



E-169  
Vol. 4

***Bolivia - Brazil Gas Pipeline  
(Bolivian Portion)***

**Environmental Management Plan**

**Indigenous Peoples Development Plan**

September 1997





**DAMES & MOORE**

A DAMES & MOORE GROUP COMPANY

*EMP & IPDP.  
(Bolivian Portion)*

**FINAL REPORT**

**ENVIRONMENTAL MANAGEMENT PLAN  
AND  
INDIGENOUS PEOPLES DEVELOPMENT PLAN**

**BOLIVIA-BRAZIL GAS PIPELINE  
(BOLIVIAN PORTION)**

**SEPTEMBER, 1997**

## PREFACE

This document presents the Environmental Management Plan (EMP) and the Indigenous Peoples Development Plan (IPDP) for the Bolivia to Brazil Gas Pipeline Project (Bolivian Portion). The Environmental Management Plan describes the detailed integrated environmental strategies that the Sponsors have set forth to minimize and mitigate all project impacts. The Indigenous Peoples Development Plan will contribute significantly to the consolidation of the territories of the indigenous peoples in the area of influence of the project. This will be accomplished by assisting them in the land titling procedures, the sustainable management of their natural resources, and the management of the Gran Chaco National Park. These documents reflect the philosophy, values, and commitment of the Project Sponsors to construct the project to high environmental and public safety standards while advancing quality of life. The plans are the result of two years of extensive study, field assessments, and public consultation and are designed to satisfy the environmental concerns and aspirations of multiple persons and groups. The Project Sponsors are proud to present this document to the World Bank, The Inter-American Development Bank (IDB), and the Corporación Andina de Fomento (CAF) as part of the loan application process for the project.

**BOLIVIA-BRAZIL GAS PIPELINE PROJECT  
(BOLIVIAN PORTION)**

**ENVIRONMENTAL MANAGEMENT PLAN  
TABLE OF CONTENTS**

---

**CHAPTER I - INTRODUCTION**

1.0	BACKGROUND .....	I-1
2.0	OBJECTIVES .....	I-4
3.0	ORGANIZATION .....	I-6

**CHAPTER II - PROGRAM No. 1: ENVIRONMENTAL MANAGEMENT SYSTEM**

1.0	OBJECTIVES AND ORGANIZATION OF THE PROGRAM .....	II-1
2.0	SUB-PROGRAM 1.1-ENVIRONMENTAL COORDINATION PLAN .....	II-3
2.1	Objectives .....	II-3
2.2	Parties Involved in the Coordination Plan .....	II-3
2.2.1	Project Sponsors .....	II-3
2.2.2	Regulatory Agencies .....	II-4
2.2.3	International Lending Institutions .....	II-4
2.2.4	Governmental Organizations .....	II-4
2.2.5	Non-Governmental Organizations (NGOs) .....	II-5
2.2.6	Indigenous Peoples Organizations .....	II-6
2.3	Coordination Scope, Mechanism, and Schedule .....	II-6
2.3.1	Regulatory Agencies .....	II-7
2.3.2	International Lending Institutions .....	II-8
2.3.3	Governmental Organizations .....	II-8
2.3.4	Non-Governmental Organizations .....	II-8
2.3.5	Indigenous Peoples Organizations .....	II-9
2.4	Mechanism and Organization .....	II-9
3.0	SUB-PROGRAM 1.2 - ENVIRONMENTAL MANAGEMENT DURING CONSTRUCTION .....	II-10
3.1	Project Sponsors .....	II-10
3.2	Environmental Project Supervisor .....	II-10
3.3	Environmental Auditor .....	II-12
3.4	EPC Contractor .....	II-12
3.5	Environmental Inspection and Management Contractor .....	II-13
4.0	SUB-PROGRAM 1.3-COMMUNITY INTERACTION .....	II-14
5.0	SUB-PROGRAM 1.4 - ENVIRONMENTAL MONITORING, INSPECTION, AND AUDITING .....	II-15

5.1	Environmental Monitoring	II-15
5.2	Environmental Inspection	II-15
	5.2.1 Project Environmental Supervisor	II-16
	5.2.2 Environmental Inspectors	II-17
5.4	Environmental Auditing	II-24

**CHAPTER III - PROGRAM No. 2: ENVIRONMENTAL PROTECTION AND MITIGATION DURING CONSTRUCTION**

1.0	OBJECTIVES AND ORGANIZATION OF THE PROGRAM	III-1
	1.1 Objective	III-1
	1.2 Organization	III-1
2.0	PROJECT COMPONENTS	III-3
	2.1 Overview of the Project	III-3
	2.2 Procurement of Pipe	III-3
	2.3 Storage Yards	III-3
	2.4 Borrow Areas	III-4
	2.5 Access Roads	III-5
	2.6 Camps	III-6
	2.7 Right-Of-Way Description	III-7
3.0	STANDARD CONSTRUCTION ACTIVITIES	III-8
	3.1 Right-Of-Way and Extra Work Space Preparation	III-8
	3.1.1 Clearing	III-8
	3.1.2 Grading	III-10
	3.2 Erosion and Sedimentation Control and Water Quality Protection	III-15
	3.2.1 Areas Prone to Erosion	III-16
	3.2.2 Standard Erosion Control Techniques	III-16
	3.2.3 Specialized Erosion Control Techniques	III-17
	3.2.4 Sedimentation Control	III-17
	3.2.5 Slope Stabilization	III-17
	3.2.6 Responsibilities, Monitoring, and Schedule	III-18
	3.2.7 Reporting	III-18
	3.3 Pipe Preparation	III-18
	3.3.1 Transportation	III-18
	3.3.2 Stringing	III-19
	3.3.3 Bending	III-19
	3.3.4 Welding and Weld Inspection	III-20
	3.4 Ditching	III-20
	3.4.1 Topsoil Segregation	III-21
	3.4.2 Temporary Ditch Plugs	III-21
	3.5 Lowering-in/backfilling	III-22
	3.5.1 Trench Dewatering	III-23
	3.5.2 Trench Breakers	III-24

	3.5.3	Padding . . . . .	III-25
	3.5.4	Backfilling . . . . .	III-25
	3.5.5	Use or Disposal of Blast Rock . . . . .	III-26
	3.6	Hydrostatic Testing . . . . .	III-26
	3.7	Cathodic Protection of the Pipe . . . . .	III-29
	3.8	Final Clean-up . . . . .	III-29
4.0		SUB-PROGRAM 2.1: SPECIAL AREAS AND SPECIALIZED CONSTRUCTION . . . . .	III-30
	4.1	Objectives and Responsibilities . . . . .	III-30
	4.2	Special Areas . . . . .	III-30
	4.2.1	Bañados de Izozog (Río Parapetí) . . . . .	III-31
	4.2.2	Gran Chaco National Park and Integrated Management Area . . .	III-32
	4.2.3	Río San Miguel Floodplain and Aeolic Plains . . . . .	III-33
	4.2.4	Bañado de Taquaral . . . . .	III-34
	4.2.5	El Carmen Outcrops . . . . .	III-34
	4.3	Specialized Construction Methods . . . . .	III-35
	4.3.1	Blasting . . . . .	III-35
	4.3.2	Two-Tone Approach . . . . .	III-36
	4.3.3	Drag Sections . . . . .	III-37
	4.3.4	Stovepipe . . . . .	III-37
	4.3.5	Residential Area Construction . . . . .	III-37
	4.3.6	Boring . . . . .	III-38
	4.3.7	Jacking . . . . .	III-38
	4.3.8	Directional Drilling . . . . .	III-39
	4.3.9	Equipment Crossovers . . . . .	III-39
	4.3.10	Agricultural Area Construction . . . . .	III-40
	4.4	Wetland Crossings . . . . .	III-42
	4.4.1	General Measures . . . . .	III-42
	4.4.2	Additional Work Space Areas . . . . .	III-43
	4.4.3	Spoil Pile Placement/Control . . . . .	III-44
	4.4.4	Wetland Crossing Procedures . . . . .	III-44
	4.5	Waterbody Crossings . . . . .	III-54
	4.5.1	General Measures . . . . .	III-55
	4.5.2	General Procedures . . . . .	III-56
	4.5.3	Waterbody Crossing Procedures . . . . .	III-57
	4.5.4	Combined Wetland/Waterbody Crossings . . . . .	III-60
5.0		SUB-PROGRAM 2.2: WASTE MANAGEMENT . . . . .	III-62
	5.1	Objectives . . . . .	III-62
	5.2	Organization . . . . .	III-62
	5.3	Solid Waste Management . . . . .	III-63
	5.3.1	Introduction . . . . .	III-63
	5.3.2	Objectives . . . . .	III-64
	5.3.3	Sources of Solid Wastes . . . . .	III-64

