INTER-AMERICAN DEVELOPMENT BANK

BOLIVIA

Transredes Capital Expenditures (2001-2005)
(BO-0192)

ENVIRONMENTAL AND SOCIAL IMPACT REPORT
(ESIR)

October 2002

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ACRONYMS AND ABBREVIATIONS LIST

AAC	Autoridad Ambiental Competente
APG	Asamblea del Pueblo Guarani
CARE	Social NGO. Cooperative for Assistance and Relief Everywhere
CERDET	Centro de Estudios Regionales y Desarrollo (Tarija)
CIDOB	Confederacion de Pueblos Indigenas de Bolivia
CLHB	Compañía Logística de Hidrocarburos de Bolivia
CONAF	National Forest Corporation
dBA	Decibels (A)
DAA	Declartoria de Adecuacion Ambiental
DIA	Declaratoria de Impacto Ambiental
DGICSA	Dirección General de Impacto, Calidad y Servicios Ambientales
DINAAR	National Direction of Archaelogy
EEIA	Estudio de Evaluación de Impacto Ambiental
EFP	Environmental Follow-up Plan
EHSSMS	Environmental, Health and Safety, and Social Management System
EIA	Environmental Impact Assessment
EMP	Environmental Management Program
EMS	Environmental Management System
ENDE	National Electric Company
ESMP	Environmental and Social Management Plan
GYRG	Yacuiba-Rio Grande Gas Pipeline Project (Gasoducto Yacuiba Rio Grande)
HSES	Health & Safety, Environmental and Social
IDB	Inter-American Development Bank
MA	Manifiesto Ambiental
MDSMA	Ministerio de Desarrollo Sostenible y Medio Ambiente
MDSP	Ministerio de Desarrollo Sostenible y Planificación
MM-PASA	Medidas de Mitigación – Plan de Adecuación y Seguimiento Ambiental
OCY I	Oleoducto Camiri – Yacuiba 1, OCY 1
OCY II	Oleoducto Camiri – Yacuiba 2, OCY 2
OCY-3	Oleoducto Choretí - Yacuiba
ORCAWETA	Organización de las Capitanías Weenhayek y Tapiete
PAA	Plan de Adecuación Ambiental
PMP	Prevention and Mitigation Plan
RASH	Reglamento Ambiental para el Sector Hidrocarburos
RCs	Relacionadores Comunitarios
ROW	Right of Way
RTCO	Reglamento de Actividades Hidrocarburiferas en Tierras Comunitarias de Origen (Proyecto de Reglamento)
SCADA	Supervisory Control and Data Acquisition System
SERNAP	National Service of Protected Areas
SIRESE	Super Intendencia de Hidrocarburos del Sistema de Regulacion Ambiental
SMP	Social Management Program
SPCP	Spill Prevention and Control Plan
TCO	Tierras Comunitarias de Origen
VMARNDF	Vice Ministerio de Medio Ambiente, Recursos Naturales y Desarrollo Forestal
VMEH	Viceministerio de Energia e Hidrocarburos
YABOG	Gasoducto Yacuiba-Rio Grande.
YPBF	Yacimientos Petroliferos Fiscales Bolivianos

I. INTRODUCTION

1.1 Transredes S.A. (*Transporte de Hidrocarburos, S.A.*) is the main hydrocarbon transportation company in Bolivia. It was created in May 1997 under Bolivia's capitalization process which transferred to the private sector the natural gas and liquids transportation pipelines and associated facilities of Yacimientos Petrolíferos Fiscales Bolivianos (YPBF), the former Bolivia state oil and gas monopoly. Transredes holds non-exclusive concessions for the operation and expansion of its domestic and export gas and liquids pipeline systems (the "Concessions"). The Concessions are for 40 years, subject to the Company's compliance with the terms of the capitalization agreement. The petroleum and natural gas market, including transportation, is a critical factor in Bolivia's future economic prospects and growth

1.2 Transredes is a Bolivian company that operates in Bolivia under Bolivian laws. The principal ownership of Transredes consist of Shell and Enron, each owning 25 percent, Bolivian pension funds which own 34 percent, and private and institutional investors which hold the remainder of the shares. All of Shell's and Enron's investments in Transredes were up front and presently Shell nor Enron owes any money to Transredes; that is Transredes is a stand-alone company.

1.3 The transaction considered by the IDB consists of the financing of Transredes 2001-2005 capital investment program ("Investment Plan") to maintain and expand its delivery capacity of gas from Bolivia for exports to Brazil and also to accommodate growth in demand for the delivery of both gas and liquids in the Bolivian market. The 2001-2005 Investment Plan consists of (a) certain improvements and enhancements to Transredes existing gas and liquids system to support a more efficient continuation of the services currently provided by Transredes ("Continuity of Services"), and (b) the expansion of the gas and liquids transportation capacity of the Transredes pipeline ("Gas Expansion Plan" and "Liquid Expansion Plan"). The Investment Plan does not include any works or investments related to the Bolivia-Brazil Gas Pipeline expansion by Gas Trans Bolivano or the Cuiaba Gas Pipeline Project. The 2001-2005 Investment Plan is estimated at upto US$ 463 million, but inidividual expansion projects are subject to final approval of the Bolivian Superintendency of Hydrocarbons.

II. PROJECT DESCRIPTION

A. Existing Transredes Operations and Facilities

2.1 Transredes' transport operations are divided into two different systems or networks, liquid and gas, which traverse Bolivia from North to South, between Santa Cruz and Argentina, and from East to West, from Santa Cruz to La Paz and the port of Arica in Chile. These two systems/networks are located in seven (7) out of nine (9) Bolivian departments.

2.2 Transredes' main activities/operations are the transportation of natural gas, liquefied petroleum gas (LPG), crude oil, and diesel within Bolivia, as well as import and export of these products. Transredes' transport operations are divided into two different systems or networks, liquid and gas. Transredes currently owns and operate approximately 3,000 kms of gas pipelines and 2,700 of liquid pipelines.

2.3 The liquid and gas systems/networks are located in seven (7) out of nine (9) Bolivian departments and are divided into seven subsystems, three (3) liquid and four (4) gas subsystems. The Liquid

System consists of: Subsystem I: Norte Santa Cruz integrated by five stations and six oil pipelines. Subsystem II: Santa Cruz – Yacuiba integrated by four main pipelines, four lateral pipelines, and five stations. And Subsystem III: Santa Cruz – Sica Sica – Arica integrated by three main pipelines, two lateral pipelines, and six stations (See Figure 2.1). The Gas System consists of: Subsystem IV: Colpa – Yacuiba . Subsystem V: Cochabamba – Oruro – La Paz. Subsystem VI: Taquiperenda – Cochabamba – Sucre – Potosí . and Subsystem VII: Rio Grande – Cochabamba (See Figure 2.2).

2.4 As part of these two systems' operations, Transredes performs continuous maintenance activities on pipelines and stations, including right-of-way (ROW) maintenance, pipelines burial, relocation of supports, paint jobs, cathodic protection, welding, realignment of retention structures, and relocation of signs. Regular maintenance of stations include checkups of engines, pumps, turbines, compressors, generators, valves, electric systems, fire fighting system, measurement points, general infrastructure, and supervisory control and data acquisition system (SCADA).

2.5 A summary of the key infrastructure components operated by Transredes as part of these subsystems transporting different hydrocarbon products is presented in Table 2.1. A summary of equipment and available capacity of the gas compression and liquid pump stations is presented in Tables 2.2 and 2.3, respectively. Additional information for each subsystem is presented in Annex 1.

2.6 In addition, Transredes owns 51% and provides operation, environmental, social, health and safety (ESHS) and administrative services to Gas TransBoliviano, S.A[1]. It also owns 12% of the Transporte Brasileira Gasoducto, who owns the Brazilian segment of the Bolivia - Brazil pipeline. Transredes provides operational and ESHS services to Gas Oriente Boliviano Ltda, owner of the Cuiabá pipeline, and manages the YPFB maritime terminal in Arica, Chile.

B. Investment Plan

2.7 The Transredes 2001-2005 Investment Plan, which is the project under consideration for IDB financing, consists of three components:

(a) Continuity of Services: maintenance, upgrade and improvements of existing pipelines and stations;
(b) Gas Expansion Plan: construction of a new gas pipeline and a new compression station, as well as upgrading of two existing compression stations; and
(c) Liquid Expansion Plan: construction of new pipelines and two pump stations, as well as improvements of existing pipelines, stations and terminals.

2.8 Most of these works will be performed on existing ROWs or previously intervened areas. Only two small sections of new gas pipelines and four sections of new liquid pipelines will require alternative routes to avoid communities that have developed along existing ROWs. A description of the Investment Plan components is presented below.

Continuity of Services

2.9 The Continuity of Services program includes projects necessary to maintain both gas and liquids systems in good operative conditions, as well as enhancements in order to improve the

[1] Owner of the Bolivian section of the Bolivia -Brazil pipeline.

environmental, health and safety components. This program is divided into five different components, which are described below.

(a) Operational Safety component includes projects/programs related to personnel, communities and facilities' safety issues, such as: protection/alarm systems in stations; pressure monitoring in liquid system; automatic GLP pumping in Santa Cruz terminal; fire fighting system in stations; and risk analysis of inhabited and station areas.

(b) Environmental component includes projects/programs to enhance environmental conditions in current or future operations, such as: wastewater treatment in stations; drinking water treatment systems in stations; old stations cleanup; replace diesel engines; and environmental audits.

(c) Operative Continuity component includes projects/programs for enhancement/upgrading of transport equipment, facilities and pipelines, such as: variations, replacements, burial, and improvements of pipelines.

(d) Optimization component includes implementation of new technologies, system enhancement and upgrading projects, such as: cathodic protection; communications system; SCADA system; instrumented inspection; liquid measurement system; and replace of pipelines in river crossings.

(e) Infrastructure component includes construction and enhancement of infrastructure in stations; such as: runoff and industrial drainage systems; energy distribution rooms; fuel storage; control rooms in stations; manifold modifications; side slope stabilization structures; and grounding systems for protection against electric discharges.

Gas Expansion Plan

2.10 The Gas Expansion Plan, which is the largest component of Transredes' 2001-2005 Investment Plan in terms of costs, aims to increase the existing gas transport capacity between Yacuiba and Santa Cruz in order to meet the demand represented by the opening of new markets in Brazil. The main component of the plan is the construction of a new pipeline between Yacuiba and Rio Grande, parallel to the existing pipeline along this segment.

2.11 The Yacuiba – Rio Grande gas pipeline project comprises an expansion of the existing gas transport system (YABOG), which carries natural gas over a distance of 430 km from the Yacuiba area in southern Bolivia and the Rio Grande compression station, located southwest from Santa Cruz. The main objective of this project is to transport gas necessary to supply approximately 30 mscmd (million standard cubic meters per day) of natural gas to Brazil through the existing Bolivia – Brazil pipeline (BBPL) that extends from the Rio Grande terminal, approximately 60 Kms east from the Bolivia – Brazil border, to Sao Paulo.

2.12 The implementation of this project will provide Bolivia with the capacity to increase its gas exports by 26 million cubic meters per year while bringing additional export income of US$500 million annually and treasury income of US$100 million in royalties and taxes. At the present time, the gas system capacity is being increased to 6.8 mscmd by installing a 28 -Km Loop between Río Grande and Saipuru station, a new compressor station at Taquiperenda and additional compression units at the Saipuru station. The YABOG pipeline capacity is also being increased to the design pressure (MAOP – maximum allowable operating pressure) compatible with existing specifications. This pressure increase will further raise the system capacity to 8,2 mscmd. The remaining additional capacity required of 22 mscmd will be achieved through construction of the Yabog Expansion Pipeline.

2.13 The Yabog Expansion Pipeline will share the same ROW used by the YABOG pipeline along most of its route, as well as the same pressure control stations and associated facilities plus one (1) additional compression station being built in Taquiperenda. Only two new pipeline sections (7 km total) will require a different ROW to avoid the settlements of Villamontes and Caigua, which have developed along the YABOG's ROW over the past 30 years. The YABOG's diameter is 24" and its current ROW is 25 m wide, while the Yabog Expansion Pipeline diameter will be 36" and their combined ROW width along common areas will be 30 m wide. For construction purposes, five (5) additional meters will be temporarily used for a total of 35 meters. In common sections to both pipelines, these will be separated 5 m between its centerlines. The ROW in sections requiring new intervention will be 30 m wide and, according to Transredes, land use agreements along new ROW will restrict any development to occur within a 200 m wide corridor.

Liquid Expansion Plan

2.14 The Liquids Expansion Plan aims to increase the existing liquid system transport capacity in order to meet the changing demand in Bolivia, as well as to transport the liquids produced due to increased gas pumping. The main components of the plan are:

(a) Construction of a two loops (parallel pipeline), 125 and 135 km respectively (OCY-3) to the existing OCY-1 (Camiri – Yacuiba) and OCY-2 (Camiri – Villamontes) pipelines;
(b) Construction of Cordillera pump station near Camiri, Santa Cruz Department;
(c) Construction of Campero pump station in La Paz Department (OSSA 2); and
(d) Upgrade of existing pipelines and reception/pump systems in OCSZ-2 (Camiri – Santa Cruz), OSSA-1 (Santa Cruz – Huayñacota), and OSSA-2 (Huayñacota – Arica).

2.15 The existing OCY-1 and OCY-2 pipelines carry liquid hydrocarbon products over a distance of 260/160 km from the Yacuiba/Villamontes area in southern Bolivia and the Camiri station located near Camiri, Santa Cruz Department. The main objective of this project is to guarantee a minimum transport capacity of 32,000 bpd (barrels per day) along the Yacuiba – Camiri route. The majority of the two loops (OCY-3 pipeline) will share existing ROWs (used by OCY-1 and OCY-2 pipelines, and YABOG's ROW in Villamontes), as well as the same pump stations and associated facilities, plus one additional pump station (Cordillera) to be built north from Camiri. Only two new sections totaling 4.5 km will require completely new ROWs in Tiguipa and near Cordillera station to avoid urban areas along the existing ROWs.

2.16 The OCY-1 and OCY-2 diameter is 6" and its ROW is 13m wide, while the OCY-3 diameter will be 8" and its ROW in sections requiring new intervention will also be 13 m wide. In sections common to other pipelines, these will be separated 1 m, according to ASME B31.4 between its centerlines and during construction 18 m ROW will be required. In addition, the OCY-1, OCY-2 and the new OCY-3 will be buried 1 m below ground surface level to reduce potential risks of accidents. The Cordillera pump station will be located 17 km north from the Choreti station and to the west of the Abapo-Camiri road. This new station area will be 10 hectares and its pumping capacity will be 30,000 bpd.

C. Project Workforce

2.17 In order to support the Transredes existing operations in 2001, there were approximately 390 direct employees and 1200 contracted personnel. The workforce needed during the construction Investment Plan projects will vary based on the different activities to be performed. The estimated number of workers needed during construction of each loop will vary from 80 to 200

workers. The OCY-3 pipeline and Cordillera pump station construction together will require 300 workers approximately, while the Campero pump station construction will require 100 workers. Together, during construction of loops and compression station works a total number of approximately 2200 workers will be required, 700 and 1500 out of these totals non-specialized and specialized personnel, respectively.

D. Project Schedule and Costs

2.18 The Continuity of Services and Gas Expansion Plan components will be implemented from 2001 through 2005. The Liquid Expansion Plan will be implemented during 2002 and 2003.

2.19 The estimated cost for the 2001-2005 Investment Plan is estimated at upto US$ 463 million, and includes approximately US$ 241 million for the Gas Expansion Plan (principally the YABOG expansion), US$ 95 million for Continuity of Services, and US$ 82 million for the Liquids Expansion Plan (principally the OCY-3 expansion). In terms of the Continuity of Services components, at a minimum, the following amounts are budgeted: US$ 8.8 million for operational safety, US$ 1.7 for environmental, US$ 38.9 for operative continuity, US$ 20.5 for optimization, and US$ 3.4 for infrastructure. Tables 2.4 and 2.5, respectively, present a cost breakdown for the Continuity of Services and Liquids Expansion Plan.

E. Project Alternative Analysis

2.20 The Environmental Impact Assessments developed for the Yabog Gas Expansion Pipeline and the OCY-3 Liquid Expansion project included alternative analysis necessary to assess different options (including a *No Build* option) and determine the best alternative to achieve proposed goals while minimizing potential impacts. In both cases, maximum use of existing ROWs accounts for the most sustainable solution to transport hydrocarbon products along the Transredes' network.

2.21 In terms of the gas expansion plan, different options for expanding capacity on the existing pipelines, including construction of loops with different diameters, increasing compression capacity of existing stations and installation of additional compression stations in different locations were analyzed. This analysis concluded that construction of the GYRG pipeline in staged loops along existing ROWs (YABOG) is the best alternative to provide gas needed in Santa Cruz to satisfy Brazil's increasing demand. Both bypasses to Villamontes and Caigua (two new loops totaling 7 km to avoid the settlements of Villamontes and Caigua involve a route variation to avoid residential areas and minimize its total length, thus minimizing cost and impacts on natural resources. In addition, the bypass to Villamontes uses the existing Pilcomayo River crossing, thus avoiding any additional impact on the river, and the bypass to Caigua avoids the area of future town expansion.

2.22 In terms of the liquids expansion plan, different options for expanding capacity on the existing pipelines, including construction of loops with different diameters, increasing pump capacity of existing stations and installation of additional loops in different locations were analyzed. This analysis concluded that construction of the OCY-3 pipeline as two staged loops along existing ROWs is the best alternative to increase the liquid transport capacity. A route variation of 3.5 km to bypass Tiguipa (settlement that has established along the existing ROW (see Figure 2.4)) through an agricultural area was selected to avoid residential areas and minimize its total length, thus minimizing costs and impacts on natural resources.

III. INSTITUTIONAL AND LEGAL FRAMEWORK

A. Institutional

Energy

3.1 The hydrocarbon transportation activity is regulated at the national level by the *Superintendencia de Hidrocarburos del Sistema de Regulación Ambiental (SIRESE*). SIRESE is responsible for the application and enforcement of the Hydrocarbon Law (Law No 1689).

Environmental and social

3.2 In Bolivia, the environmental management institutional framework was created in 1992, with the enactment of the National Environmental Law (Law No 1.333). The new institutional framework for environmental management was based in the decentralization of environmental management, with responsible units at the national, departmental and municipal (local) levels. At the national level, responsibility for national environmental policy, regulations, planning and research was given to the Ministry of Sustainable Development and Environment (currently Ministry of Sustainable Development and Planning (*MSDP*)). In each of Bolivia's nine Departments, a "Prefectura" is responsible for implementing the Ministry's environmental policy.

