

# Non-Technical Summary

Environmental Impact Assessment



Baku-Tbilisi-Ceyhan  
Crude Oil Pipeline:  
Turkey

Draft for Disclosure  
June 2002

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## Background

This document is the Non-Technical Summary (NTS) of the Environmental Impact Assessment (EIA) of the Turkish section of the Baku-Tbilisi-Ceyhan Crude Oil Pipeline Project (BTC Project). In Turkey, the BTC Project comprises 1,076 km of pipeline (and associated facilities) from the Georgian border to the Mediterranean coast and a marine terminal at Ceyhan. The EIA has been carried out in conformance with best international practice. The EIA's main objectives were to ensure that all potential impacts of the BTC Project on the physical, biological and human environment were fully investigated, mitigated where necessary and reported to interested parties.

**The findings of the EIA process for the complete BTC Project are presented in three separate Reports, one for each country (Azerbaijan, Georgia and Turkey) that the pipeline crosses. In Azerbaijan and Georgia, the report is termed an ESIA (Environmental and Social Impact Assessment), however all three reports cover both environmental and social issues.**

For Turkey, local and international EIA experts have examined all BTC Project activities that have the potential to give rise to environmental and social impacts. The examination was underpinned by extensive studies of baseline aspects and a carefully planned public consultation programme. Close interaction between the EIA and the BTC Project design has enabled the majority of impacts of concern to be designed out of the BTC Project or be reduced to an acceptable level. The BTC Project is committed to further studies, monitoring, careful management and reporting during the construction, commissioning and operation phases.

## Benefits to Turkey and the region

The exploitation of the hydrocarbon reserves of the Caspian States of the former Soviet Union is widely recognised as essential for this region's future development and its long-term political and socio-economic stability. Caspian reserves are currently estimated at between 17-33 billion barrels. This compares to proven reserves in the United States of 29 billion barrels and 15 billion barrels in the North Sea<sup>1</sup>. In one field, known as the Azeri, Chirag and Gunashli (ACG), estimated recoverable reserves are 5.2 billion barrels. However, local and regional energy demand within the greater South Caucasus and Central Asia regions is, and is anticipated to remain, insufficient to warrant the level of extraction of petroleum resources necessary to drive this economic uplift. Additional export capacity to wider geographical markets is therefore required to accommodate new production from the ACG field. Limited options already exist for exporting Caspian crude oil, but the capacity and reliability of these fall far short of that required to meet long-term regional objectives.



<sup>1</sup>"BP Statistical Review of World Energy - June 2001"

# Introduction

BP is leading the US \$2.9 billion Project to design and install a new pipeline. This pipeline will transfer up to 50 million tonnes of crude oil per annum (or one million barrels per day) from Sangachal on the Caspian Sea coast, via Azerbaijan, Georgia and Turkey to the Mediterranean. Crude oil will be supplied to international markets via tankers loaded at a new marine terminal to be located near Ceyhan (Adana Province in the Gulf of Iskenderun) on the Turkish Mediterranean coast. The entire pipeline route, which is 1760 km long, is shown in Figure 1.

**Figure 1. Baku-Tbilisi-Ceyhan Crude Oil Pipeline Route**



Construction of the pipeline will enable crude oil to be transported more economically and safely and with less environmental risk than if it was to be transported by a combination of pipelines and tankers via the Turkish Straits.

BP is managing the BTC Project on behalf of an international group of companies (BTC Owners) that will form the BTC Company (BTC Co). Funding for the BTC Project will be from a variety of sources including the equity funding of the BTC Owners themselves as well as from international senior lenders, including the International Finance Corporation (IFC) (commercial funding arm of the World Bank Group for the private sector), the European Bank for Reconstruction and Development, Export Credit Agencies, Commercial Banks and Political Risk Providers.

Routing this oil pipeline through Turkey will facilitate the development of an energy corridor between Asia and Europe. Transit and operating fees for the Turkish section of the pipeline are capable of generating up to US \$200 million per annum during the first 16 years of operation and up to US \$290 million per annum during the following 24 years of operation, depending upon the actual volumes of crude oil transported through the BTC Pipeline. Turkey will benefit from a share of the profits from the proceeds of oil sales by, TPAO (Turkish Petroleum Company), construction and operation of the pipeline by BOTAŞ and through the employment and skills training opportunities for local Turkish people.

BOTAŞ will build the BTC Pipeline and produce the EIA Report under a lump-sum turnkey contract for US \$1.4 billion for the BTC Owners. The BTC Project represents a major commercial opportunity for Turkish companies, who are expected to conduct the major part of construction.

There are a number of anticipated benefits for settlements situated along the route of the proposed pipeline and in the vicinity of the marine terminal, particularly during the construction period in terms of short-term and, to a lesser extent, long-term employment. In addition, off-set benefits will accrue to the environment and settlements in the vicinity of the pipeline and marine terminal by virtue of the planned community and environmental investment programmes currently under development.

The Project has been developed within a strict legal framework and this is summarised in box 1.



## Box 1. Overview of the Legal Framework for the BTC Project

The BTC Project is being implemented within the framework of an Inter-Governmental Agreement (IGA) between the three countries through which the pipeline will pass. This includes unexecuted forms of the three Host Government Agreements (HGA) and with respect to the Republic of Turkey, the Lump-Sum Turnkey Contract and the Treasury Guarantee which together form the binding international and controlling domestic law governing the BTC Project.

Each HGA is also executed by the Governments and the BTC Participants as a legally binding contract defining the fiscal and legal regime under which the BTC Project is to be developed. The HGAs clearly demonstrate the requirements of specific environmental and social standards and procedures as well as a broader range of national and international standards and guidelines. The HGAs also define the transit fee regime and the tax framework for the pipeline for the lifetime of the BTC Project and establishes the administrative responsibility of different governments for the BTC Project, in addition to the transit right of way and the security of the pipeline. The HGAs also specify the work that the BTC Participants must undertake, including environmental and social impact assessments. The EIA is one of the most important steps in the permitting process and is a requirement for the implementation of the BTC Project. This EIA has been written to fulfil the requirements of the World Bank Guidelines, EC Directives and Turkish legislation.

As both Turnkey Contractor and Designated Operator, BOTAŞ is responsible during Project implementation and operation respectively for all environmental planning, mitigation, management and monitoring in Turkey. This is an ongoing process and will not stop with the approval of the EIA Report by the Ministry of Environment (MoE). Rather, as Turnkey Contractor and (subsequently) Designated Operator, BOTAŞ is (and will remain) responsible for delivery of all commitments made in the EIA Report and for the development and implementation of the various outline Management and Monitoring Plans presented in the EIA Report (Appendix C) to the satisfaction of BTC Owners and the Turkish regulators.

## Project overview

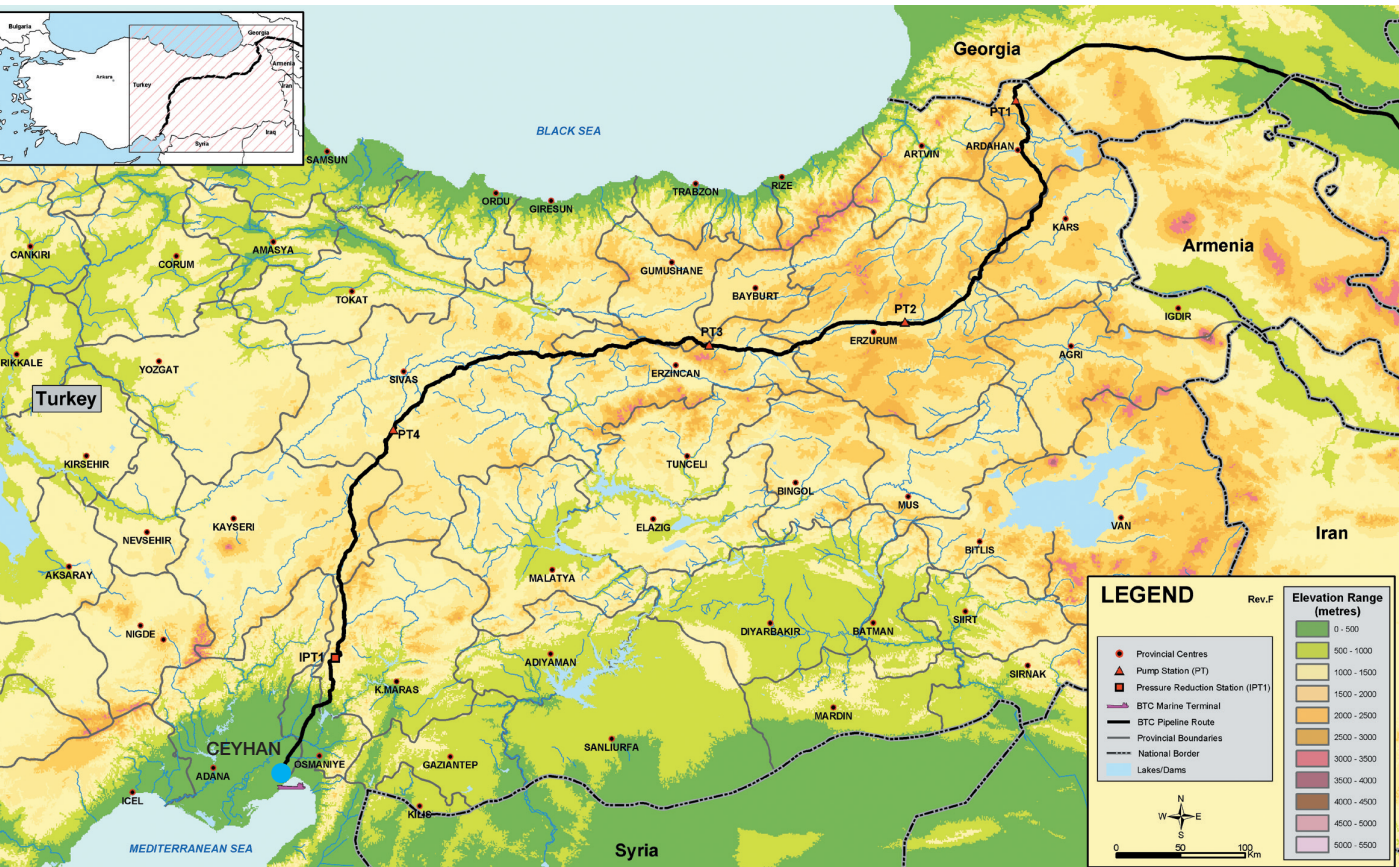
The development of the BTC Pipeline Project is being undertaken by a group of petroleum companies (TPAO, SOCAR, BP, Statoil, Unocal, Itochu, Delta Hess and ENI) currently referred to as the BTC Owners. BOTAŞ, the state-owned Turkish Petroleum Pipeline Corporation is responsible for designing, constructing and operating the pipeline, marine terminal and associated facilities in Turkey on behalf of BTC Owners. When the BTC Owners sanction their investment in the BTC Project in mid-2002, they will form an operating company named BTC Co.



# Introduction

The route of the Turkish section of the BTC Pipeline is between Turkgozu, in Ardahan Province, on the Georgian-Turkish border and Ceyhan in Adana Province on the Mediterranean coast. From the Georgian border to the BTC Marine Terminal Ceyhan, the total length of the Turkish section is approximately 1,076 km. It will cross the provinces of Ardahan, Kars, Erzurum, Erzincan, Gumushane, Sivas, Kayseri, Kahramanmaraş, Osmaniye and Adana. The route of the BTC Pipeline and marine terminal location in Turkey are shown in figure 2.

**Figure 2.** Baku-Tbilisi-Ceyhan Crude Oil Pipeline Route – Turkey section



The BTC Pipeline will be buried along its entire route, except at surface facilities (Above Ground Installations - AGIs). These installations include:

- ▶ four pump stations, to transfer the oil along the pipeline, each occupying between 13 and 18 ha of land
- ▶ one pressure reduction station, to control the pressure in the last 130 km section of the pipeline, occupying approximately 6 ha
- ▶ fifty two block valve stations that will allow sections of pipeline to be isolated for maintenance or in the case of an emergency, approximately 40 m by 40 m in size
- ▶ metering stations (at the first pump station and at the BTC Marine Terminal) to measure the quantities of oil entering and leaving the pipeline within Turkey

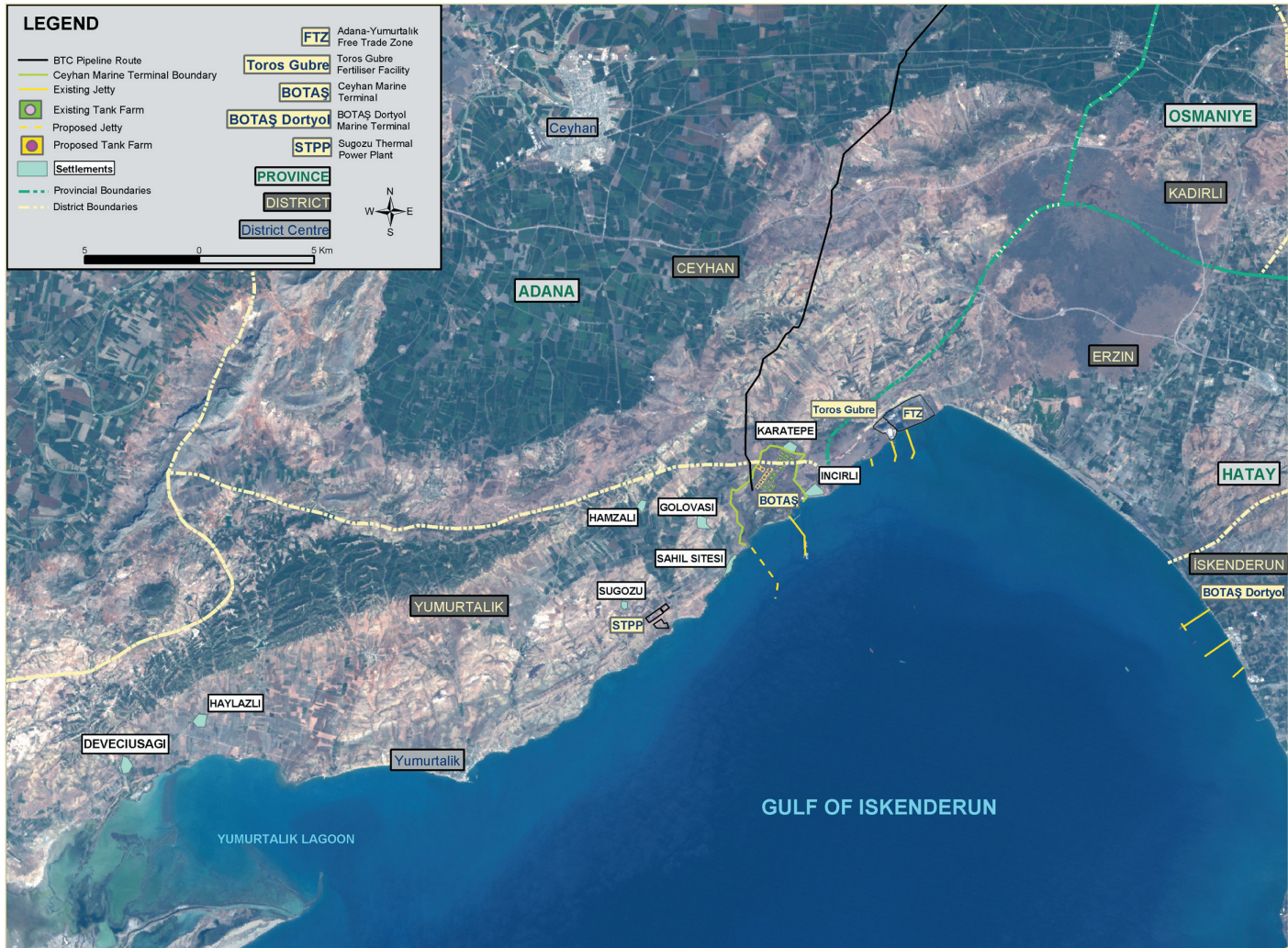


# Introduction

The four pump stations will be permanently staffed therefore require accommodation facilities. The pipeline will be equipped with a 'leak detection system'. It will be operated continuously and will only be out of service during planned maintenance periods. The pipeline and all facilities have been designed to withstand earthquakes.