5.3.4	Solid Waste Classification Procedures	III-66
5.3.5	Solid Waste Management Principles	III-66
5.3.6	Solid Waste Training	III-67
5.3.7	Solid Waste Receptacles	III-67
5.3.8	Solid Waste Generation Minimization Procedures	III-68
5.3.9	Solid Waste Recycling Procedures	III-68
5.3.10	Guidelines for Onsite Landfill Design	III-69
5.3.11	Guidelines on Solid Waste Transportation Procedures	III-74
5.3.12	Solid Waste Final Disposal Procedures	III-74
5.4	Domestic and Sanitary Waste	III-76
5.4.1	Introduction	III-76
5.4.2	Objectives	III-76
5.4.3	Sources of Sanitary Wastes	III-77
5.4.4	Sanitary Waste Treatment Procedures	III-78
5.4.5	Wastewater Treatment and Effluent Discharge Laws and Regulations	III-78
5.5	Hazardous Waste	III-83
5.5.1	Objectives	III-83
5.5.2	Sources of Hazardous Wastes During Construction	III-83
5.5.3	Hazardous Waste Classification Procedures	III-85
5.5.4	Hazardous Waste Management Procedures	III-86
5.5.5	Hazardous Waste Storage Areas and Containers	III-88
5.5.6	Hazardous Waste Transportation	III-90
5.5.7	Hazardous Waste Training	III-91
6.0	SUB-PROGRAM 2.3: RESTORATION AND REVEGETATION	III-94
6.1	Objectives	III-94
6.2	Organization and Responsibilities	III-94
6.3	Description	III-94
7.0	SUB-PROGRAM 2.4: PROTECTION OF FLORA AND FAUNA	III-97
7.1	Objectives	III-97
7.2	Protection of Flora and Fauna	III-97
8.0	SUB-PROGRAM 2.5: SPILL PREVENTION, CONTROL AND CONTAINMENT PLAN (SPCCP)	III-99
8.1	Objectives	III-99
8.2	Organization	III-99
8.3	Spill Prevention and Containment Measures	III-100
8.3.1	Materials Inventory	III-100
8.3.2	Storage Areas and Storage Tanks	III-101
8.3.3	Refueling Operations	III-102
8.4	Preparedness and Prevention Measures	III-104
8.4.1	Design and Operation of Work Camps	III-105
8.4.2	Fire Equipment	III-105
8.4.3	Loading and Unloading Facilities	III-105

8.4.4	Aboveground Storage Tank Inspections	III-106
8.4.5	Spill Control Equipment	III-106
8.4.6	Communication and Alarm Systems	III-106
8.4.7	Miscellaneous Equipment	III-106
8.4.8	Testing and Maintenance of Equipment	III-107
8.4.9	Access to Communications or Alarm Systems	III-107
8.4.10	Required Aisle Spacing	III-107
8.4.11	Arrangements with Local Authorities	III-107
8.4.12	Emergency Equipment	III-108
8.5	Emergency Response Measures	III-110
8.5.1	Emergency Measures	III-110
8.5.2	Emergency Coordinators Duties	III-111
8.5.3	Evacuation Procedures	III-111
8.6	Spill Incident Response Procedures	III-112
8.6.1	Procedures	III-112
8.6.2	Spill Reporting Procedures	III-116
8.6.3	Arrangements with Police, Fire Departments, and Hospitals	III-117
8.7	SPCCP Security Provisions	III-117
8.8	SPCCP Employee Training Program	III-118
8.9	Controlled SPCCP Document Distribution List	III-118
9.0	SUB-PROGRAM 2.6: PROTECTION OF HISTORICAL AND ARCHAEOLOGICAL RESOURCES	III-120
9.1	Objectives	III-120
9.2	Pre-Construction Archaeological Prospection	III-120
9.3	Accidental Discovery Plan During Construction	III-122
9.4	Reporting and Coordination	III-125
10.0	SUB-PROGRAM 2.7: AIR QUALITY PROTECTION AND NOISE CONTROL	III-127
10.1	Air Quality	III-127
10.2	Noise Control	III-127
11.0	SUB-PROGRAM 2.8: WORKERS ACTIVITIES	III-129
11.1	Objectives	III-129
11.2	Code of Conduct	III-129
11.3	Penalties	III-130
11.4	Monitoring and Reporting	III-131
12.0	SUB-PROGRAM 2.9: WORKERS ENVIRONMENTAL TRAINING	III-132
12.1	Objectives	III-132
12.2	Organization and Responsibilities	III-133
12.3	Scope of Environmental Training	III-133
12.3.1	Right-of-Way	III-134
12.3.2	Community Relations	III-134
12.3.3	Erosion Control	III-134
12.3.4	Wetlands	III-135



	12.3.5 Creeks and Waterbodies . . . . .	III-135
	12.3.6 Water Withdrawal and Discharge Procedures . . . . .	III-136
	12.3.7 Spill Prevention, Containment and Control Plan . . . . .	III-136
	12.3.8 Protected Flora and Fauna . . . . .	III-136
	12.3.9 Cultural resources . . . . .	III-137
	12.3.10 Air Quality . . . . .	III-137
12.4	Schedule . . . . .	III-137
12.5	Monitoring and Reporting . . . . .	III-138
13.0	SUB-PROGRAM 2.10: WORKER'S HEALTH AND SAFETY . . . . .	III-139
13.1	Objectives . . . . .	III-139
13.2	Health Plan . . . . .	III-139
13.3	Health Advisory: Tropical Diseases . . . . .	III-141
	13.3.1 Diseases Transmitted by Insects . . . . .	III-141
	13.3.2 Diseases Transmitted through Food and Water . . . . .	III-144
	13.3.3 Sexually Transmitted Diseases . . . . .	III-146
13.4	Construction Safety Plan . . . . .	III-146
	13.4.1 Safety Policy . . . . .	III-148
	13.4.2 General Instructions . . . . .	III-148
	13.4.3 Responsibilities . . . . .	III-149
	13.4.4 Construction Safety Program For Contractors And Subcontractors	III-151
	13.4.5 Accident Prevention . . . . .	III-153
	13.4.6 Hazard Communication . . . . .	III-154
	13.4.7 Safety Training And Education . . . . .	III-155
	13.4.8 Personal Protective Equipment . . . . .	III-156
	13.4.9 First Aid . . . . .	III-158
	13.4.10 Good Housekeeping . . . . .	III-159
	13.4.11 Drinking Water . . . . .	III-160
	13.4.12 Sanitation . . . . .	III-161
	13.4.13 Occupational Noise Exposure . . . . .	III-161
	13.4.14 Ionizing Radiation . . . . .	III-162
	13.4.15 Illumination . . . . .	III-162
	13.4.16 Gases, Vapors, Fumes, Dusts and Mists . . . . .	III-163
	13.4.17 Ventilation . . . . .	III-163
	13.4.18 Respiratory Protection . . . . .	III-165
	13.4.19 Fire Protection and Prevention . . . . .	III-167
	13.4.20 Flammable and Combustible Liquids . . . . .	III-170
	13.4.21 Signs, Signals, and Barricades . . . . .	III-171
	13.4.22 Tools - Hand and Power Operated . . . . .	III-172
	13.4.23 Blasting and the Use of Explosives . . . . .	III-175
	13.4.24 Welding . . . . .	III-185
	13.4.25 Rigging Equipment for Material Handling . . . . .	III-196
	13.4.26 Automotive Equipment . . . . .	III-199
	13.4.27 Material Handling Equipment . . . . .	III-202

13.4.28	Working Over or Near Water	III-212
13.4.29	Construction Guidelines	III-214
13.4.30	Spill Response	III-225

**CHAPTER IV - PROGRAM No. 3: ENVIRONMENTAL OPERATIONS PLAN**

1.0	OBJECTIVES AND ORGANIZATION	IV-1
2.0	RIGHT-OF-WAY MONITORING, CONSERVATION, AND CONTROL	IV-2
2.1	Allowable Uses of the Right-of-Way	IV-2
2.2	Access Restrictions and Control	IV-2
2.3	Monitoring Scope and Schedule	IV-3
2.3.1	Right-of-Way Overflights	IV-3
2.3.2	Satellite Image Analysis	IV-3
3.0	COMPRESSOR STATION	IV-4

**CHAPTER V - PROGRAM No. 4: COMPENSATION PLAN**

1.0	OBJECTIVES AND ORGANIZATION OF THE PROGRAM	V-1
2.0	SUB-PROGRAM 4.1 - INDEMNIFICATION TO AFFECTED POPULATIONS AND ECONOMIC UNITS	V-2
2.1	Objectives and Organization	V-2
2.2	Right-of-Way Acquisition	V-2
2.3	Other Affected Parties	V-4
2.4	Compensation for Non-Indigenous Communities	V-4

**CHAPTER VI - ENVIRONMENTAL MANAGEMENT PLAN COST**

**LIST OF TABLES**

Table III.1	Summary of Roads to Be Upgraded in Bolivia
Table III.2	Environmental Description, Construction Methodology, and Protection Measures along the Pipeline Alignment
Table III.3	Wastewater Treatment Plant - Sewage Estimation Design Aid (Metric Units)
Table III.4	Commercial Sources of Package Wastewater Treatment Plants
Table III.5	Proposed Permissible Discharge Limits for Treated Wastewater Effluent Parameters as per Bolivian Regulations
Table VI.1	Summary of Costs - Environmental and Social Programs (in \$US)
Table VI.2	Summary of Costs - Environmental Management Plan - EMP (\$US)
Table VI.3	Environmental Management Plan (EMP)
Table VI.4	Sponsors' Environmental Manager and Auditor

## LIST OF FIGURES

- Figure I.1 Components of the Environmental Management Plan
- Figure II.1 Environmental Management Organization
- Figure III.1 Typical Cross-Section of 30 M Wide Right-of -Way
- Figure III.2 Permanent Barrier Bars or Terraces
- Figure III.3 Filter Fence Construction Design
- Figure III.4 Typical Erosion Control Fabric Configuration
- Figure III.5 Typical Trench Breakers
- Figure III.6 Typical Plan View of Extra Work Space Required at Four Major Rivers Crossed by the Pipeline
- Figure III.7 Conventional Wetland Construction Procedure (Method II)
- Figure III.8 Push/Pull Wetland Construction (Method III)
- Figure III.9 Open-cut Water Body Procedure (Method I)
- Figure III.10 Landfilling Methods
- Figure III.11 Location of Proposed Waste Management Facilities At Camp Sites
- Figure III.12 Sub-base and Final Cover Design Elements
- Figure III.13 Leachate Collection System
- Figure III.14 Gas Collection System Components
- Figure III.15 Typical Arrangement of the Purestream Brand Package Wastewater Treatment Plant
- Figure III.16 Typical Arrangement of the TEII Brand Package Wastewater Treatment Plant
- Figure IV.1 Typical Pipeline Right-of-Way Barrier Gate

## CHAPTER I INTRODUCTION

### 1.0 BACKGROUND

The Bolivia-Brazil Gas Pipeline project is one of the priority programs of the Bolivian and Brazilian governments. This project, which is now in its initial implementation phase, is a major undertaking that will help to integrate economically both countries. It has the broad support of both governments, a significant amount of participation by the private sector and the public, and may receive partial financing from the World Bank, the Inter-American Development Bank (IDB), and the Corporación Andina de Fomento (CAF).

