INTER-AMERICAN DEVELOPMENT BANK

Regional

URUGUAYANA GAS PIPELINE PROJECT

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ENVIRONMENTAL AND SOCIAL IMPACT REPORT

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LIST OF ACRONYMS

ARP	Areas Naturales Protegidas
CGC	Compañia General de Combustibles S.A.
EIA	Environmental Impact Assessment
ENARGAS	Ente Nacional Regulador del Gas
EPPSA	Environmental Protection Plan for Sensitive Areas
ESDR	Environmental and Social Due-Diligence Report
GE	Gas del Estado
GOA	Government of Argentina
IADB	Inter-American Development Bank
IFC	International Finance Corporation
IUCN	World Conservation Union
NSE	North-South Environmental Incorporated
OPIC	Overseas Private Investment Corporation
PRI	Private Sector Department (IADB)
ROW	Right-of-Way
SHER	Safety, Health, Environment and Risk
TGM	Transportadora de Gas del Mercosur S.A
TGN	Transportadora de Gas del Norte S.A
TGS	Transportadora de Gas del Sur S.A
TOR	Terms of Reference
WB	World Bank

1.0 INTRODUCTION

1.1 Prior to the privatization of Gas Del Estado (GE) in 1992, the Argentine Gas Industry was controlled by the Government of Argentina (GOA). The State-owned Company, YPF, held the exclusive rights over the development and production of all new hydrocarbon reserves in Argentina.

1.2 In 1992, the GOA, via a competitive bidding process, privatized the state-owned company GE, which resulted in the creation of two privately-owned natural gas transportation companies, namely Transportadora de Gas del Norte S.A. (TGN) and Transportadora de Gas del Sur S.A. (TGS), along with eight privately-owned distribution companies. The gas transportation assets were divided into two trunk pipeline systems, the northern system assigned to TGN and the southern system assigned to TGS. This division gave both systems access to natural gas sources and to the main demand centers. As a result of the privatization, TGN is connected to eight of the nine currently existing distribution systems in the country, serving primarily northern and central Argentina and the industrial area along the Paraná River between the cities of Rosario and Buenos Aires. TGS is connected to four distribution systems serving southern Argentina and the greater Buenos Aires area.

1.3 In the Argentine energy matrix, (composed of natural gas, oil-by products, hydroelectricity, coal, and nuclear energy) gas consumption represents 47% of total energy consumption (1996). Natural gas usage in Argentina is almost double the average of worldwide natural gas usage. Additional growth for the Argentine industry is expected in the next five to ten years as natural gas in Argentina has a price advantage over competing residential and industrial energy sources. This fact, coupled with a projected reserve life of approximately 20 years, fosters estimates of an annual 3.7% growth in Argentina's natural gas demand through the year 2010. Significant growth is also expected in the use of natural gas throughout the region driven by a rapid growth in energy demand in Brazil, Chile, and Uruguay, as well as petrochemical production served by natural gas.

1.4 Argentina and Bolivia will become major natural gas exporters to Chile and Brazil, and to a lesser extent to Uruguay. There are several projects in various stages of development to connect Chile and Brazil to the Argentine and Bolivian gas basins, including two pipelines that already move gas from Argentina to Chile. TGN will likely play a significant role in the development of these markets, through its strategic position as operator of the northern portion of the Argentine pipelines, which are connected to the two most important Argentine gas reserves. This privileged position gives TGN the opportunity to contribute to the energy needs in the region by means of exporting natural gas.

1.5 TGN holds a 35-year license granted by the GOA that provides the company with the exclusive right to operate the natural gas transportation pipeline system in the northern and central region of Argentina. These pipeline systems are connected to two of the principal producing gas fields in northern and central-western Argentina, namely the Noroeste basin

and the Neuquen basin. Transportadora de Gas del Mercosur (TGM) will develop and operate the Project under the terms and conditions of the License granted to TGN, which has been explicitly extended by the GOA to cover the Project.

1.6 The proposed project involves the construction and operation of a 437 km, buried, 24" diameter natural gas pipeline known as the Uruguayana Gas Pipeline Project ("Project") located in the Provinces of Entre Ríos and Corrientes, northeastern Argentina. The Project sponsors have formed a special purpose company constituted especially for the purpose of this Project. TGM is the vehicle whereby the sponsors will seek long-term financing for the development of the Project. TGM's voting shares are divided as follows: Nova Gas Internacional S.A., a subsidiary of TransCanada Pipelines Limited (21.792%); Tecgas N.V., a holding company of the Techint Organization (21.792%); Compañia General de Combustibles S.A. - CGC (21.792%); Petronas Argentina S.A., a holding company of Petroliam Nasional Berhad (14.624%); and CMS Gas Argentina Company, a subsidiary of CMS Energy Co. (20.00%).

2.0 PROJECT DESCRIPTION

2.1 Project Description and Location

2.1 The proposed project involves the construction and operation of a 437 km, buried, 24" diameter natural gas pipeline running in a northeasterly direction. The pipeline will commence near Aldea Brasilera (Province of Entre Ríos), and terminate in Paso de Los Libres (Province of Corrientes) along the Argentinian margin of the Uruguay River (see Annex 4 – Regional Map). The pipeline will cross the Uruguay River, which serves as the international border, attached beneath an existing bridge. The proposed pipeline will be the first direct connection of the hydrocarbon transportation network systems between Argentina and Brazil. It is initially designed to supply natural gas to the recently approved 600 MW combined cycle Uruguayana Thermoelectric Power Plant, located in the City of Uruguayana, Brazil, State of Rio Grande do Sul.

2.2 The Project's design could provide an opportunity for future expansion through the continuation of the gas pipeline from the city of Uruguayana to other fast growing energy consumption areas located in southern Brazil, including the capital of the State of Rio Grande do Sul, Porto Alegre. The Project provides regional economic integration, as it will export natural gas from Argentina that will serve as input for the generation of electric power in Brazil. The Project at hand is an effort by TGN to increase its existing pipeline extension of 4,900 km by 9%. This Project contributes to past expansion efforts of the original pipeline system by 745 km, and increases the overall compression capacity by 17%, resulting in overall increased capacity of 62%.

2.3 The proposed pipeline will parallel an existing right-of-way (ROW) that corresponds to highway routes 18, 12, 127 and 14. The pipeline route will traverse the municipalities of

Aldea Brasilera, Tezanos Pinto, El Pingo, Bovril, Federal, Los Conquistadores and San Jaime in the Province of Entre RPos, as well as Colonia Libertad, Parada Pucheta, Bonpland, and Paso de los Libres in the Province of Corrientes. The pipeline will be offset from the existing highway ROW by approximately 250-300 m (800-1000 ft), with additional space being provided adjacent to built areas and municipal centres. The pipeline will primarily traverse flat agricultural and pasture land, scrubland, limited forestry plantations, and numerous rivers, streams and inundated areas.

2.4 The original project proposal incorporated use of the international bridge between Paso de los Libres, Argentina and Uruguayana, Brazil and the required permits for this crossing have been obtained. However, TGM is seeking permits for an alternative crossing downstream of the bridge. This crossing would require a 4,400 m route extending from the existing proposed ROW (at km 415+663) to a point adjacent to the river where it would cross beneath the river bed within the local basalt bedrock. This would utilize directional drilling and would not require trenching within the actual channel and thus reduce environmental impacts.

2.2 Project Design Features

2.2.1 Pipeline Design and Construction

2.5 The pipeline includes a section of approximately 431.8 km extending from the Aldea Brasilera compressor station to a point just outside the town of Paso de Los Libres. The pipe will have a diameter of 24" (609.6mm). At this point, a measuring station will be installed to assess the volume of exports flowing to export to Uruguayana, Brazil. The remaining 4.6 km portion of pipeline from the measuring station to the Brazilian border on the Uruguay River will have the same diameter of 24". The remaining 12 km portion of the pipeline from the border to the future Uruguayana power plant is the responsibility of Sulgas, a subsidiary of the Brazilian Company Petrobras, and is not considered in this assessment.

2.6 The pipeline will be designed and constructed in accordance the Natural Gas Regulatory Entity (ENARGAS) N.A.G. - 100 guideline, "Argentine Minimum Safety Standards for Transportation and Distribution of Natural Gas and other Gases along Pipelines" (1993 edition), as well as with reference to applicable international engineering design codes and standards as set forth in the project Environmental Impact Assessment (EIA). Codes and standards relating to mechanical works and pipes, surface treatment and corrosion control, electrical works, metering and instrumentation, civil works and structures, and quality assurance will provide the minimum reference for design purposes. Relevant design features of the proposed pipeline include:

a 24" (609 mm) diameter pipeline;

a p.s.i. of 70,000 (material - API 5L X 70);

pipeline will be buried to a depth of 1.5 m (2.0 m under stream crossings) and covered with backfill;

a 15 m wide right-of-way;

16 blocking valves installed every 30 km along the length of the pipeline;

scraper traps installed every 145 km along the pipeline;

the pipeline will cross the Uruguay River, either attached beneath the international bridge between Paso de los Libres and Uruguayana or downstream passing under the river; and

no compressor stations are planned as part of this project, although compressor stations will be installed in the future as required by potential natural gas demand.

2.7 The total easement required for the ROW will be about 18 m including 15 m for access and machinery operation and about 3 m for the trench and placement of pipe prior to emplacement. Construction will occur simultaneously in two fronts, one from Aldea Brasilera to Federal and the other from Federal to Paso de los Libres. It is estimated that approximately 200 workers will be required to undertake the work.

2.8 Construction of the pipeline will require the removal and replacement of approximately 844, 284 m^3 of soil. A total of 103 rivers, streams and small arroyos will require crossing. Directional drilling will be utilized on four of the largest rivers to avoid trenching through the river beds.

2.2.2 Natural Gas Supply and Transportation

2.9 The pipeline will operate at a design pressure of 75 kg/cm^2 and posses a transportation capacity of 2.8 million m^3/day. The maximum allowable operating pressure for the pipeline is 85 kg/cm^2. Natural gas will be supplied by the Aldea Brasilera Plant, the present end point of the Mesopot<mico Pipeline which crosses beneath the Paran< River. A metre station will be constructed outside the town of Paso de los Libres (kilometre 431.8) in order to measure export volumes to the Uruguayana plant in Brazil. Base conditions for the composition of the natural gas to be transported are outlined in Table 1.1.