3.3 Depending upon the nature of the activities involved in different specific projects, the issuance of the environmental permit requires consultation with different sector institutions, such as: Forestry Superintendency (*Superintendencia Forestal*) for deforestation activities; National Service of Protected Areas (*Servicio Nacional de Areas Protegidas – SERNAP*) for activities in protected areas, national parks, forestry reserves, etc; Vice ministry of Rural and Indigenous Issues (*Ministerio de Asuntos Campesinos y Pueblos Originarios*) for activities with indigenous communities or TCOs; National Direction of Archaeology (*Unidad Nacional de Arqueología – UNAR*) for activities in areas of archeological interest.

3.4 For the energy sector, at the national level, all environmental coordination and permit applications are processed through the Environmental Unit of the *ViceMinisterio de Energía e Hidrocarburos (VMEH*). Nevertheless, ad the executive level, the *Autoridad Ambiental Competente (AAC)* is the *Vice Ministerio de Medio Ambiente, Recursos Naturales y Desarrollo Forestal (VMARNDF) of the Ministerio de Desarrollo Sostenible y Medio Ambiente (MDSP),* through its *Dirección General de Impacto Calidad y Servicios Ambientales*. At the Department level, according to Article 7 of the *Reglamento de Control Ambiental,* the AAC are the *Prefectos.*

Health and Safety

3.5 The Ministry of Health and Social Security (*Ministerio de Salud y Previsión Social*) regulates and controls health, hygiene and welfare issues related to environmental matters. In the working environments, occupational health and safety issues are the responsibility of the Ministry of Labor.

B. Legal

3.6 In Bolivia, the National Environmental Law (Law No 1.333) was enacted in 1992, establishing both an environmental management institutional framework and general environmental regulations. The specific regulations were launched in 1995 (Decree D.S. 24176 of 8 December 1995). The decree consists of a set of regulations concerning several aspects of environmental

management: (a) general environmental management, including the Environmental Impact Assessment (EIA) system (*Regulación General de Gestión Ambiental)*; (b) prevention and control of environmental pollution (*Regulación Prevención y Control Ambiental)*; (c) air pollution (*Regulación en Materia de Contaminación Atmosférica,*); (d) water pollution (*Regulación en Materia de Contaminación Hídrica)*; (e) hazardous activities (*Regulación para Actividades con Sustancias Peligrosa)*; and (f) waste management (*Regulación de Gestión de Residuos sólidos).*

3.7 Specific environmental regulations for the hydrocarbon sector (*RASH-Regulaciones Ambientales para el Sector Hidrocarburos*, D.S. No. 24335) were issued in July 19, 1996. These regulations set up the specific technical and administrative procedures governing the preparation and approval of environmental studies for oil and gas activities. They also include the following regulations: General Regulations for Environmental Management; Environmental Prevention and Control Regulations; Atmospheric Contamination Regulations; Water Pollution Regulations; Hazardous Substances Regulations; and Solid Wastes Regulations. The hydrocarbon industry representative body, together with the Vice Ministry of Sustainable Development and Planning, and the Vice Ministry of Energy and Hydrocarbons, started an update and review of these regulations about a year ago, to ensure that both "upstream" (exploitation and production) and "downstream" (transportation and distribution) activities follow international environmental best practices. Nevertheless, given the recent changes in Government, the new regulations have not been enacted yet.

3.8 The environmental licensing process for the hydrocarbon sector projects consists of four basic steps: The applicant must present an Environmental Brief (*Ficha Ambiental)* to the UMA-VMEH. This Brief contains a description of the project, the environmental baseline and the project's impacts. Upon these descriptions, the UMA-VMEH suggests the category under which the Project should be classified, and the technical report to the DGICSA-VMARNDF, which will classify the Project. Category I projects require a full EIA study (*Estudio de Impacto Ambiental Integral*); Category II projects require Specific EIA study *(Estudio de Impacto Ambiental Específico*); Category III projects only require a Statement of Mitigation Measures and an Environmental Management Plan (*MM-PASA*); and Category IV projects do not require any environmental study (This category does not apply to activities or projects of the oil and gas sector). The projects are approved upon the review of the environmental studies, and according to the project categorization. For Categories I and II, an environmental permit is issued (*Declaratoria de Impacto Ambiental - DIA),* whereas Categories III and IV are informed that an environmental permit is not required (*Certificado de Dispensación Ambiental).*

3.9 For projects that were undergoing implementation, operation and/or abandonment when the Environmental Law regulations were enacted, an Environmental Manifest (*Manifiesto Ambiental – MA*) is required. Such *MA* must inform about the environmental status of a particular project and its direct area of influence, and propose a corrective action plan to address the identified deficiencies. When the *MA* is approved, the project is granted a *Declaratoria de Adecuacion Ambiental (DAA).*

3.10 As part of the capitalization process, the Government of Bolivia approved Supreme Decree No 24.412 that establishes that all environmental pollution caused in or around the YPFB facilities would constitute environmental liabilities to be transferred to the Government of Bolivia. Remediation actions of these liabilities do not require an environmental license but a work plan to be approved by a technical committee of the *VIP* (*Viceminsterio de Inversiones y Privatización*), *MDSP* and the *VMEH.*

Health and Safety

3.11 Supreme Decree No. 24176 requires that a "Health & Safety Plan" be submitted to the *Dirección de Seguridad Industrial del Ministerio de Trabajo*, for any work, activity or project to guarantee a safe work environment to all workers. Such requirement, along with occupational health & safety standards constitutes the legal framework enforced by the Ministry of Labor. This plan should define the creation of the *Comité Mixto de Higiene y Seguridad Industrial*. This Committee will be conformed by company executives and an equal number of company workers.

Public Participation and Indigenous People

3.12 Under Bolivian legislation (Law 1333, Environmental Regulations and RASH), the legal representative of the project must carry out public consultation, and the results of this process must be included in the EIA. Observations, suggestions, and recommendations of the locally affected population ought to be taken into consideration during the impact-identification phase of the EIA.

3.13 Also relevant to the Project is Law 1.775 of October 18, 1996, regarding Agrarian Reform, which regulates the process concerning indigenous territories (TCOs). These regulations give the indigenous people the possibility to get titles for community lands not only for agricultural purposes, but also for hunting and collecting. The indigenous rights over the TCOs recognize the collective property over the land and the right to participate in the sustainable use of their renewable natural resources. The TCOs cannot be sold. The internal distribution and use of those lands are regulated by the community ancestral costumes. According to this Law, TCOs can only be expropriated for public utility. The hydrocarbon (gas and liquid) transportation activity in Bolivia is considered to be a service of public utility. The price to be paid for a TCO will be fixed by the Superintendencia Agraria, and compensation can include the provision of lands of equal or better quality.

3.14 The constitution of ROWs is a subject that still remains unregulated. A Law proposal to regulate this matter is currently under discussion by the Viceministry of Energy and Hydrocarbon. Currently, however, expropriation remains as a legal path to constitute ROWs.

3.15 Another regulation that is currently in the process of discussion *is* "*Reglamento para Operaciones Hidrocarburíferas en Tierras Comunitarias de Origen - TCO*". The objective of this regulation will be to rule the consultation and participation of indigenous people and communities in matters concerning the prevention, follow-up and control of the social and environmental impacts of hydrocarbon activities in TCOs. According to the proposal, the relevant authorities are the *VMARNDF* as competent environmental authority, and the *VMEH* as sector institution.

3.16 Finally, the revision of the *Reglamento Ambiental para el Sector Hidrocarburos (RASH)*, has been stopped due to the change of government in Bolivia; the RASH will include regulations regarding the implementation of projects and activities in protected areas and TCOs.

C. Project Compliance Status

Existing Operations and Facilities

3.17 Soon after taking over the operation of the system in 1997, Transredes proceeded with the necessary steps to meet the applicable environmental regulatory requirements. For the existing operations, the Company produced seven (7) separate Environmental Manifests (*Manifiesto*

Ambiental) and corresponding corrective action plans (*Planes de Adecuación Ambiental*) for all the facilities of each of the seven subsystems. The Manifests identified existing impacts caused by previous and ongoing operations, as well as proposed actions to be implemented in the future to provide compliance with existing regulations and standards. All such Manifests were approved and the applicable environmental permits (*DAAs*) were granted to all existing operations and facilities (see Table 3.1). The Company is proceeding with the implementation of the corrective action plans.

Investment Plan

3.18 The Environmental Impact Assessments (EIA) for the two principal works in the Investment Plan, the YABOG gas expansion pipeline and the OCY-3 liquids expansion were prepared and submitted to the applicable authorities for approval. Both were made available to the public and had public consultation (see Section VII for details). The EIA for YABOG was approved in July 2002 and the EIA for the OCY-3 liquids expansion was granted on August 30, 2002. Table 3.2 presents a summary list of the environmental permits for the gas and liquids expansion projects.

3.19 At the request of the IDB, Transredes prepared an Environmental Analysis, which evaluated the potential environmental and social impacts associated with the Investment Plan. This environmental analysis was made available to the public. In addition, at the specific request of the IDB, a series of public consultation meetings were held in order to present the proposed Investment Plan and the Transredes plan to mitigate and monitor potential environmental, social, and health and safety impacts and risks (see Section VII for details).

Environmental and Social Liabilities

3.20 The primary cause of the Transredes environmental liabilities is related to environmental pollution caused in or around the YPFB facilities inherited by the Company. Those constitute environmental liabilities to be transferred to the Government of Bolivia, according to the Concession Agreement. Remediation actions of these liabilities do not require an environmental license. A Technical Committee consisting of the Vice Ministry of Energy and Hydrocarbons, YPFB, the Vice Ministry of Environment, Natural Resources and Forestry Development and Transredes was established to jointly prepare a priority list of the environmental liabilities identified in the environmental audits Phase I and II. The prioritization was based on the following criteria: potential risks associated to public health, environment and industrial safety; levels and type of existing pollution, principally related to soils and surface and underground water; actual and potential use of the land (industrial versus agricultural) and degree of intervention.

3.21 The second principal Transredes environmental liability is the oil spill in the Desaguadero River. On January 30, 2000, an oil spill of apparently 29,000 barrels of crude oil spilled from the Huayñacota-Charaña-Arica (OSSA II) pipeline. This spill resulted in oil spilling into the Desaguadero River near the community of Calacoto, Province of Pacajes, Department of La Paz. Upon becoming aware of the accident, Transredes reacted by stopping the flow on the pipeline and implementing an emergency response plan to contain the oil spill in the river in order to minimize the affected area. Transredes then implemented a comprehensive cleaning operation and a compensation plan for the affected families. In February 2000, the Hydrocarbon Superintendence imposed a pecuniary fine to Transredes for the accident, against which the Company appealed to the Supreme Court of Justice. The judicial recourse is yet to be judged.

3.22 On May 2000, Transredes performed an Environmental Audit to determine the compensatory, mitigatory and reparatory measures that were required. The Audit was requested by the Interministerial Committee chaired by the *Viceministerio de Medio Ambiente, Recursos Naturales y Desarrollo Forestal (VMARNDF)*, in compliance with articles 108 and 109 of the Prevention and Control of Environmental Pollution Regulations (*Regulación de Prevención y Control Ambiental*). Based on the results of the Audit, Transredes presented the Environmental Corrective Plan (*Plan de Adecuación Ambiental*), which was approved by the VMARDNF on July 8, 2002 (see Section VI.E for more details). Associated with the spill, VMARNDF identified non-compliances with the Environmental Law Regulations, resulting in a Bs 12,249,585 fine to Transredes, who in turn appealed to the Minister. Final resolution is pending.

3.23 In relation to the social liabilities, the main issues concern the YABOG construction and the social impacts to fishing concessions and the noise impacts from station San Antonio. In August 2002, Transredes signed a compensation agreement with Saturnino Sanchez for damages caused to his fishing concession during the YABOG construction crossing the Pilcomayo River in 1999. On 25 July 2002, Transredes signed an agreement with ORCAWETA, the indigenous organization representing the *capitanes* of the Weenhayek people, in which noise treatment at San Antonio station was implemented in September 2002. Also, on 22 July 2002, Transredes mediated an agreement between the Alcadía de Villamontes and YPFB, to ensure that YPFB fully completes the decommissioning of the YABOG construction sites and wastes.

3.24 One remaining issue concerns the legal rights of Transredes over the San Antonio station, and the right of way of the OCY-1. Given that the indigenous territory is undergoing the process for being recognized as a TCO, it was agreed that conversations regarding this issue will continue once the results on the TCO claim are known, given that Transredes was granted ROW and station properties in the capitalization process.

IV. ENVIRONMENTAL AND SOCIAL CONDITIONS

4.1 Transredes' existing operations are distributed around seven (7) out of nine (9) departments in Bolivia. The Investment Plan will be distributed all over Transredes' operations area, but the new facilities will be exclusively built on the Tarija, Chuquisaca, Santa Cruz, Cochabamba and La Paz Departments. This chapter contains a general description of environmental and social conditions surrounding Transredes' existing operations area, as well as a more specific description of the liquid (OCY-3) and gas (GYRG) expansion's area of influence.

4.2 The Area of Direct Influence (ADI) of the proposed Investment Plan is defined as the right-of way (ROW) of all existing oil and gas pipelines operated by the Company. The Area of Indirect Influence (AII)) of the proposed Investment Plan encompasses a larger area, involving a corridor 1 to 5 kms wide, centered on existing or new ROWs, depending on different site conditions, such as river crossings.

A. Environmental

4.3 This section describes the environmental conditions of the entire Transredes' existing project area and more specifically on the southern region where most of the gas and liquids expansion plans will be implemented.

Geography

4.4 Bolivia can be subdivided in five main geographic regions: The *Andean Plateau, the Valley Region, the Yungas, the Chaco Plain,* and the *Low Plains of the Amazon and Paraná Valley* . The hydrocarbon transportation system of Transredes extends across the physiographic units of he *Chaco plain*, the *Yungas* of Chaparé, the *Valleys* of the intermountain region and the high *Andean Plateau*, reaching the borders of Chile and Argentina. It does not cross the Amazon region and the low lands of the Pantanal. The Transredes' gas system (OSSA-II) also crosses the region of Taracapá in northern Chile to reach the Port of Arica. Along its route, the OSSA-II pipeline crosses the high *Andean Plateau* (3000 to 4000 masl) on the Chilean side, an *Intermediate Depression* (1000 to 1500 masl), the *Coastal Mountain Range* (0 to 1700 masl) and the *Arica Coastal Plain*.

4.5 The expansion project area is located in a geological region that is part of the "Asymmetrical Syncline" comprising Tertiary and Quaternary sediments up to 1500 to 2000 m thick. The Sub-Andean Belt that surrounds the area to the west consists of a series of tightly folded anticlines and synclines formed by rocks dating from the Paleozoic, Mesozoic and Cenozoic Eras. The geological processes that formed the Sub-Andean mountain chain include Quaternary deposits, the Upper and Lower Chaco Tertiary formations, and the Cretaceous formations of Cajones, Yantata and Ichoa. It is characterized by a very irregular topography with deep, narrow valleys interspersed by ranges of north-south hills. On the east the basin is bounded by the isolated hills of Izozog and the Chiquitos range.

Climate

4.6 In the *Andean Plateau*'s average temperature is less than 10°C and there is less than 500mm of annual precipitation. The *Valleys* present moderate climates, with average temperatures of 28°C and approximately 500 and 600 mm of rain every year. In the *Yungas* region year-round humid conditions prevail. The *Chaco Plain* presents a dry climate.

4.7 In the expansion area, temperatures show low variability throughout the year, with average values ranging between 26.6^{o}C and 15°C. The warmest month is December and July the coldest. There is a single period of heavy rainfall between the months of November and March. Despite its short duration, the heavy rains have a tremendous capacity to carry floating debris, sediments and suspended matter. The relative humidity varies throughout the year on a monthly basis, showing a similar pattern to the other climatic parameters. The relative humidity is lowest during July to November, increasing from December to reach maximum values during December to May. This area belongs to the climate type BSwh according to the Koppen classification, which is characteristic of the Chaco plains.

Hydrology

4.8 In Bolivia, the superficial hydrographic system in the area of Transredes operations originates from three sub-basins: the Mamoré sub-basin within the bigger basin of the Amazon River; the Plata sub-basin, to which the Pilcomayo River belongs; and the Plateau sub-basin. The *Amazon basin* occupies 724,000 km^2 of the Bolivian territory. Its rivers are the most important in the country due to their current, navigability and potential use. The Mamoré River originates in the Cochabamba and Chayanta Mountain Ranges, and together with the Caine and Chayante Rivers gives rise to the Río Grande in Huayrapata. It flows to the North and receives waters from various other rivers along its course. In the confluence with the rivers Ichilo and Chapare its name changes to Mamorecillo and then Mamoré. The Ichilo River originates in the Caballero province (Santa Cruz Department) and has as tributaries the Sajita, Víbora, Chimoré and Choré Rivers. Other main rivers in the area are: Yapacaní, Moile, Palacios, Piraí, Guendá, Parapetí, and

Bañado. The *Plata sub-basin* is shared internationally by Brazil, Bolivia, Argentina and Paraguay, and occupies 229,500 km^2 of the Bolivian territory. Its main rivers are the Paraguay, the Pilcomayo and the Bermejo. The Pilcomayo River originates in the province of Oruro at 5,200 m altitude. It extends over 840 km and discharges into the Esmeralda River at 265 m above sea level.

4.9 The project expansion area crosses the drainage basins of the Grande, Parapetí and the Pilcomayo Rivers. The existing ROWs cross these rivers near their alluvial fans that form where they leave the Sub-Andean Belt. The regime is almost torrential, with very large flood peaks especially during the rainy season. These floods are relatively short in duration and have a very high capacity to carry floating material, with bottom transport and suspended sediment. At medium or low flow periods the rivers are reduced to channels that meander over the wide riverbed formed during the flood flows. The main hydrogeographic system is formed by these above mentioned rivers and a large number of smaller intermittent streams. The minor tributaries of the three main rivers begin in the Sub-Andean Belt, which due to an undulating topography and weak geological formation gives rise to steep unstable valleys. The heavy rainfall can reach up to 100 mm a day and cause the typically torrential stream to form steep U- or V- shaped valleys. Erosion takes place at the bottom of the steep banks, causing slips and landslides. For much of the year the streams are dry, which reduces their importance for water supply. They create a local habitat and help provide water for cattle ranching. A description of the main river basins is presented in Table 4.1.

Flora

4.10 In the *Andean Plateau*, the majority of the vegetation in the region are grassy plains with a rich variety of grasses and dichotomous herbs, but also presents shrubs and some trees. The *Valleys* present fertile soils that are auspicious to agriculture of vegetables, cereals and fruits. This region is composed of dry forests, chaparrals, thickets and eroded soils, generally deciduous. In the *Yungas* vegetation consists of evergreen forests with a high diversity in its natural state, structurally similar to the Amazon forest. The *Chaco Plain* presents is comprised of low forests, spiny thickets, dry savannas and moist soils, adapted to the scarce precipitation in the area.