The pipeline will extend approximately 3,100 km from the Río Grande Natural Gas Plant, located approximately 40 km southeast of the city of Santa Cruz de la Sierra in Bolivia, through Sao Paulo, turning south and terminating near the city of Porto Alegre in Brazil. The 555-km Bolivian sector of the pipeline will follow a relatively straight line, running in a east-southeast direction. The pipeline will be installed at a minimum of one meter below grade. In Bolivia, the pipeline right-of-way will be 30 meters wide during construction and 17 meters wide during operation. The right-of-way will run approximately parallel to, and south of the Santa Cruz to Puerto Quijarro railway and, for approximately 120 km, will represent the boundary between the Gran Chaco National Park to the south and the Integrated Management Area of the Park to the north.

An Environmental Impact Statement (EIS) for the pipeline project was prepared by Dames & Moore (1996). The EIS was based on a comprehensive review of existing information, field work, and community workshops which were completed to evaluate the biophysical and socioeconomic environment and the potential impacts in the area of influence of the project. The EIS integrated technical and environmental concepts in the analysis to ensure that the project is constructed, operated, and managed with consideration for the conditions presented by the project's natural and social surroundings. The EIS was directed at maximizing the project's

benefits in the area of influence, while preventing, minimizing and mitigating its potential negative effects.

The EIS (Dames & Moore, 1996) is the fundamental reference document for the EMP and the IPDP and is cited repeatedly throughout these documents.

The area of influence of the project was defined in the EIS as the area included within imaginary lines located 10 km to the north of the Santa Cruz to Puerto Suarez railroad and 10 km to the south of the proposed pipeline alignment. This area lies on the drainage divide between the Amazon river basin to the north and the Paraguay river basin to the south. The pipeline will cross the predominantly dry forest of the Bolivian Chaco region in the Department of Santa Cruz, in the southeastern portion of Bolivia. The proposed pipeline route lies within the Llanura Chaqueña, which is generally very flat, with little relief, except where the plain is cut by occasional small streams and creeks.

On its western portion, the Llanura Chaqueña is drained by the Río Grande and the Parapetí river, which flow northward to the Amazon basin. The central portion is drained by the Río San Miguel, which flows southward. On the eastern portion, the Sierras Chiquitanas are drained by the San Rafael/Aguas Calientes, Tucavaca, and Otuquis rivers, which flow south and east to the Paraguay river. The gas pipeline will also traverse two wetland regions: the Bañados de Izozog, associated with the Río Parapetí; and the Bañados de Otuquis, associated with the Otuquis river.

Administratively, the pipeline right-of-way is located within the Provinces of Cordillera and German Bush. However, the project's area of influence also includes portions of the Province of Chiquitos, where the main towns are located along the Santa Cruz-Puerto Suárez railroad system. The urban centers located within the area of influence of the project include the towns of Pailón, San José de Chiquitos, Roboré, El Carmen, Puerto Suárez, and Puerto Quijarro.

An additional community considered in the EIS is the Capitanía del Alto y Bajo Izozog (CABI). The CABI community is settled outside and to the south of the project's direct area of influence. CABI has a direct relationship with the creation and administration of the Gran Chaco National Park and its Integrated Management Areas. The Gran Chaco National Park is considered the most

sensitive area within the project's area of influence due to its protected status, large biological resources, indigenous populations, and biogeographic status.

The project sponsors have carried out an extensive public consultation program (Dames & Moore, 1996; Indigenous Peoples Development Plan, attached), including the indigenous groups present in the area, the Izocéño/Guaraní, the Chiquitanos and the Ayoreos. The environmental and compensation measures described in this plan and in the Indigenous Peoples Development Plan largely reflect and thoroughly address the concerns of the affected communities in the study area, as well as those of other commenting parties.

## 2.0 OBJECTIVES

The Environmental Management Plan for the Bolivia to Brazil Gas Pipeline presents a comprehensive strategy for environmental protection by requiring that environmental impacts be avoided, minimized, and mitigated. The project sponsors have defined a philosophy of environmental protection which reflects their commitment to follow the programs and sub-programs designed and described within this document.

The project sponsors recognize and promote the need for sustainable development through natural resource protection while also placing a high priority on human health and prosperity. The plan requires that all project activities, from construction design and practices through operational standards, are performed in compliance with all applicable environmental, health, and safety laws.

In order to accomplish the goals of environmental protection established for the project, the EMP places emphasis on a comprehensive system of environmental supervision, which includes three levels of review:

1. The Construction Contractor is responsible for conducting environmental monitoring on their own work.
2. An Environmental Inspection and Management Contractor, independent from the Construction Contractor, will oversee all activities and report any non-compliance to the Project Sponsors' Environmental Committee.
3. A third-party Environmental Auditor, who will report directly to the international lending institutions, will audit all activities related to the environment, from field activities to the reporting activities of the Environmental Inspection Contractor.

This multi-layered environmental review procedure reflects the commitment of the project sponsors to environmental protection. This document provides guidance to the construction

contractor, the environmental inspection contractor, and the environmental auditor to ensure project compliance with all programs.

Along with the natural environment, this document addresses the social and economic conditions of the indigenous peoples. A specific compensation plan has been developed to mitigate environmental impacts to non-indigenous communities and to promote opportunities for the indigenous peoples that inhabit the project's area of influence. The Indigenous Peoples Development Plan is a significant component of the environmental approach of the project, and is attached as a stand-alone document. Together, these documents represent a comprehensive environmental strategy for this important regional project.

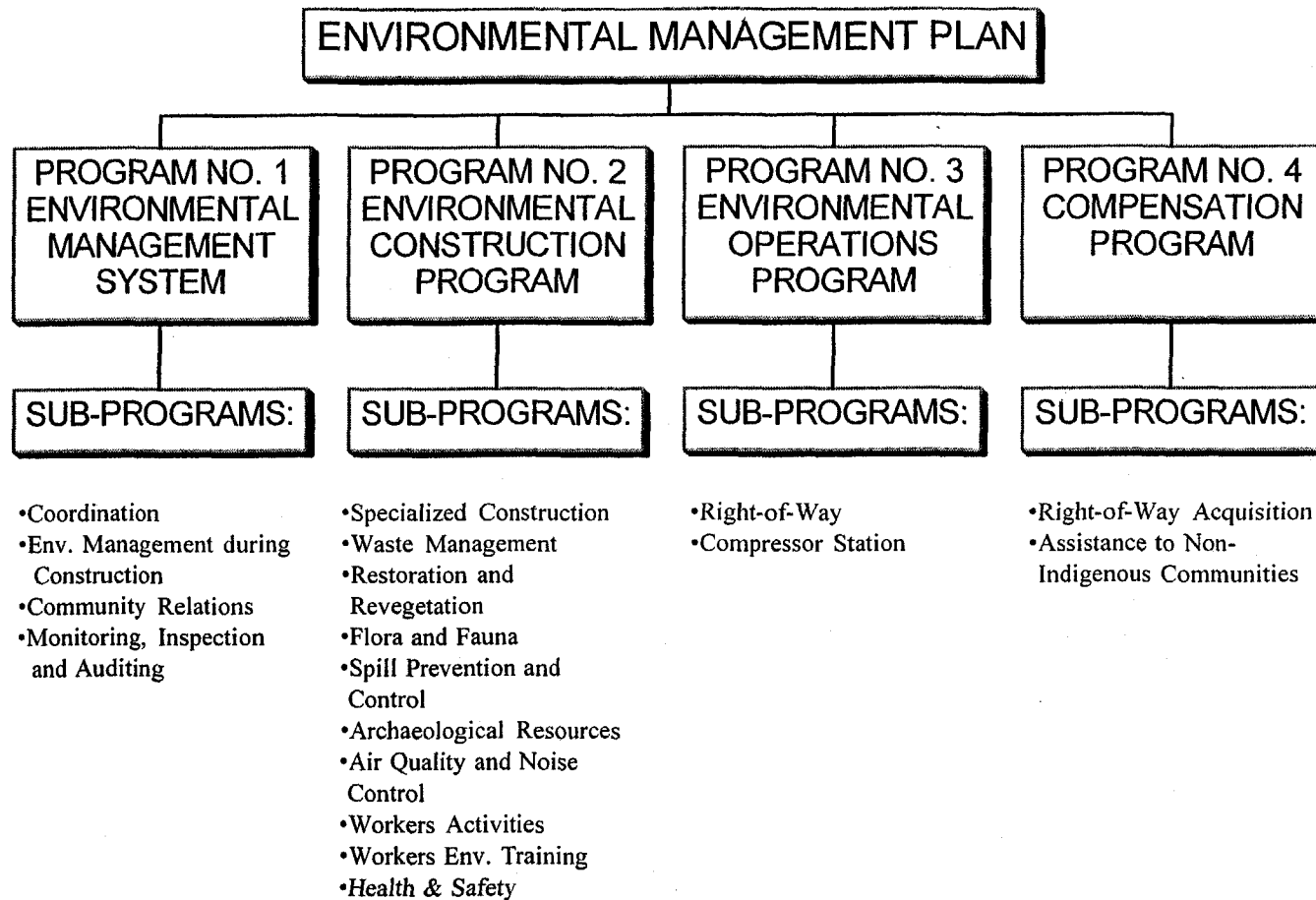


### 3.0 ORGANIZATION

The Environmental Management Plan is divided into four programs, as follows (Figure I.1):