The new BTC Marine Terminal will be located on the northern shores of the Gulf of Iskenderun near Ceyhan (see figure 3).

**Figure 3.** Location of new and existing marine terminal



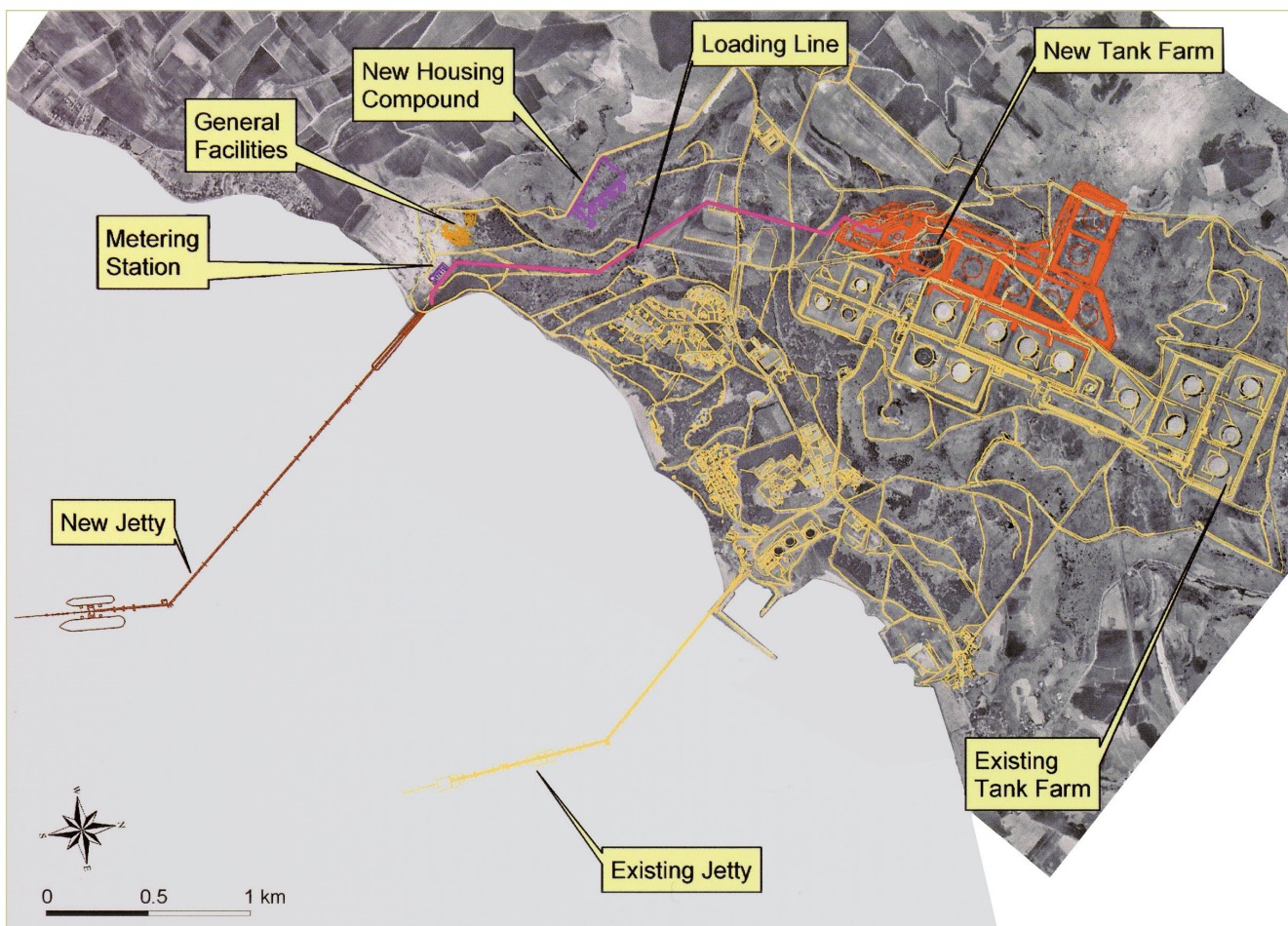
# Introduction

The terminal's principal function will be the storage of crude oil transported along the pipeline prior to its loading onto tankers and export to world markets. Located adjacent to an existing BOTAS site, the terminal, will comprise the following facilities:

- ▶ equipment to reduce the pressure of oil in the pipeline
- ▶ a 'tank farm' of seven oil storage tanks, with associated facilities including a fire station and an electricity substation
- ▶ approximately 6 km of loading lines from the tank farm to the end of the jetty
- ▶ an export jetty (approximately 2,600 m in length) and associated oil loading facilities
- ▶ on-site wastewater treatment plant
- ▶ housing compound and general facilities for permanent staff
- ▶ a backup system for the monitoring and control of the entire BTC Pipeline system (primary control of the pipeline will be exercised from Sangachal in Azerbaijan)

The general layout of the marine terminal is shown in figure 4. It will occupy an area of approximately 70 ha.

**Figure 4.** Layout of marine terminal



The overall BTC Project schedule is shown in figure 5.

**Figure 5** Schedule to Project Completion

Activity	2002	2003	2004	2005
EIA Disclosure to Public				
EIA Determination by MOE				
EIA Approval				
Land Acquisition				
Mobilisation of Construction Effort				
Pipeline Construction				
Pump Station and Other AGI Construction				
Ceyhan Marine Terminal Construction				
Commissioning				
Issue of Work Completion Certificate and commencement of normal operations				

## Environmental, health and safety policies

In addition to meeting international and Turkish standards on environment, health and safety, the BTC Project has been designed to meet the requirements of the BTC Owners on whose behalf it will be constructed and operated. As the organisation responsible for planning, construction and operation of the BTC Project in Turkey, BOTAŞ recognises that it has a responsibility to manage environmental and social issues so that adverse impacts are mitigated and positive benefits are maximised.

### Health Safety & Environmental Policy

We fully endorse the BP Group Policy and are committed to our worldwide corporate goals: no accidents, no harm to people and no damage to the environment.

Getting HSE right is a fundamental part of our business in the Caspian Sea Region and BP through our operations in exploration, development, extraction and transport of oil & gas fully supports its goals and requirements.

In meeting with this policy we will:

1. Expect all personnel to demonstrate commitment to, and leadership in, health, safety and environmental (HSE) protection, performance and compliance.
2. Manage HSE performance in compliance with the expectations in the BP "Getting HSE Right" management system.
3. Audit the environmental management system against ISO 14001.
4. Inform our employees, contractors, partners, stakeholders, government agencies and the public of relevant HSE aspects of our operations. Openly listen, consult and respond to their concerns.
5. Endeavour to continuously improve HSE performance.
6. Meet or exceed applicable HSE legislation, regulations and company requirements.
7. Ensure our employees and contractors are familiar with our HSE systems, and are competent and trained to carry out their work safely and with due regard for the environment.
8. Provide employees with a safe place to work.
9. Maintain a commitment to incident and pollution prevention, maintain emergency response plans and resources, and manage emergency situations resulting from our activities.
10. Set annual HSE objectives and targets and openly report our performance. Audit compliance with our policies and take corrective action where appropriate.

No task is so important that we cannot take time to plan and implement it in a safe and environmentally responsible manner.

**David Woodward**  
Business Unit Leader BP Azerbaijan  
September, 2001

### HS&E Commitment Statement

My Objective is to guarantee the success of the Project by my unremitting promotion of a Preventative HS&E Culture among the Project Team and Contractors.

I will empower my key management staff such that we will demote Cost and Time constraints as secondary considerations in order to realise my commitment to ensure:

**NO harm to any person**  
**NO damage to Property or the Environment**

Gokhan BILDACI  
General Manager

BOTAŞ Petroleum Pipeline Corporation



# Introduction

## EIA process and methodology

This document summarises the EIA, which has been undertaken by the international consulting company, Environmental Resources Management (ERM), together with specialist Turkish partners, Energy and Environmental Investments Inc (ENVY), Veri Arastirma and the Centre for Black Sea and Central Asia Studies (KORA). KORA is established under the auspices of the Middle East Technical University (METU), Ankara.

The main objective of the EIA process to date has been to ensure that all potential impacts of the BTC Project on the physical, biological and human environment are fully investigated, reported and, where necessary, managed. As such, the EIA incorporates both environmental and social assessments.

The EIA process formally commenced in summer 2000, when the first corridor options were discussed between BTC Owners and the Turkish government agencies. Since then, the EIA studies have helped to determine the route and the EIA process has applied a range of techniques to identify, predict, evaluate and mitigate the potential impacts associated with the BTC Project (see box 2). These have ranged from stakeholder consultations to systematic field surveys to quantitative modelling of predicted emission levels. For ease of reporting, this process can be presented as a stepped sequence of activities (see figure 6), but, in practice, it is a dynamic and iterative process.

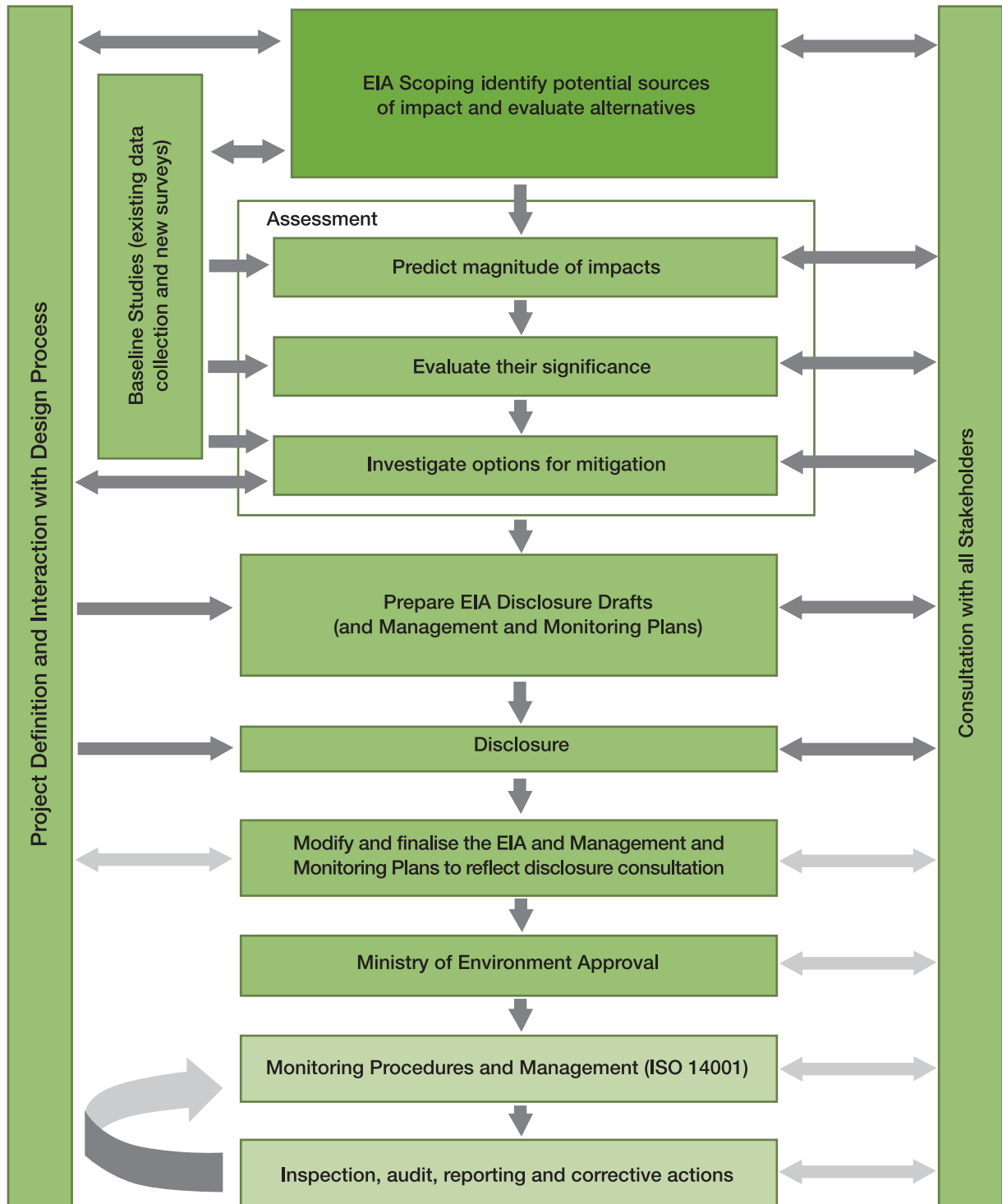
- ▶ Impact identification started in scoping and continued throughout the EIA. Essentially it looked at all potential project interactions with environmental and social systems, and with the aid of expert judgement and stakeholder consultation focused on those interactions of most importance for the EIA
- ▶ Predicting impacts took into account mitigation measures already contained in project design. For some issues, such as noise and air quality, impacts could be calculated and modelled using computer programmes. For others, such as archaeology and employment, this was not possible. For these, expert judgement and stakeholder consultation had a critical role
- ▶ The significance of impacts was evaluated against criteria developed for the BTC Project. These criteria varied, so that for noise clearly established numerical limits set by Turkish law and international standards were used. For other aspects, such as ecology or livelihoods, expert judgement, Turkish and international guidance, and stakeholder consultation all helped set the criteria
- ▶ Through mitigation, the BTC Project has sought to reduce negative impacts to as low as reasonably practical, and through enhancement, to maximise benefits and positive impacts. Mitigation focused especially on those impacts evaluated as most significant, and was generally applied in a hierarchical approach

### **Box 2. Mitigation in the BTC Project was largely applied through a hierarchy whereby:**

- ▶ a primary objective was to avoid impacts completely, eg through routing decisions around settlements and archeological features, or adopting a technology that avoided a certain type of emission
- ▶ if avoidance was not possible, then impacts were reduced at origin, eg through narrowing the Right of Way (strip of land in which pipeline construction activities take place) or minimising wastes
- ▶ where avoidance or reduction at origin could not be achieved, then the impact was managed on site, eg through erosion control measures, landscaping, protective fencing, and waste management
- ▶ where none of the above were practical, impacts were managed at the receptor, eg through transplantation of rare flora and fauna, moving beehives away from pipeline construction corridors, and conducting safety awareness training in local schools and settlements
- ▶ some impacts were completely unavoidable and have required 'repair' mechanisms such as reinstatement of the pipeline corridor
- ▶ where none of the above were practical, compensation was applied, eg for affected agricultural land users/landowners and fishermen



Figure 6. Overview of the EIA Process



# Introduction

The outcome at the end of the prediction-evaluation-mitigation sequence was a residual impact, ie that which is predicted to remain after mitigation. Sometimes this impact was viewed as either unacceptable or having room for improvement. Further mitigation was then examined or alternative design or routing solutions were developed. In a number of instances, therefore, the sequence was applied in a cyclical manner until a satisfactory outcome was achieved, rather than as a once-through sequence. The impacts discussed and reported in the EIA include both the potential and residual ones, but it is the residual impacts that are pertinent to decision-making.

In addition to the activities outlined above, and Public Consultation described later in this Summary, the EIA included two other important activities:

- ▶ EIA - Design interaction: the design engineering and EIA teams have interacted closely throughout the development of the BTC Project, particularly in key areas such as determining the pipeline route, selecting the sites for the marine terminal and AGIs, undertaking environmental risk assessments and developing land reinstatement measures
- ▶ Baseline data collection: through desk studies, field surveys and consultation, baseline data collection has been a fundamental EIA activity since the early stages of the BTC Project. Some of the main studies are summarised in box 3 below:

## Box 3. Baseline Data Collection

### Basic Engineering Phase (and EIA Scoping)

- ▶ Cultural Heritage (Archaeology) Survey
- ▶ Habitat Survey (Phase-1)
- ▶ General Environmental Aspects Surveys (geology, soils, water crossings and water resources)
- ▶ Stakeholder Identification
- ▶ Geohazards Survey
- ▶ Soil Sampling at the Proposed Tank Farm location for the BTC Marine Terminal
- ▶ Preliminary Consultation with Authorities

### Detailed Engineering Phase

- ▶ Project Information Distribution
- ▶ Bird Survey
- ▶ Marine Turtle Survey
- ▶ Cultural Heritage (with archeological focus) Surveys
- ▶ Seasonal Marine Surveys (chemistry and biology)
- ▶ Geohazards Survey
- ▶ Habitat Survey (Phase-2)
- ▶ Environmental Input (Ecology and Archaeology) into Route Narrowing Works
- ▶ Surface Water and Groundwater Quality Survey
- ▶ Noise Survey
- ▶ Air Quality Survey
- ▶ Soil Survey
- ▶ Local, Regional and National Authority Consultation
- ▶ Socio-economic Household Questionnaire
- ▶ Socio-economic Settlement Questionnaire (with village heads known as Muhtars)
- ▶ Public Consultation Meetings with Local Communities



# Public consultation

Public consultation, apart from being good practice, is an absolute necessity to understand how a project will impact stakeholders and to obtain their ideas and opinions on how the impacts should be managed. The feedback from consultation is an important influence on project design and implementation. Consultation is also an early opportunity for local people to become better informed about planned activities. The BTC Project has carried out public consultation in line with national regulations, IFC requirements and international best practice.

