nitrogen blanket technology will be used on all tanks to prevent hydrocarbon vapour release from tanks. Pressure control valves will operate to relieve pressure increase by releasing gas via the flare system. All tanks will be bunded to 110% of volume and appropriate drainage via the slop oil system to wastewater treatment.
Chemical Storage	Separate bunded storage tanks for 98% sulphuric acid liquid and 50% caustic liquid that will be imported via railway. Chemicals will be diluted as required for use in the UGCC processes.
Oily Water System	Waste oil and oily wastewater collection tanks with initial separation via oil separator system prior to effluent being sent to waste water treatment system.
Storage and Packing Facilities	Packing house and storage warehouse for packaging and storing HDPE and PP pellet products. The total estimated storage and packing area will be 27,000 m^2 (300 metres by 90 metres). Other buildings for logistic and delivery support included in Project.

Source: Duty Specification (U&O)

2.6.3.2 Raw Water Supply

The raw water for the UGCC will be provided by a 630 mm diameter underground pipeline spur, of approximately 12 km in length, from the existing Kungrad - Karakalpakya water supply pipeline. The tie-in point for the UGCC spur will be located between the existing tie-in points of the Akchalak Gas Compressor Station and the Kungrad Soda Plant. This spur will supply the Akchalak settlement (existing and new) as well as the UGCC. A back-up supply will also be provided from the Tuyamuyun – Nukus water supply pipeline for rare periods when the Kungrad water supply pipeline is unavailable. The water supply arrangements are illustrated in Figure 2.11.

Figure 2.11: Water supply pipelines



Source: MML with basemap under licence from Googlemaps

Water for the Kungrad - Karakalpakya water supply pipeline is abstracted from the Urgenchtransgaz (UTG)-operated Kungrad abstraction station (water supply unit – WSU), located approximately 20 km east north east of the town of Kungrad. The WSU is supplied via a channel of approximately 3.5 km length, which routes water from the main Amu Darya River located to the east. The Project will therefore not require a new abstraction point from the Amu Darya River. The Kungrad - Karakalpakya water pipeline capacity is 80 000 m^3/day, although since Uzbekistan independence and the cessation of supply of water to Kazakh gas compression stations the current usage from this pipeline has reduced to 30—35 000m^3/day.

The maximum design water demand for the UGCC is 1 470 m^3/hour (35 280 m^3/day), with the actual normal daily demand being 1 115 m^3/hour (26 760 m^3/day). This figure will, however, be significantly reduced as a result of water reuse measures that are being included in the design of the UGCC such that the water demand is predicted to be 725 m^3/hour (17 400m^3/day). Under all water demand scenarios the Kungrad - Karakalpakya water pipeline has sufficient capacity to supply the UGCC, and with water reuse the demand will utilise approximately 22% of the pipeline capacity.

The water will be transferred to an on-site raw water pond prior to treatment in a reverse osmosis (RO) plant and storage in tanks for transfer or for use on the UGCC site. Treated water uses include for cooling tower make up water, feed water for demineralised water plant, potable water, service water and firewater.

The connection to the Tuyamuyun – Nukus water supply pipeline will be via re-commissioning of a 19 km section of pipeline (still in-situ) that was installed to provide water along the length of the former Ural-Bukhara pipeline. The re-commissioned section will be from the reserve water supply point for the Kungrad Soda Plant near the Project site but never used. A pipeline spur, of approximately 20 km in length, will be constructed to tie-in with the decommissioned 19 km section of pipeline with the UGCC, with the decommissioned pipeline also being re-instated. The reinstatement of the decommissioned 19 km length of the Tuyamuyun – Nukus water supply pipeline is the responsibility of Uzkummunhizmat Agency. Water for the Tuyamuyun - Nukus water supply pipeline is abstracted from the Amu Darya River at a location upstream of the Kungrad WSU abstraction station and upstream of the offtake that feeds the Sudoch'ye Lakes.

The new water pipelines will follow the existing water pipeline route where it traverses the escarpment to the Ustyurt Plateau thereby minimising further disturbance to the escarpment.

The process water system used at the UGCC will be designed to be a closed system whereby all wastewater streams will either be recycled within the process or captured and re-routed to the waste water treatment system resulting in a zero-discharge waste water system. A wastewater retention pond of capacity of 2 million cubic metres will be used to store treated water from the wastewater treatment system to allow reuse in the process to reduce the overall water demand as noted above. The raw water abstraction requirements have been sized with this in mind.

2.6.3.3 Solid Waste Facilities

Solid waste from the UGCC will be segregated and stored in appropriate storage facilities prior to removal for reuse, recycling or disposal by appropriately licensed waste contractors. These facilities will be located at waste storage areas both inside the UGCC site boundary and at a location approximately 2 km north of the UGCC, as illustrated in Figure 2.9. Full details of the wastes and proposed management arrangements are presented in Section 10.

In general waste storage facilities will meet the following requirements:

- Waste will be stored in a manner that prevents the co-mingling or contact between incompatible wastes, and allows for inspection between containers to monitor leaks or spills;
- Waste stores will be closed containers to keep wastes away from direct sunlight, wind and rain;
- Secondary containment systems will be constructed with materials appropriate for the wastes being contained and adequate to prevent loss to the environment;
- Secondary containment will be included wherever liquid wastes are stored in volumes greater than 220 litres. The available volume of secondary containment will be at least 110 percent of the largest storage container, or 25 percent of the total storage capacity (whichever is greater), in that specific location;
- Adequate ventilation will be provided where volatile wastes are stored;
- Clear labelling and demarcation of storage areas, including provision of signs and documentation of waste storage location on a facility map or site plan for distribution and/or display for site staff; and
- Periodic inspections of waste storage areas will be carried out to identify any aspects that require maintenance or improvements.

The on-site waste storage facilities will mainly serve non-hazardous wastes, but will include for storage of waste oils. Each waste type will be stored in appropriate and segregated waste storage facilities to allow recycling and reuse where appropriate. Any hazardous waste will be stored in a separate area from non-hazardous waste. Uzbek regulations require certain materials such as scrap metals to be recycled, but there are also a range of other wastes that will also be sent to recycling facilities including paper, cardboard, waste wood, waste glass and plastics.

Gaseous and liquid residues follow the removal of solids from the Oily contaminated sludge will be disposed of in the onsite thermal oxidiser this is discussed in more detail in Section 2.6.3.5. The sludge will come from the wastewater treatment plant where it will have been subject to a neutralisation process prior to separation from the wastewater stream. Coke from process filters and columns will be stored in the waste storage area and sold for to be used in the manufacturing industry.

The offsite waste facility will predominantly be used for storage of industrial waste, which will include process wastes such as catalysts, waste activated carbon and contaminated packaging materials. These waste materials will be removed by specialist contractors for recycling or specialist disposal to facilities licensed to receive them.

2.6.3.4 Wastewater Treatment System

As noted above, all wastewater streams will either be recycled within the process or captured and re-routed to the waste water treatment system before onward discharge to a wastewater pond thereby resulting in a zero-discharge waste water system. All wastewater routed to the wastewater storage pond will be required to meet the IFC standards for wastewater disposal (the EHS Guidelines for Polymer Manufacture, 2007).

The effluents from the UGCC and their proposed treatment/disposal route will be as follows:

- Oily / solvent waste water – primary treatment through oil separators and retention basin to remove oil followed by biological treatment (aerobic biological digestion) if required in the wastewater treatment plant before discharge to wastewater storage pond;
- Non-oily waste water – routed to a retention (check) basin in the wastewater treatment plant for testing followed by biological treatment (aerobic biological digestion) if required or routed straight to wastewater storage pond;
- Blowdown water / clean storm water– routed directly to wastewater storage pond;

- Sanitary waste water – septic tank followed by biological treatment in wastewater treatment plant before discharge to wastewater storage pond;
- Contaminated storm water – routed to wastewater treatment plant for treatment before discharge to wastewater storage pond; and
- Firewater – routed to wastewater pond.

Wastewater reuse from various parts of the process including from the wastewater pond will be optimised during commissioning and early operation. At this stage it is anticipated that up to 390 m^3/hr will be recycled/reused, representing up to 35% of normal daily water demand (thereby reducing water demand from 1 115m^3/hr to 725 m^3/hr).

The wastewater pond will be fully lined, with a capacity of 2 million m^3 and an area of approximately 400 m by 600 m. The pond will be surrounded by a bund of approximately 8 m. The wastewater pond will be located approximately 2.5 km east of the Project site, as illustrated in Figure 2.9.

Reed beds will be incorporated within the wastewater storage pond effecting further treatment of wastewaters whilst maximising the opportunity for habitat creation. Wastewater will be retained for reuse within the UGCC resulting in a zero discharge design for operation of the UGCC, which is in line with the EHS General Guidelines (April 2008) which state: "*Zero discharge design/Use of treated waste water to be included in project design processes.* There will therefore be no discharge to the environment that will be required to meet Uzbek discharge standards. However, any water being directed to the pond will be treated to meet the wastewater requirements of the EHS Guidelines for Polymer Manufacture.

2.6.3.5 Thermal Oxidiser

A thermal oxidiser will be installed within the UGCC site for the destruction of excess waste volatile organic compound (VOC) gases (e.g. ethylene, propylene, butane and hexane) from various sources around the UGCC process which can not be sent to the flare in order to minimise emissions of these compounds to atmosphere. It will also oxidise the gaseous and liquid elements derived from the oily waste sludge produced by the WWTS while removing the solid fractions. The thermal oxidiser will be fuelled on methane from the U&O supply.

2.6.4 Supporting External Infrastructure

The associated infrastructure that will be developed to support the operation of the UGCC is summarised in Table 2.5 and illustrated in Figure 2.9.

Table 2.5: Overview of key features of the UGCC associated infrastructure

Infrastructure	Column
Sales Gas Pipeline	Gas pipeline for sales gas from UGCC to Akchalak Gas Compressor Station (9 km). In addition, pipeline serves as back-up gas supply to site as fuel gas for start-up of UGCC.
Roads	Access road to the UGCC site will be constructed to connect with the main road network at the existing gas compressor plant 5 km from the UGCC site. The total land take area allocated for the new road is 9 Ha.
Railway Spur	A new railway connection will spur from the Kyrkkyz Railway Station to the UGCC. The total length is 7 km. A 21 m right of way has been secured with a total land take of 14.7 Ha.
Electricity Transmission Line (incoming and export of power)	In addition to the power generation plant at the UGCC a new 110 kV power connection will be constructed from the Kungrad Soda Plant substation to a new substation at the UGCC site (~12 km). This infrastructure will be developed by Uzbekenergo who will be responsible for any environmental works required to satisfy Uzbek permitting requirements.

Infrastructure	Column
	A 10 kV connection will also run from the UGCC to the UGCC settlement. The total length of this connection is approximately 6 km. A 10 kV distribution line will also follow the pipeline route between the upstream and downstream component locations.
Downstream Settlement	A new settlement will be constructed adjacent to the existing Akchalak settlement and include construction of a range of facilities to support the new enlarged settlement including a school, health centre, shops. The appropriate area earmarked for the development of the new settlement is 1 km by 0.7 km, with a total land allocation of 85 Ha.

Source: Uz-Kor

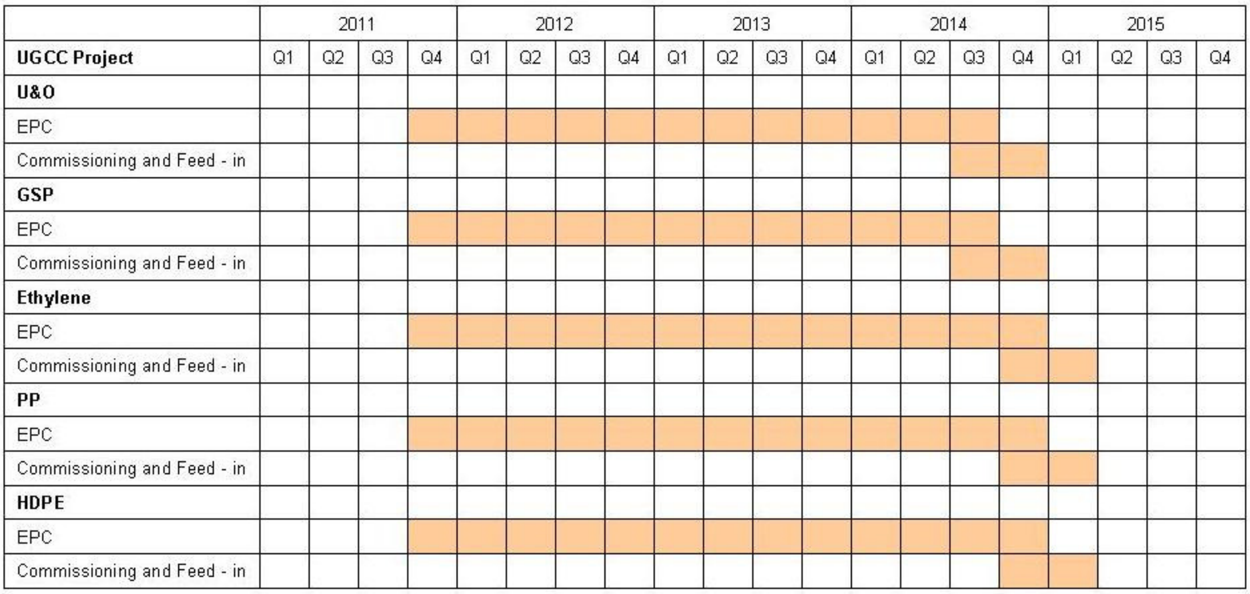
Maximum use will be made of existing utility corridors with the raw water and electricity transmission lines running in parallel with existing pipeline corridors to minimise the disturbance of undeveloped land.

2.6.5 Construction Philosophy

Construction and development of the UGCC is expected to commence in 2011. The overall schedule for construction of the UGCC component of the Project will depend on the delivery period of a number of major plant items. The total construction periods for each of the main parts of the UGCC are summarized as follows, and illustrated in Figure 2.12:

- U&O: 36 months;
- GSP: 36 months;
- Ethylene: 40 months; and
- Polymer: 40months.

Figure 2.12: Indicative Construction Timetable for UGCC



Source: MM

All construction contractors will be required to implement the following environmental, social and health and safety requirements:

- Construction contractor to provide environmental and social management and mitigation plan at least six months prior to the commencement of construction that addresses the requirements of the ESMP contained within Volume IV of this ESIA;
- All construction contractors (including sub-contractors) will be required to be ISO 14001 compliant and to be able to demonstrate that its local joint venture partners are also accredited to ISO14001 or can provide evidence of working to a formal management system; and
- The Invitation to Tender (ITT) requires that international standards for construction health, safety and environmental management are employed.

During the construction management phase there will be a dedicated full time member of the Project Management team from Uz-Kor who will oversee environmental management and monitoring and liaise with the counterparty in the EPC contractor teams.

2.6.6 Operation and Maintenance Philosophy

Uz-Kor will be responsible for the operations and maintenance (O&M) organisation for the UGCC, pipeline and Surgil Field. It is proposed that the majority of employees will be sourced from the existing organisation or employed directly as Uz-Kor employees. It is proposed that key operational staff will be supported by experienced employees from Honam, Kogas and UNG.

The UGCC will be operated and maintained by Uz-Kor with support of specialist contractors as required for certain aspects of the UGCC.

Under normal operating conditions, the UGCC will be operated at 100% of capacity with a design basis of 8 000 hours per year. It is anticipated that the UGCC will be shut down once every three years, for a period of one month, for maintenance purposes.

Under the equipment maintenance strategy, replacing, overhauling or remanufacturing of items will be undertaken at fixed intervals, regardless of plant condition at that time. This will include an established component and service database that provides the basis for a routine monitoring and maintenance (M&M) programme and leak detection and repair (LDAR) programme. Provisions will include a dedicated maintenance shop and team of 100 Uz-Kor employees. Maintenance and servicing will be undertaken continuously based upon vendor's instructions and can be accommodated under normal operation through redundancy inherent in Project design.

2.6.7 Decommissioning

As a design basis the Project life is 25 years. Upon end of life of the Project, all plant will be drained and made safe. All product will be removed from site to market.

All hazardous wastes will be removed and sent for safe disposal, either within the Project's solid waste disposal area or under license by a third party contractor. A full ground investigation, including soil and groundwater monitoring, will be undertaken in and around all Project components associated with the UGCC to identify any contamination. If contamination is identified, a remedial programme will be elaborated as part of decommissioning.

Remaining plant will be considered for re-use and recycling following dismantling. A dedicated decommissioning strategy (possibly including the preparation of an ESIA and ESMP specifically relating to decommissioning) will be developed in advance of the end of Project life.

A retrenchment strategy will be elaborated to minimise potential socio-economic consequences in the vicinity of the UGCC area associated with possible unemployment issues

3. Need for the Project and Analysis of Alternatives

3.1 Introduction

This chapter discusses the needs case and the alternative considerations that have been studied in determining the preferred Project concept, as defined in Chapter 2. Alternatives are encountered in relation to a range of Project considerations including on the basis of technical measures of effectiveness, cost and schedule, as well as environmental and social considerations.

The needs case has been reviewed in the context of economic, socio-economic and market factors in order to evaluate whether there are sufficient drivers to justify development of the Project.

Those significant alternatives considered for the Project are broadly categorised as follows, and discussed in more detail below:

- No project option;
- Location and routing alternatives for the Project components, including the gas field infrastructure, pipeline routes, UGCC and associated infrastructure;
- Options and alternatives for key technical and process aspects of the Project.

3.2 Needs Case

3.2.1 Introduction

This section presents background on the Uzbekistan economy to provide the context that the oil and gas sector has within the economic growth aims of the Uzbekistan government. It also briefly reviews the market context in relation to the products (PP and HDPE) of the Project. The socio-economic and environmental setting is presented in relation to the potential secondary and/or indirect benefits that could be realised as a result of diversifying the economic base in the region.

3.2.2 Existing Economic Focus

A dry, landlocked country, Uzbekistan's main economic focus has been in relation to cotton, where it is the world's second-largest cotton exporter and fifth largest producer. A large proportion of the country's land is intensely cultivated in irrigated river valleys to produce cotton. Uzbekistan is recognised however as having significant economic potential that has yet to be fully realized and development of this potential will be a key aspect in realising economic gains on both an individual and national basis.

Investment has the potential to improve not only economic standards, but also social and environmental standards in Uzbekistan and Karakalpakstan. It has been recognised internationally that there is need for support for projects within Uzbekistan that will lead to social and environmental enhancements. The World Bank has, in particular, supported projects aimed at improving the social wellbeing of people across the country. As an example of an International Finance Institution involvement, the World Bank's assistance has:

- helped Uzbek people gain access to higher quality drinking water;
- helped the country restore the biodiversity of the wetlands near Lake Sudoch'ye, thereby raising the water levels and increasing the incomes of the people living in its vicinity;
- contributed to changes in the quality and pricing of cotton and the development of new – albeit still limited - marketing opportunities offered to producers of cotton;

- supported the initiation of design of several projects with the potential to be financed under the Clean Development Mechanism (CDM) of the Kyoto Protocol; and
- capacity building grant in health and education in support of reforms in these sectors.

Long term environmental and social development will however need to be achieved through increasing national delivery, which would need to be supported by a corresponding increase in availability of funds at regional and national level to pay for these programmes.

Uzbekistan possesses significant energy resources in the form of oil, gas, coal and hydropower, and is understood to occupy a place in the top ten gas producers in the world. Investment by Russia, China and South Korea in Uzbekistan's gas and oil industry over recent years has offered economic diversification and growth prospects for the country. Development of these energy resources will therefore play a central role in delivering increased prosperity that will then allow social and environmental enhancements to be realised. New oil and gas fields have been identified in Karakalpakstan in recent years, which offer the potential to raise additional revenues for the region, with subsequent opportunities for the people and environment as a result of this increased economic activity.

3.2.3 Natural Gas Industry in Uzbekistan

Oil and natural gas are abundant in Uzbekistan with more than 171 currently operational oil and gas fields. In total there are 52 natural gas fields and in total Uzbekistan's natural gas reserves are estimated to be around 1.87 trillion m^3. The Uzbekistan government is promoting foreign capital to develop these industries with a view to providing a major boost to the country's economy. The oil and gas industry of Uzbekistan is a major lifeline for the country's economy and the exploration of new reserves and increase in production of oil and gas is a prime focus for the government. The discovery of major Karakalpak gas fields on the central Ustyurt Plateau and under the bed of the Aral Sea during the 1990's has led to the Uzbek Government upgrading this region to become the number one national priority for future investment in gas field development and production.

The development of the UGCC (in collaboration with the development of the Surgil Field) for the production of polyethylene and PP, coupled with other major projects in the country such as the Mubarek Gas Processing Plant and Shurtanneftegaz gas chemical works are seen as major projects by the Government. Within the context of the global economic climate it is deemed that an active policy of modernization and expansion is crucial for capacity building and raising the power and competitiveness of the national economy.

3.2.4 Socio- Economic / Environmental Context

The Aral Sea was formerly the fourth largest lake in the world with an area of 68 000 square kilometres (26 300 sq mi). However, the sea has been steadily shrinking since the 1960s after the rivers that fed it were diverted during Soviet time and latterly for irrigation projects in Uzbekistan. As a result, the region's once prosperous fishing industry has been virtually destroyed, bringing unemployment and economic hardship to the remaining communities in the area. The town of Muynak, close to the project area, was once a thriving harbour and fishing port that employed approximately 30 000 people in the industry; Muynak now lies approximately 100 km from the shore of the remaining Western Basin of the Aral Sea. The economy of the region is now largely supported by agriculture, in the form of cotton and rice.

The shrinkage of the Aral Sea basin is the most pressing environmental problem currently faced by Uzbekistan. However, together with historic agricultural practices, these aspects have combined to produce significant health implications of the local populous. Farmers in the region have for many years adopted the use of highly toxic pesticides and other harmful chemicals in order to sustain agriculture yields and as part of the husbandry requirements for cotton crops. These chemicals have ultimately accumulated within agricultural lands surrounding the former Aral Sea basin which now, through high levels of salinity, are subject to desertification. This desertification of the landscape has allowed high winds to generate toxic dust storms from former agricultural areas and which contains the remnants of these chemicals and toxic elements. These toxic components have been documented to lead to a range of chronic and acute illnesses among the local populous.

Some success has been achieved by the Kazakh authorities in stabilising and restoring the Northern part of the Aral Sea through repair of the Syr Darya irrigation works and construction of the Dike Kokaral dam. Similar ambitions for the Amu Darya basin through Uzbekistan would entail a substantial reduction in water demands for irrigation along the lower Amu Darya River, which at present is considered to be socially and politically unmanageable and unacceptable due to the reliance of the area on agriculture.

Irrigation water requirements are the determining factor for alleviating environmental pressures on the Aral Sea. In order to achieve success in reducing irrigation demands, it is necessary to increase the productivity of water, measured in tons of product per cubic meter of water. This can only be achieved with significant investment in irrigation infrastructure and the agricultural sector, which requires increased revenues from across the economy.

The exploitation of oil and gas reserves in Karakalpakstan, with associated export of product and consequential injection of funds from outside the region, has the potential to generate a major source of income for the region. This income provides a potential revenue stream for improvement into schemes designed to modernise irrigation infrastructure and agricultural practices, thus improving the overall productivity of water. Such practices would go some way to raising the overall socio-economic well-being of the region. In addition, this may result in a reduction in the amount of water diverted from the Aral Sea, possibly facilitating re-charge of the sea and partial alleviation of the acute environmental problems faced by the region.

3.2.5 Market Context

3.2.5.1 Overview

At present, Uzbekistan imports PP for use in manufacturing and produces a basic amount of its own PP. It is understood that the existing Shurtan Gas Chemical Complex currently produces up to 125 000 tonnes of polyethylene per year. As such, investments made in this Project for the production of PP and HDPE products are seen as an opportunity to replace the burden and risk associated with reliance on importation of these materials that are important inputs to a range of manufacturing processes. Moreover, significant opportunities have been identified for the sale of PP to the markets of other Commonwealth of Independent State (CIS) countries, Russia, Western Europe and China. Markets for other types of polyethylene, including low density (LDPE) and linear low density (LLDPE) are understood to be less attractive.

3.2.5.2 High Density Polyethylene (HDPE)

HDPE is a versatile polyethylene resin used in moulding applications (46% of total demand), film and sheet (25%) and piping and extrusion (13%). Global HDPE demand in 2008 was 32 million tonnes per year and is forecast to grow at 4% per year to 2032, reaching 92 million tonnes by 2032.

Approximately 13 million tonnes of new capacity is due to come on stream in 2014, 40% of which will be in the Middle East, the largest exporter of HDPE. Significant additions are expected to take place in Northeast Asia, where demand for HDPE is forecast to grow strongly at a rate of 5.9% per year to 2032. Demand in Uzbekistan is small, standing at approximately 48 000 tonnes in 2008; however, demand is forecast to grow at an average rate of 5.7% per year on the back of strong demand growth from injection and blow moulding applications.

Shurtan Gas Chemical Complex is the only HDPE producer in Uzbekistan at present and operates at production levels of approximately 125 000 tonnes per year. There are no other expansions currently planned in Uzbekistan. It is expected that the larger proportion of sales from the proposed UGCC facility will target the export markets due to the small domestic market size relative to the proposed new plant capacity. Over 35 % of the production is forecast to be sold in China and 40% to Europe in the first ten years of operation (UGCC – Feasibility study for UGCC Project in Uzbekistan, cmaiglobal, April 2009).

3.2.5.3 Polypropylene (PP)

PP has the greatest demand among all the polyolefin's[4], accounting for 40% of total global polyolefin's requirements. Injection moulding and film and sheet are the largest demand sectors, comprising 36% and 22% of the market, respectively. Global PP demand is currently 47 million tonnes and is forecast to grow at 4.2% per year to 2032.

Approximately 18 million tonnes of additional capacity is planned to come on stream by 2013, the majority of which will be in Northeast Asia and the Middle East. Demand in Uzbekistan is small at present, estimated at 7 000 tonnes in 2008; this is forecast to grow at 3.5 tonnes per year to 2032, driven by demand for injection moulding systems. There is no PP production in Uzbekistan at present and no other expansions are formally planned at this stage. The UCGG facility is expected to capture most of the domestic market; however, the majority of PP production will be sent to export markets in Europe, Turkey and China. (source: UGCC – Feasibility study for UCGG Project in Uzbekistan, cmaiglobal, April 2009).

[4] A **polyolefin** is a polymer produced from a simple olefin (also called an alkene with the general formula C_nH_{2n}) as a monomer. For example, Polypropylene is a polyolefin which is made from the olefin propylene another example would be polyethylene produced by polymerizing the olefin ethylene.

3.2.6 Conclusion

The above sections have set out the economic, socio-economic and market context for development of the Project. The Project can therefore be concluded to fulfil the following needs:

- Inward investment from outside Uzbekistan;
- Injection of revenue to the regional and national economy that will provide funds for supporting wider socio-economic development goals in areas such as agriculture;
- Increased production of plastics pre-cursors (PP and HDPE) that will reduce Uzbekistan's reliance on imports of these materials as industrial sectors that use them are developing;
- Conversion of energy resources (oil and gas) into stable product that can be readily exported into the world market to generate important export revenue;
- Addition of valuable economic activity into the Karakalpakstan region after the decimation of the fishing industry caused by the retreat of the Aral Sea;
- Diversification of the local economy from agriculture and reduction of reliance on a single economic sector; and
- Regional funds that can support improvements to irrigation system thereby increasing efficiency of water use that could ultimately assist in allowing recharge of the Aral Sea.

3.3 'No Project' Alternative

3.3.1 Environmental Perspective

The 'no project' option considers the position if the gas reserves from the Surgil Field are not used for the purposes of the Project, or for any other commercial enterprises. Under this option there would be no further exploitation of the natural gas reserves in the Surgil Field over and above that which occurs at the present time and no development of the UGCC. As such, the baseline environment would be left in its existing state.

As has been outlined in Section 3.2.4, the current environmental condition of the Surgil Field area has been significantly affected by the retreat of the Aral Sea and desertification of former agricultural areas such that it is now a degraded environment, with chemical residues in dried sediment resulting in toxic dust that also presents a health hazard to local people. The area is already developed as a consequence of the drilling operations that have been conducted in the Surgil Field since exploratory drilling operations began in 1991: the Surgil Field currently has 28 operational wells, with drilling activities being undertaken at a further 10 well sites. Undertaking no further development of gas wells in this area will not lead to any improvements or rehabilitation of the environment, which would remain in its degraded state.

The reinstatement of part or all of the Aral Sea, thereby allowing rehabilitation of the local environment, could only be achieved through significant investment in regional water management infrastructure and practices, which would require major injections of funding. Exploitation of oil and gas reserves would be a very important source of this investment. Not developing fields such as the Surgil Field would significantly reduce the regional and national ability to achieve long term environmental rehabilitation goals.

From the environmental perspective, the Project has been designed in close collaboration with environmental specialists. Design has been aligned with local, national and international standards for a Project of this type. Where significant environmental impacts have been predicted, a range of appropriate mitigation measures have been proposed. These measures will be written into Project loan documentation and also incorporated within construction and operation ESMPs covering all phases of the Project life. These requirements will be externally audited periodically on behalf of the Lenders.

3.3.2 Economic Perspective

As outlined in Section 3.2.2, economic diversification away from agriculture is seen by the Uzbekistan and Karakalpakstan Governments as important in achieving sustained economic growth, with development of energy resources being one of the most significant growth sectors. Revenues from oil and gas exploitation can be harnessed back into the Uzbek economy, allowing opportunities for investment in the agriculture sector and in particular in the highly inefficient irrigation infrastructure. Lack of diversification and continued over-reliance on agriculture, a typically water intensive industry in Karakalpakstan, will do little to either diversify or strengthen both local and national economic prospects, or indeed provide for an opportunity to increase the productivity of water. Without such economic development, and increased investment in infrastructure, it is difficult to see how significant improvements will be made in the sustainable use of water.

From the economic perspective, the Project would contribute to the strengthening and diversification of the Karakalpak economy assisting the region to combat any severe economic difficulties experienced within any one industry. The Project would also be expected to have a positive knock-on effect upon supply-chain businesses.

Together with the Shurtan Gas Chemical Complex, the Project would ensure the security of supply of HDPE and PP products within Uzbekistan and offers the potential to further establish trading relationships with key international markets.

Not developing the Project would result in the benefits noted above not being realised. Further, the capacity to supply HDPE and PP products to domestic customers may be outstripped should demand grow within Uzbekistan, at a rate predicted in other parts of the world. In this circumstance, the country would have to rely on importation, which has inherent price and supply risks.

3.3.3 Socio-economic Perspective

From a socio-economic perspective, Karakalpakstan, and the Project area in particular, suffers from high levels of unemployment and economic hardship. The town of Muynak, once a bustling fishing port of great significance to the former Soviet Union, has witnessed a rapid decline in both its economic fortunes and population since the early 1980s. The majority of the population that remain in the Project region now work in agriculture. In addition, the declining state of the environment of Karakalpakstan has had a corresponding impact upon the social wellbeing of those individuals who have elected to remain in the region following the retreat of the Aral Sea.

The Project will provide good quality direct employment and training opportunities for local people as well as stimulating secondary economic activity in the form of suppliers and other local service providers that will be supported by the increased income of people working at the Project facilities. The Project should also assist in the delivery of improved social standards for the people of the Project region. Those workers based at the permanent settlement associated with the UGCC will have access to a range of services and facilities, including hospitals, schools, emergency services and a secure and clean water supply, etc. Local settlements, such as Akchalak, will also benefit from certain shared services that the UGCC development will bring (fire fighting service, waste management, etc.). Beyond the immediate area around the Project, funds paid directly to the local district government at Muynak and Kungrad will also have additional resources to invest in socio-economic improvements, which would be unrealised without the revenue from the Project.

3.3.4 Conclusion

It can be concluded that the ‘no project’ alternative would not satisfy objectives aimed at the sustainable development of the Project region. Only with responsible and sustainable economic development of initiatives such as the proposed Project can revenues be raised that collectively address pressing issues of environmental and social concern. The ‘no project’ alternative is therefore not considered to represent the most efficient use of natural gas reserves in Karakalpakstan.

3.4 Location / Routing of the Project Components

3.4.1 Gas Field and Pipeline Routing

The geographical boundary for commercial drilling activities in the area of the Surgil Field was designated based upon the following statutes:

- the decision of the Khokim of Muynak district No. 04-94 of 6 April 2005; and
- the architectural and planning task No. 9 of 10 May 2005.

When selecting the location of exploration for hydrocarbon reserves, the Surgil Field site was selected in consideration of the following factors:

- probable reserve and historically discovered reserves;
- field remoteness from transport communications and processing centres;
- depth of occurrence of productive horizons;
- local environmental quality; and
- other factors determining labour input and material resources required for hydrocarbon exploration, mining and transportation.

It is apparent that the location of oil and gas mining enterprises are intrinsically dictated by the geographical location of the reserves. To an extent, therefore, the location of development of the supply gas field for the Project is subject to limited comparison with alternatives. Nonetheless, as witnessed in the above list, the Project proponents considered a variety of associated factors prior to electing to exploit the hydrocarbon reserves of the Surgil Field. Ultimately, the decision was made that the Surgil Field offered the optimum location for natural gas supply for the Project.

The Surgil Field and the UGCC are required to be connected by new pipelines for the transfer of gas and condensate of approximately 115 km. The land through which the pipelines will cross is undeveloped with the exception of the presence of a number of existing utility corridors that pass through the dry Aral Sea bed and Ustyurt Plateau, that includes a section that traverses the escarpment at the Urga crossing to connect these two areas. Selection of an appropriate route included maximising the use of the existing utility corridors and where the pipelines had to be routed through undisturbed land to select a route that avoided or minimised disturbance of sensitive environmental or social features.

The pipelines route will therefore track the existing gas pipeline connection of the Surgil Field to the Ural Bukhara Pipeline for 47 km, including utilising the existing Urga crossing, with construction being within the existing pipeline corridor width. The ground has already been disturbed and no sensitive environmental or social features are present within or adjacent to the pipeline corridor that would be affected by installation of the new pipelines. Utilisation of the existing Urga crossing has been selected as it will minimise the disturbance of the geological structure of the escarpment that would have been caused if a new crossing point was constructed. In order to continue to utilise existing pipeline corridors the new pipelines will be routed south for 31 km from the operational Ural Bukhara Pipeline along a decommissioned section of that pipeline. A total of 78 km of the 115 km pipeline (68%) will therefore utilise existing pipeline corridors which will significantly reduce the amount of undisturbed ground through which the pipelines will need to be constructed.

It is not possible to utilise existing utility corridors for the remaining route of the pipeline so route selection has focussed on avoidance of sensitive environmental and social features. The Ustyurt Plateau, through which the pipeline will be constructed, is in this area flat, monotonous, stony desert with limited grazing of livestock from local villages on the sparse vegetation. There are therefore no sensitive features on the Plateau that need to be avoided by the pipeline route so technical considerations such as geotechnical conditions have been the main influence on selection of the route. The main consideration for this part of the pipeline route has been to avoid potential impact on the escarpment at the edge of the Ustyurt Plateau and therefore the route has been selected to avoid the new pipelines being within 2 km of the escarpment.

3.4.2 UGCC

Two locations were considered as potential sites during site selection studies for the UGCC:

- Site A is located approximately 6 km southwest from Ravshan settlement, close to the town of Kungrad; and
- Site B is located on the Ustyurt Plateau, approximately 5 km northeast of Kyrkkyz railway station and the existing Akchalak settlement.

Site A is located approximately 100 metres to the north of the Kungrad-Beyneu railway line and 100 metres south of the road linking Ravshan to the Kungrad Soda Pant. There is also a 110 kV high voltage (HV) electricity line that runs adjacent to the site. Given proximity to road, rail and electricity supply links, site A was considered to be served well by existing infrastructure.

The water pump station serving the Kungrad Soda Plant is located approximately 500 metres northwest of the site, offering the potential to tap in to the existing water supply infrastructure. The site is also well served by existing communications infrastructure. Moreover, proximity to Ravshan and Kungrad would offer a plentiful labour supply for the construction and operational periods of the Project.

However, site A was considered to present a number of disadvantages, particularly from a geotechnical perspective; soils are sedimentary and salty, leading to destructive effects upon built materials. Moreover, groundwater depths of five metres were considered problematic for the construction phase of the plant. As a consequence, it was considered that these factors would considerably complicate preparatory construction works, resulting in an additional 30% in capital investment in comparison to site B.

Site B is located approximately 1 km northwest and 2 km northeast of an 110kV HV electricity line with a further 35kV electricity line approximately 2 km to the south of the site. As such, site B is well served by existing electricity lines. As with site A, site B is also well served by existing transport infrastructure, with an existing railroad and international highway located approximately 5 km southwest of the site.

As with Site A, water for development of Site B can be sourced from tapping into the existing water supply infrastructure with connection to the Kungrad - Karakalpakya water supply pipeline.

The land at Site B consists of flat, virgin ground, minimizing the risk of encountering contaminated or destructive soils during construction activities. However, as for the rest of the region, soils are highly saline. At 5 km distance, the closest settlement is of sufficient distance from potential construction activities to avoid adverse impacts. The site is also characterized by the absence of any notable hydrological network; the main groundwater is considered to exist at more than 50 metres depth with only limited perched water pockets at shallower depths.

Both sites met a number of the key site selection criteria including proximity to transport, water supply and electricity supply infrastructure and local labour. There were however certain factors that favoured the selection of Site B, which included:

- The land requirements for development of the UGCC plant and ancillary infrastructure are significant, with further land required for laydown areas. Site B offers sufficient land and flexibility so as to ensure that there should be no impacts upon Project schedule resulting from problems accessing equipment during construction and commissioning stages;
- The land is low relief, allowing relatively straightforward construction practice;
- Ground conditions would permit easier ground preparation resulting in significantly lower cost of construction
- Favourable groundwater depth would limit the potential for complications during plant construction;
- Proximity to the existing buried gas pipeline infrastructure (Central Asian and Bukhara-Ural) and other utilities. The connections to these utilities can largely use existing utility corridors thereby reducing the need to develop virgin ground.

Further, given the respective distances involved, it has been determined that the cost of construction of the Project pipelines between the Surgil Field and site B (115 km) would be slightly lower than the cost of constructing pipelines between the Surgil Field and site A (124 km).

As such, site B, the location near Akchalak settlement on the Ustyurt Plateau, has been selected as the favoured location for development of the UGCC.

3.5 Assessment of Technology Selection

3.5.1 Surgil Field

3.5.1.1 Gas Wells

Well design needs to take into account achieving the highest extraction level from productive horizons in a safe and reliable manner. The selection of drilling technique, well structure and well equipment (e.g. casing, flow string, etc) are therefore important factors in achieving these goals.

For the Surgil Field the nature of the geological strata and the fact that gas reserves are generally found in pockets rather than in larger volumes in specific horizons has influenced the feasible techniques that can be implemented. Vertical drilling is a well established technique with a single well being drilled to the required depths with, if appropriate, hydrocarbons being extracted at a number of different horizons over the depth of the bore. Advances in drilling techniques have however also introduced the use of horizontal (or directional) drilling whereby a horizontal bore is advanced from the base of a vertical drilling bore along a hydrocarbon reserve layer. This technique has been used in the oil and gas industry to reach hydrocarbons under ecologically-sensitive areas.

For the Surgil Field, the fractured nature of the strata and distribution of the gas reserves means that horizontal drilling is not effective in maximising the gas extraction levels. Although vertical drilling will result in a larger number of wells, the use of horizontal drilling is not considered to be feasible. Given the fact that the environment of the Surgil Field is already degraded there is also no driver for horizontal drilling on environmental grounds.

The requirements for the use of drilling rigs and drilling technology are set out in the "Safety rules in gas-and-oil producing industry of the Republic of Uzbekistan" approved by Gosgortekhnadzor of the Republic of Uzbekistan on February, 7, 2000 for the design and drilling of production wells.

3.5.1.2 Drilling Fluids and Drilling Cuttings

The primary functions of drilling fluids used in oil and gas field drilling operations include removal of drilled cuttings (rock chippings) from the wellbore and control of formation pressures. Other important functions include sealing permeable formations, maintaining wellbore stability, cooling and lubricating the drill bit, and transmitting hydraulic energy to the drilling tools and bit.

Drilled cuttings removed from the wellbore and spent drilling fluids are typically the largest waste streams generated during oil and gas drilling activities. Numerous drilling fluid systems are available, but they can generally be categorized into one of two fluid systems:

- Water-Based Drilling Fluids (WBDF): The continuous phase and suspending medium for solids (or liquid) is water or a water miscible fluid. There are many WBDF variations, including gel, salt-polymer, salt-glycol, and salt silicate fluids;
- Non-Aqueous Drilling Fluids (NADF): The continuous phase and suspending medium for solids (or liquid) is a water immiscible fluid that is oil-based, enhanced mineral oil-based, or synthetic-based.

The IFC Environmental, Health, and Safety Guidelines for Onshore Oil and Gas Development identify both types of drilling fluid as acceptable for use in well drilling. The Project will use both WBDF and NADF due to the nature of the strata and the climatic conditions at the Surgil Field. WBDF will be utilised for the first 50 metres of drilling with NADF used for all drilling below that depth.

The chosen method for disposal of the spent drill cuttings and fluids are discussed in Section 3.5.1.3.

3.5.1.3 Related Upstream Technology Selection

Chapter 2 provides a comprehensive description of the Project components and facilities. This section provides a brief summary of some key upstream project component technologies selected, expanding on any alternative options and/or reasons for their selection taking into account technical, economic and environmental, health and safety considerations.

Table 3.1: Summary of Upstream Technology Selection

Upstream Component	Selected Design / Technology	Reasoning for Technology Selection
Drill Cutting and Drilling Fluid Disposal	Drilling cuttings and spent drilling fluid will be treated by neutralisation and cementation in dedicated drilling waste disposal basins lined with clay or other impermeable liner constructed near the gas wells. The treatment process will encapsulate any hydrocarbon contaminants and create a stable solid material that will build up over the duration of operation of the disposal basin. Upon completion of the basin it will be capped with an impermeable top to prevent water ingress.	Storage in dedicated tanks or lined pits prior to treatment, recycling, and/or final treatment and disposal is recognised as suitable disposal solution in the EHS Guidelines. Alternative options to inject spent cuttings and fluids into a dedicated disposal well or into the annular space of a well has been ruled out due to economic constraints and difficulties in gaining approval under local Uzbekistan Design Codes.
CGTU Flare	One flare stack is currently used for continuous flaring from the degassing process of both condensate and water at the Surgil Field. The Project plans to recycle a flare gas for onsite generation.	Operation of flare prevents continuous venting of hydrocarbons to the atmosphere from degassing process. Implementation of improvements to flare operations has been selected so as to minimise flare volume thereby reducing emissions of greenhouse gases. Use of the captured gas for onsite generation will increase the utilisation of raw materials and reduce the requirement for use of alternative gas sources for power generation at site. This approach is in line with the EHS Guidelines which set out the objective to minimise and avoid continuous flares. The flare will be retained for emergency and abnormal operation scenarios.
CGTU Auxiliary Power	Power currently imported. Project plans to install 7 gas fired generators to be powered using waste gas from the degassing process that is currently flared.	Proven technique and provides an independent power complex onsite. Planned work to capture flare gas for onsite generation in line with the EHS Guidelines objective to minimise and avoid continuous flares. Selection of gas fired power generation utilises available waste gas stream from degassing unit and is higher efficiency, lower CO_2 emissions that use of oil fired generation. No air quality or health impacts will result from onsite generation.
CGTU Produced Water and other waste water	New waste water treatment plant installed, including primary treatment facilities. Treated effluent then discharged to cement lined evaporation pond.	Waste water treatment to the EHS Guidelines for effluent discharge to evaporation ponds. No offsite discharge from site to land/water environment. Evaporation ponds recognised as suitable disposal solution for produced water under the EHS Guidelines. The alternative options would have been treatment and disposal of effluent to ground/water environment or removal of effluent to off site disposal facility. Discharge to ground was not considered to be environmentally acceptable and removal of effluent for off-site disposal was not considered to be economic or to represent a better environmental solution.

3.5.2 UGCC

For all major process stages within the UGCC Uz-Kor has sought tenders from established global suppliers with the aim of selecting equipment and plant that is proven and is in use at similar installations around the world. This approach has been used in order to ensure the plant design is optimised for the required technical performance, local conditions and environmental, health and safety (EHS) standards.

The scale of the proposed UGCC plant is well within the commercially proven range and the technology employed at all stages of the complex is mature and well understood. This, added to the fact that the technology providers invited to tender are well established and reputable, provides confidence that the technology procurement process will deliver the required technical and EHS standards.

Chapter 2 provides a description of the Project components and facilities. This section provides a brief summary of some key UGCC project component technologies selected, expanding on the key options and/or reasons as to their selection taking into account technical, economic and environmental, health and safety considerations.

Table 3.2: Summary of UGCC Technology Selection

UGCC Component	Selected Design / Technology	Reasoning for Technology Selection
Gas Separation Plant	The GSP will be formed of a number of units for which the GSP supplier will select the most efficient and cost effective option to meet the operational and HSE performance requirements. The selected technologies will include: • molecular sieve technologies for dehydration and mercury removal process steps; • low temperature turbo-expander technology for the Ethane Recovery Unit; • acid gas removal through use of proprietary amine based solvent removal system.	The selected GSP technology supplier has been delivering gas technology to the gas processing industry for over 90 years and has extensive experience providing technologies for GSPs. Supplier experience and use of proven technology is the primary driver for selection of GSP technology. Molecular sieve technologies efficiently remove low concentrations of polar or polarizable contaminants. They are a widely used and proven technology in the industry and are selected for ability to treat the gas specification received at the GSP and treat to minimise contaminants to required levels. Low temperature turbo-expander technology is currently the most efficient process for obtaining high ethane and propane recoveries with reported benefits over other conventional technologies. The use of amine based solvent acid gas removal system is a high performance technology using solvents that was introduced more than 20 years ago with the selected supplier having over 400 units in commercial service worldwide.
Ethylene Plant	Steam cracking technology to be supplied by an international and reputable supplier selected by competitive tender.	Although various alternative options exist, steam cracking of saturated hydrocarbons (thermal pyrolysis in the presence of steam) is the primary source of olefins globally. Selection of an established and well proven technology is therefore the primary driver to selection of the proposed technology. The steam cracking technology options offered by the potential suppliers use the same basic process, and the suppliers are considered to be reputable technology providers and well suited for the Project.
HDPE Plant	Bimodal HDPE production process	The selected supplier has an extensive global technology position with its slurry-based technology for the production of HDPE. The technology is proven and has been selected for its ability to produce the HDPE products

UGCC Component	Selected Design / Technology	Reasoning for Technology Selection
		required efficiently and to the required specification. The proposed HDPE process has a total licensed capacity of over 6.0 million tons per year world wide.
PP Plant	Bulk reactor system followed by a gas phase reactor system.	The process most commonly used is either a gas phase or bulk reactor system followed by a gas phase reactor system for the sequential production of the PP product. The bulk process currently represents approximately half of global PP capacity. The supplier's process is similar to other supplier's processes with certain proprietary design aspects that provide higher efficiency, higher throughput, higher yield and lower installation costs.
Cooling System	Closed loop water cooling (evaporative cooling).	Installation of air cooling system not feasible due to climatic conditions of the project location (high summer temperature and low winter temperature) which inhibits this technology use. Evaporative cooling represents BAT for the cooling process based on efficiency requirements and minimum water use.
Waste Water Treatment	Closed circuit wastewater treatment system, including fully lined wastewater pond. All waste water streams will either be recycled within the process or captured and re-routed to the waste water treatment system resulting in a zero-discharge waste water system.	Technically proven. The waste water discharge philosophy is considered to be aligned to the EHS Guidelines that aim for zero discharge design / Use of treated waste water to be included in project design processes.
Water Supply	12 km pipeline spur from the existing Kungrad to Karakalpakya water pipeline to an on-site raw water pond. Water for this pipeline is abstracted from the Kungrad WSU – linked to the Amu Darya River.	Technically and economically viable solution tying into existing infrastructure and minimising need for extensive new infrastructure. Use of existing abstraction point means project will not require a new abstraction point from the Amu Darya River. Various water recycling opportunities included in the process design to minimise the overall water use as such aligned to the EHS Guidelines objectives to minimise water use.
Electric Power and Steam Generation	Onsite power generator, 3 gas turbines and waste heat recovery (WHRU) boilers fired on sales gas supplied from the GSP unit and / or natural gas supplied from the Project gas fields. Low pressure steam supplied primarily by turbine exhausts and extractions to maximize energy utilization. High pressure steam will be generated from the WHRU. . Low NOx technology will be used as the base case for the gas turbines.	Selected power and steam generation technology will be more energy efficient than use of separate power generation and steam raising plants. Use of sales gas as fuel will result in lower emissions than use of oil or other fossil fuels. Use of intermittent renewable generation (e.g. wind, solar) is not feasible given the need for 24 hour secure power and steam supply and use of non-intermittent renewable generation (e.g. biomass) is not feasible due to lack of available and reliable fuel source. Combined heat and power generation is considered as best available technique for gas fired generation.

4. Policy, Legal and Institutional Framework

4.1 Introduction

This section provides an overview of the relevant national and international legislation and policies applicable to the Project.

4.2 National and Regional Requirements

The following provides an overview of the basis of environmental and social policy of the Republic of Uzbekistan (RUz) including the description of the existing institutional and regulatory frameworks, the environmental policy and strategies, the national EIA procedure and the current project permitting status.

4.2.1 Institutional Framework

4.2.1.1 Powers of the State

The Republic of Uzbekistan (RUz) is an independent democratic republic based upon 1992 Constitution (as amended on 28 December 1993, 24 April 2003, 11 April 2007, and 18 April 2011). The national environmental and social policy in Uzbekistan is based on the provisions of the country's Constitution.

Under the 1992 Constitution the powers of the state are exercised in the interests of the people (Article 7). The most critical issues of the social and political life are brought up to nationwide discussion, referendum (Article 8).

Under the 1992 Constitution all RUz citizens have equal rights and freedoms and are all equal under the law without distinction as to gender, ethnicity, nationality, language, religion, social background, convictions, personal and social status (Article 18).

The Constitution defines personal rights and freedoms:
- the right to life (Article 24), the right to liberty and security (Article 25);
- the right of defence against trespass to honour and dignity, interference with privacy, family and home (Article 27), the right to free travel and movement (Article 28);
- the freedom of thought, speech and opinion (Article 29);
- the freedom of conscience (Article 31); political rights (Articles 32-35);
- economic and social rights: the right to property (Article 36);
- the right to work, to free choice of work, fair terms of work and protection against unemployment (Article 37); and
- the right to paid leave (Article 38), the right to social welfare benefits in respect of old age, disability, loss of breadwinner, and other (Article 39), the right to qualified medical service (Article 40), the right to education (Article 41), and the right to creative work and inventions (Article 42).

The Constitution also provides safeguards of human rights and freedoms proclaiming that the state secures rights and freedoms of its citizens (Article 43) and guarantees to everyone juridical protection of rights and freedoms (Article 44) when males and females enjoy equal rights (Article 46).

Specific articles that address environment protection issues within the Constitution are:

- Article 50. All citizens shall protect the environment;
- Article 51. All citizens shall be obliged to pay taxes and local fees established by law;
- Article 54. Any property shall not inflict harm to the environment; and
- Article 55. Land, subsoil, flora and fauna and other natural resources are protected by the state and considered to be resources of national wealth subject to sustainable use.

Uzbekistan is a presidential republic in which *the President* is the executive head of the state who secures efficient coordination of governmental authorities (Article 89). The President issues decrees, resolutions and ordinances which shall be binding across Uzbekistan (Article 94).

The bicameral Supreme Assembly*, or 'Oliy Majlis' (OM)*, comprising the Legislative Chamber and the Parliament, is the legislature with a power to shape laws. In line with the Constitution any law has legal effect provided it is enacted by the Legislative Chamber, approved by the Parliament and signed by the President (Article 84). OM defines the national environmental and social policies, approves national environmental programs, develops and adopts national environmental and social legislation, coordinates environmental compliance monitoring actions, defines the rates of environmental charges and establishes respective incentives, etc.

The Cabinet of Ministers (CM) is the executive with the responsibility of securing efficient functioning of the national economy, social and community services, enforcement and enacting national laws and regulations. It comprises the Prime Minister, Deputy Prime Ministers, Ministers, State Committees Chairmen and the Government Executive of the Karakalpakstan Republic (Article 98). CM exercises state control of environment protection and natural resources management along with the State Committee for Nature Protection of the Republic of Uzbekistan and the local governments. Based on its environmental and social mandate CM pursues the national environmental and social policy; regulates natural resources management; is responsible for natural resources inventory and evaluation; coordinates development and implementation of national socio-economic programmes; develops mitigation measures; establishes procedures for collecting environmental charges, pollution and waste disposal fees; sets up limits for the use of natural resources and waste disposal; develops environmental education and awareness system; identifies zones of special environmental management, environmental protection and management regimes; develops international environmental relations.[5]

The Councils of People's Deputies, or 'Kengashi', led by governors known as '*khokims'*, are the representative bodies of government authority in regions, districts, cities and towns (except for towns under regional jurisdiction and city districts). Under the Constitution they address any issues within their mandate and responsibility based on the interests of the state and its citizens (Article 99). The Kengashi are responsible for law and order; security and safety of citizens; issues of economic, social and cultural development; local budgets and taxes; local utilities; environment protection, civil registration; local standards and regulations (Article 100) and enforcement (Article 101). The term of office for both the Kengashi and the khokim is five years. The khokim is personally responsible for decisions and actions taken by Kengash while decisions of the khokim are binding to all ventures, institutions, organisations, associations as well as public officers and citizens across the respective territory (Article 104).

The environmental mandate of *regional/local government authorities* includes: identification of environmental priorities for the respective territory; approval of regional (local) environmental programs;

[5] Law No.754-XII on Nature Protection dated December 9, 1992 (as amended).

inventory and evaluation of natural resources; inventory of environmentally hazardous facilities; logistical support to environmental actions; environmental permitting; waste management; collection of environmental charges; and environmental control. [6]

The gathering of citizens ('makhalla') is an independent local form of self-government in Uzbekistan. Makhalla pursues general initiatives and actions locally, including environment-related ones. The main principles of makhalla are democracy, publicity, social justice, humanism and mutual aid. Makhalla is responsible for taking decisions on issues of local importance, including infrastructure improvement and development, arrangements for 'khashars' (voluntary unpaid work on Sunday), provision of social aid to low-income families, etc.

Settlements, kishlaks (villages) and auls (mountain villages) are governed by *aksakals (chairmen)* and their advisors who are elected by the gathering of citizens for a period of 2.5 years (Article 105).

4.2.1.2 The Karakalpakstan Republic

The RuZ Constitution defines Karakalpakstan as an independent republic constituting a part of the Republic of Uzbekistan (Article 70). The Karakalpakstan Republic has its own Karakalpak Constitution (enacted on 9 April 1993) which may not contravene the provisions of the RUz Constitution (Article 71). The law of the Republic of Uzbekistan is binding across Karakalpakstan (Article 72) while relations between the Republic of Uzbekistan and the Karakalpakstan Republic shall be governed by treaties and agreements between the two parties (Article 75).

The national institutional framework is mirrored in the Karakalpakstan Republic. Under the Karakalpak Constitution, which echoes all fundamental provisions of the RUz Constitution, *the 'Jokargy Kenes' (JK) of Karakalpakstan* – the supreme body of power in Karakalpakstan – is the legislature (Article 68) who exercises its power through JK members who are elected for a period of 5 years (Article 69). *The Chairman of Jokargy Kenes* is the highest official of the Republic of Karakalpakstan responsible for interaction between the legislature and the executive of the Republic of Karakalpakstan and elected by the JK members (Article 80). *The Presidium of Jokargy Kenes* manages the work and operation of Jokargy Kenes and is composed of the Chairman of Jokargy Kenes, his deputies, chairmen of the committees and commissions, and the party leaders in JK of Karakalpakstan (Article 84).

The Council of Ministers of Karakalpakstan – the Government of the Republic of Karakalpakstan - is the executive in Karakalpakstan (Article 86). It is formed by the Jokargy Kenes of Karakalpakstan and has responsibility of securing effective functioning of the economy, social and community services, enforcing national and local laws and regulations (Article 87). The Council of Ministers is headed by the Chairman who is appointed by JK (as advised by the JK Chairman and the President of the Republic of Uzbekistan) and who enters into the Cabinet of Ministers of the Republic of Uzbekistan (Article 88).

4.2.1.3 Environmental Regulators

The State Committee for Nature Protection (SCNP) of the Republic of Uzbekistan ('Goskompriroda') is the primary environmental regulator. The Goskompriroda reports directly to the Parliament and is responsible at national, regional (oblast) and local (district) levels for the development and enforcement of the national environmental and conservation policy, overseeing environmental compliance, the integrated

[6] Law No.754-XII on Nature Protection dated December 9, 1992 (as amended).

environmental management across various sectors, and securing healthy environment conditions across the country. The Goskompriroda mandate is set forth in the Regulation on the State Committee for Nature Protection of the Republic of Uzbekistan enacted by the Parliament in 1996.

The structure of Goskompriroda takes the form of a central body in Tashkent with regional branches and agencies providing scientific and technical support. Regional environmental authorities are structured similarly to the Goskompriroda. Karakalpakstan has its own State Committee for Nature Protection - Goskompriroda of the Karakalpakstan Republic, who is part of Goskompriroda of the Republic of Uzbekistan and reports to it. The Goskompriroda of the Karakalpakstan Republic will oversee the environmental compliance of the Project at construction and operation phases.

There are some other ministries and agencies in Uzbekistan that have responsibilities related to environment protection and control. Such responsibilities include facilitation in setting up and maintaining a robust system of state environmental control, development and implementation of environmental programmes, strategies, and action plans to address conservation and sustainability issues.

Other state bodies of the Republic of Uzbekistan dealing with environment related issues are:
- Ministry of Agriculture and Water Resources (MAWR);
- State Committee for Land Resources, Surveys, Cartography and the State Cadastre (or Goskomgeodezkadastr);
- State Committee for Geology and Mineral Resources (or Goskomgeologia)
- Centre of Hydro-meteorological Service (or Uzhydromet)
- Ministry of Health (or MHRUz);
- State Inspectorate for Exploration Supervision, Operations Safety Supervision of Industry, Mining and Utilities Sector (or Sanoatgeokontekhnazorat) and
- Ministry of Internal Affairs (or MVD).

All national ministries, state committees, inspectorates and other national institutions have their respective branches or offices operating in the Republic of Karakalpakstan that report to the central body of the respective ministry, state committee, inspectorate, etc.

4.2.2 National EIA Process

The Regulation on State Environmental Expertise (SEE), approved by Decree No.491 of the Cabinet of Ministers on 31 December 2001 and amended in 2005 and 2009, defines the legal requirements for EIA in Uzbekistan. SEE is a review process conducted by the Goskompriroda Department for SEE (‘Glavgosecoexpertiza’) at either the national or regional level, depending on the project category.

The Regulation on SEE stipulates four categories of development within the SEE context, ranging from Category 1 (High Risk) to Category 4 (Local Impact). According to the definition provided in Appendix 2 of Decree No.491, the Project is defined as Category 1 project – High Risk. The qualifying criteria within Appendix 2 are:

- 9. Extraction of fuel resources: oil, gas, coal, etc.
- 18. Oil and gas pipelines of the republican priority; and
- 19. Oil and gas processing plants.

Since the Project is categorised as High Risk, SEE procedures for this Project are undertaken at the national level.

This process of environmental impact review evaluates:

- the compliance of planned, proposed or existing projects with environmental requirements;
- the risk level associated with planned, proposed or existing projects and their possible or existing impact on the environment and public health; and
- relevance and feasibility of proposed mitigation measures aiming to protect the environment and ensure sustainable use of natural resources.

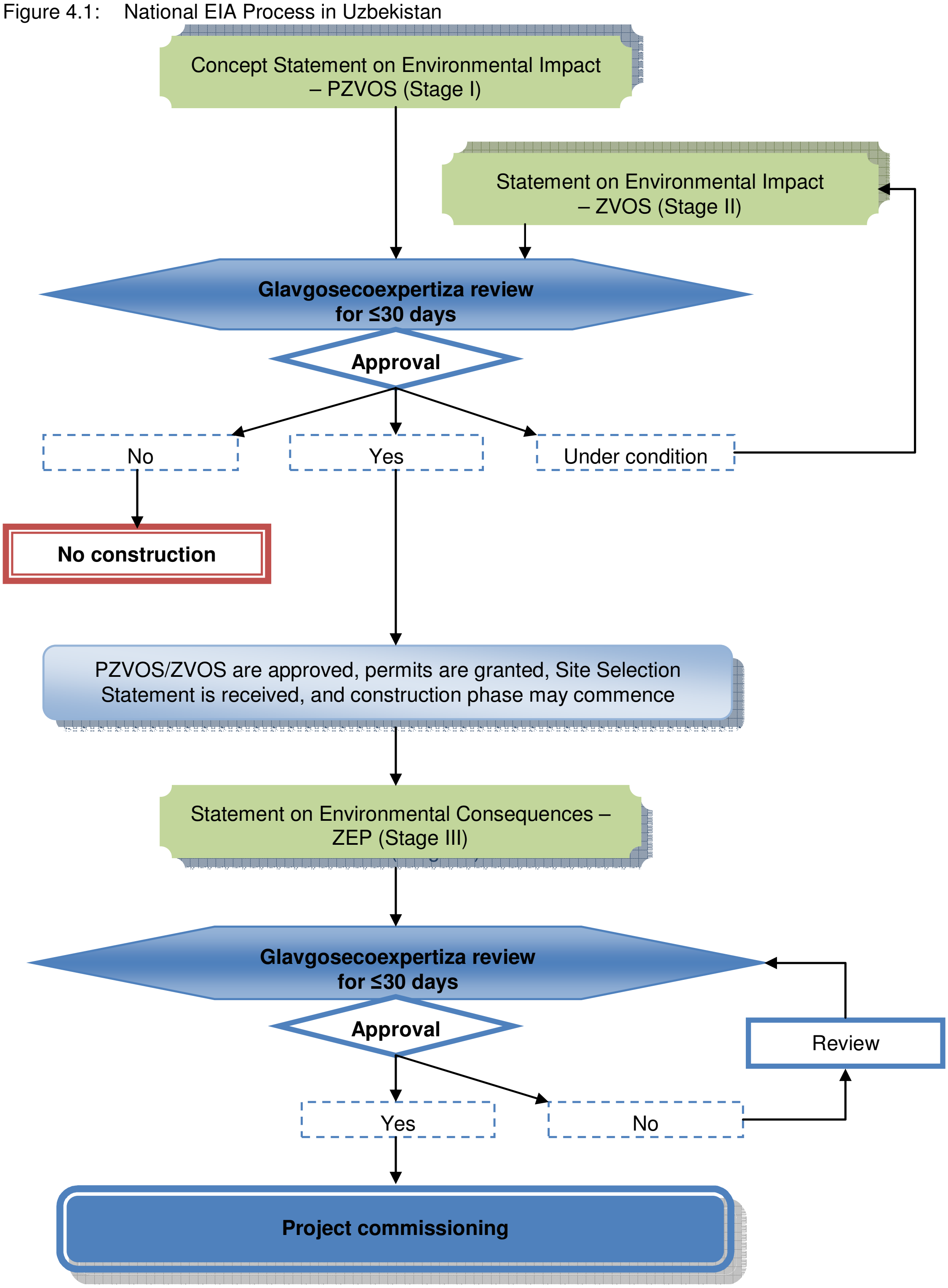
Pursuant to Section 10 of the Regulation on SEE, the developer must conduct the EIA assessment process ('OVOS' is the national acronym) in a phased approach, providing OVOS documents for review by the Glavgosecoexpertiza at three distinct stages of the Project. Section 11 of the Regulation on SEE outlines the information that should be within the documentation at each of these stages. The three OVOS stages and their required deliverables are summarised as follows:

- The 'Concept Statement on Environmental Impact' (Stage I – 'PZVOS' is the national acronym), to be conducted at the planning stage of the proposed project prior to development funds being allocated. The Concept Statement is required to provide details on environmental baseline conditions, land use, proposed construction methods, proposed technologies, plant and equipment, estimated discharges and emissions, waste management, considered alternative options, mitigation measures, health and safety risk assessment, environmental response planning and potential impacts.
- The 'Statement on Environmental Impact' (Stage II – 'ZVOS' is the national acronym), to be completed where it was identified by the Glavgosecoexpertiza at Stage I that additional investigations or analyses were necessary. The Statement must be submitted to the Glavgosecoexpertiza before approval of the project feasibility study, and therefore before construction can commence. The Statement is required to assess the environmental suitability of project sites based on the results of engineering and geological investigations, modelling or other required studies, environmental analysis of technology relating to revealed site problems, the results of public hearings (if required) and also to justify the selected mitigation measures.
- The 'Statement on Environmental Consequences' (Stage III – 'ZEP' is the national acronym) represents the final stage in the SEE process and is to be conducted before the project is commissioned. The report details the alterations to the project design which have been made in light of the Glavgosecoexpertiza review at the first two stages of the EIA process, the comments received through the public hearings, the environmental norms applicable to the project and environmental monitoring requirements associated with the project and principal conclusions.

SEE approval (Glavgosecoexpertiza opinion) is a mandatory document for project financing by Uzbek banks and other lenders (Section 18) at Stages I and II and for project commissioning at Stage III of the national EIA procedure.

An overview of the national EIA process is provided in Figure 4.1.

Figure 4.1: National EIA Process in Uzbekistan



Source: Regulation on the State Environmental Expertise in the Republic of Uzbekistan No.491 of 31.12.2001 (as amended on 05.06.2009).

4.2.3 Project Permitting Status

This section reflects the Project permitting status as at 31 May 2011.

In compliance with national EIA requirements in the Republic of Uzbekistan, a Stage I EIA was undertaken in 2006-2007 by UzLITIneftgaz. The Concept Statement on Environmental Impact was prepared within the framework of the Project Pre-feasibility Study ('PTEO' is the national acronym) and encompassed the construction of all Project components, including the Surgil Field, gas and condensate pipelines and UGCC. Stage I documentation was submitted to the SEE for review and approval in two parts:

- Part 1. Development of Surgil Field, including gas and condensate pipelines construction; and
- Part 2. Construction of the UGCC.

The Glavgosecoexpertiza reviewed Stage I documentation for Parts 1 and 2 of the Project and granted its approval No.18/38z on 16 February 2007 and No.18/56z on 23 February 2007, respectively. Stage II was deemed as not required for the Surgil Field and pipeline components of the Project (Part 1). However, the Glavgosecoexpertiza determined that a Stage II assessment was required to be undertaken for the UGCC within the framework of the Project Feasibility Study ('TEO' is the national acronym).

Stage II of the national EIA process for the UGCC was undertaken by UzLITIneftgaz and completed in 2009 when the Statement on Environmental Impact was submitted to the Glavgosecoexpertiza and received approval No.18/368z on 16 July 2009. A translation of the Glavgosecoexpertiza approvals of national EIA Stage I and Stage II documentation of the Project is provided in Appendix C, Volume III.

Stage III of the national EIA is required for all Project components and is to be undertaken and submitted to the Glavgosecoexpertiza within the framework of the detailed design documentation development before operational activities commence. This stage has yet to be completed.

Construction activities associated with the Surgil Field and pipeline components of the Project were jointly authorised along with approval of the design of the UGCC via permit PP-797 of 18 February 2008. A translation of the permit PP-797 of 18 February 2008 is provided in Appendix D, Volume III

Approval for the construction of the UGCC will be applied for upon appointment of the EPC Contractor following completion and approval of the TEO.

4.2.4 Environmental Regulatory Framework

4.2.4.1 Environmental Policy and Strategies

The major emphasis of the environmental policy of Uzbekistan is on environmental safety being regarded as a strategic component of national security, and the most important aspect of protecting the vital interests of the state, society and identity. The environmental safety policy of the country is based on the Constitution, national laws, the National Security Concept of the Republic of Uzbekistan, the principles of the Rio de Janeiro Declaration on Environment and Development and the Johannesburg Declaration on Health and Sustainable Development with due regard of national commitments under international conventions and agreements, as well as legislative experience of leading countries.

Nowadays the conservation policy of Uzbekistan backed up with mitigation and environmental management measures is based on the following principles:

- integration of the economic and environmental policy to support conservation and restoration of the environment as pre-requisite for increasing the society standard of living;
- change from protection of individual elements of nature to the overall and integrated conservation of eco-systems;
- responsibility of all members of the society for environment protection, biodiversity conservation, environmental improvement and securing healthy environmental conditions for the population.

Since the country gained independence RUz has developed over 100 laws and regulations, and revised old Soviet legislation and policies. One of the country's objectives is the transition to sustainable social and economic development. For this purpose RUz has revised and improved the national environmental legislation, enacted new environmental laws and regulations, developed programmes and action plans to address environmental issues and promoted sustainable use of natural resources.

The National Sustainable Development Strategy (NSDS) was introduced in 1997 to serve as the overarching framework for sustainable development. It functions as the basic reference document for all strategies and legislation. In theory, a strategy, plan, programme or law cannot be adopted if it is not consistent with the NSDS.

The Strategy is essentially a statement of principles to guide development in all sectors in the country. It seeks to provide a healthy life for all people by ensuring progressive and stable socio-economic growth; to promote a market economy; to integrate the economy into the world market; to stabilize the environmental situation in the country; and to maintain and improve a favourable environment, ensuring the rational use of land and water resources and the effective use of other natural resources in order to preserve them for coming generations.

In order to formulate the overall strategy for the transition of the country to sustainable development the National Environmental Action Programme (NEAP) has been developed by the Cabinet of Ministers of Uzbekistan (as advised by Goskompriroda) in 1998. The NEAP identifies environmental priorities and tools for addressing them. NEAP key targets are environmental sustainability, healthy environment to live in, and promotion of international cooperation in addressing the most critical issues, such as the Aral Sea environmental legacy.

For the purpose of meeting the long-term political goals of Uzbekistan associated with environment and health the Goskompriroda and the Ministry of Health supported by other relevant ministries and agencies and with technical assistance from the World Health Organization (WHO) has developed the National Environmental Health Action Programme of the Republic of Uzbekistan (NEHAP) in 1999. Neither the NEAP nor the NEHAP has been revised since their introduction.

With the view to implementing NEAP and NEHAP the Environmental Action Plan (EAP) for the period 1999-2005 was developed in October 1999. Only in September 2008 EAP was updated for the period 2008-2012. Key action focus is on environmental protection and safety, sustainable use of natural resources and introduction of environmentally sound techniques, enhancement of the regulatory framework, environmental education and awareness.

RUz has joined and signed a set of international conventions, protocols, agreements and memorandums addressing environmental issues (these are described in Section 1.3.6). Respective commitments of Uzbekistan define and govern to a certain extent the environmental policy and strategies of the country.

The country's commitments under the Convention on Biodiversity (1992), ratified by RUz in 1995, include the National Biodiversity Strategy and Action Plan (NBSAP) developed and approved in 1998. The purpose of the National Biodiversity Strategy is to provide the overall planning framework for the management of biological resources in the country. The National Biodiversity Action Plan, which is part of NBSAP, is linked to sectoral, intersectoral, regional and local management plans. According to NBSAP the priority (strategic) national biodiversity objectives are: improving the system of protected natural areas, public awareness and education, sustainable use and conservation of biodiversity resources and securing the vital capacity of ecosystems.

Recognizing that one of the critical factors in improving the environment and preventing environment-related problems is the environmental knowledge and awareness among the population the country developed the Program and the Concept for promoting environmental education, training and re-training in the Republic of Uzbekistan. This effort was undertaken jointly by the Goskompriroda, the Ministry of Higher and Professional Education and the Ministry of Public Education in 2005.

Currently in Uzbekistan there are 15 laws that directly regulate issues associated with environment protection and sustainable use of natural resources and more than 20 laws that specify environmental norms.

The key national environmental law is the Law on Nature Protection (1992). This law as well as other environment-related laws and regulations are described below.

4.2.4.2 Law No.754-XII on Nature Protection (1992)

The principal legal instrument regulating nature conservation is Law No.754-XII on Nature Protection dated December 9, 1992 (as amended). This Law establishes the legal, economic and institutional framework for environment protection and sustainable use of natural resources. The Law contains a series of Articles which outline specific environmental requirements.

Under Law No.754-XII, any potential impact on the environment associated with economic activities is limited by environmental norms and quality standards, guaranteeing the environmental safety of the population and restoration and protection of nature resources. Maximum allowable norms of environmental impacts are established for specific proposed developments. Developers should adopt environmental and other criteria, regulating maximum loads on the environment. Environmental norms are approved by the

Goskompriroda, the Ministry of Health of Uzbekistan (MHRUz), and the State Committee for Supervision of Industrial and Mining Safety as consistent with their responsibilities.

Table 4.1 outlines some key Articles of Law No.754-XII, and their associated requirements. Where appropriate the specific quantitative emission/discharge limits applicable to the Project from national and regional legislation are described in each specialist assessment chapter. .

Table 4.1: Significant Requirements of Law No.754-XII

Article	Requirement
14 Environmental norms and standards	Environmental impacts shall be minimised by environmental norms and standards. Any project is subject to establishing maximum allowable norms of environmental load. This is undertaken at the detailed design phase of the Project by specialist Design Institutes. In the case of the Surgil Project, these have yet to be established or approved by Goskompriroda.
18 Subsoil and mineral resources	Sustainable use of subsoil and mineral resources shall be secured during production operations while avoiding environment and subsoil pollution. Subsurface and mineral resources may be used for reclamation of land damaged during production operations. Renewable minerals must be used within the limits of their natural renewal.
19 Water and water bodies	The surface, underground and marine water resources of the Republic of Uzbekistan can be only used provided that there are sufficient water volumes in natural circulation; water purity is secured up to the standard, aquatic flora and fauna are under conservation, pollution of water bodies is avoided, ecological balance in water bodies is maintained and water bodies as landscape elements are not damaged.
20 Air	Changes in air quality, air pollution and air degradation shall be avoided to conform to established norms. In compliance with provisions of the international agreement all entities and individuals must phase out and at a later stage stop the production of ozone depleting substances.
22, 41, 45 Waste disposal; Environmental requirements to developments; Protection against contamination associated with waste	The owners of wastes have responsibility for safe disposal of waste in such a way that seeks to maximise opportunities for re-use or recycling and that is safe to the environment. Waste disposal shall logistically be arranged by local authorities. Key requirements include: • Ventures, organizations, establishments, and individuals should seek to implement waste-free and low waste technologies, reduce generation of production and consumption wastes, provide for their disposal and utilization and follow the procedures of their separation, storage, disposal and utilization. Commissioning of facilities that do not comply with these environmental requirements is forbidden. • It is forbidden to store and dispose of hazardous wastes on settlements lands, protected landscapes and recreational areas, historical sites, within water bodies, within water protection zones, in places where there is a risk to life and the health of citizens or in natural areas which are specially protected. • The disposal of wastes in the subsurface layer is permitted in exclusive cases, as justified through appropriate ground investigations. Requirements apply for the provision of health and safety of citizens and the protection of the environment. • The treatment of wastes and disposal or storage of wastes in landfills is authorised by the state bodies for nature protection.
33 Economic instruments to promote protection of the environment	The existing economic instruments include: • Resources user charges, pollution charges and other payments associated with environmental impact; • Tax differentiation and financial incentives for introduction of low-waste and resource-recovery technologies; • Taxes levied on environmentally hazardous technologies and operations; • Licenses/permits to discharge and emit pollutants or to perform other environmentally hazardous activities; • Allocation of responsibilities for the recovery of disturbed environment; • Compensative payments for the damage to the environment;

Article	Requirement
	• Deprivation of bonuses and awards for officers; • Incentive prices and mark-ups for environmentally friendly products; • Economic sanctions against natural resources users for wasting natural resources and confronting with the established norms; • Performance bonuses to groups and individual workers for promoting nature protection and manufacturing of environmentally friendly products; • Other economic incentives as identified by the national legislation and local authorities.
34 Environmental charges	• Resources user charges and pollution charges include environmental taxes and other compulsory payments associated with the use of natural resources as well as compensative pollution charges associated with emissions, discharges and waste disposal, and conservation and renewal fees imposed on users of natural resources; • Environmental tax rates and other payments associated with the use of natural resources are set in compliance with the legislation and depend on occurrence, quality, renewal capacity, accessibility, complexity, productivity, location, possibility of processing of natural resources and wastes re-use and recycling opportunities and other factors; • Rates of pollution charges associated with emissions, discharges and waste disposal are subject for approval by the Cabinet of Ministers of Uzbekistan as advised by the Goskompriroda; • Rates of conservation and renewal fees are subject for approval by the Cabinet of Ministers of Uzbekistan; • Resources user charges constitute part of the primary cost of the product (works or services); • Compensative pollution charges and charges associated with exceeded norms and non-sustainable use of natural resources are collected by levy on the user profit; • Collected resources user charges, conservation and renewal fees are transferred to the national budget; • Collected compensative pollution charges associated with emissions, discharges and waste disposal are transferred to the relevant nature conservation funds; • Paid resources user charges and compensative pollution charges does not exempt from the responsibility to undertake environmental activities and to repair the environmental damage.
35 Nature conservation funds	The Goskompriroda and its regional bodies may establish national and local nature conservation funds. The Regulation on the Nature Conservation Funds as approved by the Cabinet of Ministers of Uzbekistan details set-up and disbursement procedures. There are also Community Nature Conservation Funds that may be set up and operated as prescribed by law.
38 Emergency response and environmental hazards	Where accidents occur, an organisation should immediately initiate emergency response pursuant to the emergency response action plan with notification to respective governmental bodies, environmental authorities and emergency response organisations to mitigate environmental impacts associated with the accident.
46 Environmental certification	It is forbidden to use raw materials, implement technological processes and manufacture products without appropriate environmental or hygienic certificates or with deviation from established parameters.

4.2.4.3 Supporting National and Regional Legislation

State environmental control of issues related to the protection of soil and water, air, flora, fauna and specifically the environmental safety of the population is exercised through a range of national environmental laws and regulations.

Moreover, Karakalpakstan has developed a series of laws specific to the region. Where Karakalpakstan legislation is in force this should be considered in parallel with national legislation.

Table 4.2 contains a non-exhaustive reference list of national and regional environmental laws applicable to the Project.

Table 4.2: Supporting National and Regional Legislation

Category	Legislation
National laws	Law of the Republic of Uzbekistan on State Sanitary Supervision No.657-XII of 03.07.1992 (as amended on 03.09.2010)
	Law of the Republic of Uzbekistan on Water and Water Management No.837-XII of 06.05.1993 (as amended on 04.01.2011)
	Law of the Republic of Uzbekistan on Local Government Authorities No.913-XII of 02.09.1993 (as amended on 31.12.2008)
	Criminal Code, Section 4. Environmental Crimes, approved on 22.09.1994 (as amended on 04.01.2011)
	Code on Administrative Liability, approved on 22.09.1994 (as amended on 04.01.2011)
	Law of the Republic of Uzbekistan on Subsoil No.2018-XII of 23.09.1994 (as amended on 04.01.2011)
	Law of the Republic of Uzbekistan on Atmospheric Air Protection No.353-I of 27.12.1996 (as amended on 10.10.2006)
	Law of the Republic of Uzbekistan on Protection and Use of Flora No.543-I of 26.12.1997 (as amended on 04.01.2011)
	Law of the Republic of Uzbekistan on Protection and Use of Fauna No.545-I of 26.12.1997 (as amended on 04.01.2011)
	Land Code, approved on 30.04.1998 (as amended on 04.01.2011)
	Law of the Republic of Uzbekistan on State Land Cadastre No.666-I of 28.08.1998 (as amended on 03.12.2004)
	Law of the Republic of Uzbekistan on Forestry No.770-I of 14.04.1999 (as amended on 04.01.2011)
	Law of the Republic of Uzbekistan on the Protection of the Population and Areas against Natural and Man-Made Emergencies, No.824-I of 20.08.1999 (as amended on 17.09.2010)
	Law of the Republic of Uzbekistan on Wastes No.362-II of 05.04.2002 (as amended on 04.01.2011)
	Law of the Republic of Uzbekistan on Environmental Expertise No.73-II of 25.05.2000 (as amended on 04.01.2011)
	Law of the Republic of Uzbekistan on Radiation Safety No.120-II of 31.08.2000 (as amended on 18.12.2007)
	Law of the Republic of Uzbekistan on State Cadastres No.171-II of 15.12.2000 (as amended on 04.01.2011)
	Law of the Republic of Uzbekistan on Protected Natural Areas No.710-II of 03.12.2004
National decrees and regulations	Decree of the Cabinet of Ministers of Uzbekistan on the Red Book of the Republic of Uzbekistan No.109 of 09.03.1992
	Decree of the Cabinet of Ministers of Uzbekistan on Restricted Water Use in Uzbekistan No.385 of 03.08.1993 (as amended on 02.04.2010)
	Decree of the Supreme Council of Uzbekistan on Reinforcement of the Protection of Valuable and Endangered Species of Flora and Fauna and Harmonisation of their Use No.937- XII of 03.09.1993

Category	Legislation
	Decree of the Cabinet of Ministers of Uzbekistan on Establishing Quotes for the Calculation of Penalties for Damage Caused to Flora of Uzbekistan No.293 of 27.07.1995 (as amended on 01.04.2005)
	Decree of Oliy Majlis of Uzbekistan on Approval of the Regulations on State Committee for Nature Protection of the Republic of Uzbekistan No.232-I of 26.04.1996 (as amended on 04.01.2011)
	Decree of the Cabinet of Ministers of Uzbekistan on Approval of Regulatory Documents in Conformity with the Law of Uzbekistan on Subsoil No.19 of 13.01.1997 (as amended on 17.12.2010)
	Decree of the Cabinet of Ministers of Uzbekistan on the National Biodiversity Strategy and Action Plan of the Republic of Uzbekistan №139 of 01.04.1998 (as amended on 19.09.2000
	Decree of the Cabinet of Ministers of Uzbekistan on the National Environmental Action Program of Uzbekistan for the period 1999-2005 No.469 20.10.1999 (as amended on 14.04.2004)
	Decree of the Cabinet of Ministers of Uzbekistan on Approval of the Regulations on the State Environmental Expertise in the Republic of Uzbekistan No.491 of 31.12.2001 (as amended on 05.06.2009)
	Decree of the Cabinet of Ministers of Uzbekistan “Regulations on National Environmental Monitoring in Uzbekistan to Coordinate Monitoring Activities of Ministries and Agencies” No.111 of 03.04.2002
	Decree of the Cabinet of Ministers of Uzbekistan on Improving the System of Pollution and Waste Disposal Charges in Uzbekistan No.199 of 01.05.2003 (as amended on 02.04.2010)
	Decree of the President of Uzbekistan on Measures to Improve the Procedure for Issuing Licenses for the Use of Subsurface Resources No.PP-649 of 07.06.2007 (as amended on 23.12.2010)
	Annex No.2 to Regulation of the Cabinet of Ministers of Uzbekistan “Regulations on State Control and Supervision of Subsoil Management, Conservation, Exploration and Sustainable Use of Mineral Resources” No.19 of 13.01.1997 (as amended on 19.07.2007)
	Annex No.2 to Decree of the Cabinet of Ministers of Uzbekistan “Regulations on the Procedure for Issuing Mining Allotment Permits to Develop Deposits of Mineral Resources” No.20 of 13.01.1997 (as amended on 10.07.2004)
	Annex No.3 to Decree of the Cabinet of Ministers of Uzbekistan “Regulations on the Procedure for Issuing Mining Allotment Permits to Develop Deposits of Mineral Resources” No.20 of 13.01.1997 (as amended on 10.07.2004)
	Annex No.1 to Decree of the Cabinet of Ministers of Uzbekistan “The National Strategy for Reducing Greenhouse Gases Emissions (main provisions)” No.309 of 09.10.2000
	Annex No.2 to Decree of the Cabinet of Ministers of Uzbekistan “Measures to Implement the National Strategy for Reducing of Greenhouse Gases Emissions” No.389 of 09.10.2000
	Regulation on Measures for Ground Water Management, Enhancement of Ground Water Protection against Pollution and Depletion, enacted by Decree of the Cabinet of Ministries of the Republic of Uzbekistan No.179 of 08.04.1992
	Regulation on Water Protection Zones for Water Reservoirs and Other Waterbodies, Rivers, Main and Irrigation Canals as well as for Drinking Water and Household Water Supply Sources, and Sources of Sanatoria and Health Improving Facilities in Uzbekistan, enacted by Decree of the Cabinet of Ministers of Uzbekistan No.174 of 07.04.1992 (as amended on 24.09.2003)
	Instructions on Inventory of Pollution Sources and Rating Pollutant Emissions for Ventures in Uzbekistan, enacted by Order of the Chairman of the State Committee for Nature Protection of the Republic of Uzbekistan No.105 of 15.12.2005. Registered in the Ministry of Justice of Uzbekistan No.1533 of 15.12.2005
Environmental legislation of Karakalpakstan	Law on Nature Protection (03.03.06)
	Law on Atmospheric Air Protection (16.08.97)
	Law on Protected Natural Areas (29.08.05)
	Law on Water and Water Management (24.12.93)
	Law on Subsurface Resources (29.08.06)
	Law on Environmental Expertise (05.10.07)
	Land Code (29.08.06)

At present Uzbekistan uses a more reactive, as opposed to preventative, approach to management of environmental impacts associated with new developments. The focus of the project in exercising the preventative environmental control should be on technical measures and process solutions aimed at reducing possible environmental impacts.

4.2.4.4 Economic Instruments in Environmental Management

Economic instruments are used as supplements to the regulatory tools in Uzbekistan. These instruments apply the polluter pay principle (PPP) and user pay principle (UPP) approach. The main purpose of economic instruments is to provide a good basis for an adequate valuation of nature resources and promote their efficient and intended use.

The system of environmental charges and payments for the use of natural resources has been developing gradually. It plays a dual role: revenue-raising to finance public environmental spending and behaviour changing through creating incentives for reducing emissions, discharges and waste. First introduced in 1992, the system was revised in 1995 with the introduction of pollution charges based on gross emissions/discharges and values of disposed waste. In 2003 new changes have been introduced. Compensative pollution charges are now collected by the Goskompriroda and Nature Protection Funds, and distributed between the state budget - 60%, and Nature Protection Funds – 40%. The next step was the introduction of user charges levied on those who use water, land, forests, subsoil and other resources.

Since 1998, Uzbekistan launched a new tax system. Existing resource payments were transferred to the rank of taxes: water tax, land tax and subsoil tax. Proceeds raised are transferred to the state budget. Some non-compliance penalties like those associated with protected flora and fauna are collected by local Nature Protection Funds while few are shared between the state budget and the Nature Protection Funds at 50% by 50%.

Rates of pollution charges and environmental taxes are set by the Cabinet of Ministers. These will be applied to the project at the operational stage.

4.2.5 Social Regulatory Framework

4.2.5.1 Social Policies and Strategies

Uzbekistan pursues a policy of protecting human rights and freedoms in conformity with international standards. As a fully fledged member of the United Nations Organization, RUz assumes an obligation to comply with international human rights acts and apply them to the national policy and practice of law.

The Republic of Uzbekistan has ratified over 40 international acts on human rights, including:
- the Universal Declaration of Human Right (1948), ratified by RUz in 1991;
- the International Covenant on Civil and Political Rights (1966), ratified by RUz in 1995;
- the Convention on the Elimination of All Forms of Discrimination against Women (1979), ratified by RUz in 1995; and
- the Convention on the Elimination of All Forms of Intolerance and of Discrimination Based on Religion or Belief (1981), ratified by RUz in 1997.

All key provisions of the Universal Declaration of Human Rights (1948) were fully introduced in the 1992 Constitution of the Republic of Uzbekistan.

The social policy in Uzbekistan is defined at the national government level and is reflected in laws, regulations and national social programmes. Some examples of national social programmes implemented in Uzbekistan are listed below:

- National Disabled People Rehabilitation Programme (1996-2000);
- National programme 'Year of Protecting the Older Generation Interests' (2002);
- National programme 'Year of Health' (2005)
- National programme 'Year of Social Welfare' (2007);
- National programme 'Year of Young Adults' (2008); and
- National programme 'Year of Harmoniously Developed Generation' (2010).

In 2007 Uzbekistan developed the Welfare Improvement Strategy (WIS) focused on the economic growth to reduce poverty in the country. The WIS strategy replaced two interim documents: the Living Standards Strategy for the Population of Uzbekistan (2004-2006) and the Interim Poverty Reduction Strategy Paper (2005-2010). Through the WIS strategy the government is committed to implementing measures for improving living standards, social services and quality of education and health care, as well as addressing rural development issues.

In order to meet these objectives, the Government has launched reforms in agriculture, privatization, trade and tax reform, and support to public administration and decentralisation. At the regional level, the government provides loans against subsidized interest rates to vulnerable households for home-based income-generating activities, family businesses and livestock development. The loans are financed from the Employment Fund (run by the Ministry of Labour and Social Welfare), while the eligible households are identified and selected through the Citizens' (Mahalla) Committees.

In March 2009, the Cabinet of Ministers of Uzbekistan adopted the Nutrition Improvement Strategy for 2009-2011, which is part of the WIS Strategy and aimed primarily at helping women and children.

Land issues in Uzbekistan are regulated by the 1998 Land Code which replaced the 1990 Law on Land and is considered as the principal legal instrument in dealing with land-related issues in Uzbekistan. It sets legal, economic and institutional framework for land allocation, use, ownership and conservation. According to the Land Code (Article 16) land is public property, protected by the state and considered to be the resource of national wealth subject to sustainable use.

The land legislation of the Republic of Uzbekistan is based on the following principles:

- land conservation, improving soil quality and fertility as land is regarded as an important natural resource;
- sound, effective and permitted use of land;
- enhanced protection, expansion and permitted use of agricultural, especially irrigated, land;
- state and other types of support in implementing measures to increase fertility of agricultural land, irrigation and protection of land;
- prevent damage to the earth and the whole environment, ensuring ecological safety;
- variety of land ownership and land use, equal rights of parties involved in land relations, protection of their legitimate rights and interests;
- payment-based land use; and
- integrity and accessibility of information on the country's land resources.

The national legislation differentiates between agricultural and urban land and these are treated differently under Uzbek Law. While agricultural land issues are covered and treated under the Land Code, urban land issues are covered under the Civil Code, The Housing Code and the Urban Construction Code.

The agricultural legislation incorporates three key laws regulating land allocation/relocation and use/lease/ownership issues associated with agricultural land users. These laws are Law No.600-I on Shirkat (Cooperative) farm (1998 as amended), Law No.602-I on Private Farm (1998 as amended) and Law No.604-I on Dehkan (Individual) Farm (1998 as amended). In detail land allocation and reallocation issues associated with the project are addressed in Section 7.2.3.2.

All information on the country's land including natural, economic, legal regimes of land, land categories, land quality and value, location and size of land plots, land allocation to owners, users, tenants as well as state registration of land ownership registration data is collected and stored in the State Land Cadastre. Based on the information from the State Land Cadastre the National Land Report is issued annually to summarize information on the quantitative and qualitative conditions of the country's land including land classification by category, industry, owners, users, tenants, and other inventory parameters.

4.2.5.2 Social Regulators

Social laws are developed, adopted, revised or amended by Oliy Majlis. Other national regulations are developed by the Cabinet of Ministers as advised by respective ministries and agencies responsible for social issues. These include:

- Ministry of Labour and Social Welfare (or MLSW);
- Regional (Oblast), municipal and local governments;
- State Inspectorate for Exploration Supervision, Operations Safety Supervision of Industry, Mining and Utilities (or Sanoatgeokontekhnazorat);
- the Ministry of Health (or MHRUz);
- the State Committee for Nature Protection (or Goskompriroda);
- the State Committee on Land Resources, Surveys, Cartography and State Cadastre (Goskomgeodezcadastre); and
- the Trade Union Federation Council.

The Ministry of Labour and Social Welfare of the Republic of Uzbekistan (MLSW) is the key regulator in the social sector responsible for labour-related issues, employment, pension benefits, social welfare and migration issues. The MLSW monitors compliance with the law and reports to the Cabinet of Ministers of the Republic of Uzbekistan. The MLSW mandate is set forth in the Regulations on the Ministry of Labour and Social Welfare enacted by the Cabinet of Ministers in 2007.[7]

The MLSW operates through its central body in Tashkent, the network of its regional branches, local employment centres, social welfare departments and the MLSW of the Republic of Karakalpakstan. All report to the central MLSW body.

[7] Decree of the Cabinet of Ministers of Uzbekistan on measures to implement Decree of the President of the Republic of Uzbekistan No.PP-616 of 06.04.2007 on measures to increase employment and improve performance of the authorities responsible for labour and social welfare

4.2.5.3 Key Social Legislation

Social legislation in Uzbekistan covers the whole spectrum of social related issues, including employment, health and safety, education, health care, social protection, migration and consumer rights. Social legislation will be considered in detail in Section 7, Social Impact Assessment. Table 4.3 provides a summary of the key social laws of the Republic of Uzbekistan.

Table 4.3: Key social laws of the Republic of Uzbekistan

Category	National Laws
Employment and Occupational H&S	Law No.657-II of the Republic of Uzbekistan on State Sanitary Supervision of 03.07.1992 (as amended on 03.09.2010)
	Labour Code of the Republic of Uzbekistan of 01.04.1996 (as amended on 22.12.2010)
	Law No.839-XII of the Republic of Uzbekistan on Occupational Health and Safety of 06.05.1993 (as amended on 07.12.2001)
	Law No.265-I of the Republic of Uzbekistan on Protecting Health of Citizens 29.08.1996 (as amended on 19.05.2010)
	Law No.ZRU-57 of the Republic of Uzbekistan on Occupational Safety at Hazardous Industrial Facilities of 25.08.2006
	Law No.ZRU-174 of the Republic of Uzbekistan on Mandatory State Social Insurance against Occupational Accidents and Diseases of 10.09.2008
	Law No.ZRU-210 of the Republic of Uzbekistan on Compulsory Civil Liability Insurance of the Employer of 16.04.2009
Community H&S	Law No.1064-XII of the Republic of Uzbekistan on the Appeal of Citizens of 06.05.1994 (as amended on 13.12.2002)
	Law No.816-I of the Republic of Uzbekistan on the Prevention of the Disease Caused by Human Immunodeficiency Virus (HIV) of 19.08.1999
	Law No.123-II of the Republic of Uzbekistan on Psychiatric Services of 31.08.2000
	Law No.215-II of the Republic of Uzbekistan on Protecting the Population against Tuberculosis of 11.05.2001
	Law No.402-II of the Republic of Uzbekistan on Donation of Blood and its Components of 30.08.2002
	Law No.ZRU-97 of the Republic of Uzbekistan on Preventing Iodine Deficiency Disorders of 30.08.2007
Women's rights	Family Code of the Republic of Uzbekistan of 01.09.1998
Social Protection and Welfare	Law No.422-XII of the Republic of Uzbekistan on Social Protection of Disabled Persons in the Republic of Uzbekistan of 18.11.1991 (as amended on 11.07.2008)
	Law No.938-XII of the Republic of Uzbekistan of the Republic of Uzbekistan on State Pensions of 03.09.1993 (as amended on 22.12.2010)
	Law No.616-I of the Republic of Uzbekistan on Employment of 01.05.1998 (as amended on 22.12.2009)
Indigenous peoples	1992 Constitution of the Republic of Uzbekistan (as amended on 18.04.2011)
	Resolution of Oliy Majlis of Uzbekistan on Approval of the Declaration on the Elimination of All Forms of Intolerance and of Discrimination Based on Religion or Belief No.505-I of 30.08.1997
	Resolution of Oliy Majlis of Uzbekistan on ratification of the Convention Concerning Discrimination in Respect of Employment and Occupation No.499-I of 30.08.1997
Land allocation and use	Civil Code of the Republic of Uzbekistan of 01.03.1997 (as amended 22.09.2010)
	Land Code, approved on 30.04.1998 (as amended on 04.01.2011)
	Law No.600-I of the Republic of Uzbekistan on Shirkat (Cooperative) Farm of 30.04.1998 (as amended on 25.12.2009);
	Law No.602-I of the Republic of Uzbekistan on Private Farm of 30.04.1998 (as amended on 25.12.2009);

Category	National Laws
	Law No.604-I of the Republic of Uzbekistan on Dehkan (Individual) Farm of 30.04.1998 (as amended on 09.09.2010);
	Law of the Republic of Uzbekistan on State Land Cadastre No.666-I of 28.08.1998 (as amended on 03.12.2004)
	Housing Code of the Republic of Uzbekistan of 24.12.1998 (as amended on 22.12.2009)
	Urban Code of the Republic of Uzbekistan of 04.04.2002 (as amended on 04.01.2011)

4.3 International Requirements

4.3.1 Overview

In addition to national and regional legislation, as Uz-Kor is potentially seeking international finance, it is important that the Project meets international lending requirements. The following international guidelines are relevant to the Project and will be considered during the ESIA process:

- The Equator Principles;
- FC Performance Standards on Social and Environmental Sustainability;
- IFC Guidance Notes: Performance Standards on Social and Environmental Sustainability; and
- IFC Sector Specific EHS Guidelines;
- ADB's Safeguards Policy Statement and other social policies;
- Organization for Economic Co-operation and Development (OECD) Recommendation for Common Approaches; and
- Adopted International Conventions and Protocols.

Further details on these lending requirements are included in the following sections.

4.3.2 The Equator Principles

The Equator Principles[8] 2006 are a voluntary set of guidelines designed to manage environmental and social issues associated with Projects subject to project financing[9]. The Equator Principles were developed by leading financial institutions. Currently, more than 70 Equator Principles Financial Institution's (EPFI's) are signatory to the guidelines.

Uzbekistan is considered to be a low income country by the Organisation for Economic Co-operation and Development (OECD) (i.e. not designated as High-Income, as defined by the World Bank Development Indicators Database). As such, and as directed by the Equator Principles, for the purposes of project financing in Uzbekistan, Project proponents are required to demonstrate not only compliance with host country laws but also compliance with the all the applicable IFC Performance Standards and supporting the EHS Guidelines.

[8] The Equator Principles were first adopted in June 2003 by a number of key commercial lenders as a voluntary set of guidelines developed to ensure that projects under consideration for finance are developed in a manner that is socially responsible and reflective of sound environmental management practice. The Equator Principles apply to all new project financings with total capital costs of $10 million or more across all industry sectors globally.

[9] Project financing is a method of funding in which the lender looks primarily to the revenues generated by a single project both as the source of repayment and as security for the exposure.

4.3.3 International Finance Corporation (IFC)

The IFC is a member of the World Bank Group and is recognised as an international leader in environmental and social sustainability policy. As a part of the 'positive development outcomes' outlined in the IFC's Policy on Social and Environmental Sustainability, the corporation applies a comprehensive set of social and environmental Performance Standards in its project review process. In April 2006, the IFC published its Policy and Performance Standards (PSs) on Social and Environmental Sustainability.

Table 4.4 identifies the relevant IFC Performance Standards and summarises how these have been incorporated into this environmental and social assessment.

Table 4.4: IFC Performance Standards – Relevance to Project

Performance Standard	Scope and Triggers	Action in ESIA
PS1 - Social and Environmental Assessment and Management Systems	PS1 establishes the importance of: (i) integrated social and environmental assessment; (ii) effective community engagement through information disclosure and consultation with local communities; and (iii) the client's management of social and environmental performance throughout the life of the project.	This report constitutes a social and environmental assessment. The ESIA Report provides an explanation of the consultation and disclosure activities undertaken and planned for the future and also includes an ESMP for the management and mitigation of significant environmental impacts.
PS2 - Labour and Working Conditions	PS2 recognizes that economic development should be balanced with workers rights. PS2 aims to: establish, maintain and improve the worker-management relationship; promote the equal opportunity of workers, and compliance with national labour and employment laws; protect the workforce by addressing child labour and forced labour; and promote safe and healthy working conditions.	Issues pertaining to labour and working conditions are fully applicable to the Project and undergo assessment within Chapter 7.
PS3 – Pollution Prevention and Abatement	PS3 recognizes that increased industrial activity often generates increased levels of pollution to air, water, and land that may threaten people and the environment at the local, regional, and global level. PS3 aims to: avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities; and to promote the reduction of emissions that contribute to climate change.	Issues pertaining to pollution prevention and abatement are fully applicable to the Project and undergo assessment throughout the report.
PS4 – Community Health, Safety and Security	PS4 aims to: avoid or minimize risks to and impacts on the health and safety of the local community during the project life cycle; and ensure that the safeguarding of personnel and property avoids or minimizes risks to the community's safety and security.	Issues pertaining to community health, safety and security are fully applicable to the Project and undergo assessment within Chapter 7.
PS5 – Land Acquisition and Involuntary Resettlement	PS5 aims to: avoid or at least minimize involuntary resettlement wherever feasible by exploring alternative project designs; mitigate adverse social and economic impacts from land acquisition by (i) providing compensation for loss of assets and (ii) ensuring that resettlement activities are implemented with appropriate consultation and disclosure; and improve or at least restore the livelihoods, standards of living and living conditions of displaced persons..	No involuntary resettlement impacts are envisaged and therefore this SP is not triggered. Land acquisition is applicable to the Project. These issues are addressed within Chapter 7.
IPS6 – Biodiversity Conservation and Sustainable Natural Resource Management	PS6 encourages sustainable development while recognising that the protection and conservation biodiversity is fundamental to sustainable development. PS6 aims to promote the sustainable management and use of natural resources through practices that integrate conservation and development.	Issues pertaining to biodiversity conservation and sustainable natural resource management are fully applicable to the Project and undergo assessment specifically within Chapters 8, 9 and 10.

Performance Standard	Scope and Triggers	Action in ESIA
PS7 - Indigenous Peoples	PS7 aims to: ensure that the development process fosters full respect for Indigenous Peoples; avoid, minimize or compensate adverse impacts of projects on Indigenous Peoples and provide opportunities for development benefits; establish and maintain an ongoing relationship with affected Indigenous Peoples throughout the life of the project; and foster informed participation of Indigenous Peoples when projects are to be located on traditional or customary lands under use by the Indigenous Peoples.	During the scoping stage of the Project it was determined that IFC performance standards on indigenous peoples are not triggered as there are not likely to be any adverse impacts on indigenous peoples. Therefore, this PS is not triggered. This issue is addressed within Chapter 7.
PS8 - Cultural Heritage	PS8 recognizes the importance of cultural heritage for current and future generations. PS8 aims to protect cultural heritage from the adverse impacts of project activities and support its preservation.	No issues are anticipated in relation to cultural heritage features. However, potential impacts upon cultural heritage are addressed within Chapter 17.

PS3 on Pollution Prevention and Abatement requires reference to be made to the relevant EHS Guidelines; these are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). The following EHS Guidelines are considered applicable to the Project:

- Electric Power Transmission and Distribution (April 2007);
- General EHS Guidelines (April 2007);
- Gas Distribution Systems (April 2007);
- Natural Gas Processing (April 2007);
- Onshore Oil and Gas Development (April 2007);
- Petroleum-based Polymers Manufacturing (April 2007); and
- Thermal Power Plants (December 2008).

Where host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever standards are more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, a full and detailed justification for any proposed alternatives is needed as part of the site-specific environmental assessment.

With reference to the IFC categorisation of Projects, this Project is considered to be a ‘Category A’ project for the purposes of assessment due to the number of components associated with the Project and the area over which the Project components extend. Under IFC definition a proposed project is classified as Category A if it is likely to have *significant adverse environmental impacts that are diverse, irreversible or unprecedented*. Typically, these projects may affect an area broader than the sites or facilities subject to physical works. The ADB categorisation of the Project is discussed in Section 4.3.4.

4.3.4 Asian Development Bank (ADB)

The ADB Safeguards Policy Statement (SPS) 2009 sets out policy principles and outlines the delivery process for ADB’s safeguard policy in relation to environmental safeguards. The ADB has adopted a set of specific safeguard requirements that borrowers/clients are required to meet in addressing environmental and social impacts and risks. ADB staff will ensure that borrowers/clients comply with these requirements during project preparation and implementation.

The safeguard requirements (SR) are operational policies that seek to avoid, minimize or mitigate the adverse environmental and social impacts of projects. ADB’s safeguard policy framework consists of three operational safeguard requirements; Table 4.5 identifies the relevant ADB safeguard requirements and summarises how these have been incorporated into this environmental and social assessment.

Table 4.5: ADB Safeguard Policy Relevant to Project

Safeguard	Scope and Triggers	Action in ESIA
Environmental safeguard requirement (SR1)	Environmental safeguards are triggered if a project is likely to have potential environmental risks and impacts. The ADB requires the ESIA Report to be produced in line with their defined scope; to include explanation of meaningful consultation and grievance redress and include an EMP in line with their scope.	This report constitutes the ESIA, and sets out the proposed management and mitigation actions for the significant environmental impacts. It also provides an explanation of meaningful consultation and includes an ESMP for the management of environmental impacts.
Involuntary resettlement safeguard requirement (SR2)	The involuntary resettlement safeguards covers physical displacement (relocation, loss of residential land, or loss of shelter) and economic displacement (loss of land, assets, access to assets, income sources, or means of livelihoods) as a result of (i) involuntary acquisition of land, or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas. It covers them whether such losses and involuntary restrictions are full or partial, permanent or temporary.	No involuntary resettlement impacts are envisaged and therefore this SP is not triggered. This issue is addressed within Chapter 7.
Indigenous peoples safeguard requirement (SR3)	The Indigenous Peoples safeguards are triggered if a project directly or indirectly affects the dignity, human rights, livelihood systems, or culture of Indigenous Peoples or affects the territories or natural or cultural resources that Indigenous Peoples own, use, occupy, or claim as an ancestral domain or asset. The term Indigenous Peoples is used in a generic sense to refer to a distinct, vulnerable, social and cultural group	SR3 is triggered by positive impacts. In this project, there are limited impacts (equivalent to "moderate beneficial impacts" as per the classification used in this ESIA) to ethnic Karakalpaks. Therefore, the project is classified as Category B (Not Significant) according to ADB categorisation. This issue is addressed within Chapter 7.

The scoping stage typically determines the need for a Gender Action Plan; otherwise this is to be addressed under SR1 through assessment and management of gender impacts. It is not considered that a stand alone gender action plan will be required for this Project. For completeness, baseline data will be collected on gender roles and equality and gender equity in the socio-economic baseline and opportunity measures will be considered in the ESMP.

A consolidated Operations Manual specifies ADB's internal review procedures for due diligence and for supervision throughout the project cycle in relation to each safeguard policy area. In addition to the three safeguard policies, several sector policies have environmental safeguard elements, for example, those pertaining to water, energy, and forestry.

Projects are categorised, A, B or C based on the magnitude of their potential environmental and social effects. With reference to ADB's Safeguard Policy Statement (SPS) SR1 on Environment, the Project is considered to be a 'Category A' project for the purpose of this assessment. ADB defines a 'Category A' project as one that is likely to have significant *adverse environmental impacts that are irreversible, diverse, or unprecedented*. The IFC categorisation of the Project is discussed in Section 4.3.3.

An environment and social assessment for a Category A project is required to examine the project's potential positive and negative impacts, compare them with those of feasible alternatives (including the "without project" scenario) and recommend any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and to improve performance. This report constitutes the ESIA on behalf of the Project sponsor. The above considerations have defined the rigour of this ESIA, the scope of the ESMP and the disclosure and consultation requirements for the Project.

4.3.5 OECD Recommendation on Common Approaches

The OECD aims to promote good environmental and social practice, as embodied within the guidance document 'Revised Council Recommendation on Common Approaches on the Environment and Officially Supported Export Credits' (2007). These 'common approaches' contain environmental and social standards that are applied to officially supported export credit agencies with a view to ensuring compliance with established international standards. The recommendations apply to projects with a repayment term of two years or more.

The key requirements of the OECD Recommendation are broadly in line with the requirements of the Equator Principles and supporting IFC PSs. Table 4.6 identifies the recommendations and summarises how these have are satisfied by this environmental and social assessment process and the findings and recommendations contained herein.

Table 4.6: OECD Recommendation on Common Approaches– Relevance to Project

Recommendation	Scope and Triggers	Action
Screening and classification of projects	This concerns consideration of all applications for assistance as early as possible in the risk assessment process, as well as categorisation of the project as either Category A (potential for significant adverse environmental impacts) , B (potential environmental impacts less adverse than those of Category A projects) or C (likely to have minimal or no adverse environmental impacts).	The Project is categorised as Category A under the OECD definition, with the potential for significant adverse environmental impacts. This categorisation is broadly in line with classification defined under Appendix 2 of Decree No. 491 and also under the IFC definition.
Environmental review	Determining the need for an EIA. In broad terms, Category A projects require an EIA to be undertaken, the scope of a review for a Category B project may vary from project to project, depending upon the project's potential negative and positive environmental impacts and for a Category C project no further action is required. Projects in all cases should comply with host country standards.	The Project has been determined to require an EIA in line with Decree No. 491. The Project has completed Stage I for the upstream component (gas field and pipelines); Stage II was not required by the authorities for the upstream component. The Project has completed Stages I and II for the UGCC; these have been approved by the authorities. Stage III for the entire Project will be completed prior to commissioning. This ESIA has been compiled in consideration of both national legislation and the findings of the national EIA.
Evaluation, decision and monitoring	Members are required to evaluate the information resulting from screening and review, and decide whether to request further information, decline or provide official support; and decide whether this should involve mitigation measures, covenants, monitoring requirements to fulfil prior to, or after the final commitment for official support.	This ESIA provides a detailed assessment of the potential environmental impacts of the Project and also a range of provisions for mitigation and monitoring which have been agreed to by Uz-Kor. Progress against these Project commitments will be assessed by the Lender's environmental and social representatives post financial close for the duration of the Project.
Exchange and disclosure of information	For Category A projects, project information and the EIA should be disclosed as early as possible in the review process and at least 30 calendar days before a final commitment to grant official support. Both Category A and B projects should make available to the public at least annually environmental information on projects, for which a Member has made a final commitment with respect to providing official support.	In line with IFC and ADB requirements for consultation and disclosure, Project information has been made available to stakeholders and the general public at key stages of the ESIA process, including during the ESIA scoping and ESIA assessment stages. The Draft and Final ESIA Reports will also be disclosed to the public in due course. The Final ESIA Report will undergo a 120 day disclosure period in line with ADB requirements. Following financial close, the Project will be monitored for compliance with Project

Recommendation	Scope and Triggers	Action
		commitments contained within the ESMP throughout construction, operation and decommissioning. Monitoring reports will be disclosed bi-annually.
Reporting and monitoring of the information	Members shall monitor and evaluate experiences with the Recommendation and report on performance an on-going basis or at a minimum semi-annually (if Category A or B).	Not a Project responsibility.

4.3.6 Adopted International Conventions and Protocols

The Republic of Uzbekistan has adopted several international Conventions and Protocols aimed at addressing environmental issues. Those potentially applicable to the Project, and for which Uzbekistan is signatory, are outlined in Table 4.7.

Table 4.7: Potentially Applicable Conventions and Protocols

Convention or Protocol	Overview	Relevance to Project
Vienna Convention on Ozone Layer Protection (1985), ratified in 1993 Montreal Protocol on Substances that Deplete the Ozone layer (1987), ratified in 1993 London (1990) and Copenhagen Amendments to the Montreal Protocol (1992), ratified in 1998	The Montreal Protocol (a Protocol to the Vienna Convention on Ozone Layer Protection) is designed to protect the ozone layer by phasing out the production of numerous ozone depleting substances.	Through limitation of the release of chloride and bromide containing ozone depleting substances, the Project will support Uzbekistan's contribution toward the anticipated recovery of the ozone layer by approximately 2050.
UN Framework Convention of Climate Change (1992), ratified in 1993 Kyoto Protocol (1997), ratified in 1999	The Kyoto Protocol (a Protocol to the UN Framework Convention on Climate Change (UNFCCC)) aims to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.	The Project will comply with all national standards for GHG emissions in order to contribute to Uzbek targets set in line with the adoption of the Kyoto Protocol.
Convention Concerning the Protection of World Cultural and Natural Heritage (1972), ratified in 1995	The Convention Concerning the Protection of World Cultural and Natural Heritage is the precursor to the establishment of UNESCO World Heritage Sites as a place (i.e. natural or built environment) that is listed by the UNESCO as of special cultural or physical significance.	Uzbekistan has four UNESCO World Heritage Sites. However, the Project will have no interaction with these. As such, requirements under the convention will not be triggered.
Convention on Biodiversity (1992), ratified in 1995	The Convention on Biological Diversity (CBD) is an international legally binding treaty with three principal goals: conservation of biological diversity (or biodiversity); sustainable use of its components; and fair and equitable sharing of benefits arising from genetic resources.	Issues pertaining to biodiversity conservation and sustainable natural resource management are fully applicable to the Project and undergo assessment specifically within Chapters 8 and 9.
UN Convention to Combat Desertification (1994), ratified in 1995	The United Nations Convention to Combat Desertification is intended to combat desertification and mitigate the effects of drought through national action programs. The Convention is based on the principles of participation, partnership and decentralization; the backbone of	The Project will not result in accelerated desertification. Revenues from the Project within Uzbekistan can contribute to aspects of national action programs thereby supporting Uzbekistan's commitments.

Convention or Protocol	Overview	Relevance to Project
	Good Governance and Sustainable Development.	
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1989), ratified in 1996	The Basel Convention was designed to reduce the movements of hazardous waste between nations, and specifically to prevent transfer of hazardous waste from developed to less developed countries. It does not, however, address the movement of radioactive waste. The Convention is also intended to minimize the amount and toxicity of wastes generated, to ensure their environmentally sound management as closely as possible to the source of generation, and to assist LDCs in environmentally sound management of the hazardous and other wastes they generate.	The Project will comply with all national and international standards for hazardous waste generation and management. Issues pertaining to hazardous waste generation are applicable to the Project and are addressed in Chapter 10.
Bonn Convention on Conservation of Migrating Species of Wild Animals (1998), ratified in 1998	The Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or the Bonn Convention) aims to conserve terrestrial, marine and avian migratory species throughout their range.	Issues pertaining to Project interactions with migratory species undergo assessment within Chapter 8.
Convention on International Trade of Endangered Species of Flora and Fauna (1973); ratified in 2000	The aim of Convention on International Trade of Endangered Species of Flora and Fauna ('CITES') is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.	Issues pertaining to biodiversity conservation are fully applicable to the Project and undergo assessment within Chapter 8.
Ramsar Convention on Wetlands (1971), ratified in 2002	Formally known as the Convention on Wetlands of International Importance, especially as Waterfowl Habitat, the Ramsar Convention is an international treaty for the conservation and sustainable utilisation of wetlands.	Lake Sudoch'ye is a wetland of international importance for biodiversity and is one of the last wetlands remaining within the Amu Darya delta. The lake has been proposed for inclusion in the Ramsar List of Wetlands for International Importance. As such, potential Project interactions are discussed in Section 8.

The national legislation of Uzbekistan place a priority on provisions stipulated in international agreements as opposed to national law. Specifically, the Law on Nature Protection specifies (Article 53) that if the international agreement, which the Republic of Uzbekistan is signatory of, sets requirements other than those specified in the existing national environmental laws or regulations, the provisions of the international agreement shall prevail except where national legislation sets more stringent requirements.

5. Assessment Scope and EIA Process

5.1 Introduction

In accordance with international lending requirements for environmental and social assessment, the scope of works for the ESIA includes:

- Environmental, social, labour, gender, health, safety, risks and impacts;
- Primary Project and related facilities. This includes reviewing potential cumulative impacts and planned or unplanned but predictable developments caused by the project that may occur later or at a different location;
- Risks and impacts that may arise for each key stage of the project cycle, including pre-construction, construction, operations and decommissioning or closure;
- Role and capacity of the relevant parties including government, contractors and suppliers; and
- Potential third party impacts including supply chain considerations.

The ESIA has identified negative and positive, direct and indirect, and cumulative impacts of the Project related to the bio-physical and the socio-economic environment.

The definition of the Project includes all infrastructure and facilities that are directly part of the proposed development or are associated development that exists specifically for or as a result of the Project.

This section presents the key findings of the scoping stage and the general methodology followed to produce the present ESIA to international standard.

5.2 Scoping Stage

As the first step in the ESIA process, MML produced a Scoping Report (April 2010) that set out the potential environmental and social issues associated with the Project and established the scope and methodology of the environmental and social assessment of significant impacts. The scoping process sought to identify the potential beneficial and adverse impacts relevant to this Project, i.e. given the type, scale, magnitude, and location of the proposed development.

Based on the findings of the scoping assessment and consultation activities undertaken to date the significant environmental and social aspects associated with natural gas drilling, refining and pipeline transportation and petroleum based polymer manufacture for the key stages of the project cycle are summarised in Table 5.1 below. The table is intended to be a summary and is not an exhaustive list of potential impacts, some of which were identified during the ESIA process following the Scoping stage. Detailed consideration of all potential impacts has been reported in the subsequent individual assessment chapters.

This scoping phase was informed by the international standards and guidelines set out in Section 4.3, particularly applicable EHS Guidelines.

Table 5.1: Overview of Likely Significant Environmental and Social Aspects

Project Aspect	Project Phase	Potential Impact				Summary of Potential Impact
		Positive	Negative	Cumulative[10]	Transboundary[11]	
Socio-economics						
Public Health, Community Safety and Security	Construction	✓	✓			– Improvements to local health and education facilities through local investment brought by the Project development. – Potential security issues associated with regards to new workforces coming into community area. – Emissions associated with construction works and vehicle movement could have negative health impacts on surrounding communities.
	Operation	✓	✓			– Potential negative impact on community safety, particularly during the operation phase and include the threat from major incidents or accidental releases. – Potential positive impact associated with emergency response facilities being implemented as part of the Project within remote region of Uzbekistan. – Operational emissions may have a negative impact on the health of surrounding communities.
Community Relations and Conflict Management	Construction	✓	✓			– Conflicts may arise during the construction and operations phase of the Project due to a number of potential reasons, such as noise impacts and conflicting interests among the local communities, to be mitigated against through effective community consultation.
	Operation		✓			
Archaeological and Cultural Heritage	Construction		✓			– It is not anticipated that the gas fields and pipeline routes will encounter features of archaeological or cultural heritage value during construction or operations phase. – Desk-top study and archaeological walkover has identified potential impact of UGCC construction and operations on surrounding historical monuments and ancient burial grounds.
	Operation		✓			

[10] Cumulative impacts – The combination of multiple impacts from existing projects, the proposed project and/or anticipated future projects that may result in significant adverse and/or beneficial impacts that would not be expected in case of a stand-alone project.

[11] Transboundary Impacts – impacts that extend to multiple counties, beyond the host country of the project but are not global in nature. Examples include use of pollution international waterways (any river or body of surface water that flows through two or more states).

Project Aspect	Project Phase	Potential Impact				Summary of Potential Impact
		Positive	Negative	Cumulative[10]	Transboundary[11]	
Occupational Health and Safety	Construction	✓	✓			– There are potential occupational health and safety risks associated with the construction and day to day operations of all aspects of the Project. – Employment protocols are implemented to ensure the safety of staff during both the construction and operation phases.
	Operation	✓	✓			
Employment Generation	Construction	✓		✓		– Employment opportunities anticipated for the local area generated during both the construction and operations phase of the Project.
	Operation	✓		✓		
Land Acquisition	Construction					– Acquisition/allocation of land is anticipated, however, no physical or economic displacement is expected because land to be allocated to the Project is vacant and unutilized government land.
Community Investment	Construction	✓		✓		– Potential for the Project to lead to direct and indirect investment in the local economy, as well as on a regional and national level.
	Operation	✓		✓		
Provision of Electricity and Contribution to Energy Security	Construction			✓		– The development will provide a source of electricity to the local surrounding area as well as contributing to overall energy security.
	Operation	✓		✓		
Temporary Population Increase	Construction	✓	✓			– The arrival of construction workforce will lead to a temporary population increase within the local project area.
	Operation	✓	✓			– A smaller but permanent population increase within the Project area will occur due to plant workforces relocating.
Ecology and Biodiversity						
Habitat Alteration	Construction		✓			– Potential negative impacts on terrestrial ecology and biodiversity of the project footprint through habitat loss and disturbance during construction phase. This may include a reduction in current vegetation cover and possible disturbance of ground nesting birds.

Project Aspect	Project Phase	Potential Impact: Positive	Negative	Cumulative[10]	Transboundary[11]	Summary of Potential Impact
	Operation		✓			– Potential negative impacts on local ecology and biodiversity through delivery movements from the UGCC site. – As the pipelines are to be buried underground, species migratory paths, e.g. saiga, should not be obstructed in any way during the Project operations phase.
Water Resources and Hydrology						
Abstraction and effects on surface water flow patterns	Construction		✓	✓		– Potential temporary or permanent changes to surface water flow and drainage patterns during project construction and establishment. – Due to water scarcity within the project area, there is potential for the Project to impact upon the quality, availability and quantity of water supplies to local water users.
	Operation		✓	✓		– The high water demands of the UGCC during operation have the potential to impact the reliability, quality and quantity of local water supplies.
Effluent Discharges and Water Quality	Construction		✓			– Water quality is at risk of contamination during the construction phase of the Project through mismanagement of wastewater streams.
	Operation		✓			– Discharges of industrial process wastewater from the gas refining process and polymer production facility. – Other waste streams include cooling water blowdown and hydrostatic testing water associated with the pipeline commissioning.
Ground Water						
Abstraction and impact of contaminative releases	Construction		✓			– Due to water scarcity in the Project region, there is the potential for Project water demands during both construction and operation phases to impact upon groundwater pressure and quality that will affect existing abstractors, including livestock herders. – Ground water and possibly surface water are potentially at risk of contamination from the construction, commissioning and operational phase of the gas fields, pipelines and UGCC.
	Operation		✓			
Materials and Waste						
Waste Management	Construction		✓			– Waste steams produced during construction will primarily be of non-hazardous forms.

Project Aspect	Project Phase	Potential Impact: Positive	Negative	Cumulative[10]	Transboundary[11]	Summary of Potential Impact
	Operation		✓			– Potential hazardous waste materials produced across the Project sites may include oils and solvents, paints, coatings, contaminated ground, used batteries etc. – Hazardous and non-hazardous waste streams not handled, stored or disposed of in a fashion that is consistent with good EHS practice has the potential to negatively impact Project workforces and the surrounding environment.
Ground Conditions						
Land contamination	Construction		✓			– Potential contamination of soil and groundwater by spills and leaks of fuel and other chemicals. In addition the handling and disposal of solid and liquid wastes arising from drilling and gas production operations, UGCC operations plus construction activities for all project components could potentially lead to contamination impacts if not properly managed.
	Operation		✓			
Geology and erosion	Construction		✓			– Potential physical impacts due to earth moving and disturbance to allow access to the site and possible subsistence due to extraction of gas and fluids.
	Operation		✓			
Noise and Vibration						
Noisy construction activity	Construction		✓	✓		– Due to the distance of local sensitive receptors from the various Project sites, it is not deemed necessary to carry out a vibration assessment as part of the ESIA. – Potential noise impact will come from a range of construction activities across the Project sites, particularly through piling, drilling, excavation works and site vehicle movements. – Cumulative noise impacts where two or more of the Project components meet (e.g. UGCC and associated infrastructure).
	Operation		✓	✓		– Noise impacts during operation phase are not expected to be due to the transmission distance of the Project sites from local sensitive receptors. – Cumulative noise impacts of the operational Project components in combination with nearby industry (e.g. Akchalak Gas Compressor Station, Kungrad Soda Plant).

Project Aspect	Project Phase	Potential Impact				Summary of Potential Impact
		Positive	Negative	Cumulative[10]	Transboundary[11]	
Traffic and Transportation						
Traffic Movements	Construction		✓			– Continued road traffic movements on established access tracks that traverse the field due to the delivery of prefabricated plant and equipment to the UGCC site and all other project locations. – During the construction of the UGCC site, large plant items may need to be transported via existing shipping and rail networks.
	Operation		✓			– Export of materials from the UGCC site will be done via road and rail which may impact upon existing road and rail users. – Approximately a 5km extension to existing road network and also to rail link is required to link mainline railway to UGCC site.
Infrastructure Damage	Construction		✓			– Increased volumes of construction traffic on existing track routes, as well as use of rail and shipping methods to deliver large plant materials to the UGCC site.
	Operation		✓			– Materials to be exported from the UGCC site via road and rail which has the potential to negatively impacts existing routes.
Landscape and Visual						
New infrastructure in landscape	Construction		✓	✓		– The construction phase of the pipeline and UGCC site development may lead to some visual impact on the surrounding area. These will however be temporary in nature within a remote setting.
	Operation		✓	✓		– Little associated visual impacts from pipelines as they will be buried underground. – There are limited nearby visual receptors near the Surgil Field. – Infrastructure associated with the UGCC site, such as the stacks, have the potential to visually impact surrounding receptors and landscape setting.

Project Aspect	Project Phase	Potential Impact				Summary of Potential Impact
		Positive	Negative	Cumulative[10]	Transboundary[11]	
Air Quality						
Gas field and UGCC	Construction		✓	✓	✓	– Emissions associated with construction site plant and equipment as these often use diesel which leads to the emission of particulate matter (PM_{10}) and nitrogen oxides (NOx). – Emission from construction traffic vehicles can lead to a temporary increase in local air pollutants in the area surrounding construction activities. – Dust arising from construction activities and vehicle movements and can be mechanically transported off site and has the potential to soil properties and vegetation.
	Operation		✓	✓	✓	– Emissions from power generation, such as the combustion of fuels produces a range of air pollutants include NOx, particulates, sulphur dioxide (SO_2) and carbon monoxide (CO). These have the potential to lead to acute and chronic health impacts, and resident employees at the Akchalak settlement could be affected. They also have the potential to contribute to nutrient nitrogen and acid deposition which can have detrimental impacts on ecosystems and designated sites. – Emissions point sources such as gas turbines and cracking furnaces at the UGCC site can impact upon local air quality. – Emissions released from the UGCC may result in bi-products or as fugitive emissions. – Emissions associated with the diesel generators used to power the drilling rigs and CGTU.
Staff movements and maintenance	Construction		✓			– Dust and emissions generated from traffic movements delivering construction materials to the project sites on un-surfaced roads.
	Operation		✓			– Dust generated from traffic movements associated with infrastructure maintenance on un-surfaced roads.
Carbon						
Emissions of greenhouse gases	Construction		✓	✓	✓	– Emissions of GHGs will arise from several components, particularly with regards to the 'embodied carbon' costs of the materials used during construction, and also the GHG emissions associated with construction phase transportation and disposal activities.

Project Aspect	Project Phase	Potential Impact				Summary of Potential Impact
		Positive	Negative	Cumulative[10]	Transboundary[11]	
	Operation		✓	✓	✓	– Emissions of GHGs will arise from several components, particularly the energy use in powering the pipeline and UGCC, drilling rigs, the flaring of excess gases and any vented or fugitive emissions that may occur from the pipeline itself or associated storage vessels.

5.3 Impact Assessment Methodology

5.3.1 Introduction

Following scoping and identification of likely environmental effects, specialist assessments were carried out in order to predict potential impacts associated with the development and propose measures to mitigate the effects as appropriate. Each assessment chapter (Sections 7 to 17) follows a systematic approach, with the principle steps being:

- Description of assessment methodology used;
- Identification of the spatial and temporal scope of potential impacts (zone of influence);
- Description of baseline conditions;
- Impact assessment;
- Identification of appropriate mitigation measures as required; and
- Assessment of residual environmental effects.

5.3.2 Zone of Influence

The zone of influence (ZoI) indicates where proposed works, including related facilities and infrastructure will have a direct or indirect impact on the physical and social environment. This can result from aspects such as the physical land-take or as a result of the extent of the potential impact that extend beyond the development physical boundary such as noise emissions or emissions to air. The zone of influence can also vary according to the stage of the Project being assessed such that construction impacts may have a greater area of impact than for operation.

For each impact assessment chapter the spatial and temporal zone of influence will be defined.

5.3.3 Baseline

Baseline information has been collated from a range of sources including publicly available information, primary data collection (via the LEC) and through consultation. Relevant baseline information used to support the assessment process is referenced / summarised in the relevant impact assessment chapters. Supporting baseline reports are provided where relevant in supporting appendices.

5.3.4 Assessment of Effects

5.3.4.1 Overview

The assessment of the significance of effects and identification of residual impacts has taken account of any incorporated mitigation measures adopted by the Project, and is largely dependent on the extent and duration of change, the number of people or size of the resource affected and their sensitivity to the change. The criteria for determining significance are specific for each environmental and social aspect but generally for each impact the magnitude is defined (quantitatively where possible) and the sensitivity of the receptor is defined. Generic criteria for defining magnitude and sensitivity are summarised below.

5.3.4.2 Magnitude

The assessment of magnitude will be undertaken in two steps. Firstly, the key issues associated with the Project have been categorised as beneficial or adverse. Secondly, the magnitude of potential impacts have been categorised as major, moderate, minor or negligible based on consideration of the parameters such as:

- Duration of the impact - ranging from beyond decommissioning to temporary with no detectable impact;
- Spatial extent of the impact – for instance, within the site, boundary to regional, national, and international;
- Reversibility - ranging from permanent requiring significant intervention to return to baseline to no change;
- Likelihood – ranging from occurring regularly under typical conditions to unlikely to occur; and
- Compliance with legal standards and established professional criteria - ranging from substantially exceeds national standards and limits / international guidance to meets or exceeds minimum standards or international guidance.

Table 5.2 outlines generic criteria for determining magnitude.

Table 5.2: Criteria for Determining Magnitude

Magnitude (Beneficial or Adverse)	Description
Major	Fundamental change to the specific conditions assessed resulting in long term or permanent change, typically widespread in nature, and requiring significant intervention to return to baseline; exceeds national standards and limits.
Moderate	Detectable change to the specific conditions assessed resulting in non-fundamental temporary or permanent change.
Minor	Detectable but minor change to the specific condition assessed.
Negligible	No perceptible change to the specific condition assessed.

Source: MML

5.3.4.3 Sensitivity

Sensitivity is generally site specific and criteria have been developed from baseline information gathered. The sensitivity of a receptor will be determined based on review of the population (including proximity / numbers / vulnerability) and presence of features on the site or the surrounding area. Generic criteria for determining sensitivity of receptors are outlined in Table 5.3. Each detailed assessment will define sensitivity in relation to their topic.

Table 5.3: Criteria for Determining Sensitivity

Magnitude (positive or negative)	Definition (considers duration of the impact, spatial extent, reversibility and ability of comply with legislation)
High	Vulnerable receptor (human or terrestrial) with little or no capacity to absorb proposed changes or minimal opportunities for mitigation.
Medium	Vulnerable receptor (human or terrestrial) with limited capacity to absorb proposed changes or limited opportunities for mitigation.
Low	Vulnerable receptor (human or terrestrial) with some capacity to absorb proposed changes or moderate opportunities for mitigation
Negligible	Vulnerable receptor (human or terrestrial) with good capacity to absorb proposed changes or and good opportunities for mitigation

Source: MML

5.3.4.4 Impact Evaluation and Determination of Significance

Impacts will be identified and significance will be attributed taking into account the interaction between magnitude criteria and sensitivity criteria as presented in the significance matrix in Table 5.4.

Table 5.4: Impact Significance Matrix

Magnitude of Impact	Sensitivity of Receptors			
	Negligible	Low	Medium	High
Negligible	Insignificant	Insignificant	Insignificant	Insignificant
Minor	Insignificant	Insignificant	Minor	Minor
Moderate	Insignificant	Minor	Moderate	Moderate
Major	Insignificant	Minor	Moderate	Major

Source: MML

For each aspect, the significance of impacts will be discussed before and after mitigation (i.e. residual impact). Impacts identified as have major or moderate significance based on the above approach are classified as significant impacts.

Where feasible the following hierarchy of mitigation measures will be applied to reduce, where possible, the significance of impacts to acceptable levels:

- Mitigation / elimination through design;
- Site / technology choice; and
- Application of best practice.

5.3.4.5 Uncertainty

Any uncertainties associated with impact prediction or the sensitivity of receptors due to the absence of data or other limitation will be explicitly stated. Where applicable, the ESIA will make commitments concerning measures that should be put in place with monitoring and /or environmental or social management plans to deal with the uncertainty. This will be summarised in the Project environmental and social management and monitoring plan (ESMP) that will form part of the ESIA and implemented through the Project ESAP.

5.3.5 Assessment of Cumulative Impacts

Cumulative impacts are those effects that may result from the combination of past, present or future actions of existing or planned activities in a project's zone of influence. While a single activity may itself result in an insignificant impact, it may, when combined with other impacts (significant or insignificant) in the same geographical area and occurring at the same time, result in a cumulative impact that is significant.

The assessments within this ES have included, where relevant, an assessment of the cumulative impact of the Surgil Project with other present and planned developments in the zone of influence.

The list of planned developments which have been included in the cumulative impact assessment is provided in Table 5.5.

Table 5.5: Projects Included in the Cumulative Impact Assessment

Projects or Planned Development	Socio-economics	Ecology and Biodiversity	Water Resources and Water Quality	Materials and Waste Management	Ground Conditions	Noise and Vibration	Traffic and Transportation	Landscape and Visual Amenity	Air Quality	Carbon
Akchalak Gas Compressor Station	✓		✓			✓		✓	✓	✓
Kungrad Soda Ash Plant			✓					✓	✓	

Other oil and gas developments are taking place on the Ustyurt Plateau and in the Aral Sea basin that were considered when identifying projects or developments that may need to be considered in the cumulative impact assessment.

On the Ustyurt Plateau the Urga gas field is being developed with associated gas field development such as the Akchalak gas field and is being developed by Petronas (under concession from UNG). The closest development activity (Akchalak field) from the Urga project is approximately 25 km from the nearest Project component and therefore will not be subject to any cumulative impacts and has not been considered further.

In the Aral Sea Basin the East and North Berdakh gas fields, developed and operated by UNG, are located near to the village of Uchsay to the south east of the Surgil field. The Berdakh CGTU is 24 km from the Surgil CGTU and at least 16 km from the nearest gas well being developed as part of the Surgil Project. Again, this distance between the Surgil Project and the Berdakh gas fields will not result in any cumulative impacts. Consideration was given to indirect cumulative impacts such as traffic impacts on roads from Muynak to Uchsay and to the Surgil Field but the capacity of the road and number of vehicle movements was not assessed to be significant and thereby did not represent a potentially significant cumulative impact that needed to be assessed.

5.3.6 Proposals for Monitoring

Where appropriate, proposals for future monitoring have been put forward within the assessment chapters. These proposals for monitoring have been designed to evaluate the accuracy of the impact prediction and the success of the implemented mitigation measures. All future monitoring has been committed within the ESMP constituting Volume IV of this ESIA documentation.

6. Information Disclosure, Consultation and Participation

6.1 Overview

This section outlines the information disclosure, consultation and participation activities that have been undertaken as part of the ESIA process (in accordance with the Public Consultation and Disclosure Plan (PCDP) developed at the outset of the ESIA process and presented in ESIA Appendix E Volume III) and the outcomes of these activities, as well as those planned throughout the lifecycle of the Project.

The section consists of the following subsections:
- 6.2 Principles of Consultation;
- 6.3 Consultation Requirements;
- 6.4 Core Stakeholders and Consultees;
- 6.5 Project Consultation Activities and Outcomes; and
- 6.6 Project Grievance Redress Mechanism.

6.2 Principles of Consultation

Early and ongoing consultation, disclosure and meaningful stakeholder engagement is a key requirement for projects financed by the ADB and under the Equator Principles. The ESIA will be informed by the outcomes of consultation activities that will be guided by the PCDP initially produced for the Project at the outset of the ESIA process (May 2009) and updated subsequently.

The Project PCDP has been designed to guide public consultation and disclosure activities up to the completion of the ESIA Report and through the construction and operational phases of the project. It is a strategic document for planning meaningful and appropriate consultation with stakeholders that will be periodically updated as the Project progresses. Stakeholders are defined as persons and entities who are interested in, are affected by, or can affect the outcome of the Project. Specific objectives of the PCDP are to provide a consultation strategy for the Project to:
- Ensure all legal and international finance requirements related to consultation are addressed;
- Involve a full range of stakeholders in the planning of the project to improve the acceptability of the project design, implementation and monitoring;
- Encourage an open dialogue with local neighbouring communities and especially project affected persons where the project is located;
- Keep all interested and affected stakeholders informed of project progress; and
- Provide a grievance mechanism for Project Affected Peoples (PAPs) to raise complaints that are appropriately addressed by the Project.

The PCDP is underpinned by the principles that community engagement should be free of external manipulation, interference, coercion and intimidation and conducted on the basis of timely, relevant, understandable and accessible information. Consultation activities should always be well planned and based on principles of respectful and meaningful dialogue.

The methods used to identify key consultees to be included within the PCDP have been summarised in the following section.

6.3 Consultation Requirements

6.3.1 Overview

This sub-section provides an overview of the international consultation, disclosure and stakeholder engagement requirements of the ADB, the Equator Principles and the IFC, and the national requirements contained within the Uzbek EIA procedures.

6.3.2 International Consultation Requirements

6.3.2.1 Introduction

Many large-scale international developments are required to comply with a number of requirements outlined by the Equator Principles and multilateral financing institutions. This is true for this particular Project, and the various consultation requirements which have to be met have been outlined below.

6.3.2.2 ADB Consultation Requirements

ADB's SPS (2009) explains that the ADB is committed to working with borrowers/clients to put meaningful consultation processes into practice. For policy application, the ADB see meaningful consultation as a process that:

i. Begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle;
ii. Provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people;
iii. Is undertaken in an atmosphere free of intimidation or coercion;
iv. Is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and
v. Enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.

ADB requires borrowers/clients to engage with communities, groups, or people affected by proposed projects, and with civil society through information disclosure, consultation, and informed participation in a manner commensurate with the risks to and impacts on affected communities. For projects with significant adverse environmental, involuntary resettlement, or Indigenous Peoples impacts, ADB project teams will participate in consultation activities to understand the concerns of affected people and ensure that such concerns are addressed in project design and safeguard plans.

ADB's Safeguard Requirement (SR) 1: Environment, specifies that projects must:

- Carry out meaningful consultation with affected people and facilitate their informed participation;
- Ensure women's participation in consultation;
- Involve stakeholders, including affected people and concerned nongovernmental organizations, early in the project preparation process and ensure that their views and concerns are made known to and understood by decision makers and taken into account;
- Continue consultations with stakeholders throughout project implementation as necessary to address issues related to environmental assessment;

- Establish a grievance redress mechanism to receive and facilitate resolution of the affected people's concerns and grievances regarding the project's environmental performance;
- Disclose a draft environmental assessment (including the ESMP) in a timely manner, before project appraisal, in an accessible place and in a form and language(s) understandable to affected people and other stakeholders;
- Disclose the final environmental assessment, and its updates if any, to affected people and other stakeholders; and
- Implement the ESMP and monitor its effectiveness. Document monitoring results, including the development and implementation of corrective actions, and disclose monitoring reports.

6.3.2.3 The Equator Principles

Of the ten Equator Principles, Principle 5: Consultation and Disclosure specifically addresses requirements relevant to the PCDP which include:

- Consult with project affected communities in a structured and culturally appropriate manner;
- Ensure project affected communities' free, prior and informed consultation and facilitate their informed participation as a means to establish whether a project has adequately incorporated their concerns[12];
- Make available the ESIA documentation and action plan, or Non-Technical Summaries (NTS) thereof to the public for a reasonable minimum period in the relevant local language and in a culturally appropriate manner;
- Take account of and document the process and results of the consultation, including any actions agreed resulting from the consultation; and
- Ensure disclosure occurs early in the assessment process before the Project construction commences, and on an ongoing basis.

The Equator Principles also state that projects are required to demonstrate compliance with IFC Performance Standards on Social and Environmental Sustainability (IFC Performance Standards). These standards also have specific requirements for consultation as specified below.

6.3.2.4 The IFC Performance Standards

There are eight IFC Performance Standards applicable to private sector projects in emerging markets. Each Performance Standard has specific consultation requirements and these are embedded in the general requirements of Performance Standard 1: Social and Environmental Assessment and Management Systems. These requirements are similar to those of the Equator Principles and they specifically refer to the need for and means of achieving community engagement, disclosure of relevant project information, appropriate consultation processes and grievance mechanisms.

The preparation of this PCDP has been informed by the following IFC good practice guidance documents:

- Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets (May 2007); and
- Doing Better Business Through Effective Public Consultation: A Good Practice Manual (November 1998).[13]

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[12] This only applies to projects predicted to have significant adverse environmental and social impacts on affected communities.

[13] Both documents are available here (as of March 2009): http://www.ifc.org/ifcext/sustainability.nsf/Content/Publications_GoodPractice_StakeholderEngagement.

6.3.3 National Consultation Requirements

Under the requirements of Uzbekistan (Decree of the Cabinet of Ministers of Uzbekistan on Approval of the Regulations on the State Environmental Expertise in the Republic of Uzbekistan No.491 of 31.12.2001 as amended on 05.06.2009) public hearings and disclosure of information are carried out at Stage II of the national EIA process in accordance with the SEE (or Glavgosekoexpertisa) Opinion on the need for public hearings.

The 'Statement on Environmental Consequences' details the alterations to the Project design which have been made in light of the SEE review of the first two stages of the EIA, the comments received through the public hearings if undertaken, the regulatory environmental limits applicable to the development and those environmental requirements associated with the development.

There is no official regulatory guidance as to which type of project requires a public hearing or how public hearings should be conducted. The approach to planning the public meetings as part of the PCDP process for the Project has been guided by typical local practice[14] and international best practice embodied by the standards summarised below.

6.4 Core Stakeholders and Consultees

6.4.1 Area of Influence and Selection of Districts for Consultation

Within the Project area of Influence there is only one existing host community, the Akchalak settlement, which is located approximately 5 km south west of the UGCC location. Consultation has therefore been targeted towards this host community and more generally targeted to the two host districts of Kungrad (where Akchalak is located) and Muynak. Such an approach captures all members of the public and stakeholders who could potentially be directly or indirectly affected by the Project and associated infrastructure. The consultation process also included a range of local government bodies such as representatives from the local communities and also the Head of Education and Health, as these bodies held information that would be very important to the project.

6.4.2 Direct Stakeholders

Direct stakeholders include:
- People living in the closest communities to the Surgil Field and UGCC sites (there are no communities within close proximity to the pipeline route);
- Local women's groups;
- Local social and community service providers (e.g. health and education);
- Local governmental bodies related to public welfare, environmental protection and permitting for the Project;
- Existing Uz-Kor staff and their trade union representatives; and
- Neighbouring and supply chain industries and businesses including livestock owners using the Ustyurt Plateau.

[14] Based on their extensive local knowledge and experience, the LEC have advised the IEC on the typical approach for undertaking public meetings in the Republic of Karakalpakstan specifically and Uzbekistan more generally.

The role of each stakeholder in the consultation process for the Project is summarised in Table 6.1.

Table 6.1: Direct Stakeholder Groups

Stakeholder Group	Reasons for Inclusion within the Consultation Process
Affected Communities	
Upstream, Surgil Field - Uchsay settlement located 9km from Muynak	There is potential for this local settlement to be affected both negatively and positively by the proposed development, e.g. during construction phase of the gas field development. Consultation for Uchsay has been hosted in Muynak located in near proximity given a lack of suitable meeting facilities within the Uchsay settlement itself. It is important for local communities to be included within consultation process to ensure that they have the opportunity to voice any concerns they may have and also gain access to up-to-date information on the project and the ways in which they may be affected by it.
Downstream, UGCC site: Akchalak and Elabad Settlements	There is potential for these local settlements to be directly affected both negatively and positively by the proposed development, especially the Akchalak settlement where a new community will be constructed adjacent to the existing settlement to house workers and their families. It is important for local communities to be included within consultation process to ensure that they have the opportunity to voice any concerns they may have and also gain access to up-to-date information on the project and the ways in which they may be affected by it.
Local Government Bodies	
Heads of local government ('Aksakals') of closest settlements: ■ Uchsay settlement (Surgil Field) ■ Akchalak Settlement (UGCC) ■ Muynak District Government ('Hakimyat') ■ Kungrad District Government ('Hakimyat');	Due to the scale of the proposed Project, local settlements will be interested in the practices being adopted to ensure that local communities are not negatively affected by the development. They will also be interested in the potential benefits that the Project may provide to these local settlements, such as job opportunities and infrastructure improvements. Relevant stakeholder groups from the Muynak and Kungrad Hakimyat's are summarised below.
Manager of Kungrad and Muynak Hakimyat Education Departments	Interested in the potential local benefits that the Project may bring to the surrounding areas through the development of new schools and education facilities. This individual is also important to the consultation phase as they can provide a source of useful information.
Manager of Kungrad and Muynak Hakimyat Health Departments	They will have an interest in the health and safety aspects of the Project and what has been proposed to ensure that potential health impacts associated with the Project are minimised e.g. air pollution associated with construction phase. They will also be interested to know what health and welfare benefits the project will feed back to the local community, e.g. the development of new hospitals and health care facilities.
Manager of Kungrad and Muynak Hakimyat Agriculture Departments	They will be interested to know how the Project may impact on local agriculture practices (e.g. through water resource use). They will also be interested to know what benefits the Project will be feeding back into the local agriculture sector.
Republic of Karakalpakstan Government;	They will be interested to know what benefits the Project will be contributing to Karakalpakstan, such as the benefits to local health care, education, the production of local jobs and the opportunity to bring economic wealth to the area etc.
State Committee for Nature Protection ("Goskompriroda");	They will have an interest in ensuring that the Project and associated infrastructure will have minimal negative impacts on local nature and wildlife. They will also have an interest in what nature benefits the project will plan to bring to the local area in order to offset any negative impact the construction and operational activities may have on the local environment

Stakeholder Group	Reasons for Inclusion within the Consultation Process
Lower Amu Darya Basin Authority (responsible for water resources management).	They will be interested in ensuring that the Project does not affect the local watershed management practices which they carry out.
Institute of History, Archaeology and Ethnography, Uzbek Academy of Sciences	Interesting in safeguarding cultural heritage sites and practices of the Karakalpak peoples.
Aral Basin Delta Management Organisation	Manage the Aral Basin delta and will be interested in potential impacts on water flow as a result of the project's water abstraction and other activities/
Local Community Women's Groups	These groups promote the interests of women in pursuit of gender equality, they report to the Hakimyats. They will be interested in employment and other opportunities for women.
Existing Staff	
Manager(s) and staff representative(s) of Surgil Field and CGTU;	As these people are working at the current Surgil CGTU they will be affected by the transition to new ownership and expansion works associated with this Project. It is important that they are included in the consultation process in order for them to voice their opinions and have access to up-to-date information about the Project.
Manager(s) and staff representative(s) of drilling contractors at the Surgil Field;	As above
Local Industry and Business	
Kungrad Soda Plant (downstream);	Local industry which is located within the vicinity of the proposed project and therefore could potentially be affected by the projects development.
Urgenchtransgaz-operated Akchalak Gas Compressor Station and associated rail loading facility;	Local industry within the vicinity of the proposed UGCC Project development.
Livestock owners who use the Ustyurt Plateau in the summer	These livestock owners periodically use the pieces of land on which the UGCC and associated infrastructure (i.e. workers camp, rail connection, motor road connection, raw water supply line connection, sales gas pipeline, wastewater pipeline and disposal area and electrical power line connection, etc.) is proposed to be developed on.
Takhiatash Dam Operators	Water abstraction for the Project must be assessed with consideration of flows in the catchment area of this dam.
Local Social Services in Project Affected communities	
Medical Centres	These facilities will be required to provide service to the new population of workers and their families entering the local communities
Schools	
Employment centres	Important for maximising local employment benefits.

6.4.3 Indirect Stakeholders

Indirect stakeholders can be defined as those persons or organisations that may be able to influence the outcome of the Project, either because they can contribute knowledge or improve project design or mitigate social and/or environmental impacts, or because they have political influence in the Project that needs to be considered. Indirect stakeholders relevant to the Project as identified in Table 6.2.

Table 6.2: Indirect Stakeholder Groups

Stakeholder Group	Reasons for Inclusion within the Consultation Process
National and International Government Bodies	
Ministry of Agriculture and Water Resources; Ministry of Labour Protection and Social Welfare; Ministry of Health Protection; Ministry of Foreign Affairs; Ministry of Amelioration and Water Facilities; Agency of Oversight on Safe Industrial Work Conduction and Upland Oversight; and United Nations Development Programme (UNDP).	National and International Government Bodies are important stakeholders as they are able to provide source of information to the consultation phase. For example, information relating to local labour practices. They also have the ability to influence decisions made regarding the Project.
Non-Governmental Organisations and Civil Society	
"International Fund of Saving Aral (IFSA)"; "National Association of Uzbekistan NGOs"; "Education and Development"; "Intellect" (concerned with interests of young people); "Development of Abilities of Disabled People"; "Karakalpak Department of Uzbek Association on Reproductive Health"; "Soglom Avlod Uchun" (concerned with safeguarding local welfare); "Association of General Doctors of the Karakalpakstan Republic"; "Association of Businesswomen"; "Daulet" (implements donor funded community development programmes); "Golden Heritage of the Aral"; "Union for Protection of Aral and Amu-Darya"; "Environmental Movement of Uzbekistan"; "Armon" (concerned with environmental rights); "Alliance on Saving Saiga" (concerned with protection of wild antelope); "Union for Protection of the Aral Sea and Amu Daryu"; "Fund for a Healthy Generation" "EkoSan" (concerned with health and environmental issues); "Karakalpak State Art Museum"; "Centre for Social and Economic Research (academic institute)"; "International Red Cross"; "GreenPeace"; and "Uzbekistan Society for the Protection of Birds (Bird Life)". "Committee of Writers of Karakalpakstan" "Organisation of Blind People"	Non-Governmental Organisations (NGOs) are an important source of information for the Project consultation phase, for example information relating to local cultural practices and community values. They also have the power to influence aspects of the Project to ensure that the Project is carried out in an environmentally and socially sound manner.
Media	
"Free Karakalpakstan" (regional newspaper in Karakalpak language); "Narodnoe Slovo" (national newspaper in Russian language); and "Khalk Suzi" (national newspaper in Uzbek language) "Erkin Karakalpakstan" local news paper	It is necessary for local media groups top be involved in the consultation process as from a publicity point of view it is important that they have access to complete sources of information to ensure that media coverage is delivering the most up-to-date and accurate Project information.

6.5 Project Consultation Activities and Outcomes

6.5.1 Overview

This sub-section presents the activities undertaken during the ESIA process and their outcomes, and summarises those activities planned throughout the remainder of the Project's lifecycle in accordance with the PCDP presented in Volume III Appendix E and the requirements outlined in Section 6.3. These activities are presented in chronological order in Table 6.3 below.

Table 6.3: ESIA Consultation and Disclosure Chronology

Project Phase	Activity	Date	Objectives
ESIA Scoping	Preliminary Stakeholder Meetings	February 2009	• Disclose information about the Project and the consultation process; • Enable the site visit team to respond to any queries / concerns that stakeholders had about the Project; and • Obtain where possible baseline environmental and social information relevant to the Project.
	Scoping Report Non-Technical Summary Disclosure	July 2010	• Disclose the contents of the Scoping Report in full and in a condensed community leaflet • Invite comments before finalisation of the ESIA ToR • Invite people to Scoping Public Exhibitions
	3 x Scoping Public Exhibitions	July 2010	• Disclose the contents of the Scoping Report • Respond to stakeholder concerns or queries and ensure they are addressed in the ESIA • Invite comments before finalisation of the ESIA ToR
ESIA Assessment	ESIA Private Meetings with: • Regional / District Government Departments • Community leaders • Community women • Community businesses • NGOs	August 2010 - March 2011	• To gather specialist information and identify specialist stakeholder concerns for inclusion in the ESIA • To encourage participation of project affected communities in the ESIA process
	3 x Draft ESIA Public Exhibitions	July 2011	• Disclose the contents of the Draft ESIA • Respond to stakeholder concerns or queries and ensure they are addressed in the ESIA before finalisation • Invite comments before finalisation of the ESIA
ESIA Reporting	Draft ESIA National Disclosure	August 2011	• Disclose the full Draft ESIA at locations accessible to local communities together with the Non Technical Summary • Invite comments before finalisation of the ESIA

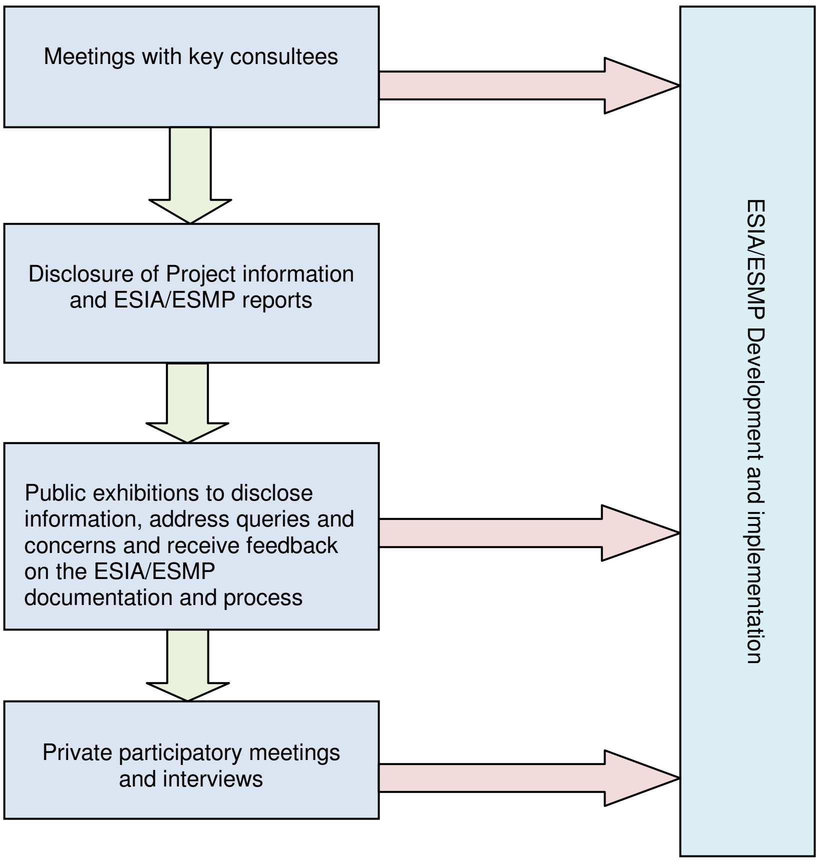
Project Phase	Activity	Date	Objectives
	Draft ESIA International Disclosure	August 2011	• Disclose full Draft ESIA on ADB and Uz-Kor website for a period of 120 days within which time stakeholders can comment before ESIA finalisation
	Disclosure of final ESIA Report	November 2011	• Disclose final ESIA so stakeholders can participate in monitoring
ESMP Monitoring during construction and operation	Ongoing stakeholder engagement and implementation of grievance mechanism	Throughout construction, operation and decommissioning	• Receive and resolve grievances • Disclose information about Project risks, impacts and opportunities
	Disclosure of monitoring reports	Bi-annually	• Disclose effectiveness of ESMP

6.5.2 ESIA Consultation

6.5.2.1 Overview

In order to comply with the requirements outlined in Section 6.3, the ESIA consultation, disclosure and participation activities and outcomes reported in the sub-sections below, and those planned (in accordance with the PCDP) are described in the remainder of this section. These activities can be broadly categorised into the components identified in Figure 6.1 overleaf.

Figure 6.1: ESIA Consultation, Disclosure and Participation Components



These activities have occurred to varying degrees, throughout the ESIA scoping, assessment, reporting phases as outlined below. ESIA monitoring is planned throughout the lifecycle of the Project as summarised in the ESMP (Volume IV to this ESIA).

6.5.2.2 ESIA Scoping Consultation

Preliminary Stakeholder Meetings and Interviews

During the first ESIA site visit in February 2009, preliminary meetings were conducted with a number of the Project's identified direct stakeholders. The general purpose of these meetings was for the site visit team (consisting of Uz-Kor and international and local ESIA team environmental and social specialists) to:

- Disclose information about the Project and the consultation process;
- Enable the site visit team to respond to any queries / concerns that stakeholders had about the Project; and
- Obtain where relevant environmental and social information to inform the scoping study by gathering baseline information and identification of likely significant impacts.

During the meetings, the site visit team introduced themselves, explained the Project and the ESIA process and then invited comments and questions. Any comments or questions raised by stakeholders were discussed until the stakeholders were satisfied with the level of information provided. The site visit team asked open ended questions to gauge initial opinions on the Project; in some cases more detailed questions were asked in order to obtain specific baseline information. These meetings are summarised in Table 6.4 below.

Table 6.4: Preliminary Stakeholder Meetings and Interviews

Date	Stakeholder(s) met	Meeting location	Key topics discussed
02.02.09	Republic of Karakalpakstan State Committee for Nature Protection ("Goskompriroda")	State Environmental Committee Office in Nukus	Water shortages and shrinkage of Aral Sea. Ecological sensitivity of Ustyurt Plateau and Sudoch'ye Nature reserve / RAMSAR site. Land use arrangements between state forestry authorities and migratory herders. Employment benefits at downstream area.
03.02.09	Manager of Surgil Field and CGTU	Surgil Separation Plant	Labour and working conditions. Need for new worker accommodation and water supply.
03.02.09	Aksakal of Uchsay settlement	Aksakal Office	Local governance, demographics and community needs.
04.02.09	Aksakal of Akchalak settlement	Aksakal Office	Local governance, demographics and community needs.
05.02.09	Kungrad (downstream) District Government ('Hakimyat')	Uz-Neftegaz Office in Kungrad	Health, education and agriculture.