- Program No. 1 - Environmental Management System. This program describes the management structure, the relationship among the parties, and the reporting procedures to ensure that the environmental aspects of the project are managed effectively.
- Program No. 2 - Environmental Protection and Mitigation During Construction. This program establishes the environmental protection guidelines that the Construction Contractor must meet or exceed to ensure that the construction work proceeds in compliance with all applicable regulations and requirements.
- Program No. 3 - Environmental Operation. This program describes the environmental follow-up procedures to ensure that the project remains in compliance with applicable regulations and requirements during its operations phase.
- Program No. 4 - Compensation. This program describes compensation measures for non-indigenous communities in the area of influence the project. The Indigenous Peoples Development Plan, while considered part of the compensation structure of the project, is attached as a stand-alone document.

Figure I.1. Components of the Environmental Management Plan for the Bolivia-Brazil Gas Pipeline Project (Bolivian Portion).



## CHAPTER II

### PROGRAM No. 1:

## ENVIRONMENTAL MANAGEMENT SYSTEM

### 1.0 OBJECTIVES AND ORGANIZATION OF THE PROGRAM

The Environmental Management System (EMS) for the Bolivia to Brazil Gas Pipeline Project (Bolivian Portion) establishes the organization, responsibilities, mechanisms, and procedures to ensure that the project is executed in compliance with all applicable environmental regulations and requirements.

The EMS comprises four sub-programs (Figure I.1):

- **Sub-Program 1.1 - Environmental Coordination.** The Environmental Coordination sub-program identifies all the parties involved in the environmental components of the project, and establishes the following:
  - a. The nature of the relationships among the parties.
  - b. The type of coordination necessary among the parties.
  - c. The mechanism and schedule of coordination activities.
  - d. The organization established to carry out the coordination activities.
- **Sub-Program 1.2 - Environmental Management During Construction.** This sub-program describes the environmental management structure during construction (Figure II.1), indicating the relationship between the project sponsors, the Engineering, Procurement and Construction Contractor (EPC), the construction contractor, the environmental inspection contractor, the environmental auditor, and the lending institutions.
- **Sub-Program 1.3 - Community Interaction.** This sub-program establishes the mechanisms for maintaining good relations with the communities in the area of influence of the project.

- Sub-Program 1.4 - Monitoring, Inspection and Auditing. This sub-program describes the system of checks and balances to ensure that the environmental protection measures are applied in compliance with all applicable environmental regulations and requirements.

## 2.0 SUB-PROGRAM 1.1 - ENVIRONMENTAL COORDINATION PLAN

### 2.1 Objectives

The objectives of the Environmental Coordination Plan are:

1. To identify the parties involved in the environmental aspects of the project.
2. To describe the nature of their involvement in the project.
3. To determine the type of coordination required with each party.
4. To establish the mechanism and schedule of the coordination activities.

### 2.2 Parties Involved in the Coordination Plan

The parties or entities involved in the environmental aspects of the project can be divided into the following groups:

1. Project sponsors.
2. Regulatory agencies.
3. International lending institutions.
4. Governmental organizations.
5. Non-governmental organizations.
6. Indigenous peoples organizations.

#### 2.2.1 Project Sponsors

The project sponsors are the group of private firms which are promoting the project. These include:

- Transredes, S.A., a consortium formed by ENRON and Shell, and the people of Bolivia, who are included as a result of the capitalization structure which makes them shareholders of 50% of the firm.

- Petrobras, the Brazilian national oil and gas company.
- The BTB Group, formed by Broken Hill Proprietary Company, El Paso Energy (formerly Tenneco Energy), and British Gas.

### 2.2.2 Regulatory Agencies

The Ministry of Environment and Sustainable Development in Bolivia is the main regulatory agency with jurisdiction over the project. On February 19, 1997, the Ministry issued the Environmental License for the project, which is the main environmental permit required to execute the project.

Specific permits for the project, such as hazardous waste transport and effluent discharges, are also within the jurisdiction of the Ministry and are part of the Environmental License. However, these activities should be presented to the authorities for their concurrence.

### 2.2.3 International Lending Institutions

The Brazilian portion of the project will be partially financed by the World Bank, the Inter-American Development Bank (IDB), and the Corporación Andina de Fomento (CAF). The international lending institutions view this project as one; therefore, while the Bolivian portion of the project will not receive funding from the international lending institutions, it will have to comply with the environmental requirements of these institutions, which are reflected in this EMP.

### 2.2.4 Governmental Organizations

Several governmental organizations at the national level have an interest in the project. These include:

- The National Directorate for Archaeological Resources affiliated with the Ministry of Culture. The Institute will oversee the archaeological prospection and accidental discovery measures that will be implemented for the project.
- The Instituto Nacional de Reforma Agraria (INRA), which will oversee land titling issues regarding indigenous populations.
- The Secretaría Nacional de Asuntos Etnicos, which will cooperate with the Land Demarcation and Titling Program of the Indigenous Peoples Development Plan (IPDP) attached.

At the municipal level, the project has involved the local governments of the main towns located within the project's area of influence: Pailón, San José de Chiquitos, Roboré, El Carmen, Puerto Quijarro and Puerto Suárez.

#### 2.2.5 Non-Governmental Organizations (NGOs)

The main NGOs active in environmental and socio-economic issues in the area of influence of the projects are:

- Wildlife Conservation Society (WCS), which is working with the Capitanía del Alto y Bajo Izozog (CABI, see below) in projects related to the protection of biodiversity and the sustainable management of the Gran Chaco National Park.
- The Centro de Estudios Jurídicos e Investigación Social (CEJIS), which provides legal assistance to indigenous communities in the area of influence of the project.
- Apoyo al Campesino-Indígena del Oriente Boliviano (APCOB), which functions as a center for training, information and social research in the area of influence of the project.

- The Centro de Investigación y Promoción al Campesinado (CIPCA) is a group devoted to community development, run by Jesuits.

### 2.2.6 Indigenous Peoples Organizations

The project has coordinated with two main organizations that represent the three indigenous peoples represented in the area of influence of the project (Izoceño/Guaraníes, Chiquitanos and Ayoreos):

- The Confederación Indígena del Oriente Boliviano (CIDOB), which represents the three indigenous groups listed above.
- The Capitanía del Alto y Bajo Izozog (CABI), which represents the Izoceño/Guaraní people and is responsible for the administration of the Gran Chaco National Park.

Other indigenous organizations in the area are the Centro Ayoreo Nativo del Oriente Boliviano (CANOB), which represents the Ayoreos, and the Coordinadora de Pueblos Etnicos de Santa Cruz (CPESC). Finally, the Fundación Iwi-Iyambae serves as the technical arm of CABI and has collaborated in aspects of this EMP.

### 2.3 Coordination Scope, Mechanism, and Schedule

Coordination activities are aimed at maintaining a positive relationship between the project and all the parties involved. The scope of the coordination includes the following (specific coordination requirements are described within individual programs of this EMP and the IPDP):

1. Keep the different parties informed of the progress of the project. This involves submitting required reports to local authorities or the international lending institutions, or conducting periodic meetings with indigenous and non-indigenous groups to gather their perception about the project as it develops.



2. Activate the provisions to achieve conflict resolution as needed.
3. Coordinate with local authorities for scheduled visits, if any, by pipeline workers to the towns.

The mechanism of coordination will vary, depending which party is involved, as follows:

### 2.3.1 Regulatory Agencies

The main mechanism of coordination with the Ministry of Environment and Sustainable Development will be the monthly reports required by the Environmental License issued for the project issued by the Ministry on February 19, 1997. The Environmental License requires that the project sponsors file monthly environmental monitoring reports throughout the construction period.

According to the Subsecretariat of Environment (letter MDSP-DGMA-C-No. 1280/97, dated September 19, 1997, in lit.), the monthly reports on the implementation of environmental measures must be detailed and include graphical information as needed. They must include:

- Progress report on inspection and control activities, indicating the percentage of progress of the works and the implementation of environmental measures.
- Monitoring reports, indicating which parameters have been monitored, methods and equipment used.
- Environmental audits done on the project.
- A narrative describing community interaction.

Engineering reports must also be presented.

Additionally, the following documentation must be presented to the Ministry:

- Documents advising of start of activities.

- A schedule of the implementation of environmental measures, which should be tied to the engineering schedule.

### 2.3.2 International Lending Institutions

There will be two main mechanisms of coordination with the international lending institutions:

1. The project sponsors' Environmental Committee will report monthly to the banks on the progress of the project and the compliance with environmental measures.
2. The environmental auditor will report directly to the banks on the level of compliance of the project as well as the adequacy of the environmental documentation and monitoring for the project.