Consultation will continue throughout the design, construction, operation and closure phases of the BTC Project. To date, the process has involved a 20 month period of conducting surveys, in-depth interviews, community meetings and working group meetings with a range of stakeholders including: settlements along the route and in the vicinity of the marine terminal, provincial and local authorities (elected and appointed), government departments, academics, international and national non-governmental organisations (NGOs) and other interest groups, (see box 4).

Consultations to date have highlighted a number of key issues, including both perceived benefits and concerns associated with the BTC Project. These issues revolved around the environment, employment, land acquisition and compensation, safety, security and health, reinstatement of land, infrastructure, agricultural activities, and the impact of construction workers, construction camps, pump stations, and the marine terminal on local residents. These issues have been fed into the BTC Project design processes and the EIA.

This Non-Technical Summary of the EIA has been prepared specifically for public disclosure and comment. The report is being widely disseminated and is available for comment for a period of 60 days from late June to late August 2002. Following the 60-day disclosure period, all comments received will be addressed and incorporated as appropriate into the EIA, prior to formal submission to the Ministry of Environment of the Turkish Government.

## Box 4. Public Consultation and Disclosure

During the initial consultation phase approximately 500 Press Packs and over 2,000 Information Packs have been distributed. Workshops and meetings have been attended by approximately 260 NGOs and 60 Press organisations. Face-to-face interviews have been held with 1,855 households along the pipeline route and near the marine terminal. An additional 424 face-to-face interviews and 210 telephone interviews have been held with Muhtars in affected settlements.

During the disclosure process, approximately 40,000 Community Pamphlets and 15,000 copies of this Non-Technical Summary will be distributed to settlements along the pipeline route and near the marine terminal. 32 community meetings will be held in addition to meetings with all governors (10), sub-governors (35) and other local elected and appointed authorities of the provinces and districts along the pipeline route and in the vicinity of the marine terminal. Meetings will also be held with national government departments (16), national and local NGOs, interest groups and the Press.

Regular meetings have been held with the Ministry of Environment to update them on progress and will continue during the disclosure process.

During construction and operation, a Project Community Relations Team will manage consultation and community liaison.



Consultation meeting, Kahramanmaraş



NGO meeting Ankara



Consultation meeting, Osmaniye



# The project setting

As stated above, the EIA included extensive baseline studies of the physical, biological and social conditions along the route and at the marine terminal site. The following text summarises the general setting for the BTC Project.

## The physical environment

In the north, the pipeline route crosses a variety of terrains ranging from the scenically attractive landscapes of the Yalvizcam and Allahuekber mountains to the flat and rolling agricultural land either side of the Otlukbeli mountains. North of Erzincan, the Otlukbeli Mountains are striking, almost plateau-like hills with grassy sub-alpine meadows. Further west they rise into the true alpine zone, with dramatic landscapes characterised by extensive views across sparsely-vegetated mountains.

Further south, agricultural landscapes on marl and karst predominate. Near Refahiye, are the Tecer Mountains with high quality landscapes of craggy mountains, broad grassy valleys, and forests beyond. After the Kizilirmak Valley the route follows the Sivas Provincial Highway to Imranli, crossing numerous rivers along the way. East of Sivas is distinctive karst landscape, a complex, hilly terrain formed from narrow ridges of gypsum enclosing small basins appearing as stony hummocks in a rolling grassy plain. Continuing south of the Acioz River is an unremarkable landscape of agriculture, roads, and with numerous rivers and streams.

Towards the southern end of the route are the distinctive stepped plateaux of the Uzun area, followed by the pine forested foothills and hills of the Taurus Mountains. This is followed by the intensively farmed, irrigated Cukurova Plain, finally reaching the low, rounded, maquis-covered hills near the Marine Terminal site on the Mediterranean coast.



**Yalvizcam Mountains\*:** The pipeline climbs steeply into the southern part of the Yalvizcam Mountains to above the treeline, reaching altitudes of 2,500 m above sea level where, in spring, wildflowers and the adjacent mountain ranges provide a high level of scenic value



**Imranli\*:** The route descends steeply to cross the meandering Acioz River, its valley forming a green band of meadows and trees in an otherwise more barren landscape



**Posof\*:** The route climbs steadily into the rolling, forested hills interspersed by sub-alpine meadow clearings (2,100 m above sea level) north of Posof before passing west of the town

Soils along the route reflect local geology, land form, land use and climate. In the steep mountains and high valleys of the north-east, soil erosion is active though soil formation through weathering largely balances this. The area was once active volcanically and extensive sheets of tuff (ash) are common; soils derived from this have low fertility. Highland grazing and valley-bottom horticulture drives much of the local economy, but forestry is also important. Westward, for approximately half of its entire length, the route crosses plains soils, exploited to produce rain-fed cereals. Small, almost circular, basins enclosed by hard gypsum with large subsurface caverns occur East of Sivas.

The route shares a significant length of the East Anatolian Natural Gas Pipeline (NGP) corridor where in some places unsuccessful reinstatement has resulted in noticeable levels of soil erosion and riverbank degradation. Turning south, the relief increases and plains give way to irrigated valleys with silt and fine sand soils. The Taurus Mountains have sandy, often infertile, soils supporting conservation forestry and small-scale grazing. The southern foothills of the Taurus comprise soils derived from soft limestone, and landslides are common. Further south the irrigated plains have fertile sandy soils supporting a thriving horticultural economy. The route terminates at the coast in low hills with soils of volcanic origin.



# The project setting

The route crosses six watersheds, containing several large rivers, and numerous smaller streams. In the Aras watershed in the northeast, the route crosses three transboundary rivers flowing into Georgia the Posof, the Kura and the Hasankale. Water quality in these rivers tends to vary between good and poor, reflecting the levels of industrial inputs and intensity of farming in their catchments. Many rivers and streams are important for fish, supporting a number of species that are protected and/or have a commercial value. Surface water resources along the route also include dams and reservoirs. The route has been selected to avoid these.

Aquifers occur along the route in a number of locations: the Pasinler Plain, the Erzurum Plain, the Goksun Plain and the Adana-Ceyhan Plain. These aquifers are of two general types:

- ▶ Confined aquifers are separated from the surface by impermeable rock strata and are not particularly vulnerable to pipeline construction or operation. The total length of confined aquifer crossed is approximately 40 km
- ▶ Unconfined aquifers are in continuity with the land surface and are therefore potentially vulnerable to disturbance and contamination during construction or operation. The total length of unconfined aquifer crossed is approximately 140 km

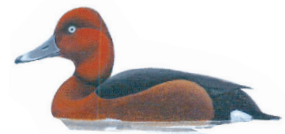
Groundwater is an important resource for settlements along the route, where much of the drinking water is drawn from springs and wells.

## Biodiversity

**Species:** Turkey has a rich and varied ecology with a high degree of endemism (species that are unique to a particular area). Over 500 endemic plant species have been observed along the 500 m route corridor. Examples of approximately 10% of Turkey's 1,876 globally-threatened plant species and 30% of the country's 178 globally-threatened vertebrate animals have also been observed within 250 m of the route. These proportions will be much lower for the actual working corridor itself. Globally endangered species include an orchid (*Ophrys reinholdii* ssp. *Leucotaenia*), a cyclamen (*Cyclamen coum*), Meadow Viper (*Vipera ursinii*), and White-headed Duck (*Oxyura leucocephala*). An additional 24 species of nationally threatened plants occur within the 500 m route corridor, the rarest in a national context being *Barbarea auriculata* var. *paludosa* and *Verbascum subserratum*, both of which are Critically Endangered. Little information exists to identify nationally threatened fauna, but 15 bird species whose maximum breeding population in Turkey is 500 pairs or below occur within the 500 m route corridor.



Montagu's harrier



Ferruginous duck

**Internationally Important Sites:** The pipeline crosses the centre of the area in which the Ulas and Alacorak Lakes lie (five lakes being considered for designation as Internationally Important Wetlands under the Ramsar Convention) but has been routed carefully to avoid all the lakes by approximately 1 km. The lakes support two globally-threatened birds (including White-headed Duck globally the rarest bird along the route), and at least 13 nationally-rare bird species. Construction is planned to occur in late summer between the end of the birds' breeding season and the main autumn migration period, stringent mitigation measures will be adopted to minimise disturbance and habitat damage.

**Nationally Important Sites:** The route crosses two sites protected under national legislation Posof Wildlife Protection Area, established primarily for the globally-threatened Caucasian Black Grouse, and Sarikamis Forest designated as a Natural Site for its important Scot's Pine forest communities. The reasons for the chosen routes are discussed in box 5.

Further west, the route passes within 100 m of a third site, the Gumushane-Kelkit-Cemali Wildlife Protection Area, established to protect Turkish Chamois and Wild Goat. It also passes in close proximity to two Important Bird Areas (IBAs): Ardahan Forest and Erzurum Plain (which have no legal protection). In addition, 49 ecologically sensitive areas have been identified along the route, mainly on the basis of the plant species they contain.



# The project setting

## Box 5. Routing Considerations through Protected Areas

**Posof (Wildlife Protection Area).** In Georgia, the district of Akhalkalaki raised serious security concerns, and thus the pipeline route was altered to avoid this area. Consequently, the pipeline entry point into Turkey changed and now crosses into the Posof Wildlife Protection Area. The area cannot be avoided and following consultations with the official staff of the Erzurum Regional Directorate of Forestry responsible for the protection of the Posof area construction work will be allowed within the area providing necessary precautions are taken to avoid disturbance to the Caucasian Black Grouse and damage to their habitats. Detailed studies were undertaken to develop an acceptable route through this area.

**Sarikamis Forest (Natural Site Area).** Alternative routes were considered. A route to the west of the current corridor would have proved difficult to construct and is prone to earthquakes, landslides and other geohazards. A route to the east would have traversed a greater linear distance of the Sarikamis Forest. The current route corridor traverses the fringes of the forest area and utilises a natural tree break as the pipeline corridor. The status of Sarikamis is currently being re-assessed.

The most valuable ecological site along the route comprises the **Alacorak and Ulas Lakes** - a complex of five lakes that meets the criteria for designation as a Ramsar site, ie a Wetland of International Importance. The many important species of waterfowl that use the lakes includes the globally threatened White-headed Duck, *Oxyura leucocephala*. The BTC Pipeline route has been selected so that it is generally separated from the lakes themselves by approximately at least 1 km.



Otlukbeli Mountains north of Erzincan\*



Sarikamis Forest, Ardahan

## Cultural heritage setting

Turkey, being a cradle of many different cultures and civilisations during history, in addition to serving as a bridge between eastern and western cultures has a rich archeological and cultural heritage resource. Consideration of these heritage resources has played an important part throughout the planning of the pipeline. Desktop studies followed by field investigations revealed a total of 179 archeological sites within a 2 km wide corridor. Sites discovered during fieldwork, were registered in accordance with the relevant legislation, and appropriate administrators and experts participated directly in the field studies or have been informed. The presence of cultural heritage resources was a considerable factor in route development.

## The social environment

The settlements along the pipeline route and those neighbouring the BTC Marine Terminal are broadly similar in socio-economic characteristics. The majority of settlements are small and rural with fewer than 2,000 inhabitants. Ten percent of Turkey's population resides in the ten provinces in which the pipeline and marine terminal are located, and 0.2% live within a 4 km wide corridor centred on the pipeline Right of Way.

Population patterns along the pipeline route in general reflect local environmental characteristics. The more mountainous and gently rolling steppe landscapes of the north-east contain relatively isolated high altitude villages with a low and decreasing population density. Conversely, the southern provinces are experiencing in-migration, and are thus more densely populated and generally



# The project setting

more urbanised. Settlements along the pipeline route experience seasonal migration, particularly in northern and some central provinces, where accessibility to isolated villages is hindered in winter months. The settlements neighbouring the marine terminal, have generally had a stable population over the past five years, with the exception of slight increases in the numbers of males associated with construction and operation of various industrial facilities since the 1970s.

Although Turkey is characterised by a diversity of languages, cultures and traditions, the majority of surveyed respondents are Turkish speaking Sunni Muslims. Many of the settlements along the pipeline are geographically remote and often traditional in their attitude towards women and 'outsiders', whereas settlements in the marine terminal study area have already been exposed to increasing levels of industrialisation and are thus more accustomed to outside influences and the socio-cultural differences (see box 6).

## Box 6. Participation of Women in Public Consultation

Ensuring the engagement and participation of women has been a focal point of the public consultation programme. In some instances, barriers had to be overcome where women were unable to attend public consultation meetings. Such barriers included:

- Involvement in domestic or agricultural activities such as the upkeep of animals, seasonal harvesting or care of children and elderly
- The perception that women's interaction with 'outsiders' (especially other men) may damage family honour

Separate women's meetings and individual meetings with women in their homes were held to ensure that women were able to easily access project information and had the opportunity to ask questions freely. This meant the participation of women at a number of the consultation meetings was particularly high, for example in Goksun district centre, Kahramanmaras where 140 women attended one women's meeting.

The main concerns raised by women are generally associated with security and safety, health, impacts to local infrastructure and agricultural activities and employment (particularly for their husbands or sons although in some cases for the women themselves).



Eighty percent of surveyed rural households, within the pipeline corridor, either use or own land for agricultural purposes. Moving along the pipeline route, communal land is replaced by state land as the second most common form of landownership. Livestock grazing dominates the northern and central areas of the pipeline route. The flat southern irrigated Cukurova Plain supports a thriving and diverse agricultural and horticultural economy. Finally, close to the marine terminal, soil fertility falls with the presence of volcanic hills separated occasionally by valleys devoted to agricultural crops. Rain-fed agriculture (non-irrigated) is most widespread in the northern and central provinces, whereas irrigated agriculture becomes increasingly important moving west and south.

Along the pipeline route, there is a high dependency on land with cereal and livestock production as the main sources of livelihood (income and subsistence based). Bee keeping is found in all the provinces along the pipeline route, but is most widespread in Kars and in the central provinces of Sivas and Kayseri. Industry and service sectors are on the whole limited to urban areas, largely in the provincial centres.