4.11 Most of the hydrocarbon transportation system in Bolivia crosses areas formed by different vegetative formations. *Campos Cerrados* are well-drained savannas that are characterized by pastures with isolated short trees (2 to 3 m), adapted to periodic fires. *Bosque Húmedo de Llanura* are found in plains of altitudes between 150 and 250 meters above sea level (masl), with average temperatures of 24°C and precipitation levels between 1200 and 1800 mm/year, what favors the development of a dense evergreen vegetation. *Bosque Seco Chaqueño* is characterized by the capacity to sustain long periods of drought. The adverse climatic conditions have permitted certain protection and water conservation mechanisms to develop, such as spines/thorns, sclerosed leaves, plants with succulent stems, absence of leaves, etc. These forests are found at an altitude of 300 to 600 masl. The composition of the flora in this area changes radically according to the climatic and edaphic conditions. *Bosque Serrano Chaqueño* is found at the foot of the mountain range up to an altitude of 1500 masl. In this formation two or three strata can be found, the epiphytes are the most abundant kind, and the trees can reach a height of up to 25 m. This zone can be further subdivided according to altitude and relief. *Bosque Tucumano Boliviano* is characterized by high humidity and low precipitation levels. The flora present some adaptations to trap the moisture, lower its temperature and form water drops. Epiphytes are very abundant in this environment, particularly the orchids. *Bosque Chiquitano Semi-deciduo* is a vegetal formation constituted by forests, savannas, rocky outcrops and wetlands located within 300 and 1200 masl, with 1000 to 1200 mm of rain, and an average temperature of 26°C. Most

trees have a height of approximately 20 m, some reaching 30 m. *Valles Secos Interandinos* are composed of xerophytic vegetation, with an average of 500 – 600 mm of rain a year and 28°C average temperature. The topography is undulated with valleys. The vegetation is dry and shallow, and epiphytes are abundant. *Bosque Montano Húmedo* has exuberant evergreen vegetation in areas with an average precipitation of 2500 – 3000 mm a year. *Puna Altoandina* is dominated by herbs and shrubs and few trees. It is located at 2500 to 4800 masl, where the temperature is less than 10°C and the precipitation less than 500 mm a year.

4.12 According to the Forestry Map of Bolivia, on a regional level the pipeline expansion area is located in the Chaqueño region, which is part of the Boreal Chaco. The forest in this region is characterized by a variety of mainly spiny succulent plants; the canopy is low and continuous, with isolated emergent species whose floristic composition and structure vary according to edaphic, topographic and climatic conditions. The expansion project area shows 5 types of forest, pasture lands, crops, and sandy areas. The following forest and vegetative covering types were identified.

- *Very Low Forest* is found between Km 180 and Km 206. This area is characterized by little tree growth and the dominance of herbaceous vegetation and grass.
- *Low Forest* extends from Km 88 to Km 176 and from Km 206 to Km 271. The dominant layer of this zone is formed by tall (10 m) trees, but sparse enough to have only low wood harvesting potential. The lower stratum is so dense, it is almost impenetrable, which is the main characteristic of these woods.
- *Medium Forest* is also called Serranean Forest is found in the southern part of the pipeline area, beginning at Km 255. There, the topography becomes more undulating and rainfall levels increase.
- *Riverside Forest* is found on the banks of the Grande, Parapetí and Pilcomayo Rivers. There is a high tree density in these areas because of the high moisture levels and rich soils, due to the transport and deposit of materials by the river.
- *Cultivated Fields* are cultivated both mechanically and manually. The mechanically cultivated crops are found north of the Río Grande (Km 88 to Km 150), within the Mennonite Colonies (Km 260 to Km 280) and in the Campo Pajoso zone (Km 442 to Km 513), and involve clearing of large tracts of land.
- *Pasture and Fallow Lands* appear mostly in the central and northern sectors of the project area. Extensive livestock farming and agriculture are among the main activities of the inhabitants in the area.

Fauna

4.13 One of the most numerous trophic groups present in this area are primary consumers. A variety of monkeys, foxes, deer, armadillos, jaguars, pumas, anteaters, and tapirs can be found in the project area, especially along the streambeds of the watershed basins. Some small mammals like mice, bats, masmosas and porcupines inhabit the project area, as well as several reptile species and various fish. Many bird species are crucial to maintaining floral diversity by functioning as seed dispersers. Several migratory birds use the area. In the high Andean Plateau, the local fauna is composed of different wild species, such as guanaco, vicuña, cougar, fox, flamenco, eagle, cóndor, and suri; as well as of some domestic species, such as llamas and alpacas. While lower areas are more commonly known for presence of guanacos, tarucas, and vizcachas. There are a number of threatened and/or endangered species that live in the area and are present in the CITES list (Agreement on International Trade of Threatened Fauna and Flora Wildlife Species).

Protected Areas

4.14 In terms of protected areas in Bolivia, the Project will not affect any protected area under jurisdiction of the National System of Protected Areas of Bolivia (Sistema Nacional de Áreas Protegidas de Bolivia – SERNAP). Only in the valley region, the transport system (OSSA-1 and GAA) passes close to the border of the Natural Area of Integrated Management of Amboró (*Área Natural de Manejo Integrado Amboró - ANMI*). The ANMI of Amboró is located in the buffer zone of the Amboró National Park in the Yungas region. In the Chaco plains, the GVT (Gasoducto Villamontes – Tarija) or YABOG pipeline of Transredes passes through the border of the ANMI of Aguaragüe Mountain Range (*Area Natural de Manejo Integrado Serranía del Aguaragüe*).

Noise

4.15 In December 2000, a noise measurement program was undertaken to determine background conditions. The conclusions obtained from this program are as follows: Noise levels along existing ROWs typically averaged between 42 and 46 dBA; noise levels around existing stations were in general less than the maximum allowable levels; the average values registered for towns and communities were low; and in communities located along the Santa Cruz – Yacuiba highway an increase in average levels was noted due to vehicles traffic but never exceeded average permissible levels.

GYRG Route

4.16 The following is a brief environmental description of the GYRG pipeline starting at Campo Grande community at the joining point of the YABOG gas pipeline with the San Alberto oilfield and ending in the Rio Grande compression station.

4.17 Northward from the southern end of the route at Yacuiba, the first 25 Kms traverse flat or gently sloped agricultural lands. As it follows further north before arriving to the Pilcomayo River, the topography changes abruptly reaching mountainous and heavily forested areas where 30 degrees hill slopes of up to 100 meters height are common. North from the Pilcomayo River, the existing YABOG pipeline runs through the populated areas of Villamontes and Caigua where alternative route variations have been included. After these populated areas, the pipeline route is intersected by the Yacuiba – Santa Cruz highway in several points before reaching the Machareti River. Further north from this river, the route goes through gentle rolling hills and intermittently forested areas passing by the community of Nancaroinza. Following through undulated terrain covered by low forest the pipeline route reaches some ravines before crossing Las Tablas creek and the Parapeti River. In this area, the ROW is frequently used as a public road.

4.18 After crossing the Parapeti River, the pipeline route crosses through woodlands and plains located to the east of Charagua until it reaches the Saipurú compression station. Following north from this station, there is limited access to a densely forested area that extends up to Rio Grande. Extensive cattle grazing is observed along the ROW in this area. However, human settlements disappear as the route continues northward excepting a few ranches and a military reserve area. Due to the minimal human intervention, this ROW section presents more significance in terms of wildlife habitat and forest vegetation along the entire route. Also, 40 kms before reaching Rio Grande the route crosses the western edge of the Arenales de Guanaco (sand dunes area). After Rio Grande, the route moves along intensively developed agricultural plains until it reaches the Rio Grande station.

OCY-3 Route

4.19 The following is a brief environmental description of the OCY-3 area, corresponding to the two loop routes comprising the OCY-3 pipeline.

4.20 For Loop 1 (Campo Grande – Tiguipa), northward from Campo Grande (Yacuiba), this loop crosses the Subandean Piedemonte, paralel to the *Serrania del Aguarague* between the localities of Palmar Grande y El Palmar. This area is characterized by a slightly undulated topography, and vegetation typical of the *Bosque Seco Chaqueño* formation presenting different levels of intervention that range from forests altered by intensive cattle grazing to completely degraded areas due to intensive agricultural activities. The OCY-1 ROW has been further intervened since its construction in 1955 traversing some sectors currently urbanized. In some areas such as Tiguipa and Villamontes, the urbanized area reaches the ROW boundaries.

4.21 For Loop 2 (Tiguipa – Cordillera Station), this loop crosses a mountain range between Camiri and Choreti known as the Serrania of Sararenda. This section presents superficial soils highly susceptible to erosion mixed with rock outcrops. The natural vegetation found in this sector corresponds to the *Bosque Serrano Chaqueño* formation presenting different levels of intervention that also range from forests altered by intensive cattle grazing to completely degraded areas due to intensive agricultural activities; and to the Bosque Seco Chaqueño interrupted by crops and grazing areas nearby urban and rural zones. In some places such as the Boyuibe-Choreti-Cordillera section, the route crosses high sloped and narrow valley areas highly susceptible to erosion processes. The ROW has also been further intervened since its construction in 1955 traversing some sectors currently urbanized.

B. Social

4.22 This section describes the social conditions of Transredes' existing project area and, specifically, of the southern region where most of the expansion plans will be implemented in. The expansion projects for gas and liquids will all take place in the Chaco plains, crossing the Departments of Santa Cruz, Chuquisaca and Tarija, except for the new compressor station in Campero, located southwest of the La Paz department, in the Andean Plateau.

Population

4.23 The population of Bolivia is multi-ethnic, socially and culturally different according to their own cultural and historical characteristics. In the Andean Plateau, the majority of the population belongs to the Aymara and Quechua cultures, and the rest are "mestizos" – the offspring of the mix between the Spanish and the Natives. In La Paz, the Aymara culture is prevalent, in Cochabamba, Potosí and Chuquisaca the Quechua, and in the valleys of Tarija, the mestizos. The northern Yungas are inhabited mainly by afrobolivians and the southern Yungas by Quechua, yuras and other native groups. In the Chaco Plains the population is represented by the Ava-guaranies, Weenhayeek and Quechua and Aymara immigrants originating from the Andean region and Tarija, and the local chaqueño farmers.

Economic Characteristic

4.24 Intensive agriculture, cattle, sheep and llama raising are practiced in the north Andean Plateau, along with fishing and handcrafting in the Lake Titicaca area. In the central Andean Plateau, the agriculture activities decrease due to the poor soil quality, and the cattle raising and handcrafting

increase; there is also some mining activity. In the valleys, the predominant economic activities are agriculture, cattle raising, industry, handcrafting, and trade. In the Chapare Yungas, coca leaves is cultivated along with bananas, pineapples, hearts of palm, etc. The hydrocarbon extraction is an important source of income for the country in this area. In the Chaco Plains, cattle raising is the main activity, in conjunction with fishing in the Pilcomayo River region. A very important part of the economy of this region is the big gas reserves in the petroleum fields extending from Santa Cruz to the Argentina border.

Land Use

4.25 The transportation system of Transredes crosses through private, communal and fiscal lands, with different land uses, such as: agricultural, grazing, industrial and sub-urban and urban zones. Since the pipeline system was built (some 40 years ago), demographic expansion occurred along the axis La Paz, Cochabamba and Santa Cruz; and Santa Cruz, Camiri, Villamontes and Yacuiba. It is estimated that the hydrocarbon system of Transredes passes near 400 small rural communities, 12 villages between 5,000 and 60,000 people, and cities such as Oruro, Tarija, Cochabamba, El Alto de La Paz , Santa Cruz de la Sierra, and the city and port of Arica in Chile.

Liquid and Gas Expansions' Influence Area

4.26 The expansion projects are located in the lowlands of Bolivia, in the region of the Bolivian Chaco, extending in the case of the GYRG along 430 kilometers from Yacuiba, on the border with Argentina, to the Río Grande plant in the Provincia of Cordillera in the Department of Santa Cruz. The project crosses at most through three administrative departments: Tarija, Chuquisaca, and Cordillera in Santa Cruz; three provinces: Gran Chaco in Tarija, Luis Calvo in Chuquisaca, and Cordillera in Santa Cruz: and six municipal sections: Yacuiba and Villamontes in the province of Gran Chaco, Macharetí in Luis Calvo, and Charagua, Cabezas and Boyuibe in Cordillera. The expansion projects also interferes with six claims of Indigenous Lands (*Tierras Comunitarias de Origen– TCO*): Weenhayek, Machareti-Ñancaroinza-Carandaiti, Charagua Sur, Charagua Norte, Isoso, and Tacovo

4.27 The present population group results from historical events that have occurred in the Bolivian Chaco. The native population comprises Guarani and Weenhayek indigenous groups. The total urban population within the expansion project area is 59,278 and the rural population is 18,371. The main social groups that are found in the project area are: *Mennonite Communities,* where agriculture is highly mechanized (mainly corn, cotton and sunflowers); *Quechuas and Aymaras*, who have settled in the towns and areas with market activities; *Chaqueño Farmers*, who are not considered an ethnic indigenous group or ranchers (They are known as "chaguancos" and are of guaraní origin that "remained within a ranch regime." They are closer in culture to the karai (half-caste white race) and are either cowboys or farmers/gardeners in the ranch).

4.28 Cattle farming is one of the main economic activities in the Chaco region of Bolivia. The most common system of livestock farming is open field grazing. Activities vary from small cattle farming (less than 50 heads) to medium producers (50 to 200 heads), and large operations (more than 200 heads). Most livestock farming takes place in the municipality of Yacuiba, with a total of 30,154 heads, whereas the livestock distribution in other communities is as follows: 5,490 heads in Villamontes; 935 heads in Machareti; 7,699 heads in Charagua, and 28,830 heads in Cabezas.

4.29 Other important activities are forestry, fishing and hunting, and temporary employment in cattle ranches. In addition to the Mennonite communities, some private companies are practicing

extensively mechanized agriculture in the north section of the project area. Amongst the main cropsare soya, sorghum and beans to be sold in regional and national markets, as well as corn, peanuts, potatoes, yuca (mandioca), vegetables and citric fruits to be sold in local markets or for subsistence consumption. The total cultivated area in the project area is 39,979 ha.

4.30 Fishing activities have been mainly developed in the Pilcomayo River and represent 20% of national production. This activity is mostly practiced by residents of Villamontes and the Weenhayek people living along the riverbanks. Fishing constitutes a source of income and an important source of food throughout the year. About 20% of the male population mainly from the southern side of the project area work in this activity during the main flowering seasons.

4.31 The basic public services in the project area, such as potable water, sewer systems, electricity, and telephone are mainly found in Yacuiba and Villamontes. Some communities have water supply infrastructure that could potentially be affected by the expansion projects, such as the communities of Chimeo, Caigua, Lagunita, Puesto García, Tiguipa and Tentami. In the Yacuiba – Villamontes section, the National Electricity Company (ENDE) has high-tension power-lines running along the west boundary of the YABOG's ROW. In the communities of Villamontes and Tiguipa, ENDE has both high and low-tension power lines on existing ROWs. In the Charagua and Ipitacuape municipalities, a telephone cabling extends along some sections of the ROW.

4.32 The main transport routes in the project area are the railway and the paved highway between Yacuiba and Santa Cruz. This highway connects the main towns of the Bolivian Chaco, and is classified as national highway and part of the primary road network. The communities located west of the Yacuiba – Santa Cruz highway are connected to it by local roads that cannot be used during part of the year due to the lack of maintenance provided. The existing ROWs are commonly used as a mean of communication between communities, towns and isolated properties becoming a local and/or regional highway.

Indigenous Groups

4.33 There are two ethnic groups along the pipeline expansion routes: the Guaraní and the Weenhayek. The *Guaraníes Ava-Chiriguano* group is comprised of about 50,000 members, which economy is based on subsistence farming and the production of goods for trade; the *Weenhayek*, indigenous people also known as Mataco, Wikyi or Wichi, currently live in 17 communities located on the right bank of the Pilcomayo River, in the area of Villamontes and in the community of Timboy, and their total number is 2,525. Fishing is its most important activity (Cattle farming is not practiced by this group). They are also known as gatherers of wild fruits and honey.

4.34 The pipeline expansion projects passes through six claims of Indigenous Lands *(Tierras Comunitarias de Origen – TCO*) of the Weenhayek and Guarani (Macharetí, Charagua Sur, Charagua Norte, Isozog, and Takovo) groups. In the TCO *Weenhayek*, in the Province of Gran Chaco (Tarija Department) the expansion project will cross 4 of the 17 communities. In the TCO *Macharetí*, located in the Province Luis Calvo (Chuquisaca Department), the proposed project will cross 2 of the 14 guarani communities. In the TCO *Charagua Sur*, in the Province of Cordillera (Santa Cruz Department), the expansion project will pass close to 5 of the 16 guarani communities. In the TCO *Charagua Norte*, located in the Province of Cordillera (Santa Cruz Department), the project will pass close to one of the 20 guaraní communities. With regard to the *TCO Isoso* and TCO *Takovo*, the expansion project does not cross or passes near any of the communities.

V. ENVIRONMENTAL AND SOCIAL IMPACTS

5.1 The principal potential negative environmental, social, and health and safety impacts and risks are associated with: (a) the construction activities of the Investment Plan, (b) the operation of the existing and new (future) facilities and operations, and (c) environmental liabilities acquired by Transredes at the time of concession takeover. This section presents a summary of the principal potential environmental and social impacts and risks associated with the construction of the Investment Plan works (section 5.A) and the operation of Transredes facilities, both the new facilities from the Investment Plan (section 5.B) and the existing facilities (section 5.C). A summary of anticipated positive benefits from the project are presented in section 5.D.

A. Construction Phase

5.2 The principal components of the Investment Plan are the construction to complete the OCY-1 and OCY-2 pipeline expansion (liquids system expansion) and the YABOG pipeline expansion (gas system expansion), which are also the principal potential sources of environmental and social impacts during construction of the Investment Plan. Since the new pipeline alignments will be almost exclusively within the existing Transredes right-of-ways (ROW), the environmental and social impacts will be greatly minimized. Therefore, the majority of the construction impacts will be limited to the areas immediately adjacent to the ROW and mitigated with standard construction environmental and social management procedures. Since the expansion projects are basically along existing pipelines and ROWs, there is very limited need for new access roads, no involuntary resettlement required, and no known historical or archeological sites that will be impacted.

Environmental

5.3 The principal potential environmental impacts include a limited loss of vegetation, erosion, air emission by trucks and machinery, noise, potential soil contamination from fuels, lubricants, hydraulic fluids, solvents and/or other chemical products and wastes that could potentially reach the water body.