### 2.3.3 Governmental Organizations

The main type of coordination with governmental organizations will be as follows:

1. The National Directorate for Archaeological Resources will approve the archaeological prospection activities and will inspect the prospection work.
2. The Instituto Nacional de Reforma Agraria (INRA) and the Sub-Secretariat of Ethnic Affairs will perform the land titling activities under their jurisdiction within the Indigenous Peoples Development Plan (IPDP). A formal operating agreement will be sought with these agencies to execute the land titling activities.

### 2.3.4 Non-Governmental Organizations

NGOs will be informed about the progress of the project in a transparent and timely manner. The Wildlife Conservation Society, in its role as technical advisor to CABI, is expected to participate in the implementation of programs within the IPDP.

### **2.3.5 Indigenous Peoples Organizations**

Both CABI and CIDOB will actively participate in the programs contemplated within the Indigenous Peoples Development Plan, under agreements to be executed with each organization. CABI will also participate in the right-of-way revegetation sub-program and the update of the biodiversity baseline for the Gran Chaco National Park area.

### **2.4 Mechanism and Organization**

Coordination activities will be carried out continuously with all parties involved. Reporting requirements with the Ministry of Environment and Sustainable Development, as well as coordination with the National Directorate for Archaeological Resources and local government will be the responsibility of the Project Environmental Supervisor. Coordination with the Sub-secretariat of Ethnic Affairs within the Land Titling Program of the Indigenous Peoples Development Plan will be the responsibility of the Manager of the IPDP.

### **3.0 SUB-PROGRAM 1.2 - ENVIRONMENTAL MANAGEMENT DURING CONSTRUCTION**

Compliance with environmental regulations and requirements involves the Lending Institutions, the Project Sponsors; the Engineering, Procurement and Construction (EPC) Contractor; the Environmental Inspection and Management Contractor; and the Environmental Auditor (Figure II.1). The functions and interrelationships for each of the parties is as follows:

#### **3.1 Project Sponsors**

The project sponsors are accountable for the project to the local authorities and lending institutions. A project sponsors' Environmental Committee will be formed to facilitate the coordination of all environmental issues among multiple sponsors. The Environmental Committee will include one representative from each of the project sponsors, who will have equal voice and vote on decisions made by the committee. The sponsors will name a coordinator for Bolivia and a coordinator for Brazil from the Environmental Committee. The coordinators will be able to make decisions on environmental matters, which will hold until the entire committee reviews them.

#### **3.2 Environmental Project Supervisor**

The Environmental Project Supervisor, acting on behalf of the project sponsors, will ensure environmental compliance of the project by working and coordinating with the Environmental Inspection Contractor, Environmental Management Unit, the Project Management Contractor; the project sponsors' Environmental Committee; community representatives; and environmental representatives of the Bolivian and Brazilian Governments. If efforts to resolve environmental compliance matters can not be quickly and satisfactorily resolved at various levels of the functional organization, the Environmental Supervisor will immediately report unresolved issues to the project sponsors' Project Manager and Environmental Committee, who have stop work authority through the Project Management Contractor. The Environmental Project Supervisor will formally document environmental compliance matters in the form of written reports which will

be presented to the project sponsors' Environmental Committee on a weekly basis. The Environmental Project Supervisor's specific responsibilities will be to:

1. Assure compliance with the environmental requirements of the plans and procedures and all license and permit conditions imposed on the project by Bolivian and Brazilian regulatory agencies.
2. Ensure that environmental agreements, mitigation plans and the project-specific EMP are properly implemented and monitored.
3. Monitor and evaluate the activities of a technical staff (Environmental Inspection Contractor) responsible for monitoring, and directing compliance with the EMP.
4. Review and evaluate reports prepared by the Environmental Inspection Contractor.
5. Prepare and present weekly environmental compliance reports for the entire pipeline to the project sponsors' Environmental Committee.
6. Provide briefings to the Environmental Committee and the Lending Institutions as requested.
7. Periodically inspect construction areas of the pipeline corridor for compliance with the non-compensatory items of EMP's, inspection and monitoring programs.
8. Coordinate with the Environmental Inspectors, the Environmental Management Unit, the project sponsors' Environmental Committee, the Project Management Contractor as necessary to promote and ensure environmental compliance.
9. Cooperate with and provide information as requested by the Project Environmental Auditor who will audit the project on behalf of the lending institutions (see below).

10. Implement actions and establish policies to avoid, minimize, control, or mitigate potential impacts from project construction on the physical, biological, and socioeconomic environment.
11. Receive, investigate and resolve complaints from communities regarding abuses, violations, or conflicts derived from work behavior and other related construction activities (traffic, road kills, hunting and fishing, dust, property damage, and conflicts with communities, among others). The EPS should make this location and availability known to communities along the right-of-way.
12. Perform other duties and functions assigned by the project sponsors' Environmental Committee.
13. The Project Environmental Supervisor will stay with the project after construction, until environmental provisions during the pre-operations phase are implemented.

### **3.3 Environmental Auditor**

The Environmental Auditor will report directly to the lending institutions. He or she will audit the environmental compliance activities of the Project Sponsors, the EPC Contractor, the Environmental Project Supervisor, and the Environmental Inspection Contractor (see Section 5.3). The Environmental Auditor will be able to request information and expect cooperation from the entire functional organization.

### **3.4 EPC Contractor**

The EPC Contractor and his Construction Contractor will be responsible for constructing the pipeline in compliance with all environmental regulations and requirements as specified in this Environmental Management Plan and the contract and is fully accountable, on environmental matters, to the project sponsors' Project Manager and Environmental Committee.

### **3.5 Environmental Inspection and Management Contractor**

The Environmental Inspection Contractor will be a third party firm specialized in environmental issues, which represents the Project Sponsors in the field and determines if all environmental protection provisions are met. The Environmental Inspection Contractor will have a Spread Chief and an inspector for the Bolivian portion of the project. Environmental inspection is a continuous oversight function to ensure that the EPC contractor adheres to environmental protection requirements. The Environmental Inspection Contractor will work with the EPC Contractor directly to assure environmental compliance. The findings of the environmental monitoring program will be reported directly to the Environmental Project Supervisor.

#### 4.0 SUB-PROGRAM 1.3 - COMMUNITY INTERACTION

The project will establish offices in Santa Cruz, La Brecha and San José de Chiquitos, which will manage the IPDP. These offices will serve as the main point of contact between the project and affected communities. Their phone numbers and the name of the contact persons will be widely distributed in the communities.

The IPDP Manager and the Project Environmental Supervisor will work together to establish a relationship with both the indigenous and non-indigenous communities. For the towns of Pailón, San José de Chiquitos, Roboré, El Carmen, Puerto Suárez and Puerto Quijarro, local authorities will be informed of the progress of the project, particularly regarding activities that may affect them most, such as:

- Periods of intense traffic.
- Scheduled visits by the pipeline workers to the towns.
- Need for increase availability of goods and services to accommodate the needs of the incoming work force.

While it is anticipated that the likelihood of conflict with the communities is low, the Environmental Project Supervisor will try and resolve any conflict or dispute that may arise. Should the Environmental Project Supervisor be unable to resolve the conflict, a mediator, chosen by both parties will be involved. Only in cases where a mediator is unable to resolve a conflict, will standard legal channels be invoked.



## 5.0 SUB-PROGRAM 1.4 - ENVIRONMENTAL MONITORING, INSPECTION, AND AUDITING

### 5.1 Environmental Monitoring

Environmental monitoring is the responsibility of the EPC Contractor, through his Environmental Manager. Monitoring activities are an internal function of the EPC Contractor to verify the day-to-day compliance with environmental requirements on the part of the Construction Contractor.

### 5.2 Environmental Inspection

The objective of the environmental inspection is to provide third party review of the implementation of the EMP measures by the EPC contractor. The primary function of the Environmental Inspection Contractor will be to monitor construction activities such that recommendations outlined in the EMP are implemented in an appropriate manner. Specifically, the Environmental Inspection Contractor (EIC) shall:

- 1 Develop a Work Plan for the implementation of the Environmental Inspection Program. The Work Plan shall establish the personnel identification, personnel responsibilities, field logistics, schedules, training, monitoring requirements, monitoring report forms, and communication and reporting with the project sponsors and the EPC Contractor.
- 2 Inspect the technical environmental specifications established in the EMP covering construction procedures, installation and operation of campsites, the standard of conduct of the construction workers with respect to the environment, the quality of environmental work performed by the contractors, the compensation measures (including the IPDP), and other factors as deemed necessary by the environmental inspection contractor. The contractor shall observe and report all activities during the construction phase of the project as related to the following issues:
  - a. Erosion control measures.
  - b. Vegetation and wildlife protection measures.

- c. Solid and sanitary waste management practices.
  - d. Hazardous materials management and disposal practices
  - e. Air quality protection and noise control.
  - f. Spill prevention, containment, and control measures.
  - g. Trench construction practices in standard/specialized areas.
  - h. Accidental discovery of cultural resources and human remains.
  - i. Work camps and right-of-way abandonment/closure.
  - j. Compensation measures, including the Indigenous Peoples Development Plan.
3. Inspect compliance with the EMP technical requirements, as well as specifications established in the Bolivian and Brazilian environmental legislation and the requirements by the international lending institutions.
  4. If necessary, make recommendations regarding adjustments to the management system to ensure that the environmental protection process proceeds smoothly and efficiently during the construction phase of the project.

The project sponsors and the EPC contractor will provide access to all construction documents and environmental agency licensing documents/correspondence. They will also facilitate contact with their respective engineering and monitoring teams to ensure that the work activities comply with the requirements of the EMP.