Figure 6.2: Meeting with Republic of Karakalpakstan State Committee for Nature Protection (“Goskompriroda”)

Source: MM ESIA Team site visit

Figure 6.3: ESIA Team Social Specialist Meeting with Aksakal of Akchalak Settlement

Source: MM ESIA Team site visit

The information gathered from these meetings, along with a review of project documentation and site visit observations was used to produce the Scoping Report in February 2009. Following project delay, the Scoping report was updated and finalised in April 2010. The scoping Report was disclosed to stakeholders as outlined below.

Scoping Report Non-Technical Summary Disclosure

Information about the Project and the findings of the Scoping report were disclosed to all of the stakeholders identified in Section 6.3 via distribution of Scoping Non-Technical Summary (NTS) documentation. The objectives of this disclosure were to enable informed participation of stakeholders in the ESIA process and to invite comments before finalisation of the ESIA Terms of reference (TOR) outlined in the Scoping Report.

The Scoping NTS information was essentially a summary of the preliminary review of environmental and social impacts and how they will be assessed in the ESIA process. The Scoping NTS documentation was set out in simple language and non-technical terms making it easy to understand for people who are not familiar with the Project, the ESIA process and other technical engineering, social and/or environmental phraseology. It was produced in two formats targeting two different groups of stakeholders and consideration was given to education, profession and literacy levels when deciding on levels of detail, style and substance. The following two Scoping NTS documents were produced for distribution:

- Scoping NTS Report; and
- Scoping NTS Community Leaflet.

The Scoping NTS Report was produced in the two national languages, Russian and Uzbek, and the regional language, Karakalpak. The Scoping NTS Community Leaflet was produced in all three languages as well.

The Scoping NTS Report was distributed via post in July 2010 to non-local stakeholders who may be affected by or have an opinion on the Project. The report was accompanied by a covering letter inviting the stakeholders to comment on the Project either via written correspondence or in person at Scoping Public Exhibitions (see below).

The Scoping NTS Community Leaflet was a four page document that was distributed to local community members in July 2010 who may be directly affected by the Project. This leaflet included details of the public exhibitions and described the process for making formal comments. The leaflet was distributed in public meeting places such as the town hall and other social meeting places. Through engagement with local government officials, particular efforts were made to target information to marginalised or vulnerable members of the community and encourage their participation at, and input to, the public exhibitions.

Mott MacDonald

Scoping Public Exhibitions

The Scoping NTS information was also presented at three Scoping Public Exhibitions organised for interested stakeholders at the following locations:

- Kungrad City (capital of the downstream District), 27.07.10;
- Akchalak Settlement (downstream project affected community where residents of Elabad have access to as well), 28.07.10; and
- Muynak City (capital of the upstream District where residents of nearby Uchsay have access to), 29.07.10.

These events were organised in coordination with the Kungrad and Muynak Hakimyats (District Governments) and residents of each district were invited to any or all of the three meetings through the media outlets.

The objectives of these exhibitions were to disclose the contents of the Scoping Report (including the PCDP), respond to stakeholder concerns or queries about the Project and the ESIA process and to ensure that they are addressed in the ESIA and to facilitate stakeholder participation prior to finalisation of the ESIA ToR.

The public exhibitions were announced and publicised in the local newspapers seven days in advance (the generic press release to newspapers for these consultation events is presented in Appendix F, Volume III). In addition, written invitations were sent to stakeholders along with the Scoping NTS Report. The Scoping NTS Community Leaflet that was distributed in local communities also had details of the exhibitions.

At the exhibitions there were information boards with project information and a summary of the Scoping study findings. These were presented alongside the ESIA/PCDP programme, followed by a ‘question and answer’ session and discussions. Full photo reports of the three public exhibitions are presented in Appendix G, Volume III.

The main topics that emerged from the Kungrad City exhibition were in relation to the potential job opportunities that this Project will bring to the surrounding areas, the amount of resources that are going to be fed from the Project into local development, and the potential health impacts that the Project could have on local communities. In relation to jobs, the Project is expected to generate more than a thousand new jobs, including professionals and specialists in other fields. Currently the Council of Ministers of Karakalpakstan is carrying out a programme of training local specialists (on the similar plant SGCC). Moreover recruitment of specialists will be made based on the demand and primarily sourced from the Karakalpakstan region where available. The stakeholder comments and queries and how they were responded to at the exhibition are summarised in Table 6.5 below.

Table 6.5: Summary of Kungrad City ESIA Scoping Public Exhibition Stakeholder Comments and Responses

Stakeholder	Comments	Uz-Kor Response at Scoping Exhibition
Chairman of the Committee of Writers of Karakalpakstan	Will there be an International Legal Expertise carried out on Surgil project? Is there a possibility to direct part of the profit of the complex (25%) for the development of local community? [(a)]	Within the framework of the project financing it is foreseen to involve local and international legal consultants. All comments received during the public exhibitions will be communicated to the management of Uz-Kor and the ESIA team for consideration.
Chairman of the Organisation of Blind People	How will the social aspects of the project be implemented?	A PCDP (ESIA, Volume III) has been developed and the requirements for ongoing consultation will be encapsulated in the Environmental and Social Management Plan (ESMP, Volume IV) being produced for the Project which will be implemented. The ESMP will ensure that all the economic, ecological and social aspects (creation of new jobs, construction of new schools and hospitals, development of infrastructure and welfare) will be disclosed/discussed. Social issues will be assessed and mitigated throughout the ESIA process (see sections 7.4 and 7.5 of this report) and monitored thereafter according to the ESMP (see Volume IV, section 2.2.2 and 2.3.2).
Housewife	What are the job opportunities and guarantees for job? What will be the procedure (will it be similar to that of Kungrad Soda Ash plant?)?	Construction of the UGCC Complex will create more than a thousand new jobs, in different fields, including professionals in specific fields as well as specialists in other fields. Currently the Council of Ministers of Karakalpakstan is carrying out a program of preparing local specialists (on the similar plant SGCC). Moreover recruitment of specialists will be made based on the demand and primarily from the local community.
Pensioner	Impact of the project to health of local community, children?	This will be considered in detail through the ESIA process (see sections 7.4, 11.4 and 15.8 of this report). Technological activities, carried out in accordance with the ESIA mitigation recommendations will safeguard the health and safety of people. These will be embedded as Project commitments in the ESMP (see Volume IV, section 2.2 and 2.3).
KKGTU. Inspector	Had an assessment of the projects in relation to industrial safety been carried out yet?	All the necessary permits and conclusions on the Project are being obtained along process, in accordance with the rules set by the Legislation of Uzbekistan.
Pensioner	When the project will be completed?	Start up of the plant is scheduled to the second half of 2014/early 2015

Note: [(a)] This question was not responded to directly at the public exhibition but has been addressed through the Social Impact Assessment presented in Section 7 of this ESIA, specifically in terms of Community Investment Programme identified within mitigation.

Figure 6.4: ESIA Scoping Public Exhibition in Kungrad City (capital of the downstream District), 27.07.10

Source: Uz-Kor

The main topics that emerged from the Akchalak Settlement exhibition were in relation to the new settlement plans, the potential for ecological and human health impacts during the development construction phase, potential job provisions to the local people, and the potential waste streams that the proposed development will produce. A concern was also raised in relation to the current ecological problems associated with Ustyurt Plateau and the potential for this project to have similar problems. As outlined above, information on local job provision is available within the social impact assessment, which also covers aspects of settlement planning and potential human health impacts caused by the Project. Information on potential waste streams is available in the waste management chapter and issues covering ecological impacts are covered in detail in the ecology chapter. Specific mitigation measures are included in the ESMP.

The stakeholder comments and queries and how they were responded to at the exhibition are summarised in Table 6.6 below.

Table 6.6: Summary of Akchalak Settlement ESIA Scoping Public Exhibition Stakeholder Comments and Responses

Stakeholder	Comments	Uz-Kor Response at Scoping Exhibition
Akchalak Magisterial Gas-Pipeline Operation worker	Will the construction of the plant have an impact on the health of local people and ecology, taking into account that the Ustyurt Plateau has environmental problems? [(a)] Will the effect be similar to that of the Aluminium plant in Tajikistan on the health of people?	The ESIA (before the construction of the plant) will study local area from an ecological and social perspective. The results of these studies will be taken into account and will serve as a base for further realisation of the project and avoidance and mitigation of negative impacts. As for the negative impact on the health of people - the production is not poisonous or hazardous. Moreover all wastes and disposals from the project will be within the boundary limits of allowable national and international standards. (post meeting – ESIA Volume II assesses all likely environmental impacts on local communities whilst Sections 2.2 and 2.3 of the ESMP (Volume IV) stipulate the required mitigation measures.)

Stakeholder	Comments	Uz-Kor Response at Scoping Exhibition
Resident of Akchalak settlement	Is relocation of the present settlement planned?	The project will be located at a distance of about 5-6 km away from the settlement that is why relocation of the settlement is not foreseen.
Akchalak Magisterial Gas-Pipeline Operation Chief Engineer	What wastes will there be from the plant and what is an impact of those wastes to health of local people?	Within the project appropriate measures on waste treatment, utilisation of waste and construction of special waste areas are foreseen. (post meeting - Section 10.4 of this report further addresses waste impacts.)
Doctor in the local hospital	Utilisation of solid wastes and waste water?	The technological part on solid waste and waste water treatment will fully comply with national and international standards. (post meeting - A Site Waste Management Plan Framework is included within section 3.7 of the ESMP (Volume IV).)
Akchalak Magisterial Gas-Pipeline Operation Controller	What types of specialists will be needed for the Complex?	As it was already mentioned more than 1000 new jobs will be created and the demand in work force on the plant as well as on the surrounding infrastructure will be diverse.
Resident of Akchalak settlement	Why there are no representatives of investors with you?	Current activity is carried out within the framework of PCDP (public consultation and disclosure plan) report of the international ESIA consultant. The representatives of the JV together with specialists of local environmental consultant (Uzlitineftgaz) have to present answers to all questions which you may have. Also we have to inform the management of the JV and the ESIA specialists about all your comments, in order to take them into account in the project.
Akchalak Magisterial Gas-Pipeline Operation Engineer	How was the site for construction of the plant selected? Could it be changed? There is constant wind which blows towards the settlement	Before designing the location of the project the local area was thoroughly studied and all factors, including the direction of the wind, were taken into consideration. There will not be any disposal from the plant which will harm the health of the people, additionally the wind (the main wind) blows not directly to the settlement from the site of the plant. (post meeting - Section 3.4 of this report addresses site selection.)
Resident of the Akchalak settlement	Where can the local community turn to in case of breach of ecological standards?	On any matters it is possible to address representatives of the JV and the local environmental consultant (Uzlitineftgaz) via e-mail or telephone, which are indicated on the posters.
Akchalak Magisterial Gas-Pipeline Operation Technician	What percentage of specialists will be recruited from the local population?	It is expected that as much as possible the recruitment will be out of local population. However there will also be other specialists, including international, with the knowledge of specifics of the equipment and the technological processes. (post meeting - Section 7.5.2 of this report discusses local employment.)
Resident of the Akchalak settlement	How will the social aspects of the project be implemented?	Realisation of the project has number of social and economic benefits to, first of all, the local community. The most important of those, as it was mentioned before, creation of new jobs, infrastructure, welfare, etc. (post meeting - Section 7.5 discusses implementation of mitigation and enhancement measures related to community impacts.)
Resident of the Akchalak settlement	Compensation for the harm to the local community?	There will not be any harm from the plant which would necessitate compensation. Firstly, all wastes will be within the allowable norms, and secondly the project foresees methods, and probably special equipment for utilisation of wastes.

Stakeholder	Comments	Uz-Kor Response at Scoping Exhibition
Akchalak Magisterial Gas-Pipeline Operation Security Guard	What type of products will the plant produce?	Production of polypropylene, high density polyethylene and gas.

Note: [(a)] The answer to this question is more fully elaborated through the detailed description of the baseline environment of the Ustyurt Plateau and subsequent impact assessment as described in this ESIA.

Figure 6.5: ESIA Scoping Public Exhibition in Akchalak Settlement (downstream project affected community), 28.07.10

Source: Uz-Kor

The main topics that emerged from the Muynak city exhibition included queries regarding the methods used to select the chosen project location, and the proportion of the money generated from the project that is going to stay in Uzbekistan. Information on the site selection process can be found in the analysis of alternatives Section 3. The stakeholder comments and queries and how they were responded to at the exhibition are summarised in Table 6.7 below.

Table 6.7: Summary of Muynak Settlement ESIA Scoping Public Exhibition Stakeholder Comments and Responses

Stakeholder	Comments	Uz-Kor Response at Scoping Exhibition
Resident of Muynak city	What benefits will the local community receive from the project?	Realisation of the project has number of social and economic benefits to, first of all, the local community. The most important of those, as it was mentioned before, creation of new jobs, infrastructure, welfare etc. (post meeting - Section 7.4 discusses project impacts including positive impacts and section 7.5 discusses mitigations and benefit enhancement measures.)
Lawyer of the local municipality	What is the amount of the project? What is a share of Uzbek side?	This project is one of the largest projects being implemented in Uzbekistan. Approximate amount of the project is around USD 4 billion.
Editor of local news paper "Erkin Karakalpakstan"	What are the positive and negative effects of the project?	It is expected that there will be a number of social and economic benefits as a result of implementation of the project. The site chosen for the construction of the plant does not have substantial flora and fauna, which could be affected as a result of construction. Moreover International and National Environmental Consultants will prepare ESIA reports before the construction of the complex. (post meeting - Section 3.1 of Volume I of the ESIA provides a non-technical summary of the expected impacts.)
Supervisor of cultural centre	Why the site for construction was chosen at Akchalak and not around Muynak?	When designing the project all the characteristics of the site have been taken into account. (post meeting - Section 3.4 of this report addresses site selection.)

Figure 6.6: ESIA Scoping Public Exhibition in Muynak City (capital of the upstream District), 29.07.10.

Source: Uz-Kor

6.5.2.3 ESIA Assessment Consultation

ESIA Assessment Private Meetings

Following completion of the Scoping Phase of the ESIA, the main ESIA assessment commenced and a number of private meetings were held with stakeholders to disclose information and gather specialist opinions on key areas of the assessment. These meetings are summarised in Table 6.8 below.

Table 6.8: Summary of ESIA Assessment Private Meetings

Date	Stakeholder(s) met	Meeting location	Key topics discussed and opinions and responses provided.
25th Nov. 2010	Kungrad/ Muynak District Hakimyat	Kungrad and Muynak Town Halls	Project land allocation: land is government land and none is being used by indigenous peoples for traditional lifestyle activities and there are no hereditary rights under Uzbek law. Land allocations from the Kungrad Hakimyat have been applied for by Uz-Kor for the UGCC and downstream components. UG has separately applied for land allocations relevant to the upstream part of the Project which will novate over to Uz-Kor as and when they take ownership of the Surgil Field. Under this arrangement, project proponents own their facilities and are allocated the right to use the land. Uz-Kor was allocated land in 2009 specifically for the downstream component of the Project; MML has been provided with a copy of the land allocation certificate (Decision no. 118/3, dated 4th March 2009) issued by the Kungrad district Mayor.
25th Nov. 2010	General Manager of Soda Ash Plant	Akchalak	Presented water management scheme of the Soda Ash Plant and their experience of being able to effectively achieve higher water re-use than originally planned.

Date	Stakeholder(s) met	Meeting location	Key topics discussed and opinions and responses provided.
11 March 2011	Takhiatash Dam Operators Management	Takhiatash Dam	The dam managers explained their role as the regulators of water flows down the 60 km section of the Amu Darya, as well as associated canals, from Kipchek to the mouth of the formal Aral Sea. They also described the regime for facilitating flows down the Amu Darya from Takhiatash and the role of the Interstate Commission for Water Co-ordination (ICWC) of Central Asia in co-ordinating water flows from the Tuyamuyun Reservoir system and in regulating flows down the Amu Darya. Schematics of the Amu Darya from its source until its lower reaches in Karakalpakstan were provided.
14 March 2011	Lower Amu Darya River Basin Management Board ('NABUIS'), Ministry of Agriculture and Water Resources	Nukus	NABUIS elaborated upon the role of the ICWC in co-ordinating the water requirements of the countries through which the Amu Darya flows, and they offered their initial opinion that they had no concerns with Project plans proposals for abstraction from the Amu Darya. NABUIS indicated that project water abstractions from the Kungrad WSU would have no impact upon flows to the Sudoch'ye lake system, as these lakes are fed by alternative flows from the Amu Darya upstream of the Kungrad WSU. Also, there is a network of pumps downstream of the Kungrad WSU serve to divert water from the Amu Darya for irrigation purposes during the period May to August. MML understands from NABUIS that residential water supplied in this area is primarily from groundwater sources.
14 March 2011	Woman representative of Akchalak Gas Compressor Station	Akchalak	Feedback on consultation which was seen as very good. Women have made significant progress in implementing their rights. 69 women working at Akchalak Gas Compressor Station including one at managerial level. UGCC may bring significant opportunity for employment of women. Estimate an additional 30/40 women are available for employment who are currently not employed. Women do not consider introduction of project as a negative issue in any way as it represents a significant opportunity for secondary service provision. Women would always benefit from business development training. Chairman of Akchalak settlement is a woman. Hopes project will be a success and hope that women in Akchalak will benefit in terms of employment. Trade union agreement signed by all staff. Includes specific benefits for women.
14 March 2011	General Manager, Akchalak Gas Compressor Station	Akchalak	The gas compressor station has no concerns about the water supply scheme for the Uz-Kor UGCC (i.e. sharing the use of the Kungrad water supply pipeline. The gas compressor station considers that even with the addition of the Uz-Kor UGCC, water abstraction into the Kungrad water supply pipeline would still be significantly less than historically 9prior to independence). However, this could only be confirmed through study of the historical water abstraction data pre 1996 which should be available from UNG (parent company of UrgenchTransGaz).
14 March 2011	Head of Akchalak Community Women's Group	Akchalak	Main issue is to have playgrounds for kids and outdoor space to walk outside / entertain kids. Have a cultural centre – need disco and beauty salons. No sports centre currently. Need exercise / keep fit for women. Role of Women's Group: 3 women in total – looks for supporting female employment and also looking at harmony of relations between male and females and also to protect women's rights.
14 March 2011	General Manager of Soda Ash Plant	Akchalak	Provided detailed information on all Soda Ash plant emissions for consideration within the Uz-Kor ESIA. Overall, the soda ash plant is very happy to have Uz-Kor developing the Surgil project in the area. The soda ash plant has no concerns about the shared use of the Kungrad water supply pipeline with Uz-Kor.

Date	Stakeholder(s) met	Meeting location	Key topics discussed and opinions and responses provided.
15 March 2011, 25 Nov. 2010	Institute of History, Archaeology and Ethnography, Uzbek Academy of Sciences	Nukus	The Institute confirmed that the Project will not result in a significant negative impact upon cultural heritage sites or features, given both the scarcity of known features within the Project area and the development of the pipelines along already disturbed routes. To confirm, Uz-Kor proposed that a representative of the Institute accompanies Uz-Kor on a reconnaissance drive along the proposed pipeline route. Uz-Kor proposes to facilitate an archaeological 'watching brief' to attend all excavation works during the Project construction phase
15 March 2011	Aral Basin Delta Management (ABDM)	Nukus	The ABDM clarified the system of lakes located in the lower Amu Darya river delta, south of the Kungrad WSU: the main Amu Darya river flows into the lake system at Muynak and a number of additional lakes are fed directly and indirectly by the river. Only one lake – Mejedurechye – is used as a potable water supply; all other lakes have high salinity and used mainly for fishing. The ABDM is responsible for maintaining the level of water in the lake system at Muynak via operation of dam's on their northern boundaries. ADBM is of the opinion that additional Project abstractions from the Kungrad WSU would not affect flows into the Sudoch'ye lane system, as this system is fed by a collector drain spur from the Amu Darya upstream of the Kungrad WSU.
16 March 2011	Ministry of Agriculture and Water Resources	Tashkent	Disclose information about the Project and discuss the following issues: UGCC water supply and demand; consideration of project abstraction demand in relation to existing flows and existing abstraction demands from the Amu Darya River; Sudoch'ye Lake system; Project offset opportunities; opinions and commitments of the Ministry.

The information gathered and concerns raised at these meetings have been fed back to the relevant ESIA specialists and addressed in the assessment to produce this draft ESIA.

Draft ESIA Public Exhibitions

The advanced draft ESIA non-technical summary information was presented at three public exhibitions organised for interested stakeholders at the following locations:

- Akchalak Settlement (main downstream project affected community, to which residents of the locally affected Elabad settlement have access to also), 07.07.11;
- Kungrad City (capital of the downstream district), 07.07.11; and
- Muynak City (capital of the upstream district where, residents of the locally affected Uchsay settlement have access to), 08.07.11.

These events were organised in coordination with the Kungrad and Muynak Hakimyats (District Governments) and residents of each district were invited to any or all of the three meetings through the media outlets.

The objectives of these exhibitions were to disclose the findings of the advanced draft ESIA and to respond to stakeholder concerns, queries or opinions on the predicted impacts and proposed mitigation and enhancement measures, and to ensure that they are addressed in the final ESIA.

The public exhibitions were announced and publicised in the local newspapers and by radio seven days in advance. In addition, written invitations were sent to stakeholders.

At the exhibitions, presentation of project information and a summary of the advanced draft ESIA findings were made by Uz-Kor. These were presented followed by a 'question and answer' session and discussions.

The main topics that emerged from the Akchalak Settlement Advanced Draft ESIA Public Exhibition were in relation to the ecological and health impacts of the project, and whether climatic and weather conditions such as prevailing wind directions have been taken into account in the site selection and management of the facilities. Uz-Kor explained that weather conditions were considered, and that the facilities were well away from human population centres with a large sanitary protection zone acting as a buffer for the Akchalak community. Furthermore, there would be no toxic or poisonous discharges that could harm people's health. Other queries related to the type of jobs being created and whether they will go to local people, as well as the level salaries being paid. Uz-Kor explained that the ESMP includes measures for local employment preferences and that many jobs will be created covering a diverse range of skills sets, some of which would be filled locally, whereas others would need external specialists. All jobs would pay above average salaries for Uzbekistan. Specific mitigation measures are included in the ESMP including local skills development programme.

The stakeholder comments and queries and how they were responded to at the exhibition are summarised in Table 6.9 below.

Table 6.9: Summary of Akchalak Settlement Draft ESIA Public Exhibition Stakeholder Comments and Responses

Stakeholder	Comments	Uz-Kor Response at Exhibition
Local member of the medical profession	Will the construction of the plant have an impact on the health of local people and ecology, taking into account that the Ustyurt Plateau has ecological problems?	The draft ESIA concludes that there will be no ecological impacts that cannot be mitigated through the application of the ESMP. Furthermore, the Project will not result in the production of materials being released into the environment that will be poisonous or hazardous to people's health. Moreover all wastes and disposals from the project will be within the boundary limits of allowable local and international standards. (post meeting - Sections 7.4, 11.4 and 15.8 of this report address health impacts and section 8.4 discusses ecological impacts.)
Chief engineer of the Akchalak Magistral Gas-pipeline operation	How much will be salary for local personnel?	The salary for employees will above the average salary Uzbekistan.
Operator of the Akchalak Magistral Gas-pipeline operation	What types of specialists will be needed for the UGCC complex?	As it was already mentioned, more than 1000 new jobs will be created and the demand in work force for the plant as well as the surrounding infrastructure will be diverse.
Local member of the medical profession	Are climatic conditions of the region taken into account in developing the project, for example weather conditions, direction of the major winds, etc? [b]	Average climatic conditions for each season are taken into account in the development of the Project, as well as direction of major winds. Also all production will be located far from main settlement areas which will be protected by the sanitary protected zone.
Accountant of the Akchalak Magistral Gas-pipeline operation	What percentage of specialists will be recruited from the local population? [c]	As many as possible people will be recruited from the local population. However there will also be other specialists brought in, including international specialists, with specific knowledge of the equipment and the technological processes being used. (post meeting - Section 7.5.2 of this report discusses local employment.)

Note: [a] The answer to this question is further elaborated through the detailed description of the baseline environment of the Ustyurt Plateau and subsequent impact assessment as described in this ESIA.

[b] The answer to this question is further elaborated in the air quality assessment of this ESIA (see Section 15)

[c] A fuller response to this question is elaborated via consideration of employment generation as elaborated within the Social Impact Assessment presented in Section 7 of this ESIA.

Figure 6.7: Draft ESIA Public Exhibition in Akchalak Settlement (downstream project affected community), 07.07.10

Source: Uz-Kor

The main topics that emerged from the Kungrad City exhibition were in relation to queries about local atmospheric and health impacts, to which it was explained that these are being avoided and mitigated through the robust ESIA process that has been undertaken to meet national and international standards. Furthermore, the ADB would not finance a project that was going to have an adverse affect on public health. In response to queries about employment opportunities, Uz-Kor explained that many of the jobs would be specialised, and that the Council of Ministers of Karakalpakstan was preparing workers for jobs by sponsoring their training in an existing chemical complex elsewhere in Uzbekistan. Many of these people are local, and preference will be given to local people to fill the roles created, subject to them having the correct skills. The anticipated timeframe for the Project was explained also.

Table 6.10: Summary of Kungrad City Draft ESIA Public Exhibition Stakeholder Comments and Responses

Stakeholder	Comments	Uz-Kor Response at Exhibition
Hakimiyat of the Kungrad District	How will the construction of the UGCC affect the local atmosphere and other aspects of the environment?	In all stages of construction the management procedures on emissions to atmospheric air, generated waste waters and solid wastes, will be implemented strictly in accordance to sanitary-hygienic standards of Uzbekistan and international best practice so adverse impacts will be avoided or mitigated. (post meeting - Section 15.8 of this report discusses air quality impacts and other sections including 8.4, 9.4, 12.4 and 14.4 discuss other environmental impacts such as ecology, water, noise, vibration and landscape. Section 3.1 of Volume I of the ESIA provides a non-technical summary of all of the expected impacts.)
Local housewife	What are the job opportunities and guarantees for job? What will be the procedure?	Construction of the Complex will create more than a thousand new jobs in different fields, including low skilled jobs, professionals in specific fields and specialists in other fields. Currently the Council of Ministers of Karakalpakstan is carrying out a program of training up local specialists at the similar SGCC plant in Uzbekistan. Recruitment of specialists will be made based on the demand, and where the skills are available, people will primarily be recruited from the local community. (post meeting - Section 3.3 of Volume IV (ESMP) details the recruitment policy.)
Local pensioner	What will be the impact of the project to the health of the local community, especially children?	One of the main of the requirements of the ADB is that Projects will not be financed if they result in negative impacts on people's health. The ESIA has been undertaken by local and international consultants to consider environmental impacts in relation to public health. Technological and other activities, carried out in accordance with the ESIA recommendations, will serve as a guarantee of safety of the environment and health of people. (post meeting - Sections 7.4, 11.4 and 15.8 of this report address health impacts.)
Pensioner	When will the project be completed?	Start up of the plant is scheduled for the second half of 2014 and it will be fully operational by 2015.

Figure 6.8: Draft ESIA Public Exhibition in Kungrad City (capital of the downstream District), 07.07.11

Source: Uz-kor

The main topics that emerged from the Muynak city exhibition included queries regarding what benefits the community would receive. Uz-kor explained that there would be a number of social benefits, most notably employment generation, infrastructure development and also some community facilities in the Akchalak settlement. One participant asked why Akchalak had been selected as the site for the UGCC complex rather than Muynak and Uz-Kor explained that there were a wide range of determinants for site selection and the chosen site scored the highest. There was also a query about the economic value of the Project and it was explained that it was one of the largest Project currently being developed in Uzbekistan with an approximate value of USD 4 billion.

The stakeholder comments and queries and how they were responded to at the exhibition are summarised in Table 6.11 below

Table 6.11: Summary of Muynak Settlement Draft ESIA Public Exhibition Stakeholder Comments and Responses

Stakeholder	Comments	Uz-Kor Response at Exhibition
Local pensioner	What benefits will the local community receive from the project?	Realisation of the project has number of social and economic benefits to the local community. The most important of those, as it was mentioned before, will be the creation of new jobs, infrastructure, and welfare facilities. (post meeting - Section 7.4 discusses project impacts including positive impacts and section 7.5 discusses mitigations and benefit enhancement measures.)
Supervisor of Muynak cultural centre	Why was the site for construction chosen at Akchalak and not around Muynak?	When designing the project all the characteristics of the site have been taken into account and the site at Akchalak was the most feasible option considering all elements. (post meeting - Section 3.4 of this report addresses site selection.)
Representative of Muynak municipality	What is the economic value of the project?	This project is one of the largest projects being implemented in Uzbekistan with an approximate value of USD 4 billion.

Figure 6.9: Draft ESIA Public Exhibition in Muynak City (capital of the upstream District), 08.08.11

Source: Uz-kor

6.5.2.4 ESIA Disclosure

Draft ESIA Disclosure – in Uzbekistan

The draft ESIA documentation (including the Non-Technical Summary) is anticipated to have been translated to Russian, Uzbek and Karakalpak before the end of August 2011 and hard copies will be disclosed in the local communities to enable local stakeholders to raise comments and concerns before finalisation. One copy of the draft ESIA will be provided at the following locations in Karakalpakstan:

- Uz-Kor Head Office in Nukus;
- UstyurtGaz head office in Kungrad;
- Muynak District Hakimyat office in Muynak Town;
- Kungrad District Hakimyat office in Kungrad District; and
- Akchalak Settlement Aksakal Office in Akchalak.

The report will also be posted in all languages on the Uz-Kor website: www.Uz-kor.com.

Draft ESIA Disclosure - International

The draft ESIA will be disclosed on the ADB website (scheduled for mid August 2011) in English for a period of 120 days in accordance with the ADB Operational Manual. During this period, national and international stakeholder comments will be addressed and incorporated into the ESIA before finalisation scheduled for December 2011.

Disclosure of Final ESIA Report

After the 120 disclosure period and once stakeholder and ADB comments and queries have been incorporated and addressed in the ESIA report, the report will be finalised. The final ESIA will be disclosed in the local communities and on the Uz-Kor and ADB website. Hard copies of the draft ESIA will be provided in the local communities at the following locations:

- Uz-Kor Head Office in Nukus;
- UstyurtGaz head office in Nukus;
- Muynak District Hakimyat office in Muynak Town;
- Kungrad District Hakimyat office in Kungrad District; and
- Akchalak Settlement Aksakal Office in Akchalak.

6.5.3 Consultation Planned throughout the Lifetime of the Project

In order to comply with international finance standards, the Project will require public consultation and disclosure activities and mechanisms to continue beyond the ESIA process throughout the lifecycle of the Project. These activities, which include disclosure of ESMP monitoring reports, are guided by the PCDP presented in ESIA Volume III. The key activities are summarised in Table 6.12 below.

Table 6.12: Summary of Stakeholder Engagement activities beyond the ESIA Phase throughout the Project's lifetime.

Project Phase	Stakeholder Engagement Activity	Frequency	Responsibility
Construction	Disclosure of recruitment policy and employment opportunities within local communities and via employment centres	Three months before construction commences	Uz-Kor / EPC Contractor
	Grievance logging and resolution	Continuous	Uz-Kor and EPC contractor CLOs
	Disclosure within local communities of ESMP monitoring reports and grievance records	Every six months	Uz-Kor
	Community Information campaigns	At start of construction and annually thereafter, continuing in to operations	Uz-Kor
Operations	Public Exhibition to announce the commissioning of the plant, potential impacts and how they will be managed. Also to disclose employment opportunities.	1 month before commissioning	Uz-Kor
	Disclosure within local communities of ESMP monitoring reports and annual Sustainability Reports to summarise ESMP complaints and other sustainability issues. (see Volume IV)	Annually	Uz-Kor
	UGCC Facility and Visitor Centre Tours for Local School Children	Annually	Uz-Kor
Decommissioning	Public Exhibition to announce the de-commissioning of the plant, potential impacts and how they will be managed, for example through land restoration.	1 months before decommissioning	Uz-Kor
	Consultation and disclosure activities with workers who will be affected by retrenchment. The retrenchment procedures, timelines and workers legal and additional rights and entitlements will be clearly presented to them in accordance with the retrenchment plan to be developed for the Project.	At least one month prior to retrenchment activities commencing (to be more clearly defined in specific decommissioning retrenchment plan to be developed at the time).	Uz-Kor

6.6 Project Grievance Redress Mechanism

6.6.1 Overview

A project performance grievance mechanism has been established prior to the commencement of construction activities and an ongoing grievance register will be maintained through construction and operation by the Community Liaison Officer (CLO).

6.6.2 Community Liaison Officer (CLO)

Uz-Kor has appointed a CLO who will be a local point of contact for enquiries or complaints related to the Project's performance. During the construction phase the CLO will be physically located at the site of the UGCC with regular (weekly) visits to the upstream element of the Project. During construction, the CLO will organise weekly 'surgeries' in the settlements of Akchalak and Muynak during which any member of the public can attend and speak to the CLO in person raising any grievance or observation. These will be recorded as per the prescribed procedure in the Grievance Mechanism. In addition, the CLO will hold weekly meetings with the Aksakals of the Akchalak, Elabad and Uchsay settlements to ensure that any grievances lodged by members of the public direct to the Aksakal are communicated through to Uz-Kor for documentation and resolution as per the Grievance Mechanism.

During the operational phase the CLO's fixed point of contact details will be the Uz-Kor registered office in Nukus. The creation of the CLO position was advertised in the local communities and via the Karakalpak Regional Governments. The full job description is provided in Volume IV.

Sultan S. Annaklychev, Community Liaison Officer, Uz-Kor Gas Chemical
133A Dostnazarov Street
Nukus City
Republic of Karakalpakstan
Republic of Uzbekistan
Nukus Office Mob. +99890 727 92 77
Fax +99861 222-21-87
e-mail: sultanshakh@mail.ru

In addition contact details for the head office in Tashkent are also provided in the event that stakeholders want to raise issues in relation to the performance of the CLO requiring alternative contact access to the Uz-Kor organisation.

First Deputy Chairman, Mr Leonid Evdokimov, Uz-Kor Gas Chemical
Uz-Kor Gas Chemical
12th Floor
International Business Centre
107B Amir Temur Street
Tashkent
Republic of Uzbekistan
Tashkent Office Number. +99871 238 92 23
Fax +99871 238 92 24

The CLO will be the point of contact for submitting written comments and grievances about the Project. Anyone will be able to submit a grievance to the Project if they believe a practice is having a detrimental impact on the community, the environment, or on their quality of life. They may also submit comments and suggestions. A format for logging grievances will be established.

The CLO's contact details will be disclosed to the local community and displayed prominently on the site boundary along with the likely duration of construction works. The CLO will organise and manage the project performance grievance mechanism and processes related to localised disturbances. The CLO will also be responsible for disseminating appropriate information on the construction programme and operational maintenance works on a timely basis to those who are likely to be indirectly affected or if specific impacts are potentially a nuisance. Uz-Kor will also include clauses in the EPC and sub-contractor contracts stating that they will need to identify a staff member responsible to act as their own CLO, who will regularly report to the main Uz-Kor CLO.

6.6.3 Uz-Kor Website

Uz-Kor have established a project specific website with the following address: www.Uz-Kor.com. This website will have a 'contact us' page with a summary of the grievance mechanism outlined below and an invitation for stakeholders to submit concerns and comments.

6.6.4 Grievance Classification, Logging and Resolution

A tabulated standard form will be prepared for recording any environmental complaints that are received from the public or government organisations by whatever medium i.e. visits to the site, telephone calls or correspondence. The form will concisely list the following information:

- Date of the complaint;
- Name and contact address of the complainant;
- Brief description of the complaint, with a file reference to any correspondence from the complainant;
- Brief description of the action taken by the Project Plant Management to investigate the cause of the complaint and bring about corrective action, if justified; and
- Date of reply to the complainant, with a file reference to any correspondence.

The CLO will complete the complaints record and classify grievances according to Table 6.13.

Table 6.13: Grievance Classification Criteria

Grievance Classification	Risk Level	Validity	Response
Low	No or low	Unsubstantiated	CLO will conduct investigation, document findings and provide a response
Medium	Possible risk and likely a one off event	Possible substantiation	CLO and an appropriate investigation team will conduct investigation. The Site Manager or HS Manager may decide to stop work during the investigation to allow the corrective preventive actions to be determined. The CLO will provide a response.
High	Probable risk and could reoccur	Probable substantiation	CLO will get EPC to organise a Major Investigation Team including Uz-Kor for prompt investigation and resolution. Work will be stopped in the affected area. The CLO will provide a response.

The Project will aim to protect a person's confidentiality when requested and will guarantee anonymity in annual reporting. Individuals will be asked permission to disclose their identity. Investigations will be undertaken in a manner that is respectful of the aggrieved party and the principle of confidentiality. The aggrieved party will need to recognise that there may be situations when disclosure of identity is required and the Project will identify these situations to see whether the aggrieved party wishes to continue with the investigation and resolution activities. There will be no costs or retribution of any kind associated with using the grievance mechanism.

The CLO will log receipt of the grievance, formally acknowledge it, track progress on the investigation and resolution, and respond in writing with feedback to the aggrieved party. The CLO will initiate the investigation and ensure its speedy conclusion aiming to provide a response with 10 working days, unless there are exceptional circumstances. If the Project receives a large number of unsubstantiated grievances, the process will be reviewed to define instances when no response is needed.

Uz-Kor and the CLO will use environmental and social indicators during the construction phase to monitor effectiveness of the system. Project staff, and outside authorities as appropriate, will also contribute to the investigation. The CLO will identify an appropriate investigation team with the correct skills to review the issue raised and to decide whether it is Project related or whether it is more appropriately addressed by a relevant authority outside the Project. The investigation will also aim to identify whether the incident leading to the grievance is a singular occurrence or likely to reoccur. Identifying and implementing activities, procedures, equipment and training to address and prevent reoccurrence will be part of the investigation activities. In some cases it will be appropriate for the CLO to follow up at a later date to see if the person or organisation is satisfied with the resolution or remedial actions.

The CLO will summarise grievances to report on project performance bi-annually during construction and annually during operation removing identification information to protect the confidentiality of the complainant and guaranteeing anonymity.

6.6.5 Grievance Mechanism Disclosure

Prior to the start of the main construction activities, the CLO contact details and information material about the grievance redress mechanism will be disclosed in the local communities. Posters will be placed in the Aksakal offices in Akchalak, Elabad (downstream project affected communities) and Uchsay (upstream project affected community), and on all Project buildings. A draft monitoring matrix will be prepared including a standard complaints filing form, standard acknowledgement forms and a grievance tracking system.

The Grievance Investigation Team's composition and terms of reference will also be available from the Project and Aksakal offices prior to start of Project. The investigation team will include a women's group representative.

7. Social Impact Assessment

7.1 Overview of the Assessment

The approach, social baseline, predicted likely impacts, mitigation and enhancement measures, and the conclusions of the Social Impact Assessment (SIA) are summarised in this section. This chapter looks at how people and communities may be affected as a result of the Project in terms of the way they live, work and interact with one another on a day-to-day basis. The broad objectives of the SIA will be to ensure that key potential socio-economic and community impacts have been identified, assessed, mitigated and managed in a consultative and constructive manner. The primary purpose of the SIA is to safeguard the well-being of project affected peoples and where possible, bring about a more sustainable and equitable biophysical and human environment as a result of the Project.

7.1.1 Project Description

The Project involves the development of three distinct yet interrelated components:

- **Upstream:** New gas production wells and the construction and expansion of associated production infrastructure, including the extension of an existing Complex Gas Treatment Unit (CGTU) at the Surgil Field (the 'Surgil CGTU');
- **Downstream:** The construction and operation of the Ustyurt Gas Chemical Complex on the Ustyurt Plateau for the production of HDPE and PP and the export of sales gas.
- **Pipelines:** The construction and operation of a new below ground gas and condensate pipelines to connect the Surgil Field to the new UGCC.

A full project description is provided in Chapter 2.

7.1.2 General Approach

7.1.2.1 Spatial Scope of Assessment

For an SIA, the practicality of defining the spatial parameters of communities comprising of social receptors and resources is complex because there are different types of communities which often overlap and seamlessly merge into one another.

There is a range of characteristics which can be used to define communities, for example:

- Geographical: defined by specific distances measured for example on a metric scale or by walking distance;
- Administrative: defined by local government boundaries;
- Socio-cultural: defined by shared interests, values or bonds such as religion or class status or family; and
- Economic/business: defined by financial interdependencies and relationships.

Based on the project design, location, construction and operation activities, the IFC definition of the influence area, and the consideration of communities likely to be affected, the immediate area of influence for the SIA of the Project encompasses:

- A ten kilometre radius of the Surgil Field and UGCC, to cover housing and community facilities that will be affected; and
- 500 metres on either side of the pipeline.

The wider area of influence includes Muynak and Kungrad districts which the baseline describes along with the Karakalpakstan region as a whole.

7.1.2.2 Temporal Scope of Assessment

The Project has been assessed by comparing the existing social conditions (ascertained with document review and sites visits) with the change expected over time as a result of the Project. Social impacts have been assessed for the following phases of the Project:

- Site preparation and construction: expected to commence in 2012 lasting a period of approximately 30 months;
- Operation: UGCC expected to commence with start-up in 2015 and normal operations in 2016, lasting a period of approximately 25 years; and
- Decommissioning: expected to commence in 2040 lasting a period of approximately 6 months.

The baseline conditions are those assumed to be prevailing immediately prior to the start of site preparation.

7.1.3 Structure of Chapter

This Chapter begins with a presentation of the methodology and assessment criteria used for the SIA (section 7.2) followed the socio-economic baseline (section 7.3). Impacts are identified and assessed (section 7.4) and mitigation and enhancement measures are presented (section 7.5). The report concludes with a summary of key findings and residual impacts (section 7.6).

7.2 Methodology and Assessment Criteria

7.2.1 Overview

This section presents the methodology and evaluation criteria used to assess the social impacts of the proposed Project. The overall approach aims to predict the impacts of constructing and operating the Project on local socio-economic and community resources and receptors (defined in Section 7.3 below). The remainder of this chapter presents an introduction to the specialism; describes the international standards, consultation inputs, desk study and field reconnaissance activities; defines social resources and receptors, the magnitude and sensitivity criteria used for establishing the significance; and concludes with the significance categories for the SIA.

7.2.2 Introduction to Specialism

Social impact assessment (SIA) includes the processes of analysing, monitoring and managing the intended and unintended socio-economic and community consequences, both positive and negative, of planned interventions such as the proposed Project and any social change processes invoked by those interventions.

There is no specific Uzbek regulatory guidance on SIA requirements so the methodology used draws on guidance for SIA by the International Association for Impact Assessment (IAIA)[15] and the international standards and requirements discussed in Section 7.2.4.

The IAIA conceptualises social impacts as changes to one or more of the following:

- People's way of life – how they live, work, play and interact with one another on a day-to-day basis;
- Their community – its cohesion, stability, character, services and facilities;
- Their culture – their shared beliefs, customs, values and language use;
- Their environment – the quality of the air and water people use, the availability and quality of the food they eat; the level of hazard or risk, dust and noise they are exposed to, the adequacy of sanitation, their physical safety, and their access to and control over resources;
- Their health and wellbeing – whereby health is a state of complete physical, mental, social and spiritual wellbeing and not merely the absence of disease or infirmity; perceptions of safety; and
- Their personal and community property rights – access issues; how people are economically affected and experience personal disadvantage or advantage.

Social, economic and biophysical impacts are inherently and inextricably interconnected. Change in any of these domains will lead to changes in the other domains. The primary purpose of a social impact assessment is to bring about a more sustainable and equitable biophysical and human environment.

[15] International Association for Impact Assessment, Social Impact Assessment: International Principles, May 2003.

7.2.3 National Legislation and Regulations

7.2.3.1 Overview

Section 4.2.5 of the ESIA provides an overview of the social regulatory framework of Uzbekistan. The purpose of this section is to elaborate on the components of this framework by identifying and describing the legal and regulatory requirements related to the following social topics considered in this SIA:

- Land allocation and reallocation (transfer);
- Indigenous Peoples;
- Labour and working conditions;
- Community health and safety;
- Women's rights and gender equality; and
- Social protection and welfare.

The laws and regulations related to these areas are discussed in the sub-sections below.

7.2.3.2 Land Allocation and Reallocation (Transfer)

According to the 1998 Land Code of the Republic of Uzbekistan, all land in Uzbekistan is state property and permits for use of land are granted and monitored by the State through the rayon and oblast administrations.

National legislation envisages the following types of land transfers: for use, lease, or ownership by legal entities (only with objects of trade and services infrastructure); and for lifelong inheritable ownership (with housing), use, or lease by individuals. While all land transactions are subject to State regulation, some transactions occur with special permission of the State.

The laws and procedures for expropriating agricultural and urban land are treated differently under Uzbek Law. While agricultural land issues are covered and treated under the Land Code, urban land issues are covered under the Civil Code, the Housing Code, and the Urban Construction Code.

The Land Code identifies several categories of land users, who are eligible for compensation for losses and damages in connection with land acquisition:

- Land tenants – citizens who were allocated land plots for individual housing construction and/or dehkan farming on the basis of life-long tenure;
- Lessees (leaseholders) – farmers, who were allocated land plots for agricultural production purposes, on the basis of a long-term lease;
- Land owners – users of land plots occupied by trade and services infrastructure, which are used as private property. Land, occupied by trade and services infrastructure, however, may not be sold separately from the latter; and
- Land users – all other enterprises, organizations and institutions, which are entitled to use non-agricultural lands. This is the largest category, which includes enterprises and institutions of all types (private and public). Examples include hospitals, schools, private enterprises, and factories.

Legislation envisages compensation for damages to land users in full, including lost profits, in the following instances: (a) seizure, purchase or temporary occupation of land; (b) limitation of the rights of users; (c) deterioration of land quality due to the effects of construction works, servicing, and other activities that lead to reductions in the quantity or quality of agricultural products.

Under Article 8 of the 1998 Land Code, land resources found in the Republic of Uzbekistan are subdivided into the following categories according to land use:

- Lands for agricultural purpose - lands granted for agricultural needs or meant for these purposes are subdivided into irrigated and non - irrigated lands; arable lands; lands taken up by hayfields, pastures, established orchards and vineyards;
- Lands of populated areas (towns, settlements towns and rural populated areas) - lands located within town and village boundaries and also within the limits of rural populated areas (settlements);
- Lands of industry, transport, communication, defence and other purpose;
- Lands of nature, health protection, recreation purpose - lands taken up by protected natural territories possessing natural medical factors and also lands used for recreation and tourism;
- Lands of historical and cultural purposes - lands taken up by historic and cultural monuments;
- Forest land resources - lands covered with forest and also non - covered with forest but granted for needs of the forestry economy;
- Water lands resources - lands taken up by water objects, water economy structures and derivational canals along water objects; and
- Reserve lands.

Karakalpakstan, although an autonomous region, adheres to the Uzbekistan Land Code.

7.2.3.3 Indigenous Peoples

According to the Government of Uzbekistan, the country is strengthening its legal basis for human rights practices. Parliament has adopted more than 120 laws and ratified more than 60 international treaties on human rights, including six major United Nations human rights conventions. The government is integrating universally recognized norms of international law into national legislation. Various government agencies are developing action plans to implement major provisions of international human rights instruments. Uzbekistan has signed the Millennium Declaration.

7.2.3.4 Labour and Working Conditions

This section the key labour laws and requirements of the Republic of Uzbekistan, which are framed by the Labour Code of the Republic of Uzbekistan (1996), as discussed below.

The Labour Code of the Republic of Uzbekistan (1996)

The Labour Code of the Republic of Uzbekistan (1996) as amended on 22.12.2010 is the key national labour-focused legislation which takes into account the interests of the employees, employers and the state, promotes fair and safe labour conditions, and protects the labour rights and occupational health of employees.

Over 30 articles of the Labour Code are directly linked to health and safety issues and the key articles are summarised in Table 7.1 below.

Table 7.1: Health and Safety Provisions of the Labour Code of the Republic of Uzbekistan (as amended on 22.12.2010)

Article	Description
Article 116	Reduced work hours
Article 117	Reduced work hours for employees exposed to hazardous conditions
Articles 118	Reduced work hours for employees of special occupations
Article 211	H&S requirements
Article 212	Employee's obligations to comply with H&S standards, procedures and instructions
Article 215	H&S briefing and training
Article 217	Provision of employees with milk, medical preventative nutrition, PPE and personal hygiene products
Article 220	Additional H&S measures for disabled employees
Article 221	First medical aid to employees and their transportation to health care institutions
Article 222	Reporting and investigation of accidents
Article 223	H&S compliance supervision and control

For the purpose of regulating labour relations and harmonizing social and economic interests of both employees and employers, the Labour Code specifies collective bargaining through collective contracts and agreements. Collective contracts are signed at the enterprise level while collective agreements are for the sectoral and regional levels.

Under the Labour Code, Collective Agreements are of three types:
- General;
- Sectoral; and
- Territorial.

The General Agreements are signed between social partners including the Trade Union Federation Council, the National Association of Employers and, if required, the Government. The General Collective Agreement will describe general principles of the coordinated social and economic policy, including provisions on wages, labour conditions, work and rest hours, environmental safety and health protection, benefits for creating additional jobs for disabled, etc.

Sectoral and Territorial Collective Agreements are signed between respective Trade Union organisations and employers and, if required, the Ministry of Labour and Social Welfare (MLSW) or the local government. Sectoral and Territorial Collective Agreements will include health and safety provisions, provisions for favourable labour conditions, increased wages for hazardous labour conditions, etc.

Collective contracts, which as a rule are signed every year between the employer and employees, set forth mutual obligations on remuneration, work and rest hours, annual leave periods, health and safety, provisions for women and employees under 18 years old and environmental safety.

Law No.839-XII on Occupational Health and Safety (1993)

Law No.839-XII on Occupational Health and Safety (1993) as amended on 07.12.2001 has provided the legal framework for managing health and safety issues at enterprises of any form of ownership, improving labour conditions and wellbeing at production facilities, setting up a system of social, economic, organizational, technical, sanitary and medical preventive health and safety measures.

Table 7.2 below summarises basic principles of the Law No.839-XII.

Table 7.2: Basic principles of Law No.839-XII (Article 4)

Item	Description
1	priority of the life and health of an employee over the production performance
2	coordination of health and safety activities with economic and social policy
3	establishment of uniform health and safety requirements for all enterprises irrespective of their form of ownership and management
4	ensuring environmentally safe labour conditions and systematic control of the environment at workplaces
5	supervision and monitoring of universal compliance with H&S requirements at enterprises
6	participation of the state in funding health and safety activities
7	H&S training at higher and specialised secondary education institutions
8	providing incentives for the development and introduction of safe equipment, technologies and PPE
9	wide-scale use of scientific achievements, technologies and the best national and international practices associated with health and safety
10	free access to special work clothes and footgear, PPE and medical-preventative nutrition
11	tax policy to stimulate occupational health and safety
12	mandatory investigation and registration of occupational accidents and occupational disease cases and on that basis keeping the public informed on the levels of occupational accidents and diseases
13	social protection of the employees interests who have become victims of occupational accidents or diseases
14	all-round support of trade unions and other non-governmental organisations, enterprises and individuals to health and safety activities
15	international cooperation in addressing health and safety issues

In 2008 the Oliy Majlis enacted Law No.ZRU-174 on Mandatory State Social Insurance against Occupational Accidents and Diseases for the purpose of enhancing the social protection of citizens by establishing their legal rights to compulsory state social insurance against occupational accidents and diseases, providing access to compensations for any injury to life and health of employees as a result of occupational accident or diseases, and improving occupational health and safety, working conditions, and the health of employees. Under this law any employer (legal entities or individuals) is obliged to provide the employees with the insurance against occupational accidents and diseases.

Law No.265-I on Protecting Health of Citizens (1996)

Law No.265-I on Protecting Health of Citizens (1996) as amended on 19.05.2010, elaborates the Article 40 of the RUz Constitution (1992) according to which “everyone has the right to qualified medical service”. This law defines principles of the health service and the right of citizens to health protection by the state. The law guarantees equal rights to access and the quality of medical attendance.

The Law No.265-I sets forth the main principles of health protection. These include:
- Respect of the right to health protection;
- Availability of medical assistance to all social groups;
- Priority of preventative measures; and
- Social protection of disabled citizens.

For the purpose of preventing occupational diseases the Ministry of Health issued Executive Order No.300 on Mandatory Medical Examination at Employment and Periodic Medical Examinations of Workers exposed to Hazardous and Unfavourable Occupations of 06.06. 2000. The Executive Order is binding on all the employers across Uzbekistan (regardless of the form of ownership and management).

Health and Safety Regulators

The Cabinet of Ministers of the Republic of Uzbekistan affects the overall control of occupational health and safety. Uniform compliance with labour legislation in the Republic of Uzbekistan is the responsibility of the Public Prosecutor General and Public Prosecutors of the Republic of Uzbekistan.

The general health and safety compliance is the responsibility of:
- Ministry of Labour and Social Welfare;
- State Inspectorate for Exploration Supervision, Operations Safety Supervision of Industry, Mining and Utilities Sector;
- Ministry of Health; and
- State Committee for Nature Protection.

For the purpose of compliance control the MLSW, the State Inspectorate for Exploration Supervision, Operations Safety Supervision of Industry, Mining and Utilities Sector and the State Committee for Nature Protection operate through health and safety inspections while the Ministry of Health operates through occupational health inspections.

The MLSW (including regional branches) and its Health and Safety Directorate, the State Labour Inspection, including in the Republic of Karakalpakstan, local employment centres and social welfare departments constitute a single system for health and safety compliance supervision and monitoring of ministries and agencies, institutions, organisations, industrial and agricultural enterprises. Hazardous facilities are responsibility of the State Inspectorate for Exploration Supervision, Operations Safety Supervision of Industry, Mining and Utilities Sector.

Supporting H&S Legislation

In addition to the main laws as mentioned above there is supporting health and safety legislation in Uzbekistan that includes national laws, regulations, the Sanitary Rules and Norms (SanPiN), State Occupational Safety Standards (GOSTs, or O'z DSt), Construction Codes and Regulations (SNiPs), health and safety guidelines applicable to hazardous facilities, manufacturing processes, products, etc. In addition to national requirements, various sectors enforce sectoral and inter-sectoral health and safety norms, requirements and procedures. The most relevant to the project supporting health and safety legislation is summarised in Table 7.3 below.

Table 7.3: Supporting Health and Safety Legislation

Category	Legislation
National laws	Law of the Republic of Uzbekistan on State Sanitary Supervision No.657-II of 03.07.1992 (as amended on 03.09.2010)
	Law of the Republic of Uzbekistan on Occupational Safety at Hazardous Industrial Facilities No.ZRU-57 of 25.08.2006
	Law of the Republic of Uzbekistan on Mandatory State Social Insurance against Occupational Accidents and Diseases No.ZRU-174 of 10.09.2008
	Law of the Republic of Uzbekistan on Compulsory Civil Liability Insurance of the Employer No.ZRU-210 of 16.04.2009
National decrees and regulations	Decree of the Supreme Council of Uzbekistan on the procedure of enacting the Law on Occupational Health and Safety No. 840-XII of 06.05.1993
	Decree of the Cabinet of Ministers of the Republic of Uzbekistan No.378 of 29.07.1993 on approving the Regulations on State Assessment of Labour Conditions (as amended on 08.05.2007)
	Decree of the Cabinet of Ministers of the Republic of Uzbekistan No.538 of 07.11.1994 on State Management of Occupational Health and Safety
	Decree of the Cabinet of Ministers of the Republic of Uzbekistan No.58 of 16.02.1995 on approving the Regulations on the Occupational Health and Safety Authority of the Ministry of Labour and Social Welfare of the Republic of Uzbekistan
	Decree of the Cabinet of Ministers on Approving the Regulations on Investigation and Recording of Occupational Accidents and Other Damage to the Health of Employees No.286 of 06.06.1997 (as amended on 17.12.10)
	Decree of the Cabinet of Ministers of the Republic of Uzbekistan on organisation of the State Inspectorate for Safety Supervision of Industry, Mining and Utilities Sector №323 of 10.07.2004 (as amended on 05.06.2010)
	Decree of the Cabinet of Ministers of the Republic of Uzbekistan on Approving the Procedure for compensating damage caused to employees as a result of injury, occupational disease or other health impacts while performing employment duties №60 of 11.02.2005 (as amended on 05.06.2010)
	Decree of the Cabinet of Ministers of the Republic of Uzbekistan on Approving the Procedure for setting and disbursement of the proceeds of H&S funds of enterprises, organisations and institutions №245 of 12.11.2008
	Decree of the President of the Republic of Uzbekistan No.PP-616 of 06.04.2007 on measures to increase employment and improve performance of the authorities responsible for labour and social welfare
	Decree of the Cabinet of Ministers of the Republic of Uzbekistan No.95 of 08.05.2007 on measures to implement Decree of the President of the Republic of Uzbekistan No.PP-616 of 06.04.2007 on measures to increase employment and improve performance of the authorities responsible for labour and social welfare
	Regulations on State Assessment of Labour Conditions approved by the Cabinet of Minister of Uzbekistan on 29.07.1993 (as amended on 08.05.2007)
	Regulations on H&S officer approved by the Ministry of Labour on 14.12.1995
	Standard regulations on H&S management approved by the Ministry of Labour on 29.06.1996 (as amended on 19.10.2010)
	Standard regulations on H&S training and knowledge testing approved by the Ministry of Labour on 29.06.1996 (as amended on 19.10.2010)
	Regulations on Investigation and Recording of Occupational Accidents and other Damage to the Health of Employees approved by the Cabinet of Ministers on 06.06.1997 (as amended on 17.12.10)
Guidelines and procedures	Guidelines for assessing labour conditions and attestation of workplaces against labour conditions approved by the Ministry of Labour of the Republic of Uzbekistan and the Ministry of Health of the Republic of Uzbekistan on 17.02.1996 (as amended on 20.07.2001)

Category	Legislation
	Regulations on H&S Instructions Development approved by the Ministry of Labour of the Republic of Uzbekistan on 04.12.1999
	Guidelines for rational employment of disabled employees approved by the Ministry of Labour of Uzbekistan on 18.11.1999
	Procedure of attestation of workplaces where the labour of invalids is used approved by the Ministry of Labour of the Republic of Uzbekistan of 18.11.1999 (as amended on 29.10.2010)
	Procedure for compensating damage caused to employees as a result of injury, occupational disease or other health impacts while performing employment duties approved by the Cabinet of Ministers on 11.02.2005 (as amended on 05.06.2010)
	Procedure for setting and disbursement of the proceeds of H&S funds of enterprises, organisations and institutions approved by the Cabinet of Ministers of Uzbekistan on 12.11.2008;
	Executive Order of the Ministry of Health of the Republic of Uzbekistan on Mandatory Medical Examination at Employment and Periodic Medical Examinations of Workers Engaged in Hazardous and Unfavourable Occupations No.300 of 06.06.2000
SanPiNs	0032-94 – Sanitary norms of the infrasound level at workplaces
	0046-95 – Hygienic norms. Maximum allowable concentrations (MAC) of pollutants in the working zone
	0100-00 – Sanitary procedures and norms for working at personal computers, video-display terminals and office equipment
	0113-01 – Preventive sanitary supervision over new technological processes, machinery, devises, tools, chemicals and other products for the purpose of occupational health
	0117-01 – Sanitary norms for infrasound levels at workplaces
	0119-01 – Sanitary norms for allowable electric fields of industrial frequencies (50Hz)
	0120-01 – Sanitary norms for allowable noise levels at workplaces
	0121-01 – Sanitary norms for allowable electrostatic fields at workplaces
	0122-01 – Sanitary norms for total and local vibration at workplaces
	0124-01 – Sanitary norms for allowable ionisation levels in residential, public and industrial premises
	0141-01 – Hygienic classification of labour conditions against hazard and adverse health effects of the working-environment factor, hardship and intensity of the workflow
	0142-01 – Sanitary procedures and norms for UV radiation under production conditions
	0165-04 – Sanitary norms for allowable induction of continuous magnetic fields of industrial frequencies (50Hz) at workplaces
	0175-04 – Identification and assessment of the noise and vibration hazards at workplaces
	0200-06 – Sanitary procedures and norms for hygienic evaluation, categorization of surface and ground water sources and their selection for portable and domestic water supply of the population in Uzbekistan
	0203-06 – Sanitary and hygienic norms for microclimate in production premises
GOSTs	O'z DSt 12.0.001:2005 – System of standards for scientific management of labour, industrial sanitary and occupational health and safety
	GOST 12.0.230:2007 – Occupational safety standards system. Occupational safety and health management systems. General requirements

7.2.3.5 Community Health, Safety and Security

Under the 1992 National Constitution everyone has the right to qualified medical service (Article 40). This Article is elaborated in Law No.265-I on Protecting Health of Citizens (1996).

Law No.265-I on Protecting Health of Citizens (1996)

Law No.265-I on Protecting Health of Citizens (1996) as amended on 19.05.2010 is the basic legal instrument regulating community health issues in Uzbekistan. The basic principles of health protection as set forth in Article 3 are:

- Respect for human rights to health;
- Access of all groups of the population to health care;
- Priority of preventive measures;
- Social protection of citizens in the event of the loss of health; and
- Unity of medical science and practice.

Under Law No. 265-I Uzbek citizens have the inalienable right to health. The state provides health care to citizens regardless of age, sex, race, nationality, language, religion, social origin, convictions, personal and social status. The State guarantees citizens protection against discrimination, regardless of whether they have any form of disease (Article 13).

Foreign nationals residing in the Republic of Uzbekistan guarantees the right to health in compliance with international treaties of the Republic of Uzbekistan (Article 14).

Citizens have the right to receive accurate and timely information about factors that affect community health, including information on the sanitary-epidemiological welfare of the territory of residence, rational principles of nutrition, of goods, works and services and their safety, compliance with sanitary norms and rules (Article 15).

Every citizen has the right to free medical advice and very family has the right to choose a family doctor (Article 18).

RUz has a unified health system, which is a combination of public, private and other health care systems (Article 7).

The public health system comprises the Ministry of Health, the Ministry of Health of the Republic of Karakalpakstan, regional health authorities and health authorities of the city of Tashkent, their offices in towns and districts. The public health system also involves state-owned medical and preventive treatment facilities, research institutes, education institutions, pharmaceutical companies and organizations, health care institutions, institutions of forensic medical examination, manufacturers of medicines and medical equipment, as well as other enterprises, institutions and organizations whose main activities are related to community health (Article 8).

The private and other health care systems include individuals engaged in private medical practice or private pharmaceutical activities, preventive treatment, private pharmaceutical institutions, and enterprises producing medical and pharmaceutical products financed using private funds and borrowings (Article 10).

Health care in Uzbekistan forms part of the national social policy which also covers employment, income generation, social protection, pensions, education, support to women and consumer rights.

National Health Policy and Strategies

The President and Oliy Majlis are main players who set priorities, formulate national health policies, and determine means and identify sources for carrying out these policies. National health policies are reflected in laws, regulations and national health programmes. Some examples of national health programmes implemented in Uzbekistan are listed below:

- National programme for reforming the health care system of the Republic of Uzbekistan (1998-2005);
- National Healthy Generation Programme (2000-on-going);
- National programme 'Year of Health' (2005); and
- National programme for early detection of congenital and hereditary diseases to prevent the birth of disabled children (2008-2012).

Health Regulators

The Cabinet of Ministers of the Republic of Uzbekistan is the top level of health system regulation both in terms of regulation and financing. The Cabinet of Ministers is accountable to the President and Oliy Majlis. It develops strategies, approves the health budget and holds other governmental agencies accountable for the implementation of health policies (Article 4).

The lower level of regulation is represented by implementing agencies. The Ministry of Health assumes administrative responsibilities and reports to the Cabinet of Ministers of Uzbekistan. The MHRUz mandate is set forth in the Regulations on the Ministry of Health enacted by the Cabinet of Ministers in 1999[16]; the Ministry of Finance and its regional branches are responsible for the implementation of financing directives. It only deals with the disbursement and control of public funding to public providers of health care. All national institutions receive budgetary funding from the Ministry of Finance via the Ministry of Health.

Government regulation at the sub-national level is carried out by regional and local health authorities. Regional health authorities are responsible for the management of health services and it allocates resources to health care facilities based on guidelines determined by the Ministry of Health.

[16] Decree of the Cabinet of Ministers of the Republic of Uzbekistan No.18 of 14.01.1999 on approving the Regulations on the Occupational Health and Safety Authority of the Ministry of Labour and Social Welfare of the Republic of Uzbekistan

Supporting Community H&S Legislation

In addition to Law 265-I on Protecting Health of Citizens (1996) as mentioned above, there is supporting community health and safety legislation in Uzbekistan that includes national laws and regulations, the Sanitary Rules and Norms (SanPiN), Construction Codes and Regulations (SNiPs), etc. The key supporting community H&S legislation is summarised in Table 7.4 below.

Table 7.4: Key supporting community H&S Legislation

Category	Legislation
National laws	Law No.1064-XII on the Appeal of Citizens of 06.05.1994 (as amended on 13.12.2002)
	Law No.816-I on the Prevention of the Disease Caused by Human Immunodeficiency Virus (HIV) of 19.08.1999
	Law No.123-II on Psychiatric Services of 31.08.2000
	Law No.215-II on Protecting the Population against Tuberculosis of 11.05.2001
	Law No.402-II on Donation of Blood and its Components of 30.08.2002
	Law No.ZRU-97 on Preventing Iodine Deficiency Disorders of 30.08.2007
National decrees and regulations	Decree of the Cabinet of Ministers of Uzbekistan on immediate initiatives to improve the provision and distribution of pharmaceuticals and medical devices in the country No.404 of 06.08.1994
	Decree of the Cabinet of Ministers of Uzbekistan on state quality control of the pharmaceuticals, medical aids and substances for medical-preventive nutrition, No.181 of 25.05.1995
	Decree of the Cabinet of Ministers of Uzbekistan on approving the list of diseases potentially dangerous to other people in the community No.96 of 20.02.1997
	Decree of the Cabinet of Ministers of Uzbekistan on the improvement of financing mechanisms of health care delivery institutions, No.532 of 02.12.1997
	Decree of the President of Uzbekistan on the State Programme for Reforming the Health Care System of Uzbekistan, No.UP-2107 of 10.11.1998
	Decree of the Cabinet of Ministers of Uzbekistan on improvements of the financing of state institutions No.414 of 03.09.1999
	Decree of Oliy Majlis on enacting Law No.816-I on the prevention of the disease caused by human immunodeficiency virus (HIV) No.817-I of 19.08.1999
	Decree of Oliy Majlis on enacting Law No.123-II on Psychiatric Services No.124-II of 31.08.2000
	Decree of the Cabinet of Ministers of Uzbekistan on the State Programme of Mother and Child, No.68 of 05.02.2001
	Decree of the Ministry of Health of Uzbekistan on confirming the storage, distribution, retail and registration principles of narcotic, psychotropic medications and their precursors No.521 of 28.11.2001
	Decree of the President of Uzbekistan on the improvement of research activities No.UP-3029 of 20.02.2002
	Decree of the Cabinet of Ministers of Uzbekistan on measures to improve research activities No.77 of 04.03.2002
	Decree of the President of Uzbekistan on the next steps of health reforms No.UP-3214 of 26.02.2003
	Decree of the Cabinet of Ministers of Uzbekistan on the review of the appeals process No.96 of 03.03.2003
	Decree of the Cabinet of Ministers of Uzbekistan on measures for further development of the national mother and child screening system No.195 of 23.04.2004
	Decree of the Cabinet of Ministers of Uzbekistan on the National programme 'Year of Health' No.30 of 25.01.2005
	Decree of the President of Uzbekistan on the National programme for early detection of congenital

Category	Legislation
	and hereditary diseases to prevent the birth of disabled children No.PP-892 of 18.06.2008
	Decree of the Cabinet of Ministers of Uzbekistan on measures to improve organizational structure and performance of centres for AIDS prevention No.1 of 05.01.2009
SanPiNs	0029-94 – Sanitary norms and procedures for radiation safety
	0036-95 –Norms of physiological requirements in nutrient materials and energy for various groups of population in Uzbekistan
	0096-00 – Sanitary norms and procedures to protect population against impacts of electromagnetic fields generated by radio engineering facilities
	0105-01 – Average daily rational norms of food products consumption categorised by gender-related, age-related, professional groups of population in Uzbekistan
	0125-01 – Hygienic norms of annual consumption of health and hygiene items by the population
	0144-03 – Hygienic procedures and norms of optimal and allowable housing density in the residential areas of cities in Uzbekistan
	0146-04– Sanitary procedures and norms for designing residential houses in the climatic conditions of Uzbekistan
	0147-04 – Maximum allowable concentrations (MACs) of micro-organisms in ambient air of communities in the Republic of Uzbekistan
	0148-04 – Maximum allowable concentrations (MACs) of bacterial fertilizers in ambient air of communities in the Republic of Uzbekistan
	0179-04 – Hygienic norms. List of Maximum Allowable Concentrations (MACs) of pollutants in ambient air of communities in the Republic of Uzbekistan including Annex 1
	0193-06 –Norms of radiation safety (NRB-2006) and basic sanitary procedures to ensure radiation safety (OSPORB-2006)
	0227-07 – Procedures and norms of real estate planning and development in communities of Uzbekistan
	0236-07 – Sanitary norms and procedures to ensure safety for the population based in the vicinity of high voltage transmission lines
	0267-09 – Sanitary norms and procedures for allowable noise levels in residential premises, public buildings and within the dwelling zone

7.2.3.6 Women's Rights and Gender Equality

Under the 1992 National Constitution, women enjoy equal rights to men (Article 46). Women's rights in Uzbekistan are also guaranteed by other international instruments ratified and signed by Uzbekistan, some of them are listed below:

- Forty-hour Week Convention (1935) of the International Labour Organisation, ratified by RUz in 1995;
- Maternity Protection Convention (Revised) (1952) of the International Labour Organisation, ratified by RUz in 1992;
- Convention on the Elimination of All Forms of Discrimination against Women (1979), ratified by RUz in 1995;
- Vienna Declaration on Human Rights (1993); and
- Beijing Declaration and Platform for Action (1995).

In 1999 Uzbekistan declared the 'Year of Women'. This national programme involved a set of measures to strengthen the role of women in the family, the government and the society, enhance the protection of their legal, social and spiritual interests. Specific actions included for example, provision of the right to retire at age of 55 subject to 20 years of employment history and additional benefits for employed women of certain occupations.

In 2007 the National Action Plan was adopted to implement recommendations of the Committee on the Elimination of Discrimination against Women (UNCEDAW). In the same year the draft law "On guarantees of equal rights and opportunities for women and men" was initiated to define the guarantees of equal rights and opportunities for women and men in political, economic, social, cultural and other spheres of the society, and to regulate the legal framework to prevent any gender discrimination.

The existing laws and regulations of Uzbekistan recognize the equality of political, social and economic rights of citizens irrespective of their gender, and they provide additional safeguards for women committed to family responsibilities. The key relevant laws are summarised in Table 7.5 below:

Table 7.5: Example Safeguards for Women as Provided in the National Legislation

Legislation	Provisions
Family Code (1998)	Article 2. Family relations are regulated by the principle of voluntary marriage of a man and a woman, equality of personal and property rights of spouses, settlement of family disputes to the mutual agreement.
	Article 3. All citizens have equal rights in family relations. Any sort of direct or indirect restriction of rights, establishment of direct or indirect benefits to marriage and interference in family relations based on gender, race, nationality, language, religion, social origin, convictions, personal and social status and other circumstances are not permitted.
Labour Code (1996)	Article 6 prohibits any discrimination in the employment relationships. All citizens have equal opportunities in the possession and use of labour rights. The imposition of any restrictions or granting of privileges in employment based on gender, age, race, nationality, language, social origin, property and employment status, religion, beliefs, membership of public associations, as well as other circumstances not related to business merits of employees and employees' performance is unacceptable and constitutes discrimination.
	Article 224 prohibits refusals to hire or payment reductions on the grounds of pregnancy or availability of children.
	Article 225 prohibits employment of women at jobs with poor working conditions and jobs involving underground works as well as lifting and moving heavy loads by women exceeding the maximum allowable norms for women loads
	Article 226 makes provisions for the transfer of pregnant women to other easier jobs excluding any adverse impacts
	Article 227 makes provisions for the transfer of women with children under the age 2 to other easier jobs excluding any adverse impacts
	Article 228 prohibits engaging pregnant women or women with children under the age of 14 in the night work, the overtime work or the work on weekends and holidays, as well as in business trips without their consent. At the same time any engagement of pregnant women and women with children under the age of 3 in the night work is allowed only against a medical opinion confirming that the this work will not impact the health of the mother and the child
	Article 228-1 makes provisions for women with children under 3 working in institutions and organisations financed from the budget to have a reduced (35 hour) working week without loss of pay
	Article 233 provides working women with maternity leave of seventy calendar days before childbirth and fifty-six calendar days after childbirth (in case of difficult childbirth or the birth of two or more children the maternity leave will be seventy calendar days after childbirth) including payment of the maternity leave allowance of the state social insurance in the amount of 100% of the woman's average earnings
	Article 234 makes provisions for child care leaves of two to three years for working women
SanPins	0115-01 – Sanitary norms of maximum allowable loads for women lifting and moving heavy loads

7.2.3.7 Social Protection and Welfare

Social protection mechanisms in Uzbekistan include a comprehensive system of legal regulations, law enforcement agencies, national and municipal authorities with responsibility to provide material and logistical assistance to citizens in need, the pension system, support to students, large and low-income families through the budgetary tool and state guarantees.

National Social Protection Policy and Strategies

The President and Oliy Majlis are the key players who define priorities and national policies of social protection. These are reflected in the national social protection programmes undertaken in Uzbekistan. Such national programmes include, for example:

- National programme 'Year of protecting the interests of the older generation' (2002);
- National programme 'Year of Social Protection' (2007); and
- National programme for early detection of congenital and hereditary diseases to prevent the birth of disabled children (2008-2012).

Currently, the legal basis of national social welfare policy is Decree of the President of the Republic of Uzbekistan on strengthening the targeted support for socially vulnerable groups No.UP-3017 of 25.01.2002. This document formed the basis for the National of Social Welfare Programme focused at:

- Improving the pension system;
- Elderly people care;
- Maternity welfare;
- Protection and support of families;
- School children protection;
- New jobs and unemployment reduction;
- Improvement of social welfare funding; and
- Strengthening the role of Mahalla as the key link in targeted social safety nets.

Social Welfare Legislation and System in Uzbekistan

Table 7.6 below demonstrates the key components of the social welfare system in Uzbekistan.

Table 7.6: RUz Social Welfare Components

Form of social protection and support	Beneficiary categories	Type of payment/services
Social protection of disabled people	Disabled adults and children	Prosthetic and orthopedic devices, wheelchairs, hearing aids, books, textbooks, etc, services through the centers of medical, social and vocational rehabilitation
Social protection of alone elderly people in need of constant care	Alone elderly people	Home visiting services, free supply of essential food products, free-of-charge home maintenance and renovation
Social support to low-income families and families with children	Low-income families, families with children under 16 and families with children under 2	Allowances
Incentives and preferences	disabled groups 1 and 2, single pensioners, elderly citizens, orphans, children from poor families	Rent assistance, preferential payments for transport services, provision of free medicines and food in hospitals, admittance to health spa facilities, orthopedic products, school supplies, free-of-charge home renovation
Pension benefits	Pensioners	Retirement, disability and fatality pension allowances
Social protection of unemployed	Unemployed citizens	Unemployment allowances and employment support services
Social protection of children deprived of parental care and orphans	Orphans, children deprived of parental care	Improvement of the resource base of orphanages, social and psychological support at rehabilitation centers for orphans

This system is governed by social protection laws are developed, adopted, revised or amended by the Oliy Majlis. Other national regulations are developed by the Cabinet of Ministers. The MLSW is the key regulator responsible for social welfare. The MLSW reports to the Cabinet of Ministers of the Republic of Uzbekistan.

Table 7.7 details key social protection legislation of Uzbekistan.

Table 7.7: Key social protection legislation of the Republic of Uzbekistan

Category	Legislation
National laws	Law No.422-XII on Social Protection of Disabled Persons in the Republic of Uzbekistan of 18.11.1991 (as amended on 11.07.2008)
	Law No.938-XII on State Pensions of 03.09.1993 (as amended on 22.12.2010)
	Law No.616-I- on Employment of 01.05.1998 (as amended on 22.12.2009)
National decrees and regulations	Decree of the Cabinet of Ministers of Uzbekistan on measures to implement the Law on State Pensions No.6 of 10.01.1994
	Decree of the Cabinet of Ministers of Uzbekistan on approving lists of enterprises, institutions, jobs, positions providing the right to pension benefits granted on preferential terms No.250 of 12.05.1994
	Decree of the Cabinet of Ministers of Uzbekistan on adopting legislation required to implement the Law of the Republic of Uzbekistan on State Pensions No.249 of 11.05.1994
	Decree of the Cabinet of Ministers of Uzbekistan on further enhancing the management of the off-budget Pension Fund No.490 of 21.10.2004
	Decree of the President of the Republic of Uzbekistan on strengthening the targeted support for socially vulnerable groups No.UP-3017 of 25.01.2002
	Decree of the Cabinet of Ministers of Uzbekistan on improving the system of temporary disability benefits No.71 of 28.02.2002
	Decree of the Cabinet of Ministers of Uzbekistan on strengthening social assistance to lonely elderly people, pensioners and disabled persons in need of constant care No.106 of 29.03.2002 (as amended on 24.03.2010)
	Decree of the President of Uzbekistan on measures to strengthen social support for pensioners No.UP-3921 of 17.09.2007
	Regulations on the Pension Fund under the Ministry of Finance of the Republic of Uzbekistan approved by Decree of the Cabinet of Ministers of Uzbekistan No.490 of 21.10.2004

7.2.4 International Standards

7.2.4.1 Overview

The SIA has been undertaken using the performance standards and requirements of the likely international lenders. These include the safeguard and other policies of the ADB as well as the Equator Principles which embody the International Finance Corporation Policy and Performance Standards (PS) on Social and Environmental Sustainability.

7.2.4.2 Asian Development Bank (ADB) Social Policies

ADB's Safeguard Policy Statement (2009) consists of three operational policies that aim to avoid, minimize, or mitigate adverse environmental and social impacts, including protecting the rights of those likely to be affected or marginalized by the development process. The three Safeguard Requirements (SR) address:

- Environment (SR1),
- Involuntary resettlement (SR2); and
- Indigenous peoples (SR3).

All of these SR are relevant to the SIA and the requirements are summarised below.

Safeguard Requirement 1 Environment (SR1)

SR1 is triggered if a project is likely to have potential environmental and social risks and impacts. The ADB requires the ESIA Report to be produced in line with their defined scope; to include explanation of meaningful consultation and grievance redress and include an ESMP in line with their scope.

Safeguard Requirement 2 Involuntary resettlement (SR2)

SR2 covers physical displacement (relocation, loss of residential land, or loss of shelter) and economic displacement (loss of land, assets, access to assets, income sources, or means of livelihoods) as a result of (i) involuntary acquisition of land, or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas. It covers them whether such losses and involuntary restrictions are full or partial, permanent or temporary.

As explained in detail in the SIA, no involuntary resettlement impacts are envisaged and therefore this SP is not triggered.

Safeguard Requirement 3 Indigenous peoples (SR3)

SR3 is triggered if a project directly or indirectly affects the dignity, human rights, livelihood systems, or culture of Indigenous Peoples or affects the territories or natural or cultural resources that Indigenous Peoples own, use, occupy, or claim as an ancestral domain or asset. The term Indigenous Peoples is used in a generic sense to refer to a distinct, vulnerable, social and cultural group.

As explained in detail in the SIA, no adverse impacts are envisaged on indigenous peoples (the Karakalpak peoples). However, there are likely to be beneficial impacts on ethnic Karakalpak peoples and therefore SR3 is considered to be triggered on this basis. This section provides further detail on likely impacts together with identification of enhancement measures.

Additional Requirements in the form of ADB's Social Protection Strategy, Labour and Gender Policies

The ADB also has a social protection strategy (2001) which requires developers, contractors, sub-contractors and suppliers to comply with the internationally recognized core labour standards (CLS) in its operations. CLS include four basic rights and principles at work:

- Freedom of association and the right to collective bargaining;
- Elimination of discrimination in employment and occupation;
- Elimination of all forms of forced and compulsory labour; and
- Effective abolition of child labour.

ADB's Handbook on Poverty and Social Analysis (2007) identifies additional labour standards that reinforce CLS, such as those related to workers with family responsibilities, protection of migrant workers, working hours for young workers, and industrial relations. Other labour standards that complement the CLS and contribute to inclusive social development cover such subjects as occupational health and safety, employment promotion, minimum wages and payment of wages, social security, and labour administration and labour inspections.

ADB's Policy on Gender and Development (GAD) (1998) adopts mainstreaming as a key strategy in promoting gender equity. The GAD Policy aims to mainstream gender considerations into all ADB activities, including macroeconomic and sector work, and lending and technical assistance (TA) operations. The key elements of ADB's policy include gender sensitivity, gender analysis, gender planning, mainstreaming, and agenda setting. The GAD Policy aims to ensure that special design features and strategies are built into projects to facilitate and encourage women's involvement and ensure tangible benefits to women.

In all ADB projects, including program and sector loans, gender considerations are to be addressed as part of the initial social assessment (ISA) that is now required for all ADB projects. If the ISA identifies significant gender issues, these will be examined further through detailed gender analysis and development of a Gender Action Plan. The need for detailed gender analysis has not been identified in relation to this Project. However, gender issues are considered throughout the SIA and efforts have been made to encourage women's involvement in the Project and the realisation of benefits to women.

7.2.4.3 IFC Performance Standards and Environment Health and Safety Guidelines

In addition to the above ADB policies and requirements, reference will also be made to the following IFC Performance Standards (PS) that are relevant to this SIA:

- IFC PS1 – Social and Environmental Assessment and Management System;
- IFC PS2 – Labour and Working Conditions;
- IFC PS4 – Community Health, Safety and Security;
- IFC PS5 – Land Acquisition and Involuntary Resettlement; and
- IFC PS7 – Indigenous Peoples.

The requirements of these PS are summarised below.

PS1 - Social and Environmental Assessment and Management Systems

PS1 establishes the importance of: (i) integrated social and environmental assessment; (ii) effective community engagement through information disclosure and consultation with local communities; and (iii) the client's management of social and environmental performance throughout the life of the project.

PS2 - Labour and Working Conditions

PS2 recognizes that economic development should be balanced with workers rights. PS2 aims to: establish, maintain and improve the worker-management relationship; promote the equal opportunity of workers, and compliance with national labour and employment laws; protect the workforce by addressing child labour and forced labour; and promote safe and healthy working conditions.

PS4 – Community Health, Safety and Security

PS4 aims to: avoid or minimize risks to and impacts on the health and safety of the local community during the project life cycle; and ensure that the safeguarding of personnel and property avoids or minimizes risks to the community's safety and security.

PS5 – Land Acquisition and Involuntary Resettlement

PS5 aims to: avoid or at least minimize involuntary resettlement wherever feasible by exploring alternative project designs; mitigate adverse social and economic impacts from land acquisition by (i) providing compensation for loss of assets and (ii) ensuring that resettlement activities are implemented with appropriate consultation and disclosure; and improve or at least restore the livelihoods, standards of living and living conditions of displaced persons.

PS7 - Indigenous Peoples

PS7 aims to: ensure that the development process fosters full respect for Indigenous Peoples; avoid, minimize or compensate adverse impacts of projects on Indigenous Peoples and provide opportunities for development benefits; establish and maintain an ongoing relationship with affected Indigenous Peoples throughout the life of the project; and foster informed participation of Indigenous Peoples when projects are to be located on traditional or customary lands under use by the Indigenous Peoples.

IFC Environment Health and Safety Guidelines

PS2 and PS4 in relation to occupational and community health and safety respectively requires reference to be made to the relevant Environmental, Health and Safety (EHS) Guidelines. These are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). The following IFC EHS Guidelines are considered applicable to the Project:

- Electric Power Transmission and Distribution (April 2007);
- General EHS Guidelines (April 2007);
- Gas Distribution Systems (April 2007);
- Natural Gas Processing (April 2007);
- Onshore Oil and Gas Development (April 2007);
- Petroleum-based Polymers Manufacturing (April 2007); and
- Thermal Power Plants (December 2008).

This SIA outlines mitigation measures aimed to ensure compliance with these guidelines, specifically in relation to the following key areas:

- Occupational health and safety:
  - Use of Personal Protective Equipment (PPE);
  - Hazard Operational Studies (HAZOP) to identify hazards and formulate appropriate management plans;
  - Use of a formal Permit to Work (PTW) system to ensure that all potentially hazardous work is carried out safely and ensures effective authorization of designated work, effective communication of the work to be carried out including hazards involved, and safe isolation procedures to be followed before commencing work;
  - Provision of specialised first aid providers;
  - Specific provision of measures to avoid and mitigate impacts related to the following:
    - Fire and explosion;
    - Air quality;
    - Hazardous materials;
    - Transportation; and
    - Well blowouts;
  - Development of an Emergency Preparedness and Response Plan.

- Community health and safety:
  - An adequate safety zone around the facilities should be established based on a risk assessment;
  - A community emergency preparedness and response plan that considers the role of communities and community infrastructure as appropriate should also be developed;
  - To prevent public contact with dangerous locations and equipment and hazardous materials, access deterrents such as fences and warning signs should be installed around permanent facilities and temporary structures with controlled access points (guarded gates);
  - Means for detecting intrusion (for example, closed-circuit television) should be considered. To maximize opportunities for surveillance and minimize possibilities for trespassers, the facility should have adequate lighting;
  - Where security personnel are used appropriate due diligence must be performed on the company and the individuals;
  - Public training to warn of existing hazards, along with clear guidance on access and land use limitations in safety zones or pipeline rights of way should be provided; and
  - Vehicular traffic signs should clearly designate the separate entrances for trucks / deliveries and visitor / employee vehicles.

7.2.5 Desk Study and Field Reconnaissance

The ESIA team has made four visits to the project area. During the first visit, a social development specialist attended and participated in meetings with stakeholders. For the second, third and fourth visits, social aspects were covered by the Project Manager. Observations and specific data requests made during those visits have informed the results of this SIA.

The desk-top study entailed collecting primary data through consultation with Hakim's and other local stakeholders and studies specifically commissioned for the Project such as the master plan for the new Akchalak settlement.[17]

Data was also collected from a range of published sources including websites, articles and reports from the local authority, government organisations, and non-governmental organisations working in Karakalpakstan. Sources included other project documentation for other development projects being implemented in Karakalpakstan, general country profiles from the UN and other agencies, census data ('Settlement Passports'), geographic encyclopaedic and travel publications and consultation reports.

7.2.6 Social Resources and Receptors

Impacts are broadly assessed in the SIA by analysing the extent to which a project results in social receptors gaining or losing access to and control over socio-economic resources. Social receptors are individuals, socio-cultural groups or business entities including:

- Community residents and users of community facilities and services;
- Public and private community and social service providers;
- Community associations and business organisations; and
- Employers, employees, and job seekers.

[17] Preliminary Feasibility Study of the Masterplan of the Akchalak workers settlement, developed by GUP UzshakharsozlikLITI in 2011

Socio-economic resources are business or community assets, facilities, services and opportunities. These include both human and non-human existing and potential resources within the areas of influence, for example:

- Community facilities and services in areas such as such as health, education, retail and recreation;
- Commercial and residential properties and accommodation;
- Livelihood, employment and training opportunities;
- Local business customer bases and growth opportunities; and
- Natural resources such as fish, forests and oil and gas reserves.

Despite the distinction between socio-economic resources and receptors presented above it is important to note that in many cases receptors are also resources; for example a local market is a community resource for local residents but as a small business it could also be a receptor in its own right that is directly affected by the Project.

7.2.7 Determining Significance of Impacts and Effects

Determining the significance of socio-economic and community impacts and their effects is one of the main purposes of an SIA. It enables the identification of necessary mitigation and benefit enhancement measures as well as an indication of the related financial costs associated with the social impacts of a project. A social impact can be either beneficial or adverse and is assessed by comparing the quality of the baseline conditions with the predicted quality of the social environment once the project is in place.

In order to describe the significance of an impact it is important to distinguish between two concepts, magnitude (of impact) and sensitivity (of receptors). In situations where legal standards and established professional criteria are not available, sensitivity and magnitude is determined according to professional judgement and the classifications ascribed are supported with sound reasoning and factual evidence. The use of these two concepts for this SIA is outlined below.

7.2.7.1 Magnitude

The magnitude of an impact and its effects is the extent to which the impact results in a social receptor gaining or losing access to or control over socio-economic resources resulting in a beneficial or adverse effect on their wellbeing. Well-being refers to the financial, physical and emotional conditions.

The assessment of magnitude has been undertaken in two steps. Firstly, the key social impacts associated with the project and their related beneficial and adverse, direct and indirect, and cumulative effects have been identified. Secondly, the magnitude of impacts and effects have been categorised as either major, moderate, minor or negligible based on consideration of the parameters listed below along with professional judgement:

- Duration of the impact;
- Spatial extent of the impact;
- Number of people or groups affected; and,
- Likelihood.

Table 7.8 below summarises the typical varying degrees of impact magnitude.

Table 7.8: Criteria for Determining Magnitude of Impact

Categorisation	Determination
Major adverse / beneficial	A probable impact that affects the wellbeing of groups of many people or business entities within a widespread area beyond the project life.
Moderate adverse / beneficial	A possible impact that will likely affect either the wellbeing of a group of people or business entities beyond the local area of influence into the wider area of influence or continue beyond the project life.
Minor adverse / beneficial	An impact that may affect the wellbeing of a small number of people and/or households or businesses, or occurs exceptionally, mostly within the project area of influence and does not extend beyond the life of the project.
Negligible	An impact that is localised to a specific location within the project's site boundary and is temporary or unlikely to occur with no detectable affect on the wellbeing of people or a business entity so that the socio-economic baseline remains consistent.

7.2.7.2 Sensitivity

The sensitivity of receptors is related to their socio-economic vulnerability, measured by their capacity to cope with social impacts that affect their access to or control over additional or alternative social resources of a similar nature, ultimately affecting their well-being. Sensitive or vulnerable receptors generally have less means to absorb adverse changes, or to replicate beneficial changes to their resource base than non-sensitive or non-vulnerable receptors.

When considering sensitivity the type of resources in question varies between receptors. For example, a community's vulnerability might be measured in terms of their resilience to loss of community facilities, whereas an individual's vulnerability can be considered as their resilience to deprivation, loss of livelihood assets or opportunities (their job). Activities that increase impoverishment risks contribute to vulnerability. Impoverishment risks include landlessness, joblessness, homelessness, marginalisation, increased morbidity and mortality, food insecurity, loss of access to common property resources, and social disarticulation[18]. Table 7.9 below presents the guideline criteria used to categorise the sensitivity of receptors.

Table 7.9: Criteria for Determining Sensitivity of Receptors

Value/Sensitivity Category	Determination
High	An already vulnerable receptor with very little capacity and means to absorb proposed changes or with very little access to alternative similar sites.
Medium	An already vulnerable receptor with some capacity and means to absorb proposed changes or with little access to alternative similar sites.
Low	A non vulnerable receptor with limited capacity and means to absorb proposed changes and with some access to alternative similar sites.
Negligible	A non vulnerable receptor with plentiful capacity and means to absorb proposed changes and with good access to alternative similar sites.

[18] Michael M. Cernea has written extensively on impoverishment risks.

7.2.8 Assigning Significance

The significance of an impact has been determined by the interaction between the magnitude of impacts and the sensitivity of receptors affected as depicted in the significance matrix shown in Section 5.3.4.4. Professional judgement has been used by appropriately qualified social scientists when assigning significance.

7.2.9 Data Limitations

The local community demographic census data was based on 2010 socio-economic passports prepared for each settlement / district. The socio-economic passports present data in a pre-scribed format as per Uzbekistan government requirements. Clarifications were sought where required through consultation with local government officials to address any inconsistencies and to update the 2010 data to allow for any changes because the 2011 census data had not been published at the time of writing. The data is expected to be accurate and follows expected trends.

7.3 Baseline Description

7.3.1 Overview

This section presents social baseline data on: population and demographics; economic environment; labour rights and project employment; land use and natural resources; community organization and local governance; social services and infrastructure; recreation, tourism and culture; gender and vulnerable groups.

7.3.2 Demographic Overview

7.3.2.1 National Context

The 2010 estimated population of Uzbekistan was just over 27.8 million. In 2008, the population density was almost 61 people per square kilometre. The urban based population is around 37 percent, with those aged 0 to 14 being almost 30% and those over 65 years of age (men and women) around five percent of the population. The average annual population growth rate was estimated at just less than one percent in 2010 with the urban population growth rate only slightly greater than the rural population growth rate.

Uzbeks are the main ethnic group representing 80% of the population, with Russians and Tajiks representing about five percent of the population, and Kazakhs and Karakalpaks each about three percent. A large majority (88 percent) of Uzbek's are Muslim (mostly Sunnis), with nine percent being Eastern Orthodox and the last three percent other denominations. Languages used include Uzbek (the official language), Russian and Karakalpak.

7.3.2.2 Karakalpakstan Region and Kungrad and Muynak District Context

Karakalpakstan is a semi-autonomous area occupying the western side of Uzbekistan. The population is estimated at 1,500,000. About a third are of Karakalpak ethnic group origin (discussed in more detail in Section 7.3.3), another third are Uzbek and just short of a third are Kazakh. There is also a small Korean population that was established during Soviet control of the area.

In 2001, the ADB estimated that almost 75 percent of the Karakalpakstan population was rural, a trend which has not likely changed significantly. Of the ADB's 2001 estimated 1.1 million rural inhabitants of Karakalpakstan, 50 to 70% were considered to be poor and 20% severely poor.

Between 1970 and 1980, there was extensive out migration from many parts of Karakalpakstan and especially Muynak District for economic reasons when the highly productive fishery, fish processing industry and navigation services were decimated by the drying of the Aral Sea. During this period some 14,500 people including qualified specialists, sailors, fishermen, and labourers in the fish processing industry migrated out of the area. Migration stabilised to some extent in the late 1990s although the rural to urban migration put pressure on the urban services and infrastructure in the area.

The upstream components of the Project are located in the Muynak District which in 2010 had a population estimated to be 28,300 people. The population density is 0.8 persons per square km and about 46 percent of the district's population were classified as 'urban dwellers' and 54 percent as 'rural dwellers'. The ethnic breakdown of the population showed 62 percent being Karakalpak, 37 percent being Kazakh, and less than one percent being Russian, Uzbek, Tatar, Korean or Turkish.

The town of Muynak, which is the closest town to the Project, once had a thriving harbour in the 1960s and fishing industry that employed approximately 30,000 people. It now lies approximately 100km from the shore of the remaining western basin of the Aral Sea and has a much reduced population. It is estimated that over 10,000 jobs were lost in the Muynak District over the last 40 years as a result of the drying of the Aral Sea, which began in the 60s and deteriorated in the 70s and 80s. To put this in context, the total population of the Muynak District was only approximately 27,300 people in 1970.[19]

The downstream components of the Project are located in the Kungrad District which in 2008 had an estimated population of 113,500, just over 72,000 of whom were classified as 'urban dwellers' and almost 41,000 were 'rural dwellers'. The estimated population density per square kilometre was 1.5 persons and the number of working age was 62,400. Kungrad has about 5,000 more women than men. The population is almost 25 percent Karakalpak, 40 percent Uzbek and 35 percent Kazakh, with a very small number of Russians, Tatars, Ukrainians, Korean and Turks.

7.3.2.3 Local Community Context

The nearest settlement to the Surgil Field (upstream Project component) is the small village of Uchsay, with a population of 1,444 people. Uchsay is the most northerly settlement within Uzbekistan and is approximately 15 km north-east of the town of Muynak in the Muynak District.

Akchalak Settlement within the Kungrad District is the nearest community to the UGCC Site (downstream components) and the new workers' settlement will be constructed adjacent to this existing settlement. Akchalak is located approximately 50 km west of the town of Kungrad and is under the administration of the Kungrad District Government. The settlement was first established as a few houses around a railway crossing point in 1976 and following the construction of the Akchalak Gas Compressor Station the settlement grew quickly as workers moved in to the area. By April 2011 it had grown to a population of 954 residents.

[19] Uzbekistan State Statistics Authority

One of the largest industrial businesses in the downstream area is the Kungrad Soda Plant, which is located approximately 10 to 12 km south-east of the UGCC site, adjacent to the Elabad settlement which in April 2011 had a population of 2,020 residents.

Table 7.10 below presents a demographic overview of these nearest project affected communities.

Table 7.10: Demographic overview of local project affected communities

	Uchsay Settlement		Akchalak Settlement		Elabad Settlement		Total/Average	
	No.	%	No.	%	No.	%	No.	%
Gender:								
Males	682	47.2%	471	49.4%	1,122	55.5%	2,275	50.7%
Females	762	52.8%	483	50.6%	898	44.5%	2,143	49.3%
Total	1,444	100.0%	954	100.0%	2,020	100.0%	4,418	100.0%
Ethnicity:								
Uzbeks	3	0.2%	309	32.4%	723	35.8%	1,035	22.8%
Karakalpak	97	6.7%	85	8.9%	835	41.3%	1,017	19.0%
Kazakhs	1,344	93.1%	557	58.4%	450	22.3%	2,351	57.9%
Russians	0	0.0%	0	0.0%	6	0.3%	6	0.1%
Turkmen	0	0.0%	0	0.0%	4	0.2%	4	0.1%
Tatars	0	0.0%	2	0.2%	2	0.1%	4	0.1%
Tubins	0	0.0%	1	0.1%	0	0.0%	1	0.0%
Total	1,444	100.0%	954	100.0%	2,020	100.0%	4,418	100%
Age groups:								
Under 16 yrs	464	32.1%	368	38.6%	675	33.4%	1,507	34.7%
16 - pensioners	867	60.0%	517	54.2%	1,335	66.1%	2,719	60.1%
Pensioners*	113	7.8%	69	7.2%	10	0.5%	192	5.2%
Total	1,444	100.0%	954	100.0%	2,020	100.0%	4,418	100.0%

Source: Based on 2010 socio-economic passports prepared for each settlement as per Uzbek national requirements and subsequent consultation with Settlement Council Chairmen to update the data and provide clarification in lieu of 2011 Census Data being published

Notes:

**Pension age is 55 for women and 60 for men*

From Table 7.10 it can be seen that the Akchalak settlement is the smallest of the communities with fewer than 1,000 people and only 200 households, compared to 1,444 people and 242 households in Uchsay and 4,418 people and 508 households in Elabad.

The ethnicity of each of the local communities varies noticeably; in the upstream settlement of Uchsay the overwhelming majority of people are Kazakh (93.1%), as is the case in the downstream settlement of Akchalak, although with a smaller majority (58.4%). The situation in Elabad (the community least affected by the Project) is different, with the majority of people being Karakalpak who consist of 41.3% of the population, compared to 8.9% in Akchalak and 6.7% in Uchsay.

7.3.3 Characteristics of Karakalpak Ethnic Peoples

7.3.3.1 Overview

Approximately half a million Karakalpak ethnic people (Karakalpaks) live on the southern shore of the Aral Sea in the Karakalpak Autonomous Oblast (republic). This section explores the extent to which the Karakalpaks could be considered to meet the ADB definition of Indigenous Peoples (IPs) and therefore the potential for triggering ADB SR3 on IPs. The ADB's defining characteristics for (IPs) is as follows:

> "A distinct, vulnerable, social and cultural group possessing the following characteristics in varying degrees:
> (1) Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others;
> (2) Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories;
> (3) Customary cultural, economic, social, or political institutions that are separate from those of the dominant society and culture; and
> (4) A distinct language, often different from the official language of the country or region."[20]

Each of these characteristics is discussed in relation to the Karakalpaks in the sub-sections below.

7.3.3.2 Identification as Members of a Distinct Indigenous Cultural Group

The Karakalpaks were formerly nomadic herders and fisher-folk whose distinct identity was first recorded in the 16th century. They are a heterogeneous people, their appearance ranging from European to Mongoloid. They are a confederation of many tribes, organised into two major divisions or 'arıs', the On To'rt Urıw (meaning fourteen tribes) and the Qon'ırat. Within each tribe are a number of clans, or 'koshe', of several extended families claiming descent from a common ancestor. The Karakalpaks actually refer to themselves as Qaraqalpaqs, whilst the Uzbeks call them Qoraqalpogs.

Karakalpaks have their own culture and traditions, cultural dress and they come from a nomadic culture and still carry on some traditions associated with that, even though very few still travel[21]. Clan identity remains very important to the Karakalpaks up to the present day and children are taught to value and respect their clan from an early age. The Karakalpaks are very proud of their ethnic and cultural identity, which is also respected as distinct by Uzbeks, Kazakhs and Russians living in the region.

In conclusion, the Karakalpaks are considered to meet the first characteristic of ADB's definition of indigenous peoples in terms of self-identification as members of a distinct indigenous cultural group and recognition of this identity by others.

Despite their strong sense of clan identity, the Karakalpaks appear not to have a strong nationalistic identity as Karakalpaks[22]. In fact, their sense of nationhood is said to be the weakest among Central Asian

[20] ADB Safeguard Policy Statement, June 2009.

[21] From an interview with Shamil Amirov, an expert in Archaeology from the Institute of History, Archaeology and Ethnography of Karakalpak Branch of Uzbek Academy of Sciences (considered a global expert).

[22] Philips,J, People on the move: Introducing the nomads of the world, 2002.

groups[23]. In that sense, the Karakalpaks maintain more of a pan-Turkic identity than a narrow sense of Karakalpak nationhood, and they do not really look on the Uzbeks and Kazakhs as an alien people. Overall, the Karakalpak sense of loyalty to their tribe or a clan is far more intense than any generic sense of ethnic identity as Karakalpaks, and individual clans live interspersed among Uzbeks, Kazakhs other ethnic groups within society and don't stay together in one area[24].

The Karakalpaks are very close to the Kazakhs and they interact and even intermarry in some cases. There have been studies carried out to show that Uzbeks and Karakalpaks have been living together and helping each other (for example for projects that will be mutually beneficial) for centuries[25].

In conclusion, the Karakalpaks meet the defining ADB characteristic of cultural distinctiveness, whilst recognising that that this cultural identity is not reflected in nationalist ambitions or segregation from other ethnic groups on a day to day basis. Although Karakalpaks are considered to be culturally distinct they are socio-economically integrated with other ethnic groups within Uzbek society.

7.3.3.3 Collective Attachment to Geographically Distinct Habitats or Ancestral Territories

Recent archaeological evidence indicates that the Karakalpaks may have formed as a confederation of different tribes at some time in the late 15th or the 16th centuries at some location along the Syr Darya or its southern Zhany Darya outlet, in proximity to the Kazakhs of the Lesser Horde. This would explain why their language, customs and material culture are so very similar to that of the Kazakhs.

Today the Karakalpak population is mainly confined to the central part of Karakalpakstan that is irrigated by the Amu Darya River[26]. They have lived here since the 18th century when they were driven from their homelands in the Syr Darya river valley by the Kazakhs[27]. The largest communities live in Nukus, the capital of Karakalpakstan, and the surrounding large towns, such as Khodzheli, Shimbay, Takhiatash, and Kungrad. Rural Karakalpaks mainly live on former collective or state farms, most of which have been recently privatised. Many rural Karakalpaks have been seriously affected by the desiccation of the Aral Sea, which has significantly affected the local fishing industry along with much of the grazing and agricultural land in the north of the delta.

Karakalpaks are taught from a young age that the northern Aral area is their “paternal homeland” and they have a psychological attachment to the whole area of Karakalpakstan, and in some cases the areas where their paternal ancestors lived[28]. However, for approximately the past 100 years, none of the Karakalpak peoples in Uzbekistan have been dependant on traditional pastoral (nomadic agriculture) activities for their subsistence or livelihoods.[29]

[23] http://www.everyculture.com/Russia-Eurasia-China/Karakalpaks-Orientation.html

[24] Olsen, JS and Pappas, NC, An ethnical dictionary of the Russian and Soviet Empires; Greenwood Press, Westport 1994.

[25] From interview with Shamil Amirov an expert in Archaeology from the Institute of History, Archaeology and Ethnography of Karakalpak Branch of Uzbek Academy of Sciences (considered a global expert).

[26] Cernea, MM and Kudat, A, Social Assessments for Better Development, World Bank, 1997.

[27] Knowlton,M, Uzbekistan, 2006.

[28] From an interview with David Richardson, a scientist who is currently writing a book on the ethnography of the Karakalpak people (he is considered an emerging specialist)

[29] Karakalpakstan State Art Museum in Nukus.

When asked in November 2010, the Kungrad and Muynak District Hakimyats acknowledged that the Karakalpaks have a collective attachment to the Karakalpakstan region as a whole and specifically the original Aral Sea (the remaining part of the sea, that is the dried up areas of sea bed, is barren and uninhabitable other than through specialist camps and the Karakalpaks do not go there), however they stated that none of the land in the project area is being visited or used by Karakalpaks for traditional cultural or lifestyle activities. This information was verified by the specialists consulted to inform this ESIA who - when the project location was described to them - all stated that the Karakalpaks did not have a collective attachment to these specific areas because they had been uninhabited by local communities for a long time[30].

In summary, whilst the Karakalpaks do have a collective attachment to Karakalpakstan as a whole, and in some cases specific areas, this attachment does not translate into cultural practices and or pilgrimages to these areas away from their homes (which are largely in urban or semi-urban areas). Furthermore, Karakalpaks do not have a collective attachment to any of areas in the Project footprint. In conclusion, Karakalpaks are not thought to meet this characteristic of IPs in relation to this Project, and therefore Project would not trigger ADB SR3 on the grounds of having impacts on the 'territories or natural or cultural resources' that Karakalpaks 'own, use , occupy or claim as their ancestral domain' (ADB SR3 Paragraph 9).

7.3.3.4 Separate Customary Cultural, Economic, Social, or Political Institutions

The Karakalpak Autonomous Oblast was created on February 19, 1925 by separating lands of the ethnic Karakalpaks from the Turkestan Autonomous Soviet Socialist Republic and Khorezm People's Soviet Republic. In 1932 the oblast became the Karakalpak Autonomous Soviet Socialist Republic, and it was joined to the Uzbek SSR in 1936. It is because of that transfer that Karakalpaks entered into the sphere of Uzbekistan at the latter's independence in 1991, instead of their more closely related Kazakhs[31].

There is widespread recognition that Karakalpaks have never enjoyed any political independence as an ethnic community[32]. The specialists consulted to inform this ESIA explained that Karakalpakstan is in theory a semi-autonomous Republic within Uzbekistan and has its own parliament and legislature, but in fact all of the major decisions are made in Tashkent and are merely 'rubber-stamped' in Karakalpakstan[33].

Also as a result of the Soviet legacy, the Karakalpakstan government is ethnically varied and integrated. During the Soviet Union all government offices and institutions were made up of teams of people from different ethnic groups. Now it is not a strict rule any more, but this practice continues today in political and economic institutions[34].

[30] From interviews with David Richardson, a scientist who is currently writing a book on the ethnography of the Karakalpak people (he is considered an emerging specialist) and Shamil Amirov an expert in Archaeology from the Institute of History, Archaeology and Ethnography of Karakalpak Branch of Uzbek Academy of Sciences (considered a global expert).

[31] www.karakalpak.com

[32] Olsen, JS and Pappas, NC, An ethnical dictionary of the Russian and Soviet Empires; Greenwood Press, Westport 1994.

[33] From an interview with David Richardson, a scientist who is currently writing a book on the ethnography of the Karakalpak people (he is considered an emerging specialist).

[34] From an interview with Shamil Amirov, an expert in Archaeology from the Institute of History, Archaeology and Ethnography of Karakalpak Branch of Uzbek Academy of Sciences (considered a global expert).

As well as being politically integrated, the Karakalpaks also participate in most economic institutions, and the widespread poverty in region was shared by a number of ethnic groups and not distinct to ethnic Karakalpaks[35].

The most defining institutions of the Karakalpaks are socio-cultural, namely the tribe and the clan, and its distinct practices, the most notable of which is exogamy. Exogamy is the social arrangement where marriage is allowed only outside of a social group, which in the case of Karakalpaks is the clan and tribe. Exogamy has always been a strong tribal characteristic of Karakalpaks who in general were required to marry up to seven generations outside of the clan of their mother. Karakalpak children always appertain to the tribe of their father and it is forbidden to marry with all representatives of the tribe of the father regardless of their location of residence and the number of generations passed since direct real kinship. Girls and boys from same tribe were (and are at present) considered as sisters and brothers.

Rare cases of breach of exogamy among Karakalpaks have in the past been strongly punished by public disgrace and expulsion from the settlement. There are only two clans where tribal exogamy was not in use: the Qanly clan from Kypshaq tribe, and Qayshyly clan from Qtay tribe. However, this is generally denied by members of these tribes as it is considered a source of shame.

Exogamy is not only practices by Karakalpaks, but also by Kazakhs, Kyrgyz and Altay Turkic people. A Soviet ethnologist in 1960s and 1970's undertook research that identified that these other groups tended to reduce the degree of exogamy from seven to three or four generations. However, Kazakhs living in Karakalpakstan have been influenced by Karakalpak marriage rites and culture, and they now practice the same degree of exogamy as the Karakalpaks[36].

In summary and conclusion, the Karakalpaks are considered to share and participate in the same socio-economic and governance institutions of mainstream society, within which a number of ethnic groups are politically and economically integrated in accordance with Soviet traditions. The clan and tribe is the distinctive socio-cultural institution of Karakalpaks, which has different practices from modern Uzbek society, the most notable of which is exogamy. However, other ethnic minorities in the project area, such as Kazakhs also share the practice of exogamy and it is not considered uncommon or unusual. Overall, it is concluded that the Karakalpaks do not meet this third defining characteristic of IPs. The one area where there could potentially be grounds for triggering SR3 in relation to the presence of this characteristic would be if the project would affect the socio-cultural institution of the tribe or the clan, however such potential impacts are not considered to be likely as a result of the Project.

7.3.3.5 Distinct language that is Different from the Official Language of the Country or Region

The Karakalpaks' language belongs to the Kipchak family of Turkic languages, and they are closely related linguistically and culturally to the Kazakhs. Their written language is Turkic used commonly by all Turkistan people until the end of the nineteenth century, and their spoken language is very close to Kazakh language and Kyrgyz language.

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[35] www.karakalpak.com

[36] From an interview with Shamil Amirov an expert in Archaeology from the Institute of History, Archaeology and Ethnography of Karakalpak Branch of Uzbek Academy of Sciences (considered a global expert).

Karakalpak language had become a written language in the Soviet period for the first time and an alphabet was developed that was based on the Arabic letters at first. In 1972 Karakalpak was used as the medium of instruction at all levels in the schools of Karakalpakstan[37]. The transition to the Latin letters has been accelerated in a movement to remove the influence of the Russian language from everyday life. While Karakalpak and Uzbek are both official languages in the autonomous republic, the government of Uzbekistan has recently been replacing the Karakalpak names of populated places, geographical features, and administrative divisions with Uzbek language names only.

Karakalpak culture was suppressed during the process of Sovietisation however one of the positive legacies from the Soviet period is that the overwhelming majority of children still go to school and adult literacy is extremely high. However following Uzbek independence it is no longer obligatory to teach Russian and many good schools now attempt to teach English as an alternate foreign language. In the past many older rural Karakalpaks never learnt to speak Russian and now it is common to find young people in the cities who can only speak Karakalpak.

Specialists consulted to inform this ESIA stated that having a separate language does differentiate the Karakalpaks from other ethnic groups and mainstream society, and that this language is used in day to day interactions between Karakalpaks[38]. However Karakalpaks can all speak Uzbek and or Russian, and in some cases in urban areas they cannot speak Karakalpak.

In conclusion, the Karakalpaks meet the fourth defining characteristic of ADB's definition of indigenous people as they have a distinct language that is different from the official language of the country.

7.3.3.6 Local Community Context

As identified in Section 7.3.2.2, the majority (almost two thirds) of the population of the Muynak district and one quarter of the Kungrad District are of the Karakalpak ethnicity. As illustrated in Table 7.10, the average percentage of Karakalpak people in the three project affected communities is only 19% and these are concentrated in the Elabad settlement (41.3%) which is the least affected by the project out of the three. Karakalpaks are a minority in the Uchsay (upstream) and Akchalak (downstream) settlements, which consist of 6.7% and 8.9% Karakalpak peoples, respectively.

7.3.4 Land Requirements for the Project and Present Land Use

7.3.4.1 Overview

This section discusses the present land use and presents the land requirements for each facility in each project site, the locations of which are shown in Figure 2.1. As shown in Table 7.11 below, prior to the ESIA process commencing in 2009, the only land that was allocated for industrial purposes was the site of the Surgil Field.

[37] Akiner,S, Islamic Peoples of the Soviet Union, 1983.

[38] From an interview with Shamil Amiro, an expert in Archaeology from the Institute of History, Archaeology and Ethnography of Karakalpak Branch of Uzbek Academy of Sciences (considered a global expert).

Table 7.11: Overview of Land Requirements for the Project and Present Land Use and Allocation

Infrastructure	Construction land required (Ha)	Operation land required (Ha)	Present Land use	Present Land allocation
Upstream Surgil Field (Allocation from Muynak)				
Gas Wells	279.3	47.88	The existing Surgil Field consists of Surgil CGTU and 28 drilled wells located within the former footprint of the Aral Sea basin. The area is highly saline, with salt accumulation occurring below the surface in the subsoil and salt on the soil surface being clearly visible. As a result of this, there is no agricultural activity around the gas fields other than occasional small scale ambulatory grazing of animals. By 1994, 94 percent of the land area around the Aral Sea area was considered salinated and was too salty for agriculture production.	In 2006 permission was granted by the Muynak District Government for Ustyurtgaz to exploit the entire field for industrial development. Upon financial close all land will be reallocated to Uz-Kor. Specific areas are allocated on a one by one basis and so far 167.55 ha of the total areas required has been allocated to the Project, consisting of: - 68.06 ha. well heads - 76.85 ha. pipelines - 12.64 ha. access roads - 10 h.a earth pits See Table 7.12 for specific details.
Well Pipelines (Diameter = 108mm)	325.72	191.6		
Collector Pipelines (Diameter = 351mm)	31.97	31.97		
Collector Pipelines (Diameter = 273 mm)	10.35	10.35		
Access road from CGTU to GGSs and wellheads	56.7	14.7		
Surgil Field electricity transmission network	441	441		
Gas Gathering Stations	6	6		
Security valves	0.6	0.6		
Surgil CGTU	6	6		
Surgil Workers Accommodation	1	1		
Access Road to Surgil CGTU from Uchsay	29.26	29.26		
Upstream Sub-Total	***1187.9***	***780.36***		
Pipelines (Allocation from Muynak and Kungrad)				
Gas pipeline from Surgil CGTU to UGCC (Diameter = 1020mm)	368	368	The pipelines will travel from the Surgil field across the former Aral Sea bed south and then East to the Ustyurt Plateau, an area of elevated land (150m approx) that stretches from the Aral Sea and Amu Darya river delta in the east to the Caspian Sea in the west. The pipeline route area is uninhabited and completely undeveloped other than oil and gas operations. Local inhabitants of Akchalak keep livestock which is grazed on the plateau. These are generally small scale agricultural practices that have experience in traversing pipeline routes during construction and once completed.	No land has been allocated for the pipelines as of June 2011 however it will be Government owned land that will be allocated. 89 km of the pipeline route was unallocated previously, whereas 31 km was previously allocated for the Ural – Bukhara pipeline
Within Kungrad area. (60.9%)	*224*	*224*		
Within Muynak area (39.1%)	*144*	*144*		
Condensate pipeline from Surgil CGTU to UGCC (diameter = 168mm)	264.5	264.5		
Within Kungrad area. (60.9%)	*161*	*161*		
Within Muynak area (39.1%)	*103.5*	*103.5*		
Condensate pipeline from Berdak CGTU to the tie-in with Surgil pipeline	59.8	59.8		
Gas pipeline from Berdakh CGTU to the tie-in with Surgil pipeline	83.2	83.2		
10 kV electricity supply for pipeline	241.5	241.5		
Within Kungrad area. (60.9%)	*147*	*147*		
Within Muynak area (39.1%)	*94.5*	*94.5*		
Pipelines Sub-Total	***1017***	***1017***		
Downstream UGCC (Allocation from Kungrad)				
Rail-road spur	10.29	10.29	The UGCC site will be located approximately 115 km away	Prior to the project this land was unallocated by
Wastewater Storage Pond	128	128		

Infrastructure	Construction land required (Ha)	Operation land required (Ha)	Present Land use	Present Land allocation
Water pipelines between UGCC and Wastewater Storage Pond	13	13	from the Surgil Fields and occupy an area of undeveloped land located on the Ustyurt Plateau.	the Kungrad District Government for industrial purposes.
Water supply Pipeline to UGCC (from Kungrad water supply pipeline)	20.4	20.4		190 ha already allocated to Uz-Kor under Decision No 118/3 of March 2009. Uz-Kor will progress with the remaining allocation applications as the downstream development is progressed.
Water supply Pipeline to UGCC (from Nukus water supply pipeline)	34	34	This land is semi arid desert that is uninhabited and not currently used for industrial purposes	
Gas sales pipeline from UGCC to Akchalak GCS	23.4	23.4		
UGCC access road from Kungrad-Beineu highway	5.25	5.25	There is some ambulatory herding but as in with the Surgil field and the pipeline route, this is sporadic and is not expected to be impacted upon by the Project.	
Solid waste storage area	8.16	8.16		
Water supply / disposal from Akchalak settlement to UGCC	8.5	8.5		
Workers accommodation in Akchalak extension	70	70		
UGCC site	85	85		
Downstream UGCC Sub-Total [(a) (b)]	***406***	***406***		
Total allotment of land to Uz-Kor	**2610.9**	**2245.36**	NA	NA
Allocation from Kungrad	***938***	***938***		
Allocation from Muynak	***1672.9***	***1307.36***		

Note: (a) Land allocation for the 12km 110kV transmission line connection to the Kungrad Soda Ash plant sub-station will be the responsibility of Uzbekenergo. Currently, the status of application for allocation from Uzbekenergo is unknown together with the quantity of land to be allocated. However, the route alignment of the transmission line is known and based on this, it is possible to infer that the land is currently unallocated and the present land-use is semi arid desert that is uninhabited and currently not used for industrial purposes (albeit, the route runs parallel for 10km to a corridor currently allocated to Uzbekenergo which is used for current electricity supply to the Ustyurt Plateau region).

(b) Further limited temporary land allocation will be required for the temporary workers accommodation during the construction phase. Currently the size of land allocation required for this temporary infrastructure is unknown as this is dependent on feedback from the eventual selected EPC bidders. This temporary land allocation is likely to be immediately adjacent to the UGCC site currently allocated and will be required for the duration of the construction period following which the land will be reinstated and returned to the government.

The land use of the project sites is elaborated in the sub-sections below.

7.3.4.2 Surgil Field Current Land Use

The Surgil Field is located on the north-western edge of the Amu Darya river delta within the former Aral Sea basin, approximately 40 km to the north-west of Muynak town, 40 km south south-east of the western lobe of the existing Aral Sea. The northern extent of the Project location, comprising the Surgil Field, and the northern section of the pipeline route, is located to the south of the existing Aral Sea. The Aral Sea is a landlocked basin that has reduced significantly in area and volume since the 1960’s as a result of poor water resource management. The Surgil Field is therefore located within the former footprint of the Aral Sea.

According to United Nation Environment Programme's (UNEP) Aridity Index, most of Uzbekistan's territory is classified as a "drought zone" and therefore prone to land degradation and desertification. The area where the Surgil Fields is located, having been a former water basin, is characterised by extremely flat topography. The wider Amu Darya river delta, located to the east of the gas field, is so flat that the river has changed its route several times over the millennia. The former Aral Sea basin is highly saline, with salt accumulation occurring below the surface in the subsoil and salt on the soil surface is clearly visible in some parts of the Surgil Field. The destructive effect of salination on the soil structure explains the absence of any agricultural activity around the gas fields other than some small scale grazing of animals. By 1994, 94 percent of the land area around the Aral Sea area was considered salinated and was too salty for agriculture production.

The area proposed as the Surgil Gas Field is currently being used by Ustyurtgaz (UG) a subsidiary of UNG) who were allocated land rights to develop and operate the existing field from the Muynak district government in 2006. All works carried out before June 2010 were the responsibility of UG. Works after this date were carried out by the UGCC Management Directorate (UMD). UMD is a temporary entity set up by UNG (who have 100% ownership) as a contractor to provide all of the facilities and infrastructure for the upstream works. UMD's primary remit is for construction, and when infrastructure has been built it will be transferred to Uz-Kor.

The total areas of land that will be used for the Project are 161.55 ha as illustrated in Table 7.12, which also shows whose ownership the works fall under.

Table 7.12: Surgil Field Land Allocation Data

№	Well №	Actual gathering length (m)	Land take areas (ha) already obtained					Ownership
			Roads	Gathering lines	Well heads	Earth pits	Application being reviewed by Hakimyats	
1	1				0.36			Ustyurtgaz
2	2				0.36			Ustyurtgaz
3	3	1040	0.5	1.04	0.36			Ustyurtgaz
4	4	1785		0.76				UGCC Management Directorate
	4	1785			2.14		0.36	Ustyurtgaz
5	5	1804	1.0	1.8	0.36			Ustyurtgaz
6	6	3800		3.8	0.36			Ustyurtgaz
7	8	2850		2.85	0.36			Ustyurtgaz
9	10	5330	2.23	5.33	0.36			Ustyurtgaz
10	12	30	0.24	0.03	0.36			Ustyurtgaz
11	13	1544	0.24	1.54	0.36			Ustyurtgaz
12	15	3136		3.14				UGCC Management Directorate
	15	3136			0.36			Ustyurtgaz
13	20	4920		4.92				UGCC Management Directorate
	20	4920			0.36			Ustyurtgaz
14	29	1210		1.21	0.36			Ustyurtgaz
15	30	1926		2.29				UGCC Management Directorate

№	Well №	Actual gathering length (m)	Land take areas (ha) already obtained					Ownership
			Roads	Gathering lines	Well heads	Earth pits	Application being reviewed by Hakimyats	
	30	1926	1.93		0.36			Ustyurtgaz
16	31	1853		1.85				UGCC Management Directorate
	31	1853	0.5		1.0		0.36	Ustyurtgaz
17	32	1900		1.26				UGCC Management Directorate
	32	1900			1.0		0.36	Ustyurtgaz
18	33	1256		1.0				UGCC Management Directorate
	33	1256	0.5		1.0			Ustyurtgaz
19	34	2620	1.6	2.9	0.36			Ustyurtgaz
20	35	2750		2.75	0.36			Ustyurtgaz
21	36	3075		0.94				UGCC Management Directorate
	36	3075			2.5		0.36	Ustyurtgaz
22	37	1086	0.75	1.08	0.36			Ustyurtgaz
23	39	230			2.1		0.36	Ustyurtgaz
24	40	557			2,1		0.36	Ustyurtgaz
25	41						0.36	Ustyurtgaz
26	42	3608		2.688				UGCC Management Directorate
	42				2.1		0.36	Ustyurtgaz
27	43	260		0.36			0.36	Ustyurtgaz
28	44	742		0.74	0.36			Ustyurtgaz
29	45	493		2.10				UGCC Management Directorate
30	46				2.1			UGCC Management Directorate
31	47				2.1			UGCC Management Directorate
32	49				2.1		0.36	UGCC Management Directorate
33	50	2580			2.1		0.36	UGCC Management Directorate
	50	2580					2.58	UGCC Management Directorate
34	51				2.1		0.36	UGCC Management Directorate
35	52				2.1		0.36	UGCC Management Directorate
36	53				2,1			UGCC Management Directorate
37	54				2.1		0.36	UGCC Management Directorate
38	55				2.1			UGCC Management Directorate
39	57				2.1			UGCC Management

№	Well №	Actual gathering length (m)	Land take areas (ha) already obtained					Ownership
			Roads	Gathering lines	Well heads	Earth pits	Application being reviewed by Hakimyats	
								Directorate
40	58				2.1			UGCC Management Directorate
41	59	551					0.36	UGCC Management Directorate
42	60				2.1			UGCC Management Directorate
43	61				2.1			UGCC Management Directorate
44	63				2.1			UGCC Management Directorate
45	64						0.36	UGCC Management Directorate
46	65				2.1		0.36	UGCC Management Directorate
47	67				2.1		0.36	UGCC Management Directorate
48	74				2.1		0.36	UGCC Management Directorate
49	75				2.1			UGCC Management Directorate
50	79				2.1			UGCC Management Directorate
51	85				2.1			UGCC Management Directorate
52	Access Roads		3.15		6.00			Ustyurtgaz
55	1020mm pipeline			26.70				Ustyurtgaz
56	Collector 273x11			3.77				Ustyurtgaz
57	Earth pit					1.00		Ustyurtgaz
58	Earth pit					3.00		UGCC Management Directorate
59	GGS-1						1.00	UGCC Management Directorate
60	GGS-2						1.00	UGCC Management Directorate
61	CGTU					6		Ustyurtgaz
	Total: 167.55		**12.64**	**76.85**	**68.06**	**10.0**		

Source: Uz-Kor

Notes: Land allocation projects for GGS 1, 2, wells № 41, 43, 59, 64 and gathering line №50 are at the development phase.

Outside of the landtake footprint of the Project to the south east of Muynak there are approximately seven lakes which are located downstream of the Kungrad WSU and are fed either directly or indirectly by the Amu Darya. Land in this area will not be required for the Project however there is the potential for impacts as a result of extraction from the Kungrad WSU.

These lakes were created as part of a wetland area that is primarily used for growing reeds and straw for animal husbandry and to reduce the mobility of potentially harmful dust from former agriculture areas around Muynak. Some of the lakes now also serve as fishing lakes, with one lake, Mejgurechye, which is a freshwater lake, also providing drinking water to local people. The main users of Muynak lakes are farms and small businesses engaged in fishing. In August 2011, 29 enterproses had lease agreement with the Muynak District Government, as illustrated in Table 7.13.

Table 7.13: Muynak Lake Small Scale Fishing Leaseholders.

Private businesses number	Name of leaseholder	Name of lake area leased	Lake area water surface area (ha.)
1	Kazakdarya	Zhyltyrbas Karamush	17,675
2	Sudochie KUOS	Bekdulla-A	750
3	Pask small private enterprise	Sudoch'ye-Lar	425
4	Amu Darya LLC	Mezhdurechie Kuksu	4,458
5	Amu-Aral small private enterprise	MezhShgerul Kyzylk	14,498
6	Zh. Turganbaeva farm	Uzynkaiyr	50
7	E. Duisenbaev farm	Khozhakul	900
8	Milada farm	Sary bas	1,250
9	Raimbek farm	Makhpalkul	300
10	S. Khazinobon farm	Khazhakoltyk	106
11	D.P. Zhalakudyk	Sudoch'ye-Semon	225
12	Posledny don private farm	Karamulla Aitpai	410
13	Salamat-Batyr KK	Besomyt-Dongelek	120
14	Ozera-Risheta	Batys Sherman	200
15	Zhubatkan Oil Service	Kubla Sherman	400
16	AGANN farm	Ulken Sudoch'ye	4,900
17	Bakhyt-Gulbakhar farm	Kuat-Yrza	125
18	Tarbiya-Tabyn	Makhpalkul	3,025
19	Nukus-Sherzhurek	Domalak	2,905
20	Karayarshy	Taily	1,628
21	Albina Alfa private farm	Seksenkul	50
22	Plutos-Service	Arka uzynkaiyr koli	100
23	Baidaugen	Akkala koli	30
24	KAMAZ Autocentre	Akpetkei sis Bos kuller	150
25	Tanir-Kadyr farm	Ashshikol	100
26	Rossi-Nukus	Zakirkol	330
27	Ada Fortuna Nukus	Akpetkei sis Samyrat	100
28	Makha-Shakha Nukus	Sarybas koli	1250
29	Zheingaliy makhsym	Kyzyl keme koli	565

Source: Data from Muynak District Government as of 28.08.2011

7.3.4.3 Pipelines Route Land Use

The pipelines begin in the Surgil field in the former Aral Sea, which spans the border between Kazakhstan and Uzbekistan. The Aral Sea has undergone a desertification process and has receded by about 150 km. The area around Muynak Town is no longer the thriving port it used to be resulting in loss of Port and commercial fishing jobs.

The pipeline route travels across the former Aral Sea south and then west to the Ustyurt Plateau. The Ustyurt Plateau is an area of elevated land that stretches from the Aral Sea and Amu Darya river delta in the east to the Caspian Sea in the west and spans both Uzbekistan and neighbouring Kazakhstan. In total, the plateau extends approximately 200,000 km² and has an average elevation of 150 metres. The plateau in the vicinity of the Project site consists primarily of flat stony semi-arid desert and drops sharply to the former bed of the Aral Sea presenting a cliff-like appearance.

7.3.4.4 UGCC Site Land Use

The southern extent of the Project comprises the UGCC which will be located approximately 115 km away from the Surgil Fields and occupy an area of undeveloped land located on the Ustyurt Plateau. This land is semi arid desert that is uninhabited and not currently used for industrial purposes. There is some ambulatory herding but as in with the Surgil field and the pipeline route, this is sporadic and is not expected to be impacted upon by the Project.

There are salt mining operations located to the South West of the UGCC site however these are outside the physical Project footprint (3.4km) and are therefore not considered as a social receptor. The salt mine is the raw product supply to the Kungrad Soda Ash plant which has been fully included within the consultation undertaken for the Project.

Lake Sudoch'ye represents the largest lake system in the vicinity of the Project lying to the south and east and well outside the Project area. The lake is located within the Amu Darya river delta, approximately 85 km to the south of the existing Aral Sea and the town of Muynak, and approximately 60 km to the north-west of the town of Kungrad. The size of the lake varies seasonally depending on the water levels of the Amu Darya. Lake Sudoch'ye is one of the last wetlands remaining within the Amu Darya delta and has been proposed for inclusion in the Ramsar List of Wetlands for International Importance. The project will not affect any social or livelihood uses of the Lake.

7.3.5 Labour, Working Conditions and Economics and Livelihood Context

7.3.5.1 National Context

The Republic of Uzbekistan has been a member of the International Labour Organization (ILO) since 1993 and as of January 2010, it was a signatory to 13 conventions of the ILO. In March 2008 Uzbekistan ratified the two ILO conventions addressing child labour:

- Minimal Age of Employment Convention №138; and
- Prohibition and Immediate Action for Elimination of the Worst Forms of Child Labour Convention №182.

Notable ILO conventions that Uzbekistan has not ratified include Freedom of Association and Protection of the Right to Organise Convention, 1948.

The minimum age for employment is 16 years old. Article 77 of the Labour code provides that a person of 15 years of age can be hired for the purpose of gaining experience, with the written consent of a parent or guardian, for work that does not cause harm to his health and development while not infringing the educational process.

Uzbekistan had a low gross domestic product (GDP) per capita in purchasing price parity of $2,800 in 2009 according to the CIA World Factbook[39] although it is increasing, for instance, from $2,500 in 2007. Industry provides approximately 40 percent of the country's GDP with oil and gas production being major contributors, services almost 34 percent and agriculture almost 27 percent. Primary energy production increased from just over 60 million metric tonnes (Mt) oil equivalent in 2000, to almost 62 million Mt in 2005, to almost 68 million Mt in 2007. Yet there are still energy self-sufficiency issues. In 2007, Uzbekistan imported five times the amount of oil that it exported, but it exported 15 billion cubic metres of natural gas products without importing any. In 2009, estimates were that Uzbekistan produces 70,910 barrels of oil per day (bbl/day) and consumes 145,000 bbl/day. According to UN Data, energy consumption per capita was estimated in 2007 at close to 1,915 kilograms oil equivalent.

Latest estimates (January 2010) are that Uzbekistan has 594 million barrels of oil proved reserves and 1.84 trillion cubic metres of natural gas proved reserves. Uzbekistan's proved natural gas reserves places it in the top 20 countries with gas reserves in the world. Based on the availability of oil and natural gas resources, and greater production capacity, Uzbekistan's industrial growth production in 2009 was estimated at 6.7 percent, a high rate in comparison to other countries worldwide. Uzbekistan has an estimated 9,706 kms of gas pipelines and 868 kms of oil pipeline (2009).

Uzbekistan's main trading partners are Russia, the Ukraine, Kazakhstan and China. Traditionally cotton, along with gold, has been a major export earner for the country. Agriculture production has declined significantly in the past decades as a result of the drying of the Amu Darya and Syr Darya rivers and Aral Sea as well as from the intensive production of cotton which led to an overuse of fertilisers and chemicals. Uzbekistan is landlocked and its supply of water is dependent on rivers from neighbouring countries.

Socio-economic development is hampered by inflation, unemployment and income distribution inequalities. In 2008, the official inflation rate varied between 12 and 14 percent and the unofficial rate went as high as 38 percent. In 2005, unemployment was recorded as low 0.3 percent and underemployment as high as 20 percent by the Employment Office records of the population aged between 16 and 64 years.

Inequality in income distribution has created regional areas of deprivation (for instance Karakalpakstan) as well as at the local level. Population below the poverty line was estimated at 26 percent in 2008. In terms of percentage share of household income and consumption in 2003, the lowest ten percent of the population had less than three percent of GDP and the highest ten percent of the population had almost 30 percent.

7.3.5.2 Karakalpakstan Region and Kungrad and Muynak District Context

Karakalpakstan is one of the two poorest regions of Uzbekistan. The region depends totally on support from Tashkent as there are few local sources of capital for investment. In 2003, 33% of employment in Karakalpakstan was in agriculture, 25% was in health, education, science and culture, 8.8% was in

[39] See: https://www.cia.gov/library/publications/the-world-factbook/geos/uz.html

construction and another 8.8% was in industry. However as elsewhere in Uzbekistan, only 80% of jobs are permanent as opposed to seasonal or temporary.

Karakalpakstan has been particularly hard hit by the overall decline in incomes since independence. In 2003, the World Bank estimated that 36.4% of the population of Karakalpakstan was poor and unable to meet basic consumption needs (as opposed to 27.5% for Uzbekistan as a whole and 9.2% in Tashkent). Roughly a third of these people are living in extreme poverty. The average wage income in Karakalpakstan is about half that for Uzbekistan as a whole. The average monthly salary ranges from $100 to $250, but can be less. Some jobs offer only 50,000 to 80,000 Som a month, less than is considered necessary to live on. Many organisations suffer from a permanent cash crisis such that wages are paid several months in arrears.

Unemployment is very high in Karakalpakstan but the actual figure is unclear as the majority of unemployed do not register with an employment agency. Many others are under employed, doing casual work on a daily basis, or odd jobs on a cooperative farm. Médecins Sans Frontières has estimated that unemployment combined with under employment might amount to as much as 70% of the workforce. Karakalpakstan ranks fourteenth out of the fourteen regions of Uzbekistan for economic development. Within those fourteen regions, Karakalpakstan has the lowest per capita monetary income, standing at only 58% of the national average and only 40% of the average for Tashkent city. Families in Karakalpakstan rely on pensions from former agriculture and fishing activities, wages from remaining jobs and existing agricultural activities such as livestock grazing and some fishing and hunting. Cotton, rice and melons are the main agriculture products in the region. Supplementary income is gone from production and sale of muskrat fur pelts and dairy cows, which required the former watery and reedy habitat which has now been lost. Hunting, especially of grouse, is still common in the region.

During the 1990s, the former state and collective farms were transformed into independent farm cooperatives or shirkats. Hopes for improved farm productivity failed to emerge and now these cooperatives are being disbanded and privatised into a larger number of small farms. Agricultural workers now have some of the lowest incomes and many still face continued economic uncertainty.

As well as agriculture, the livelihood of people in Kungrad and Muynak Districts is supported by industrial work. In addition to the Kungrad Soda Ash Plant (commissioned in 2004) which uses the chlorine-sodium salt deposits 33km north-west of Kungrad City, the other large scale enterprises employing citizens in the Kungrad District are a cotton-refining plant and a food products plant[40]. There is little large scale industry in the Muynak District and the Uchsay settlement other than that provided by Uzbekneftegaz (via its subsidiary Ustyurtgaz) at the East Berdakh field and CGTU and the more recent development of the Surgil field.

The Uzbekistan institute “UzNIIP Gradostroirelstva” developed the Regional Development Scheme of the Republic of Karakalpakstan” (henceforth referred to as the Regional Development Scheme of Karakalpakstan) in 1993 and this was approved by the Cabinet of Ministers of the RUz on May12th, 1996 128/5. The short-term development strategy included focus on:

- Business reform through the creation of more small enterprises and firms, joint ventures and private firms; and
- Transport infrastructure improvement.

[40] District Government’s local socio-economic profile, 2007.

The industrial long-term development strategy included a focus on:
- Provision of agricultural raw materials and development of food processing to ensure local food security; and
- Manufacture of building materials, products and construction for capital construction needs.

The industrial development plan in the Kungrad District is focussed on:
- Agricultural products processing and provision of agricultural machinery services;
- Development of light industry; and
- Construction materials sector.

Since 1993 a revised regional development strategy has not been published and no other significant developments apart from UGCC are thought to be envisaged in the Kungrad District or surrounding areas.

7.3.5.3 Local Community Context

Currently 97 staff work at the Surgil Field CGTU under contracts with Uzbekneftegaz (UNG), and 95 of these are local people from the Karakalpakstan region. Work shifts are rotational with employees staying at the sites for 15 days on followed by 15 days leave. The staff live in workers accommodation facilities on the northern outskirts of the Uchsay settlement. The accommodation does not have piped water supply or sanitation facilities and water is delivered by truck on a weekly basis. UNG has communicated plans to construct or upgrade the accommodation facility at the Surgil Field CGTU. All staff employed at Surgil Gas Field are members of the Trade Union of the Fuel and Power Sector, Chemical Industry and Mining Sector of Uzbekistan.

Including the employment at the Surgil field, the distribution of the wider livelihood activities among the population of the three nearest project affected settlements is presented in Table 7.14 below.

Table 7.14: Local community livelihood statistics

	Uchsay Settlement		Akchalak Settlement		Elabad Settlement		Total/Average	
	No.	%	No.	%	No.	%	No.	%
Blue collar Workers*	73	5.1%	333	34.9%	1,243	61.5%	1,649	33.8%
White collar workers**	62	4.3%	51	5.3%	90	4.5%	203	4.7%
Business owners	5	0.3%	5	0.5%	2	0.1%	12	0.3%
Unemployed	725	50.2%	128	13.4%	0	0.0%	853	21.2%
Non-economically active***	579	40.1%	437	45.8%	685	33.9%	1,701	39.9%
Total	1,444	100.0%	954	100.0%	2,020	100.0%	4,418	100.0%

Source: Consultation with Settlement Council Chairmen in lieu of 2011 Census Data being published

* *Manual workers in material production employed at industries, construction, transport and other similar sectors and those involved in physical labour including agricultural workers.*

** *Non-manual workers including administrative and managerial personnel, engineers and technical staff and other professionals, commercial, office staff, etc.*

*** *Pensioners and under 16yr olds.*

It can be seen from Table 7.14 above that unemployment is particularly high in the Uchsay settlement, the most northerly settlement in Uzbekistan. Over 50% of the population are registered as unemployed reflecting the impacts of the drying of the Aral Sea as well as the difficulties in attracting investment and employment opportunities to such a remote location. Unemployment was cited as the key social problem facing the Uchsay settlement by the Aksakal (head of settlement) who was interviewed as part of the scoping study consultation. The Aksakal also explained that of the youth of community is generally well qualified from technical colleges with degrees generally specialised in the oil and gas sector. However, they lack experience and opportunities.

The Akchalak settlement has an official unemployment rate of 13.4%. However, as is the case throughout Karakalpakstan, the actual figure is probably much higher as many people do not register themselves as unemployed. The population of Akchalak has been stable for a while and growth is hampered by lack of employment opportunities.[41] Many people are required to travel across the border to nearby Kazakhstan for temporary contract work positions. Scoping consultation with the Akchalak Aksakal revealed that the majority of the blue collar workers are employed at the existing Akchalak Gas Compressor Station and the Kyrkkyz Railway Station. Similar to Uchsay, the Aksakal explained that most of the unemployed are young technical graduates.

ESIA Scoping Consultation with the Kungrad District Hakimyat (head of District government) revealed that there is no livestock farming activity in the direct vicinity of the UGCC site. However, there is livestock farming activity (primarily sheep) further north in the area that the pipeline will be crossing through. The sheep herders are employed by the sheep owners who typically own 200 sheep each but who pool their sheep to make herds of up to 4,000. The herders take the sheep up to the Plateau in the summer to graze and bring them back south to pens in the winter. The herders are used to pipe laying and maintenance activities due to the historical construction and operation of the Ural-Bukhara pipeline and the Central Asian pipeline and they are not expected to disrupt their livelihood activities because the herders will still be able to cross the pipes with their livestock.

7.3.6 Social and Community Services and Infrastructure

7.3.6.1 National Context

Uzbekistan has high literacy rates with almost 100 percent for both men and women being literate (defined as those over the age of 15 who can read and write). Uzbekistan is ranked as one of the top ten countries for public education expenditure, spending approximately 9.5 per cent of its GDP in the education sector although the information is based on early 1990 data. The gross enrolment rate for primary and secondary school for both males and females between 2005 and 2008 was almost 100 percent and women made up 41 percent of third level students.

In terms of health, for the 2005 to 2010 period, life expectancy at birth for women and men was estimated at 71 and 65 years respectively. The HIV/AIDS adult prevalence rate was estimated in 2007 as less than 0.1% with about 16,000 people living with the disease.

There is no state social security system as such in Uzbekistan and people’s first line of support comes from their extended family, friends and neighbours. Coinciding with the removal of food subsidies in 1994, the Uzbek government introduced a new social assistance scheme based on the traditional pre-Soviet local community groups, known as mahallas in Uzbek or ma'ka'n ken'es in Karakalpak. These committees consist of a group of elders who try to solve social problems and conflicts within the community. The

[41] Preliminary Feasibility Study of the Masterplan of the Akchalak workers settlement, developed by GUP UzshakharsozlikLITI in 2011

chairman is elected but other members can only be nominated by the local district executive or Hakimyat. Under the scheme the local ma'ka'n ken'es receive funds from central government. Families in need can apply to the ma'ka'n ken'es for assistance and, depending on merit, can be granted a cash income for up to three months. The main priorities are families with a large number of children, the unemployed or disabled, single mothers, widowers and pensioners. In 1995, the first full year of operation, some 28% of households in Karakalpakstan received payments.[42]

7.3.6.2 Karakalpakstan Region and Kungrad and Muynak District Context

According to Medicins Sans Frontier (MSF) a non-governmental organisation working in the health sector, the health care system in Karakalpakstan has been under-funded and heavily affected by the decline of well-being determinants that affect overall health, including the declining environmental health, loss of jobs and low salaries which have negatively affected temperature control in houses and nutrition choices.

MSF cites government spending on health care in Karakalpakstan as being as low as $US 6.5 per capita in 2002. These spending levels were reflected in health indicators including high maternal mortality, high rates of respiratory and diarrhoeal disease, and alarmingly high rates of tuberculosis. In 2002, the rate of tuberculosis in Karakalpakstan was 89 cases per 100,000 people per year, much higher than the national average of between 18 and 41.

Public health has been affected by the environmental degradation which means there are potential health risks related to salinisation of drinking water, dust storms and the presence of agricultural chemical pollutants in the environment and food chain. Public health is also affected by the cold climate conditions and poor living standards. In the winter the gas pressure goes down with the temperature in Karakalpakstan and many families survive throughout the winter with no gas at all.

Access to water in rural areas In Karakalpakstan is limited with statistics suggesting that only one third of the population have access to a regular supply. Shallow wells have dried up and people rely on supplies of rationed water or hand pumps. Water quality from local wells tends to be poor in quality and highly saline.

In 2007, Muynak District had 13 kindergartens providing pre-school education for 690 preschool age children for a total coverage of 19.7%. There were 16 secondary schools enrolling 5,548 pupils (95.3% coverage). There were also two agriculture and production colleges hosting 1,115 students. 87% of the population has access to gas and 79% to drinking water but communal infrastructures require rehabilitation and extension.[43]

In 2007, Muynak District had two hospitals with 150 beds, six primary health care points, seven rural clinics, three drugstores, staffed by 35 medical doctors and 245 nurses. There was also a private organization providing health care services. Public health in Muynak District is poor. A study in 2003[44] that examined self-rated health in the area found that consistent with mortality rates in the area, the prevalence of 'poor' self-rated health was high. Factors negatively associated with self-rated health include psychosocial factors and environmental concern as well as the community of residence and age.

[42] See independent researcher's website, "The Karakalpaks": http://www.karakalpak.com/people.html.

[43] ADB Muynak District profile, 2008. Available at: http://www.abd.uz/index.php/en/karakalpakstan/pilot-districts/muynak-district.pdf

[44] E.J. Crighton, SJ. Elliott, R Upshura, JvdMeer, and I.Small; 'The Aral Sea disaster and self-rated health'; *Health & Place, Volume 9, Issue 2, June 2003,* Pages 73-82

According to the 2010 Kungrad District Profile, 100% of the population has electricity, 99.9% have gas, and 80.2% have piped water. Only 34.3% of the district's population has access to sewerage services. The Kungrad District has 57 primary and secondary schools. There are 24,440 students in schools and colleges and 2,595 teachers. It also has four hospitals and 25 clinics with approximately 675 beds.

Kungrad City has 281 km of roads of which 15 km are classified as having international significance, 47 km are national and 50 km are regional.

7.3.6.3 Local Community Context

The ESIA scoping consultation interview with the Aksakal of the Uchsay settlement revealed that the settlement has two schools and a kindergarten (constructed by Ustyurtgaz as a corporate social responsibility investment). The settlement has a medical station but not a hospital. Potable water is supplied three days a week (Tuesday, Thursday and Saturday) through water pipelines laid in 2007 by Ustyurtgaz. For the existing Surgil field Uchsay workers camp, water is brought in trucks on a weekly basis. The key community infrastructure need identified through consultation is street lighting.

Near to the UGCC project area there are two neighbouring industrial developments that have housing accommodation and facilities: one near the Soda Ash Plant and the other at Akchalak, which is the closest community to the UGCC. Approximately 100% of the existing Akchalak settlement is connected to gas, electric and water supply. There is limited housing stock and no availability of accommodation for a large work force. Lodging of workers with local families or in hotels, hostels or rented housing are not options. Table 7.15 below shows that most (62%) of the housing in the Akchalak settlement are one storey individual buildings, with the remainder being two-storey sectional buildings.

Table 7.15: Akchalak Settlement Housing Condition

Housing stock type	Total Area m^2	Percentage of total	Territory ha.
One storey individual housing	7,750	61.51	400
Two storey sectional housing	4,850	38.49	2,100
Total	12,600	100	

Source: Preliminary Feasibility Study of the Masterplan of the Akchalak workers settlement, developed by GUP UzshakharsozlikLITI in 2011

Table 7.16 below shows us that the community facilities and services provided in the Akchalak settlement that are below the Uzbekistan standard for 1,000 people include kindergartens, secondary schools, medical centres and day clinics and sports complexes. The settlement does not currently have any public catering establishments, libraries, public service establishments, pharmacies, post-and-telegraph offices or housing-service organizations (shirkat).

Table 7.16: Akchalak Settlement Current Social and Community Services Provision

Community facility	Unit	Standard	Actual	% of standard
Population	thousand people	1000	1000*	
Kindergartens	children	87	80	92%
Comprehensive secondary schools	Places	150	90	60%
Shops	shelf place, m^2	85	100	118%
Public catering establishments	seats	8	-	0%

Community facility	Unit	Standard	Actual	% of standard
Housing-service organizations (shirkat)	object	1	-	0%
Club-cinema	seats	35	80	229%
Library	Thousand volumes	5	-	0%
Public service establishment	Work. places	4	-	0%
Pharmacy	object	1	-	0%
Post-and-telegraph office with savings bank	object	1	-	0%
Polyclinic (RMC) with day hospital	visits / beds	33/15	15/6	50%
Bath	seats	5	10	200%
Fire station	Motor vehicles	2	2	100%
Market	shelf place, m^2	24	-	0%
Sports complex	Hectares	0.55	0.5	91%
Tennis court	m^2	80	-	0%
Premises for culture-mass works	m^2	50	-	0%
Hotel	rooms	6	6	100%

Source: Preliminary Feasibility Study of the Masterplan of the Akchalak workers settlement, developed by GUP UzshakharsozlikLITI in 2011

*The actual current population (see Table 7.10 in the baseline) is 954, however this has been rounded up to 1,000 for indicative purposes because the standard is for 1,000 people.

The ESIA scoping consultation interview with the Kungrad Hakimyat (head of District Government) identified the Akchalak settlement as having one school with a capacity for 90 pupils but is catering for 150 pupils. The school was recently refurbished in 2008 with finance provided by central government.

The scoping consultation interview also revealed that the Akchalak settlement had one clinic but no permanent doctors. Patients are required to pay for 30% of the cost of drugs and healthcare is subsidised for poor and vulnerable people. Most of the Health complaints in the Kungrad District relate to cardiovascular diseases, diseases of the urinary tract and gastro-intestinal tract diseases.[45] No incidences of HIV/AIDS have ever been reported in the Muynak District or the Akchalak and Elabad settlements in the Kungrad District[46] Sickness reporting statistics for the Akchalak and Elabad settlements in 2010 are presented in Table 7.17 below.

Table 7.17: Application to medical and preventive treatment institutions on account of sickness in 2010

	Akchalak settlement	Elabad settlement
Incidences of reported sickness	7,036	7,412
Incidences of diagnosis of illness	2,356	2,610
Incidences of in-patient treatment	196	530
Incidences of out-patient and preventive treatment	6,840	212

[45] Consultation response letter from the Kungrad District Medical Organisation 01.04.2011

[46] Consultation response letter from the Muynak District Hospital, 05.04.2011; and, consultation response letter from the Kungrad District Supervision Centre for Sanitation and Epidemiology, 06 April 2011 – See Appendix L, Volume III.

Source: Consultation response letter from the Kungrad District Medical Organisation 01.04.2011

From Table 7.17 we can see that there were 196 incidences of in-patient treatment in the Akchalak settlement, which out of a total population of 954, equates to approximately 20%.

7.3.7 Gender Relations

An ADB gender assessment in the Karakalpakstan region undertaken in 2008 found that women had low levels of economic independence and were affected by gender stereotypes and domination by ethnic Uzbeks who are more patriarchal in comparison with Karakalpak people. The assessment also found that women had limited access to fertile lands in remote areas. Women tend to have limited control over money which is exacerbated by lack of household income and women tend to work in low paying sectors (agriculture) or at low paying levels (milkmaid, cleaners, etc.).

Women are represented in Karakalpakstan as each district has a women's council and the chairwoman of the council is automatically designated Deputy District Head. However, gender relations are affected by the local challenges households and communities face with providing decent living standards and with addressing water use and employment problems.

Two active women's groups were identified in the local project affected communities, one in the Akchalak Gas Compressor Station and the other in the Akchalak settlement itself, of which the Hakimyat is a woman. The role of these groups is to look for supporting female employment, enhance the gender relations and also to protect women's rights.

Through stakeholder interviews with a woman representative of the Management Team of the Akchalak Gas Compressor Station, the following were identified as the three key issues faced by local women in the area:
1. Employment for women;
2. Lack of infrastructure for young children's leisure and recreation (e.g. play parks); and
3. Lack of entertainment and sports facilities for women and teenagers.

The Head of the Akchalak Community Women's Group explained that of the 389 people employed in the Akchalak community, 121 of them are women (31% of total). 69 women work at the gas compressor station, including one who works at the managerial level. The remainder work in secondary employment such as teachers, railway employees, nurses and private business owners (i.e. equal ownership between husband and wife). One woman is employed as member of the Hakimyat. Akchalak is the area where the greatest local employment benefits are expected to be realised, however existing situation is assumed to be comparable in Uchsay and Elabad settlements also.

Figure 7.1: Local Woman Selling Fish in the Akchalak Settlement

Source: MML Site Visit

It is estimated that there are 78 women looking for work in the Akchalak settlement that could be employed by the Project. Some of these women are reported to be educated and skilled, and typical jobs they could fill in Project such as this are laboratory workers that are part of teams responsible for automation equipment and environmental management.

The woman representative of the Management Team of the Akchalak Gas Compressor Station expressed the opinion that women have made significant progress in implementing their labour rights in the region in the last ten years. For example, the Trade union agreement of the Akchalak Gas Compressor Station includes the following benefits and entitlements specifically for women:

- Women with children under three years old work one day less per week but still receive the same salary as other employers;
- Women with two or more children who are under 12 years old or who have disabled children under 16 years old have four additional days of paid leave;
- Women on maternity leave with children under three years old can apply for partially paid leave;
- Maternity leave commences six months into pregnancy rather than the seven months specified by the Uzbekistan Labour Code; and the total leave period is three years, two of which are paid, rather than the six months paid leave specified by the Uzbekistan Labour Code; and:

- Every woman who has a child under the age of six or seven (school age) is entitled to one day of paid leave per month for the purpose of school preparation.

When interviewed as part of the ESIA Scoping process, the Aksakal of the Uchsay settlement explained that vulnerable groups such as women and families with many children are supported by the government through a national programme. This Programme provides allowances for unemployed women and childcare benefits for up to two year olds.

All of the women interviewed through the ESIA consultation process have been supportive of the project and hope that it will bring employment (both directly and through secondary service provision such as laundry and catering), training and infrastructure and service benefits to the area that will further empower women.

7.3.8 Governance and Community Organisation

Uzbekistan gained independence from the Soviet Union in 1991. The Republic of Karakalpakstan is the only area with territorial autonomy with special status in Uzbekistan. The Uzbek Constitution states that the Karakalpak Constitution may not contradict the Uzbek Constitution and that the laws of Uzbekistan are also mandatory and binding on the territory of Karakalpakstan.

The public administration system in Uzbekistan is comprised of two tiers, central and local. Local governments are subdivided into regional, district and city administrations. In addition, community self-government bodies operate locally, although they are not part of the central public administration.

Hakims (chairman) have representative and executive powers. There are Hakims at regional, district and town levels. They are responsible for guaranteeing law and order, addressing economic and social development issues and forming the local budget. The regional Hakim appoints the Hakims for the districts and towns.

The Hakims of districts and towns report to the regional Hakim and local council (Hakimyat). The local council consists of elected public representatives and is responsible for local affairs and executing resolutions of upper level bodies. The term of office for the local council members and the Hakim is five years. Councils conduct their activities through council sessions, which are convened by the Hakim at least twice per year or on the initiative of two thirds of the members. District and town Hakimyats are responsible for: nursery, primary and secondary schools; social welfare (except for state housing); primary health care and hospitals (shared with other levels of government); culture, leisure and sports facilities; water supply, electricity, gas, sewage and district heating; waste collection and disposal, street cleaning, cemeteries and environmental protection; town planning, local development, tourism and roads; local administration, civil defence, police and fire brigades.

Local government is supplemented by self-governing community organizations. The Law on Community Self-Government adopted in 1993 and subsequently revised in 1999, defines community self-government as “independent activity by citizens, guaranteed by the Constitution and the Laws of the Republic of Uzbekistan, for the purpose of resolving issues of local importance according to their own interests and history, as well as to national traditions, spiritual values and local customs.” The Karakalpak peoples have their own governance institutions that are recognised and supported by the national government.

The self governing community organisations elect a chairman and counsellors for a two-year term. Community self-governments are non-governmental organizations separate from the system of central government. They enjoy the rights of legal entities, possess unique official seals and are subject to registration with local government bodies. The guiding principles of self-government are democracy, humanism, openness, social justice and local autonomy. The self government organisations can convene public gatherings.

7.3.9 Tourism and Recreation

Karakalpakstan has a long rich cultural history although tourism services and activities are in their infancy. The first officially licensed company to provide tour services was established in the Karakalpak capital of Nukus in 2005. Surrounded by ancient sites, Nukus is a young city founded in 1932. Its main attraction is the Savitsky Art Museum, the Karakalpak State Museum. Tour destinations in Karakalpakstan include the former Aral Sea shore (for visitors to see the “cemetery of ships”); Khodjeli, an ancient graveyard; Ellikkala, an ancient site of fifty fortresses; Badai Tugai, a national nature reserve; Khiva, an ancient city of Khorezmian civilisation; and, Bukhara, a city of mosques and madrassas. Yurt (a nomad's tent made of felt) camping is available from March to April in the Elikkalinsky district near the ruins of the ancient fortress of Ayaz-Kala.

Tourists are encouraged to visit Karakalpak in the fall, when horse races, equestrian games, cock fights, and national wrestling competitions are organized to celebrate cotton harvesting. Fishing is a main Karakalpak hobby and there is some hunting in the area. Sports halls exist in more populated area for children to play volleyball and basketball. When the weather is clement, there are outdoor sports and picnics. Families tend to eat together and organise their own entertainment. Watching TV is a common pastime.