2.3 Project Schedule and Costs

2.10 Construction of the Uruguayana natural gas pipeline should begin by September 1999. According to the contract between TGM and the contractor (Techint S.A.), construction of the pipeline must be completed by March 31, 2000. Construction delays beyond this date will result in penalties levied upon the contractor of up to (but not exceeding) $US 21.6 million, or 37% of the contract price. The contract further stipulates that natural gas must be delivered to the Uruguayana power plant by June 1, 2000.

2.11 Total project cost is estimated at US$ 158 million[1]. This estimated cost covers all project related expenses including capital disbursements, operating expenses, environmental mitigation plans and expenses, financial fees and expenses, interest, taxes and contingencies. Engineering and construction costs (the value of the turnkey pipeline construction contract) account for approximately $US 58.4 million. Approximately $US 49.7 million of the total project cost is related to the procurement of pipe and related material. Initial operating and maintenance costs are estimated at $US 920,000 annually.

2.4 Project Alternative Route Selection Analysis

2.12 An alternative pipeline route selection process was undertaken by the project proponent utilizing a range of environmental, social, engineering, and economic criteria (see Table 2.1). An alternative route was considered to the east of the proposed route. No apparent alternative was available to the west. It was determined that the proposed route would be the most feasible. This decision was based on a physical survey of the routes, aerial survey, analysis of topographic maps and satellite imagery.

2.13 The proposed pipeline route is considered the most suitable as it is aligned with an established transportation corridor that includes a railway line (Ferrocaril Mesopotamico Gral. Urquiza S.A.), and national routes No. 127, 12, 14 and 18. The pipeline will be installed approximately 250-300 m from the existing roadways, principally to the east. As the pipeline alignment will follow the height-of-land (*Cuchillas de Montiel*) associated with this existing transportation ROW, the proposed route limits the number of stream and river crossings that will be required. Where crossings are required, the proposed route ensures that rivers and streams will be crossed at their narrowest margins.

2.14 The proposed pipeline follows an existing corridor where human intervention has led to extensive vegetation clearance and a transition of open woodland to crop and pasture land. As a result, the proposed route ensures that no extensive clearing of natural vegetation is required, and that no endemic, vulnerable or endangered floral species are likely to be affected. Furthermore, excessive felling or clearing will not be required as the preferred route passes through areas of low tree and bush density, and by avoiding interference with large marshy lowlands. The proposed route also seeks to limit interference with the habitat of endemic, vulnerable or endangered faunal species or important mating areas.

[1] This total cost assumes that the pipeline will be attached to the existing bridge between Paso de los Libres, Argentina and Uruguiana, Brazil. An additional estimated $US12 million would be required if the pipeline was to cross the Uruguay River using the directional drilling method.

2.15 The proposed pipeline will have the least possible impact on cultivated or plantation areas and traverses primarily unimproved pasture and/or agricultural land oriented to annual crops with a six-month rotation period. These lands have the capacity to recover relatively quickly from construction impacts and will be quickly returned to productive use. Additionally, the proposed route will have only a very minor impact on plantations (predominately *Eucalyptus* spp.) and will not impact other crops such as fruit tree species located in the region. In general, the proposed pipeline route seeks to limit interference with high valuable plots in order to reduce expenses associated with permits and easements.

2.16 Populated areas will not be affected as the proposed route will be located outside of built areas in the different municipalities, and will not hinder local growth. As the route runs adjacent to an existing transportation ROW, few new access roads will be required. In addition, the proposed route traverses a region with the lowest potential for seismic activity in Argentina. Finally, effort has been made to select the shortest route possible as pipeline length is directly related to project construction cost.

3.0 LEGAL AND INSTITUTIONAL FRAMEWORK

3.1 Institutional

3.1.1 Energy Sector

3.1 In Argentina, the Ente Nacional Regulador del Gas (ENARGAS) is the institutional and regulatory entity that oversees the activities of the natural gas sector. ENARGAS was established by the Natural Gas Law (Law 24,076), and is responsible for enforcing the provisions of the laws applicable to the gas sector. ENARGAS is governed by a board of directors appointed by the GOA, subject to confirmation by Congress, and operates under the supervision of the Ministry of Economy and Public Works and Services.

3.2 ENARGAS has the broad authority to regulate the operations of the natural gas transportation and distribution companies. The main objectives and functions of ENARGAS are: (i) protect consumers; (ii) regulate tariffs; (iii) enforce governing laws and resolutions; and (iv) ensure fair rates to customers and non-discriminatory access to service. ENARGAS is an established, well-reputed institution which provides stability to investors and customers through the quality of its services. As the regulatory entity in the sector, ENARGAS has published recommended practices for environmental protection associated with the construction and operation of natural gas pipelines (see Section 3.2.1).

3.1.2 Environment

3.3 At the federal level, the Secretariat of Natural Resources and the Environment is responsible

for the promotion and control of the environment and conservation of natural resources within national jurisdiction. However, this does not extend to gas pipeline projects which come under the sole responsibility of ENARGAS.

3.4 With respect to natural gas transportation, ENARGAS is responsible for issuing regulations and establishing procedures aimed at correcting, reducing and preventing environmental damages arising from natural gas pipeline construction and operation, and is in charge of enforcing compliance with relevant regulations. ENARGAS must approve the project EIA in accordance with Law No. 24,076 (see Section 3.2.1). ENARGAS has full regulatory responsibility for all phases of the construction and operation of the pipeline.

3.5 At the provincial level, the respective ministries exercise the responsibility for environmental protection and control. Within the Province of Corrientes, the Ministry of Agriculture, Livestock, Industry and Commerce, through the Subsecretary of Natural Resources has regulatory authority and was the lead agency responsible for reviewing the project EIA. However, for this project, a working group was commissioned to review the documentation and monitor the project throughout its construction phase. This working group, known as the Comision Provincial de Grandes Emprendimientos Regionales, has representation from the following provincial entities: Ministerio de Obras y Servicios Publicas (Subsecretaria de Recursos Hidricos), Ministerio de Produccion y Desarrollo (Subsecretaria de Recursos Forestales y Medio Ambiente), and Secretario General de la Gobernacion.

3.6 In the Province of Entre RPos, the Direccion de Hidraulica y Recursos Hidricos (Subsecretaria de Obras Publicas) provides approval for pipeline construction and specific river crossings.

3.7 The municipalities or districts, into which the different provinces are divided, are also empowered to issue and enforce compliance of certain environmental regulations concerning activities that are carried out or that impact the relevant municipal area.

3.1.3 Health and Safety

3.8 Workplace health and safety is regulated at the federal level by the Ministerio de Trabajo y Seguridad Social (Work and Social Security). The regulations were enacted in April, 1972. The ministry has the authority to inspect work throughout the entire country as well as demand assistance from provincial authorities when needed.

3.2 Legal

3.2.1 Environment

3.9 The Natural Gas Law establishes the legal and regulatory framework for the transportation and distribution of gas in Argentina, and for this Project. The applicable regulations of this Law are: Decree No. 1,738/92, the bidding document for the privatization of Gas del Estado (the "Pliego"), the transfer agreements, resolutions issued by ENARGAS, and the licenses of the newly privatized companies.

3.10 ENARGAS has established guidelines related to environmental aspects of gas pipeline construction and operation (Guide of Recommended Practices for the Protection of the Environment during the Construction of Pipelines and their Subsequent Operation, Guide NAG-PR-001). Compliance with this guideline is compulsory with respect to all works authorized by ENARGAS under Law No. 24,076. The guideline includes procedures for performing an environmental impact assessment, developing environmental protection plans (mitigation and monitoring), and the performance of environmental audits. The guidelines have been formally incorporated to Resolution NAG 100/93, "Minimal Argentine Security Norms for the Transportation and Distribution of Natural Gas and other Gases through Pipelines", issued by ENARGAS and applicable to the gas industry.

3.11 Based on these guidelines, an EIA must be prepared by the project sponsor. The EIA is then submitted to ENARGAS for approval. Prior to approval, ENARGAS reviews the EIA in detail and prepares a list of any outstanding issues or questions which must be addressed by the proponent within 10 days. This review forms an annex to the original project resolution. The EIA is also submitted to the affected provinces for their review. They may also require additional clarification from the project proponent.

3.12 The applicable federal laws and regulations that apply to this Project are: N.A.G. 100/93 (which includes the Guidelines), the Hazardous Waste Law No. 24,051 and its regulatory Decree No. 831/93, and the workplace health and safety Law No. 19,587.

3.13 The Hazardous Waste Law is promulgated by the Secretaria de Recursos Naturales y Ambiente Humano which reports directly to the President of Argentina. It sets toxicity limits for any residue and requires any companies handling toxic residues to register in the Registro Nacional de Generadores y Operadores de residuos Peligrosos (National Registry of Generators and Operators of Hazardous Residues). An Annual Environmental Certificate is required for any operators or generators of hazardous materials (i.e., not project specific).

3.14 The Argentine Constitution grants all citizens the right to a healthy and well-balanced environment capable of sustaining human development. Each State has an obligation to protect the rights of its inhabitants, to promote the rational use of natural resources, and to protect the cultural and natural heritage of its habitants. Based on these rights, each Province has developed and promulgated environmental legislation. This Project must comply with all environmental laws applicable to the provinces of Entre Ríos and Corrientes.

3.15 In the Province of Entre Ríos, the following provincial legislation is applicable to the Project: Law No. 8,880, which approves the federal Hazardous Waste Law for provincial jurisdiction, and Law No. 9,032, which regulates the admissibility of injunctive judicial actions in connection with environmental damage.

3.16 In the Province of Corrientes, Law No. 4,731 requires the performance of an EIA prior to the construction of any work that may affect the provincial environment or natural resources; and Law No. 5,067 (enforced by the Ministry of Agriculture, Cattle, Industry and Commerce, through the Subsecretary of Natural Resources) defines the activities that are subject to the preparation of an EIA and establishes the requirements and procedures for performing an EIA. This project is subject to Law 5,067, however, a separate EIA under this law was not requested. The Province reviewed and commented on the EIA prepared under the ENARGAS NAG-PR-001 guidelines.

3.17 Table 3-1 provides a list of applicable regulatory and compliance requirements associated with provincial, federal and international institutions. Table 3.2 provides a list, and the status, of required permits and authorizations necessary for construction and operation of the Uruguayana Natural Gas Pipeline project.