The environmental inspection staff will have the following responsibilities:

#### **5.2.1 Project Environmental Supervisor**

The Project Environmental Supervisor will supervise all inspecting activities performed by the Environmental Inspection Contractor, set overall inspection priorities, maintain a project database of licensing/compliance issues, follow up on compliance sections, and compile all field data and prepare weekly reports to the Project Sponsors Environmental Committee. He/she will communicate any non-compliance to the Project Sponsor's Environmental Committee within 24 hours of

occurrence. The Project Sponsor's will then communicate with PETROBRAS regarding any reported non-compliance.

The Environmental Management Plan's Community Relations program is aimed at promoting good relations with the communities in the project's area of influence and increasing communication about the Project Sponsor's environmental awareness. Petrobras' Community Relation Department administers this program. The community relations program includes the following components:

- Maintaining a Public Liaison during construction.
- Developing an environmental education program.
- Developing a public information program about the project.
- Educating the construction labor force regarding proper relations with the host communities.

The Project Environmental Supervisor will oversee the implementation of these programs, and furnishing interested parties with information regarding the project's environmental issues and the steps involved in the mitigation of environmental impacts. The Project Environmental Supervisor will also interact the affected land owners and local residents to minimize potential negative perceptions regarding the project. The Project Environmental Supervisor will receive and address community complaints regarding non-compliance and other social conflicts that may arise during construction.

### **5.2.2 Environmental Inspectors**

The Environmental Inspectors will be stationed at the work camps to oversee all field activities. The Environmental Inspector's responsibilities will include, but not limited to, inspecting erosion control, water quality, protected wildlife species, cultural resources, water resources, vegetation, and protected areas. They will observe and record all activities related to the following elements:

1. Identifying areas that require stabilization.
2. Ensuring all erosion and sedimentation control devices are installed and maintained properly.

3. Inspecting restoration of upland areas, water bodies and wetlands.
4. Ensuring that all construction activities occur within authorized work areas and only approved access roads are used.
5. Ensuring that the requirements set forth in the Spill Prevention Containment and Control Plan are met.
6. Inspecting waste collection and disposal practices.
7. Inspecting construction activities daily to verify and document that contractors are complying with the requirements of this EMP and EIA, the environmental provisions included in the construction drawings and the environmental conditions of the license.
8. Photo-documenting the condition of sensitive areas and work spaces prior to, throughout, and after construction.
9. Documenting (including photos/videos) construction activities.
10. Identifying potential problems and advising the Project Management Contractor (EPC Contractor) of appropriate actions prior to occurrence.
11. Inspecting that the soil profile is restored as required.
12. Communication and education with the Project Management Contractor (EPC Contractor) on project specific environmental concerns.
13. Inspecting the repair of all ineffective temporary erosion control measures.
14. Recording the locations of surface drainage and irrigation systems.

15. Inspecting tests of subsoil and topsoil where appropriate to determine the extent of compaction across the disturbed ROW in agricultural areas.
16. Evaluating imported soils used as fill and/or additional cover material in sensitive areas (i.e., agricultural, residential, and wetland areas).
17. Inspecting hydrostatic test fill, discharge activities, and required sampling of the test water.
18. Inspecting that Water Body and Wetland Crossing Plans are properly implemented.
19. Observing dewatering structures and slope breakers such that they will not direct water into known cultural resource sites or locations of sensitive species.
20. Observing that trench dewatering activities do not result in the deposition of sand, silt, and/or sediment near the point of discharge into a wetland or water body.
21. Advising the Project Management Contractor when conditions (such as wet weather) make it advisable to restrict construction activities in agricultural or wetland areas.
22. Inspect construction activities related to social compensatory programs, including road rehabilitation, borrow pit restoration, landfill siting and construction, and others.
23. Supervise worker behavior and adherence to the Environmental Code of Conduct.
24. Record any violations of the Worker Code of Conduct, as specified in the EMP and Environmental Construction Plan, along with the penalty of punishment imposed for each violation.

The Environmental Inspectors will be required to use best judgment in the field at all times to ensure that violations, audits, and other environmental related documentation are transmitted to appropriate project personnel. Each Environmental Inspector will have peer status with the other project

inspectors in the field. The Environmental Inspectors will report compliance problems to the Project Management Contractor and the Project Environmental Supervisor who in turn, will report all issues to the project sponsors' Environmental Committee.

The Environmental Inspectors will also evaluate the success of revegetation and stabilization of the right-of-way (ROW) and temporary work areas following construction. The inspection will also include visual inspection and documentation of temporary vegetation for sediment and substrate stabilization techniques. If deficiencies in the establishment of temporary vegetation cover are discovered, the Environmental Inspectors will report these to the Project Management Contractor.

All erosion control devices are to remain in place and in a functional condition until stabilization is achieved. Once stabilization is achieved, all temporary erosion and sedimentation control devices will be removed. All such materials removed will be disposed in compliance with applicable regulations and conditions of licenses or permits for the project. The Environmental Inspector will oversee that these activities are performed in the designed manner.

During routine inspections of the ROW, the Environmental Inspector will also make visual observations of the re-establishment of native vegetation within disturbed areas. The amount of native vegetation cover returning within areas disturbed by construction will be documented by the EIC.

The Environmental Inspection staff shall monitor the work being performed in the following work stations:

1. Right-of-Way (ROW) Trench Construction. The EMP differentiates between areas where standard construction techniques or where special techniques are required along the pipeline route. The EIC staff shall observe that those areas where special techniques need to be applied are correctly chosen.
2. Right-of-way Erosion Control and Slope Stabilization. There are two situations in which the question of soil stability and conservation appears: a) "Normal" areas, without major

restrictions, requiring standard procedures in construction, earth movement, and water control; b) "Critical" areas, such as those with clearly defined topography, greater susceptibility to erosion, riparian areas, sandy soils, and others which require special procedures. The EMP and EIA identify these areas and describes specific techniques to control erosion and sedimentation during construction. The Environmental Inspectors will verify that erosion control measures are implemented in areas with the following conditions:

- a. Areas that are most susceptible to erosion.
- b. In the aeolic plains, and river and wetland crossings.
- c. Areas requiring special materials such as hay bales and filter fabric fences.
- d. Areas requiring revegetation or mulching.

The Environmental Inspection staff will prepare reports on the effectiveness of the erosion control and remedial actions performed. The Inspectors must certify in the report that the EPC Contractor has met the following objectives while performing erosion control measures: (1) safety of the work and (2) the avoidance of environmental damage to surrounding areas.

3. Waste and Hazardous Materials Management and Disposal Areas. The EMP and the EIA present procedures and minimum standards for the supply, storage, management, and disposal of waste and hazardous materials. The EIC staff will monitor the following elements:

- Record overall quantities and types of waste being generated at each work location along the route, work camps, and other support facilities.
- Observe construction at landfills to determine whether onsite location and minimum design specifications meet the objectives required by the EMP.
- Observe that, at least, EMP storage, handling, and transporting standards for safe disposal of all wastes in all support facilities and along the right of way are being implemented.

- Observe that closure of all landfills are performed in accordance to EMP standards.
4. Sanitary Waste Treatment Areas. The EMP presents standard methods and regulations that must be adhered to in treatment of sanitary wastes and the proper disposal of treated effluent. The EIC staff will monitor the following elements:
    - Assessment of package wastewater treatment plant physical requirements including system capacities, pipe connections, effluent discharge points.
    - Review all regulations and compliance requirements on the treated effluent.
    - Review water quality test data on the treated effluent.
  5. Camp Sites: Central and Mobile Camps. Ensure camps are sited in accordance with approved locations and constructed in accordance with approved design criteria. Inspect and control waste water treatment procedures, worker conduct, flora and fauna protection, and waste management practices including landfill construction.
  6. Access Roads. Restrict movement of personnel and supplies to approved access roads. Ensure recommended road improvements are implemented as designed. Ensure any fill material is procured from approved borrow areas.
  7. Pipe Storage Sites. Monitor loading and off-loading to ensure worker safety. Ensure compliance with established spill prevention and control practices.
  8. Special Construction Sites, i.e. Larger River Crossings, Compression Stations, City Gates. The EMP describes construction procedures for special areas. The role of the Environmental Inspector is to inspect all work in these area for compliance with these plans, specific restrictions, and adherence to extra work space requirements.



### 5.3 Environmental Management Unit

The members of the Environmental Management Unit has the responsibility of the entire distance and construction period of the pipeline project within a given area of expertise.

*Compensation Manager and Management Unit Coordinator.* This is a full time engagement for the entire distance and construction period of the pipeline. The position's responsibility is to monitor that all packages are administered as the compensation packages of the Environmental Management Plan and Environmental Impact Assessment dictate. This position will also be the coordinator for this unit. This position will report directly to the Project Sponsors' Environmental Committee through the Project Environmental Supervisor.

*Socioeconomist.* Administer the socioeconomic compensation programs on a local and regional level.

*Biological Scientist.* The position's responsibility is to implement all compensation measures in regard to flora and fauna.

*Communication, Educational and Public Relations.* This position's responsibility is to inform, educate, and make aware the local public in the area of the pipeline construction and inform the international community of the pipeline progress.

*Social Scientist.* This is a full time engagement for the entire distance and construction period of the pipeline. The position's responsibility is to monitor, assist and direct the compensation plan for the Indigenous Peoples Development Plan. The role of the Social Scientist is to serve as liaison with indigenous organizations and executing agencies. Additionally, he will work closely with the Manager of the IPDP to monitor the proper execution of the program.