Muynak is about a three hour drive from Nukus. It has a hotel, restaurant, museum, cinema and war memorial. The Museum is frequently closed and receives approximately one hundred foreign visitors a year. The Museum has exhibits focussing on the Muynak and Uchsay port when the fishing industry and area was thriving. Some of the exhibitions are in a poor state.

7.3.10 Human Rights and Vulnerable Groups

According to the Government of Uzbekistan, the country is strengthening its legal basis for human rights practices. Parliament has adopted more than 120 laws and ratified more than 60 international treaties on human rights, including six major United Nations human rights conventions. The government is integrating universally recognized norms of international law into national legislation. Various government agencies are developing action plans to implement major provisions of international human rights instruments. Uzbekistan has signed the Millennium Declaration. Equal opportunity is a principle addressed in Uzbekistan's Constitution.

Economic pressures have made Karakalpakstan worse off than other parts of Uzbekistan. The unemployed and underemployed are vulnerable. Economic deprivation in the area has contributed to higher rates of alcoholism (particularly among men) as well as social problems related to theft, addiction and prostitution. Domestic violence has also been identified as an issue in Karakalpakstan which economic pressures can exacerbate.

The ADB 2004 Country Profile found that in Karakalpakstan that almost 1.3 million people in were exposed to high or very high water pollution and more than half a million were exposed to high or very high air pollution. Those with environmental health problems and chronic respiratory and diarhorreal diseases are considered vulnerable. In particular, tuberculosis rates are high in Karakalpakstan. Because of the challenges of paying for heating, families tend to concentrate in main rooms and so tuberculosis and other hygiene related diseases are more easily spread.

Forced labour, including of children and especially in the agricultural and construction industries, are recognised problems in Uzbekistan. It is a source country for the trafficking of women and girls to Kazakhstan, Russia, Middle East, and Asia for the purpose of commercial sexual exploitation. Men are trafficked to Kazakhstan and Russia for purposes of forced labour in the construction, cotton and tobacco industries. The US has categorised Uzbekistan as a Tier 2 Watch List Country which means it does not fully comply with their minimum standards, but are making significant efforts to bring themselves into compliance with those standards. It is not known how significant the issue is for Karakalpakstan however the region does border with Kazakhstan. The ESIA data collection and consultation has not identified forced labour as an issue in the local project affected communities.

7.4 Assessment of Impacts

7.4.1 Overview

This chapter predicts social impacts expected to occur as a result of the Project and assesses their beneficial and adverse effects by predicting their significance prior to mitigation according to the criteria specified in Chapter 3. Impacts have been considered and assessed for the site preparation and construction, operation and decommissioning phases of the Project. Mitigation and benefit enhancement measures are proposed in Chapter 7.5.

7.4.2 Construction Phase Impacts

7.4.2.1 Impacts on Karakalpaks and Ethnic Minorities

In summary of the information and analysis presented in section 7.3.3 , Karakalpaks meet the first and the fourth defining ADB characteristics of IPs in relation to having a distinct cultural identify and language respectively, however the project is not expected to affect either of these characteristics and therefore SR3 is not triggered on these grounds.

In relation to the second defining ADB characteristic of collective attachment to geographically distinct territories in the project area; whilst Karakalpaks have a collective attachment to Karakalpakstan as a whole and to the homelands of their forefathers, they do no have a collective attachment to any specific area within Karakalpakstan. Furthermore, there are no areas which fall within the Project footprint to which attachment of any definition is held given that the project areas have long been uninhabited or on the whole used by local populations. Therefore, overall the Karakalpaks do not meet this defining characteristic.

Considering the third defining ADB characteristic, it is concluded that the Karakalpaks do not have separate economic or political institutions. They do have distinct socio-cultural and customary institutions in the form of the tribe and clan and the related practices, most notably of exogamy. However, the practice of exogamy is also shared by other members of society in the project area such as ethnic Kazakhs. The project is not expected to affect the tribe or clan structure, or the related socio-cultural practices, therefore SR3 will not be triggered on the grounds of this characteristic.

Overall, the Karakalpaks do not meet all four of the ADB's defining ADB characteristics of IPs as defined in paragraph 6 of SR3 and it is therefore concluded that they are not IPs according to the ADB definition.

For those characteristics which the Karakalpaks do partially meet; ADB's Safeguard Requirement (SR) 3: Indigenous Peoples is only triggered if:

"…a Project directly or indirectly affects the dignity, human rights, livelihood systems, or culture of the Indigenous Peoples or affects the territories or natural or cultural resources that Indigenous Peoples own, use, occupy, or claim as an ancestral domain or asset."

The project is not expected to directly or indirectly affect the dignity, human rights, livelihood systems or culture of the Karakalpaks or the resources or territories that they use, occupy or claim as their ancestral domain as stipulated in SR3 3 paragraph 9, therefore it is concluded that SR3 is not triggered by this Project. The project is likely to be classified by the ADB as Indigenous Peoples 'Category C – no impact'.

It is recognised that that poverty is currently shared across ethnicity within Karakalpakstan and the Project localities, and other ethnic groups such as Kazakhs are in need of development assistance and poverty reduction measures just as much as Karakalpaks. Therefore, mitigation measures will be targeted towards poverty stricken areas in the Project locality, for example Muynak, without discrimination towards any specific disadvantaged ethnic groups.

Rather than adverse impacts on Karakalpaks and ethnic minorities, the Project is actually expected to have mainly beneficial impacts on these groups even prior to the application of mitigation and enhancement measures discussed in section 7.5. These beneficial impacts include:

1. Providing employment opportunities to Karakalpaks and other marginalised ethnic groups for a limited period of time (see section 7.4.2.3 for more details);
2. Enhancing the Karakalpaks and ethnic minorities' technical skills;
3. Promoting gender equity in terms of employment of Karakalpak and Kazakh women;
4. Providing business opportunities to Karakalpak and ethnic Kazakh entrepreneurs as suppliers of various goods and services; and
5. Providing income (through taxes) to the local governments which they can use for local development and indirectly benefit all Karakalpaks and ethnic minorities in the region.

These impacts have the potential to address the existing situation of high levels of unemployment and poverty in the Karakalpakstan experienced across all ethnic groups. In conclusion; impacts on Karakalpak peoples and ethnic minorities is considered to be a **beneficial impact of minor to moderate significance.**

7.4.2.2 Land Allocation and Re-allocation

The Project will not result in any physical or economic displacement of people therefore, ADB Safeguard Requirement 2: Involuntary resettlement is not triggered. However, land will have to be allocated or reallocated for the Project's use for industrial purposes. The lands for this Project will be allocated as "Lands of industry, transport, communication, defence and other purposes." Land allocation certificates are provided from the Government based on the payment of a land allocation tax which incorporates land value. No compensation or entitlements have been or are expected to be paid to other land users as there is no land use other than herders who use a small section of the land near the UGCC on a rotational and non-uniform basis.

The area proposed as the Surgil Gas Field is currently being used by Ustyurtgaz/UMD (both subsidiaries of UNG) which were allocated land rights to develop and operate the existing field from the Muynak district government. This upstream land permit is in the process of being transferred from UNG to Uz-Kor and this process is expected to be completed by June 2013. The land permit will include existing and proposed wells and will cover the entire Surgil Field. The new land allocation will provide Uz-Kor with land rights for the duration of the Project.

Moving downstream, the Project pipeline will cross the plateau as the land becomes semi-desert wilderness. No land has been allocated for the pipelines as of June 2011 however it will be Government owned land that will be allocated. Pipeline design work is expected to be finalised by October 2011 and the land allocation process is expected to be complete by early 2012. The application process is expected to take approximately two weeks. This land has some of the lowest value in the Kungrad and Muynak Districts with little scope for agriculture use other than herding. Near the existing settlement of Akchalak, there are a small number of livestock herders who move among the various nearby areas. Based on the fact that land for herding is plentiful and the existing pattern of movement is rotational, stakeholders consulted through the ESIA process have indicated that access to alternative land is not a problem.

There are salt mining operations located to the South West of the UGCC site however these are outside the physical Project footprint (3.4km) and are therefore not considered as a social receptor. The salt mine is the raw product supply to the Kungrad Soda Ash plant which has been fully included within the consultation undertaken for the Project.

The buried pipeline route will be 115 km long. This will include two pipelines (one for gas and one for condensate) being laid adjacent to each other: 1,020 mm and a 168 mm in diameter respectively. Hence a linear area of land will be affected temporarily during excavation and laying of the pipes and then be returned to its original state. The location of pipelines split between the Kungrad and Muynak Districts is presented in Table 7.18 below

Table 7.18: Location of Pipelines split between the Kungrad and Muynak Districts

Pipeline Section	Kungrad District	Muynak District	Total
115 km gas/condensate pipelines from CGTU to UGCC	60.9%	39.1	100%

Source: Uz-Kor

In accordance with regulation KMK 3.06.08-97 Transit Pipelines (KMK is national Construction Codes and Regulations of Uzbekistan), after the pipeline has been laid the contractor will reinstate all collecting channels, drainage systems, snow-retaining facilities and roads located in the right-of-way or crossing it as well, in order to recultivate the area and restore the natural landscape.

The UGCC is in Kungrad District and the District Government has already allocated land to Uz-Kor for certain aspects of the Project (see Table 7.19). These land area allocations were confirmed by Decision No. 118/3 dated 4th of March 2009 issued by the Kungrad District Hakim, and the Resolution of Cabinet of Ministers of Republic of Karakalpakstan, Nukus city (Ref. No: 44/4) dated April 2, 2009. The approval of the land allocation is for the purpose of the construction of a gas chemical complex and all necessary engineering, communications, service utilities and power supply networks for the Joint Venture UzKorGasChemical Limited Liability Company. Table 7.19 provides details of this decision.

Table 7.19: Land Currently Allocated for the UGCC and Associated Infrastructure

Facility	Length (m)	Width (m)	Total area allocated (ha)
Ustyurt gas chemical complex	980	867	85
Camping area	1,000	700	70
Railroad network	7,000	21	14.7
Road	5,000	18	9
Power supply network	10,000	10,000/50*10m2	0.2
Water supply pipeline	5,000	23	11.5
Total			**190.4**

Source: Resolution of Cabinet of Ministers of Republic of Karakalpakstan, Nukus city Ref. No: 44/4. Date: April 2, 2009

The land allocation requirements and status of allocation progress for the Project is summarised in Table 7.20. A detailed summary of all land allocation for the Project is provided in Table 7.21.

Table 7.20: Land Allocation Requirements and Status of Allocation Progress for the Surgil Project

Project Component	Intended Land Use	Existing Land Use	Land Area Required (ha)	Status of land Allocation to Uz-Kor
Surgil Field	Gas field - Drilling and CGTU	Formerly seabed until 30-40 years. Low value land with existing allocation to Ustyurtgaz. Currently there is the Surgil CGTU and 28 wells have been drilled. This area is uninhabited and the only land use is for industrial purposes in the form of the existing gas extraction operations.	161.55 ha currently allocated with total of 780.36 ha permanent allocation required. During construction, a further 365.54 ha will be temporarily allocated to the Project to facilitate well drilling. All allocation will be from Muynak District.	Part of the field is allocated (51 wells and 2 GGS) to Ustyurtgaz and upon financial close will be reallocated to Uz-Kor (see Table 7.12). Uz-Kor will progress with the remaining allocation applications as the field development is progressed,
Surgil Field to UGCC pipelines (including spur from Berdakh CGTU)	Transport of gas and condensate	Moving downstream the land changes from former seabed of the Aral Sea to the desert wilderness of the Ustyurt Plateau. For 68 km of its length, the pipeline follows existing pipeline corridors including the former route of the Ural Bukhara pipeline. This area is uninhabited and the land is not used, except for a small amount of cattle herding on the Ustyurt Plateau. These herders are used to pipeline construction and maintenance activities which are not anticipated to impact upon their livelihoods.	A total of 1,017 ha land allocation will be required for the pipeline component of the Project (gas and condensate pipelines and electricity supply). This will require allocation from both Muynak and Kungrad districts. The pipelines connect the Surgil CGTU to the UGCC. The allocation from the Muynak district will cover the pipeline section traversing from the former Aral Sea basin whilst the allocation from Kungrad district will cover the pipeline section traversing the Ustyurt Plateau.	Preliminary design documentation illustrating the route selection are expected to commence in October 2011 with design completion being anticipated in early 2012. Following this, allocation is expected to be completed within 2-4 weeks.
UGCC	Gas Separation Plant; Ethylene Plant; High Density Polyethylene Plant; Polypropylene Plant; Utilities and offsites (including waster treatment systems).	Mainly unused (some ambulatory herding) and uninhabited. Land is unallocated government land. There will be no significant impact on the herders who have vast tracts of land to graze livestock on.	190 ha for the UGCC and related facilities have been allocated. See Table 7.19 for more details on the amount of land acquired. An additional 215.6 ha is required to accommodate all required infrastructure.	190 ha already allocated to Uz-Kor under Decision No 118/3 of March 2009. Uz-Kor will progress with the remaining allocation applications as the downstream development is progressed,

Notes: Further data on land allocation can be seen in Table 7.21

Table 7.21: Detailed Summary of all Land Allocation for the Surgil Project

Infrastructure	Units	Number	Land allocation during construction (Ha. per piece / km)	Land allocation during construction (total Ha.)	Permanent Land allocation during operation (Ha. per piece / km)	Permanent Land allocation during Operation (total Ha.)
Upstream Surgil Field (Allocation from Muynak)						
Gas Wells	pieces	133	2.1	279.3	0.36	47.88
Well Pipelines (Diameter = 108mm)	km	191.6	1.7	325.72	1	191.6
Collector Pipelines (Diameter = 351mm)	km	13.9	2.3	31.97	2.3	31.97
Collector Pipelines (Diameter = 273 mm)	km	4.5	2.3	10.35	2.3	10.35
Access road from CGTU to GGSs and wellheads	km	56.7	1	56.7	1	14.7
Surgil Field electricity transmission network	km	210	2.1	441	2.1	441
Gas Gathering Stations	pieces	6	1	6	1	6
Security valves	pieces	6	0.1	0.6	0.1	0.6
Surgil CGTU	pieces	1	6	6	6	6
Surgil Workers Accommodation	pieces	1	1	1	1	1
Access Road to Surgil CGTU from Uchsay	km	29.26	1	29.26	1	29.26
Upstream Sub-Total				***1187.9***		***780.36***
Pipelines (Allocation from Muynak and Kungrad)						
Gas pipeline from Surgil CGTU to UGCC (Diameter = 1020mm)	km	115	3.2	368	3.2	368
Within Kungrad area. (60.9%)	*km*	*70*	*3.2*	*224*	*3.2*	*224*
Within Muynak area (39.1%)	*km*	*45*	*3.2*	*144*	*3.2*	*144*
Condensate pipeline from Surgil CGTU to UGCC (diameter = 168mm)	km	115	2.3	264.5	2.3	264.5
Within Kungrad area. (60.9%)	*km*	*70*	*2.3*	*161*	*2.3*	*161*
Within Muynak area (39.1%)	*km*	*45*	*2.3*	*103.5*	*2.3*	*103.5*
Condensate pipeline from Berdak CGTU to the tie-in with Surgil pipeline	km	26	2.3	59.8	2.3	59.8
Gas pipeline from Berdakh CGTU to the tie-in with Surgil pipeline	km	26	3.2	83.2	3.2	83.2
10 kV electricity supply for pipeline	km	115	2.1	241.5	2.1	241.5
Within Kungrad area. (60.9%)	*km*	*70*	*2.1*	*147*	*2.1*	*147*
Within Muynak area (39.1%)	*km*	*45*	*2.1*	*94.5*	*2.1*	*94.5*

Infrastructure	Units	Number	Land allocation during construction (Ha. per piece / km)	Land allocation during construction (total Ha.)	Permanent Land allocation during operation (Ha. per piece / km)	Permanent Land allocation during Operation (total Ha.)
Pipelines Sub-Total				***1017***		***1017***
Downstream UGCC (Allocation from Kungrad)						
Rail-road spur	km	7	1.47	10.29	1.47	10.29
Wastewater Storage Pond	pieces	1	128	128	128	128
Water pipelines between UGCC and Wastewater Storage Pond	km	5	2.6	13	2.6	13
Water supply Pipeline to UGCC (from Kungrad water supply pipeline)	km	12	1.7	20.4	1.7	20.4
Water supply Pipeline to UGCC (from Nukus water supply pipeline)	km	20	1.7	34	1.7	34
Gas sales pipeline from UGCC to Akchalak GCS	km	9	2.6	23.4	2.6	23.4
UGCC access road from Kungrad-Beineu highway	km	5	1.05	5.25	1.05	5.25
Solid waste storage area	pieces	1	8.16	8.16	8.16	8.16
Water supply / disposal from Akchalak settlement to UGCC	km	5	1.7	8.5	1.7	8.5
Workers accommodation in Akchalak extension	pieces	1	70	70	70	70
UGCC site	pieces	1	85	85	85	85
Downstream UGCC Sub-Total (a) (b)				***406***		***406***
Total allotment of land to Uz-Kor				**2610.9**		**2245.36**
Allocation from Kungrad				***938***		***938***
Allocation from Muynak				***1672.9***		***1307.36***

Source: Uz-Kor

Note: (a) Land allocation for the 12km 110kV transmission line connection to the Kungrad Soda Ash plant sub-station will be the responsibility of Uzbekenergo. Currently, the status of application for allocation from Uzbekenergo is unknown together with the quantity of land to be allocated. However, the route alignment of the transmission line is known and based on this, it is possible to infer that the land is currently unallocated and the present land-use is semi arid desert that is uninhabited and currently not used for industrial purposes (albeit, the route runs parallel for 10km to a corridor currently allocated to Uzbekenergo which is used for current electricity supply to the Ustyurt Plateau region).

(b) Further limited temporary land allocation will be required for the temporary workers accommodation during the construction phase. Currently the size of land allocation required for this temporary infrastructure is unknown as this is dependent on feedback from the eventual selected EPC bidders. This temporary land allocation is likely to be immediately adjacent to the UGCC site currently allocated and will be required for the duration of the construction period following which the land will be reinstated and returned to the government.

In summary, the review of the allocation of the land certificates and the current use of the land plots and land rights show that the land for the gas field was previously allocated for the development of gas drilling, the land for the pipelines is an established area of pipelines traversing the region and the pipelines will not cross any settlements and the UGCC will be constructed on land which has not previously been developed in any way. Therefore it is concluded that there will be no need for involuntary resettlement, either physical or economic displacement.

The social impact of land use changes as a result of allocation and reallocation is considered to be an **insignificant impact based on minor magnitude and low sensitivity**. Taking into account that there is a large amount of land of similar quality available in the surrounding area, the amount of land required for the Project is considered to be of minor magnitude. A small number of herders use it on a rotating basis and there is plenty of similar land that can be accessed easily for such use.

7.4.2.3 Short-Medium Term Employment Generation

The construction phase, expected to begin in late 2011 is scheduled to last 40 months and generate 7,357 to 7,432 temporary jobs. 657 of these jobs will be with Uz-Kor and the remainder will be with EPC contractors. The vast majority of these jobs will be generated in the downstream section of the project, as illustrated in Table 7.22 below.

Table 7.22: Overview of Short-Medium Term Employment Generation Estimates During Construction

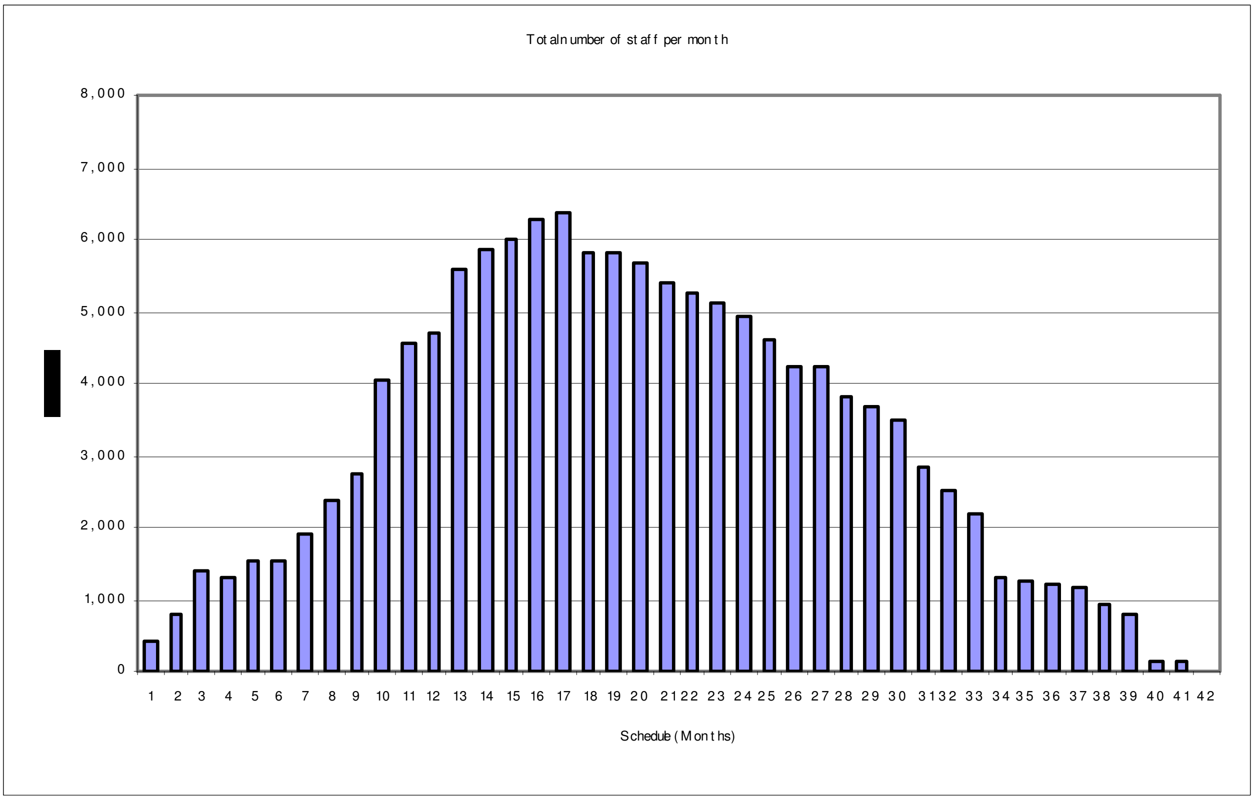
	Total staff	From Karakalpak Region	From Kungrad District	From Muynak District	From other Karakalpak areas	From other areas of Uzbekistan	International
Upstream:							
CGTU contractors	100-150	80-135	56-95	24-40	0	25-20	0
Drilling contractors	200-225	120-135	84-95	36-41	0	80-90	0
Pipeline & infrastructure contractors	100	80	56	24	0	20	0
Sub-total	400-475	280-350	196-146	84-105	0	125-130	0
Downstream:							
UGCC Contractors	6300	1260	504	126	630	1260	3780
UGCC Uz-Kor staff	657	223	67	45	111	334	100
Sub-total:	6957	1483	571	171	741	1594	3880
Total:	**7357-7432**	**1763-1833**	**767-817**	**225-276**	**740**	**1719-1724**	**3880**

From Table 7.22 we can see that approximately 24% of all construction workers will be from Karakalpakstan, and of those, approximately 44% will be from the Kungrad District and only 13% from the Muynak District, thus reflecting the shortage of skilled workers in Muynak.

Figure 7.2 shows the expected profile of the construction contractor workforce for the UGCC (the project component generating the most jobs. The construction workforce programme reflects peaks in:

- Off-site infrastructure occurring in months 16-19;
- Polymer component occurring in months 20-24; and
- Ethylene component occurring in months 29-35.

Figure 7.2: Construction Manpower Schedule.



Source: Uz-Kor and Preliminary EPC Contractor proposals

Employment generation is considered to be a **beneficial impact of moderate significance**. This is based on moderate magnitude and medium sensitivity. Moderate magnitude is based on the high numbers of employees and the fact that there will be several beneficiary groups, however the duration of contracts will be relatively short. Potential workers are considered to be of medium sensitivity, with local workers having higher levels of vulnerability than workers coming from further away who are deemed to have some ability and means to choose where they wish to work. The provision of a job stabilises vulnerability to some extent as regular income contributes to a worker's personal and household well-being. Employment opportunities would also significantly benefit local women, who through the ESIA consultation activities, have expressed a desire for employment and opportunities to obtain new skills.

7.4.2.4 Health, Safety, Security of Workers on Construction Site and In Accommodation

Construction activities and the use of construction temporary worker accommodation pose potential risks to the health, safety, security and therefore well-being of construction workers if not managed appropriately. Workers will be exposed to generic health and safety risks that are encountered by all construction projects, such as those related to facility design and the risk of structural failure, exposure to noise and vibration, traffic hazards, personal accident or injury, etc. In addition, there will be potential impacts specific to this type of project with the key hazards being:

- Fire and explosions (e.g. resulting from well-blow outs or gas leakage);
- Working in confined spaces (e.g. in chemical substance storage containers);
- Working at heights (e.g. on drilling rigs), oxygen deficiency and asphyxiation (e.g. from gas leakages);
- Electrocution (e.g. from high voltage power lines in the substation to be constructed);
- Chemical hazards (e.g. from the polymer plant);
- Railway related accidents (e.g. signal failure and train collision);
- Working in proximity to wild animals (e.g. wolves); and
- Exposure to extreme weather conditions (sub-zero temperatures in the winter and very hot temperatures in summer).

Generic community health and safety issues associated with the use of temporary accommodation sites include those relating to sanitation, disease, cultural alienation and fire. There are also potential adverse impacts on workers related to their terms of engagement and relationship with their employer.

Such impacts could result in fatality, and are therefore considered to be major magnitude, and although many may be experienced and all should be appropriately trained, the workers are at daily risk and therefore of medium sensitivity. As such, the unmitigated impact of the risk to the health, safety, security and well-being of workers is considered to be **an adverse impact of moderate significance**.

7.4.2.5 Health, Safety and Security of Local Communities during Construction

Environmental impacts on local communities related to traffic, air quality and noise have been assessed in detail in the respective chapters of the ESIA. In summary, risks to communities relate to:

- Exposure to disease (for example the introduction of HIV/AIDS by the construction workers);
- Water quality deterioration and availability shortages;
- Construction traffic hazards; and
- Abuses of power by security personnel; and
- Generic community health and safety risks associated with any chemical processing plant related to members of the public entering potential dangerous or unauthorized areas of the project site.

There is also the risk of unsustainable capacity on facilities and services as a result of migrant construction workers and potential conflict with migrant communities; this is discussed separately in Section 7.4.2.7 on induced development.

Overall, because there are no local communities within close proximity to the construction sites, impacts on the health, safety, security and well-being of the local communities as a result of construction activities are considered to be an **adverse impact of minor significance.**

7.4.2.6 Industrial and Community Infrastructure Development

Upstream Components and Pipelines

There will be further expansion of the current Surgil CGTU capacity (within the current site boundary) which will involve the addition of an LTS train to the existing three LTS trains allowing an increase in treatment capacity from 6 million m^3/day to 9 million m^3/day. Since there is currently no power supply source at the CGTU site, it is planned that an on-site power source be provided. Seven gas-powered generators will be used on site to allow the construction of an independent power complex. The power generators will be fired on waste gas from the degassing process thereby gaining utilisation of waste gas that is currently flared. Electricity from the generators will be distributed via a 10kV overhead line network to the Surgil Field facilities including the CGTU, the personnel camp, the six GGS, individual wells and the gas and condensate pipelines from the Surgil CGTU. The lines will be supported by concrete poles approximately 10.5 m in height to allow a minimum transmission line ground clearance of 6 m.

Two artesian wells have been drilled to provide process water for the Surgil CGTU and operators' camp. The completed water supply and water treatment system is expected to be commissioned by the end of the first quarter of 2011. Water supply is required for utility and potable purposes, production purposes, and emergency fire-fighting. The water treatment plant will have a capacity of 12 m^3/h. A fire-fighting reserve of 566 m^3 will be created. For production purposes, two reservoirs each with a capacity of 300 m^3 will be created.

Uz-Kor is currently exploring the potential with the Academy of Sciences of the Republic of Uzbekistan Institute of Microbiology for the introduction of algae organisms to the produced water evaporation ponds to facilitate with the decomposition of any hydrocarbon contamination of the water.

The Project involves the construction and operation of below ground pipelines for the transfer of gas and condensate from the Surgil Field to the UGCC. Separate 115km length pipelines for the transport of the gas and condensate will be laid adjacent to each other and will consist of a 1,020 mm gas pipeline and a 168 mm condensate pipeline. A 24 km condensate pipeline (108 mm) link from the East Berdakh Field to the Surgil condensate pipeline is also planned under the ownership of Uz-Kor; this condensate pipeline will tie in with the Surgil condensate pipeline at a point 22 km along its length.

Downstream components and Akchalak Workers' Settlement

According to the decision of the President of the RUz on February 18th 2008 No.II-797, a new settlement will be built adjacent to the existing Akchalak workers settlement to accommodate the 445 workers who are expected to live near the UGCC site. An additional 84 workers are expected to commute from Kungrad on a daily basis.

Of the 445 workers and their families to live in the new settlement, 106 workers are anticipated to be from outside Uzbekistan for the period up to 2020 and 85 workers are anticipated to be from Uzbekistan but not from Karakalpakstan. The remaining 254 workers to be housed in the new settlement through to the period 2020 will be from Karakalpakstan. Post 2020, there is not anticipated to be any international workers remaining at the site. Of the 445 workers to be housed in the new settlement post 2020, it is anticipated that 360 workers will be from Karakalpakstan and 85 workers from wider Uzbekistan.

A Preliminary Feasibility Study of the Masterplan of the Akchalak Workers Settlement was produced by GUP UzshakharsozlikLITI in 2011 and this estimates that these workers and their families will equate to the community consisting of approximately 1,650 people for whom new housing and facilities will be provided. The construction of the Akchalak Worker's settlement is due to be commissioned in 2015 and housing construction is expected to be complete by 2016. The new housing to be developed is summarised in Table 7.23 below.

Table 7.23: Summary of housing to be constructed as part of the Akchalak Workers' Settlement

Residential buildings types	Housing stock: No. of units	Total area of units m²	%	m² per person	Approx No. of people	Density m²/ person	Land area (Ha)
One-storey buildings with 1 apartment of 5 x rooms (102.4 m²)	100	10,240	29.8	21	488	1,200	8.5
2-storey buildings with 2 apartments of 5 x rooms (210.5 m²)	101	21,260	61.8	21	1,012	1,800	11.8
2-storey hostel for single workers with 29 x rooms (580 m²)	5	2,900	8.4	20	145	1,000	2.9
Grand total	206	34,400	100		1,645	1,333	23.2

Source: Preliminary Feasibility Study of the Masterplan of the Akchalak workers settlement, developed by GUP UzshakharsozlikLITI in 2011

The infrastructure serving Akchalak village was never completed (as demonstrated in Table 7.16) and people living there suffer from a general lack of infrastructure. Both the new and the existing settlements at Akchalak will be served with electricity generated by gas turbines at the UGCC giving them electricity security for the whole community and creating an enabling environment for localised development. Additionally, clean water will come from water treated at the UGCC and will provide the community with an improved quality of water compared with their current supply which tends to be saline. Waste water treatment facilities as well as a municipal waste management and recycling service also form part of the Project benefits for the people of Akchalak and represent a significant improvement in the quality and availability of infrastructure.

This new settlement is acknowledged in the Regional Development Scheme of Karakalpakstan which notes that the settlement's economy will be centred around the UGCC. Constraints to developing multi-sectoral industry are the remoteness and harsh climatic conditions of the location. As such, Uz-Kor will finance the construction of the new settlement and improvement of existing infrastructure in cooperation with the Government.

The provision of Project accommodation should help to minimise incidence of vice activities (excessive use of alcohol, drugs and exploitation or prostitution by workers). The provision of Project accommodation should contribute to the positive management of induced development from the in-migration of additional people because of perceived economic opportunities.

Uz-Kor will create and finance the operations of a new fire fighting station including the deployment of 8 fire engines at the UGCC facility thereby enhancing the existing emergency services provisions. As well as serving the new industrial facilities, this service will tackle fires the new workers settlement to be constructed and the existing Akchalak settlement.

The impact of infrastructure development is considered to be a **beneficial impact of moderate significance** because the magnitude is moderate and the community is considered highly sensitive. The magnitude is moderate because the infrastructure is localised and the community facilities will continue beyond life of project. Most of the proposed infrastructure improvements should positively affect people's well-being and benefit the community. The community is already vulnerable with very little capacity to address its development needs through limited government funding for social and community infrastructure, facilities and services. As a result, little work has been carried out recently with regard to infrastructure development. Therefore the injection of outside investment in housing as well as the provision of industrial and commercial facilities within the new settlement and the creation of jobs, is expected to enhance the well-being of existing communities and stimulate local economic development increasing the reach of project benefits to local businesses as well. The impact of additional community facilities and services is discussed in the operational impacts Section 7.4.3.4.

7.4.2.7 Induced Development, Population Changes and the Potential for Cultural Tension

Project-induced in-migration may substantially change the context in which a project operates. There are three main drivers where in-migration can increase project risks and costs[47]:

- Creation of new migrant stakeholder groups;
- Unmet promises of local participation, benefit and development; and
- Deterioration in the social context in which the project is operating.

Each of the three is relevant for this Project. A region like Karakalpakstan with a substantial rural population, little diversity in terms of economic opportunities, high unemployment and underemployment, highly concentrated development and a low per capita GDP is likely to experience high levels of internal migration toward economic opportunity.

Potential new migrant stakeholder groups could include:

- Returning family, extended family members and former residents – seeking improved living conditions and employment or opportunities to provide goods and services to the project or local population.
- Labourers and for the upstream section their families – temporary and permanent workers employed by the project who move to the area with or without family to be close to their place of employment. Their migration and settlement introduces issues related to the adequacy of public infrastructure, services, utilities, housing, and sustainable resource management.

Given the nature of the oil and gas industry, it is usual practice for workers to be housed in dedicated construction camps with workers employed on a rotational shift basis. Experience of oil and gas workers camps in this region (including other fields in the Aral Sea basin) is that there shift workers are likely to return to their families when off-shift. As a result of this it is expected that there is unlikely to be a significant number of 'camp followers' (entrepreneurs arriving to capture business opportunities associated with the construction labour of the project) and this is the situation evidenced with similar types of Projects.

Despite the expected absence of temporary camp followers, in the longer term, the availability of jobs around the Surgil Field has the potential to attract the unemployed and underemployed people in the region. Aspects that will discourage in-migration are the site's remoteness, the fact that job opportunities are unlikely to be long term and that there not many places to stay while visiting. In-migrants will be

[47] Based on IFC's "Project and People: A Handbook for Addressing Project-Induced In-Migration"

competing with local community members who are keen to benefit from the Project's job opportunities and economic benefits.

The well-being of the local community and their social context may deteriorate with the influx of outside labour. It is recognised that the existing population is struggling economically and there is already pressure on some services. In the particular Project context, the labour in-migration could contribute to disease epidemics, increased occurrence and practice of social vices and ethnic tensions, for instance from the presence of a large Korean workforce in an area where people want jobs. The Project area is close to a remote area where some hunting takes place and it is possible that the construction of some access roads will contribute to higher levels of hunting. Sometimes in situations where there are concentrations of construction workers with spending power, commercial sex workers and a local sex trade can be established. This usually leads to a rise in the incidence of sexually transmitted diseases in the local area.

At the same time, a potentially beneficial impact of the increase in population from construction workers may be a higher demand for locally produced food and services, which could create benefits for local farmers, producers and traders, who will be able to sell more of their product for cash, enabling them to purchase goods and services for themselves. The presence of the Project can be managed to increase the skills base, potentially increase the accessibility and availability of goods and services, provide steady wages and improve local incomes. Careful management will be required to prevent a localised "boom and bust" cycle that could easily accompany the construction phase.

The rate and magnitude of in-migration is estimated based on probability related to the project characteristics as summarised in Table 7.24. For this project, there is a large workforce requirement; a moderate ongoing demand for labour, goods and services; and, the area has low capacity to meet the Project's infrastructure service and employment needs. The highest rates of in-migration will occur during the construction phase when labour requirements are highest and most diverse and when the Project will make the greatest contribution to the local economy. The Project has a considerable operations phase demand for labour, and to a lesser extent goods and service, and in-migration will likely tail off after the first few years of operation.

The analysis above shows that the magnitude of induced development from in-migration, which is additional to the direct workers, can be categorised as moderate by balancing out the factors that contribute to greater and lesser impact. The recipient communities are considered to be highly sensitive because of their individual and collective vulnerability. The influx of thousands of Korean workers could have an adverse affect of the character of the existing community. This is both in terms of the carrying capacity of the infrastructure and services, as well as the culture and psychological well-being of the existing population.

Ultimately, whether the impact is determined as adverse or beneficial will depend on the management of the induced development, most importantly:

- The extent to which the community can provide sufficient facilities and services to cope with the enlarged population;
- How much of the government revenue and project revenue generated is spent in the local area;
- The extent to which the local population perceives their community is benefiting from the Project;
- The willingness of the local community to accommodate the presence of in-migrants for economic reasons; and,
- The cultural sensitivity shown by the labour force to the hosting community.

Mitigation and enhancement measures will aim to help this be a beneficial impact, however without mitigation, impact of induced development is considered to be an **adverse impact of moderate significance**.

Table 7.24: Summary of Project against Key Factors and their Determinations that IFC Identify as Affecting the Impact of In-Migration

Factor	Determination Leading to Greater Impact of In-Migration	Determination Leading to Lesser Impact of In-Migration	This Project
Scale of Project (project construction and operation, labour goods and services)	Large	Low	Greater impact on in-migration based on: Large construction labour force; Large project for area Substantial operational labour force. Large tax revenues for government.
Area Capacity to Meet Project Needs/Population Density of Project Area	Low	High	Greater impact of in-migration based on: Low – a very remote area with basic service provision
Tendency Towards Population Concentration	High	Low	Lesser impact on in-migration based on: Low – mostly a rural area with dispersed and small populations
Assimilative Capacity	Low	High	Average impact on in-migration based on: Medium – The area is used to a mix of ethnicities
Opportunities for Compensation and Benefits Speculation	High	Low	Lesser impact on in-migration based on: Low – no compensation expected; benefits will be focussed on meeting basic community infrastructure needs
Proximity to Large Population Centres	Far	Close	Greater impact on in-migration based on: The area is remote and far from large population centres

Source: MML based on IFC “Projects and People: A Handbook for Addressing Project-Induced In-Migration”

7.4.3 Operation Phase Impacts

7.4.3.1 Potential Impacts on Karakalpak Peoples and Ethnic Minorities

Section 7.4.2.1 predicted that construction phase impacts on Karakalpak ethnic peoples be a beneficial impact of minor to moderate significance because the project has the possibility to: i) provide employment opportunities; ii) enhance their technical skills; iii) promote gender equity in terms of employment of Karakalpak and ethnic Kazakh women; iv) Provide business opportunities to Karakalpak and ethnic Kazakh entrepreneurs as suppliers of various goods and services; and v) provide income (through taxes) to the local governments which they can use for local development and indirectly benefit Karakalpaks and ethnic minorities in the region.

All of these impacts are relevant to the operational phase as well, but fewer Karakalpak and ethnic Kazakh people are expected to benefit from employment opportunities than for the construction phase. However, the employment opportunities that are provided will be longer term and are more likely to result in technical and other skills development for Karakalpak and ethnic Kazakh men and women. This will have a more significant impact on livelihoods as income sources and opportunities will be more sustainable (including diversification away from dependence on traditional livelihoods of agriculture and fishing which have suffered significant demise with the drying of the Aral Sea). Moreover, once the project is operational, the tax benefits accrued will continue on an annual basis for the life of the Project and this will contribute to the government's efforts for long term sustainable development of the Karakalpakstan region and the local project affected communities within which the Karakalpak, Kazakh and other ethnic minority people live.

In conclusion, despite fewer Karakalpaks and ethnic minorities benefiting from employment opportunities, for the above reasons the operational impacts on Karakalpak peoples and other ethnicities is also considered to be **a beneficial impact of minor to moderate significance.**

7.4.3.2 Generation of Permanent Employment

The operational phase of the Project is anticipated to have direct long term employment benefits through the generation of new jobs, estimated to total 626 at peak employment in 2020. Approximately 86% of these will go to people from Karakalpakstan, of which approximately 37% will go to people from the Kungrad District where the UGCC is located, and 14% will go to people from the Muynak District. These figures are illustrated in Table 7.25 overleaf.

Table 7.25: Estimate of Permanent Employment Generation During Operations

	Total staff	From Karakalpakstan	From Kungrad District	From Muynak District	From other Karakalpak areas	From other areas of Uzbekistan	International
Upstream:							
CGTU	97	95	66	29	0	2	0
Downstream:							
Phase 1 (2015-2020)	529	338	101	34	203	85	106
Phase 2 (2020-2040)	529	444	133	45	266	85	0
Phase 2 Total :	**626**	**539**	**199**	**74**	**266**	**87**	**0**

Upon the transfer of Surgil Field from UstyurtGaz to Uz-Kor, all 97 staff are expected to transfer across to Uz-Kor in the same positions and all will be paid at least the same or higher salaries than they currently receive from UNG. All staff will be appropriately consulted about this transfer.

Most of the employment benefits will be realised at the downstream end of the Project and by 2020 it is estimated that the UGCC will employ 529 permanent staff consisting of:

- 445 workers who will live in the new Akchalak workers' settlement with their families; and
- 84 specialists who will commute from Kungrad City on a daily basis.[48]

The downstream components of the Project will also result in direct employment benefits through the creation of the Akchalak workers' settlement to house workers and their families. As summarised in Table 7.26 below, the existing 248 employees at the gas-compressor station in Akchalak is expected (by 2020) to

[48] Preliminary Feasibility Study of the Masterplan of the Akchalak workers settlement, developed by GUP UzshakharsozlikLITI in 2011

be supplemented with an additional 110 non-project specific jobs in the catering, clothing and the construction industry sectors through facilities to be included in the new Akchalak workers' Settlement. When combined with the additional 12 jobs to be created at the gas-compressor station and the 259 new jobs at the UGCC, this is expected to result in an additional 692 jobs at the downstream component of the Project by 2030.

Table 7.26: Downstream long-term direct employment benefits resulting from the UGCC and Akchalak settlement

Downstream project component	Without Project employment status	With Project employment status
Akchalak Workers Settlement:		
Gas-compressor station	248	260
Bakery with confectionery and lemonade shops	-	25
Sewing and knitted goods clothing workshop	-	40
Construction industry industrial base	-	50
Sub-total	**248**	**375**
Gas-chemical complex:	**-**	**529**
Grand total	**248**	**904**

Source: Preliminary Feasibility Study of the Masterplan of the Akchalak workers settlement, developed by GUP UzshakharsozlikLITI in 2011

In addition to the 904 jobs directly created in the downstream component of the Project, there will be a multiplier effect of additional employment being indirectly generated through spin-off to local suppliers of equipment, raw material and services. Also, economic and employment opportunities will be created as a result of the personal expenditure of the new population of workers and their families (estimated to be 1,645 people) who will be living in the Akchalak settlement by 2030. Some of these employment benefits should work towards redressing gender disparities in the area because the sewing and knitted goods clothing workshops are expected to provide 40 permanent employment positions for women.

The operation phase permanent employment is considered to be of moderate magnitude because although the number of directly created jobs created is a little over 10% of the number created in the construction phase, these jobs are permanent rather than temporary. The majority of these jobs are expected to be filled by people from Karakalpakstan, and people from the local districts of Kungrad and to a lesser extent Muynak. The workers are considered to be a social receptor of medium sensitivity due to the high levels of deprivation in the area, and the provision of permanent contracts will contribute to personal and household stability, well-being and capacity to cope with economic shocks in the long term. Hence the impact is categories as a **beneficial impact of moderate significance.**

7.4.3.3 Health, Safety, Security and Well-being of Operational Workers and their Families

The main occupational health and safety risks related to the Project have been outlined in Section 7.4.2.4 and these are considered to relate, on the whole, to the operational phase of the Project too. If not mitigated appropriately through the continued development and implementation of Uz-Kor's existing policies and procedures and where necessary, monitoring of sub-contractors, there are significant risks to the health and safety of Uz-Kor staff that will be operating the Surgil Field and the UGCC facility.

In addition to occupational health and safety risks whilst working on site, the well-being of workers and their families could deteriorate within their community environment if the new Akchalak workers' settlement (where 1,654 people are expected to live) does not adequately cater for their needs through the provision of appropriate social and community facilities and services.

Table 7.27 overleaf compares the existing Akchalak community facilities and services, with those to be included in the new Akchalak workers settlement. It clearly shows that that the standard is met in relation to each community facility and service for the new workers, but it is not met when the existing community's needs are factored in. Lack of capacity of the settlement to cope with the demands being placed on social and community facilities and service would have an adverse affect on the well-being both the existing Akchalak community, and that of the new workers and their families. Levels of health and educational attainment could suffer, and migrant workers could feel alienated and depressed without sufficient cultural and sporting facilities.

Mitigation will be included within the Project design to safeguard the occupational health and safety of workers and to address the shortage of social and community facilities and services. The migrant workers are considered to have medium sensitivity as they will be exposed to occupational health and safety risks on a daily basis and their families may initially be socially and culturally alienated. The impact of occupational health and safety risks is considered to be of moderate magnitude as it could result in a fatality. Therefore, without mitigation, risks to the health, safety and well-being of operational workers And their families is considered to be **an adverse impact of moderate significance.**

Table 7.27: Provision of Additional Community Facilities and services in the Akchalak Settlement

Parameter	Unit	Without Project (existing community)			With Project (UGCC only)			With Project (UGCC and existing community)		
		Standard	Actual	% of standard	Standard	Forecast	% of standard	Standard	Forecast	% of standard
Population	Thousand people	1000	1000*		1654	1654		3000	3000**	
Kindergartens	children	87	80	92%	140	140	100%	279	220	79%
Comprehensive secondary schools	pupils	150	90	60%	373	373	100%	480	463	96%
Shops	Shelf place, m^2	85	100	118%	115	115	100%	300	215	72%
Public catering establishments	seats	8	-	0%	13	13	100%	24	13	54%
Housing-service org.	object	1	-	0%	1	1	100%	1	1	100%
Club-cinema	seats	35	80	229%	58	58	100%	105	138	131%
Library	Thousand volumes	5	-	0%	5.4	5.4	100%	15	5.4	36%
Public service establishment	Work. places	4	-	0%	3	3	100%	15	3	20%
Pharmacy	object	1	-	0%	1	1	100%	1	1	100%
Post-and-telegraph office with savings bank	object	1	-	0%	1	1	100%	1	1	100%
Polyclinic with (RMC) day hospital	visits / beds	33	15	50%	40	40	100%	99	55	56%
Bath	seats	5	10	200%	8	8	100%	15	18	120%
Fire station	Motor vehicles	2	2	100%	2	2	100%	2	4	200%
Market	Shelf place, m^2	24	-	0%	50	50	100%	72	50	69%
Sports complex	hectares	0.55	0.5	91%	0.13	0.13	100%	1.65	0.63	38%
Tennis court	m^2	80	-	0%	130	130	100%	130	130	100%
Premises for culture-	m^2	50	-	0%	82	82	100%	90	82	91%
Hotel	rooms	6	6	100%	10	10	100%	18	16	89%

Source: Preliminary Feasibility Study of the Masterplan of the Akchalak workers settlement, developed by GUP UzshakharsozlikLITI in 2011

* The actual current population (see Table 7.10 in the baseline) is 954, however we have rounded this up to 1,000 here for indicative purposes because the standard is for 1,000 people.

** 3,000 Is the estimated peak number or inhabitants of the new settlement.

7.4.3.4 Health, Safety, Security and Well-Being of Local Communities

The main community health, safety and well-being risks related to the Project have been outlined in Section 7.4.2.5 and these are considered to relate, on the whole, to the operational phase of the Project too. The Kungrad WSU will extract water from the Lower Amu Darya and Chapter 9.4.4 concludes that without mitigation, this may have a minor adverse significant impact on the water resources of the Muynak Lake, and the upstream social receptors that use it for fishing and agriculture.[49] In the downstream area, the future Akchalak community will be extended but it will still be located more than three kilometres away from any of the operational project components, therefore impacts on this community will be minor at most. Overall, impacts on the community health, safety, security and well-being of local communities during the Operational Phase are considered to be an **adverse impact of minor significance**.

7.4.3.5 Industrial Development Revenue and National Energy Security

The Project developers have identified that the rich untapped natural gas resources of the Surgil Field provides an ideal opportunity for the provision of natural gas raw material for the production of industrial PP and polyethylene products. These products plus any associated gas sales can then be exported to national and international markets.

The most pressing environmental and social problem currently being faced by Uzbekistan is the crisis in the Aral Sea basin. Poor water management over an extended period of time has resulted in partial drying up of the sea and contamination of surrounding areas by agricultural chemicals. This is now having a strong negative impact on economic activity and on the general health of the population in Uzbekistan's regions neighbouring the Aral Sea. The exploitation of oil and gas with associated export of product and consequential injection of funds from outside the region is a major source of income to raise the overall socio-economic profile of the region and to allow much needed investment in water and agricultural infrastructure

At present, Uzbekistan imports PP for use in manufacturing and produces a basic amount of its own PP. Investments made in this Project could replace the burden and risk associated with heavy reliance on importation of PP products. Substantial opportunities have been identified for the sale of PP to the markets of other Commonwealth of Independent State (CIS) countries, Russia, Western Europe and China.

Revenues from the production of these products will be shared with the Karakalpakstan government. Specifically; the Muynak District will receive revenues from resource tax, while the Kungrad District will collect land tax revenues from the project. Exact amounts are not known at this stage however the resource tax revenues are expected to be higher than land tax revenues, thus redressing the slight imbalance in community investment that the Project is giving to the Kungrad District (namely, the Akchalak workers' settlement) over the Muynak District. The tax revenues will go towards meeting the current priorities of both Districts which include social and economic development in the form of improvement of health care, population welfare and business and employment generation through new jobs.

The energy security and industrial development revenues are considered to be a **beneficial impact of moderate significance**. The magnitude is categorised as moderate as the industrial development is of a

[49] Mitigation in relation to this issue is discussed in section 9.5 of the Water Resources Chapter, rather than section 7.5 of this chapter.

scale to benefit the region rather than the nation. The region is considered a receptor of medium sensitivity because of its existing deprivation levels. The region is not considered to have the same levels of high vulnerability and lack of capacity to cope as the individual communities and households. The region, while generally poor, does receive government and revenue transfer support as part of the wider Republic. It also has taxing powers although these are limited because of the low tax base.

7.4.4 Decommissioning Phase Impacts

The decommissioning phase of the Project is not likely to commence until 2040 at the earliest. As it is far into the future, it is difficult to produce an accurate and meaningful prediction of the significance of impacts and their effects because the baseline conditions are likely to have changed notably by this phase of the Project. Likely social impacts resulting from the decommissioning phase of the Project that are predicted to be the most significant are identified below.

Subsequent assessment of these and other potential social impacts and effects will be required within the twelve months prior to the Decommissioning Phase. Section 7.5 proposes some generic mitigation measures that are likely to be required in order to offset or reduce the adverse significance of the aforementioned likely impacts and effects.

7.4.4.1 Retrenchment of Staff

The decommissioning phase may result in retrenchment which is defined as:
- Closure of plant resulting in loss of jobs; and/or
- Job losses due to efficiency gains or falling demand of companies services; and/or
- Job losses arising from downsizing in operations or restructuring of the workforce.[50]

The resultant loss of employment is likely to have an adverse effect on the well-being of retrenched staff and their dependents and the significance of these effects will need to be determined immediately prior to the decommissioning phase.

7.4.4.2 Depletion of Gas Resources

The Surgil Field will be decommissioned when gas supplies are depleted. There will be opportunity costs related to using the gas for PP and polyethylene production and energy security instead of for other current or future needs. Substitution sources for energy and inputs to production of PP and polyethylene will be needed from other fields in Uzbekistan to extend the life of the UGCC beyond 2040.

7.4.4.3 Redundant Facilities and Unused Land

Once the Project has reached the end of its life the equipment and facilities may become redundant, and in extreme cases derelict. If not mitigated appropriately, this could potentially pose community health, safety and security risks for the people and natural resources due to unsafe equipment and/or contaminated land. It could also lower the amenity value of the Project area due to visual intrusion of derelict structures.

[50] IFC Good Practice Note: Managing Retrenchment, August 2004, Number 4.

7.4.5 Cumulative Impacts

Within the social assessment, the Akchalak Gas Compressor Station (GCS) has been considered along with the Surgil Project. The existing Akchalak settlement was established to house people working at the GCS and the numbers of people working there have been included as part of the social baseline. As an enhancement measure of the Surgil Project, investments and improvements will be made in Akchalak to address the problems experienced by residents there related to the lack of infrastructure.

Urga is another project being developed in the Surgil project vicinity by Petronas (under concession from UNG). The Urga Project consists of developing the Urga field in the Aral Sea basin and also several smaller fields (termed "Akchalak") up on the Ustyurt plateau. In the event of emergencies (e.g. well blow outs and combustion of gas, etc.) this Project could have the potential to present increase the risk of cumulative impacts on the health, safety and well-being of the Akchalak community (the nearest settlement, 1km away), in the event that such disasters caused a chain reaction of emergencies at the UGCC facility. However, the Urga Project EIA concludes that emergencies at the drilling sites would not represent immediate danger at the Akchalak settlement or the UGCC facility. Therefore, there is not considered to be a cumulative impact on community health and safety as a result of the Urga Project.

In the Aral Sea Basin, the East and North Berdakh gas fields, developed and operated by UNG, are located near to the village of Uchsay to the south east of the Surgil field. The Berdakh CGTU is 24km from the Surgil CGTU and at least 16km from the nearest gas well being developed as part of the Surgil Project. Again, it has been established that this distance between the Surgil Project and the Berdakh gas fields will not result in any cumulative impacts.

7.5 Mitigation and Enhancement Measures

7.5.1 Overview

In this Chapter measures are proposed with the objective of enhancing beneficial and minimising adverse impacts and effects. These measures have been consolidated with mitigation and enhancement measures for other disciplines and will be implemented through the ESMP

7.5.2 Skill Utilisation/Development for Local People, Ethnic Minorities and Women

The Project provides an opportunity to contribute to addressing unemployment and underemployment in the local area through the creation of jobs. The Muynak and Kungrad districts and the Karakalpakstan Autonomous Oblast have been established in the baseline as areas suffering from deprivation. Therefore, employment generation is a significantly beneficial impact because of the high levels of localised poverty, the area's recent history of socio-economic decline. Through local skills utilisation and development, the Project aims to enhance the significance of this benefit to the region and the local communities, in particular Karakalpak peoples, ethnic minorities and women.

There will be tensions if outsiders capture unskilled and semi-skilled job opportunities that could have been filled locally, and during the construction phase the EPC contractor will be required to work with Hakims and other appropriate local representatives to identify local staff who can carry out the construction work. Uz-Kor will reflect the requirement to prioritise local employment in its Recruitment Policy (see ESMP, Volume IV) and the contractor will also reflect this in their employment policy.

To maximise benefits specifically for Karakalpaks, ethnic minorities and local women Uz-Kor's recruitment policy will:

1. Promote equal opportunity to men, women and all ethnic minorities,
2. Maximize employment opportunities for Karakalpaks and ethnic minorities, where it is justified in respect of considerations of cost and quality;
3. Select and recruit local born Karakalpak capable employees working in construction phase for operation phase if their skills are required; and
4. Inform its local suppliers, contractors of this plan and the requirement to comply with the procedures (also discussed in Section 7.5.3 in relation to modifying procurement practices).

Where it is justified in respect of considerations of cost and quality, Uz-Kor and its contractors will adopt a quota and ensure that their unskilled labour workforce is proportionally distributed between ethnic minorities (based on ethnic distribution in the region/district) and is targeted towards poverty stricken areas in the Project locality , for example Muynak, without discrimination towards any specific disadvantaged ethnic groups (including Kazakhs and Uzbek/Koreans), taking into account that poverty is shared across ethnicity within Karakalpakstan and the Project localities. A local employment quota for women will be set at by Uz-Kor with consideration of needs and skills levels.

Uz-Kor will monitor contractors in this regard, and where these quotas are not met, it will be incumbent on Uz-Kor and the Contractors to demonstrate absence of appropriate skills availability among Karakalpak peoples.

Among the workers, cultural tensions may arise between migrant workers and Karakalpaks and the mitigation measures appropriately include cultural sensitivity programs to address this issue.

In recognition of the shortage of sufficiently skilled local labour in the region, the Karakalpakstan Council of Ministers has established a training programme for potential petrochemical workers for the operational phase of the Project. At the expense of UNG, 100 new employment positions have been created at the only other petrochemical processing plant in the country, the Shurtan GCC in the south of Uzbekistan. These positions are currently being filled by people from Karakalpakstan who are receiving on the job specialist training to enable them to assume positions at the Akchalak UGCC once it is operational.

Also, during the operational phase the Project will establish an apprenticeship and short work placement program for local youth or children of workers who are 16 to 18 years of age. This program will contribute to the development of local skills. Consideration will be given to approaching local NGOs to assist with basic skills development for the local youth and women.

7.5.3 Modifying Procurement Practices to Support Local Enterprise

Stakeholder consultation confirmed that people living in the Project area are keen to benefit from the presence of the Project, especially women. Supporting local economic development through engaging local services enterprises in the supply chain will provide such opportunities. At the same time it is recognised that the project location is remote, already deprived and some of the Project skills are highly specialised. That said there are some goods and services that could be procured locally, such as: catering, cleaning and laundry services, security, pest control, printing and photography, floor covering, painting and corrosion work, vehicle maintenance, uniform production, fencing, paving, etc. For this Project, it is suggested that local procurement should refer to goods and services purchased within the Karakalpakstan Autonomous Oblast.

Ways to modify procurement practices[51] in order to maximise local benefits, especially for women, Karakalpaks and ethnic minorities, include establishing a local procurement policy that prioritises local contracting by:

- Making minor modifications to the procurement policy such as:
  - Communicating future demand;
  - Having longer contract periods to justify acquisition of capital equipment;
  - Simplifying tender procedures so it is easier for local companies to participate;
  - Producing tender documents in local languages;
  - Holding tender workshops locally to help understanding of need and process;
  - Lowering the price of tender documentation; and
  - Making prequalification efforts match the contract type and amount;
- Making price preferences for local firms;
- Unbundling contracts so that local entrepreneurial services can be tapped;
- Reserving a proportion of a contract value or a whole contract for local enterprises to implement;
- Wavering or lowering the need for performance bonds;
- Using main contractors to engage local firms in their supply chain; and
- Uz-Kor will inform its local suppliers and contractors of the employment policy to set a quota for local staff, and ensure that their unskilled labour workforce is proportionally distributed based (on ethnic distribution in the region/district) and will be targeted towards poverty stricken areas in the Project locality , for example Muynak, without discrimination towards any specific disadvantaged ethnic groups.

Efforts will be made to provide local gender orientated and ethnic group development benefits through including a quota for the number or value of contracts provided to local female and or Karakalpak and ethnic Kazakh business owners or partners (subject to their existence) in areas such as cleaning and catering for example.

7.5.4 Financial and Money Management Awareness Seminars

The objective of local employment and procurement measures is to maximise the local economic benefits though more jobs being filled and work being won by local people and businesses from the region, and particularly from the Kungrad and Muynak Districts. However, it is important that local people are also provided assistance with how to appropriately manage what may be a sudden influx of income that in the case of the construction phase at least, may not be sustainable. Therefore, the Project will partner with local banks to provide financial seminars on money management in the Akchalak community.

As the construction period is relatively short, it is important that construction workers and other service providers in the community who may be beneficiaries recognise the short boom/bust cycle that the construction phase may induce. It is important that the benefits of paying off debt and saving for the end of the contract period are clearly highlighted, especially during the first year of construction when the workers have an opportunity to plan how to best to use their wages. The financial seminars will not try and sell any financial products, but rather focus on the principles of good personal and household financial management. Uz-Kor will provide leaflets and other resources that will be made available for the local

[51] Discussed in more detail in Engineers Against Poverty's "Maximising the contributions of local enterprises to the supply chain of oil, gas & mining projects in low income countries: A briefing note for supply chain managers & technical end users available at http://www.engineersagainstpoverty.org/_db/_documents/EAP_Briefing_Note_-_Local_Enterprise_Participation.pdf

communities and workers through the local Hakimyat offices and at the Project's visitors centre in Akchalak.

7.5.5 Project Commitments on Workers' Rights

The Project will be consistent with Uzbekistan Labour codes and the requirements of the ADB social safeguard requirements and the IFC's Performance Standard on Labour and Working Conditions. This entails the Project establishing commitments on workers' rights including:

- Observing statutory requirements of the Uzbekistan Labour code including establishment of a labour grievance mechanism and the minimum age for employment.
- Ensuring acceptable conditions of work including by observing national statutory requirements related to minimum wages and hours of work.
- Meeting international standards related to paying all wages, including bonuses and premium pay for overtime work, to all employees in a timely fashion and in a manner consistent with ILO Convention 95.
- Commitment to ensure that all workers continue to be paid during the periodic one month maintenance outage periods.
- Not taking any action to prevent employees from exercising their right of association and their right to organise and bargain collectively.
- Ensuring no workers are charged fees to gain employment on the Project.
- Ensuring rigorous standards for occupational health and safety are in place (discussed in Section 7.5.8 below).
- Basing employment decisions on principles of non-discrimination and equal opportunity, in particular fair and equal pay, especially for women carrying out the same work as men.

These commitments will be enforced upon contractors and subcontractors via subcontract clauses with requirements to address them in management systems and work procedures. In addition to the above commitments, to meet the IFC PS 2 on Labour and Working Conditions the contractors will be required to:

- Adopt a Human Resource Policy appropriate to the size and workforce which indicates the approach for management employees;
- Produce job descriptions and provide written contracts and other information that outline the working conditions and terms of employment, including the full range of benefits[52];
- Report regularly on the labour force profile, including gender, ethnicity, and location source of workers (for instance from the district, from Karakalpakstan, from Uzbekistan and other countries);
- Report regularly on labour and working condition key performance indicators, for instance hours worked (regular and overtime) during period and cumulatively, hours lost, number and type of accidents, near misses, site audits and meetings, training, use of labour grievance mechanism, etc;
- Hold toolbox talks on labour law issues and the labour grievance mechanism twice a year during the construction phase;
- Organise a training program and keeping individual training registers for each construction worker which they can have at the end of contract for procuring future work; and
- Establish occupational health and safety procedures in the overall environmental management system which provide workers with a safe and healthy work environment taking into account the inherent risks for this type of project (see below).

[52] Benefits might include life insurance, health care, disability/invalidity coverage, maternity/paternity leave, retirement provision, redundancy payments over and above legal minimum, lay-off pay, extra employment injury benefit, survivors' benefits, extra paid holiday entitlement, compassionate leave, reimbursement for flights home, payment of children's education, employee education needs, and in kind benefits such as sports or child day care facilities, meals, transportation provision and others.

Contractors and sub-contractors will be made aware of their role in ensuring the Project meets international standards related to labour and working conditions. In particular, overtime arrangements and the timely payment of wages should be addressed. The contractors will also be expected to provide all construction workers with a summary of their employment service and training activities at the end of contract as a means to finding continued employment. This will be done through the provision of briefings to sub-contractors and enforced through contractual clauses and regular monitoring (internally by Uz-Kor and externally by independent monitors) of contractors' activities and performance.

7.5.6 Establishment of a Workers' Code of Conduct

The Project will establish a Code of Conduct for the labour force. The Code of Conduct recognises the provision of resources by the employer and shares responsibilities among the workers for the use of equipment, procedures and training. It aims to contribute to a harmonious relationship with local communities, to reduce behaviours that could lead to social conflict, and to prevent further environmental degradation.

Typical issues to be addressed will include:
- Proper use of PPE and other work equipment that has been provided;
- No hunting, poaching or illicit use of local natural resources;
- Careful use of local natural resources and project resources, especially water and electricity;
- Discreet sexual behaviour that takes into consideration messages about sexually transmitted diseases;
- No involvement in human trafficking;
- Restrictions related to consumption of alcohol and drugs;
- Prohibition of fire arms on site;
- Safe driving practices;
- Behaviour for accessing and using the workers' accommodation facilities;
- Respect for the local community and its cultural norms in which labourers are working; and
- Professional behaviour and integrity when dealing with the public.

Some codes of conduct also address ethical conduct with regards to bribery, acceptance of gifts, and use of business resources.

7.5.7 Cultural Sharing and Tolerance Training for Workers

The in-migration of a significant number of international construction workers into the Project communities will result in a large increase of foreigners in a small community. Therefore, the international workforce will receive training regarding cultural sensitivities of Uzbek, Karakalpak and Kazakh communities via distribution of information brochures. Specific attention will be given to educating foreigners about ethnic Karakalpak and Kazakh traditions and intangible cultural heritage. Depending on proximity and likelihood of interaction, language training could be appropriate. There is a small Korean population already established in the region that could be useful resources regarding appropriate themes to be addressed in relation to the Korean workers that are expected to make up a large percentage of the international labour force.

Initial proposals from EPC contractors have made commitments to address cultural differences and are actively planning to deal with these through employment of actions such as:
- Provide a friendly working environment;
- Have events, such as parties, for foreign workers who are away from their home

- Establish communication channels between all employees across organisations; and
- Provide monthly ethic and cultural education sessions

Whichever contractor is appointed, Uz-Kor will ensure that the EPC contractors make efforts to share their cultural values and practices with the local Hakim so there is some understanding among the host community. Some, other options for consideration might be food fairs, trade exhibitions and open houses or tours to specific areas of the work site for the local leaders or community members to understand more about the project, the company its activities and its workforce.

7.5.8 Occupational Health and Safety Management

Health and safety will be considered in all Project activities to reduce the risk of accidents and illness. The EPC contractors will be responsible for developing procedures to address the health and safety risks during construction and their management systems will be periodically monitored by Uz-Kor to ensure compliance with Uzbekistan regulations and the IFC's Environmental, Health and Safety Guidelines, the requirements of which are outlined in Section 7.2.3 and 7.2.4.

Uz-Kor has developed a Terms of Reference (ToR) for the safety work that must be undertaken by the EPC contractors. This states that to comply with the project specification, the contractor will perform the following series of safety reviews of the work at appropriate stages during execution of the project to ensure that the plant is designed and constructed in a safe manner:
- Process hazard/Safety review (HAZOP);
- Risk Analysis;
- Plot Plan Review;
- 3D Model/General Arrangement Review;
- Fire/Gas Detection and Protection; and
- Emergency Shutdown.

The contractor must have sufficient experience obtained from projects similar to this project on each item, but qualified subcontractors will also be used when necessary. Furthermore, the contractor will give sufficient notice of these design safety reviews to allow Uz-Kor to exercise its right to participate in these reviews.

The comprehensive HAZOP assessment will aim to prevent accidents, injuries and work-related diseases, through the identification of the causes of physical, chemical, biological and radiological hazards, and by prioritising hazard elimination, hazard control and hazard minimisation.

The ToR states that the HAZOP study will be carried out by a small multi disciplinary team and the members of that team should have sufficient experience and knowledge so that most questions can be answered on the spot. The team members will be carefully selected and given the authority to recommend design changes, where necessary, with minimal reference to higher authority. Typically, the HAZOP team will be comprised of:
- Chairman/Facilitator;
- Process Engineer;
- Licensor Representative (where applicable);
- Operations/Commissioning Representative; and
- Secretary.

Other discipline engineers will be used to undertake the HAZOP study on a needs basis.

The HAZOP will result in the production of a Health and Safety Plan. A key typical measure that will be included in the health and safety plan to safeguard workers will be the provision of appropriate PPE and training in how to use it. Management procedures to address temperature stress, for instance heated shelter for outdoor workers in winter and shade shelters in the summer,[53] will also be provided.

An emergency preparedness and response plan and escape routes will be identified. Training and drills based on the accident and emergency preparedness and response plan must be carried out regularly with workers and local health authorities. As a minimum there will be:

- Quarterly drills without equipment deployment;
- Evacuation drills and training from the facilities under different weather conditions and time of day; and
- Annual mock drills with deployment of equipment;

In addition to equipment and procedures, workers will also receive appropriate training and toolbox talks on risk issues. All employees will carry out induction health and safety training prior to commencement of work. OHS issues will be part of the employee training plan and courses, including refresher courses, will be provided every year. Training will include the provision of appropriate written materials to reinforce learning.

The contractors will provide medical services inside the workers' camps and regular medical check ups to ensure the good health of workers throughout the construction phase.

Uz-Kor will develop its own policies and procedures and to ensure that detailed health and safety management plans are developed and systems are implemented once the Project becomes operational.

7.5.9 Optimising Labour Accommodation Design and Management

Section 7.4.2 identified the construction of the permanent Akchalak settlement as a significant beneficial impact of the Project as it will be a catalyst for socio-economic development and relieve pressure on existing social and community services. However, special considerations and measures will be required to ensure that the well-being of workers, and where relevant, their families is upheld in both the construction and operational phases of the Project and across all camps in the upstream and downstream areas. These considerations are outlined below.

Temporary accommodation will be provided for the construction workers for each component of the Project. The construction of the temporary accommodation and supporting facilities will be the responsibility of the upstream EPC contractor. Uz-Kor's contract with the contractors will indicate that the accommodation needs to comply with guidance and standards presented in the IFC and the European Bank for Reconstruction and Development (EBRD) guidance note on "Worker's Accommodation: Processes and Standards". The guidance describes standards for identifying a safe and healthy location, applying appropriate construction standards, providing adequate and sanitary living conditions as well as appropriate leisure and health facilities. In terms of workers' accommodation standards it provides guidance on food safety, water sanitation and waste management, and building regulations. It is noted that the Heads of Works EPC contract includes an overarching statement that commits the contractor to the

[53] See ACGIH (a member-based organization that advances occupational and environmental health) guidance from 2005.

adherence with international lender standards. However it will be important during the contract negotiation stage to ensure the EPC contractor fully understands their obligations.

Recommendations for the type of staff to manage the temporary accommodation, appropriate management policies, security and grievance procedures and ongoing liaison with local communities are provided in the above mentioned IFC/EBRD guidance. In accordance with this, an accommodation manager will be appointed to ensure standards are followed and the accommodation is well maintained. The workers' code of conduct (see section 7.5.6) will address behaviour related to using and accessing the accommodation. Any fees that workers are charged for accommodation or transportation will be identified at the time of contract and made known to the workers before they sign. The labour grievance mechanism will also cover complaints related to the accommodation and Uz-Kor will audit contractors' worker camps.

From the initial proposals from EPC contractors for the downstream components of the Project the indication is that a typical construction worker accommodation complex would provide facilities for around 1,500 workers in a fully equipped and furnished air-conditioned and heated facility. As there will be four separate EPC contracts there will be four separate accommodation complexes, one for each EPC contractor for the UGCC development. Each facility would typically include:

- Accommodation, including appropriate provision for:
  - Unskilled labour camp;
  - Skilled labour camp;
  - Sub-construction staff; and
  - Manager/guest house.
- Catering / restaurant
- Sports and recreation – including outdoor facilities, fitness, cinema,
- Prayer rooms (if required)
- Medical facilities;
- Utilities; and
- Power, water, waste, communications, roads.

In relation to permanent accommodation facilities, Uz-Kor have contracted a Design Institute to develop permanent accommodation plans for the Surgil Field that includes a range of accommodation, catering and recreational facilities. In addition to dormitories for 72 people with a maximum of four people per room and a canteen, the draft plan contains a mini-football pitch, basketball and volleyball court and guesthouse.

According to Uz-Kor an "oriental style" will be used in the project accommodation areas with modern colours and high quality fittings and finishing. The seasonal temperature extremes are being considered in the architectural design as is artistic design and architectural finishing for the entrances and fencing.

7.5.10 HIV/AIDS Awareness Raising Campaign

The influx of a large number of construction workers, many of whom will be international workers away from their families in their home country, poses sexual health risks to both workers and the local communities. The Project recognises this and will run a sexual health and HIV awareness campaign with the production of information leaflets to be distributed in the local communities and the provision of free condoms for workers. Information will be prepared and disclosed in a culturally sensitive manner but it will be targeted towards young adults of consenting age, especially Karakalpak and ethnic Kazakh women, who are considered to be particularly vulnerable. As well as leaflets, seminars will be held in the training, information and visitors centre discussed later in this chapter.

7.5.11 Safeguarding Community Health, Safety and Security

In order to mitigate potential impacts on community health, safety and security, infrastructure and equipment safety and hazardous material safety will be addressed in the Project's Health and Safety Plan and Emergency Preparedness and Response Plan.

Access barriers and other methods will be implemented to prevent public having contact with dangerous locations, equipment and hazardous materials, In particular, appropriate site layouts, fencing of work sites, regular testing of equipment, use of qualified personnel, separation and signage for hazardous materials and good traffic management will be addressed. All signage will be in Uzbek, Karakalpak and Kazakh.

In relation to driving in the local community, the contractors will develop procedures that prevent accidents related to traffic that include safe driving on site, establishing rights of way, speed limits, vehicle inspection requirements and other measures.

The contractors will coordinate with local civil services including police, fire fighters and medical personnel with regards to establishing the Emergency Preparedness and Response Plan and any drills or training addressing it. As defined in the Plan, people living near or on the site will be informed and trained in appropriate emergency responses.

The management plans will ensure that the existing environmental degradation through poor management of natural resources is not exacerbated and will not contribute to additional natural disasters. The labour force will not be allowed to hunt and awareness will be raised about not wasting water and electricity. These activities will be addressed in the labour code of conduct (see Section 7.5.6) and need to be reinforced in 'toolbox talks'.

In terms of community exposure to disease, the high levels of tuberculosis in the area are a risk, especially when the use of a local labour force is being promoted. The Project will provide free tuberculosis testing and immunisation prior to contract. If this is done on site, the Project should consider providing this service to interested residents of Akchalak. Poor nutrition is associated with increased risk of acquiring tuberculosis. The Project will provide at least one free hot, well balanced and nutritional meal to workers as part of the terms of contract, especially in the upstream section which is more remote and further from a more permanent settlement.

With regards to security and safeguarding of personnel and property, the contractors will be required to:

- Ensure fencing of appropriate height is in place around site perimeter;
- Hire security staff responsible for control of access to site and ensure that appropriate due diligence is performed on them (companies and individuals) before they are appointed. Security staff will need to be trained at least annually in the use of force, the emergency preparedness plan, human rights, security procedures and reporting of incidents;
- Establish a registry/identification system for staff and visitors upon entrance to site;
- Implement a visitor orientation programme;
- Ensure appropriate signage around site perimeter, especially in relation chemical and gas related hazards and to traffic speed and with regards to the boundary of the Project site.

The Project will deploy a Gas Rescue Squad (GRS) for the purposes of rescuing people (workers and community members) in emergency and situations and undertaking measures on prevention, containment and elimination of hazards threatening the dwelling settlements in neighbouring locations to enterprises. The key duties of the GRS will be to:

- Conduct complex rescue and emergency operations in gas-explosive areas, which require the application of respiratory protective and special projective tools;
- Inspection of technical regulations, rules and instructions in the treatment of gas containing the toxic components on issues of gas security; and
- Development of process means for explosion and poison prevention.

Leaflets will be prepared by Uz-Kor and distributed in the Akchalak community to raise awareness about health and safety risks associated with petrochemical facilities, and they will also be available at the training, information and visitors centre, as discussed below.

7.5.12 Training, Information and Visitors Centre and Guided Tours for Children

Uz-Kor will establish a training, information and visitors centre at the UGCC facility. This will be a multi-purpose resource used to facilitate a number of mitigation measures outlined in previous mitigation sub-sections of this report; for example, financial management and HIV/AIDS awareness seminars, and information points containing leaflets on these and other topics such as community health safety and security.

The centre will contain information about the history of the region and the Karakalpak culture, as well as the history of the development of the Project and visions for the future. Guided tours of the UGCC facility and the visitor centre to school children will be offered on an annual basis to educate them about the region, the Project and opportunities for a career in the petrochemical industry.

7.5.13 Additional Community Facilities and Services in the Akchalak Settlement

The Project will provide additional community facilities and services that go above and beyond the Project's requirements to cater for the need of only the workers and their families. The provision of these facilities and services will significantly benefit the existing Akchalak community and contribute to the regeneration of what is a deprived area.

Table 7.28 overleaf compares the existing Akchalak community facilities, and those to be included in the new Akchalak workers settlement just to cater for 1,654 new workers and their families, with the additional facilities and services that are being included to address the lack of capacity in the existing community. As demonstrated from this table and already explained in Section 7.4.3, without these additional facilities and services, the well-being of the existing community and the new migrant worker community may suffer. As a result of these additional provisions, the Uzbekistan standard is met in relation to each community facility and service for all residents, anticipated to reach 3,000 people at peak.

Many existing facilities and services will be expanded, for example comprehensive secondary schools will go from only meeting 60% of the standard for 1,000 people, to 134%; and, polyclinics (RMC) with a day hospital will go from 50% to 100%.

New facilities that will be introduced will include public catering establishments, housing-service organizations (shirkat), a library, a public service establishment, pharmacies, post-and-telegraph offices with savings bank, markets and tennis courts.

The existing community and the new workers are expected to benefit significantly from this and their everyday well-being should improve as result of these Project developments.

Table 7.28: Provision of Additional Community Facilities and services in the Akchalak Settlement

Parameter	Unit	Without Project (existing community)			With Project (UGCC only)			With Project (UGCC and existing only)			With Project with mitigation		
		Standard	Actual	% of standard	Standard	Forecast	% of standard	Standard	Forecast	% of standard	Standard	Forecast	% of standard
Population	Thousand people	1000*	1000*		1654			3000			3000**	3000**	
Kindergartens	children	87	80	92%	140	140	100%	279	220	79%	279	297	106%
Comprehensive secondary schools	pupils	150	90	60%	373	373	100%	480	463	96%	480	643	134%
Shops	Shelf place, m^2	85	100	118%	115	115	100%	300	215	72%	300	318	106%
Public catering establishments	seats	8	-	0%	13	13	100%	24	13	54%	24	27	113%
Housing-service org.	object	1	-	0%	1	1	100%	1	1	100%	1	2	200%
Club-cinema	seats	35	80	229%	58	58	100%	105	138	131%	105	140	133%
Library	Thousand volumes	5	-	0%	5.4	5.4	100%	15	5.4	36%	15	17	113%
Public service establishment	Work. places	4	-	0%	3	3	100%	15	3	20%	15	15	100%
Pharmacy	object	1	-	0%	1	1	100%	1	1	100%	1	1	100%
Post-and-telegraph office with savings bank	object	1	-	0%	1	1	100%	1	1	100%	1	2	200%
Polyclinic with (RMC) day hospital	visits / beds	33	15	50%	40	40	100%	99	55	56%	99	99	100%
Bath	seats	5	10	200%	8	8	100%	15	18	120%	15	17	113%
Fire station	Motor vehicles	2	2	100%	2	2	100%	2	4	200%	2	2	100%
Market	Shelf place, m^2	24	-	0%	50	50	100%	72	50	69%	72	72	100%

Parameter	Unit	Without Project (existing community)			With Project (UGCC only)			With Project (UGCC and existing only)			With Project with mitigation		
		Standard	Actual	% of standard	Standard	Forecast	% of standard	Standard	Forecast	% of standard	Standard	Forecast	% of standard
Sports complex	hectares	0.55	0.5	91%	0.13	0.13	100%	1.65	0.63	38%	1.65	1.65	100%
Tennis court	m^2	80	-	0%	130	130	100%	130	130	100%	130	130	100%
Premises for culture-	m^2	50	-	0%	82	82	100%	90	82	91%	90	90	100%
Hotel	rooms	6	6	100%	10	10	100%	18	16	89%	18	18	100%

Source: Preliminary Feasibility Study of the Masterplan of the Akchalak workers settlement, GUP UzshakharsozlikLITI (2011)

* The actual current population is 954, however this is have rounded this up to 1,000 here for indicative purposes

** 3,000 Is the estimated peak number or inhabitants of the new settlement.

7.5.14 Community Investment Framework (CIF)

The ESIA identifies that the local communities suffer from inadequate community infrastructure, facilities and services, high levels of poverty and deprivation and a lack of employment and livelihood opportunities for local residents. The local communities are in need of additional investment; however government finance is constrained in addressing these problems.

The Project will contribute to addressing these challenges through the implementation of Community Investment Programmes (CIP) which channel private sector finance and other resources into community development in partnership with local community stakeholders. CIPs can also contribute to the local government management of induced development effects by supporting local infrastructure and developing local capacity to assimilate migrant populations.

Uz-Kor has developed a Community Investment Framework to guide the development of the CIPs in partnership with the local communities. The CIF is underpinned by the principles of transparency, inclusiveness and fair and equitable distribution of benefits. The CIF explains the process for developing CIPs targeted towards the project affected communities, and specific development areas (such as health, education, community empowerment, etc.).

Communities will be mobilized to form Community Investment Stakeholder Committees (CISC) with targeted representation from local community members including women and ethnic minorities. The committees will be assisted to prepare CIPs for each settlement in order to decide how funds will be utilized. Uz-Kor has set an indicative budget of $500,000 per annum during construction and $350,000 during operations and ultimately it will be up to the CISC to determine how these funds are to be utilized. The three project affected settlements of Uchsay, Akchalak and Elabad will be the target beneficiaries of the CIPs and will provide representatives for the CISC, which will determine on an annual basis the exact allocation of funds between these settlements. Suggested CIP activities are presented in Table 7.29.

Table 7.29: Examples of Community Investment Programmes for Consideration by the Community

Examples of CIP Component	Examples of Activities
Education	Provide college or technical school scholarships for deserving students, in particular from poor families, cultural minorities, physically handicapped persons, and single parent families.
	Use skilled company personnel to offer training in basic accounting, computer applications, management, inventory control, and so forth for micro enterprises and community based organizations.
	Support educational programs to enhance productive skills for women, such as running small businesses, sewing, and crafts production.
	Develop a community computer-resource centre, including donations of older computers and computer time.
	Provision of text books, warm clothing and/or feeding programs for school children as a means to encourage school attendance.
Health	Support a health clinic or sponsor visits by medical personnel, including company doctors and nurses.
	Upgrade the community's potable water system and provision of small water desalination plants which have been implemented in other parts of Karakalpakstan with success.
	Promote women's health-care issues, including maternity and prenatal care..

Examples of CIP Component	Examples of Activities
	Support alcohol and substance abuse programs
	Improved heating through greater gas pressure supply, recognising that the cold conditions greatly effect household health
Poverty Reduction	Finance a self-sustaining endowment for a micro credit program, or financing for small and medium enterprises.
	Provide financing, technical, and managerial assistance to develop cooperatives in areas such as crafts, food services, and building materials, and provide marketing assistance.
	Expanding access to solar panelling which has been introduced in remote areas of Karakalpakstan to provide lighting, radio and TV use, water pumping and street lighting, which provides recreation opportunities and greater safety in public areas.
	Sponsor social and financial empowerment programs for poor women and ethnic minorities.
Community empowerment and development	Offer company facilities and funds to be used by community groups.
	Build, maintain, and support multipurpose community centres.
	Develop local centres to provide internet and telephone access.
Environment	Promote water conservation and re-use programs.
	Provide support to local environment-friendly (responsible) companies.
	Promote use of barren land for sustainable housing, reforestation, or other environmental use.
Cultural and historical heritage	Sponsor an inventory of local cultural and historical resources, especially related to the Karakalpak traditional way of life.
	Host exhibitions of employee, family, and community art, culture, and history.
	Provide space for clubs or groups to discuss local history and culture.

Some of the example activities in the above table are closely linked to ESIA commitments already defined, for example those related to providing technical scholarships for students. Others are tailored to addressing other community needs identified throughout the ESIA process, for example those related to water shortages. Addressing gender equality will be a cross-cutting objective of all activities.

7.5.15 Reclamation of Land and Reallocation for Socio-economic Use during Decommissioning

During the decommissioning phase of the project, all of the industrial facilities will be removed, the gas wells will be capped and the land will be reclaimed without any contamination. The pre-project landscape will be restored and the land will be available for re-allocation for other uses such as other industrial development or commercial activities including fishing.

The wells in the former Aral Sea bed will be completely sealed meaning that subject to the success of wider restoration measures the sea water will be able to return without contamination of aquatic ecosystems. It is hoped that the eventual reclamation of this land and the re-growth of the Aral Sea will contribute to the reverse in the socio-economic decline that the area has suffered over the last 40 years. The fishing industry may be able to function more widely, thus supporting local livelihoods.

During the decommissioning phase Uz-Kor will be required to ensure that the disused site is safe (for instance, no contaminated land or redundant installations) and redeveloped, or landscaped to ensure that amenity value of the site is at a minimum returned to its initial state or improved.

7.5.16 Retrenchment Planning in Decommissioning

If there are likely to be retrenchment impacts during the Decommissioning Phase these will need to be assessed and managed. This significance of impacts and effects must be evaluated according to the following factors:

- Total number of workers;
- Percentage of workforce;
- Percentage of working population;
- Characteristics of current job market;
- Level of diversification in the local economy; and
- Secondary impacts of unemployment.

If significant impacts and effects are predicted, a Retrenchment Plan will need to be developed to manage them. The key steps in planning and managing retrenchment are summarised as:

- Ensure retrenchment is necessary – look for alternatives.
- Gather preliminary information on:
  - Workers' rights and obligations;
  - Job market for skills lost;
  - Areas where jobs losses will be from; and
  - Gender and ethnic background analysis.
- Consultation with key stakeholders.
- Develop a Retrenchment Plan by defining the nature of retrenchment and establishing procedure/s accordingly:
  - Revised structure of workforce;
  - Numbers of workers required;
  - Draft timeframe;
  - Develop criteria for dismissal; and
  - Determine budget.
- Implement Retrenchment Plan:
  - Announce number of dismissals;
  - Interview those affected;
  - Make severance payments; and
  - Provide assistance programs.

Retrenchment planning is part of IFC PS 2 Labour and Working Conditions and will be essential for the Project to address this in the future.

7.5.17 Ongoing Stakeholder Relations through Implementation of the PCDP

Finally, Uz-Kor recognises that the cooperation and support of the local community will contribute to the success of the Project. Effective community relations are essential to minimise conflict and to ensure community members and other stakeholders are correctly informed with regards to impacts, how they might be affected by disturbances and how they can comment or complain in a meaningful way. The consultation already undertaken by Uz-Kor and consultants throughout the ESIA phase is reported in Chapter 6. Ongoing consultation throughout the life of the Project will be guided by the Public Consultation and Disclosure Plan (PCDP) presented in Appendix E, ESIA Volume III that was produced at the outset of the ESIA and process and has subsequently been amended to incorporate the disclosure measures covered in this social mitigation section.

7.5.18 Summary of Mitigation and Other Measures

Table 7.30 below summarises the suggestions the mitigation and enhancement measures identified above.

Table 7.30: Mitigation and Enhancement Measures for the SIA

Type of Mitigation / Enhancement	Provisions to Address Socio-Economic Impacts & Effects
Embedded mitigation – mitigation which is built-in to the project during the design process	Project commitments to workers' rights established within Project documentation, including contracts with all contractors and subcontractors; Modifying procurement practices to support local enterprises; Assigning community liaison officer responsibilities; Building accommodation and staff facilities to international standards; Training, information and visitors centre and guided tours; Optimizing labour accommodation design and management.
Mitigation of significant effects	Monitoring of implementation of Project commitments to workers' rights; Workers' Code of Conduct established by main contractor for Project; Regular toolbox talks by all contractors and subcontractors regarding Project commitments to worker's rights, the worker's code of conduct and occupational health and safety plans and procedures; Uz-Kor to develop health and safety management system; Project focus on occupational health and safety with appropriate plan, procedures and training; Ensure contractors undertake comprehensive HAZOPS; Production and drills on emergency preparedness and response plan; Cultural sharing and tolerance training; Financial management seminars for local workers; Money management brochures; Staff grievance mechanism; Training of all international workers in cultural sensitivities of Uzbek communities (via brochures); Establishing a project performance grievance mechanism.
Mitigation of non-significant effects	Toolbox talks for safeguarding personnel and property; Training of security staff in human rights, use of forces, security plan, emergency preparedness and incident reporting; Community health, safety and security awareness leaflets; HIV/AIDS awareness raising sessions Ongoing consultation and information disclosure; Fencing and signage around site perimeter; Annual sustainability reporting; Retrenchment planning in decommissioning.
Enhancement	Recruitment Policy stating requirement to prioritise local employment (this will also be reflected in contractor's employment policy) especially for women, Karakalpaks and other ethnic minorities; Apprenticeship programs; Community investment programme; Tuberculosis testing and immunization Special measures to promote employment and other benefits to women Karakalpaks and other ethnic minorities

7.6 Summary of Impacts, Mitigation and Residual Significance

The significance of identified and assessed impacts can change through implementation of mitigation and enhancement measures. The residual effects of the Project's social impacts are identified in Table 7.31.

Table 7.31: Summary of Impacts and Residual Significance

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation & Enhancement	Residual Significance
Construction						
Construction works	Potential Impacts on Karakalpaks and Ethnic Minorities	Medium	Minor-Moderate	Minor-Moderate beneficial	Employment quotas proportional to ethnic distribution in the districts / region	Moderate beneficial
Construction works	Land allocation and reallocation	Low	Minor	Insignificant	Dossier maintained on land acquisition	Insignificant
Construction works	Employment generation	Low to Medium	Moderate	Moderate beneficial	Local skills utilisation (reflected in Recruitment Policy, see ESMP, Volume IV) and the contractor's employment policy. Apprenticeships and training of local workforce Local procurement Financial management seminars and money management brochures Staff grievance mechanism Workers' Code of Conduct Training of all international workers in cultural sensitivities of Ethnic Karakalpak and Kazakh communities (via brochures)	Moderate-Major Beneficial

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation & Enhancement	Residual Significance
Construction works	Risks to health, safety and security of workers on site and in construction accommodation	Medium	Major	Moderate adverse	Project commitments to workers' rights in accordance with international standards to be reflected in Uz-Kor and contractor's Human Resources Policies Occupational H&S management Ensure contractors undertake comprehensive HAZOPS Toolbox talks on OHS risk issues Emergency preparedness and response plan Provision of accommodation to international standards Tuberculosis testing Cultural sharing and tolerance training, especially in relation to the cultural practices of Karakalpaks and Kazakhs	Insignificant
Construction works	Risks to health, safety and security of local communities	Low	Major	Minor adverse	Site security measures Emergency preparedness and response plan Deployment of Gas Rescue Squad Community health safety and security leaflets HIV/AIDS awareness sessions Community grievance mechanism	Insignificant
Construction works	Infrastructure development	High	Moderate	Moderate beneficial	Provision of accommodation to international standards; Community investment programme	Moderate Beneficial
Construction works	Induced development	High	Moderate	Moderate adverse	Local skills utilisation (also reflected in Recruitment Policy, see ESMP, Volume IV) Apprenticeships Local procurement Tuberculosis testing Financial management seminars Workers' Code of Conduct	Moderate Beneficial

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation & Enhancement	Residual Significance
Operations						
Operation of gas field, pipelines and UGCC	Potential Impacts on Karakalpaks and Ethnic Minorities	Medium	Minor-Moderate	Minor-Moderate beneficial	Preferential employment generation	Moderate beneficial (in accordance with ADB SR3, impact is category B - "limited").
Operation of gas field, pipelines and UGCC	Permanent employment	Medium	Moderate	Moderate beneficial	Project commitments to workers' rights in accordance with international standards to be reflected in Uz-Kor and contractor's Human Resources Policies Local skills utilisation Apprenticeships Tuberculosis testing Workers' Code of Conduct Training of all international workers in cultural sensitivities of Ethnic Karakalpak and Kazakh communities (via brochures) Staff grievance mechanism	Moderate-Major Beneficial
Operation of gas field	Risks to health, safety, security and well-being of operational workers and their families	Medium	Moderate	Moderate adverse	Uz-Kor to develop health and safety management system Ensure contractors undertake comprehensive HAZOPS Toolbox talks on OHS risk issues Emergency preparedness and response plan Provision of accommodation to international standards HIV/AIDS awareness raising	Insignificant

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation & Enhancement	Residual Significance
Operation of gas field	Risks to health, safety and security of local communities	Major	Low	Minor adverse	Site security measures Emergency preparedness and response plan Deployment of Gas Rescue Squad Provision of Additional Community Facilities and services in the Akchalak Settlement HIV/AIDS awareness raising Community health, safety and security awareness raising Guided tours Community grievance mechanism	Minor beneficial (mainly as a result of the provision of additional facilities and services in the Akchalak settlement
Operation of gas field, pipelines and UGCC	Industrial development revenue and national energy security	Medium	Moderate	Moderate beneficial	Community investment program	Moderate Beneficial
Provision of fire fighting services	Use extended to Akchalak community	Medium	Minor	Minor beneficial	Provision of training and jobs for local people	Minor Beneficial
Decommissioning						
Decommissioning	Retrenchment of staff			Such a future scenario makes it is difficult to produce an accurate and meaningful prediction of the significance of impacts and their effects	Retrenchment planning	Too far in the future to accurately assess
Decommissioning	Redundant facilities and unused land				Site safe and returned to initial state or improved in terms of amenity	

7.7 Proposed monitoring and reporting

ADB SPS SR1 requires external/independent and internal monitoring of all Category A projects on a semi-annual basis. Semi annual monitoring reports will disclosed on ADB website in full and to affected people in a form and language (Uzbek, Karakalpak and Kazakh) they can understand.

Monitoring of social issues will be important, especially with regards to worker management, workers' terms and conditions (including the labour accommodation), occupational health and safety and grievances. Internal and external monitoring will need to ensure that the Project commitments to worker's rights are implemented, in particular with regards to:

- Use of child labour;
- Payment of minimum wages and overtime;
- Not taking any action to prevent employees from exercising their right of association and their right to organise and bargain collectively;
- Ensuring no workers are charged fees to gain employment on the Project;
- Implementation of plans, procedures and training for occupational health and safety;
- Non-discrimination and equal opportunity;
- Use of the labour grievance mechanism;
- The existence of human resource policies, job descriptions, written contracts;
- Provision of information to labour force regarding rights and working conditions; and
- Employee training activities.

Adherence to the OHS plan and procedures will be taken seriously and audited frequently. A warning system for violations and non-compliance will be established and implemented for the monitoring system to be effective. The Project will aim to reduce the number of accidents among Project workers to a rate of zero, especially accidents that could result in lost work time, disability, or even fatalities. Uz-Kor will also audit contractors' workers' accommodation camps.

Regular monitoring of the project performance grievance mechanism and stakeholder engagement needs to take place. The impact of the enhancement activities, including community investment program, will also be required.

7.7.1 Annual Sustainability Reporting

Annual reporting, based on monitoring results, will be a project requirement. It will address the full range of social issues addressed in this SIA, including but not limited to details on:

- The labour profile and OHS performance;
- The land allocated;
- Contributions to the local economy;
- CIP investments, activities and outcomes; and
- Stakeholder engagement.

Two of the most common frameworks used by international private sector companies for annual sustainability reporting are the Global Reporting Initiative (GRI) and UN Global Compact. The GRI's Sustainability Reporting Framework sets out the principles and performance indicators which organisations can use to measure and report their economic, environmental, and social performance. The GRI has been working with the IFC to align some of its reporting requirement with the IFC's PS. The Global Compact is a framework for businesses that voluntarily commit to aligning their operations and strategies with ten universally accepted principles in the areas of human rights, labour, the environment and anti-corruption. Global Compact companies are expected to:

- Set in motion changes to business operations so that the Global Compact and its principles become part of its strategy, culture and day-to-day operations;
- Publicly advocate the Global Compact and its principles; and
- Annually communicate on progress in implementing the ten UN Global Compact principles.

Using either approach for the Project's annual s reporting will contribute to a positive corporate reputation.

7.8 Legislative Compliance

7.8.1 Uzbekistan Legislation and Policy

In accordance with legislation in Uzbekistan there are specific actions which the Project must undertake in order to demonstrate compliance.

Table 7.32: Social Laws of Uzbekistan and Project Compliance

Legislative Requirements	How Project Compliance will be Achieved
Land Code of the Republic of Uzbekistan (1998)	All land allocation for the Project has been and will be conducted in accordance with the Land Code of the Republic of Uzbekistan.
The Labour Code of the Republic of Uzbekistan (1996)	The Project will promote fair and safe labour conditions, protect the labour rights and occupational health of employee and ensure that the interests of employees, employers and the state are upheld in accordance with the national law. This will include: observing national minimum wages and requirements regarding hours of work; not restricting the rights of workers to organise and bargain collectively; ensuring no workers are charged fees to gain jobs; ensuring rigorous H&S standards are in place; and basing employment decisions on principles of non-discrimination and equal opportunity.
Law No.839-XII on Occupational Health and Safety (1993) and supporting legislation	
Law No.265-I on Protecting Health of Citizens (1996) and supporting legislation	In order to protect the health of citizens, the Project will have an emergency preparedness and response plan, HIV/AIDS awareness initiatives, TB testing for employees, a gas rescue squad and a fire fighting service.
Women's Rights and Gender Equality laws	Uz-Kor's Recruitment Policy which is discussed in the ESMP (Volume IV) will have stipulations for non-discrimination in employment of staff and equal opportunities for all. In addition, women carrying out the same work as men will be paid the same wages. There will be local skills training which will be open to women and a quota for the number or value of contracts provided to local women business owners.
National Social Protection Policy, Strategies and Legislation	In support of local communities, Uz-Kor are investing in infrastructure in Akchalak, providing health and safety information in the form of leaflets about emergencies and prevention of HIV/AIDS, and investing in training so that people can take up employment opportunities. Local people and companies will be prioritised for recruitment and procurement wherever possible.

7.8.2 International Requirements

7.8.2.1 Asian Development Bank

Table 7.33: ADB Requirements and Project Compliance

Safeguards	How Project Compliance will be Achieved
Environmental safeguards (SR1)	This report constitutes the ESIA, and sets out the proposed management and mitigation actions for the significant environmental impacts. It also provides an explanation of meaningful consultation, a PCDP and includes an ESMP for the management of environmental impacts. In support of local communities, Uz-Kor are investing in infrastructure in Akchalak, providing health and safety information in the form of leaflets about emergencies and prevention of HIV/AIDS, and investing in training so that people can take up employment opportunities. Local people and companies will be prioritised for recruitment and procurement wherever possible.
Involuntary resettlement safeguards (SR2)	The Project will not result in any physical or economic displacement of people therefore, ADB Safeguard Requirement 2: Involuntary resettlement is not triggered. The lands for this Project will be allocated as “Lands of industry, transport, communication, defence and other purposes.” No compensation or entitlements have been or are expected to be paid to other land users as there is no land use other than herders who use a small section of the land near the UGCC on a rotational and non-uniform basis. Dossier to be maintained on land acquisition.
Indigenous peoples safeguards (SR3)	Indigenous peoples safeguards (SR3) is not triggered as ethnic Karakalpak people are not considered to meet all four of the ADB defining characteristics of Indigenous Peoples •
Social Protection Strategy	For the protection of workers, the Project has defined a recruitment plan, a retrenchment plan and has established a labour grievance mechanism. Furthermore, as part of their Human Resources policy, Uz-Kor will: • not obstruct freedom of association and the right to collective bargaining, • eliminate discrimination in employment and occupation; • eliminate of all forms of forced and compulsory labour; and • not employ child labour.
Gender Policy	The need for detailed gender analysis has not been identified in relation to this Project. However, gender issues are considered throughout the SIA and efforts have been made to encourage women’s involvement in the Project and the realisation of benefits to women. There will be local skills training for women and a 10% quota for the value of contracts provided to female business owners (subject to adequate quantity of proposals from female business owners).

7.8.2.2 International Finance Corporation (IFC)

Table 7.34: IFC Requirements and Project Compliance

Performance Standards	How Project Compliance will be Achieved
IFC Performance Standard 1 - Assessment and Management of Social and Environmental Risks and Impacts	This ESIA and the ESMP meet the requirements for identification and mitigation of impacts set out in IFC PS1. Consultation to be guided, monitored, recorded and reported according to PCDP. Benefit sharing: ■ Community investment programme ■ Provision of training and jobs for local people
IFC Performance Standard 2 – Labour and Working Conditions	Project commitments to workers' rights in accordance with international standards Local skills utilisation Apprenticeships Local procurement Financial management seminars Workers' Code of Conduct Occupational H&S management Provision of accommodation to international standards Retrenchment planning Monitoring: ■ Prohibition on use of child labour; ■ Payment of minimum wages and overtime; ■ Not taking any action to prevent employees from exercising their right of association and their right to organise and bargain collectively; ■ Ensuring no workers are charged fees to gain employment on the Project; ■ Implementation of plans, procedures and training for occupational health and safety; ■ Non-discrimination and equal opportunity; ■ Use of the labour grievance mechanism; ■ The existence of human resource policies, job descriptions, written contracts; ■ Provision of information to labour force regarding rights and working conditions; and ■ Employee training activities.
IFC Performance Standard 4 – Community Health, Safety and Security	Site security measures Emergency preparedness and response plan Deployment of Gas Rescue Squad Provision of Additional Community Facilities and services in the Akchalak Settlement Community investment program Provision of training and jobs for local people Decommissioned site to be made safe and returned to initial state or improved in terms of amenity
IFC Performance Standard 5 – Land Acquisition and Involuntary Resettlement	Maintain dossier on land acquisition
IFC Performance Standard 7 – Indigenous Peoples	Therefore, this PS is not triggered as there are no adverse impacts on indigenous peoples predicted.

Performance Standards	How Project Compliance will be Achieved
	This issue is addressed earlier within this Section.
IFC EHS General Guidelines and sector specific guidelines: ■ Electric Power Transmission and Distribution (April 2007); ■ Gas Distribution Systems (April 2007); ■ Natural Gas Processing (April 2007); ■ Onshore Oil and Gas Development (April 2007); ■ Petroleum-based Polymers Manufacturing (April 2007); and ■ Thermal Power Plants (December 2008)	Project commitments to workers' rights in accordance with international standards Occupational H&S management Provision of accommodation to international standards Occupational H&S ■ Management ■ Use of Personal Protective Equipment (PPE) ■ Hazard Operational Studies (HAZOP) to identify hazards and formulate appropriate management plans ■ Use of a formal Permit to Work (PTW) system to ensure that all potentially hazardous work is carried out safely and ensures effective authorization of designated work, effective communication of the work to be carried out including hazards involved, and safe isolation procedures to be followed before commencing work ■ Provision of specialised first aid providers ■ Specific provision of measures to avoid and mitigate impacts related to the following: – Fire and explosion; – Air quality; – Hazardous materials; – Transportation; and – Well blowouts; Development of an Emergency Preparedness and Response Plan Community Health and Safety: ■ An adequate safety zone around the facilities should be established based on a risk assessment; ■ A community emergency preparedness and response plan that considers the role of communities and community infrastructure as appropriate should also be developed; ■ To prevent public contact with dangerous locations and equipment and hazardous materials, access deterrents such as fences and warning signs should be installed around permanent facilities and temporary structures with controlled access points (guarded gates); ■ Means for detecting intrusion (for example, closed-circuit television) should be considered. To maximize opportunities for surveillance and minimize possibilities for trespassers, the facility should have adequate lighting; ■ Where security personnel are used appropriate due diligence must be performed on the company and the individuals; ■ Public training to warn of existing hazards, along with clear guidance on access and land use limitations in safety zones or pipeline rights of way should be provided; and ■ Vehicular traffic signs should clearly designate the separate entrances for trucks / deliveries and visitor / employee vehicles.

7.9 Statement of Significance

This Chapter has looked at how people's way of life may change as a result of the Project in terms of the way they live, work and interact with one another on a day-to-day basis. Almost all the impacts will be beneficial, especially if a full range of mitigation and enhancement measures that are recommended are implemented. The SIA concludes that in terms of socio-economic and community impact and effects, the Project will be of moderate beneficial significance to the local community and the region.

8. Ecology and Biodiversity

8.1 Introduction

8.1.1 Overview of the Assessment

This chapter represents the Ecological Impact Assessment (EcIA) of the Project. It identifies the relevant framework of nature conservation legislation, and identifies and assesses potential significant adverse impacts, before defining appropriate mitigation, compensation and enhancement measures that will be implemented as part of the Project.

The purpose of the international ecological impact assessment is to identify potentially significant adverse impacts on ecological baseline of national and international ecological importance. The baseline includes protected areas, habitats and species with information being used from primary and secondary sources.

8.1.2 General Approach

8.1.2.1 Background

Uzbekistan is a signatory of the Convention on Biological Diversity (CBD), whereby the CBD defines biodiversity as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems". As a signatory, Uzbekistan has a responsibility to safeguard its biodiversity and in accordance with Article 14 of CBD as far as possible and as appropriate to introduce procedures requiring environmental impact assessment of proposed projects likely to have significant impacts on biological diversity and to introduce arrangement to ensure environmental consequences of its policies and procedures are duly taken into account.

8.1.2.2 Spatial Scope

The impact assessment for the ESIA follows IFC Performance Standard Number 6 (IFC PS6) guidance on ecological impact assessments. This includes the allocation of a conservation value to the ecological features (protected sites, habitats and species) which are likely to be directly or indirectly impacted by the Project within a Zone of Influence (ZoI). Under the IFC guidance, the requirements of PS6 apply to projects in all habitats, whether or not those habitats have been previously disturbed and whether or not they are legally protected. Specifically a project is required to:

- Assess significance of project impacts on all levels of biodiversity as an integral part of social and environmental assessment process;
- Take into account differing values attached to biodiversity by specific stakeholders;
- Identify impacts on ecosystem services; and
- Assess major threats to biodiversity, especially habitat destruction and invasive alien species.

Where critical or legally protected areas are likely to be affected the developer must retain qualified and experienced external experts to assist in the assessment.

Habitat destruction is recognised as a major threat to maintenance of biodiversity and to assess likely significance of impacts, PS6 makes the following recommendations depending on habitat status:

- Modified Habitat: exercise care to minimise any conversion or degradation of such habitat, depending on scale of project, identify opportunities to enhance habitat and protect and conserve biodiversity as part of operations.
- Natural Habitat: developer will not significantly convert or degrade such habitat unless no financial/technical feasible alternatives exist, or overall benefits outweigh cost (including those to biodiversity), and conversion or degradation is suitably mitigated. Mitigation must achieve no net loss of biodiversity where feasible; offset losses through creation of ecologically comparable area that is managed for biodiversity, compensation of direct users of biodiversity.
- Critical Habitat: in areas of critical habitat the developer will not implement project activities unless there are no measurable adverse impacts on the ability of the critical habitat to support established populations of species described or on the functions of the critical habitat; no reduction in population of a recognised critically endangered or endangered species and lesser impacts mitigated as per natural habitats.

As defined by IFC PS6, a 'critical' habitat is a subset of both natural and modified habitat that deserves particular attention. Critical habitat includes areas with high biodiversity value, including: habitat required for the survival of critically endangered species (IUCN); areas having special significance for endemic or restricted-range species; sites that are critical for the survival of migratory species; areas supporting globally significant concentration or numbers of individuals; areas with unique assemblages of species, and areas having biodiversity of significant social, economic or cultural importance to local communities.

8.1.2.3 Structure of the Report

Section 8.2 of this Chapter provides details regarding the survey and impact assessment methodology. Section 8.3 describes the ecological baseline conditions across the entire area of the Project, and Section 8.4 includes the impact assessment for each component of the Project. Section 8.6 then summarises the residual effects, the monitoring requirements and a statement of significance.

8.2 Methodology and Assessment Criteria

8.2.1 Overview

The objectives of this Chapter of the ESIA were met by obtaining baseline information from within the ZoI (see definition below) from a wide range of sources, this included:

- A desk study to review previous information and available reports;
- Field reconnaissance surveys; and
- Detailed ecological surveys undertaken by the LEC.

8.2.2 Ecological Zone of Influence

As part of this ecological assessment, all ecological features within the ZoI of each of the Project components were investigated. The ZoI includes:

- Areas directly within the land take for the proposed development and access;
- Areas which will be temporarily affected during construction;
- Areas likely to be impacted by hydrological disruption; and
- Areas where there is a risk of pollution and noise disturbance during construction and /or operation.

A ZoI was identified as a distance of the footprint of each components of the Project, this included:
- Protected sites within 10 km;
- Habitats within 500 m;
- Flora within 500 m;
- Fauna within 500 m; and
- Migratory species (birds and mammals) within 2 km of each component.

Baseline information was gathered from secondary data sources for the vast majority of the ZoI and in addition targeted surveys were undertaken to further investigation specific areas of interest within the ZoI. This approach allowed sufficient information to be gathered to characterise the ZoI for assessment purposes.

8.2.3 Legislative & Policy Background

8.2.3.1 International Conventions

The following international conventions and guidelines are considered applicable to the Project: and will be referred to as relevant during the impact assessment and evaluation process:
- Convention on Biological Diversity (CBD), 1992;
- Convention on Wetlands of International Importance (Ramsar Convention), 1971;
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1975; and
- Bonn Convention on the Conservation of Migratory Species of Wild Animals, 1979 (as amended).

8.2.3.2 National Legislation and Guidance

Biodiversity Policy and Strategies

The national biodiversity policy in Uzbekistan is based on the provisions of 1992 National Constitution defining that flora and fauna as well as other natural resources are protected by the state and considered to be resources of national wealth subject to sustainable use (Article 55) and is governed to a certain extent by the respective commitments undertaken by Uzbekistan under international conventions and memorandums signed and ratified by RUz.

Two key policy documents for the conservation in biodiversity in Uzbekistan are:
- National Biodiversity Strategy and Action Plan (NBSAP) (United Nations Office in Uzbekistan), 1998; and
- National Action Plan for Environmental Protection and Ecological Provisions for Uzbekistan's Sustainable Development (NAPEESD), 1999.

The NBSAP, developed and approved in 1998, outlines the country commitments under the Convention on Biological Diversity (1992), ratified by RUz in 1995 in recognition of the importance of biodiversity conservation for the purpose of sustainable development. One of the main objectives of NBSAP is to set up a sustainable system of protected natural areas covering over 10% of the total area in the country. Ratification of the Convention on Biological Diversity (1992) provided Uzbekistan with an access to international financial sources and foreign investments in biodiversity conservation including to improve the system of protected natural areas.

The NAPEESD was developed in 1999 with the assistance of the World Bank to ensure a unified approach to environmental planning. The biodiversity strategy was incorporated into the NAPEESD as one of its major components.

Species of national importance are all listed in the Uzbekistan Red Data Book (UzRDB), and all species listed within the UzRDB are legally protected.

Biodiversity Regulators

Biodiversity regulators in Uzbekistan include:
- Goskompriroda; and
- Ministry of Agriculture and Water Resources (MAWR).

The Goskompriroda is the primary regulator. Within Goskompriroda, the State Inspectorate for Flora and Fauna Conservation (Gosbiocontrol) is responsible for biodiversity and protected natural areas. Gosbiocontrol exercises compliance supervision and regulation through the network of its regional and local branches including Gosbiocontrol of the Republic of Karakalpakstan reporting to the central body of Gosbiocontrol in Tashkent.

The Central Forestry Authority within MAWR has direct responsibility for forests and forest resources, including the protected natural areas. It monitors compliance, defines forestry policy and legislation.

Biodiversity management and conservation in Uzbekistan are regulated through a range of national and regional laws and regulations.

Table 8.1 contains a non-exhaustive reference list of national and regional biodiversity-related legislation applicable to the Project.

Table 8.1: National and regional biodiversity-related legislation

Category	Legislation
National laws	Law No.754-XII of the Republic of Uzbekistan on Nature Protection of 09.12.1992 (as amended on 04.01.2011)
	Law No.543-I of the Republic of Uzbekistan on Protection and Use of Flora of 26.12.1997 (as amended on 04.01.2011)
	Law No.545-I of the Republic of Uzbekistan on Protection and Use of Fauna of 26.12.1997 (as amended on 04.01.2011)
	Law No.770-of the Republic of Uzbekistan on Forestry I of 14.04.1999 (as amended on 04.01.2011)
	Law No.171-II of the Republic of Uzbekistan on State Cadastres of 15.12.2000 (as amended on 04.01.2011)
	Law No.710-II of the Republic of Uzbekistan on Protected Natural Areas of 03.12.2004
National decrees and regulations	Decree of the Cabinet of Ministers of Uzbekistan on the Red Book of the Republic of Uzbekistan No.109 of 09.03.1992
	Decree of the Supreme Council of Uzbekistan on Reinforcement of the Protection of Valuable and Endangered Species of Flora and Fauna and Harmonisation of their Use No.937- XII of 03.09.1993
	Decree of the Cabinet of Ministers of Uzbekistan on Establishing Quotes for the Calculation of Penalties for Damage Caused to Flora of Uzbekistan No.293 of 27.07.1995 (as amended on 01.04.2005)
	Decree of Oliy Majlis of Uzbekistan on Enacting Law No.543-I of the Republic of Uzbekistan on Protection and Use of Flora No.544-I of 26.12.1997

Category	Legislation
	Decree of the Cabinet of Ministers of Uzbekistan on Approving the Regulations on the National Protected Natural Areas Cadastre of the Republic of Uzbekistan №104 of 10.03.1998
	Decree of the Cabinet of Ministers of Uzbekistan on the National Biodiversity Strategy and Action Plan of the Republic of Uzbekistan №139 of 01.04.1998 (as amended on 19.09.2000)
	Decree of Oliy Majlis of Uzbekistan on Enacting Law No.770-of the Republic of Uzbekistan on Forestry of No.771-I of 15.04.1999
	Decree of the Cabinet of Ministers of Uzbekistan on Approving Specific Regulations Relating to Forests Conservation №506 of 22.11.1999
	Decree of the President of Uzbekistan on the Transformation of the State Forestry Committee of the Republic of Uzbekistan into the Central Forestry Authority under the Ministry for Agriculture and Water Resources of the Republic of Uzbekistan №UP-2536 of 07.02.2000
	Decree of the Cabinet of Ministers of Uzbekistan on Approving the Regulations on the Forest Categorisation Procedure of the Republic of Uzbekistan №215 of 05.06.2000
	Decree of the Cabinet of Ministers of Uzbekistan on Approving the Regulations on the National Flora Cadastre of the Republic of Uzbekistan and the National Fauna Cadastre of the Republic of Uzbekistan №343 of 05.09.2000
	Decree of the Cabinet of Ministers of Uzbekistan on Approving Forest Categories of the Republic of Uzbekistan №163 of 09.04.2001
	Decree of the Cabinet of Ministers of Uzbekistan "Regulations on National Environmental Monitoring in Uzbekistan to Coordinate Monitoring Activities of Ministries and Agencies" No.111 of 03.04.2002
	Decree of the Cabinet of Ministers of Uzbekistan on Enhancing Control of Biological Resources Management, Import and Export from the Republic of Uzbekistan No.508 of 28.10.2004
	Decree of Oliy Majlis of Uzbekistan on Enacting Law No.710-II of the Republic of Uzbekistan on Protected Natural Areas No.711-II of 03.12.2004
	Regulations on the Forest Service approved by Decree of the Cabinet of Ministers of Uzbekistan No.203 of 09.09.2008
Biodiversity legislation of Karakalpakstan	Law on Nature Protection (03.03.06)
	Law on Protected Natural Areas (29.08.05)

8.2.3.3 Biodiversity Policy and Strategies for the Oil & Gas Sector

In addition to international requirements as stipulated within the CBD and requirements in accordance with national legislation, the Government of Uzbekistan, supported by the Global Environment Facility (GEF) is currently involved in a project to mainstream biodiversity into Uzbekistan's oil and gas sector policies and operations (GEF, July 2010). The two specific components of the project are:

- Enabling policy, legislative and institutional environment for mainstreaming biodiversity conservation concerns in the oil-and-gas sector; and
- Demonstrating biodiversity mainstreaming technologies on the ground.

Specific expected outcomes from the project include:

- Laws on subsurface resources, terrestrial planning and protection and use of flora and fauna, with "avoid-reduce-remedy-offset" principles;
- National maps of areas where oil & gas activities are to be avoided, allowed and restricted;
- Amendments to the State Ecological Examination and EIA instruments;
- Capacity building for key state and private institutions to enable enforcement of biodiversity and environmental policies;
- Production of a guidebook for oil-and-gas biodiversity conservation approaches;

- Demonstration of biodiversity risk mitigation measures, this has now included the setting-up of a monitoring area to assess biodiversity risks across the Ustyurt Plateau which includes the Project area covered within this ESIA;
- Integration of avoidance and mitigation technologies into the design of a major oil-and-gas development within the Ustyurt Plateau; and
- Introduction of biodiversity offsetting schemes.

8.2.4 Consultation

Full details regarding consultations are provided in Chapter 6.

As part of the ESIA and understanding local interest in the Project the following organisations were consulted with regards to ecology and biodiversity matters:

- State Committee of the Republic of Uzbekistan for Nature Protection - Goskompriroda;
- Ministry of Agriculture and Water Resources (MAWR) of the Republic of Uzbekistan;
- Committee of Management of the Sudoch'ye Lake (CMSL) - during the formal public consultation event at Kungrad and formal communications with Uz-Kor;
- Bird Conservation Society of Uzbekistan, Tashkent;
- Institute of Biology of the Academy of Sciences of the Uzbekistan Academy of Sciences;
- Institute of Zoology of the Academy of Sciences of the Uzbekistan Academy of Sciences;
- SPE Botanica of the Academy of Sciences of the Uzbekistan Academy of Sciences;
- Institute of Microbiology of the Academy of Sciences of the Uzbekistan Academy of Sciences;
- Lower Amu Darya River Basin Management Board ('NABUIS'), Ministry of Agriculture and Water Resources; and
- Aral Basin Delta Management (ABDM).

Consultation and issues raised as part of the scoping responses with regards to ecology and biodiversity issues are summarised in Table 8.2.

Table 8.2: Summary of Key Consultation Responses

Name of Organisation	Key Concerns	Comment
Committee of Management of the Sudoch'ye Lake (CMSL)	Formal communications from CMSL "Project "Sudoch'ye" is a component of 1-(E) of an international project "Water supply to coastal areas of the Aral Sea and the environmental protection". Hence if the object "Sudoch'ye" serves as a security facility of the environment through the water supply, the Soda factory and UGCC serve as facilities for economic development of the country. According to the similar chemical objects of Soviet period it is known, what negative influences on environment will be during the building and the further operation of UGCC. It is also necessary to notice that there are modern technologies for recycling of wastes. But at the same time at designing of such objects, such technologies cannot be considered, in connection with haste of performance of the project or with the lack of technology. Therefore, for environmental contamination prevention, first of all, the guarantee at the state level is necessary, i.e. building and the further operation of UGCC should correspond to requirements of the State Ecological Examination and corresponding laws of RU and RK on nature protection, and in a case of not conformity to the requirements, it will lead to a project suspension"	Response from Uz-Kor "As you know, the project carried out in accordance with the Decree of the President of the Republic of Uzbekistan # 797 from 18.02.2009 and # 1168 from 04.08.2010. To implement the project, it is expected to attract funding on the basis of the conditions of the project financing, i.e. the fixed assets will be attracted from the international financial institutions like ExIm Bank of Korea, Asian Development Bank, etc. In accordance with the requirements of project financing, before approval of funding, the comprehensive environmental assessment by the independent international company should be carried out. The issue of conformity of the project to all ecological norms and standards is very important for attraction of funding and in the case of no compliance with any ecological standards, funding for the project would not be possible. But the most important thing is that the project should meet all requirements of Republic Uzbekistan on ecology. Considering the above-stated, we can assure you that at designing and building of the factory and all connected infrastructure all features of region will be considered and observance to all ecological norms and standards will be provided" This ESIA provides re-assurance that there will be no significant impact on the Sudoch'ye Lake State Sanctuary.
Institute of Biology of the Academy of Sciences of the Uzbekistan Academy of Sciences;	Review of the ecological impacts of the Project on the biodiversity. The key issues raised by the Institute of Biology: • This project site has no negative factors of anxiety, the negative impact on the migratory route of Saiga antelope. • While implementing the "Construction of Ustyurt GCC on Surgil field with field development" certainly there are problems with biodiversity conservation at project area, in particular the problems of the avifauna and Saiga.	The Institute of Biology independently confirm that the Project would not have a significant impact on Saiga and migratory bird species. These key concerns have been addressed within this ESIA, and a range of mitigation and biodiversity offsetting measures are being implemented.

Name of Organisation	Key Concerns	Comment
	• Anthropogenic disturbance of natural ecosystems of Surgil field causes scarcity of biodiversity area. This water area does not provide the necessary living space, is not significant for birds in the nesting period. Many birds in this region deviate from the original migration route, due to factors - lack of food in the area which leads to the weak migration of birds. • During the migration of birds prefer to fly at different height and therefore, at the height of bird migration project area does not create barriers. • Analysis of bird's migration shows that the bigger part of Sudoch'ye wetland birds fly to the northeast and the smaller part to the west. In April, most birds fly to the north-east, in May fly to the east and west due to the feed migration to the Muynak and Sarybas gulfs and further to Siberia. • Queries relating to the "Construction of Ustyurt GCC on Surgil field with field development" require the preservation of biodiversity at this territory.	
Akchalak Magisterial Gas-Pipeline Operation worker	Will the construction of the plant have an impact on the health of local people and ecology, taking into account that the Ustyurt Plateau has environmental problems? Will the effect be similar to that of the Aluminium plant in Tajikistan on the health of people?	The ESIA (before the construction of the plant) will study local area from an ecological and social perspective. The results of these studies will be taken into account and will serve as a base for further realisation of the project and avoidance and mitigation of negative impacts. As for the negative impact on the health of people - the production is not poisonous or hazardous. Moreover all wastes and disposals from the project will be within the boundary limits of allowable national and international standards.
Resident of the Akchalak settlement	Where can the local community turn to in case of breach of ecological standards?	On any matters it is possible to address representatives of the JV and the local environmental consultant (Uzlitineftgaz) via e-mail or telephone, which are indicated on the posters.

8.2.5 Previous Studies

A desk study was undertaken to obtain baseline ecological information. This review focused on the identification of ecological features of international and national conservation value. Information was obtained from the following organisations and online resources:

- Birdlife International (Important Bird Areas);
- World Wildlife Fund (Key fact sheets);
- UN Environment Programme (UNEP);
- Saiga Conservation Alliance; and
- IUCN Red Data Book Database (Red list).

As part of the desk study, a review was undertaken of available reports from previous surveys and investigations from within the study area, this included the following information:

- Species composition, abundance and distribution of rare species of birds in the Southern Aral Sea in summer 2009 (Mitropolskiy, 2009). Bird Conservation Society of Uzbekistan;
- Incorporating environmental flows into water management in the Amu Darya river delta (Schluter, et al. undated);
- Important Bird Areas in Uzbekistan – Primary sites for conservation, Tashkent, Uzbekistan (Kashkarov et al., 2008);
- Geo-ecology of Ustyurt Plateau. Republic of Uzbekistan/ Regional ecology of the Central Asia. Contract areas of OAO Gazprom./ under the editorship of Professor P.V. Pankratiev, IPK GOU VPO Orenburg State University, 2009; and
- ESIA for the development and construction of Urga, Kuanysh and Akchalak group fields of the Ustyurt region (Neftegaztexnologiya Co Ltd).

In addition, as part of this study the Institute of Biology, Berdoq, undertook an independent review of the biological diversity of the Ustyurt Plateau (Matekova & Pirjanova, 2011) specifically in response to the development of this Project. This review was based on their local knowledge, previous experience and summary of previous studies and reports. A copy of this review is provided in Appendix H, Volume III. The Institute of Biology review and the reports listed above are all directly relevant in providing baseline ecological data used to assess the potential impacts of the Project on ecology and biodiversity.

8.2.6 Field Reconnaissance

Field reconnaissance was undertaken in February 2009 and June 2010, the reconnaissance included visits to all of the Project component sites including the upstream Surgil Field, the downstream UGCC and interconnecting pipeline locations. The reconnaissance made a broad assessment of the ecological importance of the sites and identified ecological sensitive areas. Subsequently, the scope of works and specification for more detailed ecological surveys was produced, to allow the ecological surveys and assessment to focus on the key ecological features and likely significant impacts. This work was undertaken by the LEC (see below).

8.2.7 Ecological Field Surveys

In addition to the review of previous studies relevant to the impact assessment for the Project, detailed ecological surveys of areas of specific interest within the ZoI to inform the ecological baseline for the ESIA were undertaken by Texnet ("Local Environmental Consultant") in July 2010 (Texnet 2010) and May/June 2011 (Texnet 2011) and by the Institute of Biology also in May 2011. The full and detailed reports are included in ESIA Volume III Appendix I. The ecological surveys undertaken by the LEC included:

- Descriptions of the vegetation types, formations and associations;
- Botanical surveys;
- Birds surveys;
- Mammal surveys; and
- Reptile surveys (including nocturnal surveys).

Detailed breeding and migratory bird surveys were not specifically undertaken as part of this ESIA, as extensive monitoring of birds within the ZoI of the Project had already been undertaken since 2007, and continue to be undertaken as part of the studies being carried out by the Bird Conservation Society of Uzbekistan. These previous and detailed bird surveys have been reviewed as part of this ESIA and provide a robust baseline assessment of the importance of bird within the ZoI.

The ecological surveys undertaken as part of this ESIA were undertaken at specific study areas; these locations were identified as either being of ecological interest or representative of the wider biodiversity within the ZoI.

The primary data collected during the ecological field surveys, and secondary data and information from the review of previous studies, including the review undertaken by the Institute of Biology, was then used to inform the impact assessment, as presented in this Chapter.

8.2.8 Assessment of Impact Significance

8.2.8.1 Determining Sensitivity and Magnitude

In accordance with IFC PS6, the conservation value (sensitivity) or weighting attributed to each ecological feature which occurs within the ZoI of the Project is highlighted within Table 8.3. The magnitude of the potential impacts upon each feature is then assessed for the construction and operation of the Project are presented in Table 8.4.

Table 8.3: Criteria for Determining Conservation Value (Sensitivity of the receiving environment)

Conservation value (sensitivity)	Examples	Species criteria	Habitat or Site Criteria
Very High	Very high importance and rarity. International scale with limited potential for substitution.	IUCN Critically endangered and endangered species.	Internationally designated sites (or equal status). Critical habitats of significant international ecological importance.
High	High importance and rarity, national scale, or regional scale with limited potential for substitution, species of international status but not within designated areas.	IUCN Vulnerable species. Nationally protected species of significant population size and importance.	Nationally designated sites (or equal status). Areas of critical habitats of national ecological importance, and natural habitats of significant ecological importance and/or high biodiversity with limited potential for substitution.
Medium	High or medium importance and rarity, local or regional scale, and limited potential for substitution, species of national status but not within designated areas.	IUCN Near Threatened species. Nationally protected species or rare species, but not a significant population size and not of national importance.	Regionally important natural habitats. Natural habitats. Modified habitats with high biodiversity or under significant threat of loss within the region.
Low	Very low or low importance and rarity, and local scale.	IUCN Least Concern. Species of local national importance.	Undesignated sites and habitats of natural habitats of some local biodiversity and cultural heritage interest. Modified habitats with limited ecological value. Other sites with little or no local biodiversity and cultural interest. Modified habitats with limited biodiversity value.
Negligible	Very limited ecological importance.	IUCN Least Concern species. Species of no national importance.	Highly modified habitats of no biodiversity value.

Table 8.4: Guidelines for Definition of Magnitude in the ESIA

Magnitude (positive or negative)	Definition (considers duration of the impact, spatial extent, reversibility and ability of comply with legislation)
Major	Fundamental change to the specific environmental conditions assessed resulting in long term or permanent change, typically widespread in nature (regional national and international), would require significant intervention to return to baseline; exceed national standards and limits.
Moderate	Detectable change to the specific environmental conditions assessed resulting in non-fundamental temporary or permanent change.
Minor	Detectable but minor change to the specific environmental conditions assessed.
Negligible	No perceptible change to the specific environmental conditions assessed.

The criteria categories in this section differ slightly from the criteria defined for the other specialist chapters. This is in recognition of the fact that they reflect the EcIA international guidance and are therefore deemed necessary to follow.

8.2.8.2 Assigning Significance

The significance has been determined by the interaction between the magnitude of impacts and the sensitivity of receptors affected, as depicted in the significance matrix shown in Table 8.5.

Table 8.5: Impact Significant Matrix

Magnitude (positive or negative)	Conservation value (sensitivity)				
	Negligible	Low	Medium	High	Very High
Negligible	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant
Minor	Insignificant	Insignificant	Slight	Moderate	Moderate
Moderate	Insignificant	Slight	Moderate	Large	Large
Major	Insignificant	Slight	Moderate	Large	Critical

As part of the impact assessment, appropriate mitigation and compensation measures are reviewed and included to minimise any potential adverse impacts of the Project on biodiversity. The residual impacts are then determined.

8.2.9 Data Limitations

The ecological surveys only focused on the typical habitats and areas of ecological interest. Due to the large scale of the Project it was neither possible nor practical to survey the entire Project area. As such, unexpected ecological features may arise during the course of construction and operation work. Where possible this assessment has considered the nature of potential unexpected ecological features and this is addressed directly in the ESMP (Volume IV).

8.3 Baseline Description

8.3.1 Overview

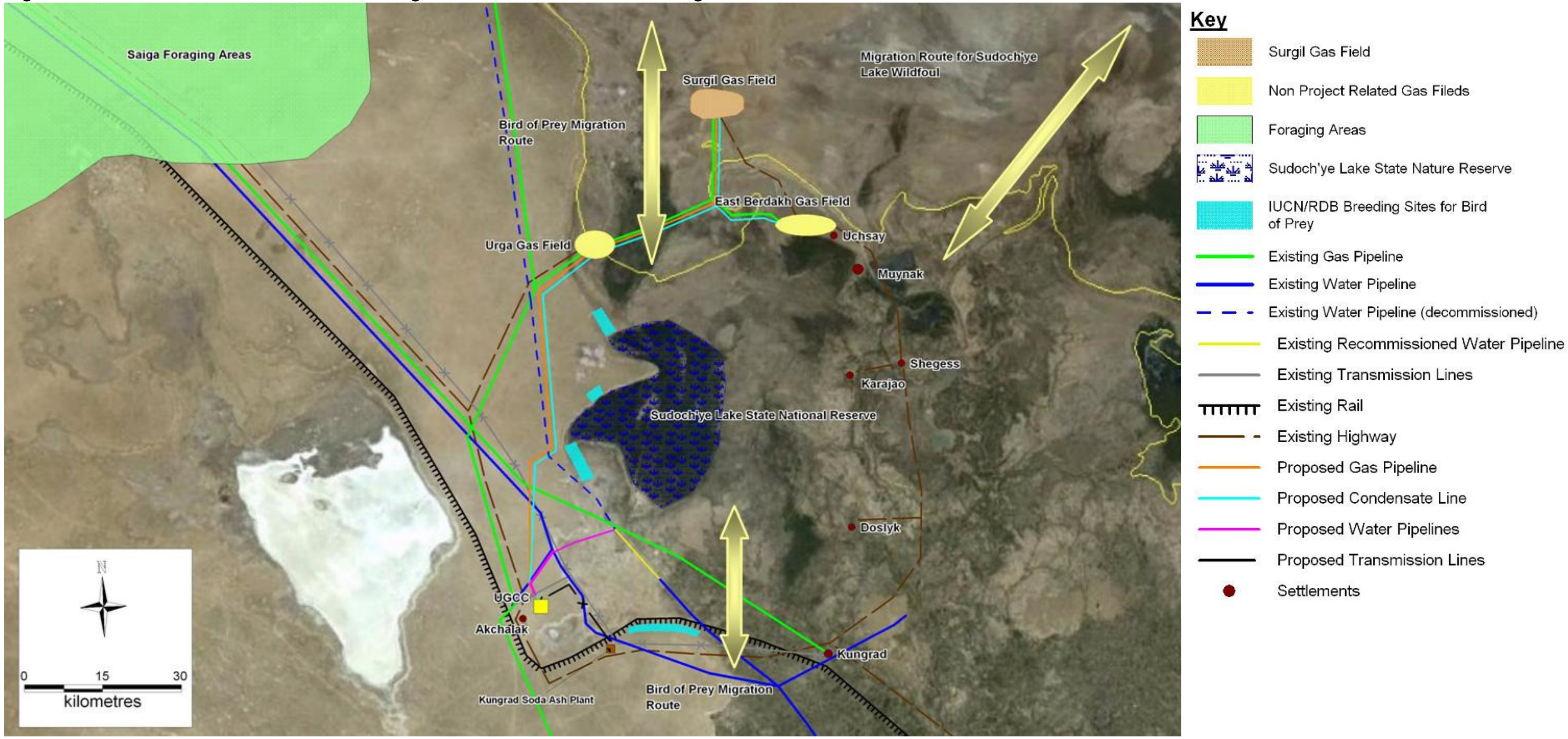
The following sections describe the ecological features which occur within the ZoI of the Project. Protected sites and important areas are covered in Section 8.3.2. The subsequent sections then summarize the key ecological features within each of the different areas of the Project, with a brief description of the habitats and information on the presence of protected and notable species of national or international ecological importance.

The section has been structured to reflect the habitat types that are found within the whole project ZoI rather than by project component. This approach reflects that fact that habitats and features span all three project components. Where appropriate the most relevant project components to which the feature or habitat relates to have been noted.

8.3.2 Protected Sites

Only one legally protected site is close but not within the ZoI of the Project, the Sudoch'ye Lake State Reserve and Important Bird Area (IBA). The Sudoch'ye Lake State Reserve is, at its closest point to Project activities is 3 km from the pipeline route, but is at least 50 km from the Surgil CGTU and 30 km from the UGCC. The Saigachy State Nature Preserve is located further a field away from the Project but also on the Ustyurt Plateau. Both of these sites are illustrated in Figure 8.1.

Figure 8.1: Location of Protected Sites, Migration Routes and Bird Nesting Areas



Source: MML

8.3.2.1 Sudoch'ye Lake State Reserve

The Sudoch'ye Lake is of international ecological importance and very high conservation value for holding globally threatened breeding and migratory bird species (Kashkarov *et al.*, 2008), as listed in Table 8.6. The Reserve covers 46 567 ha of open water, areas of dense reed beds, scrub habitats, saline lagoons, marshy grasslands, and saxual habitats. Sudoch'ye Lake is fed by channels sources from the Amu Darya River. The remaining Aral Sea is located to the north, the Ustyurt Plateau to the west and the Kyzylkum desert to the east.

The Sudoch'ye Lake State Reserve is currently being considered for inclusion as a wetland site of international importance for inclusion under the Ramsar Convention (i.e. a Ramsar site designation) and therefore is recognised as a potential receptor in the impact assessment phase.

Table 8.6: Key Species of Lake Sudoch'ye

Key species	Breeding population	Migration/Wintering populations
Dalmatian Pelican *Pelecanus crispus*	3 to 300 pairs	Up to 500
Ferruginous duck *Aythya nyroca*		Up to 200
White-headed duck *Oxyura leucocephala*	Up to 50 pairs	Up to 4,000
Greater spotted eagle *Aquila clanga*		2 to 5 on migration
Saker falcon *Falco cherrug*	1 to 3 pairs	
Asian Dowitcher *Limnodromus semipalmatus*		1 to 10 on migration
Slender-billed curlew *Numenius tenuirostris*		1 to 4 on migration

Source: Kashkarov et al 2008

8.3.2.2 Saigachy State Nature Preserve

The only other legally protected site within the region is the Saiga Nature Sanctuary which is within a wider Saiga foraging area. The Saiga foraging areas are, at the closest point, 45 km north west of any of the Project components and are therefore outside the direct ZoI of the Project and will not be directly impacted. The Saiga Nature Sanctuary within the wider foraging area is designated as an IBA. The key feature of the Nature Sanctuary is the Saiga *tatarica* antelope. These antelope have, however, been recorded within the ZoI of the Project and the impacts on these species are covered under Section 8.3.5.1 below.

8.3.3 The Semi-desert Biome and Vegetation Associations

8.3.3.1 Overview

Karakalpakstan occupies over more than 7.2 million hectares and represents a vast semi-desert biome. This biome is made up of various vegetation associations and over 50 different vegetation types and associations have been identified through primary survey (see Texnet 2010 report in Appendix I). The biome can be defined into two broad geographical areas:

- Former bed of the Aral Sea, which predominantly consists of:
  - Open drifting sand habitats with spare ephemeral plant species on the Aral Sea bed; and
  - Tamarsk thickets with halophytes.
- The Ustyurt Plateau, which predominantly consists of:
  - Tamarsk thickets with halophytes;

- Hummocky sands with Peganum associations;
- Grey-brown takyr with *Anabasis salsa* communities;
- Shrub and saxual communities;
- Grey-brown takyr with *Artemisia terrae-albae* communities; and
- Natural *Haloxylon aphyllum* communities.

Each of these areas is described in more detail below, along with a description of the vegetation found within the specific study areas.

8.3.3.2 The Former Bed of the Aral Sea

The former bed of the Aral Sea, on which the Surgil Field and part of the pipeline are being developed, is a vast area of homogenous, highly degraded habitats with low floristic and faunistic diversity. The former bed of Aral Sea is however, rather unique it is historical context and formation, with the area being slowly colonised by saline-tolerant vegetation. However, the vegetation communities within the Aral Sea are degraded and heavily modified of low conservation value.

The bed of the former Aral Sea is flat and largely un-vegetated, with sandy soils (with shells) and takyr-like soils. Secondary ephemeral ruderal communities include tamarisk, karabarak, saltwort, *Nitraria* sp., *Salsola rigida*, *Alhagi* sp, *Coroline caspica, Aeluropus sp*, *Peganum harmala*, seepweed, *Salsola paulsenii*, goosefoot, saltmarsh sea lavender, muchweed and swine's-bane. These all occur with patches of common reeds *Phragmites australis*.

In some areas tamarisk and saxaul dominate, with patches of annual and perennial herbaceous plants (*Alhagi* sp, *Coroline caspica*, *Aeluropus* sp., *Peganum* spp, seepweed, *Salsola paulsenii*, butter tree, *Eremopyrum buonapartis*).

Other areas are dominated with herb *Artemisia terrae–albae* with open patches of clay desert. The vegetation is represented by gypsophilic and psammophilous species with Haloxylon-Artemisia and Gramineou -Artemisia associations. Several species of graminaceous plants (*Stipa* sp., reed, *Aeluropus* sp.) and saltworts, *Climacoptera aralensis* and *Alhagi* sp. occur. Of the shrubs haloxylon, *Salsola arbuscula*, *Atraphaxis* sp., and tamarisks (2 species) dominate.

Haloxylon aphyllum (a large scrub which dominates the semi-arid biome, Figure 8.2) and *Anabasis -salsa* associations are dominant in many of the surrounding areas with several species of saltworts, ephemeras and ephemeroides species. Other species present include *Salsola arbuscula, Salsola rigida, Cornulaca korshinskyi*. Around the haloxylon desert *Salsola rigida* grows; there are also some bushes of *Alhagi* sp., *Coroline caspica*, *Climacoptera* sp., goosefoot, seepweed and butter tree.

Figure 8.2: Typical vegetation on the former Aral Sea bed at Surgil

Source: Texnet 2010 Report

8.3.3.3 The Ustyurt Plateau

The Ustyurt Plateau, on which part of the pipeline and the UGCC are being developed, occupies the northern part of the Aral-Caspian watershed. The plateau is limited by escarpment on almost all sides. In the east, the escarpment of Ustyurt defined much of the former western shore of the Aral Sea. In the south it is cut off to Kunya-Darya ancient alluvial plain and the valley Uzboy. In the west - to the hollow Karynyaryk and the sands of the North -Caspian Kara Kums, and in the north - to the Caspian lowland.

On the Ustyurt Plateau (Momotov, 1973), the vegetation can form monodominant communities with *Salsola arbusculiformis, Anabasis salsa, Artemisia terrae-alba, Haloxylon aphyllum* and *Salsola orientalis* communities. Less frequently, dominants and subdominant plant communities include *Salsola arbuscula, Atraphaxis spinosa, Stipa richteriana, S. hohenackeriana, S. gemmascens,* and *Nanophyton erinaceum.*

In the south of Ustyurt Plateau, large areas are occupied by monotonous vegetation cover of *Anabasis salsa* association, which creates a monotone gray background for many kilometres. A patchwork of associations of Anabasis, wormwood *Salsola arbuscula* and some other plants also occur in the central and northern parts of the Ustyurt Plateau.

In the less diverse areas of the Ustyurt Plateau the herbaceous vegetation is dominated by ephemeral plant species. The cover is often formed by one species with even distribution of plants in the entire area of the association. The associations of anabasis, wormwood, and haloxylon often appear this way. Only *Rheum tataricum*, *Atraphaxis spinosa* and *Stipa richteriana* are clearly visible against the background of wormwood and *Salsola arbuscula* (Figure 8.5).

The vegetation types across the Ustyurt Plateau can be regarded as being natural habitats and of medium conservation value, although some areas are regarded as being relatively modified due to previous development activities and disturbances. The open escarpment habitats with bare rock and scree are, however, regarded as being critical habitats due to the presence of breeding IUCN/RDB listed birds of prey, and this habitat is therefore regarded to be of high conservation value.

Key vegetation, flora and fauna associated with each of these communities / associations within each study area are described below. An indication of their conservation value is provided in Table 8.8.

Figure 8.3 *Rheum tataricum* in typical semi-arid vegetation on the Ustyurt Plateau

Source: TexNet 2010 report

An area of 'clay desert' is situated in the northeast of the Ustyurt Plateau and along the Ustyurt escarpment is dominated by an *Anabasis salsa-Artemisia* community. Adjacent to the cliff, the 'hilly clay desert' with a takyr-like surface is dominated by an *Artemisia* community. Further to the southeast the vegetation was largely of 'herb-Tamarix-Halostchys belangeriana' communities. On Akkum ridges the vegetation comprised of 'shrub-Haloxylon' communities with common reed, reedmace on wet areas. Figure 8.4 illustrates the Ustyurt escarpment.

Figure 8.4: The Ustyurt Escarpment

Source: Texnet Report

Further south the area largely comprises of greyish-brown takyr dominated by an *Artemisia* vegetation community (70-75% coverage). To the southwest the area is characterised by takyr with red pebbles and a *Salsola rigida-Anabasis salsa* community. Further southwest the Artemisia community persists and the terrain becomes rough with hills comprised of takyr and red pebbles. The terrain becomes uneven and sandy with fine pebbles further southwest and is dominated by *Artemisia terrae-albae* community.

The grey-brown takryr soil across the fields are dominated by *A. terrae-albae* with the associated herbaceous community, with *Salsola rigida-Anabasis salsa* covering 60-70%. Along the gas pipeline route the soil takes the form of a grey-brown takyr with small pebbles and is dominated by Gramineous-Artemisia vegetation. On the eastern side of the Ustyurt Plateau the flat plain is formed of a grey-brown takyr with small pebbles dominated by shrubs such as *S. rigida* and *A. salsa* with herbs including *Coroline caspica* and *P. harmala*. The grey-brown takryr soil of the cliff area near to Lake Akushpa supports a *Salsola rigida-Anabasis salsa* dominated community similar to that found on the eastern side of the Ustyurt Plateau. Further north the terrain slopes towards to the lake and the grey-brown takyr soil with small pebbles supports vegetation similar to that found on the eastern side of the Ustyurt Plateau. Secondary growth 'weed-ruderal' communities dominated the plateau cliff and include species such as tamarisk, *Atraphaxis* and *P. harmala*. Figure 8.5 illustrates the vegetation of the Akushpa plateau.

Figure 8.5: Vegetation of the Akushpa plateau

Source: Texnet report

The areas around the UGCC site is presented by saline gypsophyt desert with a dominance of *Anabasis salsa*. In addition to Anabasis salsa there are several types of saltworts, ephemeras and ephemeroides. Of shrubs, in the community composition includes *Salsola arbuscula, Atraphaxis* sp., some bushes of bindweed and marsh-beet. Herbaceous plants include *Alhagi* sp., seepweed, muchweed, goosefoot and butter tree. *Anabasis salsa* is an active indicator of salinity, since it facilitates the transfer of salts from deeper horizons to the surface with an annual fall. The structure of the community is very mosaic.

Haloxylon is largely absent from this area; dominant *Salsola rigida* association in some areas grow no more than 35-45 cm in height. In the composition of the association there are some species of barnyard grass, *Atraphaxis* sp, *Salsola arbuscula, Alhagia* sp, and dried ephemeras and ephemeroides.

Some areas of vegetation are represented by gypsophilic species, ephemeras and ephemeroides, along with patches of S*alsola rigida- Anabasis salsa* and *Anabasis salsa* association. Here, there are several species of climacoptera and perennial and annual halophytes. Of shrubs, there are *Salsola arbuscula, Atraphaxis sp., Salsola arborea*. Other species include *Nanophyton erina-ceum*, butter tree, and swine's-bane goosefoot (two species).

8.3.4 Floristic Diversity

The floristic diversity across the whole Project area is generally low and reflects the open and arid vegetation type associated with the Ustyurt plateau and former Aral Sea bed. Over 400 species have been recorded Karakalpakstan, with over 200 genera represented by 46 families. The chenopodiaceae and the asteraceae being the dominant families representing over 30% of all species found within the region.

Four important plant species listed within the Red Data Book of Uzbekistan have been previous recorded from the Project area namely:

- *Malococarpus crithmifolius*: A rare relict species found on the Ustyurt Plateau found, located on gravel, saline soils near freshwater and mineralized springs;
- *Tulipa buhseana*: In the Aral Sea desert, on sandy and clayey soils of plains and foothills;
- *Euphorbia sclerocyathium*: Found on the Ustyurt Plateau on stony and sandy deserts, salt marshes and saline gray-brown soil; and
- *Salsola chivensis*: A relict species of northern Uzbekistan found on the Ustyurt Plateau and relict mountains Kyzyl Kum on gray-brown gypsum and marl soils.

All four of these plant species are regarded as being of medium conservation value (Uzbekistan RDB listed but not included or of least concern in the IUCN Red List). Other rare species, but not listed in the RDB, but have been previously found within the Project area include *Crataegus korolkowii, Artemisia austriaca, Atriplex pratovii* and *Crambe edentula.* None of these species are listed as being of conservation concern by the IUCN Red List.

Following the detailed floristic surveys undertaken as part of this ESIA in May 2011, only one of the eight RDB or rare plant species (as listed above), has been confirmed as occurring within the ZoI of the Project, namely *Salsola chivensis. S.chivensis* is a relict species of northern Uzbekistan found on Grey-brown gypsaceous and marl soils on the Ustyurt plateau. During the 2011 surveys *S.chivensis* was recorded from three locations close to the Urga and the GCTU site.

The only other notably plant species recorded during the May 2011 surveys was *Allium usturtense*, which is a recently described species, and may be endemic to habitats around Sudoch'ye. However, this species was not found within the ZoI of the Project and therefore highly unlikely to be impacted by the Project.

The results from the floristic surveys undertaken in May 2011 can be found in Appendix J, Volume III.

8.3.5 Faunistic Diversity

8.3.5.1 Mammals

Saiga Antelope

Saiga *Saiga tatarica* are widely spread across the Ustyurt region and the local population within the region is near to extinction. The most important population exist within the Saiga Nature Sanctuary which is within a wider Saiga foraging area approximately 45 km to the north west of the Project site and is an area of international importance for Saiga. During winter months Saiga migrate eastwards over very large distances (Berger *et al.,* 2008), and could potential migrate into the ZoI of the Project, notably across the pipeline routes between UGCC and Surgil. However, in recent years the populations within the Saiga Nature Sanctuary are known to be changing their migration patterns due to the unfavourable conditions brought on by regional climate changes (Institute of Biology review). The Saiga populations are now migrating further north, and away from the Project sites.

During the TexNet surveys undertaken in 2010, the remains of three Saiga antelope minus their horns were, however, found near the escapement south of Urga. This not only confirms that Saiga are being poached, but that there is occasional migration of Saiga into the ZoI, specifically local to the route of the proposed Project pipelines. Saiga antelope are classified by the IUCN as 'Critically Endangered' and are of very high conservation value.

Other Mammal Species

A total of 21 other mammal species were recorded during the survey from across the Project area (see Texnet report in Appendix I, Volume III). In the fixed sands Libyan jird *Meriones libycus* burrow, zasian mole vole *Ellobius tancrei*, mid-day jird *Meriones meridianus*, and tolai hare *Lepus tolai* were all present and wide spread. In the gypsum desert two burrows of red fox *Vulpes vulpes* were found.

A number of species were recorded in the clay-gypsum desert including tolai hare, yellow ground squirrel *Spermophilus fulvus*, Svertzov's jerboa *Allactaga severtzovi*, Libyan jird and great gerbil *Rhombomys opimus*. Lesser white-toothed shrew *Crocidura suaveolens*, tolai hare, short-tailed bandicoot rat *Nesokia indica*, and tamarisk jird *Meriones tamariscinus* were also found. A wolf *Canis lupus* track was found in the Karateng field along with golden jackal *Canis aureus* and red fox, as well as field signs of badgers *Meles meles*. Wild boar *Sus scrofa* have been reported by locals and muskrat *Ondatra zibethicus* are said to be abundant.

Along a five kilometre transect through clay-gypsum desert signs of long-eared hedgehog *Hemiechinus auritus*, tolai hare, yellow ground squirrel, Svertzov's jerboa, great gerbil, red fox, corsac fox *Vulpes corsac* and Asiatic wildcat *Felis silvestris ornate* were observed.

A night survey was conducted along the line of the existing pipeline and three species, tolai hare, Svertsov's jerboa and small five-toed jerboa *Allactaga elater* were recorded. A whiskered bat *Myotis* sp. was observed over the plateau near the cliff.

No IUCN/RBD mammal species were recorded within the ZoI of the Project site.

8.3.5.2 Reptiles & Amphibians

A total of five reptile species were recorded during the surveys, although a further 13 reptile and one amphibian species are known to occur within the area. Steppe agama *Trapelus sanguinolentus*, steppe runner *Eremias lineolata*, and rapid racerunner *Eremias velox* were all common and encountered in shrubs and rodent borrows.

Four reptile species, sunwatcher *Phrynocephalus helioscopus*, steppe agama, rapid racerunner and steppe runner were recorded during the surveys at the UGCC.

Tortoise *Testudo horsfieldii* (predated; IUCN Vulnerable), which is of high conservation value, is likely to occur across most of the area and within the ZoI of the Project. No other IUCN/RDB reptile or amphibian species are likely to be present within the ZoI.

8.3.5.3 Birds

Over 300 bird species have been recorded within the area. However, the majority of the bird species found are common species of least conservation concern and typical of the open semi-arid habitats across the Aral Sea bed and the Ustyurt Plateau. A summary description of the important breeding and migratory bird species found across the Project site, based on bird surveys undertaken in 2010 and the Bird Conservation Society of Uzbekistan report) is provided below.

Breeding Bird Species

The majority of the modified habitats of the former Aral Sea only support common breeding bird species of negligible conservation value, including the alien myna bird *Acridotheres tristis*. In inundated areas, these habitats are of slightly higher avian interest and are of low to medium conservation value, typically with large breeding populations of black-winged stilt *Himantopus himantopus* and other common wildfowl, terns, and waders.

Lake Sudoch'ye is the most important bird area within the region and supports over 230 bird species. Within the wetland and marginal habitats around Lake Sudoch'ye over 192 bird species have been recorded; of these, 51 species were recorded during the ESIA surveys and likely to be breeding, ten of which are listed in the Uzbekistan red Data Book. The most numerous species were glossy ibis *Plegadis falcinellus,* Eurasian spoonbill *Platalea leucorodia* and red-crested pochard *Netta rufina*. The lake also supports a diversity of wildfowl, gulls and terns characteristic of open water habitats, as well as passerine species associated with reedbed habitats around the lake.

The Ustyurt escapement provides nesting opportunities for numerous species including several birds of prey species: roller *Coracias garrulous*; blue-cheeked bee-eater *Merops persicus;* sand martin *Riparia riparia;* and Eurasian jackdaw *Corvus monedula*.

The Ustyurt escarpment is particularly important for breeding birds of prey. The breeding bird surveys undertaken by the Bird Conservation Society of Uzbekistan between 2006 and 2009, identified the nesting sites of rare birds of prey species along the escarpment, and although the nest sites for these species may be more than 2 km from the Project site, these species have very large home ranges and are likely to be feeding within the ZoI (typically feeding in areas more than 10 km from the known nest location).

Six species were found to be breeding within or near to the ZoI of the Project site:

- lesser kestrel *Falco naumanni (*at a location north of where the pipeline goes up the escapement at Urga);
- steppe eagle *Aquila rapax* (at a location near to the UGCC site & the 110kV transmission line);
- imperial eagle *Aquila heliaca* (on the Tally plateau/escarpment near to the pipeline route); and
- long-legged buzzard *Buteo rufinus* and sakar falcon *Falco cherrug (*both at locations to the east of where the 110 kV transmission line runs up to the UGCC site).

The white-tailed eagle *Haliaeetus albicilla* breeds on the escarpment but the nest site is located approximately 20 km east of the 110kV transmission line and the breeding population is unlikely to be impacted (although could be affected during migration, see below). Eagle owl *Bubo bubo* also breeds on the escarpment, but again the nest site is away from the pipeline route and this species has a smaller home range compared to the other birds of prey. The Pallas's fish eagle *Haliaeetus leucoryhus* has been recorded in the area, but breeding has not been confirmed (Bird Conservation Society of Uzbekistan report, 2009), and the breeding area is outside the ZoI.

In addition, golden eagle *Aquila chrysaetos*, pallid harrier *Circus macrourus*, greater spotted eagle *Aquila clanga* and Egyptian vulture *Neophron percnopterus* have previously been recorded in the area by the Institute of Biology and the Bird Conservation Society of Uzbekistan, but not recently, probably due to recent declined in bird of prey numbers across the region.

Across the Ustyurt Plateau to the west of the escarpment, 15 bird species were recorded by TexNet in 2010, typically large flocks of desert species such as greater short-toed lark *Calendrella brachydactyla* and desert finch *Rhodospiza obsoleta*. European roller and bee-eaters *Merops* sp. Black-tailed sandgrouse *Pterocles orientalis* and pin-tailed sandgrouse *Pterocles alchata* were also recorded nesting on the plateau, flying to the nearby lake for water. All of these species are likely to be breeding within the ZoI.

Figure 8.1 shows the key breeding sites and migration route for these species. A full list of other breeding bird species found within the different locations can be found in the Texnet 2010 report in Appendix I, Volume III, and summary a of the IUCN and Uzbek Red Data Book Species listed in Table 8.7.

Migratory Bird Species

A large number of migratory bird species have been recorded across the wider area, and these are listed in the Institute of Biology report (see Appendix H, Volume III). The majority of these migratory species are of least conservation concern (negligible conservation value). In total, 19 IUCN/Uzbek RDB migratory species have been recorded (listed in Table 8.7) within the area (from different sources). Although not all species are likely to be within the actual ZoI of the Project site, in summary:

- Nine IUCN/RBD species are associated with the Sudoch'ye lake system. Studies undertaken by the Institute of Biology and the Bird Conservation Society of Uzbekistan have concluded that a majority of the bird migration to/from the Sudoch'ye Lake is to the North East and away from the ZoI of the Project; and
- For the remaining ten species, three are partial migrates and seven are long-distant migratory species. All ten are likely to migrate across the ZoI of the Project site.

Table 8.7: IUCN & Uzbek Red Data Book Bird Species in the area and within the ZoI

Bird species	Breeding	Migratory	Within the ZoI of the Project site
Great white pelican Pelecan onocrotalus		X (Sudoch'ye)	No
Dalmatian pelican Pelecanus crispus		X (Sudoch'ye)	No
Pygmy cormorant Phalacrocorax pygmeus		X (Sudoch'ye)	No
Little egret Egretta garzetta		X (Sudoch'ye)	No
Spoonbill Platalea leucorodia		X (Sudoch'ye)	No
Glossy ibis Plegadis falcinellus		X (Sudoch'ye)	No
Mute swan Mygnus olor		X (Sudoch'ye)	No
Ferruginous Duck Aythya nyroca		X (Sudoch'ye)	No
Lesser kestrel Falco naumanni	X	X (p)	Yes
Steppe eagle Aquila rapax	X	X (l)	Yes
Imperial eagle Aquila heliaca	X	X (l)	Yes
White-tailed eagle Haliaeetus albicilla	Breeding outside the ZoI	X (l)	Yes
Long-legged buzzard Buteo rufinus	X	X (l)	Yes
Pallas's Fish Eagle Haliaeetus leucoryphus	??	X (l)	Yes
Sakar falcon Falco cherrug	X	X (l?)	Yes
Great black-headed gull Larus ichthyaetus		X (Sudoch'ye)	No
Pin-tailed sand grouse Pterocles alchata	X	X (p)	Yes
Roller Coracias garrulus	X	X (l)	Yes
Houbara bustard Chlamydotis undulata		X (p)	Yes

Source: Texnet, Insitute of Biology & Uzbekistan Bird Conservation Society reports: (p) – partial migrant, (l) – long distant, ?? breeding uncertain.

8.3.6 Summary of Ecological Features

From the ecological baseline as described in the previous sections, the key ecological features which occur within the ZoI of the Project and which are therefore likely to be effected by the Project and their conservation value is summarized in Table 8.8. This lists only the key ecological features and feature of significant importance; habitats and species of negligible conservation value are not included in this ESIA. Details about all other features and the likely impacts are described in the TexNet report (Appendix I, Volume III) and in the National EIA.