3.2.2 Health and Safety

3.18 Worker health and safety will be assured by pipeline contractor and proponent compliance with Argentine Law No. 19.587/72 – Hygiene and Security in the Workplace, Regulatory Decree No. 911/96 (Law 19.587) - Security and Health in the Construction Industry. Other applicable health, safety and environmental guidelines includes ENARGAS Resolution NAG 100/93, "Minimal Argentine Security Norms for the Transportation and Distribution of Natural Gas and other Gases through Pipelines" (see Table 3.1).

3.2.3 Other Requirements

3.19 Specific permits for water extraction and deposition during hydrostatic testing are not required. However, the project proponent is obligated to inform the relevant provincial authority when tests will be carried out.

3.20 The proposed project has been reviewed against the following World Bank policies: (i) Natural Habitats (4.04); (ii) Indigenous People (4.20); (iii) Cultural Properties (4.11); and (iv) Resettlement Guidelines (4.30). The proposed project has also been reviewed against the standards set forth in the OPIC Environmental Handbook (1998), as well as OPIC prohibitions on financing projects located in “natural” forests, and the prohibition on financing projects located in IUCN category I-IV protected areas (see Table 3.1).

3.21 The construction contract awarded to Techint S.A. stipulates that the contractor will provide an accredited environmentalist and an accredited safety specialist to remain available and on-site throughout the period of the contract. They are responsible to provide direction, as required, to the contractor. In addition, both the project EIA and TGM's Health, Safety and Environmental Procedures are identified as exhibits to the contract and are interpreted as forming a part of the contract.

3.3 Project Status

3.22 An initial environmental impact assessment for the proposed project was completed in September 1997. The EIA included the identification of project-related environmental and social impacts, as well as associated mitigation measures and monitoring programs. The EIA also included a limited analysis of alternative pipeline routes. The preliminary EIA was submitted to various municipal, provincial, and national regulatory (ENARGAS) agencies for comment. The EIA was made publicly available on June 26, 1998 and June 27, 1998, through project announcements posted in two regional newspapers, *El Diario* and *El Litoral*.

3.23 A revised environmental impact assessment based on environmental guidelines provided by the IADB was completed in October, 1998. This document includes: project background and design details; a review of relevant environmental legislation and regulations; a description of baseline environmental and social conditions in the project area; a description of potential environmental and social impacts; proposed mitigation measures; a monitoring plan; contingency plan; health and safety management guidelines; and a description of the proposed social communication program.

3.24 Requests for additional detail and clarification were made by the Province of Corrientes (Servicio Provincial de Gestion Ambiental) on December 16, 1998. Specifically, the Province requested the filing of a contingency plan, mitigation plan, and route selection process. These were submitted by TGM on February 10, 1999.

3.25 In response to the original EIA, ENARGAS prepared an extensive set of questions and requests for further details on March 5, 1999. These covered all aspects of the environmental parts of the EIA including project description, environmental description, evaluation of environmental impacts, environmental protection plan, and environmental monitoring plan. Each question or request was responded to by TGM within the required 10 day period. Both of these documents form an annex to the original ENARGAS Resolution No. 598.

3.26 A public consultation program was carried out between January and March 1999. Consultation activities included meetings and interviews with various landowners, municipal representatives, business owners and other interested parties proximate to the proposed pipeline, as well as the distribution of pamphlets and notices through various media outlets (newspapers, radio). This process provided the local population with an opportunity to better understand the project, its potential environmental and social impacts, as well as the proposed mitigation procedures for health, safety and the environment. Detailed information on the public consultation program is provided in section 7.0.

3.27 Table 3.2 provides a status of required permits and authorizations necessary for construction and operation of the Uruguayana Natural Gas Pipeline project. The project has received approval notices authorizing the initiation of construction from the following governmental agencies: ENARGAS (Resolution 598); Comision Provincial de Grandes Emprendimientos Regionales, Corrientes (with a corresponding decree from the governor of the province); and from the Direccion de Hidraulica y Recursos Hidricos, Entre RPos. The ENARGAS approval covers all aspects of the pipeline construction and operation at the national level. The permit prepared by the Province of Corrientes was dated February 18, 1999 and provided specific authorization for the pipeline to cross all watercourses and provincial roads. The permit from Entre RPos was an authorization to initiate work and to undertake the required river crossings, contingent upon inspection of each crossing by the Province during construction.

3.28 The project has received authorization from the Direccion Nacional de Vialidad (dated August 23, 1999) to attach an 18 inch pipeline to General Vargas international bridge between Paso de los Libres and Uruguayana, Brazil. This authorization stipulates the fixed fee to be levied against the project proponent as well as the payment method. In order to finalize the agreement, the project proponent will be required to sign a formal compensation agreement with the Direccion Nacional de Vialidad (*Convenio de resarcimiento por el aprovechamiento del puente para el paso de las instalaciones*). The project has also received a permit (Resolution 299/98) from the Secretariat of Energy, Ministry of Economy, Works and Public Services, authorizing the exportation of natural gas to Brazil

3.29 The original project proposal incorporated use of the international bridge between Paso de los Libres, Argentina and Uruguayana, Brazil. However, TGM is presently seeking permits for an alternative crossing downstream of the bridge. This crossing would require a 4,400 m route extending from the existing proposed ROW (at km 415+663) to a point adjacent to the river where it would cross beneath the river bed within the local basalt bedrock. This would utilize directional drilling and would not require trenching within the actual channel and thus reduce environmental impacts. A separate Environmental Analysis has been prepared for this alternative crossing and TGM submitted on August 13. 1999 its request for permits to undertake this crossing to the Province of Corrientes and to ENARGAS. ENARGAS, is presently reviewing the request.

4.0 ENVIRONMENTAL AND SOCIAL CONDITIONS

4.1 Environmental Conditions

4.1.1 Climate

4.1 The climate in the project area is characterized as humid sub-tropical with little annual temperature variation and relatively abundant rainfall throughout the year. The region is typified by an average annual temperature of 66 degrees Fahrenheit (18.8 degrees Celsius). The average temperature in the coldest month (July) is 55 degrees Fahrenheit (12.7 degrees Celsius), while the average temperature for the warmest month (January) is 79 degrees Fahrenheit (26.1 degrees Celsius). Days with sufficiently cold temperatures to produce frost are rare.

4.2 Year-round precipitation contributes to the humid sub-tropical climate and helps to moderate seasonal temperatures. Rainfall in the region averages 40 to 70 inches (1000-1800 mm), while the peak rainy season occurs in the fall. Winter months are slightly drier. In general, however, precipitation is distributed relatively uniformly throughout the year with no pronounced wet or dry seasons.

4.3 Prevailing winds in the area usually originate from the east, either in the form of warm and humid subtropical air (northeast) or cold and humid polar air (southeast). Occasionally, cold, dry winds from the southwest will cause temperatures to decrease. Greatest mean wind speeds (14 km/h) occur from August to November. Mean annual relative humidity is 73 percent.

4.1.2 Geology and Geomorphology

4.4 The proposed route lies within the southern portion of the Brasilian Shield which, in this area, consists of basalt and tuff deposits of volcanic origin. This basement complex is overlain by a sedimentary sequence dominated by sandstones, siltstones and shales which range in age from Cretaceous to Tertiary. These younger rocks, in turn, are overlain by unconsolidated sediments consisting of clays and silts which were deposited in lacustrine or deltaic environments during the Pleistocene. In places, these are overlain by wind derived ("loess" deposits) fine sands and silts deposited during the Holocene Period.

4.5 A series of faults, trending generally in a north to south direction, have resulted in the formation of tilted blocks within the sedimentary sequence. However, the Brasilian Shield forms a stable platform and seismic activity in this region is currently very low.

4.6 The geomorphology of the proposed pipeline route is characterized by flat fields and soft rolling hills or "ridges" which form a portion of the Chaco-Pampa Plain (*Llanura Chaco Pampeana*). These ridges are low and are typically covered by lime deposits. Along the *Cuchillas de Montiel* (Height of Land) elevations range from 65 to 80 meters above sea level. The flat topography and clay subsoils common to this plain have resulted in a region dominated by wetlands and small streams with minimal channel down-cutting.

4.1.3 Soils

4.7 Based on the U.S. system of soil classification, three different soil orders are represented along the proposed pipeline route: mollisols, alfisols, and vertisols. Generally, such soils are formed under grassland or open woodland environments. They tend to have dark surface horizons due to the accumulation of organic matter from the decomposition of grasses and sedges. They are also commonly rich in base salts (calcium and sodium) due to their formation under semiarid to sub-humid, temperate conditions. Drainage in these soils is quite variable ranging from well to imperfectly drained. Within the area of the pipeline route, all of these soils tend to have a high clay content. As a result, they tend to become very hard and massive when dry and very sticky with low permeability when wet.

4.8 Mollisols are typical found at the commencement of the pipeline and are associated with the undulating penneplain near the Paran< River. These dynamic soils are subject to erosion, and have a significant loess content and a high clay content.

4.9 Alfisols appear in slightly higher, flat to undulating areas with poorly defined drainage patterns. The soils are dense, with a high clay content and an impermeable subsurface horizon. Alfisols are also found in areas with very limited slopes that are susceptible to erosion.

4.10 Vertisols are typically associated with the slightly undulating peneplains. The vertisols located along the proposed route typically contain a high percentage of clay (40–50%). These soils are often found in areas of micro-relief or uneven ground called "gilgai", and are prone to soil contraction and expansion due to the high clay content.

4.1.4 Surface Hydrology

4.11 Surface water features associated with the proposed pipeline route drain into either the Paran< River system or the Uruguay River system. More specifically, surface water features can be classified as follows: (i) small streams that drain directly into the Paran< River; (ii) streams forming part of the Gualeguay River system; (iii) streams associated with the Mocoreta River basin; (iv) streams associated with the Miriñay River basin; and (v) small streams that drain into the Uruguay River. The Gualeguay system is part of the Paran< River basin, while the Mocoreta and Miriñay systems are part of the Uruguay River basin.

4.12 Much of the proposed pipeline route traverses the height-of-land located in the region. This feature separates the Paran< and Uruguay river systems and limits the number of river and stream crossings required by this project. The route also traverses the upper portion of the Gualeguay River basin which is characterized by a flat, poorly drained area located between 60 and 75 m above sea level. Numerous marshlands have developed in this area, with inundated and flooded areas 500-600 meters wide that form extremely flat zones.

4.13 Based on the layout of the proposed pipeline route, it is expected that 8 major crossings, 13 medium crossings, and 82 minor crossings will be required. The eight major crossings are as follows: Mocoreta, Curuzu Cuatia, MiriZay, Ayui, and Las Conchas and associated tributaries.