5.4 Loss of vegetation: Vegetation removal and deforestation activities will be limited given that the expansion areas for the new pipelines will mainly be confined to the existing ROWs. This is similar for new stations, where vegetation cover is limited to mainly secondary vegetation and does not include any protected or endangered species. Exceptions occur where ROW is located in sensitive areas in the Chaco forest (i.e., south of Villamontes, south of Nancorainza and south of Grande river). In this area, the expansion of the YABOG pipeline will require a widening of the ROW, thus a loss of approximately 250 to 450 has of the native forest cover along the existing ROW is estimated. This amount represents less than 0.01% of the Chaco forestland in the project expansion area.

5.5 Tree cutting (falling) along the ROW should allow the regeneration of plants and trees that are not currently developed due to a lack of sunlight, as is the case of the Sotillo (*Schinopsis cornuta*), Quebracho Colorado (*Schinopsis Quebracho Colorado*), and Cuchi (*Astronium urundeva*), which will therefore benefit from an opening up of the forest canopy. This natural succession will temporarily change the structure and composition of the native vegetation until the original forest structure of the surrounding area is re-established. According to the results of the EIA vegetation surveys, impacts could occur at the following points: YABOG Km 100, Km 130 and Km 197. The protected species that have been identified include the cactaceous

Gymnocalycium pflanzii and *Monvillea parapetiensis*; also there is the presence of the Quebracho Colorado, a national species threatened by intensive land use.

5.6 Impacts on fauna: The impact on wildlife is primarily related to (a) the loss of vegetation by tree falling and the effects on wildlife and birds associated with this activity; and (b) changes in water courses associated to rivers crossing activities. With regard to the wildlife and birds, amongst the most sensitive areas are: the section extended from the southern bank of Grande river to Km 206 of the YABOG pipeline, known as the Paisaje del Chaco de Llanura Aluvial; the section extended between Km 373 of YABOG and south of Nancaroinza; and the section extended from the southern bank of the Pilcomayo river to Km 440 of YABOG. With regard to aquatic resources, sensitive fishing areas include the Grande, Parapetí and Pilcomayo rivers, as well as the Saipurú, San Lorenzo, Chorritos, Charagua, La Tabla, Cuevo, Tiguipa and Camatindi creeks.

5.7 Erosion: Vegetation clearing, leveling and excavation backfilling or compacting has a potential to provoke erosion. Nevertheless, the new stations and the new pipelines will be located mainly on flat areas, where the potential for erosion is lower. However, erosion is likely to happen in the sandy and unstable soils such as those in the area known as Arenales de Guanacos, to the south of the Grande river. These soils constitute an area of special sensitivity. There are sections through these dune areas (88.5 ha between pipeline markers K176 and K268) that due to their unstable nature will need additional efforts to successfully re-vegetate upon construction completion.

5.8 Air emissions: Dust and/or particulate material are likely to be produced by earth movement activities and mobilization of heavy machinery and, vehicles emissions during the construction, especially during the dry season. Other air pollutants produced by stationary and mobile engines/machinery include carbon monoxide (CO), sulfur dioxide (SO_2), and nitrogen oxides (NOx) from combustion engines. Some measurements were made at Tiguipa station during the OCY-3 EIA preparation, and elevated CO levels were detected. The effects on air quality, however, are expected to be temporary and localized (limited to the construction and immediate adjacent areas).

5.9 Noise: Increased noise levels will result from the use of machinery, vehicles, and explosives. The maximum noise levels generated by the types of machinery to be used in the pipeline construction will be 85 dBA (at a distance of 10 meters from equipment). This means that noise levels will drop to 60 dBA (the sound of a normal conversation) within 180 meters of the construction activities, and drop to 40 dBA (the sound of a quiet place) within 2 kilometers. Likewise, noise levels produced by vehicles at 35 Km/h will vary between 68 and 72 dBA. These are temporary effects, given that equipment/vehicles operation periods are limited by construction needs and to daylight hours. Many portions of the ROW area are already impacted by public transportation uses, including for example, the Camiri – Yacuiba road, the Santa Cruz – Yacuiba railroad, and inhabited areas.

5.10 Soil contamination*:* The potential degradation of physical and chemical characteristics of soils can result from improper disposal of solid/liquid wastes, leachate seepage/infiltration, or hydrocarbon leaks/spills. Potential sources of soil contamination are used materials, solid wastes, liquid effluents associated to directional drilling activities or production water, fuel, lubricants, and chemical products, among others.

5.11 Damages to existing infrastructure: During construction, there is a risk of affecting existing infrastructure, such as potable water supply lines, irrigation channels, electric power lines, fences, and cattle watering holes. The density of infrastructure services that could potentially be affected increases towards the south, with the greatest incidence being between Machareti station and

Chimeo. Cattle watering holes are particularly critical in the cattle farming areas of the GYRG (YABOG) pipeline. These artificial water storage ponds are constructed in ground depressions very close to the YABOG ROW and are highly susceptible to sediment deposition.

5.12 River Crossings: Environmental concerns are high at river crossings, where impacts may potentially extend over a larger area downstream the crossing section. River or creeks crossings using open trench methods could cause changes in bottom profiles and river banks could indeed become susceptible to erosion problems. Erosion occurring on ROW's adjacent cleared areas could increase the sediment load carried over, resulting in increased turbidity levels in the water bodies traversed by these pipelines. Of particular concern are river and creek crossings in areas where indigenous people conduct their fishing and agriculture activities. On the other hand, discharges of drilling fluids from directional drilling are a potential source of contamination. The OCY3 pipeline will cross two of the main rivers (Pilcomayo and Parapeti). The Pilcomayo river crossing its planned to be performed by open ditch, whereas for the Parapeti river crossing method a geotechnical study will be carried out to subsidize the decision regarding the best technical, environmental, social and economical method of crossing.

Social

5.13 Social and cultural impacts: Campsites will be built at Caigua, Saipurú and Taquiperenda stations. The expansion construction will also use available services at Villamontes and localities near the work areas. In Saipuru area impacts will be potentially higher, given that the number of foreign workers will be bigger and the works will last for a longer period in this area. Estimated impacts are related to cultural conflicts between foreign workers and local residents, potential increase in violence and prostitution, and potential dissemination of exogenous diseases.

5.14 Impacts on economic activities: Noise from construction activities at the different work fronts and the loss of forest due to vegetation clearing could temporarily affect: (a) the ranching activities (where cattle eat leaves from the lower branches of trees in the forest), particularly in areas bordering the YABOG ROW; (b) the occasional hunting activities of the Guaraní communities near the ROW, in particular in the areas of Charagua Sur and Machareti; nevertheless, hunting activities are mainly carried out outside the areas of immediate influence of construction activities, to the east of the ROW (Serranía de Aguarague and Piedemonte) and to the west in the floodable areas of Isoso; (c) a total of 29 ha of crops and private property located alongside the ROW; and (d) the fishing activities of the Weenhayek people whose economy depends on fishing in the Pilcomayo during the months of March to September.

5.15 Weenahyeek: In relation to the mitigation of impacts on the Weenahyeek TCO, which is crossed by the gas and liquids expansion project, Transredes contracted a special social study to identify the main impacts and design cultural appropriate and sensitive mitigation and compensation measures. The information was incorporated into the EIA prepared in 2002. The Executive Summary of the study is presented in Annex 2

B. Operation Phase

5.16 In general, the principal impacts during the operational phase are: (a) potential risk of accidents involving spills, fires, and explosions; and (b) potential increased noise levels, air emissions and soil contamination at pump and compressor stations. This section focuses on the operational impacts of new projects of the investment plan, whereas Section V.C summarizes impacts and liabilities associated with existing Transredes operations.

Environmental

5.17 Noise: Impacts due to increase of noise levels are likely to be significant on receptors/areas located nearby the three compressor stations where the turbine engines operate. Using information from similar facilities, it is possible to estimate the potential effects from the increased noise emissions. The maximum noise levels will occur in the vicinity of the Saipurú and Taquiperenda stations, which operate with two 5,600 HP gas turbine engines. These engines will generate noise levels of approximately 103 dBA (at a distance of 1.8 meters from the noise generating equipment/facility). This suggests that noise levels will drop to approximately 60 dBA within 250 meters of the facility. The Saipurú and Taquiperenda stations are located more than 15 km away from the closest populated centers. The estimated noise levels in the Tiguipa station are below the World Bank limits (Pollution Prevention and Abatement Handbook, 1998)(see Table 5.1) and no sensitive receptors have been reported to exist in the surroundings of the Cordillera station area.

5.18 Air emissions: The most significant sources of air quality impacts during the operation stage are the combustion emissions from the compressor stations. The combustion emissions of greatest importance are oxides of nitrogen (NOx) and carbon monoxide (CO). There are also a small volume of fugitive emissions that will escape from flanges, fittings and valves. All three of the new stations will utilize gas powered turbine engines. Daily emission rates or loads were calculated using the updated version of AP/42, section 3.1 (USEPA, 2000). Total NOx daily emission loads resulted 14.8 kg/d in Saipurú, 11.8 kg/d in Caigua, and 14.8 kg/d in Taquiperenda. Total CO daily emission loads resulted 2.1 kg/d in Saipurú and 4.2 kg/d in Taquiperenda.

5.19 Ambient air quality: Given the relatively small volume of emissions from the compressor stations and the relatively small stack heights, maximum impacts were predicted to occur in the immediate vicinity of each station. Potential effects from the increased emissions were evaluated using the SCREEN3 dispersion model developed by the USEPA. Both the maximum ground level NOx and CO concentrations predicted to result from the operations will be well below the World Bank limits (Pollution Prevention and Abatement Handbook, 1998)(see Table 5.2).

5.20 Soil and water contamination: During operation stages, a release/spill from a liquids pipeline or improper handling and disposal of solid/liquid wastes in compressor or pump stations could result in potential soil, ground water or surface water contamination.

5.21 Impacts on fauna: In principle, elevated noise levels from pumping or compressor stations could have different potential effects on existing fauna and aquatic species, as well as hydrocarbon spills/leaks that reach surface water bodies. Nevertheless, impacts on fauna are likely to be of small magnitude given that the project expansion follows an existing ROW, and therefore can only marginally increase existing impacts.

Social

5.22 Damages to existing infrastructure: This impact could result along ROWs as a result of maintenance/repair activities, in particular in areas located nearby existing towns, where different utility services share a limited space adjacent to the ROW. A cut in an irrigation system that crosses the ROW, the interruption of water supply to the watering holes or other reservoirs could directly affect the production of different crops that are used for human consumption or for animal fodder. The density of infrastructure services that could potentially be affected increases towards the south with the greatest incidence being between Machareti station and Chimeo.

5.23 Alteration in water availability: The Cordillera station will require a water supply well to satisfy its sanitary and industrial needs. Such well could cause a variation in the aquifer reserves, thus diminishing this resource availability. Nevertheless given the small quantities required, this impacts is likely to be of small magnitude and importance. The station will need during approximately 3,300 l/day during operation.

C. Existing Impacts

5.24 As a result of the preparation of the *MAs*, a number of environmental and social liabilities were identified and remediation action plans drafted, including an implementation schedule. The principal liabilities related to: (a) soil and water contamination due to improper waste management prior to capitalization; and (b) elevated waste water discharges, air quality emissions and noise levels at pump and compressor stations.

5.25 The priority remediation actions have already been implemented by Transredes during the initial years of operation. However, additional activities required to correct existing liabilities are part of the Investment Plan proposed to be financed. Table 5.3 presents a general list of environmental deficiencies that will be corrected as part of the Investment Plan. Table 5.4 presents the list of generalized liabilities by facility.

5.26 Parallel to the preparation of the *MAs*, the Bolivian government agreed to have all environmental liabilities originated by YPFB operations transferred to the National Treasury. For that purpose, Phase I and II audits were carried out to estimate the amount to be credited to Transredes in its opening balance in order to cover the required remediation actions. Liabilities were identified, priorities for remediation were assigned and a General Remediation Plan was presented to the Bolivian government for approval. Currently, Specific Remediation programs are being prepared for four high and two medium priority sites located in the areas near Santa Cruz; Old Station 1, Samaipata, Yapacani, Humberto Suarez Roca, Carrasco and Caranda stations.

Environmental

5.27 In January 2001, Transredes performed sampling/monitoring activities at numerous stations in order to assess status after initial upgrading activities had been implemented. The results of these monitoring varied from station to station. In general, these results showed that in certain cases some deficiencies still remained unsolved. Therefore, additional actions were proposed to correct existing situations. In the year 2000, an air emissions and noise levels inventory was carried out on 25 stations of Transredes system. The emissions of in the inventory were CO, CO_2, NOx and SOx. Local, World Bank, San Joaquin Valley UAPCD, and USEPA regulations were considered to assess emission rates from all sampled sources. Table 5.5 presents the air quality parameters of concern for each subsystem. In all cases, additional actions were proposed to correct existing situations.

5.28 Noise at compression and pump stations was found to be a problem, in particular at the Transredes Central offices in Santa Cruz (electric generators) and the San Antonio station which is located approximately 0.5 kilometers from a Weehnayek community. Transredes has made a commitment to put silencers, which have since been fitted by the company. These silencers with an equipment attenuation of 30dBA are in operation and the noise levels will be monitored on a systematic way, as part of the monitoring program.

5.29 When available, municipal landfills are being used to dispose of non-hazardous wastes produced during operation activities. In some cases, these facilities may be in full compliance with all Bolivian environmental requirements.

5.30 Given the delay in the Government approval of the specific remediation programs for the liabilities originated by YPFB operations that were transferred to the National Treasury, in the Sica-Sica station, contaminated soils from YPFB (environmental liability waiting to be cleaned) is stored in a confined and lined pit to prevent soil contamination. Nevertheless, the area lacks the appropriate monitoring wells for early detection of potential underground water and soil pollution. Similar situation exists in the confined area where the Desaguadero spill polluted soils are stored. Similarly, at the Tarata site (This old station is now used for storage of construction material as well as for spill control equipment), the slop underground tank and buried lines (existing liabilities) have not yet been removed and no evidence of cleaning exists. Nevertheless, these issues are included under the liability agreement with the government.

5.31 Some of the stations have asbestos-containing materials in roofing tiles and fire retardant walls. Written instructions and signs are in existence. Many valve seals and gaskets on the pump/compressor stations and mainline valves are made with asbestos. Asbestos gaskets and seals are still in use.

5.32 On January 30, 2000, an oil spill of 29,000 barrels of crude oil spilled from the Huayñacota-Charaña-Arica (OSSA II) pipeline into the Desaguadero River. This spill resulted in oil spilling into the Desaguadero River near the community of Calacoto, Province of Pacajes, Department of La Paz. Upon becoming aware of the accident, Transredes reacted by stopping the flow on the pipeline and implemented an emergency response plan to contain the oil spill in the river in order to minimize the affected area. Transredes then implemented a comprehensive cleaning operation and a compensation plan for the affected families (see Section III.C and VI.E for details).

Social

5.33 Agricultural and human encroachment on the right-of-way has been identified as an exiting liability and is being addressed by Transredes in the Investment Plan. In some isolated cases (i.e. Esteban Arce village) the local communities are not aware of the exact location of the pipelines through their villages.

5.34 In terms of impacts on Weenhayek Communities, during the last 30 years, hydrocarbon activities (exploration, production and transportation) along with many other activities (agriculture, cattle raising, Chaco war, railway, and road building) have affected this indigenous group. The YABOG and OCY-1/OCY-2 expansion will indirectly affect the communities of San Antonio and Capirendita. A significant portion of the Weenhayek economy is related to fishing in the Pilcomayo, which in the past has been affected by the crossing of the YFPB pipeline

D. Positive Impacts/Benefits

5.35 At a national level, the Transredes Investment Plan will have a positive impact on the Bolivian economy due to the investment of approximately US$400 million, which will be distributed among different service sectors. Currently, transportation of hydrocarbons through Transredes' network is generating income for the central government (through taxes paid by companies) and for retirement funds that participate in capitalized companies. The project will result in increased income to the national government and local *prefecturas* through royalties and taxes, which will help decrease the governmental fiscal deficit and balance of payments.

5.36 At a local level, during construction, increased employment opportunity is a positive impact of the Transredes Investment Plan, although temporary. In total, approximately 2000 workers will be required at construction areas. Preference will be given to local labor, making use of the availability of resources in all populated centers located nearby the expansion projects area, such as Santa Cruz, Yacuiba, Villamontes, Caigua, Charagua, etc. As a result, local economy will temporarily benefit from the projects' needs for construction supplies and services. It has been anticipated that most of the project's supplies will be purchased in Santa Cruz and Yacuiba. In addition, workers will demand products for consumption, such as food, soda, cigarettes and clothing, as well as services related to health and entertainment, increasing cash circulation in the local economy, mainly in the towns of Villamontes, Saipurú, Charagua, Taquiperenda, Yacuiba and Santa Cruz. The enhancement of access roads and the temporary availability of enhanced medical services will also have a positive impact on the communities living nearby project areas.

5.37 In the medium and long term, the Investment Plan will provide the remediation of existing liabilities, enhancement and upgrading of facilities, thus contributing to reduce environmental and social risks such as spills, leaks and fires associated with the operations of the Transredes gas and liquid transportation network. In addition, the Bank participation has enhanced the Company's environmental, social, and health and safety management systems.

5.38 The additionality of the IDB participation has been particularly significant in relation to improving environmental and social management by Transredes. At the early stages, the IDB performed a pre-analysis mission in late 1999, which identified various concerns about the way Transredes was handling environmental and social issues. As a result, the IDB required that Transredes implement certain important steps, and the IDB suspended due-diligence activities until the Company demonstrated a substantial corporate effort to properly manage all environmental and social issues within their business.

VI. ENVIRONMENTAL, SOCIAL, HEALTH AND SAFETY MANAGEMENT

6.1 This chapter provides an overview of Transredes' approach and strategy to address environmental, social, and health and safety issues associated both with the Investment Plan and to the Company's overall operations. These commitments are expressed in the Transredes Health, and Safety, Environment and Social (HSES) management system (see Section VI.F for details), which was recently (August 2002) certified under ISO 14001. The HSES management system includes an Environmental and Social Management Plan (ESMP) for each of the expansion projects, for both construction and operation phases. Each ESMP consists of the following main programs: (a) Prevention and Mitigation; (b) Environmental Follow-up; (c) Contingency Plan; (d) Health and Safety Plan; (e) Restoration and Abandonment; (f) Social Management; and (g) Code of Conduct. A summary of environmental and social mitigation measures and monitoring programs is presented in Sections VI.A and VI.B, respectively. The HSES also includes health and safety requirements (see Section VI.C), contingency plans and procedures (see Section VI.D) and corrective actions to resolve liabilities (see Section VI.E).