Table 8.8: Summary of key ecological features which occur within the ZoI

Ecological Features	Legal protection and importance	IFC/International status	Conservation value
Protected Sites			
Sudoch'ye Lake State Nature Sanctuary	International Protected under national legislation, Important Bird Area & proposed Ramsar site	Critical habitat, as holds significant populations of IUCN/RDB species.	Very high
Key vegetation communities			
Within the Aral Sea bed:			
Open drifting sand habitats with spare ephemeral plant species	None	Modified habitat, due to habitat degradation, low species richness and invasive species.	Low
Natural *Haloxylon aphyllum* communities	None	Modified habitat, due to habitat degradation, low species richness and invasive species.	Low
Tamarsk thickets with halophytes	None	Modified habitat, due to habitat degradation, low species richness and invasive species.	Low
Within the Ustyurt Plateau:			
Tamarsk thickets with halophytes	None	Natural habitats, RDB/IUCN listed species present, but not in significant numbers	Medium
Hummocky sands with Peganum associations	None	Natural habitats, RDB/IUCN listed species present, but not in significant numbers	Medium
Grey-brown takyr with Anabasis salsa communities	None	Natural habitats, RDB/IUCN listed species present, but not in significant numbers	Medium
Shrub and saxual communities	None	Natural habitats, RDB/IUCN listed species present, but not in significant numbers	Medium
Grey-brown takyr with Artemisia terrae-albae communities	None	Natural habitats, RDB/IUCN listed species present, but not in significant numbers	Medium
Ustyurt escarpment with bare rock and scree	None	Critical habitat, due to presence significant populations of RDB/IUCN species	High
Plant species			
Salsola chivensis	Uzbekistan Red Data Book	Rare	Medium
Bird species			
Lesser kestrel *Falco naumanni*	IUCN Red List; Uzbekistan Red Data Book	Vulnerable	High
Steppe eagle *Aquila rapax*	Uzbekistan Red Data Book	Near Threatened	Medium
Eastern Imperial eagle	IUCN Red List; Uzbekistan Red	Vulnerable	High

Ecological Features	Legal protection and importance	IFC/International status	Conservation value
Aquila heliaca	Data Book		
White-tailed eagle *Haliaeetus albicilla*	IUCN Red List; Uzbekistan Red Data Book	Vulnerable	High
Long-legged buzzard *Buteo rufinus*	IUCN Red List	Least Concern	Low
Pallas's Fish Eagle *Haliaeetus leucoryphus*	IUCN Red List; Uzbekistan Red Data Book	Vulnerable	High
Saker falcon *Falco cherrug*	IUCN Red List; Uzbekistan Red Data Book	Vulnerable	High
Pin-tailed Sandgrouse *Pterocles alchata*	IUCN Red List; Uzbekistan Red Data Book	Vulnerable	High
European roller *Coracias garrulus*	IUCN Red List; Uzbekistan Red Data Book	Near Threatened	Medium
Houbara bustard *Chlamydotis undulata*	IUCN Red List; Uzbekistan Red Data Book	Vulnerable	High
Reptile species			
Tortoise *Testudo horsfieldii*	IUCN Red List	Vulnerable	High
Mammal species			
Mongolian Saiga *Saiga tatarica*	IUCN Red List; Uzbekistan Red Data Book	Critically Endangered	Very high

8.4 Assessment of Impacts on Ecological Features

8.4.1 Summary of the Likely Effects

Below is a summary of the likely effects of the main activities associated with the Project and the characteristics of the potential impacts on the key ecological features prior to mitigations. Subsequently in Section 8.4.2, 8.4.3 and 8.4.4, only the likely significant impacts are discussed.

8.4.1.1 Construction Effects

During construction of the Project the potential **direct** effects will include:

- Noise and light disturbance from the construction activities affecting foraging and breeding birds and mammals. Any likely impact on birds and mammals would, however, only likely to be localised, temporary, reversible and hence unlikely to be significant;
- Dust deposition around the working areas affecting adjacent habitats. This is only likely to be very localised and temporary and not significant;
- Localised changes in hydrological conditions and increased risk of localised pollution events due to use of construction vehicles affecting adjacent habitats and subsequent local effects on ground-nesting bird species and mammals. These effects are only likely to be very localised, temporary and not significant;
- Compaction of soils and habitat degradation resulting from an increase in off-road vehicle movements which is likely to effect the condition of habitats, as well as off-road vehicle movement disturbing bird and mammals which could be locally significant if not mitigated;
- Habitat loss resulting from the extraction of aggregates for the construction of the road network. While this would be localised, there would be a permanent loss of natural habitats and irreversible. Although the natural habitats would be replaced by modified habitats (cliff faces and scree);

- Habitat loss resulting from the installation and construction of the pipelines would be significant, although temporary and reversible; and
- Pipeline trenches and borrow pits causing the entrapment of fauna and acting as a barrier to the migration of fauna which could potentially be significant, although this would be localised and temporary, although may not be reversible (depending on the species and the size of the impact).

During construction of the Project the potential **indirect** effects will include:
- An immigration of construction workforce which is likely to result in increased hunting and shooting of mammals and birds. The impact on birds and mammals would only be temporary (during the construction period only), but could be locally significant and possible irreversible;
- Accidental introduction and dispersal of invasive species from construction activities, which could have a long-term and irreversible effect on the local biodiversity; and
- Unauthorised waste disposal which could result in some habitat loss and potential spread of non-native invasive species (flora and fauna). This is, however, only likely to be localised.

8.4.1.2 Operational Effects

During the operations of the **direct** effects of the Project on the ecological features are likely to include:
- Increased noise and light disturbance from vehicle movements across the working area disturbing breeding and foraging bird and mammal species, although this is only likely to be localised and not significant;
- Water abstraction from the Amur Darya River to supply the UGCC site and associated infrastructure and settlements;
- Habitat loss resulting from the footprint of the UGCC and associated infrastructure;
- Disturbance to migratory birds from flares, which would be localised and unlikely to be significant;
- Increased air emissions affecting habitats around the UGCC site;
- Electrocution and increased collision risks to birds due to the installation of overhead lines which could have an effect on the important breeding and migratory populations, with the potential for permanent and significant impacts; and
- Erosion risk from uncontrolled surface water run-off, which is likely to only have a localised and not significant effect on habitats.

During the operations of the **indirect** effects of the Project on the ecological features are likely to include:
- Increase in hunting and shooting of mammals and birds as a result of an increase in the local population, visitors to the areas and general urbanisation around the Akchalak settlement, which although may be localised could potentially have a significant effect on important bird and Saiga populations which could be irreversible;
- Increase risk of accidental oil pollution from vehicles which would likely to only have a local effect on habitats.
- Accidental introduction of invasive species from visitors and related urbanisation, especially around the UGCC site, which could have a long-term and irreversible effect on the local biodiversity; and
- Unauthorised waste disposal / uncontrolled leaching for solid waste management area which, while only localised, could affect habitats and increase the risk of spreading invasive species (fauna & flora).

8.4.1.3 Summary of the Likely Significant Impacts

Following a review of the ecological baseline and the likely effects of the Project on the ecological features within the ZoI, it is possible to identify the likely significant impacts on which this assessment is focussed.

Notwithstanding, mitigations identified in this assessment are considered relevant to cover all possible impacts identified in the preceding sub-section. The significant effects can be summarised as:

- Temporary habitat loss during the pipeline construction and permanent loss from the UGCC site;
- Temporary habitat degradation and loss of habitats resulting from increased traffic movement, especially during construction;
- Spread of invasive fauna and flora during construction and operational phases of the Project;
- Hunting of migratory and breeding birds and mammal species, notably birds of prey and Saiga;
- Electrocution and collision risks to breeding and migratory bird species; and
- Entrapment of fauna, notably reptiles and potentially the occasional Saiga.

In the subsequent sections, the significant ecological impacts are described for each of the three different components of the Project.

8.4.2 Upstream Component - Surgil Field, CGTU and Associated Infrastructure

8.4.2.1 Protected Sites

The Sudoch'ye Lake State Reserve is outside the ZoI of the Project, and therefore the proposed construction and operational activities at Surgil will have no direct impact on this protected site.

8.4.2.2 Habitats

The Surgil Field, including the CGTU, is situated within a mosaic of modified and natural habitats typical of the bed of the Aral Sea. These habitats are of low conservation value. The impact of drilling, construction and operations of the Surgil Field (including the CGTU) on these habitats due to habitat loss will be minor. This is not only because of the low conservation value of the habitats, but also because of the very localised impacts and the small areas of habitats which would be lost in relation to the vast areas of existing habitats within the wider area.

The construction and operational impacts of Surgil CGTU and associated infrastructure, prior to mitigations, is likely to be of slight adverse significance. The proposal road network across the Surgil fields will have minimum impacts on ecological features within the ZoI of the development. There is likely to be some disturbance to breeding bird and mammals during construction, all of low conservation value. There will be some permanent loss of modified habitats of low conservation value associated with the actual operational activities. However, an established road system would significantly reduce the current disturbances and habitat degradation associated with 'off-track' traffic which currently traverses the Surgil area. Therefore any impacts on biodiversity are likely to be negligible.

8.4.2.3 Flora and Fauna

During drilling and construction at the Surgil Field and CGTU there is likely to be localised effects on the local bird and mammal population due to hunting by construction workers, as well as light and noise disturbance. However these species within the Aral Sea bed are of only low conservation value, and prior to implementation of management mitigations the impacts are likely to be of slight adverse significance (depending on the species).

During all drilling and construction work there is the risk of introducing and spreading invasive flora and fauna. For instance, plants may be introduced accidentally through the importation of soils or may be 'carried' into the area on plant vehicles. Alien species may also be un-intentionally introduced through landscape planting. Faunal alien species (such as the Myna bird *Acridotheres tristis*), although not intentionally introduced follow human movements and increase their range with increased urbanisation. The invasion of alien species is a significant threat to local biodiversity. However, owing to the relatively low conservation value of the habitats at Surgil, the impact of alien species, prior to mitigations, is likely to be of slight to moderate adverse significance.

During operations at the Surgil Field and CGTU, the impacts will be similar, with localised disturbance to species from noise and light and occasional hunting from workers at the CGTU. The flare at the Surgil CGTU and possibly the GGSs is likely to cause some disturbance to migratory bird species and the occasional kill. However, continuous flaring will be eliminated with realisation of the project and therefore the CGTU flare and GGS flares will only operate during rare periods of abnormal operation. This represents an improvement from the baseline case. Notwithstanding, no significant bird migration is known to occur across the old Aral Sea bed and no bird species of conservation concern have been recorded within the ZoI of the CGTU site, and hence the significance of impact is likely to be negligible.

As part of the associated infrastructure, a network of 10kV transmission lines will be erected. There is a small risk of electrocution to bird species which occur within the ZoI. However, within the Surgil Field the bird species present are of low conservation value, and with no significant bird migration routes, any potential impacts prior to mitigations is likely to be negligible.

During decommissioning, the works will be undertaken in accordance with national and international guidance with embedded mitigation measures. However, during the works, prior to mitigations, there is likely to be localised, temporary slight adverse significance impacts in the habitats and on the local fauna from hunting similar to that identified for the construction phase.

8.4.3 Downstream Component - UGCC Site and Associated Infrastructure

8.4.3.1 Protected Sites

The Sudoch'ye Lake State Reserve is outside the ZoI, and therefore the proposed construction and operational activities at the UGCC will have no direct impact on this protected site. In addition, the breeding and migratory bird species associated with the State Reserve would not be directly affected. However, due to the size of the Project, there is likely to be an increase in hunting activities within the wider area, and this is likely to include hunting of bird species associated with the protected site. Prior to mitigations, the impact significance on the project site is likely to be of moderate adverse.

As pat of the operations, primary water supply for the UGCC site will be provided by abstractions from the Amu Darya River. The Sudoch'ye Lake and its associated water bodies will not be impacted by this water abstraction. This is because the water supply to the Project is being abstracted downstream of where the river which feeds into the Sudoch'ye lake system. Hence there is no connectivity/pathway between the water abstraction point and Sudoch'ye and therefore water abstraction required for the Project will not change the existing baseline flows into the lake system. During rare periods when the primary water supply is out of service, a reserve supply is available from an abstraction point significantly upstream from the Sudoch'ye Lake feed. Periods when water will be sourced from this reserve supply are considered to be very rare. Further details are provided in Chapter 9.

8.4.3.2 Habitats

The habitats around the UGCC site, and its associated infrastructure (the wastewater pond, the expanded Akchalak settlement, and along the route of the 5km access road and the 7km railway spur), are less species diverse and of lower ecological importance than in other areas on the Ustyurt Plateau; this is in part due to the already disturbed nature of the landscape from existing pipelines, use by local people, and access tracks. The habitats which will be directly impacted within these areas are therefore regarded as being of low conservation value, because they are natural habitats which have been partially modified from previous construction activities in the area, with the exception of the escarpment habitats which remain of high conservation value.

As part of the construction activities, the low conservation habitats of the Ustyurt Plateau (rather than habitats of the escarpment) will also be impacted from establishment of laydown areas, temporary roads, vehicle soil compaction and dust pollution resulting from the movement of construction traffic across the site. Approximately 200 ha of habitats of low conservation value, would be lost under the footprint of the UGCC site and associated developments; prior to mitigations, this is likely to represent a slight adverse impact.

In addition, a 12 km water supply pipeline spur and a 30km reserve water supply pipeline spur are to be constructed east across the Ustyurt Plateau parallel to an existing water supply pipeline, down the escarpment and connecting to existing pipelines. As with the UGCC site the habitats within these areas are of low conservation value, and the impact slight adverse, prior to mitigations. With the exception of the escarpment habitats which are of high conservation value and the impact prior to mitigations is likely to be moderate.

As part of the UGCC operations, additional water abstraction from the Amu Darya River is required. This additional abstraction from the river is a 62% increase on the current level of abstraction for the Kungrad WSU, but this represents an increase from 23% to 36% of the maximum capacity of the Kungrad WSU. However, given predicted flows in the river, and the storage and supply capacities of the Kungrad WSU, the water abstraction is unlikely to reduce water volumes downstream of the WSU abstraction point during low flows by more than 1% (except in rare periods of critical low flows where the abstraction would be about 5% of critical low flows) and therefore does not represent any significant change in the current flows and is highly unlikely to have a significant impact on habitats or associated flora and fauna downstream on the abstraction point.

8.4.3.3 Flora and Fauna

The impact of construction and operations on the flora and fauna at the UGCC site are likely to be similar to that for each of the other components of the Project. Impacts on species are predicted to arise as a result of increased hunting, noise and light disturbances and the potential introduction and spread of invasive alien flora and fauna.

Saiga are not normally found within the ZoI for this downstream component of the Project and therefore no direct impacts are anticipated, there is the possibility of the occasional accidental migration of individual Saiga into this area, but the impact on the Saiga is only likely to be moderate adverse, prior to mitigations.

During construction of the downstream components the Project would not have any significant direct effect on individual nesting sites of IUCN/RDB protected bird species, and would not have any significant effect on the habitats in which these species forage. No nesting bird species of conservation importance have been recorded between 2006 and 2009 by the Bird Conservation Society of Uzbekistan on the escarpment where the water supply pipeline will transverse.

During operations, the only potentially significant effects are in relation to potential electrocution and collision risks with the 12km 110kV transmission line to the UGCC and the 10kV power line running from the UGCC parallel to the pipeline route, this would affect both the breeding and migratory populations. Of the protected bird species, the following are known to be vulnerable to electrocution and collision risks and these species have been recorded within the ZoI of the Project site and therefore likely to impacted:

- steppe eagle;
- imperial eagle;
- white-tailed eagle;
- Pallas's fish eagle, and
- Houbara bustard.

These bird species are of medium to high conservation value, they are rare in Uzbekistan, and population sizes within the region are low. Therefore, the killing or injury of only a few individual birds is likely to have a significant impact on the local and national population. For instance, white-tailed eagle is only known from a single breeding site in Uzbekistan on the Ustyurt escarpment. Prior to mitigations, the impact of the Project on these species is likely to be of moderate to large adverse significance.

A summary of the impacts is provided in Table 8.10.

8.4.4 Component 3 - Below Ground Gas & Condensate Pipelines and Associated Infrastructure

8.4.4.1 Protected Sites

The Sudoch'ye Lake State Reserve is outside the ZoI of the Project, and therefore the proposed construction and operational activities at Surgil will have no direct impact on this protected site. However, there is likely to be indirect impacts on the protected site during both construction and operations, which are described below.

The hunting of birds and mammals around the Sudoch'ye Lake protected site is already in existence. During construction of the pipelines there is likely to be an increase in the hunting of birds along the entire route of the pipeline, as well as those areas adjacent to the pipeline where access is available to the Sudoch'ye Lake. The impact of increased hunting and associated disturbance during construction on this site which is of very high conservation, prior to mitigations, is likely to be large adverse.

The Project will not incorporate the construction of any new permanent access route to the pipeline. During operations of the pipeline, the impacts would be considerably less than during construction due to less disturbance and fewer people being present within the areas. As such, there would be a slight adverse impact, prior to mitigations.

8.4.4.2 Habitats

The pipeline will transverse habitats of medium conservation value on the Ustyurt Plateau, habitats of high conservation value on the Ustyurt Plateau escarpment and habitats of low conservation value across the bed of the Aral Sea. However, much of these habitats are already partly disturbed and impacted from previous pipeline works and access tracks which already transverse across the entire area. Of the 115 km of pipeline, approximately 78 km will be near to or within existing pipeline corridors, including the escarpment corridor. A summary of the total areas of habitats likely to be lost as part of the construction (and operations) of the pipelines is given in 7.4.2.2 (land allocation identification for the Project).

While the impact is likely to be long-term (it can take 50-70 years for the habitats to recover from significant disturbance), the impact is localised and represents a small proportion of the total area of habitat across the entire Ustyurt Plateau (certainly less than 0.01% of the total area). The impact of construction, prior to mitigations, is therefore only likely to be moderate adverse.

During operations of the pipeline no significant ecological impacts on the habitats are likely. During decommissioning, the pipeline will be removed and the impacts will be similar to construction, depending on the decommissioning methodologies at the time.

8.4.4.3 Flora and Fauna

The only notable plant species which is likely to be negatively affected during the construction of the pipeline is population of *Salsola chivensis* within the areas of the Urga site and the GCTU. The loss of habitat, deposition of dust and trampling from construction activity is likely to have a slight adverse impact on the species population.

During construction of the pipelines, local bird, mammal and reptile species are likely to be negatively affected as a result of hunting, construction noise, increased traffic and light disturbance. These effects would be localised and temporary during the construction of the pipeline and associated infrastructure only. As such, the impact prior to mitigation is likely to be of slight to moderate significance depending on the species (see Table 8.10).

The most significant potential negative effects during the construction of the pipeline, if realised, would be upon the local Saiga population. Saiga is of ‘very high’ conservation value, and populations across the region have been in significant decline over the past 10-20 years. Saiga were previously known to migrate across the pipeline route during winter/spring months; however, in recent years this has changed, and now it is likely that only the occasional individual Saiga will migrate across the area. Those activities which are likely to have an impact on the individual Saiga are:

- Increased hunting from construction workers and additional hunting resulting from increased ease of access to the area;
- Additional lighting and construction activities across the area, especially at night, which is then likely to disturb migrating and foraging Saiga; and
- Entrapment to individual Saiga in the pipeline trench, especially as Saiga migration is at night when they are unable to see the trenches (especially juveniles); and

The magnitude of the impact of construction on the Saiga, prior to mitigations, therefore is likely to be of moderate significance due to the very high conservation value of this species, and only slight adverse during operations due to significantly reduced human activity across the area.

The pipeline construction works will not have any direct or indirect effects on any of the breeding population of IUCN/RDB breeding bird species, as all species are outside the ZoI for this component of the Project, with the exception of pin-tailed sandgrouse and Houbara bustard (Table 8.8). The potential impacts on these two species will be due to the temporary loss of habitat and noise disturbance during construction. Impacts would only be temporary and localised and only a small proportion of the population is likely to be adversely affected. However, given the high conservation value of these two species the impact prior to mitigations is likely to be of moderate adverse significance.

Other specific likely effects associated with the construction of the pipeline would include:
- Loss of rare plants species (Table 8.8) within the habitats along the route of the pipeline upon the Ustyurt Plateau. These species are likely to occur, but due to the vast area of existing and unaffected habitats the significance of the impact prior to mitigations is likely to only be of slight adverse significance; and
- Impacts upon the local tortoise population resulting from accidental entrapment with the pipeline trenches, injury and killing from construction work. The impact is likely to be localised, but due to the high conservation value of this species, the significance of the impact prior to mitigations is likely to be of moderate adverse significance.

As part of the operations, there will be a 10kV transmission line installed adjacent to the pipeline route. Given that this is a small transmission line and other larger transmission lines already transverse the area, any likely impact on bird species resulting from potential electrocution is likely to be slight adverse, prior to mitigations.

During operation, there will be some disturbances from occasional maintenance works and increased level the impact on fauna (notably birds and mammals) is likely to be negligible.

During decommissioning, the works will be undertaken in accordance with national and international guidance with embedded mitigation measures. However, during the works, prior to mitigations, there is likely to be localised, temporary slight adverse significance impacts on the local fauna, notably from hunting.

8.4.5 Cumulative Effects

From a review of other previous development within the region, an assessment of the potential cumulative can be made with the following considerations:
- The overall pipeline length is 115km including approximately 47km (40% of the entire pipeline length) across the basin of the former Aral Sea within existing pipeline route corridors to the Urga crossing.
- On the Ustyurt Plateau, the pipeline will track south for 31km within the existing (but decommissioned) Ural Bukhara pipeline route corridor which is highly disturbed. This represents 27% of the entire pipeline length or 44% of the pipeline length actually up on the plateau.
- The downstream UGCC components of the Project will be largely built within an existing industrial context and its supporting settlement will expand Akchalak rather than introduce a new settlement elsewhere on the plateau. However, this could lead, in the long-term to future developments and industrialisation within the region, although this Project alone will not be a key catalyst in this long-term development.

The only likely ecological features which could be potentially be significantly impacted by cumulative effects are on:
- the Sudoch’ye Lake Nature Sanctuary, due to increased disturbance from other developments and increased human disturbance;
- IUCN/ Uzbekistan Red Data Book bird species, due to increased disturbance and hunting activities, and
- the Saiga population from increased disturbance and hunting activities.

Any potential cumulative effects impacting on the Sudoch'ye Lake Nature Sanctuary will be unlikely due to the increased legal protection (notably with the designation as a Ramsar site) and management of the site, which will be supported by this Project.

Both the IUCN listed birds of prey species and the Saiga, could potentially be impacted by the cumulative effects, especially because both the birds of prey and Saiga are already in decline. However, taking all the above into account, through site selection and route selection, the Project is not going to significantly contribute to any further fragmentation of the Saiga territory or degradation of Ustyurt habitats which support both Saiga and endangered bird of prey species. The appointment of the Wildlife Warden (see mitigation section below), and working with local communities to raise awareness of the importance of local wildlife is likely to contribute towards a more long-term and sustainable protection of wildlife and biodiversity with the area.

In addition, the Saiga Conservation Alliance states: "The main driver in the decline is poaching and rural poverty, pressures that can be addressed through public awareness and targeted empowerment." The Project aims to bring significant socio-economic benefit to the region (thereby alleviating much of the rural poverty) and in addition, through implementation of identified mitigation measures, it can be adequately demonstrated that the Project is proactively going to assist raise public (and worker) awareness.

Addressing underlying causes of biodiversity loss is fundamental to long-term sustainability of a project, and is core to the Government of Uzbekistan's initiative on mainstreaming biodiversity into Uzbekistan's oil-and-gas sector policies and operations.

8.5 Mitigations and Enhancement Measures

8.5.1 Overview

The Project is a large infrastructure development with three components spread over a large geographical area, and hence the close management of these impacts will be critical to ensuring that the impacts are effectively and consistently managed.

However, given the size of the Project and sensitivity of some of the habitats and species within the region, ecological impacts are not considered critical. In the following sections the mitigation and compensation measures for the Project are summarised; these are in addition to those mitigations proposed in the national EIA. These measures will be enforced to ensure that any impacts to the ecology and biodiversity of Uzbekistan are minimised, and to ensure compliance with national legislation and IFC PS 6 performance standards. Mitigations identified in the national EIA and this ESIA will be collated in the ESMP contained within Volume IV.

Critical to the responsible implementation of the proposed mitigation measures are:
- The implementation of the ESMP. This will provide the framework for how and when the mitigation and compensation measures summarised below will be undertaken;
- Implementation of the biodiversity offsetting measures;
- Appointment of a Project Wildlife Warden by Uz-Kor who will be responsible for ensuring the delivery of the ecological aspects of the ESMP and associated mitigation measures; and
- Adherence and support to the Government of Uzbekistan's initiative on mainstreaming biodiversity into Uzbekistan's oil-and-gas sector policies and operations.

8.5.2 Generic Mitigation Measures

The following generic mitigation measures will be applied throughout the Project:

- The layout of the associated infrastructures will be designed to take into consideration local environmental conditions. The pipelines follow routes of least ecological impact and of minimum distance. The pipeline route has been selected to follow existing pipeline route corridors, and the UGCC site adjacent to existing infrastructure;
- The route of the transmission line should also follow the alignment of existing transmission lines, and the finalised route to be agreed by Uzbekenergo in consultation with Uz-Kor management and Wildlife Warden.
- All temporary working areas will be kept to a minimum and all habitat loss minimised;
- Access routes for construction and operational activities will be kept to a minimum. All off-road access will be prohibited or allowed along pre-defined routes that limit the extent of off-road activity. Plans will be implemented to minimise all construction traffic activities. These actions will significantly reduce potential impacts on habitats and disturbance to species;
- No night time construction work will be permitted; and
- Noise disturbance will be kept to a minimum and comply with national standards.

8.5.3 Specific Mitigations Measures

The following specific mitigation measures will be applied throughout the Project:

8.5.3.1 Hunting and poaching

Hunting and poaching of birds and mammals of all species will be prohibited. All staff of construction and service organizations will be under obligation not to undertake poaching (unauthorized production of animals and slashes) or hunting throughout the whole area of the development. Signage will be installed illustrating the hunting ban throughout the Project area. This requirement will form part of the construction camp and settlement code of conduct. A key responsibility of the Project Wildlife Warden shall be enforcement of the hunting ban, raising awareness of the need not to hunt and to raise awareness in the local communities about the importance of nature conservation. Any member of staff (Uz-Kor or contractor) found in violation of the hunting ban will be subject to disciplinary action.

8.5.3.2 Habitat Removal

A framework habitat removal and re-instatement plan will be produced that will set out the minimum requirements for such activities, and details how re-instatement activities should be carried out, will be contained within the ESMP. This plan will need to be elaborated prior to any construction works commencing and be approved by a nominated ecological specialist. The plan will include as a minimum a requirement to:

- Clear all surface vegetation and subsequently strip the top soil two weeks prior to the digging of the pipeline trenches. This is to reduce the risk of injury or killing of reptile or mammals which may be harbouring within the working areas;
- Where possible, strip the vegetation and the top soil (prior to pipeline trenching), before the start of the bird breeding season. This is to minimise the number of breeding birds which may nest within the impact area of the works. This is not necessary for works undertake outside of the bird nesting period (September to April);
- Store top soil alongside the pipeline; and

- Return the soil back into the pipeline trench in the same order as the soil was removed during reinstatement, in order to ensure that the top-soil is returned to the surface.

8.5.3.3 Floristic Species

To significantly reduce the impact of the pipeline construction works on the local populations for the rare plant *Salsola chivensis*, mitigations include:

- The collection of seeds from *S.chivensis* plants prior to the start of construction. Seeds will be collected from plants within the Project area, but not necessarily from plants which will be directly impacted by the pipeline route. The objective of collecting seeds is to preserve the genetic diversity of this species and the collection of seed for habitat reinstatement. Seed collection will need to be undertaken at the optimum time of year, and collected by a qualified botanist.
- *S. chivensis* seeds will then be deposited at the national germplasm collection for future propagation with the aim to ensure the ex-situ conservation of this species and preservation of the species genetic resources.
- *S.chivensis* seeds will also be collected and subsequently sown across the pipeline construction area as part of the habitat re-instatement plan.
- To minimise potential trampling of *S.chivensis*, and other plant species, as a result of construction activities across the Project area, off road vehicle movements need to be minimised and managed so that vehicles keep to the specific construction road networks and do not cross natural habitats.

8.5.3.4 Invasive Species

All construction and operational activities will comply with the International Petroleum Industry Environmental Conservation Association (IPIECA) guidelines on the prevention and management of alien plant and animal species across the Project. Details will be provided in the ESMP with regard to the responsibility of the Wildlife Warden to monitor the construction activities to ensure compliance with the IPIECA guidelines.

8.5.3.5 Preservation of Bird Species

In order to ensure the safety of habitats and the biodiversity of Lake Sudoch'ye as a national ornithological reserve and the most important international ornithological site in the region, no access and no construction activities will be undertaken within at least 2 km of the Sudoch'ye border. Clear signage will be placed to ensure that no activities are undertaken within this buffer zone around the protected site.

8.5.3.6 Wildlife Education and Training

It is important that all workers engaged on the Project are made aware of the environmental and ecological sensitivities of the region, the Project site and their own actions. The Wildlife Warden will include information in this regard in the construction site induction and incorporate outreach works on the importance of preserving habitats of animals and prevention of poaching.

8.5.3.7 Pipeline Measures

Specific pipeline construction mitigation measures in addition to the above include:

- Egresses from the trench to allow safe access of the animal out of the trench, provided every 250 m, in order to assist with animals trapped within the trench of the pipeline. This is done by periodically requiring a digger to add a slope into the trench;

- Weekly checks of the pipelines trenches should be undertaken to check and remove any entrapped animals.

8.5.3.8 Overhead Transmission Line Design

Construction and operation of power lines may cause bird deaths, especially of medium and large sizes (harriers, buzzards, eagles, falcons, etc.), which are usually dominated by rare and endangered species. Distribution lines may pose a risk to migratory birds that migrate over the Ustyurt Plateau at very low altitudes. To reduce this potentially significant impact:

- Bird reflection devices will be installed on the 10 kV transmission lines which run 20km south and 20 km north in parallel to the Sudoch'ye Lake protected site.
- Bird reflection devices will be installed across the entire length of the 12 km 110kV transmission line runs up the escarpment to the south-east of the UGCC site, these are the areas where the impact may be most likely on bird migrating in/from the Lake and across the escarpment.
- The transmission line pole and insulator design will follow the Birdlife International Position Statement on birds and power lines recommendations and suggested practices.
- Monthly monitoring will be made along the transmission line route to check for evidence of bird kill due to electrocution. If evidence is found of bird deaths resulting from electrocution then appropriate mitigation measures will be put in place.

8.5.4 Biodiversity Offsetting

In addition to the mitigation measures, a series of compensation and enhancement measures are proposed which will assist in benefiting biodiversity:

- Any borrow pit from which materials are extracted to support the building of structures as part of the Project will not be back filled. These pits will enhance the local landscape for wildlife, notably providing local refuges as nesting and foraging areas for reptiles, mammals and birds. As part of the habitat reinstatement plan, opportunities for developing these wildlife enhancement refuges can be explored.
- Any borrow pit more than 1 m deep will be designed with an egress to allow the safe movement of animals out of the pits.
- Owing to the international importance of the Sudoch'ye Lake, Uz-Kor will consult with the NGO Committee of the Sudoch'ye Lake Sanctuary with a view to supporting a Sudoch'ye Biodiversity Education Programme. Working with local schools and the local community, awareness of the importance of the local nature conservation interests will be enhanced, through workshops, community posters, lectures and visits to the Lakes by local school groups supported by Uz-Kor. Uz-Kor will also consult with local conservation bodies, local communities and the Goskompriroda to identify possible support provision from Uz-Kor to the development of a long-term management plan for the Sudoch'ye Lake.
- After implementation of the mitigation measures as described above, there remains a likely slight adverse significant impact on the local Saiga populations due to disturbance during construction works of the pipeline and potential for increased in hunting activities. Owing to the very high conservation value of Saiga and the uncertainty regarding the potential impacts, Uz-Kor will consult with the Saiga Conservation Alliance to determine areas of support for further research on the migration of Saiga across the region and to better understand the ecology of Saiga. Such information would then be useful in understanding why Saiga are in such decline and subsequently to identify what measures are needed to conserve the Uzbekistan Saiga population in the long-term.
- As part of the UGGC site development a wastewater storage pond will be established. This will include the creation of wetland and reedbed habitats which would significantly benefit the biodiversity within the region. These ponds will include areas of reedbeds, marginal wetland habitats and areas of open water

which are likely to remain wet throughout the year. The total area of this pond will be approximately 24 ha. This wetland habitat will significantly enhance the ecological and biodiversity value of the area, especially for migrating bird species, but also enhancing the local flora and fauna, and will have a moderate beneficial impact on biodiversity within the area.

The mitigation measures and biodiversity offsetting detailed within this ESIA complement the Government of Uzbekistan's initiative on mainstreaming biodiversity into Uzbekistan's oil-and-gas sector policies and operations. While this Government of Uzbekistan initiative is still being developed, it is recommended that Uz-Kor consults with the Government in the development and implementation of oil-and-gas sector policies and operations with the opportunity to mainstream biodiversity into the operations of the Surgil Project activities. And subsequently, for the Surgil Project to act as a flagship for biodiversity conservation in the oil-and-gas sector in Uzbekistan.

8.5.5 Summary of Mitigation Measures

Table 8.9 presents a summary of ecological mitigation measures to be implemented by the Project.

Table 8.9: Summary of Ecological Mitigation Measures of the Project

Type of Mitigation	Provisions to Address Ecological Impacts & Effects
Embedded mitigation – mitigation which is built-in to the project during the EPC procurement and design process	Finalisation of pipeline routing to minimise the impacts on natural habitats. Transmission lines and associated infrastructure being constructed within the corridors of existing infrastructure. Final routing to be confirmed in consultation with Uz-Kor Wildlife Warden.
	Elimination of continuous flaring in the Surgil Field reducing potential impact of migrating birds.
Mitigation of significant effects	Ban hunting and poaching activities
	Appointment of a Wildlife Warden to oversee the construction and operational ecological impacts
	Develop a habitat removal and re-instatement plan
	No construction activities to encroach within 2km of the Sudoch'ye nature reserve boarder.
	Bird reflection mitigation will be installed on the 10kV distribution lines that run within 20km of Sudoch'ye protected site, and on the entire length of the 110 kV transmission line.
	The OHL poles and insulators to be design in accordance with the Birdlife International Position Statement.

Type of Mitigation	Provisions to Address Ecological Impacts & Effects
Mitigation of non-significant effects	All working areas to be kept to a minimum. Implement through the ESMP IPIECA guidelines for prevention and management of alien invasive species. Access routes for construction and operation works to be kept to a minimum along pre-defined routes to limit off-road activity. Collection of *S.chivenis* seeds for preservation and inclusion in habitat reinstatement. No night time construction. Implement best practicable means (BPM) for reduction of noise (refer to noise chapter 11) Excavated aggregate to be stored to minimise wind blown dust Where possible, along the pipeline route the stripping of vegetation and scraping off top layers should be undertaken before the start of the bird breeding season (September- April) Excavated material to be returned in the same phasing to ensure the top soil is returned to the surface in line with Uzbek national requirements for reinstatement. Sloped pipeline trench side provided every 250m to enable any trapped animals a means of egress. Ecological issues to be included in the site staff induction for all components. For those with specific responsibilities, the wildlife warden will undertake specific training.
Enhancement	Provision of financial or resource support to Sudoch'ye Biodiversity Education Programme. Nature of support to be determined by consultation with the NGO Committee for the management of the Sudoch'ye Lake Sanctuary regarding support for a Sudoch'ye Biodiversity Education Programme Wildlife warden work with local schools and other bodies to raise general awareness of the community to nature conservation / water conservation issues. Provision of financial or resource support to the Saiga Conservation Alliance. Nature of support to be determined by consulting the Alliance. Undertake habitat creation around the waste water storage pond. Support to the Government of Uzbekistan's initiative on mainstreaming biodiversity into Uzbekistan's oil-and-gas sector policies.

8.6 Summary

8.6.1 Residual Impacts

Investigations have been undertaken to assess the potential impacts of the Surgil Project in Karakalpak on the ecological features and biodiversity within the zone of influence of the Project. The impact assessment, in accordance with the legislative requirements of the Government of Uzbekistan, and the international guidance under the IFC Performance Standards has been based on primary data collected during the ecological field surveys, and secondary data from the review of previous studies, including the an independent review undertaken by the Institute of Biology of Uzbekistan.

The investigations have identified a number of key ecological features within the ZoI, which without mitigations, would be significantly impacted by the Project, notably:

- The Sudoch'ye Lake State Nature Sanctuary;
- Modified habitats with the former Aral Sea bed;
- Natural habitats within the Ustyurt Plateau;
- A population of the Uzbekistan Red Data Book plant species *Salsola chivensis;*
- Ten species of IUCN/Red Data Book listed birds, including seven birds of prey species;
- One species of IUCN Red list reptile; and

- Saiga antelope.

Following the implementation of the mitigation and compensation measures which will be delivered through the EMSP, these key impacts of the Project will be significantly reduced, and the residual impacts predominantly associated with construction activities and largely temporary. In summary:

- During construction and operations the upstream components of the Project will not have any significant residual effects on any of the ecological features, with the exception of the habitats which are of low conservation value.
- During construction of the pipeline component and associated infrastructure, there will be slight and temporary adverse impacts on bird species associated with the Sudoch'ye Lake, temporary loss of natural habitats of the Ustyurt Plateau, localised disturbance to breeding bird species (notably pin-tailed sandgrouse and Houbara bustard), and potential disturbance or killing of individual Saiga antelope.
- During the operations of the pipeline component and associated infrastructure, the only residual impact is likely to be result from increased hunting of bird and mammals, although this will be managed through the appointment of a Wildlife Warden.
- During construction of the downstream components of the Project and associated infrastructure, there will be slight and temporary adverse impacts on natural habitats of the Ustyurt Plateau & escarpment, localised disturbance to breeding bird species (notably pin-tailed sandgrouse and Houbara bustard), and potential disturbance or killing of individual Saiga antelope.
- During the operations of the downstream component and associated infrastructure, there will be some loss of natural habitat on the Ustyurt Plateau and potential electrocution of individual IUCN/RDB birds of prey as part of the 12km 110Kv transmission line.

While the Project is likely to lead to some slight adverse impacts on habitats and specific species (as summarised above), there will be significant benefits to biodiversity within the ZoI, this will include:

- Consultation with the Sudoch'ye Lake State Sanctuary NGO Committee management team with a view to supporting a Sudoch'ye Biodiversity Education Programme.
- Consultation with the Saiga Conservation Alliance to determine areas of support for further research on the migration of Saiga across the region and to better understand the ecology of Saiga, subsequently to identify what measures are needed to conserve the Uzbekistan Saiga population in the long-term.
- Creation of 24 Ha of wetland and reedbed habitats which would significantly benefit the biodiversity within the region, especially for migrating bird species, but also enhancing the local flora and fauna, and will have a moderate beneficial impact on biodiversity within the area.

Following the implementation of the mitigation and compensation measures, the Project is in full compliance with National legislation on nature conservation and biodiversity, and adheres to the IFC Performance Standards for Biodiversity Conservation and Sustainable Natural Resource Management, specifically:

- The Project will not have any significant detrimental impact on any legally protected sites.
- With the implementation of the ESMP and specifically the biodiversity offsetting and the appointment of a Wildlife Warden, no critical or endangered species populations would be significantly impacted.
- The temporary and localised adverse impacts associated with construction activities will not affect the habitats ability to function and support species.
- Mitigation and compensation measures which will be delivered through the ESMP which will ensure that the Project activities are exercised with care to minimise the impacts, and with enhancements.
- The implementation of the ESMP will ensure no long-term significant conversion of degradation of natural habitats.
- Alternatives have been explored as part of the development of the Project and the Project has been designed and alternations made to minimise the potential environmental impacts.

- Mitigation and compensation measures proposed in the ESIA and implemented through the ESMP will ensure that significant effects will be reduced to acceptable levels.

The residual impacts, post monitoring and IFC compliance is summarised in Sections 8.6.2 and 8.6.3.

Table 8.10: Summary of Key Significant Impacts and Mitigations

Activity	Potential Impact	Sensitivity Score (Conservation value)	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Upstream components – Construction						
Habitats	Loss of open drifting sand habitats.	Low	Minor	Slight adverse	Minimise working area, minimise area of habitats loss.	Insignificant
	Loss of natural Haloxylon communities.	Low	Moderate	Slight to moderate adverse	Minimise working area, minimise area of habitats loss.	Slight adverse
Species	Hunting of bird and mammal species from construction workers.	Low to medium	Minor	Slight to moderate adverse, depending on species	Introduction of hunting ban, awareness programme and appointment of Wildlife Warden	Insignificant
	Potential for introduction of invasive flora and fauna effecting natural habitats.	Low	Moderate	Slight adverse	Adherence to IPIECA guidelines on prevention & management of alien species. ESMP provides framework on how this management is out in place.	Insignificant
	Noise and light disturbance to birds and mammals.	Low	Minor	Slight adverse	Use of best practice standard and minimise noise and light pollution. Cessation of continuous flaring at the Surgil Field.	Insignificant
Upstream components– Operations						
Species	Hunting of bird and mammal species.	Low to medium	Minor	Slight to moderate adverse, depending on species	Introduction of hunting ban, awareness programme and appointment of Wildlife Warden	Insignificant
	Potential electrocution of bird species from installation of 10Kv transmission line.	Low	Minor	Slight adverse	Adhere to Birdlife International Position Statement on transmission line design	Insignificant
	Noise and flare disturbance to birds and mammals.	Low	Minor	Insignificant	Use of best practice standard and minimise noise pollution. Cessation of continuous flaring at the Surgil Field.	Insignificant
Upstream components – Decommissioning						
Habitats	Open drifting sand habitats.	Low	Minor	Slight adverse	Minimise working area, minimise area of habitats loss	Insignificant

Activity	Potential Impact	Sensitivity Score (Conservation value)	Magnitude Score	Impact Significance	Mitigation	Residual Significance
	Natural Haloxylon communities.	Low	Moderate	Slight to moderate adverse	Re-instatement of habitats.	Slight adverse
Species	Hunting of bird and mammal species.	Low to medium	Minor	Slight to moderate adverse, depending on species	Introduction of hunting ban, awareness programme across all employee and appointment of Site Ecologist	Insignificant
	Potential for introduction of invasive flora and fauna effecting natural habitats.	Low	Moderate	Slight adverse	Adherence to IPIECA guidelines on prevention & management of alien species. Decommissioning EMP to detail how this management is out in place and implementation of the DEMP	Insignificant
Pipelines – Construction						
Protected site	No direct impact on Sudoch'ye Lake, but impact from potential increased hunting and visitor disturbance on birds associated with the Sudoch'ye Lake.	Very high	Moderate	Large adverse	Introduction of hunting ban, awareness programme across all employees and enforcement of the ban. Clear demarcation/signage along site boundaries nearest the Sudoch'ye Lake restricting access	Slight adverse
Habitats	Temporary loss of habitats on the Ustyurt Plateau and escarpment.	Low for habitats on the Ustyurt Plateau, high for the escarpment habitats	Minor	Slight to Moderate adverse	Use of existing infrastructure corridors and crossing of Ustyurt escarpment to minimise natural habitat loss. Minimise working area, re-instatement of habitats after construction. Reinstatement plan to be implemented through the ESMP, including 20 year post construction monitoring & interventions if unsuccessful.	Slight adverse
Species	General: Hunting of bird species, including IUCN listed species.	Medium to high	Moderate	Slight to moderate adverse, depending on species	Introduction of hunting ban, awareness programme and appointment of Wildlife Warden.	Slight adverse

Activity	Potential Impact	Sensitivity Score (Conservation value)	Magnitude Score	Impact Significance	Mitigation	Residual Significance
	General: Noise and light disturbance to birds and mammals.	Low	Minor to moderate	Slight adverse	Minimise working areas, minimise frequency of construction traffic. Management of construction traffic to avoid excessive off-road access. No night time construction work	Insignificant
	General: Potential for introduction of invasive flora and fauna effecting natural habitats.	High	Moderate	Slight adverse	Adherence to IPIECA guidelines on prevention & management of alien species. ESMP to provide framework on how this management is out in place.	Insignificant
	Specific: Potential loss of *S. chivensis* due to habitat loss, trampling and dust deposition.	Medium	Low	Slight adverse	Re-instatement of habitats condition would result in no long-term impacts, details provided in the ESMP including 20 year post construction monitoring & interventions if unsuccessful. Impacts will only be localised and temporary. Collection of plant seed prior to construction. Re-seeding after construction and deposit of seeds and plants in national germplasm collection	Insignificant

Activity	Potential Impact	Sensitivity Score (Conservation value)	Magnitude Score	Impact Significance	Mitigation	Residual Significance
	Specific: Impact on individual Saiga from hunting, and accidental entrapment within the pipeline excavations, especially during migration months.	Very high	Low	Moderate adverse	Introduction of hunting ban, awareness programme and appointment of Wildlife Warden No night time working (especially during migration periods, October – November, February - April). Weekly checks of the pipeline trenches to check and remove trapped animals. Minimise the period of pipeline trench works. Minimise time between trench excavation and pipe laying. Re-instatement of pipeline trench as soon as possible after pipe laying to reduce risk of entrapment Monitoring of Saiga migration across the pipeline route. For 10 years post-construction.	Slight adverse , but insignificant impact on the Saiga population within the region.
	Specific: Impact on tortoise population from accidental entrapment, injury and killing.	High	Minor	Moderate adverse	Weekly check of the pipeline trenches to check and remove trapped animals. Minimise the period of pipeline trench works. Minimise time between trench excavation and pipe laying. Re-instatement of pipeline trench as soon as possible after pipe laying to reduce risk of entrapment. Stripping of the vegetation and subsequent scrapping of top-soil 1-2 weeks prior to trenching works to reduce potential for reptiles.	Insignificant

Activity	Potential Impact	Sensitivity Score (Conservation value)	Magnitude Score	Impact Significance	Mitigation	Residual Significance
	Specific: Impact on protected breeding birds due to habitats loss and noise disturbance, notably pin-tailed sandgrouse and Houbara bustard.	Medium to High	Minor	Slight to moderate adverse depending on species	Stripping of the vegetation and subsequent scrapping of top-soils prior to bird breeding season (main breeding season is May- July) and prior to trenching works to reduce potential for breeding birds.	Slight adverse
Pipelines - Operations						
Protected site	No direct impact on Sudoch'ye Lake, but impact from potential increased hunting and visitor disturbance on bird species associated with the Sudoch'ye Lake.	Very high	Minor	Slight adverse	Introduction of hunting ban, awareness programme across all employees and enforcement of the ban. Clear demarcation/signage along Project locations nearest the Sudoch'ye Lake restricting access. Biodiversity offset: Consultation with Sudoch'ye Lake Management NGO Committee with a view to support establishment of a Sudoch'ye Ecology Education Programme, involving local schools, raising awareness of the importance of biodiversity.	Insignificant
Species	Hunting of bird, including IUCN listed species and mammal species by persons undertaking maintenance works on the pipelines and associated infrastructure	High	Moderate	Slight to moderate adverse, depending on species	Introduction of hunting ban, awareness programme across all employee and enforcement of the ban.	Slight adverse
	Potential for electrocution and collision risks to IUCN/RDB migratory and breeding associated with the 10kV transmission line.	High	Minor	Moderate adverse	Installation of bird deflection devices on the 10kV transmission line. Adhere to Birdlife Position Statement on transmission line design	Insignificant

Activity	Potential Impact	Sensitivity Score (Conservation value)	Magnitude Score	Impact Significance	Mitigation	Residual Significance
	Impact on individual Saiga from hunting.	Very high	Minor	Moderate adverse	Introduction of hunting ban, awareness programme and appointment of Wildlife Warden Annual monitoring of Saiga migration across the area for 10 years post-construction. Biodiversity offset: Consultation with the Saiga Conservation Alliance to determine areas of support and research into the movement of Saiga and measures to help restore Saiga population in Uzbekistan	Insignificant
Pipelines – Decommissioning						
Habitats	Temporary loss/disturbance of habitats on the Ustyurt Plateau.	High	Minor	Moderate adverse	Minimise working area, re-instatement of habitats after works. Reinstatement plan to be implemented through the Decommissioning EMP.	In significant
Species	General: Hunting of bird species associated with critical habitats and Sudoch'ye Lake.	Medium to high	Moderate	Slight to moderate adverse, depending on species	Introduction of hunting ban, awareness programme and appointment of Wildlife Warden.	Slight adverse
Downstream components – Construction						
Protected site	No direct impact on Sudoch'ye Lake, but minor impact from potential increased hunting and visitor disturbance on bird associated with the Sudoch'ye Lake.	Very high	Minor	Moderate adverse	Introduction of hunting ban, awareness programme across all employees and enforcement of the ban. Clear demarcation/signage along boundaries of Project areas nearest the Sudoch'ye Lake restricting access	Insignificant

Activity	Potential Impact	Sensitivity Score (Conservation value)	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Habitats	Temporary loss/disturbance of habitats on the Ustyurt Plateau due to construction traffic compacting soils and removal of soils for construction. Temporary disturbance to critical habitats down the Ustyurt escarpment from the water pipeline construction.	Low to medium	Moderate	Moderate adverse	Use of existing infrastructure corridors and crossing of Ustyurt escarpment to minimise natural habitat loss. Minimise working area, re-instatement of habitats after construction. Reinstatement plan to be implemented through the ESMP, including 20 year post construction monitoring & interventions if unsuccessful.	Slight adverse
Species	General: Hunting of bird and mammal species, including IUCN listed species.	Medium to high	Moderate	Slight to moderate adverse, depending on species	Introduction of hunting ban, awareness programme and appointment of Wildlife Warden.	Slight adverse
	General: Noise and light disturbance to birds and mammals.	Low	Minor to moderate	Slight adverse	Minimise working areas, minimise frequency of construction traffic. Management of construction traffic to avoid excessive off-road access. No night time construction work	Insignificant
	General: Potential for introduction of invasive flora and fauna effecting natural habitats.	High	Minor	Slight adverse	Adherence to IPIECA guidelines on prevention & management of alien species. ESMP to provide framework detail how this management is out in place.	Insignificant
	Specific: Impact on individual Saiga from hunting, due to increase number of construction works present within the area.	Very high	Minor	Moderate adverse	Introduction of hunting ban, awareness programme and appointment of Wildlife Warden	Slight adverse
Downstream components - Operations						

Activity	Potential Impact	Sensitivity Score (Conservation value)	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Protected site	No direct impact on Sudoch'ye Lake, but impact from potential increased hunting and visitor disturbance. No impact from the water abstraction from the Amu Darya River.	Very high	Minor	Moderate adverse	Introduction of hunting ban, awareness programme across all employees and enforcement of the ban. Clear demarcation/signage along boundaries of Project nearest the Sudoch'ye Lake restricting access. Biodiversity offset: Consult with Lake Sudoch'ye Management NGO Committee regarding provision of support for establishment of a Sudoch'ye Ecology Education Programme, involving local schools, raising awareness of the importance of biodiversity.	Insignificant
Habitats	Loss of habitats on the Ustyurt Plateau as part of the footprint of the UGCC site.	Medium	Moderate	Moderate adverse	Minimise working area. Utilisation of existing infrastructure corridors for water supply pipeline and 110kV transmission line connection, especially to reduce impact in areas where the Ustyurt escarpment is traversed. Compensation: As part of Project component wastewater pond will be created (24 ha). The design for the ponds will include the creation of reedbed habitats. In addition to the open water, the reedbeds will significantly enhance the biodiversity within the area. These areas to be managed accordingly.	Slight beneficial effect through creation of wetland habitats
Species	Hunting of bird and mammal species by local residents and site workers.	High	Minor	Slight to moderate adverse, depending on species	Introduction of hunting ban, awareness programme across all employee and enforcement of the ban.	Slight adverse, depending on effectiveness of the hunting ban.

Activity	Potential Impact	Sensitivity Score (Conservation value)	Magnitude Score	Impact Significance	Mitigation	Residual Significance
	Impact on individual Saiga from hunting by site workers and local residents.	Very high	Minor	Moderate adverse	Introduction of hunting ban, awareness programme for conservation of Saiga. Annual monitoring of Saiga migration across the area for 10 years post-construction. Biodiversity offset: Consultation with the Saiga Conservation Alliance regarding possible contribution, research into the movement of Saiga and measures to help restore Saiga population in Uzbekistan	Insignificant
	Specific: Potential for electrocution and collision risks to IUCN/RDB migratory and breeding associated with the 12 km 110kV transmission line.	High	Moderate	Moderate to large adverse	Installation of bird deflection devices on the 110kV transmission line. Adhere to Birdlife Position Statement on transmission line design	Slight adverse
Downstream components - Decommissioning						
Habitats	Temporary loss/disturbance of habitats on the Ustyurt Plateau.	Low	Minor	Slight adverse	Minimise working area, re-instatement of habitats after works. Reinstatement plan to be implemented through the Decommissioning EMP.	Insignificant (potential benefits depending on decommissioning plans)
Species	Hunting of bird and mammal species.	Low to medium	Minor	Slight to moderate adverse, depending on species	Introduction of hunting ban, awareness programme across all employee and appointment of Wildlife Warden.	Slight adverse
	Potential for introduction of invasive flora and fauna effecting natural habitats.	Low	Moderate	Slight adverse	Adherence to IPIECA guidelines on prevention & management of alien species. Decommissioning EMP to detail how this management is out in place and implementation of the DEMP	Insignificant

8.6.2 Proposed Monitoring

To ensure that the proposed mitigation and compensation measures are successful and meet the objective of reducing the ecological impacts of the Project, a series of monitoring activities will be undertaken by the Project.

For the construction phase the monitoring activities will include;

- Daily monitoring of construction areas for general disturbance of habitats and fauna through encroachment, noise and extent of working area;
- Monthly audit of construction areas to monitor temporary working area size, number and extent of temporary access routes, construction vehicles use of specified access routes, levels of noise and light disturbance;
- Monitoring hunting activities across the region;
- Monitoring of vegetation for endangered species and breeding birds, burrowing mammals, reptiles and amphibians one day before vegetation clearance;
- Monthly monitoring of construction area including at uncovered lagoons for presence of deceased wildlife and deceased birds;
- Bi-weekly checks of the pipelines trenches to release any entrapped animals;
- Monitoring of Saiga migration across the pipeline route during construction period;
- Annual monitoring of the extent of invasive species distribution at project site.

The programme for monitoring the ecological features post-construction includes:

- Assessments of the recovery of the habitats and botanical diversity following reinstatement along the pipeline route with surveys at specific locations every two years for 20 years post-construction.
- Annual monitoring of Saiga antelope to assess the annual migration patterns across the area for 10 years post-construction. This monitoring can form part of the biodiversity offsetting, following consultation with the Saiga Conservation Alliance;
- Monitoring hunting activities across the region to assess the effectiveness of the enforcement measures;
- Checks and surveys for invasive alien flora and fauna every two years for 20 years.

These monitoring activities do need to be undertaken over a long time frame as given that the Project is within the relatively extreme environmental condition on the Aral Sea bed and on the Ustyurt Plateau, habitats and species population are slow to recover and therefore it can take several years before the success of the mitigation measures can be assessed.

As the Surgil Project is within the proposed project area for the Government of Uzbekistan's initiative on mainstreaming biodiversity into Uzbekistan's oil-and-gas sector policies, the long-term monitoring will comply and report into the proposed monitoring of the Government's initiative.

Annual environmental reports will be submitted for review to the Goskompriroda and other ecological bodies for their information. Information from these surveys will be regularly reviewed and if evidence suggests a decline in the ecological conditions relating to the construction and operational activities of the Project then intervention and further mitigation measures will be reviewed, defined and implemented. Additional mitigations may need to include:

- If the vegetation is slow to recover and recolonize, then further collection and re-seeding of plant species will be undertaken.

- If the Saiga antelope are shown to be migrating across the development area and being significantly affected by the construction/operational activities then measures to either exclude Saiga from the working areas, or measures to support a captive Saiga breeding population will be considered.
- If the Saiga antelope are shown to be impacted by hunting activities either directly or indirectly related to the development, then stricter control measures will be put in place. This may include further restrictions on public access, police-control access points to the Plateau or measures put in place to support a captive Saiga breeding programme, subject to agreement with Goskompriroda.
- If invasive flora and fauna are found to be colonising into the development area, then plans to eliminate the invasive species will be enforced.

8.6.3 Statement of Significance

As part of the Surgil project a range of mitigation and compensation measures, notably the creation of new habitats and increasing local community awareness about the importance of the local wildlife, it is unlikely that there would be any long-term significant loss in overall biodiversity across the region. No protected sites and no critical habitats would be significant adversely impacted. While there is the risk of individual Saiga antelope being affected, the Project would not have a significant adverse impact on the Saiga population within Karakalpak.

There is the potential for significant slight adverse effects on breeding and migratory bird species due to temporary habitat loss, temporary noise and light disturbances during construction, electrocution & collision risks with transmission lines and increased hunting. Biodiversity offsetting measures will be put in place to compensate and monitoring measures undertaken whereby, if necessary, appropriate interventions will be implemented if adverse effects are detected.

The mitigation measures and biodiversity offsetting as proposed within this ESIA is in compliance with the Government of Uzbekistan's initiative on mainstreaming biodiversity into Uzbekistan's oil-and-gas sector policies.

Table 8.11 presents a summary of the Project ecological impacts in the form of a Habitat Decision Framework against the requirement of IFC Performance Standard 6, Biodiversity, Conservation and Sustainable Natural Resource Management.

Table 8.11: IFC Habitat Decision Framework – Summary of Significant & Cumulative Effects

IFC PS6 compliance requirement	Significance of the Surgil Project and IFC compliance with the Performance Standard	Cumulative Effects
Will the project impact on a site legally protected or proposed for protection?	No. All activities of the Project will be a minimum of 2 km from the Sudoch'ye Lake State Nature Sanctuary and proposed Ramsar Site. Potential slight adverse impacts from increased hunting and visitor disturbances to bird associated with the Sudoch'ye Lake will be managed and offset.	Highly unlikely, increased legal protection and active management of the Sanctuary will ensure protection.
Will the project impact on critical habitats?	No. All impacts on critical habitats will be very localised, temporary and insignificant.	Unlikely. Majority of previous developments are contained within a relatively small area.

IFC PS6 compliance requirement	Significance of the Surgil Project and IFC compliance with the Performance Standard	Cumulative Effects
Will the project reduce populations of any recognised critically endangered or endangered species?	No. With the implementation of the ESMP and specifically the biodiversity offsetting and the appointment of a Wildlife Warden. No critical or endangered species populations would be significantly impacted but there is likely to be some slight adverse impacts on specific ecological features, notably breeding/migratory bird species.	Possible. Several bird of prey species are already in decline within the region, and with increased industrialisation within the region, there could be significant cumulative effects. Saiga antelope are also in decline within the region, and any slight additional negative effects could have significant cumulative effects. Mitigated through Biodiversity Offsetting and awareness raising of the importance of wildlife conservation.
Will there be measurable adverse impacts on the habitats ability to support its high value species and functions?	No. There will be temporary and localised adverse impacts during construction, but this will not affect the habitats ability to function and support species.	Unlikely, although continued development and industrialisation within the region could have an impact long-term.
Will the project impact on modified or natural habitats?	Yes, but mitigation and compensation measures which will be delivered through the ESMP. This will ensure that the Project activities are exercised with care to minimise the impacts, and with enhancements (as described in Section 8.5.4).	Unlikely. Some of the existing modified habitats could be degraded further, but any impacts are likely to be much localised and insignificant. In addition any potential risk of further contamination or degradation of the environment will be managed in accordance with best practice procedures.
Will the project lead to significant conversion or degradation of natural habitats?	No. The implementation of the ESMP will ensure no long-term significant conversion of degradation of natural habitats.	Unlikely, although continued development and industrialisation within the region could have an impact long-term.
Are there technical and financially feasible alternatives?	Alternatives have been explored as part of the development of the Project (see Chapter 3 of the ESIA), and the Project has been designed and alternations made to minimise the potential environmental impacts.	-
Do the overall benefits to biodiversity outweigh costs?	Implementation of the biodiversity offsetting measures and the ESMP will be important to ensure compliance, while there is likely to be some slight adverse impacts on specific ecological features.	-
Can any significant conversion or degradation be mitigated to acceptable levels?	Mitigation and compensation measures proposed in the ESIA and implemented through the ESMP will ensure that significant effects will be reduced to acceptable levels.	-

Note: Table adapted from the Habitat Decision Framework, Annex B of the IFC PS 6.

9. Water Resources and Water Quality

9.1 Introduction

9.1.1 Overview of the Assessment

This chapter addresses the potential impacts of construction and operation of the Project on hydrology, hydrogeology and flood risk. The assessment framework is set out in Chapter 5 and the assessment of potential impacts has been based on the Project description given in Chapter 2. The objective of this assessment is to identify any potential significant adverse impacts on the water environment and to set out appropriate mitigation to address these impacts as part of the Project.

Assessment has been based on published information, previous reports, information available from national organisations such as the Ministry of Agriculture and Water Resources, and international data from FAO and AQUASTAT. Where deficiencies in available information have been identified these have been highlighted and assumptions on the worst case scenario for the purposes of the impact assessment have been made and appropriate mitigation measures identified.

The emphasis of this assessment has been on the period when irrigation demands are greatest as these represent the most significant existing abstractions, and together with the operation of Tuyamuyun Dam and the Takhiatash Barrage control what flow is available at the Kungrad WSU. Although low flows are experienced in winter months, the sensitivity to potential reductions in flow is insignificant given the low demands for water resources from the Amu Darya and the capacity to use small changes in regulation to mitigate for any flow reduction.

Following a description of the methodology, including an overview of relevant national and international legislation, in Section 9.2, the baseline assessment is described in Section 9.3. The potential impacts which include flood risk, surface drainage, water resources and wastewater are assessed in Section 9.4. Section 9.5 presents the necessary mitigation measures. The summary of the impacts and any residual impacts following mitigation are reported in Section 9.6. The assessment concludes with a proposed monitoring plan (Section 9.7) and a statement of significance (Section 9.8).

9.2 Methodology and Assessment Criteria

9.2.1 Legislative Background

9.2.1.1 Uzbekistan

Water resources management, allocation and use in Uzbekistan are under the control of the Ministry of Agriculture and Water Resources (MAWR), which oversees national specialised associated, provincial and district departments of agriculture and water resources, and inter-provincial and inter-district canal management authorities.

All issues related to water resources management, allocation and use within Uzbekistan are regulated by the following documents:

- Constitution of the Republic of Uzbekistan, 1992;
- Law of the Republic of Uzbekistan “On water and water use,” 1993;
- Land Code of the Republic of Uzbekistan, 1998;
- Law of the Republic of Uzbekistan “On shirkat (cooperative) farm,” 1998;

- Law of the Republic of Uzbekistan "On private farm," 1998;
- Law of the Republic of Uzbekistan "On dehkan (individual) farm," 1998;
- Law of the Republic of Uzbekistan "On nature conservation," 1992;
- Decree No.385 of the Cabinet of Ministers, Republic of Uzbekistan, 3 August 1993 "On limited water use in the Republic of Uzbekistan";
- Decree No.174 of the Cabinet of Ministers, Republic of Uzbekistan, 7 April 1992 "On confirming the Provision on protection zones of water reservoirs and other water bodies, rivers, main canals and collectors as well as sources of drinking and municipal water supply and recreation meaning in the Republic of Uzbekistan"; and
- Provision on the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan, 2001.

According to Article 55 of the Constitution of the Republic of Uzbekistan, *"Land, depths, water, flora and fauna and other natural resources are national wealth, should be rationally used and are under state protection."*

The Law "On water and water use," enshrines the key objectives for water legislation in Uzbekistan setting out the following requirements:
- Article 1 requires "Regulation of water relations; effective use of water for population and economic needs; protection of water from pollution, mineralization and exhaustion; prevention and liquidation of a harmful impact of water resources; improvement of state water objects; and protection of the rights of enterprises, organizations, dehkan farms and citizens in field of water relations."
- Article 3 stipulates that "water resources are the state property and wealth of the Republic of Uzbekistan, should be rationally used and are protected by the state".
- Article 4 establishes "a single state water fund of the Republic of Uzbekistan, which includes rivers, lakes, water reservoirs, other surface water bodies and sources, canals and ponds, groundwater and glaciers."

At the same time, the Law stipulates, "the right to use water from the interstate Amu Darya, Syrdarya, and Zerafshan rivers, Aral Sea and others is determined by interstate agreements". The Law of Uzbekistan "On water and water use" recognizes relevant requirements to "transboundary watercourses" which are given as "interstate" ones. This Law also authorizes the State (through authorized agencies) to carry out management and control of water use and protection.

Article 30 of the same Law introduces limited and fully or partially chargeable water use. The conditions and orders relating to limited water use are determined by the Decree No. 385 of the Cabinet of Ministers of 3 August 3 1993, which has confirmed the "Provisional order of limited water use in the Republic of Uzbekistan."

Article 8 sets out that the following special state agencies are authorized to regulate water use:
- Water management authorities (surface water);
- State Committee for Geology (groundwater); and
- State Supervision Committee for security in industry and mining (thermal and mineral waters).

All interrelations in water resources within Uzbekistan are based on the above mentioned documents and corresponding contracts on water delivery. Water is delivered on a contractual basis to all water consumers including provincial and district water organizations and separate units. As a rule, the volume of water passing through the border of the neighbouring states is specified in interstate agreements.

9.2.1.2 International

The main conventions that Uzbekistan has ratified in relation to water-use and water quality is the UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes (UNECE Water Convention), adopted in 1992 and entered into force in 1996.

Reference is also made to the IFC Performance Standard 3 on Pollution Prevention and Abatement, Performance Standard 4 on Community Health, Safety and Security and IFC Performance Standard 6 on Biodiversity Conservation and Sustainable Natural Resource Management. In addition, relevant EHS sector Guidelines have been used to inform water conservation use and waste water management issues associated with the Project.

In general the EHS Guidelines promote the need for water conservation programs to be implemented commensurate with the cost of water use. These promote the continuous reduction in water consumption and achieve savings in the water pumping, treatment, and disposal costs. Water conservation measures may include water monitoring/ management techniques; process and cooling/heating water recycling, reuse, and other techniques; and sanitary water conservation techniques. Specific reference is made to addressing water use in relation to process water reuse and recycling including cooling systems, heating systems and building facility operations.

9.2.2 Consultation

Full details regarding consultations are provided in Chapter 6. Consultation and issues raised with regards to hydrology, hydrogeology and flood risk issues are summarised in Table 9.1.

Table 9.1: Summary of Consultation

Name of Organisation	Meeting Date	Key points raised by Uz-Kor	Comment by Consultee
State Environmental Committee of the Republic of Karakalpakstan	2 February 2009	Water shortages and shrinkage of Aral Sea and approach to addressing water supply issues for the Project	State Environmental Committee has provided detailed information on water supply options, plant water use and recycling and overall plant needs to address concerns on potential water shortages.
Lower Amu Darya River Basin Management Board ('NABUIS'), Ministry of Agriculture and Water Resources	14 March 2011	Capacity of Kungrad WSU and current customers Capacity of WSU to accommodate Project water requirements based on worst case scenario in low flow conditions Potential impact of Project water supply abstraction on water flow to Sudoch'ye Lakes	NABIUS stated no concern in capability of Kungrad WSU to supply Project requirements under all demand and flow scenarios. Kungrad WSU abstraction point from Amu Darya is downstream of offtake feeding Sudoch'ye Lakes so would have no impact

Name of Organisation	Meeting Date	Key points raised by Uz-Kor	Comment by Consultee
Aral Basin Delta Management	14 March 2011	Management of Sudoch'ye Lake system and water in flow arrangements.	Only one lake is used as a potable water supply; all other lakes are saltwater and used mainly for fishing. Aral Basin Delta Management gave opinion that additional Project abstractions from the Kungrad WSU would not affect flows into the Sudoch'ye Lake system, as this system is fed by a collector drain spur from the Amu Darya upstream of the Kungrad WSU.
Ministry of Agriculture and Water Resources (MAWR)	16 March 2011	Confirmation of management of water flows in relation to Sudoch'ye Lakes. Role of the Interstate Commission for Water Coordination of Central Asia in the management and coordination of water flows down the Amu Darya, based upon multi- or bi-lateral agreements between the countries. Scale, management and operation of the Tuyamuyun Reservoir, including uses for both drinking water, irrigation and energy generation via hydro schemes	MAWR advised of policy to reduce irrigated land in Karakalpakstan to reflect changes in agriculture with corresponding decrease in water demand. MAWR is to undertake a series of studies into integrity of existing water supply infrastructure in Project area and determine system losses with a view to undertaking programme of upgrades. MAWR confirmed that on the basis of Project information provided they had no concern regarding water supply.
Committee of Management of the Suduch'ye Lake (CMSL)	By correspondence	Confirmation of any concerns CSML may have in relation to the development of the Project	CMSL stated that the UGCC must be designed and perform in accordance with requirements of the State Ecological Examination and Uzbekistan nature protection laws (Uz-Kor has confirmed by correspondence with CMSL that the Project will be designed and operated with due consideration of all natural features of the region and compliance with all ecological norms and standards will be provided).

Follow on from the consultation with the MAWR the Ministry has provided a formal letter (dated 2nd June 2011) confirming their view that the abstraction for the Project has almost no influence on the water flow of Amudarya river downstream of the Takhiatash Hydro station in the context of current and future river basin management. The Ministry also confirmed that the Project does not have any influence over the Sudoch'ye Lake system. A copy of the letter and an unofficial translation is included in Appendix M. The Ministry noted that difficulties may arise only during critical low flows of the river, but that this could be compensated by options such as connecting to the Nukus-Tuyamuyun water supply pipeline, increasing the capacity of the Kungrad WSU water reservoir or development of groundwater supplies if suitable aquifer sources could be found.

9.2.3 Desk Study

A desk study was undertaken to obtain relevant baseline hydrological and hydrogeological information. The data made available for this chapter are summarised in Table 9.2. Data sources include Uz-Kor, Amu

Darya BVO, the Ministry of Agriculture and Water Resources, the Lower Amu Darya Basin Administration of Irrigation Systems (LABAIS) and Urgenchtransgaz.

Table 9.2: Available Data and Data Sources

Source	Description	Period
Amu Darya BVO	10 day flow data at selected Gauging Stations	1989-2010
Amu Darya BVO	Canal Diversions	1995-2010
Amu Darya BVO	Mean 5 year flows at selected gauging stations	1955-1995
Ministry of Agriculture and Water Resources	Abstractions for canals, pump stations and intakes downstream of Nietbaitas	2010
Urgenchtransgaz	Kungrad WSU actual annual water consumption	1998-2010
Nukus- Tuyamuyun WSU	Nukus- Tuyamuyun WSU annual water consumption	2010
Uz-Kor	Kungrad WSU actual quarterly water consumption	2005-2010
Uz-Kor	Raw water demand for the UGCC	design

In addition to this data background information and information on water quality and groundwater were sourced from Uz-Kor and other EIA reports undertaken for projects in the Project area.

There remain a number of data limitations which are summarised below:

- Detailed forecasted demands for the Kungrad WSU and Tuyamuyun – Nukus WSU
- Independent groundwater quality data.

Groundwater sampling and testing will be undertaken as part of a ground investigation to be undertaken in June 2011 at the Surgil Field and will provide further baseline information on current groundwater quality.

No specific hydrology field study was undertaken for this assessment. Field observations were made by the ESIA project team during site visits that have been utilised in this assessment. No independent hydrological modeling of the Amu Darya River was considered necessary to assess the impact of the water supply requirements for the Project due to the level of hydrological data already available from the various gauging stations on the river.

9.2.4 Assessment of Impact Significance

The methodology adopted for this chapter is consistent with the generic method described in Chapter 5. There are no national or international standards for the specific hydrological thresholds to be used for ESIA and hence the assessment of impacts relies to a large degree on professional judgment.

Three types of impact are assessed in this chapter:

- Water resources (including groundwater resources);
- Wastewater; and
- Flood risk.

The magnitudes of potential effects are assessed in terms of the scale and timing of proposed abstractions relative to the baseline water resources. The sensitivity of a specific receptor is based on the available water resources as described in the baseline status. In water scarce areas such as the Aral Sea basin even relatively small abstractions may be significant in terms of the ESIA and require consideration of mitigation.

Wastewater impacts address the effects of wastewater discharges on receptors and predominantly concern water quality issues. Where national or international standards exist these are used as indicators of magnitude and, in the case of potable standards, sensitivity. In this chapter reference is made to Maximum Permissible Concentrations (MPC) as defined in legislation of the Republic of Uzbekistan and where appropriate international standards such as those published by the World Health Organisation (WHO) and IFC are referred to.

Flood risk impacts address the risk to the proposed development (including operatives, infrastructure and members of the public etc.) arising from flooding. The impact of the development on the flood risk to third parties (such as downstream sites) is not included in the scope due to the low density of temporary and permanent roads, the low density of existing settlements and the low annual precipitation. The magnitude of flood risk is measured in terms of the flood hazard and the sensitivity reflects the capacity of a receptor to accommodate additional runoff and the vulnerability of any affected infrastructure.

Following the consideration of appropriate mitigation measures a final assessment of the residual impacts is made such that the ESIA can conclude with a statement of significance.

9.3 Baseline Description

9.3.1 Introduction

In this desert area, the river network in the region around the Project drains towards the Aral Sea. There are no perennial natural rivers or streams other than the Amu Darya. Along the southern shores of the Aral Sea there are flows from the drainage networks associated with the nearby irrigated areas.

The water resources of this region are reliant on the Amu Darya and hence the baseline description focuses on the catchment of this river.

During the last quarter of the 20th century inflows to the Aral Sea have decreased significantly as a direct result of irrigation causing the water level to drop by 17 meters and the surface area to decrease by more than 50%. Consequently, a sand-salt desert with an area of more than 30 000 km^2 has emerged from the dried out Aral Sea bed. The decline in the Aral Sea has been well documented[54] and therefore will not be elaborated in detail within in this assessment.

9.3.2 Climate

The climate of the Project area is defined as semi-arid with annual precipitation between 100 mm and 140 mm. Precipitation falls as winter snow with rain typically occurring in April and sometimes in early May. Rare but intense storms during summer months are important for both local biodiversity and provision of grazing for local herdsmen. April is the wettest month with around 16% of the annual rainfall falling in this month. The driest months are July, August and September.

Within the Project area, winter snow cover is reported not to exceed 17 kg/m^2 and there are, on average, 27 days of snow cover a year. There is, on average, 15 mm thickness of ice once in 5 years increasing to 20 mm once in 10 years.

54 Time to save the Aral Sea? Food and Agriculture Organisation of the United Nations Agriculture and Consumer Protection Department (Spotlight/1998)

The average annual air temperature is reported to be 10.2℃. Monthly average air temperature ranges from -5.9°C in January to 26.6℃ in July. The absolute minimum and maximum values are reported to be -31℃ and +44℃ respectively and, on average, there are 104 days a year when the temperature is less than 0℃.

9.3.3 Regional Surface Water Resources

9.3.3.1 Hydrology and Flow Regulation

The Amu Darya is the larger of the two rivers of Central Asia that feed the Aral Sea – which now comprises two or three barely connected water bodies. The basin is 1 017 800 km^2 in area although the catchment area for the Amu Darya is reported to be 250 000 km^2 since a number of rivers in the Amu Darya basin do not reach the Amu Darya itself. In its upper reaches it forms the border between Tajikistan, Uzbekistan and Afghanistan.

From the Tien Shan and Pamir mountains it flows into the desert lowlands of Turan through Uzbekistan and Turkmenistan and drains into the Aral Sea (Figure 9.1). The majority of the catchment area lies outside Uzbekistan with around 82% of the surface runoff entering from Turkmenistan and 16% generated from within Uzbekistan[55].

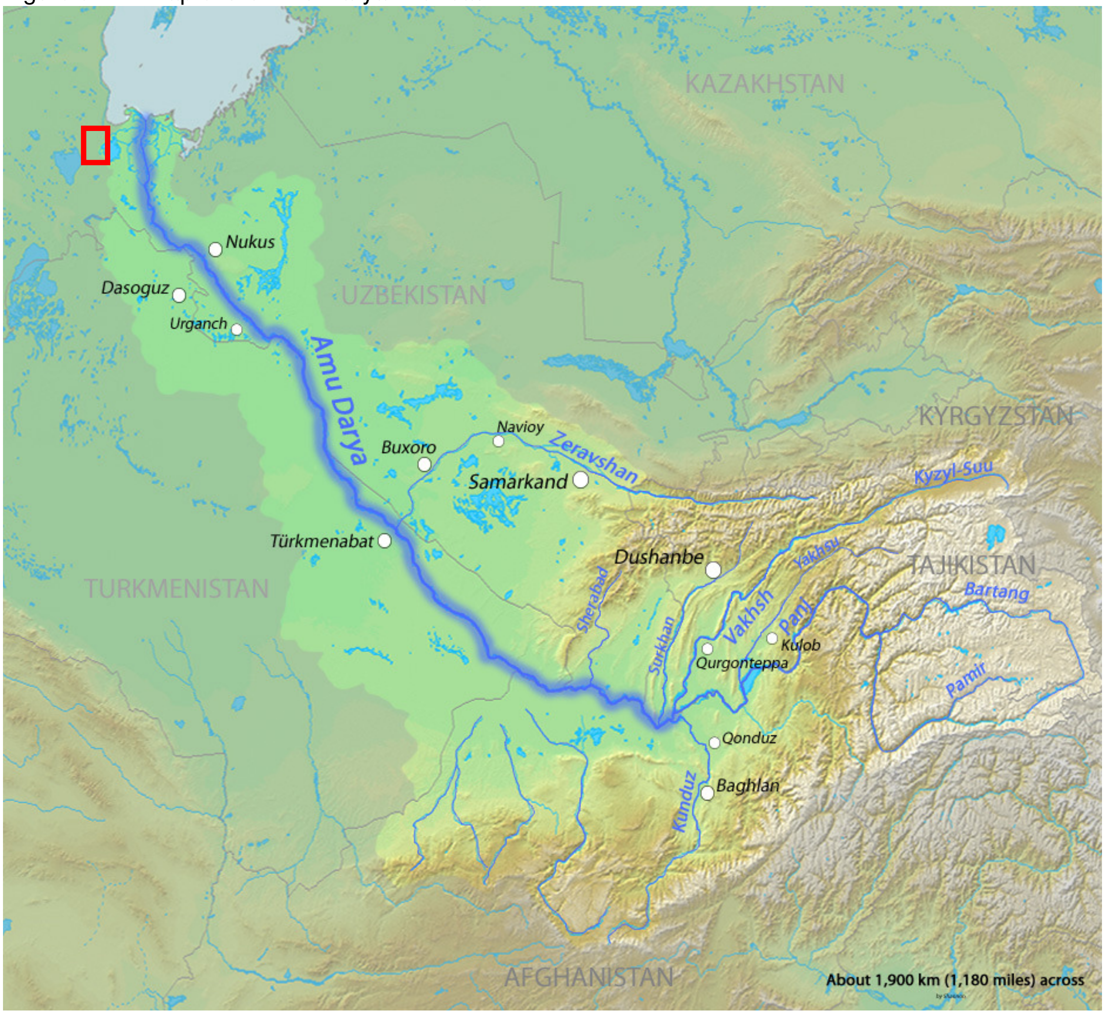
The river flows 2 574 km from the head of the river Pyandj to the Aral Sea[56] although it only becomes the Amu Darya by name at the confluence of the rivers Pyandj and Vakhsh in Tajikistan. In terms of overall contribution, in a median year, the Pyandj contributes around 33 400 million m^3 and the Vakhsh around 20 100 million m^3[57].

[55] Aquastat water balance sheet, Food and Agriculture Organisation of the United Nations

56 Amu Darya BVO (http://www.icwc-aral.uz/bwoamu.htm)

[57] www.icwc_aral.uz, October 2010

Figure 9.1: Map of the Amu Darya river basin



River basin shown in light green.
Approximate study area location outlined in red.

Source: Background and river course data from http://www2.demis.nl/mapserver/mapper.asp

All major tributaries join the river within the first 180 km. The Kunduz River (Afghanistan) joins at 12 km from the Pyandj and Vakhsh confluence, the Kafirnigan River joins after 38 km, the Surkhandarya River after 137 km and the Sherabad River after 180 km. There are no major tributaries downstream of the Sherabad confluence as a result of diversion of rivers for other uses, most notably the Zeravshan River.

Major irrigation systems were constructed in the Amu Darya River Basin in the 1950s and 1960s during the period of Soviet rule. The total irrigated area fed by the river is now estimated to be 3.8 - 4 million hectares. These developments together with the hydro-power developments on the Vakhsh River transformed the Amu Darya into a partially regulated system.

There are two large river seasonal storage reservoirs: Nurek on the Vaksh River and Tuyamuyun in the lower reaches of the Amu Darya. In addition, there are numerous smaller reservoirs within the basin including reservoirs on the main river for hydro-power and for irrigation storage purposes throughout the basin.

Nurek dam, located on the Vaksh River, is now operated primarily to generate year-round hydro-power. If built, the Rogun dam, upstream of Nurek, could have a greater impact on the flows and potentially might reduce the availability of water in the Lower Amu Darya in summer while increasing winter flows. The other main tributary of the Amu Darya, the Pyandj, is not at present regulated and is likely to remain so in the foreseeable future.

The potential interaction between the Rogun dam and the Project was discussed with the MAWR and other stakeholders during consultation and no issues were raised. Based on this consultation and knowledge of operation of the water flow management arrangements in the Lower Amu Darya it has been concluded that as the Pyandj tributary supplies the majority of flow and is unregulated, any impact of the Rogun Dam on the seasonal hydrograph will be mitigated by numerous storage systems as discussed below. As such there is not considered to be a specific cumulative impact between operation of the Rogun dam and the Project.

Downstream of the Vakhsh-Pyandj confluence there are no major additional natural inflows and river flows are dominated by diversions for irrigation in both Turkmenistan and Uzbekistan as illustrated in Figure 9.2. The maximum permissible abstraction is controlled, both in overall terms and through allocations administered through the Amu Darya BVO in response to actual water resource availability. When water is short, agreement is reached on reduced allocations to the various intakes along the river.

There are, however, significant irrigation return flows, principally in the middle reaches – notably from the Yuzny Collector (via Lake Sultandag) and Parsankul Collector on the right bank – which raises the river's mineralisation levels.

There are two major control structures in the lower reaches of the Amu Darya, used to facilitate irrigation diversions into Karakalpakstan, Khorezm and the neighbouring territories in Turkmenistan: the Tuyamuyun dam and the Takhiatash Barrage.

The Tuyamuyun dam, completed in 1980, is located at the southern end of the Amu Darya delta. It is an impounding dam, with three off-stream compartments with total storage volume of 7.2 km^3 and an active storage volume of 4.7 km^3. Operation of the Tuyamuyun dam now regulates the flow in the Lower Amu Darya providing greater control over the seasonal flow variations, including significant down stream flooding that has previously been experienced. The release of water from the reservoirs into the Amu Darya is under the control of the Lower Amu Darya River Basin Management Board ('NABUIS'), which forms part of the Ministry of Agriculture and Water Resources. The release volumes have to be increased gradually to allow the discharge to scour a channel in the downstream river bed to avoid causing flooding. NABIUS therefore has to maintain a delicate balance between maximising water held in storage during the spring snow melt to provide sufficient reserve for irrigation releases over the summer period and ensuring the reservoir levels are suitable for the dam and reservoir complex to accommodate high flood inflows during this snow melt period and/or spring rains.

The Takhiatash Barrage, located on the outskirts of Nukus, serves north Karakalpakstan and adjacent territories. In addition to diverting supplies to irrigation networks, the Barrage is operated to supply cooling water to the Takhiatash thermal power station. The release of flows through the Barrage are affected by the need to meet irrigation demands as well as maintaining the upstream pond water level to allow a gravity cooling water flow to the Takhiatash gas-oil fired power station nearby.

The Sudoch'ye lake system is fed by drainage from irrigated areas that are supplied from the Amu Darya at the Takhiatash Barrage.

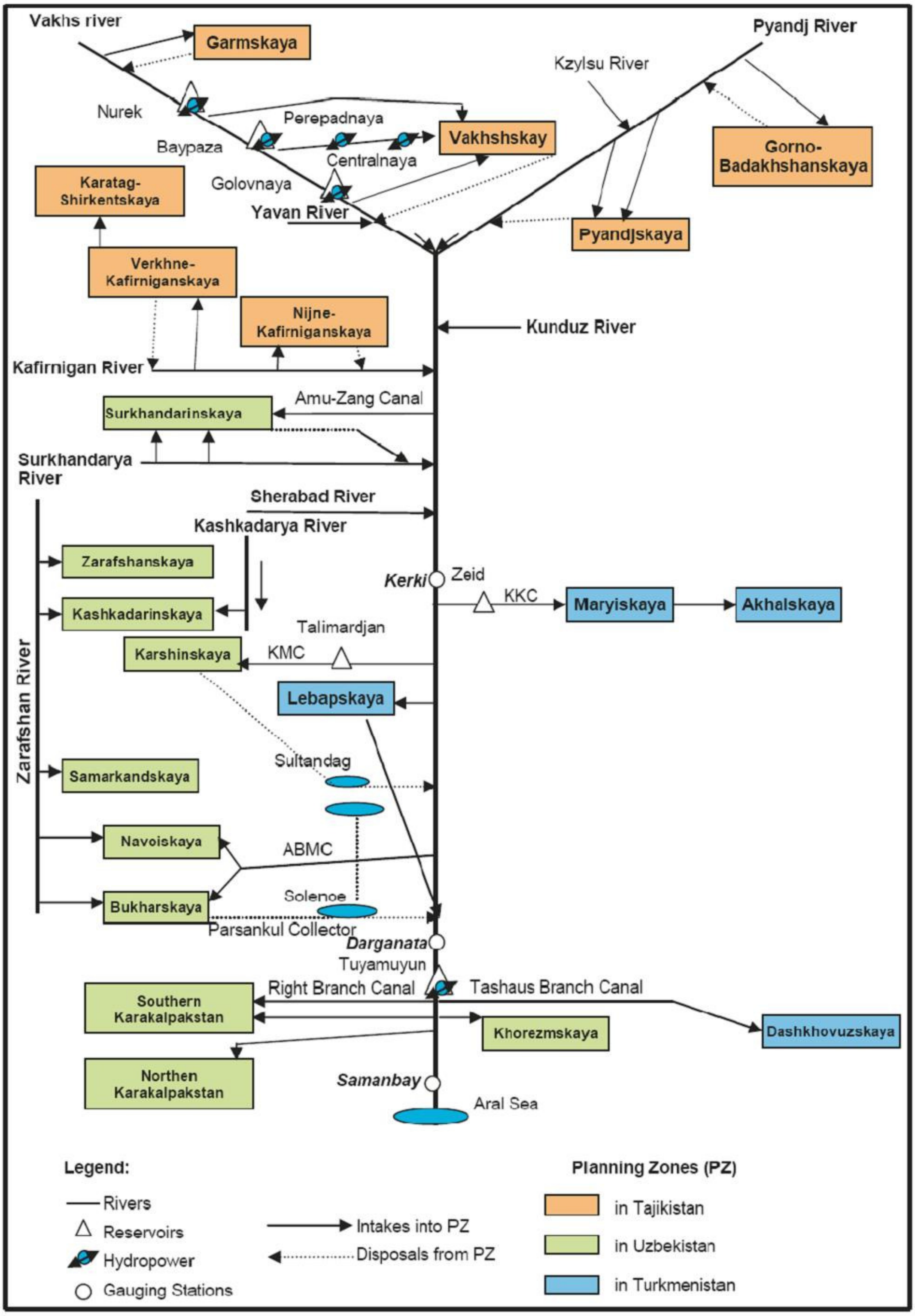
Interstate agreements set out a commitment to supply 5 km^3/yr (158 m^3/s) into the Aral Sea and there is a standing agreement that a minimum environmental flow of 50 m^3/s should be maintained in the river downstream of the Takhiatash Barrage (BVO Amu Darya pers. comm.) to ensure adequate water levels in the Amu Darya are retained to meet downstream user requirements. It is not known exactly when these commitments were instated but they are likely to have been in place for over 10 years given that the legislation to form the Interstate Commission for Water Coordination, whose stated aims is regulating water resources in the basin, has been in place since 1993. However a report on water management in Lower Amu Darya[58], whose contributors included inputs the MAWR, Center of Hydrometeorological Service, Uzbekistan and Academy of Sciences, Institute for Bioecology, Nukus, reported that the interstate commitment to supply 5 km^3/yr into the Aral Sea has often not been observed nor enforced. The report also notes however that there are plans to increase the water flow to the Amu Darya delta up to 10 km^3/year depending on water availability of the year.

As discussed further in Section 9.4.4.1 below there are renewed efforts from the countries within which the Amu Darya basin is located (Tajikistan, Uzbekistan, Kazakhstan, Turkmenistan and Kyrgyzstan), with support and encouragement from the international organisations (UN, UNECE, UNDP), to improve the functioning of International Fund for Saving the Aral Sea (IFAS) in order to achieve its intended objectives, a key priority of which is integrated water resources management for the Amu Darya Basin. Achievement of this objective will be delivered through a range of actions including adherence to such flow commitments as exist for flows into the Aral Sea and releases at the Takhiatash Barrage.

A dam was constructed across the Lower Amu Darya in 2007-08 to create an artificial system of lakes in and around Muynak (as can be seen in Figure 9.4). This measure was taken to prevent flows in the Amu Darya from draining into the dried Aral Sea Basin and being lost through evaporation and infiltration and to improve the socio-environmental conditions in and around Muynak. The Muynak lakes and wetland is supporting diversification of agriculture by allowing the growth of reed beds and straw for animal feed and bedding and to address dust issues that had been caused by the desertification of former agriculture areas. It has been found to have limited biodiversity value at this time being a relatively newly established habitat. There are no minimum flow requirements for the Muynak Lakes however it will benefit from the minimum environmental flow commitments for releases from the Takhiatash Barrage made by BVO Amu Darya. .

[58] Incorporating environmental flows into water management in the Amudarya river delta - Maja Schlüter1, G. Khasankhanova2, U. Abdullaev2, V. Talskikh3, R. Taryannikova3, I. Joldasova4, T. Khamzina2, R. Ibragimov2, C. Pahl-Wostl51

Figure 9.2: Schematic of the Amu Darya River Basin



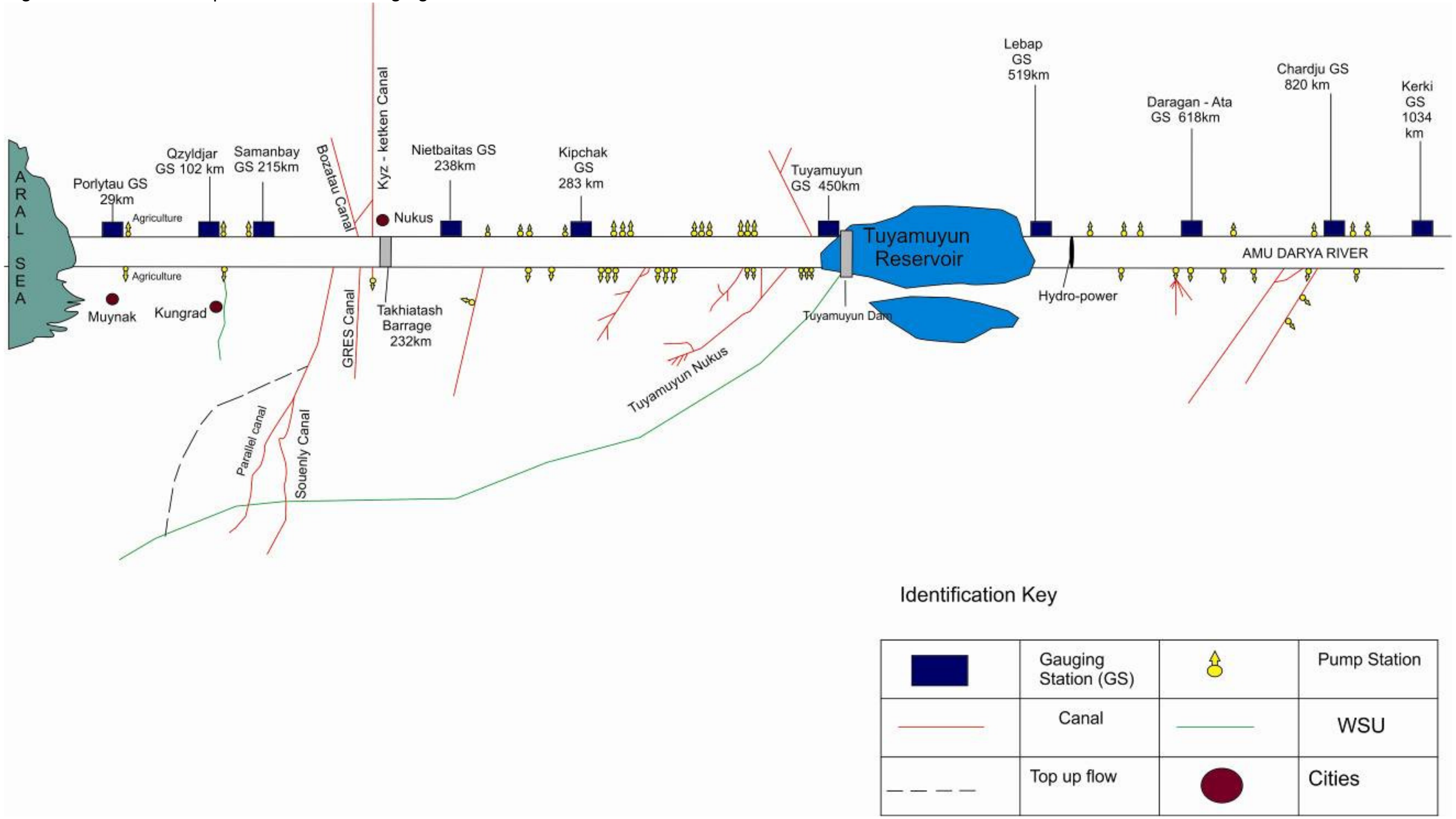
Source: MM based on maps from Lower Amu Darya Basin Management Authority

9.3.4 Recorded Flows

9.3.4.1 Flows in Lower Amu Darya

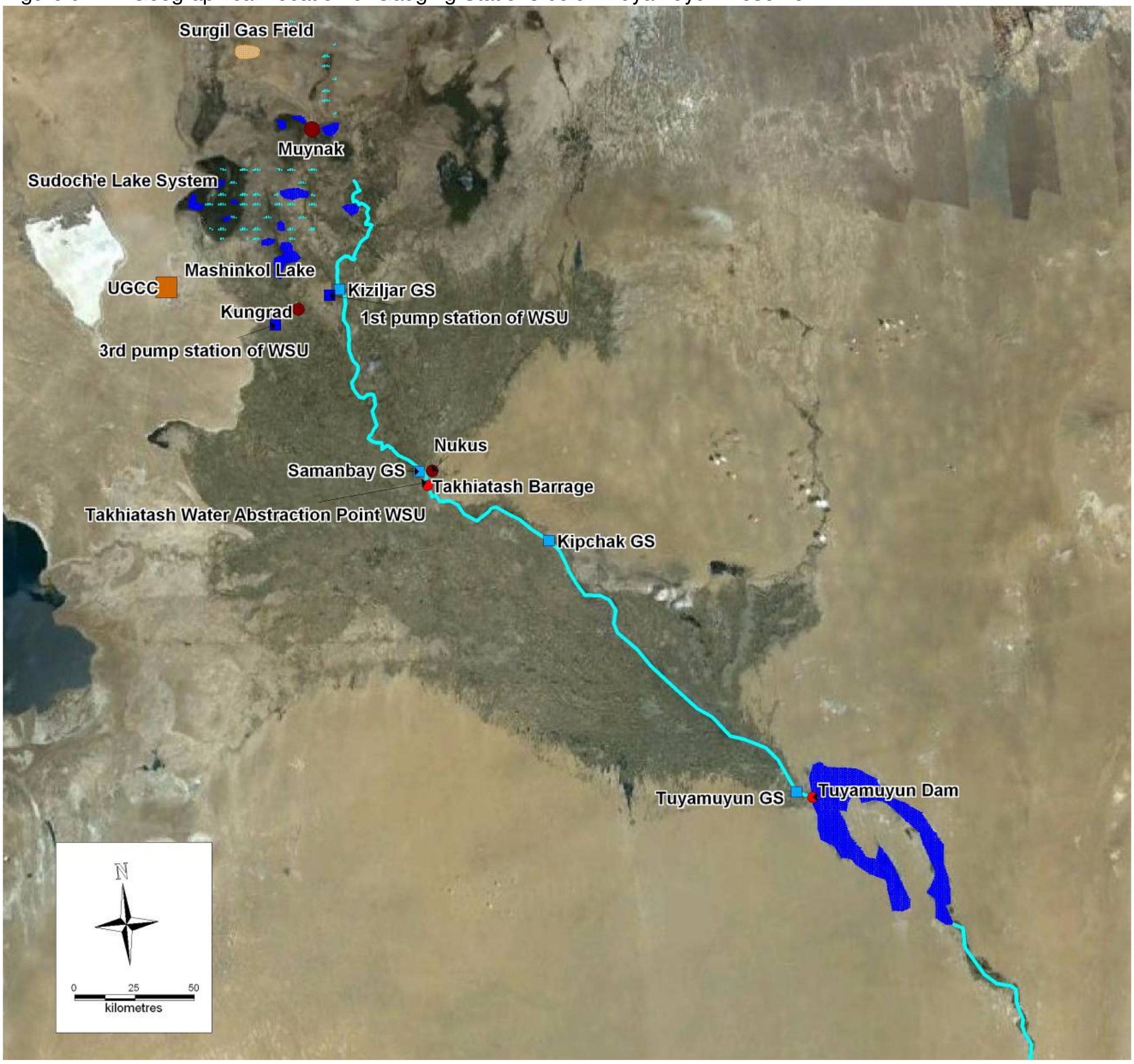
Flows in the Amu Darya are monitored by a network of gauging stations along its entire length. For the purposes of this assessment relevant gauging stations referred to are shown in the linear representation shown in Figure 9.3 and geographically in Figure 9.4.

Figure 9.3: Linear Representation of Gauging Stations



Source: MML

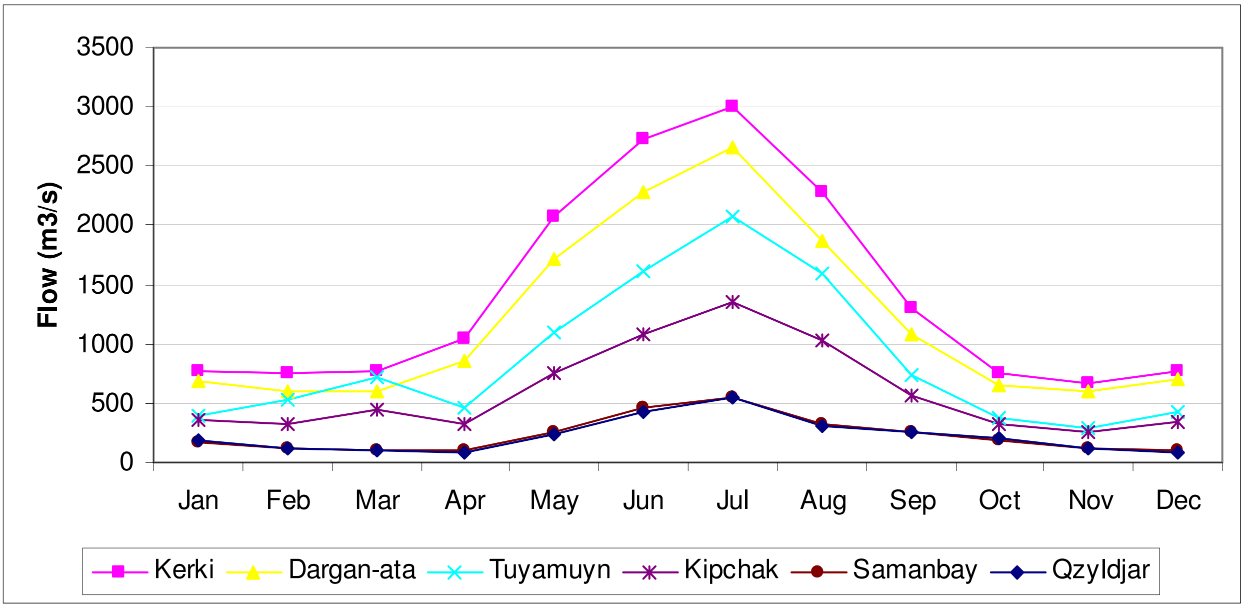
Figure 9.4: Geographical Location of Gauging Stations below Tuyamuyun Reservoir



Source: MML

The average monthly flows at selected gauging stations on the main river for the period January 1989 to February 2011 (Figure 9.5 and Table 9.3) decrease from Kerki gauging station (167 km upstream of Tuyamuyun) to Samanbay gauging station (17 km downstream of the Takhiatash Barrage) reflecting the significant impact of regulation and abstraction for irrigation over recent years. For reference, the average annual flow decreases from 1 412 m^3/s at Kerki to 201 m^3/s at Qzyldjar (also referred to as Kiziljar).

Figure 9.5: Average monthly flows at selected BVO gauging stations



Source: Amu Darya BVO 10 day flows Jan-1989 to Feb -2011

Table 9.3: Average monthly flows (m^3/s)

Month	Kerki	Dargan-ata	Tuyamuyun	Kipchak	Samanbay	Qzyldjar
Jan	777	684	400	357	171	194
Feb	753	595	535	333	126	122
Mar	768	597	728	443	99	101
Apr	1052	854	462	328	100	92
May	2076	1720	1099	752	266	245
Jun	2723	2283	1612	1076	457	424
Jul	2997	2655	2080	1357	555	541
Aug	2275	1874	1599	1036	327	317
Sep	1300	1083	745	562	262	255
Oct	754	652	373	321	193	201
Nov	674	597	288	253	118	116
Dec	768	699	434	342	109	88
Annual	**1412**	**1172**	**863**	**588**	**219**	**202**

Source: Amu Darya BVO - 10 day flows Jan-1989 to Feb-2011

Flow in the river rises between March and May in response to melting snow, and rain on the plains, and increases through the summer with melting snow and ice in the mountain ranges upstream. The flow declines from September to February with the formation of ice.

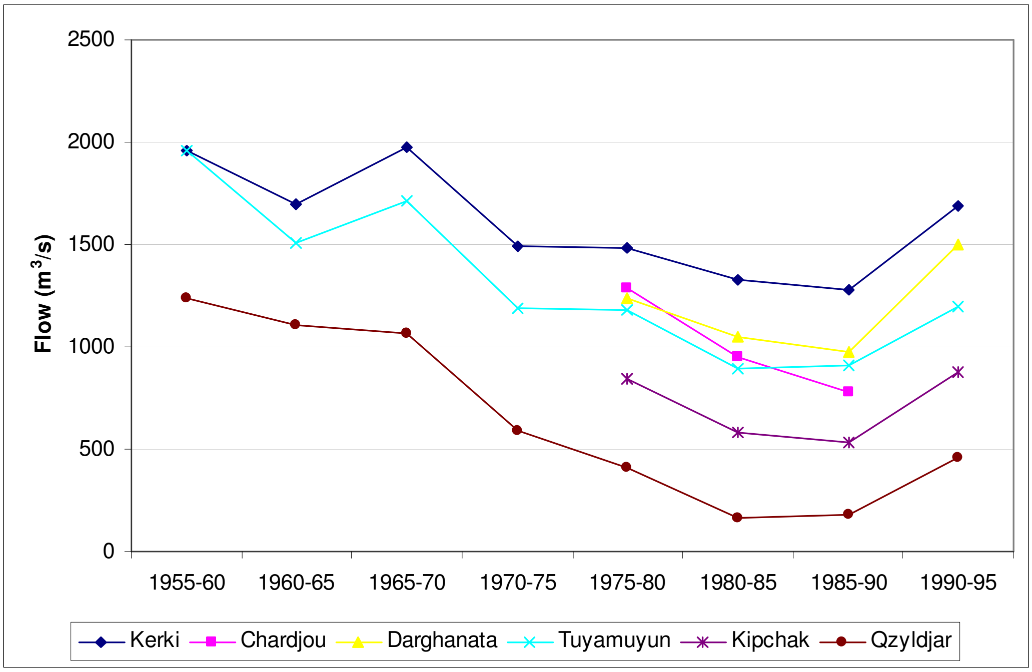
The impact of irrigation on the flows in the Amu Darya is further illustrated in Table 9.4 and Figure 9.6 which show that there has been a downward trend in recorded flows since the 1950's and that significant diversion occurs between upstream and downstream gauging stations. . The Tuyamuyun dam was completed in 1980 and stabilised the flows recorded at Tuyamuyun to some extent. The increase in flows in the 1990's however reflects the impact of reduced irrigation during the transition from Soviet rule and the introduction of measures to protect downstream flows.

Table 9.4: Historic flows in Amu Darya

Gauging station	Mean five year flow (m^3/s) in hydrological year							
	1955-60	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95
Kerki	1960	1696	1972	1490	1484	1329	1281	1687
Chardjou	-	-	-	-	1287	954	777	-
Darghanata	-	-	-	-	1237	1053	977	1500
Tuyamuyun	1956	1509	1709	1192	1180	891	907	1195
Kipchak	-	-	-	-	843	580	530	875
Qzyldjar	1240	1107	1069	587	406	165	184	457

Source: Sredazgiprovodkhlopok (now Uzgip)
Note: cells marked as "-" denote that no measurement data is available

Figure 9.6: Mean five year flow (m^3/s) at selected BVO gauging stations



Source: Amu Darya BVO 10 day flows Jan-1989 to Feb -2011

The flows at Qyzldjar gauging station are being used for the purposes of this assessment as being representative of the available flow for the Project after all other water use abstraction have been taken into consideration. It is located approximately 13 km downstream of the Kungrad WSU offtake. Flow data from the Samanbay gauging station is however also relevant as it is immediately downstream of the Takhiatash Barrage and provides data on the flow levels released through the Barrage.

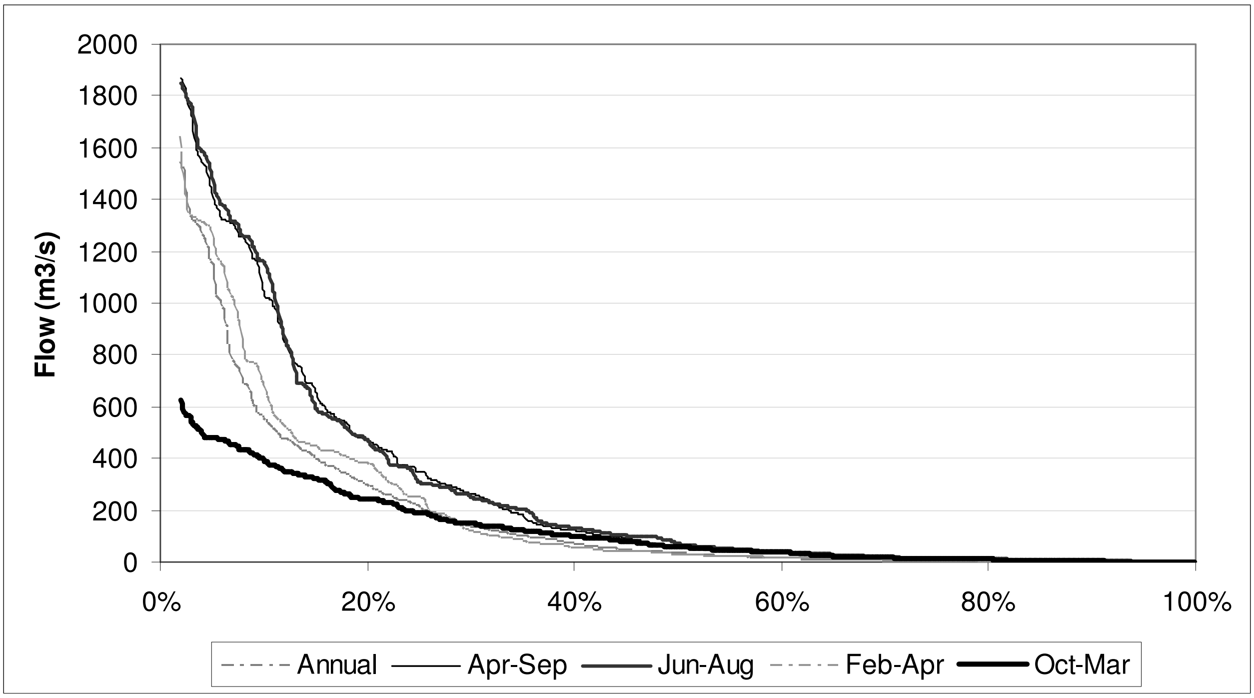
The flow duration curve derived for Qyzldjar based on the 10-day flow record is presented in Figure 9.7 and summarised in Table 9.5. Given the highly regulated nature of the river at this location and the influence of upstream storage on low flows the use of 10-day flows is acceptable for this study. Periods during which ice was observed at the gauging station, and therefore no flow could physically be measured by BVO, have been removed from the analysis. Ice was recorded generally between January and February, although in rare years it was also recorded in March, November and December. In total, ice is recorded on 16% of the 10-day periods at Qyzldjar.

The presence of ice does not imply zero flow but that gauging was not possible (e.g. due to ice floes) and hence it is not appropriate to replace all 10-day periods with zero. In fact replacing all records of ice with zero would significantly over-estimate the frequency of low flows. Ice is rarely recorded at upstream gauging stations, only being recorded in December 2010 at Kerki and January and February 2008 at Tuyumayun. Substantial flow therefore reaches the Takhiatash Barrage and, given the scale of the discharge structures at the barrage (23 opening, a ship lock, irrigation outlets and a fish pass), it is likely that flow continued during periods when ice was recorded. This is supported by the fact that ice was only recorded for 8% of the 10-day periods at Samanbay gauging station (13km upstream of Qyzldjar).

The results give the percentage of each period during which the flow will be equal to or greater than the value given by the curve or in the table. For example, the flow would be equal to or greater than 2.8 m^3/s for 95% of the average year (i.e. 345 days). As such the results give an indication of the probability of the flow falling below a specified value at Qyzldjar gauging station. For the seasonal statistics, the statistics represent the percentage of time a specific flow is expected to be exceeded within the specified season. For example, a flow of 3.0 m^3/s is expected to be exceeded for 95% of the time during the April to September season.

Seasonal statistics are calculated by only including data from the specified season in the exceedance analysis and give a more focussed assessment of low flows during the selected period of interest when demands on water resource are greatest.

Figure 9.7: The annual and seasonal 10-day flow duration curves at Qyzldjar gauging station



Source: Amu Darya 10 day flows Jan-1989 to Apr-2010

Note: The x axis represents the percentage of time that the flow exceeds the flow given on the y axis based on the available period of record (i.e. the probability that a given flow will be exceeded).

The Oct-Mar curve is derived from 10-day periods when no ice was recorded).

Table 9.5: Seasonal percentage exceedance flows at Qyzldjar Gauging Station (m^3/s)

%	99.0	95.0	90.0	80.0	70.0	60.0	50.0	40.0	30.0	20.0	10.0	5.0	2.0
Annual	1.9	2.8	4.7	10.9	18.4	34.2	58.0	109	204	364	677	1256	1595
Oct-Mar	1.2	2.7	4.1	10.0	17.1	37.8	57.0	99.2	149	245	394	479	623
Apr-Sep	2.2	3.0	5.0	11.8	20.6	36.0	65.0	128	279	483	1106	1457	1878
Jun-Aug	2.1	2.8	4.7	11.4	19.4	38.6	71.3	130	252	469	1161	1490	1851
Feb-Apr	1.2	2.8	5.4	9.2	16.0	22.0	33.0	58.0	124	386	695	1290	1659

Source: Amu Darya 10 day flows Jan-1989 to Apr-2010

The differences between the flow duration curves reflect the strong seasonality of the flow regime and in particular the increased prevalence of low flows during the winter months. . These low flow periods are however outside the critical irrigation period and likely to be indicative of water being stored in the Tuyamuyun reservoir for later release for irrigation. Whilst flow levels are usually low during the winter period this is a reflection of the water resource requirements in this heavily managed river basin, and is indicative of the fact that the winter period is not considered to be subject to water resource pressures from multiple demands. The flow duration curve for early spring (February to April) indicates that river flows are still low at a time when there is an upsurge in leaching prior to irrigated cropping.

Flows increase significantly during the summer months (June to August) and the recorded 10-days flows indicate that the river flow did not drop below 1.8 m^3/s in recent years. This reflects the influence of upstream regulation and indicates the potential to manage low flows through the operation of the Takhiatash Barrage.

9.3.4.2 Flood Flows

Major flood events on the Amu Darya are caused by snow melt events. The annual hydrograph shows a slow overall rise to a peak in July, declining in the same manner in September. This overall pattern reflects the annual rise and fall in temperature and the availability of snow at different altitudes in the upper catchment. Superimposed on this overall rise are a number of individual events with peaks lasting in the order of 10 to 20 days as a result of variations in temperature.

Floods arise predominantly in the catchment upstream of the Vakhsh-Pyandj confluence and together with inflows from the smaller tributaries travel some 1000 km along the Amu Darya to Tuyamuyun. Irrigation diversions and return flows impact on the hydrograph form, particularly in the middle reaches of the Amu Darya. In addition, the hydrograph is attenuated by storage within the river channel and by river losses.

The maximum flow in the Amu Darya was recorded during the July 1998 flood when 6 800 m^3/s was recorded at Kerki and 3 280m^3/s at Kipchak. The peak inflow to the Tuyamuyun reservoir recorded just upstream of the reservoir at Birata (Darganata) in the floods of both 1998 and 2005 was around 6 500 m^3/s. It is reported that the maximum recorded flow in the Amu Darya at Tuyamuyun is believed to be 9 600 m^3/s (in 1968)[59].

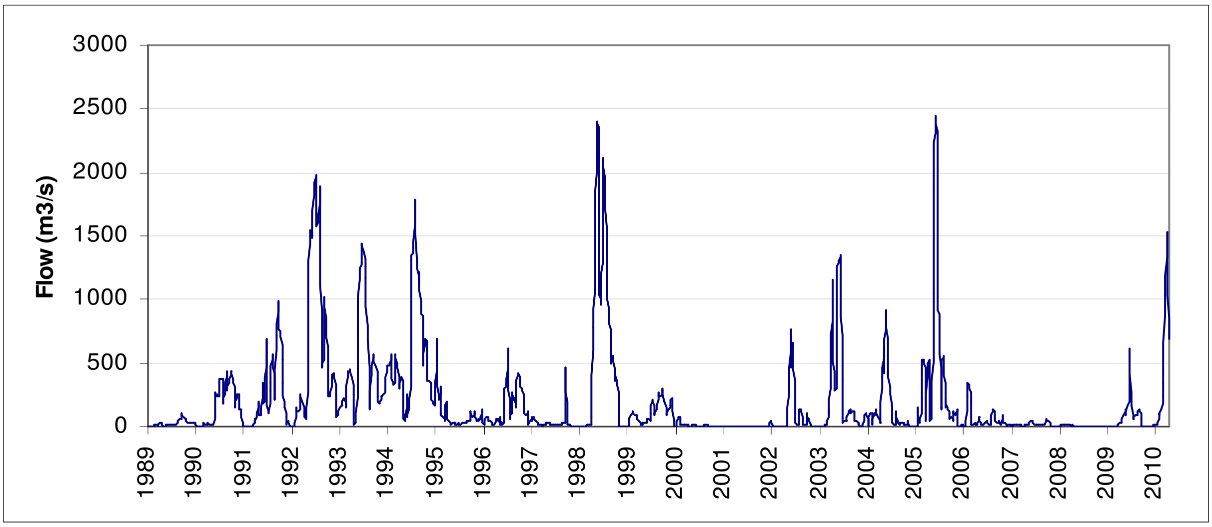
The maximum 10 day flow recorded at Qyzldjar gauging station during the period January 1989 to February 2011 is 2 439 m^3/s which occurred in July 2005.

[59] MMTS, 2010c Drainage, Irrigation and Wetland Improvement Project – Phase 1. AS6: Amu Darya Basin Water Management Studies. Final Report. Mott MacDonald – Temelsu for Ministry of Agriculture and Water Resources / Projects Implementation Unit for Water Infrastructure. March 2010.

9.3.4.3 Low Flows

Figure 9.8 illustrates the occurrence of low flow periods within the available record and emphasises the relative magnitude of flows (see Table 9.5 for specific low flow statistics). It is evident that the driest period in recent times occurred during 2000 and 2001 (as illustrated in Figure 9.8). Low flows were also recorded at Qyzldjar in 2007-2009.

Figure 9.8: 10 day flows at Qyzldjar (1989 to 2010)



Source: Amu Darya BVO

The 2000 and 2001 droughts were experienced across Central Asia due to low snow falls leading to lack of snow melt and therefore not limited to the Amu Darya basin. The drought was particularly extreme in the lower reaches of the Amu Darya although Wegerich[60] reports that there are various views as to the severity of both droughts.

Precipitation during 2000 was reported to have been 15% below the annual average, SANIIRI[61] indicated that there was 30% less available water for irrigation, while the recorded water levels in Nurek and Tuyamuyun reservoirs indicate that water levels were 10% and 50% lower than average respectively.

Mott MacDonald's study into drainage, irrigation and wetland improvements in the Amu Darya Basin 2010 for MAWR found that allocation of water during drought periods has favoured traditional farming areas further upstream (e.g. Bukhara, Termiz and Khorezm) over more recently developed farming areas in the Lower Amu Darya and Karakalpakstan in an effort to support higher value crops and to try and improve the efficiency of water use by allocating it to more experienced farmers. These findings are also consistent with Wegerich study which concluded that the causes of the severe water shortages experienced in 2000 and 2001 were largely political and primarily due to the allocation of water by upstream users. This is also likely to have been influential in the 2008 water allocation and low flows seen in the Lower Amu Darya.

[60] Natural Drought or Human Manmade Scarcity in Uzbekistan, Kai Wegerich, School of Oriental and African Studies, October 2001.

[61] A regional research organisation which hosts the Interstate Coordination Water Commission of Central Asia Scientific Information Center for water problems (SIC ICWC).

As important as the physical quantum of flows available at the intakes supplying the Project are the agreements and management arrangements for the distribution of flows in the Lower Amu Darya. Water management in the Amu Darya is controlled by the Interstate Commission for Water Coordination (ICWC) and there is scope for political interference and decision making based on economic priorities influencing the way in which water is managed throughout the Amu Darya. The international river basin water control organisations (BVO) are responsible for the implementation and monitoring of allocation of water across the basin.

At quarterly meetings of the ICWC the limits on the quantity of water to be allocated to the major areas of each country for the upcoming irrigation season are agreed, based on the estimated flows. These quantities are typically defined for each ten day period. The international river basin water control organisations (BVO) are responsible for the implementation and monitoring of these allocations.

For the Lower Amu Darya (downstream of Tuyamuyun), the BVO calls a meeting of water specialists at the viloyat level every 10-15 days to agree, in the context of the limits agreed by the ICWC, the releases from Tuyamuyun and the flow through Takhiatash Barrage, and the flows allocated to each major off-take.

Water allocation based on political imperatives can however now be expected to be influenced by the identified need for improvement management of water resources and the diversification of the Uzbek economy away from water intensive agriculture, with the oil and gas sector a clearly identified growth sector. Discussions with the Ministry of Agriculture and Water Resources as part of consultation for this Project identified that the Ministry is developing a number of strategies aimed at reducing the volume of water diverted for agricultural irrigation purposes. Of particular note, the Ministry indicated that, as a direct result of strategies encouraging a move from irrigation-intensive farming to less water intensive crop farming, and livestock farming, Uzbekistan has achieved a 40% reduction in the geographical extent of irrigated land over the past 20 years. Policies encouraging a reduction in the intensity of water use associated with agriculture are embodied within a number of Laws and Resolutions of the Republic. In particular, these laws and resolutions encourage:

- Limits for water use by agriculture;
- The upgrade of the existing irrigation network;
- Increased efficiency of water use; and
- Improved efficiency in relation to problems associated with a high number of small-scale farmers..

Improvements in the efficiency of water use for agriculture and the need to provide supplies of water to oil and gas projects such as the Surgil Project can be expected to influence water demand management. Increased water availability as irrigation efficiency improves can be expected to reduce the risk of low flow situations caused by poor water management. There is also a commitment by BVO Amu Darya to maintain minimum flows from the Takhiatash Barrage under all conditions.

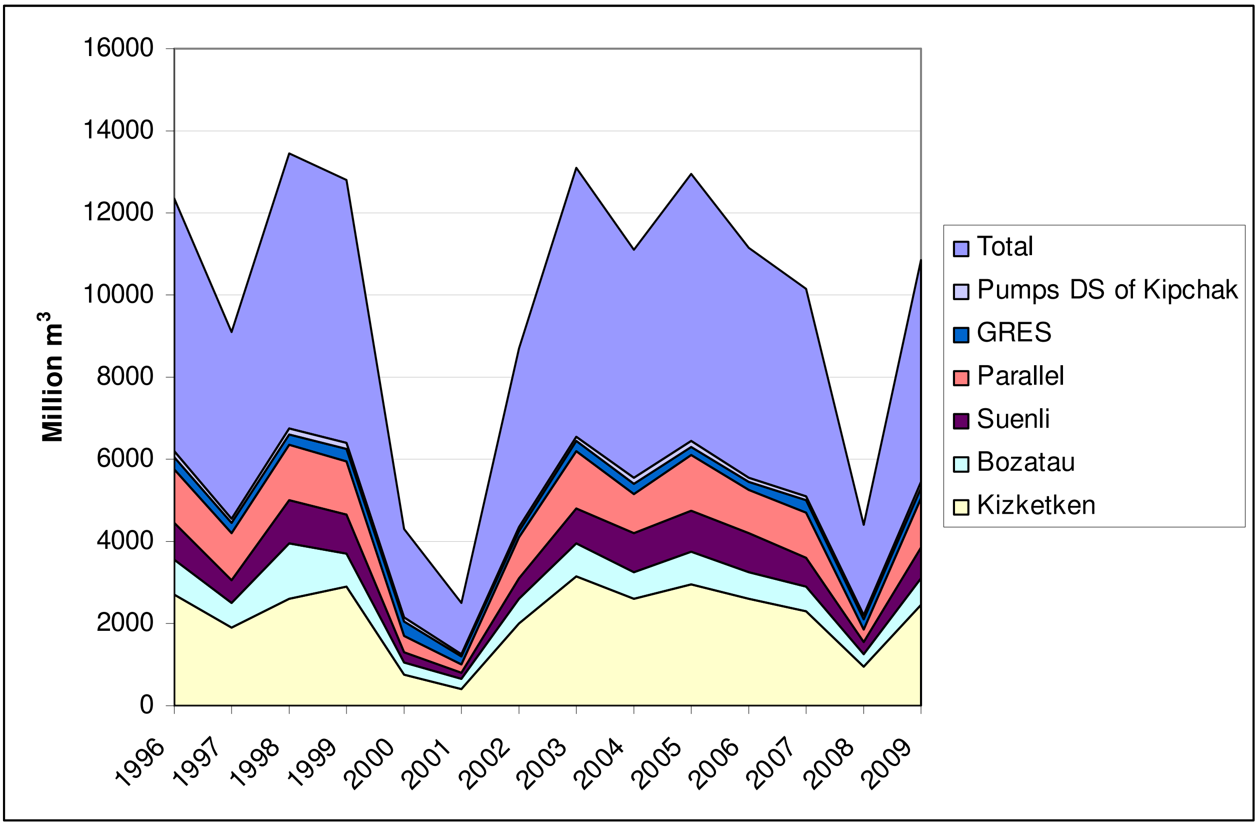
9.3.4.4 Irrigation Diversions

Diversions for irrigation are a significant factor in the lower catchment downstream of the Tuyamuyun dam. The distribution volume for each irrigation system is decided by Lower Amu Darya Basin Administration of Irrigation Systems (NABUIS) based on the discharge forecast of the Amu Darya. NABUIS modifies the distribution volume for each irrigation system intermittently depending on the change of the storage volume of Tuyamuyun Reservoir and the flow regime of the Amu Darya during irrigation period.

In the case that NABUIS decides to change the distribution volume for each canal system, all water users associations (WUA) are informed about the decision through the Irrigation System Department (AIS).

Irrigation diversions for the canals located between Kipchak gauging station and the Takhiatash Barrage, are significant (Figure 9.9). Data provided by BVO Amu Darya indicates that the majority of the total diversion is accounted for by the Kizketken, Parallel, Suenli and Bozatau canals. The average annual diversion during the period 1995-2010 was 4 891million m^3 (155 m^3/s) and peaked in 1998 at 6 734 million m^3 (214 m^3/s). The impact of the low flows on diversions during 2001 and 2002 is clearly evident.

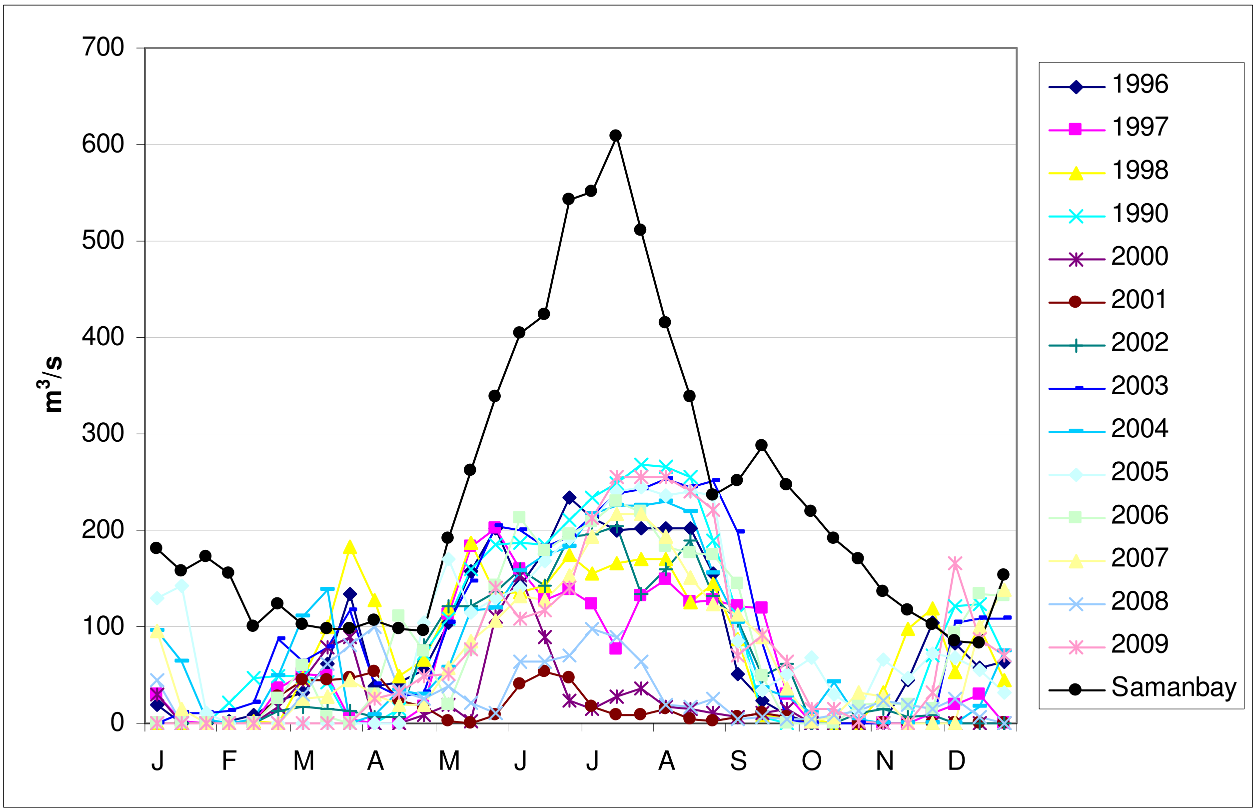
Figure 9.9: Annual Diversions at Takhiatash Barrage (1995-2009)



Source: Amu Darya BVO

The monthly diversions for Kizketken canal are presented in Figure 9.10 (with the flow at Samanbay gauging station for the purpose of comparison) and reflect the general seasonality and inter-annual variability of diversions. The diversion peaks in July and August with the maximum diversion varying from 269 m^3/s in 1990 to 54 m^3/s in 2001. This figure illustrates the magnitude of irrigation diversions when compared to flows in the Amu Darya River and supports the case for focussing the assessment on the summer months when demands for water resource is greatest and therefore sensitivity to any reductions in flow greatest.

Figure 9.10: Monthly Diversions for the Kizketken Canal (1995-2009)



Source: Amu Darya BVO

The most direct and reliable way of estimating the total volume diverted from the Amu Darya river is to compare recorded flows at upstream and downstream gauging stations. The recorded flows at Kipchek and Samanbay gauging stations (located upstream and downstream of Takhiatash Barrage respectively) indicate that in an average year (for the period 1995 to 2010) 368 m^3/s is diverted or lost from the river, which represents about 63% of the average flow recorded at Kipchek. This value exceeded 90% during the summer months of 2000 and 2001 indicating the sensitivity of flows downstream of the Takhiatash Barrage to irrigation diversions.

Flow diversions between the Samanbay gauging station and the Qyzldjar gauging station, including for the Kungrad WSU, are significantly lower, being on average 5.7 m^3/s (~3%) against an average flow at Samanbay of 219 m^3/s. This accords with the similarity of the average monthly flows illustrated in Figure 9.5.

Irrigation efficiency in this region is understood to be low (50% at best) and, downstream of Tuyamuyun, drainage from the irrigated areas is not returned to the Amu Darya but to separate drainage systems and so represents a loss to the system.

The MAWR, funded by the World Bank in 2003, commissioned the Uzbekistan-Drainage, Irrigation and Wetlands Improvement Phase-I Project. It was reported that water use efficiency in the irrigation sector is extremely low, often being reported at around 30% although in reality it is even lower. The main reasons for low water use efficiency were concluded to be:

- lack of incentives for farmers to improve production and productivity;
- inadequate drainage, waterlogging and soil salinity that require large water applications for leaching which in turn actually leads to a vicious circle of further increases in application rate to keep soil salinity under control;
- deteriorated irrigation and distribution infrastructure which is becoming a constraint to good water management;
- poor irrigation practices due to poorly graded fields, long furrows, long intervals between irrigation ditches and reliance on shallow groundwater levels for meeting crop water requirements; and
- inadequate institutional capacity for proper management and O&M of the system and lack of mechanisms for water charges and cost recovery.

The report concluded that recent studies show that with reasonable standards of management, the water resources of Aral Sea basin are adequate to meet current irrigation requirements and provide an appropriate volume for environmental purposes in the lower reaches of the rivers and delta area.

The MAWR has advised that it is now undertaking a series of studies into the integrity of existing water supply and irrigation infrastructure in Project area and to determine system losses with a view to undertaking programme of upgrades that will reduce these losses and thereby require a lower abstraction rate to support irrigation requirements. This is coupled with a policy to reduce irrigated land in Karakalpakstan to reflect changes in agriculture from high water intensive crops like cotton to those requiring less water, such as livestock. It is therefore evident that with a combination of a small improvement in the efficiency of irrigation, reductions in losses from the irrigation system and a reduction in the areas being irrigated would have a significant impact on the flow at Takhiatash Barrage and available water for downstream users.

At this stage there are no specific predictions on the potential reductions in irrigation flows so assessment of any new abstraction will still need to be made relative to currently available flow data, but improved management of water in the Amu Darya can be expected to increase available flows and to reduce the frequency and duration of low flow periods.

9.3.4.5 Sensitivity of Regional Surface Water Resources

The above sections have highlighted the managed nature of the Amu Darya and the susceptibility of the management regime to competing political priorities rather than water resource requirements. This situation significantly contributed to low flow periods in the Lower Amu Darya in the last 10 years. Changes to agriculture and improvements to the efficiency of the irrigation network can be expected to improve the availability of water in the Lower Amu Darya and commitments to ensure minimum flow levels released at Takhiatash Barrage will reduce the likelihood of a repeat of these low flow occurrences. For the purposes of this assessment however the sensitivity of the Amu Darya to additional abstraction is adjudged to be high.

9.3.5 Surface Water Quality

The BVO "Amu Darya" is currently carrying out a programme of water quality sampling exercises in two reaches of the Amu Darya: The middle reach between Kelif (upstream of the confluence with the Sherabad-doria river) and Birat gauging stations and the lower reach of the river from the gauging station at Tuyamuyun to the gauging station at Samanbay (see Table 9.6).

Twelve water quality parameters (pH, smell, colour, HCO_3, K, Na, Mg, Ca, solid residue, common hardness, permanent hardness, chlorides, sulphates) are analysed for the middle reach and six parameters (colour, Mg, Ca, solid residue, common hardness) are analysed for the lower reach.

The water quality generally deteriorates downstream (e.g. at the upstream boundary of the middle reach suspended solids range from 0.3-1.0 g/l whereas at the downstream end suspended solids range between 0.5-1.5 g/l). Further downstream at the Samanbay gauging station the suspended solids vary between 0.6-2.2 g/l.

The Tuyamuyun dam significantly impacts on water quality in terms of the concentration of suspended solids. This is reflected in data available to the project that indicates that the loss of live storage some of the reservoirs at Tuyamuyun has been significant, with only certain parts of the reservoir being able to be flushed such that around 1 km^3 of capacity has been lost since construction in 1980.

The Takhiatash Barrage was designed and is operated to control flows in the river and raise levels for the intakes of the major canals Souenly, Parallel, Kattagar and Kizketken, and for the cooling water supply to the nearby Takhiatash power plant. It therefore has less effect on water quality than Tuyamuyun Dam.

The following table presents the minimum and maximum values for the parameters monitored as reported by BVO for the Samanbay gauging station[62], which is the closest gauging station to the abstraction point for the Kungrad WSU, from which the UGGC supply will be drawn.

Table 9.6: BVO Water Quality Analysis at Samanbay Gauging Station

	pH	Smell Point	Colour	HCO3 g/l	Mg g/l	Ca g/l	S/S g/l	Hardness g/l
Minimum	6	0	Colourless	0.15	0.022	0.052	0.6	6.5
Maximum	8	1	Light brown	0.25	0.098	0.180	2.2	17.6

Source: Amu Darya BVO; no date indicated for data provided

Salinity levels downstream of the Tuyamuyun dam are high and a recent study[63] has shown that the current operation of the scheme leads to a build up of saline water during winter months such that even under dry year conditions, the WHO standards for drinking water will be exceeded by 30% after two years, so that the impact of dry years in the context of water stress becomes visible.

Some further water quality data is also available for the average chemical composition of water supplied from the Kungrad WSU pipeline, from which the raw supply for the UGCC will be drawn, and is shown in

[62] More accurate and extended chemical analysis on river water made at the GS Qyzldjar are available at Uzhydrometereology agency of the Republic of Uzbekistan.

[63] Froebrich J, Bauer M, Ikramova M, Olsson O (2007): Water Quantity and Quality Dynamics of the THC – Tuyamuyun Hydroengineering Complex – and Implications for Reservoir Operation. Env Sci Pollut Res 14 (6) 435–442

Table 9.7. The quality of water is variable and for design purposes the EPC contractor has been provided with design water quality data shown in Table 9.7 that has been derived from 3-years of water quality data provided by the Kungrad WSU. These data will be used by the UGCC EPC contractor as worst case water quality parameters in order to design the UGCC water treatment plant. Potable water will be supplied from the water treatment plant rather than using the raw water supply for that purpose.

Table 9.7: Water Quality from Kungrad WSU

Parameter	Unit	Water Quality Data [1]	Design Water Quality
Temperature	ºC	14	-
Taste	score	1	-
Smell	score	2	-
Transparency	cm	30	30
pH	pH unit	7	8.03
Chloride	mg/l	216	340
Oxidizability	mg/l KMnO	1.9	1.1
Total hardness	mg-ekv/l	9.1	600
Hardness constant	mg-ekv/l	6.7	-
Carbonate hardness	mg-ekv/l	2.4	305
Calcium	mg-ekv/l	5.2	122
Magnesium	mg-ekv/l	3.9	71.12
Alkalinity	meq/l	2,4	-
Solubility of oxygen,	mg/l	10,6	-
BOD $_{5,}$	mg/l	0,3	-
Dry residue	mg/l	1042	-
Nitrate nitrogen,	mg/l	0.34	3
Nitrites-nitrogen,	mg/l	0.006	2.7
Iron,	mg/l	0.13	0.018
Sulphate	mg/l	474	456
TDS	mg/l	1112	1332
Coli index		1183	-
Coli titer		333	-
Total microbiological number		14	-

Source: PFS "Surgil Field complex construction with valuable components retrieval" OAJ "O'ZLITINEFTGAZ"

Note: Date not available.

Elevated levels of dissolved minerals and salinity mean that the water does not meet Uzbek drinking water standards as set out in O'zDSt 950:2000, although the exceedance of chemical parameters are mostly minor. Due to the presence of coliform bacteria in the samples, the water does not meet the WHO standards for drinking water without treatment. In addition, the high salinity and sulphate concentrations indicate that the water will not pass the WHO 'acceptability' criteria, based on taste.

Based on water quality data available and the limited use of water from the Lower Amu Darya for irrigation at the point of abstraction of the Kungrad WSU the sensitivity of water quality is assessed to be low.

9.3.6 Groundwater Resources

In the Aral Sea Basin and the surrounding region groundwater occurs in two regionally important aquifers. The first is an unconfined, shallow aquifer up to 150 m thick comprised of gravel, sand, sandstone and siltstone. The shallow aquifer interacts with the water in the Aral Sea and as a result groundwater levels have dropped with sea level during the recent decline and as a result of recent droughts.

Water levels are reported to be 8 to 10 m below the surface in the desert areas but have risen in irrigated areas to depths of only 1 to 3 m with corresponding increases in salinity. There are also separate local perched water pockets near the surface created by percolation into the ground being confined by variable clay layers.

The second lower aquifer is formed of Upper Cretaceous sediments and confined by lower Neogene and Palaeogene Clays. This aquifer is regionally important for water supply, irrigation and stock watering, but water levels have declined with time in response to abstraction. This has resulted in a marked reduction in groundwater discharge into the Aral Sea and monitoring data indicates that the influence of the Aral Sea on groundwater levels, flows and quality is unlikely to extend beyond 100 km.

There has been limited study of the groundwater quality in the Ustyurt region. In general though, it is known that throughout the area and in all aquifers, salinity is a significant constraint on groundwater use. Mineralisation of groundwater can vary depending on local conditions but is reported to be between 10 to 80g/l, with groundwater occurring nearer the surface (5-8m depth) being at the upper end of the range, at 75-80g/l. In certain sites where geo-morphology results in localised depressions, the build up of salt from evaporating processes can lead to salinity reaching 200-300g/l and more in the groundwater below these areas.

The composition of the groundwater severely restricts the utilisation of untreated groundwater for uses such as potable supply, agriculture or other social uses as high salinity levels, as well as other parameters, exceed the GOST 950:2000 standard ("Requirements for Potable water. Requirements for quality control").

Residents downstream of the Kungrad WSU are understood to source potable water from groundwater resources, as in other parts of Karakalpakstan this may be focused on fresh water lenses associated with the irrigation canals and therefore not affected by the poor water quality of the regional groundwater.

In general the sensitivity of the regional groundwater resources is considered to be low with some localised areas where potable abstraction is occurring being of high sensitivity.

9.3.7 Surgil Field: Surface and Ground Waters

The Surgil Field, located within the former Aral Sea bed, is characterised by extremely flat topography. The wider Amu Darya River delta, located to the east of the fields, is so flat that the river has changed its route several times over the millennia.

The former Aral Sea bed is highly saline, with salt accumulation occurring below the surface in the subsoil and salt on the soil surface is clearly visible in some parts of the Surgil Field[64]. The destructive effect of salination on the soil structure explains the absence of any agricultural activity from the gas fields and the

[64] Visible salt presence on the ground surface also occurs around the irrigated areas in the Amu Darya delta.

wider northern delta area, though a lack of water and irrigation infrastructure is possibly the more important driver.

There are no permanent natural water bodies in the vicinity of the Surgil Field. As the gas field is located at the far extremity of a basin-wide irrigation system with inherently greater demand than water available, water deficits are the norm and agricultural requirements usually take precedence over environmental demands.

The nearest established surface waters to the Project locations are the lakes of the Sudoch'ye Nature Reserve complex recreated by the presence of the Sudoch'ye Dam, about 50 km from the CGTU and the Muynak lake system fed from the Lower Amu Darya River. The Sudoch'ye lake system is fed from flows into a main collector drain (Parallel Canal irrigation diversion) which originates from the Amu Darya at the Takhiatash Barrage, about 115 km upstream of the Kungrad WSU abstraction point.

Following a number of site visits by Mott MacDonald, it is understood that water levels in the Sudoch'ye system are monitored by three bodies: the Goskompriroda; the Ministry of Agriculture and Water Resources; and the State Joint Stock Corporation 'Uzbalik', who hold responsibility for fisheries management on behalf of the Uzbek Government.

At Muynak there are approximately seven lakes which are located downstream of the Kungrad WSU and are fed either directly or indirectly by the Amu Darya. . These lakes were created as part of a wetland area that is primarily used for growing reeds and straw for animal husbandry and to reduce the mobility of potentially harmful dust from former agriculture areas around Muynak. Some of the lakes now also serve as fishing lakes, with one lake, Mejgurechye, which is a freshwater lake, also providing drinking water to local people.

Water levels in all lakes are controlled via a network of dams which are operated to inundate the area to the north by the Aral Boyi Delata Basqarmasi, or 'Aral Basin Delta Management'.

The existing gas fields at Surgil utilise water transported to the site by tanker from Muynak for all required purposes. The Muynak water supply system is already under stress, especially in periods of low flow in the Amu Darya, and supplies for potable and domestic use take priority.

Based on data from existing abstraction wells at the Surgil Field saline groundwater is known to be available at a depth of about 90 m in the Surgil Field. Shallow groundwater at depths of 5 - 8m is also present in perched pockets of groundwater confined by local clay deposits, although these deposits are highly saline. The depths to groundwater measured at five water wells in the Surgil Gas field in May 2011 varied between 0.55 and 3.5 m below ground level.

At the CGTU it is proposed to use deeper saline groundwater from proposed artesian wells for the drilling and well development. A water treatment plant will be installed for treating groundwater drawn from the deeper boreholes near the CGTU for process, potable and other domestic water uses associated with the camp development adjacent to the Surgil CGTU. The water treatment plant will be designed to optimally treat the groundwater quality encountered in the deeper CGTU boreholes and is expected to be based on a reverse osmosis process, thereby reducing the amount of treatment chemicals the water treatment process will need. No water supply boreholes suitable for direct potable supply to local communities are present within the Project area of influence.

As part of the ground investigation undertaken in May and June 2011 at the Surgil Field groundwater sampling was carried out from two abstraction wells at the CGTU and at water abstraction wells at five of the gas well sites in the Surgil Field in order to determine the shallow water quality (see appendix K for final survey results). (State Nature Protection Committee of the Republic of Karakalpakstan, 2011). The range of groundwater quality data from sampling of the CGTU abstraction boreholes and from the shallower gas well abstraction boreholes is presented in Table 9.8. Groundwater from the CGTU boreholes will act as the raw water supply for process water and potable water for the Surgil Field.

Table 9.8: Groundwater Quality Data at Surgil Field

Parameter	Unit	Groundwater Quality gas wells boreholes	Groundwater Quality CGTU boreholes	Maximum Permissible Concentration [1]
pH	pH unit	7 - 10	7 – 7.5	-
Total hardness	mg-ekv/l	6.6 – 10.7	8.55 – 8.7	7
Calcium hardness	mg-ekv/l	19.4 – 37.5	29.4 – 33.4	7
Calcium	mg-ekv/l	4.0 – 28.1	10.4 – 13.0	180
Magnesium	mg-ekv/l	9.4 – 22.9	16.4 – 23.0	40
Chloride	mg/l	5103 – 32181	7191 – 8032	300
Sulphate	mg/l	141 – 504	454 -474	100
$BOD_{5,}$	mg/l	1.4 – 3.4	1.4 – 2.8	6
COD	mg/l	85 – 178	144 - 150	30
Nitrate nitrogen,	mg/l	1.5 – 1.75	1.5 – 1.75	45
Nitrites-nitrogen,	mg/l	0.018 – 0.063	0.05 – 0.25	3.3
Ammoniacal nitrogen	mg/l	0.08 – 0.61	0.01 – 0.37	0.5
Phosphate	Mg/l	0.002 – 0.004	0.0015 – 0.0025	-
Chromium	mg/l	0.0011 – 0.002	0.0017 – 0.002	0.02
Copper	mg/l	0.012 – 0.038	0.017 – 0.019	1000
Iron,	mg/l	0.001 – 0.08	0.012 – 0.04	0.5
Boron	mg/l	0 - 0.5	0.05 -5.0	8
Fluoride	mg/l	0.4 – 1.5	0.4 – 0.8	0.05
Manganese	mg/l	Not detected – 1.0	Not detected	5
Cadmium	mg/l	0.003 – 0.101	0.005 - 0.017	0.001
Zinc	mg/l	0.006 – 0.041	0.011 – 0.041	3.0
Nickel	mg/l	0.148 – 0.404	0.099 – 0.171	0.1
Selenium	mg/l	0.006 – 0.032	0.0047 – 0.0142	0.01
Arsenic	mg/l	0.001 – 0.0031	0.0013 – 0.004	0.05
Potassium	mg/l	86.6 – 277	367 - 447	-
Total petroleum hydrocarbons (TPH)	mg/l	0.061 – 0.191	0.137 -0.139	0.05

Source: State Nature Protection Committee of the Republic of Karakalpakstan, May, June 2011

Note 1: MPC from Uzbek drinking water standards as set out in O'zDSt 950:2000

The results showed that the groundwater in both the shallow and deep aquifers is generally saline with chloride concentrations between 5103 and 8032 mg/l and sulphate between 141 and 504 mg/l. The exception to this is the water well at Surgil Gas well 3, where the water is much more saline with chloride of over 32,000 mg/l, elevated ammoniacal nitrogen, pH of 10 but lower sulphate of 141 mg/l.

Comparison of the results with Uzbek drinking water standards as set out in O'zDSt 950:2000 shows that the groundwater is not suitable for drinking (without treatment) because:

- Chloride and sulphate in all samples exceed the MPC of 300 mg/l and 100 mg/l respectively. Although there are no comparable WHO standards, the water is unlikely to pass the ‘acceptability’ test due to taste;
- Total and carbonate hardness in all samples exceed the MPC of 7 mg/l, although the MPC appears to be very low and there are no international standards for hardness;
- Fluoride exceeds the MPC of 0.05 mg/l in all samples, although the concentrations are at or below the WHO limit of 1.5 mg/l;
- Cadmium, nickel and selenium exceed the MPC of 0.001 mg/l, 0.01 mg/l and 0.01 mg/l respectively in most samples, However only 3 samples exceed the WHO limit of 0.003 mg/l for cadmium and none are above the WHO limit of 0.04 m/gl for selenium;
- COD in all samples exceeds the MPC of 30 mg/l. There are no international standards for COD;
- TPH in all samples exceed the MPC of 0.05 mg/l.

These data indicate that the underlying shallow aquifer is of low sensitivity.

9.3.8 Pipelines: Surface and Ground Waters

There are no permanent surface water receptors along the pipeline route. A dried up river channel in the vicinity of the Surgil Field and pipeline route is shown on topographic maps running from the left abutment of the Sudoch’ye Dam northwards towards the western lobe of the existing Aral Sea. This water course only flows during rare events when water is released from the Sudoch’ye Dam to safeguard the dam during periods of higher rainfall and river flows. Other such channels are shown in the area between the Sudoch’ye Dam and Muynak.

The Ustyurt Plateau is vast and comprised principally of white limestone, clay and sandstone covered with rocky limestone desert and no known surface water receptors.

For the stretch of pipeline in the Aral Sea basin the unconfined, shallow aquifer noted in Section 9.3.6 is a potential groundwater receptor with respect to wastewater for the construction phase of the pipeline in that area, although as noted above, it is highly saline with restricted uses. On the Ustyurt Plateau the aquifer is at a depth of 50 - 70 m and therefore is unlikely to be at risk from the pipeline.

The sensitivity of surface and groundwater receptors for the pipelines is therefore considered to be low.

9.3.9 UGCC

The UGCC will be located within the Kungrad district on the Ustyurt Plateau, within the vicinity of the Akchalak settlement. The characteristics of the UGCC site are consistent with the pipeline route along the plateau. There are no records of permanent surface water bodies on the Ustyurt Plateau within the Project area with only temporary runoff following heavy rainfall. .

The Sudoch’ye lake system, below the Ustyurt Plateau is at least 30 km from the UGCC and therefore too distant to be a receptor to be affected by discharges from the UGCC. In relation to abstraction for the UGCC, the feed for the Sudoch’ye Lakes is from the Amu Darya at the Takhiatash Barrage, at least 115 km upstream of the abstraction point for the Kungrad WSU, the water supply point for the UGCC, and therefore there is no connectivity/pathway between the Project water abstraction point and Lake Sudoch’ye and there will be no change in the existing baseline flows into the lake system.

The Muynak Lakes are fed from the Lower Amu Darya and could be potentially impacted by abstraction of water for the Kungrad WSU to supply the Project.

A report on the engineering and geological conditions of the Akchalak area[65] states that water bearing aquifers of Cretaceous and Jurassic deposits, at a depth of over 500-800 m are present on the plateau. There is also groundwater in the area at a depth of 50 - 70 m which is characterised by high mineralization from 10 to 15 g/l.

Near the Akchalak area, there are wells where water is at a depth of 10 - 25 m and not connected with the main water-bearing aquifer. These water lenses are of limited volume but have been found to have a lower mineralization level not exceeding 3 g/l.

Based on these observations, it is assumed that the well in Akchalak settlement is completed in the Cretaceous aquifer, because the depth to water measured in May 2011 (State Nature Protection Committee of the Republic of Karakalpakstan) is 31 m, and the chloride concentration is 9435 mg/l. This water is not suitable for potable supply without treatment, due to the exceedance of the MPC for COD, fluoride, cadmium, nickel, hardness and sulphate as well as the elevated chloride.

The sensitivity of surface water receptor is negligible since they are only present temporarily after heavy rainfall. The Sudoch'ye lake system does not represent a sensitive surface water receptor. The Muynak Lakes are considered to be a receptor of medium sensitivity due to their use for agriculture and in providing mitigation against potentially harmful dust present in the former agriculture areas around Muynak. The lakes are of limited biodiversity value being a relatively newly established habitat and have not therefore been considered as a biodiversity receptor in relation to water resources.

The sensitivity of the groundwater is considered to be low for the main aquifers due to depth and poor quality, but with locally medium sensitivity for localised shallower wells.

9.3.10 Potential Impact of Climate Change

9.3.10.1 Water Resources

The potential impact of climate change on the water resources of Uzbekistan are assessed in the United Nations Framework Convention on Climate Change (UNFCCC) Second National Communication (SNC) [66] and further reviewed in the UNEP report Environment and Security in the Amu Darya Basin[67].

Data from the UK Climate Change Unit for Uzbekistan as reported by UNEP indicates that in the past 50 years, air temperatures in the basin have been increasing by 0.1-0.2ºC a decade. Moreover, since the 1950s the number of days with air temperatures higher than 40ºC has been reported to of doubled in the Amu Darya delta region[51] while a significant reduction of low temperature recurrence has been observed, even with due account taken of the abnormally cold winter of 2007-2008. Temperatures are projected to rise by 2-3ºC in the next 50 years.

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[65] Engineering and geological conditions of Akchalak area, Kungrad District, Republic of Karakalpakstan - Master Plan Substantiation by State Design Research Institute Of Engineering Survey In Construction, Geoinformation And Urban Inventory 2010

[66] Uzbekistan Second National Communication, United Nations Framework Convention on Climate Change (UNFCCC), December 2008.

[67] Environment and Security in the Amu Darya Basin, Environment and Security Initiative by UNEP (2011).

Precipitation changes in the past 50-70 years have not been uniform[52]. Lowlands in the middle Amu Darya basin have seen some increase in precipitation. In the upper basin some mountains have seen increased precipitation (Central Pamir, Zarafshan) others a decrease (Eastern Pamir, Hindu-Kush) (Shiklomanov, 2009).

Analysis of the number of days with heavy precipitation revealed that the number of days with precipitation of more than 10 mm increased in plain and foothill territories[51]. There was a relatively small (about 9%) observed increase in the number of days with precipitation of more than 20 mm in mountainous areas. It is therefore evident that although observed precipitation has increased slightly in recent years, it is the increase in temperature that is the dominant factor when assessing potential impacts of climate change.

Rapid depletion of the Amu Darya basin's glaciers and changes in snow accumulation have been observed since the end of the 20th century in central Asia, although glaciers at high altitudes have suffered little loss of ice. Overall the glacier retreat totals several hundred metres for many large glaciers while hundreds of small glaciers have vanished. The SNC reports that "in view of expected warming and preservation of the current precipitation rates, the rate of glaciation decrease in the Aral Sea Basin is expected to be from 0.2% to 1% per year".

The SNC developed climate scenarios based on the MAGICC/SCENGEN 4.1 [68] model and emission scenarios A2 and B2 [69]. The scenarios were reviewed taking into account the impact of sulphate aerosols for three horizons (2030, 2050 and 2080). Statistic downscaling was then used for more detailed interpretation of the scenarios. The SNC report states that the current rates of the flow with high natural variability are expected to remain the same until 2030. Flow will potentially decrease by 10-15% in the Amu Darya River Basin by 2050 (under Scenario A2). However, during extremely warm and dry years, flow in the Amu Darya River Basin might decrease by 25-50%.

Furthermore, the SNC reports that the increase of evaporation coupled with warming will lead to water loss in the irrigation zones. It is expected that irrigation norms will increase on average by 5% by 2030, 7-10% by 2050, and 12-16% by 2080[70]. The expected decrease in river flow combined with the increased irrigation demands will lead to an increase in the pressure on water resources and the likelihood of an increase in the severity of droughts during low-flow years.

The implication of the SNC assessment is that the average flows presented in Figure 9.5 and Table 9.3 will remain the same until 2030 after which they could decrease by 10-15%. The reduction after 2030 could increase to up to 50% during extremely dry years. These decreases compare to a reduction in flow of over 60% at Qzyldjar due to the increase in irrigation since 1955 (Table 9.4 and Figure 9.6). It can therefore be concluded that no significant changes in flow as a result of climate change need be allowed for within the 25 year design life of this project.

Impacts on groundwater are not directly addressed in the SNC. It is, however reasonable to conclude that the main impacts will result from potential increases in evaporation and reductions in recharge from surface water. Neither of these factors is expected to lead to significant changes before 2030.

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[68] MAGICC/SCENGEN is a coupled gas-cycle/climate model (MAGICC; Model for the Assessment of Greenhouse-gas Induced Climate Change) that drives a spatial climate-change SCENario GENerator (SCENGEN). MAGICC has been one of the primary models used by IPCC since 1990 to produce projections of future global-mean temperature and sea level rise.

[69] IPCC AR4 scenarios (http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf)

[70] Assessments carried out by SNC using the CROPWAT and ISAREG models

The SNC assessment indicates that the predicted change in agro-climatic conditions will not significantly impact agriculture productivity in Uzbekistan within the next 20 years. Changes in heat and moisture supply will however significantly impact on productivity by 2050-2080. It is therefore reasonable to conclude that no significant changes as a result of climate change will arise in irrigation demands during the 25 year design life of the project. Any significant changes that do arise are most likely to be caused by changes in irrigation practise or basin water management. As discussed in Section 9.3.4.3, the Ministry of Agriculture and Water Resources is undertaking a programme of efficiency improvements aimed at actually reducing irrigation abstraction from the Lower Amu Darya. The impact of climate change is therefore not anticipated to result in a net increase in overall irrigation abstraction requirements over the project lifetime.

The increase in temperature may lead to indirect impacts on non-agricultural demands in the longer term and hence an increase in the industrial abstractions at the Kungrad WSU and the Tuyamuyun - Nukus WSU. However, given that the recorded average annual abstraction at the Kungrad WSU (Figure 9.14) has decreased over the last 5 years by some 15% (Table 9.12)[71] any small rate of increase after 2030 due to the indirect impact of climate change is not considered significant to this study.

Therefore, in conclusion, it is evident that recent observations indicate that the flow in the Amu Darya is far more sensitive to changes in irrigation practises, industrial abstractions and the operation of upstream barrages and reservoirs than the potential impacts of climate change post 2030. The impact of climate change has not therefore been quantified in terms of water resources within the 25 year design life of the project. Anthropogenic impacts such as changes in water resource management, changes in irrigation practises and changes in the operating regime of upstream barrages and reservoirs are likely to be dominant influences on water resources during the lifetime of the project.

9.3.10.2 Flood Risk

Global warming will lead to a general increase in the frequency and intensity of extreme hydro-meteorological phenomena such as floods, droughts, mudflows and avalanches.