4.14 The classification of stream size is partly qualitative and partly quantitative, based on the size of the river channel at the crossing point and the size of their associated watershed. Major crossings are those rivers having a drainage basin greater than 500 km^2 in size. The difference between minor and medium crossings is more qualitative based on their width and relative flow at the proposed crossing point. Table 4.1 provides a summary description of stream and watercourse crossings based on 14 pipeline sections.

4.1.5 Groundwater

4.15 Data on the depth, volume of flow and quality of groundwater have been derived from existing sources using information from test wells located at the following locations along the proposed route: Aldea Brasilera, Bovril, Los Conquistadores, Maria Grande, Federal, San Jaime and Paso de los Libres.

4.16 Static water levels and flow rates were recorded in existing wells and reflect only the uppermost groundwater aquifer. During testing, all static levels were well below ground level. Static water levels along the route range from 8.5 m below ground level at San Jaime to 41 m at Bovril. The static water level at Federal is 22.5 m below ground level, while at Aldea Brasilera, the static water level is 16.5 m below ground level. Average flow rates range from 12,000 liters per hour in Bovril, to 1,200 liters per hour in Paso de los Libres. Flow rates average 2,500 liters per hour at Maria Grande and 1,400 liters per hour at San Jaime.

4.17 Groundwater resources throughout the region are generally considered to be of good quality.

4.1.6 Vegetation

4.18 The proposed pipeline is located in the Nandubay zone assemblage of the Espinal vegetation

association. This open woodland assemblage is typically referred to as Mesopotamian Parkland or Mesopotamian Savanna and extends through the provinces of Entre RPos, Corrientes and Santa Fe. It is characterized by a single arboreal stratum comprised of carob trees (*Prosopis algarrobilla* or *P. nigra*), as well as espinillo (*Acacia caven*), molle – pepper tree (*Schinus* spp.), and ChaZar (*Geoffroea descorticans*).

4.19 The shrub stratum is typically comprised of *Castela tweedei, Cassia corymbosa, Tabernamontana australis, Rollinia emarginata, Eugenia uniflora, Buddleja stachydioides* and *Gochnatia argentina*. Graminoid species common in the herbaceous layer include *Stipa* spp., *Setaria caespitosa*, *Botrichloa lagurioides*, *Aristida* spp., *Pasalpum* spp., and *Briza* spp. Aggressive *Bromelia serra* (chaguar) and *Eryngium eburneum* species are abundant in areas of excessive pasture activity.

4.20 Common seral stage communities located in the region include: Yatay palm groves growing in acidic sandy soils and comprised of *Butia yatay* with a rich shrub and herbaceous layer; *Elionorus* and *Pancium* pastureland communities; and "Paspalum" (*Andropogon lateralis*) and/or *Anoxopus* spp. fields associated with slightly acidic, moist soils.

4.21 Undisturbed areas of native vegetation have the potential to support plant species which are of special concern (i.e., endemic, vulnerable or threatened species). However, areas of undisturbed vegetation are limited. More detailed mapping has identified potentially sensitive vegetation communities at specific points along the proposed route, typically in association with river crossing sites (i.e. presence of arrayan, guayabo, laurel, timbo, or oreja de negro species that may provide wildlife habitat).

4.22 Wetlands and other environmentally sensitive features provide important habitat for a variety of wildlife and plant species. Further, wetlands provide water storage and control functions which reduce erosion and flooding, and improve water quality. The region is characterized by extensive swamp and wetland areas fed by local rainfall and groundwater. Based on detailed mapping of the pipeline route, approximately 38 wetland and swamp areas have been identified along the pipeline route. Many of these marshes are characterized by limited anthropogenic intervention. Vegetation is comprised of cattail and bullrush, water hyacinth, willow and ceibo (*Erythrina crista galli*) tree species. Wetland habitats located in the region have not been classified or assessed in order to determine their ecological value.

4.23 With the exception of selected hilltops (*cuchillas*), swamps and wetland areas, the region has been subjected to significant transformation as a result of farming and pasture activity. Major transformations that have or are taking place in the region include the clearing of land for agricultural crops, intensive livestock production, and the cutting of *Prosopis* spp. for timber and poles. In addition, scattered plantations of *Eucalyptus* spp. as well as orchards (orange) were identified adjacent to the pipeline route.

4.1.7 Terrestrial Wildlife and Fisheries

4.24 The majority of the pipeline route traverses open woodland utilized for extensive pasture, intensive pasturelands and/or agricultural land. Open woodland areas consist primarily of carob trees (*Prosopis* spp.), as well as espinillo, pepper tree and chaZar. There is a significant amount of marsh or wetland habitat in the vicinity of the pipeline route. The open woodland, riverine corridors and marsh habitat along the proposed pipeline route provide habitat for waterfowl, raptors, amphibians and various furbearers. Intensive grazing and agricultural activities have the greatest impact on wildlife in the vicinity of the proposed pipeline.

Mammals

4.25 Riverine corridors and wetland areas may provide suitable habitat for a number of mammals, including carpincho, marmosa, weasal, fisher, pampa fox, pampa deer, and hare. A total of 66 mammalian species may have ranges that overlap the proposed pipeline route. Of the 66 species, two are considered endangered, 11 are considered vulnerable and four are considered rare.

Avifauna

4.26 Approximately 244 species of birds may inhabit the region or have ranges that overlap the pipeline route. Seven bird species in the region are considered vulnerable and 26 are considered rare. Bird species of note include the rhea, colorado, common tatupa, maca, heron, raven, various ducks, hawks, and eagles, the common cotorra (parrot), and the common vulture.

Amphibians and Reptiles

4.27 An estimated 34 amphibian and reptilian species may inhabit the region of which three are considered endangered, 13 vulnerable and one rare. Amphibians include the common frog, chaco-type frog, climbing frog, monkey frog, blackberry frog, yellow-bellied toad, and nosy toad. Reptiles in the region include various snakes and lizards, and possibly the yacarð.

Fisheries Resources

4.28 Watercourses in the provinces of Entre RPos and Corrientes may provide important fish habitat. In particular, the small rivers and streams may provide important fish habitat as they provide the connection between the numerous wetlands that function as spawning sites and the larger rivers and watercourses in the region (e.g., Uruguay, Paran< rivers).

4.29 No large lakes are proximate to the proposed pipeline route.

Endangered, Vulnerable or Rare Species

4.30 A coarse-scale assessment of faunal resources has been undertaken based on provincial distribution and survey lists, bibliographic review and direct observation. Table 4.2 lists all endangered, vulnerable or rare species. Of the approximately 390 faunal species that may be present in region, 5 are considered endangered, 28 are considered rare, and 41 are considered vulnerable. However, due to the paucity of undisturbed habitat in the area, these endangered, rare or vulnerable species will not likely be encountered along the proposed pipeline route, with the exception of the rhea and carpincho.

4.2 Socioeconomic Conditions

4.2.1 Land Use

4.31 Land use along the proposed pipeline is characterized by livestock raising, agriculture, and limited plantation development. According to the project EIA, approximately 44% of the lands traversed by the pipeline are classified as natural woodland (open woodland areas consisting primarily of carob trees (*Prosopis* spp.), as well as espinillo, pepper tree and chaZar that are utilized for extensive grazing), 36.5% as agricultural cropland, 16.5% as natural grazing land (improved pasture areas), and 2.5% as plantation. There are no identified recreation, mining or aggregate extraction activities along or adjacent to the pipeline route. Hunting and fishing activities in the area are subsistence and/or complimentary in nature and of minimal importance to the local population. The status of these and other land use categories in the area of the proposed pipeline route are discussed below.

Agriculture and Livestock

4.32 Livestock raising is the predominant economic activity in the region. Key livestock species include cattle, sheep, pigs, goats, horses, donkeys, mules, chickens and rabbits. Annual and perennial crops also play an important role in the local economy, although agricultural land use is most important around the city of Paran< and the outskirts of Paso de los Libres. Agricultural crops of importance include barley, corn, oats, wheat, sunflower, flaxseed, oranges, tobacco, and sugarcane. Wool production is particularly important in this area as it is among the leading wool-producing regions of Argentina. Limited irrigated agriculture is present in the region.

Plantations and Forestry

4.33 Several plantations are traversed by or are located adjacent to the proposed pipeline route in the municipalities of Monte Caseros and Paso de los Libres (Province of Corrientes). Approximately 2.5% of the lands traversed by the pipeline are classified as plantation. Plantation trees range in height from 1.5 m to 25 m. The predominant species planted, *Eucalyptus salinga*, provides high yields of wood suitable for cellulose and lumber, as well as posts for electrical poles and telephone lines.

4.34 Citrus plantations (mandarin orange) occur in areas adjacent to the proposed pipeline as a

result of the favorable climatic and soil conditions (mostly in the Province of Corrientes).

Other Land Uses

4.35 The pipeline route will traverse the localities of Aldea Brasilera, Tezanos Pinto, El Pingo, Bovril, Federal, Los Conquistadores and San Jaime in the Province of Entre RPos, as well as Colonia Libertad, Parada Pucheta, Bonpland, and Paso de los Libres in the Province of Corrientes. Most lands along the pipeline route are privately owned by individuals or families. There are a number of individual residences located in proximity to the pipeline route.

4.36 No national or provincial parks, national or provincial park reserves (i.e., *Areas Naturales Protegidas* (ARPs)), national or provincial historic sites, migratory bird sanctuaries or wildlife areas are traversed by or adjacent to the proposed pipeline.

4.37 No other special land uses or environmentally significant areas have been identified along or adjacent to the proposed pipeline route.

4.38 No indigenous settlements or land claims exist in proximity to the proposed pipeline route.

4.2.2 Population and Demographics

4.39 Based on data provided by the 1991 National Population and Housing Census, the Province of Entre RPos has a total population of 1,020,257 inhabiting an area of 78,781 km^2, whereas the Province of Corrientes has a total population of 795,594 inhabiting an area of 88,199 km^2. Population densities in the Province of Entre RPos are 13 people / km^2, while the population density in the Province of Corrientes is 9 people / km^2.

4.40 Within the Province of Entre RPos, the proposed pipeline will traverse the departments of Paran< with a population of 276,160, Villaguay (population of 43,829), Federacion (population of 48,713), and Federal (population of 22,121). In the Province of Corrientes, the pipeline will traverse the departments of Curuzu Cuatia with a population of 39,922, Monte Caseros (population of 29,390), and Paso de los Libres (population of 41,129).