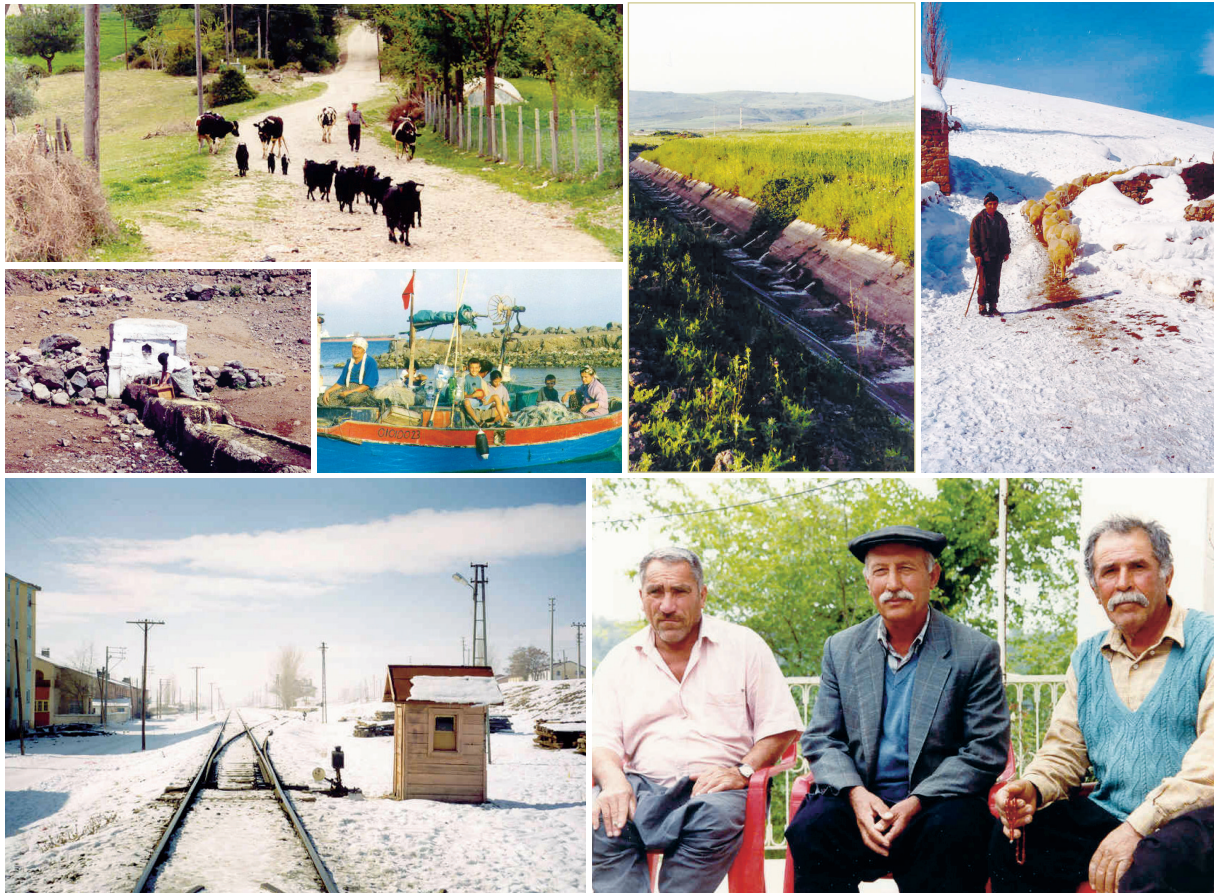
Consultation meetings with women, Sivas



Consultation meetings with women, Kayseri



# The project setting



In the vicinity of the proposed marine terminal, many local residents rely on fishing, agriculture and animal husbandry. This dependence on natural resources continues in spite of the on-going depletion of these due to land expropriation for development purposes and decreased access to fish stocks as a result of jetty developments along the Iskenderun Gulf coast. Waged employment contributes only a small proportion of income to settlements in the study area.

1.	2.	3.	1. Livestock, Osmaniye
4.	5.		2. Irrigation channel, Adana
			3. Shepherd, Sivas
			4. Water fountain, North East Anatolia
			5. Fishing boat, Sahil Sitesi, Adana
6.		7.	6. Railway crossing, Erzurum
			7. Yenigun Residents, Osmaniye

All provinces, in which the BTC Project is located, with the exception of Adana, have levels of Gross Domestic Product (GDP) per capita below the average for Turkey. Approximately 7% of the adults surveyed reported that they are unemployed. These figures do however hide the high levels of underemployment, variations between rural and urban areas and the lack of available formal waged employment.

Infrastructure availability and quality correlates with the degree of urbanisation. Most surveyed settlements are linked to electricity and telecommunications networks, although supply is usually irregular, particularly in central provinces. Water provision varies. In Erzincan and Adana, nearly all surveyed settlements have regular piped water, whereas in Ardahan the majority of settlements have no proper water supply and rely on surface or groundwater sources (eg village fountains, wells, tanks). Sewage and waste disposal is a problem in most surveyed settlements. Residents often identify the absence of formal disposal systems as a factor contributing to poor health. Few of the surveyed settlements have services beyond primary schools, coffee houses, local markets and transport services. A wider range of services of potential use during construction (eg banks, health clinics) is available in district centres.



# Engineering and route selection

## Planning the concept

The BTC Project is the culmination of several years of detailed assessment of options for the export of crude oil from newly developed Caspian oil fields. The assessment has taken account of issues such as safety, technical feasibility, environmental and social implications, capital and operating expenditure, schedule, operability, reputation and Government agreements.

A number of strategic alternatives for the export of Caspian oil were considered. One option was the 'No Development Option'. This option would obviously remove all potential negative impacts arising from the construction and operation of the BTC Project. However, the benefits of the BTC Project (US \$1.4 billion for Turkey), including the income accruing from transit tariffs for the Government of Turkey and the increased operational employment opportunities (mainly at the BTC Marine Terminal), would not be realised.

Possible alternative methods of transporting crude oil were assessed, namely by waterway, road, rail and pipeline. The studies concluded that a pipeline was the most safe and environmentally acceptable option. Pipelines terminating at the Black Sea would require tanker traffic to pass through the Istanbul Strait or oil to be off-loaded into a pipeline to bypass the Istanbul Strait. An Environmental Risk Assessment and additional studies concluded that a pipeline through Azerbaijan, Georgia and Turkey to the Gulf of Iskenderun was commercially viable, and a more favourable environmental option and was therefore the preferred solution.

## Development of the pipeline route in Turkey

The BTC Pipeline route in Turkey has developed through a number of phases and as a result of a number of influencing factors. The various phases of route development and some of the studies and factors that fed into it are shown in figure 7.

Ongoing interaction between the EIA and pipeline design teams resulted in environmental and social constraints being taken into consideration wherever possible in the routing of the pipeline (see box 7). Several route corridors in Turkey, between the Georgian border crossing and the marine terminal in the Gulf of Iskenderun, were evaluated to determine the most advantageous 10 km wide 'Corridor of Interest'. Specific studies were carried out to refine this to a 500 m wide 'Preferred Route Corridor' and then to a 100 m wide 'Specified Route Corridor' in conjunction with the full EIA process. Studies included appraisal by pipeline engineers and specialists in geotechnical engineering and geohazards, assessment by environmental specialists including archeologists and ecologists, and assessment by experts on social issues. The final stage in the development of the route was the refining of the 100 m wide corridor to the 'Construction Corridor' (working width) within which the pipeline will be constructed.

### Box 7. Geohazards

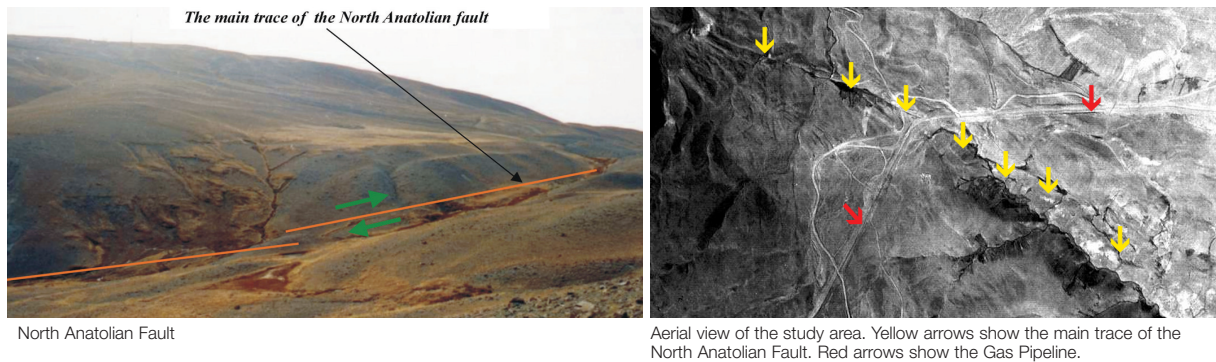
Geohazards had an especially important role to play in pipeline route development. By definition a geohazard is a physical feature that could pose a hazard to the construction or operation of the pipeline. Geohazards encountered during the BTC Project design included areas vulnerable to landslides, fault zones and gypsum areas prone to rapid ground subsidence and ground instability under seismic events. The BTC Project addressed these geohazards through a programme of baseline studies to understand their precise nature and then developed a solution through avoidance, route alignments (eg across fault zones), and other design measures.

#### A typical example of how the BTC Project addressed geohazards is provided by the North Anatolian Fault:

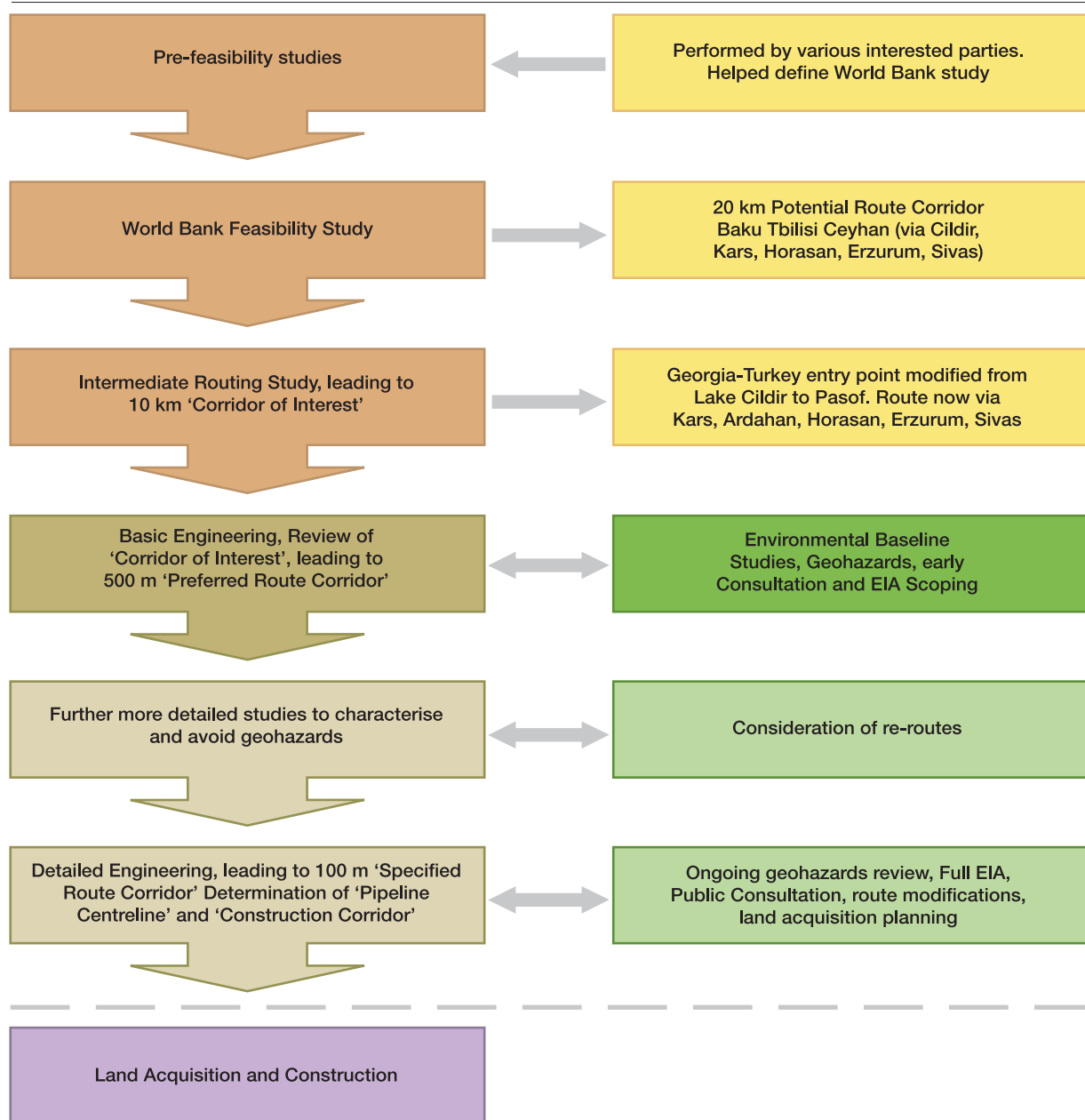
This fault is in the Karadag, a high mountain range north of Erzincan. Ideally pipelines are routed to avoid active fault zones but in Turkey many fault zones run east-west and cannot be avoided by the BTC Pipeline. The North Anatolian Fault zone is crossed twice. Since crossing is unavoidable the BTC Project emphasis was on detailed studies by international experts so that appropriate mitigation measures could be developed. Mitigation included the angle of crossing with respect to the fault configuration (this is critical to pipeline stability in the event of seismic movement), together with various design measures such as pipe wall thickness, trench design and filling material. Another key measure, in the event of a pipe failure is the location of block valves to shut down oil flow either side of the fault zone, should such an intervention ever be needed.



# Engineering and route selection



**Figure 7.** Outline of the Route Development Process



As mentioned above, EIA Scoping influenced the development of the 500 m route corridor. In the course of Detailed Design there have been 193 route changes (see table 1).



# Engineering and route selection

**Table 1.** Summary of route changes

	Route Change Outside 28 m Corridor	Route Change Outside 100 m Corridor	Route Change Outside 500 m Corridor
Archaeology	1	34	-
Ecology	1	5	1
Social	3	7	1
Water Resources	1	14	4
Geohazards	12	16	11
Economy	-	4	-
Constructability	6	7	1
Design	5	6	3
Other Engineering Issues	-	49	1
Total Route Changes	29	142	22

As can be seen from table 1, route changes have occurred for a variety of reasons, many of them very site-specific. A sample of these is given below in box 8.

## Box 8. Examples of route changes

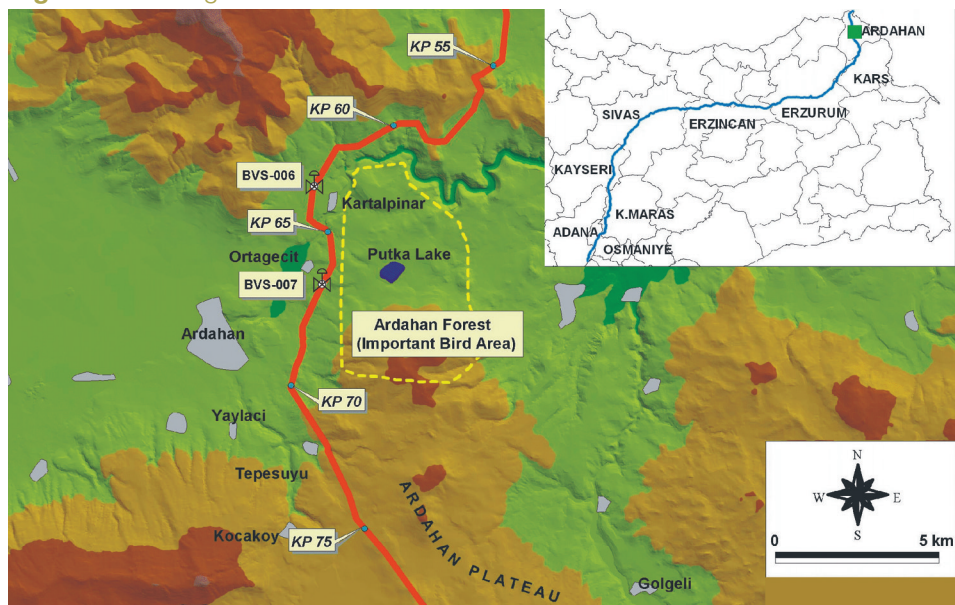
- ▶ Koprucok village, Erzurum Province: the route was modified to avoid two presently unnamed archeological sites encountered during the cultural heritage filed surveys
- ▶ Near the village of Akcatas, Erzurum Province, a river crossing was modified so that crossing at 90° could be achieved, an area containing trees could be avoided and the route could avoid an area of difficult topography
- ▶ Close to the village of Kurbancayir the opportunity was taken to shorten the original route, and in the process pass through more level topography and avoid eroded soils
- ▶ At Geben, Kahramanmaraş Province, the original route passed close to the future Geben dam and in very close proximity to the nearest housing in the settlement (less than 15 m). The route was moved to provide a 250 m clearance and the working width was reduced to 22 m
- ▶ A similar re-route was undertaken at the village of Andirin, Kahramanmaraş Province, to move further away from housing and adopt a narrower working width



Through phased route development, in combination with modifications as new information came to light, a large number of potential impacts have been avoided through route selection. Other examples are provided elsewhere in this document (see figure 8).