The average dates of extreme frosts on the territory of Uzbekistan shift towards winter season but due to the natural high climate variability, there is a risk of late spring and early fall frosts. According to the SNC an increase in the daily precipitation is expected which could lead to an increased risk of phenomena caused by heavy precipitation. It might be expected that as the climate warms, the period of frost and snow cover decreases and the rate of glacier melt increases that peak flood flows during winter will increase beyond 2030 and the peak flows will occur earlier in the winter season than at present.

Both the SNC and UNEP identify priority adaptation measures as enhanced flood protection and the use of special construction techniques in high risk zones, monitoring of avalanches, mudflows and lakes, and the improvement of forecasts and warning systems.

However, given that significant climate change impacts are not expected until after 2030 no measures have been considered necessary to take in this study to consider the risk of increased flooding. It should also be noted that as the Amu Darya has significant storage reservoirs along its length it is likely that some buffering of increased flood flows will be achieved with the knock on effect of increasing retained water to address lower flow periods at other times of the year.

[71] The peak abstraction decreased by over 20% for the last 5 years

9.4 Assessment of Impacts

9.4.1 Introduction

Three types of potential impact are considered in this section:

Water Resources (including groundwater)

Table 9.9 provides a summary of the water requirements for the three components of the Project that are considered in this assessment.

Table 9.9: Summary of Water Requirements

Project Component	Uses	Total Water Requirement	Water Source to be tapped	Total Available Water Source	Remarks
Upstream	Gas wells, process water for CGTU, potable water	400 m^3/day	Groundwater from the deep aquifer > 350m depth from boreholes near CGTU	Regionally important aquifer subject to abstractions for potable water and stock watering	No other ground water abstractions known within 25 km of Surgil Field abstraction wells
Pipeline	Hydrostatic testing only	96,520 m^3 as one off requirement if no recycling 49,440 m^3 based on hydrotesting on sectional basis with water reuse.	Groundwater from the deep aquifer > 350m depth from boreholes near CGTU	Regionally important aquifer subject to abstractions for potable water and stock watering	No water requirement during operation.
Downstream	Make up for Cooling Water (evaporative cooling), demineralised water, potable water and service water	26,760 m^3/day based on maximum water requirement under normal operating conditions with no water reuse. 17,400 m^3/day based on implementation of maximum water recycling and reuse	Amu Darya River via the Kungrad WSU	17,452,800 m^3/d annual average based on flow measurements at Qzyldjar Gauging Station, immediately upstream of Kungrad WSU abstraction 175,680 m^3/d lowest flow Aug 2001 at Qzyldjar Gauging Station is representative of flows under critical low flow conditions,	Flows in the Amu Darya are heavily managed with the flow released through the Takiatash Barrage directly affecting water availability at Kungrad WSU abstraction point. Extremely low flows were experienced in 2000 and 2001 due to poor management and allocation. Low flows also experienced during winter period due to recharging of storage but that is outside the critical irrigation period so more likely water available from other sources.

Groundwater will be used to support the drilling operations in the Surgil Field and for water supply to the CGTU and associated settlement. Boreholes will be located at each drill sites whilst water to the CGTU will be sourced from two boreholes located outside the fence boundary of the CGTU. Groundwater supplies to the CGTU will be treated within a water treatment plant within the CGTU to ensure potable standards for the settlement. Potable water from this supply will be tankered to drill crews within the Surgil Field. Water for drilling operations from boreholes located at the drill sites will not be treated. Water from the two groundwater boreholes at the CGTU will be used to supply water for the hydrostatic testing of the pipeline during commissioning.

Raw water supply to the UGCC will be supplied via new water pipeline connections to be constructed from the Kungrad WSU water supply pipeline with a back up connection to the Nukus-Tuyamuyun WSU water supply pipeline. Both of these water supply pipelines are fed by abstraction from the Amu Darya River.

As surface water and groundwater are scarce in the area and generally of poor quality, the assessment of impacts considers potential impacts of the Project on:

- River or canal flows to the extent that users of water for domestic, livestock watering and irrigation, or biodiversity suffer an inferior supply in terms of quantity, timing of availability or quality; and
- Groundwater pressures and quality that will affect existing abstractors, including cattle herders and deep-rooted vegetation.

The impact of water abstraction on biodiversity has been addressed in Chapter 8: Ecology and Biodiversity.

Waste Water

Groundwater and possibly surface waters are potentially at risk of contamination from the construction, commissioning and operational activities of the Project facilities, including the management and disposal of wastewater and other fluids generated by the Project. Potential contamination issues are also addressed within Chapter 10 and Chapter 11. Expected key wastewater and liquid waste streams for the Project that will require consideration of appropriate disposal include spent drilling and completion fluids, produced water, sewage effluents, pipeline hydrostatic test water, plus process effluents and site drainage from the UGCC.

Flood Risk

The construction and establishment of new Project infrastructure could potentially incur changes to surface water flow and drainage patterns (temporary or permanent) in the vicinity of the Project sites. In addition, impacts of occasional but intense runoff will require consideration both in terms of protecting project infrastructure and ensuring that project works do not cause erosion or sedimentation. Either of the latter could impact on local biodiversity and vegetation.

Initiatives aimed at restoring the Aral Sea would lead to an increase in level in the Large Aral Sea and hence could potentially impact on the project infrastructure that is located within the exposed bed of the sea. It is difficult to define the historic full level of the Aral Sea as the level has been decreasing significantly even before the introduction of large scale irrigation in the 1950's. However, for the purpose of this study the state of the lake in 1960 will be used as historical reference point.

Micklin [72] reports that from the middle 18th century until 1960, sea level varied by 4 and 4.5 m. Sea level was in a "high" phase between 1910 (when accurate and regular observations commenced) and 1960 with level changes of less than 1 m. However, since 1960 the level has fallen rapidly. In 1960, sea level was 53.29 m with an area of 68,000 km^2 and an average depth 16 m. By 1987 the level had fallen to 12.9 m, the area had decreased by 40%, and the average depth dropped to 9 m.

Figure 9.11: The Area of the Aral Sea in 1960

Source: Glantz and Zonn, The Aral Sea: Water, climate, and environmental change in Central Asia (WMO-982), 2001

Note: Level = 53.29 m

In 1990 after the deeper Berg Strait fully dried out and joined the eastern coast of the Aral Sea cutting the water body into two (the Small Aral Sea to the north and bigger Large Aral Sea to the south) . The total volume of water in the Aral Sea then had fallen to 370 km^3 with a combined area of 40 394 km^2. The Small Aral Sea accounted for a volume of less than 30 km^3 and an area of 3 500 km^2. The Large Aral Sea is fed by Amu Darya while the Small Aral Sea is fed by the Syr Darya. The level in the Small Aral Sea largely depends on the discharge to the Large Sea via the Kokaral dam which varies substantially from year to year.

The level in the Large Sea has continued to fall since 1990 and in 2000 the level was recorded as 33.30 m. The level in the Small Sea rose until the spring of 1989 when a sudden breach in the Kokaral dam led to a

[72] Micklin, P., 2000. Managing Water in Central Asia. Royal Institute of International Affairs, London, pp. 1– 72.

gradual reduction in level and in 2000 the level was recorded as 40.50 m. Figure 9.12 illustrates the area of both seas in 2000.

Figure 9.12: The Area of the Aral Sea in 2000

Source: Glantz and Zonn, The Aral Sea: Water, climate, and environmental change in Central Asia (WMO-982), 2001

Note: Level = Large Sea level = 33.30 m; Small Sea level = 40.50m

Glantz and Zonn [73] consider the potential change in level resulting from alternative development strategies. Their optimistic scenario would lead to an increase in the level of the Large Aral Sea by 5m from the level in 2002 to 35.90 m while their pessimistic scenario would lead to a decrease in level by 5m and a level of 25.90 m. This is a substantial range that reflects the sensitivity of the levels in the sea to water management issues within the Amu Darya basin.

The UGCC site will be located approximately 115 km away from the Surgil Fields and occupy an area of undeveloped, flat land located on the Ustyurt Plateau. While annual rainfall is extremely low, infrequent short intense rainstorms could result in surface runoff. Overall it is considered unlikely that the UGCC would be in danger of flooding by surface water provided that the normal design standards for drainage are adhered to. In addition, the flooding of adjacent infrastructure is not considered likely given the remote location of the UGCC (reference Chapter 2 Section 2.3) and the lack of any existing surface drainage. The UGCC is located outside of the area occupied by the former Aral Sea and therefore would not be impacted

[73] Glantz and Zonn, The Aral Sea: Water, climate, and environmental change in Central Asia (WMO-982), 2001

by any rise in seal levels resulting from restoration measures. These potential impacts were therefore not included in the scope of the ESIA.

Periodic surface flooding of gas field facilities is unlikely although the pipelines located within the former Aral Sea bed may possibly arise during occasions of emergency releases from the irrigation network to the south of the Project area, including Lake Sudoch'ye. The pipeline infrastructure in this area is therefore designed to account for these rare flood events as well as any increase in the level of the Large Aral Sea resulting from restoration measures. This impact is considered further in sections 9.4.2 and 9.4.3.

9.4.2 Gas Fields

9.4.2.1 Water Resources

Groundwater abstraction will supply the process water requirements for the gas fields including for well drilling uses, CGTU process requirements, firewater and for domestic use after treatment. A number of water supply boreholes will be drilled near the GGSs including a water supply borehole for each gas well. In addition two further boreholes at the CGTU will be created to supply the other water needs. The use of groundwater avoids the transport of additional water by tanker from Muynak and therefore there will be no impact on the water resources of the lakes as a result of raw water supply to the Surgil Field.

For the Surgil Field water consumption for the well drilling process is based on water requirements for preparatory works for drilling (43m^3/day), during drilling and fixing (72m^3/day) and during test (20m^3/day). Given that the maximum number of wells being drilled at any one time will be five, the maximum water required for the gas wells will be therefore 360m^3/day. A water recycling system is included at each drilling rig to produce clarified water for use in drilling mud preparation and other uses for which it is suitable. To produce the clarified water, the drilling fluid passes through a cutting separator, sand separator and vibrosieve to remove rock and other solid materials, after which it is pumped to a tank and treated with coagulant and flocculent to clarify it to the required reuse standard.

Estimated flows for water consumption for the CGTU are predicted to be 12.5 m^3/day. Firewater will also be drawn from the groundwater abstraction and used to fill two tanks, which will require a single abstraction of 566m^3. Potable and domestic water requirements will be supplied by from a water treatment plant that will desalinate groundwater. Potable supplies of 28 m^3/day are required, which would necessitate a slightly higher abstraction rate to account for the rejection flow from the water treatment plant. The maximum total groundwater abstraction for the CGTU and potable supply will therefore be approximately 40 m^3/day.

Groundwater from the CGTU boreholes will also be used to supply water for hydrostatic testing of both the gas field pipelines and the main cross country pipelines connecting the CGTU to the UGCC. Hydrostatic testing water from the gas field pipeline testing will be reused at the drilling sites for production of drilling mud or diverted to the evaporation pond at the CGTU. The volumes of hydrostatic test water will be low given the pipelines specifications from the wells to the GGSs and from the GGSs to the CGTU. Pipelines connecting wells to GGS will be 108 mm diameter and maximum of 1.5 km resulting in a maximum of 13.7 m3 of hydrotest water per pipeline. For the five pipelines connecting the GGSs to the CGTU the diameter will be 273 mm and the maximum length 4 km generating a maximum of 234 m^3 of hydrostatic testing water. Consideration of the water requirements and mode of operation for hydrostatic testing of the main pipelines is addressed in Section 9.4.3.

Overall, it is anticipated that under normal operation a maximum of 400 m^3/day of groundwater abstraction will be required covering all uses at the Surgil Field including gas wells, potable water and CGTU water use. As the sensitivity of the groundwater receptor is interpreted to be low (based on the baseline salinity and consequential lack of resource users) and the magnitude of impact of the abstraction during the construction, operation and decommissioning phases is minor and the overall impact significance is predicted to be insignificant.

9.4.2.2 Wastewater

Wastewater streams for the gas fields could include the following:
- produced water[74];
- hydrostatic testing water;
- other general wastewaters including sewage waters, drainage waters, tank bottom water, fire water, equipment and vehicle wash waters and general oily water.

Experience with drilling of the existing Surgil gas wells has shown that produced water levels are low. Based on current operational experience and the forecast for well development for the field, it is predicted that the volume of produced water from drilling operations will amount to up to 33 m^3/day. Analysis of produced water samples from existing wells has shown that it contains high levels of mineral ions (1.7 – 2 g/l) and solid resides (up to about 13 g/l), and can also be expected to be contaminated with hydrocarbons. Produced water will be treated in the CGTU wastewater treatment plant, which has a capacity of 12 m^3/hr, in order to remove hydrocarbons and solid residues. The treated water can then be used for other uses at the gas fields such as preparation of drilling mud or directed to the evaporation pond.

The evaporation pond, which has been recently upgraded, has been designed to allow evaporation of up to 12,000 m^3/year, over an area of 12 ha. It has been lined with an impermeable liner that has a coefficient of permeability of no greater than 1 x 10^{-7} centimetres per second (cm/sec) in line with international standards to prevent leaching of wastewater into the underlying groundwater. The pond has been sized to accommodate all produced water and other wastewater flows from the gas field and CGTU operation on an annual basis up to the maximum anticipated wastewater flow requirements. There is no discharge from the evaporation pond.

The use of evaporation ponds for disposal of produced water is identified in IFC Guidelines for Onshore Oil and Gas Development as an acceptable method. Alternative disposal options for produced water such as re-injection into disposal wells or into the annular space of a well has been ruled out due to economic constraints and difficulties in gaining approval under local Uzbekistan Design Codes.

Other wastewaters will be treated in the wastewater treatment plant prior to being discharged to the evaporation pond.

With the wastewater treatment facilities to be utilised and the fact that there will be no discharge to the environment, the magnitude of potential impact from wastewater discharge and spillage is considered to be negligible. When assessed in combination with the low sensitivity of the underlying groundwater and the lack of surface water feature the overall impact is insignificant.

The wastewater streams from temporary and permanent toilet facilities will be disposed of using septic tank and soakaways with solid waste removed from site via licensed contractor. The wastewater quality would

[74] Produced water is a term used in the oil industry to describe water that is produced along with the oil and gas. Oil and gas reservoirs have a natural water layer (formation water) that lies under the hydrocarbons and is extracted with the oil and gas.

be designed to comply with Uzbek standards for the maximum allowable concentrations in wastewater discharged to land and therefore the impact is expected to be insignificant. Care will need to be taken in avoiding water supply boreholes used for potable water or stock water.

There could be a risk to groundwater from pollution from improper storage or accidental release of contaminated wastewater, chemicals or oil. The gas field and CGTU infrastructure incorporates design features intended to address this risk including:

- Bunding of storage tanks with impermeable bunds constructed of materials compatible with the stored contents sized to contain 110% of the tank capacity;
- Sumps and drains will be constructed to prevent leakage of contents into the ground;
- Closed drainage system for transmission of wastewater to wastewater treatment plant and to evaporation ponds to prevent inundation and overflow in the even of storm events;
- Evaporation pond designed to international standard for prevention of leaching of wastewater.

With the plant design features incorporated and given the low sensitivity of the groundwater quality the significance of impact to groundwater from pollution is considered to be insignificant.

9.4.2.3 Flood Risk

It is considered that only high flows sustained for a considerable period of time through the Sudoch'ye outfall, combined with similar high flows down the Amu Darya, could result in surface flooding of the Aral Sea in which the gas fields are located, and saturation of the ground through which the pipelines run, and that these circumstances are highly unlikely. Therefore the impact of flood risk is not expected to be significant, especially when combined with the low density of the development. Given the arid nature of the environment any build up of flood water would rapidly soak away or evaporate.

Studies were undertaken at the time of the original development of the CGTU to determine potential flood risk and the site was raised by 1.5 m during construction in order to avoid any potential flooding issues that were identified. The gas wells will also be designed to Uzbek standard, to ensure that water would not be able to infiltrate the well heads.

In addition mitigation is considered in the form of an emergency plan to protect operatives and infrastructure from the impact of rare but intense summer rainfall events.

The levels in the Large Aral Sea may slowly begin to rise during the life of the project should restoration measures begin to take effect. It is extremely unlikely that the full 5m increase in level associated with an optimistic assessment of restoration measures[75] would be realised within the lifetime of this project. It is more likely that levels will remain stable or slowly begin to rise by a few cm a year. Raising the floor level of the CGTU by 1.5m is sufficient to mitigate for any potential increase in the Large Aral Sea resulting from restoration measures within the lifetime of the project.

The gas wells are to be designed to Uzbek standard and will be completely sealed meaning that subject to the success of wider restoration measures sea water can return without any risk of contaminating aquatic ecosystems.

[75] Glantz and Zonn, The Aral Sea: Water, climate, and environmental change in Central Asia (WMO-982), 2001

The pipeline route travels across the former Aral Sea south and then west to the Ustyurt Plateau. The overall pipeline length is 115 km including approximately 47 km (40% of the entire pipeline length) across the basin of the former Aral Sea within existing pipeline route corridors to the Urga crossing. The pipes are to be buried in a trench 1.5 m in width and at least 2.5 m in depth and will be hydraulically tested prior to commissioning (see section 2.5.3). The pipeline would continue to function should the levels in the Aral Sea begin to rise slowly as a result of restoration. However, this is not anticipated during the life of the project, moreover, rising water levels would affect a number of existing pipelines as well as those required for this project therefore requiring a coordinated approach to future water level management.

9.4.3 Pipelines

9.4.3.1 Water Resources

The new natural gas pipeline and condensate pipelines will cross the Aral Sea Basin and the Ustyurt Plateau over a distance of 115 km. As noted above, there are no permanent surface water features over the length of the pipeline that could be impacted by construction or operation of the pipelines. The pipelines will however cross the dry channel that acts as an emergency spillway channel from the Sudoch'ye Dam. Operation of this spillway is rare (approximately once every 5 years) and so this channel will not, under normal operation, be filled with water that would be at risk during the construction or operation phase of the pipelines.

There is a risk that pipeline construction could coincide with operation of the spillway, although this risk is considered to be remote. In the event that this occurred the potential impact could be the washing away of excavated trench materials and soil stockpiles. This material should be uncontaminated and pose a limited risk to the environment associated with locally elevated levels of solid material that would then settle out of the flow as the velocity decreases. The risk to water quality may increase in the event that poor construction management has led to ground contamination from fuel and oil associated with operation of the excavation and other construction machinery. In the event that an uncontrolled release into the spillway occurred during the construction of the trench the significance of the impact would be considered to be minor due to the moderate sensitivity of the receptor and the low magnitude of the impact.

In order to minimise the risk of interference with operation of the spillway the pipelines will be buried at a greater depth of at least 3m rather than the 1.5m depth for other sections of the pipeline. This will ensure a greater weight of overburden material to reduce the risk of scour in the event of operation of the spillway in flood events that may expose the pipeline. The pipeline trench will also be fully reinstated and flattened in order that it does not represent an obstruction to flood flowpaths as the water drains to the Aral Sea. The significance of any impact on operation of the spillway after installation of the trench is therefore considered to be insignificant.

Construction of the pipeline that crosses the dry Aral Sea bed is likely to intersect the unconfined, shallow aquifer in some locations depending on the proposed depth of the pipeline and associated infrastructure. The minimum design depth is 1.5 m however the exact depths may vary due to local conditions. . The shallow aquifer is saline and not therefore exploited as a regional water resource. It is therefore assessed that any impact will be insignificant based on the negligible/low sensitivity of the receptor and the low magnitude of the impact. Good construction environmental management practices will however be implemented in order to minimise the risk of a spill from construction vehicles or machinery in the vicinity of the trench.

Once operational the pipeline will have no impact on groundwater or the Sudoch'ye overflow. Decommissioning impacts are predicted to be similar to construction impacts. All pipelines would be emptied and pigged prior to removal from the ground. Reinstatement of the pipeline trench would be carried out in accordance with Uzbek standard BCH 179-85. Instruction for land reinstatement following pipeline laying.

9.4.3.2 Wastewater

The pipelines will require to be hydrostatically tested prior to operation. Table 9.10 summarises the volumes of water that will be required for hydrostatic testing. The water will be sourced from the groundwater boreholes at the CGTU.

Table 9.10: Pipelines Hydrostatic Testing Volumes

Feature	Distance (km)	Pipeline diameter (mm)	Hydrostatic testing volume (m^3)
Gas pipeline (total)	115	1020	93,970
Condensate pipeline (total)	115	168	2,550

The water use requirements for hydrostatic testing of the whole length of the gas pipeline are significant, with 93,970 m^3 of groundwater required to be abstracted from boreholes at the CGTU and then disposed of following completion of the testing.

Discharge of the hydrostatic testing water to land is the usual option for disposal. The water will mainly compose of groundwater but could contain chemical additives (corrosion inhibitors, oxygen scavengers, and dyes) that may be added to prevent internal corrosion or to identify leaks during the testing, and it may also contain solid residues and other pollutants present in the pipeline as a result of construction. Discharge would probably be at the UGCC end of the pipeline with the water allowed to discharge to a designated area and infiltrate into the ground. The aquifer on the Ustyurt Plateau is at least 50m below ground level and is saline, so is not used for potable supply or cattle watering. Discharge of the hydrostatic testing water could have a moderate magnitude of impact due to the composition of the water and potential presence of pollutants but when combined with the low sensitivity of the aquifer the significance of the impact on the deep groundwater is predicted to be minor.

There could however be isolated perched groundwater lenses at depths as little as 2m below ground level that would be more directly impacted by the discharge of hydrostatic testing water. In some areas on the Ustyurt Plateau localised abstractions for homestead irrigation or stock watering are made from these shallow deposits that could be affected by any pollution of the shallow groundwater by the hydrostatic testing water if discharged in an uncontrolled manner. Although the level of contamination of the hydrostatic testing water is not expected to be high, the salinity of this water could be expected to be higher than that of shallow groundwater used for homestead or stock watering and therefore pose a risk to these uses if the location and rate of discharge was not well controlled and carried out in areas away from any local abstractions. The sensitivity of the shallow aquifer can be considered to be medium given that it is used for small scale social uses, and the magnitude of the potential impact could be moderate if the discharge rate and location are not carefully controlled. Under these circumstances the significance of the impact can be predicted to be moderate.

It is likely that in some sections of the pipeline shallow groundwater could be encountered within the pipeline trench. As this water will be clean groundwater, it will be pumped out and allowed to soak into the ground away from the trench to maintain dry working conditions. To prevent the risk of this water becoming contaminated good construction environmental management will be implemented. In the event that a fuel or spill does contaminate this groundwater the contaminated water will be pumped out into barrels for appropriate disposal by licensed waste contractor.

The potential impact on flood risk has been scoped out of the ESIA based on the pipeline route and lack of surface water bodies in the region. Consideration of the impact on the Sudoch'ye overflow has been addressed above under the water resources section.

During operation the pipeline will be subject to periodic maintenance and pigging. Small amounts of wastewater may be generated at this time but will be collected at the pigging stations and removed by licensed waste contractor or transferred to the UGCC or CGTU wastewater treatment plants for treatment and disposal.

9.4.4 UGCC

9.4.4.1 Water Resources

Overall, the UGCC has a design consumption of a maximum of 1 470 m^3/hr of raw water, although the maximum raw water consumption under normal operation will be 1 115 m^3/hr. This consumption rate (abstraction rate) includes any evaporative losses from the water system including from the cooling towers and raw water storage ponds. All raw water is pre-treated in a reverse osmosis plant to reduce the mineral content to the level required for other plant uses. The RO plant treatment efficiency is 85%, with 15% of the raw water being discharged as wastewater from this stage of treatment, therefore for normal operation 949 m^3/hr of RO water is used in the process. Table 9.11 presents a summary of the RO water consumption during commissioning and normal operation, and an overview of the further treatment processes. A one-off fill of 360 m^3/hr of fire-fighting water will also be required at commissioning.

Table 9.11: Normal Process Water Requirements for UGCC

Water Requirement	Initial Consumption at Commissioning (m^3/hr)	Normal Consumption during Operation (m^3/hr)	Overview of water treatment process and requirement
Make up for Cooling Water (evaporative cooling)	997	772	Evaporative cooling represents BAT for the cooling process based on efficiency requirements and minimum water use. Cooling water is dosed with biocide to minimise biological and bacterial growth in the towers.
Demineralised Water	272	146	Demineralised water for process water will be produced from RO water following a process of filtration (through an activated carbon filter), treatment to remove cation and anion ions. Condensate from the filtration process is mixed with the de-ionized water from the demineralised water package and polished using condensate polisher package before being returning to the demineralised water tank. Effluent arising from regeneration of the resin ion exchange beds will be neutralized prior to mixing with non-oily waste water stream.
Potable Water	33	11	Potable water, meeting World Health Organisation (WHO) and local standards, produced from RO water by activated carbon filtration, remineralisation and chlorination, will be used for sanitation purposes in both the UGCC and in the UGCC workers settlement at Akchalak. Two potable water tanks will each have 12 hours storage capacity for the total facility based upon design consumption rates set in accordance with international

Water Requirement	Initial Consumption at Commissioning (m^3/hr)	Normal Consumption during Operation (m^3/hr)	Overview of water treatment process and requirement
			guidelines.
Service Water	20	20	Some RO water will be used as service water for utility stations and process water if water quality meets the licensor's requirement.

Based on normal operational water requirements of 1 115 m^3/hr (26 760 m^3/day) for total water consumption, cooling water make-up accounts for approximately 70% of the raw water supply to the UGCC.

Two sources of raw water supply are planned for the Project:

- Main supply of raw water for the UGCC will be provided by a 630 mm diameter, 12 km pipeline spur from the existing Kungrad to Karakalpakya water pipeline. Water for this pipeline is supplied from the Kungrad WSU. The Kungrad WSU abstracts water from the Amu Darya approximately 120 km downstream of the Takhiatash Barrage.
- Back up supply of raw water for the UGCC will be provided by a 30km pipeline spur from the Tuyamuyun - Nukus WSU. The Tuyamuyun - Nukus WSU abstracts water from the Amu Darya immediately downstream of the Tuyamuyun reservoir, which is approximately 120 km upstream of the Takhiatash Barrage, with a small top up from an irrigation canal offtaking immediately upstream of the Barrage.

The route and connection points for the UGGC connections to both WSU pipelines are shown in Figure 2.11 in the Project Description. Identification of water abstraction points for the two WSUs to be utilised is provided in Figure 9.13.

The UGCC design will include a 100 000 m^3 raw water pond to provide storage and buffer capacity on site.

The main water supply will provide water to the UGCC except during rare extended periods when the Kungrad WSU is out of service for maintenance. During normal periods of maintenance, the Kungrad WSU will continue to supply the UGCC from a 2 million m^3 storage reservoir built into the design of the WSU.

Figure 9.13: WSU Water Abstraction Points from Amu Darya

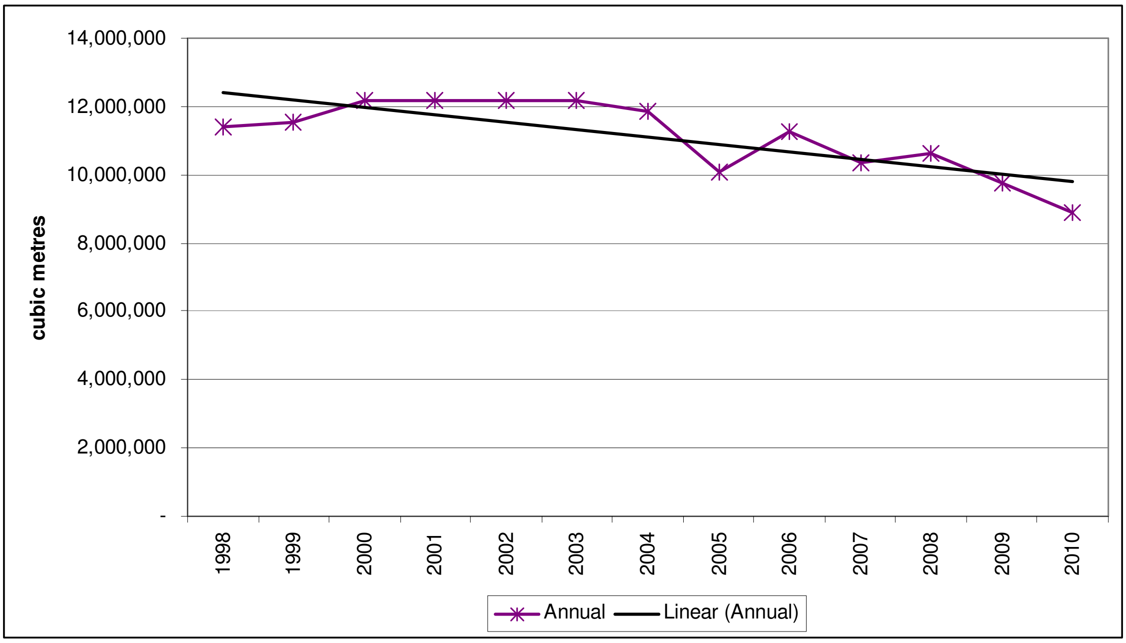
Source: Mott MacDonald

Water for the Kungrad WSU is abstracted from the Amu Darya River at a downstream location and consists of three pump stations with a 2 million m^3 storage capacity pond located at pump station 1. The purpose of the pumping stations is to ensure that pressure within the pipeline is maintained and also to provide chlorine dosing facilities thereby effecting basic water treatment. It should be noted that this abstraction point is 115 km below the abstraction that feeds the Sudoch'ye Lakes and below the Takiatash Barrage, which is the flow control to the Lower Amu Darya.

The water supplied by the Kungrad WSU only supplies the major industrial facilities located on the Ustyurt Plateau including the Akchalak Gas Compressor Station (and two other compressor stations located further up the Ustyurt Plateau) and the Kungrad Soda Ash Plant. There are no irrigation users supplied from the Kungrad WSU. Historically it used to supply compressor stations in Kazakhstan along the route of the Central Asian gas pipeline but supplies to these stations was terminated in 1996 with the break up of the Soviet Union.

Figure 9.14 shows the annual water abstraction to the Kungrad WSU from 1998 to 2010. The linear trend line illustrates the reduction in abstraction volumes in the last 12 years.

Figure 9.14: Water abstraction from Kungrad WSU



Source: MM graph derived from data supplied by Urgenchtransgaz on water use from Kungrad WSU 1998-2010

More detailed abstraction data, recorded on a quarterly basis for the Kungrad WSU from 2005 to 2010, is presented in Table 9.12.

Table 9.12: Actual water consumption (m^3) at Kungrad WSU

Year	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Annual
2005	1,796,200	3,104,900	3,279,500	1,895,400	10,576,000
2006	1,769,000	2,978,400	4,217,500	2,303,100	11,268,000
2007	2,192,900	2,683,500	3,153,900	2,312,700	10,34,300
2008	2,378,900	2,885,800	3,023,300	2,352,200	10,640,200
2009	2,232,700	2,730,500	2,786,600	2,020,500	9,830,300
2010	1,960,300	2,344,200	2,589,200	2,011,800	8,905,500

Source: Urgenchtransgaz (operators of the Kungrad WSU),

The actual annual water consumption at Kungrad WSU varies from 10.58 million m^3 (28,975 m^3/d) in 2005 to 8.90 (24,400 m^3/d) million m^3 in 2010 and peaks in 2006 at 11.27 million m^3 (30,870 m^3/d). The average consumption between 2005 and 2010 has been 10.26 million m^3 (28 110 m^3/d).

Kungrad WSU has an estimated design capacity of 125 000 m^3/day as the WSU is understood to have been built to supply all the water requirements of Uzbek and Kazakh compressor station north of the Kungrad WSU.

The normal raw water demand for the UGCC of 26 760 m^3/day (1 115 t/hr) would therefore nearly double the current average annual water consumption of the Kungrad WSU (increasing it to approximately 54 870 m^3/day). This combined total still however only represents 44% of the capacity of WSU.

When considering the UGCC normal operational raw water requirements against flows in the Amu Darya comparison has been made with the monthly average flows at the Qzyldjar gauging station (which is located some 13 km downstream of the Kungrad WSU intake) based on the data presented in Table 9.3. The available network storage, which includes 2 million m^3 at pump 1 of the Kungrad WSU, is equivalent to approximately 60-80 days of storage (based on the range of annual demands recorded in 2005-10) and therefore would buffer any sub-monthly variations in river flows. The storage reduces to 30-40 days if a peak factor of 2 is assumed which is still sufficient to average out daily variations in abstraction at the intake.

Table 9.13 shows the normal water demand for the UGCC as a percentage of the monthly average flows between Jan-1989 to Feb-2011. This comparison takes into account the seasonal variation in flow in the Amu Darya.

As can be seen, under all average seasonal flows the abstraction for the UGCC is <0.35% of the flow in the Amu Darya and therefore is a very minor influence on flow, particularly when compared with irrigation demands. As noted in Section 9.3.4.4 in an average year 368 m^3/s is diverted or lost from the river between the Kipchek and Samanbay gauging stations (located upstream and downstream of Takhiatash Barrage respectively) which when compared to the normal operating requirement of the UGCC of 26,760 m^3/d (0.31 m^3/s) illustrates the minor impact of the Project abstraction on flows compared to upstream irrigation diversions.

Table 9.13: UGCC water requirements as % of flow at Qzyldjar gauging station

Month	Qzyldjar Gauging Station		UGCC water demand as % of flow at Qzyldjar Gauging Station
	m^3/s	m^3/day	
January	194	16,761,600	0.16%
February	122	10,540,800	0.25%
March	101	8,726,400	0.31%
April	92	7,948,800	0.34%
May	245	21,168,000	0.13%
June	424	36,633,600	0.07%
July	541	46,742,400	0.06%
August	317	27,388,800	0.10%
September	255	22,032,000	0.12%
October	201	17,366,400	0.15%
November	116	10,022,400	0.27%
December	88	7,603,200	0.35%
Annual	**202**	**17,452,800**	**0.15%**

Consultation with the Chief Office of Water Use at the MAWR has confirmed that the Ministry considers that the abstraction for the UGCC would have virtually no influence on the water flow of Amu Darya River downstream of the Takhiatash Barrage. Under critical low flow periods the Ministry did highlight that some additional water source may be required to supplement the Kungrad WSU supply. The Ministry also confirmed that the Project abstraction does not have any influence over the Sudoch'ye lake system.

Table 9.14 illustrates the relative magnitude of the UGCC normal operational demand by expressing it as a percentage of the average monthly flow at Qzyldjar gauging station during the worst case dry years of 2000 and 2001. Monthly averages have been used as there is sufficient storage at the Kungrad WSU to buffer the daily variations in flow.

Table 9.14: UGCC demand as percentage of the monthly flow at Qzyldjar gauging station under critical low flow conditions

Months	2000		2001	
	Average monthly flow m^3/day	Normal UGCC demand as % of flow	Average monthly flow m^3/day	Normal UGCC demand as % of flow
Jan	6,393,600	0.4%	- 1	n/a
Feb	2,370,240	1.1%	354,240	7.5%
Mar	1,039,680	2.6%	241,920	11.1%
Apr	616,320	4.3%	256,320	10.4%
May	869,760	3.1%	204,480	13.1%
Jun	607,680	4.4%	221,184	12.1%
Jul	354,240	7.5%	175,680	15.2%
Aug	584,640	4.6%	218,880	12.2%
Sep	449,280	6.0%	297,840	9.0%
Oct	496,800	5.4%	248,832	10.7%
Nov	403,200	6.6%	259,200	10.3%
Dec	- 1	n/a	328,320	8.1%

Note 1: flow gauging records affected by ice so no flow records available

The magnitude of the impact peaks in July 2001 when the demand would represent 15% of the monthly flow. It can therefore be concluded that in periods of critical low flow the abstraction has a moderate and therefore significant impact on the Lower Amu Darya.

Further consideration of alternative supply options during periods of critical low flow below the Takhiatash Barrage have however also been considered and are discussed below.

As has been reported earlier, the 2000/01 drought in the Lower Amu Darya is widely believed to have been heavily influenced by political decisions on the priority for water allocation upstream rather than as a reflection of the availability of water in the Amu Darya. The International Fund for Saving the Aral Sea (IFAS) is mandated to implement the priority environmental and socio-economic objectives of the Aral Sea Basin countries. There have however been criticism from stakeholders and international donor organisations of the ineffective way in which IFAS has been operating since its inception in 1993. Since 2009 there has been renewed effort from the participating countries (Tajikistan, Uzbekistan, Kazakhstan, Turkmenistan and Kyrgyzstan) with support and encouragement from the international organisations (UN, UNECE, UNDP) to improve the functioning of IFAS in order to achieve its intended objectives. Key priorities have been identified as integrated water resources management, environmental protection, socio-economic development and improved institutional and legal instruments for water resources management and an action plan to deliver on these objectives between 2011 and 2015 has been developed.

Whilst the IFAS initiatives are no guarantee that improvements in water resource management will eliminate the risk of low flows in the Lower Amu Darya associated with skewed water allocations and political interference, it does provide an indication that the issue is receiving serious attention and that a formal legal framework for interstate water management is likely to be put in place. These matters are clearly out of Uz-Kor's direct control but the importance of the oil and gas industry to the Uzbek economy does provide some leverage that could be used to lobby the Uzbek government in relation to water resource management priorities.

Also of relevance in relation to low flows is the stated commitment by Amu Darya BVO to release 50 m^3/s at the Takhiatash Barrage and to supply 5 km^3/yr into the Aral Sea, both of which will contribute to reducing the risk of critical low flows occurring at the Kungrad WSU abstraction point as a result of water being held back further upstream.

Not withstanding the above points the sensitivity of the Amu Darya in periods of critically low flow is high and the magnitude of the impact of the abstraction would be at least moderate resulting in a moderate and therefore significant potential impact.

The Muynak lake system is fed from the Lower Amu Darya and under critical low flow conditions the Project abstraction could result in a reduction in flow feeding the lakes. However as the Muynak lakes have been created by damming the Lower Amu Darya it is considered that it would only be after extended periods of critical low flows that the influence of the Project abstraction would lead to levels in the lake system dropping significantly and affecting its uses for agriculture and dust suppression. It should also be noted that critical low flows in the Lower Amu Darya are more often experienced during winter periods due to the retention of water at the Tuyamuyun Reservoir and other storage systems to meet spring/summer irrigation demand. Given the main uses of the Muynak Lakes require flows to be sustained during the spring/summer period also, it is less sensitive to lower flows during the winter period. Therefore the impact magnitude on the Muynak lakes, given their medium sensitivity, is considered to be minor and therefore of overall minor adverse significance.

9.4.4.2 Wastewater

Section 2.6.3.4 outlines the wastewater streams that the UGCC will generate, and which will include the following waste water streams[76]:

- Non-oily wastewater such as water treatment plant (RO plant and demineralisation plant) blowdown and cooling tower blowdown;
- Oily / solvent wastewater from equipment drains that could contain hydrocarbons;
- Sanitary waste water was office and domestic facilities including canteens;
- Potentially contaminated surface water including from paved areas subject to washing down, from areas that could be subject to contamination and from areas around storage tanks and bunds;
- Clean surface water from non-contaminated areas such as roofs, dry storage areas and bunded areas that drain through interceptors;
- Firewater.

The main wastewater flow will be non-oily wastewater, the various constituent streams of which are presented in Table 9.15.

Table 9.15: Estimated Wastewater Volumes

Origin	Quantity (t / hr)
Non-oily wastewater	420
Oily / solvent wastewater	126
Sanitary wastewater	20
Potentially contaminated surface water	Discontinuous
Clean surface water	Discontinuous
Firewater	Discontinuous

The UGCC design will include a comprehensive wastewater drainage and treatment system. Uncontaminated and potentially contaminated drainage will be segregated with the clean water drainage system. Potentially contaminated surface water from around the plant will be drained to localised sumps where it will be tested to confirm whether it is contaminated and also allow some solids to settle in the sumps. Contaminated surface water will then routed through oil interceptors prior to being routed to the wastewater retention pond.

Non-oily process wastewater will be routed to the wastewater treatment plant to be treated by neutralisation.

Oily/solvent contaminated wastewater will drain to dedicated underground collection and pumping sumps that will be nitrogen blanketed and fitted with vent filters to minimise VOC emissions. The contents of the sumps will be pumped through an oil interceptor to remove immiscible hydrocarbons and then routed to the wastewater retention pond.

Sanitary wastewater will drain to a septic tank for collection and from there will be removed by tanker for offsite disposal at an appropriately licensed facility.

[76] Project Specification for Drainage System Design. SE-000-CA-4-1004, Revision No 1. Revision Date 21 July 2008

All treated waste water is directed to a 2 million m^3 waste water retention basin located at the Waste Water Treatment Unit of the UGCC complex. From this point the proposed final disposal route in the original design had assumed for discharge of the treated wastewater by pipeline routed down the escarpment to the west of the UGCC and discharging to land in the Aral Sea Basin. An earth bund would have been constructed to prevent the wastewater from flooding a salt mining area in the vicinity of the discharge area. The wastewater quality would be designed to comply with Uzbek standards for the maximum allowable concentrations in wastewater discharged onto land and allowed to percolate into the ground. Due to the high mineral content of the raw water it would be anticipated however that the concentration of chloride and sulphate in particular in the treated water may not have meet Uzbek standards for discharge to land and that it would have been necessary to seek a derogation from the Uzbek authorities in relation to this discharge. The disposal route of wastewater has however been modified as a result of the ESIA process to remove any discharge to the environment (land or watercourse). For the purposes of this ESIA assessment the initial assessment of impacts has been carried out on the original design proposals. Details of the revised wastewater arrangements are discussed under the mitigation section in Section 9.5.4.2.

The sensitivity of the potential receptors (groundwater and undefined surface drainage systems) is expected to be low based on the fact that the unconfined, shallow aquifer is known to be of high salinity and does not meet WHO standards for potable water. The potential magnitude of the impact from this discharge would however be moderate to high due to the volume of the discharge and the fact that it is unlikely to be able to meet Uzbek standards without significant additional treatment. The significance of the impact can therefore be assessed to be minor/moderate and therefore significant.

9.4.4.3 Flood Risk

The only cause of flooding that has been assessed in this ESIA is the pluvial flooding arising from storm events and the surface water drainage. The potential impact of fluvial flood risk has been scoped out due to the lack of surface water bodies in the vicinity of the Project site.

In addition to the UGCC, temporary access roads, a spur road connection 5 km long and a 7 km rail spur will be constructed from the existing transportation route to the site of the UGCC, on the plateau.

Design rainfall for the UGCC site has been specified in the ITB documents provided by Uz-Kor[77] and presented in Table 9.16 and Table 9.17.

Table 9.16: Design Rainfall Data

Parameter	Value
Average Annual Rainfall	108 mm
Maximum daily rainfall	37 mm
Max/Average/Min rain hours per month	44/20/2 hours

Source: Basic Engineering Design Data SE-000-BA-4-1001 rev 0, 19th June 2008

77 Basic Engineering Design Data SE-000-BA-4-1001 rev 0, 19th June 2008

Table 9.17: Maximum rainfall intensity for a range of durations (10 year return period)

Minutes				Hours			
5	10	20	30	1	12	24	48
Intensity (mm/min)				Intensity (mm/min)			
3.9	2.9	1.8	1.4	0.7	0.1	0.03	0.02

Source: Basic Engineering Design Data SE-000-BA-4-1001 rev 0, 19th June 2008

The use of a 10 year design frequency for surface drainage is reasonable provided that contingency arrangements are put in place to manage the risk to infrastructure and operatives arising from storm events that exceed the design frequency,

The specification and associated standards for drainage are set out in the *Project Specification for Drainage System Design*[76] . This specification states that the peak storm water run off and drainage system discharge shall be calculated using the Rational Formula using the run off coefficients as given in Table 9.18 below.

Table 9.18: The runoff coefficients specified for use with the Rational Formula

Surface Type	Coefficient
Roofs	0.95
Pavement (concrete or asphalt)	0.90
Compacted crushed stone	0.70
Compacted Soil	0.50
Undeveloped sandy areas	0.30

Source: Project Specification for Drainage System Design. SE-000-CA-4-1004, Revision No 1. Revision Date 21 July 2008

Whilst the design capacity of the surface drainage system, based on the design frequency, is considered to be adequate for the expected rainfall intensity, it is consider appropriate to further mitigate the risk through development of an emergency plan for to manage the risk to infrastructure and operatives arising from storm events that exceed the design frequency.

Given the low rainfall, the temporary access roads, new spur road connection and new rail spur for the UGCC are unlikely to form a significant barrier to flow, so it is considered that the impact of roads in inducing flooding during any one event is minor and overall negligible.

The magnitude of flood risk is assessed as minor and the sensitivity of the receptors (areas adjacent to the Project area and the shallow aquifer) is assessed as negligible/low. Consequently the significance is assessed as insignificant.

9.5 Mitigation Measures

9.5.1 Introduction

The types of mitigation measures are described below. With respect to hydrology mitigation measures for the potential impacts on water resources, water quality and flood risk will be considered. Some of the mitigation described is embedded within the Project design as part of the evolution of design during the detailed design phase and reflects good industry practice and/or improvements on existing infrastructure where it existed. In other cases however mitigation has been identified and is being adopted as a result of the findings of the ESIA process in order to reduce identified significant impacts. Measures are also being included to further reduce the potential impacts associated with non-significant impacts and are considered as enhancement measures to reflect the implementation of best practice where possible.

9.5.2 Gas Fields

9.5.2.1 Water resources

The existing gas fields at Surgil have been utilising water transported to the site by tanker from Muynak for all required purposes. The Muynak water supply system is already under stress, especially in periods of low flow in the Amu Darya, and supplies for potable and domestic use will take priority. The Project will include for the drilling of two boreholes at the CGTU to supply groundwater for all gas field requirements. A small desalination plant will be included for the production of potable and domestic water supplies. This measure will remove the requirement to take water from an already stressed WSU at Muynak and remove water tanker traffic from the road.

As part of the project design a fully lined evaporation pond is being constructed at the vicinity of the CGTU. As well as being part of the wastewater treatment system for the gas field the evaporation pond will also act as a water storage pond from which water can be recycled for certain uses such as preparation of drilling mud. This will include hydrostatic testing water and clarified water from separation of drilling cuttings from drilling fluids. Drilling fluids will be recycled following removal of drilling cuttings to reduce the amount of new drilling fluid that will need to be prepared. These measures will further reduce the water demand at the site. At this stage it is not possible to quantify the reduction in water usage on a per well basis from implementation of these measures, but monitoring of water use will be undertaken as part of the environmental management and monitoring plan.

Good practice standards for storage of oil, fuel and chemicals will be implemented including bunding of all tanks in line with international standards and the design and construction of the drainage system to minimise the risk of leakage into the ground from wastewaters contained therein.

Groundwater monitoring will also be undertaken to ensure the reliability of quality of the water supply throughout the project lifetime. A groundwater monitoring strategy is provided in the ESMP.

9.5.2.2 Wastewater

Improvements to the infrastructure at the Surgil Field have included the construction of a wastewater treatment facility and a fully lined evaporation pond design to international standards to prevent ingress of wastewaters into the underlying ground. All wastewaters now receive at least primary treatment (neutralisation, removal of oil and initial settlement of suspended solid matter prior to discharge of the treated water to the evaporation pond. Produced water in particular is now treated and retained rather than being discharged to land thereby reducing the impact of this activity.

The evaporation pond has been sized to achieve the required evaporation rate to treat the anticipated wastewater throughout the year. In practice, a proportion of the treated wastewater will be recycled thereby reducing the overall volume of wastewater to be evaporated. As a result of the implemented system the gas field site is a zero discharge facility.

As part of the ESMP the quality of the water in the evaporation pond will be periodically monitored. This will enable appropriate reuse options to be considered if the water meets specified quality standards.

9.5.2.3 Flood risk

Although the risk of flooding at the site is remote a contingency plan to address the potential risk to infrastructure and operatives during extreme storm events will be prepared.

9.5.3 Pipelines

9.5.3.1 Water Resources

As noted in Section 9.4.3.2, significant quantities of water are required to undertake hydrostatic testing (albeit significantly reduced following mitigation). In order to reduce the volumes required hydrostatic testing will now be carried out on a sectional basis, with each section between the block valves being separately tested and the water returned to the evaporation pond at the CGTU, which has already been constructed, to retain it prior to reuse in the next section. The hydrostatic test water will be subject to treatment by means of settlement and oil skimming prior to being reused. Upon completion of the hydrostatic testing the water used to test the final section of pipeline will be discharged to the wastewater retention basin at the UGCC for treatment and reuse. Table 9.19 illustrates the reduction in water use by taking the approach of sectional testing. It is expected that top up water will be needed at each reuse stage. Assuming a top up rate of a third of the initially required volume per section the total volume requirement would be reduced to 49,440 m^3. It is therefore anticipated that this approach will reduce water use requirements for hydrostatic testing by at least 50%.

Table 9.19: Water use for hydrostatic testing on sectional basis

Feature	Distance (km)	Pipeline diameter (mm)	Hydrostatic testing volume (m^3)
Gas pipeline (total)	115	1020	93,970
Gas pipeline section between valves	30	1020	24,500
Condensate pipeline (total)	115	168	2,550
Condensate pipeline section between valves	10	168	220

9.5.3.2 Water Quality

As noted above, to reduce the potential for discharge of contaminated water to ground and to the aquifer hydrostatic testing water will be retained and ultimately treated in the UGCC wastewater retention pond. This will prevent any intentional discharge to the environment.

The risk of pollution of groundwater and the risk to surface water from spillages to ground during construction will be managed through the implementation of international good practice construction environmental management. This will include the storage fuel tanks or drums in temporary bunded areas, drip trays on construction equipment, provision of oil absorbent materials in the event of oil spills, management of soil and trenched materials in appropriate stockpiles to minimise dust in dry weather and silt run-off in the event of heavy rainfall.

9.5.3.3 Flood Risk

Section 9.4.3.1 outlines the risk associated with construction of the pipeline through the dry channel of the Sudoch'ye Lakes overflow. It is likely that this channel would only flow when water is released from Sudoch'ye, which is done when the water level in the Lakes reaches 52 metres. To minimise the risk of operation of the overflow coinciding with the construction of the pipeline through this area the following measures are proposed to be implemented;

- Construction of this section of the pipeline will be programmed for after the main snow melt period that is known to raise water levels in the Amu Darya
- The pipeline contractor will liaise with the Aral Basin Delta Management, which has responsibility for water management at the Sudoch'ye Lakes, to get advanced warning of the potential for the Sudoch'ye Lake overflow to operate.

Good practice construction environmental management measures will be implemented to minimise the risk of pollution of the ground or groundwater being mobilised during a flood event and carried forward into the marshy areas into which the Sudoch'ye Lakes overflow drains.

To reduce the potential impact operation of the overflow may have on the pipeline where it crosses the channel it will be buried at a minimum depth of 3m to minimise the risk of scour exposing the pipeline and risks causing fracture if it floats or is subject to lateral pressure from high water flow. There is extensive experience globally of installing gas and oil pipes in high flow river or marine environments to minimise this risk so appropriate construction methods utilising this knowledge will be adopted in this situation.

9.5.4 UGCC

9.5.4.1 Water Resources

The most significant hydrological impact of the UGCC is the potential impact on water resources and the vulnerability of the raw water supply given the baseline water resources.

The following mitigation measures will be implemented to reduce the significance of the potential impact of abstraction from the Amu Darya:

- Water conservation and wastewater reuse; and
- Provision of a back up raw water supply that is abstracted upstream of the major irrigation abstractions in the Lower Amu Darya.

In addition, mitigation measures will be implemented for managing the impact of wastewater effluent such that it complies with the appropriate international standards.

Water Conservation and Wastewater Reuse Measures

Relevant IFC sector guidelines require projects to reduce water consumption as far as practicable when located in water-scarce regions. The Project falls within this category.

A review of the design of the water and wastewater system by Uz-Kor has identified opportunities for reuse of treated non-oily wastewater and for utilising the wastewater retention pond for water storage allowing further wastewater to be reused for appropriate plant uses. Table 9.20 sets out the current design and normal water demand compared to the water reuse options.

Table 9.20: UGCC annual raw water demand including reuse options.

Scenario	Condition	(t/hr)	(t/day)	(t/yr)	Water savings compared to normal scenario	
					t/hr	%
Without water reuse	Design	1,470	35,280	11,760,000	-	-
	Normal	1,115	26,760	8,920,000	-	-
With water reuse from WWTP[1]	Normal	895	21,480	7,160,000	220	19.7%
With water reuse from WW[2] pond	Normal	945	22,680	7,560,000	170	15.2%
With water reuse from WWT and WW pond	Normal	725	17,400	5,800,000	390	35.0%

Source: Uz-Kor

[1] Treated non-oily waste from waste water treatment plant

[2] Waste water from wastewater pond

The design aims to achieve 220 m^3/hr re-use (approx 20%) under normal operating conditions giving a raw water demand of 895 m^3/hr. Ultimately, once the evaporation pond is established, it will supply a further 170 m^3/hr resulting in a raw water demand of 725 m^3/hr.

When considering the inclusion of water re-use in determining the potential impact of abstraction on the Amu Darya River. Table 9.21 presents the UGCC demand as a percentage

The design demand without reuse and the normal demand with reuse have been used as they represent the range of potential abstractions.

Table 9.21: UGCC water demand with full water recycling as percentage of monthly flow at Qzyldjar gauging station

Months	% of Monthly Average Flow [1] 1989 - 2011	% of Monthly Average Flow 2000	% of Monthly Average Flow 2001
Jan	0.10%	0.3%	n/a
Feb	0.17%	0.7%	4.9%
Mar	0.20%	1.7%	7.2%
Apr	0.22%	2.8%	6.8%
May	0.08%	2.0%	8.5%
Jun	0.05%	2.9%	7.9%
Jul	0.04%	4.9%	9.9%
Aug	0.06%	3.0%	7.9%
Sep	0.08%	3.9%	8.3%
Oct	0.10%	3.5%	7.0%
Nov	0.17%	4.3%	6.7%
Dec	0.23%	n/a	5.3%

Note 1: Based on Amu Darya BVO - 10 day flows Jan-1989 to Feb-2011

The magnitude of the impact peaks in July 2001 has reduced the demand from 15% of the monthly flow to 9.9% when full re-use under normal operating conditions is considered.

It can therefore be concluded that in dry years the impact of abstraction with maximum water reuse still has a moderate and therefore significant impact on the Lower Amu Darya but has been reduced compared the non-recycling situation. This will also provide some mitigation for flows into the Muynak Lakes, although the dammed nature of the lakes will mean they are less susceptible to short terms low flow conditions.

Implementation of the commitment to release 50m^3/s at the Takhiatash Barrage will however mean that the risk of a repeat of the critical low flow conditions of 2000 and 2001 should be significantly reduced. With this committed flow the abstraction for the UGCC under normal operations with no reuse would constitute 0.7% of the available water at the Kungrad WSU abstraction point (taking into account the small number of minor abstractions amounting to, on average, 5.7 m^3/s between Takhiatash Barrage and Kungrad WSU abstraction). Implementing maximum water reuse would reduce this proportion to 0.45%. Under these circumstances the sensitivity of the Lower Amu Darya would be considered to be medium and the magnitude of the impact from the abstraction to be minor resulting in an impact of minor significance and therefore not significant. The impact at Muynak lakes will also be reduced to insignificant due to the committed flow reaching the lake system.

The Project aims to maximise the productivity of each kg of water through the reuse of water and is therefore a relatively efficient and economic use of water in a region where water resources are limited and low efficiency irrigation is the norm.

It is proposed that as part of the operational environmental management system that within 1 year of operation the Project Company should undertake a water efficiency audit. The requirements for this are defined in the ESMP.

Reserve Supply

The design of the water supply system already includes for some reserve stored capacity. This includes the following features:

- 2 million m^3 storage tank at Kungrad WSU;
- 100,000 m^3 raw water storage pond at the UGCC;
- 2 million m^3 wastewater retention pond.

Taking into account the reserve stored capacity volumes, other users on the Kungrad WSU and reuse of 15% of the wastewater retention pond capacity the number of days reserve supply under the different water demand scenarios is as shown in Table 9.22. Use of this reserve stored capacity is likely to be required in the event that abstraction into the Kungrad WSU from the Lower Amu Darya was not possible due to water resource allocation in low flow periods or due to maintenance.

Table 9.22: Operation on Reserve Storage

Scenario	Condition	(t/hr)	Number of days operation on reserve storage capacity
Without water reuse	Design	1,470	43
	Normal	1,115	52
With water reuse from WWTP	Normal	895	59
With water reuse from WW pond	Normal	945	57
With water reuse from WWT and WW pond	Normal	725	67

In order to provide an additional alternative supply option the design has incorporated a back up supply provided by a 1 020 mm pipeline spur from the Nukus-Tuyamuyun water supply pipeline which is abstracted from the Amu Darya at Tuyamuyun. Connection to the Nukus-Tuyamuyun water supply pipeline was also noted by the Chief of Water Use at the MAWR as an appropriate option for supply during critical low flow conditions for the Kungrad WSU.

The offtake point from the Amu Darya for the Nukus-Tuyamuyun WSU at Tuyamuyun is 335 km upstream of that for the Kungrad WSU. In 2010 21 771 000 m^3 (equivalent to 0.69 m^3/s) was abstracted from the Amu Darya predominantly for irrigation. The Deputy Director of the WSU reports that the number of water consumers drawing from the WSU as of 01.01.2011 is 101 662 of which 100 304 are farms. No information has been made available by the WSU on the maximum capacity of the Nukus-Tuyamuyun abstraction but based on irrigation abstraction data for other canals and diversions, which have shown reductions since the 90s, it is reasonable to assume that additional capacity is available in the WSU such that during any period when the Nukus-Tuyamuyun WSU acted as the reserve supply for the UGCC the abstraction could be increased to accommodate some or all of the increased demand.

As presented in Table 9.23, based on flow data shown in Table 9.3, the Nukus-Tuyamuyun WSU abstraction (based on 2010 figures) represents 0.08% of the flow in the Amu Darya under average flow conditions and 0.24% of the flow under the lowest monthly average flow at Tuyamuyun gauging station. This abstraction would increase to 0.12% and 0.35% of flow in the Amu Darya under average and low average flow conditions respectively for UGCC normal operational water demand and to 0.10% and 0.31% for UGCC water demand under the maximum recycling scenario.

Table 9.23: UGCC abstraction as proportion of Nukus-Tuyamuyun WSU and Amu Darya Flows

Scenario	m^3/s	As proportion of Amu Darya average monthly flow	As proportion of Amu Darya lowest average monthly flow
Average monthly average flow of Amu Darya at Tuyamuyun GS	863	100%	-
Lowest average monthly flow of Amu Darya at Tuyamuyun GS	288	33%	100%
Nukus-Tuyamuyun WSU	0.69	0.08%	0.24%
UGCC abstraction normal ops	0.31	0.04%	0.11%
UGCC abstraction max recycling	0.2	0.02%	0.07%
Total WSU + UGCC normal ops	1.00	0.12%	0.35%
Total WSU + UGCC max recycling	0.89	0.10%	0.31%

Under critical low flow conditions in the Amu Darya the Nukus-Tuyamuyun WSU abstraction would be expected to form a higher proportion of the flow than is shown above, but as the availability of water at this point is directly linked to the operation of the Tuyamuyun reservoir release and so subject mainly to water resource management allocation decisions, it is less susceptible to potential impact associated with lower river flows that can characterise the Amu Darya below the Takhiatash Barrage. Importantly in relation to available water the abstraction point for the WSU is upstream of the major irrigation abstractions between the Kipchek Gauging Station and Takhiatash Barrage, which between them take 63% of the average flows recorded at Kipchek, and is therefore less susceptible to critical low flow conditions.

The sensitivity of the Amu Darya at the Nukus-Tuyamuyun WSU intake is assessed to be medium and the potential impact of the UGCC abstraction to be moderate under low flow conditions (precautionary impact magnitude due to lack of specific critical low flow data). The impact is therefore assessed to be moderate and significant.

As previously noted water management in the Amu Darya is subject to interstate agreement and is therefore highly susceptible to political interference. Improvements in interstate co-operation, the implementation of regional legislation and improved water resource management should reduce the risk of critical low flows due to inequitable water allocation in future. Uz-Kor will consult closely with the Uzbek government to ensure that the water requirements of oil and gas project such as Surgil are given appropriate consideration in water resource management planning.

9.5.4.2 Wastewater Treatment

The residual wastewater streams from the wastewater treatment plant that can not be reused will be routed to a wastewater retention/evaporation pond rather than discharged to land or to watercourse as had been previously included in the original design. The construction of the wastewater retention pond will incorporate ecological habitats such as reed-beds which in turn serve to further treat the wastewater. The complex will therefore achieve zero discharges from Uz-Kor controlled facilities. This is fully in-line with relevant IFC sector guidelines which state: "*Zero discharge design/Use of treated waste water to be included in project design processes*". This is the proposed approach from the perspective of mitigation as there will be zero discharges and coupled with available space, there will be no need for physical or economic resettlement to accommodate the retention pond. The magnitude of the potential impact of wastewater discharge from the UGCC on groundwater will therefore now be negligible and the impact insignificant. The creation of ecological habitats in the pond will be beneficial effect on ecological resource in the area.

With the construction of the wastewater retention pond and consequential zero discharges from the facility, stringent Uzbek discharge standards no longer need apply (especially with respect to conductivity). However, in order to maintain overall water quality in the wastewater disposal pond the IFC standards for wastewater disposal, as set out in Table 9.24, will be employed as the minimum design specification for the wastewater treatment plant.

If the wastewater in the pond is to be considered for off-site uses (such as irrigation), the water must meet relevant Uzbek discharge standards, as set out in Table 9.24, before such use. Whilst alternative uses of the water are recommended for consideration in due course, it is unlikely that any firm plans for re-use of the water off-site should be considered at this stage until the UGCC is commissioned and the actual water chemistry is known (and hence compliance or not with stringent Uzbek parameters such as conductivity).

Table 9.24: Applicable Wastewater Standards

Pollutant	Unit	Maximum Allowable Concentration for wastewater to ground, Uzbekistan Law	IFC Wastewater Guidelines (Polymer Manufacture, 2007)
pH	S.U.	6.5 – 8.5	6 – 9
Temperature Increase	°C	<5°C temperature increase	<3°C temperature increase
BOD_5	mg/l	6	25
COD	mg/l	30	150
Total Nitrogen	mg/l	11.2 (nitrate + nitrite)	10
Total Phosphorous	mg/l	-	2
Ammonium oxide	mg/l	2	-
Sulphide	mg/l	-	1
Chloride	mg/l	350	-
Sulphate	mg/l	500	-
Oil and Grease	mg/l	0.3	10

Pollutant	Unit	Maximum Allowable Concentration for wastewater to ground, Uzbekistan Law	IFC Wastewater Guidelines (Polymer Manufacture, 2007)
Total Suspended Solids	mg/l	<0.75mg/l increase	30
Cadmium	mg/l	-	0.1
Chromium (total)	mg/l	-	0.5
Chromium (hexavalent)	mg/l	-	0.1
Copper	mg/l	-	0.5
Zinc	mg/l	-	2
Lead	mg/l	-	0.5
Nickel	mg/l	-	0.5
Mercury	mg/l	-	0.01
Phenol	mg/l	-	0.5
Benzene	mg/l	-	0.05
Vinyl Chloride	mg/l	-	0.05
Adsorbable Organic Halogens	mg/l	-	0.3
Iron	mg/l	0.3	-

As the Project is located within a water scarce region, Uz-Kor will continue to look for opportunities to reuse more of the water from the wastewater pond. During commissioning water use based on the adopted design including water reuse will be optimised. Further work will however also be carried out in the first 1-2 years to identify further options for reuse.

9.5.4.3 Flood Risk

It is proposed that mitigation for flood risk is required in the form of an appropriate emergency plan for the operation and evacuation of the site in the eventuality of an extreme pluvial event.

In addition to temporary access roads, a spur road connection 5 km long and a 7 km rail spur will be constructed from the existing transportation route to the site of the UGCC, on the plateau.

Given the low rainfall, and that the road and railway are unlikely to form a significant barrier to flow, it is considered that the impact of roads in inducing flooding during any one event is minor and overall negligible.

9.6 Summary

A tabulated summary of the impacts for hydrology and hydrogeology are given in Table 9.25, Table 9.26, and Table 9.27, highlighting the specific Project component (i.e. Gas Fields, Pipelines, UGCC) and the phase of development (construction, operation, etc.) within which the impact will potentially occur.

Table 9.25: Summary of Impacts for Gas Field

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Gas fields – Construction						
Water Resources	Abstraction of groundwater for construction	Negligible – saline aquifer, not suitable for potable or agriculture	Minor – low level of abstraction, aquifer not suitable for potable or agriculture	Insignificant	Recycling of drilling fluid to reduce water consumption	Insignificant
Wastewater	Spillage from construction/drilling equipment	Negligible – saline aquifer, not suitable for potable or agriculture	Minor - Good practice construction environmental management included as standard requirement for construction/drilling contractors	Insignificant	Uz-Kor to monitor implementation of good practice construction environmental management	Insignificant
	Uncontrolled discharge of drilling fluids	Negligible – saline aquifer, not suitable for potable or agriculture	Moderate	Insignificant	Drilling fluids to be pumped to drilling fluid separation plant within drilling barn for recycling	Insignificant
Flood Risk	Inundation from rainfall	Negligible – no permanent surface water features, infrequent rainfall	Low	Insignificant	Contingency plan for extreme events	Insignificant
Gas Fields – Operation						
Water Resources	Abstraction of groundwater for operation	Negligible – saline aquifer, not suitable for potable or agriculture	Minor – low level of abstraction, aquifer not suitable for potable or agriculture	Insignificant	Recycling of water through wastewater treatment plant for use on site. Discontinuation of transportation of water from Muynak thereby reducing water stress on local supply unit	Insignificant – aquifer use Beneficial – cessation of water supply from Muynak
Wastewater	Produced water discharge to land	Negligible – saline aquifer, not suitable for potable or agriculture	Moderate	Minor Adverse	Evaporation pond to contain and treat all wastewater. Zero discharge from site	Insignificant
	Spillage from operational equipment	Negligible – saline aquifer, not suitable for potable or agriculture	Minor - Good practice operational environmental management included as standard requirement for operator	Insignificant	Uz-Kor to monitor implementation of good practice operational environmental management	Insignificant

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Flood Risk	Inundation from rainfall	Negligible – no permanent surface water features, infrequent rainfall	Low	Insignificant	Contingency plan for extreme events	Insignificant
Gas Fields – Decommissioning						
Water Resources	Abstraction of groundwater for operation	Negligible – saline aquifer, not suitable for potable or agriculture	Minor – low level of abstraction, aquifer not suitable for potable or agriculture	Insignificant	None	Insignificant
Wastewater	Spillage from decommissioning equipment and during emptying of tanks and pipes etc	Negligible – saline aquifer, not suitable for potable or agriculture	Minor - Good practice environmental management included as standard requirement for decommissioning contractors	Insignificant	Uz-Kor to monitor implementation of good practice environmental management	Insignificant
		Medium – return of Aral Sea	Moderate – potential for pollution of returning Aral Sea from drilling fluid disposal basins, tank and pipeline contents etc	Moderate Adverse	Detailed decommissioning plan to empty all tanks, pipelines etc, removal all structures, tanks and equipment. Gas wells to be properly capped to prevent water ingress. Drilling fluid basins to be capped with impermeable layer to prevent ingress of water and migration of contaminants	Minor Adverse
Flood Risk	Inundation from rainfall	Negligible – no permanent surface water features, infrequent rainfall	Low	Insignificant	Contingency plan for extreme events	Insignificant
	Inundation from return of Aral Sea	Medium – return of Aral Sea	Moderate	Moderate Adverse	Continued liaison with Uzbek Government and IFAS to confirm timetable for inundation (if relevant) to allow sufficient time for planning and execution of decommissioning plan	Insignificant

Table 9.26: Summary of Impacts for Gas and Condensate Pipelines

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Pipelines – Construction						
Water Resources	Use of groundwater for hydrostatic testing	Negligible – saline aquifer, not suitable for potable or agriculture	Moderate	Insignificant	Hydrostatic testing in sections and storage and reuse of the water to reduce total water requirement by 50%	Insignificant
	Construction of pipeline through Sudoch'ye overflow	Medium – Sudoch'ye overflow links to marsh area	Minor	Minor Adverse	Design to account for potential high water table in region of dry channel Liaison with Aral Basin Water Management for early warning of possible operation of the overflow Programming of pipeline construction outside main snow melt period	Insignificant
Wastewater	Hydrostatic testing	Low – saline aquifer >50m	Moderate – discharge to ground	Minor Adverse	Discharge to CGTU evaporation pond for reuse after testing of each section and discharge to UGCC wastewater treatment plant after testing of final section; no discharge to land	Insignificant
		Medium – local shallow groundwater lenses potentially used for agriculture	Moderate – discharge to ground	Moderate Adverse		Insignificant
	Spillage from construction equipment/vehicles	Low – saline aquifer >50m	Minor - Good practice construction environmental management included as standard requirement for construction/drilling contractors	Insignificant	Uz-Kor to monitor implementation of good practice construction environmental management	Insignificant
Flood Risk	Construction of pipeline through Sudoch'ye overflow	Medium	Minor	Minor Adverse	Account for frequency and duration of surface water flows in dry channel during design Contingency plan for extreme events	Insignificant
Pipelines – Operation						
Water Resources	None – no water will be required during operation	N/A	N/A	N/A	N/A	N/A

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Wastewater	Small quantities of wastewater produced during maintenance and pigging	Negligible	Negligible - Wastewaters collected and disposed of by licensed waste contractor or at UGCC or CGTU WWTP	Insignificant	None	Insignificant
Flood Risk	None – pipeline will be fully buried	N/A	N/A	N/A	N/A	N/A
Pipelines – Decommissioning						
Water Resources	Decommissioning of pipeline through Sudoch'ye overflow	Medium – Sudoch'ye overflow links to marsh area	Minor	Minor Adverse	Liaison with Aral Basin Water Management for early warning of possible operation of the overflow Programming of pipeline decommissioning outside main snow melt period	Insignificant
Wastewater	Spillage from decommissioning equipment and during emptying of pipes etc	Negligible – saline aquifer, not suitable for potable or agriculture	Minor - Good practice environmental management included as standard requirement for decommissioning contractors	Insignificant	Uz-Kor to monitor implementation of good practice environmental management	Insignificant
		Medium – return of Aral Sea in Aral Sea Basin section of pipeline	Minor – potential for pollution of returning Aral Sea condensate pipeline contents	Moderate Adverse	Detailed decommissioning plan to empty pipelines and remove completely. Reinstatement to follow Uzbek requirements	Minor Adverse
Flood Risk	Decommissioning of pipeline through Sudoch'ye overflow	Medium	Minor	Minor Adverse	Account for frequency and duration of surface water flows in dry channel during design Contingency plan for extreme events	Insignificant

Table 9.27: Summary of Impacts of UGCC

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
UGCC – Construction						
Water Resources	Water for construction uses tankered from Kungrad	Medium	Low – water requirements	Minor Adverse	Construct connection to Kungrad WSU at very start of construction to minimise amount of time water tankering required	Insignificant
Wastewater	Spillage from construction equipment/vehicles	Low – saline aquifer >50m, not suitable for potable use	Minor - Good practice construction environmental management included as standard requirement for construction/drilling contractors	Insignificant	Uz-Kor to monitor implementation of good practice construction environmental management	Insignificant
Flood Risk	Inundation from heavy rainfall event	Negligible – flat area with no permanent surface water features	Low	Insignificant	Contingency plan for extreme events	Insignificant
UGCC – Operation						
Water Resources	Abstraction from Amu Darya via Kungrad WSU during non-low flow period	Medium – Amu Darya heavily abstracted for irrigation and other uses	Minor - UGCC abstraction amounts to 0.7% of flow in Amu Darya	Minor Adverse	Wastewater recycling to reduce water demand by up to 35% Basin management through discussions with BVO "Amu Darya"	Insignificant
	Abstraction from Amu Darya via Kungrad WSU during critical low flow periods	High – during critical low periods water allocation to irrigation users favoured	Major – UGCC abstraction amounts to 7-15% of flow in Amu Darya	Major Adverse	Use of a back-up raw water supply from Tuyamuyun - Nukus WSU which is abstracted from upstream of major irrigation users; Use of reserve supply storage at Kungrad WSU, raw water pond and wastewater retention pond Wastewater recycling to reduce water demand by up to 35% Basin management through discussions with BVO "Amu Darya" and monitor implementation by BVO of committed 50m^3/s flow release at Takhiatash	Moderate Adverse - Significant
	Abstraction from Kungrad WSU during winter low flows and	Medium – No irrigation consumption but need to maintain some flow to	Moderate – artificially dammed lakes and wetland area with capacity	Minor Adverse	Use of back-up raw water supply from Tuyamuyun - Nukus WSU which is abstracted from upstream	Insignificant

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
	potential reduction in flow to Muynak Lakes	Muynak Lakes, for which main uses are agriculture and dust suppression, with some fishing and one lake providing freshwater for drinking	to buffer low flows so levels only affected after extended period of low flow		of major irrigation users, and has very low demand in winter, outside irrigation period; Use of reserve supply storage at Kungrad WSU, raw water pond and wastewater retention pond Wastewater recycling to reduce water demand by up to 35% Basin management through discussions with BVO “Amu Darya” and implementation by BVO of committed 50m^3/s flow release at Takhiatash	
Wastewater	Discharge of treated wastewater to land at base of escarpment	Low – saline aquifer, not suitable for potable or agriculture	Moderate/High	Moderate/Minor Adverse	Wastewater recycling to reduce wastewater volume; All wastewater to be discharged to wastewater retention/evaporation pond; zero discharge from site.	Insignificant
Flood risk	Increased runoff from areas of hardstanding	Low	Negligible	Insignificant	Embedded mitigation (appropriate design of surface drainage to manage the risk of surface ponding); Emergency Plan to manage the risk to infrastructure and operatives during storm events in excess of the 10 year design storm.	Insignificant
UGCC – Decommissioning						
Water Resources	Decommission of raw water supply and associated infrastructure (Raw water demand removed and water resources return to baseline status).	High	Moderate Beneficial	Moderate Beneficial	None	Moderate Beneficial
Wastewater	Spillage from decommissioning equipment/vehicles	Low – saline aquifer, not suitable for potable or agriculture	Minor - Good practice construction environmental management included as standard requirement for	Insignificant	Uz-Kor to monitor implementation of good practice construction environmental management	Insignificant

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
			construction/drilling contractors			
		Medium – local shallow groundwater lenses potentially used for agriculture	Minor - Good practice construction environmental management included as standard requirement for construction/drilling contractors	Minor Adverse	Uz-Kor to monitor implementation of good practice construction environmental management	Insignificant
Flood Risk	Inundation from heavy rainfall event	Negligible – flat area with no permanent surface water features	Low	Insignificant	Contingency plan for extreme events	Insignificant

9.7 Proposed Monitoring

9.7.1 Water Conservation

The essential elements of a water management program involve:
- Identification, regular measurement, and recording of principal flows within the facility;
- Definition and regular review of performance targets, which are adjusted to account for changes in major factors affecting water use (e.g. industrial production rate); and
- Regular comparison of water flows with performance targets to identify where action should be taken to reduce water use further as part of a continuous improvement programme.

Principal streams identified for inclusion of continuous monitoring equipment as a minimum include:
- Abstraction volumes from Kungrad WSU pipeline;
- Abstraction volumes from Tuyamuyun – Nukus WSU pipeline (reserve water supply);
- Cooling water discharge flow;
- Volume flows to the evaporation pond;
- Groundwater abstraction volumes (CGTU); and
- Discharge volumes to evaporation pond (CGTU).

9.7.2 Water Quality

Water quality sampling at proposed temporary water supplies for Gas Field, Pipeline and UGCC sites:
- Water quality sampling at the proposed intake locations;
- Groundwater levels at Gas Field site;
- Groundwater quality and water levels at proposed locations of boreholes for water supply to Gas Field; and
- Groundwater levels in and around the dry channel that acts as an emergency spillway channel from the Sudoch'ye Dam for design purposes.

9.8 Statement of Significance

The most significant impact of the proposed Project is the water resource impact during critical low flow which has been assessed as being of major significance. This is primarily due to the high level of sensitivity in this region which has limited water resources. The implementation of wastewater recycling, the use of storage lagoons and waste water evaporation lagoons and the provision of a back up supply (the Tuyamuyun-Nukus WSU) reduces the impact significance to moderate, but significant, during critical low flow periods. For the majority of time water resources will be sufficient for abstraction for operation of the Project to have an insignificant impact on flows. However it is only through engagement with Amu Darya BVO and the Uzbek government as part of the wider IFAS programme for improving water resource management in the whole of the Aral Sea Basin that the risk of critical low flows can be adequately mitigated.

The impact on the Muynak lake system is assessed to be minor with the implementation of the above mentioned mitigation measures when considered with the fact that the lakes are a dammed system and therefore will have an inbuilt level of storage making them less susceptible to flow variations. The lakes are of no biodiversity value and there is no minimum flow requirement to be sustained. The implementation of a committed minimum release flow of 50m^3/s at the Takiatash Barrage by the BVO Amu Darya will also provide a sustained flow to the Muynak lake system.

The potential impacts of wastewater quality are assessed as insignificant following the construction of a contained wastewater pond at the gas fields and the UGCC. There will be no discharges from either facility.

The potential impact of flood risk is assessed as insignificant provided that consideration is given to the need to include measures to manage the risk to infrastructure and operatives during storm events in excess of the design frequency.

10. Materials and Waste Management

10.1 Introduction

This section outlines the proposed approach for the management of the key waste arisings predicted during the construction/drilling, operation and decommissioning phases of the three principal component parts of the Project; the Surgil gas field, the Project pipelines and the UGCC.

Waste management is a key aspect to be assessed by the Project in order to achieve minimisation of raw material consumption and ensure that any final treatment or disposal of wastes generated by the Project is conducted in an environmentally sound manner, particularly for hazardous wastes.

The scope of this chapter is limited to all solid wastes and those liquid wastes that are not treated via the wastewater treatment plant. The section is structured as follows:

- A brief overview of the relevant waste management legislation and policy in Uzbekistan and the methodology employed in assessing the significance of impacts associated with the generation of waste from the Project;
- Description of baseline waste operations;
- An assessment of the significance of waste arisings from the principal component parts of the Project;
- Mitigation measures for the appropriate management of these arisings; and
- A summary and statement of the significance of any residual impacts.

10.2 Methodology and Legislative Requirements

10.2.1 Waste Management Legislation and Policy in Uzbekistan

10.2.1.1 Overview

The following provides an overview of key legislation relating to waste management and disposal in Uzbekistan and national waste management requirements applicable to the project.

10.2.1.2 Policies, Strategies and Procedures

The Cabinet of Ministers of Uzbekistan sets and approves national policies, strategies, programmes and procedures relating to waste management including allocation of hazardous waste disposal sites and adjustment of waste disposal charge rates as set forth in Article 5 of the Law on Wastes. Local governments are responsible for waste management policies, strategies and procedures at the local level.

10.2.1.3 Regulators

The key regulators in the waste management sector in Uzbekistan are:

- State Committee on Nature Protection (performs the overall control function to monitor compliance with the waste management legislation, coordinates activities of other ministries and agencies involved in waste management, maintains the State Cadastre of Waste Disposal Sites, approves waste generation norms and waste disposal limits);
- Ministry of Health (oversees compliance with hygienic norms and standards associated with waste management, identifies measures to protect health against waste impacts, identifies hygienic and sanitary standards for recycled products, develops guidelines for waste hazard rating);
- Uzkommunhizmat Agency (deals with municipal solid waste (MSW) management and disposal issues);

- State Inspectorate for Safety in Industrial Production, Mining and Utilities, referred to in Uzbekistan as 'Sanoatkontekhnazorat' (deals with mining and radioactive waste management, disposal and recycling issues).

10.2.1.4 National Waste Management Legislation

The waste management legislation in Uzbekistan applicable to the project includes:

National Laws

- Law of the Republic of Uzbekistan on Wastes No.362-II of 05.04.2002 (as amended on 04.01.2011);
- Law No.754-XII on Nature Protection dated December 9, 1992 (as amended on 04.01.2011).

Regulations

- Decree of the Cabinet of Ministers of the Republic of Uzbekistan on Improving the System of Pollution and Waste Disposal Charges in Uzbekistan No.199 of 01.05.2003 (as amended on 02.04.2010);
- Decree of Oliy Majlis of Uzbekistan on Enactment of the Law of the Republic of Uzbekistan on Wastes issued on 05.04.2002 No.363-II;
- Decree of the Cabinet of Ministers of the Republic of Uzbekistan on Enhancing the Use and Recycling of Mercury Lamps and Devices No.405 of 23.10.2000.

Guidelines and Instructions

- O 'z RH 84.3.22:2006 - Production and consumption waste. Waste inventory and waste disposal limits approval procedure (issued by the Goskompriroda of Uzbekistan, 2006);
- O'z RH 84.3.21:2005 - Production and consumption waste. Guidelines for setting waste generation norms (issued by the Goskompriroda of Uzbekistan, 2005);
- O ' z RH 84.3.19:2005 – Environment Protection. Production and consumption waste management. Terms and definitions (issued by the Goskompriroda of Uzbekistan, 2005);
- O'z RH 84.3.18:2005 - Production and consumption waste. Waste Data Sheet (issued by the Goskompriroda of Uzbekistan, 2005);
- O'z RH 84.3.17:2005 - Production and consumption waste. Procedure for developing the Waste Disposal Limit Document (issued by the Goskompriroda of Uzbekistan, 2005);
- O'z RH 84.3.16:2005 - Production and consumption waste. Guidelines for setting waste disposal limits (issued by the Goskompriroda of Uzbekistan, 2005);
- O'z RH 84.3.15:2005 - The waste inventory procedure (issued by the Goskompriroda of Uzbekistan, 2005);
- O'z RH 84.3.11:2004 - Requirements for handling mercury and its compounds, mercury-based waste, and mercury containing devices (issued by the Goskompriroda of Uzbekistan, 2004);
- O'z RH 84.3.10:2004 – Regulation on handling mercury-containing products in the Republic of Uzbekistan (issued by the Goskompriroda of Uzbekistan, 2004);
- O'z RH 84.3.8:2004 – Methodology for integrated waste hazard rating (issued by the Goskompriroda of Uzbekistan, 2004);
- Instruction for hazardous wastes generation, use and storage reporting as per Form No.3 - Hazardous Waste (half-year, annual reporting) (issued by the State Statistics Department of the Republic of Uzbekistan, 1997);
- KMK 201.12-96 – A Landfill for burial and land storage of industrial hazardous wastes. Tashkent, 1996;
- Provisional waste norms for cities and regions of Uzbekistan approved by khokims.

SanPins and GOSTs

- SanPiN RUz №0157-04 - Sanitary requirements for storage and disposal of municipal solid waste (MSW) at MSW landfills in Uzbekistan;
- SanPiN RUz №0128-02 29.07.02 - Hygienic classifier of toxic industrial waste;
- SanPiN RUz №0127-02 29.07.02 – Sanitary procedures for industrial waste inventory, classification, storage and disposal;
- SanPiN RUz №0068-96 - Sanitary regulations for collection, storage, transportation, disposal and recycling of municipal solid waste (MSW);
- GOST 17.0.0.05-93 - Unified system of standards for environmental protection and rational use of resources. Waste Data Sheet. Composition, content, presentation and amendment procedures (adopted as the interstate standard by Uzstandart letter № 05/01-144 of 11/06/2003);
- GOST 30333-95 Material Safety Data Sheet. Basic principles. Information on safety during production, use, storage, transportation, and recycling (adopted as the interstate standard by Uzstandart letter №05/01-144 от 06.11.2003);
- GOST 17.9.0.2-99 Environment protection. Waste management. Waste Data Sheet. Composition, content, presentation and amendment procedures (adopted as the interstate standard by Uzstandart letter №05/01-144 от 06.11.2003);
- GOST 17.9.1.1-99 Environment protection. Waste management. Waste classification. Waste definition by the genetic principle and categorization (adopted as the interstate standard by Uzstandart letter №05/01-144 от 06.11.2003);
- GOST 30774-2001 Resources saving. Waste management. Waste Hazard Data Sheet. Main provisions (adopted as the interstate standard by Uzstandart letter №05/01-144 от 06.11.2003);
- GOST 30775-2001 Resources saving. Waste management. Identification and coding. Main provisions (adopted as the interstate standard by Uzstandart letter №05/01-144 от 06.11.2003).

10.2.1.5 Waste Management in Uzbekistan

Law on Wastes No.362-II of 05.04.2002 (as amended) provides the basis of legislative regulation for waste management in Uzbekistan. The following provides an overview of key provisions of the Law applicable to the Project:

- The main objective is to ensure that waste management avoids any impact to life and health of citizens, and the environment. Any activity of any project may be restricted, suspended or terminated in case of non-compliance with waste legislation that entails damage to life and health of citizens, and the environment or when hazardous waste is generated without technical or other safety measures to protect life and health of citizens, and the environment (Law on Wastes, Article 17);
- The project shall comply with sanitary norms and standards, safety and environmental requirements to ensure efficient waste management (Law on Wastes, Article 22);
- Waste generated by the project shall be the property of the project (Law on Wastes, Article 4);
- The project shall comply with the respective waste management legislation of the Republic of Karakalpakstan (Law on Wastes, Article 3);
- Provided any international agreement signed by the Republic of Uzbekistan stipulates other requirements than those specified in the waste management legislation of the Republic of Uzbekistan, requirements of the international agreement shall govern (Law on Wastes, Article 3);
- It will be a responsibility of the Project (under Law on Wastes, Article 15) to:
  - keep records on generated waste and report to respective authorities (the Waste Inventory Document, the Waste Data Sheet, Waste Hazard Data Sheet, Form № 3- Environment. Toxic Waste Generation, Handling and Storage Report);
  - rate the level of generated waste hazard (every five years);

- develop, obtain approval of and comply with the Waste Generation Norms and Waste Disposal Limits;
- collect, and properly store the waste in such a way as to prevent destruction and deterioration of waste of high resource value and subject to recycling;
- take measures to develop and introduce waste recycling technologies;
- prevent mixing of waste unless this is required by the applied technology;
- avoid storage, treatment, recycling and disposal of waste at illegal sites;
- monitor sanitary and environmental conditions at project owned waste disposal facilities;
- reinstate land disturbed as a result of waste management;
- maximise recycling and ensure environmentally safe disposal of non-recyclable waste;
- report to authorities on illegal waste disposal sites and measures taken;
- pay waste disposal charges;
- recover damage caused to the life, health and property of citizens, the environment, or other companies as a result of waste management.

10.2.1.6 Municipal Solid Waste

SanPiN RUz №0157-04 - Sanitary requirements for storage and disposal of MSW at landfills in Uzbekistan defines that MSW shall be collected through a unified system of specialised utilities and shall be disposed at MSW landfills.

MSW may include various items, goods, materials unsuitable for further use, and waste like paper, food waste, wood, metals, textiles, leather, rubber, glass, stones, charcoal and ash, house and street sweeps, fallen leaves, parts and screenings (particles of 15 mm or less).

SanPiN RUz №0157-04 quotes average MSW generation rates in Uzbekistan as described in Table 10.1.

Table 10.1: Average MSW Generation Rates in Uzbekistan

MSW generation rates per capita	Season			
	Winter	Spring	Summer	Autumn
Average rate kg/day	0.8	1.0	1.3	1.6
Average rate m^3/day	0.0025	0.0028	0.0030	0.0039
Average rate kg/year	292	401	474	584
Average rate m^3/year	0.82	1.03	1.09	1.43
Weight by volume kg/m^3	355.6	587.6	434.0	406.0

10.2.1.7 Hazardous waste in Uzbekistan

Hazardous waste in Uzbekistan is defined as waste that contain substances with at least one of the defined hazardous properties (toxicity, infectivity, explosive hazard, fire hazard, high reactivity, radioactivity) and available in such amounts and in such a way as to pose an imminent or potential risk to human life and health, the environment, both in their current state or when exposed to other substances.

Hazardous waste is classified into five groups known as ‘hazard classes’. Waste hazard is assessed based on the provisions of SanPiN №0128-02 29.07.02 - Hygienic classifier of industrial hazardous waste and SanPiN №0127-02 29.07.02 – Sanitary procedures for industrial waste inventory, classification, storage and disposal.

Waste hazard classes include:
- Class I – extremely hazardous waste;
- Class II – highly hazardous waste;
- Class III – moderately hazardous waste;
- Class IV – low-hazardous waste, and
- Class V – non-hazardous waste.

Hazard classes, physical characteristics and chemical composition of toxic industrial waste are determined by designated process laboratories of companies or research institutes requiring involvement of specialists from Goskompriroda and the Sanitary Epidemiological Stations (SES).

The State Statistics Committee has generated a special statistics form to collect data on generated hazardous wastes: Form № 3- Environment. Hazardous Waste Generation, Handling and Storage Report. This report provides information on 15 streams of waste distinguished by pollutants (chrome, asbestos, mercury, etc.) and hazard classes.

10.2.1.8 Wastes Inventory

At the design phase the Project shall complete a waste inventory procedure as specified in Goskompriroda's Guideline O'z RH 84.3.15:2005 - The waste inventory procedure is required in order to identify all types of actually generated waste (both domestic and industrial), their physical, chemical, mechanical and hygienic characteristics and consumer properties.

The waste inventory shall be undertaken once and be updated in case of major repairs, upgrades or process modifications. This document will also serve as a basis for Waste Data Sheets (WDS) and the Waste Disposal Limit Document to be developed by the Project at the design phase. The Waste Inventory Document is subject to approval by Goskompriroda.

A WDS is a document to confirm the point of origin, amounts, properties and potential hazards of waste. The WDS aims at assessing risks associated with waste management and obtaining information on waste as a recoverable resource.

The WDS should be developed for each type of generated waste and shall include the following information:
- waste description, location, company information;
- general data of generated waste including generation rate (t/year), total amount accumulated, type, aggregative state, code (local + international);
- waste specific characteristics like density, mass, humidity, composition, hazard class, etc.

10.2.1.9 Waste Generation Norms and Waste Disposal Limits

The Law on Wastes specifies (Article 18) the general requirement for any project to set and comply with waste generation norms and waste disposal limits. The procedures for setting waste generation norms and waste disposal limits were developed and approved by Goskompriroda in 2005 (O'z RH 84.3.21:2005 - Production and consumption waste. Guidelines for setting waste generation norms and O'z RH 84.3.16:2005 - Production and consumption waste. Guidelines for setting the waste disposal limit, respectively).

Waste Generation Norm (WGN) is a fixed amount of a particular type of waste generated per unit of the manufactured product or per unit of crude material. WGN aims at minimizing waste generation and improving waste management.

Waste Disposal Limit (WDLs) is maximum amount of waste permitted for temporary storage for a fixed period of time. WDLs aim at reducing environmental impact associated with generated waste. Limits are set based on actually available storage areas, production capacity, crude material consumption, preventive measures and waste management planning. Limits should be summarised in the WDL Document to be developed by the Project at the design phase based on waste inventory and provisions of Goskompriroda's Guideline O'z RH 84.3.17:2005 - Production and consumption waste.

10.2.1.10 Waste Transportation

Transportation of hazardous wastes shall be in specially designated types of vehicle with a waste transportation certificate and a permit. Responsibility for safe transportation of hazardous waste shall be with a transporting organisation (Law on Wastes, Article 20).

Provided generated waste is subject to export and import operations, or hazardous waste is subject to transportation, an environmental certification procedure shall be completed by the project to confirm compliance with sanitary and environmental norms and standards associated with waste management (Law on Wastes, Article 19).

10.2.1.11 Waste Treatment

MSW treatment may include biodigestion (SanPiN RUz №0157-04).

10.2.1.12 Waste Recycling and Re-use

MSW

MSW may be re-used as material for backfilling open pits and quarries provided food waste content is less than 15%.

Hazardous Waste

The national requirement for mercury-containing waste and materials (spent mercury lamps, devices, etc.) is to use only specialised contractors for recycling and treatment properly licensed by Goskompriroda of Uzbekistan. Currently mercury recycling facilities are available in Tashkent, Andizhan, Fergana, Navoi, Zaravshan and Bukhara (Decree of the Cabinet of Ministers of the Republic of Uzbekistan on Enhancing the Use and Recycling of Mercury Lamps and Devices No.405 of 23.10.2000).

10.2.1.13 Waste Storage and Disposal

The Law on Wastes (Article 22) specifies general requirements for waste storage and disposal. Waste disposal of recyclable waste is prohibited in Uzbekistan. Storage and disposal of waste in the environment including in nature conservation and protected areas, settlements, health and recreational areas or historical and cultural facilities is prohibited. Waste disposal in subsoil is allowed in exceptional cases provided special investigations prove it is safe for health, the environment, and natural resources. Hazardous waste disposal facility of the project is subject to national approval.

All wastes (hazardous and non-hazardous) generated and landfilled by the Project will be subject to waste disposal charges used in Uzbekistan as an economic instrument to promote waste recycling and re-use.

MSW

MSW landfills in Uzbekistan are accommodated in such a way as to ensure that landfill operations comply with sanitary and epidemiological requirements and are safe to both human health and the environment. A MSW landfill may service one settlement or a group of settlements.

MSW landfills may be used to dispose of construction waste and some types of industrial waste rated at Hazard Class III and IV however this will require a special approval from a respective Centre for Sanitary and Epidemiological Supervision (CSES).

Hazardous Waste

Industrial hazardous waste shall be disposed at hazardous waste landfills as specified in SanPiN RUz №0127-02 29.07.02 – Sanitary procedures for industrial waste inventory, classification, storage and disposal.

Industrial waste rated under Hazard Class IV may be disposed at MSW landfills as an insulating material provided concentrations of toxic substances in aqueous extract are similar to concentrations in MSW leachate, with BOD_{total} and COD being less than 300 mg/l O_2, and waste homogeneous structure being made of minimum 250mm fractions (SanPiN RUz №0157-04 - Sanitary requirements for storage and disposal of municipal solid waste at MSW landfills in Uzbekistan).

Industrial waste rated under Hazard Class IV and III may be disposed of at MSW landfills provided their share is 30% maximum and concentrations of toxic substances in aqueous leachate is similar to concentrations in MSW leachate (BOD_{total} and COD is 3400-5000 mg/l O_2 (SanPiN RUz №0157-04)).

Permits for combined landfilling of industrial and municipal waste are granted by local CSES based on results of analyses completed by accredited laboratories (SanPiN RUz №0157-04).

Landfill owners are responsible for safe storage and disposal of waste to avoid potential impacts to human health and the environment (SanPiN RUz №0157-04).

10.2.2 International Requirements

10.2.2.1 International Finance Corporation (IFC)

As discussed inn Chapter 4, PS3 on Pollution Prevention and Abatement requires reference to be made to the relevant EHS Guidelines; these are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). The following IFC EHS Guidelines contain relevant information related to waste management for the Project:

- General EHS guidelines (2007);
- Onshore Oil and Gas Development (April 2007);
- Petroleum-based Polymers Manufacturing (April 2007).

The IFC EHS Guidelines for Onshore Oil and Gas Development state that waste materials should be segregated into non-hazardous and hazardous wastes for consideration for re-use, recycling, or disposal.

Waste management planning should establish a clear strategy for wastes that will be generated including options for waste elimination, reduction or recycling or treatment and disposal, before any wastes are generated. A waste management plan documenting the waste strategy, storage (including facilities and locations) and handling procedures should be developed and should include a clear waste tracking mechanism to track waste consignments from the originating location to the final waste treatment and disposal location.

The IFC EHS Guidelines for Petroleum-based Polymers Manufacturing state that the storage and handling of hazardous and non-hazardous wastes should be conducted in a way consistent with good EHS practice for waste management, as described in the General EHS Guideline. Industry-specific hazardous wastes include waste solvents and waste oil, spent catalysts, saturated filtering beds, and solid polymer wastes from polymerization plants.

These guidelines have been used to frame the waste management approach for the Project and assess the Project's ability to meet GIIP.

10.2.2.2 Asian Development Bank

The ADB Safeguards Policy Statement (SPS) 2009 sets out policy principles and outlines the delivery process for ADB's safeguard policy in relation to environmental safeguards. The ADB has adopted a set of specific safeguard requirements that borrowers/clients are required to meet in addressing environmental and social impacts and risks. ADB staff will ensure that borrowers/clients comply with these requirements during project preparation and implementation.

With respect to waste management, Environmental safeguards (SR1) is the most relevant ADB safeguard and in particular the requirement to include measures within an ESMP for the management of environmental impacts associated with waste generation.

10.2.3 Consultation

Table 10.2 outlines a summary of the issues of relevance to waste generation and management raised by individuals and organisations in attendance at the Public Exhibition in Akchalak settlement on 28 July 2010.

Table 10.2: Summary of Consultation Responses

Individual / Organisation	Key Concerns	Comment
Akchalak Mgistral Gas-pipeline operation	Potential impact of construction of the UGCC on the health of local people and on ecological features	Individual assured that, in relation to waste, all wastes and disposals from the Project will be managed in line with local and international standards.
Resident of Akchalak settlement	Is relocation of Akchalak settlement planned as part of the Project [question assumed to relate to potential health impacts of operation of the UGCC upon local residents]	This EISA has addressed health issues that may arise from waste disposal. Community impacts are addressed in the SIA.
Akchalak Mgistral Gas-pipeline operation	What wastes will be generated from the UGCC and what will be the impact of those wastes upon the health of local people?	Individual assured that the Project will provide adequate waste treatment facilities, ensure the utilisation of waste materials where possible and implement and manage special (hazardous) wastes within designated areas – the proposed philosophy is described in this ESIA.

Individual / Organisation	Key Concerns	Comment
Local hospital doctor	What will happen with solid wastes generated by the Project?	Solid wastes will be managed in line with the requirements of local and international standards a dedicated solid waste management facility will be produced. Propose to produce a Site waste management plan for the construction and operation phase that can be disclosed to the wider community.

10.2.4 Desk Study

The assessment of impacts from waste generation has been conducted on the basis of a desk-based review of Project information provided by Uz-Kor.

10.2.5 Field Reconnaissance

The ESIA Project Team conducted four visits to the Project area, covering the period January 2009 to March 2011. During this time the Project Team was able to observe, first hand, the waste management practices adopted during drilling operations in the Surgil Field. Reference is made to the observations noted during these site visits in Section 10.4.1.

It should be noted that the construction of the Project pipelines and UGCC had not commenced during the field reconnaissance visits undertaken by the ESIA Project Team. As such, the discussion of baseline conditions in Section 10.3 and assessment of impacts in Section 10.4, in relation to the Project pipelines and UGCC, are based entirely on information provided for review by Uz-Kor.

10.2.6 Assessment of Impact Significance

An assessment of the significance of impacts with regards to waste arisings has been carried out for the construction, operational and decommissioning phases of the Project. The assessment follows the standard assessment structure outlined in Chapter 5.

10.3 Baseline Description

10.3.1 National Overview

Presently there are insufficient hazardous waste disposal or treatment facilities within the immediate Project area. It is understood that the lack of proper waste management facilities is a problem in Uzbekistan. The national strategy for waste management (NWMS) for the Republic of Uzbekistan illustrates the state of waste management practices in Uzbekistan in the period up to 2005. These are summarised as follows:

- In the period up to 2005, in excess of 100 million tonnes of waste was generated in Uzbekistan annually, of which 14% was considered to be toxic. Accumulation of large amounts of industrial waste brings the problem of appropriate disposal. Land allocations are required in order to designate land for this use.
- Up to 90 million tonnes of waste was generated by industry in the form of overburden rock, flotation tailings, slags and clinkers. A significant amount of toxic waste is generated by the chemical industry in the form of phosphogypsum, lignin, manganese slag and sulphur into the environment.
- In 2003, the volume of waste removed by sanitation companies ranged from 5.53% to 58.43% of waste. Only 0.2% of total waste was re-used in manufacturing. In excess of 2 billion tonnes of solid waste was

considered to be accumulated in the pits, dumps and sludge reservoirs occupying land plots that may otherwise be used for agricultural purposes.
- In the period approaching 2005, waste was disposed of at 160 dumps across the country, covering a total of approximately 2 000 hectares. More than 90 percent of the dumps were said to be in inadequate condition, having been established without due means of engineering protection to prevent spillage of waste into the environment, or protective systems are in extremely inadequate state. As such, this waste presents a pollution threat to the surrounding environment.
- Due to the lack of funds and waste treatment and recycling facilities, almost 2 billion tons of industrial and household waste had been accumulated and held in unsuitable landfills and storages within company territories that fall short of compliance with modern standards.
- There was a major issue regarding the lack of landfills for disposal of industrial, medical, biological, and agricultural waste.
- The environmental impact of the waste disposal is not monitored and required technological standards for land disposal and treatment are not met. Almost no landfills have wells to control run-off from dumped material. Only 20 landfills have partial enclosure and only 16 have administrative and auxiliary buildings.

In light of the above statistics, the UN ECE recommended the development of a National Waste Management Strategy (NWMS) by the Goskompriroda. The NWMS was developed in 2005 and covered the following priority areas:
- reduction, reuse and recycling of solid waste;
- protection of water quality from contamination by unmanaged wastes;
- containment, collection, treatment and management of hazardous wastes including radioactive wastes;
- awareness-raising among decision-makers and the general public;
- provision of economic incentives for proper waste management; and
- promotion and sharing of “best practices”.

In essence, the NWMS aims to create an environmentally and economically effective waste management industry in Uzbekistan. The NWMS references international standard waste management practices, provides an overview of waste management economics, and introduces technology options that allow for increased efficiency of resource use and promote waste minimisation.

Chapter 3 of the NWMS outlines the major goals, objectives and principles of the strategy, namely to:
- Create administrative, legal, and economic incentives to reduce non-renewable loss of raw material resources;
- Improve waste collection and treatment system towards implementation of the components of selective collection of raw components for subsequent use as secondary raw material as well as progressive means for waste separation and industrial recycling tapping into foreign experience;
- Create and duly maintain waste disposal, recycling, and liquidation infrastructure;
- Introduce effective economic incentives to re-introduce generated waste back into the economy;
- Introduce grounded limitations for waste disposal;
- Introduce a ban for land disposal of waste with a secondary resource value;
- Introduce an institution for regional waste management planning;
- Engage all stakeholders in the resolution of the issue; and
- Improve the system of payments for waste generation and disposal.

The NWMS aims to facilitate strict government regulation of waste management activities with a view to encouraging:

- The introduction of standard management systems at waste management companies and systems able to assess their effectiveness and compliance.
- Minimize waste generation;
- Maximum possible re-use of waste;
- Maximum possible utilization and treatment of waste;
- Waste treatment for utilization or subsequent soil disposal; and
- Soil disposal of waste in special landfills enabling environmental safety.

Chapter 4 of the NWMS introduces the National Waste Management Action Plan (WMAP). The WMAP is intended to implement the principles formulated within the NWMS. Stage I of the WMAP ran from 2006 to 2008 and was aimed at improving and implementing organizational, legal, scientific, and economic prerequisites to reform national waste management by building upon the positive elements of the existing system. The second stage, lasting from 2009 and 2012, is intended to deliver full-scale implementation of the WMAP. The third stage, commencing in 2013, will see the further development of the WMAP and NWMS based on analysis and review of experience gained during stages I and II in accordance with the socio-economic development of the nation.

It is clear that the NWMS and associated WMAP are aiming to improve the availability and quality of waste disposal facilities within Uzbekistan and by the time the Project is commissioned and operational, waste facilities should have improved. However the situation as it currently stands further reinforces the need for the Project to highlight and utilise all technically feasible and available re-use/recycling opportunities. Only residual waste which cannot be re-used or recycled will be sent to landfill.

10.3.2 Gas Fields

A comprehensive description of Project drilling activities is provided in Chapter 2 and in Appendix A of Volume III.

Drilling waste is the principle waste stream associated with the current gas field drilling operations. Drilling waste is defined as a mix of drilling rock with drilling fluids/muds and water acquired during the drilling process. Typically both water-based drilling fluids (WBDF) and non-aqueous based fluids (NABF) (with bentonite clays as a thickener) are utilised.

The WBDF are classified as of low hazard wastes (Class IV) and the NABF as moderately hazardous wastes (Class III) according to the Uzbek Legislation on waste categorisation. Therefore the exact categorisation of drilling waste is dependent upon the type of drilling fluid used.

Currently drilling waste is collected in dedicated drilling waste disposal basins lined with clay or other impermeable liner constructed near the gas wells. Drilling mud and drilling waste is pumped to the basins where it is neutralised and mixed with hardening agents such as cement or proprietary hardening agent to stabilise the drilling waste and react and encapsulate hydrocarbon contaminants and other drilling mud additives. Solidified material settles creating a solid layer that builds up over the duration of operation of the disposal basin.

The oil content in current drilling waste should not exceed 5.9%. Practice has shown that drilling waste neutralisation by hardening agents works most effectively when the oil product content is less than 7%. For drilling wastes with oil contents greater than 7% neutralisation require the use of calcium salts.

Existing gas field drilling and production operation wastes are summarised in Table 10.3.

Table 10.3: Disposal quantities and routes for existing waste streams associated with the gas field operations

Waste stream	Source	Quantity	Disposal route
Tank cleaning cuttings	Cleaning during the maintenance of tank internal surfaces from the gas condensate storage tank farm	0.24 t / year	Disposal to territory landfill
Waste glands	Gland replacement during repair of gate valves	0.0087 t / year	Disposed along with hard domestic waste (HDW)
Iron and steel	Generated during process equipment repair	25 t / year	Sent for recycling to Vtorsvetmet
Nonferrous metal	Generated during process equipment repair	1 t /year	Sent for recycling to Vtorsvetmet
Stubs	Generated during electric welding works	0.083 t / year	Sent for recycling to Vtorsvetmet
Hard domestic waste (HDW)	From the workers settlement	1.35 t / year	Disposal to territory landfill
Sweepings from asphalt area	General cleaning from the territory area	6 kg / year	Disposed along with hard domestic waste (HDW)
Food waste	From the workers settlement	1.095 t /year	No waste all used by dinning room personnel

Source: Uz-Kor

Naturally occurring radioactive materials (NORM) do not exist within the Surgil geological strata. From time to time produced sand can arise from the reservoir. Typically sand production can be controlled using effective downhole control measures avoiding the need to handle and dispose of sand. Should any produced sand arise, then this is treated as an oily waste and can be temporarily stored before being sent to landfill for disposal.

10.3.3 Pipelines and UGCC

There are no existing waste management activities in relation to Project pipelines and UGCC as these are both planned infrastructure.

10.4 Assessment of Impacts

10.4.1 Overview

10.4.1.1 Overview

Wastes will be generated during both the construction and operational phases and at the eventual decommissioning of the Project for which appropriate waste management, minimisation and disposal practices will need to be established. Wastes will also be generated from the CGTU and Akcholak settlement. The likely waste types from both the construction and operational phases of the Project include solid, liquid, hazardous, non hazardous and inert wastes.

Potential hazardous waste materials generated during construction across the Project sites include: oils and solvents (including empty containers, oily rags, clean up materials, hydraulic fluids, lubricants, etc.); paints; coatings; contaminated ground (potentially from leakage and spillage); used batteries; etc. Management of these hazardous wastes will require particular consideration, particularly any final treatment or disposal options.

The principle potential impacts which can arise from the generation of waste from the Project are as follows:

- Contamination of receiving environments (particularly surface watercourses, groundwater and the ground) due to leakage and spillage of wastes associated with poor waste handling and storage arrangements;
- Fugitive emissions, such as dust, associated with the handling and storage of some waste streams;
- The use of landfill, which is a finite resource and are typically scare as well as being poorly engineered in Uzbekistan;
- The use of thermal oxidation which poses additional air quality impacts and climate change impacts;
- Visual amenity impacts associated with poor storage of waste; and
- Increased waste miles from transporting waste materials from the Project site.

10.4.2 Surgil Gas Fields

10.4.2.1 Drilling and Production Waste Streams

Drilling Fluids and Drilled Cuttings

The characteristics of the three types of drilling fluid, or mud, to be used on the Project are summarised in Table 10.4.

Table 10.4: Characteristics of Drilling Muds

Type of mud	Top of Interval (m)	Bottom of interval (m)	Density of mud (g/cm^3)	Component Type	Density (g/cm^3)	Component concentration in drilling mud (mg/kg)
Clay polymer	9	400	1.10-1.12	Bentonite	2.4	440841
				Soda ash	2.5	45946
				Caustic soda	2.1	34234
				K-4	1.03	106306
				Water	1	99100
Clay polymer with additional oil	400	1500	1.16-1.18	Bentonite	2.4	500000
				Soda ash	2.5	21368
				Caustic soda	2.1	17949
				K-4	1.03	184615
				CMC-600	1.6	25641
				Oil	0.85	86325
				Graphite silver	1.8	17949
				Water	1	146153
Ligno-sulphonate with additional oil	1500	2950	1.18-1.20	Bentonite	2.4	280672
				Soda ash	2.5	39496
				Caustic soda	2.1	18487
				K-4	1.03	184874
				CMC-600	1.6	86555
				Ferro-cromelignosulphoate	1.26	39496
				Oil	0.85	175630
				Graphite silver	1.8	14286
				Water	1	150420

Table 10.5 provides a summary of the total amount of drilling mud, and a breakdown of the drilling mud components, required per casing string of each well in the Surgil Field. The table also provides an estimation of the total amounts of drilling mud components required for Project drilling activities in the Surgil Field.

Table 10.5: Total Amount and Composition of Drilling Mud per Well

Drilling Mud Component	Amount of Drilling Mud Component per Casing String (tonnes)					
	Extended direction (0 to 50 metres)	Conductor string (0 to 400 metres)	Intermediate string (0 to 1500 metres)	Production string (0 to 2,950 metres)	Total per well	Total for Project (133 wells)
Bentonite	5.8	18.5	--	--	24.3	3232
Clay	--	--	39.5	25.4	64.9	8632
Soda ash	0.4	1.2	1.7	3.6	6.9	918
Caustic soda	0.3	0.9	1.4	1.7	4.3	572
K-4	1.4	4.6	14.7	16.7	37.4	4974
CMC-600	--	--	2	3.6	5.6	745
Ferro-cromelignosulphonate	--	--	--	7.8	7.8	1037
Oil	--	4.6	6.8	15.9	27.3	3631
Graphite silver	--	--	1.4	1.3	2.7	359
Total	**7.9**	**29.8**	**67.5**	**76**	**181.2**	**24100**

Drilling waste will be the most significant waste arising from the Surgil Field. It is typically classified as class III to IV under Uzbek waste characterisation legislation. Therefore environmental impacts could potentially occur from the poor handling of this waste stream and inappropriate disposal methodology resulting in contaminated discharges to the receiving environment, in particular the land, groundwater and surface water.

Drilling waste associated with the 105 new wells for the Project has been estimated at 19 026 tonnes. For the Project drilling waste is to be collected in dedicated disposal basins lined with clay or other impermeable liner constructed near the gas wells. A disposal basin will be constructed per well in the immediate vicinity of each well. The area for construction of the basin will be surveyed to select the most appropriate location and an excavator used to create the basin structure, which is then lined with a clay layer. Drilling cuttings will be separated from the drilling mud waste in the cuttings storage barn and removed for disposal at the Muynak landfill. Separated drilling mud will be recycled where possible with any waste drilling mud diverted to the disposal basin where it will be immediately neutralised in order to stabilise the waste and prevent migration. The neutralisation process involves the changing the physiochemical properties of the drilling waste by hardening the waste with either Portland cement of ECO-2 hardener. Solidified material will settle creating a solid layer that builds up over the duration of operation of the disposal basin. The result is an immobile and inert waste stream which will be covered with a further layer of clay or impermeable liner upon completion of the drilling operations to permanently encase the drilling waste in situ and prevent any infiltration of water, even in the even of inundation of the area by the returning Aral Sea if it occurs. Details of the drilling cuttings management procedure are provided in Appendix B.

A small wastewater stream (supernatant liquid) will be produced when the stabilised drilling waste layers are compacted. This wastewater will be clarified by the addition of aluminium sulphate and removed by tanker for use around the drilling well site for dust suppression.

According to IFC EHS Guidelines for Onshore Oil and Gas Development (April 2007), on-site or off-site biological or physical treatment to render the fluid and cuttings non-hazardous prior to solidification with cement and / or concrete is an acceptable industry best practice for dealing with drilling wastes containing drilling fluids or muds. Therefore the Project is compliant in this regard.

In summary, the Project will result in a significant increase in the volume of drilling waste in comparison to existing drilling operations in the field (an additional 23 918 tonnes of drilling mud making a total of 28 992 tonnes for the Surgil Field as a total). The existing and proposed treatment and disposal method for this waste is deemed to be in accordance with common industry best practice. Given the industry best practice approach being adopted by the Project, it is considered that the magnitude of any impact associated with drilling waste will be low and the sensitivity of any receptors would be minor. Therefore the impact is considered insignificant.

General Non-Hazardous and Hazardous Wastes

An approximation of the total general waste arisings generated from drilling operations at the new wells is provided in Table 10.6.

Table 10.6: Approximation of General Waste Generation in the Surgil Field

Waste Type	Amount of Waste (tonnes)	Storage Method	Disposal Method
Iron and steel scrap	8.5	Segregated and suitably protected storage	Sent for recycling to Vtorsvetmet
Non-ferrous scrap metal	0.2	Segregated and suitably protected storage	Sent for recycling to Vtorsvetmet
Stubs	0.015	Segregated and suitably protected storage	Sent for recycling to Vtorsvetmet
Oil contaminated cleaning cloths	0.056	Segregated and suitably protected storage	Sent to licensed waste oil disposal facility
Hard domestic wastes during preparatory works	1.8	Temporarily stored in a segregated waste storage area	Disposal to territory landfill
Hard domestic wastes during drilling, fixing and test period	13	Temporarily stored in a segregated waste storage area	Disposal to territory landfill
Food wastes	2.7	Container near the dining room trailer	Disposal to territory landfill
Mercury lamps	0.009	Careful segregated storage. Avoiding glass breakage is important due to the mercury content.	Sent to licensed mercury disposal facility.

The proposed strategy for disposing of general hazardous and non-hazardous waste from the Surgil Field is to establish segregated and suitably protected areas for temporarily storing each waste steam. Waste materials will be segregated into non-hazardous and hazardous wastes to allow for re-use or recycling, where appropriate, or disposal as a final option.

An ESMP has been prepared for the Surgil Project (see volume IV) which includes a framework waste management plan to be used to inform specific waste management plans for specific activities including drilling. The detailed waste management plans will highlight all potential waste streams that will be generated during the well drilling phase (refer to Table 10.4, Table 10.5 and Table 10.6). Typical provisions for a detailed waste management plan are given 10.5.1.

For the operational phase of the Surgil Field, an ESMP has been developed for implementation by the Project. This covers a broad suite of operational controls required to prevent environmental impacts and includes waste management. The ESMP constitutes Volume IV of this ESIA. From a waste management perspective, the ESMP aims to reduce the amount of waste produced in the first instance and seek to find re-use/recycling opportunities for unavoidable waste streams.

The generation of the above stated materials as part of the Project will result in a moderate increase in the volume of general waste materials generated during drilling and construction in comparison to existing drilling operations in the field. This is largely due to establishing a new workers accommodation settlement and an increase in the output capacity of the existing CGTU from 6 billion m^3/year up to 9 billion m^3/year.

10.4.2.2 Decommissioning Waste Streams

Decommissioning of onshore facilities usually includes the complete removal of permanent facilities and well abandonment, including associated equipment, material, and waste disposal or recycling.

Wells will be abandoned in a stable and safe condition. The well will be sealed to the ground surface with cement plugs and any known hydrocarbon zones isolated to prevent fluid migration. Aquifers will also be isolated. Importantly, no associated infrastructure will be left on the bed of the Aral Sea once the field is depleted.

Decommissioning of associated pipelines will involve removing them for reuse or recycling. When the pipelines are to be removed, there will be similar impacts as experienced during the construction phase. Prior to removal they will be disconnected and isolated from all potential sources of hydrocarbons; cleaned and purged of hydrocarbons; and sealed at the ends.

Prior to decommissioning, an appropriate contractor will be appointed who will be required to prepare and decommissioning environmental management plan (DEMP). This will document current best practice at the time for decommissioning gas wells and associated pipelines and equipment. The DEMP will need to include a section on waste management detailing the environmental protection controls which will be put in place for the storage, safe handling arrangements of each waste stream and its final disposal method.

10.4.3 Pipelines

10.4.3.1 Construction Waste Streams

Environmental and social impacts associated with the Project pipelines will predominantly arise during the construction phase and will typically be short term, reversible impacts associated with environmental aspects such as fugitive emissions to air and noise from construction activities.

Table 10.7 summarises the types of wastes that are likely to be generated by construction of the pipeline and associated activities. The table provides estimates of the quantities of waste arisings, where possible, and indicates the most appropriate method of disposal.

Table 10.7: Typical Wastes Generated During Pipeline Construction

Activity	Waste Generation	Approximate Quantity	Disposal
Site preparation	Topsoil.	Negligible.	Re-use upon reinstatement.
	Rubbish from construction, e.g. used empty containers, packaging, etc.	35 tonnes per week.	Collect in covered skips or tipper trucks to send to a licensed waste disposal site.
	Scrap metal.	35 to 210 tonnes.	Sell as scrap.
	Sewage.	1 tanker per month.	Cesspit - taken to an appropriate wastewater treatment site.
Working width preparation	Topsoil, timber, brash, fence posts, wire etc.	15 tonnes/day for 20 days (approx 300 tonnes).	Re-use where possible. Otherwise recycled.
Pipe-string and bending, welding, testing and coating	Pipe-bands and end caps, spent welding rods, grinding wheels, visors, and shot-blast.	<35 tonnes for whole construction	Collect in covered skips or tipper trucks and send to licensed waste disposal site. Reuse end caps.
Excavation and lowering and laying	Excavated material, pumping discharge.	Unknown (dependant on ground water levels during construction).	Use excavated material to bed the pipeline where possible. Pump water to land using suitable filtration/settlement techniques in accordance with international and local requirements.
Backfilling and grading	Surplus spoil and rock.	Dependent upon ground conditions.	Re-used as part of land reinstatement.
Vehicle use and maintenance	Oils, fuels and lubricants.	Approx 20,000 litres.	Collection of used oil by competent carrier for recovery and re-use.
Mess huts, miscellaneous, etc	Canteen refuse, safety equipment, etc.	1 tonne/week for 20 weeks (approx 20 tonnes).	Bins on spread. Collect in covered skips and send to licensed waste disposal site.
Mobile site toilets	Sewage.	Approximately 20 emptied weekly.	Disposal by appointed waste management contractor to municipal wastewater treatment works.
Pigging operation	Mill scale, weld splatter, rust and other debris.	1.5 – 3.5 tonnes	Collect and contain at test locations and remove to an appropriate licensed facility.

Source: Uz-Kor

All pipeline trenches will be dug and the pipeline laid in the bottom of the trench. The excavated trench material will then be used to cover the pipeline and this will be compacted to the finished level. It is not anticipated that there will be any waste fill associated with laying the pipelines.

Typical pipeline construction wastes that are defined as hazardous wastes are listed in Table 10.8. Where there are alternative fit-for-purpose materials (e.g. welding rods and shot blast) these will be used in preference to those that form hazardous wastes on disposal.

Table 10.8: Potential Hazardous Wastes Generated During Construction

Category	Description / examples
Oils and solvents	Empty containers, oily rags, thinners, solvents, degreasers, hydraulic fluids, lube oils, used oil spill clean-up/absorbent materials and associated contaminated soil.
Paint	Primers, paints and empty cans.
Coatings	Used for coating pipe joints or repairing damaged factory applied coatings.
Batteries	Vehicles, potable equipment.
Fluorescent tubes	From site offices.
Drilling muds	Only if contaminated because bentonite clay muds are generally used.
Welding rods	Depending on composition of the material.
Shot blast	Depending on composition of the material.

The Project will result in the generation of a moderate volume of a range of non-hazardous and hazardous wastes during construction. It is expected that the majority of the potential impacts associated with construction waste can be effectively managed through implementation of the ESMP which provides the framework with specific details to be prepared by the construction contractor. The identified waste management practices will ensure that a large proportion of potential waste arisings (e.g. excavated soil, stones, etc.) will be either re-used or recycled. However, the principal impact associated with this activity is going to be related to the disposal of residual waste in landfill facilities which are a finite resource.

10.4.3.2 Testing and Commissioning

During commissioning, the pipelines will be filled with nitrogen after drying. Nitrogen will be kept in the pipeline to prevent corrosion until gas or condensate is transferred for transport. The nitrogen will then be vented off to the atmosphere. Nitrogen is a non-toxic gas that makes up a large proportion (78%) of normal atmospheric conditions and is not considered to be a gas that contributes to global warming. This release will have no impact on the atmosphere and, thus, will be of no impact significance with the volumes under consideration.

10.4.3.3 Operational and Maintenance Waste Streams

During normal operation, pigging operations will need to be periodically conducted. Pigging in the maintenance of pipelines refers to the practice of using pipeline inspection gauges (PIGS) to perform various operations on a pipeline without stopping the flow of the product in the pipeline.

PIGS are typically used in oil and gas pipelines to clean the pipes but also there are "smart pigs" used to measure things like pipe thickness and corrosion along the pipeline. The pigging process for the Project will be undertaken periodically and will result in some waste product from the pipelines being discharged and collected in the UGCC. This waste product is likely to be a combination of condensate, natural gas and any impurities which may be present in the pipeline. The level of pigging waste generated is expected to be small and will be monitored. It is anticipated that sludge and condensate wastes will not exceed 0.8 tonnes per annum. The total annual volume will however be confirmed by monitoring as part of the operational phase waste inventory

The use of pigging is important in reducing the use of hazardous materials such as polychlorinated biphenyls (PCBs), which are known carcinogens. Before pigging became widespread, pipelines needed to be routinely cleared using effluent treatment methods which typically generate a hazardous waste stream.

Other than pigging wastes, there will be no other significant volumes of continuous solid or liquid waste arisings. Maintenance works will generate occasional waste streams. It is proposed that all maintenance waste is collected and returned to the UCGG for handling and disposal. It is assessed that the impact of waste associated with operation and maintenance of the pipelines will be insignificant.

10.4.3.4 Decommissioning Waste Streams

The current proposed decommissioning options for below-ground pipelines is to remove them and sell the steel as high value scrap metal. The pipelines will be firstly disconnected and isolated from all potential sources of hydrocarbons; cleaned and purged of hydrocarbons. Once removed, the pipeline trenches will reinstated. Residual waste streams will be disposed of in accordance with the most appropriate identified method at the time of decommissioning. Maximum use of recycling and reuse will be made in devising the waste management approach for decommissioning.

As per the Surgil Field, prior to decommissioning, an appropriate contractor will be appointed who will be required to prepare a DEMP. This will document current best practice at the time for decommissioning below-ground pipelines and will need to include a section on waste management.

10.4.4 Ustyurt Gas Chemical Complex (UGCC)

10.4.4.1 Construction Waste Streams

Table 10.9 summarises the types of wastes that are likely to be generated by construction of the UGCC and associated activities combined with the most appropriate method of disposal.

Environmental and social impacts associated with the construction phase of the UGCC will typically be short term, reversible impacts associated with environmental aspects such as fugitive emissions to air and noise from construction activities. These potential impacts will be effectively managed through elaboration of detailed waste management plans following the framework waste management plan in the ESMP (Volume IV). The specific details of which will be prepared by the construction contractor but are summarised in Section 10.5.1.

Table 10.9: Typical Wastes Generated During Construction of the UGCC

Waste stream	Waste classification under Uzbek legislation	Estimated volume	Disposal
Domestic waste	IV	15,403m^3	Bins on spread. Collect in covered skips and send to licensed waste disposal site.
Vehicle oil	II	4.3m^3	Collection of used oil by competent carrier for recovery and re-use.
Transmission oil	II	6m^3	Collection of used oil by competent carrier for recovery and re-use.
Paints	III	1.24m^3	Collection by competent carrier for recovery and re-use.
Scrap non-ferrous metals	III	15,150m^3	Sell as scrap
Oil contaminated cleaning materials	IV	7m^3	Collection by competent carrier for recovery and re-use.
Tyres	IV	1546	Collection by competent carrier for recovery and re-use.
Residues and stubs of steel welding electrodes	IV	7.3t	Collection by competent carrier for recovery and re-use.
Unsorted scrap metal	IV	50t	Sell as scrap
Insulated wires and cables	IV	14.924m	Collection by competent carrier for recovery and re-use.
Bricks	IV	32m^3	Re-use. Surplus material should be retained on site.
Cement	IV	47m^3	Collection by competent carrier for recovery and re-use.
Concrete mix with dust less than 30%	IV	234m^3	Collection by competent carrier for recovery and re-use.

Source: Uz-Kor

The construction of the UGCC will result in the generation of a moderate volume of a range of non-hazardous and hazardous wastes during construction. The waste management practices identified in Table 10.9 will ensure that a large proportion of potential waste arisings (e.g. excavated soil, stones, etc.) will be either re-used or recycled. However, the principal impact associated with this activity is going to be related to the disposal of any residual waste in landfill facilities which are a finite resource.

10.4.4.2 Operational Waste Streams

Overview

One of the key environmental issues of the polymer sector is the generation of a relatively large quantity of spent solvents and non-recyclable waste. The unavoidable waste streams will be treated in recovery and / or abatement systems or be disposed of as waste.

Hazardous wastes generated through the operations are expected to include spent chemicals, catalysts, adsorbents and waste oils / diesel. Packaging and accommodation settlement wastes will also be generated.

Guidance on managing wastes streams in the polymer sector is provided in the IFC EHS Guidelines for Petroleum-based Polymers Manufacturing (April 2007). Another source of industry best practice is provided in the Reference Document on Best Available Techniques (BAT) in the Production of Polymers (August 2007).

Best Available Techniques (BAT) for Polymer Wastes

Polymer wastes are produced during normal plant operation (e.g., latex filtering and sieving, powder screening and granule grinding); campaign changes; start-up; and maintenance and emergency shutdowns of polymer processing equipment.

Waste emission and consumption data illustrated in Table 10.10 represents the reported emission and consumption levels of twenty four HDPE production facilities in Europe. The average age of these plants is 15 years and their average capacity in 1999 was 161 kilotonnes per annum. It should be noted that the data provided in Table 10.10 do not take into account the different properties of the product, such as bimodal polyethylene or high molecular weight polymers, which can lead to a strong deviation in energy and water consumption.

Table 10.10: Emission and Consumption Data of HDPE Plants

Emission/consumption source	Factor
Monomer consumption (kg / tonne of product)	1008
Inert waste emissions (to landfill) (kg / tonne of product)	0.5
Hazardous waste emissions (to treatment or incineration) (kg / tonne of product)	3.1

Source: The Best Available Technique (BAT) Reference Document (BREF) on for the Production of Polymers (August 2007)

The BAT Reference Document (BREF) for the Production of Polymers (August 2007) identifies BAT for inert and hazardous waste emissions from the production of HDPE. Table 10.11 identifies the maximum allowable annual emissions levels of inert and hazardous based upon production rates for the UGCC. In the table it has been assumed that BAT emission levels for polypropylene are the same as those for HDPE.

Table 10.11: BAT Emission Limits for Inert and Hazardous Waste from the Production of Polymers at the UGCC

	HDPE	Polypropylene
Total Annual Production (tonnes / year)	383,000	83,000
BAT Emission Levels for Inert Waste (kg / tonne of product)	0.5	0.5
Maximum Annual Emissions of Inert Waste (kg)	191,500	40,500
BAT Emission Levels for Hazardous Waste (kg / tonne of product)	3.1	3.1
Maximum Annual Emissions of hazardous waste (to treatment or incineration (kg)	1,187,300	251,100

The IFC EHS Guidelines for Petroleum-based Polymers Manufacturing (April 2007) recommended pollution prevention and control measures for solid polymer wastes are as follows:

- Recycling or re-use of waste streams where possible instead of disposal (i.e. the sale of waxes to the wax industry);
- Segregation and storage in a safe location. Some polymer wastes might be unstable and prone to self-heating and self-ignition. Such waste should be stored in a safe manner and disposed of (e.g., incinerated) as soon as practical.
- Appropriate on-site management, including submerging pyrophoric spent catalysts in water during temporary storage and transport until they can reach the final point of treatment to avoid uncontrolled exothermic reactions will be employed for those that cannot be returned.

The IFC EHS pollution prevention and control principles form a fundamental element of the proposed waste management strategy for the operational phase of the UGCC.

Waste Management Strategy at UGCC

The strategy for managing operational waste streams at the UGCC has been aligned to the IFC EHS pollution prevention and control measures and BAT principles and adopts the waste management hierarchy approach of reducing waste production in the first instance and seeking re-use and recycling opportunities for unavoidable waste streams. Waste disposal via landfill site or thermal oxidation is a last resort wherever possible. Storage and handling of hazardous and non-hazardous wastes will be conducted in a way consistent with good EHS practice for waste management, as described in the IFC General EHS Guideline. Industry-specific hazardous wastes include waste solvents and waste oil spent catalysts, saturated filtering beds, and solid polymer wastes from polymerization plants.

The on-site waste storage facilities will be mainly for non-hazardous wastes, but will include for storage of waste oils. Each waste type will be stored in appropriate and segregated waste storage facilities to allow recycling and reuse where possible. Any hazardous waste will be segregated and stored in a separate area from non-hazardous waste. Uzbek regulations require certain materials such as scrap metals to be recycled, but there are also a range of other wastes that will also be sent to recycling facilities including paper, cardboard, waste wood, waste glass and plastics.

The offsite waste facility will be located approximately 2 km north of the UGCC and predominantly be used for storage of industrial waste, which will include process wastes such as catalysts, waste activated carbon and contaminated packaging materials. These waste materials will be removed by specialist contractors for recycling or specialist disposal to facilities licensed to receive them. Taking into account the developing nature of the waste disposal sector in Uzbekistan, in the event that suitable specialist disposal facilities are unavailable at the outset of the project the offsite waste storage facility has sufficient space and flexibility to allow expansion of storage facilities to otherwise store waste materials until such time as a suitable specialist disposal facilities becomes available. Any expanded storage facilities would be designed to meet Uzbek standards and to be in accordance with IFC EHS standards.

Table 10.12 presents an overview of the waste handling strategy for the UGCC.

Table 10.12: Overview of waste handling strategy for the UGCC

Waste	Hazardous / Non-hazardous	Estimated volume	Source	Potential environmental Impact	Disposal method	Compliance with IFC EHS Guidelines for Petroleum-based Polymers Manufacturing (April 2007
Hazardous						
Catalysts	Hazardous	35.1m^3 from acetylene reactor to be replaced every 6 years, 2.1m^3 from MAPD reactor to be replaced every 10 years, 13.9m^3 from mercury removal reactor to be replaced every 5 years, 20.4m^3 from c_4 reactor every 5 years.	Catalyst bed replacement in scheduled turnarounds of monomer purification reactors (e.g. hydrogenation of impurities in lower olefins)	Spent catalysts can contain nickel, platinum, palladium, and copper, depending on the process.	All catalysts will be first neutralised at the polymer plant at the UGCC site. They will be placed in the hazardous waste area at the industrial waste storage area (2 km north of the UGCC) prior to being collected by specialist companies (against a respective agreement) such as Ecotibyot (Andijon Region) and Sitora (Bukhara Region) who are properly licensed to handle mercury-containing waste in Uzbekistan.	Yes – Recycling or re-use of waste streams where possible instead of disposal is considered best practice Prior and appropriate on-site management is best practice for waste catalysts
Catalysts at mercury removal unit from gas feedstock	Hazardous	28.27 m^3 / every 3 years	Gas feedstock system	Hazardous waste potentially containing mercury	Waste will be neutralised before being placed in the hazardous waste area at the industrial waste storage area (2 km north of the UGCC) prior to being collected by specialist companies (against a respective agreement) such as Ecotibyot (Andijon Region) and Sitora (Bukhara Region) who are properly licensed to handle mercury-containing waste in Uzbekistan.	Yes – Recycling or re-use of waste streams where possible instead of disposal is considered best practice Prior and appropriate on-site management is best practice for waste catalysts
Catalysts at mercury removal unit from condensate feedstock	Hazardous	11,000 m^3 / every 3 years	Condensate feedstock system	Hazardous waste potentially containing mercury	Waste will be neutralised before being placed in the hazardous waste area at the industrial waste storage area (2 km north of the UGCC) prior to being collected by specialist companies (against a respective agreement) such as Ecotibyot (Andijon Region) and Sitora (Bukhara Region) who are properly licensed to handle mercury-containing waste in Uzbekistan.	Yes – Recycling or re-use of waste streams where possible instead of disposal is considered best practice Prior and appropriate on-site management is best practice for waste catalysts

Waste	Hazardous / Non-hazardous	Estimated volume	Source	Potential environmental Impact	Disposal method	Compliance with IFC EHS Guidelines for Petroleum-based Polymers Manufacturing (April 2007
Polymer wastes (abnormal)	Non-hazardous	Unknown	Campaign changes; start-up; and maintenance and emergency shutdowns of polymer processing equipment	Potentially hazardous wastes. Potential contamination of receiving environment	Bespoke disposal depending on the nature of the waste streams generated. Likely to be sold to manufacturers for re-use as low sort product.	Yes – Recycling or re-use of waste streams where possible instead of disposal is considered best practice Prior and appropriate on-site management is best practice for waste catalysts
Fluorescent tubes	Hazardous	Exact number unknown, quantities are not anticipated to be more than 100 annually	Associated with routine and on-going maintenance in the facility	Fluorescent tubes contain mercury Use of finite landfill resource	Initially will be placed in the hazardous waste area at the industrial waste storage area (2 km north of the UGCC). Used fluorescent tubes will be collected by specialist companies, such as Ecotibyot (Andijon Region) and Sitora (Bukhara Region) who are properly licensed to handle mercury-containing waste (including used fluorescent tubes) in Uzbekistan.	Yes – Recycling or re-use of waste streams where possible instead of disposal is considered best practice
Contaminated packaging	Hazardous	Expected to be low as only appropriate contractors will provide deliveries to the site.	Primarily associated with chemical deliveries	Unknown contaminants and potential contamination of receiving environments Use of finite landfill resource	Initially will be placed in the hazardous waste area at the industrial waste storage area (2 km north of the UGCC). Collected by specialist contractor for recycling. Usually the packaging is contaminated with oil. Such packaging waste is collected by affiliated waste paper collection centres of JSC II Sanoatqalinqog'ozsavdo.	Yes – Recycling or re-use of waste streams where possible instead of disposal is considered best practice
Waste oil	Hazardous	Dependent upon maintenance activities	Associated with routine and on-going maintenance in the facility and outages	Potential contamination of receiving environment	Initially to be stored in the on site waste oil storage area. All waste oil will be dispatched to the petroleum storage depot for secondary reusing (main customers are Bukhara and Fergana Refineries).	Yes – Recycling or re-use of waste streams where possible instead of disposal is considered best practice

Waste	Hazardous / Non-hazardous	Estimated volume	Source	Potential environmental Impact	Disposal method	Compliance with IFC EHS Guidelines for Petroleum-based Polymers Manufacturing (April 2007
Oily contaminated sludge	Hazardous	5-10 m^3 / month	Sludge will be generated from the wastewater treatment system	Potential contamination of receiving environment	Sludge will be separated to remove solids to form sludge cake. The cake will be removed from the UGCC and taken to a licensed land fill via an appropriate contractor. Gaseous and liquid remains will be thermally oxidised at the UGCC site.	Yes – Thermal oxidation and landfilling of these waste streams is considered BAT and therefore best practice in the absence of treatment
Hydrocarbons from caustic storage	Hazardous	4 m^3 / month	Caustic storage	Potential contamination of receiving environment	Gas is vented from the caustic drum of the ethylene plant and sent as sour gas to the waste heat recovery boiler. Drained hydrocarbons from the drum will be sent to py-gasoline or py-oil tank in the tank area	Yes – Hydrocarbons to be recovered. Therefore considered best practice.
Waste Electronics and Electrical Equipment (WEEE) – Hazardous	Hazardous	Dependent upon maintenance regimes	Maintenance and replacement of electrical equipment	May contain heavy metals depending on the item	On the basis of Vendors' procedures, all WEEE waste is to be segregated into nonferrous and ferrous metals and will be dispatched to facilities for reuse. Nonferrous metals are recycled at the JSC Tashkent Scrap Non-ferrous Metal Recycling Plant, which produces electrical transformers, electrical batteries etc. Ferrous metals are dispatched to APO Uzmetkombinat (responsible for recycling scrap ferrous metal).	Yes – Recycling or re-use of waste streams where possible instead of disposal is considered best practice
Non-hazardous						
General waste	Non-hazardous	2-7 tonnes / month	Kitchen, workers facilities and local settlements	Potential contamination of receiving environment. Visual amenity impacts Use of finite landfill resource	Placed in segregated general waste storage area (on the UGCC site) before being dispatched to landfill. There is a plant which recycles municipal wastes in Nukus and the feasibility of recycling waste here is being investigated further.	Yes – Recycling or re-use of waste streams where possible instead of disposal is considered best practice

Waste	Hazardous / Non-hazardous	Estimated volume	Source	Potential environmental Impact	Disposal method	Compliance with IFC EHS Guidelines for Petroleum-based Polymers Manufacturing (April 2007
Cardboard	Non-hazardous	100 – 300 kg / month	From packaging and deliveries etc	Potential contamination of receiving environment. Visual amenity impacts	Placed in segregated general waste storage area (on the UGCC site) with consideration given to potential fire hazard before being dispatched for recycling. Affiliated recycling centres are available in all regions of Uzbekistan.	Yes – Recycling or re-use of waste streams where possible instead of disposal is considered best practice
Plastic	Non-hazardous	80 – 120 kg / month	From packaging and deliveries etc	Potential contamination of receiving environment. Visual amenity impacts	Placed in segregated general waste storage area (on the UGCC site) before being dispatched to a facility for re-use or recycling. Based on experience at a similar plant, there are plenty of firms in Uzbekistan who can recycle plastic such as affiliates of JSC II Sanoatqalinqogozsavdo.	Yes – Recycling or re-use of waste streams where possible instead of disposal is considered best practice
Glass	Non-hazardous	5 – 10 kg / month	Maintenance, deliveries, workers facilities	Potential contamination of receiving environment. Recycling potential.	Placed in segregated general waste storage area (on the UGCC site) before being dispatched to a facility for re-use at cement plant. The nearest of which is approximately 680 km from the UGCC site. An affiliated site is being investigated.	Yes – Recycling or re-use of waste streams where possible instead of disposal is considered best practice
Polymer wastes (normal)	Non-hazardous	60 kg / day from HDPE plant	Latex filtering and sieving, powder screening and granule grinding,	Potential contamination of receiving environment. Visual amenity impacts. Re-use potential.	Waste polyethylene granules and powder will be sold to manufactures for re-use as low sort product. There will be no requirement for disposal.	Yes – Recycling or re-use of waste streams where possible instead of disposal is considered best practice
Granulation section waste	Non-hazardous	100 kg / day from the PP	Latex filtering and sieving, powder screening and granule grinding,	Potential contamination of receiving environment. Visual amenity impacts. Re-use potential.	Waste polyethylene granules and powder will be sold to manufactures for re-use as low sort product. There will be no requirement for disposal	Yes – Recycling or re-use of waste streams where possible instead of disposal is considered best practice

Waste	Hazardous / Non-hazardous	Estimated volume	Source	Potential environmental Impact	Disposal method	Compliance with IFC EHS Guidelines for Petroleum-based Polymers Manufacturing (April 2007
Scrap metal	Non-hazardous	100 – 300 kg / month	Associated with outages and maintenance	Potential contamination of receiving environment. Visual amenity impacts. Recycling potential.	Placed in segregated general waste storage area (on the UGCC site) before being dispatched to a facility for re-use. Uzmetkombinat plant is located approximately 1100 km from UGCC site. An affiliated scrap metal collection centre is being investigated.	Yes – Recycling or re-use of waste streams where possible instead of disposal is considered best practice
Pallets	Non-hazardous	Total numbers unknown at preset, number will depend on exact volume of materials required at site and delivery method.	Associated with deliveries	Potential contamination of receiving environment. Visual amenity impacts	Placed in segregated general waste storage area (on the UGCC site) before being dispatched to a facility for re-use. There are a lot of firms in Uzbekistan licensed to reuse plastic waste including plastic pallets, so Uz-Kor will dispatch all plastic waste to them.	Yes – Recycling or re-use of waste streams where possible instead of disposal is considered best practice
Zeolite, solid wastes during renovation of adsorbents, solid wastes during renovation of filters	Non-hazardous	62,83 m^3 / every 3 years	Adsorbents	Potential contamination of receiving environment.	Zeolite adsorbents to be temporarily stored before being dispatched to a reuse facility. All zeolite adsorbents are dispatched to private enterprises such as Masilieve, Ogneupor or Shiroq Servisand. They are added to feedstock of rotary furnaces at cement plants for decomposition and crushing into powder. The nearest cement plant is approximately 680 km from the UGCC site. An affiliated site is being investigated.	Yes – Recycling or re-use of waste streams where possible instead of disposal is considered best practice
Coke	Non-hazardous	Approximately 70 t / year from filters 2m^3 / month from the column	From filters and column	Potential contamination of receiving environment	To be accumulated and stored temporarily in a lined pit at the UGCC site and sold for future manufacturing purposes	Yes - Recycling or re-use of waste streams considered BAT.
Green waste	Non-hazardous	3 – 5 tonnes / year during first 5 years of operation increasing to between 5 – 10 tonnes a year thereafter.	From the surrounding settlements and the facility	Potential contamination of receiving environment Composting potential	Initially collected and placed in the segregated general waste storage area (on the UGCC site). To be collected and ultimately used as compost.	Yes – Recycling or re-use of waste streams where possible instead of disposal is considered best practice

Waste	Hazardous / Non-hazardous	Estimated volume	Source	Potential environmental Impact	Disposal method	Compliance with IFC EHS Guidelines for Petroleum-based Polymers Manufacturing (April 2007
Solid waste from demineralisation unit during renovation of the filters	Non-hazardous	25 30 m^3 every 3 – 5 years.	Demineralisation unit cation and anion exchangers	Potential contamination of receiving environment	Initially will be stored in the hazardous waste area at the industrial waste storage area (2 km north of the UGCC). Activated carbon is to be dispatched to private enterprise such as Masilieve, Ogneupor or Shiroq Servis. They are added to feedstock of rotary furnaces at Cement Plant for decomposition and crushing into powder. The nearest of which is approximately 680 km from the UGCC site. An affiliated site is being investigated.	Yes – Recycling or re-use of waste streams where possible instead of disposal is considered best practice
Solid wastes from ASU during renovation of adsorbents	Non-hazardous	3000 – 35000 kg of Zeolite to be changed every 5 – 10 years. 1000 – 1100 kg of aluminium oxide to be changed every 5 – 10 years.	From the air separation unit	Potential contamination of receiving environment	Initially will be stored in the hazardous waste area at the industrial waste storage area (2 km north of the UGCC). Activated carbon is to be dispatched to private enterprise such as Masilieve, Ogneupor or Shiroq Servis. They are added to feedstock of rotary furnaces at Cement Plant for decomposition and crushing into powder. The nearest of which is approximately 680 km from the UGCC site. An affiliated site is being investigated. Also can be used as a secondary raw material in manufacturing construction materials.	Yes – Recycling or re-use of waste streams where possible instead of disposal is considered best practice
Waste activated carbon	Non-hazardous	30 – 35 m^3 to be changed every 3 – 5 years	From the treatment of potable and domestic water	Potential contamination of receiving environment	Initially will be stored in the hazardous waste area at the industrial waste storage area (2 km north of the UGCC). Activated carbon is to be dispatched to private enterprise such as Masilieve, Ogneupor or Shiroq Servis. They are added to feedstock of rotary furnaces at Cement Plant for decomposition and crushing into powder. The nearest of which is approximately 680 km from the UGCC site. An affiliated site is being investigated. Activated carbon is also used as secondary raw material for construction materials.	Yes – Recycling or re-use of waste streams where possible instead of disposal is considered best practice

Waste	Hazardous / Non-hazardous	Estimated volume	Source	Potential environmental Impact	Disposal method	Compliance with IFC EHS Guidelines for Petroleum-based Polymers Manufacturing (April 2007
Solvent wastes	Non-hazardous	20 – 25 kg / day	Formed as cake in the waste water treatment system	Potential contamination of receiving environment	Cakes are temporarily stored on site before being sent to landfill in accordance with the regulation of Goskompriroda.	Yes – No feasible re-use facilities available for this waste therefore best practice is safe and appropriate disposal
Waste Electronics and Electrical Equipment (WEEE) – Non-hazardous	Non-hazardous	Dependent upon maintenance regimes	Maintenance and replacement of electrical equipment	Recycling opportunities	On the basis of Vendors' procedures, all WEEE waste is to be segregated into nonferrous and ferrous metals and will be dispatched to facilities for reuse. Nonferrous metals are recycled at the JSC Tashkent Scrap Non-ferrous Metal Recycling Plant, which produces electrical transformers, electrical batteries etc. Ferrous metals are dispatched to APO Uzmetkombinat (responsible for recycling scrap ferrous metal).	Yes – Recycling or re-use of waste streams where possible instead of disposal is considered best practice

Source: Uz-Kor

10.4.4.3 Decommissioning Waste Streams

The Best Available Technique (BAT) Reference Document (BREF) on for the Production of Polymers (August 2007) provides the following design considerations for waste management during end-of-life polymer plant decommissioning:

- Integrating consideration of the environmental impact from the eventual decommissioning of the unit at the design stage, thereby allowing for an easier, cleaner and cheaper decommissioning process;
- Adopting preventive techniques for the generation of large quantities of solid waste, including:
  - avoiding underground structures;
  - incorporating features that facilitate dismantling;
  - choosing surface finishes that are easily decontaminated;
  - using an equipment configuration that minimises trapped chemicals and facilitates drain-down or washing;
  - designing flexible, self-contained units that enable phased closure; and
  - using biodegradable and recyclable materials where possible.

Uz-Kor will employ all these approaches where possible and will continuously review waste disposal to identify more environmentally acceptable routes in accordance with BAT and the IFC General EHS Guideline. As with the Surgil Field and underground pipelines, prior to the eventual decommissioning of the UGCC, a DEMP will be prepared detailing the best practice approach that will be adopted. The DEMP will include a section on waste management. Any underground pipelines will be removed and sold for high value scrap metal.

10.4.5 Impact Significance

In the absence of a confirmed approach to waste management for the Project, the sensitivity of any receptors is potentially high and the magnitude of impacts could, in some circumstances be considered major. However, from the outset, the waste management strategy for the Project has given due consideration to both IFC EHS Guidelines and BAT and consequently best practice measures are to be implemented throughout.

On this basis it is considered that the impacts associated with waste generated from the site will be ultimately insignificant. This is demonstrated in more detail in Section 10.5 which elaborates on the mitigation measures and Section 10.6 which discusses the resultant residual impacts.

10.4.6 Cumulative Effects

It is believed that a significant proportion of the waste arisings from this Project can be re-used or recycled and that there are a number of enterprises within Uzbekistan with the capability to process these waste streams accordingly. The most prominent of which are cement plants which can use a number of the waste streams from the Project as feedstock to their rotary furnaces.

Cumulative effects in relation to waste of the Project are likely to be the extra demand placed on local re-use and recycling facilities. This would obviously reduce the availability of these facilities for other users currently in the area or who may move into the region in the future.

Aside from this, the lack of suitable landfill sites within Uzbekistan as a whole (as discussed in Section 10.3.1) make landfill a resource which should be avoided as a final disposal option wherever possible. This further incentivises Uz-Kor to re-use or recycle every waste stream for which it is technically feasible to do so.

10.4.7 Transboundary Effects

No waste will be exported outside Uzbekistan so no transboundary impacts are deemed to be applicable to this Project.

10.5 Mitigation Measures

10.5.1 General Waste Management Provisions

For all construction activities, a waste management plan will be produced as part of the detailed design and will include construction waste management. A framework for the waste management plan has been provided in the ESMP which is included a Volume IV of this ESIA. The final waste management plan will identify likely waste arisings, appropriate handling, reuse and recycle opportunities and, as a last resort, disposal methods. The waste management plan will be prepared in accordance with the Law on Waste of the Republic of Uzbekistan and the NWMS and in consultation with the Goskompriroda.

For the operational phase, the production of a detailed waste management procedure within the framework provided in the ESMP for all operations at the Project will be fundamental to ensuring best practice waste management is undertaken and becomes embedded into the operational philosophy of the Project. The waste management procedure will provide the following;

- Highlight the relevant policy and legislation such as the Law on Waste of the Republic of Uzbekistan and the NWMS
- A Site Waste Management Plan (SWMP) which will contain;
  - A map showing each temporary waste storage location for the Project
  - A description of each waste generated by the operation of the facility, the appropriate handling methodology, the correct approach for temporary storage and the correct route for removal/disposal off site
  - Waste generation data collection for each waste stream by volume. This should include the proportion of each waste stream going for reuse, recycling or disposal. Any unusual waste volumes should be investigated
  - Any waste monitoring as deemed to be necessary
  - An audit schedule which details the frequency of waste management audits and those responsible for undertaking them
  - A section related to continuous improvement and corrective actions where audit findings can be recorded and incorporated into the waste management procedure. This will also highlight any new and feasible reuse or recycling opportunities which may arise over time.
  - A mechanism by which to routinely track waste consignments from the originating location to the final waste treatment and disposal location.
  - The correct procedure for reporting any environmental incidents related to waste.
  - The specific regulatory reporting requirements as they relate to waste.

Furthermore, procedures surrounding waste streams being sent to the thermal oxidiser will be prepared. Currently, as documented in the waste management strategy presented in Table 10.12, waste which will be sent to the on site thermal oxidiser includes the non solid fraction of the contaminated sludge from the waste water treatment plant (WWTP). Operational controls will be developed to ensure only the appropriate waste streams enter the thermal oxidiser.

Furthermore, a review is currently being undertaken of the locally available waste disposal options to ensure that they will be available to accept the relevant waste streams during both the construction and operational phases of the project.

Both the onsite and offsite waste storage facilities will be designed to include the following:
- Separate storage areas for hazardous and non-hazardous wastes
- Separate skips for each waste stream to allow segregation in order to maximise re-use and recycling opportunities
- All skips to have a suitable cover
- Liquid wastes/oil/chemicals to be stored in tanks or drums located in bunded areas which can hold 110% of the total storage volume.
- Spill kits to be available at all times

In addition, a valid copy of all waste carriers' licences will be kept on site. The transfer notes will be completed in full and contain an accurate description of the waste and be signed by the producer and carrier before waste leaves the site.

It is expected that these operational controls and design measures will be largely sufficient in avoiding the potential environmental impacts typically associated with waste generation. Furthermore, the waste management strategy described in Table 10.12, is considered to represent good industry practice since Uz-Kor are seeking to minimise waste generation in the first instance and identify and maximise re-use opportunities for waste streams which are unavoidable. This waste management strategy will form part of the overall operational SWMP for the Project once it is developed.

10.5.2 Legislative Compliance

10.5.2.1 Uzbekistan Legislation and Policy

In accordance with legislation in Uzbekistan there are specific actions which the Project must undertake in order to demonstrate compliance.

For instance, at the design phase, a complete waste inventory procedure for the Project must be completed as specified in Goskompriroda's Guideline O'z RH 84.3.15:2005. The waste inventory procedure must identify all types of actually generated waste (both domestic and industrial), their physical, chemical, mechanical, hygienic characteristics and any consumer properties.

This document will also serve as a basis for WDS and the WDL Document which must also be developed for the Project at the design phase. Once finalised, the waste inventory document must be submitted for approval by Goskompriroda.

The principle Law on Wastes No.362-II of 05.04.2002 (as amended) provides the basis of legislative regulation for waste management in Uzbekistan as it applies to the Project. The provisions of this legislation and associated compliance by the Project is summarised in Table 10.13.

Table 10.13: Law on Wastes No.362-II of 05.04.2002 and Associated Project Compliance.

Legislative Requirement	How Project Compliance will be Achieved
Keep records on generated waste and report to respective authorities (the Waste Inventory Document, the Waste Data Sheet, Waste Hazard Data Sheet, Form № 3- Environment. Toxic Waste Generation, Handling and Storage Report)	These specific documents will be prepared and will form part of the reporting requirements of the waste management procedure of the EMS for the Project.
Rate the level of generated waste hazard (every five years);	Waste hazard will be rated every five years. This reporting requirement is to be captured in the EMS.
Develop, obtain approval of and comply with the Waste Generation Norms and Waste Disposal Limits;	These specific documents will be prepared and will form part of the reporting requirements of the waste management procedure of the EMS for the Project. Resultant WDL's will be complied with by the Project.
Collect, and properly store the waste is such a way as to prevent destruction and deterioration of waste of high resource value and subject to recycling;	Waste streams with re-use or recycling potential have been highlighted and will be collected and stored in such a way that their properties do not deteriorate, thereby rendering re-use/recycling impossible
Take measures to develop and introduce waste recycling technologies;	Waste streams will be re-used on the site wherever possible. However, recycling will be largely undertaken by specialist waste management contractors.
Prevent mixing of waste unless this is required by the applied technology;	Wastes will be temporarily stored in a segregated waste management area either in the industrial waste storage area (2 km north of the UGCC) or the general waste storage area (on the UGCC site)
Avoid storage, treatment, recycling and disposal of waste at illegal sites;	A valid copy of all waste carrier's licences will be kept on site. The transfer notes will be completed in full and contain an accurate description of the waste and be signed by the producer and carrier before waste leaves the site. This should reduce the likelihood of waste being taken to illegal sites.
Monitor sanitary and environmental conditions at project owned waste disposal facilities;	The Project will operate a thermal oxidiser but no landfill sites. Environmental conditions (such as emissions out of the stack) of the thermal oxidiser will be continuously monitored as part of BAT.
Reinstate land disturbed as a result of waste management;	All temporary waste storage areas and the site of the thermal oxidiser will be re-instated when the Project is eventually decommissioned.
Maximise recycling and ensure environmentally safe disposal of non-recyclable waste;	Waste streams with re-use or recycling potential have been highlighted. Re-use and recycling forms a fundamental part of the waste management strategy for the Project and all feasible opportunities will be maximised.
Report to authorities on illegal waste disposal sites and measures taken;	A procedure for regulatory reporting of any incidents, including the discovery of illegal waste disposal sites, will form part of the EMS.
Pay waste disposal charges;	Disposal charges will be paid as they are incurred.
Recover damage caused to the life, health and property of citizens, the environment, or other companies as a result of waste management	The Project will be operated in an environmentally and socially responsible manner. In the unlikely event of any environmental incidents occurring at the site (including those related to waste) then they will be fully investigated.

It is considered that the Project is able to achieve compliance with all relevant provisions for waste management as stated in Uzbek legislation.

10.5.2.2 International Requirements

International Finance Corporation (IFC)

Compliance with PS3 on Pollution Prevention and Abatement in relation to waste management is achieved by implementing GIIP measures as described in the IFC EHS Guidelines which for the Project are Onshore Oil and Gas Development (April 2007) and Petroleum-based Polymers Manufacturing (April 2007).

A demonstration of compliance with the waste management provisions of each of these guidelines documents is presented in Table 10.14.

Table 10.14: IFC Requirements and Associated Project Compliance

Legislative Requirement	How Project Compliance will be Achieved
IFC EHS Guidelines for Onshore Oil and Gas Development	
Waste materials should be segregated into non-hazardous and hazardous wastes	Compliant. Segregation of waste streams will occur in temporary waste storage areas.
Consideration for re-use, recycling, or disposal	Compliant. Waste streams with re-use or recycling potential have been highlighted. Investigations into suitable regional facilities which can take these waste streams are ongoing.
A waste management plan documenting the waste strategy, storage (including facilities and locations) and handling procedures should be developed and should include a clear waste tracking mechanism to track waste consignments from the originating location to the final waste treatment and disposal location.	Compliant. A SWMP will be developed and will include these provisions.
IFC EHS Guidelines for Petroleum-based Polymers Manufacturing	
Industry-specific hazardous wastes include waste solvents and waste oil spent catalysts, saturated filtering beds, and solid polymer wastes from polymerization plants.	Compliant. All potential waste streams associated with the UGCC have been identified.
Storage and handling of hazardous and non-hazardous wastes should be conducted in a way consistent with good EHS practice for waste management,	Compliant. A SWMP will be developed and will include these provisions.
Recommended management strategies for spent catalysts include the following: • Appropriate on-site management, including submerging pyrophoric spent catalysts in water during temporary storage and transport until they can reach the final point of treatment to avoid uncontrolled exothermic reactions; • Return to the manufacturer for regeneration, or off-site management by specialized companies that can either recover the heavy or precious metals, through recovery and recycling processes whenever possible, or manage spent catalysts according to hazardous and non-hazardous waste management recommendations presented in the General EHS Guidelines. Catalysts that contain platinum or palladium should be sent to a noble metals recovery facility.	Compliant. All catalysts will be first neutralised at the polymer plant at the UGCC site. Potential suitable third parties who can take waste catalysts have been identified and further investigations are ongoing.