A. Environmental and Social Mitigation Measures

6.2 The environmental and social mitigation measures are consolidated in each of the ESMP for the liquid expansion and the gas expansion projects, specifically as part of the Prevention and Mitigation Program (PMP). The contents of the PMP include the following environmental and social components for construction and operation: (a) construction and campsite preparation and

management; (b) protection of special areas and specialized construction; (c) erosion and sedimentation control; (d) protection of flora and fauna; (e) protection of archaeological and historical resources; (f) air quality control; (g) noise emissions control; (h) waste management; (i) spill prevention and control; (j) training and education; and (k) operation stage. As part of the construction contract, and based on the guidelines presented in the ESMP, the Contractor must prepare a specific environmental management plan for its activities.

6.3 In addition to the Prevention and Mitigation Program component, the ESMP also contains a Social Management Program (SMP). The SMP presents an integral strategy to promote a long-term relationship with different project stakeholders. This program includes the following components: (a) information/communication with community; (b) protection to social and economic infrastructure, which pincludes compensation due to construction and for limited use restrictions of ROW; and (c) support to use of local labor and services. The program includes the continuous presence of specialized community relation coordinators (*Relacionistas Comunitarios-RCs*), communication and information techniques that are adequate to each different public, priority to hire local workers, complaints follow-up mechanisms, and compensation mechanisms for property damages and losses during construction activities. In relation to the mitigation of impacts on the Weenahyeek TCO, which is crossed by the gas and liquids expansion project, Transredes contracted a special social study to identify the main impacts and design cultural appropriate and sensitive mitigation and compensation measures. The Executive Summary of the study is presented in Annex 2.

6.4 A brief description of the PMP for both construction and operation is presented below.

Construction Phase

6.5 Construction and campsite preparation and management: This program establishes specific environmental management measures to be implemented during construction in order to minimize the potential impacts that could result from construction activities. The thirteen (13) components address impacts related to the following key construction activities: (a) camp construction; (b) widening and preparation of ROW; (c) disposal of excavated soils; (d) signs and signals; (e) work front and pipe storage; (f) plant mobilization and pipe transport; (g) pipe management: stringing, alignment and welding; (h) trench opening and backfilling; (i) river crossings; (j) hydrostatic test: (k) restoration and clean-up; (l) final re-vegetation; and (m) final re-vegetation.

6.6 Protection of Special Areas and Specialized Construction: This component addresses the technical requirements and construction techniques for pipeline construction in sensitive areas, such as river crossings or high altitude zones. Some of these technical requirements include: (a) exclusive use of “smooth blasting”, with proper handling of explosives, previous preparation of blasting plan, use of warning signs and protections during blasting activities, and allocation of resources for proper emergency response in case of contingencies/accidents; (b) use of two different platform levels in steep topography areas to minimize earth and rocks removal; (c) use of drilling techniques to pass underneath roads or railroads; and (e) preparation of specific plans for river crossings, using either directional drilling (such as in the case of the Parapetí river), or open trench, and including proper handling and disposal of dredged materials, and preventive measures for leveling, excavation/backfill and restoration activities.

6.7 Erosion and Sedimentation Control: This component includes a set of procedures to: minimize exposed surface soil area and duration; protect critical areas by proper runoff handling; establish vegetation as soon as possible after final leveling; and provide proper maintenance to measures

until stable conditions be reached. These procedures are presented in the form of standard techniques, such as: (a) standard techniques to protect ROWs, wetlands, and water quality of nearby water bodies (i.e. small channels, etc.); (b) standard techniques for sedimentation control in steeply sloped ROW areas; and (c) standard techniques for slope stabilization using artificial devices (i.e., flow breakers, mesh filters, wood barriers, sand bags, etc.).

6.8 Protection of Flora and Fauna: This component comprises recommended procedures regarding (a) workers' awareness programs regarding protection of flora and fauna, in particular of protected or endangered species; (b) affectation of habitats; (c) prevention of pressures caused by hunting; and (d) limitation of worker's access areas other than construction zones.

6.9 Protection of Historical/Archaeological Resources: This component will be implemented in coordination with the National Unit of Archaeology (UNAR) and is designed to ensure that in case a potential archaeological/historical finding is made during construction, it will appropriately and timely evaluated, collected and registered.

6.10 Air Quality Control: Example measures proposed to mitigate impacts on air quality are: (a) flexible construction schedule, to adjust to meteorological conditions; (b proper vehicles/equipment maintenance; (b) use of water trucks to keep construction areas wet; (c) modify stack/chimney heights to comply with applicable standards; and (d) avoid waste burning.

6.11 Noise Emissions Control: Example measures proposed to minimize noise emissions are: (a) strict application of daylight schedule; (b) consider combined effect after exposure to more than one period of different noise levels; (c) restrict use of explosives; (d) vehicle maintenance program; and (e) use of appropriate equipment.

6.12 Waste Management: This component comprises the guidelines for appropriate handling and disposal of solid and liquid wastes, in compliance with international good practices and local legislation, and includes: (a) waste identification and classification; (b) waste minimization; (c) selection of proper disposal alternative; (d) final disposal; and (e) process documentation. As part of the construction contract, and based on these guidelines, the Contractor must prepare a Waste Management Plan (WMP) for the construction site.

6.13 Spill Prevention and Control: This component contains guidelines to minimize potential risks of spills and to properly control spills if they occur. As part of the construction contract, and based on these guidelines, the Contractor must prepare a specific Spill Prevention and Countercontrol Plan (SPCCP) including the following key set of procedures: (a) spill prevention, control and containment, such as inventories, storage, and fueling operations; (b) measures to prevent soils or water contamination; (c) materials and operational resources; (d) training; (e) emergency response; (f) spill response; and (g) clean-up measures.

6.14 Training and Education: This component includes a series of training sessions addressed at both the technical and administrative personnel of the Contractor. Such training sessions include the following components: (a) role and responsibilities of the companies involved; (b) role and responsibilities of the Contractor with regard to the implementation of the ESMP; (c) specific responsibilities of environmental inspectors; (d) general project description and construction stages; (e) potential impacts during each construction stage; and (f) measures and recommendations to meet objectives. These training sessions have a special emphasis on aspects that related to avoiding impacts on the communities, such as the erosion and sedimentation control procedures, spill prevention and control, and protection of flora and fauna species and cultural resources.

Operation Phase

6.15 The PMP establishes maintenance and inspection procedures to prevent and mitigate environmental and social impacts during operation, such as: (a) quarterly aerial ROW inspections using helicopters to identify potentially eroded areas, river bank conditions, and unauthorized uses of existing facilities; (b) restricted ROW access, using proper physical barriers, as well as signs; (c) guidelines for the implementation of agricultural activities in the ROW; and (d) satellite imagery analysis at intervals of 2, 5 and 10 years to determine and update conditions along ROWs. Health and safety and contingency/emergency procedures during operation are presented in Section 6.C and 6.D, respectively.

B. Environmental and Social Monitoring

6.16 The environmental and social monitoring requirements for construction and operation are established in the Environmental Follow-up (EFUP) and the Social Management Plan (SMP) components of the ESMP, which are briefly summarized below.

Construction Phase

6.17 The EFUP establishes the guidelines for monitoring of surface water and noise. Other parameters such as soil erosion, air quality, and flora and fauna are not monitored during construction, but only during operation.

6.18 In terms of baseline water quality monitoring, the Contractor will sample all relevant water bodies to be crossed by the pipeline, for the following parameters: Total Petroleum Hydrocarbons (TPH); Benzene, Toluene, Ethyl Benzene, Xylene (BTEX); Oil and Greases; Total Dissolved Solids; Total Suspended Solids (TSS); Turbidity; Biological Oxygen Demand (BOD); Chemical Oxygen Demand (COD); Metals; Total Phosphate; Nitrate, Sulfate; Coliforms; Detergents; pH; and Temperature. During construction, water quality monitoring of river crossing will be performed for: TPH, oil and grease, coliforms and turbidity. When directional drilling is used on river crossings samples of drilling muds will also be taken prior to disposal and analyzed for the following parameters: TPH; BTEX; Oil and Greases; Total Suspended Solids; Metals (Cadmium, Copper, Chromium, Iron, Lead,); Ammonia; Sulfurs; PH; and Temperature.

6.19 For the Rio Grande, Rio Parapeti, Rio Pilcomayo, Mayor Depressions and Minor Depressions, samples will be collected upstream and downstream of the point of crossing (50 meters away) prior to construction, during construction and following construction. Parameters for water quality sampling include general water quality (pH, acidity, conductivity, turbidity, TSS, TDS), bacteriologic parameters (BOD_5, COD), and chemical parameters including metals, oils and grease, and TPH. Following hydrostatic testing, test water will be analyzed at least once prior to discharge. Discharge flow will be monitored so as not to exceed 10% of the average stream flow. Analytical parameters will include oil and grease, COD, metals (Iron, Cr^{+3} and Cr^{+6}) and phenolic compounds. General water quality parameters (pH, temperature, TSS, TSD and temperature) as well as visual parameters will also be registered. If hydrostatic test water analytical parameters exceed established limits, the water will be stored and treated prior to discharge, as per the mitigation measures outlined in the Transredes' Campsite Preparation and Management Program (Refer to paragraph 6.4)

6.20 In cases were water is withdrawn for consumptive (potable) uses during construction, the water will be tested monthly for the following parameters: pH, conductivity, turbidity, hardness, total suspended solids, free residual chlorine, chlorides, iron, sulfates, and total and fecal coliforms.

6.21 Noise levels will be monitored to assess compliance with Bolivian regulations (*Reglamento en Materia de Contaminación Atmosférica)* and World Bank limits (see Table 5.1). Noise monitoring will be conducted at work sites, near communities, and at temporary camp areas, on a monthly basis during construction.

6.22 The social monitoring strategy is established in the Social Management Plan (SMP) and relies on the use of trained public relation coordinators (*RC-Relacionista comunitario*) to be permanently in the field. The SMP includes periodic meetings with local communities, proactive solutions to social issues, periodic meetings with construction contractors, documentation/reporting, and feedback and follow-up to the communities.

Operation Phase

6.23 The monitoring of vegetation recovery will be conducted for five years after construction. Monitoring will consider the different types of vegetative covers. Plant survival, composition relative to cover and percent cover (using a quadrant) will be monitored during the first month after completion of restoration and at three-month intervals thereafter. Corrective measures may be taken as necessary. Strict control over the potential spread of invasive species/weeds will be implemented.

6.24 Periodic visits to the ROW will be conducted particularly after heavy rainfall events to assess soil stability and erosion. The focus will be on performance of permanent erosion control structures at water crossings, and areas with steep slopes. Any cracks, slope failures or erosion events will be recorded and summarized in a report (monthly) which will include location, data, photographic records, description of area/problem, course of action, and recommended priority.

6.25 Air quality monitoring will measure atmospheric conditions (NOx and SO_2) at the source and site boundary of each compressor station at the station's perimeter twice a year in order to assess compliance with applicable standards.

6.26 For the existing operations, a list of standard monitoring activities was prepared for each subsystem, including monitoring conditions of fuel/lubricants drums or containers, monitoring hazardous and non-hazardous wastes handling, and inspecting water used on hydraulic tests for corrosion inhibitors contents, among others. Table 6.1 presents a standard sampling plan to be implemented during the subsystem upgrading process.

C. Health and Safety

6.27 The general health and safety framework applicable to all Transredes operations is developed in the Health and Safety Plan (HSP), which is part of the Corporate Health and Safety and Environmental System consolidated in the HSES Manual (M*anual de Salud, Seguridad, Medio Ambiente, Social y de Operaciones).* Specific health and safety measures for the expansion projects are contained in the specific ESMPs, which in turn are incorporated into the Contractor's contract, including the responsibility to develop and implement the specific HSP for each construction site.

6.28 The Transredes Health and Safety Plan contains a set of policies that are developed into guidelines and then translated into specific procedures for occupational health and safety. The procedures related to occupational health include, among others: drug and alcohol control; monitoring of unsafe work conditions; health monitoring of each employee; annual medical check-ups of operation employees; inspections of work noise levels; pathogen control in the circulatory system; health audits; food handling hygiene; and plants, animals and insects risks. An Emergency Medical Evacuation Plan is also part of the HSP. In regards to occupational safety issues, Transredes procedures include the following procedures, among others: training in the use of personal protective equipment, defensive driving, fire fighting, emergency response, first aid, hazardous waste management, and environmental protection; periodical safety reviews to identify potential hazards; use of personal protective equipment (PPE); and accidents investigation and reporting procedures.

D. Contingency Plan and Procedures

6.29 Transredes' Corporate Contingency and Emergency Management System (EMS) reflects the Company's commitment to protect the environment surrounding its operations, including the health and safety of its employees and the communities. Based on the Corporate EMS, each facility and each new construction and operation develops its own specific Contingency and Emergency Plan, including, among others, detailed plans for evacuation, risk maps, responsibilities and actions of the stations' operators, key contact information, locations of response equipment, and the specific procedures to minimize or control the emergency (spill, fire, release of gas, etc.).

6.30 The principal components of the EMS are: response organization; authorities, responsibilities and individual identification; spill or release identification procedure; notification procedures; methods of locating spills; on-site coordination and response; availability of resources and manpower; remediation actions; and investigation and reporting.

6.31 Transredes maintains a complete system to document and report spills and releases. According to Bolivian legislation (Article 124 Reglamento Ambiental del Sector Hidrocarburos, RASH), spills bigger than 12.5 bbls (more than 2 m^3) must be reported to the Environmental Director of VMEH, Superintendent of HC of SIRESE, to the MDSP, and to local authorities. Transredes' system includes the following criteria: spills larger than 12.5 bbls (2 m^3) are reported; spills of between 0.5 and 12.5 bbls are registered for statistical reasons; and leaks under 0.5 bbls are not registered. All registered spills and leaks are documented in terms of place, date, kilometer, type of event, identification of the pipe and system, specific product, amount spilled and recovered, type of impact, environmental impact assessment (type of soil, river, urban or rural area, etc.); and corrective actions are implemented. The spills or leaks are subject to follow-up and monitoring.

6.32 A Contingency Plan (Crisis Management Plan) for the liquid expansion project (OCY-3) has been developed to respond to risks identified in the risk analysis included in the corresponding EIA. This plan proposes an organizational structure to be put in place and procedures to be implemented to handle contingencies during project construction and operation. It also contains maintenance guidelines. The main goal of this plan is to minimize effects of incidents on workers, population, environment, private and company property, and operational continuity. This plan includes the following components: procedures to classify events, list of telephones, specific responsibilities, forms, list of legal documents, storage inventories, list of key personnel, medical emergency evaluations, emergency supplies and needs, implementation notes, and list of procedures for other situations.

6.33 The Transredes' Contingency Plan for the gas expansion project (GYRG) addresses the risk scenarios identified in the risk analysis, which was included in the corresponding EIA. The plan includes two main components: Company Strategic Plan and Operational Plan. The Company Strategic Plan identifies the functions and responsibilities of the people in charge of emergency response, outlines the resources, training programs, and response strategies based on established risk scenarios. The Operational Plan provides: specific procedures to be followed during control emergencies caused by leaks, fires, explosions or other natural threats, such as initial response procedures; determination of the scale of the emergency; establishment of a command center; selection of operational strategy; senior-level decision making; and reporting on the emergency and effectiveness of the response.

E. Corrective Action Plan

6.34 Transredes has two main liabilities arising from its operations: those inherited from YPFB at the time of capitalization and those related to the oil spill into the Desaguadero River. In relation to the liabilities inherited from YPFB, Transredes signed an agreement with the Government on June 11, outlining a work plan containing environmental actions to be approved prior to start of clean up and detailing the process for sign off after remediation of any existing liability is completed. This agreement clearly places the responsibility for clean up with the Government. Transredes, however, has US$2.4 million in its balance sheet from capitalization to carry out this work. Any over budget will remain under the government's responsibility. Transredes is obliged to carry on the remediation in a period of three years starting from the date of signature of the Agreement, which can be extended with a 90-day notice.

6.35 With regard the liabilities in connection with the Desaguadero spill, Transredes has performed the Environmental Audit, in compliance with articles 108 and 109 of the Prevention and Control of Environmental Pollution Regulations (*Regulación de Prevención y Control Ambiental*) and at the request of the Interministerial Committee chaired by the *Viceministerio de Medio Ambiente, Recursos Naturales y Desarrollo Forestal (VMARNDF).* Based on the results of the Audit, Transredes presented a three-part Environmental Corrective Plan (*Plan de Adecuación Ambiental*):

(a) Monitoring and sampling to confirm that the hydrocarbon concentrations in soil, water and sediments and benthos comply with internationally accepted standards, and includes definition and prioritization of sampling points and establishes monitoring and analysis protocols, documentation chain of custody as well as sampling procedures, QA/QC controls and HSE management requirements for those participating in the process.
(b) Health monitoring (agreed with the Ministry of Health through Note VMEH 7849-UMA 1269/01); and
(c) Information and public consultation.

6.36 In addition, the Ministry of Sustainable Development and Planning (MDSP) determined that the Company must implement four additional initiatives listed below.

(a) A private short-term compensation plan under which Transredes has paid the full amount of US$ 3,792,158, including a total of US$ 1,217,213 given to communities prior to the publication of the Environmental Audit. On August 2, 2002, MDSP signed the confirmation that Transredes has fully complied with this requirement.
(b) A strategic plan to help the recovery of the area using the medium-term compensation resources of US$ 2,252,621 identified by the Audit. Transredes has complied will the

exception of two communities. The outstanding payments (US$60,000) have been deposited in legal accounts awaiting collection by each community.

(c) A road reparation plan to be carried out with the Prefects of La Paz and Oruro. Contracts have been signed with both Prefects for implementation at a total cost of US$ 189,575.

(d) A waste treatment plan for the residuals held in Sica Sica. This followed the normal licensing process beginning with a *Ficha Ambiental* that classified the project as Class II, production of an EIA with the appropriate public consultation and final government approval in the form of an environmental license. Annex 3 presents a summary of the waste treatment plan.

F. Environmental, Health and Safety Management

6.37 The Transredes' Health and Safety and Environment and Social Management System (HSES) is part of a business management system that integrates Quality, Environment, Health, Safety, and Social components. The HSES Management System is based upon ISO 14.000, U.S. OSHA 18.001 standards, and SHELL/Dutch Group guidelines. During the year 2000, an ISO 9000 implementation process began and the Quality component was successfully certified in December 2001, under the ISO 9001 Standard. During year 2001, an ISO 14.001 implementation process started and in July 2002 the pre-certification audit was undertaken. The ISO 14001 certification was issued on August 30, 2002.