The EIA and design engineering teams also worked closely together to identify and assess alternative locations for Above Ground Installations such as pump stations, the pressure reduction station and block valve stations, as well as the temporary construction camp locations and access roads.

**Figure 8.** Routing to avoid Ardahan Forest



# Engineering and route selection

## Evaluation of options for the marine terminal site

In parallel to the pipeline route selection process, five alternative sites for the BTC Marine Terminal at the Gulf of Iskenderun were identified. These sites were assessed against a range of criteria including the minimisation of any negative environmental and social impact. The study concluded that the marine terminal should be constructed within the boundaries of the existing BOTAS terminal site near Ceyhan and that it would comprise a new facility, with its own dedicated jetty, constructed adjacent to the existing facilities.

## Some of the project alternatives considered

Aside from route development and marine terminal site selection, a number of alternatives were considered during EIA and design. The main ones are summarised in table 2 below.

**Table 2. Summary of Main Alternatives Considered**

Alternatives considered	Selected option
<b>Pipeline:</b>	
Pressure reduction station locations: two on hillsides, one in wooded valley, one on level agricultural land	Level agricultural land site was selected for minimised land area required, landscape, reduced visual and ecological impacts
Pump drivers: Consideration of crude oil and gas fired engines and turbines	Gas-fired reciprocating engines were selected for highest efficiency, lowest carbon dioxide emissions and low nitrogen and sulphur oxides emissions
Block valve locations: basic requirements comprised maximum spacing intervals, either side of specified river crossings	Final positioning was based on environmental risk assessment that considered a range of sensitivities, including ecology, groundwater and surface water
<b>Marine Terminal:</b>	
Tanker loading at jetty versus offshore mooring buoy	Jetty selection was based on smaller operational footprints lower construction impacts and existing experience in BOTAS of jetty operations
Oil storage tanks: floating roofs versus fixed roofs	Significantly greater Volatile Organic Carbon (VOC) losses result during tank filling for fixed roofs as opposed to floating roofs, so the latter was chosen
VOC Emissions Control during Tanker Loading: <ul style="list-style-type: none"><li>▶ condensation through refrigeration</li><li>▶ adsorption onto activated carbon</li><li>▶ absorption back into the crude oil</li><li>▶ oxidation via an elevated flare or an enclosed ground flare</li></ul>	Flaring was selected on the basis of significantly higher efficiency in combusting VOCs. Although this results in higher CO <sub>2</sub> emissions, the most viable alternative (absorption) would have local air quality impacts. Initially an elevated flare was the preferred option but this was subsequently rejected on the grounds of noise and visibility in favour of an enclosed ground flare.

## Construction

The pipeline and associated facilities are designed for a minimum lifetime of 40 years. Contractors experienced in major pipeline construction, will undertake construction of the pipeline, terminal and associated permanent facilities, working to the specifications developed by the BTC Project team.

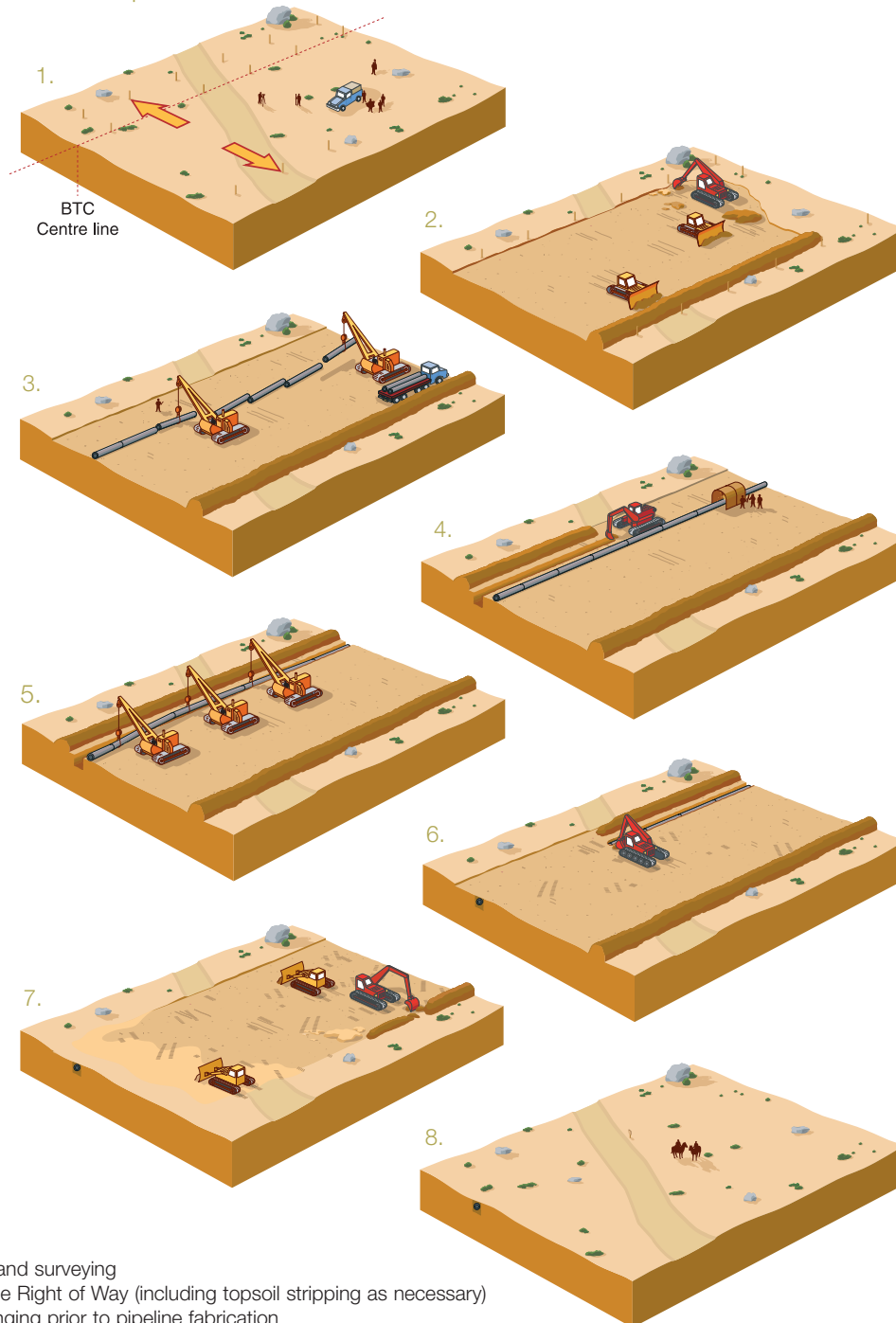
Pipeline construction is a sequential process and comprises a number of distinct operations, undertaken by a large range of specialised and general plant (known as the construction spread, see figure 9). Pipeline construction will be achieved using a number of conventional construction spreads to accomplish pipeline installation, and additional special section crews to accomplish river crossings and other specialised pipe segment installations. Mobilisation and construction is estimated to last from autumn 2002 to late 2004. Should the start of the construction period force two winters' work, then the duration estimate would need to be adjusted since construction slows considerably during the winter months (as some areas of the route may not be accessible). The rate of progress of each sequential operation is dependent on the terrain and the nature of the activity. The direction of



# Engineering and route selection

construction will be at the construction contractors' discretion, in consultation with the appropriate authorities taking technical requirements into account. The construction of the pipeline will require a number of temporary facilities, which will include worker camps, pipe storage yards and temporary access roads.

**Figure 9.** Construction process



1. Setting out and surveying
2. Preparing the Right of Way (including topsoil stripping as necessary)
3. Pipeline stringing prior to pipeline fabrication
4. Excavating the trench (other methods may also be used where necessary)
5. Laying of pipeline in the trench (ditching)
6. Backfilling with subsoil
7. Reinstating the Right of Way (including replacing the topsoil)
8. After completion of reinstatement

Safe crossing points across the construction works taking place along the pipeline route will be provided at all times. Illustrations are for guidance only. Methods and equipment may vary from those shown above.



# Engineering and route selection

## Hydrostatic Testing

The entire pipeline and tank facilities at Ceyhan will be subjected to hydrostatic pressure testing to prove the strength and integrity of the pipeline system. On completion of the construction of the BTC Pipeline, a hydrostatic test will be carried out to demonstrate fitness for purpose of the BTC Pipeline and the associated facilities in accordance with the relevant standards. Water abstraction sources will be selected to suit the geographical location of the pipeline and will be large enough to facilitate filling of the pipeline test sections without any detrimental effect to the surrounding environment and existing resource users. The displaced hydrotest water may be transferred to another section of pipe or discharged at a suitable location. Discharge locations, treatment and rates will be agreed in advance with the relevant authorities.

## Commissioning

Commissioning of the pipeline, block valves and associated AGIs will ensure that the pipeline system has been constructed in accordance with the design and that the system is ready for operation. Commissioning will also ensure that there are no defects in the pipeline system, which could cause problems during start-up or during operation.

## East Anatolian Natural Gas Pipeline reinstatement strategy

The BTC Pipeline will be constructed parallel to the recently constructed NGP for approximately 320 km of its length. Distances between the two laid pipes will be generally in the range of 12 to 18 m. In a number of areas the existing NGP has caused noticeable impacts in terms of land degradation (erosion, soil productivity and visual appearance) and damage to banks at some river crossings.

The BTC Project has developed a two-phase approach to reinstatement in the vicinity of the NGP. Phase I will entail the NGP construction contractor undertaking remedial reinstatement measures prior to the commencement of BTC Pipeline construction in order to remediate existing problems. Phase II will involve the BTC Contractor undertaking any additional mitigation measures in specific areas across the two parallel pipeline corridors.

Specific areas identified as requiring restoration measures prior to, or during, reinstatement of the BTC Pipeline, are as follows and will be fully addressed in accordance with the BTC Project Reinstatement Plan:

- ▶ general reinstatement (principally the reinstatement of the BTC corridor to pre-NGP conditions)
- ▶ adjacent agricultural land, eg in areas of poor topsoil management
- ▶ hill slope reinstatement, eg installation of slope breakers across entire parallel corridors
- ▶ erosion, eg in areas of fill and gully development
- ▶ river crossings, eg bank and bed erosion



# Environmental and social issues

This section outlines some of the key baseline considerations, potential Project impacts, mitigation objectives and techniques, and the main residual impacts of various aspects such as soils, landscape, ecology, livelihoods, health and safety, and concludes with a summary of non-routine impacts and cumulative impacts.

## Soils

Soil is an important environmental resource intimately affected by pipeline construction and closely associated with the functioning of other resources such as landscape, ecology and of course agricultural land use.

Reinstatement of the BTC Pipeline has the objective of helping nature to preserve as much of the soil integrity as possible, by providing a basis for natural processes themselves to complete the process, ie to recover. The more successful reinstatement is, the more rapid recovery will be. Natural flora and fauna will then become re-established, agricultural productivity will return to its former level, and the disturbed landscape will regain the same appearance as its surroundings.

Conversely, where soils are fragile, sensitive to disturbance and difficult to reinstate, recovery processes will take longer. Where this happens, secondary impacts to ecology, agricultural land use and landscape/visual appearance may endure for years and be clearly perceptible. Fragility can derive from the nature of the soil itself, combined with other factors such as slope, topography and run-off characteristics.

Soils along the pipeline route vary considerably in terms of their character, the other resources they support and the existing pressures, such as erosion, they face. The BTC Project has addressed these challenges through a series of studies and close engagement between the environmental and design teams to develop the 'Reinstatement Plan'. The Plan is tailored to the variety of conditions that will be encountered once construction starts and is a fundamental part of the overall environmental management of the BTC Project.

The Reinstatement Plan specifies performance requirements to be met by the construction contractor. These are: to meet specific erosion performance criteria developed by leading experts and attain re-vegetation requirements within specified time constraints. The Plan provides for pre-construction surveys in order to gain an understanding of soil characteristics and flora that are specific to the actual working corridor. Subsequently, the Plan provides for separate stripping of topsoil and subsoil, segregated storage, monitoring and management of the resource during storage and finally its replacement. Provision is also made for slope stabilisation during construction and rapid stabilisation of the reinstated soil, through such means as planting, seeding, selective use of fertiliser and mechanical methods, including use of jute mats. The Reinstatement Plan also addresses related matters such as reinstatement in ecologically sensitive areas and at river crossings.

The BTC Project's planned approach to soil management and reinstatement will ensure that along the majority of the route, soils (and consequential impacts to other resources) will generally be of minor significance. Although soils will be disturbed, their recovery following reinstatement will be rapid. In addition, BOTAŞ has started a programme of remedial works along the route of the reinstated NGP that is addressing areas of erosion caused by the works associated with this Project. This programme is particularly addressing areas of soil erosion and water crossings.

In some areas along the route, however, impacts will potentially be significant. Examples of where this is the case are where the topsoil is thin and underlain by tuff and marl, (see box 9).

Polygonal karst soils, *Xerochrepts*



Montane steppe interspersed with exposures of whitish underlying marl \*



# Environmental and social issues

## Box 9. Soil Types

Tuffaceous soils are derived from volcanic ash and have a low productivity. They are generally present in north-east Turkey and they are an important soil for coniferous woodland, shrubs and coarse grassland. They have less importance to agriculture but are important in the context of landscape amenity and nature conservation. They are thin and vulnerable to erosion. Their subsoil has effectively zero productivity meaning that any mixing of top and subsoil drastically reduces the already low productivity of the topsoil, with a knock-on effect on the vegetation it supports. The subsoil is also whitish in colour with the result that mixing also leads to a visible trace across the landscape.

Marl is a clay material present beneath thin topsoils on hills, plateaux and plateaux scarps and thicker topsoil layers on plains. Where topsoils are thin, agricultural use is usually limited to grazing, whereas on the plains it has an important function in rainfed agriculture. As with tuffaceous soils, mixing of the two leads to reduction in productivity and a visible trace across the landscape.

These are two typical soils that will require special attention during construction and reinstatement. Topsoil thickness will be established so that it can be stripped to a depth that minimises the degree of mixing with the unproductive subsoil. For tuff, shrubs and coarse grasses will be set aside for replanting. For marl, input on the most appropriate site specific measures to be employed will be obtained through expert and landowner (or land user) consultation. In all instances, and throughout the work, soils specialists will be included in the on-site environmental management team. Even with these measures there is still a degree of uncertainty over how such fragile soils will respond to construction disturbance and reinstatement, and how quickly they will recover. A post-reinstatement programme of monitoring and after care will be implemented so that any problems that arise can be rapidly remedied.

## Landscape and visual amenity

The pipeline and its associated facilities will be constructed, and will operate, in a variety of landscapes, many of them with intrinsic aesthetic value. The pipeline will be buried throughout its length, apart from where it emerges at AGIs. While construction of the pipeline will be a clearly visible activity, it will also be temporary and is not viewed as having a significant potential for landscape or visual impact. In the longer term however, the visibility of the pipeline, and therefore its degree of impact will depend on the success of reinstatement and the speed of recovery.

For the majority of its length, where reinstatement will be relatively straightforward, and in areas of little or no landscape value, impacts will be minor. In time, there will be little or no evidence of the pipeline in the landscape. In certain areas, however, particularly where vulnerable soils have been disturbed (as discussed in Soils), the pipeline may cause more noticeable landscape impacts. Mitigating potential landscape impacts in such areas will mainly be achieved by the soil management practices described previously.

The main landscape and visual impacts due to the BTC Project will result from the pump stations, pressure reduction station and the marine terminal. The pump stations and pressure reduction station are located in landscapes of varying quality and their landscape and visual impacts will be of minor significance due to the implementation of landscape plan. To the extent practical, site selection for these facilities has considered landscape issues. For the pressure reduction station, for example, landscape and visual impact was a considerable factor in final site selection following provisional location of the facility in an area of high aesthetic value.

The marine terminal is the largest above ground component of the overall Project. Comprising seven large storage tanks, related facilities, accommodation, an enclosed flare, causeway and jetty it will be a prominent feature in the coastal landscape. The presence of large oil tankers at the jetty will add to the visual impact. However, the terrain and presence of the existing BOTAŞ Terminal will either screen some potential viewers or limit them to partial views. Landscaping and selection of appropriate colour schemes (especially for the tanks and buildings) will further reduce impacts. The coastal settlement at Sahil Sitesi, however, will have a complete view of the causeway, jetty and tanker loading activity. Current and future views of the marine terminal are shown below.