4.41 The vast majority of the project area consists of low-density rural areas with isolated populations. Exceptions include the town of Federal (Department of Federal) with a population of 13,418, and the city of Paso de los Libres with a population of 34,000 people. In-migration is limited and most inhabitants of the region were born in the area. Population growth is low and in some cases (e.g., El Pingo), population growth rates are negative.

4.2.3 Local Economy

4.42 Economic development and employment in the area is primarily related to agriculture and cattle ranching. A significant portion of the population is self-employed. In general, per-capita incomes are moderate in comparison to other areas of Argentina. Most areas have access to basic infrastructure such as water, electricity, and roads. However, while natural gas is usually available as household fuel for cooking and heating in most areas of Argentina, both urban and rural populations in the provinces of Entre RPos and Corrientes remain dependent on woodfuel (charcoal and firewood), kerosene and bottled GLP (propane tanks) for cooking and heating.

4.43 Tourism plays a limited role in the area associated with the proposed pipeline, although Paso de los Libres is often utilized as a stopover point for overland travelers to the Igu<zu Falls area. Key service centers located in proximity to the proposed pipeline include Paran< and Federal in the Province of Entre RPos, and Paso de los Libres in the Province of Corrientes.

4.44 Small to medium scale manufacturing and industrial activities are generally limited to the provincial capitals (Paran< in the Province of Entre RPos and Corrientes in the Province of Corrientes) and larger service centers in the region (Federal and Paso de los Libres).

4.2.4 Infrastructure

4.45 Infrastructure (e.g., roads, local services) in the provinces of Entre RPos and Corrientes is considered adequate to support project activities. Medical facilities and emergency services are available in Paran<, Federal, and Paso de los Libres.

4.46 It is expected that temporary housing (i.e., worker camps) will be constructed in order to meet accommodation needs of project personnel. These camps will be self-sustaining and fully-serviced. Transportation to and from the camps to the construction sites will be provided by the contractor. Transportation to local centers (e.g., weekend trips) will also be provided by the contractor. Policies and procedures for the operation of the worker camps have been prepared by the contractor (see Section 6.1).

4.47 Within the Province of Entre RPos, the following access roads are located within the proposed pipeline route area: Former national route No. 131; National routes No. 127, 12 and 18; Former provincial route No. 10; Former provincial route G; and Provincial routes No. 32, 1, 6, 22, 5, 28 and 2.

4.48 Within the Province of Corrientes, the following roads will be crossed: National route No. 14; Provincial routes No. 77, 25 and 78; and Former provincial route No. 40.

4.49 The pipeline will cross the Ferrocarril Mesopotamico Gral. Urquiza S.A. railway line in several locations. Numerous high, medium, and low voltage power lines will be traversed along the pipeline route.

4.2.5 Archeological, Historic and Culturally Sensitive Resources

4.50 No registered or potential archeological, historic or culturally sensitive resources occur along or adjacent to the proposed pipeline. This conclusion is based on correspondence with Jorge RodrPguez who is an archeologist living in the Province of Entre RPos. Archeologist Jorge Rodriquez was recommended to the proponent by the Instituto Etnogr<fico de la Universidad Nacional de Buenos Aires, as well as by environmental specialists with both the Provinces of Corrientes and Entre RPos.

4.2.6 Property Easements and Rights-of-Way

4.51 A total of 366 landowners controlling 537 land parcels will be affected by the proposed pipeline route. Land parcels traversed include agricultural properties, cattle raising properties, and plantation establishments. The proposed project will not require any expropriation of land or the resettlement of individuals, communities or infrastructure (i.e., homes, farm buildings, etc.). Lands required for scrapper traps and the meter station will be purchased at market value.

4.52 Pipeline ROWs are obtained by contacting each individual landowner and securing their authorization for construction work. Prior to commencement of the work, a "Preliminary Survey Certificate" is prepared that describes elements of the property that may be affected by the construction process, and may include photographs and site maps. The document is signed by the landowner (or a legal representative) and those responsible for the work (i.e., TGM and the contractor).

4.53 Upon completion of the construction work, a "Damage Certificate" is prepared that lists all damages and effected property elements. This document is also signed by the landowner (or a legal representative) and those responsible for the work (i.e., TGM and the contractor). Based on this documentation, the amount paid to the landowner in the form of compensation for damages is determined. The actual amount paid is determined after construction and based on the level of damage generated. Payment for damages must take place within three months of the signing of the damage certificate.

4.54 Upon completion of the construction work and the compensation assessment process, a survey drawing is filed with the Cadastral Board and Property Registry of each province in order to establish the easement. Each easement includes two restrictions on the land title as follows: (i) no construction may occur within 30 m on either side of the center line of the

natural gas pipe; and (ii) no deep rooted trees may be planted within 12.5 m on either side of the pipeline.

4.55 The corresponding easement fee is determined by the size of area affected, with fee payments regulated by Decree 861/96 and ENARGAS resolution 584/98. Easement payments may be received monthly or yearly, based on negotiation with individual landowners.

4.56 As of September 16, 1999, ROW authorizations have been confirmed for 463 of the 537 land parcels. Eighteen parcels are currently under negotiation between TGM and the landowners, 11 parcels were authorized through ENARGAS, 9 parcels have been referred to ENARGAS, but not yet authorized, 17 parcels are under investigation with respect to ownership, 4 are publicly owned, and the owners of an additional 15 are yet to be contacted. Where the project proponent and the landowner cannot reach mutual agreement, the negotiation is referred to ENARGAS. ENARGAS will arbitrate the negotiation, or refer the issue to a federal judge, in accordance with appropriate procedures and regulations.

5.0 ENVIRONMENTAL AND SOCIAL IMPACTS

5.1 The proposed project will traverse largely flat to undulating terrain, along a height-of-land that corresponds with an existing transportation right-of-way. This pipeline alignment will limit the number of river and watercourse crossings required by the proposed route. In some cases, where major river crossings are required, directional drilling methods will be utilized. No natural habitats or protected areas (e.g., national parks) will be traversed by the proposed pipeline route.

5.2 No resettlement of local populations will be required as part of the proposed project and no indigenous communities or land claims will be traversed by the proposed route. The majority of the proposed pipeline will traverse unimproved pastureland or cropland that will be restored to productive use. A limited area of forestry plantation will be affected by the proposed pipeline. No orchards will be traversed by the proposed route.

5.3 Primary environmental and social impacts associated with the construction and operation phases of the proposed pipeline route are summarized below. A list of the potential environmental and social impacts identified in the project Environmental Impact Assessment is presented in Table 5.1.

5.4 In addition to the impacts identified in the EIA, the proponent and construction contractor have recently (August 1999) completed detailed mapping and mitigation planning along the pipeline route. The maps identify the location of sensitive areas including key river and arroyo crossings, wetlands, vegetation communities, wildlife habitat, areas of potential erosion, and locations where drainage may be altered. Each of these sites or areas is described in detail in the accompanying report (Environmental Protection Plan for Sensitive Areas); see Section 6 for details.

5.1 Construction Phase

5.1.1 Environment

5.5 Principal environmental impacts associated with the project construction phase are as follows: (i) temporary loss of vegetation; (ii) generation of dust and air emissions from earth moving equipment; (iii) noise impacts; (iv) increased potential for soil erosion and sedimentation, particularly at stream crossings; (iv) waste management along the pipeline route and at worker camps (e.g., sanitary waste water disposal, etc.); and (v) potential spills of petroleum products.

Vegetation

5.6 The majority of the pipeline route traverses open woodland utilized for pasture, pastureland and agricultural land. In open woodland areas, the removal of vegetation may have both environmental and economic impacts. The loss of trees and brush will be minimized as the pipeline passes through areas of low tree density.

5.7 Primary vegetation impact issues associated with the proposed pipeline route include loss of potentially merchantable fuelwood or timber; damage to trees along the temporary work space and access roads during initial clearing; vegetation loss due to necessary grading; loss of, or damage to, important site-specific vegetation assemblages or valuable trees; the handling of slash and the potential for fire; the creation of push-outs (e.g., areas along the pipeline route utilized to store the excess excavated material removed from the right-of-way during clearing). These potential impacts are considered minor and easily mitigable.

5.8 Sensitive ecological areas will be crossed during construction. These areas include small bodies of water, small rivers and streams, floodlands and swamps. These ecosystems nurture abundant vegetation, thus originating a special environment for wildlife. These areas have been identified by the EIA as "delicate", and mapped in detail along the proposed route. Sensitive site and area specific mitigation measures are proposed for each of these locations in the Environmental Protection Plan for Sensitive Areas.

Air Quality

5.9 Air quality impacts associated with pipeline construction will be minimal as there are no compressor stations proposed as part of this project. Construction activities associated with the use of heavy machinery, soil movement and excavation, and increased vehicular traffic, may result in increased levels of airborne or vehicle emissions, and consequent air quality problems. However, dust generation depends upon construction techniques, localized soil conditions and the level of soil and atmospheric moisture. Standard mitigation procedures are available to control dust impacts (see Section 6.1).

5.10 The operation of construction machinery may contribute to short-term localized air quality impacts. This impact is considered minor.

Noise

5.11 Operation of heavy machinery (e.g., excavators, graders, trucks, dredges, power shovels, drills, etc.) may result in localized noise impacts. Particular attention should be paid to the potential noise impacts associated with pipeline construction on sensitive sites (e.g., nesting habitats) or during sensitive times (e.g., nesting season). The potential for serious noise impacts is considered minimal given the short periodicity and localized nature of the impact.

Soils

5.12 The potential for soil erosion during pipeline construction is considered minimal primarily due to the undulating to flat topography along the pipeline route. However, several construction activities have the potential to generate soil erosion and sedimentation impacts.

5.13 Land clearing involving the removal of vegetation from the pipeline route may result from right-of-way preparation, camp establishment, grading, excavation and soil movement, as well as machinery and equipment operation and maintenance. The trenching and excavation process may require the movement of up to 844,284 m^3 of soil.

5.14 These activities may lead to greater soil exposure and increased erosion potential. Vegetation clearing may also contribute to flora and faunal changes as a result of habitat alteration, changes in microclimate, habitat fragmentation, and/or an increase in invasive or exotic species. In particular, vegetation clearing at river crossings is a significant concern as this activity has the potential to decrease riverbank and slope stability. Slope disturbance associated with the larger river courses and the corresponding potential for washouts, increases the likelihood of erosion and sedimentation in streams and rivers.