6.38 The HSES is under the responsibility of the Health, Safety, Environment and Social (HSES) Vice-Presidency, which was created in December 2000, and presently this unit has over 20 staff persons. Since then, Transredes has substantially improved its environmental and social and health and safety management system, implementing intensive training, standard procedures, and extensive upgrade of facilities.

6.39 The Corporate HSES Management System is consolidated in the Corporate HSES Manual (*Manual de Salud, Seguridad, Medioambiente, Social y Operaciones*), compliant with ISO 14.001 principles and guidelines. The Manual is under the supervision of the Quality Manager, who coordinates its distribution, updating and review, given that the HSES system is managed under a continuous improvement framework. The contents of the HSES Manual include, among other sections: Policy and Strategic Objectives; Organization, Responsibilities, Resources Competence, Standards and Documentation; Risk Management Processes; Planning; Implementation, Correctives and Preventive Actions and Performance Reports; and Evaluation and Auditing. The HSES Manual also includes a set of annexes with specific procedures on Health, Safety, Environment, Social, and Legislation.

6.40 Specifically with regard to the Environmental Management component, the Company has set up a steering committee including top managers to carry on the follow up and review of the environmental management system.

6.41 With regard to the structure of the environmental management component of the HSES management system, which is consolidated in the Environmental Management System (EMS), Transredes followed the guidance provided in ISO 14001, as follows: (a) *Identification of Environmental Aspects*, environmental aspects of Transredes operations were identified taking into account legal requirements, previous environmental accidents and environmental liabilities, and based on the environmental aspect identified, management objectives were established; (b) *Identification of Legal Requirements*; (c) *Establishment of Objective and Goals*, which takes into consideration the legal requirements, significant environmental aspects, technology options, financial, operational and business requirements, and interests of third parties (mainly local

communities); (d) *Design of the Environmental Management Program* to reach the goals and objectives as established; (e) *Designation of Responsibilities*, by function and level; and (f) *Operational and Financial Resources, Schedules and Timeframes* for the implementation of the environmental management programs.

6.42 With regard to the implementation and operational requirements of the EMS, Transredes also follows the ISO 14001 guidelines. In terms of *Roles, responsibilities and* authorities, these are defined, documented and communicated. The Transredes President provides the essential resources and the high-level management (*Vice-presidencia de Salud, Seguridad, Medio Ambiente y Social - VPSSMS*) of Transredes coordinates the EMS. *Training and Awareness* Programs are implemented in accordance with the specific training needs that have been identified. For example, key operational personnel are trained on specific issues related to emergency management. Transredes maintains an *EMS Documentation system*, where essential elements of the EMS are described and linked with documentation related. Transredes maintains procedures for D*ocument Control*, which allows for documentation to be updated by authorized personnel. Updated versions are available in the corporate Intranet. In addition, there is a library that maintains the documentation filed according to a specific procedure. Transredes maintains an *Emergency Preparedness and Response Procedures* to identify and respond to potential accidents and emergency situations, which include: Medical Plan for Emergency Evacuation; Crisis Administration Plan; Corrective, Preventive and Emergency Maintenance; and Emergency Plans Elaboration.

6.43 The Transredes EMS also has specific procedures to prevent and mitigate environmental impacts linked to the existing operations, for example, Installation Inspections by External Parties and Attention, Cleaning and Recuperation of Hydrocarbons Discharges/Leaks. In addition, the EMS contains *Monitoring and Measurement* procedures to regularly monitor and measure the key aspects of its operations that may have a significant impact on the environment. The EMS also has *Compliance and Corrective/Preventive Actions* procedures to investigate and correct non-compliances. This procedure is periodically applied to both new projects and routine operations. The identification, maintenance and filing of environmental records follows the Environmental Registration procedure.

6.44 Transredes also implements an *Environmental Management System Audit Program* that follows a specific procedure for periodic environmental audits (Planning, Execution and Follow up of EMS Internal Audits).

VII. INFORMATION DISCLOSURE AND PUBLIC CONSULTATION

7.1 As part of the Company's Corporate HSES Management System, Transredes has a Social Strategy that explicitly states that local population and all affected parties must be informed on the Company's policies, activities and safety standards.

7.2 Specific disclosure of information and public consultation were undertaken for both the gas and the liquids expansion projects. Transredes's strategy concerning public consultation for the liquids and gas expansion projects was developed based on the International Finance Corporation (IFC) guidelines “Doing Better Business Through Effective Public Consultation and Disclosure”.

7.3 The disclosure strategy for *Gas Expansion Project (YABOG*) was implemented in four phases, from April 2000 to October 2001. Phase 1 consisted of disclosure of information on the project in Spanish and Guaraní (April to May, 2000). Phase 2 consisted of meetings with municipal

governments (May to June, 2000). Phase 3 comprised disclosure of an executive summary of the EIA in Spanish and Guaraní and two public meetings with non-indigenous communities (January to July 2001). Phase 4 consisted of disclosure of the draft EIA in municipalities, communities, and to NGOs, including the *Asamblea del Pueblo Guaraní (APG)*, between June and July, 2001. Seven (7) Community Liaison Officers (*Relacionadores Comunitarios, RCs*) helped people that could not read or write to understand the project impacts and express their opinions and concerns. Meetings with various sectors of the central government were also held (August to October 2001). In July 2001, Transredes held a meeting with Asamblea del Pueblo Guarani (APG), in which executive summary of the EIA, in Spanish and Guarani were distributed, and a discussion held on the proposed project. In total 74 consultation meetings took place among indigenous communities, non-indigenous communities, municipalities, NGOs and government institutions. More than 2000 copies of the summarized versions of the EIA in Spanish and Guaraní and 70 copies of the complete draft EIA were disclosed.

7.4 For the *Liquid Expansion Project* (OCY-3 and Cordillera station), consultation process also followed a phased process. Phase 1 consisted of initial meetings with indigenous and non-indigenous communities, as well as with NGOs and central government. A brochure, in Spanish and Guaraní, and a printed version of the information presented in the meeting was distributed (February 2002). Phase 2 comprised the disclosure of the executive summary of the EIA, in Spanish and Guaraní, and of the draft EIA in communities, municipalities, and to NGOs (April to May 2002). Phase 3 consisted of disclosure of information concerning the EIA, both in Guaraní and Spanish, and a second meeting in communities and municipalities (May 2002). In total 64 consultation meetings took place among indigenous communities, non indigenous communities, municipalities, NGOs and government institutions; more than 2000 copies of summarized versions of the EIA in Spanish and Guarani were distributed and 60 copies of the complete draft EIA.

7.5 Another set of meetings for the two expansion projects were conducted with different sectors of civil society in Santa Cruz (April 29, 2002); with *Confederación de Pueblos Indígenas del Oriente, Chaco y Amazonía (CIDOB*) on April 30, 2002; and in La Paz, on May 7, 2002 with the *Asamblea del Pueblo Guaraní (APG*), representatives of the central government and several NGOs.

7.6 At the specific request of the IDB, Transredes prepared an Environmental Analysis, which evaluated the potential environmental and social impacts associated with the Investment Plan. This environmental analysis was made available to the public. Also at the request of the IDB, Transredes conducted four public meetings in Oruro (22 April 2002), La Paz (23 April 2002), Cochabamba (24 April 2002) and Villamontes (27 April 2002). These meetings were held in order to present the proposed Investment Plan and the Transredes plan to mitigate and monitor potential environmental, social, and health and safety impacts and risks.

VIII. RECOMMENDATIONS

8.1 The Bank (IDB) will require as part of the Loan Agreement that the Company (Transredes) and all portions of the Investment Plan and Transredes operations shall, at all times during the life of the Loan Agreement, comply with each of the following:

(a) All applicable environmental, health and safety Bolivian regulatory requirements, in particular: (i) all the conditions established in the environmental permits; (ii) all environmental, health and safety requirements of the Project contracts, and any

subsequent modifications; and (iii) all requirements associated with any environmental, health and safety related permits, authorizations, or licenses that apply to the Project or the Project Company.

(b) All aspects and components of the various Transredes environmental, social, health and safety documents.

(c) Applicable aspects of the World Bank General Environmental Guidelines (World Bank Pollution Prevention and Abatement Handbook, 1998).

(d) Applicable aspects of the International Finance Corporation General Health and Safety Guideline (1998).

(e) Consult with IDB before approving or implementing any and all substantive changes to the Project or its timetable that could potentially have material negative environmental, social, or health and safety effects.

(f) Send written notice of any and all noncompliance with any environmental and social requirements of the Loan Agreement and any significant environmental, social, or health and safety accident, impact, event or environmental claim.

(g) Ensure that all companies contracted for construction or operation activities comply with the applicable environmental and social requirements of the Loan Agreement.

(h) Implement ongoing information disclosure and consultation activities related to environmental, social, and health and safety aspects of the Investment Plan and Transredes operations.

(i) Implement an environmental, health and safety management system that is consistent with the main principles of ISO 14001.

8.2 Prior to the date of Financial Closure, the Company must:

(a) Present a finalized Corrective Action Plan for all existing environmental and social liabilities and issues, including those in the Agreement signed between Transredes and the Government of Bolivia on July 11, 2001, subsequent internal environmental audits performed by Transredes as part of the ISO 14001 certification process, and the material issues identified as part of the IDB environmental and social due-diligence. The Corrective Action Plan must be in form and substance acceptable to the IDB, including without limitation, a description of corrective actions, the organizational structure and assigned personnel responsible for the implementation of the actions, and the estimated budget and time schedule of implementation, including key milestones.

(b) Present a summary on the status of any pending legal or administrative actions related to the Desaguadero oil spill.

(c) Present evidence of noise abatement related to Station San Antonio.

(d) Present a summary of current legal status and negotiation related to the Weenhayeek community and the legal rights of Transredes at station San Antonio and the rights-of-way (ROW) of the OCY-1.

8.3 Prior to First Disbursement of the Loan, the Company must:

(a) Present a consolidated final version of the Environmental, Social, Health and Safety Management Plan (ESHSMP) for construction applicable to the liquid and gas expansion systems, in form and substance acceptable to the IDB, including without limitation, the organizational structure responsible for the implementation of the ESHSMP, the assigned personnel and budget as well as the schedule of implementation, with the relevant milestones, in particular for the development of the detailed operational Construction Procedures to be developed by each Contractor. The ESHSMP must include the mitigation measures and monitoring programs as specified in the Transredes Health,

Safety and Environment (HSE) management system, including without limitation: (i) Construction and campsite preparation and management; (ii) protection of special areas and specialized construction, in particular for river crossings and for works on indigenous lands; (iii) erosion and sedimentation control; (iv) protection of flora and fauna; (v) protection of archaeological and historical resources; (vi) air quality control; (vii) noise emissions control; (viii) waste management; (ix) environmental awareness, training and education programs; (x) the Worker's Code of Conduct, which must address, among other aspects, sanitary and health practices regarding endemic and sexually transmissible diseases, and guidance to reduce the potential for conflict and ensure peaceful coexistence with the local and indigenous population; (xi) the community relations and social communication program, including without limitation, communication and participation strategies for indigenous groups and compensation measures and criteria for environmental and social damages to indigenous populations and resources; and (xii) the specific and detailed operational Construction Procedures developed by the Contractor to comply with Transredes specifications. The ESHSMP must also include: (i) the Contingency and Emergency Plans for construction; and (ii) the Health and Safety Plan for the construction phase.

(b) Present a final version of Environmental, Social, Health and Safety Management Plan (ESHSMP) for the existing Transredes operations, in form and substance acceptable to the IDB, including without limitation, the organizational structure responsible for the implementation of the ESHSMP, the assigned personnel and budget as well as the schedule of implementation, with the relevant milestones. The ESHSMP must include the detailed operational Maintenance Procedures and Monitoring Programs as specified in the Transredes Health, Safety and Environment (HSE) management system, including without limitation: (i) erosion and sedimentation control; (ii) air quality control; (iii) noise emissions control; (iv) waste water monitoring; (v) waste management; (vi) environmental awareness, training and education programs; and (vii) the community relations and social communication program, including without limitation, communication and participation strategies for indigenous groups and compensation measures and criteria for environmental and social damages to indigenous populations and resources. The ESHSMP must also include (i) the Contingency and Emergency Plans, including the Spill Prevention and Countercontrol Measures for the operational phase of the Project; and (ii) the Health and Safety Plan for the operational phase.

(c) Present, in form and substance acceptable to the IDB, the Company's Corporate HSES Management System (HSESMS), consistent with the main principles of ISO 14001 for environmental aspects and OSHAS18001 for health and safety. The HSESMS must be consolidated in the Corporate HSES Manual (*Manual de Salud, Seguridad, Medioambiente, Social y Operaciones)*, which must include without limitation: Policy and strategic objectives; organization, responsibilities, resources competence, standards and documentation; risk management processes; planning; implementation, correctives and preventive actions and performance reports; evaluation; and auditing.

8.4 Prior to each disbursement, the Company must certify compliance with all environmental and social requirements in the Loan Agreement.

8.5 During the life of the Loan Agreement, the Company must prepare and submit an Environmental and Social Compliance Report, in form, content and frequency as determined by the IDB.

8.6 The Bank will monitor the project's environmental, social, and health and safety aspects via internal Bank supervision actions (e.g., site visits, review of documentation, etc.) and will contract an external independent environmental consultant to perform more detailed

supervision/monitoring actions. In addition, the Bank will have the right, as part of the Loan Agreement, to contract for the performance of an independent environmental, health, and safety audit, if needed.

FIGURE 2.1

LIQUID SYSTEM

FIGURE 2.2

GAS SYSTEM

Table 2.1. Gas and Liquid Infrastructure

Infrastructure/Facilities	Quant.
Gas pipeline network	2969 kms
Liquid pipeline network	2775 kms
Compression stations (Gas)	11
Gas terminals	4
Gas control and reception stations	16
Gas control and delivery stations	56
Pump stations (Liquids)	18
Liquid terminals (Arica maritime terminal)	1

Table 2.2. Equipment in Gas Compression Stations

Station	Compressor Units	Potential (HP)	GeneratorUnits	Potential (HP)
Oconi	2 gas	2,100	-	-
Parotani	3 gas	1,833	-	-
Oruro	2 gas	1,600	-	-
San Antonio	3 gas	420	1 gas	25
Caigua	2 gas	7,600	2 gas	600
Cerrillos	5 gas	2,354	2 gas	188
Torrepampa	3 gas	1,800	2 gas	128
Tapirani	3 gas	1,245	2 gas	314
Qhora Qhora	2 gas	1,320	-	-
Yapacani	1 gas	4,700	2 gas	650
Saipuru	1 gas	5,500	2 gas	944
Total	27	30,472	13	2,849

Table 2.3. Equipment in Liquid Pump Stations

Station	Pump Units	Potential (HP)	Generator Units	Potential (HP)
Station # 1 (Santa Cruz)	4 gas	3,470	1 gas	314
Samaipata	3 gas	2,370	2 gas	518
Oconi	1 diesel 3 gas	3,045	2 gas	379
Buena Vista	2 diesel 2 gas	2,930	2 gas	370
Sayari	1 diesel 2 gas	2,245	1 diesel	154
Sica Sica	1 diesel 2 gas	2,245	1 diesel	97
Pocitos	1 gas	430	1 gas	314
Tiguipa	3 gas	1,575	2 gas	716
Chorety	2 diesel 1 gas	2,140	1 diesel 1 gas	668
Cerrillos	1 diesel	220	-	-
Surubi	1 diesel 1 gas	1,535	-	-
Carrasco	3 gas 1 diesel	3,585	2 gas	836
Yapacani	4 gas	735	2 gas	422
H. Suarez	2 gas	550	-	-
Caranda	3 gas	1,332	2 gas	110
Cochabamba	1 gas	1,265	-	-
Pampa Tambo	2 diesel	1,710	2 diesel	320
Lima Tambo	2 diesel	1,710	2 diesel	320
Total	49	33,092	24	5,538

Table 3.1. Existing facilities and DIA Date of Issuance

Facilities		DIA Date of Issue
I	Stations I, Caranda, Humberto Suarez Roca, Yapacaní and Carrasco, as well as pipelines Station I-Palmasola-Station I, Surubí-Carrasco, Carrasco-Caranda, Vibora-Caranda and Caranda-Santa Cruz	08/13/99
II	Stations Chorety, Tiguipa Yacuiba, Cerillos; pipelines Camiri-Santa Cruz, Camiri-Yacuiba, Yacuiba-Camiri, Cerrillos –Chorety; lateral pipelines Camatindi, Cambeiti, Porvenir, Vuelta Grande, San Roque and La Vertiente	10/22/99
III	Stations Samaipata, Buena Vista, Sayari, Sica Sica, Oconi; pipelines Río Grande-Santa Cruz, Santa Cruz-Huayñacota, and Huayñacota-Charaña	10/26/99
IV	Stations Caigua, San Antonio; measurement stations Carrasco, Colpa, Yacuiba, Tarija; gas pipelines Caranda-Colpa, Colpa-Mineros, Colpa-Yacuiba, Río Grande -Santa Cruz, Carrasco-Colpa, Villamontes-Tarija, Tarija-El Puente, Tarija-ENDE, Bermejo-Ramos; lateral gas pipelines Naranjillo, Campo Santa Cruz, El Palmar, La Peña, Porvenir, San Roque, La Vertiente, Vuelta Grande and Katari	11/09/99
V	Stations Parotani, Oruro and Senkata	11/24/99
VI	Gas pipelines Taquiperenda-Tarabuco, Tarabuco-Huayñacota, Sucre-Potosi, Cerrillos-Monteagudo, Tarabuco-Qhora-Qhora, Qhora Qhora-Sucre, Cerrillos; Stations Cerrillos, Torrepampa, Tapirani, Qhora Qhora and Sucre	01/17/00
VII	Gas pipelines Oconi and Santa Cruz-Huayñacota	01/07/00

Table 3.2. Investment Plan Project Compliance Status

Project	Category	Environmental License	Date of Issue	Permit Status
MM-PASA Palmasola – La Guardia Pipeline Construction	III	Certificate of Dispensation	12/15/97	Finalized
MM-PASA Station No. 1 transfer, construction and Pipeline implementation	III	Certificate of Dispensation	12/18/97	Finalized
MM-PASA Tiguipa Station transfer	III	Certificate of Dispensation	08/18/98	Finalized
MM-PASA Construction of OSSA I and GAA variations - La Guitarra Sector	III	Certificate of Dispensation	08/31/98	Finalized
MM-PASA Construction Argentina - Terminal Pocitos pipeline	III	Certificate of Dispensation	03/31/99	Finalized
EIA GAA Expansion – Parotani Sector	II	DIA	04/28/99	Finalized
MM-PASA GLP supply to Flamagas S.A	III	Certificate of Dispensation	06/23/99	Finalized
MM-PASA expansion pipeline branch Hauyñacota -Valle Hermoso	III	Certificate of Dispensation	07/30/99	Finalized
EIA Pilcomayo crossing by Colpa-Yacuiba gas pipeline	II	DIA	08/10/99	Finalized
EIA Yapacani station	II	DIA	08/19/99	Finalized
MM-PASA Saipuru station construction	III	Certificate of Dispensation	08/19/99	Ongoing
EIA Paloma – Carrasco Propane pipeline	II	DIA	06/21/00	Stand by
MM-PASA Río Grande-Santa Cruz pipeline	III	Certificate of Dispensation	07/06/00	Finalized
MM-PASA Temporary pump unit in Cochabamba	III	Certificate of Dispensation	10/10/00	Finalized
MM-PASA Liquids and Gas Transport in San Alberto	III	Certificate of Dispensation	10/19/00	Finalized
Water well perforation	III	Certificate of	10/04/00	Finalized

at Santa Cruz terminal		Dispensation		
MM-PASA La Vertiente lateral pipeline construction	III	Certificate of Dispensation	03/09/01	Finalized
EIA Villamontes-Tarija gas pipeline expansion	II	DIA	06/04/01	Stand by
MM-PASA GTC Camiri gas pipeline connection	III	Certificate of Dispensation	07/06/01	Finalized
EIA Río Grande-Santa Cruz pipeline	II	DIA	07/10/01	Stand by
EIA Lluta river crossing	II	DIA	08/03/01	Finalized
MM-PASA Construction of Loop 30 Km.	III	Certificate of Dispensation	10/25/01	Finalized
MM-PASA Taquiperenda station construction	III	Certificate of Dispensation	11/20/01	Finalized
EIA Yacuiba-Río Grande gas pipeline expansion project	I	DIA	07/12/02	Finalized
EIA OCY-1/OCY-2 expansion and Cordillera station construction	II	DIA	08/30/02	Finalized

Table 4.1. Summary of Main River Basins

Grande River

The Grande river basin begins in the mountains of the Cordillera Real de los Andes (5000 masl) and flows towards the village of Abapo extending over an area of 60,600 Km^2. The Grande river basin is approx. 360 Km wide (east-west) and 200 Km long (north-south). The rainfall distribution in this watershed is irregular varying between 500 mm/yr at the Cordillera base to more than 2,000 mm/yr at altitudes of 2,500 to 2,000 masl. In Abapo, the 50 year maximum flow is predicted to be 7000 m^3/s while the highest event recorded was 11,400 m^3/s which relates to a 100 year event. The average peak flow is 4,000 m^3/s. The development of the Grande river floods is variable reaching velocities of 4 m/s. The Grande river extends south to approximately reach Km 130 of the GYRG pipeline but there are no tributaries present between the ROW crossing and the southern end of the basin.