Source: IFC EHS Guidelines for Onshore Oil and Gas Development (2007) and IFC EHS Guidelines for Petroleum-based Polymers Manufacturing (2007) and Uz-Kor

The Project has also given due consideration to the IFC EHS General Guidelines (2007) and the requirements related to waste management. The Project is believed to be compliant with the following waste management themes within the IFC EHS General Guidelines (2007) as follows;

- General waste management:
  - Waste management planning; the source of all waste streams from the Project has been identified and characterised along with the proposed final disposal option.
  - Waste Prevention; opportunities to prevent waste production in the first instance have been identified wherever possible. An example of this is minimising produced sand in the well drilling operation.
  - Recycling and reuse; waste reuse and recycling opportunities have been identified. Investigations into suitable facilities that can process such waste streams are ongoing.
  - Treatment and disposal; where re-use of recycling is not feasible or possible, appropriate treatment and/or final disposal options have been identified for all waste streams.
- Hazardous waste management
  - Waste storage; temporary waste storage areas have been identified and designed according to industry best practice.
  - Transportation; all waste containers designated for off-site shipment will be secured and appropriately labelled with loading overseen by competent and trained Uz-Kor employees.
  - Treatment and disposal; where re-use of recycling is not feasible or possible, appropriate treatment and/or final disposal options have been identified for all waste streams, including those considered to be hazardous.
  - Monitoring; procedures for waste tracking will be developed. In addition there will be routine audits of internal waste management practices to ensure ongoing compliance throughout the life of the Project. Any recommendations for improvements in the waste management practices of the Project will form part of ongoing operational reporting.

It is considered that the Project will achieve compliance with all relevant provisions for waste management as provided in the IFC EHS Guidelines.

Asian Development Bank

The ADB Safeguards Policy Statement (SPS) 2009 sets out policy principles and outlines the delivery process for ADB's safeguard policy in relation to environmental safeguards. With respect to waste management, Environmental safeguards (SR1) is the most relevant ADB safeguard and in particular the requirement to include measures within an ESMP for the management of environmental impacts associated with waste generation.

The ESMP is provided in Volume IV of this ESIA. It is considered that the Project will achieve compliance with all relevant provisions for waste management as provided in The ADB Safeguards Policy Statement (SPS) 2009.

10.6 Summary of Residual Impacts

A tabulated summary of the residual impacts associated with waste are given in Table 10.15, Table 10.16 and Table 10.17, highlighting the specific Project component (i.e. Surgil Field, Pipelines, UGCC) and the phase of development (construction, operation, etc.) within which the impact will potentially occur.

Table 10.15: Summary of Residual Impacts for Surgil Field

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Surgil Field – Drilling and Operation						
Waste generation, handling and storage	Contamination of receiving environments (particularly surface watercourses, groundwater and the ground) due to leakage and spillage of wastes associated with poor waste handling and storage arrangements Waste streams which pose a significant environmental hazard: • Disposal of drilling fluids and cuttings • Potentially contaminated sand production from well completion	High	Major	Major Adverse	Develop a waste management handling procedure Implement BAT for disposal of drilling fluids Avoid sand generation in the first instance. Implement BAT for disposal of any contaminated sands which are generated. Identify a suitable temporary storage location for each waste stream Both the onsite and offsite waste storage facilities will be designed to include the following: • Separate storage areas for hazardous and non-hazardous wastes • Separate skips for each waste stream to allow segregation in order to maximise re-use and recycling opportunities • All skips to have a suitable cover • Liquid wastes/oil/chemicals to be stored in tanks or drums located in bunded areas which can hold 110% of the total storage volume. • Spill kits to be available at all times	Insignificant
Waste generation, handling and storage	Fugitive emissions, such as dust, associated with the handling and storage of some waste streams	Low	Moderate	Minor Adverse	Cover any skips used for the temporary storage of waste	Insignificant
Waste generation, handling and storage	Visual amenity impacts associated with poor storage of waste	Low	Minor	Insignificant	Develop a waste management handling procedure All waste storage vessels to be covered at all times	Insignificant

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Choice of final waste disposal option	The use of landfill, which is a finite resource and are typically scare as well as being poorly engineered in Uzbekistan	Low	Moderate	Minor Adverse	Characterise each waste stream as either hazardous or non-hazardous Seek to minimise waste production in the first instance Where waste streams are unavoidable, highlight potential re-use and recycling opportunities according to current best practice	Insignificant
Choice of final waste disposal location	Increased waste miles from transporting waste materials from the Project site.	Low	Moderate	Minor Adverse	Identify waste handling facilities in close proximity to the Project Review the locally available re-use/recycling facilities to ensure they can accept the waste streams. Undertake this during detailed design	Insignificant
Surgil Field – Decommissioning						
Decommissioning of the Surgil Field	Impacts associated with waste generated during decommissioning	High	Major	Major Adverse	Develop a DEMP, including a section on waste management, which will need to incorporate best practice at the time	Insignificant

Table 10.16: Summary of Residual Impacts for Pipelines

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Pipelines – Construction and operation						
Waste generation, handling and storage	Contamination of receiving environments (particularly surface watercourses, groundwater and the ground) due to leakage and spillage of wastes associated with poor waste handling and storage arrangements	High	Major	Major Adverse	Develop a waste management handling procedure Identify a suitable temporary storage location for each waste stream Both the onsite and offsite waste storage facilities will be designed to include the following: • Separate storage areas for hazardous and non-hazardous wastes • Separate skips for each waste stream to allow segregation in order to maximise re-use and recycling opportunities • All skips to have a suitable cover • Liquid wastes/oil/chemicals to be stored in tanks or drums located in bunded areas which can hold 110% of the total storage volume. • Spill kits to be available at all times	Insignificant
Waste generation, handling and storage	Fugitive emissions, such as dust, associated with the handling and storage of some waste streams	Low	Moderate	Minor Adverse	Cover any skips used for the temporary storage of waste	Insignificant
Waste generation, handling and storage	Visual amenity impacts associated with poor storage of waste	Low	Minor	Insignificant	Develop a waste management handling procedure All waste storage vessels to be covered at all times	Insignificant
Choice of final waste disposal option	The use of landfill, which is a finite resource and are typically scare as well as being poorly engineered in Uzbekistan	Low	Moderate	Minor Adverse	Characterise each waste stream as either hazardous or non-hazardous Seek to minimise waste production in the first instance Where waste streams are unavoidable, highlight potential re-use and recycling opportunities according to current best practice	Insignificant

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Choice of final waste disposal location	Increased waste miles from transporting waste materials from the Project site.	Low	Moderate	Minor Adverse	Identify waste handling facilities in close proximity to the Project Review the locally available re-use/recycling facilities to ensure they can accept the waste streams. Undertake this during detailed design	Insignificant
Pipelines – Decommissioning						
Decommissioning of the pipelines	Impacts associated with waste generated during decommissioning	High	Major	Major Adverse	Develop a DEMP, including a section on waste management, which will need to incorporate best practice at the time	Insignificant

Table 10.17: Summary of Residual Impacts for UGCC

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
UGCC – Construction						
Waste generation, handling and storage	Contamination of receiving environments (particularly surface watercourses, groundwater and the ground) due to leakage and spillage of wastes associated with poor waste handling and storage arrangements	High	Major	Major Adverse	Develop a waste management handling procedure as part of the ESMP Identify a suitable temporary storage location for each waste stream Both the onsite and offsite waste storage facilities will be designed to include the following: • Separate storage areas for hazardous and non-hazardous wastes • Separate skips for each waste stream to allow segregation in order to maximise re-use and recycling opportunities • All skips to have a suitable cover • Liquid wastes/oil/chemicals to be stored in tanks or drums located in bunded areas which can hold 110% of the total storage volume. • Spill kits to be available at all times	Insignificant
Waste generation, handling and storage	Fugitive emissions, such as dust, associated with the handling and storage of some waste streams	Low	Moderate	Minor Adverse	Cover any skips used for the temporary storage of waste	Insignificant

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Waste generation, handling and storage	Visual amenity impacts associated with poor storage of waste	Low	Minor	Insignificant	Develop a waste management handling procedure All waste storage vessels to be covered at all times	Insignificant
Choice of final waste disposal option	The use of landfill, which is a finite resource and are typically scare as well as being poorly engineered in Uzbekistan	Low	Moderate	Minor Adverse	Characterise each waste stream as either hazardous or non-hazardous Seek to minimise waste production in the first instance Where waste streams are unavoidable, highlight potential re-use and recycling opportunities according to current best practice	Insignificant
Choice of final waste disposal location	Increased waste miles from transporting waste materials from the Project site.	Low	Moderate	Minor Adverse	Identify waste handling facilities in close proximity to the Project Review the locally available re-use/recycling facilities to ensure they can accept the waste streams. Undertake this during detailed design	Insignificant
UGCC – Operation						
Waste generation, handling and storage	Contamination of receiving environments due to leakage and spillage of waste streams from the operation of the UGCC	High	Major	Major Adverse	Develop a waste management handling procedure Identify a suitable temporary storage location for each waste stream Both the onsite and offsite waste storage facilities will be designed to include the following: • Separate storage areas for hazardous and non-hazardous wastes • Separate skips for each waste stream to allow segregation in order to maximise re-use and recycling opportunities • All skips to have a suitable cover • Liquid wastes/oil/chemicals to be stored in tanks or drums located in bunded areas which can hold 110% of the total storage volume. • Spill kits to be available at all times	Insignificant

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Waste generation, handling and storage	Fugitive emissions associated with the handling and storage of operational waste streams	Low	Moderate	Minor Adverse	Cover any skips used for the temporary storage of waste	Insignificant
Waste generation, handling and storage	Visual amenity impacts associated with poor storage of wastes	Low	Minor	Insignificant	Develop a waste management handling procedure All waste storage vessels to be covered at all times	Insignificant
Thermal oxidation of waste streams; coke and oil contaminated sludge	The use of thermal oxidation which poses potential air quality and climate change impacts	Medium	Major	Moderate Adverse	Design and operate the thermal oxidiser according to BAT. Additional detail related to the air quality and climate change impacts of the thermal oxidiser are presented in Chapter 14 and Chapter 15 respectively. Control of waste streams being fed into the thermal oxidiser to avoid significant fluctuations in fuel quality and ultimately emissions from the stack. Develop a procedure as part of the EMS.	Refer to Chapter 14 and Chapter 15 for further detail related to the residual impacts associated with the thermal oxidiser.
Choice of final waste disposal option	Waste associated with the UGCC being placed in landfill which is a finite resource and are typically scare as well as being poorly engineered in Uzbekistan	Low	Moderate	Minor Adverse	Characterise each waste stream as either hazardous or non-hazardous Seek to minimise waste production in the first instance Where waste streams are unavoidable, highlight potential re-use and recycling opportunities according to current best practice	Insignificant
Choice of final waste disposal location	Increased waste miles from transporting waste materials from the Project site.	Low	Moderate	Minor Adverse	Identify waste handling facilities in close proximity to the Project Review the locally available re-use/recycling facilities to ensure they can accept the waste streams. Undertake this during detailed design	Insignificant
UGCC – Decommissioning						
Decommissioning of the UGCC	Impacts associated with waste generated during decommissioning of UGCC	High	Major	Major Adverse	Develop a DEMP, including a section on waste management, which will need to incorporate best practice at the time	Insignificant

10.7 Proposed Monitoring

Uz-Kor will set out a programme for waste management monitoring programs to address all activities that have been identified to have potentially significant impacts on the environment during construction and operation. The procedures for monitoring the effectiveness of mitigation proposed within this Chapter and the framework waste management plan in the ESMP will be incorporated within the detailed waste management plans to be developed for the Project.

The monitoring will be sufficient to provide representative data for the parameter being monitored, and conducted by trained individuals following monitoring and record-keeping procedures. Monitoring data will be analysed and reviewed at regular intervals and compared with the operating standards so that any necessary corrective actions can be taken.

10.8 Statement of Significance

The most significant need for the Project is to ensure that operational controls are used to minimise waste production in the first instance wherever possible. Where waste avoidance is not possible then Uz-Kor will maximise re-use and recycling opportunities. This will be achieved through the identification of suitable third parties to take specific waste streams who operate in the region.

It is considered that sufficient operational controls, such as the establishment of a detailed waste management plan, will be enacted during all phases of the Project such that any direct risk posed to the environment from the handling and temporary storage of waste in and around the Project site will be insignificant.

11. Ground Conditions

11.1 Introduction

This Chapter considers the potential impacts to ground conditions associated with construction, operation and decommissioning of the Project. The assessment framework is set out in Chapter 5 and the assessment of potential impacts is based on the description of the Project provided in Chapter 2. Specific objectives of the assessment are to assess:

- Potential impacts of the Project on geology, soils and groundwater, from the construction phase, subsequent operation and the decommissioning phase of the Project;
- Potential impacts on geology, soils and groundwater from existing contaminated land in the Project Area and future contamination as a result of the Project; and
- Potential secondary impacts from these contamination sources on other sensitive receptors such as human health, ecology and water.

Appropriate mitigation measures to avoid or reduce any identified significant impacts are also presented.

Each phase of the Project has the potential to impact on soils, with potential implications on soil quality and land use, in addition to groundwater quality if mobilisation of contamination occurs. The geology and soils of an area can also impose constraints on the construction, particularly the presence of contaminated and unstable land. Such constraints will be considered in both the Project design as well as in construction and operational procedures.

Sensitive receptors associated with ground conditions comprise key features such as designated (regionally, nationally or internationally) important geological sites or agriculturally or ecologically valuable soils. With respect to groundwater, key features include aquifers important for their use in irrigation, industry or most importantly drinking water. There is also a potential for secondary impacts from existing or future contaminated ground to sensitive receptors that may be nearby, such as human health (nomad farmers, contractors and site/maintenance workers); and, wildlife and livestock.

Based on the perceived connectivity between the above receptors and the ground conditions, the effects on these receptors with respect to impacts from contaminated ground are discussed in this chapter.

For this assessment, the study area includes the area no greater than that within approximately 500m of the boundary of the Project areas i.e. the well heads in the Surgil Field, the Surgil CGTU, the gas and condensate pipelines and the UGCC. Geology, soils and groundwater further away are unlikely to be significantly affected by operations associated with Project activities. However, due to the potential presence of historic contamination, which based on historic studies is believed to be more widely spread within the Aral Sea Basin, for the purpose of investigating surface soils, the study radius has been extended to 1km.

Following a description of the assessment methodology in Section 11.2, subsequent sections provide information on baseline ground conditions (Section 11.3), the impact assessment (Section 11.4) and mitigation measures proposed (Section 11.5). A summary of the impacts and any residual impacts following mitigation are reported in Section 11.6.

11.2 Methodology and Assessment Criteria

11.2.1 Legislative Background

11.2.1.1 International

Key standards and documents on international best practice related to the assessment and management of contaminated land, and good practice for pollution prevention and control include the following:

- IFC Performance Standard 3 Pollution Prevention and Abatement, in Performance Standards on Social & Environmental Sustainability (IFC, 2006)
- IFC Guidance Notes: Performance Standards on Social & Environmental Sustainability (IFC, 2007a), specifically Guidance Note 3: Pollution Prevention and Abatement;
- IFC General EHS Guidelines: Environmental, Contaminated Land (IFC, 2007g)
- Various IFC Environmental, Health, and Safety (EHS) Sector Guidelines, including:
  - IFC EHS Guidelines for Onshore Oil and Gas Development (IFC, 2007b);
  - IFC EHS Guidelines for Natural Gas Processing (IFC, 2007c)
  - IFC EHS Guidelines for Petroleum-based Polymers Manufacturing (IFC, 2007d)
  - IFC EHS Guidelines for Large Volume Petroleum-based Organic Chemicals Manufacturing (IFC, 2007e)
  - IFC EHS Guidelines for Thermal Power Plants (IFC, 2007f)
- Joint E&P Forum/UNEP Technical Publication on Environmental Management in the Oil and Gas Industry (E&P/UNEP, 1997).

IFC guidance (IFC, 2006) outlines the requirement for impact and risk assessment for key stages of a project, before construction, during construction, during operation and during and after the decommissioning stage. It also provides guidance on pollution prevention and control, waste disposal, handling of hazardous materials and emergency response.

IFC guidance for contaminated land (IFC, 2007c) gives a broad outline of the requirement for risk screening, risk management, detailed quantitative risk assessment and risk reduction measures, where risk factors: source, pathways and receptors are likely to co-exist. The risk screening involves identification of contamination, sampling and testing, evaluation of the results and verification of sensitive receptors and the exposure pathways. Where necessary, a detailed risk assessment builds on the risk screening and involves detailed ground investigation to identify the scope of contamination.

The assessment also makes reference to the following Integrated Pollution Prevention and Control (IPPC) Best Available Technique (BAT) Reference Notes:

- IPPC Reference Document on BAT in the Large Volume Organic Chemical (LVOC) Industry February 2003 - Pollution prevention. IPPC presumes the use of preventative techniques before any consideration of end-of-pipe control techniques. Many pollution prevention techniques can be applied to LVOC processes and this guidance describes them in terms of source reduction (preventing waste arisings by modifications to products, input materials, equipment and procedures), recycling and waste minimisation initiatives.
- IPPC Reference Document on BAT for Mineral Oil and Gas Refineries February 2003.
- IPPC Reference Document on BAT for Large Combustion Plants July 2006.

11.2.1.2 National

Issues related to protection of geology, soils and groundwater in Uzbekistan are regulated by relevant national legislation including:

- Law of RUz "On subsoils" is approved by Law of RUz No.444-II dt. 13.12.2002г. (last revision was made by Law of RUz No.133 dt. 18.12.2007).
- Annex No. 2 to Regulation of CM of RUz "Regulations on state control and supervision for usage and protection of subsoils, geological survey of subsoils and rational usage of mineral resources" No. 19 dt. January 13, 1997 (last revision was made by Regulation of CM of RUz No. 147 dt. 19.07.2007).
- Regulation of CM of RUz "On program of actions for environment protection in RUz for 1999-2005 years" No. 469 dt. October 20, 1999 (last revision was made by Regulation of CM of RUz No. 183 dt. 14.04.2004).
- Regulation on order of application of compensation payments for pollution of environment and disposal of wastes on the territory of RUz, approved by Regulation of CM of RUz No.199 dt. 01.05.03. (last revision was made by Regulation of CM of RUz No.15 dt. 06.02.2006).
- Regulation on measures for subsurface water usage regulation, amplification of their protection from pollution and exhaustion, approved by Regulation of CM of RUz No.179 dt. 08.04.1992.
- Instructions for carrying out inventory of pollution sources and normalization of pollutant emissions into the atmosphere for the ventures of RUz, approved by the Order of Chairman of State Nature Committee of RUz No. 105 dt. 15.12.2005. Registered in the Ministry of Justice of RUz No. 1533 dt. 15.12.05.

11.2.2 Evaluation of Baseline Conditions

The evaluation of baseline conditions uses a variety of sources, including historical information on geology, and the existing contamination status of the sediments in existing and proposed construction areas of the Project. The following information sources have been used to establish the baseline conditions:

- Primary sources, including:
  - A ground investigation survey commissioned by Uz-Kor (presented in Appendix K), and undertaken by State Nature Protection Committee of the Republic of Karakalpakstan in May and June 2011 to establish:
    - baseline soil quality and contamination conditions within the area of the proposed UGCC and associated waste disposal and waste water storage facilities;
    - soil quality and groundwater conditions in the Surgil Gas Field;
  - Information from field surveys undertaken by MML.
- Secondary sources, including:
  - Desk based research of published literature/journals/papers/studies and online resources; and
  - Information provided by Uz-Kor, including Project ground and geotechnical investigation reports, Concept Statements for the Surgil Field and Pipelines and an Aral Sea Basin Pollution Study conducted in 2008 (JV Aral Sea Operating Company).

11.2.3 Field Reconnaissance

Field reconnaissance was undertaken in February 2009, June 2010, November 2010 and March 2011 by members of the MML project team. The reconnaissance included visits to all of the Project sites including the upstream Surgil Field, the downstream UGCC and associated facilities plus the interconnecting pipeline locations.

The visit was undertaken to make a visual assessment of the baseline conditions at the Project sites to determine the potential for future site works to impact on the existing ground conditions. The visit also included an assessment of the potential for the presence of soil and groundwater contamination and highlighted current practices that may have negative implications for soil and groundwater quality.

11.2.4 Ground Investigation Survey

In light of the potential presence of soil and groundwater contamination in the Project area, Uz-Kor commissioned a ground investigation survey in May and June 2011 to establish baseline soil quality and contamination conditions at selected Project locations, namely:

- The UGCC plant;
- The proposed Waste Storage Site A (located north of the UGCC);
- The proposed Waste Storage Site B (located south of the UGCC);
- The waste water storage reservoir;
- Various Surgil Gas Wells; and
- The CGTU.

This investigation also included surface sampling of evaporate soil at various locations in the Aral Sea Basin within up to 1000m to the north, northeast, south and southeast of the Surgil Field CGTU to understand potential contamination concentrations in the evaporate soils.

In addition this investigation established shallow groundwater conditions in various groundwater abstraction wells in the Surgil Gas Field and at the CGTU.

11.2.4.1 Assessment Criteria

An assessment of potential land contamination has been undertaken by comparison of soil and groundwater quality data with local and international standards derived for protection of human health.

As a first stage of assessment, to address the risks to human health, the results of the analytical testing on soil samples have been compared to Maximum Permissible Concentrations (MPC), published by the Research Institute of Sanitation, Hygiene and Occupational Diseases of Ministry of Health of Uzbekistan (2006).

The scientific basis of the MPCs derived for Uzbekistan is unclear. Comparison with internationally recognised and scientifically peer reviewed standards for assessment of ground contamination suggests that the MPCs are potentially conservative. For comparative purposes, the following standards have also been used in this contamination risk assessment:

- Canadian Environmental Quality Guidelines (CEQG) published by the Canadian Council of Ministers of the Environment (CCME, 2011); and
- Dutch Intervention Values (DIV) published by the Dutch ministry for social building, regional planning, and environment administration (VROM, 2009).

The generic assessment criteria used in this report for the assessment of risks to human health from the presence of soil contamination are presented in the following table. For this assessment, the CEQG derived for residential land use have been used. Two Dutch standards are presented, a Target Value and an Intervention Value. The Target Value is the baseline concentration value below which compounds and/or elements are known or assumed not to affect the natural properties of the soil. The Intervention Values represent contamination thresholds above which the functional properties of the soil for humans, plants and animals are seriously impaired or threatened. Under such circumstances, remediation may be required. The contamination level at which the Interventional Values are set reflects Dutch health and societal policy considerations. Intervention Values for soil are expressed as the concentration in a standard soil (10% organic matter and 25% clay).

The Dutch and Canadian Standards have been derived by modelling exposure under the following assumed conditions:

- Residential land uses
- Temperate climatic conditions
- Contamination exposure to children through direct and dust ingestion

By considering childhood exposure in a residential setting, the Standards assume exposure of the most sensitive human receptor groups in society. This has a negative effect on the thresholds potentially making the risk assessment more conservative than would be the case if the thresholds were derived for adult staff on a commercial site. However due to the assumption of temperate climatic conditions, the conservatism inherent in the Standards from considering the most sensitive human receptors may be counterpoised by an underestimate of the exposure to dust which could be expected in more arid conditions characteristic of the Site. Nonetheless, the Dutch and Canadian Values, based on generic assessment criteria, are considered to represent a sound, scientific and internationally recognised basis for reviewing the contamination levels on a comparative basis against the contamination assessment based on the Uzbekistan MPCs.

Table 11.1: Generic Assessment Criteria for Soils

Parameter	Units	Local MPC	CCME (residential)	Dutch*	
				Intervention Value	Target Value
Arsenic	mg/kg	2.0	12	76	29
Cadmium	mg/kg	2.0	10	13	0.8
Chromium	mg/kg	6.0	64	380	100
Copper	mg/kg	3.0	63	190	36
Iron	mg/kg	-	-	-	-
Lead	mg/kg	32.0	140	530	85
Mercury	mg/kg	2.1	-	4**	0.3
Nickel	mg/kg	4.0	50	100	35
Selenium	mg/kg	0.5	1	-	-
Zinc	mg/kg	23.0	200	720	140
Cyanide	mg/kg	-	0.9	20 (free) 50 (complex)	- -
DDE	mg/kg	0.5 (total)	0.7 (total)	2.3	-
DDD	mg/kg			34	-
DDT	mg/kg			1.7	-
Mineral Oil	mg/kg	0.03	1700-2500	5000	-

* for a 'Standard Soil' with 10% organic matter
** for organic mercury

11.2.5 Determination of Impact Significance

Potential impacts of the Project on geology, soils and groundwater are identified through consideration of:

- Any site investigation and remediation of land/water contamination;
- Construction activities, such as drilling and excavations;
- Operation of the Project;
- The disposal of any potentially contaminated process water/oils during or post development; and
- Decommissioning of the Project.

Based on the assessment framework set out in Chapter 5 the following section provides further information regarding the proposed methodology to determine the significance of impacts related to ground conditions. The significance of potential impacts is a function of the sensitivity of the receptor associated with ground conditions, and the magnitude (duration, spatial extent, reversibility, likelihood and threshold) of the impact.

Table 11.2 presents the criteria for determining the sensitivity of geological, soil and groundwater receptors.

Table 11.2: Criteria for Determining Sensitivity of Features

Importance/Value of soil	Definition
High	Agricultural Land (soil of excellent quality with no limitations, can support a very wide range of agricultural crops); or nationally or internationally important for its geology; or groundwater resources used for major potable supplies with limited potential for substitution.
Medium	Agricultural Land (soil of good quality with minor limitations, can support a wide range of agricultural crops); or regionally important for its geology. Groundwater quality suitable for industrial/agricultural use without treatment (abstraction point/s within 1km of the site boundary)/slightly saline groundwater which requires treatment for use as drinking water; and/or moderate level of substitution.
Low	Agricultural Land (soil of good to moderate quality with moderate to moderately severe limitations, can sometimes support a wide range of agricultural crop, or cereals and scrubland); or locally important for its geology. Moderate salinity groundwater suitable for industrial use following treatment; and/or high level of substitution.
Negligible	Agricultural land (soil of poor quality with severe limitations, supports mainly scrubland), not important for its geology. No groundwater present beneath the site or groundwater highly saline and unsuitable for use.

All human health receptors are considered to be of high value.

Table 11.3 presents the criteria for determining the magnitude of impacts on geology, soils and groundwater.

Table 11.3: Criteria for Determining Magnitude of Impact

Magnitude of Impact (positive or negative)	Criteria
Major	Fundamental change to the specific environmental conditions assessed resulting in temporary or permanent change.
Moderate	Detectable change to the specific environmental conditions assessed resulting in non-fundamental temporary or permanent change.
Minor	Detectable but minor change to the specific environmental conditions assessed.
Negligible	No perceptible change to the specific environmental conditions assessed.

In Table 11.4 the magnitude of the impact and value of the features impacted are combined to determine the likely significance of each impact. The predicted effect may be modified by professional judgement. If the impact is negative then the effect is adverse, if the impact is positive then the effect is beneficial.

Table 11.4: Assessment of Impact Significance

Magnitude of Impact	Sensitivity of Receptors			
	Negligible	Low	Medium	High
Negligible	Insignificant	Insignificant	Insignificant	Insignificant
Minor	Insignificant	Insignificant	Minor	Minor
Moderate	Insignificant	Minor	Moderate	Moderate
Major	Insignificant	Minor	Moderate	Major

11.2.5.1 Assessment of Environmental Effects With Respect to Contaminated Land

Some areas of the Project are located on land that, based on historic activities, has either been affected by contamination or have the potential to be affected by contamination. The assessment identifies and assesses the potential impacts that identified contamination risks may pose on the geology, soils and groundwater sensitive receptors. Where mobilisation of contamination occurs, contamination may spread and affect a larger area and such mobilisation may have secondary impacts on human health and ecological receptors. The assessment addresses the impacts related to the existence of, and or creation of contaminated land as a result of the construction, operation and decommissioning of the Project.

This assessment follows the standard EIA methodology for assessment of impacts from existing contamination and potential future contamination from the Project to the defined ground receptors (primarily soil, geology and hydrogeology with consideration of secondary receptors such as human health and ecology). At this stage a contaminated land risk assessment has not been undertaken although one is proposed as the next step for defining specific risks based on the findings of the ESIA assessment.

11.2.6 Data Limitations

To the extent that some of the assessment in this report is based on information obtained in ground investigations, persons using or relying on this report should recognise that any such investigation can examine only a fraction of the subsurface conditions. This limitation is particularly relevant to this project, due to its large scale, the extent of the Surgil field, the small number of samples tested, lack of details of methods and quality control and reliance on reported data. As such, unexpected contamination may be encountered during the course of the construction work.

Soil and groundwater testing undertaken by State Nature Protection Committee of the Republic of Karakalpakstan in 2011 was limited by the analytical capability of the chemical testing laboratory. A number of contaminants, including polycyclic aromatic hydrocarbons, volatile organic compounds and polychlorinated biphenyls, were not tested for during the investigation in 2011 as the laboratory did not have the equipment to test for these contaminants. However, testing undertaken provides an overall assessment of the main contaminants, metals and hydrocarbons, and therefore provides an indicator of the likely ground contamination.

Data from a number of sources has been used to support this assessment. It is worth noting that this assessment has been undertaken in the absence of the following data:

- Detailed construction design of the pipeline at the ascent of the escarpment at Urga. Details of the ground conditions and stability at the escarpment.
- Detailed design of the UGCC wastewater lagoon.

11.3 Baseline Description

11.3.1 Geology

11.3.1.1 Regional Geology and Geomorphology

Geologically, the entire project area including the gas field forms part of the North Ustyurt Basin, a deep basin filled with sedimentary rocks of Jurassic to Tertiary age. These sediments are predominantly clastic rocks and range in thickness from several 100m to 5km, overlying an older sequence of Permo-Triassic Red Beds and Palaeozoic carbonate and clastic rocks. Although oil is mostly produced from Jurassic and older rocks, some gas fields are in shallower Eocene sandstones.

A summary of the regional sedimentary geology based on The Encyclopaedia of European and Asian Regional Geology (Moores & Fairbridge, 1997) is presented in Table 11.5 below:

Table 11.5: Regional Sedimentary Geology of Uzbekistan

Age	Maximum Thickness	Description
Quaternary	5-60m	Deposited mainly by river systems in mountainous regions. Reddish sand dunes in desert region
Neogene - Miocene to early Pliocene	500-700m	Red shale, clays, marls, sandstone and conglomerate, with rare gypsum.
Middle – Late Palaeogene	600m	Sandstone, clay and limestone. Oil and gas deposits are concentrated in the lower part of this formation.
Early – Middle Paleogene	300-500m	Gypsum and carbonate
Cretaceous	200-1200	Shale, siltstone, grey sandstone and limestones. Many petroleum deposits.
Upper Jurassic	60-300m	Conglomerate and cross bedded sandstones
Middle Jurassic (Dogger)	150-300m	Coal bearing Finer than lower Jurassic
Lower Jurassic (Lias)	90-400m	Conglomerate, sandstone, shale and coal
Upper Triassic	20-80m thick	Sandstones, conglomerates and dark reddish shales Unconformity at base.
Lower Triassic	20-80m	Grey, yellow and reddish sandstone, shales and conglomerates.

Not all of these units are present in the project area.

The Surgil Field is characterised by complicated geological structures, with lithologies consisting of sandstones, siltstones and clays. Gas is produced from several sandstone strata, which are both horizontally and vertically variable, in the Upper (1,590m to 2,260m depth), Middle (2,132m to 2,921m depth) and Lower Jurassic (2,713m to 3,006m depth). The expected maximum depth of the new wells is 2950m.

The northern part of the project area, the location of the Surgil gas field, is located in the footprint of the former Aral Sea, and generally comprises flat desert plain.

On the western edge of the plain the land rises steeply along the edge of the Ustyurt Plateau. The plateau forms an area of uplift (Ulmishek, 2001) and stretches between the Aral Sea in the East and the Caspian Sea in the West. It has an area of approximately 200,000 km^2 and an average elevation of 150 m and generally consists of featureless stony desert. The edge of the plateau is clearly marked by a steep escarpment which is lined by boulders and evidence of landslips from past tectonic activity. Dense sandstones and limestones cover the top of the plateau protecting it from erosion.

11.3.2 Regional Soils

The general properties of the desert soils across the region include very low organic matter and the presence of carbonate and solonchaks (salt crusts) (Makhmudovich, 2001). These soils are extremely dehydrated and contain a high concentration of gypsum.

The high salinity ground conditions and the arid climate mean that the land is not suitable for agriculture without irrigation.

11.3.3 Regional Groundwater

11.3.3.1 Recharge

The average annual rainfall reported by the Kungrad meteorological station is 108mm, decreasing from the north to the south of the country. There are significant abstractions from the Amu Darya River for irrigation. The low rainfall and high summer temperatures indicate that there is little modern recharge outside of the areas of irrigation and away from the irregularly flowing ephemeral rivers.

11.3.3.2 Summary of Aquifers

There are two regionally important aquifers in the Aral Sea basin:

- An unconfined shallow sand and gravel aquifer which varies in thickness from several to 150m (Salokhiddinov); and
- A lower aquifer of Upper Cretaceous sediments confined by lower Neogene and Palaeogene clays. The clays separating the two aquifers are on average 200-300m thick (Salokhiddinov).

Shallow Aquifer

The shallow aquifer is comprised of Sarmatian and Tortonian (Miocene) formations which are in hydraulic continuity. The depth to water in the area is extremely variable and uncertain but is thought to be at a depth greater than 25 m (National Holding Company, 2008) and generally between 55-77 m. However, in irrigated areas, the groundwater level can rise to within a few metres of the ground surface (Salokhiddinov and Olov et. al. 2009). The water table is thought to fall below the base of the Sarmatian formation in the northern basin of the plateau. The aquifer is comprised of gravel, sand, argillaceous-silty sandstone, and loamy sand sediments (Salokhiddinov). The base of the aquifer is marked by a transition into pre Miocene rocks. The elevation of this surface varies sharply from an elevation of 18-22 m to 55-60 m increasing in the direction of dip of the rocks of the Turonian Stage.

Monitoring of observation wells indicates that the influence of the Aral Sea on groundwater levels, flows and quality within this aquifer is unlikely to extend beyond 100 km and that flow within this aquifer was generally towards the Aral Sea (Salokhiddinov), although the flow pattern may change in response to the shrinking of the sea.

In the north of the plateau the groundwater flow direction is northwest towards the Samsky salt marshes and the cliffs of the plateau. In the central area of the plateau, groundwater flows east towards the Barsakelmes basin. To the south, groundwater flows south from the Central-Ustyurt hills and the Goglenkuyusin ridge towards the Assekeaudan depression and then to the Sarykamysh Lake.

Cretaceous Aquifer

The deeper Cretaceous aquifer is comprised of sediments confined by lower Neogene and Palaeogene clays. The aquifer thickness increases from approximately 120 m in the east to 570 m in the west (Salokhiddinov). East of the project area, this aquifer is artesian with hydraulic head reaching 1-30 m above the ground surface. Groundwater flow is largely from west to east.

The Upper Cretaceous sediments of Uzbekistan are typically limestones and gypsum that overlie shales, sandstones and carbonates (Mukhin, 1997).

This aquifer is regionally important for water supply, irrigation and stock watering, but water levels have declined with time in response to abstraction. This has resulted in a marked reduction in groundwater discharge into the Aral Sea.

11.3.3.3 Groundwater Quality

Salinity

Throughout the area and in all aquifers, salinity is a significant constraint on groundwater use without treatment. It is understood from Uz-Kor that saline water is available at a depth of about 80-90 m in the Surgil Field. This water is used in the drilling and well development, but would require desalination for domestic use. Analysis for major ions of water from two water wells (NGGI, 2010) confirms that the water is brackish, with neutral pH and total dissolved solids of 9.4 to 13.2 g/l, dominated by sodium, chloride and sulphate ions.

Engineering geology and meteorology studies carried out for the UGCC design report that the water level is at a depth greater than 25 m, and that groundwater is mineralised, containing sulphate and sulphate-chloride, with total dissolved solids at levels ranging from 3 g/l to 30 g/l. The groundwater will only be suitable for technical use (Salokhiddinov and National Holding Company, 2008).

Regionally the salinity of groundwater within the upper aquifer varies from 0.78 g/l to 61 g/l. The area surrounding the Amu Darya River is reported to have a mean salinity of 2.7g/l making it unsuitable for use as drinking water. It is likely that the mean salinity of this aquifer is even higher in the area of the proposed development (Olov et. al. 2009). In the southern half of the plateau it varies from 30-35 g/l. However within the Assekeaudan and Sarykamysh depressions to the south, salinity can reportedly exceed 100 g/l.

Typically the groundwater in the northern part of the plateau is less saline than in the south as a result of the increased annual average recharge in the north. Less saline water has been found in wells associated with the Tartun groundwater reservoir. The Cretaceous aquifer is believed to be less saline and is used for drinking water supply.

11.3.3.4 Existing Users and Potential Impacts

A number of water wells are known to be present on the Ustyurt Plateau, although none are within the immediate vicinity (>1 km) of the UGCC site or UGCC supporting infrastructure. These are believed to be used to feed surface reservoirs used for the watering of livestock. Wells are found in the Cretaceous aquifer throughout the artesian basin but most are concentrated in the centre of the basin. Abstractions are used for water supply, irrigation and stock watering. It is important that the condition of these already stressed water resources is not worsened in terms of both availability and quality.

11.3.4 Ground Investigation at the Individual Project Locations

Ground investigation was undertaken at the individual project locations during May and June 2011. The site works comprised soil and groundwater sampling and testing and were completed by State Nature Protection Committee of the Republic of Karakalpakstan. Details of the investigation works are presented in the following Sections with the full report presented in Volume III Appendix K.

11.3.4.1 Soil Sampling & Testing – UGCC

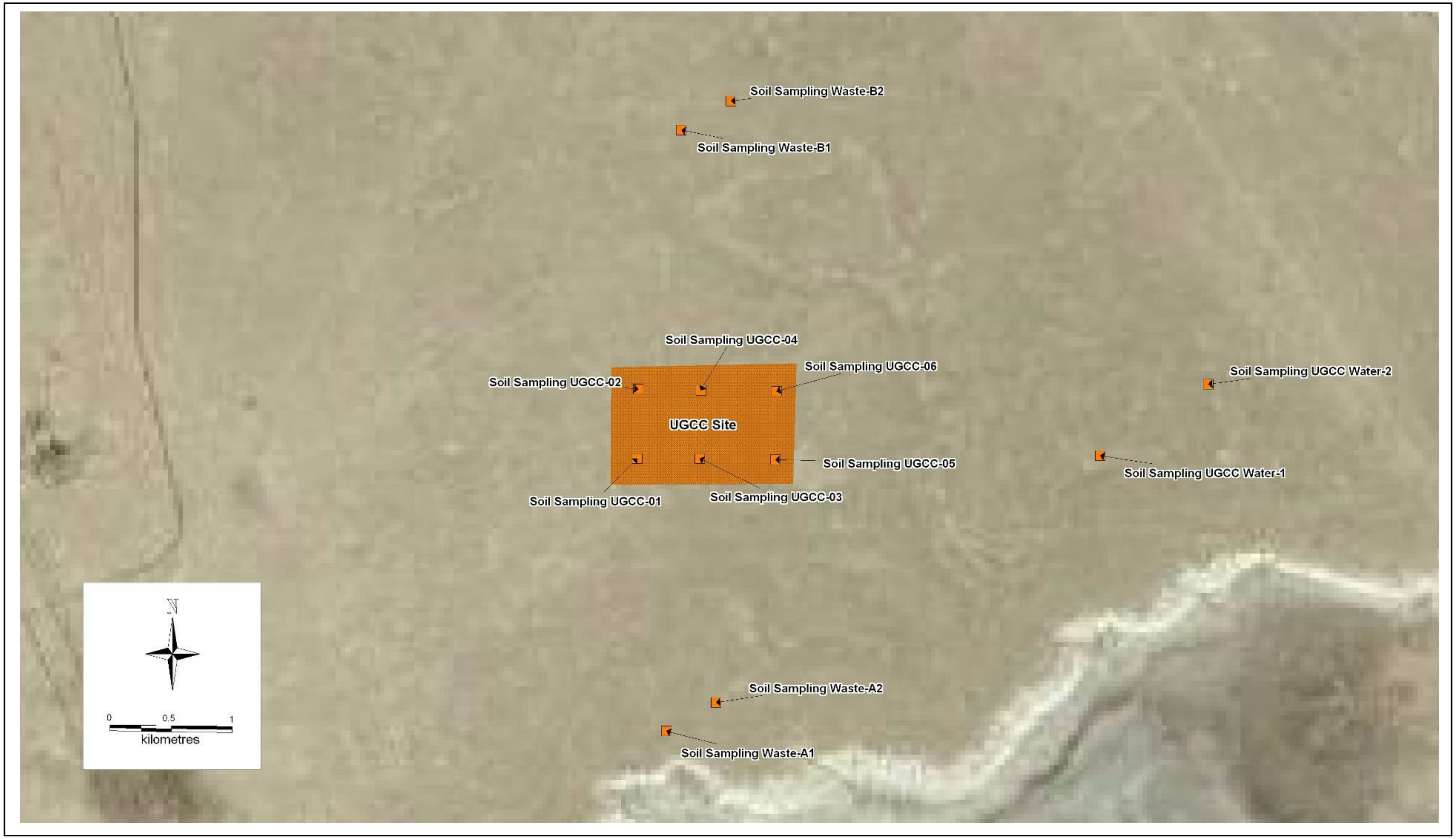
A soil investigation was undertaken in the area of the proposed UGCC and the associated solid waste disposal facility and waste water storage facility. Machine dug trial pits were excavated to a depth of between 1m and 1.5m below ground level (bgl) at six locations within the proposed UGCC site, two locations at each of the proposed waste storage sites and two locations at the proposed waste water storage site. Two samples were taken at each location targeting the topsoil and subsoils at depths of 0.2mbgl and 1mbgl. A total of 24 disturbed soil samples were collected. A summary of the exploratory locations and samples is presented in Table 11.6 and shown on Figure 11.1 overleaf.

Table 11.6: Soil Sampling Points

Site	Sampling Reference No.	Depth of Sample (m)	Location	
			X	Y
UGCC	UGCC-01	0.2	58.2617	43.1674
		1		
	UGCC-02	0.2	58.2618	43.1725
		1		
	UGCC-03	0.2	58.268	43.1674
		1		
	UGCC-04	0.2	58.2681	43.1724
		1		
	UGCC-05	0.2	58.2756	43.1673
		1		
	UGCC-06	0.2	58.2757	43.1723
		1		
Solid Waste Disposal Site A	Waste-A1	0.2	58.2647	43.1474
		1		
	Waste-A2	0.2	58.2697	43.1495

Site	Sampling Reference No.	Depth of Sample (m)	Location	
			X	Y
		1		
Solid Waste Disposal Site B	Waste-B1	0.2	58.2661	43.1915
		1		
	Waste-B2	0.2	58.2711	43.1936
		1		
Waste Water Storage Reservoir	UGCC Water-1	0.2	58.3083	43.1676
		1		
	UGCC Water-2	0.2	58.3192	43.1728
		1		

Figure 11.1: Ground Exploration Locations at the UGCC Site



Soil samples were sent for a range of laboratory testing. Based on the absence of any known historic land use in the area, it was considered that any contamination that may be present in soils is likely to be naturally occurring. The laboratory tests therefore focused on the following general suite of contaminants:

- pH
- Conductivity
- Sulphates
- Nitrites
- Nitrates
- Chloride
- Cyanide
- Total Petroleum Hydrocarbons (TPH)
- Arsenic
- Cadmium
- Chromium
- Copper
- Iron
- Lead
- Nickel
- Mercury
- Selenium
- Zinc

11.3.4.2 Soil and Groundwater Sampling and Testing – Surgil Field and CGTU

Groundwater

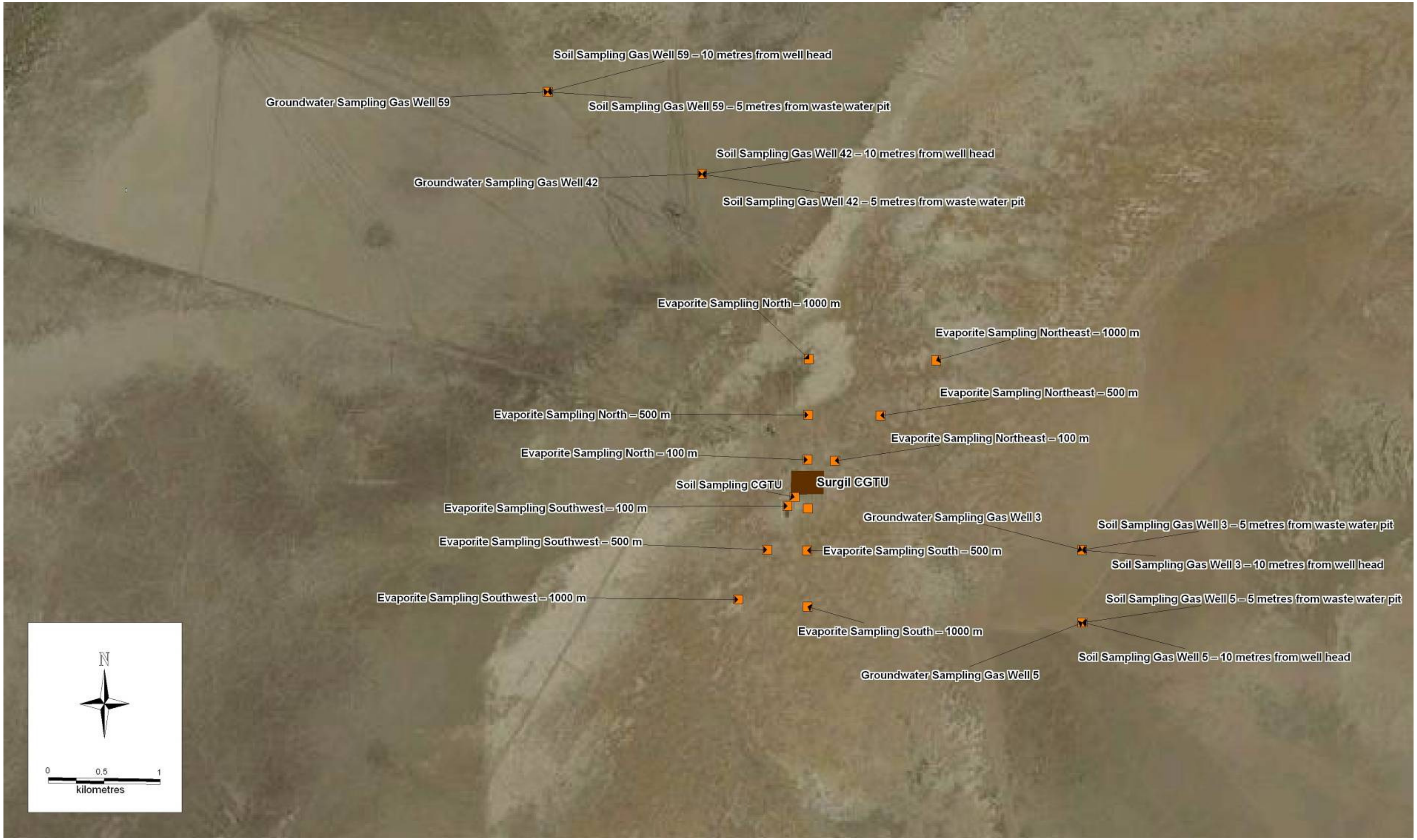
Groundwater sampling and quality testing was undertaken at groundwater abstraction wells in the Surgil Gas Field, at the CGTU and in the Akchalak settlement to establish the shallow water quality at these locations.

Field groundwater quality sampling and testing was undertaken at two abstraction wells at the CGTU and at abstraction wells at five of the gas well sites in the Surgil Field. Sampling in the Surgil Field was undertaken at two old well sites and three new well sites. Sampling and testing of a well at the Akchalak settlement was also included. A total of eight groundwater samples were collected. A summary of the exploratory locations and samples is presented in Table 11.7 and are shown on Figure 11.2.

Table 11.7: Groundwater Sampling Points

Site	Sampling Reference No.	Groundwater Level (m)	Location	
			x	Y
Abstraction Well 1 – CGTU	CGTU Water 1	Unknown	Unknown	Unknown
Abstraction Well 2 – CGTU	CGTU Water 2	Unknown	Unknown	Unknown
Surgil Gas Well 3	Surgil Water 1	0.55	58.7274	44.0314
Surgil Gas Well 5	Surgil Water 2	2.43	58.7274	44.0256
Surgil Gas Well 42	Surgil Water 3	3.5	58.6849	44.0618
Surgil Gas Well 59	Surgil Water 4	3.28	58.6676	44.0685
Surgil Gas Well 54	Surgil Water 5	2.8	Unknown	Unknown
Well in Akchalak settlement	Well	31	Unknown	Unknown

Figure 11.2: Ground Exploration Locations in the Surgil Gas Field



Water samples were sent for a range of laboratory testing. The laboratory tests included:

- pH
- Total hardness
- Carbonate hardness
- Calcium
- Magnesium
- Sulphate
- Chloride
- Biological oxygen demand (BOD)
- Chemical Oxygen demand (COD)
- TPH
- Nitrite
- Nitrate
- Ammoniacal nitrogen
- Phosphate
- Fluoride
- Manganese
- Potassium
- Arsenic
- Boron
- Cadmium
- Chromium
- Copper
- Iron
- Nickel
- Selenium
- Zinc

Soils

A soil investigation was undertaken at locations between the CGTU and the produced water storage reservoir, and at five of the gas well sites in the Surgil Field at the same locations as the groundwater monitoring.

Two machine dug trial pits were excavated to a depth of between 0.8m and 1.5mbgl at each well site, one within 5m of the edge of the current/historic drill fluid storage area and one within 10m of the well head. Two samples were taken at each location, targeting the topsoil and sub-soils at depths of 0.2mbgl and 1mbgl. A total of 20 disturbed soil samples were collected. A summary of the exploratory locations and samples is presented in Table 11.8. The locations of the exploratory holes undertaken are shown on Figure 11.2.

Table 11.8: Soil Sampling Points

Site	Sampling Reference No.	Depth of Sample (m)	Well Location	
			x	Y
CGTU	CGTU Soil 1	0-0.2	58.6951	44.0358
		1.0		
Surgil Gas Well 3 – 5 metres from waste water pit	Surgil Soil 1A	0-0.2	58.7274	44.0314
		1.0		
Surgil Gas Well 3 – 10 metres from well head	Surgil Soil 1B	0-0.2	58.7274	44.0314
		1.0		
Surgil Gas Well 5 – 5 metres from waste water pit	Surgil Soil 2A	0-0.2	58.7274	44.0256
		1.0		
Surgil Gas Well 5 – 10 metres from well head	Surgil Soil 2B	0-0.2	58.7274	44.0256
		1.0		
Surgil Gas Well 42 – 5 metres from waste water pit	Surgil Soil 3A	0-0.2	58.6849	44.0618
		1.0		
Surgil Gas Well 42 – 10 metres from well head	Surgil Soil 3B	0-0.2	58.6849	44.0618
		1.0		
Surgil Gas Well 59 – 5 metres from waste	Surgil Soil 4A	0-0.2	58.6676	44.0685

Site	Sampling Reference No.	Depth of Sample (m)	Well Location	
			X	Y
water pit		1.0		
Surgil Gas Well 59 – 10 metres from well head	Surgil Soil 4B	0-0.2	58.6676	44.0685
		1.0		
Surgil Gas Well 54 – 5 metres from well head	Surgil Soil 5	0-0.2	Unknown	Unknown
		1.0		

Soil samples were sent for a range of laboratory testing. The laboratory tests included:

- pH
- Conductivity
- Sulphate
- Sulphide
- Nitrite
- Nitrate
- Chloride
- Cyanide
- TPH
- Arsenic
- Cadmium
- Chromium
- Copper
- Iron
- Lead
- Nickel
- Selenium
- Zinc

11.3.4.3 Evaporite Sampling and Testing – Surgil Field

A soil investigation was undertaken at locations up to 1000m from the CGTU in the Aral Sea Basin. The investigation was intended to target potential source areas of soils that could become wind blown material that may pose a health risk to workers in these areas. The testing locations were established based on the prevailing wind direction, which is reportedly from the north and northeast. Additional samples were also located to the south and southeast of the CGTU to provide further baseline information.

Hand scrapes to a depth of 0.2mbgl were undertaken at 12 locations at varying distances from the CGTU. A total of 12 disturbed soil samples were collected. A summary of the exploratory locations and samples is presented in Table 11.9. The locations of the exploratory holes undertaken are shown on Figure 11.2.

Table 11.9: Evaporite Soil Sampling Points

Site	Sampling Reference No.	Location	
		X	Y
North – 100 m	ES-01	58.6966	44.0388
North – 500 m	ES-02	58.6967	44.0424
North – 1000 m	ES-03	58.6968	44.0469
Northeast – 100 m	ES-04	58.6997	44.0387
Northeast – 500 m	ES-05	58.7048	44.0423
Northeast – 1000 m	ES-06	58.7111	44.0467
South – 100 m	ES-07	58.6966	44.0467
South – 500 m	ES-08	58.6965	44.0315
South – 1000 m	ES-09	58.6965	44.027
Southwest – 100 m	ES-10	58.6943	44.0351
Southwest – 500 m	ES-11	58.692	44.0316

Site	Sampling Reference No.	Location	
		X	Y
Southwest – 1000 m	ES-12	58.6887	44.0276

Soil samples were sent for a range of laboratory testing. The laboratory tests included:

- pH
- Sulphate
- Potassium
- Chloride
- HCCH (pesticide)
- DDE (pesticide)
- DDD (pesticide)
- DDT (pesticide)
- Partiometil (pesticide)
- Dimethoate (pesticide)
- Malathion (pesticide)
- Aluminium
- Arsenic
- Cadmium
- Copper
- Iron
- Lead
- Nickel
- Selenium
- Zinc
- Cyanide
- TPH

11.3.5 Geology, Soils and Groundwater at the Individual Project Locations

11.3.5.1 Surgil Gas Field

Broadly, across the Surgil Gas Field, shelly sandy soil is found at varying thicknesses but generally to a maximum depth of 3 m below ground level (bgl). These soils are in turn underlain by alternating layers of clay, loamy sand and sand. Solonchaks (or salt crusts) occur at the surface across some of the area. The results of shallow intrusive ground investigation undertaken in May 2011 confirm the presence of loam and sands in shallow soils.

Soils are highly saline and extremely aggressive, but the chemical composition varies widely as described in Section 11.3.5.1 both spatially and seasonally. Some of this variability is due to redistribution by wind.

It is understood that the water wells at the Surgil Gas well sites are in the Cretaceous aquifer and that the yields are very low at between 0.11 and 0.14 litres per second. In May 2011, the depths to water measured at the locations shown in Table 11.7 varied between 0.55 and 3.5 m (State Nature Protection Committee of the Republic of Karakalpakstan).

11.3.5.2 Pipelines

In the area of the former Aral Sea, ground level varies between 42.8 m and 55 m (O'Zlitineftgaz Pipeline Study, 2008). The surface soils are highly saline with significantly elevated chloride and sulphate concentrations. The underlying geology generally comprises sand to a depth of 1.3 mbgl which is in turn underlain by loamy sand with a thickness of 0.2-0.3 m and clay interbedded with sand with a thickness greater than 3 m.

The pipeline will ascend the Ustyurt Plateau via the escarpment at Urga. Although this area is reported to show indications of tectonic disturbance and past land slides, no investigation data is available.

On the Ustyurt Plateau, ground level varies between 146.6 m and 159.8 m. The Plateau comprises a sequence of Mesozoic-Cenozoic limestone with thin layers of marl and mudstone and a surface cover of saline sandy loam. Previous ground investigation encountered a gypsum loam to a depth of 1.2 mbgl, which was in turn underlain by a shelly limestone with a thickness of between 0.3 and 0.6 m and limestone interbedded with marl greater than 3 m in thickness.

Shallow highly saline groundwater is present in low permeability sandy clay soils. According to the results of an intrusive survey undertaken in 2008 (O'Zlitineftgaz Pipeline Study, 2008), groundwater is not present above 5m depth along the pipeline route. The 2008 study has also reported that groundwater levels have been rising in and close to the irrigated areas by 10-15cm per year. However, recent surveys indicate that groundwater levels in wells within the Surgil field have been measured between 0.55 and 3.5 m below ground level (State Nature Protection Committee of the Republic of Karakalpakstan). Groundwater levels may therefore vary along the pipeline route where it crosses the Aral Sea basin.

11.3.5.3 UGCC

Intrusive investigations including boreholes and trial pits at the UGCC site have confirmed the presence of two geological formations. The first consists of Palaeogene clays and marls with some limestone and very rare sandstone. Geotechnical investigation undertaken at the UGCC site in 2010 found this layer comprised soft marlstone interbedded with shellstone (Soiltech Engineering, 2010). These sediments are approximately 25 m thick, rarely contain water and are of low permeability. They are underlain by Neogene (Miocene) limestone with interbedded marls, rare clays, gypsum and sandstones. The total thickness varies from 40 to 110 m. Both formations are overlain by a small thickness of Quaternary deposits comprising loamy soils and sands, which locally also contain gypsum and celestine.

On the Ustyurt Plateau, the soil cover consists of approximately 0.3-0.6 m (from ground investigation in 2011) of grey-brown loamy soils, which support sparse vegetation, mostly wormwood. The soils are highly saline with measured chloride ranging from 1,240 to 10,560 mg/kg and sulphate from 2,950 to 17,950mg/kg (O'Zlitineftgaz, Declaration of Environmental Impact (DEI) concerning UGCC construction).

Groundwater is present in the upper aquifer of the Miocene strata, at a depth of 50 to 70 mbgl and is reported to have a high level of mineralisation from 10 to 15 g/l. Geotechnical investigation undertaken at the UGCC site in 2010 encountered groundwater above 50 m at one location only, where a groundwater level of 36.7 mbgl was recorded (Soiltech Engineering, 2010). Laterally impersistent occurrences of shallow perched groundwater have been recorded in the area of Akchalak, located to the north of the UGCC site. Perched groundwater has been measured at a depth of 10-25 m in isolated lenses, and is reportedly not in continuity with the underlying groundwater table. The mineral content is less than 3 mg/l. (O'zGASHKLITI, 2010). The depth to water level measured in May 2011 in the well at Akchalak settlement was 31 m (State Nature Protection Committee of the Republic of Karakalpakstan).

11.3.6 Existing Contamination

11.3.6.1 The Aral Sea and Surgil Field

The Surgil Field is located within the former footprint of the Aral Sea. Intensive farming activities and heavy industry on the land surrounding the Aral Sea has had the potential to result in widespread soil contamination. Historically the sea water had been impacted by a range of contaminants, mainly from run-off from the use of agro-chemicals in farming areas and the discharge of toxic industrial waste and sewage. It is has been reported by some sources (Stewart, 2008) that these contaminants have concentrated over time as the waters have receded, leaving a chemical residue on the dry sea basin.

According to the State of Environment of the Aral Sea Basin, Regional Report of the Central Asian States, 2000 (http://enrin.grida.no/htmls/aralsoe/aralsea/index.htm) the 'Aral Sea is located along a powerful air stream running from east to west'. Light sands of the Aral Sea bed are picked up by the wind and can travel great distances in the atmosphere over large areas of Asia. (Stewart, 2008).

An investigation into the presence of potentially contaminated soils in the former Aral Sea Basin was undertaken by JV Aral Sea Operating Company between June and October 2008. Soil samples were taken over an area of some 150 km by 100 km bordering the Aral Sea and including the Surgil Field. The samples were analysed for chloride, sulphate, metals, oil, phenol and pesticide residues. Concentrations measured in October were notably higher than those in June and have therefore been used for comparison. The results for both surface (0-0.3 m) and slightly deeper (1.2-1.8 m) samples from the locations closest to the Surgil Field showed that the soils are:

- Highly saline with dry residue between 0.2 and 2%, chloride between 24,000 and 1,274,000 mg/kg and sulphate between 43,000 and 490,000 mg/kg;
- Lead, cadmium and zinc concentrations are all well below the local maximum permissible concentrations (MPC), except for one sample where the measured concentration of cadmium of 0.508 mg/kg is slightly above the MPC of 0.5 mg/kg. It should be noted that the MPC is much lower than the UK Soil Guideline Value for residential use of 10 mg/kg (EA, 2002) and the Dutch Intervention Value of 13 mg/kg;
- Oil products and phenols were generally found at very low concentrations, with the exception of three sampling locations where oil concentrations between 1.2 and 15.6 mg/kg were detected. One of these was attributed to contamination during seismic surveys. However, all the measured concentrations are considered to be extremely low and well below the Dutch Intervention Value of 5,000 mg/kg (VROM, 2009);
- Organochlorine pesticide residues were detected in approximately half of the soil samples, including HCH, DDE, DDD and DDT. All measured concentrations are below the local MPC of 0.1 mg/kg total HCH and 0.5 mg/kg for the sum of DDE, DDD and DDT. The local MPCs are well below the action values of 1.7 mg/kg DDT, 2.3 mg/kg DDE and 43 mg/kg DDD respectively (VROM, 2009).

The results of the JV investigation indicate that shallow soil in the Aral Sea Basin, including the Surgil gas field, has not been significantly impacted by historic contamination in the Aral Sea. Overall the results indicate that the soil quality is unlikely to present a significant risk to human health.

To further investigate the potential presence of contaminated soil in the Aral Sea basin, an additional survey of surface soil quality in the region of the Surgil gas field was undertaken on behalf of Uz-Kor by State Nature Protection Committee of the Republic of Karakalpakstan in May 2011. Surface soil samples were collected at depths between 0-0.2mbgl over an area of 2 square km, at locations between 100m and 1km to the north, northeast, south and southwest of the CGTU to investigate soil quality in the project area to allow assessment of potential impacts to human health within the Surgil field, and particularly at the CGTU. The sample locations were chosen based on the prevailing wind direction, from the north and northeast, to target the soils considered to be up wind and down wind of the CGTU. Details of the investigation are presented in Section 11.3.4.3. Soils were analysed for chloride, sulphate, cyanide, metals, pesticide residues and TPH. The results of the testing show the following:

- Arsenic, lead, cadmium, nickel and zinc were all below the Uzbeck MPCs.
- Copper was found at concentrations (3.2 to 3.6 mg/kg) slightly exceeding the relevant MPC of 3 mg/kg at three locations. However all concentrations are significantly lower than the Canadian EQG of 63 mg/kg and the Dutch Target and Intervention Values of 36 and 190 mg/kg respectively.

- Selenium was found exceeding the MPC of 0.5 mg/kg at nine locations to the northeast, south and southwest, where concentrations between 0.53 and 1.99 mg/kg were detected. All concentrations are significantly lower than the Dutch Intervention Value of 100 mg/kg but two exceed the Target Value of 1 mg/kg. Eight locations also exceed the Canadian EQG of 0.7 mg/kg.

- No oil products were identified in any of the samples.

- Cyanide was detected at concentrations between 0.002 and 0.018 mg/kg in three samples only, taken at locations to the southwest of the CGTU. Cyanide was not detected at any other location. There is no local MPC for cyanide, however these concentrations are significantly lower than the Canadian EQG of 0.9 mg/kg and the Dutch Intervention Value of 20 mg/kg.

- Organochlorine pesticide residues were detected in all of the soil samples, including DDE, DDD and DDT. The measured concentrations are generally below the local MPC of 0.5 mg/kg for the sum of DDE, DDD and DDT. However, at three locations, two to the northeast (at 100 m and 1000 m) and one to the southwest (at 500m), the sum of the concentrations (1.31 mg/kg, 0.98 mg/kg and 2.52 mg/kg respectively) was found to exceed the MPC. These concentrations also exceed the Canadian EQG of 0.7 mg/kg. Furthermore, the concentration of 2.22 mg/kg DDT at one location exceeded the Dutch Intervention Value of 1.7 mg/kg for this individual compound.

In summary, the results of recent soil investigation indicate that concentrations of metals in surface soils are generally low. Slight exceedances of the local MPCs for copper and selenium have been identified. However, based on the similarity of the measured concentrations in shallow soils across the area, in the Surgil gas field and on the Ustyurt Plateau (see Section 1.3.6.3), it is considered that these are broadly indicative of natural ground conditions. Elevated concentrations of DDT have been found exceeding the MPC at some locations.

The results of both investigations show that pesticides are present at low concentrations in shallow soils in the Aral Sea basin. Detectable concentrations of pesticides were found in soils at 24 of the 25 locations tested in 2008 and 2011. However, concentrations were found only slightly exceeding the local and international guidance levels in soil samples from three of the 25 locations tested, indicating that impacts are localised. Concentrations of metals detected in shallow soils were below the international guidance levels and are not considered to present a significant risk to human health.

11.3.6.2 Contamination Relating to Drilling Activities

Ground conditions in the Surgil Gas Field, particularly relating to the historic drilling activities, were investigated at five selected drilling sites, two old and three new, in May 2011. Approximately 28 wells are currently operational in the Surgil field and further wells are under construction. Historic drilling methods involved discharge of drilling fluids directly to the ground in unlined evaporation pits. Some drilling fluids used in the drilling process are oil or synthetic based and may be contaminated with caustic chemicals and hydrocarbons.

Site visits undertaken by MML have previously identified existing contamination associated with the historic operation of the Surgil Field.

Waste well testing fluids have historically been flared at discharge. Any unburned fluids were discharged to ground. It is understood that following testing, any contaminated soils have been removed for disposal as hazardous waste. Hazardous waste may have historically been disposed at the drill sites.

It is possible that discharge of waste liquids, and potentially any leaks and spills, during the drilling process may have led to localised contamination of the shallow aquifer. Low levels of contamination are indicated by the sampling of groundwater from water wells at five gas wells and two abstraction wells at the CGTU. Concentrations of TPH range from 0.06 to 0.19 mg/l. Based on these results groundwater has been slightly impacted by historic drilling activities..

Soil samples were collected in May 2011 (State Nature Protection Committee of the Republic of Karakalpakstan) at five well site locations to investigate baseline soil quality and potential impacts from existing soil contamination to human health within the Surgil field. Details of the investigation are presented in Section 11.3.4.2. Soils were analysed for chloride, sulphate, sulphide, nitrate, nitrite, cyanide, metals and TPH. The results of the testing show the following:

- Arsenic, cadmium, chromium, nickel and zinc were all below the Uzbeck MPCs.

- Copper was found at concentrations (3.2 to 7.5 mg/kg) slightly exceeding the relevant MPC of 3 mg/kg in 15 samples. However all concentrations are significantly lower than the Canadian EQG and the Dutch Target and Intervention Values. Concentrations at all other locations were below the MPC.

- Selenium was found exceeding the MPC of 0.5 mg/kg in 12 samples, where concentrations between 0.51 and 1.46 mg/kg were detected. All concentrations are significantly lower than the Dutch Intervention Value of 100 mg/kg but six exceed the Target Value of 1 mg/kg. Ten locations also exceed the Canadian EQG of 0.7 mg/kg. Concentrations in shallow samples (0.2m) were generally similar to those taken in deeper samples at 1m. Concentrations at all other locations were below the MPC.

- Lead was found slightly exceeding the MPC of 32 mg/kg in three samples. However, all concentrations were significantly lower than the Dutch Target Level of 85 mg/kg and the Canadian EQG of 150 mg/kg. Concentrations at all other locations were below the MPC.

- Cyanide was detected at concentrations between 0.002 and 0.044 mg/kg in eight samples only. Cyanide was not detected at any other location. There is no local MPC for cyanide, however these concentrations are significantly lower than the Canadian EQG and the Dutch Intervention Value.

- Oil products were found in soils at 0.2 m and 1 m in the vicinity of the wells and drilling fluid storage ponds at all locations. Concentrations between 0.033 mg/kg and 4.19 mg/kg were detected exceeding the MPC of 0.03 mg/kg. However, all the measured concentrations are considered to be extremely low and well below the Dutch Intervention Value of 5,000 mg/kg (VROM, 2009) and Canadian EQG of between 1700 and 2500 mg/kg (CCME). Oily products were noted on the soils log for the trial pit at the new well site 54, where slightly elevated concentrations were also found in the soil samples (2.56 mg/kg and 4.19 mg/kg).

In summary the results of recent soil investigation indicate that concentrations of metals in surface soils are generally low. Slight exceedances of the local MPCs for copper, lead and selenium have been identified. However, it is considered that these concentrations are broadly indicative of natural ground conditions. Oil products have been found in low concentrations at all well sites and at slightly higher concentrations at the recently drilled sites. Although concentrations slightly exceed the local MPCs, they are significantly below the Canadian and Dutch standards.

11.3.6.3 Surgil CGTU

Historic leaks and spills associated with the operation of the existing CGTU may have led to localised soil and groundwater contamination. Produced water from the CGTU was historically disposed to ground in an unlined lagoon. Analysis of produced water from 6 wells in the Surgil Field for inorganic parameters (NGGI, 2010) shows a wide range of water quality from a relatively fresh water (total dissolved solids of 0.81 to 1.46 g/l) to brine (total dissolved solids of 116 to 152 g/l). Produced water may also contain dissolved hydrocarbons, but no organic analyses are currently available.

It is understood that disposal of produced water to ground has now ceased and remediation of the contaminated soils by excavation and specialist disposal has been undertaken. Low levels of hydrocarbon contamination in groundwater are indicated by the sampling of groundwater from two abstraction wells at the CGTU. Based on these results groundwater appears to have been slightly impacted by activities in this area. As a result of recent improvement activities, currently produced waters are discharged to a lined evaporation lagoon and suitable methods for treatment are also under investigation.

During the ground investigation undertaken by State Nature Protection Committee of the Republic of Karakalpakstan in May 2011, a single trial pit was excavated at a location between the CGTU and waste water lagoon to investigate the soil quality at this location. Soils testing identified very low concentrations of oil products, 0.029 mg/kg and 0.031 mg/kg exceeding the MPC of 0.03 mg/kg, in shallow soils. However, all the measured concentrations are considered to be extremely low and well below the Dutch Intervention Value of 5,000 mg/kg (VROM, 2009) and Canadian EQG of between 1700 and 2500 mg/kg (CCME).

As part of the investigation, groundwater quality testing was also undertaken on samples taken from the abstraction wells at the CGTU. The results are discussed in Chapter 9, Water Resources and Quality.

11.3.6.4 UGCC

The main UGCC complex is located on the Ustyurt Plateau with the nearest settlement 5 km away. A soda ash plant is location 6 km away from the UGCC site. The ground at the UGCC site has been identified as semi-arid scrub land. It is understood that this site has not historically been used for any potentially contaminating activities.

Soil investigations were undertaken in the region of Karambetsky between 2004 and 2008. The UGCC is located in the northern area of this region. The exact locations of these soil sampling points were not available.

Generally soils in the region were found to have varying levels of salinity. Heavy metals found in soils were generally close to the natural geochemical background levels with the exception of arsenic and strontium. Elevated concentrations of arsenic (17.5 mg/kg and 24.7 mg/kg) and strontium (695 mg/kg and 879 mg/kg) exceed the Uzbeck MPC of 2 mg/kg and 566 mg/kg respectively at some locations. However, concentrations of arsenic do not exceed the 2009 Dutch Target and Intervention Values (29 mg/kg and 55 mg/kg respectively). Occurrence of these metals appears to be associated with the elevated concentrations of naturally occurring mineral salts in the soils. Sources of strontium include sulphate salts and the mineral Celestine, which are both present in soils.

Analysis of the nitrate and nitrite concentrations indicate that the levels are low, likely to be due to the absence of agriculture. On average the nitrite concentration has been measured at 0.1 mg/kg, which is at or close to the laboratory detection limit, thus these concentrations are not considered to be significant. Small fluctuations are considered to be linked to the geochemistry of the underlying rocks.

Analysis for hydrocarbons found concentrations ranging from 90 to 1550 mg/kg (0.09 mg/g to 1.55 mg/g). These do not exceed the Dutch Intervention Value of 5000 mg/kg. It is not known to what area of the Karambetsky region these concentrations apply. The source of these elevated concentrations is also unclear. No hydrocarbons were detected in any of soil samples at the UGCC site so the elevated hydrocarbon levels in samples from the 2004 and 2008 investigations are not reflective of contamination within the project area. Concentrations of phenols were less than 10 mg/kg (0.01 mg/g) at all locations.

Testing to measure the concentrations of mobile forms of metals was also undertaken. Slightly elevated concentrations above the MPC of mobile forms of chromium (maximum 15.1 mg/kg) and zinc (maximum 34.4 mg/kg) were encountered in some soils. Concentrations of these metals are well below the corresponding 2009 Dutch Intervention Values (380 mg/kg and 720 mg/kg respectively).

A shallow soil investigation was undertaken in the area of the proposed UGCC and the associated solid waste disposal facility and waste water storage facility in May 2011 (State Nature Protection Committee of the Republic of Karakalpakstan). Details of the investigation are presented in Section 11.3.4.1. Soils were analysed for chloride, sulphates, nitrate, nitrite, cyanide, metals and TPH. The results of the testing show the following:

- Arsenic, cadmium, chromium, mercury and zinc were all below the Uzbeck MPCs.

- Copper was found at concentrations slightly exceeding the relevant MPC of 3 mg/kg in 17 samples. Concentrations exceeding the MPCs varied between 3.2 and 4.8 mg/kg. However, all concentrations are significantly lower than the Canadian EQG and the Dutch Target and Intervention Values. Concentrations at all other locations were below the MPC.

- Selenium was found exceeding the MPC of 0.5 mg/kg in 12 samples, where concentrations between 0.51 and 1.19 mg/kg were detected. All concentrations are significantly lower than the Dutch Intervention Value of 100 mg/kg but three exceed the Target Value of 1 mg/kg. Nine locations also exceed the Canadian EQG of 0.7 mg/kg. Concentrations in shallow samples (0.2m) were generally similar to those taken in deeper samples at 1m.

- Lead was found slightly exceeding the MPC of 32 mg/kg in two samples taken at one location at the proposed UGCC site, where concentrations of 32.7 mg/kg and 47.3 mg/kg were detected. However, all concentrations were significantly lower than the Dutch Target Level of 85 mg/kg and the Canadian EQG of 150 mg/kg. Concentrations at all other locations were below the MPC.

- Cyanide was detected at concentrations between 0.001 and 0.058 mg/kg in seven samples only. Cyanide was not detected at any other location. There is no local MPC for cyanide however these concentrations are significantly lower than the Canadian EQG of 0.09 mg/kg and the Dutch Intervention Value of 20 mg/kg.

- No oil products were identified in any of the samples.

11.3.7 Value of Geology, Soils and Groundwater

The geology in the Surgil Field, with the exception of its value as a gas source, is generally assessed as having a negligible geological value, as there are considered to be no sensitive geological features in this part of the Project area. Soils are also considered to have a negligible value due to historic contamination in the area formerly covered by the Aral Sea, the high salinity and poor agricultural quality.

Geology and soils of the Ustyurt Plateau are considered to have a low value, as the area is unsuitable for agricultural purposes and there are considered to be no sensitive geological features in this part of the Project area.

Across the Surgil Gas Field in the Aral Sea Basin, groundwater in the upper aquifer is understood to be present at depths >25 m below ground level (bgl). On the Ustyurt Plateau, groundwater in the upper aquifer is understood to be present generally at depths >50mbgl, although laterally discontinuous perched groundwater is reportedly present in shallower soils. Based on the available literature, this aquifer is understood to be variably saline and, in the project area, is likely to be suitable only for industrial use. Regionally, abstractions from this aquifer are understood to be used for stock watering and irrigation. However, this is unlikely to occur in the Project area where there is no agriculture. Groundwater in the shallow aquifer is therefore considered to be a low to moderate sensitivity receptor.

Groundwater in the lower Cretaceous aquifer is artesian, confined below a considerable thickness of low permeability clay. This aquifer is understood to have a lower salinity and is regionally important for water supply. Groundwater in the Cretaceous aquifer is therefore considered to be a moderate to high sensitivity receptor.

11.4 Assessment of Impacts

11.4.1 Potential Impacts of the Project

11.4.1.1 Overview

The Project has three components which may impact on soil and groundwater quality:
- The drilling and operation of gas production wells and the expansion of an existing CGTU at the Surgil Field;
- The construction and operation of below ground gas and condensate pipelines from the Surgil Field to the new UGCC and the following associated infrastructure:
  - telecommunication line and transmission line parallel to the pipelines; and
  - the tie in of new gas and condensate pipelines from East Berdakh CGTU to the Surgil gas and condensate pipelines.
- The construction and operation of the UGCC and associated infrastructure near the village of Kyrkkyz/Akchalak on the Ustyurt Plateau, including:
  - 5 km road, 7 km rail link and a 5 km sales gas pipeline from / to the Akchalak Compressor Station;
  - 12 km electricity supply line from the Kungrad Soda Plant
  - Main and back up water conduits from regional water supply units;
  - Solid and domestic waste storage area;
  - Wastewater pond and pipelines.

The pipelines from the Surgil CGTU to the UGCC will be laid partly on the former bed of the Aral Sea at an elevation of approximately 50 metres (Baltic datum). The rest of the pipelines will be laid across the elevated Ustyurt Plateau. In order to reach the upper edge of the plateau, from the Aral Sea basin, the Surgil pipelines will ascend the escarpment at Urga, close to an existing pipeline

Potential impacts relating to the three components above are discussed separately in the following sections. Based on an initial assessment for this Project, there are three main categories of potential impact relating to soils, geology and groundwater as outlined below. These have been considered for the construction, operational and decommissioning phases of each component.

11.4.1.2 Erosion

Erosion is a significant problem for much of Uzbekistan, particularly relating to poor irrigation schemes and water depletion (Aral Sea). Wind is the main erosion factor on the open plains (Zachar, 1982) particularly on the Aral Sea bed. Desert ecosystems are particularly vulnerable to physical damage from vehicle movements, which result in loss of plant cover and disaggregation of soil particles.

11.4.1.3 Groundwater abstraction

Water supply for the UGCC will be taken from a surface water source. However, groundwater will be used to supply process water for the drilling works in the Surgil gas field and the CGTU, and treated potable water for the adjacent camp. Groundwater will be abstracted from the Cretaceous aquifer.

There is no information on other abstractions in the Project area. Groundwater is unlikely to be used for irrigation, as there is no agriculture in the area. However, it is considered that small numbers of supply wells are present in some areas of the Ustyurt Plateau, used by nomadic herders for stock watering. It is not known the exact locations of these water supply wells but no wells have been found to be present within 1 km of the UGCC boundary or the UGCC supporting infrastructure and are therefore not within the zone of influence of activities at the site. Based on our knowledge of the groundwater quality, we assume that these abstract from the deeper Cretaceous aquifer.

11.4.1.4 Contamination hazards

The main potential contamination impacts for the Project are associated with the use, transport and storage of hazardous materials and waste disposal. Contamination has potential implications for soil and groundwater quality.

Disturbance of existing soil contamination, especially in the area of the former Aral Sea bed but also at locations impacted by historic and ongoing oil and gas exploration and extraction activities, also presents a potential contamination impact.

For all aspects of the construction, operation and decommissioning works, there is the potential for secondary impacts to construction and site workers from the handling of hazardous materials including contaminated soils. Where relevant, these impacts are also discussed in the sections below. However, if appropriate Personal Protective Equipment (PPE) and standard construction methods are adhered to, the possibility of construction workers being impacted by contaminated land is low.

11.4.2 Surgil Gas Field and CGTU

11.4.2.1 Construction Phase

Erosion

Earthworks and vehicle movements relating to well drilling, and construction of roads, pipelines, CGTU and gas gathering stations have the potential to cause degradation of the desert soils, and erosion. New roads will be established and elevated using material excavated from the road sides. Potential impacts to soils are assessed as insignificant to minor adverse. A subsequent and secondary effect of erosion includes creation of dust. In some areas of the project where slightly elevated levels of some soil contaminants are known to be present this may have implications for human health and ecological receptors near to areas where construction activities are to be carried out. The potential impacts from the creation of dust are discussed in more detail in the Air Quality Chapter (see Section 15).

Groundwater Abstraction

Groundwater will be abstracted from the Cretaceous aquifer to supply the drilling works. Industrial water is required for drilling mud preparation. It is also used for various drilling operations; for pressure testing and for cleaning. The required water quality is low.

As there are no other known abstractions local to the CGTU or Surgil field (other than those relating to gas extraction activities) the impact of groundwater abstraction for the CGTU on the Cretaceous aquifer is unlikely to be significant.

Soil Contamination from Construction Activities

A range of materials are used in drilling fluids to aid the drilling process. Constituents of drilling mud include: bentonite, clay polymer, soda ash, caustic soda, oil and ferrochromelignosulphonate. Waste drilling fluids also contain drill cuttings, hydrocarbons and may contain formation waters with elevated salt and mineral concentrations. The raw materials will be stored and the drilling mud mixed onsite. Waste drilling fluids are currently and will continue to be stored in cuttings storage barns at each of the well drilling sites.

Following the drilling of the gas wells, tests are undertaken to establish flow rates and formation pressures. The tests may produce gas, condensate and formation water. The recovered liquid/gas mixture is not safe to transport (due to its explosive nature), the safest option for disposal is therefore by flaring in designated burning pits. The formation water vaporises at the high flaring temperatures. The potentially harmful products of condensate burning include smoke which may contain carcinogenic compounds such as PAHs, furans and dioxins, and unburned hydrocarbons (oil mist).

Other hazardous materials will be used during the construction of the CGTU including fuels, oils, cement and it is likely that chemicals for cleaning the pipeline will be used. These materials will require transport to the site and will be stored onsite.

Contamination impacts during drilling and construction may result from:
- Leaks and spills of hazardous materials during transport, handling and use;
- Disposal of solid and liquid wastes from the drilling process. Both well workover fluids and drilling mud contain a mixture of chemical additives and hydrocarbons which, if not suitably handled or disposed,

may result in contamination of soil and groundwater with potential implications for ecology and human health (including drillers). Pollutant migration pathways can damage soils and groundwater if seepage and leaching are not contained. There are also secondary potential implications for wildlife (including birds) or workers that could come into contact with the fluids or the sediments in the base once the lagoon has dried.

- Flaring of well testing fluids. Where flaring is not effective at burning all liquids, hydrocarbons are discharged directly to the ground;
- Spills associated with a well blow out (abnormal / emergency event). High formation pressures and gas pockets present a potential risk of a well blow out, which could potentially lead to an uncontrolled release of hydrocarbons (condensate), gas or well fluids, which may also lead to fire. The risk of uncontrolled release is greatly reduced by use of blow out preventers both during drilling and operation. Should these fail, there is a potential for significant impacts to environmental and human health receptors. However, there is considered to be a low likelihood of failure;
- Disposal of construction waste. All waste will be disposed to a suitable waste facility;
- Disposal of contaminated soils. Any soils removed during the well and CGTU construction works may require off-site disposal, for example where soil is found to be contaminated. Where contaminated land is identified, and remediated or removed, the quality of the remaining soil is expected to be improved; and
- Drilling through groundwater aquifers. Drilling fluids pumped into the borehole to aid the drilling process have the potential to directly impact groundwater if the borehole is not fully sealed.

Contamination has the potential to affect soil quality locally at each of the well drilling sites and at the CGTU construction site. Soil is considered to be a negligible sensitivity receptor. Based on its low value, the significance of impacts to soils is assessed as insignificant. However, if not suitably controlled soil contamination has the potential to impact human health. There are no inhabitants and there is no agriculture within the study area. The most likely receptors include site operatives and visitors. Ground investigation undertaken in 2011 has shown that some hydrocarbon contamination is present in soils associated with well drilling activities including storage of waste drilling fluids. Based on the results of the investigation, hydrocarbon concentrations in soils are unlikely to present a significant health risk to site workers. The significance of the potential impacts to human health associated with potential contamination resulting from drilling and construction are assessed as minor to moderate adverse without mitigation.

Historic Soil Contamination

Investigation of surface soils in the Surgil field has found slightly elevated levels of the organo-chlorine pesticide, DDT, at a number of locations within 1 km of the CGTU. The DDT is likely to have resulted from irrigation run-off from former agricultural areas around the Aral Sea on which organochlorine pesticides were heavily used. Concentrations of DDT were found to slightly exceed the national (MPC) and international (Canadian and Dutch) assessment criteria for the protection of human health at three discrete locations within the Surgil field. The US Department of Health and Human Services (DHHS) has determined that 'DDT may reasonably be anticipated to be a human carcinogen' (ATSDR).

DDT may present a potential risk to the health of workers via inhalation, dermal contact or ingestion of airborne dusts. The health risks and mitigation associated with contaminated dusts are considered further in Chapter 15, Air Quality.

Taking into account potential human health impacts, the significance of this effect is assessed as moderate adverse without mitigation.

Contamination of Groundwater

There is the potential for contamination to also affect groundwater quality in the shallow aquifer. Groundwater in this aquifer is considered to be a low sensitivity receptor. The magnitude of this environmental effect is assessed as being moderate and the significance is therefore assessed as minor adverse. In the event of a large scale contamination event such as a well blow out or tanker spill, the impacts to groundwater quality could potentially be minor to moderate adverse.

11.4.2.2 Operational Phase

Erosion

Access roads will be constructed prior to the operational phase. Based on the assumption that all vehicles will use designated roads, no significant impacts to soils from erosion are anticipated for the operational phase of the CGTU and Surgil gas field.

Groundwater Abstraction

Groundwater will be abstracted to supply the CGTU and camp. This is unlikely to have implications for other users as there are no other known abstractions in the area.

Soil Contamination from Operational Activities

Similar to the construction phase, the main potential contamination impacts for the Project are associated with the use, transport and storage of hazardous materials and waste disposal.

The gas treatment process at the CGTU involves separation of condensate and water from the gas stream. The produced water is treated to remove most condensate and is then disposed to evaporation lagoons. These evaporation lagoons have been constructed with an impermeable base.

Impacts may result from:
- Leaks and spills from the storage and use of hazardous materials at the CGTU; and
- Leaks and spills from the disposal of produced water.

Contamination has the potential to affect soil quality locally at the CGTU site. Soil is considered to be a negligible sensitivity receptor. Based on its low value, the significance of impacts to soils is assessed as insignificant. However, if not suitably controlled soil contamination has the potential to impact human health. There are no habitants and there is no agriculture within the study area and in the wider vicinity of the project site. The most likely receptors include site operatives and visitors and taking into account this potential impact to human health the significance of this effect is assessed as moderate to major adverse without mitigation.

Historic Soil Contamination

As for the construction phase (see Section 11.4.2.1) existing localised DDT contamination in shallow soils within the Surgil field may present a potential risk to the health of site workers via inhalation, dermal contact or ingestion of airborne dusts. The health risks and mitigation associated with contaminated dusts are considered further in Chapter 15, Air Quality.

Taking into account potential human health impacts, the significance of this effect is assessed as moderate adverse without mitigation.

Contamination of Groundwater

There is the potential for contamination to also affect groundwater quality in the shallow aquifer. Groundwater in this aquifer is considered to be a low sensitivity receptor. The magnitude of this environmental effect is assessed as being moderate and the significance is therefore assessed as minor adverse. In the event of a large scale contamination event such as a tanker spill, the impacts to groundwater quality could potentially be major adverse.

11.4.3 The Gas and Condensate Pipelines

11.4.3.1 Construction Phase

Erosion

Earthworks and vehicle movements relating to the pipeline and associated infrastructure construction, including temporary roads, and power and communication lines have the potential to cause degradation of the desert soils, and erosion. Potential impacts to soils are assessed as insignificant to minor adverse. A subsequent and secondary effect of erosion includes creation of dust. In some areas of the project where low levels of soil contamination are known to be present, for example in the Aral Sea area, this may have implications for human health, ecological receptors and agriculture many kilometres away. The potential impacts from the creation of dust are discussed in more detail in the Air Quality Chapter (see Chapter 15).

The pipeline will ascend the Ustyurt Plateau via the escarpment at Urga. Assuming that the pipeline structure will include protection from erosion and landslips, where it ascends the Plateau, in the long term, the structure will likely improve the stability of the escarpment in this area but may temporarily increase the risk of erosion, landslips and rockfall during construction.

Groundwater Abstraction

It is anticipated that groundwater will be sourced from abstraction wells at the CGTU in the Surgil field for hydrostatic testing during commissioning of the pipeline. Water will be abstracted to test the first section of pipeline. This will then be reused to test each of the following sections. Once the final section has been tested at the UGCC the water will be chemically tested to check that it meets the IFC water quality guidelines. Finally the water will be either treated prior to discharge, or directly discharged to the UGCC water lagoon. Further details are provided in Chapter 9 (water resources and quality).

Soil Contamination from Construction Activities

The main potential contamination impacts for the construction of the pipelines are associated with the use, transport and storage of hazardous materials and waste disposal.

Water treated with chemicals will be used to hydrostatically test the pipelines during commissioning. All water will be collected and treated at the UGCC and disposed to the UGCC wastewater pond.

Impacts may result from:
- Leaks and spills from construction equipment. This would mainly comprise fuel leaks;

- Localised soil contamination from pipeline coating practices;
- Leaks and spills during hydrostatic testing of the pipelines. This may involve discharge of large volumes of contaminated waters to the ground surface with potential for impacts to the shallow aquifer; and
- Construction may disturb contaminated soils along the pipeline route, particularly in areas of the former Aral Sea Bed where low levels of soil contamination may be present. Intrusive ground works may mobilise contaminants, resulting in the spread of contamination to other secondary sensitive receptors, for example human health.

Construction works have the potential to disturb soils along the pipeline route, particularly to create dust. There is also a potential for leaks from construction equipment or during the hydrostatic testing. Soil is considered to be a negligible sensitivity receptor. Based on its low value, the significance of impacts to soils is assessed as insignificant.

Historic Soil Contamination

Ground investigation in the Surgil field has identified slightly elevated concentrations of the organochlorine pesticide DDT in shallow soils within the Aral Sea Basin. If not suitably controlled, soil contamination has the potential to impact human health. There are no habitants and there is no agriculture within the study area. The most likely receptors include construction workers and taking into account this potential impact to human health, the significance of this effect is assessed as moderate adverse without mitigation.

11.4.3.2 Operational Phase

Erosion

No access roads will be constructed for the operational phase. Impacts to soils from erosion are anticipated for the operational phase of the pipelines. However, this will be limited due to the infrequent nature of accessing the area. The significance of the effect is assessed as insignificant to minor adverse without mitigation.

There could be a risk of erosion as the pipeline passes from the Aral Sea bed via the Urga crossing onto the Urstyurt Plateau due to landslide events. The pipeline trench into which the pipeline is installed will be dug to a sufficient depth in order to allow adequate backfilling to create a stabilised ground surface. Whilst the Urga crossing does experience land slides, the pipeline installation technique will take this into consideration in order to minimise the risk of the pipeline area be the source of landslides. The risk of erosion at this location is therefore assessed to be minor and insignificant.

Groundwater Abstraction

No significant impacts to groundwater are anticipated for operational phase of the pipelines. Potential secondary impacts as a result of contamination are discussed below.

Soil Contamination from Operational Activities

The main potential contamination impacts are associated with potential damage to the condensate pipeline. Impacts may result from large scale leaks and spills as a result of structural damage or corrosion due to aggressive soil conditions. However, protective coating applied during the construction process should minimise the likelihood of corrosion occurring and the buried nature of the pipelines minimises possible impact damage to the pipelines. Physical damage to the pipeline is considered to be a particular risk where the pipeline ascends the Urga crossing (Vostochniy 'Chink' Usturta escarpment). This area is noted to be subject to land slips which have the potential to damage the pipelines if they are exposed.

In the event of a large scale contamination event, the impacts to groundwater quality could potentially be major adverse.

Regular cleaning of the pipeline will be undertaken during its operational lifetime. Sludge and condensate collected during the cleaning process will be returned to the UGCC for handling and disposal.

Historic Soil Contamination

Localised DDT contamination in shallow soils along the pipeline route within the Surgil field may present a potential risk to the health of site workers via inhalation, dermal contact or ingestion of airborne dusts. The most likely receptors include maintenance workers. However, this will be limited due to the infrequent nature of accessing the area.

Taking into account this potential impact to human health, albeit for more limited periods of exposure that for workers at the Surgil Field, the significance of this effect is assessed as minor adverse without mitigation.

11.4.4 The UGCC

11.4.4.1 Construction Phase

Erosion

Earthworks and vehicle movements relating to the construction of the UGCC, associated infrastructure and the wastewater pond have the potential to cause degradation of the desert soils, and erosion. New roads will be constructed and elevated using material excavated from the road sides which will limit the extent and duration over which erosion could occur. Potential impacts to soils are assessed as insignificant to minor adverse. A subsequent and secondary effect of erosion includes creation of dust. The impacts from the creation of dust are discussed in more detail in the Air Quality Chapter (see Section 15).

Groundwater Abstraction

No groundwater abstraction is anticipated for the construction of the UGCC. This is not considered to be a potential impact for this part of the Project.

Soil Contamination from Construction Activities

The main potential contamination impacts for the Project are associated with the use, transport and storage of hazardous materials and waste disposal, during the construction works.

Impacts may result from:

- Leaks and spills from construction equipment or transport vehicles (tankers or trains). This would mainly comprise accidental fuel discharge, most likely during refuelling or collision accidents;
- Leaks and spills during testing of equipment; and
- Solid and liquid waste disposal.

Contamination has the potential to affect soil quality locally at the UGCC site. The soil is considered to be a negligible sensitivity receptor. Based on its low value, the significance of impacts to soil is assessed as insignificant.

Based on ground investigation data for the UGCC site, there is unlikely to be any existing contamination in soils underlying the site. However, there is a potential during the construction phase to cause contamination through leaks and spills or improper waste disposal. If not suitably controlled soil contamination has the potential to impact human health. There are currently no inhabitants and there is no agriculture within the study area. The most likely receptors include site operatives and visitors that will be working and living in the area and taking into account this potential impact to human health the significance of this effect is assessed as moderate to major adverse without mitigation.

There is the potential for contamination to also affect groundwater quality in the shallow aquifer. Groundwater in this aquifer is highly saline and is therefore considered to be a low sensitivity receptor. The magnitude of this environmental effect is assessed as being moderate and the significance is therefore assessed as minor adverse.

11.4.4.2 Operational Phase

Erosion

New roads will be established prior to operation of the UGCC. Given that all vehicles will use designated roads and no wastewater discharge to land will take place from UGCC infrastructure, no significant impacts to soils from erosion are anticipated for the operational phase of the UGCC.

Groundwater Abstraction

No groundwater abstraction is anticipated for the operation of the UGCC. This is not considered to be a potential impact for this part of the Project.

Soil Contamination from Operational Activities

The main potential contamination impacts for the operation of the UGCC are associated with the use, transport and storage of hazardous materials, and the handling of waste. A range of materials are used in the gas separation, manufacturing process and general operation of the chemical plant. These include process chemicals, fuel and chemicals for water treatment and will be stored in a tank farm at the UGCC. Significant volumes of the following chemicals will be stored at the site: liquid ethylene and propylene; LPG; butane and hexane; sulphuric acid; caustic soda; and diesel. Lesser volumes of other chemicals such as sodium hypo-chlorite; amine; and phosphate and iron dispersant will also be used and kept at the site.

Wastewater comprising oily water and non-oily process water, sanitary wastewater and contaminated storm water will be generated at the UGCC site. Water will be treated locally onsite to remove solids and separate oils. The water will then be pumped offsite and stored in a retention basin where it will be biologically treated prior to storage for reuse in the UGCC wastewater reservoir.

Impacts may result from:

- Leaks and spills during the transport, loading and unloading and storage of hazardous materials;

- Handling, transport and disposal of hazardous waste. It is understood that there will be a dedicated waste storage site for the UGCC from where wastes will be removed by licensed waste contractors ; and
- Leaks and spills during the handling, transport and disposal of wastewater.

Contamination has the potential to affect soil quality locally at the UGCC site. The soil cover on the Ustyurt Plateau is thin and of poor agricultural quality. It is considered to be a negligible sensitivity receptor. Based on its low value, the significance of impacts to soil is assessed as insignificant. However, if not suitably controlled soil contamination has the potential to impact human health. There are no inhabitants within 5 km and there is no agriculture within the study area. The most likely receptors include site operatives and visitors and taking into account this potential impact to human health the significance of this effect is assessed as moderate to major adverse without mitigation.

There is the potential for contamination to also affect groundwater quality in the shallow aquifer. Groundwater in this aquifer is considered to be a low sensitivity receptor. The magnitude of this environmental effect is assessed as being moderate and the significance is therefore assessed as minor adverse. In the event of a large scale contamination event such as a tank or tanker spill, the impacts to groundwater quality could potentially be minor to moderate adverse.

11.5 Mitigation Measures

11.5.1 Overview

The main impacts on soils for all aspects and phases of the project are considered to be erosion and contamination. This is particularly significant during the early construction phase when ground disturbance, leaks and spills are more likely. Erosion due to vehicle movements and construction works will be mitigated through construction of dedicated access roads, generally covered with hardstanding, and by confining traffic movements to these defined routes. Erosion due to construction and excavation works can be minimised by re-establishing vegetation in these areas following construction. Habitat reinstatement arrangements for all temporary working areas are discussed in Chapter 8.

Contamination impacts from leaks and spills can be mitigated through use of best practice construction methodology in line with local regulations and international guidelines. Impacts from waste can be suitably mitigated by following a project specific waste management plan. For all aspects of the Project a comprehensive Health, Safety and Environment (HSE) Plan should be implemented, aimed at preventing accidents, injuries and work-related diseases through the identification of the causes of physical, chemical and biological hazards and by prioritising hazard elimination, hazard control and hazard minimisation.

The mitigation measures identified below are incorporated into the following sections of the assessment to identify any residual impacts after mitigation. Mitigations will also be captured as part of the project Environmental and Social Management Plan (ESMP).

11.5.2 Surgil Gas Field and CGTU

11.5.2.1 Groundwater Abstraction

The availability of groundwater and potential for impacts on other users is discussed further in Chapter 9.

11.5.2.2 Contamination

Mitigation measures required for drilling in the Surgil Gas Field are summarised in Table 11.10 below:

Table 11.10: Mitigation Measures Required during the Drilling

Process/Activity	Impact	Mitigation measures
Drilling	Groundwater aquifers	Protect the aquifer by casing the borehole.
Leaks and spills	Soil quality with secondary impacts on groundwater quality and human health.	All drilling sites will be covered with concrete. Raised roadways will be lined, with drainage ditches to capture surface run off from any leaks and spills. These will feed into lined wastewater pits for the drilling sites. Drip trays and concrete lined trenches will be constructed to capture leaks and spills from equipment. Where spills occur, implement spill response plan in accordance with IFC guidance (IFC, 2007). Clean-up contaminated material in case of fuel leaks. Hazardous materials will be suitably stored to prevent leaks and spills. Adequate bunding will be provided for all fuel, chemical storage and mud mixing containers. Develop and implement an Emergency Response Plan and a separate Spill Contingency Plan in accordance with local regulations and IFC and HSE guidance.
Flaring during well testing	Production of smoke. Contamination of groundwater. Resultant impacts on land quality, human health and air quality.	Flaring to be undertaken in accordance with international guidance (IFC, 2007b, p 4). Only the minimum volume of hydrocarbons required for well testing to be flowed to reduce the amount of flaring required. The base of the flare pit to be lined with a layer of bentonite covered with sandbags. The sandbags will eventually glass over providing a seal in the base of the pit.
Drilling waste storage in surface storage pits and wastewater storage in evaporation lagoons	Soil quality with secondary impacts on groundwater quality and human health.	Where possible waste drilling fluids will be treated and re-used. Waste drilling fluids that cannot be reused, including mud and cuttings, would be stored in clay lined storage basins to prevent infiltration into underlying soils. Storage basins will be constructed using a clay liner. Wastewater evaporation lagoon for the treatment and storage of wastewater will be constructed using a clay liner. According to IFC guidance (IFC, 2007b, p 8) the liners should have a coefficient of permeability of no greater than 1x10-7 cm/sec. The drilling waste storage basings will be constructed inside storage barns to prevent rainfall ingress. Erect perimeter fences around pits and screen the pit to prevent access by humans, livestock, wildlife and birds. The drilling fluid/cuttings waste will be immediately neutralised in the storage pit in order to stabilise the waste and prevent migration. Solidified material will settle creating a solid layer that builds up during the operation of the disposal basin generating an immobile and inert waste stream. Also refer to Chapter 10. Regularly remove hydrocarbons from the lagoon surface to enable evaporation of the water. Any contamination residue from the evaporation lagoons will be excavated periodically (approximately once every three years) and taken to the licensed Muynak landfill for disposal. Sampling will be undertaken ahead of disposal to determine which hazard category the

Process/Activity	Impact	Mitigation measures
		sludge will be categorised as.
Contaminated soils at existing well sites and waste oil in pits at existing well sites.	Impacts on soil quality and secondary impacts on human health and groundwater quality.	Cover, or remove and dispose of contaminated soils that have the potential to impact sensitive receptors to a suitable landfill.
Removal of contaminated soils at existing well sites.	Impacts on soil quality over a wider area. Soil degradation leading to erosion.	Use 'damping down' measures during excavation and movement of contaminated soils to prevent dust migration.
Waste Disposal	Land quality, human health, ecology and groundwater quality.	Develop and implement a waste management plan detailing strategy, storage and handling procedures.
Well drilling and development	Worker health and safety.	Undertake works in accordance with international health and safety standards (IFC, 2007d) (also see below).

Mitigation measures required for construction and operation of the CGTU and other infrastructure are summarised in Table 11.11 below:

Table 11.11: Mitigation Measures required during construction and operation of the CGTU and other infrastructure

Process/Activity	Impact	Mitigation measures
Construction Phase		
Leaks and spills	Soil quality with secondary impacts on groundwater quality and human health.	Use best practice construction methodology in line with local regulations and international guidelines. Drip trays will be used to intercept leaks and spills from equipment and during refuelling. Develop and implement an Emergency Response Plan and a separate Spill Contingency Plan in accordance with local regulations and IFC and HSE guidance. Clean-up contaminated material in case of fuel leaks. Hazardous materials will be suitably stored to prevent leaks and spills. Adequate bunding will be provided for all fuel and chemical storage.
Earthworks for construction of roads and other project infrastructure	Mobilisation of dust and secondary impacts on human health	Undertake earthworks during suitable weather conditions i.e. low wind strength to minimise the level of wind blown dust, which may be potentially contaminated. Contractors to wear suitable PPE to protect against inhalation of dust. A quantitative risk assessment has been carried out to further specify the level of PPE required in line with site specific risk factors, a summary of which is presented below. Use 'damping down' measures during excavation and movement of contaminated soils to prevent dust migration.
Operational Phase		
Leaks and spills	Soil quality with secondary impacts on groundwater quality and human health.	Waste oil from the CGTU will be collected and transported by tanker to a suitable facility for disposal/treatment. Develop and implement an Emergency Response Plan and a separate Spill Contingency Plan in accordance with local regulations and IFC and HSE guidance.

There is a potential for impacts to the health of contractors and site workers during construction activities where existing soil or groundwater contamination may be present, or when handling hazardous waste materials. A comprehensive Occupational Health and Safety Plan aimed at preventing accidents, injuries and work-related diseases through the identification of the causes of physical, chemical, biological and radiological hazards and by prioritising hazard elimination, hazard control and hazard minimisation would be implemented.

11.5.2.3 Historic Soil Contamination

Surface soil sampling has shown that shallow soils in some areas of the Surgil field contain DDT, an organochlorine pesticide, at concentrations slightly exceeding national and international (Canadian and Dutch) human health criteria. Preliminary risk assessment indicates that elevated concentrations of DDT may present a potential risk to the health of site workers via inhalation or ingestion of airborne dusts, or dermal contact.

The preliminary risk assessment presented in this report is based on a conservative set of risk assessment thresholds assuming exposure under a generic set of receptor and pathway assumptions. In the case of the Uzbekistan assessment thresholds, the precise assumptions underpinning these standards are not recorded.

The potential impacts of site specific soil contamination exposure factors including dust creation have been assessed further through undertaking a human health Detailed Quantitative Risk Assessment (DQRA). A summary of the findings of the DQRA are presented in 11.5.2.4 and the full DQRA in Appendix III.

11.5.2.4 Detailed Quantitative Risk Assessment

The DQRA incorporates site specific exposure parameters to achieve a risk assessment that is representative of the project area. The DQRA modelling was undertaken in accordance with the UK Contamination Land Exposure Assessment (CLEA) Framework[78] which has undergone an extensive period of peer review by toxicologists and contaminated land experts, making it scientifically authoritative and defensible.

The DQRA modelling was conducted assuming a set of site specific and reasonable default input parameters to produce a set of site specific thresholds for the various contaminants. Thereafter a sensitivity analysis was performed on a range of input parameters to assess uncertainties associated with exposure across the range of exposure pathways identified in the default model for each contaminant. The following input parameters were subject to the sensitivity analysis:

- Soil ingestion rate – in recognition that Surgil Field workers could be exposed to high levels of dust and soil which could increase ingestion rates above the average levels assumed in the default model;
- Ground cover by hard surfaces or vegetation – to account for the fact that the oil field is located in a dry arid climate with very little vegetation;
- Soil temperature – in recognition of the high temperature variation present in the gas field area; and
- Wind speed – to account for the comparatively low variation in wind speed across the project area.

The outputs from the model are DQRA thresholds for inhalation and ingestion exposure pathways. The lowest DQRA threshold derived for each contaminant was compared with the thresholds used in the preliminary risk assessment and soil sample data to verify the findings of the preliminary assessment.

The findings of the DQRA show that the default site specific thresholds derived are higher than all the Uzbekistan MPCs for all measured parameters, and are also higher that the Dutch and Canadian Generic Assessment Criteria for all measured parameters, with the exception of small chain aliphatic and all aromatic TPHs. As a result the thresholds used in the preliminary assessment for all parameters except

[78] UK Environment Agency (2008): 'Updated technical background to the CLEA Model', Science Report SC050021/SR3

TPHs are considered to be conservative. It is recommended that the DQRA thresholds are applied by the Project during the assessment of any future soil investigations conducted within the gas field.

With reference to the 2011 soil investigation results, no exceedances of the DQRA thresholds were observed in the ground investigation samples for the tested determinants (including DDT concentrations), with the exception of TPHs. Furthermore the sensitivity analysis conducted on the above parameters confirms these conclusions are still valid even when accounting for conservative site specific exposure scenarios. As such the initial conclusions of the preliminary assessment which identified potential human health issues associated with tested DDT levels are no longer considered to apply and the results confirm there is no requirement for UNG / Uz-Kor to initiate additional remedial measures (including specialist PPE) at the Surgil Field to address risks to human health from the tested soil contaminants.

Based on ground investigation data collected in 2011, the generic risk assessment presented herein and the DQRA presented above, no significant contamination that could cause a significant risk to human health has been identified in shallow soils at the CGTU or at the well locations in the Surgil Gas field.

11.5.2.5 Mitigation of Risks to Human Health

Impacts to human health can be prevented by following good site practice and use of appropriate PPE in accordance with the IFC EHS General Guidelines (2007d). Suitable PPE includes: eye protection; body/leg protection; foot protection; hand protection; hearing protection; lung protection and head protection.

Regardless of the toxicological impacts assessed in the DQRA physical exposure to soil and dust can however still result in a risk to site workers and as such it is recommended good site practice and appropriate use of PPE in line with the IFC EHS General Guidelines is maintained at the gas field sites, in particular during construction works. Such requirements should be reviewed on a regular basis and PPE should be maintained and replaced when worn out. Occupational monitoring of workers will be undertaken in order to confirm the effectiveness of use of PPE and if required the PPE requirements will be revisted.

Other measures for protection of human health include: communication of potential hazards to workers; safe storage of hazardous materials; provision of suitable welfare facilities including clean water for washing and drinking; provision of suitable ventilation system in workers accommodation; environmental monitoring (e.g. gas and vapour monitoring) and emergency preparedness and response plans.

An emergency response plan will be prepared, detailing procedures, response personnel, medical support, equipment, evacuation procedures and measures for limiting or stopping potential events.

11.5.3 Pipelines

11.5.3.1 Contamination

Mitigation measures required for construction and operation of the pipelines are summarised in Table 11.12 below:

Table 11.12: Mitigation Measures required during construction and operation of the pipelines

Process/Activity	Impact	Mitigation measures
Construction Phase		
Leaks and spills	Soil quality with secondary	Use best practice construction methodology in line with local

Process/Activity	Impact	Mitigation measures
	impacts on groundwater quality and human health.	regulations and international guidelines. Chemical and oil to be stored in suitable containers and retained within mobile containment facilities with drip trays to minimise risk of loss in the event to container leakage. Develop and implement an Emergency Response Plan and a separate Spill Contingency Plan in accordance with local regulations and IFC and HSE guidance. Clean-up contaminated material in case of fuel leaks.
Leaks and spills during hydrostatic testing	Soil quality with secondary impacts on groundwater quality and human health.	Hydrostatic testing of both pipelines will be undertaken in sections to minimise the volume of water lost should a leak be detected. Develop and implement an Emergency Response Plan and a separate Spill Contingency Plan in accordance with local regulations and IFC and HSE guidance.
Waste Handling	Soil quality with secondary impacts on groundwater quality and human health.	Develop and implement a waste management plan detailing strategy, storage and handling procedures. Hydrostatic test waters will be treated at the UGCC before being disposed to the UGCC wastewater pond (see Section 1.5.3). The wastewater pond will be fully lined as per description in Chapter 2.
Operational Phase		
Leaks and spills during Emergency Event	Soil quality with secondary impacts on groundwater quality.	Safety valves will be installed along the pipe at regular intervals which can be manually or automatically operated in the event of an emergency. Safety valves will be installed along the condensate pipeline length at 10km intervals. These will minimise the volume lost and resultant contamination should there be any breaches of the pipeline structure. Develop and implement an Emergency Response Plan and a separate Spill Contingency Plan in accordance with local regulations and IFC and HSE guidance. Emergency response to include: hazard assessment prior to clean up, contractors would wear appropriate PPE and incident reporting.
Leaks and spills - general		To prevent corrosion of the pipeline and therefore any leaks, insulation and cathodic protection will be applied along the full length of the pipeline. In order to reduce the hazard of landslide damage to the pipelines the pipes will be buried as they traverse the Urga crossing. The pipeline route will be monitored on a monthly basis to check for damage and/or exposure caused by landslides. In the event that landslide erosion noted at pipeline crossing site remedial works to the area of erosion will be undertaken.

11.5.4 UGCC

11.5.4.1 Contamination

Mitigation measures required for construction and operation of the UGCC and other infrastructure are summarised in Table 11.13 below:

Table 11.13: Mitigation measures required during construction and operation of the UGCC and other infrastructure

Process/Activity	Impact	Mitigation measures
Construction Phase		
Leaks and spills	Soil quality with secondary impacts on groundwater quality and human health.	Use best practice construction methodology in line with local regulations and international guidelines. Develop and implement an Emergency Response Plan and a separate Spill Contingency Plan in accordance with local regulations and IFC

Process/Activity	Impact	Mitigation measures
		and HSE guidance. Clean-up contaminated material in case of fuel leaks.
Waste Handling	Soil quality with secondary impacts on groundwater quality and human health.	Develop and implement a waste management plan detailing strategy, storage and handling procedures.
Operational Phase		
Leaks and spills	Soil quality with secondary impacts on groundwater quality and human health.	Implement best practice methods for chemicals and oil storage including storage in appropriate containment facilities sided to contain at least 110% of the container. Emergency response for hydrocarbon storage tank leaks, installed emergency isolation valves. Develop and implement an Emergency Response Plan and a separate Spill Contingency Plan in accordance with local regulations and IFC and HSE guidance.
Waste Handling - water	Land quality, human health, ecology and groundwater quality.	Wastewater emissions will comply with local water quality and discharge regulations and will not exceed maximum allowable concentrations for discharge of wastewater to land and water. No discharge to land - oily wastewater will be treated at the UGCC before disposal in the off-site wastewater pond. Treatment will include separation of oil from the water by skimming and collection in drums, the water will then be biologically treated and pumped off-site. Sanitary wastewater will be biologically treated prior to off-site disposal. Other wastewaters that meet the local regulation quality requirements will be pumped directly off-site.
Waste handling - general	Land quality, human health, ecology and groundwater quality.	All industrial and hazardous wastes will be treated and/or disposed of at government approved waste treatment/disposal facilities. Where necessary hazardous waste containers will be designed and constructed of suitable materials to permanently contain the hazardous materials. Storage areas will be fenced off to prevent entry of unauthorized persons or vehicles. Secondary containment will be provided for hazardous material storage containers. Any underground storage tank system as defined in the government regulations will be provided with leak detection systems or secondary containment provisions, corrosion protection, overfill and overspill protection. Heavy hydrocarbon waste will be collected and re-used as fuel for the steam boiler. This will be transported by rail.
Waste Disposal - general	Land quality, human health, ecology and groundwater quality.	All wastes removed from the UGCC / waste storage site will be via licensed waste contractors either for treatment. re-use, recycling or final disposal at government licensed facilities / sites.

11.6 Summary

The significance of identified and assessed impacts can change through the implementation of mitigation enhancement measures. The residual effects of the Project contamination impacts are identified in Table 11.14.

Table 11.14: Summary of Impacts

Activity	Potential Impact	Sensitivity Score	Magnitude score	Impact and Significance	Mitigation & Enhancement	Residual Significance
Surgil Gas Field and CGTU – Construction and Decommissioning Phases						
Earthworks including: well drilling, construction of roads, pipeline, CGTU and gas gathering stations.	Erosion of soils.	Negligible-low	Minor-moderate	Insignificant-minor adverse	Construction of dedicated access roads covered with hardstanding. Habitat reinstatement for temporary working areas.	Not significant
	Mobilisation of potentially contaminated dust with secondary implications for human health.	High	Minor-moderate	Minor-moderate adverse	Implementation of a comprehensive Occupational Health and Safety Plan. Undertake human health DQRA to determine site specific factors for key pathways to facilitate the specification of appropriate PPE,, in accordance with the IFC EHS General Guidelines, required for site workers	Not significant
Well drilling activities	Leaks and spills to soils	Negligible-low	Minor	Insignificant-minor adverse	Use of best practice construction methodology in line with local regulations and international guidelines. Implement an Emergency Response Plan and a separate Spill Contingency Plan.	Not significant
	Secondary impacts to groundwater	Low	Minor-moderate	Minor adverse (major adverse – large scale spill)		Not significant
General construction/ deconstruction	Leaks and spills to soils	Negligible-low	Minor	Insignificant-minor adverse	Use of best practice construction methodology in line with local regulations and international guidelines. Implement an Emergency Response Plan and a separate Spill Contingency Plan.	Not significant
	Secondary impacts to groundwater	Low	Minor-moderate	Minor adverse (major adverse – large scale spill)		Not significant
Drilling waste storage in surface storage pits	Soil quality	Negligible	Minor to moderate	Insignificant	Evaporation lagoons and storage pits will be clay lined preventing infiltration. Solid waste will be removed periodically and disposed to the licensed Muynak landfill..	Not significant
	Secondary impacts to groundwater	Low	Minor-moderate	Minor adverse (major adverse – large scale spill)		Not significant
	Secondary implications for human health	High	Minor-moderate	Minor-moderate adverse	Fences will be erected around pits to prevent access. Workers to wear suitable PPE including dust masks.	Not significant

Activity	Potential Impact	Sensitivity Score	Magnitude score	Impact and Significance	Mitigation & Enhancement	Residual Significance
Surgil Gas Field and CGTU – Operational Phase						
Use, transport and storage of hazardous materials	Leaks and spills leading to soil contamination	Negligible-low	Minor -moderate	Insignificant-minor adverse	Use of best practice construction methodology in line with local regulations and international guidelines. Implement an Emergency Response Plan and a separate Spill Contingency Plan.	Not significant
	Secondary impacts to groundwater	Low	Minor-moderate	Minor adverse (major adverse – large scale spill)		Not significant
	Secondary implications for human health	High	Moderate-major	Moderate to major adverse	Implementation of a comprehensive Health, Safety and Environment (HSE) Plan. Use of appropriate PPE in accordance with the IFC EHS General Guidelines.	Not significant
Waste disposal	Contamination of soils, impacts to soil quality.	Negligible-low	Minor- moderate	Insignificant-minor adverse	Implementation of a site specific waste management plan.	Not significant
Pipeline – Construction and Decommissioning Phase						
Earthworks and vehicle movements.	Erosion of soils	Negligible-low	Minor- moderate	Insignificant-minor adverse	Construction of temporary roads.	Not significant
	Creation of potentially contaminated dust with secondary implications for human health.	High	Moderate	Moderate adverse	Implementation of a comprehensive Health, Safety and Environment (HSE) Plan. Use of appropriate PPE in accordance with the IFC EHS General Guidelines	Not significant
Construction/pipeline laying activities	Leaks and spills to soil	Negligible	Minor to moderate	Insignificant	Use of best practice construction methodology in line with local regulations and international guidelines. Implement an Emergency Response Plan and a separate Spill Contingency Plan.	Not significant
Pipeline – Operational Phase						
Vehicle movements	Erosion of soils	Negligible-low	Negligible-low	Insignificant-minor adverse	Limited vehicle movements due to the infrequent nature of accessing the area	Not significant
Damage to pipeline due to intentional damage, corrosion	Large scale Leaks and spills to soil	Negligible-low	Moderate-major	Moderate-major adverse	Protective coating will minimise corrosion.	Not significant

Activity	Potential Impact	Sensitivity Score	Magnitude score	Impact and Significance	Mitigation & Enhancement	Residual Significance
or landslips	Secondary impacts to groundwater	-	-	Major adverse	Implement an Emergency Response Plan and a separate Spill Contingency Plan.	Not significant
UGCC – Construction and Decommissioning Phases						
Earthworks including: construction of UGCC, associated infrastructure and wastewater pond.	Degradation of soils/erosion	Negligible-low	Negligible-low	Insignificant-minor adverse	Construction of dedicated access roads covered with hardstanding. Habitat reinstatement for temporary working areas.	Not significant
Use, transport and storage of hazardous materials	Leaks and spills leading to soil contamination	Negligible	Minor -moderate	Insignificant	Use of best practice construction methodology in line with local regulations and international guidelines. Implement an Emergency Response Plan and a separate Spill Contingency Plan.	Not significant
	Secondary implications for human health	High	Moderate-major	Moderate to major adverse	Implementation of a comprehensive Health, Safety and Environment (HSE) Plan. Use of appropriate PPE in accordance with the IFC EHS General Guidelines	Not significant
	Secondary impacts to groundwater	Low	Moderate	Minor adverse		Not significant
Waste disposal	Contamination of soils, impacts to soil quality.	Negligible-low	Minor- moderate	Insignificant-minor adverse	Implementation of a site specific waste management plan.	Not significant
UGCC – Operational Phase						
Use, transport and storage of hazardous materials	Leaks and spills leading to soil contamination	Negligible	Minor -moderate	Insignificant	Use of best practice construction methodology in line with local regulations and international guidelines. Implement an Emergency Response Plan and a separate Spill Contingency Plan.	Not significant
	Secondary impacts to groundwater	Low	Moderate	Minor adverse		Not significant
	Secondary implications for human health	High	Moderate-major	Moderate to major adverse	Implementation of a comprehensive Health, Safety and Environment (HSE) Plan. Use of appropriate PPE in accordance with the IFC EHS General Guidelines	Not significant
Waste disposal	Impacts to groundwater	Low	Moderate	Minor adverse	Implementation of a site specific waste management plan.	Not significant

Activity	Potential Impact	Sensitivity Score	Magnitude score	Impact and Significance	Mitigation & Enhancement	Residual Significance
	Contamination of soils, impacts to soil quality.	Negligible	Minor-moderate	Insignificant		Not significant

11.7 Proposed Monitoring

A groundwater monitoring plan will be instated to monitor ongoing groundwater quality during the construction and operation of the facility. Groundwater monitoring wells will be installed at locations down hydraulic gradient of the facility (and wastewater lagoon).

11.8 Statement of Significance

This chapter has assessed the impacts from the project to soil structure and soil quality and the secondary impacts to groundwater quality and human health from contaminated soils. Based on the low value of soils in the project area the Project is unlikely to have a significant impact on soils. Minor to moderate adverse impacts have been identified for groundwater and human health from existing or potential future contamination. However, it is considered that the mitigation measures presented in this document can fully address all of these impacts so that no significant residual impacts remain.

The use of appropriate personal protective equipment in accordance with the IFC EHS General Guidelines should mitigate any impacts to the health of workers in the project area.

Provided that the appropriate mitigation measures are followed, no significant residual impacts to soils and human health are anticipated for the construction, operational and decommissioning phases of this project.

11.9 Additional Reference

ATSDR, ToxFAQs™ for DDT, DDE, and DDD, Agency for Toxic Substances and Disease Agency, http://www.atsdr.cdc.gov/toxfaqs/TF.asp?id=80&tid=20, viewed 1 August 2011

CCME (2011), Canadian Environmental Quality Guidelines and Summary Table, http://st-ts.ccme.ca/

Ministry of Housing, Spatial Planning and Environment (VROM), 2009, *Soil Remediation Circular,* Directorate General For Environmental Protection, Government of the Netherlands, http://international.vrom.nl/Docs/internationaal/ENGELSE%20versie%20circulaire%20Bodemsanering%202009.pdf

Research Institute of Sanitation, Hygiene and Occupational Diseases of Ministry of Health of Uzbekistan (2006) Health and Safety, and hygienic PRACTICE OF UZBEKISTAN, SANITARY Maximum permissible concentration (MPC) and TENTATIVE Permissible concentration (MPC) EXOGENOUS HARMFUL SUBSTANCES IN SOIL,

Soiltech Engineering Co. Ltd (2010) Geotechnical Investigation Report for UGCC Project Akchalak, Uzbekistan, dated 22 January 2010

State Nature Protection Committee of the Republic of Karakalpakstan, 2011, Information Report of sampling and testing executions for soils and water at UGCC site in Kungrad District and at Surgil gas field in Muynak District.

12. Noise and Vibration

12.1 Introduction

This chapter has been prepared in order to determine the potential noise and vibration impacts of the Project and associated infrastructure.

The three main components of the Project have been assessed:

- Upstream: The expansion of associated production infrastructure for the Surgil Field, including the extension of an existing Complex Gas Treatment Unit (CGTU) at the Surgil Field (hereafter referred to as the Surgil CGTU);
- Downstream: The Ustyurt Gas and Chemical Complex (UGCC) on the Ustyurt Plateau for the production of HDPE and PP and the export of sales gas; and,
- Gas and condensate pipelines: The below ground gas and condensate pipelines (hereafter referred to as the pipelines) to connect the Surgil Field to the new UGCC.

The likelihood of noise and vibration impacts on the surrounding environment as a result of the construction, operation and decommissioning phases of the Project including the likely impact of road traffic movements have been investigated. The potential impact of freight train noise has not been considered in this assessment as it has been calculated that only a single Project freight train will use the railway line each day. The impact of this activity over the course of an entire day will be insignificant.

Noise emissions from the Project will not have a material impact beyond a distance of 2km from each of the Project components due to the propagation capacity of noise and localised environmental effects. The nearest sensitive receptors have however been included in the survey for completeness, irrespective of distance from the Project.

The primary sensitive receptors in respect of the Surgil Field are considered to be located 31 km to the south-east, in the village of Uchsay. The nearest settlement to the UGCC site is the village of Akchalak, approximately 5km to the west. The vast majority of the pipeline route area is uninhabited and undeveloped other than oil and gas operations.

Noise impacts will arise through a number of sources during each phase of the Project, potentially generating levels in excess of prevailing conditions or recommended limits at the sensitive receptors. The construction phase may result in increased noise levels as a result of site preparation activities, drilling works, excavation and foundation works, road upgrade and site traffic movements, building construction and the installation of heavy plant.

The operational phase of the Project will generate noise through the use of industrial plant such as extraction well heads, gas gathering stations (GGS) and the Surgil CGTU at the Surgil Field. The UGCC will contain a number of sources of noise including the gas separation plant (GSP), ethylene plant (EP), HDPE plant, PP plant in addition to supporting utilities and offsite infrastructure. The pipelines will not generate noise during normal operation as they will be located below ground. The activation of safety valves will generate pipeline noise, however, such an event will only occur during emergency conditions.

The likely impact of the decommissioning phase is expected to be similar to but less significant than the construction period due to a reduced need for plant and noise generating activities on site.

Vibration levels during all phases of the Project are expected to be comfortably within the necessary range for protection against cosmetic or structural damage based on the transmission distances to the nearest sensitive receptors. The potential impacts of vibration have therefore been examined in an appropriate level of detail.

As is detailed in Chapter 8 Ecology, a designated site of national ecological importance is situated at a minimum distance of 2km from the pipeline route. The designated site is at a much lower elevation and is considered to be located at a distance which will prevent any impact associated with noise from occurring during the construction phase of the pipeline. As such, the noise and vibration assessment is primarily concerned with the potential impacts on human receptors.

The noise and vibration assessment covers a number of stages encompassing the prediction of potential impacts using acoustic modelling, an analysis of predicted impacts in the context of appropriate national and international guidance, the identification of relevant mitigation measures as necessary and an appraisal of any residual impacts. The potential for cumulative impacts with existing or authorised local sources have also been determined.

A glossary of acoustic terms is detailed in Appendix L, Volume III.

12.2 Methodology

12.2.1 Legislative Background

12.2.1.1 Uzbek National Legislation

The Uzbek national construction noise norms that are relevant to all stages of the construction phase are detailed in Table 12.1, below.

The equivalent noise limits in respect of transportation noise at approximately 2m from building facades may be as much as 10dB(A) more than the levels indicated in item 5 of Table 12.1.

Table 12.1: Uzbek Construction Noise Norms [(a)]

Premises and territories	Equivalent Sound Pressure Levels, Leq dB									L_{Aeq}, dB
	31.5	63	125	250	500	1kHz	2kHz	4kHz	8kHz	
1. Hospital and sanatorium wards, operating hospitals	68	51	39	31	24	20	17	14	13	25
2. Living rooms in apartments, living premises in rest/care homes, sleeping rooms in children boarding-schools	72	55	44	35	29	25	22	20	18	30
3. Doctor's offices in hospitals, sanatoriums, polyclinics, audience halls of concert-halls, rooms in hotel, living rooms in campus	78	59	48	40	34	30	27	25	23	35
4. Hospital and sanatorium territories adjacent to the buildings	78	59	48	40	34	30	27	25	23	35
5. Territories adjacent to living houses (in 2 m from cladding structures), residential areas of neighbourhoods and housing estates, grounds of schools and pre-school institutions, school territories	84	67	57	49	44	40	37	35	33	45
6. Class premises, exercise rooms, auditoriums of schools and other educational facilities, conference-halls, audience halls of theatres, clubs, cinemas, halls for court sessions and meetings.	82	63	52	45	39	35	32	30	28	40
7. Administration working premises, working premises of design and engineering organisations, scientific and research institutes	86	71	61	54	49	45	42	40	38	50
8. Café, restaurant, canteen halls, lobby of theatres and cinemas	89	75	66	59	54	50	47	45	43	55
9. Trading halls of shops, sport halls, waiting halls of airports and transport stations, reception centers of house-keeping/municipal services	93	79	70	63	58	55	52	50	49	60

Note: [(a)] KMK 2.01.08.96 - Defence from noise

Uzbek Sanitary Protection Zone

The Sanitary-Protection Zone (SPZ) is defined as the minimum exclusion zone around a given industrial facility in order to protect sensitive receptors from noise emissions, amongst other contaminants. The SPZ aims to provide the required level of protection from site emissions under normal operational conditions.

The extent of the SPZ is fixed by the nature of the site and can be estimated according to the industrial categorization of land use. The dimensions of the SPZ are defined by way of calculation and establishing permissible emission limits. The following land uses are typically prohibited within an SPZ:

- Residential properties;
- Public or individual country houses;
- Production and storage of drinking water; and,
- Parks, sports, educational and medical facilities.

The following land uses are allowed within an SPZ:

- Non-living areas for standby emergency personnel, premises for rotational personnel, trade and meal facilities hotels;
- Administration buildings, design bureaus and research labs; and,
- Sport and recreational facilities of the closed type, public baths and laundries, garages, transport parking places, fire stations, communications, oil and gas pipelines, transmission lines, facilities for technical water supply, cooling water facilities, pump canalisation stations, recycling water supply installations, gas stations and transport service stations.

The Project's minimum recommended SPZ is 1000m. Discussions with the relevant environmental authorities, in combination with air emissions and noise modelling will confirm the eventual size of the SPZ.

12.2.1.2 International Guidelines

International Finance Corporation

The IFC has developed a thorough programme of pollution prevention and management techniques in order to ensure that projects funded by the organisation are environmentally and socially responsible. The respective limit values in the IFC Environmental, Health and Safety (EHS) Guidelines that apply to new and existing thermal power plants are detailed in Table 12.2.

Table 12.2: World Bank Group / International Finance Corporation Noise Limit Values

Specific Environment	Noise Level L_{Aeq} dB	
	Daytime (07:00-22:00)	Night-time (22:00-07:00)
Residential, educational or institutional	55	45
Industrial or commercial	70	70

Source: IFC EHS Guidelines

The EHS Guidelines require noise abatement measures be capable of achieving either the allowable $L_{Aeq,\ 1\ hour}$ ambient noise levels indicated in Table 12.2 or a maximum increase in background levels of 3dB at the nearest sensitive receptor.

British Standard 5228: Code of Practice for Noise and Vibration Control

British Standard 5228 (BS 5228) provides comprehensive guidance on a range of aspects relating to construction noise and vibration including details of typical noise levels associated with various activities, construction noise prediction methods, significance criteria and an indication of the types of measures and procedures that can be used to reduce construction noise impacts. The document forms the basis for the majority of construction noise assessments throughout the United Kingdom (UK) and is widely recognised internationally. It has been used in this assessment.

BS 5228 states that sensitive receptors typically tolerate a greater change in noise level as a result of construction activity as compared to an industrial noise source. This is said to be partly due to awareness that construction noise is not a permanent source of disturbance.

Calculation of Road Traffic Noise

The potential impact of increased public road network activity as a result of the Project has been assessed using the methodology outlined in the UK's Calculation of Road Traffic Noise (CRTN), as recommended in the Design Manual for Roads and Bridges (DMRB). The CRTN method may be applied to the construction, operational and decommissioning phases of the Project in order to calculate future noise levels as a result of changes to road traffic flows or design.

The methodology uses measured or predicted movements, road type, average speed data and traffic flow composition to determine noise levels resulting from baseline and development scenarios.

12.2.2 Consultation

Discussions were not held with the relevant environmental authorities in regards to the noise and vibration assessment methodology. MML considers that the use of the standards and guidance as detailed in Section 12.2.1 represents international best practice.

12.2.3 Assessment of Significance

12.2.3.1 Construction Phase

General Construction

Construction work is transient in nature and generally includes both stationary and moving sources of noise. Stationary sources include construction plant positioned at a given location on a temporary basis while moving sources normally comprise mobile plant and vehicles. Heavy plant such as trucks, excavators, and piling rigs typically generate the highest levels of noise.

Sensitive receptors considered in this assessment were identified during a number of site visits and from surveying maps of the local area. It has been established that the primary sensitive receptors in the local area are residential and ecological in nature. With the exception of the drill worker camps at each of the drill sites being located 70m from the drill derricks, all sensitive receptors are located in excess of 1000m from each Project component. It is considered that noise levels are likely to be below minimum significance thresholds for construction noise at such distances. In the interest of undertaking a full assessment of impact, however, noise levels at the nearest sensitive receptors have been predicted.

The first stage of the construction noise assessment involves the identification of activities that have the potential to generate high levels of noise. It is necessary to consider the contribution of all noise sources involved in a particular construction activity in order to accurately predict the likely impact.

The second stage of the assessment involves identifying and ranking the nearest sensitive receptors to planned construction areas in terms of sensitivity. The predicted impact will depend primarily on the distance from source to receiver, however, the degree and nature of incorporated mitigation measures, for example, are also of importance. The sensitivity criteria relating to noise impacts are detailed in Table 12.3.

Table 12.3: Construction Noise Receptor Sensitivity Criteria

Sensitivity	Receptor
High	Residential areas, hospitals, schools, colleges or universities, places of worship, designated environmental areas, nature area, high value visual amenity areas, graveyards
Medium	Offices, recreational areas, isolated residences, footpaths/cycle paths, agricultural land
Low	Scrub land, public open space, industrial areas, car parks
Negligible	Derelict land

For the purposes of this assessment, the limited numbers of sensitive receptors in the wider area are considered to be of high sensitivity (primarily the Akchalak settlement and the Sudoch'ye nature reserve) however these are approximately 5km and 30km, respectively, away from the UGCC.

The third stage of the construction noise assessment involves the calculation of noise at the nearest sensitive receptors and the assessment of its magnitude. The predicted level of noise received at a sensitive receptor and the duration of exposure have been considered in establishing magnitude criteria designed to protect the local environment from potential disturbance due to construction activity. The magnitude criteria have been derived from guidance provided by the IFC and other applicable bodies. The magnitude criteria used in the assessment of construction noise impact is presented in Table 12.4.

Table 12.4: Assessment of Magnitude for Construction Noise

Magnitude of Impact (positive or negative)	Definition	Duration	Construction Noise at Receptor dB(A)
Major	A significant change in conditions	Months	> 65
		Weeks	> 70
		Days	> 75
Moderate	A material but non-significant change in conditions	Months	60 – 65
		Weeks	65 – 70
		Days	70 – 75
Minor	A perceptible but restricted change in conditions	Months	55 – 60
		Weeks	60 – 65
		Days	65 – 70
Negligible	A potentially perceptible but non-significant change in conditions	Months	< 55
		Weeks	< 60
		Days	< 65

It is considered that the magnitude criteria detailed in Table 12.4 represents a compromise between practical limitations and the necessity to maintain an acceptable local noise climate during the construction phase of the Project. The impact significance of construction noise has been assessed using the significance matrix detailed in Chapter 5.

Construction Traffic

The potential effect of traffic using public roads in the vicinity of the Project during the construction phase has been assessed using the guidance of CRTN and DMRB. Road traffic noise calculated using the CRTN methodology is based on traffic flow. An increase in traffic volume of 25% is required in order to increase road traffic noise levels by 1dB. DMRB Volume 11 (Ref. 8.9) advises that a change of 1dB(A) is barely perceptible, therefore the magnitude criteria used in Table 12.5 applies to road traffic noise.

Table 12.5: Assessment of Magnitude for Construction Traffic Noise

Magnitude of Impact (positive or negative)	Definition	Change in Traffic Noise Level ($L_{A10, 18hr}$) dB
Major	A significant change in conditions	≥ 5
Moderate	A material but non-significant change in conditions	3 - < 5
Minor	A perceptible but restricted change in conditions	1 - < 3
Negligible	A potentially perceptible but non-significant change in conditions	< 1

The magnitude criteria relates to the change in noise produced by a road rather than the absolute value at any specific location. The impact significance of road traffic has been assessed using the significance matrix detailed in Chapter 5.

Construction Vibration

Ground-borne vibration from construction activity has the potential to affect the occupiers of a building or the structure itself. Such an occurrence is most typically associated with percussive piling works and normally only takes place where this type of work is carried out in close proximity to buildings. Cosmetic or structural damage to buildings generally require other factors such as differential settlement in order to develop.

The operation of heavy plant and construction vehicles other than piling normally generates markedly lower levels of vibration. The temporary nature of construction work and the typical transmission distances to the nearest sensitive receptors are likely to ensure that disturbance is unlikely to occur and that cosmetic or structural damage should not take place. Vibration levels generated by the construction phase are expected to be well within the upper limits for receiving complaints or protection against cosmetic or structural damage, normally quoted as 1 millimetre per second (mm/s) Peak Particle Velocity (PPV) at the foundations.

The typical distances at which specific construction activities may give rise to perceptible levels of vibration are detailed in Table 12.6.

Table 12.6: Distances at which Vibration may be Perceptible

Construction Activity	Distance from Activity at which Vibration may be Perceptible (meters)
Drilling	10-15
Excavation	10-15
Heavy Vehicles (e.g. dump trucks)	5-10
Hydraulic Breaker	15-20
Augured Piling	30-50

As discussed previously, the nearest sensitive receptors are located in excess of 1000m from the Project site. It is considered that vibration levels will be below minimum significance thresholds for construction noise at such distances however the potential for vibration impacts have been examined nonetheless.

12.2.3.2 Operational Phase

General Operation

With the exception of the pipelines component, the Project has the potential to generate significant levels of noise during normal operation. The Surgil Field and the UGCC contain a number of stationary sources of noise distributed over an appreciable area. In addition to noise generated through the operation of standard plant, high levels of noise may also be generated under emergency conditions for all three of the Project component's due to the activation of safety valves, for example. Such equipment operates very infrequently and over short periods of time. Emergency scenarios are therefore not considered to be significant and have not therefore been considered further in this assessment.

The noise produced by the various plant items of the Surgil Field and the UGCC during operation is generally steady in nature.

As is the case with the construction noise assessment, the principal sensitive receptors in the local area are residential and ecological in nature. The nearest receptor will be the introduced workers camp at the Surgil CGTU, located approximately 500m from operational activity.

The first stage of the operational noise assessment involves identifying and ranking the nearest sensitive receptors to each of the Project components in terms of sensitivity. The sensitivity criteria relating to operational noise impacts are the same as those specified for the construction phase, as detailed in Table 12.3. The nearby sensitive receptors are considered to be of high sensitivity due to their residential and ecological nature, however, the location of these receptors relative to the Project components will result in reduced sensitivity of receptors in actual operation.

The second stage of the operational assessment involves the prediction of noise at the nearest sensitive receptors and appraisal of magnitude. The predicted impact is primarily a function of the distance from source to receiver, however like the construction phase, the effectiveness of incorporated mitigation measures, meteorological effects and local terrain are also determining factors.

The magnitude criteria for operational impacts have been developed based on IFC guidance. The operational magnitude criteria are a function of the difference in noise level between the operational project scenario and recognised international guidelines. The magnitude criteria used in the assessment of operational noise impacts are outlined in Table 12.7.

Table 12.7: Assessment of Magnitude for Operational Noise Impact from Power Plant

Magnitude of Impact (positive or negative)	Definition
Major	Increase in noise level ≥5dB(A) above IFC guidelines
Moderate	Increase in noise level ≥3 - 5dB(A) above IFC guidelines
Minor	Increase in noise level 0 - ≤3dB(A) above IFC guidelines
Negligible	Noise level below IFC guidelines

The impact significance of the operational phase of the Project has been assessed using the significance matrix detailed in Chapter 5, based on the sensitivity criteria and magnitude criteria presented in Table 12.3 and Table 12.7, respectively.

Operational Road Traffic

Operational traffic noise impacts have been calculated using the same magnitude criteria as construction traffic noise, as detailed in Table 12.5. The impact significance of operational traffic has been assessed using the significance matrix detailed in Chapter 5.

Operational Vibration

Vibration in industrial plant items can result in damage to components and also create noise, therefore manufacturers aim to decrease vibrations by employing various anti-vibration techniques such as vibration isolation and damping systems.

These design features in addition to plant foundations have the combined effect of minimizing the ground borne vibrations to such a degree that any disturbance of the earth around the turbines, for example, is barely perceptible. Vibration through the operation of Project is therefore unlikely to cause any form of disturbance or damage to a nearby sensitive receptor.

12.2.3.3 Decommissioning Phase

General Decommissioning

The potential noise impacts associated with Project decommissioning are similar in nature and duration to those of the construction phase. As such, the sensitivity criteria and magnitude criteria presented in Table 12.3 and Table 12.4 respectively, in addition to the significance matrix of Chapter 5 apply to the assessment of the decommissioning phase of the Project.

Decommissioning Traffic

Decommissioning traffic noise impacts have been calculated according to the same magnitude criteria as construction noise, as detailed in Table 12.5. The impact significance of decommissioning traffic has been assessed using the significance matrix detailed in Chapter 5.

Decommissioning Vibration

The general guidance as applied to construction phase vibration in Table 12.6 is also applicable to the decommissioning phase of the Project.

12.3 Baseline Description

12.3.1 Upstream

The general location of the Surgil Field may be described as being rural in character as it is located within the former footprint of the Aral Sea and the surrounding terrain is very flat with limited vegetation cover. The Surgil Field is, however, an existing operational field which is under expansion with new wells and as such well drilling activity continuously occurs in the vicinity of the Surgil CGTU.

The baseline noise environment in the general area of the extraction well heads and the Surgil CGTU has increased as a result of existing Surgil Field operations. This has the effect of making the immediate area less sensitive to noise emissions. The prevailing acoustic environment at positions somewhat removed from the extraction well heads, GGSs and the Surgil CGTU is typically dominated by natural sources of sound, mainly arising through wind generated effects and other meteorological factors.

Ambient noise conditions in the wider area are likely to increase during periods of inclement weather.

12.3.2 Pipelines

The route of this Project component may be described as being semi desert and characterised by natural sources of sound other than at the northern and southern extents of the pipelines. The pipelines pass through very flat terrain except where it traverses the Ustyurt Escarpment at the Urga Crossing up to the Ustyurt Plateau.

The only changes in the acoustic climate along the route of the pipelines take place at the Surgil Field and near the UGCC site. This is due to the presence of the gas field operations to the north and the Ustransgaz-operated Akchalak GCS and Kyrkkyz Railway Station located approximately 5km from the pipelines southern termination point. The Kungrad Soda Plant contributes to the acoustic environment to a lesser degree at the southern extent of the pipelines as it is located approximately 10km south-east of the UGCC.

12.3.3 UGCC

The UGCC is located on the Ustyurt Plateau, an area of elevated land consisting primarily of stony desert which drops sharply to the former bed of the Aral Sea.

The baseline acoustic environment is generally characterised by natural sources of sound, typically caused by wind and other meteorological effects. As is the case across the entire Project, inclement weather is likely to increase ambient noise conditions across the local area surrounding the UGCC.

Anthropogenic sources of sound also contribute to the acoustic climate of the local area as detailed in Section 12.3.1 and Section 12.3.2. The primary noise sources in the vicinity of the UGCC site are the Akchalak GCS and Kyrkkyz Railway Station, each located approximately 5km west and south-west of the UGCC site. The Kungrad Soda Plant is located further afield, at a distance of approximately 10km to the south-east.

12.3.4 Baseline Noise Monitoring

No noise monitoring has been carried out for the purposes of establishing the prevailing noise baseline in the vicinity of the Project. During the initial scoping of the Project, there were some apparent specific locational aspects with respect to noise sensitive receptors which justified this approach. These are as follows;

- Noise emissions from the Project will not have a material impact beyond a distance of 2km from each of the Project components due to the propagation capacity of noise and localised environmental effects. The implications for noise monitoring with respect to each of the Project components is as follows:
  - As mentioned in Section 12.1, the closest noise sensitive receptor to the Surgil CGTU is the village of Uchsay which is 25km away at the closest point.
  - The route of the proposed pipelines traverses a semi-desert region with no discernible noise sensitive receptors with the nearest being Lake Sudoch’ye, a site of ecological importance, approximately 2km away.

- The closest noise sensitive receptors to the UGCC are the UGCC Settlement which is 3km away and the town of Akchalak which is 4km away.
- The closest noise sensitive receptor to the gas compressor station is also the UGCC Settlement and the town of Akchalak which are both approximately 1km away.

- The vicinity of the Surgil CGTU is already an operational gas extraction field and therefore the acoustic climate is already primarily characterised by gas extraction operations.

The remote proximity of the nearest sensitive receptors to the Project components is also the pre-dominant feature determining impacts and the assessment of significance associated with noise from the Project. This is addressed further in Section 12.4.

12.4 Assessment of Impacts

12.4.1 Gas Fields

12.4.1.1 Construction Phase

General Construction

There are a number of uncertainties at present in regards to the construction stage, specifically in terms of equipment to be used and techniques to be employed at the Project site. It has therefore been necessary to make a variety of assumptions based on experience of similar projects.

Typical noise source data and the construction plant items normally used for a given activity have been obtained from BS 5228. By making assumptions with respect to the arrangement of equipment likely to be operating, a number of aggregate noise levels have been developed for each construction activity.

The predicted impacts of major elements of the Surgil Field construction phase are summarised in Table 12.8. The likely impacts are considered to be conservative in nature as worst-case noise levels have been used in the assessment. Furthermore, it has also been assumed that construction plant items will be in operation at full power over the course of an entire working day and positioned at the edge of the Project site (the nearest position to sensitive receptors).

Furthermore, for the purposes of the assessment it has been assumed that temporary workers accommodation will be established close the wells. The exact location of this is still to be determined but for noise impact assessment purposes a worst case scenario assumption has been made that it will be located just 70m from a gas well.

Table 12.8: Gas Fields: Predicted Construction Noise Impacts

Sensitive Receptor	Distance to Receptor (m)	Predicted Construction Noise dB(A)				Highest Predicted Construction Noise dB(A)
		Site Preparation	Piling	Excavation	Plant Installation	
Workers Accommodation	70	85	81	82	85	85
Uchsay	25,000 from the furthest gas well drilling location	21	17	18	21	21

The highest noise levels at the nearest sensitive receptor, the workers accommodation, are likely to arise through site preparation and plant installation activity. The magnitude of the impact is above the threshold values stated in Table 12.4 and is considered to be major, however, due to the shift patterns (working during the day when noise levels will be at maximum plus two weeks on two weeks off rota) and the fact that the living accommodation is heavily insulated in order to cope with the climatic extremes of the site, the significance of the construction impact at the Surgil Field, gas gathering stations and CGTU is therefore considered to be of **minor adverse significance**.

Site preparation activity is predicted to generate the highest received noise levels at Uchsay. The predicted impact is below the threshold values stated in Table 12.4 and is therefore considered to be of negligible magnitude. The sensitivity of the receptors is considered to be high. The significance of construction impact for construction activities at the Surgil Field, gas gathering stations and CGTU at all sensitive receptors is therefore considered to be **insignificant**.

Construction Traffic

The anticipated change in noise produced by construction traffic, based on the assumption of a 10% increase in total road traffic flow and a 75% increase in HGV movements on the local road network, will result in an increase of below 3 dB(A). The magnitude of the impact is therefore considered to be minor (as per Table 12.5).

Comparing this prediction with the magnitude criteria presented in Table 12.5, the results indicate that the calculated levels exceed the lowest threshold values. The construction traffic noise impact is therefore predicted to be of **minor adverse significance**.

Construction Vibration

Vibration levels during the construction phase are expected to be comfortably within the necessary range for protection against cosmetic or structural damage as the workers accommodation and the nearest external sensitive receptor property at Uchsay are located outside the range where damage may occur or where vibration from the most significant forms of construction will cause disturbance. The effects inside the nearest sensitive receptor are likely therefore to be barely perceptible and minor in magnitude, resulting in an impact of **minor adverse significance**.

12.4.1.2 Operational Phase

General Operation

The primary contributors to the local environment include the extraction well heads, GGS's and the Surgil CGTU. The predicted noise levels have been calculated through the use of acoustic modelling. Due to the large distance between the Surgil Field and the nearest permanent receptors at Uchsay, the wells can be considered as a collection of point sources. For the operational phase, a settlement for workers is to be located approximately 500m from the CGTU. This is distinct from the workers accommodation for the drilling phase mentioned in Section 12.4.1.1.

The received noise level at a given sensitive receptor has been estimated taking account of sound attenuation resulting from geometrical divergence, atmospheric absorption and ground conditions. The model has used standard temperature and humidity gradients under downwind weather conditions. This has the effect of simulating the likely behaviour of noise in the immediate local environment, where a reduction in noise level with distance, interaction with weather conditions that are favourable to noise propagation, and the sound reflecting characteristics of local ground cover are accounted for. The aforementioned factors will have an effect on the level of noise heard at a given sensitive receptor and the model aims to consider each in the calculation.

A number of assumptions have been necessary in regards to operational noise emissions from this Project component. The primary assumption is that each well can be considered as a single point source and that it will not have a sound power level greater than 115dB(A). The predicted operational noise conditions are detailed in Table 12.9.

The sound power level represents the total acoustic energy of a source and it is expressed in decibels. An industrial item of plant normally has more than one source of noise however it is common to model such equipment as a single sound emitting entity or point source where there is a relatively large distance from source to sensitive receptor due to the behaviour of noise at distance. This assumption has therefore been modelled in the assessment of the gas fields. A further assumption is the sound power level of 115 dB(A), this noise level being based on experience of similar projects.

Furthermore, each well is assumed to emit an identical sound power level of 115 dB(A). The results presented in Table 12.9 indicate the cumulative noise levels from all wells at each of the identified sensitive receptors

Table 12.9: Gas Fields: Predicted Operational Noise Impacts

Sensitive Receptor	Predicted Project Contribution dB (L_{Aeq})	IFC / World Bank Guidance dB (L_{Aeq})	Exceed IFC / World Bank Guidance
Workers Accommodation	32	45	No
Uchsay	0	45	No

The predicted worst-case impact detailed in Table 12.9 indicates that the calculated contribution of this particular Project component is within the recommended IFC/WBG guidance. This corresponds to an impact of **insignificant**.

Operational Traffic

There will be very infrequent traffic noise emissions associated with the operation of this Project component. The associated noise emissions from such activities are considered to have an **insignificant** impact and have therefore not been modelled.

Operational Vibration

Vibration of industrial plant items can result in damage to components and also create noise, therefore manufacturers aim to decrease vibrations by employing various anti-vibration techniques. These design features have the effect of minimizing ground borne vibrations to such a degree that any disturbance of the earth around the GCS or Surgil CGTU, for example, will be barely perceptible. Vibration caused through the operation of this Project component is therefore unlikely to cause any form of disturbance or damage to any given sensitive receptor and is likely to be imperceptible, resulting in an **insignificant** impact.

12.4.1.3 Decommissioning Phase

General Decommissioning

The potential noise impacts of the decommissioning phase are similar in nature to those of the construction phase. Decommissioning noise is however typically less intrusive due to a reduced need for heavy plant (such as drilling rigs) and a shorter duration of works.

The classification of sensitive receptors is identical to that of the construction phase, as detailed in Table 12.3. The same sensitive receptor of Uchsay applies to the decommissioning phase.

Based on the findings of the construction noise assessment, it is likely that the received noise levels for all decommissioning activities will be of **minor adverse significance**.

Decommissioning Traffic

The potential decommissioning traffic noise impacts are likely to be similar to those of the construction phase. A lesser impact is, however, anticipated from decommissioning traffic movements due to reduced traffic volumes and a shorter duration of work. Based on the finding of the construction traffic assessment, it is likely that the received noise levels from decommissioning traffic activity will be of **minor adverse significance**.

Decommissioning Vibration

The potential vibration impacts of the decommissioning phase are likely to be significantly less than those of the construction phase due to the reduced need for heavy impact activity (such as drilling). As has been determined for the construction phase, vibration effects inside the nearest sensitive receptor are likely therefore to be barely perceptible resulting in an impact of **minor adverse significance**.

12.4.2 Pipelines

12.4.2.1 Construction Phase

General Construction

The general principles and assumptions of Section 12.4.1.1 also apply to the construction phase of the pipeline component of the Project. The closest point of the pipelines to a receptor will be 2km, this being Sudoch'ye. The predicted impacts of major elements of the pipeline laying process are summarised in Table 12.10.

Table 12.10: Pipelines: Predicted Construction Noise Impacts

Sensitive Receptor	Distance to Receptor (km)	Predicted Construction Noise dB(A)			Highest Predicted Construction Noise dB(A)
		Site Preparation	Excavation	Pipe Laying	
Sudoch'ye	2	45	40	44	45

Site preparation activity is predicted to generate the highest received noise levels at Sudoch'ye. This is below the threshold values stated in Table 12.4 at all sensitive receptors and represents an impact of **insignificant**.

Construction Traffic

The general principles and assumptions of Section 12.4.1.1 apply here also. The construction traffic noise impact is therefore predicted to be of **minor adverse significance**.

Construction Vibration

The predicted vibration impact of the construction phase of this Project component will be imperceptible due to the transmission distances involved. The resulting impact is deemed to be **insignificant**.

12.4.2.2 Operational Phase

General Operation

Noise impacts associated with the operation of this Project component are unlikely to occur as the above ground infrastructure is limited. This corresponds to an impact of **insignificant**.

Operational Traffic

Infrequent maintenance traffic along tracks parallel to the pipeline route associated with the operation of this component of the Project will be very limited. The noise emissions have therefore not been modelled. The resulting impact is deemed to be **insignificant**.

Operational Vibration

The vibration impact arising through the operational phase of this Project component will be imperceptible due to the transmission distances involved to the nearest sensitive receptor. The resulting impact is therefore deemed to be **insignificant**.

12.4.2.3 Decommissioning Phase

General Decommissioning

The potential noise impacts of the decommissioning phase are similar in nature to those of the construction phase. Following on from the findings of the construction noise assessment, it is likely that the received noise levels for all decommissioning activities will be **insignificant**.

Decommissioning Traffic

Decommissioning road traffic noise impacts are likely to be similar to those of the construction phase. Based on the findings of the construction traffic assessment, it is likely that the received noise levels from decommissioning traffic activity will be of **minor adverse significance**.

Decommissioning Vibration

The predicted vibration impacts during the decommissioning phase of this Project component will be imperceptible due to the transmission distances involved to the nearest sensitive receptor. The corresponding impact is rated as **insignificant**..

12.4.3 UGCC

12.4.3.1 Construction Phase

General Construction

A variety of uncertainties presently exist in relation to the construction stage of the UGCC component of the Project, mainly in terms of equipment and techniques to be used. A number of assumptions have therefore been made based on experience of similar projects, as detailed in 12.4.1.1. The predicted impacts of the primary elements of the UGCC construction phase are summarised in Table 12.11.

Table 12.11: UGCC: Predicted Construction Noise Impacts

Sensitive Receptor	Distance to Receptor (m)	Predicted Construction Noise dB(A)						Highest Predicted Construction Noise dB(A)
		Site Preparation	Piling	Excavation, Foundations & Concreting	Roadworks / Railworks	Building Construction	Plant Installation	
UGCC Settlement	3,000	11.6	7.6	8.6	39.6	13.6	11.6	39.6
Akchalak	4,000	8.4	4.4	5.4	36.4	10.4	8.4	36.4

Road and rail construction activity is predicted to generate the highest received noise levels at the nearest sensitive receptors. This is within the threshold values stated in Table 12.4 at each sensitive receptor. The construction of the road and rail network is expected to take place over a number of days at the very nearest point to the sensitive receptors, therefore it represents an impact of **minor adverse significance**.

Construction Traffic

The general principles and assumptions of Section 12.4.1.1 apply here also. The construction traffic noise impact is therefore predicted to be of **minor adverse significance**.

Construction Vibration

The predicted vibration impact of the construction phase of the UGCC will be imperceptible due to the transmission distances involved. The resulting impact is **insignificant**.

12.4.3.2 Operational Phase

General Operation

The foremost contributors of noise to the local environment include the GSP, EP, HDPE and PP plants. The predicted noise levels in Table 12.12 have accounted for the effects arising through the distance travelled by the noise to each sensitive receptor and the likely atmospheric impact on noise transmission from the UGCC. These factors influence the level of noise received at a given sensitive receptor and the model considers each in the predictive process. The UGCC has been modelled as a single point source due to a lack of detailed information relating to the large separation distance to the nearest receptors at the UGCC settlement and Akchalak. An industrial plant of the nature of the UGCC has numerous sources of noise however it may be modelled as a single sound emitting entity or point source should the nearest sensitive receptors be located at a significant distance from the plant. This is due to the transmission properties of noise over large distances. As such, it has been assumed that the UGCC has a sound power level of 125dB(A) as a worst-case. Sound power level is indicative of the total acoustic energy of a source and it is described in decibels. The assumption that the UGCC has a sound power level of 125 dB(A) is based on experience of similar large industrial operations. The predicted operational noise conditions, allowing for air absorption but not considering any noise attenuation which maybe offered by ground conditions and topography, are detailed in Table 12.12.

Table 12.12: UGCC: Predicted Operational Noise Impacts

Sensitive Receptor	Distance to Receptor (m)	Predicted Project Contribution dB (L_{Aeq})	IFC / World Bank Guidance dB (L_{Aeq})	Exceed IFC / World Bank Guidance
UGCC Settlement	3,000	44	45	No
Akchalak	4,000	40	45	No

A further significant potential noise source is the existing Akchalak gas compressor station. This has also been modelled as a single point source due a lack of detailed information. In light of the current set-up of the gas compressor station, it has been assumed that it has a sound power level of 105 dB(A) as a worst-case and it is understood to be located approximately 1 km from two sensitive receptors which are the UGCC Settlement and Akchalak. The predicted operational noise conditions are detailed in Table 12.13.

Table 12.13: Gas Compressor Station: Predicted Operational Noise Impacts

Sensitive Receptor	Distance to Receptor (m)	Predicted Project Contribution dB (L_{Aeq})	IFC / World Bank Guidance dB (L_{Aeq})	Exceed IFC / World Bank Guidance
UGCC Settlement	1,000	37	45	No
Akchalak	1,000	37	45	No

The predicted worst-case impacts detailed in Table 12.12 and Table 12.13 indicate that the calculated UGCC component contribution is, at worst, 1dB(A) below the recommended IFC/WB guidance at the UGCC Settlement whilst the calculated gas compressor station contribution is 8 dB(A) below the recommended IFC/WB guidance at both the UGCC Settlement and Akchalak. This corresponds to an impact of **insignificant.**

Operational Traffic

There will be relatively limited road traffic noise emissions associated with the operation of the UGCC component of the Project during the operational phase. There will also be a limited amount of noise emissions associated with freight train movements. Such train movements will be limited to once per day and as such the noise impact of this activity over the course of an entire day will be insignificant.