5.15 Grading requirements associated with pipeline construction are minimal due to local topographical conditions. However, in areas of relatively high relief (e.g., stream banks), grading activities may alter surface water conditions and run-off, or contribute to washouts or sheet erosion. Specific crossing and erosion control techniques have been developed by the contractor.

5.16 Excavation and soil movement may alter soil surface horizons, degrade the organic horizon and contribute to soil fertility declines. In turn, this will reduce the potential for vegetation re-establishment along the pipeline route. However, all excavated materials are to be stored in sequence of removal so individual soil horizons can be replaced in their original order.

5.17 The development of access roads to facilitate movement of construction machinery may lead to soil compaction. This is of particular concern in the numerous marshy, flooded or inundated areas along the pipeline route where soils typically have a high clay content. Soil compaction may lead to reduced porosity and infiltration, reduced drainage, greater potential for surface water flow, as well as lowered soil conductivity. In turn, this limits soil moisture retention, vegetation growth or re-establishment, and productive capacity in agricultural and grazing lands.

Waste Management and Spills

5.18 Hydrocarbon spills resulting from the operation of equipment and machinery (e.g., re-fuelling, maintenance activities) have the potential to impact surface and groundwater resources, as well as soils. Spills may occur at either the construction sites or at the work camps.

5.19 In addition, improper storage or handling of liquid and solid wastes, as well as dangerous materials, at both construction areas and at the work camps may generate a range of impacts to vegetation and wildlife, surface and ground water resources. This potential impact is minimized as a result of specific mitigation and control measures in place (see Section 6.1).

5.1.2 Socioeconomic

5.20 The principal socioeconomic impacts associated with Project construction activities are as follows: (i) possible minimal land use changes associated with plantation, agriculture and pastoral lands; (ii) social issues associated with worker camps; (iii) increased noise due to construction vehicles and works; and (iv) temporarily increased traffic.

5.21 There is no anticipated resettlement associated with the development of the proposed project. Although there are a number of individual residences located in proximity to the pipeline route (i.e., within one kilometer), there are no structures (e.g., homes, farm buildings) in the immediate vicinity of the proposed pipeline (i.e., within the right-of-way) that will be removed or damaged. Land use change impacts associated with the proposed development are minimal as agricultural and grazing lands will be returned to productive use following construction. A minimal amount of plantation land will be taken out of productive use. Compensation for any damages or loss of income incurred by individual landowners will be provided. No other land uses will be altered as a result of pipeline construction.

5.22 During the construction stage, up to 200 individuals may be contracted on a temporary basis

to provide unskilled labor. Construction jobs may be filled by individuals from various municipalities along the pipeline route. The majority of the available positions will likely be filled by individuals from the town of Federal. The construction jobs and the presence of pipeline operations personnel will generate a short-term need for local goods and services (e.g., groceries, restaurants, entertainment facilities). As well, limited construction materials may be purchased from local suppliers where feasible (see Section 5.3). However, operation of the pipeline is not expected to generate direct or significant commercial development in the region.

5.23 The influx of a significant number of construction personnel into the predominately rural setting may lead to several potentially negative social and economic impacts. These could include: short-term price distortions on local goods and services; the creation of informal markets; increased pressure on local community services, and the disruption of local socio-cultural norms (e.g., drinking, prostitution, etc.). Most of these potential impacts are considered mitigable.

5.24 It is expected that temporary housing (i.e., worker camps) will be constructed in order to meet accommodation needs of project personnel. These camps will be self-sustaining and fully-serviced. Transportation to and from the camps to the construction sites will be provided by the contractor. Transportation to local centers (e.g., weekend trips) will also be provided by the contractor. Policies and procedures for the operation of the worker camps have been prepared by the contractor (see Section 6.2).

5.25 Construction activities may result in increased traffic along local roadways. Traffic-related impacts will generally be short-term and associated with the worker camps and more intensive construction activities at the two pipeline fronts.

5.26 Operation of heavy machinery (e.g., excavators, graders, trucks, dredges, power shovels, drills, etc.) may result in noise impacts at project construction sites and at the temporary work camps. These noise impacts will typically be of short-duration and localized.

5.27 No impacts to archeological, historic or culturally sensitive resources are anticipated. No registered archeological, historic or culturally sensitive resources occur along or adjacent to the proposed pipeline (see Section 4.2.5). During the construction phase, if sites of archeological, cultural or historic significance are identified, construction work will be halted and the appropriate authorities notified. Subsequent mitigation measures will be enacted (see Section 6.2)

5.2 Operation Phase

5.28 Pipeline operation impacts are considered minor and easily mitigable. Potential impacts relate mainly to maintenance activities along the right-of-way (i.e. routine vegetation clearing) and potential environmental risks (e.g., air quality) associated with pipeline leaks

or failures. Potential risks associated with the operation of the proposed pipeline include leaks or ruptures, explosions and subsequent fire. However, a range of mitigation and contingency procedures have been established to limit the potential for occurrences of this type.

5.2.1 Environment

Vegetation

5.29 In areas where the pipeline traverses open woodland areas, pipeline operation will generate a minor impact on existing vegetation structures along the pipeline right-of-way. Although the pipeline will be buried, a 15 meter wide strip of land will be kept clear of tree growth in accordance with pipeline safety protocols. In agricultural areas, lands associated with the ROW will be returned to productive use (e.g., crops, pasture).

Air Quality and Noise

5.30 Minimal air quality and noise impacts associated with pipeline operation are anticipated. The test vents along the pipeline route may occasionally release natural gas into the atmosphere creating the potential for air quality and noise impacts. However, this is considered a minor impact as the number of vents is limited, impacts will be localized and of short duration, and measures to prevent gas releases into the atmosphere are well-defined.

Landforms

5.31 Potential landform impacts are minimal and will consist primarily of small alterations to surface elevations to accommodate pipeline trenching requirements and river crossings. As the pipeline will be below ground, the proposed development generally conforms to the landscape, although communication towers, valves, distance markers and other necessary structures will have a minor visual impact.

5.2.2 Socioeconomic

5.32 No negative socioeconomic impacts associated with pipeline operation are anticipated. Impacts to existing infrastructure (e.g., roads, bridges, railways, power lines, etc.) will be minor, short-term and easily mitigable. Existing transportation infrastructure is adequate for the movement of maintenance workers and equipment along the length of the pipeline. The projected workforce required for pipeline operation and maintenance will not require additional infrastructure support (e.g., housing, camps, etc.).

5.3 Positive Impacts/Benefits

5.33 The supply of natural gas for power generation provides a direct environmental benefit.

Natural gas power generation is relatively inexpensive, more efficient, and reduces emissions-related impacts associated with the use of fuel oil or coal.

5.34 The proposed project will provide several additional positive impacts and/or benefits. Employment opportunities will be provided during construction and operation phases of the project. In particular, up to 200 individuals from local municipalities along the pipeline route will be contracted on a short-term basis during project construction. In addition, local goods and services will be purchased by pipeline employees and the contractor where possible.

5.35 The proposed project will also positively impact on the quality of life of the region as the potential for access to a cost-effective, clean-burning source of energy for heating and cooking will be provided. A local gas distribution company, gasNEA, has been granted a license to provide this service in the provinces of Entre RPos, Corrientes, Misiones, Chaco and Formosa. Currently, the regional population currently depends upon woodfuel (charcoal and firewood), kerosene and bottled GLP (propane tanks).

5.36 Purchases of local goods and services, the short-term growth in income levels, and potential savings associated with heating and cooking fuel costs, should provide renewed opportunity for economic development in the area.

5.37 Finally, the proposed pipeline will provide the first direct connection of the hydrocarbon transportation network system between Argentina and Brazil. Consequently, the proposed project provides an important vehicle for regional (i.e., MERCOSUR) economic integration and development.

6.0 ENVIRONMENTAL AND SOCIAL MITIGATION AND MONITORING MEASURES

6.1 Mitigation

6.1 The project Environmental Impact Assessment has identified various environmental and socioeconomic impacts that will require mitigation measures during both pipeline construction and operation phases. Mitigation measures are related to the following project elements: rights-of-way; worker camps and work sites; vegetation clearing and re-vegetation; grading; excavation; surface water crossings; pipe installation; back-filling; surface erosion control; post-construction restoration; handling and laying of pipes; pipe cleaning and hydrostatic testing; spills; social aspects; and hygiene.

6.2 The Environmental Protection Plan (EPP) outlines the procedures enacted with respect to supervision and responsible parties, right-of-way permits, worker camps and work sites, trail and access road creation, special crossings, handling and laying of pipe, back-filling and covering the pipe, pipe cleaning and hydrostatic testing, restoration, waste management, noise and air contamination. Environmental training and capacity building initiatives are also addressed.

6.3 A specific Environmental Protection Plan for Sensitive Sites, which is part of the EPP, has recently (August 1999) been finalized by the Contractor (Techint S.A.) in collaboration with the environmental specialists who prepared the project EIA. This plan provides a description of site and issue-specific mitigation measures. The "sensitive sites" consist of various small areas that have been determined to warrant particular or specific measures (see below). The Environmental Protection Plan for Sensitive Sites report includes detailed methodologies for the following:

- Techniques for installing temporary and permanent plugs for controlling drainage within the pipeline trench;
- Placement of breaks and diversions for controlling surface drainage;
- Location, shape and material for berm construction;
- Erosion prevention techniques (rip rap, gabion walls, etc.);
- River crossing techniques for small (<30 m wide) streams;
- Protection of undercut and vertical river banks;
- Directional drilling techniques; and
- Geotextile placement.

6.4 This plan also provides prescriptions for 42 sites or areas along the proposed route with detailed descriptions of the following:

- Location (referenced to separate mapping);

- Identification of construction phase and operation phase responsibilities;
- Brief description of site/area characteristics;
- Brief description of project characteristics;
- Description of potential impacts;
- Detailed mitigation measures to be utilized;
- Environmental monitoring parameters and timing;
- Index of success (to determine need for active intervention);
- Reporting requirements; and
- Pre-construction photos of site/area.

6.5 A complete summary of the mitigation measures proposed in the EIA and Environmental Protection Plan is provided in Tables 6.1 (construction phase) and 6.2 (operation phase).

6.1.1 Construction Phase Mitigation Measures

6.6 Right-of-way impacts will be minimized by ensuring that the movement of machinery and vehicles through the right-of-way takes place only on authorized roads. Workers and the general public will be kept at a safe distance during operation of machinery. Finally, buildings or access points near the right-of-way will not be obstructed by materials or equipment.