*Environmental or Civil Engineer.* The position's responsibility is to address all issues in the environmental sector from an engineering technical aspect (waste, water treatment, soil and bank stabilization, and others).

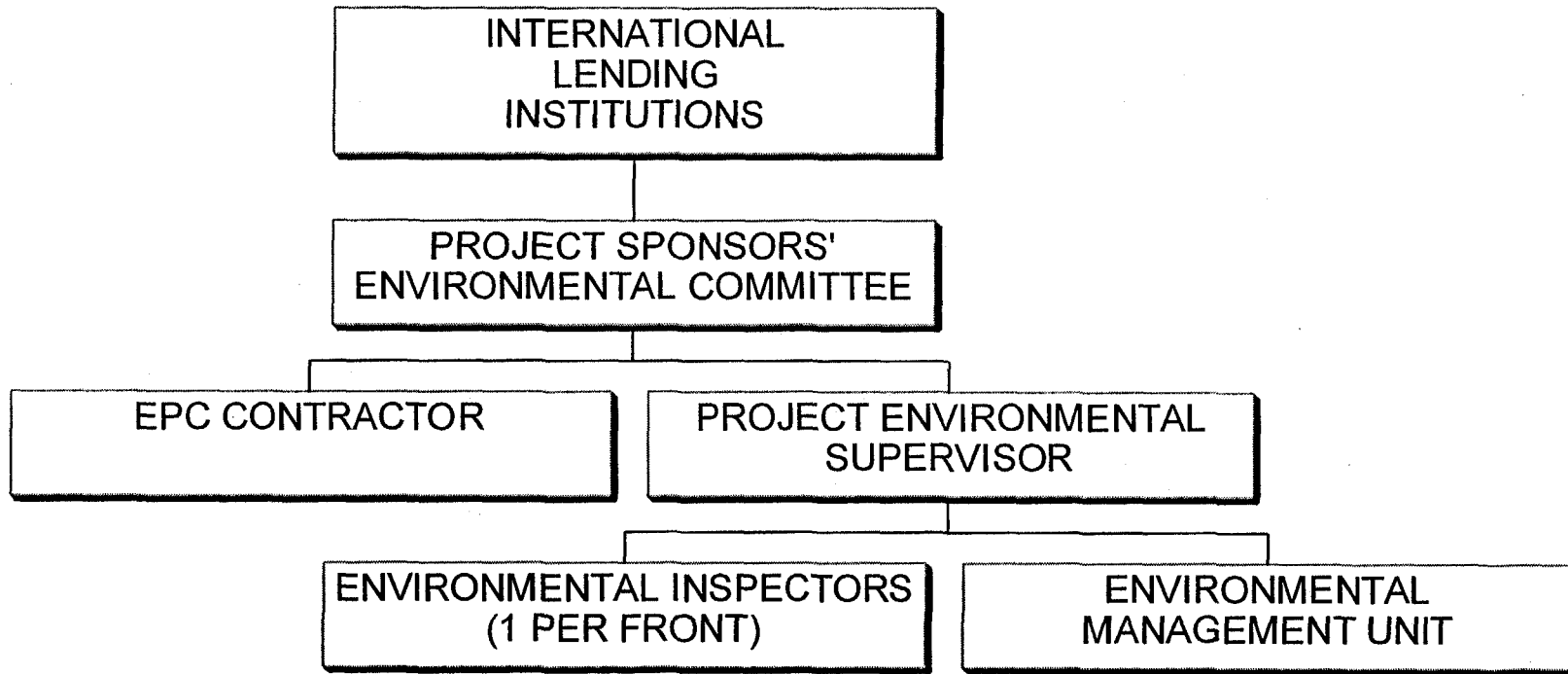
## 5.4 Environmental Auditing

The Environmental Auditor will audit environmental compliance of the pipeline project by coordinating with the Environmental Inspectors; the EPC Contractor; the Project Environmental Supervisor, Project Manager and Environmental Committee; and representatives of the Bolivian and Brazilian Governments. The Environmental Auditor may require a professional staff to fulfill his duties. It will be the responsibility of the Environmental Auditor to design and implement an effective random audit plan. The Environmental Auditor will have the authority to investigate matters at all levels of the functional organization at any time or place. Deficiencies in environmental compliance will immediately be brought to the attention of the appropriate parties by the Environmental Auditor. The Environmental Auditor will write and file concise audit reports with the lending institutions and the Environmental Committee on a monthly basis. The auditor will be paid by the project sponsors and report to the lending institutions. The Environmental Auditor specific responsibilities will be to:

1. Develop and implement an environmental audit plan designed to determine the level of compliance with environmental requirements of plans and procedures and all license and permit conditions imposed on the project by Bolivian and Brazilian regulatory agencies.
2. Determine if environmental agreements, compensatory mitigation plans and the project specific EMP are properly implemented and observed by the project sponsors and EPC Contractor, and determine the effectiveness of the environmental inspection program.
3. Investigate and evaluate the activities of the technical staff (Environmental Inspection and Management Contractor) responsible for inspecting, monitoring, and directing compliance with the project EMP.
4. Review and evaluate environmental compliance reports prepared by the Environmental Inspectors, the Environmental Project Supervisor, and the Project Sponsor's Environmental Committee.

5. Prepare and present written monthly environmental compliance audit reports for the entire pipeline to the lending institutions.
6. Periodically and randomly inspect construction areas of the pipeline corridor for compliance with the EMP, monitoring and inspection programs.
7. Investigate and coordinate with the Environmental Inspectors, the EPC Contractor and the Project Environmental Supervisor, Project Manager and Environmental Committee as necessary to determine the level of environmental compliance that is being achieved by the project.
8. Suggest actions and policies to avoid, minimize, control or mitigate potential impacts from project construction on the physical, biological and socioeconomic environment.

Figure II.1. Environmental Management Organization



**CHAPTER III**  
**PROGRAM No. 2:**  
**ENVIRONMENTAL PROTECTION AND MITIGATION**  
**DURING CONSTRUCTION**

**1.0 OBJECTIVES AND ORGANIZATION OF THE PROGRAM**

**1.1 Objective**

The objective of the environmental protection and mitigation program is to prevent, minimize, control and mitigate the potential and actual impacts from the construction and operation of the pipeline on the physical, biological and socioeconomic environments. Since the conception of the pipeline, the route and the location of associated facilities have been selected, reviewed, and modified to minimize these impacts while maintaining economic feasibility of the pipeline. Some unavoidable impacts will occur as a result of construction and, to a much lesser extent, during operation. A large proportion of the impacts to soil, water and air, and vegetation and wildlife, will be localized and temporary. All temporary and permanent impacts resulting from the project are minimized and controlled to the extent possible and are fully mitigated.

**1.2 Organization**

The program will be executed through the organizational structure described in Chapter II (Figure II.1). In addition, a protocol has been established for the chain of command and information flow during project construction. The organization will be in effect for all construction activities including project kick-off, construction, monitoring, reporting, auditing and job closure.

This program describes the environmental standards that must be met or exceeded by the Construction Contractor in order to minimize environmental impacts during construction. It is the Construction Contractor's responsibility to apply environmental measures which are as effective or more effective than those described herein. It is understood that the Construction

Contractor will perform a construction survey and will make practical decisions on the implementation of the construction protocol. **Should the contractor propose measures different from those described in this program, it is his responsibility to obtain approval from the Environmental Committee and local authorities, as needed, for the new measure.**

The program includes the following sub-programs:

Sub-Program No. 2.1 - Special Areas and Specialized Construction.

Sub-Program No. 2.2 - Waste Management.

Sub-Program No. 2.3 - Restoration and Revegetation.

Sub-Program No. 2.4 - Protection of Flora and Fauna.

Sub-Program No. 2.5 - Spill Prevention, Control and Containment.

Sub-Program No. 2.6 - Protection of Historical and Archaeological Resources.

Sub-Program No. 2.7 - Air Quality and Noise Control.

Sub-Program No. 2.8 - Workers Activities.

Sub-Program No. 2.9 - Workers Environmental Training.

Sub-Program No. 2.10 - Health and Safety.

Section 2 briefly describes the project components, and Section 3 describes standard construction techniques. Subsequent sections describe the sub-programs.

## 2.0 PROJECT COMPONENTS

### 2.1 Overview of the Project

The standard construction of a natural gas pipeline consists of distinct phases each with specific procedures, requirements, monitoring, tests and reports. The standard construction process (Figure III.1) includes right-of-way clearing, grading, ditching, pipeline stringing, bending, welding, x-raying, lowering-in, backfilling, hydrostatic testing, and right-of-way restoration. The construction methods described herein will be used unless site-specific conditions warrant special methods. Figure III.1 shows a right-of-way configuration depicting the typical sequence of construction activities that will take place.

### 2.2 Procurement of Pipe

The 555 kilometers of pipe segments in Bolivia will be purchased from private manufacturers in Japan and the United States and shipped by ocean freight to the Port of St Nicholas, 90 kilometers downriver on the Rio Paraguay in Argentina. At the port, the pipe will be unloaded and then anti-corrosion coated. The pipe sections will then be loaded on barges and transported upriver on the Rio Paraguay to the area of Puerto Suárez (Gravetal) at the Bolivia-Brazil border. From this location, the pipe will be transported by train to the storage yards in Bolivia. Some improvement and extension of railroad spurs, described in Section 2.3, will be necessary. Transport of the pipe segments from the storage yards to the right-of-way for stringing will be accomplished by truck. This process will comply with all applicable environmental regulations and safeguards, including the Port of St. Nicholas.