# Environmental and social issues

## Surface water resources

Surface water resources were a key consideration in developing the pipeline route, ensuring that it avoided features such as lakes, reservoirs and future dam projects. The pipeline route will cross more than 150 rivers and streams, as well as ephemeral channels that dry up during the summer. These will all be crossed using an open-cut construction technique ie water flow is maintained at all times. The river crossings will be undertaken by specialist construction crews.

The main impacts to surface water resources will arise from the physical disturbance of construction activity. Potentially this could lead to a number of impacts including:

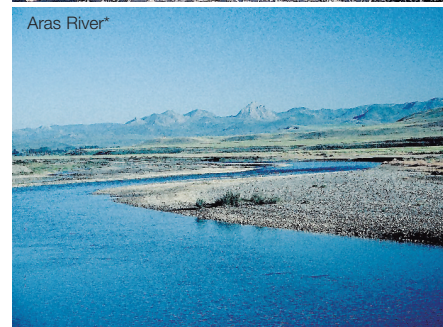
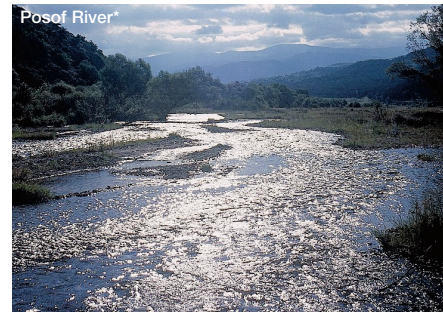
- ▶ bank erosion
- ▶ sediment entering the watercourse from working areas
- ▶ localised changes to drainage in the catchment area
- ▶ consequential effects of the above on habitats and resource use by communities

Wherever possible, periods of low flow will be chosen for watercourse crossings resulting in a quicker deposition from the water column of any sediment released. This is possible because the construction crews have the flexibility to operate to a different schedule from the main pipeline construction crews. Low flow is also a desirable time of year to cross in terms of minimising impacts to fish and other ecological populations. All reasonable steps will be taken to minimise the length of bank and bed that are directly affected. This will be achieved through fencing off such areas and any vulnerable banks that may be susceptible to damage. Bankside vegetation will be kept in place for as long as possible to help reduce sediment run-off into rivers and streams. Each crossing has been examined individually in design so that the crossing will avoid significantly affecting the stability and long-term performance of riverbanks and flood defences. Once construction is completed, the crossings will be reinstated, ensuring watercourses and their banks are returned to their natural state.

Water resources are also susceptible to pollution from construction activities, eg from fuel oil storage and handling. All potential sources of pollution will be subject to strict storage and handling controls and equipment will be maintained on site to deal with possible spills. Wastewater at construction camps (including sewage and domestic waste water, water generated by subsidiary operations) will require disposal. A comprehensive scheme for water re-use, and treatment (to Turkish Legislation and World Bank guidelines and standards) prior to its disposal to soakaway or surface water will ensure that impacts are minor. The other major discharge during construction will result from testing of the pipe for leaks using water. To the maximum extent possible the water will be re-used in the next section of pipe, thus reducing both discharge and abstraction volumes. Where discharge does occur this will be treated to a standard that is acceptable to the authorities and at a location where effects will be minor.

During operation, wastewaters will arise at the pump stations, pressure reduction station and marine terminal. These will mainly comprise treated sewage and domestic effluent and treated surface run-off. All wastewaters will be treated to Turkish Legislation and international standards and disposed of at locations where there is no significant risk of impact to sensitive receptors.

Water abstraction for use by the BTC Project (during construction and operation) is also a potential source of impact. Water resources will be utilised on the basis that they provide a sustainable source for the BTC Project without conflict with settlements and ecological resources that currently rely on the resource.



# Environmental and social issues

## Groundwater resources

Clearly the greatest risk to groundwater resources would be in the event of an operational oil spill at the terminal or along the pipeline. This issue is addressed later in the Non-Technical Summary.

The main potential impacts to groundwater during construction in unconfined aquifers will include:

- ▶ potential contamination from site drainage, discharges or accidental spills
- ▶ local reduction in groundwater levels due to abstraction for project use at construction camps or trench dewatering activities

In the first instance, in accordance with Turkish Law, there will be no abstractions or discharges within 50 m of wells and springs. Materials (eg fuel oils) will be stored and handled in a manner to avoid pollution. All solid wastes will be stored and handled in accordance with a detailed Waste Management Plan. Measures to protect surface water quality will also serve to reduce impacts to groundwater. Moderate, short-term, localised impacts to groundwater are predicted where the pipeline crosses the Pasinler Plain, elsewhere impacts will be minor.

During operation, the BTC Project will need to abstract groundwater for its own use and to discharge wastewaters that could potentially harm groundwater resources. All planned groundwater abstractions will be subject to a sustainability test. The amounts available, other users and the BTC Project's own requirements will all be examined closely to ensure that abstraction for the BTC Project will not reduce the volumes available to others. Some wastewaters may be discharged to soakaways. In addition, discharge locations will be selected well away from other users (including of course the BTC Project itself) and subject to a separate study. A Ground Protection Strategy will be developed during the construction period.



Dwarf Iris (*Iris reticulata*)

## Ecology

In addition to Protected Areas and Protected Species, the BTC Project area contains a large number of threatened and endemic species. Endemic means they are strongly associated with, or only found in, a particular area – in this case Turkey itself. There are also strong seasonal variations in species behaviour leading to many fish, birds and mammals being more sensitive to disturbance at certain times of the year than at others. Routing and planning to construct a pipeline across the breadth of Turkey to a new facility on the Mediterranean coast, while at the same time seeking to minimise its effects on biodiversity, these factors have raised significant challenges for the BTC Project. The BTC Project has faced these challenges in a number of ways from baseline studies to understand the ecology of the BTC Project area through to the development of mitigation measures that are specific to a particular route section or even a single species.

From early in the development of the BTC Project, desk studies and field surveys have been carried out by Turkish and international ecological experts. Over time these have helped build up a picture of the ecology of the pipeline route and the marine terminal surroundings. The information collected was presented and stored on a Geographic Information System (or GIS). This allowed ecological sensitivities to be mapped so that their relationship to the pipeline route, AGIs, marine terminal and other facilities could be clearly appreciated. The involvement of expert ecologists also allowed distinctions to be made between the most important or sensitive sites and those that would be less vulnerable to a pipeline construction project or terminal development. Some surveys were of a general nature, establishing habitats for example, while others were species specific, for example looking at marine turtle use of the Gulf of Iskenderun.

Understanding ecological sensitivities (or constraints) and their locations were significant aids to route development. In the first instance, a pipeline route and sites for AGIs were selected to maximise avoidance of sensitive ecological features. This was a progressive activity so that in the early stages of route development the emphasis was on avoiding areas that are designated or protected in Turkey for nature conservation purposes. As the BTC Project moved on, and more was learned, routing decisions and other design factors were influenced by route/site-specific habitats and species.



# Environmental and social issues

One important consideration in certain areas will be the actual timing and duration of the works. The EIA has established sensitive times of year including fish breeding and migration at river crossings, locations where sensitive birds and bats may breed, hibernation periods for Eurasian Brown Bear, and marine turtle use of nesting beaches, (see box 10). The BTC Project will avoid working in 'absolute constraint' areas at sensitive times. Where permitted, additional and special mitigation measures will be applied to allow works to proceed. Elsewhere, in several areas of sensitive and protected plant species, the approach will be to complete the work within a specified time period, while observing all the required management measures, so that natural recovery is made easier.



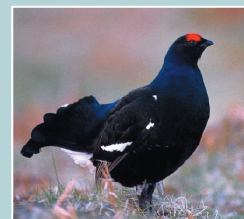
Eurasian Brown Bear

Nevertheless, disturbance of habitats and species will be unavoidable. Reinstatement will address this in terms of mitigating impacts to plant species and habitats in general. In some places reinstatement will also include species transplantation. The EIA and associated management plans also make provision for species-specific protection measures. Other specific measures will include narrowing the working corridor, especially in particularly sensitive areas and all forested areas. Environmental management during construction includes commitments to further surveys at some locations in order to resolve uncertainties over, for example, the precise locations of certain features, their spatial extent and site-specific reinstatement needs. The construction works themselves will involve supervision in sensitive areas by ecological experts and close monitoring of impacts and mitigation. Post-reinstatement surveys will be undertaken to monitor the progress of reinstated areas and so that if remedial action is required it can be undertaken quickly and effectively.

## Box 10. Protected Species

**Eurasian Brown Bear (*Ursus arctos*)** can be found along the route at Posof, Ardahan and Sarikamis Forests. The greatest threats to the Turkish Brown Bear are hunting and deforestation. In terms of the BTC Project itself, bears would be most vulnerable to impact during the winter hibernation period, and to a lesser extent when the bears, often with newly born young, emerge for the peak spring feeding period. Bears range over very wide areas in search of food and tend to avoid contact with humans. The main Project mitigation measures will include: pre-construction surveys to ensure no dens are present on the Right of Way; avoiding construction during the hibernation period where dens are found; habitat reinstatement; specific measures (eg for waste management). In all three locations where bear habitat may be crossed the route has been modified to minimise the level of disruption.

**Caucasian Black Grouse (*Tetrao mlokosiewiczii*)** is a Globally Threatened species with a restricted range. Its preferred habitat is the high altitude conifer forest and the alpine meadows around its edge. Overgrazing and deforestation (ie habitat loss) and hunting are the main pressures on this bird. As with brown bears, the BTC Project has sought to minimise impacts through route selection (and narrowed working widths) in the bird's key forest habitats. Other key measures include no construction during the main breeding period of April to July. Pre-construction surveys by expert ornithologists and special attention will be given to habitat reinstatement.



**Sub-alpine meadows** are crossed by the pipeline in several locations towards its northern end. Surveys have determined that these meadows show high floral diversity, and include a number of species that are afforded protection and/or grow only in Turkey. The main mitigation measures for these areas will include the following: pre-construction surveys by expert botanists to finalise the reinstatement measures so that they are site-specific and to identify any particularly important species for which transplantation is a viable option; a three week target between topsoil stripping and reinstatement.



# Environmental and social issues

## Air quality

During construction of all the BTC facilities the main potential impacts to air quality will be from dust. Although there will be emissions from moving vehicles, fixed plant and generators these are unlikely to cause any ambient air quality problems. Regardless of this, all vehicles and plant will be maintained in good condition to ensure their efficiency and to minimise emissions to atmosphere.

Certain soils, during dry weather and strong winds, can be blown some distance from where they are disturbed, although most soil particles will settle within 250 m and less. Some communities have expressed concerns over dust settling on crops and potentially affecting yields near to the working areas. Dust is readily controllable and the BTC Project will implement measures when (during dry, windy weather) and where (near crops, dwellings and sensitive natural areas) they are required. These will focus on controlling dust at source by, for example, wetting surfaces and enforcing limits on vehicle speeds over dry surfaces.

During operation of the BTC Pipeline, gaseous emissions to atmosphere will be limited to the four pump stations and the marine terminal. The main pollutants of concern at the pump stations will be nitrogen and sulphur oxides (NO<sub>x</sub> and SO<sub>x</sub>). Since gas has been selected as the fuel for the pump drivers, sulphur oxide emissions will be low. The pump drivers have also been selected for high efficiency and good performance on nitrogen oxide emissions. Ground level concentrations of these pollutants will be well within Turkish and international air quality standards at all four pump stations.

The air quality issues for the marine terminal are quite different. The operation of loading an oil tanker displaces gases, called Volatile Organic Compounds (or VOCs) from the tanker. VOCs can have direct implications to human health. In addition, when mixed with nitrogen oxides typically generated from power stations, they can also lead to ozone formation at ground level. In high concentrations, ozone can also have human health implications and damage crops. As described earlier, VOCs generated during tanker loading will be collected and piped to an enclosed ground flare for efficient incineration. This is currently viewed as the most appropriate way to minimise potential local air quality impacts. Consequently, effects on ground level air quality due to emissions at the marine terminal will be well within accepted limits.

## Noise and vibration

Construction is inevitably a noisy activity. Noise sources will comprise a variety of stationary and mobile construction plant along the working corridor. Especially noisy activity will include pile driving at the jetty, sheet piling at some locations, including crossings of railways and major roads. Where surface rock outcrops are encountered it may be necessary to use explosives to break up the material. Although on the face of it this may seem an activity with high noise potential, in reality charges will be buried and covered over. Blasting will be a very carefully managed activity, undertaken by specialist contractors, with full advance notification for nearby residents and communities. Blasting will not be undertaken at distances (usually less than 50 m) that could cause structural damage to buildings, including archeological features.

Although pipeline construction noise is inevitable it will also be a temporary activity. With the exception of the pump stations, pressure reduction station and some of the major crossings, noisy construction activity at any single location will rarely exceed four weeks. In addition, the noise levels will not be constant. At any single location, pipeline construction will comprise a sequence of activities moving past, each with differing noise characteristics.

Noise impacts have also been reduced to a significant extent during route selection, since one objective of routing was to ensure the widest possible margin between settlements and the route. Night-time working (22:00-06:00) will be avoided where possible.

Nevertheless, the pipeline route and its associated facilities will largely be built in quiet rural settings. Where construction activity is close to settlements and dwellings, mobile noise barriers will be used to further reduce noise levels. Noise at residences in such locations will be monitored so that additional measures can be adopted if problems are revealed. For especially noisy activities close to houses, residents will be notified in advance.



# Environmental and social issues

During operation, noise impacts will be much lower. The only substantial noise sources will be the pump stations and pressure reduction station. The pressure reduction station is sited well away from residential areas. Since the pump stations include accommodation areas, noisy machinery will be acoustically designed and enclosed to shield the accommodation from noise. Offsite impacts will therefore be minor and well within Turkish and International Standards.

Noise impacts due to construction and operation of the marine terminal will also be minor at most locations, mainly due to the separation distance of residential areas from noisy activity on the site, in combination with the application of good construction practice. The noisiest operational feature on the site will be the enclosed ground flare. Good acoustic performance was one of the criteria in selecting this option and further reductions will be sought in ongoing design.

## Traffic and transport

The vast majority of traffic and transport related issues are associated with construction activity. Construction of the pipeline represents a considerable undertaking in terms of moving pipe, equipment, people and supplies from various locations to the points at which they will be used along the route. The BTC Project has therefore comprehensively examined logistics issues not only to minimise potential impacts but also to improve efficiency and potential cost savings.

As an example, the BTC Project has examined options for moving pipe from possible manufacturing locations and ports to the main sites where it will be stored for distribution along the route. Rail transport to these main distribution centres appears to offer distinct advantages over road transport and is being examined closely in terms of feasibility, cost and reliability.

Eventually pipe, equipment, personnel and materials will be transported to the working corridor itself and this will, in many areas, involve the use of small local roads. In some of the remoter areas along the route these roads are relatively little used, although important to local settlements. Project traffic movements along them will not reach levels that could cause congestion or air quality impacts, but could noticeably increase noise in very quiet areas and pose a community safety issue. Generation of dust from dry road surfaces can also be a significant problem with large vehicles. Road quality is a concern. Some roads are not designed for heavy vehicles and the BTC Project will improve them in advance of the works. There is a potential for Project traffic to damage road surfaces and the BTC Project is therefore committed to reinstating all the roads it uses to their pre-work condition as a minimum.

These are all issues that are amenable to management and the BTC Project has addressed them in two ways:

- ▶ general traffic and transport related issues are covered in the Traffic Management Plan
- ▶ community safety issues arising from vehicle movements are addressed in the Community Safety Management Plan



Construction photos for illustration purposes only



# Environmental and social issues



Cobandede medieval bridge, Erzurum



Alaouite cemetery, Sivas



Meryemcil castle, Kahramanmaraş\*

## Cultural heritage

Cultural heritage resources, especially archaeology, were important considerations throughout the planning of the BTC Project. The cultural heritage of an area may be profoundly affected by a large-scale construction project, if it is not handled sensitively. Through careful management, however, it has been possible to plan the BTC Project to minimise the impact on cultural resources and, in addition, provide a substantial increase in the quantity of archeological information available for the BTC Project area (as described earlier in 'Project Setting').