6.7 Worker camps and work sites will be appropriately and safely maintained in order to minimize waste, provide adequate living conditions and limit environmental impacts. In particular, the location of campsites will ensure that they are not adjacent to watercourses or in areas of significant vegetation cover. No topsoil will be removed at campsites in order to promote re-vegetation once the campsite is removed.

6.8 Clearing of vegetation for the right-of-way, campsites, and construction areas will be minimized where possible and strictly controlled to minimize erosion and sedimentation concerns. No trees greater than 50 cm in diameter will be removed (except directly over the buried pipe) and shrub root structures will be left in place to help stabilize the soil. Vegetation that is cleared will be removed and stored in an appropriate location and any vegetation that falls into a water body will be removed immediately. A fringe of land immediately adjacent to the pipeline will be maintained free of trees and shrubs in order to meet safety and inspection protocols.

6.9 Grading and soil excavation impacts will be mitigated by limiting these activities except when absolutely required for construction. All soils will be removed and stored in a sequential manner in order to maintain the soil horizons. Once construction is completed,

soil horizons will be replaced in the appropriate sequence and the area returned to pre-construction conditions. Grading and excavation will not occur until the initiation of construction at the site. Holes and ditches will be clearly marked in order to prevent accidents.

6.10 As discussed in Section 4.1.4, eight major crossings, 13 medium crossings, and 82 minor watercourse crossings will be required (see Table 4.1). Numerous mitigation procedures associated with watercourse and stream crossings will be implemented in order to reduce potential impacts associated with stream bank erosion and sedimentation in watercourses, changes to the riverbed, obstruction of the natural flow of water and control of dragging spoils. In particular, up to four of the major river crossings (e.g., Curuzu Cuatia) will be accomplished using a directional drilling technique involving the threading of the pipe beneath the riverbed. This significantly reduces the potential for environmental impacts at these river crossings.

6.11 Where standard river crossings are required (e.g., trenching), the amount and timing of vegetation clearance, grading and trenching associated with the crossings will be strictly controlled and limited to the area required for construction works. Prior to construction, temporary plugs or barriers will be installed in strategic locations to avoid erosion due to rainfall or surface water run-off. Permanent plugs will be installed at the base of all slopes adjacent to water bodies. Once construction has been completed, the area will be immediately restored and natural re-vegetation promoted. Riverbeds will be refilled with original material. Original riverbed contours will also be restored in order to minimize any long-term impacts. Construction activities will be minimized at river crossing locations where the presence of important riverine vegetation has been identified (e.g., arrayan, guayabo, laurel, timbo, or oreja de negro species) that may provide wildlife habitat.

6.12 In marsh or swampy areas, access will be limited to the required equipment and machinery necessary for construction purposes in an effort to avoid soil compaction or alter natural drainage patterns including the appropriate management of temporary fill or dredge materials. As well, wooden paths or gravel will be used in access areas in order to reduce soil compaction and stabilize access routes.

6.13 Sensitive sites along the route have been mapped in detail. Sensitivity is based on special vegetation communities, wildlife habitat, stream crossings, slopes, drainage alterations, and wetlands. A total of 42 site and area specific prescriptions have been prepared which identify specific mitigation measures and methods to be employed to minimize or eliminate potential impacts.

6.14 Handling and laying of pipes, as well as backfilling may generate impacts associated with soil disturbance, alteration of the soil horizon, erosion and sedimentation. Impact mitigation measures include minimizing the length of time of ditching operations, and refilling the soil in the sequence in which it was excavated. As well, all soils will be compacted when covering ditches to avoid erosion and to compensate for natural soil subsidence. Topsoil will not be used to build barriers, ditch diversions, or plugs. Berms will be installed as required to prevent excessive surface water run-off and consequent erosion. Either a diagonal rectangular berm or herringbone berm will be constructed. The location and spacing of the berms depends on local slope and soil conditions. The exact location will be determined by the Environmental Inspector or Resident Engineer.

6.15 In order to avoid impacts to wildlife and livestock, pipes will be laid next to the ditch in a discontinuous manner at a 20^0 angle (to avoid obstructing animal pathways). Ditches and pits will be signed and roped off and barriers established to mitigate the potential for animals to fall into the ditches and become trapped and/or injured. Open ends of the pipe will be closed at the end of each day to limit animal access.

6.16 Impacts from hydrostatic testing and pipe cleaning procedures will be mitigated by ensuring that no more than 10% of the water volume of the source water body will be utilized. Testing waters will be recycled whenever feasible, or utilized to control dust generation around the construction site.

6.17 Noise and dust generation will be mitigated using standard control measures such as locating permanent noise sources away from populated areas, controlling the timing of construction activities near populated zones, prohibiting the use of horns, and spraying the construction site with water to minimize dust.

6.18 Social impacts associated with land use changes will be mitigated by holding information meetings, providing information pamphlets, and providing local contact points within municipalities. Property damage will be mitigated through the damage certification and compensation process (see Section 4.2.6). Social impacts associated with increased traffic and increased noise due to construction vehicles and works, will be mitigated by limiting public use of the access roads created for construction and operation activities, limiting and enforcing speed limits of construction vehicles, ensuring that public access routes are not impeded, and limiting construction activities to normal daytime hours. Potential impacts associated with the worker camps will be mitigated through the enforcement of strict policies and procedures for worker camp operation in outlined in Techint's manual of accident prevention and environmental protection (*Manual de Prevencion de Accidentes y Proteccion Ambiental*) dated March, 1999. These measures include establishment and posting of clear rules to be followed by the workers resident in the camps.

6.19 Standard measures will be enacted to ensure that potential health and safety impacts are mitigated, including compliance with local, national and international norms for safe construction and operation, maintaining a safe working environment (including safe and

clean worker camps), operating in appropriate weather conditions, providing occupational health and safety training programs, and ensuring that all equipment, machinery and tools are of adequate quality and in good working condition.

6.1.2 Operation Phase Mitigation Measures

6.20 During the pipeline operation phase, mitigation measures may be required with respect to inadequate re-vegetation along the right-of-way and consequent soil erosion problems. Additional mitigation requirements may also be required at river crossing sites due to bank erosion and obstructed water flow. At each identified site, a monitoring report will be prepared that provides detailed observations on the condition of the site, the identification of necessary corrective actions, and specific recommendations. These monitoring reports are prepared by the environmental supervisors and form part of the independent auditor reports. Therefore, specific actions to be taken will be determined by the project environmental inspectors and specialists. Table 6.2 outlines the specific mitigation measures to be adopted during the pipeline operation phase.

6.2 Monitoring

6.21 The Environmental Protection Plan for Sensitive Areas identifies specific monitoring requirements at each of the 42 sensitive sites or areas. The plan identifies which parameters need to be monitored, the frequency of monitoring (generally every two months and following heavy rain events), and who is responsible.

6.22 The plan also specifies the need to prepare a report at each site outlining observations during monitoring, actions required and/or recommendations, and control measures undertaken. An Index of Success is indicated to identify when monitoring results will signal a need for corrective action. The reports will be available to the environmental auditors.

6.23 Tables 6.3 and 6.4 outline the general monitoring strategy proposed for pipeline construction and operation phases as outlined in the project Environmental Impact Assessment.

6.3 Supervision and Auditing

6.24 Procedures for supervision and inspection have been established by the proponent in accordance with ENARGAS requirements. Environmental supervisors employed by the contractor and on-site environmental, health and safety inspectors employed by TGM/TGN, will maintain a daily record of operations during the construction phase. This information will be forwarded to the Coordinator – Health, Safety and Environment at TGM/TGN, who will prepare a weekly report. This weekly report will be forwarded to both the General Manager - Health, Safety and Environment, and the Project Manager, at TGM/TGN.

6.25 An independent auditor (NSC S.A.) has been contracted by the project proponent to ensure that all environmental monitoring and mitigation procedures and protocols are followed. The independent auditor will perform field inspections and review daily and weekly reports. This information will be compiled as a monthly report and submitted to TGM/TGN and ENARGAS. ENARGAS may request TGM/TGN to correct any problem or issue identified in the independent auditor's report. Supervision and audit documentation will be made publicly available via the offices of ENARGAS. The auditor has been initially contracted for four days per month (field and desk time), although additional days may be added as required.

6.4 Responsibilities, Cost and Schedule

6.26 Monitoring and control measures are the responsibility of Techint's environmental supervisor during the construction phase and for six months during the operation phase. TGN/TGM inspectors are responsible for monitoring during the operation phase. Monitoring of all variables identified in Environmental Protection Plan for Sensitive Areas will occur bimonthly, with a greater monitoring frequency in the event of exceptional rains, floods, or other anomalous events.

6.27 All pertinent information will be compiled in a monitoring record that provides details of the conditions observed as reported by the relevant personnel (environmental supervisors and inspectors). Based on this compiled information, specific issues and problems will be identified (e.g., non-compliance with established mitigation measures) and recommendations for corrective action proposed. These monitoring records will also form an important element of the independent auditor's analysis and reporting.

6.28 Estimated costs associated with all mitigation activities are as follows: re-vegetation ($375,000); erosion control measures and construction of riverbanks ($800,000); and reconditioning and recontouring of farm lands ($100,000).

6.5 Health and Safety

6.29 Several plans have been developed by the contractor in order to build upon the information provided in the Environmental Impact Assessment. These plans include a Health and Safety Management Plan, Contingency Plan and an Environmental Protection Plan. Table 6.5 provides a summary of these various plans including their primary objectives and implementation schedule. A table of contents for each of these plans is provided in Annex 2.

6.30 The Health and Safety Management plan provides an outline of the proponent's policies, procedures and training programs during pipeline construction and operation, as well as the legal framework for occupational health and safety. The Contingency Plan outlines the measures and procedures to be followed in the event of emergencies identified in the project risk analysis: explosion, fire, spills or leaks, archeological or paleontological discoveries,

wind or water erosion, and traffic accidents.

6.31 Pipeline construction and operation activities will be undertaken in accordance with TGMs Safety, Health, Environment and Risk policy, as well as the company health and safety protocols. For example, workers will be required to wear appropriate head, ear, eye and foot protection at all times during construction and operational maintenance.