The associated noise emissions from such activities are considered to have an impact of **minor adverse significance** and have therefore not been modelled.

Operational Vibration

The vibration impact of the operational phase of the UGCC component of the Project, including train movements, will be imperceptible due to the transmission distances involved to the nearest sensitive receptor. The resulting impact is therefore considered to be **insignificant**.

12.4.3.3 Decommissioning Phase

General Decommissioning

The potential noise impacts of the decommissioning phase are similar in nature to those of the construction phase. Based on the findings of the construction noise assessment, it is likely that the received noise levels for all decommissioning activities will be of **minor adverse significance**.

Decommissioning Traffic

Decommissioning road traffic noise impacts are likely to be similar to those of the construction phase. Following on from the findings of the construction traffic assessment, it is likely that the received noise levels from decommissioning traffic activity will be of **minor adverse significance**.

Decommissioning Vibration

The predicted vibration impacts during the decommissioning phase of this Project component will be imperceptible due to the transmission distances involved to the nearest sensitive receptor. The corresponding impact is therefore assessed as being **insignificant**.

12.4.4 Cumulative Effects

The potential for combined impacts exist between various Project components. This effect is most likely to occur at the northern and southern extent of the pipelines, where they connect with the UGCC and where deliveries (either by road or rail) enter the Surgil Field and UGCC areas. The possibility of such impacts exist however they will be localised and are likely to be of limited impact due to the transmission distances to the nearest sensitive receptors. The resulting impact is therefore considered to be **insignificant**.

The construction, operation or decommissioning phases of the various components of the Project may occur concurrently with those of a number of proposed or consented developments to be located nearby. It is considered however that such projects are unlikely to have a noteworthy cumulative effect due to the large separation distances involved. This assessment is inclusive of the Akchalak Gas Compressor Station and the Soda Ash Plant at Kungrad. The resulting impact is therefore likely to be **insignificant**.

The potential cumulative road traffic noise impact between various Project components is considered to be of **minor significance**. Similarly, the likely cumulative road traffic noise impact with proposed or consented developments is also considered to be of **minor significance**.

12.5 Mitigation

12.5.1 Gas Fields

12.5.1.1 Construction Mitigation

The following mitigation measures will be implemented for the control of noise impacts during the construction phase of the Project. These are considered to be in line with the World Bank Group General EHS Guidelines. These measures are also incorporated into the Environmental and Social Management Plan (ESMP) elaborated for the Project. General noise control techniques to be implemented via the ESMP include:

- Limiting vehicle speeds on the site;
- Using appropriate sound reduction equipment on plant, where necessary;
- Using only properly maintained and silenced plant;
- Positioning plant as far from the edge of the site as possible (in particular diesel generator sets);
- Machines and plant that may be in intermittent use to be shut down between work periods or throttle to a minimum;
- Material stockpiles and other structures will be effectively utilised, where practicable, to screen sensitive receptors from noise from on-site construction activities;
- Plant with directional noise features will be positioned so as to minimise the potential for noise disturbance; and,
- Hours of general construction activity (excluding specific drilling activities) will be restricted to avoid sensitive periods of the day and also to avoid night working

Plant specific control techniques to be implemented where practicable include;

- Earth moving plant - The use of exhaust silencers and ensuring equipment enclosure panels are closed at all times. The use of alternative super silenced plant;
- Compressors and generators - The use of efficient sound reduction equipment, dampening of the metal body casing and ensuring equipment enclosure panels are closed at all times. The erection of screening and placing equipment in a ventilated acoustic enclosure;
- Piling plant - The use of screening, dampening, resilient pads, proper alignment of equipment and efficient exhausts;
- Breakers and drills - The use of mufflers, dampened bits, sound reduction equipment, screening, enclosures and fixing any air line leaks; and,
- Cement mixing, materials handling and batching plant - The use of efficient engine sound reduction equipment, enclosing the engine, ensuring aggregate doesn't fall from excessive height, and avoiding hammering of the drum.

Non-engineering related mitigation measures to be adopted include informing the nearest sensitive receptors of changes to the construction programme that may result in increased noise levels and appointing a member of staff at site to manage noise complaints should they occur. Workers will also be briefed on the use of quiet work practices and appropriate construction methods.

Noise monitoring will be carried out by using sound level meters. Noise meters will be of Type 1 or 2 and calibrated (in a laboratory as well as with a calibrator before and after every monitoring exercise). Results of the monitoring will be included in a site logbook. Corrective action should be taken if noise levels as a result of construction activities results in breaches of relevant Uzbek and World Bank standards at residential receptors.

The residual impacts following mitigation are discussed in Section 12.6.

12.5.1.2 Operational Mitigation

The following mitigation measures (in line with the IFC General EHS guidelines) will be implemented for the control of noise impacts during the operational phase of the Project. The measures are incorporated into the ESMP. General noise control techniques to be implemented where practicable during the operational phase of the Project include:

- Ancillary plant will be of low noise design and employ sound attenuation techniques where required;
- Treating buildings with acoustic absorption materials, where necessary;
- Hours of general maintenance activity restricted to avoid sensitive periods of the day (e.g. religious event) and also to avoid night working;
- Following international guidance on workplace noise levels; and,
- Closing plant building doors at all times (wherever practicable).

Plant specific control techniques to be implemented where practicable include:

- Gas turbines, compressors & associated plant – The use of acoustic enclosures, inlet and exhaust silencers, duct mounted attenuators, acoustic louvres and vibration isolation systems should be employed. Acoustic barriers should be used where appropriate;
- Generators and transformers - Sound attenuation techniques such as insulation, enclosures, three-sided pens, low speed fans and low noise trims will be used where necessary; and,
- Turbine hall and other work areas - Noise will not exceed the upper exposure action values specified in the contract.

Like the construction phase of the Project, noise monitoring will be carried out using sound level meters during Project operation. Noise meters will be of Type 1 or 2 and calibrated (in a laboratory as well as with a calibrator before and after every monitoring exercise). Results of the monitoring will be included in a site logbook. Corrective action should be taken if noise levels as a result of construction activities results in breaches of relevant Uzbek and World Bank standards at residential receptors.

The residual impacts following mitigation are discussed in Section 12.6.

12.5.1.3 Decommissioning Mitigation

The potential noise impacts of the decommissioning phase of the Project are similar to those of the construction phase albeit for a shorter duration. Accordingly, the mitigation measures proposed for the construction phase also apply to decommissioning activities.

The residual impacts following mitigation are discussed in Section 12.6.

12.5.2 Pipelines

12.5.2.1 Construction Mitigation

The general principles of Section 12.5.1.1 also apply to the construction phase of this Project component.

The residual impacts following mitigation are discussed in Section 12.6.

12.5.2.2 Operational Mitigation

Noise impacts associated with the operation of the pipelines are unlikely to occur as the above ground infrastructure is limited. The residual impacts following mitigation are discussed in Section 12.6.

12.5.2.3 Decommissioning Mitigation

The general principles of Section 12.5.1.1 also apply to the decommissioning phase of this Project component. The residual impacts following mitigation are discussed in Section 12.6.

12.5.3 UGCC

12.5.3.1 Construction Mitigation

The general principles of Section 12.5.1.1 also apply to the construction phase of the UGCC component of the Project. The residual impacts following mitigation are discussed in Section 12.6.

12.5.3.2 Operational Mitigation

The general principles of Section 12.5.1.2 also apply to the operational phase of the UGCC component of the Project. The residual impacts following mitigation are discussed in Section 12.6.

12.5.3.3 Decommissioning Mitigation

The general principles of Section 12.5.1.1 also apply to the decommissioning phase of the UGCC component of the Project. The residual impacts following mitigation are discussed in Section 12.6.

12.6 Summary of Residual Impacts

A summary of the residual noise and vibration impacts of each Project component is detailed in Table 12.14.

Table 12.14: Summary of Impacts

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Gas Fields - Construction						
Site preparation	Construction noise	High	Minor	Minor	Adhere to good practice guidance of BS 5228 as follows; • Using appropriate sound reduction equipment on plant, where necessary; • Using only properly maintained and silenced plant; • Positioning plant as far from the edge of the site as possible (in particular diesel generator sets); • Machines and plant that may be in intermittent use to be shut down between work periods or throttle to a minimum; • Material stockpiles and other structures will be effectively utilised, where practicable, to screen sensitive receptors from noise from on-site construction activities; • Plant with directional noise features will be positioned so as to minimise the potential for noise disturbance; and, • Hours of general construction activity (excluding specific drilling activities) will be restricted to avoid sensitive periods of the day and also to avoid night working • Plant specific control techniques to be implemented where practicable include; • Earth moving plant - The use of exhaust silencers and ensuring equipment enclosure panels are closed at all times. The use of alternative super silenced plant; • Compressors and generators - The use of efficient sound reduction equipment, dampening of the metal body casing and ensuring equipment enclosure panels are closed at all times. The erection of screening and placing equipment in a ventilated acoustic enclosure; • Piling plant - The use of screening, dampening, resilient pads, proper alignment of equipment and efficient exhausts; • Breakers and drills - The use of mufflers, dampened bits, sound reduction equipment, screening, enclosures and fixing any air line leaks; and, • Cement mixing, materials handling and batching plant - The use of efficient engine sound reduction equipment, enclosing the engine, ensuring aggregate doesn't fall from excessive height, and avoiding	Minor Adverse
Piling	Construction noise	High	Minor	Minor		Minor Adverse
Excavation	Construction noise	High	Minor	Minor		Minor Adverse
Plant installation	Construction noise	High	Minor	Minor		Minor Adverse

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
					hammering of the drum.	
Construction traffic	Road traffic noise	High	Minor	Minor	• Limiting vehicle speeds on the site;	Minor Adverse
Gas Fields - Operation						
Operation	Operational noise	High	Negligible	Insignificant	General noise control techniques to be implemented where practicable during the operational phase of the Project include: • Ancillary plant will be of low noise design and employ sound attenuation techniques where required; • Treating buildings with acoustic absorption materials, where necessary; • Hours of general maintenance activity restricted to avoid sensitive periods of the day (e.g. religious event) and also to avoid night working; • Following international guidance on workplace noise levels; and, • Closing plant building doors at all times (wherever practicable). Plant specific control techniques to be implemented where practicable include: • Gas turbines, compressors & associated plant – The use of acoustic enclosures, inlet and exhaust silencers, duct mounted attenuators, acoustic louvres and vibration isolation systems should be employed. Acoustic barriers should be used where appropriate; • Generators and transformers - Sound attenuation techniques such as insulation, enclosures, three-sided pens, low speed fans and low noise trims will be used where necessary; and, • Turbine hall and other work areas - Noise will not exceed the upper exposure action values specified in the contract.	Insignificant
Operational traffic	Road traffic noise	High	Negligible	Insignificant	• Limiting vehicle speeds on the site	Insignificant
Gas Fields - Decommissioning						
Underground components remain in-situ	Decommissioning noise	High	Negligible	Insignificant	Same as the construction phase	Insignificant
Remove above ground components	Decommissioning noise	High	Negligible	Insignificant		Insignificant
Construction traffic	Road traffic noise	High	Minor	Minor	• Limiting vehicle speeds on the site;	Minor Adverse

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Pipelines - Construction						
Site preparation	Construction noise	High	Negligible	Insignificant	Adhere to good practice guidance of BS 5228 as follows; • Using appropriate sound reduction equipment on plant, where necessary; • Using only properly maintained and silenced plant; • Positioning plant as far from the edge of the site as possible (in particular diesel generator sets); • Machines and plant that may be in intermittent use to be shut down between work periods or throttle to a minimum; • Material stockpiles and other structures will be effectively utilised, where practicable, to screen sensitive receptors from noise from on-site construction activities; • Plant with directional noise features will be positioned so as to minimise the potential for noise disturbance; and, • Hours of general construction activity (excluding specific drilling activities) will be restricted to avoid sensitive periods of the day and also to avoid night working • Plant specific control techniques to be implemented where practicable include; • Earth moving plant - The use of exhaust silencers and ensuring equipment enclosure panels are closed at all times. The use of alternative super silenced plant; • Compressors and generators - The use of efficient sound reduction equipment, dampening of the metal body casing and ensuring equipment enclosure panels are closed at all times. The erection of screening and placing equipment in a ventilated acoustic enclosure; • Piling plant - The use of screening, dampening, resilient pads, proper alignment of equipment and efficient exhausts; • Breakers and drills - The use of mufflers, dampened bits, sound reduction equipment, screening, enclosures and fixing any air line leaks; and, • Cement mixing, materials handling and batching plant - The use of efficient engine sound reduction equipment, enclosing the engine, ensuring aggregate doesn't fall from excessive height, and avoiding hammering of the drum.	Insignificant
Excavation	Construction noise	High	Negligible	Insignificant		Insignificant
Pipe laying	Construction noise	High	Negligible	Insignificant		Insignificant
Construction traffic	Road traffic noise	High	Minor	Minor	• Limiting vehicle speeds on the site;	Minor Adverse

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Pipelines – Operation						
Operation	Operational noise	High	Negligible	Insignificant	Noise impacts associated with the operation of the pipelines are unlikely to occur as the above ground infrastructure is limited.	Insignificant
Operational traffic	Road traffic noise	High	Negligible	Insignificant	• Limiting vehicle speeds on the site;	Insignificant
Pipelines - Decommissioning						
Pipelines remain in-situ	Decommissioning noise	High	Negligible	Insignificant	Same as the construction phase	Insignificant
Remove above ground components	Decommissioning noise	High	Negligible	Insignificant		Insignificant
Construction traffic	Road traffic noise	High	Minor	Minor	• Limiting vehicle speeds on the site;	Minor Adverse
UGCC - Construction						
Site preparation	Construction noise	High	Negligible	Insignificant	Adhere to good practice guidance of BS 5228 as follows; • Using appropriate sound reduction equipment on plant, where necessary; • Using only properly maintained and silenced plant; • Positioning plant as far from the edge of the site as possible (in particular diesel generator sets); • Machines and plant that may be in intermittent use to be shut down between work periods or throttle to a minimum; • Material stockpiles and other structures will be effectively utilised, where practicable, to screen sensitive receptors from noise from on-site construction activities; • Plant with directional noise features will be positioned so as to minimise the potential for noise disturbance; and, • Hours of general construction activity (excluding specific drilling activities) will be restricted to avoid sensitive periods of the day and also to avoid night working • Plant specific control techniques to be implemented where practicable include; • Earth moving plant - The use of exhaust silencers and ensuring equipment enclosure panels are closed at all times. The use of alternative super silenced plant; • Compressors and generators - The use of efficient sound reduction	Insignificant
Piling	Construction noise	High	Negligible	Insignificant		Insignificant
Excavation, foundations and concreting	Construction noise	High	Negligible	Insignificant		Insignificant
Roadworks/Railworks	Construction noise	High	Minor	Minor		Minor Adverse
Building construction	Construction noise	High	Negligible	Insignificant		Insignificant
Plant installation	Construction noise	High	Negligible	Insignificant		Insignificant

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
					equipment, dampening of the metal body casing and ensuring equipment enclosure panels are closed at all times. The erection of screening and placing equipment in a ventilated acoustic enclosure; • Piling plant - The use of screening, dampening, resilient pads, proper alignment of equipment and efficient exhausts; • Breakers and drills - The use of mufflers, dampened bits, sound reduction equipment, screening, enclosures and fixing any air line leaks; and, • Cement mixing, materials handling and batching plant - The use of efficient engine sound reduction equipment, enclosing the engine, ensuring aggregate doesn't fall from excessive height, and avoiding hammering of the drum.	
Construction traffic	Road traffic noise	High	Minor	Minor	• Limiting vehicle speeds on the site;	Minor Adverse
UGCC - Operation						
Operation	Operational noise	High	Negligible	Insignificant	General noise control techniques to be implemented where practicable during the operational phase of the Project include: • Ancillary plant will be of low noise design and employ sound attenuation techniques where required; • Treating buildings with acoustic absorption materials, where necessary; • Hours of general maintenance activity restricted to avoid sensitive periods of the day (e.g. religious event) and also to avoid night working; • Following international guidance on workplace noise levels; and, • Closing plant building doors at all times (wherever practicable). Plant specific control techniques to be implemented where practicable include: • Gas turbines, compressors & associated plant – The use of acoustic enclosures, inlet and exhaust silencers, duct mounted attenuators, acoustic louvres and vibration isolation systems should be employed. Acoustic barriers should be used where appropriate; • Generators and transformers - Sound attenuation techniques such as insulation, enclosures, three-sided pens, low speed fans and low noise trims will be used where necessary; and, • Turbine hall and other work areas - Noise will not exceed the upper exposure action values specified in the contract.	Insignificant

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Operational traffic	Road traffic noise	High	Minor	Minor	• Limiting vehicle speeds on the site;	Minor Adverse
UGCC - Decommissioning						
Underground components remain in-situ	Decommissioning noise	High	Negligible	Insignificant	Same as the construction phase	Insignificant
Remove above ground components	Decommissioning noise	High	Minor	Minor		Minor Adverse
Decommissioning traffic	Road traffic noise	High	Minor	Minor	• Limiting vehicle speeds on the site;	Minor Adverse

12.7 Proposed Monitoring

12.7.1 Construction Phase Noise Monitoring

The relevant construction phase contractor(s) will monitor noise levels at regular intervals during the construction phase of each Project component in order to demonstrate compliance with all relevant guidelines.

12.7.2 Operational Phase Noise Monitoring

A suitable noise monitoring programme for each Project component will be developed and agreed with the Goskompriroda prior to operation of the Project.

12.7.3 Decommissioning Phase Noise Monitoring

The relevant decommissioning contractor(s) will monitor noise levels at regular intervals during decommissioning phase of each Project component in order to demonstrate compliance with all relevant guidelines.

12.8 Statement of Significance

The assessments have indicated that noise and vibration impacts due to the construction, operational and decommissioning phases of each Project component and indeed the entire Project will not be significant.

The general construction, operational and decommissioning phases of each Project component and indeed the entire Project are considered to be not significant when assessed in combination with a number of proposed or consented developments located nearby.

Road traffic and rail traffic impacts are not considered to be significant during any stage of the Project, both when it is considered in isolation and in combination with other nearby proposed or consented developments.

13. Traffic and Transportation

13.1 Introduction

This Chapter considers the potential traffic and transport impacts associated with construction, operation and decommissioning of the Project. A description of the Project is provided in Section 2. The assessment presented in this Chapter focuses on a number of aspects, including:

- Those road and rail networks external to the development site which could experience wear and tear;
- Delays to other road users as a result of abnormal loads transportation or from exceedance of road network capacity;
- Scheduling impacts (i.e. as a result of increased freight on major routes);
- Road safety implications (i.e. as a result of increased traffic flow);
- Impacts on other environmental receptors, including ecology and the water environment, as a result of, for example, run-off of contaminants; and

Health and safety requirements in relation to moving vehicles within the working area are addressed in the ESMP. Principal transportation activities predicted for each phase of the Project life are summarised in Table 13.1.

Table 13.1: Predicted Traffic and Transportation Activities

Project Lifecycle Stage	Project Activity or Element
Pre-Construction	Creation of access roads (temporary and permanent roads) Set up and operation of construction labour camps and laydown areas Importation of resources (water, aggregate, sand)
Construction	Import of abnormal loads Delivery of resources to site (concrete / water) Mobilisation of construction workforce Disposal of solid waste arisings Earthmoving, foundations, excavations Delivery of electrical equipment for OHL works (towers, conductors etc.) Delivery of electrical equipment for substation works (transformers, etc.)
Operation	Maintenance activities Regular imports and exports of project and camp materials and products

Due to the absence of human receptors, the internal road system for the Project has been excluded from the impact assessment other than where impacts on the state highway or residential settlements are considered possible. Potential nuisance (noise, air quality) and environmental impacts are considered within the relevant specialist environmental chapters of this ESIA. The transportation of materials by sea, if any is required, is also considered to be outside of the scope of this assessment. This Chapter is structured as follows:

- Methodology;
- Baseline Description;
- Assessment of Impact;
- Mitigation and Enhancement Measures;
- Summary of Residual Impacts;
- Proposed Monitoring; and
- Statement of Significance.

Due to the spatial extent of the Project components, the environmental baseline each component (gas field, pipelines, and UGCC) is discussed separately. However, for subsequent sections, the pipeline and UGCC have been considered in tandem due to a reliance on the same transport infrastructure.

13.2 Methodology

13.2.1 Methodology and Assessment Criteria

13.2.1.1 Overview

The assessment has been undertaken by desk-top study. The methodology used for the assessment is summarised as follows:

- Establishment of baseline, comprising:
  - an examination of existing traffic and transport routes serving each aspect of the proposed development; and
  - the generation of assumptions regarding road quality, traffic volumes and vehicle movements; and
- Assessment of impacts based on predicted volumes of vehicle movements generated by both the construction and the operational phases of the Project when compared with baseline traffic flows recorded on the existing road and rail network. Possible effects arising as a result of the additional traffic have been identified and their significance assessed. Significance criteria have been adopted for the prediction of impacts within this ESIA. These are outlined in the following section.

13.2.1.2 Determining Significance of Impacts and Effects

An assessment of the significance of impacts with regard to traffic and transportation has been made for the construction, operational and decommissioning phases of the Project. The significance of potential impacts is a function of the presence and sensitivity of receptors, and magnitude (duration, spatial extent, reversibility, likelihood and threshold) of the impact. The assessment follows the standard assessment approach outlined in Chapter 5.

13.2.1.3 Available Date and Data Limitations

The data made available for this chapter comes principally from the following sources:

- information provided by the Project proponent;
- publicly available traffic count data for the Kungrad to Beyneu Road; and
- observations made during the various site visits undertaken by the Project team.

However, it is worth noting that this assessment has been undertaken in the absence of the following data:

- Detailed construction and operational traffic volumes and variations across Project phases (to be provided by EPC contractor at detailed design stage;
- Detailed traffic counts on the main roads; and
- Origins of materials during construction and operation;

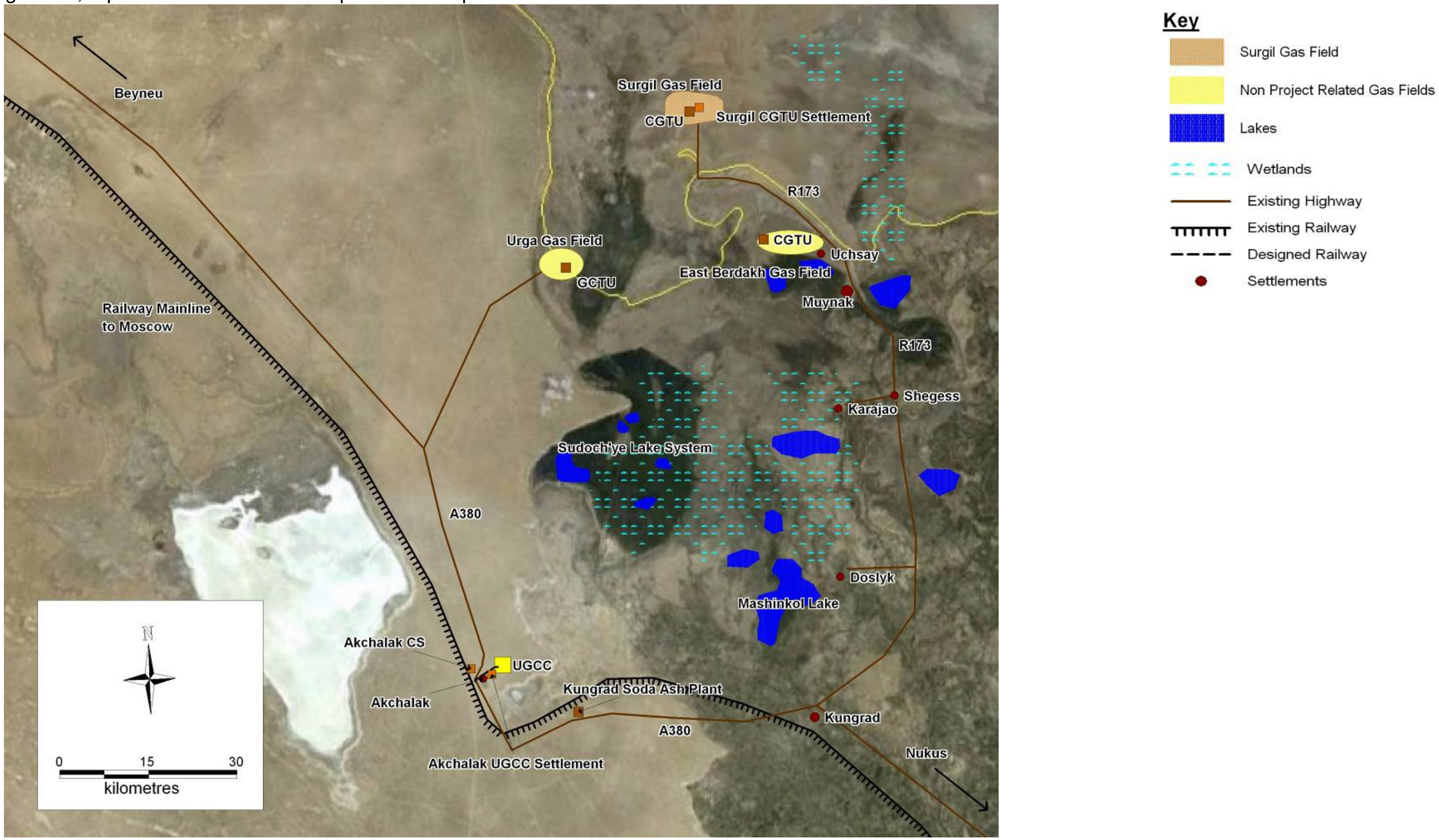
In undertaking the assessment it has been necessary to generate assumptions to overcome the absence of data based on experience of similar projects and knowledge of the likely transportation routes that materials may take. Professional judgement has been used to reduce the level of subjectivity within these assumptions as far as possible. Where professional judgement has been used an explanation for assumptions reached is provided.

13.3 Baseline Description

13.3.1 Overview of Project Transportation Network

The location of the development site, and its relationship to the local transport infrastructure and residential context, is illustrated in Figure 13.1.

Figure 13.1: Surgil Field, Pipeline and UGCC Development: Transport Infrastructure Context



Source: MML with Google Earth basemap under license

Receptors sensitive to operational and safety impacts have been identified from review of the transport network within the Project region. The following sections examine the traffic and transportation baseline applicable to each of the three main development components.

13.3.2 Gas Fields

13.3.2.1 Existing Transportation Infrastructure

The existing drilling sites and well heads of the Surgil Field are accessed by the R-173 from Muynak. The R-173 is a tarmac road that extends from Kungrad (approximately 50 km east of the UGCC site) to Muynak (approximately 40 km south-east of the Surgil Field) and onward to Uchsay and to the Surgil Field CGTU (See Figure 13.2). During the site visits it was observed that the condition of the R-173 was mixed, with some sections heavily pot-holed or lacking asphalt surface.

From the CGTU all access to the well heads is provided via a network of established tracks embedded within the surface layer of the former Aral Sea bed but no formal tarmac or hard surfaced roads have been constructed (see Figure 13.3). Historic and existing industrial activity associated with traffic movements across the former Aral Sea bed has resulted in a disturbed landscape where imprints typically remain for extensive periods as a result of the degraded nature of the soils. This phenomenon is illustrated in Figure 13.3. The ground surface degradation can be further exacerbated when driving off-road during wet weather conditions.

Figure 13.2: Tanker on R-173 between Muynak and CGTU

Source: MML site photo

Figure 13.3: Track at Surgil Field

Source: MML site photo

Current traffic volumes on highways connecting Muynak to the Surgil Field are not available, however, due to the limited number of settlements in the area (only notable village is Uchsay) and from observation during field survey, it can be concluded that these routes have low volumes of public traffic that are well below the road's capacity. .

The current estimated traffic movements associated with operation of the Surgil gas wells and CGTU is shown in Table 13.2. It should be noted that each vehicle counts as two traffic movements to account for the out and return journey along the same stretch of road.

Table 13.2: Estimated traffic movements [1] from existing Surgil Field operations

Type of Traffic	Origin/Destination	Per day	Per week
Water for process and potable use	Tankered from Muynak WSU	2	14
Condensate [2]	Transported by road to the rail station at Kungrad, approximately 185 km by road	16	112
Diesel/Oil/Process Consumables	Transported from Muynak by tanker and lorry (process chemicals/material)	2	14
Waste	Transported to a dedicated government run landfill in Muynak	2	14
Staff vehicles	To and from Muynak. Drilling workers on 2 week working shift staying at site during shift so main staff movements biweekly. Assumed other staff movements assumed for maintenance staff, management etc	6	42
Staff provisions	Van/truck from Muynak	-	4
	Maximum Total	28	200

Source: MML based on project experience

Note 1: One return journey is equivalent to two traffic movements (out and return)

Note 2: Assumed condensate production of 76 000 tpa, tanker capacity of 30 m^3, condensate density 0.9 kg/l

For the R-173 between Muynak and the Surgil CGTU the current total traffic volumes are low and the road does not operate at or near capacity.

Traffic count data for the R-173 from Muynak to Kungrad is not available but observations during the site visits indicated that the road is used mainly for travel between regional cities and has a mix of car, vans, buses and lorries/tankers commensurate with this use pattern (i.e. not dominated by lorries and trucks as per interstate and arterial national highways). Condensate tankers from the Surgil Field will use this road to take condensate to the railway station at Kungrad. The road is essentially dual carriageway from Kungrad for part of the distance to Muynak although there are no formal lane markings for much of the distance in order to signify the transmission from dual to single carriageway road. The R-173 from Muynak to Kungrad is not considered to operate at or near capacity.

13.3.2.2 Sensitive Receptors

The main road route affected by the construction of the development at the Surgil Field will be the R-173. The mainline railway could also be impacted due to the transport of construction material and CGTU equipment being transported into the region for transfer by road to the Surgil Field site.

Existing residential settlements potentially affected by the development could include Kungrad, as a result of construction material and equipment transference from rail to road at Kungrad station, Muynak and a number of smaller settlements along the R-173. Future residential receptors would include the permanent settlement located to the north east of the existing CGTU.

13.3.3 UGCC

13.3.3.1 Existing Transportation Infrastructure

The Guzar-Bukhara-Nukus-Beyneu (A-380) highway passes the Akchalak Gas Compressor Station, approximately 5 km to the west of the proposed UGCC site. Figure 13.4 presents views of the A-380 between Kungrad and Akchalak. There is currently no established road or rail network linking the UGCC site with the nearest transportation routes around the Akchalak Gas Compressor Station.

During each of the site visits by the Project team it was observed that the current condition of the A-380 highway was mixed, with many sections heavily pot-holed and/or lacking asphalt surface.

Figure 13.4: A-380 Between Kungrad and Akchalak

Source: MML site photo

Source: MML site photo

As part of the Central Asia Regional Economic Cooperation (CAREC) Corridor 2 Road Investment Program (hereafter referred to as 'the CAREC Corridor 2 Program') the ADB has allocated approximately US$600 million of multitranche financing for the upgrade of the A-380 highway. The CAREC Corridor 2 Program is aimed at facilitating the sustainable economic development of the region through improvements in the connectivity and efficiency of the transport system.

The A-380 forms part of the 'Asian Highway' being promoted by the Economic and Social Commission for Asia and the Pacific (ESCAP) of the United Nations. The highway links Uzbekistan with neighbouring states in the Central Asian region, namely Afghanistan and Turkmenistan to the south and Kazakhstan to the north. The scheme will ultimately involve the reconstruction of over 220 kilometres of the A380 within Karakalpakstan and the Khorezm and Bukhara provinces, with completion of the works anticipated by 2014 / 2015.

The upgraded road will have be dual carriageway (two lanes in each direction (total of four lanes)) with a tarmac hard shoulder on each side. The designed speed of traffic for the road will be 120 km/hour.

The ADB Technical Assistance Consultant's Report on the CAREC Corridor 2 Program (September 2010) presents information in relation to A-380 traffic flows across the Uzbekistan / Kazakhstan border at the Dautata Post from 2005 to 2009. Although this border post is located significantly north of the study area, it can be assumed, given the scarcity of any settlements or large development infrastructure between

Akchalak and the border, that these traffic counts are directly applicable to flows reaching or passing Akchalak. The traffic flow figures are presented in Table 13.3.

Table 13.3: Truck, Tonnage and Trade Value Flow through Dautata Customs Post

Item	2005	2006	2007	2008	2009
Trucks per year	2866	2634	3512	4716	4330
Trucks per day	7.9	7.2	9.6	12.9	11.9

As shown in Table 13.3, the average number of trucks passing through the Dautata Post in 2009 was 11.9. As a worst case assumption it is predicted that average flows may have increased in the subsequent two year period since the data was collected to approximately 14 trucks (28 movements) per day in 2011. In addition to these data observations made during each of the site visits and discussions held with local people indicate that current volumes of all traffic travelling between Akchalak and Kungrad on the A-380 are low and that the road is not at or near capacity. With completion of the CAREC Corridor 2 Program the capacity of the road will be significantly increased and while it can be anticipated that traffic movements will also increase, overall the there is significant unused capacity on this road.

The mainline railway across the region is an international route that links Tashkent to Moscow. The line is routed approximately 5 km to the west of the Project area and runs from Kungrad in the south and east, ascending the Ustyurt Plateau escarpment on a north-western route towards the border with Kazakhstan. A railway station is located on this line at Kyrkkyz (near to the Akchalak settlement). The line is used by passenger and freight diesel locomotives, but primarily for the transportation of freight as shown in Table 13.4. Taking into account the days on which passenger trains operate the maximum number of trains per day passing the Kyrkkyz Station is 10.

Table 13.4: Baseline Train Movements on Main Railway Line

Train Route	Week Days Operating	Stops	No. trains per day	No. of Carriages	Category
Dushanbe - Moscow	2,5,6	none	1	15-16	passenger
Moscow - Dushanbe	2,4,6	none	1	15-17	passenger
Kuljab - Moscow	7,3	none	1	15-18	passenger
Moscow - Kuljab	1,5	none	1	15-19	passenger
Tashkent - Saratov	3,6	none	1	16-17	passenger
Saratov - Tashkent	7,3	none	1	16-18	passenger
Khodzhant - Saratov	5,7	none	1	14-15	passenger
Saratov - Khodzhant	2,4	none	1	14-16	passenger
Kungrad - Beyneu	daily	yes	1	15-16	passenger
Beyneu - Kungrad	daily	yes	1	15-17	passenger
Tashkent - St. Petersburg	1	none	1	15-16	passenger
St.Petersburg - Tashkent	1	none	1	15-17	passenger
Russia - Central Asia	daily		Average 2-3	max70	freight train
Central Asia - Russia	daily		Average 2-3	max70	freight train

Source: UGCC Management Directorate

13.3.3.2 Sensitive Receptors

The village of Akchalak is located approximately 5 km to the south-west of the UGCC site and has a population of approximately 1,000 inhabitants. Akchalak is located adjacent to the mainline railway and the settlement includes a railway station (Kyrkkyz). Together with the proposed UGCC dwelling settlement, a maximum of approximately 3,650 people will be resident in the local area.

In addition, the Urgenchtransgaz-operated Akchalak Gas Compressor Station is situated approximately 5 km west of the site, and the Kungrad Soda Plant approximately 10 km south-east of the UGCC site, adjacent to the El'abad settlement.

13.3.4 Pipelines

13.3.4.1 Existing Transportation Infrastructure

The R-188 road heads north-west from Kungrad and links to a number of tracks across the plateau. Due to the sparseness of settlements along this road it is assumed that the road and tracks currently experience low traffic volumes. A network of unsurfaced tracks spreads out toward the Ustyurt plateau escarpment from the R-188.

An asphalt road has been constructed by Petronas to serve existing pipeline and compressor station assets upon the plateau. This road is publicly available and will provide the principal means of access to the pipeline working width during construction, and also for maintenance requirements during operations. The road is constructed with a 0.7 metre elevation above the surrounding topography in order to prevent the roads being covered in sand.

13.3.4.2 Sensitive Receptors

The vast majority of the pipeline route area is uninhabited. However, the route is highly developed in terms of existing pipeline infrastructure. The main sensitive receptors are livestock herders who migrate up to the plateau in the summer for their animals to access fresh grazing land. These are generally large scale agricultural businesses that have experience in traversing pipeline routes during construction and once completed.

The importation of construction materials via rail and road from Akchalak station could affect the safety of residents in Akchalak and the proposed adjacent worker settlement. These receptors are also affected by the UGCC (refer to Section 9.8.3.4).

13.4 Assessment of Impact

13.4.1 Gas Fields

13.4.1.1 Project Supporting Infrastructure

The Project will involve the construction of approximately 83 km of in-field highways, comprising the following routes:

- Surgil CGTU – Uchsay (approximately 30 km paved road);
- Surgil CGTU – GGS 1 (approximately 2.5 km paved road);
- Surgil CGTU – GGS 2 (approximately 2 km paved road);
- Surgil CGTU – GGS 3 (approximately 1 km paved road);
- Surgil CGTU – GGS 4 (approximately 3.5 km paved road);
- Surgil CGTU – GGS 5 (approximately 1.7 km paved road);
- Surgil CGTU - GGS 6 (approximately 4 km); and
- GGSs to gas wells (total of 42km unpaved gravelled roads).

The new in-field access roads will be constructed in accordance with relevant local standards. The overall road width will be 6.5 metres with a 4.5 metre central asphalt road and 1 metre gravel embankment either side. The roads will be constructed with a 0.7 metre elevation above the surrounding topography in order to prevent the roads being covered in sand. The fill material will be provided by extraction of fill material either side of the road or from nearby borrow pits.

The roads will be developed sequentially, in line with the gas well development programme with each road constructed as the first stage of construction of the GGS and corresponding gas wells associated with that GGS. The Surgil to Uchsay road will be constructed early in the construction programme. Once constructed, all traffic and vehicles will be required to use the roads in order to minimise the deterioration of ground surfaces from uncontrolled traffic movements on the dried Aral Sea bid.

Roads from the GGS to the well will be unpaved but gravelled to prevent erosion of the ground surface. During construction/drilling traffic movements will consist of intermittent movement of drilling workers (drilling teams will be working on a two week shift pattern with accommodation located at the drilling site), potable water tankers and drilling materials and camp supplies. Once drilling and commissioning are completed traffic will be restricted to infrequent well maintenance traffic.

13.4.1.2 Construction Movements

The drilling operations are considered to be part of the operational phase as it will be on-going through out the most of the lifetime of the gas field and are considered below.

At the height of construction it is anticipated that approximately 97 workers will be based on-site at the Surgil Field in connection with the expansion and modernisation of the CGTU. An additional 100 workers will be employed across the Project on the construction of associated infrastructure; a share of these will be located within the Surgil field.

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

The majority of daily movements of other workers during construction are considered to concern return journeys from the Surgil camp to on-site construction locations or the Uchsay construction camp. The assessment also assumes that there will be 48 vehicle movements (28 return journeys) per day by car from Muynak to the Surgil Field for other construction staff/managers etc.

Construction equipment and materials for Surgil Field works would be transported by road for approximately 100 km from the railway station in Kungrad. At this stage in the design process the quantity of construction materials and distribution of deliveries across the construction period is not known. In order to generate a worst case scenario, figures have been derived from the combined peak movements of trucks for importation of materials, fuel deliveries, water supply and solid waste disposal for a comparable project. In generating this figure the following assumptions have been made:

- The average working day is 10 hours;
- All materials would be transported to and from Kungrad railway station; and
- No materials would be sourced on site.

In the worst case it is assumed that there would be in the region of 100 truck journeys (200 movements) per day. It is considered that traffic volumes across the construction period would be variable, dependent on the nature of works undertaken at a given time. The total figure of 100 two way movements is inclusive of all other truck movements, including for the importation of materials, fuel and water, and the disposal of waste. Movements associated with these activities would in most cases be scheduled to coincide with particular phases of construction, or to be undertaken at regular intervals on a weekly or monthly basis. The number of movements attributed to these activities is therefore a conservative estimation.

Rail movements for the construction phase are anticipated to include delivery of key items of construction plant and major equipment items such as gas turbines and parts for the CGTU. A range of construction materials may also be required to be delivered by train depending on the ability to source materials such as concrete, cement, steel work etc from within the region by road. Existing freight trains will be utilised where possible with the plant and equipment transferred at Kungrad to specialist trucks for transport to site as abnormal loads. As a worst case assumption for rail deliveries however we have assumed that up to one freight train per day will be required.

Abnormal load movements will be required in connection with: drilling rigs (three new drilling rigs will be required to meet the current proposed drilling schedule); gas turbines and LTS plant. Based on projects of a similar nature it is assumed that there would be in the region of four abnormal load movements per month between Kungrad and the Surgil Field. As the works at the Surgil Field are essentially an extension of the existing works all abnormal loads of the types expected have already been transported safely to the Surgil Field previously. No additional road upgrades for the road between Kungrad and Muynak and up the Surgil Field are therefore considered necessary. Furthermore, due to an international programme of road improvement in the region currently being implemented, no further road upgrades are anticipated to be required to specifically support the project overland supply routes to the project site including those with Kazakhstan.

13.4.1.3 Operational Movements

Drilling is considered to be an operational activity as it will be on-going for much of the lifetime of the field. There are a maximum of five drill rigs operating at any one time. Small temporary workers camps are provided at each well drilling site for 12 to 20 workers through out the drilling phase which results in a maximum of 100 drilling workers at any one time in the Surgil Field. They will work a two week shift staying at the drilling site during that time so the traffic movements associated with these workers will be limited to up to five minibuses to transport workers to Muynak when not on shift.

A permanent accommodation camp, housing 72 personnel, will be developed at the Surgil Field for use during the operational phase. As for the construction period, the majority of daily worker movements during operations are considered to concern return journeys from the permanent Surgil camp to the CGTU and specific locations across the gas field so will not have any impact on the public road network.

It is envisaged that the existing road transportation of potable water will cease by the end of December 2011, and condensate by the end of 2014, when alternative transport arrangements associated with the Project are realised; the creation of artesian wells for water supply and transference of condensate by pipeline rather than road tanker will result in lower volumes of HGV traffic on the R-173. As water transportation only affects the in-field route to Muynak and is due to cease in December 2011, the assessment of this benefit to the road network focuses on the transport of condensate.

Following commissioning of the gas field, it is assumed that regular truck movements to and from the site will be limited to such activities as the weekly collection of various solid wastes, supply of domestic and industrial materials and transport of workers to and from site. During operation of the Surgil Field it is not expected that the frequency of vehicle movements would exceed 100 per week, including all personnel and operational movements to and from site.

13.4.1.4 Impact Assessment - Construction

Capacity – Road and Rail

Compared with the baseline situation, the increase in traffic movements on the R-173 during construction is considered of moderate magnitude for the majority of the construction period due to the temporary nature of the change. It is assumed that the road currently serves a low volume of traffic, with sufficient capacity to absorb additional journeys; the R-173 is therefore considered to be of low sensitivity to the level of temporary increases. Consequently, the significance of construction traffic generated by the proposed development is expected to be of **minor** significance in terms of the capacity of the highway network during the majority of the construction period. However, given the current low road traffic volumes it will be important to ensure a comprehensive plan that addresses road user safety, which is discussed later.

As a worst case it is assumed that up to one freight train per day will be required for delivery of construction materials, plant and equipment at the peak of construction. It is judged that the effect on the railway network would be of minor magnitude due to the temporary nature of the change and the ability of the line to accommodate an additional freight train. The sensitivity of the rail network is assessed as medium given the assumption that existing freight trains can be utilised. The impact significance is therefore judged to be **minor**.

Abnormal Loads

It is assumed that the R-173 currently experiences low traffic volumes and, due to the absence of alternative routes between Kungrad and the gas fields, it is considered that the transport of abnormal loads would result in an effect of moderate magnitude. This conclusion is influenced by the temporary nature and assumed low frequency of abnormal movements. The sensitivity of the local highway network is considered to be low as a result of abnormal loads potentially affecting north and south bound traffic. The impact significance of abnormal loads is therefore judged to be **minor** due to the potential delay caused to other road users.

Wear and Tear

With respect to the physical effects of construction traffic, it is considered that trucks (including those carrying abnormal loads) will have an effect of moderate magnitude on the local highway infrastructure due to the temporary increase in traffic. The sensitivity of the R-173 to truck movements is considered to be high as a result of existing mixed road conditions with the potential to deteriorate rapidly under high construction traffic flows. The impact of construction traffic on highway 'wear and tear' is therefore judged to be of **moderate** significance.

Road Safety

It is considered that construction traffic flows will result in a change of moderate magnitude in traffic volumes. The sensitivity of the R-173 is judged as medium as the route passes through the major settlements of Kungrad and Muynak in addition to several smaller settlements en route. On site, the route also passes the proposed worker camp. It is in these settlements that vulnerable road users (non-vehicle users) are most likely to be found. The impact of construction traffic on road safety is therefore judged to be of **moderate** significance

It is considered that increased traffic volumes will be of moderate magnitude. The sensitivity of the R-173 is judged to be low as a result of an assumed low traffic volume and ability to accommodate additional traffic flows. The significance of the potential impact on road traffic accidents is therefore assessed as **minor** and it is not envisaged that the development would result in any consequential increase in road traffic accidents on the highway network. Nevertheless, given the current low road traffic volumes it will be important to ensure a comprehensive plan that addresses road user safety and this is discussed later.

13.4.1.5 Impact Assessment - Operation

Capacity – Road and Rail

The magnitude of the beneficial impact of reducing HGV movements on the R-173 associated with the existing road transportation of potable water and condensate by the end of 2014 is considered moderate beneficial. The sensitivity of the R-173 to condensate truck movements is considered low positive. Moreover, the combined movement of cars, buses and lorries not anticipated to exceed 100 per week, which is less than the current baseline. The benefit to the R-173 is therefore assessed as **minor beneficial**.

It is assumed that major deliveries to the gas field by rail will not be required under normal operational conditions. The significance of impact on the rail network is therefore judged to be **insignificant**.

Abnormal Loads

It is not anticipated that abnormal loads will be required as part of routine operations. The impact significance is therefore judged to be **insignificant**.

Wear and Tear

The gas field road network is designed as fit for purpose and will only experience traffic related to its operational activities. The sensitivity of the receiving road network is therefore considered to be low, the magnitude of effect minor and consequently impact significance assessed to be **insignificant**.

Road Safety

The gas field worker camp is the only receptor likely to be affected by operational traffic movements. The frequency of vehicle movements on site is anticipated to be low and therefore of negligible magnitude. The sensitivity of the camp is considered to be low given habituation to the baseline traffic conditions on site and requirement for site operations to conform to international safety standards. The significance of the impact on road safety and accidents is therefore considered to be **insignificant**.

13.4.1.6 Impact Assessment - Decommissioning

At this stage it is difficult to assess the impact of decommissioning on the local highway network, as it is not possible to make a reliable forecast of road traffic growth to the year of decommissioning. Other developments will undoubtedly have taken place in the local area in the intervening period and improvements to the local highway network are likely.

However, the increase in traffic movements during decommissioning is anticipated to be no greater than that during construction. This could be reduced further if the need for the import/export of materials is minimised in the design of any future alternative use for the site, and/or if building structures were retained.

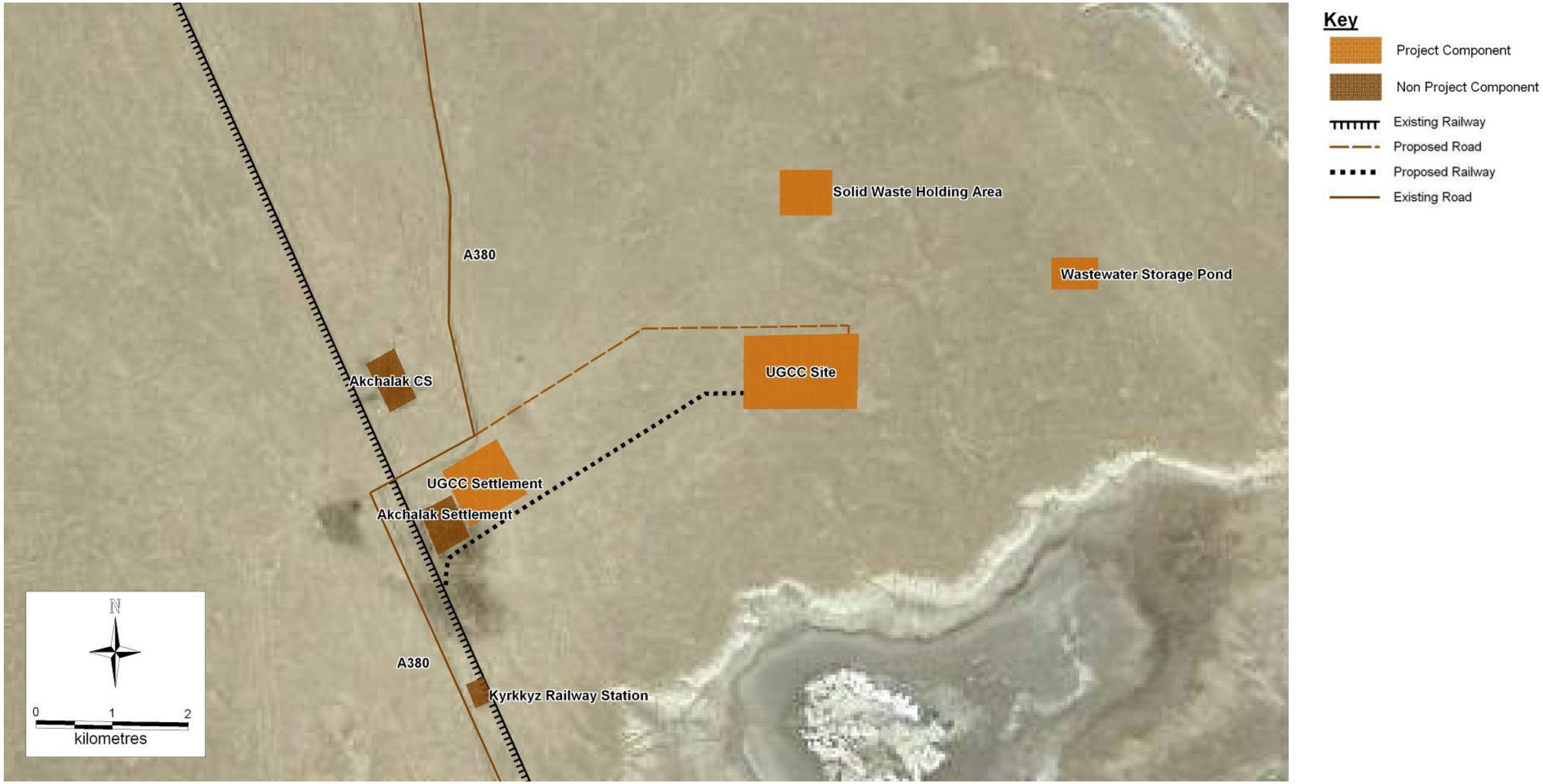
For the above reasons the operational and safety impacts of traffic movements associated with decommissioning are assumed to be no greater than those associated with construction.

13.4.2 UGCC

13.4.2.1 Project Infrastructure

Figure 13.5 summarises the proposed rail and road additions to the existing network that will serve the UGCC and associated infrastructure.

Figure 13.5: Proximity of Existing and Proposed Transportation Infrastructure to UGCC site



Source: MML with Google Earth basemap under license

A service road will be constructed to the UGCC site to connect with the A-380 adjacent to the existing Akchalak Gas Compressor Station located approximately 5 km from the UGCC site. The total land take area allocated for the new road is 9 Ha. It is envisaged that the new road network will pass approximately 1 km to the north of Akchalak settlement. The new service road will comprise two carriageways with a total width of 7.5 metres. The road surface will be raised 0.7 m from the ground surface to mitigate impacts of blown sand and ditches of 0.3 m either side will be constructed to channel any rainwater. The roads will be finished in asphalt and constructed according to national standards.

The Project will introduce a new rail spur from the existing line to the UGCC to transport the final products. It is anticipated that the new the Project will contribute approximately a maximum of one freight locomotive a day to the existing rail line.

A new railway connection of approximately 7 km length will spur from the Kyrkkyz Railway Station to the proposed UGCC site. A 21 m right of way has been secured with a total landtake of 14.7 Ha for the development. The railway spur would be situated within approximately 200 metres of the southern boundary of Akchalak.

The upgrade of the A380 being undertaken under the CAREC Corridor 2 Program will upgrade the road to dual carriageway with a tarmac hard shoulder on each side and strengthen key bridges and weak sections along its route to allow passage of heavy loads. This upgrade work will encompass any improvements that may have been required for the transportation of UGCC abnormal loads along the A380 so no additional road improvements works remote from the Project site will be necessary (including within Kazakhstan).

13.4.2.2 Construction Movements

At the peak of construction, expected at the end of 2013 / beginning of 2014, approximately 657 staff will be based on site in a temporary workers camp at the UGCC directly under the employment of Uz-Kor (this is a maximum total including JV personnel). In addition, at peak, the downstream component will involve around 6,300 staff of the EPC contractors.

The majority of daily movements are therefore considered to be return journeys from the UGCC camp to on-site construction locations. The assessment further assumes that there will be 100 return journeys (200 vehicle movements) per day by car from Kungrad to the UGCC and pipeline.

Table 13.5 lists the mobile plant that would be utilised during the construction phase and will need to be transported to site. Numbers of plant have been assumed based on projects of a similar nature. It is assumed that plant will be delivered during months 1 to 5 of the construction programme. Assuming that deliveries take place on a regular basis throughout this period, this equates to an average of fifteen plant deliveries per month or a maximum of four per week. Furthermore it is assumed that plant will be collected during months 36 to 42 of the construction programme, with the same number of monthly and weekly collections.

Once on site these vehicles and plant movements will be internal to site and not impact on the public highway.

A variety of construction materials, as summarized below, will be delivered during the construction period:

- Materials for construction of roads, vehicle parking, walkways;
- Steel;

- Concrete;
- Building materials;
- Piping.

Delivery of these materials is expected to be by truck from within the region where possible with some deliveries also arriving by rail. For the purposes of this assessment it has been assumed that 80 trucks (160 movements) per week will be required.

Table 13.5: Construction plant and numbers

Plant Type	Number
Excavators	5
Bulldozers	4
Motor Graders	2
Roller on pneumatic motion	2
Pneumowheel	2
Caterpillar and Automotive Cranes	2
Craner-pipelayers	12
Moveable welding aggregates and compressors	9
Motor-truck concrete mixers; automatic cement mixers	6
Dump trucks	2
Pipe trucks	2
Haulage trucks	10
Barriered motor cars	20
Tanks trucks	2

Source: Mott Macdonald

It will be necessary to transport prefabricated plant and equipment to the UGCC site during the construction phase. This will involve transportation of such components to Uzbekistan from other countries via existing shipping and rail networks. In the worst case it is assumed that:

- 90 per cent of imported material will arrive by rail to Kungrad Railway Station and 10 per cent by road (A-380);
- The new rail spur will not be operational until completion of the construction phase.

Abnormal load movements will be required in connection with large scale turbines, boilers and steam crackers, tanks etc. Based on projects of a similar nature it is assumed that there would be in the region of three or four abnormal load movements per month between Kungrad and the UGCC site.

13.4.2.3 Operational Movements

Operation of the UGCC complex will result in the import and export of materials by road and rail. Imports and exports by rail will be facilitated via the rail loading and unloading facility at the UGCC site.

Operation of the complex will also involve the daily commute of personnel from nearby residential settlements. The majority of the UGCC operational personnel will be bussed from the nearby dwelling settlement. An additional 100 return journeys per day by car from Kungrad along the A-380 are also assumed for assessment purposes.

Imported Materials

Information in relation to the movement of raw materials to be imported to the UGCC is outlined in Table 13.6.

Table 13.6: Transportation of Raw Materials to the UGCC

Material	Transport mode	Movement information
Ethylene	Rail	From special railway container
Propylene	Rail	From special railway container
Butene-1	Rail	Container capacity 20 m^3/hr
Hexane	Rail	Container capacity 20 m^3/hr
Diesel oil	Rail	Container capacity 20 m^3/hr
Wash oil	Rail	Container capacity 20 m^3/hr
Sulphuric acid (98%)	Rail	Container capacity 20 m^3/hr
Caustic (50%)	Rail	Container capacity 20 m^3/hr
Condensate	Rail	From special railway container

Exported Materials

Information in relation to the export of product from the UGCC is outlined in Table 13.7.

Table 13.7: Transportation of Product from the UGCC

Material	Transport mode	Movement information
Heavy Hydrocarbon Residue	Rail	Not known
HDPE and PP pellet products (25kg bags)	Rail	Railway shipment accounts for 80% of product transfer off-site. Each railway vehicle (dimension: 13.8 metre (L) x 2.79 metre (H) x 2.76 metre (W)) will have a volume of 120 cubic metres.
HDPE and PP pellet products (25kg bags)	Road	Shipment via truck accounts for 20% of product transfer off-site. Two kinds of truck will be used for truck shipment (1.2 metres and 1.3 metres high, respectively).
Gasoline and NGL	Rail	Not known
LPG	Rail	Loading to railway container with loading arm (capacity 35 ton /hr each, three pumps each, two loading arms each)

Personnel

It is understood that approximately 445 operational workers will be employed at the UGCC. The majority of these workers will be accommodated, together with their families, at the permanent dwelling settlement to be constructed as part of the Project, adjacent to Akchalak. In total, the dwelling settlement will provide homes for approximately 1,650 people. It is assumed that these workers will travel by bus from the dwelling settlement to the UGCC complex each day along the purpose built site road. The expansion of the settlement at Akchalak will also increase general public traffic associated with families and outside work travel.

It is anticipated that approximately 84 additional workers will take a return journey to the UGCC complex from Kungrad each day by car.

13.4.2.4 Impact Assessment - Construction

Capacity – Road and Rail

It is assumed that 90 per cent of construction materials will be transported to site by rail, with the remaining 10 per cent delivered by road. It is also assumed that the majority of construction workers will be based at the new workers camp adjacent to Akchalak; with a further 100 return journeys by car each day from Kungrad. It is further assumed that the mainline railway which serves the station at Kyrkkyz has sufficient capacity to accommodate the additional freight trains.

Whilst the volume of materials required in the construction phase is likely to be substantial, it is judged that the effect on the railway network would be of moderate magnitude due to the temporary nature of the change. The sensitivity of the rail network is assessed as low given the assumption that capacity exists on the network. The impact significance is therefore judged to be **minor**.

From the information outlined in Section 13.3.3.1, it is assumed that the A-380 currently serves a low volume of traffic flows from the south and north toward Akchalak and the general surrounds of the UGCC site. Given the importance of this road as a strategic component of the 'Asian Highway', the level of importance placed on the highway by the Government of Uzbekistan and the level of international investment afforded to the current upgrade of the route, it is considered that the highway is not operating to capacity and has low sensitivity to an increase in traffic flows.

The increase in traffic volumes during the construction period anticipated on this route between the UGCC site and Kungrad is considered to be of moderate magnitude. Consequently, the impact of construction traffic on the A-380 is expected to be **minor**.

Abnormal Loads

It is assumed that all abnormal loads will be delivered by rail to Kyrkkyz Railway Station and that transportation of any abnormal loads by road would only occur on those purpose built for the Project. The impact of abnormal loads is therefore judged to be **insignificant**.

Wear and Tear

With respect to the physical effects of construction traffic, it is considered that trucks (including those carrying abnormal loads) will have an effect of moderate magnitude on the local highway infrastructure due to the number of trucks and other vehicles during the construction phase. The sensitivity of the A-380 to truck movements is considered to be high at present as a result of existing mixed road conditions with the potential to deteriorate rapidly under construction traffic flows but the implementation of the CAREC Corridor 2 Program will address any deterioration of the road surface and therefore the sensitivity is determined to be low. The impact of construction traffic on highway 'wear and tear' is therefore judged to be of **minor** significance.

Road Safety

The proposed route of the new road connecting the UGCC and pipeline to the A-380, and road connection to the rail station at Kyrkkyz, pass in close proximity to Akchalak settlement and the proposed permanent adjacent dwelling settlement. As this is a permanent new route with anticipated high construction traffic flows, it is judged that the change would be of major magnitude. The sensitivity of Akchalak is considered medium as it is in these settlements that vulnerable road users (pedestrians/cyclists) are most likely to be found. The impact of construction traffic on road safety is therefore judged to be of **moderate** significance.

13.4.2.5 Operation

Capacity – Road and Rail

Operation of the UGCC will involve the import and export of a large volume of material from a new spur off the mainline railway. It is assumed that the majority of workers at the UGCC complex would be transported by bus from the new dwelling settlement at regular intervals, dependent on shift patterns. An additional 84 return journeys per day by car from Kungrad along the A-380 are also anticipated.

The new road connection to the UGCC is being designed fit for purpose and will only experience traffic related to its operational activities. The sensitivity of the receiving road network is considered to be low, the magnitude of effect minor and consequently impact significance assessed to be **insignificant**

The rail network will continue to be utilised for import and export of material, although at a decreased level to that required during construction. However, loading and unloading facilities will take place on a newly constructed rail spur. For these reasons it is judged that the effect on the rail network would be of a minor magnitude. The sensitivity of the rail network is assessed as low on the basis of available capacity to accommodate additional freight trains. The impact significance is therefore judged to be **insignificant**.

Abnormal Loads

It is not anticipated that abnormal loads will be required as part of routine operations. The impact significance is therefore judged to be **insignificant**.

Wear and Tear

The new road connection to the UGCC is being designed fit for purpose and will only experience traffic related to its operational activities. The sensitivity of the receiving road network is therefore considered to be low, the magnitude of effect minor and consequently impact significance assessed to be **insignificant**.

Road and Rail Safety

Akchalak and the permanent dwelling settlement for the UGCC workers are the only receptors likely to be affected by operational traffic movements. The frequency of vehicle movements on site is anticipated to be low and therefore of negligible magnitude. The sensitivity of the existing settlement and planned worker camp is considered to be low given habituation to the baseline traffic conditions on site and requirement for site operations to conform to international safety standards. The significance of the impact on road safety and accidents is therefore considered **insignificant**.

The construction of the new rail spur within approximately 200 metres of Akchalak represents a potential hazard to the safety of the community. As the majority of material movements in and out of the UGCC complex are anticipated to occur by rail, it is assumed that rail movements will be high. It is considered that the high volume of rail traffic on a new line would represent a fundamental and permanent change to existing conditions, and consequently it is judged to be of major magnitude. The ability of the local community to absorb these changes is considered less than that for roads due to the volumes of rail traffic anticipated in the worst case, and the vulnerability particularly of children in terms of rail safety. For these reasons the sensitivity of Akchalak is considered medium and impact significance is judged to be **moderate**.

Operation of the UGCC will require transportation of some hazardous materials to or from the UGCC, such as condensate by rail. The transport of such materials will be conducted using appropriate special containers and will transported in line with the safety requirements of the national rail network.

13.4.2.6 Decommissioning

The impacts of traffic movements associated with decommissioning of the UGCC are assumed to be no greater than those associated with construction.

13.4.3 Pipelines

13.4.3.1 Construction

Pipeline construction will be serviced from the UGCC complex. Construction impacts are therefore considered within that presented for the UGCC (refer to Section 13.4.2.4).

13.4.3.2 Operation

It is assumed that vehicle movements will be in the region of one per week due to an anticipated low requirement for maintenance activities along the pipeline during operation. The sensitivity of the receiving road network is therefore considered to be negligible, the magnitude of effect negligible and consequently impact significance assessed to be **insignificant**.

13.4.3.3 Decommissioning

The impacts of traffic movements associated with decommissioning of the pipelines are assumed to be no greater than those associated with construction. If pipelines remain are decommissioned to remain in situ then impacts are likely to be less than during construction.

13.4.4 Cumulative Effects

At this time it is not considered that any further developments are currently envisaged for the affected area and therefore an assessment of cumulative effects cannot be undertaken. Traffic effects related to existing developments in the region are considered by way of inclusion in the baseline.

The reliance on the mainline rail network for both aspects of the project will result in in-combination effects. It is assessed that impact significance would be **moderate** for the construction phase and **minor** for the operational phase of the development.

13.4.5 Transboundary Effects

It is possible that any disruption to the mainline railway to Moscow as a result of the Project would have impacts on other countries with access to the network. Impact significance in relation to the construction, operation and decommissioning phases of the Project would be as recorded in Sections 13.4.1 and 13.4.2.

13.5 Mitigation and Enhancement Measures

This section outlines proposed mitigation for those effects assessed as being of moderate or major significance. Mitigation is presented in this section by *theme* of impact rather than by site location. This approach has been adopted due to the applicability of mitigation measures to impacts resulting from all scheme components.

At this time it is assumed that mitigation proposed for construction will be duplicated at decommissioning. However, it is expected that mitigation based on contemporary knowledge and best practice will be recommended as part of any future detailed decommissioning plan.

Significant impacts associated with the construction and operational phases, and recommended mitigation measures, are outlined in Table 13.8.

Table 13.8: Mitigation and Enhancement Measures

Impact Theme	Significance	Mitigation and Enhancement Measures
Delays to road users on R-173 as a result of abnormal loads	**Moderate Adverse**	A detailed Construction Traffic Management Plan (CTMP) will be developed in consultation with the local transport authority to identify key issues and appropriate solutions. The CTMP will be produced in accordance with applicable international standards.
Wear and tear on R-173 as a result of traffic volumes	**Moderate Adverse**	Measures to reduce wear and tear will be considered as part of the CTMP. In addition, Uz-Kor will enter into a voluntary agreement with the relevant highways authority to reimburse the cost of any repairs required to the public highway network as a result of the project. To facilitate this agreement Uz-Kor will undertake pre and post-construction surveys of the affected stretches of public highway as agreed with the relevant highways authority. Ideally, the solution will involve the enhancement of the existing road network following any remedial works.
Reduced safety of vulnerable road users on the R-173 and of residents at l settlements along the R-173, and proposed worker camps at Akchalak and the Surgil Field. Reduced safety of vulnerable road users (pedestrians/cyclists) on the new road connection linking the UGCC to the A-380.	**Moderate Adverse**	Measures to reduce the risk to vulnerable road users and occupants of residential properties in the vicinity of access routes will be identified as part of the detailed CTMP. The CTMP will draw on international best practice in developing and ensuring the implementation of suitable strategies, and will consider the option of bypassing particularly sensitive communities. Consultation will be undertaken with affected communities in addition to the appropriate highways authority to ensure identified measures take into account local circumstance.
Reduced safety of residents of Akchalak, particularly children, in vicinity of the new rail spur to the UGCC complex	**Moderate Adverse**	Consultation will be undertaken with Akchalak community to establish more precisely the nature of risk and identify suitable mitigation strategies. Options to be examined will include as a minimum, securely fencing off the railway from the community and re-routing the line further from the settlement.

13.6 Summary of Residual Impacts

Residual effects are those effects that remain after mitigation has been implemented. A tabulated summary of significant impacts associated with the development and residual impacts following mitigation is presented in Table 13.9.

Table 13.9: Summary of Residual Effects

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Surgil Field – Construction and Decommissioning						
Increase in vehicle movements on the R-173	Exceedance of road network capacity resulting in disruption to existing users	Low	Moderate	Minor	N/A	**Minor Adverse.**
Import and export of construction equipment and materials by rail	Impacts on operation of rail network	Low	Moderate	Minor	It is recommended that in-depth consultation is held with the rail network operator to accurately assess the potential level of disruption to services as a result of the proposed works. Following consultation the client should develop an appropriate rail management scheme detailing suitable delivery timings and loading/unloading protocols.	**Minor Uncertain Adverse** Any residual effect will depend on the ability for the development of appropriate solutions through the consultation process.
Transference of imported abnormal loads from Kungrad rail station to the Surgil Field	Delays to road users on R-173 as a result of abnormal loads	Low	Minor	Insignificant	It is recommended that a detailed Construction Traffic Management Plan (CTMP) is developed in consultation with the local transport authority to identify key issues and appropriate solutions. The TMP should be produced in accordance with applicable international standards.	**Insignificant.** Any residual effect will depend on the ability to develop appropriate solutions through the consultation process.
Transference of imported and exported construction equipment and materials between Surgil Field and Kungrad rail station	Wear and tear on R-173 as a result of traffic volumes	High	Moderate	Moderate	Measures to reduce wear and tear should be considered as part of the CTMP. In addition, it is recommended that the client enter into a voluntary agreement with the relevant highways authority to reimburse the cost of any repairs required to the public highway network as a result of the project. To facilitate this agreement it is recommended the client undertake pre and post construction surveys of the affected stretches of public highway as agreed with the relevant highways authority. Ideally the solution would involve the enhancement of the existing road network following any remedial works.	**Minor Adverse.** Impacts to the quality of the affected public highway would be limited to the short term. **Minor beneficial** effects may result in the medium term following implementation of enhancements during remedial works
Transference of imported and exported construction equipment and materials between Surgil Field and	Reduced safety of vulnerable road users on the R-173 and of residents at Kungrad, Muynak, small	Medium	Moderate	Moderate	Measures to reduce the risk to vulnerable road users and occupants of residential properties in the vicinity of access routes should be identified as part of the detailed CTMP. The CTMP should draw on international best practice in	**Minor Uncertain Adverse.** Any residual effect will depend on the ability to develop appropriate

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Kungrad rail station	settlements along the R-173, and the proposed worker camp at the Surgil Field.				developing and ensuring the implementation of suitable strategies. It is recommended that consultation is undertaken with affected communities in addition to the appropriate highways authority to ensure identified measures take into account local circumstance.	solutions through the consultation process.
Transference of imported and exported construction equipment and materials between Surgil Field and Kungrad rail station	Potential road traffic accidents as a result of increased traffic flows on the on the R-173.	Low	Moderate	Minor	N/A	**Minor Adverse**
Surgil Field – Operation						
Decrease in HGV movements transporting potable water and condensate on the R-173	Reduction in road network users limiting impacts to existing users from safety risks and delays.	Low	Moderate beneficial	Minor	N/A	**Minor Beneficial**
Anticipated vehicle movements of 50 per day on the R-173	Exceedance of road network capacity resulting in disruption to existing users	Low	Minor	Insignificant	N/A	**Insignificant**
Major raw material deliveries to the Surgil Field	Exceedance of road network capacity resulting in disruption to existing users	Negligible	Negligible	Insignificant	N/A	**Insignificant**
Transference of imported abnormal loads from Kungrad rail station to the Surgil Field	Delays to road users on R-173 as a result of abnormal loads	Negligible	Negligible	Insignificant	N/A	**Insignificant**
Movement of operational traffic on R-173 and gas field road network	Wear and tear on R-173 and gas field road network as a result of traffic volumes	Low	Minor	Insignificant	N/A	**Insignificant**
Movement of operational traffic on R-173 and gas field road network	Increased exposure to road safety risks and accidents as a result of traffic volumes	Low	Negligible	Insignificant	N/A	**Insignificant**

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
UGCC and Pipelines: Construction and Decommissioning						
Import and export of construction equipment and materials by rail	Impacts on scheduling for rail network	Low	Moderate	Minor	It is recommended that in-depth consultation is held with the rail network operator to accurately assess the potential level of disruption to services as a result of the proposed works. Following consultation the client should develop an appropriate rail management scheme detailing suitable delivery timings and loading/unloading protocols.	**Minor Uncertain Adverse** Any residual effect will depend on the ability for the development of appropriate solutions through the consultation process.
Import and export of construction equipment and materials by road	Exceedance of road network capacity resulting in disruption to existing users	Low	Moderate	Minor	N/A	**Minor**
Transference of imported abnormal loads from Kungrad rail station to the UGCC by road	Delays to local road network as a result of abnormal loads	Negligible	Negligible	Insignificant	N/A	**Insignificant**
Transference of imported and exported construction equipment and materials by between Surgil Field and Kungrad rail station by road	Wear and tear on A-380 and local road network as a result of traffic volumes	Low	Moderate	Minor	N/A	**Minor**
Transference of imported and exported construction equipment and materials between the UGCC complex and Kyrkkyz Railway Station	Reduced safety of vulnerable road users on the A-380 and of residents at Akchalak, and adjacent proposed worker camp	Medium	Major	Moderate	Measures to reduce the risk to vulnerable road users and occupants of residential properties in the vicinity of access routes should be identified as part of the detailed CTMP. The CTMP should draw on international best practice in developing and ensuring the implementation of suitable strategies. It is recommended that consultation is undertaken with affected communities in addition to the appropriate highways authority to ensure identified measures take into account local circumstance.	**Minor Uncertain Adverse.** Any residual effect will depend on the ability to develop appropriate solutions through the consultation process.

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
UGCC and Pipelines: Operation						
Movement of operational traffic on A-380 and local road network	Exceedance of road network capacity resulting in disruption to existing users	Low	Minor	Insignificant	N/A	**Insignificant**
Transference of imported and exported materials and product to and from the UGCC via rail	Impact on scheduling for rail network Hazardous material transfer risks	Low	Minor	Insignificant	Rail transport safety / hazard management plan	**Insignificant**
Transference of imported abnormal loads to the UGCC	Delays to road users on A-380 and local road network as a result of abnormal loads	Negligible	Negligible	Insignificant	N/A	**Insignificant**
Movement of operational traffic on A-380 and local road network	Wear and tear on A-380 and local road network as a result of traffic volumes	Low	Minor	Insignificant	N/A	**Insignificant**
Movement of operational traffic on A-380 and local road network	Increased exposure to road safety risks and accidents as a result of traffic volumes	Low	Negligible	Insignificant	N/A	**Insignificant**
Operation of new rail spur adjacent to Akchalak	Reduced safety of residents of Akchalak, particularly children, in vicinity of the new rail spur to the UGCC complex	Medium	Major	Moderate Adverse	It is recommended that consultation is undertaken with Kyrrkyz community to establish more precisely the nature of risk and identify suitable mitigation strategies. Options to be examined should include as a minimum, securely fencing off the railway from the community and re-routing the line further from the settlement.	**Minor Uncertain** It is anticipated that secure fencing would reduce the risk posed by the rail spur to children subject to adequate design and maintenance

13.7 Proposed Monitoring

Procedures for monitoring the effectiveness of the mitigation measures proposed in Table 13.9 will be provided in the ESMP and will be expanded upon in specific traffic management plans. Monitoring measures should in particular be designed to identify failure or ineffectiveness of measures in terms of road and rail safety. This could, for example, include a system for monitoring driver conformity with specified road safety protocols and regular, recorded safety checks on the integrity of rail fencing in proximity to Akchalak settlement.

13.8 Statement of Significance

The following activities were assessed as having potential significant adverse impacts:

- Transference of imported abnormal loads from Kungrad rail station to the Surgil Field;
- Transference of imported and exported construction equipment and materials between the Surgil Field and Kungrad rail station;
- Transference of imported and exported construction equipment and materials between the Surgil Field and Kungrad rail station, and between the UGCC complex and Kyrkkyz Railway Station; and
- Operation of new rail spur to UGCC in close proximity to Akchalak.

Mitigation identified at this stage requires early consultation with the relevant highways authorities, development of a construction rail management scheme and pre and post road condition surveys and the formulation of a detailed CTMP (including transport of abnormal loads).

It is considered that these mitigation measures could reduce all identified impacts to minor significance. However, these assessment findings are uncertain as the effectiveness of measures would be dependent on the quality of the plans, surveys and schemes produced.

14. Landscape and Visual

14.1 Introduction

This chapter provides an assessment of the landscape and visual impacts of the construction and operation of the Project. It assesses the existing landscape resource and describes appropriate mitigation and enhancement measures that will be implemented as part of the Project.

14.2 Methodology

14.2.1 Consultation

The methodology for the Landscape and Visual Impact Assessment (LVIA) was developed from guidance internationally recognised as good practice. The sources of guidance were:

- 'Landscape Character Assessment' produced by the Countryside Agency (UK) in April 2002;
- 'Guidelines for Landscape and Visual Assessment' produced by the Landscape Institute (LI) and Institute of Environmental Management and Assessment (IEMA) in 2002 (Second Edition);
- The Department of Transport (UK) Design Manual for Road and Bridges Volume 11; and
- Landscape Institute Advice Note 01/09, February, 2009.

The baseline study established the character and quality of the existing landscape resource and identified the sensitivity of potential visual receptors (people with a view of the project). This provided the landscape context for the Project and provided an assessment of the existing landscape resource against which the predicted impacts were assessed.

Key sources of information for establishing the landscape baseline included:

- Desk study to review existing information;
- Satellite photography;
- Site visits including field reconnaissance surveys which took place in February 2009 and June 2010; and
- Detailed ecological surveys undertaken by the Local Environmental Consultant (LEC) under guidance and scope defined by Mott MacDonald.

14.2.2 Consultation

This assessment has been informed by the document titled: 'Construction of Gas Chemical Complex on the North-East part of the Akchalak Settlement of Kungrad District, Located on the Ustyurt Plateau'. This document provides background information and the requirements for the project following consultation with the Chief Architect of Kungrad District. This is reproduced in Appendix M, Volume III.

14.2.3 Spatial Scope

The assessment considered:

- The extent of primary impacts on the land to be developed and the extent of secondary impacts on the character of the landscape surrounding the project area;
- The quality and sensitivity of the landscape potentially affected by the project; and
- The impacts on people with a view of the project.

14.2.4 Zone of Visual Influence

The zone of visual influence (ZVI) is the approximate area from which the project will be visible and on which it will have an impact on landscape and/or on views. The probable boundaries of the ZVI defined the study area for the LVIA. These boundaries varied according to the height and scale of the different elements of the project.

The probable ZVI boundaries were identified as follows:
- Upstream - within 5 km of the gas production wells during construction and 10 km of the outside boundary of the expanded CGTU during operation. When the wells have been drilled and the well heads installed, the ZVI for the development would be reduced to within 10 km of the outside boundary of the CGTU;
- Pipeline - The pipelines and 10kV power lines: within 5 km either side of the outside edge of the development corridor during construction; and
- Downstream - The UGCC and associated dwelling settlement, within 10 km of the outside boundary of the development zone during construction and operation.

Impacts were assessed for the construction phase, for day one of the operational phase and for the decommissioning phase of the Project.

14.2.5 Desk Study

A desk study was undertaken to obtain baseline information. This review focused on the identification of landscape features of local, national and international value. Information was also obtained from the following organisations and online resources:

- *Report on the Study of Flora and Fauna of Surgil, North and East Berdakh, UGCC and Related Infrastructure* undertaken in July 2010 by the local consultant, TexNet Science Production Plant LLC, Tashkent. .
- Satellite Photography (Digital Globe, 2010)
- *Creeping Environmental Problems and Sustainable Development in the Aral Sea Basin*, Ed. Michael H. Glantz, Cambridge University Press 1999.

14.2.6 Field Reconnaissance

Field reconnaissance was undertaken in February 2009 and June 2010 by members of the MML project team. The reconnaissance included visits to all of the Project sites including the upstream Surgil Field, the downstream UGCC and interconnecting pipeline locations. The site visit also included visits to potential nearby sensitive receptors.

Ecological surveys were undertaken for the ESIA by the LEC under guidance and scope definition by MML which provided:
- Descriptions of the vegetation types, formations and associations; and
- Botanical surveys.

14.2.7 Assessment of Impact Significance

The assessment evaluated the value and sensitivity to change of the landscapes potentially affected by the Project according to the criteria set out in Table 14.1.

Table 14.1: Criteria for Assessment of Landscape Sensitivity

Sensitivity	Definition
High	Typically, these would be high quality landscapes which are tranquil, are largely intact and have a strong sense of identity, significant interesting features and/or historical and cultural associations.
Medium	Typically these would be moderate quality landscapes which are fairly tranquil, demonstrate some change and have a moderate sense of identity and occasional interesting features and/or historical and cultural associations.
Low	Typically these would be low quality landscapes which are not tranquil, which have experienced a high degree of change, have a low sense of identity and few / no interesting features or historic and cultural associations.
Negligible	Typically these would be degraded or damaged landscapes.

Source: Mott MacDonald

The assessment evaluated the sensitivity of visual receptors to a change in their view according to the criteria set out in Table 14.2.

Table 14.2: Criteria for Assessment of Visual Sensitivity.

Sensitivity	Definition
High	Recreational users of the landscape or tourists.
Medium	Workers in predominately outdoor professions (such as farmers or herders), local residents who work at the existing gas fields or associated installations.
Low	Workers in predominately indoor professions (such as factories and offices). Drivers and passengers in vehicles passing through the landscape. Limited tourism potential.

Source: Mott MacDonald

The assessment evaluated the magnitude of impacts on landscape character according to the criteria set out in Table 14.3.

Table 14.3: Criteria for Assessment of Magnitude of Impact on Landscape Character

Magnitude of Impact (positive or negative)	Definition
Major	Fundamental change in landscape components or character.
Moderate	Substantial change in landscape components or character.
Minor	Obvious but minor change in landscape components or character.
Negligible	Almost imperceptible change in landscape components or character.

Source: Mott MacDonald

The assessment evaluated the magnitude of impacts on visual amenity in Table 14.4.

Table 14.4: Criteria for Assessment of Magnitude of Impact on Visual Amenity

Magnitude of Impact (positive or negative)	Definition
Major	The proposed development becomes the dominant feature of the view to which other elements become subordinate.
Moderate	The proposed development forms a significant and immediately apparent part of the view.
Minor	There is a readily noticeable change to the view where change is evident but it is not the key feature in the view.
Negligible	Almost imperceptible change to the view.

Source: Mott MacDonald

The assessment evaluated the significance of impacts on landscape character and visual amenity according to the criteria set out in Table 5.4 in Section 5.

14.3 Baseline Description

14.3.1 Overview

The baseline study provided information about the existing landscape and the visual amenity of local residents and other visual receptors against which the extent and significance of the landscape and visual impacts could be assessed.

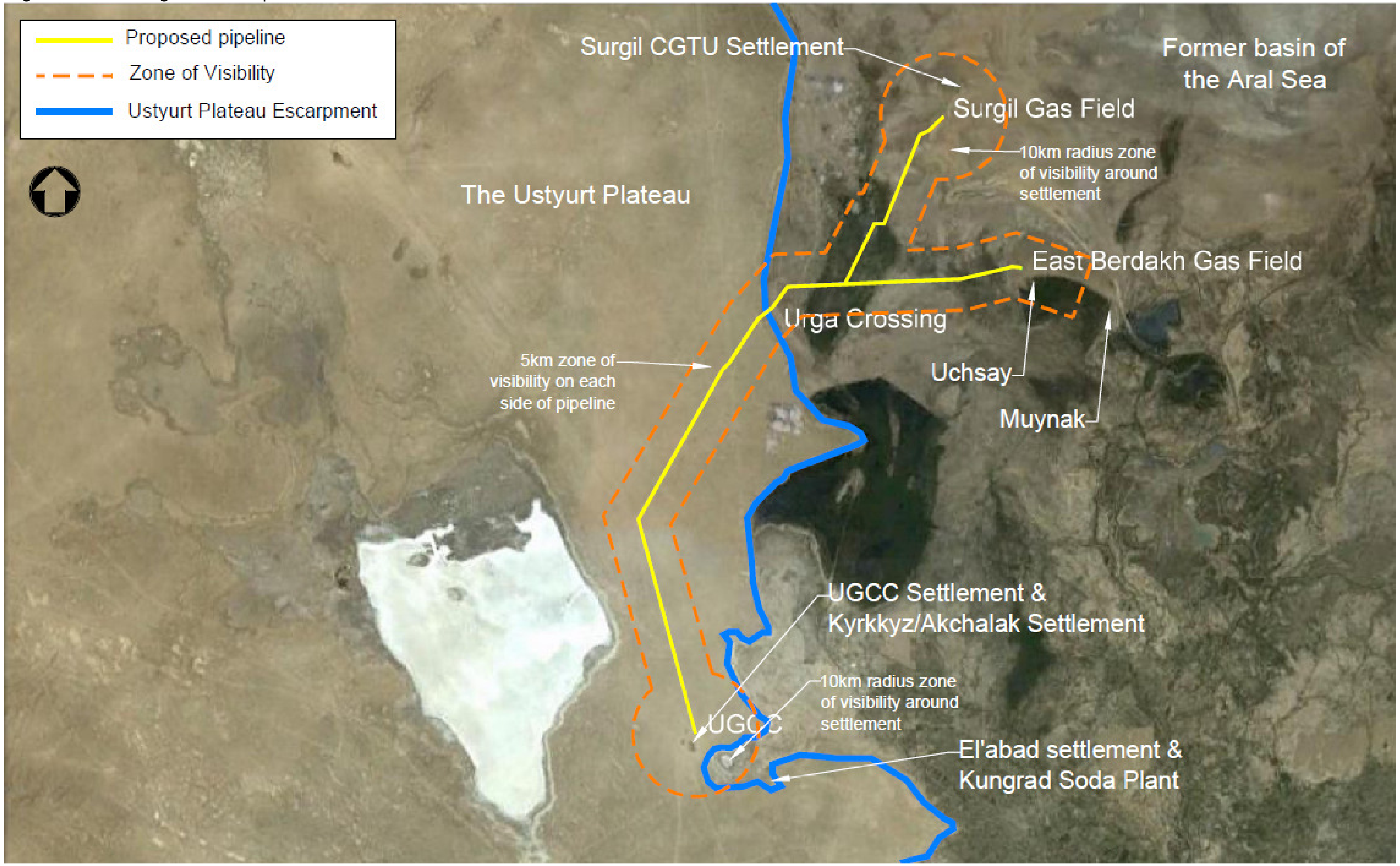
14.3.2 Landscape Character

14.3.2.1 Background

The landscape baseline study considered the following resources:
- Landscape character and quality;
- Landscape elements such as landform, land cover and land use patterns;
- Landscape features such as settlements, water bodies, topographical features; and
- Key views or vistas.

There are three different landscape character areas potentially affected by the Project. These are illustrated in Figure 14.1 and described below.

Figure 14.1: Surgil Landscape Character Areas



Source: Mott MacDonald

14.3.2.2 The Former Aral Sea Basin

The Surgil Field is located west of the Amu Darya river delta and approximately 40 km from Muynak, once the largest port on the Aral Sea. It lies within the basin of the former Aral Sea basin, 40 km south south-east of the western lobe of the existing Aral Sea and 55 km south-west of the existing eastern lobe. The landscape of the former sea bed has a flat topography and a tranquil, wilderness quality. Looking north from the Surgil Field, there are no built structures in the view. The flatness and openness of the landscape means that structures are visible up to 10 km away, though at this distance they are inconspicuous elements in the view.

There are 28 existing gas wells at the Surgil Field and a further 105 wells to be constructed, approximately 50 of which within the first 4 years of the Project. Visual aspects of the drilling and gas collection process include:

- Drilling rigs - these are approximately 45 metres high but are temporary structures to be replaced by well head structures when drilling is complete;
- Well head infrastructure – the 'Christmas Tree' is approximately 1.8 meters high and nearby flare stack of 10m in height;
- GGSs, including a small building and a gas flare stack approximately 35 metres high at each GGS;
- CGTU, including a flare stack with a height of 35m; and
- Related infrastructure - above-ground powerlines and a settlement camp (one-storey accommodation cabins).

The soil of the former sea bed is bare of vegetation and rutted by vehicle tracks in the vicinity of the existing working gas field. Existing pipelines in the Surgil Field are buried, with the excavated spoil roughly piled along the pipeline routes marking their locations and allowing for soil settlement.

The nearest settlement to the Surgil Field is the small village of Uchsay, about 30 km away, with a population of approximately 1 450 people. Uchsay is the most northerly settlement within Uzbekistan and is approximately 9 km north-west of the town of Muynak. Muynak (40 km from the Project site), once the largest port on the Aral Sea, is visited by tourists interested in viewing the lines of rusting fishing boats lying derelict on the dry sea bed north-east of the town.

The retreat of the Aral Sea and the resulting exposure of approximately 3 million hectares of sea bed have contributed to a change in the local climate of the area; the sea previously tempered the extremes of seasonal temperatures and as a result, summers have become hotter and winters have become colder. This, combined with lowered ground water levels, has led to an expansion of the desert into areas which were previously part of the Amu Darya Delta and an increase in the number and intensity of dust storms each year. The storms deposit around 70 million tonnes of sand and salt from the former sea bed and surrounding agricultural areas, each year, over a wide area up to 400 km from the area.

The Aral Sea bed is now a highly saline desert with salt accumulations in the subsoil and salt clearly visible on the surface. The high salinity has precluded the use of the area for agriculture. The soils are sandy and in places covered with sea shells left by the retreating sea. There is sparse vegetation growing on the sea bed, which, due to its history and unusual growing conditions, has become a landscape and habitat of some interest. Plant species present are tolerant of arid and saline conditions and include: Tamarix sp, Haloxylon sp, *Salsola sp, Alhagi* sp and *Aeluropus sp.* All the vegetation is slow growing and easily destroyed by soil disturbance. Tyre tracks and excavation works remain visible in the landscape for very long periods. Attempts have been made by the Ministry of Forestry in the past and are ongoing to establish planting in areas of the former Aral Sea bed to stabilise soils with mixed success and the resultant existing vegetation is sparse and fragile. Other than the existing metalled road to the Surgil CGTU, a number of established off road tracks exist used for transportation routes across the Surgil Field but there are extensive areas off the routes which are adversely affected by transport movements.

Figure 14.2: Existing Drill Rig on the Surgil Field

Source: Mott MacDonald

The landscape of the Surgil Field zone of the Project study area is of **low quality** and of **low sensitivity**. It has experienced much change due to the drilling and operation of the existing gas wells and the degradation of the soil surface and loss of vegetation caused by unregulated traffic movement across the former sea bed.

14.3.2.3 The Ustyurt Plateau Escarpment

The Ustyurt escarpment runs north south between the Ustyurt Plateau and the former Aral Sea basin to the east. The elevation of the plateau ranges from 155 metres (Baltic datum) at the Urga Crossing to 125 metres (Baltic datum) at the settlement of Akchalak. The precipitous cliffs for most of the length of the escarpment are lined with huge boulders and landslide debris caused by past tectonic activity. There is an existing pipeline and power and telecommunication lines running up the escarpment from the Aral Sea basin to the Ustyurt Plateau at the Urga crossing where there is a less vertical gradient in the escarpment. The cliffs prevented easy descent from the plateau on horseback except in a few locations, and as a consequence they provided the people of the Amu Darya delta in earlier times with a defensive wall which protected them from nomadic attack from the west. The escarpment is a dramatic feature in the landscape clearly visible from the east for 10 km.

Figure 14.3: Looking from the Ustyurt Plateau down the Escarpment to the Amu Darya Delta below.

Source: Mott MacDonald

The landscape of the Ustyurt Plateau escarpment is of **moderate quality and medium sensitivity**. It has experienced some change in the part of the escarpment where existing pipelines and power and telecommunications infrastructure are situated. It has a strong sense of identity due to its dramatic topography and historical associations.

14.3.2.4 Ustyurt Plateau

The UGCC site and associated settlement will occupy a 2 000 000 m^2 development site on the Ustyurt Plateau (including the land take for the wastewater pond). The site is currently a sparsely vegetated, flat area of desert. It is located close to existing industrial facilities: the Urgenchstransgaz-operated Akchalak Gas Compressor Station, approximately 5 km west of the site, and Kyrkkyz Railway Station, approximately 5 km south-west of the site. The Kungrad Soda Ash Plant is located approximately 8 km south-east of the UGCC site, adjacent to the El'abad settlement. The nearest settlement to the UGCC site is Akchalak, located approximately 5 km south-west of the UGCC site. There is currently no established road network to the site of the UGCC from nearby transportation routes. The Soda Plant and 110kV powerlines from the Soda Ash Plant substation across the Ustyurt Plateau are visible in the distance from the UGCC site though they are a minor feature in the landscape.

The Ustyurt Plateau is a limestone, sand and clay stony desert which lies between the Aral Sea Basin and the Caspian Sea. The plateau is approximately 200 000 km^2 in area and is largely level. It sits on a micro-tectonic plate which has gradually risen over the past four or five million years so that it now stands around 200 metres higher than the Aral Sea basin. The plateau has a tranquil, wilderness quality, with long views that contain few man-made elements. Plant communities are highly specialised and adapted to the dry and saline soils. Plants present include: *Anabasis* sp, *Salsola* sp and *Alhagi* sp. Semi-nomadic herders move their camels, sheep and goats on to the plateau in the summer to find fresh grazing land. There are a few settlements and processing facilities associated with gas and mineral extraction on the eastern side of the plateau and a number of pipelines and above ground powerlines cross the plateau. These above ground features are clearly visible up to 5 km away but form increasingly minor components of the view further away, disappearing from view completely 10 km away. Vehicle routes across the stony desert are visible from satellite photographs but at ground level, these are only visible from close to.

In the parts of the Ustyurt Plateau which have not experienced development, the landscape is of moderate quality and medium sensitivity. However the landscape in the location of the UGCC site has experienced a high degree of change with the construction of industrial complexes and associated infrastructure and settlements. Therefore the landscape of the UGCC site is of **low quality** and **low sensitivity**.

Figure 14.4: Approach to the UGCC Site with the Akchalak Gas Compressor Station in the Distance (approximately 3 km)

Source: Mott MacDonald

14.3.3 Visual Amenity

The visual baseline study identified a limited number of potential visual receptors (people with a view of the project). In the assessment it has been assumed that the Project will not be visible to receptors 10 km or more away. It will be visible to receptors but not a dominant feature of their view from between 5 km and 10 km away. It will be clearly visible to receptors within 5 km of the Project. Receptors might see the existing lit gas flare stack at Surgil from further than 10km at night. Potential receptors are listed with an assessment of sensitivity in Table 14.5 below.

Table 14.5: Sensitivity of Visual Receptors.

Receptors	Sensitivity
Residents of the Surgil camp, the El'abad and Akchalak settlements and the new UGCC settlement with a view of the Project.	Medium
Local people working in predominately outdoor occupations (such as farmers, herders and drilling workers) on the Aral Sea bed or the Ustyurt Plateau.	Medium
Local people making recreational use of the landscape or Tourists to the Aral Sea bed or the Ustyurt Plateau / Escarpment.	High
Road travellers through the area.	Low

Source: Mott MacDonald

14.4 Impact Assessment on Landscape Character and Visual Amenity

14.4.1 Potential Impacts of the Project

The Project has three components which may impact on landscape and visual amenity:

- The drilling and operation of gas production wells, construction of new in-field roads and the expansion of an existing CGTU at the Surgil Field, south of the remaining Aral Sea;
- The construction and operation of below ground gas and condensate pipelines from the Surgil Field to the new UGCC, a, telecommunication line and 10 kV transmission line parallel to the pipelines (supported on concrete pylons)and the tie in of new gas and condensate pipelines from the East Berdakh CGTU to the Surgil pipelines. To mitigate against bird deaths caused by birds flying into transmission lines, bird reflection devices will be installed on the 10 kV transmission lines which run 20km south and 20 km north in parallel to the Sudoch'ye Lake protected site, and across the entire length of the 12 km 110kV transmission line running up the escarpment to the south-east of the UGCC site, The pipelines from Surgil to the UGCC will be laid partly on the former bed of the Aral Sea at an elevation of approximately 50 metres (Baltic datum). The rest of the pipelines will be laid across the elevated Ustyurt Plateau. In order to reach the upper edge of the plateau, from the former Aral Sea basin, the Surgil pipelines will ascend the escarpment at the Urga crossing point within an existing pipeline corridor from the gas fields in the basin. At the top of the Urga crossing, the new pipelines will continue to run parallel to the existing pipelines to the tie in point with the Ural Bukhara pipeline. At this point, the new gas and condensate pipelines will be routed south for about 31 km following the same pipeline corridor as the former (now decommissioned) Ural Bukhara pipeline, which will minimise the requirement to disturb undeveloped land;
- The construction and operation of the UGCC and associated infrastructure near the village of Akchalak on the Ustyurt Plateau, the 5 km access road connection to the Kungrad – Beyneu highway and a 7 km rail link from the Kyrkkyz Railway Station and the 12 km 110 kV electricity supply line from the Kungrad Soda Ash Plant substation; and
- The decommissioning of the gas well, pipelines, other infrastructure elements, the workers' camps and the UGCC and other structures.

The impacts of the Project are described below and summarised on the Impact Summary Table 14.6.

14.4.2 Surgil Field

14.4.2.1 Impacts on Landscape Character

Construction

Construction impacts will result from:

- The construction of access roads to the wellheads;
- The drilling rigs (derricks approximately 45 m high);
- The setting up and operation of a workers' camp near the existing CGTU;
- The removal of vegetation and damage to fragile plant communities by off road construction traffic;
- Soil stripping, and other earthworks mostly associated with well drill fluid and cuttings management;
- Noise and construction traffic causing a reduction in tranquillity; and
- Light pollution from site lighting.

The Project will increase the spatial extent of the gas field but will not increase the current level of drilling activity (typically up to a maximum of 5 operational drill derricks). There is also an existing working gas field and CGTU already on the site and consequently the drilling works are not deemed to change the landscape character of the Project area. The drilling rigs will be removed once drilling has been completed. There is little local vegetation and the ground is already highly disturbed by vehicle movements. Construction impacts caused by site lighting, stockpiling of excavated materials, construction traffic and activity will be temporary. Therefore construction of the Project will result in a negative impact on landscape character of minor significance.

Operation

Operational impacts will result from:
- The presence of new built structures and 10 kV power and telecommunications lines in the landscape;
- Approximately 133 permanent well head structures ('Christmas trees') 1.8 m high; each wellhead with a nearby flare stack of 10m height distributed over an area approximately 50 km^2;
- Potential reduction of damage to fragile plant communities and the soil surface by site traffic (through use of new access roads);
- The cessation of gas flaring, except during rare periods of abnormal operation, will have a beneficial impact on the night-time environment; and
- The new permanent settlement.

The Project will greatly increase the scale of development on the Surgil Field but since the area is already developed as a working gas field it will not change the landscape character of the Project area. The drilling rigs will be replaced by much smaller pressure control structures which are 1.8 m high (each with a 10m high flare stack) and though the number of these will increase five-fold, their size means that they will not be noticeable in the wider landscape. The expanded CGTU will be within the existing site boundary and the camp settlement will be built 500 m from the Surgil CGTU. There are already power and telecommunications lines in the area and though the Project will increase the number of lines, which will have a negative impact on landscape character, the change to the landscape character is minor. New wellhead access roads may have a positive impact on the local landscape character by concentrating vehicle movement on established routes. There may be additional lighting of the night sky from the camp settlement but the current gas flaring at the CGTU will cease, except during rare periods of abnormal operation, which will have a beneficial effect on the night-time environment. Therefore the completed Project will result in a negative impact on landscape character of minor significance.

Decommissioning

At the end of the life of the Project, all above ground plant will be removed and the gas wells made safe. The wells will be capped off at ground level. Remaining plant will be considered for re-use and recycling following dismantling. There will be increased activity in the area during decommissioning but the removal of structures and the cessation of activity will eventually restore the area to a more natural state at the end of the process. A dedicated decommissioning strategy (possibly including the preparation of an ESIA and ESMP specifically relating to decommissioning) will be developed in advance of the end of Project life.

The process of decommissioning the Surgil Field will have a negative impact on landscape character of minor significance.

14.4.2.2 Impacts on Visual Amenity

Construction

Construction impacts will result from:
- The appearance of construction access roads, the permanent camp, stockpiles of excavated materials and general construction activity;
- Damage to the vegetation of the site; and
- Light pollution from construction site lighting.

The ZVI of the development will change as the project progresses. The gas wells could be visible during drilling up to 10km from the well but as they are completed and the rigs are removed and replaced with a well head structure, they will form a minor element in the view. The new built structures, depending on their size, may be visible up to a maximum of 10 km away. The visual receptors likely to pass through this zone will include local people working outdoors or making recreational use of the landscape and tourists interested in the natural environment of the region. The number of receptors is likely to be very small. Since the existing views already contain the existing gas field (including current well drilling of a similar intensity to that expected with the Project), the development will be noticeable but not a key feature of the view.

Therefore construction of the Project will result in a negative impact on receptors' views of minor significance.

Operation

Operational impacts will result from:
- The presence of new built structures and 10 kV power and telecommunications lines in the landscape;
- Reduction in damage to fragile plant communities (if site traffic uses new roads);
- Introduction of lighting to the workers' camp and additional gas flare stacks (unlit except for rare emergency periods); and
- Reduced flaring from the CGTU.

The ZVI of the development will cover an area of 10 km radius from the CGTU. The cessation of gas flaring, except during rare periods of abnormal operation (as opposed to current continuous flaring from the CGTU), will have a beneficial impact on the night-time environment. During the rare events that they are lit, it is anticipated that the visual impact would be increased, especially at night. The visual receptors likely to pass through this zone will include local people working outdoors or making recreational use of the landscape and tourists interested in the natural environment of the region. The number of receptors is likely to be very small. Since the existing views already contain the existing gas field, the development will not change the view substantially.

Therefore the completed Project will result in a negative impact on receptors' views of minor significance.

Decommissioning

At the end of the life of the Project, all above ground plant will be removed and the gas wells made safe. The wells will be capped off at ground level. Remaining plant will be considered for re-use and recycling following dismantling. There will be increased activity in the area during decommissioning but the removal of structures and the cessation of activity will eventually restore the area to a more natural state at the end of the process.

The process of decommissioning the Surgil Field will have a negative impact on receptors' views of minor significance.

14.4.3 Pipelines

14.4.3.1 Impacts on Landscape Character

Construction

Construction impacts will result from:
- Installation of the underground pipelines and associated above ground 10 kV transmission line;
- Removal of vegetation and damage to fragile plant communities by construction traffic;
- Soil stripping, stockpiling of excavated materials and other earthworks; and
- Noise and construction traffic causing a reduction in tranquillity.

The pipelines will have an impact on three landscape character areas: the former Aral Sea Basin, the Ustyurt Plateau Escarpment (adjacent to existing pipelines) and the Ustyurt Plateau. All three character areas are already crossed by pipelines and transmission lines but the Ustyurt Plateau also contains landscapes unaffected by development where the impacts will consequently be greater. The development would result in a substantial change in the undeveloped landscapes and an obvious change in landscape character in the areas with pipeline infrastructure. However, impacts will be limited to a 5 km corridor running either side of the pipeline beyond which the development would cease to have any effect. This is because construction will occupy a relatively narrow corridor (in the context of the surrounding landscape) and for much of its route will follow an existing pipeline route. The transmission lines, bird reflection devices (where used) and the concrete towers supporting the lines will be an insignificant element in the view when looked at from 5 km or more.

The construction of the Project will result in temporary negative impacts on the Aral Sea Basin, the Ustyurt Plateau Escarpment and the Ustyurt Plateau landscape character areas of minor significance.

Operation

Operational impacts will result from:
- The linear bank of soil which will be created along the length of the buried pipeline following backfill of soil excavated from the pipeline trench (to mark the route of the pipeline and allowance for soil settlement); and
- Potential reduction of damage to fragile plant communities and the soil surface by off road maintenance traffic in the vicinity of pipeline.

The completed pipeline will have permanent impacts on three landscape character areas: the former Aral Sea Basin, the Ustyurt Plateau Escarpment and the Ustyurt Plateau. These will be caused by the linear bank above the buried pipeline and associated above ground 10 kV power line. All three character areas are already crossed by pipelines and transmission lines but the Ustyurt Plateau also contains landscapes unaffected by development where the impacts will consequently be greater. The development would result in a substantial change in these undeveloped landscapes and an obvious change in landscape character in the areas with existing pipeline infrastructure. However, impacts will be limited to a 5 km corridor running either side of the pipeline beyond which the development would cease to have any effect.

The completed Project will result in negative impacts on the Aral Sea Basin, the Ustyurt Plateau Escarpment and the Ustyurt Plateau landscape character areas of minor significance.

Decommissioning

The decommissioning of the pipeline and associated transmission lines will reduce the number of man-made elements in the landscape. The raised earth banks along the route of the pipeline will remain but will gradually be eroded by wind and rain. There will be increased activity in the area during decommissioning but the removal of structures and the cessation of activity will eventually restore the area to a more natural state at the end of the process.

Overall, the decommissioning of the pipeline and the removal of the associated transmission lines will result in temporary negative impacts on the Aral Sea Basin, the Ustyurt Plateau Escarpment and the Ustyurt Plateau landscape character areas of minor significance.

14.4.3.2 Impacts on Visual Amenity

Construction

Construction impacts will result from:
- The appearance of the construction site for the installation/construction of the pipelines and associated above ground 10kV powerline;
- Removal of vegetation and damage to fragile plant communities by construction traffic; and
- Excavation, stockpiling of excavated materials and other earthworks;

The ZVI of the development will be a relatively narrow corridor 10km wide along the pipelines route. This is because the new pipeline and transmission lines will be apparent for a maximum of 5 km from either side of the pipeline. In addition much of the pipeline route will follow an existing pipeline route where the ground is already heavily disturbed. The visual receptors likely to have a view of the development include local people working outdoors or making recreational use of the landscape, residents in the settlements of El'abad and Akchalak and tourists interested in the natural environment of the region. The number of receptors is likely to be very small and along parts of the route, views already contain power transmission lines and pipelines. The development will be immediately apparent in undeveloped areas and evident but not a key feature of the view where there are already pipelines and other infrastructure.

Overall the construction of the Project will result in a temporary negative impact on receptors' views of areas with existing infrastructure of minor significance and temporary negative impacts on receptors' views of undeveloped areas of moderate significance.

Operation

Operational impacts will result from:

- The linear bank of soil which will be created along the length of the buried pipeline using soil excavated from the pipeline trench (to mark the route of the pipeline and allowance for soil settlement);
- A new 10 kV power line on concrete pylons 10 m in height along the pipeline route from the Surgil CGTU to the UGCC;
- Reduction in damage to fragile plant communities (with less intensive vehicular access from the construction phase other than for maintenance).

The ZVI of the completed development will be a relatively narrow corridor 10 km wide. The visual receptors likely to have a view of the development include local people working outdoors or making recreational use of the landscape, residents in the settlements of El'abad and Akchalak, road users of the Kungrad to Beyneu highway and tourists interested in the natural environment of the region. The number of receptors is likely to be very small and along many parts of the route, views already contain power transmission lines and pipelines. The development will be immediately apparent in undeveloped areas and evident but not a key feature of the view where there are already pipelines and other infrastructure.

Overall the completed Project will result in negative impacts of minor significance on receptors' views of both areas with existing infrastructure and of undeveloped areas.

Decommissioning

The decommissioning of the pipeline and associated transmission lines will reduce the number of man-made elements in the view. The raised earth banks along the route of the pipeline will remain but will gradually be eroded by wind and rain. There will be increased activity in the area during decommissioning but the removal of structures and the cessation of activity will eventually restore the area to a more natural state at the end of the process.

Overall the decommissioning of the pipeline and the removal of the associated transmission lines will result in a temporary negative impact on receptors' views of areas with existing infrastructure of minor significance, and temporary negative impacts on receptors' views of undeveloped areas of moderate significance.

14.4.4 UGCC

14.4.4.1 Impacts on Landscape Character

Construction

Construction impacts will result from:

- The construction of the UGCC, the dwelling settlement adjacent to the existing Akchalak settlement, the railway spur, access road, water supply pipeline and 110 kV transmission line;
- The removal of vegetation and damage to fragile plant communities by construction traffic;
- Soil stripping, stockpiling of excavated materials and other earthworks;
- Noise, activity and construction traffic causing a reduction in tranquillity; and
- Light pollution from construction site lighting.

The development will be built on an approximately 200 ha green field site covered in sparse vegetation, 5 km from Akchalak Gas Compressor Station and approximately 8 km from the Kungrad Soda Ash Plant.

The UCGG development will be within sight of the soda ash plant and though it will significantly increase the scale of development in the Ustyurt Plateau landscape character area, it will not change the character substantially in the project area given the existing industrial facilities. Construction impacts caused by reduction of tranquillity, presence of site lighting, stockpiling of excavated materials, construction traffic and activity will be temporary. The sensitivity of the whole character area is medium. However it has been degraded by existing development to low in the area of the UGCC.

Overall the construction of the Project will result in a negative impact of minor significance on landscape character.

Operation

Operational impacts will result from:
- The presence of the UGCC (including 107m high flare stack and 54.3m high with a 3.7m diameter ethylene tower and a 96.3m high with a 3.6m diameter polypropylene column), the dwelling settlement, the wastewater storage pond and associated infrastructure;
- The operation of the new 7 km railway spur;
- Traffic movements to the UGCC along 5km access road;
- 110 kV transmission line 12 km in length to the Soda Ash Plant Substation;
- Reduction of damage to fragile plant communities and the soil surface by site traffic (if traffic uses new access road); and
- Light pollution.

The development will significantly increase the scale of development and activity in the landscape character area. However there is existing industry with the Akchalak Gas Compressor Station and the Kungrad Soda Ash Plant and there are existing settlements 5 km from the site. Manufactured goods will be transported from the UGCC by rail which will reduce road traffic movements. The new access road may have a positive impact on the local landscape character by concentrating vehicle movement on an established route.

The completed Project will result in a negative impact on landscape character of minor significance.

Decommissioning

At the end of the life of the Project, all plant will be drained and made safe. Remaining plant will be considered for re-use and recycling following dismantling. There will be increased activity in the area during decommissioning but the removal of structures and the cessation of activity will eventually restore the area to a more natural state at the end of the process

The process of decommissioning the UGCC will have a temporary negative impact on landscape character of minor significance.

14.4.4.2 Impacts on Visual Amenity

Construction

Construction impacts will result from:
- The appearance of the construction site during the installation/construction of the UGCC, associated underground and above ground services, transmission lines and the new road / railway spur;
- Removal of vegetation and damage to fragile plant communities by construction traffic; and
- Excavation, stockpiling of excavated materials and other earthworks;

The ZVI of the construction site will cover an area of 10 km radius from the Project site or a 10m wide corridor along pipelines or the new railway line. The visual receptors likely to have a view of the development include local people working outdoors or making recreational use of the landscape, residents in the settlements of El'abad and Akchalak, road users on the Kungrad – Beyneu highway and tourists interested in the natural environment of the region. The number of receptors is likely to be very small and views currently include the soda ash plant, Akchalak Gas Compressor Station and local settlements. The development will be immediately apparent and evident but not a key feature of the view where there is existing industrial or other infrastructure.

Overall the construction of the Project will result in a negative impact on receptors' views of minor significance.

Operation

Operational impacts will result from:
- The presence of new built structures (including 107 m high flare stack and a 54.3m high with a 3.7m diameter ethylene tower and a 96.3m high with a 3.6m diameter polypropylene column) and 110kV power lines in the landscape;
- Wastewater Storage Pond;
- 7km railway spur and 5km access road;
- Reduction in damage to fragile plant communities (if site traffic uses new roads); and
- Introduction of lighting and additional gas flare in a currently dark sky area.

The ZVI of the development will cover an area of 10 km radius from the Project site or a 10 km wide corridor along 10 kV transmission line or the new railway line. The visual receptors likely to have a view of the development include local people working outdoors or making recreational use of the landscape, residents in the settlements of El'abad and Akchalak and tourists interested in the natural environment of the region. The number of receptors is likely to be very small (largely limited to the residents of El'abad and Akchalak) and existing views include the soda plant or Akchalak Gas Compressor Station which the local settlements were originally built to facilitate associated workers accommodation. The development will be immediately apparent and clearly evident but in an area where there are already industrial complexes and other infrastructure.

Overall the development will result in a minor negative impact on receptors' views.

Decommissioning

At the end of the life of the Project, all plant will be drained and made safe. Remaining plant will be considered for re-use and recycling following dismantling. There will be increased activity in the area during decommissioning but the removal of structures and the cessation of activity will eventually restore the area to a more natural state at the end of the process

The process of decommissioning the UGCC will have a temporary negative impact on receptors' views of minor significance.

14.5 Mitigations and Compensation Measures

Mitigation measures to reduce the impacts on landscape and visual amenity will include:

- Control of vehicle movements during construction and operation to reduce damage to fragile plant communities and pristine desert sands by restricting traffic movements to designated access roads at all times;
- Elimination of flaring in the Surgil Field through use of waste gases in on-site power generation facilities;
- Minimisation of flaring at the UGCC through employment of modern plant;
- Utilisation of existing pipeline corridors - a total of 78 km of the 115 km pipeline length (68%) will utilise existing pipeline corridors which will significantly reduce the amount of undisturbed ground through which the pipelines will need to be constructed;
- Utilisation of an existing crossing point of the Ustyurt escarpment at the Urga Crossing for the gas and condensate pipelines;
- Utilisation of an existing water supply pipeline corridor for tie ins to the Kungrad - Karakalpakya water supply pipeline and Tuyamuyun - Nukus water supply pipeline including where the Ustyurt escarpment is traversed;
- Utilisation of an existing 110kV transmission line corridor for nine of the 12km length of new transmission line including where the Ustyurt escarpment is traversed;
- Creation of a wetland habitat around the area of the wastewater storage ponds;
- Locating the dwelling settlement of the UGCC adjacent to the existing settlement of Akchalak thereby maximising use of existing infrastructure and reducing extent of visual impact;
- Removal of all construction debris from site at the end of the construction period;
- Shaping of the linear bank of soil along the length of the buried pipelines to form an even profile. This will enable easy identification of the pipeline in future years and will reduce erosion by heavy rainfall.
- Design of settlement lighting to minimise light pollution of the night-sky and light spill.

The above mitigation measures have been incorporated into the ESMP.

14.6 Residual Impacts

Residual impacts of the Project during construction and operation after mitigations have been taken into account are listed on the Impact Summary Table 14.6.

14.6.1 Summary

The Surgil Project comprises: the enlargement of an existing gas field at Surgil in the basin of the former Aral Sea, the construction of the UGCC on the Ustyurt Plateau and the construction of a gas pipeline from Surgil to the UGCC. A landscape and visual impact assessment (LVIA) was carried out to assess the impacts of the Project on the landscape and visual amenity of the area potentially affected by the Project (10 km outside the Project boundary).

Three landscape character areas will be affected by the Project: the Former Aral Sea Basin, The Ustyurt Plateau Escarpment and the Ustyurt Plateau. All three are deserts with highly saline soils that support a fragile community of plants which tolerate the arid and salty soil conditions. This vegetation is extremely fragile and easily damaged. Visual receptors of the project include local residents in the Urga camp, the El'abad settlement, and Akchalak, local people working in the landscape (such as herders) and local people and tourists making recreational use of the landscape. Many of the areas affected by the Project contain settlements and industrial infrastructure. The Surgil Field is already operational and there is a Soda Plant eight km from the site of the UGCC. However, parts of the Ustyurt Plateau that will be crossed by the pipeline are free from man-made structures and have a tranquil wilderness quality that is an important component of the landscape character of the Plateau.

Impacts caused during construction will be greater than those that will be caused by the operation of the completed project. Impacts during construction could be caused by construction activity, stripping of soils, damage to fragile desert vegetation and light pollution. Impacts during operation could include the presence of new structures, increase in vehicle movements and light pollution. Mitigations including the control of vehicle movements during construction and operation to reduce damage to fragile plant communities and pristine desert sands, the removal of all construction debris from site at the end of the construction period, the shaping soil bank along the length of the pipeline to form an even profile and the control of light to reduce light pollution will result in reduced residual impacts in some cases. Visual impacts are unlikely to change over time because the aridity and salinity of the existing soils of the area preclude the use of planting to provide screening.

Table 14.6: Summary of Impacts

Activity	Potential Impact	Sensitivity	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Surgil Field and CGTU - Construction						
Landscape Character	Construction activity will have negative effect on landscape character through soil stripping, loss of desert vegetation and light pollution	Low	Moderate negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors via Environment and social Management Plan (ESMP), removal of construction waste materials from the site, creation of linear banks to even profile along buried pipeline route, design of site lighting to minimise light pollution.	Minor Adverse
Visual Receptors: local people working in predominantly outdoor occupations such as farmers or herders	The construction access roads, drilling rigs, workers' camp, stockpiles of excavated materials, construction activity, damage to site vegetation and light pollution will have a temporary negative effect on views within 10 km of the site.	Medium	Minor negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors via ESMP, removal of construction waste materials from the site, creation of linear banks to even profile along buried pipeline route, design of site lighting to minimise light pollution.	Minor Adverse
Visual Receptors: recreational users of the landscape or tourists visiting the area.	The construction access roads, drilling rigs, workers' camp, stockpiles of excavated materials, construction activity, damage to site vegetation and light pollution will have a temporary negative effect on views within 10 km of the site.	High	Minor negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors via ESMP, removal of construction waste materials from the site, creation of linear banks to even profile along buried pipeline route, design of site lighting to minimise light pollution.	Minor Adverse

Activity	Potential Impact	Sensitivity	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Surgil Field and CGTU – Operations						
Landscape Character	The new built structures and transmission lines, additional traffic, disposal of surplus spoil and light pollution will have a negative effect on landscape character within 10km of the site.	Low	Moderate negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors via ESMP, removal of construction waste materials from the site, creation of linear banks to even profile along buried pipeline route, design of site lighting to minimise light pollution.	Minor Adverse
Visual Receptors: local people working in predominantly outdoor occupations such as farmers or herders	The new built structures and transmission lines, additional traffic, disposal of surplus spoil and light pollution will have a negative effect on views within 10km of the site. Reduction of damage to fragile plant communities and soil surface through use of new roads will have a positive effect on views.	Medium	Minor negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors. Design of site lighting to minimise light pollution.	Minor Adverse
Visual Receptors: recreational users of the landscape or tourists visiting the area.	The new built structures and transmission lines, additional traffic, disposal of surplus spoil and light pollution will have a negative effect on views within 10 km of the site. Reduction of damage to fragile plant communities and soil. surface through use of new roads will have a positive effect on views.	High	Minor negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors. Design of site lighting to minimise light pollution.	Minor Adverse
Surgil Field and CGTU – Decommissioning						
Landscape Character	Above ground plant will be removed and the gas wells capped off at ground level. Increased	Low	Moderate negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors via dedicated decommissioning strategy, removal of construction waste	Minor Adverse

Activity	Potential Impact	Sensitivity	Magnitude Score	Impact Significance	Mitigation	Residual Significance
	activity in area during decommissioning but removal of structures will eventually restore the area to a more natural state.				materials from the site, levelling of disturbed ground, design of site lighting to minimise light pollution.	
Visual Receptors: local people working in predominantly outdoor occupations such as farmers or herders	Above ground plant will be removed and the gas wells capped off at ground level. Increased activity in area during decommissioning but removal of structures will eventually restore the area to a more natural state.	Medium	Minor negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors via dedicated decommissioning strategy, design of site lighting to minimise light pollution.	Minor Adverse
Visual Receptors: recreational users of the landscape or tourists visiting the area.	Above ground plant will be removed and the gas wells capped off at ground level. Increased activity in area during decommissioning but removal of structures will eventually restore the area to a more natural state.	High	Minor negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors via dedicated decommissioning strategy, design of site lighting to minimise light pollution.	Minor Adverse
Pipelines - Construction						
Landscape Character: Surgil Field	Installation of the pipelines and associated underground and above ground services, soil stripping, stockpiling of excavated materials and damage to fragile plant communities by construction traffic. Reduction in tranquillity. Temporary impacts on area within 5 km of the pipeline site.	Low	Minor negative	Insignificant	Restriction of vehicle movements to agreed transport corridors via ESMP, removal of construction waste materials from the site, creation of linear banks to even profile along buried pipeline route, design of site lighting to minimise light pollution	Insignificant

Activity	Potential Impact	Sensitivity	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Landscape Character: The Ustyurt Plateau Escarpment	Installation of the pipelines and associated underground and above ground services, soil stripping, stockpiling of excavated materials and damage to fragile plant communities by construction traffic. Reduction in tranquillity. Temporary impacts on immediate area of pipeline route.	Medium	Minor negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors via ESMP, removal of construction waste materials from the site, creation of linear banks to even profile along buried pipeline route, design of site lighting to minimise light pollution.	Minor Adverse
Landscape Character: The Ustyurt Plateau	Installation of the pipelines and associated underground and above ground services, soil stripping, stockpiling of excavated materials and damage to fragile plant communities by construction traffic. Reduction in tranquillity. Temporary impacts on area within 5 km of the pipeline site.	Low (areas with existing pipeline infrastructure) - Medium (areas without existing infrastructure)	Minor negative	Insignificant (areas with existing infrastructure) - Minor (areas with no existing infrastructure)	Restriction of vehicle movements to agreed transport corridors via ESMP, removal of construction waste materials from the site, creation of linear banks to even profile along buried pipeline route, design of site lighting to minimise light pollution.	Insignificant – Minor Adverse
Visual Receptors: residents of the Urga camp, the El'abad settlement and Akchalak with a view of the Project	Installation of the pipelines and associated underground and above ground services, soil stripping, stockpiling of excavated materials and damage to fragile plant communities by construction traffic. Temporary impacts on area within 5 km of the pipeline site.	Medium	Minor negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors via ESMP, removal of construction waste materials from the site, creation of linear banks to even profile along buried pipeline route, design of site lighting to minimise light pollution.	Minor Adverse
Visual Receptors: local people working in	Installation of the pipelines and associated	Medium	Minor (areas with existing	Minor - Moderate Adverse	Restriction of vehicle movements to agreed transport corridors via ESMP,	Minor - Moderate Adverse

Activity	Potential Impact	Sensitivity	Magnitude Score	Impact Significance	Mitigation	Residual Significance
predominately outdoor occupations (such as farmers or herders) on the Ustyurt Plateau	underground and above ground services, soil stripping, stockpiling of excavated materials and damage to fragile plant communities by construction traffic. Temporary impacts on area within 5 km of the pipeline site.		infrastructure) - Moderate (areas with no existing infrastructure) - negative		removal of construction waste materials from the site, creation of linear banks to even profile along buried pipeline route, design of site lighting to minimise light pollution.	
Visual Receptors: local people making recreational use of the landscape or tourists on the Ustyurt Plateau	Installation of the pipelines and associated underground and above ground services, soil stripping, stockpiling of excavated materials and damage to fragile plant communities by construction traffic. Temporary impacts on area within 5 km of the pipeline site.	High	Minor (areas with existing infrastructure) - Moderate (areas with no existing infrastructure) - negative	Minor – Moderate Adverse	Restriction of vehicle movements to agreed transport corridors. Design of site lighting to minimise light pollution.	Minor - Moderate Adverse
Visual Receptors: road travellers through the area	Installation of the pipelines and associated underground and above ground services, soil stripping, stockpiling of excavated materials and damage to fragile plant communities by construction traffic. Temporary impacts on area within 5 km of the pipeline site.	Low	Minor negative	Insignificant	Restriction of vehicle movements to agreed transport corridors. Design of site lighting to minimise light pollution.	Insignificant

Activity	Potential Impact	Sensitivity	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Pipelines - Operations						
Landscape Character: Surgil Field	Presence of pipeline within 5 km of the route.	Low	Minor negative	Insignificant	Restriction of vehicle movements to agreed transport corridors. Design of site lighting to minimise light pollution.	Insignificant
Landscape Character: the Ustyurt Plateau Escarpment	Presence of new pipeline within immediate area of pipeline route.	Medium	Negligible	Insignificant	Restriction of vehicle movements to agreed transport corridors. Design of site lighting to minimise light pollution.	Insignificant
Landscape Character: the Ustyurt Plateau	Presence of new pipeline within 5 km of the route.	Low (areas with existing pipeline infrastructure) - Medium (areas without existing infrastructure)	Minor negative	Insignificant (areas with existing infrastructure) - Minor (areas with no existing infrastructure)	Restriction of vehicle movements to agreed transport corridors. Design of site lighting to minimise light pollution.	Insignificant - Minor
Visual Receptors: residents of the Urga camp, the El'abad settlement and Akchalak with a view of the Project	Presence of pipeline within 5 km of the route.	Medium	Minor negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors.	Minor Adverse
Visual Receptors: local people working in predominately outdoor occupations (such as farmers or herders) on the Ustyurt Plateau	Presence of pipeline within 5 km of the route.	Medium	Minor negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors.	Minor Adverse
Visual Receptors: local people making recreational use of the landscape or tourists on the Ustyurt Plateau	Presence of pipeline within 5 km of the route.	High	Minor negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors.	Minor Adverse
Visual Receptors: road travellers through the area	Presence of within 5 km of the route.	Low	Minor negative		Restriction of vehicle movements to agreed transport corridors.	Insignificant
Pipelines – Decommissioning						
Landscape Character: Surgil Field	There will be increased activity in the area during decommissioning. Reduction of man-made	Low	Minor negative	Insignificant	Restriction of vehicle movements to agreed transport corridors via dedicated decommissioning strategy, removal of construction waste	Insignificant

Activity	Potential Impact	Sensitivity	Magnitude Score	Impact Significance	Mitigation	Residual Significance
	elements in the landscape. The raised earth banks along pipeline route will remain but will be eroded by weather.				materials from the site, levelling of disturbed ground, design of site lighting to minimise light pollution.	
Landscape Character: the Ustyurt Plateau Escarpment	There will be increased activity in the area during decommissioning. Reduction of man-made elements in the landscape. The raised earth banks along pipeline route will remain but will be eroded by weather.	Medium	Minor negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors via dedicated decommissioning strategy, removal of construction waste materials from the site, levelling of disturbed ground, design of site lighting to minimise light pollution.	Minor Adverse
Landscape Character: the Ustyurt Plateau	There will be increased activity in the area during decommissioning. Reduction of man-made elements in the landscape. The raised earth banks along pipeline route will remain but will be eroded by weather.	Low (areas with existing pipeline infrastructure) - Medium (areas without existing infrastructure)	Minor negative	Insignificant (areas with existing infrastructure) - Minor (areas with no existing infrastructure)	Restriction of vehicle movements to agreed transport corridors via dedicated decommissioning strategy, removal of construction waste materials from the site, levelling of disturbed ground, design of site lighting to minimise light pollution.	Insignificant - Minor
Visual Receptors: residents of the Urga camp, the El'abad settlement and Akchalak with a view of the Project	There will be increased activity in the area during decommissioning. Reduction of man-made elements in the view. Raised earth banks along pipeline route will remain but will be eroded by weather.	Medium	Minor negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors via dedicated decommissioning strategy, removal of construction waste materials from the site, levelling of disturbed ground, design of site lighting to minimise light pollution.	Minor Adverse
Visual Receptors: local people working in predominately outdoor occupations (such as farmers or herders) on	There will be increased activity in the area during decommissioning. Reduction of man-made elements in the view.	Medium	Minor (areas with existing infrastructure) - Moderate (areas with no existing	Minor - Moderate Adverse	Restriction of vehicle movements to agreed transport corridors via dedicated decommissioning strategy, removal of construction waste materials from the site, levelling of	Minor - Moderate Adverse

Activity	Potential Impact	Sensitivity	Magnitude Score	Impact Significance	Mitigation	Residual Significance
the Ustyurt Plateau	Raised earth banks along pipeline route will remain but will be eroded by weather.		infrastructure) - negative		disturbed ground, design of site lighting to minimise light pollution.	
Visual Receptors: local people making recreational use of the landscape or tourists on the Ustyurt Plateau	There will be increased activity in the area during decommissioning. Reduction of man-made elements in the view. Raised earth banks along pipeline route will remain but will be eroded by weather.	High	Minor (areas with existing infrastructure) - Moderate (areas with no existing infrastructure) - negative	Minor - Moderate Adverse	Restriction of vehicle movements to agreed transport corridors via dedicated decommissioning strategy, removal of construction waste materials from the site, levelling of disturbed ground, design of site lighting to minimise light pollution.	Minor - Moderate Adverse
Visual Receptors: road travellers through the area	There will be increased activity in the area during decommissioning. Reduction of man-made elements in the view. Raised earth banks along pipeline route will remain but will be eroded by weather.	Low	Minor negative	Insignificant	Restriction of vehicle movements to agreed transport corridors via dedicated decommissioning strategy, removal of construction waste materials from the site, levelling of disturbed ground, design of site lighting to minimise light pollution.	Insignificant
UGCC Site - Construction						
Landscape Character	The construction access roads, drilling rigs, stockpiles of excavated materials, construction activity, damage to site vegetation and light pollution will have a temporary negative effect on views within 10 km of the site.	Low	Moderate negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors via ESMP, removal of construction waste materials from the site design of site lighting to minimise light pollution.	Minor Adverse
Visual Receptors: residents of the El'abad settlement and Akchalak with a view of the Project	The construction access roads, drilling rigs, stockpiles of excavated materials, construction activity, damage to site vegetation and light pollution will have a	Medium	Minor negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors via ESMP, removal of construction waste materials from the site, design of site lighting to minimise light pollution.	Minor Adverse

Activity	Potential Impact	Sensitivity	Magnitude Score	Impact Significance	Mitigation	Residual Significance
	temporary negative effect on views within 10 km of the site.					
Visual Receptors: local people working in predominately outdoor occupations (such as farmers or herders) on the Ustyurt Plateau	The construction access roads, drilling rigs, stockpiles of excavated materials, construction activity, damage to site vegetation and light pollution will have a temporary negative effect on views within 10 km of the site.	Medium	Minor negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors via ESMP, removal of construction waste materials from the site, design of site lighting to minimise light pollution.	Minor Adverse
Visual Receptors: local people making recreational use of the landscape or tourists on the Ustyurt Plateau	The construction access roads, drilling rigs, stockpiles of excavated materials, construction activity, damage to site vegetation and light pollution will have a temporary negative effect on views within 10 km of the site.	High	Minor negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors via ESMP, removal of construction waste materials from the site, design of site lighting to minimise light pollution.	Minor Adverse
Visual Receptors: road travellers through the area	The construction access roads, drilling rigs, stockpiles of excavated materials, construction activity, damage to site vegetation and light pollution will have a temporary negative effect on views within 10 km of the site.	Low	Minor negative	Insignificant	Restriction of vehicle movements to agreed transport corridors via ESMP, removal of construction waste materials from the site, creation of linear banks to even profile along buried pipeline route, design of site lighting to minimise light pollution.	Insignificant

Activity	Potential Impact	Sensitivity	Magnitude Score	Impact Significance	Mitigation	Residual Significance
UGCC Site - Operations						
Landscape Character	New built structures, transmission lines, additional traffic, and light pollution will have a negative effect on landscape character within 10km of the site. Reduction of damage to plant communities and soil surface through control of vehicle movements will have a positive effect on landscape character.	Low	Minor negative	Insignificant	Restriction of vehicle movements to agreed transport corridors. Design of site lighting to minimise light pollution.	Insignificant
Visual Receptors: residents of the El'abad settlement and Akchalak with a view of the Project	The new built structures and transmission lines, additional traffic and light pollution will have a negative effect on views within 10km of the site.	Medium	Minor negative	Minor Adverse	Design of site lighting to minimise light pollution.	Minor Adverse
Visual Receptors: local people working in predominately outdoor occupations (such as farmers or shepherds). on the Ustyurt Plateau	The new built structures and transmission lines and light pollution will have a negative effect on views within 10km of the site.	Medium	Minor negative	Minor Adverse	Design of site lighting to minimise light pollution.	Minor Adverse
Visual Receptors: local people making recreational use of the landscape or tourists on the Ustyurt Plateau	The new built structures and transmission lines and light pollution will have a negative effect on views within 10km of the site.	High	Minor negative	Minor Adverse	Design of site lighting to minimise light pollution.	Minor Adverse
Visual Receptors: road travellers through the area	The new built structures and transmission lines and light pollution will have a negative effect on views within 10km of the site.	Low	Minor negative	Insignificant	Design of site lighting to minimise light pollution.	Insignificant

Activity	Potential Impact	Sensitivity	Magnitude Score	Impact Significance	Mitigation	Residual Significance
UGCC Site - Decommissioning						
Landscape Character	Plant drained, made safe and removed for reuse/recycling. Increased activity in the area during decommissioning but removal of structures and the cessation of activity will eventually restore area to more natural state.	Low	Moderate negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors via dedicated decommissioning strategy, removal of construction waste materials from the site, levelling of disturbed ground, design of site lighting to minimise light pollution	Minor Adverse
Visual Receptors: residents of the El'abad settlement and Akchalak with a view of the Project	Plant drained, made safe and removed for reuse/recycling. Increased activity in the area during decommissioning but removal of structures and the cessation of activity will eventually restore area to more natural state.	Medium	Minor negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors via dedicated decommissioning strategy, removal of construction waste materials from the site, levelling of disturbed ground, design of site lighting to minimise light pollution	Minor Adverse
Visual Receptors: local people working in predominately outdoor occupations (such as farmers or herders) on the Ustyurt Plateau	Plant drained, made safe and removed for reuse/recycling. Increased activity in the area during decommissioning but removal of structures and the cessation of activity will eventually restore area to more natural state.	Medium	Minor negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors via dedicated decommissioning strategy, removal of construction waste materials from the site, levelling of disturbed ground, design of site lighting to minimise light pollution	Minor Adverse
Visual Receptors: local people making recreational use of the landscape or tourists on the Ustyurt Plateau	Plant drained, made safe and removed for reuse/recycling. Increased activity in the area during decommissioning but	High	Minor negative	Minor Adverse	Restriction of vehicle movements to agreed transport corridors via dedicated decommissioning strategy, removal of construction waste materials from the site, levelling of disturbed ground, design of site	Minor Adverse

Activity	Potential Impact	Sensitivity	Magnitude Score	Impact Significance	Mitigation	Residual Significance
	removal of structures and the cessation of activity will eventually restore area to more natural state.				lighting to minimise light pollution	
Visual Receptors: road travellers through the area	Plant drained, made safe and removed for reuse/recycling. Increased activity in the area during decommissioning but removal of structures and the cessation of activity will eventually restore area to more natural state.	Low	Minor negative	Insignificant	Restriction of vehicle movements to agreed transport corridors via dedicated decommissioning strategy, removal of construction waste materials from the site, levelling of disturbed ground, design of site lighting to minimise light pollution	Insignificant

14.6.2 Statement of Significance

Impacts of the Project with a significance of Moderate to Major are considered significant. There will be temporary negative significant residual impacts on:

- Local people working in the landscape and local people and tourists making recreational use of the areas of the Ustyurt Plateau which contain no existing infrastructure during construction of the pipeline; and
- Local people working in the landscape and local people and tourists making recreational use of the areas of the Ustyurt Plateau which contain no existing infrastructure during decommissioning of the pipeline.

The significance of impacts of the Project during construction and operation are listed on the Impact Summary Table 14.6 above.

15. Air Quality

15.1 Introduction

This report provides an assessment of the potential impacts during the construction and operational phases of the proposed Project on local air quality. The assessment has been carried out in accordance with national and international guidelines and has been assessed for each of the three Project components:

- Component 1 - Upstream: the Surgil Field and CGTU,
- Component 2 - Downstream: the UGCC; and
- Component 3 - Pipelines: Gas and condensate pipelines.

Due to the locations of each of the Project components the air quality assessment has split each of the components into separate study areas. These include a 15 kilometre radius surrounding the CGTU and UGGG and a 200 metre buffer along the route of the proposed gas and condensate pipelines.

15.2 Existing 'Baseline' Emission sources

15.2.1 Overview

Within each of the study areas for Component 1 and Component 2 there are a number of existing point emission sources. These have been included within the baseline assessment and are detailed below. In addition there is an existing rail line running between Kungrad and Beyneu which passes close to the existing Akchalak settlement. The line is used by passenger and freight diesel locomotives. The number of existing rail movements on the line are understood to be low.

15.2.2 Component 1 – Upstream: Surgil Field and CGTU

At present the Surgil Field exports natural gas via an existing pipeline to the Urga crossing. The Surgil Field has a number of operational wells and a CGTU. The Surgil CGTU has a number of emission sources, the largest of which is a process heating boiler. In addition, there is a waste gas flare which operates continuously to combust excess gas and prevents unburnt hydrocarbons being vented directly to the atmosphere. The existing emissions sources at the Surgil CGTU are:

- One process heating boiler (approximately 1.35 MWth input);
- One waste gas flare; and
- One fired regenerator.

15.2.3 Component 2 – Downstream: UGCC

Currently there are no emission sources associated with the proposed UGCC site. However, the wider study area has a number of existing emission sources, these include the Akchalak Gas Compressor Station (ACS) and the Kungrad Soda Ash (KSA) Plant. Existing emissions relating to the KSA Plant are either associated directly with the soda ash production or associated with energy requirements on site. The existing emissions within the UGCC study area are:

- Emissions associated with KSA Plant:
  - Two furnaces (approximately 9MWth input each);
  - Four boilers (two of these are used for heating purposes only and are therefore only operated during the winter months if required. The largest onsite boiler is approximately 25MWth input); and
- Emissions associated with the ACS:
  - Ten Gas Turbines Generators (GTGs) (6.3MWth input each).

15.3 Future 'Project' Emissions Sources

15.3.1 Overview

Within each of the study areas for Component 1, 2 and 3 there are a number of proposed emission sources associated with the Project. These have been included within the operation phase assessment and are detailed below. In addition, the Project will introduce a new rail spur from the existing line to the UGCC to transport the final products. It is anticipated that the new the Project will contribute approximately a maximum of one freight locomotive a day to the existing rail line. On this basis air quality impacts associated with the existing and proposed rail spur does not require further consideration within the assessment.

15.3.2 Component 1 – Upstream: Surgil Field and CGTU

After completion of the expanded Surgil CGTU it is anticipated that seven gas fired engines will be installed to meet the onsite energy requirements (including energy requirements of the workers' accommodation). The emissions sources included within the CGTU future operational scenario are:

- Seven 1.2 MWth gas fired engines (approximately 1.35 MWth input);
- One process heating boiler (approximately 1.35 MWth input);
- One fired regenerator; and
- Two well drilling rigs (made up of a number of emission sources totalling approximately 3.5MWth input).

During the operational phase of the Surgil CGTU the waste gas flare is only expected to operate under exceptional circumstances and has therefore not been included. Although well drilling rigs are currently operational, emissions from the well drilling rigs have only been included within the future scenario, thereby resulting in a conservative impact assessment. In addition, as the well drilling rigs move from location to location after each well has been drilled; modelling has been carried out assuming that both drilling rigs are in continuous operation throughout the year at a location close to the new workers' accommodation, near the CGTU. This is also a conservative assumption as it is likely that the drilling rigs would only be present in a single location for a maximum of 6 months of the year and it is unlikely that both would operate simultaneously close to the CGTU workers' accommodation. The drill rigs individually have their own workers' accommodation and the exposure at these receptors have been considered within this assessment. All wells have emergency flares (flare stack height of 10m) but they are only used in exceptional circumstances and have therefore not been considered further within the assessment. Furthermore, the future six GGSs will also be equipped with an emergency flare (flare stack height of 35m) but they will also only be used in exceptional circumstances and have therefore not been considered further within the assessment.

15.3.3 Component 2 – Downstream: UGCC

The UGCC will have a number of emission sources associated with it; these are described below:

- GTGs – it is anticipated that three 35 MWe GTGs will be installed at the UGCC. Primarily these will provide electricity for the site and associated processes. However heat will also be recovered to provide steam required onsite, thus improving the overall efficiency of the process. It is anticipated that the GTGs they will be provided by either Siemens or Hitachi. At present It is anticipated that only two will operate at any one time with the third acting as standby, however to be conservative, modelling has been undertaken assuming all three GTGs will operate continuously throughout the year.
- Process Boilers – Two steam-raising boilers with 110 tons/hr steam capacity will be located at the UGCC to produce additional stream required in the various processes onsite. It is expected that only one of these will operate at once with the other serving as a back up.
- Cracking Furnaces – It has been assumed five 67 MWth cracking furnaces will be installed at the UGCC to provide the additional heat required to allow the production of ethylene. Modelling has been undertaken assuming all five furnaces will operate continuously throughout the year, however, this is considered to be a conservative assumption.
- Sales Gas Compressors – Two sales gas compressors each 18.9 MWe will be installed within the UGCC. Modelling has been carried out assuming both operating simultaneously although it is likely that only one will operate with the other serving as a back up.
- Feed Gas Compressor - Two feed gas compressors each 12.7 MWe will be installed within the UGCC. Modelling has been carried out assuming both operating simultaneously although it is likely that only one will operate with the other serving as a back up.
- Waste Gas Flare – The UGCC will include a flare to prevent the venting of any waste gasses or excess gasses that cannot be utilised on site. It is expected that there will be one flare that will serve all of the processes located at the UGCC. The flare is provided with continuously operating or pulsating pilots to prevent flame out and to ensure that all releases to the flare are burned. The flare will have automatic ignition and re-injection facilities. A mixture of fuel gas and instrument air is used to generate the flame in the pilot burner and for flame control to ensure complete combustion. The height of the flare stack is 107 metres and the maximum capacity is 1,304 tonnes per hour gas flow. Although the flare is not expected to operate continuously through the year modelling has been undertaken assuming a worst case scenario assuming continuous firing.
- Thermal oxidiser – A thermal oxidiser will be installed within the UGCC site for the destruction of excess waste volatile organic compound (VOC) gases (e.g. ethylene, propylene, butane and hexane) from various sources around the UGCC process which can not be sent to the flare in order to minimise emissions of these compounds to atmosphere. It will also oxidise the gaseous and/or liquid elements derived from the separation of oily waste sludge. (the solid elements of these waste streams will be sent to landfill or sold to third parties) The thermal oxidiser will be fuelled on methane from the U&O supply.
- Fugitive emissions – At the UGCC all pipe work, valves and associated infrastructure could be subject to fugitive emissions. However, fugitive emissions are expected to be negligible as they will be controlled using best practice mitigation measures included within the plant design and therefore have not been included within the dispersion modelling.

Emissions for the future scenario at the UGCC described above will be assessed in combination with those already identified as existing emissions which will remain.

15.3.4 Component 3 – Pipelines

During the construction of the 115 kilometre gas and condensate pipelines there is the potential for emissions to air to occur. The majority of these will be in the form of dust emissions generated from excavation and earthworks associated with the laying of the pipelines and road surface. In addition, combustion related emissions will be released from construction vehicles and plant. Emissions during the construction phase will be for a limited time only and more than 500 metres from any sensitive receptors. Research carried out in the UK has indicated that, beyond 200 metres, the effects of dust emissions from construction sites and road traffic emissions on ambient air quality are negligible. On this basis effects from the construction phase of the proposed pipelines on air quality have not been considered further within this assessment. Consideration has been given to occupational exposure to dust by workers near to the Project components. Mitigation measures identified for Component 1 and 2 are therefore also applicable to Component 3.

Similarly, during operation, there are not expected to be any significant emissions from the proposed pipelines and therefore no further consideration has been given to this within the assessment.

15.4 Key Pollutants

15.4.1 Overview

The section provides an overview of the main pollutants that would be emitted as part of the proposed Project. At the Surgil CGTU and the UGCC the combustion of natural gas gives rise to a number of pollutants with the potential to negatively affect air quality at sensitive receptors. With respect to the combustion of natural gas the primary pollutant of concern is nitrogen oxides (NO_x), however, discussion is also provided below of carbon monoxide (CO) and volatile organic compounds (VOCs). Other pollutants such as sulphur dioxide (SO_2) hydrogen sulphide (H_2S) and particulates (PM_{10} and $PM_{2.5}$) have not been assessed with respect to emissions as they are not present in sufficient quantities in exhaust gas to cause potentially significant effects given that sweet gas (no H_2S content) is used as the basis of fuel.

15.4.2 Nitrogen Oxides (NO_x)

NO_x is the primary pollutant of concern emitted from the following plant included in the proposed Project:
- Surgil CGTU – Gas engines
- Surgil CGTU – Boilers
- Surgil CGTU – Fired Regenerator
- Surgil CGTU – Flare
- Surgil CGTU – Well drilling rigs
- UGCC - GTGs
- UGCC – Process boilers
- UGCC – Cracking Furnaces
- UGCC – Sales gas compressors
- UGCC – Feed gas compressors
- UGCC – Thermal Oxidiser
- UGCC - Flare
- KSA Plant – Furnace

- KSA Plant – Process and heating boilers
- ACS - GTGs

Combustion of fossil fuels generally produces two forms of NO_x, nitrogen monoxide (NO) and nitrogen dioxide (NO_2); collectively referred to as NO_x. The proportion varies depending on the combustion technology and the fuel being burnt. In the case of a natural gas fired turbine, for example, approximately 90 - 95% of the NO_x is present as NO, with the remainder being NO_2.

NO is a colourless and tasteless gas. It is readily oxidised to NO_2, a more harmful form of NO_x, by chemical reaction with ozone and other chemicals present in the atmosphere. NO_2 is a yellowish-orange to reddish-brown gas with a pungent, odour.

The production of NO_x during combustion depends on several factors, the principal of which are:

- Nitrogen in the fuel;
- Temperature of combustion;
- Geometry of the combustion chamber; and
- Ratio of fuel to combustion air.

All of the NO_x produced originates from nitrogen in the fuel or from nitrogen in the air that is used for combustion. NO_x from the fuel is referred to as 'fuel NO_x' and NO_x from the air is generally referred to as 'thermal NO_x'. NO_x oxidised directly by the radicals of the combustion reaction is referred to as 'prompt NO_x' (although this represents a very small proportion of the total). The proportion of fuel NO_x to thermal NO_x and other emissions depends on the temperature of combustion. With an increase in combustion temperature, there is an increase in thermal NO_x emissions, and hence the overall NO_x emissions. The formation of thermal NO_x is strongly dependent on the maximum flame temperature and the period that the gases remain at that temperature. It can be reduced either through the use of dry low-NO_x burners or by cooling the flames through the injection of steam or water into the combustion zone.

15.4.3 Carbon Monoxide

Carbon monoxide (CO) is produced when incomplete combustion takes place. Emissions of CO from a combustion plant such as a gas turbine are limited by optimising the fuel to air ratio to maximise the heat released per unit of fuel. Monitoring of this pollutant is often used as a measure of combustion efficiency and it is therefore in the operator's financial interest to minimise emissions. Combustion in gas turbines and engines is typically conducted at high excess air rates that result in low emissions of CO. CO is emitted from the following plant included within the proposed Project.

- Surgil CGTU – Gas engines
- Surgil CGTU – Boilers
- Surgil CGTU – Fired Regenerator
- Surgil CGTU – Flare
- Surgil CGTU – Well drilling rigs
- UGCC - GTGs
- UGCC – Process boilers
- UGCC – Cracking Furnaces
- UGCC – Sales gas compressors
- UGCC – Feed gas compressors
- UGCC – Thermal Oxidiser
- UGCC - Flare
- KSA Plant – Furnace

- KSA Plant – Process and heating boilers
- ACS - GTGs

As CO is a product of inefficient combustion it is anticipated that emissions will remain low and not cause large increases in ambient concentrations, therefore prediction of CO concentrations has not been included within the dispersion modelling.

15.4.4 Volatile Organic Compounds

VOCs are organic chemical compounds that have high enough vapour pressures under normal conditions to significantly vaporize and enter the atmosphere. A wide range of carbon-based molecules, such as aldehydes, ketones, and other light hydrocarbons are VOCs. The most common VOC is methane, a greenhouse gas that is sometimes excluded from analysis of other VOCs using the term non-methane VOCs. Common artificial VOCs include paint thinners, dry cleaning solvents, and some constituents of fuels (e.g. petrol and natural gas).

Fugitive emissions in polymer manufacturing are mainly associated with emissions from leaking pipes, valves, connections, flanges, packings, open ended lines, pump seals, gas conveyance systems, compressor seals and pressure relief valves, amongst others. Potential VOC emissions will be controlled by industry best practice and are therefore expected to be minimal during the operation of the UGCC and CGTU and have not been included further within dispersion modelling.

15.4.5 Contaminated Dust

The area around the former Aral Sea basin (within which the upstream element of the Project is located) is typically of high salinity and, in some cases, reported to contain toxic elements. However where there has been soil sampling in the former Aral Sea bed representative of the upstream area of the Project, actual levels of pollution are at most just above local guideline values and well below international standards (Dutch and Canadian Standards have been used for this assessment). A detailed soil sampling survey has been carried out to determine pollutant concentrations at locations where construction activities will take place. Chapter 11 provides further details on this survey and the soil contamination results.

Results from the ground investigation survey illustrate that at the majority of locations and for the majority of contaminants concentrations are below the national maximal permissible concentrations (MPCs). In some cases the national MPCs for selenium, copper and lead are exceeded. However the concentrations are still below relevant international standards. The study did identify that concentrations of dichlorodiphenyltrichloroethane (DDT) slightly exceeded the Dutch Intervention Value at one location and that the sum of Organochlorine pesticide residues exceeded the MPC (further details of sampling results and applicability of the standards applied are presented in Chapter 11.

It should be noted that the Project does not introduce these pollutants; however, it could introduce a pathway between existing sources and receptors. From an air quality perspective, contaminated soils can represent a risk to human health by virtue of their potential inhalation by site workers and residential receptors..

15.5 Legislation and Guidelines

15.5.1 Overview

As described previously, this ESIA is required to demonstrate that the Project meets the requirements of the Equator Principles 2006 and the Asian Development Bank (ADB). Both refer to the EHS Guidelines as defining the environmental standards against which the Project should be assessed. Details of the specific requirements in relation to air quality (which, for clarity, can be divided between 'emissions to air' and 'ambient air quality) are provided below.

15.5.2 National Requirements

15.5.2.1 Overview

The following provides an overview of key legislation relating to air emissions in Uzbekistan and respective national requirements applicable to the Project. The key regulators dealing with air emissions and ambient air quality in Uzbekistan are:

- The State Committee on Nature Protection (Goskompriroda) who develops air quality standards to protect the environment, the climate and the ozone layer;
- The Ministry of Health who develops air quality standards (sanitary norms) to protect human health oversees compliance with hygienic norms and standards associated with waste management, identifies hygienic and sanitary standards for recycled products and provides guidelines for waste hazard rating).

The key legislation relating to air emissions and ambient air quality in Uzbekistan applicable to the Project includes the following:

15.5.2.2 National Laws

- Law of the Republic of Uzbekistan on Atmospheric Air Protection No.353-I of 27.12.1996 (as amended on 10.10.2006);
- Law of the Republic of Uzbekistan on State Sanitary Supervision No.657-XII of 03.07.1992 (as amended on 03.09.2010);
- Criminal Code, Section 4. Environmental Crimes, approved on 22.09.1994 (as amended on 04.01.2011); and
- Law of the Republic of Uzbekistan on Environmental Expertise No.73-II of 25.05.2000 (as amended on 04.01.2011).

15.5.2.3 Decrees

- Decree of Oliy Majlis of Uzbekistan No.354-I of 27.12.1996 on Enactment of the Law on Atmospheric Air Protection;
- Decree of the Cabinet of Ministers of Uzbekistan on Approval of the Regulation on the State Environmental Expertise in the Republic of Uzbekistan No.491 of 31.12.2001 (as amended on 05.06.2009);
- Decree of the Cabinet of Ministers of the Republic of Uzbekistan on Improving the System of Pollution and Waste Disposal Charges in Uzbekistan No.199 of 01.05.2003 (as amended on 02.04.2010); and

15.5.2.4 Regulations

- Instructions on Inventory of Pollution Sources and Rating Pollutant Emissions for Ventures in Uzbekistan, enacted by Order of the Chairman of the State Committee for Nature Protection of the Republic of Uzbekistan No.105 of 15.12.2005.

15.5.2.5 SanPins

- SanPiN RUz No.0179-04 – Hygienic norms. List of Maximum Allowable Concentrations (MACs) of pollutants in ambient air of communities in the Republic of Uzbekistan including Annex 1; and
- SanPiN RUz No.0246-08 – Sanitary norms and requirements to protect ambient air in communities of the Republic of Uzbekistan.

15.5.2.6 Emission Limit Values

Within Uzbek legislation emissions released to the atmosphere are controlled via 'Maximum Permissible Emissions' (MPEs) which are defined on a project specific basis. Currently there are no specified standards for emissions set for the UGCC and CGTU therefore only emission limits specified within IFC guidance have been presented below and used where appropriate.

15.5.2.7 Ambient Air Quality

Uzbekistan has developed a unified system of air quality standards applicable to all regions across the country – 'Maximum Allowable Concentrations' (MACs) of pollutants and biological organisms in the ambient air to protect both human health and the environment.

MACs define the amount of the pollutant in ambient air which will impact neither human health nor the environment as a result of direct contact or exposure.

MACs have been developed by the Ministry of Health and are summarised in SanPiN RUz No.0179-04 – Hygienic norms: List Maximum Allowable Concentrations (MACs) of pollutants in ambient air of communities in the Republic of Uzbekistan. Relevant MACs are specified in Table 15.1.

Table 15.1: Summary of Relevant Ambient Air Quality Standards for Protection of Human Health ($\mu g/m^3$)

Pollutant	Averaging Period	National Standards [a]
Nitrogen Dioxide (NO_2)	30 minutes	85
	1 hour	-
	24 hours	60
	1 month	50
	Annual	40
Nitrogen Oxides (NO_x)[b]	30 minutes	600[i]
	24 hours	250[i]
	1 month	120[i]
	Annual	60[i]

Notes [a] Maximum Allowable Concentrations (MACs)

[b] NO_x is interpreted as NO within Uzbekistan. Modelling results have been compared to NO_2 standards only as these are more stringent.

Any project in Uzbekistan associated with air emissions is required to make provisions for arranging a Sanitary Protection Zone (SPZ) for new developments during the site selection phase.

An SPZ is a specially allocated zone of open space and vegetation between the development and a dwelling area that will ensure dispersion of ground level concentrations of pollutants to the level of existing norms.

The size of an SPZ depends on the sanitary category of industrial projects as defined in SanPiN 0246-08 – Sanitary norms and requirements to protect ambient air in communities of the Republic of Uzbekistan. Currently there are five sanitary project categories in Uzbekistan which impose the following SPZ requirements:
- Category I – 1000 metre SPZ;
- Category II – 500 metre SPZ;
- Category III – 300 metre SPZ;
- Category IV – 100 metre SPZ; and
- Category V – 50 metre SPZ.

Section 7 of SanPiN 0246-08 specifies and categorises types of industrial projects. Thus gas production at the UGCC is classified as a Category I project requiring a 1000 metre SPZ while the Surgil CGTU is classified as a Category II project requiring a 500 metre SPZ..

The size of a SPZ for cross-country pipelines is defined individually for each project based on safety requirements and construction standards. Thus SPZ for the gas and condensate pipelines of the Surgil Project is 50 metres.

An SPZ or any part of it shall not be considered as a reserved area of the project and shall not be used for the project extension. The national requirement prohibits accommodation within the SPZ of summer cottages, garden plots, vegetable patches, sports and education facilities, public parks, medical and preventive treatment facilities, health and leisure institutions or any type of dwelling, food processing facilities, beverages and drinking water production facilities and associated infrastructure (warehouses, etc), car or public transport parking lots, car maintenance facilities.

An SPZ is subject to landscaping based on the respective SPZ set-up document to be prepared at the project design phase. Any project shall justify and confirm the size of an SPZ by respective pollution dispersion calculations and laboratory investigations to be summarised in the SPZ set-up document subject to approval by sanitary and epidemiological supervision authorities. SPZ justification shall take into account various factors: MACs, dispersion characteristics, ambient air quality, background pollution levels, planned and existing pollution sources, noise and vibration and their sources, electric field impacts, etc. The size of SPZ may be reduced or increased based on respective justification supported by dispersion studies and calculations. Currently the assessment has been carried out assuming the statutory minimum for the respective SPZ's as currently they have not been confirmed. Based on the results of the assessment the size of the SPZ has the potential to change and increase in size.

15.5.3 IFC Requirements

15.5.3.1 Overview

As described in Chapter 4 a number of specific sections of the EHS Guidelines are applicable to the Project. Those of most relevance to air quality (in light of the emission sources and pollutants described above) are:

- General EHS Guidelines (April 2007);
- Natural Gas Processing (April 2007);
- Onshore Oil and Gas Development (April 2007);
- Petroleum-based Polymers Manufacturing (April 2007);
- Large Volume Petroleum-based Organic Chemicals Manufacturing (2007); and
- Thermal Power Plants (December 2008).

Where appropriate the above guidelines have been used as the basis for the assessment and identification of suitable mitigation measures.

15.5.3.2 Emission Limit Values

The General EHS Guidelines advise that, with respect to emission standards, when host country regulations differ from the levels presented in the Guidelines, projects are expected to achieve whichever is more stringent (it should be noted that an equivalent approach does not apply to ambient concentrations, as described below). As described above, in Uzbekistan emission limits are defined through MPEs and calculated on a mass emission basis for a specified period of time. Currently the MPEs have not been determined for the Project, therefore appropriate emission limits from the IFC guidelines have been presented and used within this assessment.

Relevant IFC standards for emissions to air applicable for small combustion facilities rated between 3 – 50MWth input are presented in the General EHS Guidelines (Section 1.1 Air Emissions and Ambient Air Quality). Relevant IFC standards applicable to combustion facilities rated over 50MWth are presented in the IFC Guidelines for Thermal Power Plants. Table 15.2 to Table 15.4 present the relevant emission limits for NO_x specified within the EHS Guidelines.