The best way to manage impacts to archeological sites is to avoid them in the first place. As information was acquired on site locations this was fed into the route engineering development through all its phases so that definition of the 500 m, 100 m and working corridors have all taken account of the presence of archeological sites and the route has been modified on many occasions in response. It is possible that further important archeological remains will be encountered during construction. As part of the strategy to deal with archeological resources, further surveys (including trenching and geophysical surveys) will be undertaken prior to construction to reduce the potential for presently unknown resources to be damaged. Where appropriate, it may be necessary to conduct salvage excavations for newly identified archeological sites and significant archeological features that cannot be avoided by changes in the route. A Cultural Heritage Management Plan has been formulated which sets out procedures to be implemented and adhered to during construction for dealing with any archeological resources that are encountered.

There are, however, a small number of sites where moderate impacts to archeological resources are predicted. This is primarily because the route cannot avoid these sites due to the presence of other constraints such as terrain and occupied settlements. The extent of these sites will be investigated during further field surveys prior to construction to determine the need for detailed surface research and/or rescue excavations. Further surveys will also identify a 'minimum impact' route through these sites and other site-specific protection measures.

Overall, impacts to cultural heritage have been managed through avoidance and site investigations. Ways to reduce impacts further, both before and during construction, will be implemented through the Cultural Heritage Management Plan, (see box 11).

### Box 11. Key features of the Cultural Heritage Management Plan include the following:

- ▶ a protocol has been signed with the Ministry of Culture governing the investigative works to be carried out along the route
- ▶ implementation of the Plan will be by suitably qualified archeological supervisors
- ▶ all topsoil stripping and, in some locations, trench excavations will be monitored in the form of a 'watching brief'
- ▶ should currently unknown archeological remains be encountered, work will be stopped and the appropriate authorities informed. Depending on the opinion of the authorities, an appropriate course of action will be identified and implemented. Depending on the extent and nature of the remains, this could involve a short cessation of activity at that site, the demarcation of a restricted working width, or for more significant finds, it may be necessary for the contractor to implement a 'move around' while archeological investigations are carried out
- ▶ exceptionally, if significant remains are discovered that cannot be recorded within the normal programme, it may become necessary, by instruction of the relevant Museum Directorate representative, for the contractor to provide protection of the deposits under the running track by provision of 'bog mats' or stone tracks over short distances



# Environmental and social issues

## Livelihoods

Animal husbandry and subsistence agriculture are the two main forms of livelihood along the pipeline corridor. Settlements neighbouring the BTC Marine Terminal rely predominantly on fishing, agriculture and animal husbandry, with a small proportion involved in wage labour.

Along most of the pipeline corridor, the BTC Project will not have any significant impact on livelihoods. This is because the pipeline will be buried and most land used as part of the 28 m working width will be reinstated within a maximum period of four months (except at the AGIs where land take will be permanent).

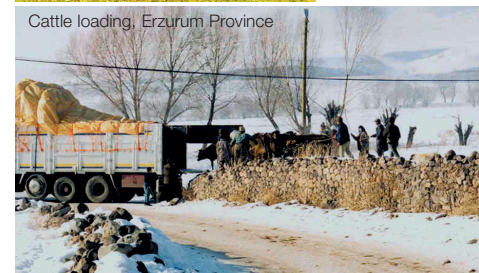
There may be situations, however, where the BTC Project could affect livelihoods. For example, land expropriation will result in a reduction in the availability of grazing land at Pump Station 1. Also, the BTC Jetty and associated exclusion zones may impact on the livelihoods of fishermen from Golovasi and Sahil Sitesi (settlements near the marine terminal), as a result of decreased access to fishing areas. The exact extent of this impact is currently being confirmed through additional studies. It is anticipated that the results will be published before the end of this EIA Disclosure Period.

The BTC Project has assessed these impacts and has developed a set of management and monitoring plans to address these and many other issues (see box 12). The strategy for land acquisition is based on compensation for loss of livelihoods, and follows guidelines set out by the World Bank and Turkish legislation.

It is expected that there will be economic benefits through potential employment opportunities and sourcing of goods and services resulting from the BTC Project, as discussed in the employment section.



Bee keeping activities



Cattle loading, Erzurum Province



Fishermen of Golovasi, Adana

### Box 12. Bee Keeping Along the BTC Pipeline Route

During Consultation it was established that bee keeping is conducted in all provinces through which the pipeline passes. Initial consultation revealed it is an important economic activity in some central and southern provinces, namely in Sivas (Imranli district), Kayseri (Fettahdere village and Sariz district) and Kahramanmaras (Andirin and Goksun district centres). Consultation at the village level conducted during September – October 2001 revealed concerns regarding the potential impact of pipeline construction on bee keeping activities.

*“The region around Fettahdere [Kahramanmaras] is famous for its diverse flora and therefore the honey produced is regarded as very valuable with bee keepers from outside the region competing for use of the flora. Bees fly over a distance of 4km to access flora for honey production. We are concerned that our bee keeping activities will be impacted by the construction of the pipeline, which will be approximately 1km from our village.”*

To address and investigate these concerns, a specific study was undertaken by an agricultural engineer specialising in bee keeping and honey production in Turkey. The study outlined the seasonality of bee keeping activities, the different bee keeping methods (stationary and mobile) that are applied in Turkey, the economic aspects of bee keeping and the potential impacts of construction on bee keeping. The recommendations for mitigation included the following measures:

- ▶ Confirming of the presence of bee keeping activities and determining whether they are mobile or stationary apiaries
- ▶ The area for expropriation along the pipeline route will be marked at least two months before the beginning of the honey production season
- ▶ Sub-governors and Muhtars in all areas where bee keeping is carried out, will be notified with an official letter, that they should not give permission to mobile bee keepers to position their hives within 300 m of the pipeline route
- ▶ At least two months before the beginning of the production season, the BTC Project will inform sub-governors and Muhtars of the need to move stationary apiaries more than 300 m from the pipeline route



# Environmental and social issues

## Employment

Currently opportunities for paid employment along the pipeline corridor are low, particularly in rural areas. Employment is therefore considered to be the most important potential benefit that the BTC Project can bring to local residents.

The BTC Project aims to maximise the opportunities for employment for local residents and to Turkey as a whole, whilst recognising the varied skill sets necessary for the construction and operation of a project of this size and other limitations such as the project timetable, financial constraints and safety of the BTC Project.

It is estimated that a total of approximately 5,000 workers will be employed at the peak of the construction phase. This will include skilled, semi-skilled and unskilled workers. Many skilled and semi-skilled positions will be for the whole project construction period. For the pipeline component, most unskilled construction positions will be for two to four months duration as construction teams move along the pipeline route. Longer periods of unskilled construction employment will be available at the construction camps, the main AGIs, such as pump stations, pressure reduction station, etc, and the marine terminal.

Upon commissioning, it is anticipated that up to 150 people will operate the pipeline and its AGIs in Turkey, and about 200 people will operate the marine terminal. All workers will receive appropriate health and safety training and job specific training as required. Settlements directly affected by the BTC Project will be given employment priority, followed by residents of the districts and provinces traversed by the pipeline or within which the BTC Marine Terminal is located. Turkish nationals will be given priority over expatriates, who will only be used where their particular skills and experience cannot be supplied by Turkish nationals.

There is a high expectation of local project employment in the settlements along the route and those adjacent to the BTC Marine Terminal. However, when compared to the total population of the neighbouring settlements, the BTC Project will provide a limited number of employment opportunities. To address this, information on employment opportunities and the recruitment process will be detailed in an Employment Strategy (see box 13), that will be developed in conjunction with the Contractors, BOTAŞ and BTC Co and communicated to all settlements within the pipeline corridor and adjacent to the BTC Marine Terminal. Concern remains, however, that the inability on the part of the BTC Project to deliver on high employment expectations could impact on relations between the BTC Project and local settlements.

### Box 13. Employment strategy

The Employment Strategy will assist in managing employment expectations and will ensure that all those eligible have access to the recruitment process. Its objectives will be to maximise local employment in skilled, semi-skilled and unskilled categories during construction and operation of the BTC Project, to provide a fair and transparent recruitment process and to enhance the local skills base through training provided by the BTC Project.

Examples of employment opportunities (for illustration purposes only)



# Environmental and social issues

## Supply chain and procurement

Construction will require the use of a variety of goods and services. Community expectations regarding the possibilities of providing goods and services to the BTC Project are high. As far as possible, the contractor will procure goods from local suppliers both through preferential letting of sub-contracts to local firms (subject to availability, quality and cost) and purchasing of goods from local retailers. This will have a positive impact on local livelihoods.

## In-migration

A sudden influx of job-seekers as a result of the BTC Pipeline and Marine Terminal is considered unlikely. However, a more gradual influx of job seekers to the Iskenderun Gulf Area, as a result of on-going industrialisation is expected. A policy on preferential employment of local labour will be published and implemented to try and counter any influx of labour.

## Infrastructure and services

As a result of the overall poor quality of infrastructure and services in project-affected settlements, local residents and local authorities along the pipeline route are sensitive to any temporary or permanent reduction in infrastructure or service provision. The BTC Project has therefore, been designed to be largely self-sufficient in terms of telecommunications, energy, water supplies, sewage treatment, waste disposal and medical services, although it will use local roads and will access some energy and water from existing local supplies (see box 14).

### Box 14. Mitigation of impacts on infrastructure and services

In order to mitigate against any negative impacts on infrastructure or service provision, the BTC Project will implement a number of key mitigation measures.

These include:

- ▶ use of appropriate construction techniques
- ▶ prior identification of features to be protected and/or reinstated
- ▶ working only within specific working areas
- ▶ identification of potential disruption in advance and where these have significant impacts, develop alternatives
- ▶ communication of all planned disruptions to the affected settlements at least three days in advance of the disruption
- ▶ restoration of all infrastructure to their pre-construction condition
- ▶ maintenance of flow in all irrigation channels, wherever possible
- ▶ implementation of a complaints and compensation procedure

In a Project of this size it is likely that there will be some instances (largely unforeseen or unplanned) when infrastructure or services, including irrigation networks, are disrupted without notice or prior planning. A complaints procedure will be publicised at settlements along the route and in the vicinity of Ceyhan to ensure that a mechanism exists for anyone with a grievance to inform the BTC Project of their concern. All concerns will be investigated by the BTC Project management.



Pipeline passing beneath railway line



Satellite communication system



Pipeline avoiding existing infrastructure



# Environmental and social issues

## Resource ownership and use

With regards to the BTC Pipeline, the major impacts on resource ownership and resource use will result from temporary and permanent expropriation of land required for construction of the pipeline and associated facilities, most importantly the four pump stations, the pressure reduction station, the 52 block valve stations, pipe storage areas and construction camps. With regards to the BTC Marine Terminal, the major impacts are likely to result from the construction of the BTC Jetty and the associated decrease in access to fishing grounds currently used by fishermen from Golovasi and Sahil Sitesi.

Some concern exists among surveyed households over the level of compensation that they will be awarded, and the length of time it will take to obtain compensation. A detailed strategy for land acquisition is currently being prepared in accordance with international standards. This study will ensure that affected persons are fairly and equitably compensated for their land and assisted in restoring their livelihoods (see box 15).

### Box 15. Land Acquisition

The BTC Project has been carefully planned to completely avoid residential areas, therefore it will not require any physical resettlement. Land will however be required to construct the pipeline and all associated facilities. For most of the pipeline route, this land will only be required on a temporary basis, until construction is complete.

Approximately 3,000 ha of land along the pipeline corridor will be acquired, which will involve the permanent expropriation of an 8 m wide corridor and land for AGIs, including the temporary expropriation of a 28 m corridor (22 m corridor in forest areas) for pipeline construction. This accounts for a small portion of some 10,000 parcels of land, affecting approximately 25,000 landowners or users for a period of time.

A Land Acquisition Plan (LAP) is currently being prepared to address land acquisition and compensation issues. The LAP process involves the identification of landowners and users. In accordance with the recently revised Turkish Law and international best practice guidelines, an agreement on compensation will be reached with all landowners and users on the price of the land as well as for physical assets (trees, fences, water wells, etc.), and any crops on it. The value of these assets will be determined by a land evaluation team and will be made in accordance with fair market value through a negotiation team prior to the land being acquired and construction commencing.



Concern also exists over potential injury to livestock, potential reduction in fishing activities downstream of river crossings, and potential impact on bee keeping. The BTC Project has committed to ensuring safe movement and undisrupted access for livestock across the Right of Way; to prevent impacts on fisheries immediately downstream of pipeline crossings; and to preventing unnecessary disturbance of apiaries.

## Community health and safety

Potential health impacts associated with the BTC Project (eg an increase in communicable diseases) is expected to be effectively controlled as a result of obligatory health screening for all successful applicants and the implementation of a Disease Awareness and Prevention Strategy, to be targeted at the BTC workforce and all settlements close to construction camps. A residual benefit of the BTC Project is thus improved health awareness among local residents and the workforce.

Safety risks as a result of construction work and associated activity will be of a low intensity and for the majority of settlements will be restricted to approximately two to four months duration of pipeline construction activity at any one particular location. Safety of the workforce and neighbouring communities is, however, a project priority. The BTC Project is therefore committed to preventing injury to local residents, the workforce and livestock, as a result of construction activities. The hazards posed by construction activities will be mitigated through a combination of communication with local residents and by implementing good working practices.

Increased traffic loads on neighbouring roads will present the greatest safety hazard for the BTC Project. To mitigate against this, traffic awareness training will be provided at local schools and at community meetings, and controls will be put in place to ensure that all construction traffic will travel at least 10 km/h below the legal speed limit.



# Environmental and social issues

## Social disturbance

Settlements within close proximity to the construction camps (ie accessible by foot) or within driving distance could potentially experience disturbance from construction workers. However, all construction workers will have to abide by a Workers Code of Conduct that will include disciplinary measures for those that break Code requirements. It will cover such issues as having respect for local settlements and customs, not allowing any fishing, hunting or unauthorised gathering of natural products by construction workers, or illegal sale or purchase of alcohol or drugs.

## Community relations

A Community Relations Programme has been designed in order to mitigate impacts from construction workers; minimise the potential for conflicts to arise; rapidly resolve any potential areas of friction; and look for ways in which the BTC Project can benefit local residents. As part of this Programme, the Construction Contractor will be required to develop a Community Relations Plan which will emphasise that workers conduct themselves as guests in the BTC Project area, and that any problems arising are rapidly resolved. The BTC Project will also appoint a Community Relations Team to monitor satisfactory implementation on effectiveness of all community relations procedures during both construction and operation of the pipeline. Cultural awareness will be included in the induction training for all workers.

Regular community meetings and open channels of communication will be actively promoted by the BTC Project. Should these measures prove ineffective, all settlements will be provided with contact details and all complaints will be dealt with promptly.

## Risk assessment, oil spill prevention and response

An extensive programme of Environmental Risk Assessment (ERA) was undertaken for both the pipeline and the marine terminal. The BTC Pipeline ERA enabled the number and location of block valves, for isolating sections of the pipeline in the event of a leak, to be optimised. It additionally provided the basis for rational judgement and decision-making regarding such matters as the adequacy of key design measures, such as burial depth and pipeline wall thickness. It will also allow the detailed development of the Oil Spill Response Plan, including determining the oil spill response equipment to be made available at particular locations.