A water quality sampling performed in December 2000 in this river resulted as follows: high concentration of solids; Hardness: 163 mg/l; Total hydrocarbon concentration: 12.9 mg/l; and BOD/COD ratio: 2.03 (low content of industrial pollutants). Making a general comparison between the concentration of the variables analyzed and the existing quality standards, the Grande river would be classified as Class A except for turbidity (Class D) and COD and BOD (Class B) variables.

Parapetí River

The Parapetí river basin extends from the Sub-Andean belt to the Chaqueño plains, and has a surface area of 14,000 Km^2. The morphology of the river is very irregular, with consequent erosion of its banks. This constant widening of the riverbed requires permanent river maintenance works in the area of the existing pipeline in order to control the formation of secondary channels. Historical flow records show a maximum flow of 3,000 m^3/s at San Antonio del Parapetí. During 11 years of records at the Choreti bridge, the maximum flows recorded were 883, 774, and 445 m^3/s. The maximum recorded volume of suspended material carried by the Parapetí river was 48.6 gr/l for an average daily flow of 120 m^3/s.

A water quality sampling performed in December 2000 in this river resulted as follows: Dissolved solids: 1,491 mg/l; Hardness: 78 mg/l; Total hydrocarbon concentration: 11.20 mg/l; and BOD/COD ratio: 1.78 (low content of industrial contaminants). Making a general comparison between the concentration of the variables analyzed and the existing quality standards in the Water Pollution Regulation, the Parapetí river would be classified as Class A except for turbidity (Class D), dissolved solids (Class B) and COD and BOD (Class C) variables.

Pilcomayo River

The Pilcomayo river basin encompasses an area of 272,000 Km^2 of which only 36% is in Bolivia while 35% is in Paraguay and 29% in Argentina. The basin area upstream of Villamontes covers an area of 78,500 Km^2. This basin's drainage system varies according to sectors. In the west and central areas, there is typically a dendritic system while in the eastern areas is a sub-parallel drainage. In general, the drainage density is medium being related to the nature of its surface materials (silty sand sediments) and the vegetation cover (arboreal). River flows measured at Villamontes vary considerably during different seasons of the year. Peak values are recorded between the months of January to April exceeding 200 m^3/s while values in the range of 30 to 60 m^3/s are recorded from July to October.

The river carries significant quantities of sediment. At Villamontes, the sediment load has been calculated as 98 million ton annually. It is thought that this load may have increased in the last few years as a consequence of intense land clearing in the headwater zones. This produces large sediment

accumulation in the outwash areas and, consequently, a retreating of the active riverbed at a rate of 7 km per year. The transported material is predominantly sand and silt resulting from erosion in the Sub-Andean sierra an Tertiary materials in the mountain foothills.

In the ROW crossing area, the river channel shows some tendency for lateral erosion. On the left bank, riverbank erosion is controlled by a series of concrete defenses. The right bank has a low relief as the river emerges from the Cordillera onto the flood plain. A river irrigation project known as PROVISA is being developed on the land forming the south river side. The total irrigation area is about 3,500 ha. The river water is diverted nearby the railway bridge upstream from the ROW crossing.

A water quality sampling performed in December 2000 in this river resulted as follows: Total solids: 71,406 mg/l; Suspended solids: 70,530 mg/l; Dissolved solids: 876 mg/l; Hardness: 382 mg/l; Total hydrocarbon concentration: 10.30 mg/l; and BOD/COD ratio: 1.85 (low content of industrial contaminants). Making a general comparison between the concentration of the variables analyzed and the existing quality standards in the Water Pollution Regulation, the Pilcomayo river would be classified as Class D for turbidity, Class C for COD and BOD, and Class A for other parameters analyzed.

Table 5.1. Noise Standards (a)

Receptors	Day From 07:00 to 22:00 h	Night From 22:00 to 07:00 h
Residential, institutional, educational	55	45
Industrial, commercial	70	70

(a) *World Bank, "Pollution Prevention and Abatement Handbook – Part III". General Environmental Guidelines.* The guidelines establish that noise abatement measures shoud achieve either the levels given in the Table or a maximum increase in the background level of 3 decibels (measures on the A scale) [dB(A)].

Table 5.2. Ambient air standards (a)

Pollutant	Concentration ($\mu g/m^3$)
Particulate matter	
Annual arithmetic mean	50
Maximum 24-hour average	70
Nitrogen Oxides (NOx)	
Maximun 24-hour average	150
Sulfur Dioxide (SO_2)	
Annual arithmetic mean	50
Maximum 24-hour average	125

(a) *World Bank, "Pollution Prevention and Abatement Handbook – Part III". General Environmental Guidelines.* Ambient Air conditions at property Boundaries, for General Application.

Table 5.3. List of General High Priority Deficiencies

Facilities	Environmental Areas	
	Water	Soils
Pump Stations	▪ Untreated gray water ▪ Gray waters not properly treated ▪ Gray waters exceed pond capacity ▪ Untreated sewage/black and gray waters ▪ Sewage water directly discharged into a water body ▪ Sewage water not properly treated ▪ Hydrocarbons and oil leakage	▪ Valves and seals leakage ▪ Hydrocarbons, oils, and wastewater spills ▪ Limited capacity of separator and pond capacity ▪ Lack of ash pits
Compressor Stations	▪ Gray water not properly treated ▪ Untreated equipment wash/gray waters ▪ Gray water discharged to the soil	▪ Oil, fuel and wastewater spills ▪ Unprotected pits
Pipelines	N/A	▪ Accidental spills of transported crude oil ▪ Uncontrolled erosion in ROWs and river crossings

Table 5.4. List of Specific High Priority Problems, by facility

Facility	Contaminated Areas
Choreti station	▪ Crude oil tanks ▪ Diesel and gas tanks ▪ Oxidation pond
Station No. 1	▪ Crude oil tanks ▪ API separator ▪ Pig launch/reception ▪ Manifold
Carrasco station	▪ Oxidation Pond ▪ API separator ▪ Old diesel tank ▪ Sloped area
Sica Sica station	▪ API separator ▪ Crude oil tank ▪ River/well banks
Cerrillos station	▪ Diesel tank ▪ Stained areas ▪ Sludge pit ▪ Compressors ▪ Pump/Generators
Samaipata station	▪ Slop drainage ▪ Crude oil tank ▪ Diesel tank ▪ Creek bank
Tarata station	▪ Pig launch/reception ▪ Old crude oil slop tank ▪ Valves
Caigua station	▪ Generator ▪ Stained area ▪ Pond
Caranda station	▪ Crude oil tanks ▪ API separator ▪ Oxidation pond

Table 5.5. Exceeded Parameters

Subsystem	Exceeded Parameters
I	NOx, CO and Noise
II	NOx, SO_2 and CO
III	NOx, CO and Noise
IV	Noise
V	NOx and Noise
VI	NOx, CO and Noise
VII	NOx and Noise

Table 6.1. General Sampling Plan

Variables	Sampling Points	Parameters to be Analyzed	Frequency
Water	Supply source, storage tank, distribution network	BTEX, DBO_5, COD, chlorides, sulfates, sulfurs, temperature, conductivity, greases, oils, and biologic analysis (bacteries)	Each 6 months
Operation water	Oxidation ponds prior to discharge	Sulfates, chlorides, suspended solids, total hydrocarbons, oils, greases, others TBD	Each 6 months
Soils	Pumping stations, measurement points, leaking pipe areas	Organic matter, total hydrocarbon, calcium, magnesium, sodium, potasium, nitrogen, phosphorus, pH, electric conductivity, greases, oils, and others TBD	Each 6 months
Air	Pumps, and generators	CO, CO_2, NOx, SO_2, and particulates	Each 6 months

ANNEX 1

GAS AND LIQUIDS SYSTEM

The seven Transredes liquid and gas subsystems are:

- Subsystem I: Norte Santa Cruz (Liquid);
- Subsystem II: Santa Cruz – Yacuiba (Liquid);
- Subsystem III: Santa Cruz – Sica Sica – Arica (Liquid);
- Subsystem IV: Colpa – Yacuiba (Gas);
- Subsystem V: Cochabamba – Oruro – La Paz (Gas);
- Subsystem VI: Taquiperenda – Cochabamba – Sucre – Potosí (Gas); and
- Subsystem VII: Rio Grande – Cochabamba (Gas).

Subsystem I: Norte Santa Cruz (Liquid)

The Norte Santa Cruz subsystem is integrated by five (5) stations and six (6) oil pipelines. The stations belonging to this subsystem are:

- Station No. 1 (City of Santa Cruz);
- Caranda station (Department of Santa Cruz);
- Humberto Suárez Roca station (Department of Santa Cruz);
- Yacapaní station (Department of Santa Cruz); and
- Carrasco station (Department of Cochabamba).

The pipelines belonging to this system are:

- Caranda - Santa Cruz pipeline (OCSC),
- Víbora - Yacapaní - Humberto Suárez - Caranda (ONSZ I),
- Carrasco - Caranda pipeline (ONSZ II),
- Station No. 1 - Palmasola pipeline (OEP),
- Palmasola - Station No. 1 (OPE), and
- Surubí - Carrasco pipeline.

<u>Station No. 1</u>
It gathers and stores production from all Caranda oilfields. It is located in the Suburban area of Santa Cruz (approximately 30,000 people). The existing equipment in this station includes:

- Four (4) gas fueled pump units totalling 2,100 HP;
- One (1) gas fueled generator unit totalling 314 HP;
- One (1) oil storage tank;
- One (1) diesel storage tank; and
- Manifolds area.

<u>Caranda Station</u>
It pumps oil production from the Caranda oilfield. It is located in a rural area on Km 95 of Santa Cruz - Cochabamba road at 23 Kms of Buena Vista (approximately 2,800 people). The existing equipment in this station includes:

- Three (3) gas fueled pump units totalling 1,332 HP;
- Two (2) gas fueled generator units totalling 110 HP;
- Four (4) oil storage tanks (only three belong to Transredes); and
- Manifolds area.

Humberto Suarez Roca Station

It is an intermediate pumping station along ONSZ I gathering and pumping production of Patujusal, Los Cusis, and Bateria Suárez Roca oilfields, as well as incoming flow from Yacapaní station. It is located in a Rural area along the access road to Santa Rosa at 12 Kms of San Luis (520 people) and 23 kms and Santa Rosa del Sarah (approximately 3,125 people). The existing equipment in this station includes:

- Two (2) gas fueled pump units totalling 550 HP;
- Two (2) oil storage tanks;
- One (1) diesel storage tank; and
- Pig launch/reception area.

Yacapaní Station

It is an intermediate pumping station on ONSZ I gathering and pumping production of Cascabel, Víbora and Sirari oilfields. It is located in a rural area along the access road connecting to the Santa Cruz - Cochabamba road at 40 Kms of Yacapaní (approximately 8,585 people). The existing equipment in this station includes:

- Four (4) gas fueled pump units totalling 735 HP;
- Two (2) gas fueled generator units totalling 422 HP;
- Four (4) oil storage tanks; and
- Pig launch/reception area.

Carrasco Station

It gathers production of oilfields located in the region and pumps production to Caranda station through ONSZ II. It is located in a Rural area along the Access road connecting to the Santa Cruz - Cochabamba road at 1.5 Kms of Entre Ríos (approximately 2,000 people). The existing equipment in this station includes:

- Three (3) gas fueled and one (1) diesel fueled pump units totalling 3,585 HP;
- Two (2) gas fueled generator units totalling 836 HP;
- Two (2) oil storage tanks;
- One (1) diesel storage tank; and
- Pig launch/reception area.

Pipelines

Subsystem I has a transporting capacity of 10,000 to 22,000 BPD and includes approximately 430 Kms of main pipelines distributed as follows:

- OCSC (∅ = 8-10 inches): 60.5 Kms;
- ONSZ I (∅ = 4-6 inches): 193.2 Kms;
- ONSZ II (∅ = 6-10 inches): 126 Kms;
- OEP (∅ = 4-6 inches): 10.78 Kms;
- OPE (∅ = 6 inches): 10.2 Kms; and
- Surubi – Carrasco (∅ = 4-6 inches): 30 Kms.

Subsystem II: Santa Cruz – Yacuiba (Liquid)

The Santa Cruz – Yacuiba system is integrated by four (4) main pipelines, four (4) lateral pipelines, and five (5) stations. The stations belonging to this subsystem are:

- Station No. 1 (City of Santa Cruz);
- Choreti station (Department of Santa Cruz);
- Tiguipa station (Department of Chuquisaca);
- Cerrillos station (Department of Chuquisaca); and
- Yacuiba station (Department of Tarija).

The main pipelines belonging to this subsystem are:

- Camiri - Santa Cruz pipeline (OCSZ);
- Cerrillos - Choreti pipeline (OCCH);
- Camiri - Yacuiba I pipeline (OCY I); and
- Camiri - Yacuiba II pipeline (OCY II).

The lateral pipelines also considered part of this system are:

- Cambeiti lateral pipeline;
- Porvenir lateral pipeline;
- Vuelta Grande - Tiguipa lateral pipeline;
- La Vertiente lateral pipeline; and
- San Roque - Tiguipa lateral pipeline.

<u>Station No. 1</u>
It gathers and stores production from all Caranda oilfields. It is located in the Suburban area of Santa Cruz (approximately 30,000 people). The existing equipment in this station includes:

- Four (4) gas fueled pump units totalling 2,100 HP;
- One (1) gas fueled generator unit totalling 314 HP;
- One (1) oil storage tank;
- One (1) diesel storage tank; and
- Manifolds area.

<u>Choreti Station</u>
It receives oil from the Camiri and southern oildfields, LPG from Vuelta Grande, and imported diesel. It pumps all products to Santa Cruz. It is located in a rural area at 2 Kms of Camiri (approximately 28,000 people). The existing equipment in this station includes:

- Two (2) diesel fueled and one (1) gas fueled pump units totalling 2,140 HP;
- One (1) diesel fueled and one (1) gas fueled generator unit totalling 668 HP;
- Three (3) oil storage tanks;
- Five (5) gasoline storage tanks;
- One (1) kerosene storage tank;
- One (1) diesel storage tank;
- Four (4) LPG storage tanks; and
- Manifolds area.

<u>New Tiguipa Station</u>

It is an intermediate station that pumps southern oilfields production to Choreti station. It also pumps processed products to supply the Tarija region. It is located in the urban area of Tiguipa (approximately 2,000 people). The existing equipment in this station includes:

- Three (3) gas fueled pump units totalling 1,575 HP;
- Two (2) gas fueled generator units totalling 716 HP;
- Five (5) oil storage tanks; and
- One (1) diesel storage tank.

Cerrillos Station

It is a pumping station for crude oil from Monteagudo oilfield to Choreti station. It is located in a rural area at 2 Kms of Cerrillos (approximately 650 people). The existing equipment in this station includes:

- One (1) diesel fueled pump totalling 220 HP;
- Two (2) oil storage tanks;
- One (1) diesel storage tank; and
- Manifolds area.

Yacuiba Station

It pumps products for distribution in Yacuiba and Argentina, and also transports diesel and crude oil to Villamontes. It is located in the urban area of Yacuiba. The existing equipment in this station includes:

- Two (2) diesel fueled pumps;
- One (1) gas fueled generator totalling 315 HP; and
- Manifolds area.

Pipelines

Subsystem II has a transporting capacity of 10,000 to 20,000 BPD and includes approximately 585 Kms of main pipelines distributed as follows:

- OCSZ (∅ = 8 5/8-10 3/4 inches): 267.25 Kms;
- OCCH (∅ = 4 1/2-6 5/8 inches): 59.7 Kms; and
- OCY I & II (∅ = 6 inches): 258.5 Kms.

Subsystem III: Santa Cruz – Sica Sica – Arica (Liquid)

The Santa Cruz – Sica Sica – Arica system, is integrated by three (3) main pipelines, two (2) lateral pipelines, and six (6) stations. The stations belonging to this system are:

- Station No. 1 (City of Santa Cruz);
- Samaipata station (Department of Santa Cruz);
- Oconi station (Department of Santa Cruz);
- Buena Vista station (Department of Cochabamba);
- Sayari station (Department of Cochabamba); and
- Sica Sica station (Department of La Paz).