Table 15.2: Pollutant Emissions Limit Values for engines rated 3-50MWth

Fuel	Pollutant	IFC Guidelines
Natural gas	Nitrogen oxides (NO_x)	200 mg/Nm$^{3(a)(b)}$ 400 mg/Nm$^{3(c)}$ 1,600 mg/Nm$^{3(d)}$

Notes: (a) Environmental, Health and Safety Guidelines General EHS Guidelines: Environmental Air Emissions and Ambient Air Quality, IFC 2007.Reference conditions: dry, 0°C, 1 atmosphere, 15% O_2

(b) Spark ignition

(c) Dual Fuel

(d) Compression Ignition

Table 15.3: Pollutant Emissions Limit Values for boilers rated 3-50MWth

Fuel	Pollutant	IFC Guidelines
Natural gas	Nitrogen oxides (NO_x)	320 mg/Nm^{3}[(a)]

Notes: [(a)] Environmental, Health and Safety Guidelines General EHS Guidelines: Environmental Air Emissions and Ambient Air Quality, IFC 2007. Reference conditions: dry, 0^oC, 1 atmosphere, 3% O_2

Table 15.4: Pollutant Emissions Limit Values for Gas Turbine above 50MWth

Fuel	Pollutant	IFC Guidelines
Natural gas	Nitrogen oxides (NO_x)	51 mg/Nm^{3}[(a)]

Notes: (a) Environmental, Health and Safety Guidelines for Thermal Power Plants, IFC 2008.
Reference conditions: dry, 0^oC, 1 atmosphere, 15% O_2

15.5.3.3 Ambient Air Quality

The General EHS Guidelines advise that 'relevant standards' with respect to ambient air quality are national legislated standards or, in their absence, the current World Health Organisation (WHO) Air Quality Guidelines or other internationally recognised sources. Where a host country's legislated standards are less stringent than either the WHO or other internationally recognised sources, the IFC acknowledge that it is acceptable to use the national legislated standards as the principal standards that the Project is assessed against.

As described above, national legislated ambient air quality standards are available and have therefore been used within the assessment to determine air quality impacts. However, for comparison purposes only, Table 15.5 also presents the current WHO and EU ambient air quality standards. The comparison shows that standards are similar; however, the national standards cover a greater number of averaging periods and include standards for NO_x for the protection of human health although these have not been used to compare modelled results against as the NO_2 standards are more stringent.

The current WHO Guidelines are provided in the Air Quality Guidelines Global Update 2005. These guidelines are intended to support actions for air quality at the optimal achievable level for public health protection in different contexts. The WHO does not formally prescribe how guidelines should be used in air quality management. However, the Air Quality Guidelines Global Update does provide 'Interim Targets' to aid the progression of policy development to bring air quality in line with the proposed guideline values.

The General EHS Guidelines specifically refer to the European Union Directives as being an 'internationally recognised source' of ambient air quality standards. Although numerically equal to the WHO standards for NO_2, the EU legislation introduces a threshold of tolerance to account for exceptional, worst case episodes. This translates as a limit not to be exceeded more than a certain number of times, and can be expressed as a 'percentile'. In an assessment of human health effects, which takes account of a relevant exposure period, this approach is considered more appropriate.

The General EHS Guidelines suggest that, as a general rule, emissions should not contribute more than 25 percent of the relevant air quality standards to allow additional, future sustainable development in the same airshed. Therefore, the significance of the impact of the Project has been discussed in the context of this suggestion.

Table 15.5: Summary of Relevant Ambient Air Quality Standards for Protection of Human Health (µg/m^3)

Pollutant	Averaging Period	National Standards [e]	WHO Guidelines[a]	European Union Limit Values [b]
Nitrogen Dioxide (NO_2)	30 minutes	85	-	-
	1 Hour	-	200	200[c]
	24 Hour	60	-	-
	1 Month	50	-	-
	Annual	40	40	40
Nitrogen Oxides (NO_x)	30 minutes	600	-	-
	24 hours	250	-	-
	1 month	120	-	-
	Annual	60	-	30[d]

Notes
[a] WHO Air Quality Guidelines for Europe. Second Edition 2000
[b] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe
[c] Not to be exceeded more than 18 times per calendar year
[d] For the protection of vegetation and ecosystems
[e] Maximum Allowable Concentrations (MACs)

15.6 Methodology

15.6.1 Baseline Assessment Methodology

Limited data are available in relation to the existing concentrations of key pollutants within the study area. An air quality monitoring study was undertaken for 2005 and 2006 within the Ustyurt region, however it is unclear what monitoring techniques were utilised or the location/locations of the monitoring sites. On this basis the monitoring data has been presented within the baseline section although it has not been used within the assessment. Instead all relevant existing emissions sources have been modelled to provide a modelled characterisation of the baseline conditions. This does not include emissions from the exiting rail or the road infrastructure as these are not considered to contribute significantly to pollutant concentrations at the modelled receptors.

15.6.2 Impact Assessment Methodology

Potential impacts from the proposed Project are divided into those associated with construction and those associated with the operational phase. The methods used to assess the two phases are described below.

15.6.2.1 Construction Phase

Construction activities can result in temporary effects from dust. ‘Dust’ is a generic term which usually refers to particulate matter in the size range 1-75 microns. Although no analysis of the particle characterisation has been undertaken, the nature of the area and activities to be carried out means that emissions of construction dust are predominantly associated with the movement and handling of minerals and therefore composed of the larger fractions of this range which do not penetrate far into the respiratory system. Therefore the primary air quality issue associated with construction phase dust emissions is normally loss of amenity and/or nuisance caused by, for example, soiling of buildings, vegetation and washing and reduced visibility. Assessment of construction dust emissions in this way is accepted as following good assessment practice. Nevertheless, it is understood that historic pollution of agricultural areas around the Aral Sea has resulted in residual deposits of potentially harmful chemicals. Generally the worst affected areas are located in agricultural regions and not in the basin of the former Aral Sea or the Ustyurt Plateau. Disturbance of the ground during construction activities could result in these chemicals being liberated and transported on dust particles to nearby receptors. As described above, a detailed soil sampling survey has been carried out to determine the pollutant concentrations at locations where construction activities will take place. The results of this survey are reported in 11.

Where concentrations in the soil are found to be below the applicable soil guideline values, potential effects from inhalation of the contaminant are not significant. This is the case for the vast majority of the study area. A low number of exceedences have been reported but these are small and confined to localised areas. Therefore for the majority of the study area it is considered that there will not be any health effects associated with contaminated dust during either the construction or operational phases as set out in Chapter 11. However as there are some localised exceedences appropriate mitigations have been provided to protect the construction workers from potential health risks.

In addition, where there are localised exceedences the construction activities are likely to generate larger fractions of dust that do not penetrate into the respiratory system. Under normal circumstances these would not be associated with any health effects. However given the potential for contamination (and therefore potential for effects from contaminated dust being entrained within the body without actually reaching deep into the respiratory system) a precautionary approach has been undertaken and mitigation measures in line with protecting workers from smaller dust fractions have been included.

Dust deposition can be expressed in terms of mass per unit area per unit time, e.g. mg/m^2/month. No relevant Uzbek or IFC standards exist for dust deposition, however, a range of criteria from 133 to 350 mg/m^2/month is found around the world as representative of thresholds for significant nuisance.

It is considered that a quantitative approach is inappropriate and unnecessary for assessing particulate emissions associated with the construction and decommissioning phases of the Project. The activities undertaken during the construction phase are likely to lead to dust emissions however given their duration and limited location of sensitive receptors a qualitative assessment of dust effects is appropriate. However, based on the potentially harmful nature of deposits within the sea bed it is still deemed necessary to assess and minimise potential dust emissions associated with the construction phase. The potential for construction and decommissioning activities to raise dust, and the likely consequences of dust emissions have therefore been assessed qualitatively.

The first stage of the assessment has involved the identification of construction activities which have the potential to cause dust emissions, and the degree of dust potential. Table 15.6 provides a generic list of all potential activities, at each stage of construction. Selected information for this table have been used within this assessment to determine the impact of the Project with respect to construction dust.

Table 15.6: Relevant Generic Dust Emitting Activities

Potential Dust Emitting Activities	Description	Dust Emission Potential
Soil handling	Potential to be high in dust nuisance, depends on soil dryness	High
Loading Activities	Potential to be high in dust nuisance, depends on soil dryness	High
Storage of materials onsite	Potential to be high in dust nuisance, depends on soil dryness	High
Transport of materials within site	Can be high depends on type of transport and nature of road surface	Medium

Potential Dust Emitting Activities	Description	Dust Emission Potential
Drilling and digging activities (Including soil excavation)	Can be high depending on type of drilling and digging activities	High
Transport of material offsite	Generally low as transport occurs by surfaced roads	Low
Construction of new buildings	Generally low although some activities with high dust raising such as material cutting can occur	Medium-Low
Assembly of plant	Generally low as involves assembling already made pieces	Low

Source: Table adapted from UK Department for Environment and Rural Affairs and Buildings Research Establishment guidance

In the second stage of the assessment, all sensitive receptors with the potential to be significantly affected by construction dust emissions have been identified. The distances from source at which construction dust effects are felt are dependent on the extent and nature of mitigation measures, prevailing wind conditions, rainfall and the presence of natural screening by, for example, vegetation or existing physical screening such as boundary walls on a site. However, research indicates that effects from construction activities that generate dust are generally limited to within 150-200 metres of the construction site boundary. To ensure a conservative assessment, any receptors within 500 metres of the construction site boundary have been identified, and their classification determined in accordance with Table 15.7. On the basis that contaminated dust may be present, no receptors have been classed as 'low'. In addition, as dust generated from the construction phase will be limited to within 500 metres of the construction activities the project is not introducing any additional human heath risks from contaminated dust to off site receptors.

Based on the SPZ for this Project there will not be any sensitive receptors within 50 metres of the pipeline route and 1000 metres of the UGCC. In addition, there will not be any receptors within 500 metres of the Surgil CGTU.

Table 15.7: Receptor Classification

Classification		
High	Medium	Low
Hospitals and clinics	Residential areas	-
-	Workers (accommodation and site activities)	-

15.6.2.2 Operational Phase

Overview

This section describes the methods used to assess the air quality impacts associated with the operational phase of the Project. Detailed dispersion modelling has been used to identify potentially significant impacts on sensitive receptors. Modelling has been carried out assuming the stack heights provided for key emissions sources and are sufficiently tall to overcome building wake effects and therefore meet Good International Industry Practice (GIIP) (the EHS Guidelines for Thermal Power Plants, December 2008).

Modelled Scenarios

As described above, modelling has been carried out to characterise baseline conditions. Therefore the following 2 Scenarios have been modelled for the Upstream and Downstream Components:

Component 1 – Upstream: Surgil Field and CGTU
- Scenario 1: Existing 'Baseline' Scenario – Modelling of existing emission sources at Surgil CGTU.
- Scenario 2: Future 'Project' Scenario – Modelling of existing situation with inclusion of additional engines and removal of waste gas flare at Surgil CGTU

Component 2 – Downstream: UGCC
- Scenario 1: Existing 'Baseline' Scenario – Modelling of the existing KSA Plant and existing ACS, existing emission.
- Scenario 2: Future 'Project' Scenario – Modelling of existing situation with inclusion of additional emission sources at Surgil the UGCC.

Dispersion modelling in both Scenarios conservatively assumes all units are operating at full load continuously throughout the year. In reality, it is expected that annual plant load factors will be lower at 8,000 hours (design case) due to downtime and associated maintenance.

In addition to the above conservative assumptions, data have been presented to identify maximum process contributions from all the point sources included within this assessment.

Model Selection

A number of commercially available dispersion models are able to predict ground level concentrations arising from emissions to atmosphere from elevated point sources such as a power plant. A new generation dispersion model - AERMOD (version 7.2.5) was used to inform the basis of the air quality assessment. AERMOD is recommended for use by the IFC as an appropriate method for predicting the emissions from point sources such as those associated with this Project. A model description is included below.

A committee, AERMIC (the American Meteorological Society / Environmental Protection Agency Regulatory Model Improvement Committee), was formed to introduce state-of-the-art modelling concepts into the US Environmental Protection Agency's local-scale air quality models. AERMIC's focus was on a new platform for regulatory steady-state plume modelling. AERMOD was designed to treat both surface and elevated sources in simple and complex terrain.

Special features of AERMOD include its ability to treat the vertical heterogeneity nature of the planetary boundary layer, special treatment of surface releases, irregularly-shaped area sources and limitation of vertical mixing in the stable boundary layer.

AERMOD is a modelling system with three separate components and these are as follows:
- AERMOD (AERMIC Dispersion Model)
- AERMAP (AERMOD Terrain Pre-processor)
- AERMET (AERMOD Meteorological Pre-processor).

AERMET is the meteorological pre-processor for AERMOD. Input data can come from hourly cloud cover observations, surface meteorological observations and twice-a-day upper air soundings. Output includes surface meteorological observations and parameters and vertical profiles of several atmospheric parameters.

AERMAP is a terrain pre-processor designed to simplify and standardise the input of terrain data for AERMOD. Input data include receptor terrain elevation data. For each receptor, the output includes a location and height scale, which is an elevation used for the computation of air-flow around hills.

AERMOD is recognised by the IFC as an acceptable model for dispersion modelling of point source emissions. However, AERMOD is not capable of calculating ambient concentrations for averaging periods of less than one hour, therefore following advice from the model developer hourly concentrations have been multiplied by a factor of 1.3 to derive half hourly concentration values.

Meteorology

The most important meteorological parameters governing the atmospheric dispersion of pollutants are wind direction, wind speed and atmospheric stability, as described below:

- Wind direction determines the sector of the compass into which the plume is dispersed;
- Wind speed affects the distance, which the plume travels, over time and can affect plume dispersion by increasing the initial dilution of pollutants and inhibiting plume rise; and
- Atmospheric stability is a measure of the turbulence of the air, and particularly of its vertical motion. It therefore affects the spread of the plume as it travels away from the source. New generation dispersion models use a parameter known as the Monin-Obukhov length that, together with the wind speed, describes the stability of the atmosphere.

For meteorological data to be suitable for dispersion modelling purposes, a number of parameters need to be measured on an hourly basis. These parameters include wind speed, wind direction, cloud cover and temperature. There are only a limited number of sites where the required meteorological measurements are made.

Dispersion model simulations were performed using six years of meteorological data from Kungrad airport (approximately 50 km to the east of the proposed UGCC location and approximately 100 km to the south of the Surgil CGTU). Data has been sourced from the National Climatic Data Center (NCDC) with one hour data interpolated from the monitored three hour values following the United States Environment Protection Agency (US EPA) guidance on Meteorological Monitoring Guidance for Regulatory Modelling Applications. . By using hourly sequential meteorological data the effects of extreme changes in regional temperatures between summer and winter have been accounted for within the dispersion modelling.

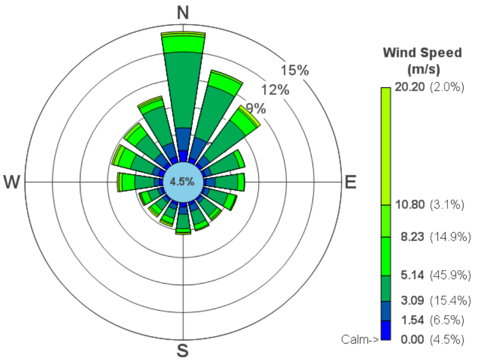
Table 15.8 presents the minimum and maximum recorded temperatures from the six years of meteorological data used within the assessment. The data indicates the extremes in temperatures experienced at the Ustyurt Plateaux.

Table 15.8: Minimum and Maximum Temperatures used with Dispersion Modelling (^oC)

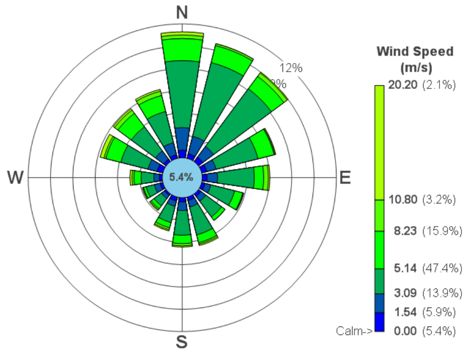
	2003	2004	2005	2006	2007	20088
Minimum	-18.2	-15.4	-23.6	-28.4	-21.1	-28.7
Maximum	39.8	40.3	44.0	42.6	41.2	44.5

Table 15.9 presents wind roses from the six years of meteorological data used with the assessment. The wind roses indicate that there is a dominance of winds from the north east. Wind speeds are between 3-5m/s, however, on average calm conditions (with speeds below 0.5 m/s) are experienced for approximately 10 percent of the time.

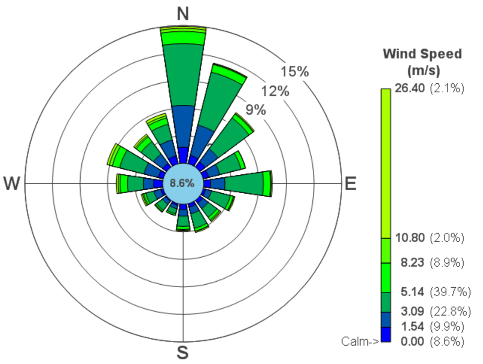
Table 15.9: Windroses for the Six Years of Meteorological Data used within the Assessment



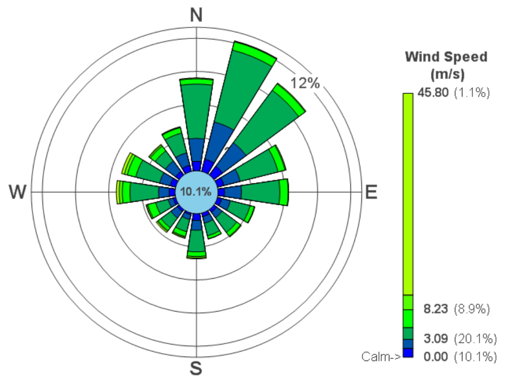
2003



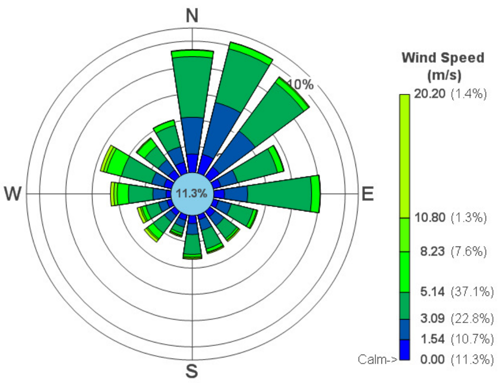
2004



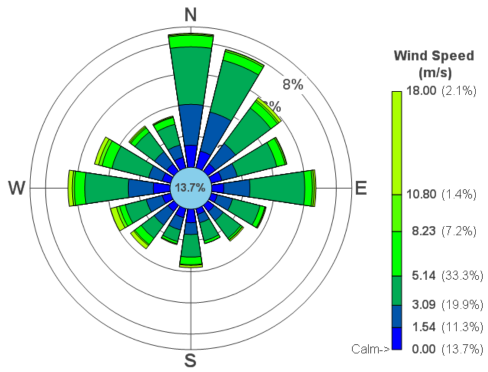
2005



2006



2007



2008

Table 15.10 presents the cloud cover for each of the six meteorological years used within the assessment. Cloud cover is presented in Okta's where zero is equivalent to clear skies and eight is overcast conditions.

Table 15.10: Cloud Cover percentages in Okta's for each Meteorological Year

Year	Cloud Cover % - Oktas's								
	0	1	2	3	4	5	6	7	8
2003	29.90	7.19	9.10	5.32	3.42	5.53	7.48	7.86	24.20
2004	30.45	8.36	10.40	6.55	4.69	6.60	9.25	8.58	15.12
2005	29.65	7.83	11.27	7.22	4.58	7.02	8.18	7.93	16.31
2006	34.22	7.26	8.65	6.27	4.26	6.29	8.09	6.88	18.08
2007	37.49	6.85	8.33	5.49	4.33	5.64	7.56	6.44	17.86
2008	36.98	7.23	9.16	6.44	5.04	6.60	8.80	7.34	12.40

Terrain

The presence of elevated terrain can significantly affect (usually increase) ground level concentrations of pollutants emitted from elevated sources such as stacks, by reducing the distance between the plume centre line and ground level and increasing turbulence and, hence, plume mixing.

With the exception of the Ustyurt escarpment, terrain in the study area is relatively flat (i.e. less than 1 in 10 gradient) and therefore not likely to affect dispersion from the existing or new emission sources. The UGCC is located upon the Ustyurt Plateau and therefore is located upon the highest ground within the region. The CGTU is located in the Aral Sea basin but is considered to be far enough away from the escarpment for it not to impact on plant dispersion. It is therefore considered that inclusion of the escarpment is not required; indeed, by not including the elevation terrain within the model a conservative assessment is being undertaken for modelled concentrations in the receptor grid at a lower elevation. Therefore, terrain in the study area was not included within the dispersion modelling.

Roughness of terrain over which a plume passes can have a significant effect on dispersion by altering the velocity profile with height, and the degree of atmospheric turbulence. This is accounted for by a parameter called the surface roughness length and calculated during the processing of the meteorological data.

Building Downwash

The movement of air over and around buildings generates areas of flow circulation, which can lead to increased ground level pollutant concentrations in the building wakes. Where building heights are greater than about 30 - 40% of the stack height, downwash effects can be significant. The dominant buildings (i.e. with the greatest dimensions likely to promote turbulence) are the Heat Recovery units, the GTGs and the cracking furnaces at the UGCC. Table 15.11 provide details of the buildings included within the air quality modelling. The building dimensions used are based on preliminary design data. It is not expected that onsite structures such as cracking towers, platforms or walkways would have a significant effect on the movement of air in their vicinity and therefore they have not been included within the dispersion modelling. These structures are designed to allow air flow to pass around or through them and therefore minimise negative effects on pollutant dispersion.

Table 15.11: Main Buildings included with the Dispersion Model

Building	X	Y	Height (m)	Length (m)	Width (m)
UGCC - GTG Building	602463.8	4780781.8	10	49.9	80.3
UGCC - HRSG Building	602408.5	4780782.2	25	50.7	40.1
UGCC - Boiler Building	602634.2	4780702.3	10	29.5	42.4
UGCC - Cracking Furnace 1	602737.9	4780765.2	35	10.4	10.7
UGCC - Cracking Furnace 2	602753	4780765.2	35	10.5	10.7
UGCC - Cracking Furnace 3	602768	4780765.4	35	10.7	10.9
UGCC - Cracking Furnace 4	602783.1	4780765.4	35	10.5	11
UGCC - Cracking Furnace 5	602798	4780765	35	10.3	11
ACS - GPA 6.3 1	597518.2	4780593.3	5	13.5	47.9
ACS - GPA 6.3 2	597523.2	4780574.8	5	14.7	47.7
ACS - GPA 6.3 3	597527.5	4780555.8	5	14.3	48.4
ACS - GPA 6.3 4	597531.3	4780536.9	5	13.6	48.6
ACS - GPA 6.3 5	597537.1	4780519.5	5	13.9	48.1
ACS - GPA 6.3 6	597541.7	4780500.6	5	13.6	48.7
ACS - GPA 6.3 7	597545.2	4780483.2	5	14.3	48.4
ACS - GPA 6.3 8	597550.2	4780463.5	5	13.9	47.5
ACS - GPA 6.3 9	597555.3	4780446.5	5	13.2	47.8
ACS - GPA 6.3 10	597559.1	4780428.3	5	14.3	48.6
ACS - GTK building	597580.1	4780360.4	21	155.8	53.2
CGTU – Eng 1	636036	4877322.6	3	3.3	7
CGTU – Eng 2	636035.8	4877313.6	3	3.3	7
CGTU – Eng 3	636035.8	4877306.4	3	3.3	7
CGTU – Eng 4	636023.4	4877323.3	3	3.3	7
CGTU – Eng 5	636023.4	4877323.3	3	3.3	7
CGTU – Eng 6	636023.4	4877323.3	3	3.3	7
CGTU – Eng 7	636023.4	4877323.3	3	3.3	7
CGTU - Boiler house	636057.1	4877315.6	3	7	7.8
UGCC - Feed Gas turbine A	602964	4780782.4	6	21.6	9.3
UGCC - Feed Gas turbine B	602984.4	4780782.4	6	22.4	9.1
UGCC - Sales Gas Turbine A	602929.2	4780778.5	8	31.2	8.9
UGCC - Sales Gas Turbine B	602942.7	4780778.7	8	31	7.3
UGCC - Admin Building	602592.6	4780869.5	12	35.3	78.7
UGCC - Guard House	602661.2	4780781.2	5	22.5	14.2
UGCC - Main Substation	602408.8	4780723.2	9.5	60.1	35.5
UGCC – Thermal Oxidizer	602863.7	4780281.7	3	14.3	12.8
UGCC - Chemical Storage	602604.6	4780152.6	8.73	99.6	74.7
UGCC - CCR Building	602704.4	4780441.6	5	64.9	47.2
UGCC - Lab Building	602704	4780356.2	5.4	24	40.8
UGCC - Auto Warehouse	602606.2	4780288	32	46	40.4
UGCC - M/T Workshop	602605.5	4780221.5	12	49.6	61.6
UGCC - Utility substation	602532.6	4780448.7	9.5	33.2	130.2
UGCC - Fire fighting building	603056.5	4780283.1	8.7	28.3	38.8

Percentage Conversion of NO_x to NO_2

NO_x emissions associated with combustion sources such as gas turbines, gas engines and gas fired boilers will typically comprise approximately 90-95% NO and 5-10% NO_2 at source. The NO oxidises in the atmosphere in the presence of sunlight, ozone and volatile organic compounds to form NO_2, which is the principal pollutant of concern with respect to environmental health effects.

There are various techniques available for estimating the proportion of the NO_x that is converted to NO_2. Total conversion is frequently used for the estimation of the annual mean NO_2 concentrations to determine the absolute upper limit of NO_2 formation. This technique is based on the assumption that all NO_x emitted is oxidised to NO_2 before it reaches ground level receptors. Total conversion has been conservatively assumed in this assessment for consideration of long term averaging periods (annual mean). A 50% oxidation of NO_x to NO_2 has been considered for short-term averaging periods (1 hour and 24 hour mean) which is also considered to be conservative.

Modelled Emissions to Air

The relevant emissions data for all the proposed plant are presented in Table 15.12 to Table 15.15. Emissions data have been calculated from specified emission limits where appropriate and noted within the Tables below – IFC emission limits have been applied wherever they are available for the combustion source in question (see Table notes below). It is expected that plant will operate below the emission limits specified and therefore the modelling results presented are likely to be conservative.

After approximately 15 years of operation (i.e. by 2026) alteration to the Project design will result in the need for the construction of a booster compressor station before gas enters the UGCC. It is not expected that these additional combustion sources will cause significant air quality impacts provided that they incorporate good design i.e. designed with appropriate stack heights and emissions controls. These additional combustion sources have therefore not been included within this assessment.

Component 1 – Upstream: Surgil Field and CGTU

Table 15.12: Emissions data used in the Dispersion Model at the Surgil CGTU

Parameter	Gas Engines	Boiler	Fired Regenerator [c]	Flare [d]	Drilling Rigs [e]
Stack Height (m)	5	15	6	35	5
Internal Stack Diameter (m)	0.3	0.264	0.1	0.75	0.52
Exit Temperature (^oC)	474	225	225	700	474
Exit Velocity (m/s)	26.6	15.2	32	9.4	26.6
NO_x emissions (g/s)	0.2 [a]	0.05[b]	0.04	1.29	0.6

Notes: [a] Assumes engines will meet half TA Luft emissions for NO_x as per manufactures data sheets

[b] Assumes boiler will meet emission limit of 120mg/m^3 which is the same a specified for boiler at the UGCC

[c] Emissions taken from National EIA

[d] Emissions taken from National EIA

[e] Drilling energy requirements assumed to be met by three of the gas engines firing continuously

Component 2 – Downstream: UGCC

Table 15.13: Emissions data used in the Dispersion Model at the UGCC

Parameter	Gas Turbines Generators [a] [c]	Cracking Furnaces [a]	Process Boiler [a]	Feed Gas Compressor [a] [c]	Sales Gas Compressor [a] [c]	Thermal Oxidizer	Flare [b]
Stack Height (m)	40	50	35	13	15	8	107
Internal Stack Diameter (m)	3	2	2.35	1.7	2	0.7	1.68
Exit Temperature (^oC)	133	177	177	521	474	500	700
Exit Velocity (m/s)	25	10.2	8.8	30.9	26.6	15.5	10
NO_x emissions (g/s)	4.4	2.1	4.6	1.3	1.7	0.19	0.02

Notes [a] Calculated from data provided by design team

[b] Calculated from National EIA

[c] IFC emission limits for 'Gas Turbines' apply (51mg/Nm^3 (15% O_2, 1 ATM, 0°C)

Component 2 – Downstream: Akchalak Compressor Station

Table 15.14: Emissions data used in the Dispersion Model at the ACS

Parameter	Gas Turbine Generators [a]
Stack Height (m)	10
Internal Stack Diameter (m)	2.59
Exit Temperature (^oC)	200
Exit Velocity (m/s)	16.8
NO_x emissions (g/s)	2.8

Notes (a) data obtained from manufacturers data sheets

Component 2 – Downstream: KSA Plant

Table 15.15: Emissions data used in the Dispersion Model at the KSA Plant

Parameter	Furnace[(a)(b)]	Boiler 1[(b)]	Boiler 2[(b)]	Boiler 3 & 4[(b)]
Stack Height (m)	25.1	30	30.5	45
Internal Stack Diameter (m)	1	1.2	1	0.8
Exit Temperature (^oC)	35.3	145	145	145
Exit Velocity (m/s)	13.7	11.87	13.5	13.5
NO_x emissions (g/s)	0.13	0.37	0.29	0.18

Notes ([a]) assumes two furnaces through one single shaft exit point
([b]) data obtained from manufacturers data sheets

A summary of the mass emissions from each of the study areas is presented in Table 15.16 and Table 15.17. Mass emissions have been presented as combination of all combustion sources for each of the Project components. Mass emissions have been calculated assuming that all plant will operate on natural gas at full load continuously throughout the year, and are therefore conservative.

Component 1 – Upstream: Surgil Field and CGTU

Table 15.16: Mass Emissions (tonnes per year) associated with the Surgil Gas Filed and CGTU

Pollutants	Surgil CGTU
Nitrogen Oxides (NOx)	125.5

Component 2 – Downstream: UGCC

Table 15.17: Mass Emissions (tonnes per year) associated with the UGCC

Pollutants	UGCC
Nitrogen Oxides (NOx)	1077.1

Human Health Receptors – Residential

Within this section of the ESIA, the phrase 'discrete receptor' has been used to refer to a specific identified location where the dispersion model has been used to predict pollutant concentrations. Additionally a 'receptor grid' refers to a dispersion modelling concept where pollutant concentrations are predicted over a grid in uniform arrangement. The discrete receptors allow air quality impacts to be assessed at identified existing receptor locations. The receptor grid aids the assessment of pollutant concentrations over a wide spatial area and, by interpolating between these points, allows the production of pollutant contours which illustrate how pollutant concentrations change across the study area.

The overall purpose of the air quality assessment is to compare predicted pollutant concentrations with the relevant standards identified in Section 15.5. The respective standards identified have been designed to be applied at specific locations and, as such, all have an averaging period associated with them which is tailored to match the likely period of exposure associated with those locations.

For the purpose of the modelling assessment, the standards have therefore been compared against concentrations predicted at discrete receptors which are located within identified residential areas and the significance criteria applied to those concentrations. This identification of residential areas has been carried out through review of proposed plans and satellite mapping for the study area. Because the location of residential areas may change in the future (i.e. new residential areas will be developed within the study area with construction of the Project), maximum values from a receptor grid and contour plots have also been presented which present the geographic spread of pollutant concentrations across the study area. Concentrations from the whole grid have been presented even if the gridded receptor lies within the SPZ of the UGCC and Surgil CGTU and this presents the worst case ground level concentration.

The predominant area surrounding both the Surgil CGTU is part of the former Aral Sea bed and therefore barren with the closest receptor being the settlement of Uchsay at 25 km outside the modelling domain. However, the Project will include the workers' accommodation to be constructed approximately 500 metres to the north east.

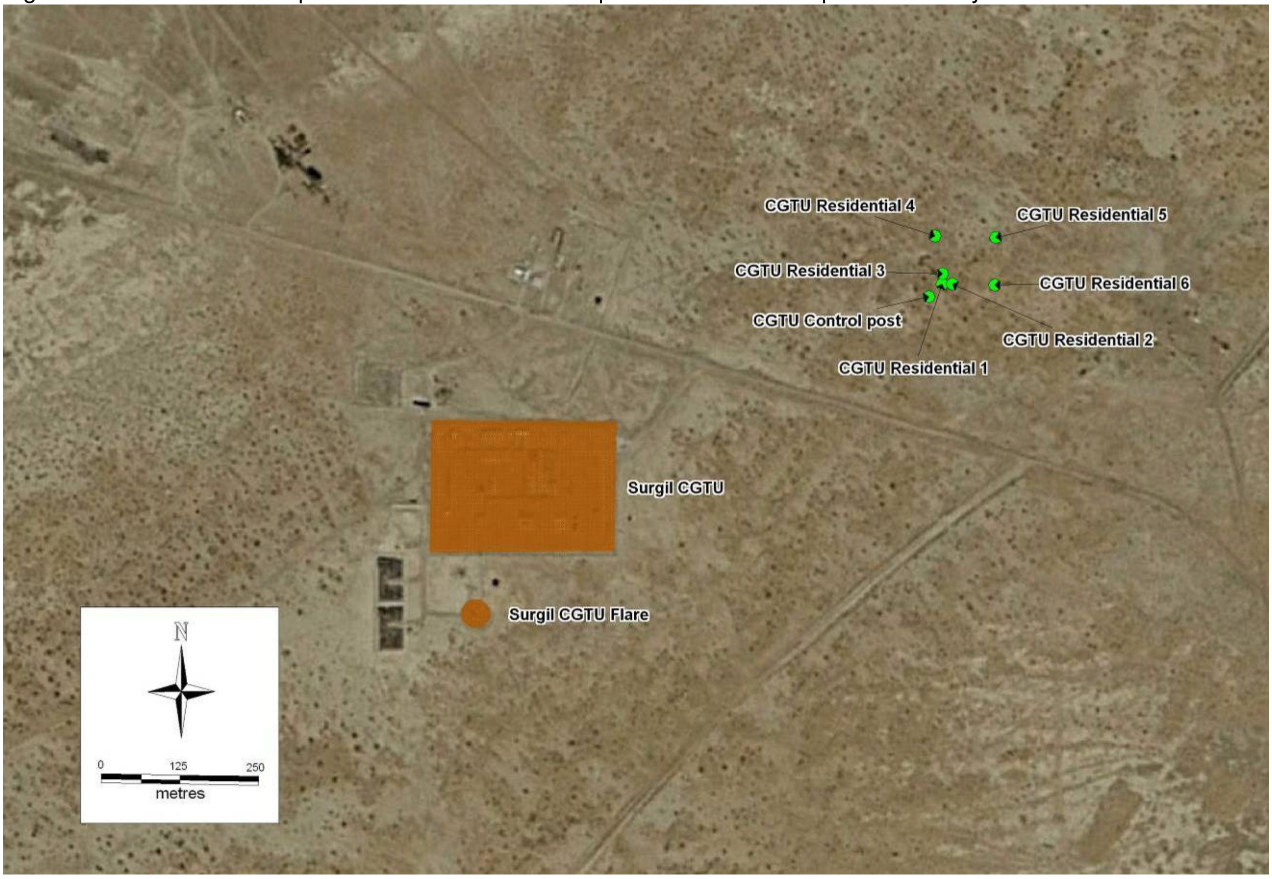
The closest settlement to the UGCC is Akchalak. As part of the Project, Akchalak will be expanded with the development of the workers' accommodation. Discrete receptors located closest to the relevant emission sources have been modelled. The locations of these receptors are presented in Table 15.18, Figure 15.1 and Figure 15.2 below.

Table 15.18: Discrete Receptors Included within the Dispersion Modelling

Sensitive Receptors	X	Y
CGTU Control Post	636578	4877688.8
CGTU Residential 1	636599.2	4877709.8
CGTU Residential 2	636615.5	4877709.7
CGTU Residential 3	636599.2	4877726
CGTU Residential 4	636586.5	4877785.6
CGTU Residential 5	636586.5	4877785.6
CGTU Residential 6	636586.5	4877785.6
Existing Akchalak Settlement 1	598509	4778766
Existing Akchalak Settlement 2	598100	4778546
Akchalak UGCC Accommodation 1	599091	4779513
Akchalak UGCC Accommodation 2	599495	4778813
Akchalak UGCC Accommodation 3	598945	4778972
Akchalak UGCC Accommodation 4	598386	4779081
Akchalak UGCC Accommodation 5	598765	4778368
Existing Akchalak Settlement 3	598342	4777991
Existing Akchalak Settlement 4	598756	4778233
Existing Akchalak Settlement 5	598431.4	4778390.9

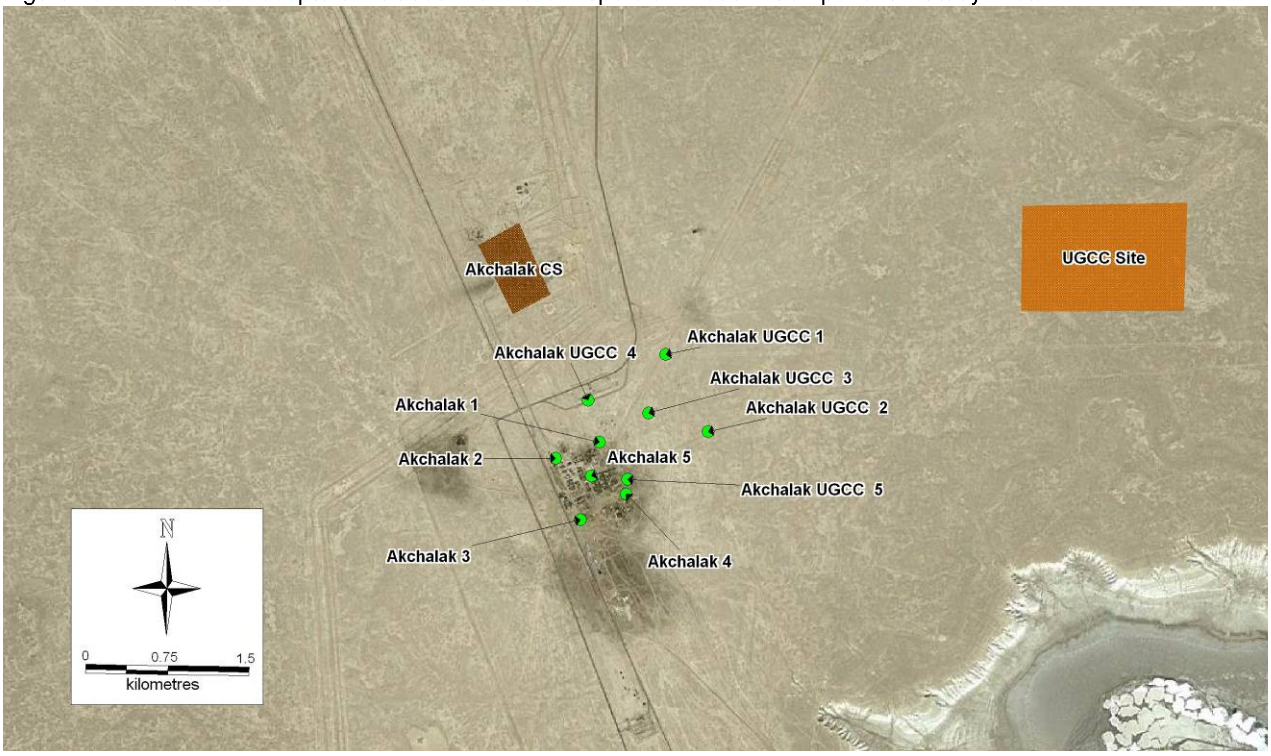
Notes: Coordinates are UTM WGS 84 Zone 40N

Figure 15.1: Discrete Receptors Included within the Dispersion Model - Component 1 Study Area



Note: Used under licence

Figure 15.2: Discrete Receptors Included within the Dispersion Model - Component 2 Study Area



Note: Used under licence

In addition to modelling the discrete receptors locations described above, uniform 'grids' of evenly spaced receptor points have been used to determine maximum pollutant concentrations at each of the Surgil CGTU and the UGCC. For the UGCC and CGTU study areas, modelling was carried out using 15 kilometre radius grids with receptors located every kilometre. In addition, at the CGTU a further 2 kilometre radius grid with receptors spaced every 250 metres was included and at the UGCC a 5 kilometre radius grid with receptors every 250 metres was used to determine maximum pollutant concentrations close to the site.

Outputs from the discrete receptors and the modelled grids have been used to present the maximum ground level process contributions from the modelled scenarios. The maximum concentrations have been used within the significance criteria described below to assess the overall significance of operational phase impacts.

At the Surgil CGTU an additional receptor grid centred on one of the drill rigs has been included to assess the pollutant concentrations likely to be experienced by workers living at the drill rig sites. A receptor grid with a 250 metres radius and a receptor spacing of 5 metres to determine maximum onsite concentrations has been used. Results have been compared to short term (1 hour and 24 hour) national standards and not occupational standards as workers live at the drill sites for a up to two weeks at a time.

Human Health Receptors - Occupational

Elevated concentrations of pollutants can have a negative effect on on-site workers; severe cases can result in respiratory irritation, discomfort or illness. Although the IFC does not specify occupational exposure limits for workers, it provides suitable sources where these can be obtained and defines appropriate measures that should be applied to maintain suitable air quality in occupational areas. In addition to assessing combustion related pollutants, assessment has been made of occupational exposure from dust during both the construction and operational phases of the project.

Occupational standards are available from a variety of sources including The National Institute for Occupational safety and Health (NIOSH). The NIOSH provides occupational exposure limits for a number of pollutants including NO_2 and VOCs which are the primary pollutant of concern for two averaging periods. These include Recommended Exposure Limit (REL) for 15 minutes time weighted average and an 8 hour time weighted Permissible Exposure Limits (PEL) suggested by the Occupational Safety and Health Administration (OSHA). Table 15.19 presents the appropriate NO_2 occupational standards used as the basis for this assessment. VOCs have not been modelled as fugitive emissions are expected to minimal and controlled through best practice mitigation included within the design. These limits are only applicable at the UGCC and not the drilling sites at the Surgil Field as workers' accommodation is located away from the UGCC.

Table 15.19: Relevant NO_2 Occupational Exposure Standards

Occupational Standards	Concentration mg/m^3
15 minute NIOSH REL	1.8
8 Hour OSHA PEL	9

Source: www.cdc.gov/niosh
REL - Recommended Exposure Limit
PEL - permissible Exposure Limits

Fugitive Emissions

Fugitive emissions in polymer manufacturing are mainly associated with emissions from leaking pipes, valves, connections, flanges, packings, open ended lines, pump seals, gas conveyance systems, compressor seals, pressure relief valves amongst others. Potential VOC emissions will be controlled by industry best practice and are therefore expected to be minimal during the operation of the UGCC and CGTU and have not been included further within the assessment.

The UGCC and CGTU will meet industry best practice to avoid the release of fugitive emissions, methods are inline with those specified within both the General and sector specific EHS Guidelines and are presented within the Mitigation Section, below.

Significance Criteria - Overview

Determining the significance of impacts identified is one of the main purposes of an environmental assessment and enables the identification of necessary mitigation measures. An environmental impact can be either beneficial or adverse and is assessed by comparing the quality of the existing environment with the predicted quality of the environment once a project is in place.

In order to describe the significance of an impact it is important to distinguish between two concepts; 'magnitude' and 'sensitivity'. The application of these concepts for this assessment is outlined in Chapter 5 of the ESIA and should be read in conjunction with this chapter. This section describes how the significance criteria for the operational phase has been derived based on assessment of magnitude of the impact and receptor sensitivity.

Significance Criteria -Construction Phase

A combination of the dust emission potential (from the activities expected during the construction phase – see Table 15.6) and their expected duration has been used to determine the impact magnitude of the construction phase, as presented in Table 15.20.

Table 15.20: Determination of Impact Magnitude – Construction Phase

Dust Raising Potential (a)	Duration	Magnitude
High	Any	Major
Medium	> 3 Months	Moderate
Medium	< 3 Months	Minor
Low	Any	Negligible

Notes[(a)] Dust raising potential defined in accordance with the approach described in Section above.

In addition, the overall receptor sensitivity has been based on the type of receptor and the distance from the construction activity boundary. Table 15.21 presents the criteria on which receptor sensitivity has been based for the significance criteria.

Table 15.21: Determination of Receptor Sensitivity – Construction Phase

		Distance to Construction Activities			
		0-50m	50-100m	100-200m	200-500m
Receptor Classification [(a)]	High	High	High	Medium	Low
	Medium	Medium	Medium	Low	Low
	Low	Medium	Low	Low	Negligible
	No Receptors	Negligible	Negligible	Negligible	Negligible

Notes: (a) Receptors classified based on method described in Table 15.6 above.

In summary, the magnitude of impacts is a product of the type of activities carried out and their durations. The receptor sensitivities are a product of the receptor type and their distance to the construction activities.

Following the definition of magnitude and sensitivity, the significance of impacts and therefore overall risk from the construction phase has been evaluated based on the significance matrix presented in Chapter 5.

Significance Criteria - Operational Phase

Guidance has been issued in the UK to assist in determining the significance of operational phase impacts in air quality assessments. This guidance recommends that significance should be determined by a combination of two aspects:

- The change in concentrations (Process Contribution (PC)) caused by the Project at sensitive receptors; and
- The resulting total concentrations (Predicted Environmental Concentrations (PEC)) at sensitive receptors as a percentage of the relevant ambient air quality standard(s).

This approach is considered to represent best practice for assessments of this kind and has therefore been adapted for determining the significance of impacts on local air quality from the Project.

Table 15.22 and Table 15.23 present the approach used for determining residential receptor sensitivity and impact magnitude for operational phase impacts which have been determined in light of World Bank/IFC guidance. Changes in ambient concentrations over 25% of the relevant standards are considered to represent an impact of 'Major' magnitude as the General EHS Guidelines note that Projects should:

"…prevent or minimize impacts by ensuring that …emissions do not contribute a significant portion to the attainment of relevant ambient air quality guidelines or standards. As a general rule, this guideline suggests 25 percent of the applicable air quality standards to allow additional future sustainable development in the same airshed.

The General EHS Guidelines classify 'poor quality airsheds' as those where relevant standards are exceeded significantly. Therefore, receptors experiencing existing ambient pollutant concentrations above the relevant standards are concluded to be of 'High' sensitivity.

For each of the key pollutants and averaging periods assessed, a number of ambient air quality standards are applicable (as described in Section 15.5).

Table 15.22: Determination of Impact Magnitude– Operational Phase

Change in Concentrations as % of Standard	Magnitude
Increase >25%	Major
Increase 15-25%	Moderate
Increase 5-15%	Minor
Increase <5%	Negligible

Table 15.23: Determination of Receptor Sensitivity – Operational Phase

Ground Level Pollutant Concentrations in Relation to Standard	Receptor Sensitivity
Above Standard	High
75 to 100% of the Standard	Medium
50 to 75% of the Standard	Low
Below 50% of the Standard	Negligible

Notwithstanding the above, any non-negligible increases causing a new exceedance of the national standards are afforded 'Major' adverse significance.

15.7 Baseline Description

Monitoring of existing air quality in the Ustyurt region was carried out in 2005 and 2006. Table 15.24 summarises the monitoring data obtained during this period. As described within the methodology Section this data has been presented for information only and not used further within the assessment as the location of the monitoring sites are not clear.

Although NO_2 is the primary pollutant of concern with respect to the Project (and therefore the focus of the dispersion modelling) results of CO have been presented for completeness. Dust (i.e. larger fractions atmospheric particulates which could cause nuisance effects) concentrations have not been presented as these are highly dependant on location and meteorological conditions and would not be appropriate given the qualitative nature of the assessment. There was no existing monitoring data for PM_{10} or $PM_{2.5}$ and no additional monitoring was considered necessary as emissions from the Project will be negligible.

Table 15.24: Baseline Monitoring undertaken in the Ustyurt region during 2005 and 2006 (µg/m^3)

Averaging Period	Nitrogen Dioxide (NO_2)		Carbon Monoxide (CO)	
	2005	2006	2005	2006
Annual Average Concentration	30	20	2,000	2,000
Maximum Single Occurrence[(a)]	60	50	5,000	4,000

Note: [(a)] Averaging period unknown

Monitoring in the Ustyurt region shows that annual mean concentrations of NO_2 are below the national and WHO annual mean objective. The Maximum Single Occurrence concentrations are also below the national standard of 85µg/m^3 averaged over 30 minutes.

National standards for annual mean concentrations of CO are 3000 µg/m^3, the monitored values for annual mean CO for both 2005 and 2006 are 2000 µg/m^3 and therefore below the standards. The maximum single occurrence values recorded in 2005 and 2006 if CO are equal to or below the national 30 minute standard of 5,000 µg/m^3 however it is not clear what time period this maximum single occurrence relates to.

Monitored values of annual mean NO_2 were between 50 and 70% of the annual mean objective. Despite this being relatively high compared to modelled baseline concentrations presented in Section 15.8 no comparisons between results can be made as it is not clear where the monitoring took place and, therefore, whether it is relevant to the study area. Within this assessment modelling of the baseline has been undertaken with all relevant combustion sources included to provide an appropriate basis for determining existing pollutant concentrations.

As part of the Environmental and Social Management Plan presented in Volume IV monitoring for both NO_2 and VOCs will be undertaken before the commissioning of the plant so that the baseline concentrations determined from the dispersion modelling can be verified. Monitoring will continue once the Project is operational to ensure that there are no significant effects at the existing residential settlements and the proposed workers' accommodation. Therefore no additional monitoring before construction is required.

15.8 Impact Assessment

15.8.1 Construction Phase

15.8.1.1 Overview

The construction of the UGCC is expected to last for approximately 44 months and will consist of large scale construction activities. Construction activities at the Surgil Field and Surgil CGTU will be of a smaller scale although it is anticipated that additional wells will be sunk for the operational period of approximately 30 years and therefore involve dust raising activities throughout the Project life. In addition to the well drilling, the predominant construction activities at the Surgil CGTU will be related to the development of the workers' accommodation and the development of a third train at the CGTU itself. Lastly, gas and condensate pipelines will be laid from the Surgil Field via the Urga crossing to the UGCC to transport the extracted gas and condensate. It is anticipated that much of the pipeline corridor will follow the route of the existing pipeline corridors (both commissioned and decommissioned) running between the Surgil Field and the existing ACS.

15.8.1.2 Construction Dust Risk

At this stage no formal construction plan has been formulated for the construction of the various Project components and has therefore been based on generic construction activities associated with the assembly of such plant. Typical construction activities and there dust raising potential are presented in Table 15.25.

Table 15.25: Construction activities associated with the key Project proponents

Section	Description of works	Key activities	Dust raising potential	Duration	Impact Magnitude
Surgil Field	Drilling of additional wells	Soil excavation Storage and transport of materials	High	>3 months (overall process ongoing through out Project lifetime – each well will take approximately 6 months to drill)	Major
Surgil CGTU	Installation of addition gas engines Building of workers accommodation	Construction of new buildings Soil Handling Excavation	Medium High High	>3 months	Major
Urga crossing to UGCC pipeline	Installation of new pipeline	Soil excavation transport of materials	High	>3 months	Major
UGCC	Installation of all processing plant including Gas Turbines, cracking furnaces and associated infrastructure	Soil handling Excavation Construction of plant Foundations Construction of new buildings	High High High Medium	>3 months	Major

The majority of the activities associated with the construction phase are classed as having a 'high' dust raising potential. Taking into account this and the duration of the works, the magnitude of dust effects is considered to be 'major' in accordance with the significance criteria defined in Chapter 5.

15.8.1.3 Construction Phase – Community Health (including worker's accommodation)

As described in previous sections, consideration has been given to potential receptors within 500 metres of the construction site boundary of the UGCC and CGTU. There are no receptors within 500 metres of the UGCC due to the categorisation of the project and the 1000 metre SPZ. At the Surgil CGTU the SPZ only extends 500 metres from the site boundary. The workers accommodation, which includes a medical clinic, are approximately 500 metres from the construction activities at the CGTU (assuming all future wells will be drilled further than 500 metres from the workers' accommodation at the CGTU). Due to the classification of the receptors, and their distance from construction activities, receptor sensitivity is classed as 'Low'.

Therefore in accordance with the significance criteria presented in Chapter 1, the risk of dust effects during the construction phase is described as 'Minor'. Nevertheless, generic good practice dust mitigations have been presented in the mitigation section below.

15.8.1.4 Construction Phase – Occupational Health

During the construction phase, activities being undertaken have been assigned a 'high' dust raising potential. Onsite workers (who will be within 50 metres of construction activities) have the potential to be exposed to excessive dust which could cause negative health effects and are considered to be of 'medium' sensitivity. This sensitivity takes account of the potentially contaminated nature of the soil.

In accordance with the significance criteria presented above, the risk of dust effects on occupational health during the construction phase is described as 'Moderate'. Mitigation measures in line with IFC guidelines have been presented to protect project workers.

15.8.2 Operational Phase Human Health Receptors – Residential

15.8.2.1 Overview

This section provides a summary of the modelled concentrations and conclusions for changes in air quality as a result of the Project. Full model results and significance descriptors are provided in Appendix N, Volume III.

Changes in emissions of CO_2 are assessed fully in Chapter 16.

15.8.2.2 Component 1 – Upstream: Surgil Field and CGTU

Scenario 1 – Existing 'Baseline' Scenario

Table 15.26 and Table 15.27 present the maximum pollutant concentrations predicted at the modelled discrete receptor locations and the modelled grids during the existing baseline scenario within the Component 1 study area.

Table 15.26: Modelled NO_2 Concentrations at Discrete Receptors, Component 1, Scenario 1 – Existing 'Baseline' Scenario (µg/m^3)

Receptor	NO₂ concentrations					
	30 Minute Max	1 Hour Max	1 Hour 99.79 Percentile	24 Hour Max	1 Month Mean	Annual Mean
CGTU Control Post	5.1	3.9	2.9	1.9	0.5	0.2
CGTU Residential 1	4.9	3.8	2.8	1.9	0.5	0.2
CGTU Residential 2	4.9	3.8	2.8	1.9	0.5	0.2
CGTU Residential 3	4.9	3.8	2.8	1.9	0.5	0.2
CGTU Residential 4	4.7	3.7	2.9	1.9	0.5	0.2
CGTU Residential 5	4.8	3.7	2.7	1.9	0.4	0.2
CGTU Residential 6	4.7	3.6	2.7	1.8	0.4	0.2

Table 15.27: Modelled Maximum NO_2 Concentrations at Receptor Grids, Component 1, Scenario 1 – Existing 'Baseline' Scenario (µg/m^3)

Pollutant	Averaging Period	Standard	PC
NO_2	30 Min Max	85	14.1
	1 Hour Maximum	200(a)	10.8
	1 Hour 99.79 Percentile	200(b)	8.2
	24 Hour Max	60	3.1
	1 Month Mean	50	1.8
	Annual Mean	40	1.0

Note: PC = Process Contribution

(a) IFC standard adopted from WHO guidelines

(b) EU standard

Scenario 2 – Future 'Project' Scenario

Table 15.28 and Table 15.29 present the maximum pollutant concentrations predicted at the modelled discrete receptor locations and the modelled grids during the future 'Project' operating scenario within the Component 1 study area.

In addition, at the CGTU modelling has been done to determine the maximum NO_2 concentrations in the vicinity of the drilling rigs as it is expected that a number of workers will be living within the drill sites while drilling is operational. Results from this modelling for comparison against the relevant national and international standards are presented in Table 15.30. Figure 15.3 presents the maximum modelled 30 minute NO_2 concentrations for the operational scenario.

Table 15.28: Modelled NO_2 Concentrations at Discrete Receptors, Component 1, Scenario 2 – Future 'Project' Scenario (µg/m^3)

Receptor	NO_2 concentrations					
	30 Minute Max	1 Hour Max	1 Hour 99.79 Percentile	24 Hour Max	1 Month Mean	Annual Mean
CGTU Control Post	26.9	20.7	15.0	10.8	2.6	1.3
CGTU Residential 1	25.8	19.9	14.4	10.4	2.5	1.3
CGTU Residential 2	26.1	20.1	14.1	10.1	2.5	1.3
CGTU Residential 3	24.5	18.9	13.9	10.3	2.5	1.3
CGTU Residential 4	22.1	17.0	15.0	9.4	2.4	1.2
CGTU Residential 5	23.3	17.9	12.9	8.9	2.3	1.1
CGTU Residential 6	24.6	19.0	13.8	8.4	2.3	1.2

Table 15.29: Modelled Maximum NO_2 Concentrations at Receptor Grids, Component 1, Scenario 2 – Future 'Project' Scenario (µg/m^3)

Pollutant	Averaging Period	Standard	PC
NO_2	30 Min Max	85	69.7
	1 Hour Maximum	200(a)	53.7
	1 Hour 99.79 Percentile	200(b)	47.7
	24 Hour Max	60	30.9
	1 Month Mean	50	14.1
	Annual Mean	40	8.4

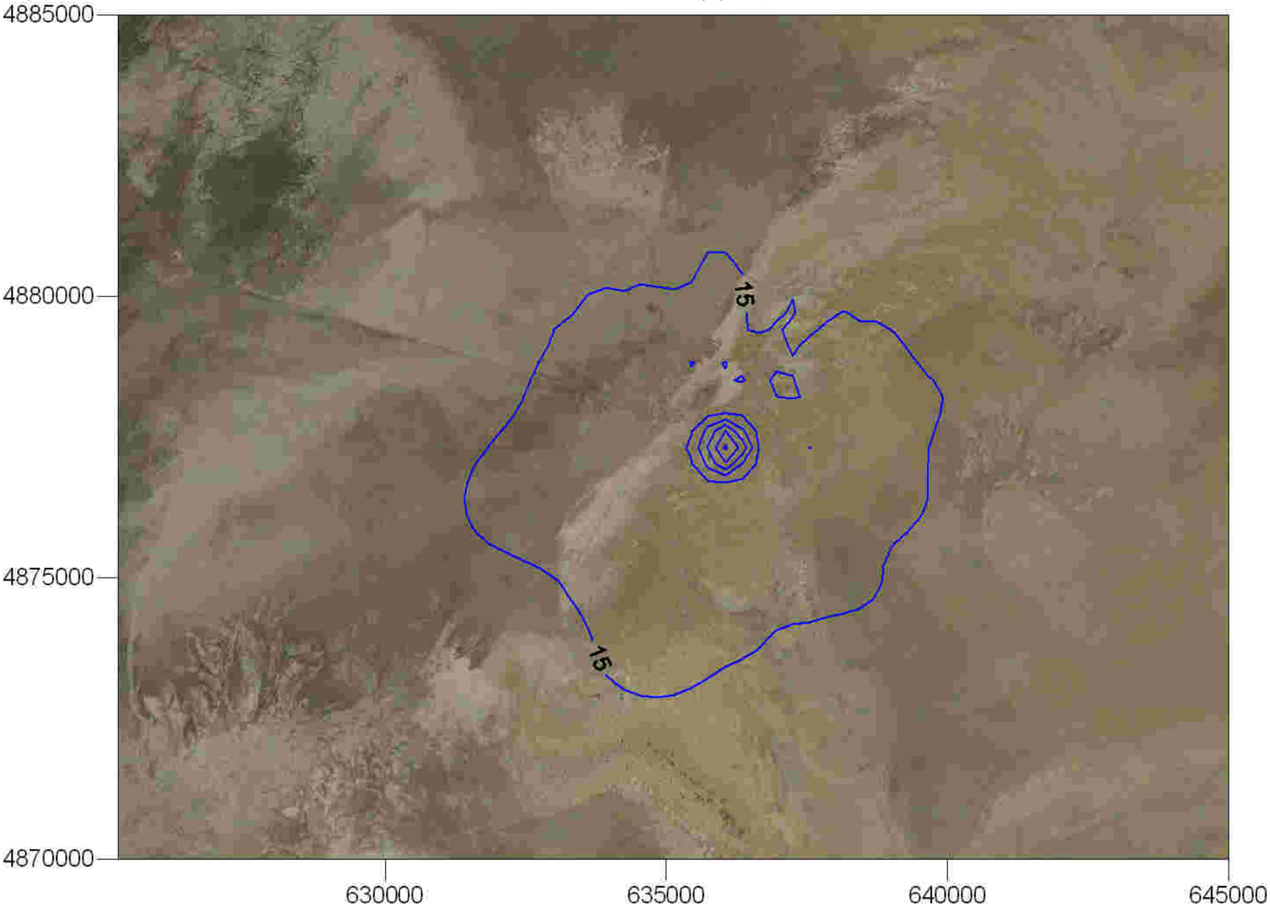
Note: PC = Process Contribution
(a) IFC standard adopted from WHO guidelines
(b) EU standard

Table 15.30: Modelled Maximum NO_2 concentrations within the Gas Well Drilling Site Boundary

Pollutant	Averaging Period	Standard	PC
NO2	30 Min Max	85	83.1
	1 Hour Maximum	200(a)	64.0
	1 Hour 99.79 Percentile	200(b)	52.6
	24 Hour Max	60	38.7

Note: PC = Process Contribution
(a) IFC standard adopted from WHO guidelines
(b) EU standard

Figure 15.3: Maximum Modelled 30 Minute NO_2 Concentrations ($\mu g/m^3$)



Source: Basemap used Licence

Notes: 2007 meteorological year (worst case)

Line represent $10\mu g/m^3$ increments

15.8.2.3 Summary

At the Surgil CGTU all modelled concentrations are below national and international standards. The worst affected discrete receptor at the workers' accommodation will experience a 30 minute maximum NO_2 concentration of 26.9 µg/m^3 which is 31.6% of the national standard. Additional modelling undertaken to determine maximum pollutant concentrations within the site boundary of the drilling rigs has shown that relevant national standards for concentrations of NO_2 will be met.

15.8.2.4 Component 2 – Downstream: UGCC

Scenario 1 – Existing 'Baseline' Scenario

Table 15.31 and Table 15.32 present the maximum pollutant concentrations predicted at the modelled discrete receptor locations and the modelled grids during the existing baseline and Project scenario within the UGCC study area.

Table 15.31: Modelled NO_2 Concentrations at Discrete Receptors, Component 2, Scenario 1 – Existing 'Baseline' Scenario (µg/m^3)

Receptor	NO_2 concentrations					
	30 Minute Max	1 Hour Max	1 Hr 99.79 Percentile	24 Hr Max	1 Month Mean	Annual Mean
Akchalak_1	23.6	18.1	14.4	7.8	1.7	0.9
Akchalak_2	22.3	17.2	12.7	5.0	1.9	0.9
Akchalak_3	16.5	12.7	10.7	4.0	1.6	0.7
Akchalak_4	17.6	13.6	11.0	5.8	1.4	0.7
Akchalak_5	20.3	15.6	12.2	6.5	1.7	0.8
UGCC accommodation 1	25.7	19.8	15.7	7.3	2.8	0.9
UGCC accommodation 2	17.7	13.6	11.4	5.0	1.8	0.6
UGCC accommodation 3	22.3	17.2	13.3	5.84	2.0	0.8
UGCC accommodation 4	29.5	22.7	18.5	9.3	2.0	1.1
UGCC accommodation 5	18.4	14.1	11.1	5.9	1.4	0.7

Table 15.32: Modelled Maximum NO_2 Concentrations at Receptor Grids, Component 2, Scenario 1 – Existing 'Baseline' Scenario (µg/m^3)

Pollutant	Averaging Period	Standard	PC
NO_2	30 Min Max	85	212.8
	1 Hour Maximum	200[(a)]	163.7
	1 Hour 99.79 Percentile	200[(b)]	124.7
	24 Hour Max	60	99.4
	1 Month Mean	50	19.3
	Annual Mean	40	8.1

Note: PC = Process Contribution

(a) IFC standard adopted from WHO guidelines; (b) EU standard

Scenario 2 – Future 'Project' Scenario

Table 15.34 and Table 15.34 present the maximum pollutant concentrations predicted for the modelled grid and at the modelled discrete receptor locations during the future operating scenario at the UGCC. Figure 15.4 presents the maximum modelled 30 minute NO_2 concentrations for the operational scenario.

Table 15.33: Modelled NO_2 Concentrations at Discrete Receptors, UGCC, Scenario 2 – Future 'Project' Scenario (µg/m^3)

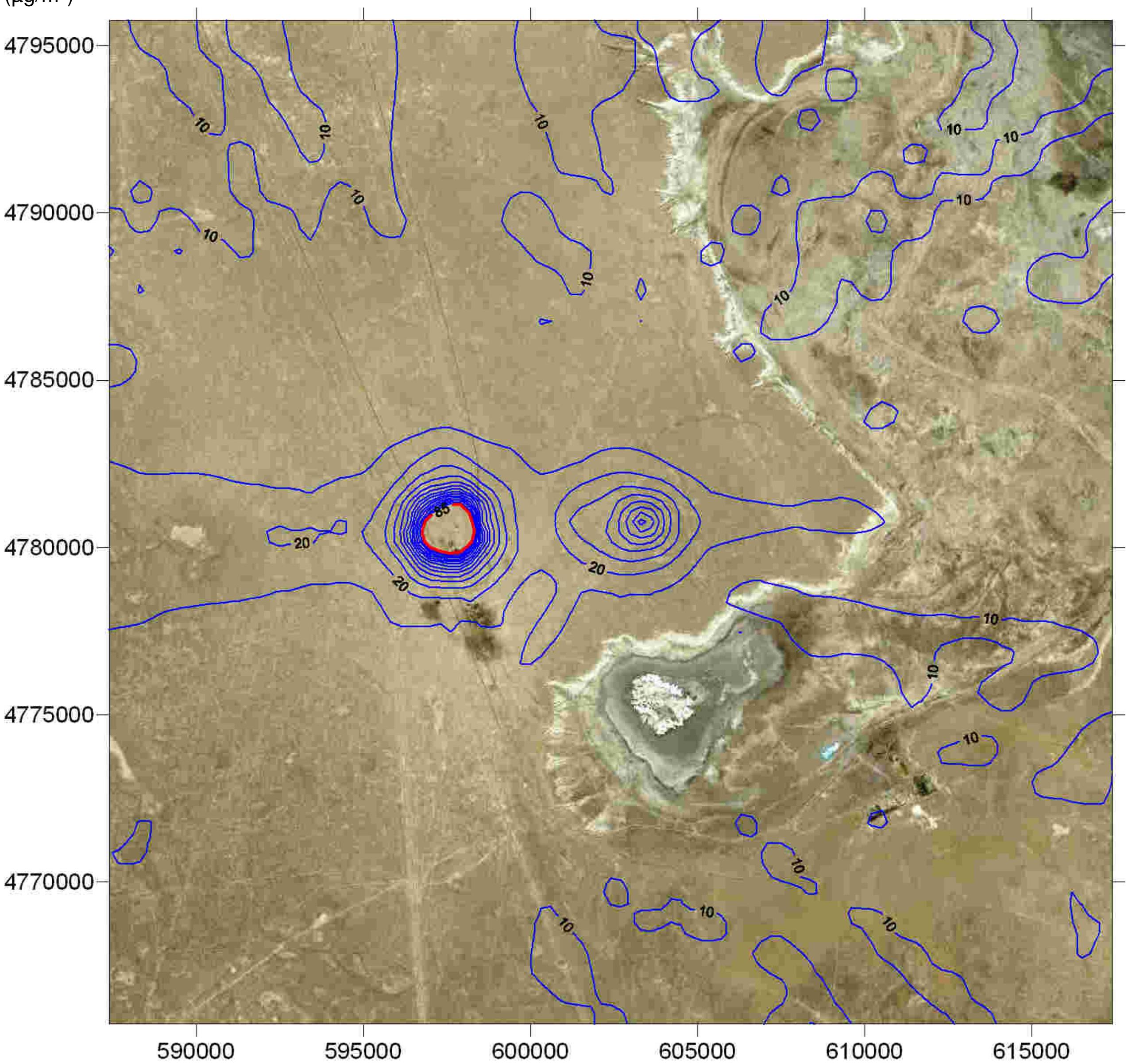
Receptor	NO_2 concentrations					
	30 Minute Max	1 Hour Max	1 Hour 99.79 Percentile	24 Hour Max	1 Month Mean	Annual Mean
Akchalak_1	23.6	18.2	14.4	7.9	2.0	1.3
Akchalak_2	22.4	17.2	12.7	5.0	2.1	1.4
Akchalak_3	17.2	13.2	10.7	4.1	1.7	1.2
Akchalak_4	18.5	14.2	11.0	5.8	1.7	1.2
Akchalak_5	20.3	15.6	12.2	6.5	1.8	1.2
UGCC accommodation 1	25.7	19.8	15.7	7.4	2.8	1.3
UGCC accommodation 2	20.7	15.9	11.4	5.0	1.9	1.2
UGCC accommodation 3	22.3	17.2	13.3	5.85	2.0	1.3
UGCC accommodation 4	29.5	22.7	18.5	9.3	2.3	1.5
UGCC accommodation 5	18.4	14.2	11.1	5.9	1.8	1.2

Table 15.34: Modelled Maximum NO_2 Concentrations at Receptor Grids, UGCC, Scenario 2 – Future 'Project' Scenario (µg/m^3)

Pollutant	Averaging Period	Standard	PC
NO_2	30 Min Max	85	212.9
	1 Hour Maximum	200$^{(a)}$	163.7
	1 Hour 99.79 Percentile	200$^{(b)}$	124.7
	24 Hour Max	60	99.4
	1 Month Mean	50	19.7
	Annual Mean	40	8.4

Note: PC = Process Contribution
(a) IFC standard adopted from WHO guidelines
(b) EU standard

Figure 15.4: Maximum Modelled 30 Minute NO_2 Concentrations, Component 2, Scenario 2 – Future 'Project' Scenario ($\mu g/m^3$)



Source: Basemap used under Licence

Notes: 2006 meteorological year (worst case)

Contour lines represent 5µg/m^3 increments

15.8.2.5 Summary

Concentrations of NO_2 at all modelled discrete receptors are well below national and international standards for both the existing and future operational scenarios. The worst affected discrete receptor is the 'Akchalak UGCC accommodation 2' which is predicted to experience a 3µg/m^3 increase in the 30 minute NO_2 maximum and a 0.6µg/m^3 increase in annual mean NO_2 concentrations.

Maximum concentrations from the modelled grid exceed the national standard for the maximum 30 minute concentration of NO_2 for the baseline and future Project scenarios. Modelling has shown that this exceedence is due to the operation of the Akchalak compressor station which is operating in both scenarios. However the exceedence only occurs at 7 receptor grid points close to the compressor station where there is currently no residential exposure. Figure 15.4 indicates that these exceedences are located adjacent to the ACS and approximately 1.2 kilometres from the existing or proposed residential receptors.

As the area of exceedence is very small and only for the national 30 minute standard the airshed is not considered degraded. Irrespective of this, the Project combustion sources meet the limits specified within IFC guidelines for a degraded airshed where they are available..

15.8.3 Operational Phase Human Health Receptors – Occupational

It is not anticipated that the occupational exposure limits described in Section 15.6.2.2 would be exceeded during the operation of any of the Project components related to the proposed Project. Contractors will ensure that all onsite combustion facilities are constructed with suitable stack heights to ensure efficient dispersion as well as appropriate incorporated mitigation measure being included to avoid fugitive emissions. Results from the dispersion modelling indicate that NO_2 concentrations onsite are likely to be well below the occupational standards and therefore have not been considered further within this assessment.

Mitigation measures discussed within this chapter include those specified to reduce the risk of occupational exposure particularly to fugitive emissions of VOCs which are relevant to improving occupational health and safety for the onsite workers.

During the operational phase dust generating activities are expected to be minimal. As such no additional mitigation is required for workers at the UGCC or onsite at the CGTU. However for workers who will be within 500 metres of unsurfaced roads or working in close proximity to the drill sites appropriate mitigations in line with IFC guidelines have been presented.

15.9 Significance of Impacts

15.9.1 Overview

This section discusses the changes in modelled concentrations at sensitive receptors between the existing baseline and future Project operating scenarios as the Surgil CGTU and the UGCC in accordance with the significance criteria described in Section 15.6.2. Full model results and significance descriptors are provided in Appendix N, Volume III.

15.9.2 Upstream Component - Surgil Field and CGTU

The assessment of construction effects on project workers in relation to dust has been identified as 'moderate'.

Predicted results indicate that at all discrete receptors during the operational phase the significance of impacts for any averaging period is 'insignificant'. In addition, dispersion modelling has shown that concentrations of NO_2 within the drilling sites are also below national and international ambient air quality standards.

15.9.3 Downstream Component - UGCC

Predicted modelled results indicate that at all discrete receptors the significance of impacts for any averaging period is 'insignificant'.

In addition based on the incorporated mitigation included within the design (described below) fugitive emissions of VOCs from the UGCC will be suitable controlled and therefore not significant. The design of the UGCC will include the latest mitigation and monitoring techniques to reduce fugitive emissions and will have the appropriate safety procedures in place should there be an exceptional circumstance resulting in an emergency situation.

15.10 Mitigation

The following mitigation measures (which are in accordance with the EHS Guidelines) for controlling air quality impacts will be incorporated into the construction phase:

- Minimizing dust from material handling sources, such as conveyors and bins, by using covers and/or control equipment (water suppression);
- Minimizing dust from open sources, including storage piles, by using control measures such as installing enclosures and covers, and increasing the moisture content;
- Dust suppression techniques should be implemented, such as applying water or non-toxic chemicals to minimize dust from vehicle movements;
- Manage emissions from mobile sources as per the EHS Guidelines for Air Emissions and Ambient Air Quality; and
- No open burning of solid waste.
- Development of a dust management plan for the construction and operational phases
- Development of an Occupational Health and Safety (OHS) plan which will include appropriate PPE for the protection of workers against contaminated dust. The OHS and dust management plan shall be consistent and complementary.

No additional mitigation measures for pollutants considered within the dispersion modelling other than measured already incorporated in the design are proposed as impacts are concluded to be 'insignificant' (mitigation measures included within the design to minimise fugitive releases of VOCs are detailed below).

The following key design features have been accounted for and are considered to be incorporated mitigation (In addition it should be noted that no emission concentrations will be higher than those assumed within the dispersion modelling):

- Appropriate stack heights for the gas turbines and the cracking furnaces to conform with Good International Industrial Practice; and
- Gas turbines to be installed to have state of the art low NO_x technology which will include dry-low NO_x burners.

As described previously a thermal oxidiser will be installed within the UGCC site. In accordance with BAT requirements, pollutant emissions from the thermal oxidiser will meet the limits established within the EU's Industrial Emissions Directive 2010. It is considered that, combined with an appropriate stack height, emissions from the thermal oxidiser will not result in significant air quality impacts. In addition, it is not anticipated that the thermal oxidiser will give rise to emissions of hydrogen chloride, hydrogen fluoride, dioxins and furans and heavy metals.

The UGCC and CGTU will meet industry best practice to avoid the release of fugitive emissions, these best practice prevention methods are inline with those specified within both the General and sector specific EHS Guidelines. The proposed sites will include the following prevention methods

- Regularly monitor fugitive emissions from pipes, valves, seals, tanks and other infrastructure components with vapour detection equipment and maintenance or replacement of components as needed in a prioritized manner (additional details of the onsite gas rescue team are detailed below);
- Maintain stable tank pressure by:
  - Coordinating filling and withdrawal schedules, and implementing vapour balancing between tanks; and
  - Use white or other colour paints with low heat absorption properties on exteriors of storage tanks for lighter distillates such as gasoline, ethanol methanol to reduce heat absorption;
- Selecting and designing tanks in accordance with internationally accepted standards to minimize storage and working losses considering, for example, storage capacity and the vapour pressure of materials being stored;
- Use supply and return systems, vapour recovery hoses, and vapour tight trucks/railcars/ during loading and unloading of transport vehicles;
- Use bottom loading truck/rail car filling systems; and
- Where vapour emissions contribute or result in ambient air quality levels in excess of health based standards, install secondary emissions controls, such as vapour condensing and recovery units, catalytic oxidisers, vapour combustion units, or gas adsorption media.

In addition to the mitigation measures above the UGCC will also have a specific gas rescue team whose task will include undertaking measures on prevention of fugitive gas leaks and potential emergencies. This will be achieved through the following:

- participate in the development and inspection of emergency response plans;
- holding the safety induction on gas security for newly hired employees and workers of contractor organisations;
- carry out lectures and discussion on gas security issues with the population of the nearest inhabited localities;
- perform air monitoring (for harmful and explosive substances) in the Project area;

- take part jointly with other services in the elaboration of measures for decreasing the concentration of harmful substances in plants, buildings and other premises to MPC (maximum permissible concentration) and MPEC (maximum permissible explosive concentration) as well as the control over their performance;
- coordinate and approve documents for the conduction of dangerous gas operations;
- control over the safe performance of dangerous gas operations;
- record and analyse the dangerous gas works performed and issue recommendations on their reduction;
- conduct inspections of the implementation of resolutions, orders and directive instructions of regulating authorities on gas security matters;
- conduct training of staff;
- conduct training of voluntary gas rescue patrols (VGP) for gas security measures and emergency response methods and practices in gassed air conditions;
- conduct training of industrial personnel for gas security rules, using protective equipment and rescue;
- control over the availability, correct selection and operating condition of gas-protective means of servicing companies, provide them to the workers and engineering-technical team, workers of gas-dangerous plants, installations and areas;
- develop instructions and lecture materials on gas security;
- commission investigation of accidents and poisoning as well as incidents caused due to gas explosion;
- carry out air monitoring to define the concentration of substances dangerous for the human health and gas explosive substances during gas-dangerous operations;
- inspect the work conditions of equipment, safety devices and the main parameters of technological processes related to gas dangerous operations;
- examine service personnel knowledge;
- systematically inform the management on the gas security conditions, defects defined and measures for their elimination; and
- store and keep a record of emergency backup equipment, applications and tools, materials, personal protective and communication equipment required for conducting of emergency response operations.

During the construction phase and where workers are potentially exposed to elevated dust levels (which could be contaminated) such as near to drill sites and unsurfaced roads the following mitigations will be implemented:

- Development of a site specific Human Health Detailed Quantitative Risk Assessment (DQRA) to fully determine potential risks at each receptor location. This will determine site specific risk factors associated with potentially contaminated soils and determine the type and level of PPE required for each activity and to specify the level of ventilation within workers accommodation.
- As a minimum, PPE such as dust masks should be used.

15.11 Summary of Residual Impacts

Table 15.35 presents a summary of the residual impacts from the proposed Project.

Table 15.35: Residual Impacts for each component of the Project

Activity	Potential Impacts	Sensitivity	Magnitude	Impact Significance	Mitigation	Residual Impacts
Construction Phase – CGTU, UGCC and Pipeline	Dust from construction activities	Low to Medium	High	Minor to Moderate	Mitigation measure in line with IFC guidelines, dust management plan, Human Health Detailed Quantitative Risk Assessment and Occupational Health and Safety plan	Insignificant to Minor Adverse
Operational Phase – CGTU	Emissions from combustion technologies, Dust from well drilling	Negligible	Negligible to Major	Insignificant	All combustion activities to have suitable stack and no receptors located with SPZ. Dust mitigation in line with IFC guidelines and dust management plan	Insignificant
Operational Phase - UGCC	Emissions from combustion activities, Fugitive emissions of VOC	Negligible	Negligible	Negligible	All combustion activities to have suitable stack and no receptors located with SPZ. Appropriate mitigations and monitoring of fugitive emissions on site	Insignificant

15.11.1 Proposed Monitoring

As part of the ESMP, ambient air quality monitoring shall be carried out for NO2 and VOCs. Other pollutants such as PM_{10} and $PM_{2.5}$ have not been included within the monitoring plan as emissions from the project will be negligible.

Monitoring for both NO_2 and VOCs will be undertaken before the commissioning of the plant so that the baseline concentrations determined from the dispersion modelling can be verified. Monitoring will continue once the Project is operational to ensure that there are no significant effects at the existing residential settlements and the proposed workers' accommodation.

Further details of the monitoring plan are presented within the ESMP within Volume IV of the ESIA.

15.12 Statement of Significance

During the construction phase the significance of air quality impacts is concluded to be 'moderate adverse'. Best practice mitigation measures have been defined to reduce these down to 'minor adverse' significance.

During operation, air quality impacts are concluded to be 'negligible'. This is based on a number of incorporated mitigation measures for point sources which have been included within the dispersion modelling, and best practice methods for the control of fugitive emissions which will be employed.

16. Greenhouse Gas Emissions

16.1 Introduction

16.1.1 Overview

This section provides an overview of emissions of greenhouse gases (GHGs) from the Project. The assessment takes account of the emissions associated with the existing and proposed operations.

16.1.2 Key Pollutants and Sources

GHGs allow incoming radiation to pass through the atmosphere but prevent much of the outgoing radiation from escaping to outer space. Over time, increased concentrations of these gases in the atmosphere are widely accepted to lead to the accelerated warming of climates around the world. This is often referred to as 'global warming' with the associated impact referred to as 'climate change'.

The greenhouse effect is a natural phenomena making the Earth inhabitable; the issue of global warming, and therefore climate change, refers to an 'enhanced greenhouse effect' due to human activity. Numerous compounds are known to contribute to global warming. Climate change is most closely associated with carbon dioxide (CO_2) due to the wide range of sources and overall contribution to the total volume of GHGs in the atmosphere. CO_2 is a gaseous product released during combustion of carbon/hydrocarbon based fuels with the amount released dependent on the carbon content of the source fuel. CO_2 is not a toxic gas but it is widely accepted as being the most significant contributor to the 'global warming' effect due to the quantity of gases released on a global scale.

In oil and gas operations, the other key GHG is methane (CH_4), which on a molecule-by-molecule basis is in the order of 25 times more potent a GHG than CO_2[79]. Natural gas contains a high proportion of methane and therefore the direct emissions of methane are considerably worse than when methane is combusted (with the carbon forming CO_2).

Other gases such as nitrous oxide (N_2O), hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride (SF_6) are recognised in the Kyoto Protocol as the key gases associated with climate change. Due to their relative physical properties, these gases are significantly more powerful GHGs, this is to say that one molecule of methane has a greater global warming potential than one molecule of CO_2. Such gases, while important, occur in much smaller quantities than CO_2.

Total GHGs are therefore often referred to in units of CO_2 equivalents (CO_2e) meaning the relative warming potentials of the gas are normalised to the equivalent mass of CO_2 required to achieve the same warming effect.

The main GHGs associated with gas operations are CO_2 and methane, and are the focus of this assessment. It is not anticipated that any significant sources of the other main GHGs outlined above will arise during the operation of the project (those that may occur, such as SF_6 associated with switchgear insulation would be dealt with in the ESMP).

[79] Based on the IPCC Fourth Assessment Report on a 100 year time horizon: http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-chapter2.pdf

16.1.3 National Perspective

Uzbekistan submitted a national communication to the UNFCCC in 2008 which provided national GHG emission estimates for the country in accordance with the IPCC methodologies. A summary of the national emissions of GHGs are presented in Table 16.1.

Table 16.1: Overview of Uzbekistan National Emissions, 1990 – 2005 (million tonnes CO_2e)

Sector	1990	1994	2000	2005
Energy	153.7	159.3	175.5	172.3
Industrial Processes	8.1	5.9	5.0	6.4
Agriculture	17.1	17.5	16.1	16.4
Waste	4.1	4.3	4.5	4.7
Land Use Change/Forestry	-1.6	-1.4	-1.0	+0.4
Total	181.1	185.6	200.1	200.2

Source: Second National Communication of the Republic of Uzbekistan under the United Nations Framework Convention on Climate Change

The national data shows that the majority of GHG emissions are associated with energy and the use of energy accounting for approximately 85% of total emissions since 1990. Industrial processes (including chemical processes) accounted for less than 5% of the total (note however that energy use from industrial processes can be included in the Energy category).

Table 16.2 presents the emissions for specific sectors in Uzbekistan, relevant to this project – fugitive emissions of oil and gas and the chemical industry. It is not clear from the inventory how emissions from a project such as this one would be allocated to different sectors, as the upstream activities such as those considered in this assessment are likely to be allocated to 1.A2 and 1.B2, while the downstream element could be attributed to all of the sectors presented below, depending on the allocation methodology. The detailed Inventory Report for 2000 suggests that there was no production of polyethylene in Uzbekistan until 2003 and therefore no emissions prior to this are included below. The extent to which they are contained in 2005 is not clear (as the National Communication does not provide as much detail).

Table 16.2: Specific Sector Emissions, 1990 – 2005 (thousand tonnes of pollutant)

Sector	Pollutant	1990	1994	2000	2005
1. A1 Energy Use, Energy Industries	CO_2	55,205	45,020	44,357	36,750
1. A2 Energy Use, Industrial Sector	CO_2	10,168	6,058	4,982	5,341
1. B2 Fugitive Emissions of Oil and Gas	Methane	2,175	2,944	3,334	3,626
2. B Chemical Industry	CO_2	2,282	1,297	1,298	1,403

Source: Second National Communication of the Republic of Uzbekistan under the United Nations Framework Convention on Climate Change

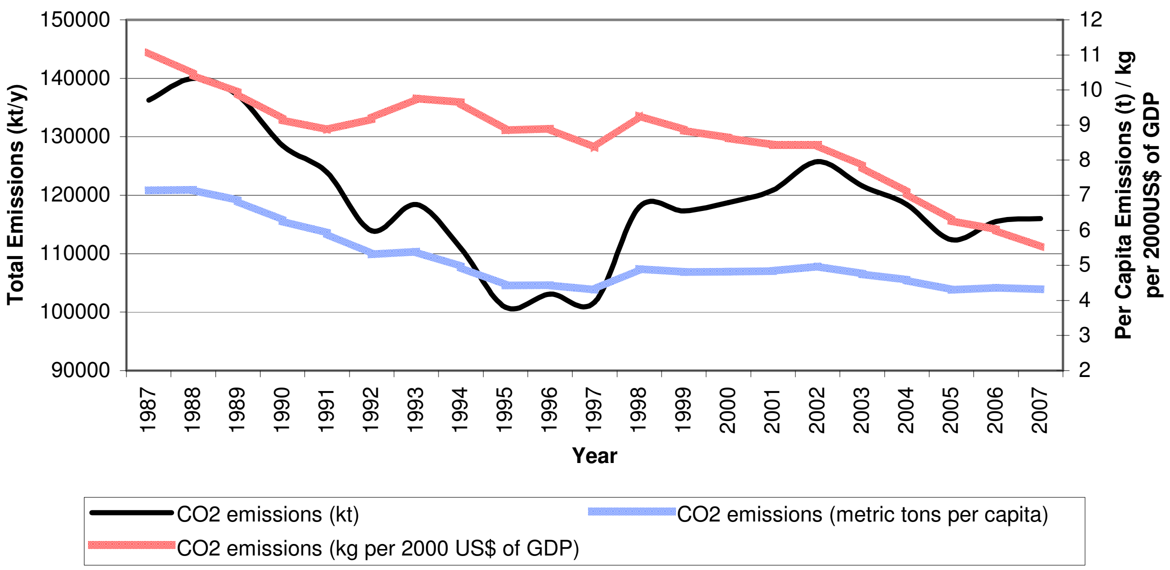
The data shows that there has been an increase in fugitive emissions category (which includes flaring from all types of energy use but also transport along pipelines). The figures indicate a marked increase in these emissions since 1990 and this is attributed in the National Communication to increased losses on pipelines since the length of pipelines in the country has increased along with productions.

The contribution of emissions from the chemical industry shows a decline since 1990. According to the National Communication, this was due to a decline in the size of the industry in the 1990s, but which has since started to recover.

In the National Communication, reduction of flaring of gases is strongly recommended in order to reduce emissions and harness useful energy or other products. The Communication notes that this kind of project has been undertaken in Uzbekistan, including for some Clean Development Mechanism projects. The installation of combined cycle power in the chemical industry is also cited as a measure that can be used to reduce emissions.

The World Bank also collects data on emissions for all countries through its dataBank service. This provides a number of measures of emissions for Uzbekistan, including some historical records up to 1960. This data is presented in Figure 16.1. This data indicates that from a total emissions peak in 1988, total annual emissions have declined then remained broadly stable since around 1998. Per capita emissions have followed a similar pattern over this time period. Emission per unit of GDP however have fallen – there has been both population growth and growth in GDP per capita over the same period, but the decrease is likely to be attributable to population increase (the figures presented are not levelised for any population growth)

Figure 16.1: Trends in Emissions for Uzbekistan, 1987 - 2007



Source: World Bank World Development Indicators 2009

Finally, CO_2 Scorecard[80] provide an ongoing review of all available published data sources on climate change and carbon emissions performance which ranks countries in a systematic way against a number of different metrics or benchmarks. This data is summarised in Table 16.3. The data shows that per capita emissions and emissions per unit of GDP are among the higher values compared to other countries of the world although this is likely due to the industrial nature of the country.

[80] http://www.co2scorecard.org/countrydata/Index/4316

Table 16.3: International Comparison of Uzbekistan GHG Emissions.

Metric	Value	World Position
CO_2 per capita (metric tons)	4.59	3rd Quartile
CO_2 per unit GDP (kg per 2005 PPP $ of GDP)	1.83	Top 10
CO_2 per unit energy consumed (kg per mill BTU)	55.07	2nd Quartile
Primary Energy Consumption per Capita (Million Btu per Person)	82.02	3rd Quartile
Primary Energy Consumption per unit GDP (Btu per 2005 PPP $)	35,251.35	Top 10

Source: US Energy Information Administration 2007,2008 (http://www.eia.doe.gov/emeu/international/) via CO_2 Scorecard
Note these figures vary from those presented in Table 16.1 which is due to different calculation methodologies and scope employed, however they are broadly consistent.

16.2 Methodology

16.2.1 Legislative Background

The United Nations Framework Convention on Climate Change (also known as the Kyoto Protocol) was first adopted for use on the 11th December 1997 and was set up to tackle global warming by introducing targets for countries to reduce emissions of GHGs including CO_2 to a stable or lower level. The key aim of the Kyoto Protocol was to ensure a collective reduction in emissions by 5.2% compared to 1990 levels for all industrialised countries.

Uzbekistan joined the UNFCCC in 1993 was an early signatory of the protocol, ratifying it in national law in 1999. The Ministry of Hydrometeorology is responsible for the legal implementation of the Protocol in Uzbekistan, including reporting requirements. The Ministry of Economy is responsible for applications of the Clean Development Protocol in the country.

The General EHS Guidelines and the IFC Performance Standard 3 require the consideration of 'significant' GHG emissions from projects, where significant is defined as '>100,000 tonnes CO_2e per year', including all facilities and supporting facilities.

The EGS Guidelines for Onshore Oil and Gas reiterate the position on flaring and venting which require measures presented in the Global Gas Flaring and Venting Reduction Voluntary Standard (published by the World Bank) to be referred to. This World Bank standard strives to avoid venting completely, and avoid continuous flaring where practicable by finding uses for products, improving well management and/or making the flare as efficient as possible. This is part of a suite of guidance aimed at resolving the issue and creating the necessary regulatory structure to reduce these sources of emissions.

Furthermore, within the EHS Guidelines for Thermal Power (2008), the importance of energy efficiency and reducing GHG emissions for new thermal power plant is promoted. Recommendations from the Guidelines that are applicable to the development to help avoid, minimise, and offset CO_2e emissions from new thermal power plants include:

- Use of less carbon intensive fossil fuels (i.e. carbon containing fuel per unit of calorific value gas is less than oil and oil is less than coal) or co-firing with carbon neutral fuels (i.e. biomass);
- Use of higher energy conversion efficiency technology of the same fuel type/power plant size than that of the country/region average. New facilities should be aimed to be in top quartile of the country/region average of the same fuel type and power plant size; and
- Use of high performance monitoring and process control techniques, good design and maintenance of the combustion system so that initially designed efficiency performance can be maintained.

Power generation (and through extension steam generation) is a key component of both the upstream and downstream elements of the project and contributes significantly to project emissions. Therefore the EHS Guidelines for Thermal Power are pertinent to the Project.

16.2.2 Desk Study

16.2.2.1 Overview

The assessment aims to identify the potential changes in the emissions with the Project in operation compared to the existing operations.

The key steps in the methodology are as follows:

- Defining the boundary of the carbon assessment and the extent of the activities to which the development is responsible for;
- Identifying the key processes and sources of emissions of the baseline and the Project;
- Quantifying the key emissions;
- Assessing the performance of the Project in the context of national and international guidelines and best practice e.g. the World Bank Group Guidelines; and
- Qualitative discussion of the project where calculations are not appropriate.

The assessment is split into:

- A quantification of the relevant emissions from the key sources that the Project is responsible for, in line with the requirements of the World Bank Group Guidelines; and
- An impact assessment, which compares post-Project impacts to the baseline case where applicable.

The upstream component of the Project involves a change in existing operations and therefore a change to Project emissions in comparison to the baseline. In this case, undertaking an impact assessment is applicable in order to determine the nature of the changes as a result of the Project. As the Project is expanding production from the Surgil Field and concerns the development of a new petrochemical facility, it is inevitable that emissions will increase.

The General EHS Guidelines state that emissions should be quantified if they are expected to be more than 100,000 tonnes per annum. This is repeated in the EHS Guidelines for Onshore Oil and Gas Development and the EHS Guidelines for Petroleum-based Polymers Manufacturing. The EHS Guidelines for Thermal Power and Performance Standard 3 also suggest that metrics can be used to establish relative performance of the Project; for example, gCO_2/kWh for a power project, or tCO_2/t for a cement kiln.

Therefore, the impacts of this Project are also assessed using a metric of emissions intensity of the operations (amount of emissions per amount of product). In this case of the upstream component, emissions per unit of gas processed are used to provide a benchmark of change in process efficiency in order to provide additional consideration of the project's impacts. For the downstream element, it is more complicated to assign a metric as the plant produces multiple products to which the emissions can be associated and therefore this has not been undertaken, although the total emissions have been compared against national emissions.

Emissions associated with certain aspects of the Project - such as the UGCC and the pipelines - are additional in the sense that they will increase the amount of CO_2 emissions not present in the baseline. Therefore, the quantification of these emissions will show an overall increase in emissions as the development satisfies increased demand for the products it will produce. For such 'additional emissions' these are quantified and presented as an impact of the Project along with commentary on the context of these emissions.

The methodology and assumptions used within the assessment are presented within this section. Where possible data associated with the proposed Project have been obtained from the relevant Project documents and the gas turbine manufacture specifications. Data relating to national grid emission factors and other combustion methods have been obtained from published sources.

Section 16.2.2.2 indicates which parts of the Project are included in the quantification and the impact assessment.

16.2.2.2 Assessment Boundaries

Overview

Assessment is focussed on the operation phase of the Project. Construction leads to the indirect emissions of GHGs through the use of materials and the construction process itself (including drilling) with supporting transport. However, although these emissions are a consideration, when annualised over the life of the project (estimated at 25 years) they are small compared to those from combustion sources which emit on a continuous basis through the life of the Project. In addition, there are a number of uncertainties associated with quantifying emissions associated with the construction phase, such as the specifications and suppliers of equipment, uncertainties in the emissions factors and the types of materials used. Given the lack of detailed construction related data at the time of assessment these emissions have been considered at a high level in this assessment based on the cost of construction using a proxy emission factor provided in the IFC CEET with an uncertainty factor added.

The assessment aims to quantify all the significant sources in emissions from the three Project components. It is not concerned with the emissions associated with end-user use of any of the products or avoided emissions associated with the production of by-products. It is noted that there is the possibility that the Project would make a positive contribution to GHG emissions compared to processes that specifically created these products either by offsetting future demand (and delaying future increases in manufacturing capacity specifically for those products) or by providing more efficient production in comparison to existing (older) facilities.

The sources of emissions that the Project will contribute to are presented in this section.

Upstream Emission Sources

The current activities at the Surgil Field mean that at present a large amount of gas is flared. Flaring at the gas field will be considerably reduced as a direct result of the Project which will provide the infrastructure to avoid flaring through not having to stabilise the condensate at the CGTU and through utilising the waste gas from degassing of produced water within power generation facilities at the CGTU. In the absence of the Project, the flaring would likely continue at the site and this presents an opportunity cost for the potentially useful gas. With the project developed the emissions from these activities will not exist as on-site power generation facilities will be developed and the condensate will be degassed instead at the UGCC.

At present, condensate from the field is collected and transported by tanker. These movements will be avoided in the project case as unstabilised condensate will be transported by pipeline to the UGCC.

Existing operations also require a heat and power demand and this is currently provided by an on-site boiler and electrical grid connection (via a 10kV line to Muynak). In the Project case the grid connection will be replaced by gas-engines which will use waste gas currently being flared from the site.

Some emissions from the wells are also expected to occur through flares present at the top of the wells. These could also occur at the GGSs. It is assumed that rate would remain proportional to the amount of gas processed in both scenarios.

Table 16.4 summarises the scope of the upstream component of the assessment.

Table 16.4: Summary of Upstream Sources of Emissions Included in the Assessment

Source	Baseline	Project	Included in Assessment
Flare (including wellheads)	Flaring of gas extracted from the fields at the well heads. Flaring of gases from the CGTU for operational purposes.	Expected to be rare and abnormal operations only for the CGTU. Flaring at the wells and GGSs assumed to be proportional to the amount of gas produced	Yes
Wells and Equipment, Construction	-	Emissions incurred through the use of equipment in the field and the drilling associated with the development at the field. This also includes construction of supporting infrastructure and camp. An assessment of the construction emissions has been undertaken based on the anticipated costs of construction (Section 16.2.2.3).	Indicative construction phase assessment
CGTU Flares	Flaring of gases at the CGTU is currently undertaken.	Expected to be rare and abnormal operations only.	Yes
Condensate	Condensate currently transported off site using road tankers.	Condensate will be transported to the UGCC by pipeline to be stabilised.	Yes
CGTU and site power demand - gas engines - boilers - auxiliary power - transport of condensate	The CGTU and field have a power demand that is currently met by the use of grid electricity. Some on site boilers for heat / steam generation.	Development of gas engine power island to provide power and heat to the CGTU and field by utilising previously flared gas.	Yes

Downstream Emission Sources

The downstream elements will lead to the emission of GHGs from the combustion of fuels to provide heat and power to the processes. In addition, the Project will also give rise to so called ‘process’ emissions such as CO_2 removed from the gas in the acid gas scrubber before the gas is used in the production process.

The downstream component requires supporting infrastructure including installation of a new 12km 110 kV transmission line, a 7km railway spur and a new settlement for onsite workers. These will lead to indirect emissions in the construction phase due to the use of the materials and fuel. However, as noted above, there is some uncertainty inherent in estimating emissions from complex items both in terms of emission factors and the types and specifications of the equipment used.

Table 16.5: Summary of Downstream Sources of Emissions Included in the Assessment

Source	Description	Quantified
UGCC Railway Settlement Raw Water Supply line Transmission line	Construction of these components will lead to indirect emissions due to the use of materials. An assessment of the construction emissions has been undertaken based on the anticipated costs of construction (see Section 16.2.2.3).	Indicative construction phase assessment
UGCC Acid Gas Removal	The process requires the removal of contaminants (including CO_2) from the gas input. These emissions have been quantified	Yes
UGCC Power - CCGTs - boilers - furnaces - utilities and offsite	Power will be provided by onsite power island. Combustion of fuels from the UGCC will lead to direct emissions. A small amount of flaring is also expected as part of the operations. These emissions have been quantified.	Yes
UGCC flare and fugitive (venting) emissions	Gas will be purged through controlled flare system. Jacketing of key equipment will ensure that most fugitive emissions are collected and sent to the flare. Online monitoring across the site will be used to detect any fugitive emissions and reduce them as necessary. No other sources of fugitive emissions are expected from the site.	Yes
Water treatment	Water will be treated through an onsite facility and will be powered by the power island. Therefore these emissions are accounted for above.	Yes
Waste treatment	Waste hydrocarbons from the plant will be processed in an on-site thermal oxidiser. At the time of the assessment, the quantities and types of hydrocarbons to be processed are not known. Therefore these emissions are excluded from the assessment. However, they are likely to only represent a small fraction of the total emissions associated with the UGCC.	No
Transport of products	Transport of products to market will be done via railway.	Yes

Pipelines

Emissions from the pipeline are primarily incurred in the construction phase and the operational phase - these are the emissions associated with the manufacturing of the pipeline and supporting infrastructure (embodied carbon in the construction) and some energy consumption associated with the provision of electrochemical protection and monitoring during the operational phase.

Note that, in the initial period of field development, there is no pumping required for delivery of the gas to the UGCC from the CGTU. However, from year 15 onwards there may be a need for a gas booster station to be installed at the Surgil Field. Exact details of the gas booster station are unknown but are likely to include seven 6MW compressors.

Fugitive emissions can also arise from the operational phase of the pipeline. These have not been considered in the assessment as they are anticipated to be negligible for a modern pipeline.

Table 16.6: Summary of Pipeline Sources of Emissions Included in the Assessment

Source	Description	Quantified
Pipelines		
New Natural Gas Pipeline Transmission line	Construction of these components will lead to indirect emissions due to the use of materials. An indicative assessment of the construction emissions has been undertaken based on the anticipated costs of construction (see Section 16.2.2.3).	Indicative construction phase assessment
New Condensate Pipeline	Construction of these components will lead to indirect emissions due to the use of materials. The condensate is currently transported from the fields by truck and these emissions will be removed and is considered in the Upstream assessment	Indicative construction phase assessment
Electrochemical protection and monitoring	There is an electrical demand for the protection of the pipelines from corrosion by using a small amount of electrical current to protect the surface. This electricity will be provided by the gas-engine generators at the CGTU site and are quantified in the upstream assessment (see Section 16.4.1.3).	Yes (in Upstream assessment)
Fugitive Emissions	It is likely that existing pipelines (particularly older lines) lead to some fugitive emissions, and this is reflected in the national inventory. However it is not possible to quantify this in relation to the Project's use of existing lines (in rare circumstances when gas is exported directly into the Ural – Bukhara pipeline during periods when the UGCC is out of service), and would remain the same in the baseline and project scenarios. Therefore these emissions have been excluded from the assessment. However, under normal project conditions, there would be an overall reduction in fugitive emissions as the older, existing lines would not be in use, and thus the fugitive emissions avoided. Fugitive emissions are expected to be negligible for a modern pipeline. Additional emissions may occur during 'pigging' maintenance where gas in sections of the pipe is evacuated although other measures are taken to avoid any release. These emissions are therefore expected to be small and intermittent and therefore have not been considered in the assessment as they are not associated with normal operating conditions.	No

16.2.2.3 Calculation Methodology

CO_2 emissions as a result of any source can be calculated based on the relevant activity data (such as energy used or power produced), and the emission factor which represents an amount of emissions per unit of activity. For example, for a combustion process using natural gas, emissions are calculated by multiplying the emission factor of the natural gas by the fuel input rate for the combustion unit.

Where possible in the assessment, primary data on the emissions has been used (for example, using the gas specification and mass balance data for the UGCC process) in order to increase the accuracy of the assessment. However, in some cases, the required information was not available and secondary sources have been used such as the IFC Carbon Emissions Estimation Tool. For the present assessment, the reference spreadsheet produced by the IFC CEET, (version 16 Nov 2010) has been use as a supplement and check for the calculations.

In order to assess the potential contribution of construction emissions, an estimate has been made based on the projected capex costs of the project. In the assessment the emission factor provided for equipment has been adapted from the IFC CEET which provides an emission factor per Euro spent. The project capex estimates are presented in US dollars and so were first converted to Euros (at a 2010 rate of US$1000 = €755). The emission factor in the CEET applied for this assessment related to 'manufacturing equipment' (a value of 367kgCO_2 per €1000 spend). It is noted that there will be a range of different equipment types in addition to other costs such as fuel costs, construction costs and spend on materials for civils which would lead to variations in the appropriate emission factor by costs. In recognition of the uncertainty associated with this type of estimation the emissions factor in the CEET was doubled (i.e. 733kgCO_2 per €1000), and then compared to the values for various sectors provided in other datasets[81].

The figure used represents a cautious estimate and could represent an overestimate of the construction emissions of the Project. In addition, there would be additional uncertainties in relation to emission factors appropriate for materials sourced in Uzbekistan. It is considered that the method applied provides an appropriate estimation of the emissions that would be incurred, particularly to put these emissions in the context of emissions incurred in the operational phase of the Project.

Emissions from the construction phase have been annualised to compare with operational phase emissions based on a Project lifetime of 25 years.

Emissions from each source or group of sources (e.g. Upstream, pipelines, UGCC) have been presented as totals and as metrics where appropriate. In analysing the findings of the assessments focusing on the totals only (absolute emissions) in isolation of other contextual information means the results can misrepresent the project as negative. This is due to the fact that growth and/or the introduction of new facilities invariably leads to an increase in emissions. Considering metrics such as emission intensities (for example emissions per unit gas extracted) allows the assessment to also consider the relative emissions of the project and factor growth into considerations of the overall efficiencies that a project might lead to. In a project of this nature the results of any GHG assessment should not be taken in isolation of other Project drivers including socio-economic factors.

16.2.3 Assessment of Impact Significance

It is typical in an EIA to assess the size of impacts and then attach a level of significance to this – such an assessment is not easily completed in relation to GHG emissions and can skew the interpretation of the results.

The global nature of emissions of GHG and the difficulty in linking the emissions of a single plant or project to a specific impact on receptors is difficult and unlike other environmental impacts. It is made more complicated due to the complexities of GHG emissions being closely related to economic growth, and in international agreement such as the Kyoto Protocol, nations with low emissions are afforded more scope to increase their emissions than more developed nations that already have high levels of emissions (indeed, the latter are expected to reduce their emissions).

The relationship of individual project emissions to global atmospheric emissions combined with the uncertainty about global atmospheric response is very complex and as such determining the significance of such individual emissions on a local scale is not possible.

Finally, the relationship of emissions from individual projects to national objectives or even international reduction targets is also difficult to resolve as the national / international policies contain provisions for growth and development as well as action plans for emissions reductions. For this reason there are currently no published guidelines for determining the significance of Project GHG emissions in EIAs

[81] For example, in the United States Bureau of Labour Statistics Input-Output data (one of the most recent and publicly available datasets), the value for Mining, oil and gas field machinery and equipment is given as 0.646 kgCO_2 \$1000, or 0.51 kgCO_2 per €1000, for plastics and rubber industry machinery 0.244 kgCO_2 \$1000, or 0.193 kgCO_2 per €1000, and for construction (infrastructure and other maintenance and repair), 0.815 kgCO_2 \$1000, or 0.64 kgCO_2 per €1000

including those of the major international lenders such as the World Bank, the European Bank for Reconstruction and Development or the ADB.

The Guidance Notes for IFC Performance Standard 3 suggest the following methods of evaluation of project GHG emissions, presented in Table 16.7.

Table 16.7: Suggested IFC Criteria for Assessing GHG Emission Impacts

IFC Criteria	Comments
The project's GHG emissions relative to the host country total national emissions to understand the magnitude of its own emissions.	Discussed in the relevant parts of this assessment.
The project's GHG emissions performance relative to the good international practice performance / host country national average performance.	Where possible, comparison to metrics has been undertaken. However, the UGCC has a complex set of inputs and output products and therefore establishing a suitable comparator for performance is not possible. As the project is still in the technical feasibility phase, it is not possible to assess specific technologies that might be employed on the site as suppliers have not been selected for all part of the plant. In addition there is little information on national or regional performance or total emissions for this type of process. Therefore the impacts have been discussed qualitatively.
The annual trend of the project's GHG emissions performance over time to monitor deterioration from the originally designed performance.	This has been considered as part of the monitoring plan for the project and included within the ESMP.
Opportunities to further improve the project's GHG emissions performance.	This has been considered in the mitigation section of this assessment. Note that benefits could also extend to cost savings or expenditure for different emission reduction strategies.

Note: The Asian Development Bank guidance refers to the IFC guidance presented in this table. The European Bank for Reconstruction and Development guidance suggests a similar set of evaluation criteria.

The IFC guidance does not, however, recommend how to assign significance to any of the impacts associated with a project, with the guidance pointing only to a presentation of the impacts. Therefore in this assessment, the criteria presented in the IFC guidance have been used and an account of the emissions has been presented but no level of significance attached to the projects' emissions. The relevance of these emissions have been discussed in relation to the criteria presented in Table 16.7.

16.2.4 Summary of Data Limitations

A review of the available data on the existing operations and proposed project has been undertaken.

Information on the construction phase of the Project is limited as the development of designs is still at feasibility stage. Therefore the assessment has used the estimated cost data as a proxy for the assessment of potential construction impacts.

Data for the operational phases has been taken from the most up-to-date information available at the time of writing and supplemented with assumptions where necessary. These are outlined in the relevant sections of the assessment.

16.3 Baseline Description

16.3.1 Upstream

16.3.1.1 Overview

At present, flaring of waste gas is undertaken at the Surgil Field which fails to utilise a potentially valuable resource and adds to the burden of emissions of Uzbekistan. However, flaring is better than directly venting gas, as methane is a much more potent GHG. An estimate of the emissions from the current flaring at the CGTU is presented in this section.

It is estimated that approximately 5.6 million m^3 (according to losses report December 2010) of waste gas is currently flared per year from the Surgil Field. The total gas consumption for boilers and consumption/losses for the Surgil Field were estimated at 6 million m^3. This data is summarised in Table 16.8.

Table 16.8: Summary of Baseline Natural Gas Losses and Consumption, 2010 (thousands of m^3 per year)

Source	Fugitive	Flared	Combusted
Maintenance Gas Relief	93.1	-	-
Equipment Venting	-	-	-
Flaring from Well Heads	-	1260.4	-
Condensate Degassing	-	4333.5	-
DEG Regenerator	-	-	30.3
Fire regenerator	-	-	222.6
Boilers	-	-	30.4
Continuous Fire	-	34.9	-
Losses in fittings	9.2	-	-
Total	102.4	5628.8	283.2

Note: These figures do not represent emissions of GHG but actual volumes of natural gas

The gas specification for gas recovered from the Surgil Field is presented in Table 16.9.

Table 16.9: Specification of Recovered Gas

Constituent	Mol Fraction %
CH_4	90.318
C_2H_6	4.545
C_3H_8	2.146
i-C_4H_{10}	0.286
n-C_4H_{10}	0.341
C_5+	0.340
H_2O	0.005
N_2	1.126
CO_2	0.893

16.3.1.2 Flared Component

Based on the gas specification, it is calculated that the gas has a density of 0.8 kg/m^3 and when 1 kg of gas is combusted 2.69 kgCO_2 are released. N_2O emissions are estimated by combining the Intergovernmental Panel on Climate Change (IPCC)[82] and CORINAIR[83] emission factor for combustion of 2.4gN_2O/GJ for natural gas. It is assumed for this estimate that the flare is 99% efficient and that the remainder escapes as methane (the dominant constituent of the natural gas).

Based on the above information, total emissions from the flaring of gas have been calculated and presented as CO_2e in Table 16.10.

Table 16.10: Calculation of Baseline Flaring GHG Emissions at Surgil Field

	Value	Units
Gas specification	As Table 16.9	
Total gas flared	5,628,778	m^3/y
	4,549,455	kg/y
Density	0.81	kg/m^3
CO_2 emission rate	2.69	kg/kg(Nat.Gas)
N_2O emission rate	0.0001	kg/kg(Nat.Gas)
Flare efficiency	99%	%
Total flare gas combusted	4,503,961	kg/y
Annual CO_2 (combusted)	12,135,816	kg/y
Annual N_2O (combusted) as CO_2e	145,164	kg/y
Total flare gas uncombusted	45,495	kg/y
Subtotal uncombusted CH_4 as CO_2e	1,137,634	kg/y
Total CO_2e	13,418,344	kgCO_2/y
	13,418	tCO_2/y

[82] The Intergovernmental panel on climate change was established to provide the decision-makers and others interested in climate change with an objective source of information about climate change.

[83] CORINAIR is an emissions inventory produced by the European Environment Agency

16.3.1.3 Combusted Component

Some gas is combusted on the site to provide heating through onsite boilers at the CGTU. The combustion of natural gas directly has an emission factor of approximately 2.69kgCO_2 per kg natural gas. The emissions associated with the combustion are presented in Table 16.11.

Table 16.11: Calculation of Baseline Combustion GHG Emissions at Surgil Field

	Value	Units
Gas specification	As Table 16.9	
Total gas combusted	283,237	m^3/y
CO_2	2.69	kgCO_2/kgNG
N_2O	0.0001	kgN_2O/kgNG
Total gas combusted	228,926	Kg/y
Annual CO_2 (combusted)	616,836	Kg/y
Annual N_2O (combusted) as CO_2	9,393	Kg/y
Total CO_2e	625,965	kgCO_2/y
	626	tCO_2/y

16.3.1.4 Vented Component

The final portion of the gas is currently directly vented. It is assumed that this corresponds to the direct venting of methane which is the majority component of the gas, where methane has a global warming potential of 25 (i.e. 1kg of methane represents 25kg CO_2e). The emissions associated with this venting are presented in Table 16.12

Table 16.12: Calculation of Baseline Vented GHG Emissions at Surgil Field

	Value	Units
Total gas vented	102,353	m^3/y
Methane warming potential	25	
Total CH_4 as CO_2e	2,558,825	kgCO_2/y
	2,559	tCO_2/y

16.3.1.5 Auxiliary Power

There is an auxiliary power demand on site to provide electricity for the operations at Surgil Field. This electricity is currently sourced from the grid via a 10kV transmission line connection to Muynak. Electricity consumption has been estimated in the Feasibility Study for the upstream component. These sources currently lead to indirect emissions through the consumption of electricity. According to the IFC CEET, the grid CO_2 emissions intensity for electricity in Uzbekistan is 0.452 kgCO_2/kWh. Therefore the emissions associated with the use of electricity at Surgil Field are calculated in Table 16.13.

Table 16.13: Calculation of Baseline Auxiliary Power GHG Emissions at Surgil Field

	Value	Units
Annual power consumption (CGTU and other sources)	2,188,606	kWh/y
Electrochemical protection of pipelines and wells	1,103,760	kWh/y
Grid emissions factor	0.452	$kgCO_2/kWh$
Total CO_2	989,250	$kgCO_2/y$
	989	tCO_2/y

16.3.1.6 Transport of Condensate

Condensate from Surgil Field is currently transported away from the site for processing by road. The condensate is transported approximately 200km from the field to the rail station where is it further transported and processed. It is assumed that the amount of condensate currently produced is proportional to that expected in the Project scenario (i.e. two-thirds of that expected in the Project). For simplicity in this assessment, only the road transport element is considered in this baseline. The estimated emissions associated with this transport are presented in Table 16.14.

Table 16.14: Calculation of Baseline Transport of Condensate GHG Emissions from Surgil Field

	Value	Units
Condensate generated	76,600	tpa
Distance travelled	400	km round trip
Emission factor	0.185	$kgCO_2/tkm$
Total emissions	5,659,449	$kgCO_2$
	5,659	tCO_2/y

Note: Emission factor for transport taken from the GHG Protocol Cross-sector Emission Factor Dataset, representing an HGV from the US emission factors set

16.3.1.7 Total Emissions and Emissions Intensity

Table 16.15 presents a summary of the total emissions from Surgil Field from existing operations.

Table 16.15: Total Baseline GHG Emissions at Surgil Field

Source	tCO_2e per year
Flared	13,418
Vented	2,559
Combusted	626
Auxiliary Power	1,488
Condensate Transport	5,659
Total	23,750

The existing CGTU has a current capacity of 6 million m^3/day. Based on the emissions calculated in this section, the indicative emissions intensity (amount of CO_2 per unit of gas processed) can be calculated. This is estimated as:

- 6 million m^3/day / 23,750 tCO_2 /year = 11.9 tCO_2 per million m^3 gas processed.

16.3.2 Pipelines

Existing natural gas pipelines connect Surgil to the Ural – Bukhara natural gas pipeline for onward export. These pipelines were constructed during the original exploitation of the Surgil Field and would have led to emissions of GHG during their construction. For the purpose of this assessment it is assumed that the continued use of the Surgil Field without the UGCC would utilise the same (present) natural gas off take scenario. For the purposes of this assessment, no emissions are attributed to the previous construction of the existing pipelines.

As discussed in Section 16.1.3, during the operational phase fugitive emissions from oil and gas distribution are a known contributor to GHG emissions. It is likely that the existing sections pipelines will contribute to fugitive emissions, although no specific data relating to these pipelines is available. It is noted, however, that under the Project case, the existing lines would be largely unused and therefore there would be a subsequent decrease in the fugitive emissions associated with them. The existing pipelines would only be used in abnormal conditions and in those cases the emissions from the existing pipelines would be equivalent to those at present.

16.3.3 Downstream

The UGCC is a new component and therefore is not present in the Baseline and no emissions are attributed to it.

16.4 Assessment of Impacts

16.4.1 Upstream

16.4.1.1 Construction

As discussed above, emissions associated with the construction of the upstream component of the Project have been estimated based on the projected costs of constructing the scheme. The projected costs are presented in Table 16.16, along with the calculation of the associated construction emissions.

Table 16.16: Estimated GHG Emissions from the Upstream Construction

Element	US$ million 2010	€million 2010
Surgil Field development	238.6	180.1
External infrastructure	260.0	196.3
Drilling	160.0	120.8
Upstream Total	508.1	383.6
Emission Factor	733	$kgCO_2$ / 1000 €
Total CO_2 emissions	281,335	tCO_2
Annualised CO_2 emissions	11,253	tCO_2/year

Source: Uz-Kor Estimates

Notes: Project lifetime of 25 year. Conversion rate of US$1000 = €755 at 2010 costs

The estimate of upstream construction costs includes the construction of the pipeline element, and these have been removed in the above table and are considered in Section 16.4.2. The Upstream costs include the entire associated infrastructure required to develop the Project's upstream phase.

The total amount of emissions estimated is annualised at 11,253 tCO_2. As discussed earlier, this figure is subject to some uncertainty and therefore provides an indication of the Project construction emissions in relation to the operational phase emissions.

16.4.1.2 CGTU Flaring

Upon the commencement of the Project, improvements in the gas fields are expected to significantly reduce the amount of the gas that is flared at the Surgil Field compared to present operations such that all the current normal operation flaring activity at the CGTU will cease and the gas will instead be used in the production of power from seven new gas turbines at an independent power complex. Flaring is only expected in emergency situations at the CGTU and therefore no emissions are assigned to it in the Project case.

There will be a limited amount of flaring at the well heads which will used for operational reasons to manage the gas flow and respond to any problems at the CGTU. These emissions are incurred in the baseline operations also, and it is assumed that they will scale with the amount of production across the field – this means they will increase by 50% based on the increased capacity (see Table 16.8, ‘Well Head Flaring’). The emissions associated with this flaring are presented in Table 16.17.

Table 16.17: Calculation of Project Case Flaring GHG Emissions at Surgil Field

	Value	Units
Gas specification	As Table 16.9	
Total gas flared	1,890,642	m^3/y
	1,528,110	kg/y
Density	0.81	kg/m^3
CO_2 emission rate	2.69	kg/kg(Nat.Gas)
N_2O emission rate	0.0001	kg/kg(Nat.Gas)
Flare efficiency	99%	%
Total flare gas combusted	1,512,829	kg/y
Annual CO_2 (combusted)	4,076,281	kg/y
Annual N_2O (combusted) as CO_2e	48,759	kg/y
Total flare gas uncombusted	15,281	kg/y
Subtotal uncombusted CH_4 as CO_2e	382,027	kg/y
Total CO_2e	4,507,068	$kgCO_2/y$
	4,507	tCO_2/y

16.4.1.3 CGTU Power and Heat

The increased demand of the CGTU means that additional power supplies are required. As noted above this will be met through the installation of seven new 1.35MW gas engines (six have conservatively been assumed as on duty). The new gas-engines will meet the site electricity demands thereby avoiding the need to import electricity from the grid. The gas-engines will use previously flared gas meaning that under normal operations, no energy will be consumed from the electricity grid. The improvements will also avoid emissions associated with previous flaring. These engines will also provide power to the GGSs which will increase in number from two to six as well as other loads on the site (pumping for the wells etc.). As detailed below, this also includes some electricity for the electrochemical protection of pipelines and wells.

The emissions from the independent power complex gas engines associated with the planned expansion of the CGTU are presented in Table 16.18.

Table 16.18: Calculation of Gas-Engine GHG Emissions at the Expanded Surgil Field CGTU

	Value	Units
Amount of gas per engine per year	10,485,720	m^3/y
Density	0.81	kg/m^3
CO_2	2.69	$kgCO_2/kgNG$
N_2O	0.0001	$kgN_2O/kgNG$
Total gas combusted	837,651	kg/y
Annual CO_2 (combusted)	2,257,031	kg/y
Annual N_2O (combusted) as CO_2	26,998	kg/y
Number of gas engines	6	
Total CO_2e	13,704,173	$kgCO_2/y$
	13,704	tCO_2/y

Additionally, heat will be provided for the CGTU process. The emissions associated with this are presented in Table 16.19. The power demand has been provided in the Feasibility Study for the Project and scales approximately linearly with the baseline based on the amount of production (given as a demand of 0.481MW).

Table 16.19: Calculation of Boiler GHG Emissions at the Expanded Surgil Field CGTU

	Value	Units
Amount of gas consumed in boiler per year	416,456	m^3/y
CO_2	2.69	$kgCO_2/kgNG$
N_2O	0.0001	$kgN_2O/kgNG$
Total gas combusted	336,600	kg/y
Annual CO_2 (combusted)	906,961	kg/y
Annual N_2O (combusted) as CO_2	13,423	kg/y
Total CO_2e	920,383	$kgCO_2/y$
	920	tCO_2/y

16.4.1.4 Gas Gathering Stations (GGSs)

Upon the commencement of the project, improvements in the gas fields will lead to the installation of six additional GGSs. These will be powered via the gas engines in the independent power complex, as such the associated emissions are accounted for elsewhere in this assessment (see Section 16.4.1.3).

16.4.1.5 Flared Emissions from Wells

Data on existing fugitive emissions from existing wells is presented in Table 16.8. The Project will see the number of wells extended to an eventual total of 133 although these will not all be operational at the same time and some will be decommissioned and sealed as the project progresses. The overall production capacity of the field will increase from 6 million m^3 per day production to 9 million m^3 per day. For the purposes of this assessment the amount of fugitive emissions are assumed to be proportional to total production of the site and are therefore increased in the same ratio as estimated for the baseline.

Accordingly, the total amount of fugitive emissions (venting) is assumed to be 2 million m^3 per year. The emissions associated with this are presented in Table 16.20.

Table 16.20: Calculation of Vented GHG Emissions at the Expanded Surgil Field

	Value	Units
Total gas vented	153,530	m^3/y
Methane warming potential	25	
Subtotal uncombusted CH_4 as CO_2e	3,838,238	$kgCO_2$
	3,838	tCO_2/y

16.4.1.6 Total Emissions and Emissions Intensity

Table 16.21 presents a summary of the total emissions from Surgil Field from existing operations.

Table 16.21: Total Emissions at Surgil Field in Project Scenario

Source	tCO_2e per year
Construction	11,253
Operational	
Combusted - Engines	13,704
Combusted - Boilers	920
Flared	4,507
Vented	3,838
Operational Total	22,970

The existing CGTU has a current capacity of 6 million m^3/day (2 bm^3/year). The Project will lead to increased production of 9 million m^3 per day (3 bm^3/year). Based on the emissions calculated in this section, the indicative emissions intensity (amount of CO_2 per unit of gas processed) in the Project case can be calculated. This is estimated as:

- 9 million m^3/day / 22,970 tCO_2 / year = 7.7 tCO_2 per million m^3 gas processed.

The total amount of emissions in the project case decreases by 3% compared to the baseline (and compared to an increase of 50% in production), based on this assessment the process is estimated to be more efficient. The emissions intensity of the project is 7.7 tCO_2 per million m^3 gas processed, and as such the project is estimated to result in an improvement in relative emissions (a reduction in emissions intensity) in the order of 35%. This is due primarily to the effective utilisation of gases that were previously flared and the transport of condensate via pipeline.

Annualised construction emissions total an equivalent of 49% of the annual operational emissions or one-third of the total annualised emissions based on the assumptions used in this assessment. This indicates that the construction element of the upstream component could be a key contributor to the overall impact - however, these emissions represent a conservative estimate of the construction contribution, as discussed in Section 16.2.2.

Uzbekistan has not calculated the emissions associated with the refining of fuels within its national emissions inventory (although this would include both gas and oil refining), and therefore it is not possible to estimated how the emissions associated with the upstream activities compares to the national refining activities. The energy sector as a whole contributed 36.75 million tonnes of CO_2e in 2005 (see Table 16.2). The emissions associated with the upstream activities represents a small fraction of the national emissions.

The operational emissions represent a decrease over the baseline in the context of national emissions. Although there is a potential increase associated with the construction emissions, this is offset to some extent by the improved efficiency of the operations. Considering the construction emissions, the total contribution from the upstream elements are still small compared to national emission. Based on this, it is not considered that the impacts at the Surgil Field could be viewed as a significant worsening of GHG emissions.

16.4.2 Pipelines

As described in Section 16.4.1.1, estimates for emissions associated with the pipeline infrastructure have been estimated based on the expected cost of construction. The pipelines will also use existing corridors which keeping construction effort efficient compared to developing new corridors. These costs associated with the pipeline development are presented in Table 16.22

Table 16.22: Estimated GHG Emissions from the Pipeline Construction

Element	US$ million 2010	€million 2010
Pipeline	150.5	113.6
Total Upstream spend	113,605	1,000 €
Total CO_2	98,836	tCO_2
Annual CO_2	3,953	tCO_2

Source: Uz-Kor Estimates

Notes: Project lifetime of 25 year. Conversion rate of US$1000 = €755 at 2010 costs

The operation of the pipeline is also likely to require some energy associated with electrochemical protection of the pipeline and for monitoring and remotely controlling operations. Power for these operations will be provided from the gas-engines at the upstream CGTU or the power generation facilities at the UGCC and therefore the emissions associated with demand are included elsewhere in the assessment of the upstream and downstream emissions. The demand for the pipelines is estimated as 80kW, which is a small fraction of the total generation either at the CGTU or the UGCC. In addition, as the pipelines are new build it is assumed that fugitive emissions from operation are negligible.

The GHG emission associated with the pipeline construction and operation is small in the context of other sources of emissions considered in this assessment. Therefore they are not considered to be a significant in determining the impact of the Project.

16.4.3 Downstream

16.4.3.1 Overview

The installation and operation of the UGCC will lead to emissions associated with the construction and operation phases, due to the consumption of materials and fuels in the construction phase and the consumption of fuel required for and emissions directly associated with the processes during the operational phase. These have been considered in this assessment at a high level to put the source of these emissions in to context compared to the operational phase. As discussed in Section 16.2.2.1, there are a number of uncertainties associated with estimating the emissions associated with the construction phase due to the complexity of the items, the available emission factors and detailed information on construction methods required.

Emissions associated with the operation of the plant have been calculated based on the sources of combustion located on the site, including the gas turbines, furnaces and boilers using figures provided in the latest mass balance for the project, which includes fuel consumption. These services provide power not only for the processing of the gas, but other ancillaries such as waste water treatment and as such cover most of the emissions associated with the on-site activities. As the Project is still in the EPC phase, the exact specification may vary from those currently expected. Fuel rates were provided as annual consumption. The facility will include the most modern technologies to minimise flaring, with losses being recovered back in to the process where possible.

16.4.3.2 Construction

As discussed above, emissions associated with the construction of the upstream component of the Project have been estimated based on the projected costs of constructing the scheme. The projected costs are presented in Table 16.16, along with the calculation of the associated construction emissions.

Table 16.23: Estimated GHG Emissions from the Downstream Construction

Element	US$ million 2010	€ million 2010
GSP	452.4	341.6
Ethylene cracker	609.8	460.4
Polymer	511.3	386.0
UT/OS	608.6	459.5
Downstream Operations Total	2182.1	1647.5
Emission Factor	1,647.5	$kgCO_2$ / 1000 €
Total CO_2 emissions	1,208,156	tCO_2
Annualised CO_2 emissions	48,326	tCO_2/year

Source: Uz-Kor Estimates

Notes: Project lifetime of 25 year. Conversion rate of US$1000 = €755 at 2010 costs

The total amount of emissions estimated is annualised at 48,326 tCO_2. As discussed earlier this figure is subject to some uncertainty and therefore provides an indication of the project construction emissions in relation to the operational phase emissions.

16.4.3.3 Heat and Power Combustion Emissions

The UGCC will result in significant power demands which will be met by on-site power generation, steam boilers and process heat supply. Power will be delivered through a suite of units:

- Combined Cycle Gas Turbines – it is anticipated that three 35MWe GTs will be installed at the UGCC. Primarily these will be to provide electricity for the site and associated processes. Heat will also be recovered to meet some of the onsite steam demand, thus improving the overall efficiency of the site. The planned operation assumes two GTs running with one on standby.
- Process Boilers – two 67MWth gas-fired steam boilers will be located at the UGCC to produce additional stream required in the various process onsite. The planned operation assumes one boiler running with the remaining on standby.
- Cracking Furnaces – Five 57MWth cracking furnaces will be installed at the UGCC and used in the production of ethylene. Four in use at any one time.
- Utilities and offsite, which includes miscellaneous sources such as the compressors, loading facilities, welfare facilities etc.

Each of the above units will give rise to emissions of GHG from the combustion of fuel. The calculated emissions are presented in Table 16.24 to Table 16.26. Table 16.27 also presents the emissions associated with the Utilities and Offsite gas consumption which includes the Feed and Sales Gas Compressors which are located on site.

Table 16.24: Calculation of CCGT Combustion GHG Emissions at the UGCC

	Value	Units
Total gas combusted	110,400,000	kg/y
CO_2	2.69	$kgCO_2/kgNG$
N_2O	0.0001	$kgN_2O/kgNG$
Annual CO_2 (combusted)	297,470,197	kg/y
Annual N_2O (combusted) as CO_2	3,558,232	kg/y
Total CO_2e	301,028,428	$kgCO_2e/y$
	301,028	tCO_2e/y

Table 16.25: Calculation of Boiler Combustion GHG Emissions at the UGCC

	Value	Units
Total gas combusted	42,400,000	kg/y
CO_2	2.69	$kgCO_2/kgNG$
N_2O	0.0001	$kgN_2O/kgNG$
Annual CO_2 (combusted)	114,245,800	kg/y
Annual N_2O (combusted) as CO_2	1,366,567	kg/y
Total CO_2e	115,612,367	$kgCO_2e/y$
	115,612	tCO_2e/y

Table 16.26: Calculation of Furnace Combustion GHG Emissions at the UGCC

	Value	Units
Total gas combusted	88,600,000	kg/y
CO_2	2.69	$kgCO_2/kgNG$
N_2O	0.0001	$kgN_2O/kgNG$
Annual CO_2 (combusted)	238,730,611	kg/y
Annual N_2O (combusted) as CO_2	2,855,610	kg/y
Total CO_2e	241,586,220	$kgCO_2e/y$
	241,586	tCO_2e/y

Table 16.27: Calculation of Utilities and Offsite Combustion GHG Emissions at the UGCC

	Value	Units
Total gas combusted	88,000,000	kg/y
CO_2	2.69	$kgCO_2/kgNG$
N_2O	0.0001	$kgN_2O/kgNG$
Annual CO_2 (combusted)	237,113,925	kg/y
Annual N_2O (combusted) as CO_2	2,836,271	kg/y
Total CO_2e	239,950,196	$kgCO_2e/y$
	239,950	tCO_2e/y

16.4.3.4 Process Emissions

Before the gas is passed to the main processing units, it passes through an acid gas remover to remove contaminants, one of which is CO_2 present in the gas stream.

This CO_2 is then emitted directly to the atmosphere via the flare stack contributing to the total emissions associated with the process. This has been estimated as part of the mass balance for the project. The emissions from this process are presented in Table 16.28.

Table 16.28: Calculation of Process (Acid Gas Removal) GHG Emissions at UGCC

	Value	Units
Total CO_2e emission	56,000	tCO_2e/y

16.4.3.5 Flare

A hot and cold purge flare will be present on site to prevent the venting of any waste gasses or excess gases that can not be utilised on site. It is expected that there will be one flare that will serve all of the processes located at the UGCC.

It is estimated that the combined rate of the purged gas sent to the flare is 206.64 kg/h. The constituents of the gas sent to the flare are not currently known, and therefore it is assumed that these comprise completely of methane and that there is a 99% conversion efficiency to CO_2. The estimated emissions from this source are presented in Table 16.29.

Table 16.29: Calculation of Flaring GHG Emissions at the UGCC

	Value	Units
Total gas flared	1,810,166	kg/y
Density	0.81	kg/m^3
CO_2 emission rate	2.75	kg/kg(gas)
N_2O emission rate	0.0001	kg/kg(gas)
Flare efficiency	99%	%
Total flare gas combusted	1,792,065	kg/y
Annual CO_2 (combusted)	4,928,178	kg/y
Annual N_2O (combusted) as CO_2e	57,759	kg/y
Total flare gas uncombusted		kg/y
Subtotal uncombusted CH_4 as CO_2e	18,102	kg/y
Total CO_2e	5,438,479	$kgCO_2/y$
	5,438	tCO_2/y

16.4.3.6 Waste

It is expected that there will be some residual hydrocarbon waste fraction from the process that will require some degree of management. At the time of this assessment, it was not known how much hydrocarbon waste would be generated, or the nature of it. Some of the waste will be dealt with by on-site thermal oxidation.

Waste gases will be combusted in the on-site thermal oxidiser. Emissions associated with the thermal oxidiser have been estimated based on the current project assumptions on the volumes of gases expected. An estimate of these emissions is presented in Table 16.30. For the purposes of this assessment, it is assumed that all of the gases are converted to CO_2 and based on 8,000 operational hours per year.

Table 16.30: Calculation of Thermal Oxidiser GHG Emissions at the UGCC

Component	Volume Nm^3/h	Density (kg/Nm^3)	$kgCO_2/kg$	Total Annual tCO_2
Hexane	366.7	3.844	3.06	34,507
Ethylene	10.8	1.251	3.14	339
Propylene	3.2	1.877	3.14	151
Butene	3.2	2.502	3.14	201
Total				35,198

Other forms of waste such as general waste, metals, process wastes such as waste oils, wastes from the HDPE process are intended to be recycled or sold-on. It is not possible to attribute emissions for these types of waste streams as this would be highly dependant on the final use. However use of waste materials in replacement of virgin materials in recycling processes could lead to some indirect benefits in terms of GHG emissions.

16.4.3.7 Products and By-products

A total of 650,000 tonnes of product will be produced at the UGCC. This includes 387,000 tonnes of HDPE and 85,000 tonnes of PP annually. As a by-product of the project, pyrolysis gas and pyrolysis oil is also produced. These have been estimated as totalling approximately 102,000 tonnes of pyrolysis gas and 8,400 tonnes of pyrolysis oil. These products will be transported from the site by rail. Emissions associated with these movements have been estimated in Table 16.31. Although the final destination of the materials is unknown, it has been assumed that the products are transported 400km from the site in order to get to market (at which point responsibility for the product lies with the buyer).

Table 16.31: Calculation of Product Delivery Emissions from the UGCC

	Value	Unit
Amount per year	650000	tpy
Distance	400	km
Emission factor	0.03692	kgCO2e/tkm
Total Annual emissions	9,599	tCO2/y

Source: Emission factor for rail transport taken from the UK Defra/DECC Greenhouse Gas Conversion Factors for Company Reporting (2010), which are referenced from the GHG Protocol

The GTs on site will produce excess power which can be exported to the national electricity grid (the site will have a connection to allow this). This could potentially offset more carbon intense generation elsewhere or represent additional electricity in to the grid in an efficient way. Alternatively the GTs could be run at lower loads and accordingly the emissions associated with them will be lower. Therefore, this assessment reflects a conservative estimate of this source of emissions. In addition the plant will provide more than 2,500,000 tonnes of sales gas for onward sale.

The emissions associated with the downstream element of the plant represent all of these products and by-products. Production of the by-products will contribute to the overall market demand for them and could offset increased production elsewhere to supply this demand. While these products will be produced at an efficient, modern facility, the impact on downstream emissions and displacement of products from potentially less efficient sources is beyond the scope of this assessment.

16.4.3.8 Total Emissions

The total emissions associated with the downstream element of the Project presented in Table 16.32.

Table 16.32: Summary of Total Emissions at UGCC

Source	tCO_2 /year
Construction	48,326
Operational	
Combustion	
- Gas Turbines	301,028
- Boiler	115,612
- Furnaces	241,586
- Utilities and Offsite	239,950
Process	56,000
Flare	5,438
Waste	35,198
Transport of products	9,599
Total Operational	**1,004,413**

The UGCC is expected to lead to annual emissions of approximately 1 $mtCO_2$ per year based on the assumptions of this assessment. As the Project is developing additional capacity, these emissions will increase the total burden of emissions in Uzbekistan. The specifics and complexity of the process, the combination of products produced and little publicly available data means that it is difficult to benchmark against other projects of similar type.

However, the proposed UGCC is considered to be a highly modern facility and is located near to the gas source used as the feed fuel. In the event that the project was located elsewhere, it is likely that the resulting emissions would be at least the equivalent of the proposed Project. The Project is therefore considered a good match for the available natural resource.

Annualised construction emissions are less than an equivalent of 5% of the operational emissions.

The total operational emissions from the UGCC represent approximately 0.5% of the national total GHG emissions of 2005. The plant also represents a substantial increase in the manufacture of plastics in the country and region as well as providing a number of other products at the site (including sales gas).

As there is no baseline against which the downstream element of the Project can be readily assessed, it is more difficult to place an increase in GHG emissions in the national context. While it undoubtedly does increase the burden of emissions, it also provides a national and regional source of products that are currently imported in to the region. The increase in emissions that such development brings is recognised internationally such that non-Annex I countries in the Kyoto Protocol (typically being 'less-developed' countries' do not have the same obligation to reduce emissions as more developed countries. The Project will be a state-of-the-art facility which will operated to modern energy-efficiency levels and this means that any increase in emissions is kept to as low a level as possible.

16.5 Mitigation Measures

16.5.1 Gas Fields

Table 16.33: Mitigation and Other Measures

Type of Mitigation	Measures
Embedded mitigation – mitigation which is built-in to the Project during the design process	Construction of new modern flare at Surgil Field to prevent direct venting of the gas following MM site visit and recommendations.
	Reduced flaring operations following the increased development of Surgil Field, reducing overall emissions.
	Implementation of monitoring to ensure flare operates efficiently and metering of gas.
	Repowering the CGTU which will utilise the previously flared waste gas.
Mitigation of effects	Use of waste heat from the gas engines to off-set boiler heat generation if feasible. Continued monitoring of flare emissions from the wells and GGS' and minimising where possible.
Enhancement	Overall reduced burden of GHG emissions from the field activities, particularly from avoiding flaring.

16.5.2 Pipelines

Table 16.34: Mitigation and Other Measures

Type of Mitigation	Measures
Embedded mitigation – mitigation which is built-in to the Project during the design process	Modern pipelines which should reduce any potential fugitive emissions compared to the existing pipelines. Use of existing pipeline corridors will avoid construction emissions in development.
Mitigation of effects	Avoiding use of existing pipelines with replacement by a new pipeline thereby reducing fugitive emissions.
	Where possible, use of local contractors and suppliers in order to minimise the amount of construction related transport required.
	Use suppliers with good sustainability credentials.
Enhancement	None.

16.5.3 UGCC

Table 16.35: Mitigation and Other Measures

Type of Mitigation	Measures
Embedded mitigation – mitigation which is built-in to the Project during the design process	Use of efficient CCGTs to provide heat and power. Optimisation of all combustion relating emissions in sources across the site to ensure high energy efficiency. Online VOC monitoring which will identify where any fugitive emissions are detected and allow prompt repair. This is supplemented by a dedicated response team to act on any events. Fugitive emissions will be collected from various points around the complex and sent to the on-site flare.
	Minimal use of flare in normal operation.
Mitigation of effects	Management of high GHG potential pollutants such as SF_6 (used as an electrical insulator) to avoid any emissions losses. An inventory of such pollutants should be kept.
Enhancement	Efficient use of regional gas supply, and conversion of condensate to useful products which was previously transported out of the area. Maximised power export to the grid. Production of by-products which may offset production elsewhere.

16.6 Summary of Residual Impacts

It is inevitable that the Project will lead to some emissions of GHGs due to the nature of the Project, its energy demand and locations.

The assessment has shown that the upstream element of the Project will increase total emissions associated with gas extraction, but also increase the efficiency of this extraction by utilising previously flared gas.

The downstream element of the Project will lead to an increment in emissions as there is no baseline case – the additional emissions represent an increase in production which is satisfying a market demand. While the emissions associated with the Project represent an additional burden to the national emissions of Uzbekistan, in the absence of the downstream element of the Project the gas would be used elsewhere and incur emissions. In addition, demand for the products produced at the UGCC would be fulfilled elsewhere, possibly outside of Uzbekistan. Therefore, while the Project represents an increase in the national burden of emissions for Uzbekistan, in the absence of the Project emissions would be incurred elsewhere in order to meet the demand for the products.

However, the UGCC is a modern facility which is geared to maximising efficiencies as far as possible, and produces a wide range of products and by-products for which the emissions are incurred. The design of the plant and process will be optimal to make most use of natural resources and maximise energy efficiency, thus minimising potential emissions.

16.7 Proposed monitoring

The Project will be required to provide information on emissions as is necessary by the national administrator that reports emissions to the UNFCCC.

In addition, the Global Gas Flaring and Venting Reduction Voluntary Standard requires that emissions and volumes of gas associated with flaring are monitored. Monitoring would also ensure that the systems are working efficiently and would help detection of any problems that might lead to a flaring or venting event.

Monitoring of emissions will be undertaken as per the requirements of the IFC Performance Standard 3. Monitoring will be undertaken through measurements of surrogates which will include, for example, all fuel consumption on the site, flaring activities and performance of acid gas removal. The monitoring plan will be designed to clearly show the performance of the plant over time; if the process becomes less efficient then more emissions will be incurred compared to the amount of products produced. Emissions will be recorded annually as part of the management plan. Collation of this data may also support the relevant national submissions to the UNFCCC.

17. Cultural Heritage

17.1 Introduction

This Chapter considers the potential cultural heritage and archaeological impacts associated with construction, operation and decommissioning of the Project. The assessment framework is set out in Chapter 5 and the assessment of potential impacts is based on the description of the Project provided in Chapter 2.

The specific objectives of the assessment are to:

- Identify and define the extent of the known archaeological and cultural heritage features within and adjacent to the study area and provide a preliminary summary of their significance;
- Assess the overall impact of the Project on known and potential archaeological constraints; and
- Assess the need for and make recommendations for further evaluation and mitigation prior to and during construction.

The assessment has been based on available published information and maps, observations made during site visits plus consultations with and information made available from national organisations such as the Institute of Archaeology and Ethnography at the Uzbek Academy of Sciences.

Following a description of the assessment methodology in Section 17.2, subsequent sections provide information on the cultural heritage baseline description (Section 17.3), the impact assessment (Section 17.4) and mitigation measures proposed (Section 17.5). These are discussed in combination for each of the Project components (the gas field; the pipelines; and the UGCC). A summary of the impacts and any residual impacts following mitigation are reported in Section 17.6.

17.2 Methodology

17.2.1 Desk-Based Study

A desk based assessment was undertaken to provide details of the archaeological potential of the Project site. The methodology for the desk-study follows the Institute of Field Archaeologist's Standards and Guidance for Desk-Based Assessments (2008).

The desk study included the following actions:

- An online search of known cultural heritage and archaeological features within the Project site and wider region;
- An examination of available topographical evidence; and
- An assessment of geotechnical data associated with the Project site.

The desk-based assessment has been used to determine and ascertain the existence of, potential for and importance of known and unknown cultural heritage and archaeological features within the proposed Project site and the significance of those features.

17.2.2 Additional Information Sources

Additional data was retrieved via the following methods:
- Discussions held with the Project proponent;
- Observations made during the various site visits undertaken by the Project team; and
- Consultation with the Institute of Archaeology and Ethnography at the Uzbek Academy of Sciences in Nukus (Section 17.2.3).

17.2.3 Consultation

Full details regarding consultations are provided in Chapter 6. During the Scoping Public Exhibitions no specific concerns were raised by stakeholders regarding potential impacts to cultural heritage from the Project.

A number of relevant stakeholders were also consulted with during the scoping and impact assessment stages of the ESIA process, including:
- Direct stakeholders - Institute of History, Archaeology and Ethnography, Uzbek Academy of Sciences (hereafter referred to as 'the Institute of Archaeology'); and
- Indirect stakeholders – NGOs, including:
  - "Golden Heritage of the Aral"; and
  - "Karalkalpak State Art Museum".

A private meeting was also held with Professor Vadim N. Yagodin, the Director of the Institute of Archaeology in Nukus, during the ESIA impact assessment stage. This meeting was held at the Institute building in Nukus on 14 March 2011 and is discussed further in Sections 17.4 and 17.5. A letter, dated 5 May 2011, from the Institute of Archaeology confirming the outcome of the meeting and the Institute's opinion is provided in Appendix G, Volume III Appendices.

17.2.4 Assessment of Significance

An assessment of the significance of impacts with regards to cultural heritage and archaeology has been made for the construction, operational and decommissioning phases of the Project. The significance of potential impacts is a function of the presence and sensitivity of archaeological receptors, and the magnitude (duration, spatial extent, reversibility, likelihood and threshold) of the impact.

The sensitivity of the archaeological potential for a site is shown in Table 17.1:

Table 17.1: Sensitivity of Archaeological Feature

Level of Importance	Description	Sensitivity
National	The highest status of site, e.g. assets of high quality and importance, including buildings. Well preserved historic landscape, whether inscribed or not, with exceptional coherence, time depth, or other critical factor(s).	High
Regional	Designated or undesignated archaeological sites; well preserved structures or buildings of historical significance, historic landscapes or assets of a reasonably defined extent and significance, or reasonable evidence of occupation / settlement, ritual, industrial activity, etc., Examples include burial sites, deserted medieval villages, historic roads and dense scatter of finds.	Medium
Local	Comprises undesignated sites with some evidence of human activity but which are in a fragmentary or poor state, or assets of limited historic value but which have the potential to contribute to local research objectives, structures or buildings of potential historical merit. Examples include sites such as historic field systems and boundaries, agricultural features such as ridge and furrow, ephemeral archaeological evidence, locally significant buildings, etc.	Low
Negligible	Historic assets with very little or no surviving archaeological interest or historic buildings and landscapes of no historical significance. Examples include destroyed antiquities, buildings of no architectural merit, or relatively modern landscape features such as quarries, field boundaries, drains and ponds etc.	Negligible
Unknown	Insufficient information exists to assess the importance of a feature (e.g. unidentified features on aerial photographs).	-

The degree or magnitude of effects is determined through consideration of the nature, scale and extent of the effect. The magnitude of effects is:

- Major, where there is severe damage or loss of the archaeological resource;
- Moderate, where a high proportion of the archaeological resource is damaged or destroyed;
- Minor, where a small proportion of the archaeological resource is damaged or destroyed;
- Negligible, where the archaeological resource will not be affected because of distance from the development or method of construction; or
- Uncertain, where the extent or nature of the historic resource is unknown, or construction techniques have not yet been determined.

The significance of the effect is dependent upon the importance of a particular site and the amount of potential damage. The assessment of significance follows the standard assessment approach outlined in Chapter.5.

17.2.5 Mitigation and Monitoring Measures

The identification of potential cultural heritage or archaeological effects is an important part of the iterative design process because it can help avoid or minimise potential negative effects of the Project by preserving archaeological remains in-situ.

Where impacts on identified archaeological assets are unavoidable appropriate mitigation measures can be recommended to offset the loss of the resource. The effects are reassessed on the basis of identified mitigation measures being in place to ascertain residual effects (Section 17.6).

17.2.6 Data Limitations

Following initial consultation undertaken with the Institute of Archaeology in March 2011, it was agreed that representatives of the Institute would accompany Uz-Kor on a site reconnaissance drive across the proposed site of the Project pipelines in order to confirm the absence of known cultural heritage features. This proposal was further encouraged by Uz-Kor in a letter issued to the Institute in April 2011. However, this proposal was not pursued by the Institute, who later expressed their opinion that the Project would have no impacts upon known archaeological features in their letter dated 5 May 2011. As such, it should be noted that the opinion of the Institute of Archaeology expressed in this Chapter is based upon desk-based assessment and does not include a field assessment component.

17.3 Baseline Description

17.3.1 Overview

Historically, the Ustyurt Plateau and wider Central Asian region was a crossroads of civilizations and preserves traces of a myriad of peoples, including the Scythians, Mongols and even more ancient civilizations. More than 200 Mesolithic and Neolithic sites and locations are understood to have been identified in the southern part of the Ustyurt Plateau. Archaeological and cultural heritage features range from World Heritage Site status to sites of national and regional significance and are located across the region. However, no such sites are located within the Project footprint, as summarized in the following subsections.

17.3.2 Gas Fields

The former Aral Sea bed upon which the Surgil Field is located may contain remnants of its former shipping and marine activities. However, from desk-based research and observations undertaken during the site visits undertaken, no archaeological features of note have been identified within the boundary of the Surgil Field.

Further, during the meeting held with Professor Yagodin, Director of the Institute of Archaeology, on 14 March 2011, Professor Yagodin indicated that he had no knowledge of any notable features within this area. This opinion was confirmed by the Institute of Archaeology in a letter sent to Uz-Kor dated 5 May 2011.

17.3.3 Ustyurt Plateau

Some key cultural heritage features of the Karakalpak part of the Ustyurt Plateau are summarized below:

- At the northern border of the Karakalpak Ustyurt, far north of the Project site, there is an open conglomeration of the Churuk, Karakuduk, and Aidabol monuments;
- Major Aibuiir Qala is a fort located 41 km north-west of the Shumanai settlement on the face of the bluff of the Ustyurt Plateau. The Qala is located far south of the Project site; and
- The Akchungul monument is located on one of the terraces of the eastern tchink of the Ustyurt Plateau within the Kungrad district. The monument, dating from the I-IV centuries, is composed of three parts and occupies an area of more than 4 hectares.

Additionally, desk based research has identified two historical monuments and three ancient burial grounds within the proximity of the UGCC site and the southern end of pipeline route on the plateau. One of the monuments is approximately 10 km north of the UGCC, whilst the other is approximately 6 km south-east of the UGCC. Field observations additionally identified some dispersed ancient burial grounds located on the edge of the plateau escarpment.

It has been determined that none of the above features fall within the Project footprint or Project area of influence.

17.4 Assessment of Impact

17.4.1 Construction

17.4.1.1 Overview

It is reasonable to assume that major groundworks will take place for the construction of both the Project pipelines and UGCC. Moreover, ground works are already underway in the Surgil Field, where activities will be expanded over the coming months and years.

Potential impacts associated with the construction phase of each component of the Project are summarised in the following subsections.

17.4.1.2 Gas Field

No archaeological features of note have been identified within the boundary of the Surgil Field. Moreover, drilling activities are already underway and have not uncovered any notable archaeological features to date. As such, the sensitivity of the environment is determined to be low. The magnitude of any effect is likely to be moderate at most. Potential construction and drilling impacts upon unknown archaeological features are therefore concluded to be **minor adverse**.

17.4.1.3 Project Pipelines

The pipelines will largely be routed alongside the path of existing pipelines that traverse the former Aral Sea bed and Ustyurt Plateau. As such, the ground is already disturbed. In addition, no known archaeological features of note have been identified along the pipeline corridor. In addition, the pipeline will maintain a minimum 2km distance from the Ustyurt plateau escarpment. It is therefore deemed that there is negligible sensitivity in relation to archaeological features. The magnitude of any effect is likely to be moderate at most. Potential construction impacts upon unknown archaeological features are therefore concluded to be **insignificant**.

17.4.1.4 UGCC and Associated Infrastructure

The UGCC and associated infrastructure will be constructed on a part of the Ustyurt Plateau that has not previously been developed. There is therefore an increased potential for encountering unknown archaeological features in comparison with other Project components. Unknown finds have the potential to cause a number of problems, including suspension to works and delays. Secondary impacts can also result, such as the need to stockpile large quantities of soil while the works are halted and additional investigation is carried out; this, in turn, can lead to secondary impacts of dust generation, with impacts upon site personnel and ecology.

As such, the sensitivity of the land is slightly increased in comparison to the other Project components and is considered to be medium. However, the magnitude of any effect is likely to be moderate at most. Potential construction impacts upon unknown archaeological features concluded to be **moderate adverse**.

17.4.2 Operation

It is not considered that any activities associated with operation of the Project have the potential to result in adverse impacts of any significance upon known archaeological or cultural heritage features.

17.4.3 Cumulative Effects

No cumulative effects arising from other developments in the region have been identified for the Project.

17.4.4 Transboundary Effects

No transboundary impacts upon archaeological or cultural heritage features are anticipated as a result of the Project.

17.5 Mitigation and Enhancement Measures

17.5.1 Introduction

This section outlines agreed mitigation measures for potential effects upon archaeological or cultural heritage features.

17.5.2 Watching Brief

A watching brief will be maintained during all excavation or earthworks during the construction phase of the Project. The scope of the watching brief is outlined as follows:

- To be prepared for unexpected finds in all areas of the Project;
- To look out for burned or blackened material, brick or tile fragments, coins, pottery or bone fragments, skeletons, timber joists or post holes, brick or stone foundations or in-filled ditches during excavations; and
- To call on the guidance of an archaeologist where there is any uncertainty.

The main phases of monitoring for the pipeline construction will be during topsoil stripping, trench excavation and drainage preparation. Monitoring will include all other Project areas to be stripped of topsoil, including the well sites, working width of the proposed pipelines, UGCC site, wastewater evaporation pond sites, all road and rail links, site compounds and all laydown areas, etc.

If addressed in the right time and manner, finds may not necessarily affect the progress of the works. Further, with the correct advice provided in a timely manner, delays can be significantly reduced.

17.5.3 Finds Management

If any unexpected finds are encountered during earthworks or excavation works the following mitigation approaches will be employed by the Project:

- Work will be immediately stopped in the area;
- The find(s) will be demarked and protected via fencing / blocking off and the site manager and Project Environmental Officer will be contacted;
- The cultural authority (Institute of Archaeology) will be informed in order to seek guidance and specialist advice for management of the find(s) and how best to proceed, given its nature and extent;
- All finds of human remains will be reported to the local coroner; and
- All finds will be recorded.

A ‘chance finds procedure’ in line with international best practice will be developed and implemented by the Project during the construction phase to capture in more detail the above mitigation approach. Uz-Kor will consult with the relevant authorities (the Institute of Archaeology and NGO’s including “Golden Heritage of the Aral” and “Karalkalpak State Art Museum”) to ensure that the procedure is acceptable to them and that it complies with local and national regulations.

A more detailed description of the chance finds procedure is presented in the ESMP in Volume IV.

17.5.4 Liaison with Archaeology Institute

Liaison will be maintained with the Institute of Archaeology throughout the construction phase of the Project in order to provide guidance and support to the Project where applicable.

17.5.5 Avoidance Mitigation

Minor alterations to the proposed route of the Project pipelines will be considered in order to avoid any impacts upon nationally, regionally or locally important archaeological or cultural heritage features should any come to light during the construction phase of the Project.

Where feasible, the impact upon unavoidable archaeological sites of at least minor significance will be minimised by reduction of the working width to the minimum practical extent. Alternatively, geotextile matting or bog mats will be laid in order to avoid subsoil ‘ripping’ at archaeologically sensitive locations.

17.6 Summary of Residual Impacts

Residual effects are those effects that remain after mitigation has been implemented. A tabulated summary of significant impacts associated with the development and residual impacts following mitigation is presented in Table 17.2.

Table 17.2: Summary of Residual Effects

Activity	Potential Impact	Sensitivity Score	Magnitude Score	Impact Significance	Mitigation	Residual Significance
Construction and Decommissioning						
Earthworks and excavations in the Surgil Field.	Disturbance to unknown archaeological features.	Low	Moderate	Minor Adverse	Use of an archaeological watching brief during all earthworks and excavations. Adoption of best practice with regard to chance finds. Liaison with archaeological officer at the local authority and also the Institute of Archaeology in Nukus.	Insignificant
Earthworks and excavations during construction and laying of the Project pipelines.	Disturbance to unknown archaeological features.	Negligible	Moderate	Insignificant	Use of an archaeological watching brief during all earthworks and excavations. Adoption of best practice with regard to chance finds. Liaison with archaeological officer at the local authority and also the Institute of Archaeology in Nukus.	Insignificant
Earthworks and excavations during construction of the UGCC and associated infrastructure.	Disturbance to unknown archaeological features.	Medium	Moderate	Moderate Adverse	Use of an archaeological watching brief during all earthworks and excavations. Adoption of best practice with regard to chance finds. Liaison with archaeological officer at the local authority and also the Institute of Archaeology in Nukus.	Minor Adverse

17.7 Proposed Monitoring

In order to minimise the risk of disturbing unknown archaeological finds the Project will engage the use of an archaeological watching brief during all earthworks and excavation works.

17.8 Statement of Significance

The project is very unlikely to impact upon cultural heritage or archaeological features, primarily because:

- No known features are known to exist within the Surgil Field, while development of the Surgil Field to date has not uncovered any previously unknown features of significance;
- The pipeline route is already largely disturbed, with limited potential for unknown archaeological features; and
- There are no known features of archaeological or cultural heritage value in the vicinity of the UGCC site and associated infrastructure.

Mitigation identified at this stage relates to the use of an archaeological watching brief during all earthworks and excavation works associated with the construction of the pipeline, UGCC and associated infrastructure. Moreover, an international best practice approach to a 'chance finds procedure' will be adopted.

It is considered that these mitigation measures would reduce all identified impacts to minor or negligible significance.