An ERA of oil spills impacting the marine/coastal environment has been undertaken. The risk assessment comprised the following elements:

- ▶ Technical Risk Assessment (TRA) with quantification of the frequency of accidental oil spills to the marine environment. The TRA is limited to the tank farm, the transport pipelines from the tank farm to the jetty, the jetty, the loading arm and to accidental events with the tankers within the operational zone of the terminal
- ▶ Oil drift modelling based on scenarios defined in the TRA
- ▶ Description of environmental conditions relevant for the risk assessment and establishment of Valuable Ecosystem Components (VEC), which will act as risk indicators. These were: fish and fisheries; salt marshes; waterfowl; sea turtles; and sea mammals
- ▶ Assessment of consequences of the VEC, based on the results of the oil drift modelling and effects of oil on the actual VEC
- ▶ Assessment of risk as a combination of frequency of an oil spill and its consequences to the VEC

The results show that the frequency and consequence values for the salt marsh (Valuable Ecosystem Components - VECs) is higher than for the other VECs. This signifies that the salt marshes in Yumurtalik lagoon have the highest environmental consequence due to operation of the BTC Marine Terminal. The Yumurtalik lagoon is also important for the waterfowl VEC and partly for the fish and fishery VEC. This acknowledges that the Yumurtalik lagoon is very sensitive and vulnerable to an oil spill from the oil export terminal. The dominating wind direction in the winter half-year makes oil drift south-southwest and possibly into the lagoon. In contrast, the predominating winds in the summer half-year, tends to press the oil further in to the Gulf of Iskenderun and there is therefore a lower probability of oiling the sensitive areas of Yumurtalik lagoon.

The second highest environmental risk is to the sea turtles, which are particularly sensitive during their breeding season from May until the end of September when the newborn sea turtles leave their nest.



# Environmental and social issues

The results of the risk assessment work will be used in developing the Oil Spill Response Plan. To minimise the local and long range impacts of such spills, prompt response is required as set out in the Oil Spill Response Plan. This will be supplemented by the Coastal Sensitivity and Shoreline Protection Plan and Containment Manuals.

## Cumulative impacts

An assessment has been made of potential cumulative (combined) impacts of the BTC Project with present and anticipated future third party projects. This has been undertaken at the global, regional, national and local level.

At the global level, the BTC Project's contribution to greenhouse gas emissions will occur primarily during operation, when the BTC Project in Turkey will contribute approximately 0.0025% (or 1/40,000) of global anthropogenic emissions of CO<sub>2</sub>.

At a regional level, the BTC Project, together with the Azeri, Chirag and Gunashli (ACG) and the Shah Deniz oil and gas projects, will provide significant developmental benefits to the economies of Azerbaijan, Georgia and Turkey.

At the national and local level, cumulative impacts are likely to occur due to the parallel development of the proposed BTC Pipeline, the proposed South Caucasus Pipeline (referred to in Turkey as the Shah Deniz Pipeline) and other planned infrastructure projects, including the proposed Koroglu Dam, and the Sugozu Power Plant (currently under construction) and the Sanko Holdings Petrochemical Plant. At a national level, considerable socio-economic benefits are expected from the inward investment and potential revenues associated with these developments, whilst the application of Turkish environmental and planning control legislation are viewed as providing appropriate mechanisms for mitigating and monitoring any potential negative impacts that might accrue.

At the local (route) level, there exists significant potential for cumulative impacts to arise at specific locations where BTC construction activities are scheduled to take place in close proximity to construction of the Shah Deniz Pipeline. Joint working arrangements are being discussed between these two projects, should their respective construction programmes indicate parallel or overlapping timetables.

The Iskenderun Gulf area has been identified as an industrial zone. There are three existing jetties and three planned jetties within the Gulf, each of which will have an associated marine exclusion zone. Other developments will also require land. Therefore, as development increases, the size of the fishing grounds available to local fishermen and land available for agriculture will continue to decrease. Although jobs will increase as a result of industrialisation, local residents, especially among the older generation, do not necessarily have the skills needed to gain employment. Without the necessary skills, local residents may have difficulty replacing lost sources of livelihood.

The BTC Project is committed to assisting in training local residents for transferable job skills thereby maximising the potential for local people to secure employment within the wider project area. However, such efforts will fall short of addressing all the cumulative impacts of industrialisation in the Iskenderun Gulf area, which is clearly not the full or sole responsibility of the BTC Project.

BTC Owners are committed to the implementation of a programme of sustainable community investments that are directed at settlements affected by the BTC Project. This programme will go some way towards bringing additional direct benefits to these settlements.



Sugozu Power Plant



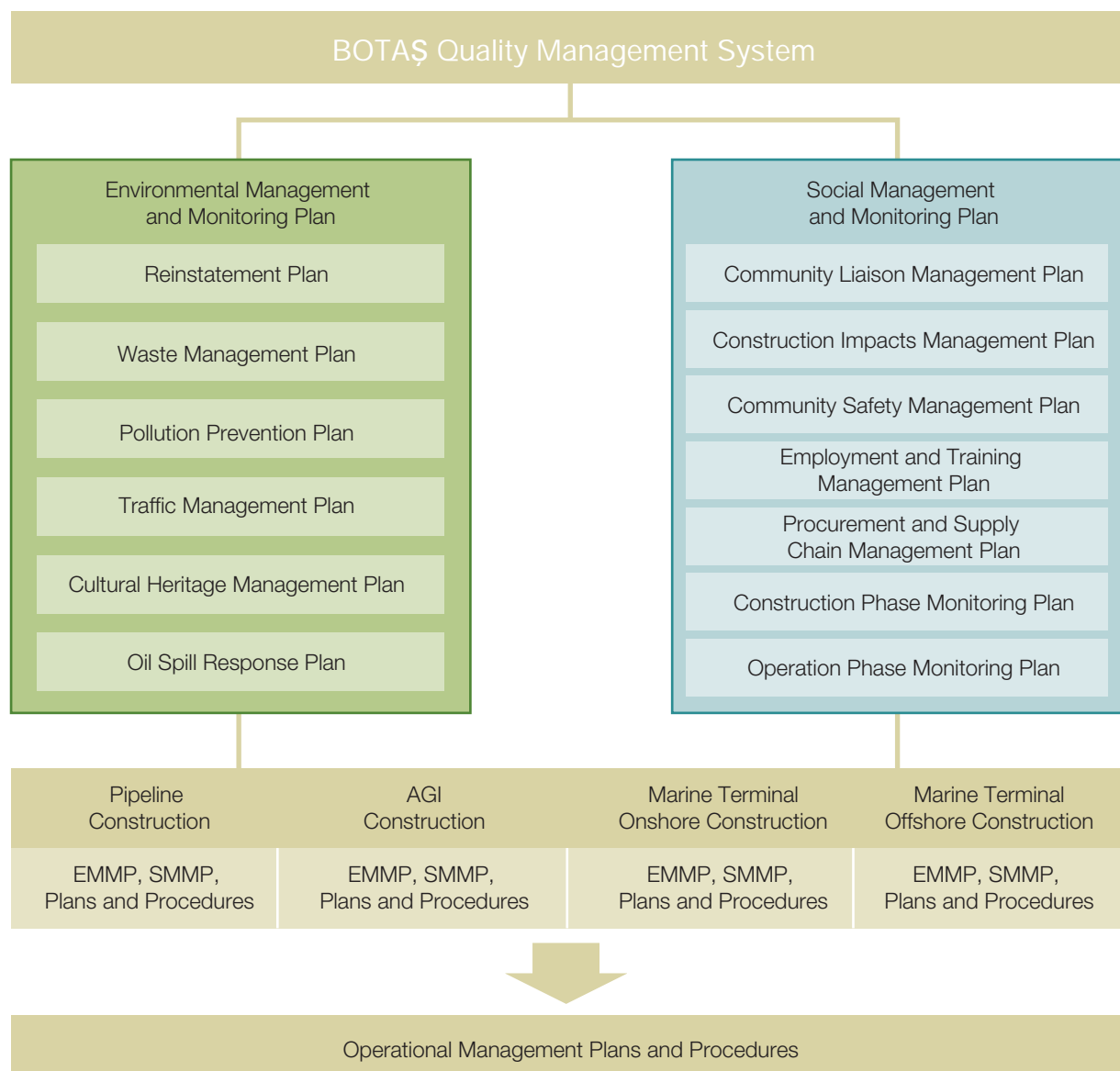
# Implementation and management

This EIA has identified a large number of measures that will be implemented to minimise and mitigate the various potential environmental and social impacts from the BTC Project. There are two broad categories of mitigation measures:

- ▶ good practice measures specific to the nature of the intended activities that will ensure the facilities are built and operated to standards of international best practice
- ▶ site-specific measures, the implementation of which will be mandatory in order to validate the basis (and hence conclusions) of the EIA

While the draft EIA report (and this Non-Technical Summary) presents the findings and commitments resulting from the EIA process up to the point of disclosure, the integration of environmental and social considerations into the implementation phases of the BTC Project will be an ongoing and dynamic management activity. A key vehicle for the delivery of environmental and social management scrutiny and control is the suite of management plans listed in figure 10.

**Figure 10** Overview of Environmental and Social Management



# Implementation and management

BOTAŞ is BTC Owners' managing Contractor for the BTC Pipeline Project. The BTC Owners are committed to the full integration of environmental and social management requirements within the overall Project Management System to be applied to the construction, operation and eventual decommissioning of the BTC Project. Currently BOTAŞ Quality Management System is providing the overall framework for managing the design and construction of the BTC Project in Turkey. Within this, BOTAŞ has developed an Environmental Management System, in accordance with the international standard ISO 14001, for which they were accredited during the Basic Engineering phase of the BTC Project.

The management plans provide the mechanism for implementation of each and every mitigation measure and commitment identified by the EIA process. These plans also provide important information to a range of individuals from the BTC Project Directorate down to site personnel and from BTC Owners and BOTAŞ through to Construction Contractors and sub-contractors. The Construction Contractors are required to adopt the suite of management plans described above, and to develop these further in an iterative process according to the specific requirements of the activities they will be engaged in. This process has been initiated by including the requirements in the Invitation to Tender documents issued to prospective contractors. The development of these plans will be subject to BOTAŞ' and BTC Owners' review and approval.

The current management plans will be an integral part of the future management system to be implemented by the BTC Pipeline operating company – BOTAŞ International on behalf of BTC Owners. Commitments made in the EIA will be embraced by the operating management system.

As public documents, the management plans, as detailed in the EIA, also provide a point of reference for regulators, communities and other interested parties who would like to understand the specific management activities to be implemented by the BTC Project as well as the allocation of responsibilities between the different parties involved. These management plans will also provide a basis for assessing the environmental and social performance of the BTC Project through external monitoring and will facilitate public scrutiny of the actions of the BTC Project.

The principal stages in the implementation of environmental and social management provisions are outlined in table 3.



# Implementation and management

**Table 3.** Steps in Implementation of Environmental and Social Management

Environmental and social management and monitoring plans	Description
Responsibilities	BOTAŞ are responsible for implementing the provisions of the EMMP and the SMMP and supporting plans. Contractors will be responsible for the implementation of, and adherence to, all the mitigation measures outlined in the EIA the EMMP and the SMMP. BTC Owners will ensure that the management plans are implemented
Inspection, Monitoring, and Auditing	BOTAŞ and its contractors will be required to demonstrate how the requirements of the EMMP, SMMP and EIA Report are being complied with. Site inspections and more formal audits by BOTAŞ will be undertaken on a regular basis. Contractors will also be required to implement a programme of internal inspections and audits. BTC Owners will act in a compliance role
Complaints Procedure and Resolution of Problems	BOTAŞ, in coordination with its various contractors, will set up a complaints procedure that will enable any complaint to be made direct to the Contractor Community Liaison Officer. Each complaint will be investigated by a BOTAŞ or Contractor Community Liaison Officer and action taken where necessary. BTC Owners will monitor the process and intervene if required
Training	BOTAŞ and its contractors will develop and implement an appropriately focused training programme that addresses the environmental and social management issues raised by the BTC Project. BTC Owners will ensure that the requisite training is provided to all personnel
Reporting and Review	BOTAŞ will develop and implement a programme of environmental and social reporting throughout all stages of the BTC Project. The reporting programme will form the basis of a programme of regular performance reviews of both contractor and BOTAŞ performance. These reviews will be used to identify areas and strategies for improvement in environmental and social performance. BTC Owners will monitor performance and intervene as necessary

Although the EMMP, SMMP and supporting environmental and social management plans are primarily aimed at the construction and commissioning phases of the BTC Project, the standards, general requirements and principles outlined in these documents will also apply throughout the operational phase of the BTC Project.



# Implementation and management

## Investment programmes

The Management and Monitoring Plans described above concern the specific project commitments and mitigation measures upon which the EIA is predicated.

Outside of the EIA Process, however, BTC Owners are committed to designing and implementing Environmental and Community Investment Programmes. These programmes are not mitigation measures but are being developed to achieve positive lasting benefits to both the environment and communities. Additionally, respect for the environment, promoting safety of personnel and contributing towards community development are among the strategic aims identified by BOTAŞ General Management in the scope of their Integrated Management System.

## Environmental investment programme

### Background

Whilst significant efforts have been taken to avoid areas of high biodiversity, largely through route selection and careful siting of above ground facilities, it is recognised that there are residual impacts on natural habitats. Direct mitigation measures and reinstatement practices will ensure that effects on natural habitats are minimized. Furthermore, to meet the requirements of the World Bank Group Policy on Natural Habitats (Operational Policy 4.04, June 2001), an Environmental Investment Programme (EIP) will be established. The aim of the EIP will be, where possible, to enhance biodiversity either directly in the area of potential impact, or indirectly through offsite projects.

### Objectives of Environmental Investments

The primary focus of the EIP will be on Protected Areas (either designated or proposed) and protected species. In addition, areas of high ecological significance outside the protected areas system or other key species will be considered.

### Environmental Investment Principles

The EIP is in the process of development. This is being undertaken through consultation with stakeholders to gain an understanding of issues/areas of concern where input would be most valuable. The intention is that potential schemes are developed and implemented in conjunction with relevant stakeholder bodies and the identification of potential partners is underway.

## Community investment programme

### Background

BTC Owners are committed to designing and implementing a Community Investment Programme (CIP) in the areas most affected by the construction activities.

### Objective of Community Investment

The objective of the CIP is to have a positive impact on communities most affected by construction activities by providing direct benefits, and by engaging with and adding value to local communities in a sustainable way. Currently BTC Co intends to implement two types of community investment projects:

- ▶ **Local Community Projects:** these projects are relatively small in scale and duration but respond to an immediate felt need at the community level. Ideas for potential projects will be based on consultation undertaken during the EIA process, which identified both household and village level needs. In addition, BTC Co will consult with locally active NGOs to vet these potential ideas, gain from the experience of NGOs in the region, and identify potential NGO implementation partners.
- ▶ **Sustainable Development Projects:** These projects will form the bulk of the community investment programme. It is anticipated that they will be much larger in scale and longer term and will aim to provide sustainable development benefits. These projects will take place primarily in communities that are directly affected by pipeline activities, but may be extended to nearby towns or groups of villages. Ideas for potential projects will be drawn from village level consultations. This will require substantial discussion with active NGOs, international development agencies and government in order to ensure that BTC Co is neither duplicating effort nor assuming the responsibilities of local or national authorities, but instead is adding value and/or filling needed gaps.



# Contact details

The EIA for the Turkish section of the BTC Pipeline Project has been more than two years in preparation. The Draft EIA and this summary document – the NTS – have been produced in order to gain feedback from all interested parties during the ‘Disclosure Period.’ This is a 60-day period during which the draft EIA Report is made available for comment. Following receipt of comments the EIA will be finalised and submitted to the Ministry of Environment of the Turkish Government for approval.

The Draft EIA Report, in Turkish, will be placed at the governorship buildings in provincial centres, sub-governorship buildings at district centres, and at local and national university libraries.

Comments can be submitted by telephone, fax, email or to the postal address provided below.

## For further information on the BTC Project, please refer to the following web-sites:

**Web site:** [www.caspiandevlopmentandexport.com](http://www.caspiandevlopmentandexport.com), where you can make comments on the BTC Project

**Web site:** [www.btc.com.tr](http://www.btc.com.tr) (BOTAŞ web site linked to [www.caspiandevlopmentandexport.com](http://www.caspiandevlopmentandexport.com))

## For comments directed to the BOTAŞ Community Relations Team please call the following number:

Free Phone: 0800 314 1001 (answering machine outside of normal working hours)

## For comments directed to BOTAŞ:

### Ebru Demirekler Yildiz

Environment Department

BOTAŞ Baku-Tbilisi-Ceyhan Crude Oil Pipeline Directorate

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## For comments directed to BP – representing the BTC Owners:

### Sukran Caglayan

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\* Photographs by Philip J. Edwards (including bottom insert photograph on cover page)





[www.caspiandevlopmentandexport.com](http://www.caspiandevlopmentandexport.com)