The pipelines belonging to this system are:

- Río Grande - Santa Cruz oil pipeline (ORSZ);
- Santa Cruz - Huayñacota pipeline (OSSA I);

- Huayñacota - Charaña (OSSA II);
- La Peña lateral pipeline; and
- El Palmar lateral pipeline.

Station No. 1

It gathers and stores production from all Caranda oilfields. It is located in the Suburban area of Santa Cruz (approximately 30,000 people). The existing equipment in this station includes:

- Four (4) gas fueled pump units totalling 2,100 HP;
- One (1) gas fueled generator unit totalling 314 HP;
- One (1) oil storage tank;
- One (1) diesel storage tank; and
- Manifolds area.

Samaipata Station

It is an intermediate station that receives crude oil coming from Station No. 1 through OSSA I and then pumps it to Oconi. It is located in a rural area at 8 Kms of Samaipata (approximately 8,000 people). The existing equipment in this station includes:

- Three (3) gas fueled pump units totalling 2,370 HP;
- Two (2) gas fueled generator units totalling 518 HP;
- One (1) oil storage tank; and
- Two (2) diesel storage tanks.

Oconi Station

This station pumps crude oil and LPG through OSSA I to the Valle Hermoso Refinery in Cochabamba. It is located in a rural area at 0.5 Kms of Oconi (approximately 200 people). The existing equipment in this station includes:

- Three (3) gas fueled and one (1) diesel fueled pump units totalling 3,045 HP;
- Two (2) gas fueled generator units totalling 379 HP; and
- One (1) oil storage tank.

Buena Vista

It is an intermediate station of OSSA I that pumps crude oil and LPG coming from Oconi to the Valle Hermoso Refinery in Cochabamba. It is located in a rural area at 10 Kms of Totora (approximately 12,000 people). The existing equipment in this station includes:

- Two (2) gas fueled and two (2) diesel fueled pump units totalling 2,930 HP;
- Two (2) gas fueled generator units totalling 370 HP;
- One (1) oil storage tank; and
- Two (2) diesel storage tanks.

Sayari Station

This station pumps crude oil and LPG. It is located in a rural area nearby Sayari (approximately 200 people), 70 Kms west from Cochabamba. The existing equipment in this station includes:

- Two (2) gas fueled and one (1) diesel fueled pump units totalling 2,245 HP;
- One (1) diesel fueled generator unit totalling 154 HP;
- One (1) oil storage tank;
- One (1) gasoline storage tank; and

- One (1) diesel storage tank.

Sica Sica Station
This station pumps crude oil and LPG to the Arica terminal in Chile. It is located in a rural area at 0.4 Kms of Sica Sica (approximately 2,700 people). The existing equipment in this station includes:

- Two (2) gas fueled and one (1) dielel fueled pump units totalling 2,245 HP;
- One (1) diesel fueled generator unit totalling 97 HP;
- One (1) oil storage tank; and
- One (1) diesel storage tank.

Pipelines
Subsystem III has a transporting capacity of 20,000 to 30,000 BPD and includes approximately 1063 Kms of main pipelines distributed as follows:

- OSSA I (∅ = 10-12 inches): 446.9 Kms;
- OSSA II (∅ = 6-12 inches): 562 Kms; and
- ORSZ (∅ = 8 inches): 54.2 Kms.

Subsystem IV: Colpa – Yacuiba (Gas)

The Colpa - Yacuiba subsystem is divided into three sectors:

- Colpa - Río Grande – Yacuiba;
- Carrasco – Colpa; and
- Villamontes - Tarija - El Puente.

These sectors include eight (8) main gas pipelines, ten (10) lateral or minor pipelines, and six (6) stations. The stations belonging to this system are:

- Caigua station (Department of Tarija);
- San Antonio station (Department of Tarija);
- Colpa station (Department of Santa Cruz);
- Carrasco station (Department of Cochabamba);
- Yacuiba station (Department of Tarija); and
- Tarija station (Department of Tarija).

The main gas pipelines belonging to this system are:

Sector A
- Caranda - Colpa pipeline (GCC);
- Colpa - Mineros pipeline (GCM); and
- Gasoducto Colpa - Yacuiba (YABOG).

Sector B
- Carrasco-Colpa pipeline.

Sector C
- Villamontes – Tarija;
- Tarija - El Puente;
- Tarija – ENDE; and
- Bermejo - Ramos.

The lateral pipelines belonging to this system are:

Sector A
- Lazo Sur - Parque Industrial;
- Naranjillos;
- El Palmar;
- La Peña;
- Campo Santa Cruz;
- Porvenir;
- San Roque;
- La Vertiente; and
- Vuelta Grande.

Sector B
- Katari.

Caigua Station
It is a compressor station that increases pressure to the YABOG pipeline. It is located in a rural area at 20 Kms of Villamontes. The existing equipment in this station includes:

- Two (2) gas compression units (turbines) totalling 7,600 HP;
- Two (2) gas fueled generator units totalling 600 HP; and
- Manifolds area.

San Antonio Station
It is a compressor station that increases pressure to the Villamontes – Tarija gas pipeline. It is located in a rural area nearby San Antonio (approximately 250 people). The existing equipment in this station includes:

- Three (3) gas compression units totalling 420 HP;
- One (1) gas fueled generator totalling 25 HP; and
- Manifolds area.

Colpa station
It is a measurement station located in a rural area nearby Bélgica (approximately 4,615 people).

Carrasco Station
It gathers production of oilfields located in the region and pumps production to Caranda station through ONSZ II. It is located in a Rural area along the Access road connecting to the Santa Cruz - Cochabamba road at 1.5 Kms of Entre Ríos (approximately 2,000 people). The existing equipment in this station includes:

- Three (3) gas fueled and one (1) diesel fueled pump units totalling 3,585 HP;
- Two (2) gas fueled generator units totalling 836 HP;
- Two (2) oil storage tanks;
- One (1) diesel storage tank; and
- Pig launch/reception area.

Yacuiba Station
It pumps products for distribution in Yacuiba and Argentina, and also transports diesel and crude oil to Villamontes. It is located in the urban area of Yacuiba. The existing equipment in this station includes:

- Two (2) diesel fueled pumps;
- One (1) gas fueled generator totalling 315 HP; and
- Manifolds area.

Tarija Station
It is station that regulates gas pressure from Villamontes and distributes it to urban areas, a cement plant and one ENDE plant. It is located in a suburban area of Tarija (approximately 91,400 people).

Pipelines
Subsystem IV includes approximately 800 Kms of main pipelines distributed as follows:

- YABOG (∅ = 24 inches): 529.6 Kms;
- VilIamontes – Tarija (∅ = 4 inches): 174 Kms;
- Tarija – El Puente (∅ = 4 inches): 86 Kms;
- Tarija – ENDE (∅ = 4 inches): 9.2 Kms; and
- Bermejo – Ramos (∅ = 12 inches): 4 Kms.

Subsystem V: Cochabamba – Oruro – La Paz (Gas)

The Cochabamba - Oruro - La Paz gas subsystem is integrated by two (2) compression stations, one (1) control point, one (1) measurement point, and one (1) pipeline. The stations/pipeline belonging to this system are:

- Oruro compression station (Department of Oruro);
- Parotani compression station (Department of Cochabamba); and
- Huayñacota - Senkata gas pipeline (Department of Cochabamba).

Oruro Station
It is an intermediate station utilized to increase pressure to the GAA gas pipeline. It is located in a suburban area of Oruro. The existing equipment in this station includes two (2) gas compression units totalling 1,600 HP.

Parotani Station
It is a compression station utilized to increase pressure to the GAA gas pipeline. It is located in a rural area nearby Parotani. The existing equipment in this station includes:

- Three (3) gas compression units totalling 1,833 HP; and
- One (1) manifolds area.

Pipeline
The Huayñacota – Senkata gas pipeline (also known as Gasoducto al Altiplano) transports natural gas to the cities of Cochabamba, Oruro, and La Paz. Its total length is approximately 350 kms.

Subsystem VI: Taquiperenda – Cochabamba – Sucre – Potosí (Gas)

The Taquiperenda-Cochabamba-Sucre-Potosi subsystem is comprised of three (3) pipelines and their associated stations. The stations belonging to this system are:

- Cerrillos station (Department of Chuquisaca);
- Torrepampa station (Department of Chuquisaca);

- Tapirani station (Department of Chuquisaca); and
- Qhora Qhora station (Department of Chuquisaca).

The pipelines belonging to this system are:

- Taquiperenda-Cochabamba pipeline (GTC);
- Tarabuco – Sucre pipeline (GTS); and
- Sucre-Potosi pipeline.

Cerrillos Station

It increases pressure to the Taquiperenda – Camiri gas pipeline. It is located in a suburban area adjacent to the Monteagudo oilfield nearby Cerrillos (approximately 650 people). The existing equipment in this station includes:

- Five (5) gas compression units totalling 2,354 HP;
- Two (2) gas fueled generator units totalling 188 HP;
- Measuring and regulating points;
- Pig launch/receiving area; and
- Manifolds area.

Torrepampa Station

It increases pressure to the Taquiperenda – Camiri pipeline. It is located in a Suburban area of Torrepampa (700 people) at 168 Kms SE of Sucre city and 75 Kms from town of Cerrillos. The existing equipment in this station includes:

- Three (3) gas compression units totalling 1,800 HP; and
- Two (2) gas fueled generator units totalling 128 HP.

Tapirani Station

It increases pressure to the Taquiperenda – Camiri (GTC) pipeline. It is located in a Rural transition zone nearby Lamboyo (approximately 490 people) at 75 Kms east of Sucre City. The existing equipment in this station includes:

- Three (3) gas compression units totalling 1,245 HP;
- Two (2) gas fueled generator units totalling 314 HP; and
- Manifolds area.

Qhora Qhora Station

This station receives gas from the Taquiperenda – Camiri pipeline (GTC) and distributes it to Sucre and Potosí through the Tarabuco – Sucre pipeline (GTS). It is located in a rural area to the southeast of Sucre City nearby Qhora Qhora (approximately 120 people). The existing equipment in this station includes:

- Two (2) gas compression units totalling 1,320 HP;
- One (1) LGP tank;
- One (1) gasoline tank; and
- Manifolds area.

Pipelines

Subsystem VI has a transporting capacity of 11.5 – 25.7 mcfpd (million cubic feet per day) and includes approximately 730 Kms of main pipelines distributed as follows:

- GTC (∅ = 6-10 inches): 575 Kms;
- GTS (∅ = 2-6 inches): 44 Kms; and
- Sucre – Potosi (∅ = 4-6 inches): 111 Kms.

Subsystem VII: Río Grande – Cochabamba (Gas)

The Río Grande – Cochabamba subsystem is comprised only of the Oconi Compressor Station (Department of Cochabamba), a measuring station, the Huayñacota node, and the Río Grande – Huayñacota gas pipeline. The Rio Grande – Huayñacota pipeline is the only pipeline included in this subsystem. The segments in this pipeline are:

- Río Grande – Taruma;
- Taruma – Samaipata;
- Samaipata – Oconi;
- Oconi – Buena Vista; and
- Buena Vista – Huayñacota.

Oconi Station

It is a compressor Station for the Río Grande – Huayñacota segment of GAA. It is located in a suburban area at 45 Kms east of Comarapa. The existing equipment in this station includes:

- Two (2) gas compression units totalling 2,100 HP;
- Two (2) diesel fueled generators; and
- Manifolds area.

Pipelines

The Río Grande – Huayñacota gas pipeline (∅ = 10 inches) is part of the GAA (Gasoducto Al Altiplano) pipeline and extends from the Río Grande Plant in Santa Cruz to the Huayñacota node in Cochabamba City, where it joins with the GTC pipeline originating from Tarabuco. The Rio Grande – Huayñacota pipeline is approx. 548 Kms long and parallels the OSSA I oil pipeline whose components are discussed as part of the Santa Cruz – Sica Sica – Arica subsystem description.

ANNEX 2

EXECUTIVE SUMMARY OF SOCIAL STUDY ON WEENHAYEK COMMUNITY
(Resumen Ejecutivo del Estudio Social sobre el Pueblo Weenhayek)

El presente informe pretende dar elementos a TRANSREDES para un conocimiento cabal de la sociedad y la cultura weenhayek de hoy, en particular la actividad de la pesca y su importancia económica para los indígenas e indicar pautas para el manejo del aspecto social durante y después de la ejecución de los proyectos de expansión previstos por la empresa.

Los weenhayek, del macro-grupo lingüístico guaycurú, están asentados en 20 comunidades (la mayoría de las cuales están ubicadas en la orilla derecha del río Pilcomayo) en la provincia Gran Chaco del departamento de Tarija. Hasta finales del siglo XIX, la economía weenhayek descansaba principalmente sobre el aprovechamiento de los recursos naturales (recolección de frutas y plantas silvestres, cacería, pesca), una horticultura rudimentaria y el trueque con etnias vecinas. La instalación en el siglo XIX de estancias ganaderas tuvo como consecuencia la paulatina reducción del territorio efectivamente utilizado por los weenhayek y la sedentarización de las tribus (*wikyi'*) nómadas, formándose comunidades más estables. La presencia criolla se incrementó a partir de la Guerra del Chaco y tuvo también como consecuencia la adopción por los weenhayek de nuevos hábitos alimenticios (harina blanca, arroz, yerba mate) y de la ropa occidental: de ahí un completo giro de la economía hacia la economía mercantil, con el objetivo de conseguir el dinero indispensable para la adquisición de estos bienes hoy indispensables.

La principal manera hoy de conseguir dinero para los weenhayek es la pesca comercial a gran escala, introducida en los años 60' por los misioneros de la Misión Sueca Libre en Bolivia. Las ganancias de los simples pescadores y de los titulares de las concesiones de pesca son considerables tomando en cuenta el nivel general de vida de este pueblo. Sin embargo el ingreso de los weenhayek a la economía monetaria no significa hasta hoy una verdadera adaptación a la misma: los weenhayek ganan dinero, pero no saben administrarlo. Las ganancias son invertidas en bienes como radios o bicicletas que son revendidos en verano (época de veda), a la mitad de precio o incluso menos, para asegurar una mínima entrada económica. El dinero se considera al igual que antaño las frutas del monte - algo que se recoge y se utiliza en el momento mismo, sin que existan los conceptos de ahorro o de inversión. Unas pocas excepciones existen en la actualidad, que se convierten en una nueva "élite" de la sociedad weenhayek - pero muestran también que un manejo real de la economía monetaria es posible entre los miembros de la etnia.

La organización política de los weenhayek, la ORCAWETA, es una organización muy joven y todavía débil. Los weenhayek adoptaron una forma de organización ajena (guaraní) para tener una representación a nivel de etnia e integrarse a la Confederación Indígena de Bolivia. Comparada a la antigua organización política propia que sólo contemplaba "jefes" (portavoces) a nivel de tribus y luego de comunidades, ORCAWETA es una novedad que todavía no está interiorizada por los comunarios. Problemas y rivalidades políticas entre dirigentes, falta de comunicación entre dirigentes y comunarios, también influyeron para que la ORCAWETA se debilite. La situación de la organización matriz es sin embargo más estable que la de la sub-alcaldía weenhayek, que desde su creación en 1995 atravesó múltiples problemas políticos y no llegó nunca a funcionar efectivamente.

El territorio utilizado y ocupado por las comunidades weenhayek es una zona intervenida desde hace más de 50 años, por la cual pasan carreteras, ferrocarril, brechas de exploración petrolera, gasoductos y oleoductos, en la cual están asentadas estancias ganaderas y pozos petroleros. Las actividades actuales y previstas por TRANSREDES pueden tener consecuencias aisladas y localizadas por ejemplo en algunas concesiones pesqueras - son problemas que deben ser discutidos con los afectados y la organización matriz ORCAWETA. Pero no tendrán impactos significativos sobre la vida actual de las comunidades.

Río abajo, los asentamientos están alejados del terreno de las actividades previstas; río arriba cerca de Villa Montes, no existe en la actualidad un real aprovechamiento de los recursos naturales considerablemente disminuidos en el pasado.

TRANSREDES, con la apertura que ha demostrado en sus procesos de consulta pública y la ejecución de sus nuevos proyectos, puede llegar más bien a generar un apoyo social importante para este pueblo, proporcinándole no sólo fuentes de ingreso (como lo hace la pesca hoy) sino también y sobre todo pautas para manejar este dinero, sin depender de iniciativas ajenas, para lograr una integración armónica y con igualdad de oportunidades a la sociedad nacional y la economía monetaria actual. En este sentido la organización de un proyecto de apoyo social (diferente a la compensación) y su fiscalización son temas fundamentales que deben ser manejados con sumo cuidado, tomando en cuenta la debilidad de la representación política de la etnia (la ORCAWETA) y la vigencia todavía muy fuerte de conceptos heredados del antiguo nomadismo.

ANNEX 4

SUMMARY OF SICA SICA WASTE TREATMENT PLAN

Following the cleaning activities associated with the Desaguaderi River oil spill, the colledted waste oil residuals were stored in specifically designed impermeable but temporary pits near to the Sica Sica pumping station.

The Vice Minister of Environment, Natural resources and Forestry Development later started an administrative process alleging that the pits were not covered by the Emergency Plans within the approved governmental "Manifiestos Ambientales". A fined was imposed a fine of US$107,233 on Transredes and the government required the company to obtain an Environmental License before beginning treatment. Transredes has appealed to the Supreme Court of Justice stating that the pits were covered under the emergency plans within the "Manifiesto Ambientales" that was approval by the government.

Transredes has began the process of obtaining an Environmental License, which was ranked as Class II by the governmental authorities.

The Transredes' Environmental Audit presented the impacts and mitigation measures for the treatment of the waste material made up of 28,500 tones (15,673 m3) of oiled soil, vegetation and assorted cleaning material.

The objective of Sica Sica Waste Treatment Plan will be to clean the soils to comply with Supreme Decree 26171 of May 9, 2001 that defines soil quality for industrial use. The process is going to last about 4 years, and will employ local people to help with: (a) classification and separation of bio- and non-biodegradable materials, (b) incineration/recycling of non biodegradable residues, and (c) land farming of the biodegradable residues. The area where the project is located is adjacent to the Sica Sica pump station south of La Paz at 3900 meters above sea level. The yearly average of rain is 380 mm, the average temperature is 9.4 degrees C, and the monthly maximum average temperature is 15.8 degrees C.

A number of public consultation meetings were held to discuss the project and prepare the EIA that was available for public review.

A water project is being developed by the company to supply water to the land farm and to the communities of Calacota Alta and Calacota Baja.