6.32 Techint S.A. has developed a manual of accident prevention and environmental protection that includes detailed occupational health and safety protocols and procedures, including contingency plans in the event of an unexpected problem. These procedures include processes for reporting, notification and investigation in the event of a worker health and safety concern. These measures are the responsibility of the Contractor. Costs for worker and public health and safety (including training) are included in the Contractor budget and do not represent an additional project expense.

6.33 An occupational health and safety training program will be implemented to ensure safe construction and operation of the pipeline. Key training issues include fire prevention and control, use of hazardous materials, operation of heavy vehicles and equipment, use of tools, personal protection equipment, defensive driving, safety with respect to specific engineering and/or construction techniques and processes, and first aid. All new employees will receive personal safety and accident prevention awareness training during the first two weeks of work. Sub-contractors will also receive safety and accident prevention training. Training will be provided by occupational health and safety professionals. Training is the responsibility of the Contractor and the project proponent.

6.34 Safety meetings will be held to provide an open forum for employees to discuss safety and accident prevention concerns, identify necessary actions and determine responsibilities for remedial action, and provide any additional training related to the methods used in accident prevention and personal safety. A methodology to conduct the safety meetings has been developed.

6.35 Detailed health and safety contingency plans including all necessary contacts (i.e., key contact names, phone numbers and addresses of local service providers), and materials and equipment available have been prepared as part of the Contractor's Manual of Accident Prevention. All health and safety incidents must be reported and records maintained of all reported job-related accidents and injuries. All personal injuries or major losses due to accidents will be investigated by TGM in order to identify the cause of the accident. Based on this investigation, additional procedures will be established if necessary to prevent the occurrence of a similar event.

6.6 Health, Safety and Environmental Management

6.36 Both TGN and Techint are ISO 9000 certified, thus each has specific management processes

and protocols related to health, safety and environmental management. In addition, TGN has enacted a safety, health, environment and risk policy (SHER Policy) which also applies to TGM. Techint has also developed its own environmental and safety policy titled "Compromiso Ambiental en las Obras de Ingenieria". Finally, Techint intends to use this project as the basis for obtaining an ISO 14000 certification.

6.37 The underlying principles of TGN/TGM's SHER policy include: (i) meeting or exceeding legal and regulatory requirements; (ii) evaluating potential impacts of TGM activities on employees and the community; (iii) developing and implementing safety, health, environment and risk-related performance benchmarks; (iv) ensuring the awareness of all employees and contractors regarding the policy; (v) safe design, construction, operation and dismantling of facilities; and (vi) the avoidance of contractors not committed to health, safety and the environment.

6.38 Techints "Compromiso Ambiental en las Obras de Ingenieria" contains specific environmental policies associated with its engineering activities. The fundamentals of this policy include: (i) promoting models of conduct of environmental concern that encourage environmental awareness among Techint personnel; (ii) safe guarding natural resources and preventing negative environmental impacts; (iii) complying with all environmental laws and norms; (iv) establishing a management system to realize the necessary modifications and revisions that include improvements in environmental methods; (v) assigning the resources necessary in order to comply with specific measures as required; (vi) establishing and executing pertinent and effective communication with company personnel and the community; and (vii) extending the culture of protection of the environment to society.

7.0 PUBLIC CONSULTATION

7.1 The proposed pipeline will traverse numerous agricultural and grazing lands, as well as a small amount of plantation land. As a result, pipeline construction activities will affect numerous landowners. Individuals and communities potentially affected by the proposed Uruguayana Natural Gas Pipeline Project have been the target of a public communication and awareness program in an effort to inform them of the project, highlight key elements and aspects of project design and scope, and provide an opportunity to elicit specific concerns and raise issues.

7.2 Public consultation opportunities associated with the proposed pipeline project have included:

1. Public disclosure of the initial Environmental Impact Assessment report. The availability of the EIA was publicized through notices in two regional newspapers (*El Diario* and *El Litoral*) on June 26, 1998 and June 27, 1998. Interested individuals were

instructed to contact TGM to obtain further information. A contact telephone number was provided.

2. Individual interviews and information sessions with each affected landowner (or their legal representative) undertaken as a result of the project proponent's right-of-way authorization and permits acquisition process (see Section 4.2.6).

3. The implementation of a comprehensive public communication program by an independent consultant between January and March 1999 involving: (i) a preliminary reconnaissance along the pipeline route to provide primary information, collect basic data and generate specific questions; (ii) an extended field program to visit individual sites (including media outlets and relevant institutions and organizations, see Table 7.1) in order to transfer detailed brochures and information regarding the pipeline, discuss issues of concern, and provide answers to both general and technical questions; and (iii) a final reconnaissance along the pipeline route to provide additional information as necessary and assess the extent to which information was diffused and adopted by various stakeholder groups.

7.3 A summary of key stakeholders groups contacted is provided in Table 7.1. Key elements of the public communication plan included:

- Individual or group meetings with representatives from local municipalities adjacent to or traversed by the proposed route;
- Planned and/or spontaneous interviews and information sessions with individuals located in the area;
- The publication of notices or articles in local newspapers;
- Interviews or announcements via radio or television outlets;
- Information presentations at local schools and colleges.

7.4 No significant concerns or issues were raised during the course of the public communication process. Of the issues raised, personal and property safety in relation to the proximity of the pipeline was the most common. One complaint from a landowner whose property is traversed by the proposed pipeline has been registered by ENARGAS. This complaint centers on the individual landowner's concern with the specific alignment of the proposed pipeline on his property.

7.5 Most individuals and representatives of municipal governments have indicated support for the project given the short-term socioeconomic benefits (e.g., employment, purchases of local goods and services) as well as the long-term benefits (i.e., significant cost-savings associated with potential access to natural gas supplies for cooking and heating) the pipeline will provide.

7.6 The project Environmental Impact Assessment is publicly available through the Secretary of Public Works in Paran<, Entre RPos, the Commission for Large Regional Projects in Corrientes, Province of Corrientes, through TGM/TGN, or through ENARGAS. All documentation submitted to ENARGAS (e.g., monitoring and supervision reports, environment, contingency, health and safety management plans, etc.) is publicly available.

7.7 Continued public outreach and information will be made available to individuals and interested stakeholder groups throughout the construction phase. For example, communication with landowners and communities during the construction process will be maintained through on-going contact by TGN right-of-way personnel. As TGN personnel live in the area, they are able to maintain regular contact with landowners, tenants and communities along the pipeline route. As well, a communication procedure is being implemented in cooperation with the Provinces. Each province will assign a telephone number and contact individual to hear any complaints or concerned which may arise. Concerned stakeholders can call this number in order to obtain information about claims, and identify their concerns relating to construction practices on their property, or indirectly through activities of the workers or worker camps.

8.0 RECOMMENDATIONS

8.1 The Bank will require that the Company (TGM) and the Project comply with each of the following:

(a) All applicable environmental, health and safety Argentine regulatory requirements;

(b) All requirements associated with any environmental, health and safety related permits, authorizations or licenses that apply to Project;

(c) All environmental, health and safety, and social requirements in the Project Concession Contract;

(d) All environmental and social mitigation measures and monitoring programs identified in any Project related environmental, health and safety document, including without limitation, Environmental Impact Assessment, Environmental Protection Plan, Environmental Protection Plan for Sensitive Sites, Public Communication Plan, Health and Safety Plan, and Contingency Plan;

(e) International Finance Corporation General Health and Safety Guidelines (July 1, 1998);

(f) Consult with IDB before approving or implementing any and all substantive changes to the Project or its timetable, particularly those changes which could have environmental or social effects;

(g) Ensure that all companies contracted for construction or operation activities comply with all environmental requirements;

(h) Implement routine activities to make project-related environmental and social information available to the local public (e.g. results from monitoring and supervision activities) and to maintain a system of consultation with the public; and

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

8.2 The Bank will request that prior to the date of Financial Closure, the Borrower will fulfill the following conditions:

(a) Submit, subject to IDB approval, the final Environmental Protection Plan, including cost estimates, time schedule and designated responsibilities for each individual component, and the final version must provide more complete definition related to liquid and solid waste management (specifically the location and adequacy of all waste disposal facilities), construction worker housing, and water crossings (specifically identification and protection, if necessary, of any special aquatic species);

(b) Submit, subject to IDB approval, the final Public Communication Plan, including the specific information disclosure (e.g. results of environmental monitoring and supervision) to the public and methods for public consultation and comply with resolution.

(c) Present the finalized Contingency Plan for the construction phase (e.g., spill and emergency response procedures, etc.), including assurances that adequate resources will be provided to ensure the plan will be fully implemented;

(d) Present the finalized Health and Safety Plan for the construction phase;

(e) Present the finalized Project Supervision Plan which will include the specific methods (e.g., use of independent environmental consultants, environmental health and safety audits and inspections, etc.) to be implemented to ensure all environmental and social measures and programs for the Project are completely and properly implemented by all responsible parties, and the final plan must provide for more frequent site visits by the independent environmental auditor;

(f) Confirm that all required rights-of-way (easements) have been obtained; and

(g) Submit evidence that ENARGAS and the Province of Corrientes have approved the proposed alternative river crossing (i.e. if the final decision is via directional drilling) between Paso de los Libres, Argentina and Uruguayana, Brazil and that the Environmental Analysis (or appropriate information) was made available to the public.

8.3 The Bank will require that the Company prepare and submit an Environmental and Social Compliance Report, in form and content acceptable to IDB. During Project construction, the Company will prepare a monthly report and after construction, the report will be prepared annually.

8.4 The Bank will require prior to completion of the Project Construction that the Borrower :

(a) Submit to IDB, in form and substance satisfactory to IDB, a final Construction Phase Environmental and Social Report, which shall include: (i) Company=s certification that the construction of the Project complied with all environmental requirements; (ii) information concerning any and all substantial deviations from the original construction plans and specifications set forth in the construction contracts, and a description of resulting adjustments made to the environmental and social mitigation measures or monitoring programs; (iii) information concerning any and all environmental or social liabilities, complaints, demands, or environmental claims; and (iv) copies of any and all important environmental or social documents or reports executed in order to satisfy environmental legal requirements;

(b) Submit to IDB, in form and substance satisfactory to IDB, a finalized Environmental Protection Plan for the operational phase of the Project; and

(c) Submit to IDB, in form and substance satisfactory to IDB, the Contingency Plan for the operational phase of the Project.

8.5 The Bank will monitor the environmental, social, and health and safety aspects of the project 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 during project construction and initial operation (including post-construction rehabilitation and re-vegetation). In addition, the Bank will have the right to contract for the performance of an independent environmental, health, and safety audit, if needed.