### 2.3 Storage Yards

A total of six storage yards are proposed along the pipeline route including Pailon, San José de Chiquitos, Roboré, El Carmen, Puerto Suárez, and possibly Tres Cruces. Each of these areas is located along the railroad tracks between Santa Cruz de la Sierra and Puerto Suarez where the pipe segments will be delivered by train and unloaded. Some improvements to these facilities will

be necessary including the extension of railroad spurs and installation of gates for ingress and egress. No substantial work will be necessary for these activities. Distribution of pipe segments from these storage yards and the subsequent clean-up and closure of these facilities will not have significant impacts on the community or environment.

A detailed description of the proposed storage yards including location, design, extent and type of improvement is provided in Section 3.5 of the Environmental Impact Statement (Dames & Moore, 1996).

Any alternate storage yard locations selected by the construction contractor may be utilized with approval of the EPC Contractor's Environmental Manager, the Project Environmental Supervisor, and the Ministry of Sustainable Development and Environment.

## 2.4 Borrow Areas

Borrow areas will not be necessary to construct the pipeline or for improvements associated with the establishment of the camp sites and storage yards. These areas will require some site grading, but no actual fill is required. Some areas of the access roads may require fill to shape the road either for elevation or width to accomplish useable and safe travel lanes to and from the pipeline right-of-way.

If borrow areas become necessary, the selection of the site will be determined by the type, extent and location of the fill needed. The Construction Contractor will be responsible for obtaining any local permit necessary to operate the borrow site. Typically, the choice will be made by the contractor based on the type and volume of material required. These requirements are expected to be small amounts of gravel and will be located close to the roadway area requiring the fill. Potential borrow area sites will be proximal to the roadway and will be areas previously cleared of vegetation whenever possible. The proposed site will be evaluated by the construction manager and reviewed by the environmental inspector to ensure that all appropriate environmental protection measures are implemented before excavation. Following excavation, the contractor will ensure that close-out of the facility is performed in an environmentally sound and safe manner.



The environmental monitor will complete an environmental report for the proposed site before, during and following excavation to ensure environmental compliance with water quality and stabilization standards.

## 2.5 Access Roads

All access roads to be used to construct the pipeline are already in place. Some roads will require upgrading to handle the increased weight and size of equipment, the higher frequency of use, and the necessity for proper drainage during construction. The improvements will require a bulldozer, motorgrader, front-end loader and dump trucks to draw fill material from adjacent roadside ditches, restore road washouts and low spots, and crown the road surface for drainage. These improvements are expected to use only fill within the road right-of-way and only infrequently require borrow areas for off-site fill acquisition. In a few areas, secondary growth vegetation has encroached on the roadway and will be cleared off the width of the roadway. No additional vegetation will be cleared for the road improvements. Following pipeline construction all road improvements will be reshaped to the newly established design to remove construction equipment impacts.

Proper measures will be taken along the length of these road improvements to maintain drainage patterns and natural habitat areas to the best extent possible. No drainage impoundment or dewatering will result from this work. Properly sized and placed culverts will be used to maintain natural drainage patterns and waterway flow rates. Existing road washouts and low spots will be evaluated and redesigned to prevent these events from occurring in the future. Sharp curves and narrow road segments will be widened to increase safety and improve the overall capacity of the road. Where this is required in the mountains, any side hill cuts will be evaluated to ensure whether slope stabilization measures are necessary. Some bridges will be upgraded with additional pilings or new decking to support the increased use and weight of the construction vehicles. Other inadequate or disabled bridges will be replaced by culverts and fill to stabilize the roadway and waterway interface.

A detailed description of the road improvements including location, extent and type of upgrade is provided in Table III.1.

## 2.6 Camps

There are eight proposed camp sites along the pipeline route to serve the pipeline construction workers. The camp sites are scheduled to serve 120 or 700 workers, but only one site at the Rio Grande Gas Plant is planned to handle 120 workers. All camps are located adjacent to the pipeline route to minimize travel requirements and vehicle traffic. All sites will require various types of upgrading from simple improvements such as clearing, fencing and clean-up to more complex installations of drinking water and wastewater facilities, power generation equipment, drinking water wells, and small road improvements. A detailed description of the camp improvements including location, size, and extent of upgrades is provided in Section 3.5 of the EIS. The Construction Contractor will develop detailed site-specific programs.

Alternate campsites selected by the Construction Contractor may be utilized with approval from the EPC Contractors, the Environmental Committee, and the Minister of Sustainable Development and Environment. For example, the location of the El Carmen camp, may have to be modified to place the camp farther from the town and minimize potential negative effects on the local community.

The Construction Contractor must secure agreements with the local authorities for the location and placement of the camps. Benefits and potential risks for the community should be informed and discussed. Once the location of a camp has been defined, the host community should be informed of the code of conduct that workers are required to follow. Procedures for submitting complaints regarding violations to the code of conduct should be explained to the community. Similarly, procedures for claiming compensation should be explained to the community.

Before constructing Camp No. 4, Spread 1, which may be located near the Integrated Management Area, the Construction Contractor must obtain a written statement of no-objection from the park administration and local authorities (CABI).

## 2.7 Right-Of-Way Description

The pipeline right-of-way runs east-southeast from the Río Grande Gas Plant, south of Santa Cruz de la Sierra, Bolivia to El Carmen de la Frontera, Bolivia at the border with Brazil. The total pipeline length is 555 kilometers and land elevations range from approximately 340 meters above sea level at Santa Cruz to as low as 90 meters near Puerto Suarez. The terrain is relatively level with occasional hills and rivers which are typically dry during most of the year. The pipeline will have a 32-inch diameter, 0.406-inch to 0.649-inch wall thickness with external coating, cathodic protection and automatic reduced pressure shutdown valves. One compressor station will be built during pipeline construction with an additional three compressor stations placed along the route as demand increases. Also, two metering stations, a Supervisory Control and Data Acquisition (SCADA) System and a fiber optic cable communication system may be part of the pipeline project.

The construction right-of-way will be 30 meters wide (Figure III.1). Additional temporary work space will be required at river crossings and road crossings. The construction activities will be coordinated with land owners, tenants or administrators along the pipeline route. The pipeline will be buried at a minimum of one meter below the surface. Compressor stations, metering stations and line valve operators will be above ground. Following construction, the right-of-way will be restored and the northern 13-meters or right-of-way will be allowed to revegetate to a natural state. The southern 17-meters over the pipeline will be the permanent right-of-way and will be regularly maintained following construction.

### 3.0 STANDARD CONSTRUCTION ACTIVITIES

Preconstruction surveys and assessments of terrain and environmental features by pipeline construction experts and environmental scientists have produced specific construction guidelines for designated pipeline segments. These guidelines are shown in Table III.2, which describes existing conditions, proposed construction methodologies, and special precautions for the different physical and environmental features of the project route. The route segments are indicated by the distance along the pipeline centerline from the project start in Santa Cruz de la Sierra at kilometer marker 0+000. The methods suggested in the table are described in this section and in Section 4.0.

#### 3.1 Right-Of-Way and Extra Work Space Preparation

##### 3.1.1 Clearing

Clearing involves the removal of trees, brush and other vegetation from the right-of-way. The following standard procedures will be followed during clearing.

1. The right-of-way boundaries are the limits of work and they will be delineated by land survey and clearly staked or flagged. In environmentally sensitive areas, the right-of-way boundary will be protected by plastic barriers or silt screens, as necessary. The Environmental Inspector will ensure that no clearing occurs beyond the right-of-way boundaries. Any exceedance of the right-of-way boundary must be assessed, stabilized, reported and repaired within three days.
2. Trees to be saved along the right-of-way shall be marked by flagging, fencing or some other method before clearing begins.
3. Brush and shrubs shall be cut or scraped at/or near the ground level thereby leaving the vegetative root systems and subsurface soils intact to the greatest extent practical. This will assist in stabilization of the right-of-way throughout the construction process.

4. Tree stumps will be removed from the entire right-of-way and normally will be buried within the right-of-way in upland areas.
5. All fences, whether they be for livestock or security, shall be maintained by the use of a temporary or permanent fence section or gap. Prior to the fence being cut, the fence will be properly braced and similar material used to construct the new fence gap. At no time should an opening be left unattended. The fence gap will be replaced after cleanup with a permanent fence of the same material and will be left in a condition similar to that before construction.
6. When tree pruning is necessary to clear the right-of-way edge, pruning cuts shall be made as follows:
  - a. Cuts will be smooth and made with proper tools;
  - b. Branch collars shall not be cut (i.e., cuts should be made immediately in front of the branch collar);
  - c. Large, heavy branches shall be precut on the underside to prevent splitting or peeling of bark;
  - d. Climbing spurs will not be used to prevent tree damage;
  - e. Trees shall be felled into the right-of-way;
  - f. Trees which have fallen into waterbodies or beyond the edge of the right-of-way shall be removed immediately;
  - g. Trees located outside of the right-of-way will not be cut to obtain timber for use elsewhere along the right-of-way; and
  - h. Trees removed from the edge of the right-of-way which are entangled by vines with adjacent trees off of the right-of-way will be felled without pulling the adjacent tree into the right-of-way or breaking large limbs. Damaged tree limbs will be treated in accordance with the above requirements.

## **Useable Timber**

Timber not specifically designated for other uses will be left in tree lengths and stacked along the edge of the right-of-way, used for rip-rap, or to control erosion. Rip-rap must be removed from the right-of-way after construction is complete. Timber shall not be stacked in drainage ways or left within wetlands unless site specific conditions warrant and procedures are approved by the Chief Environmental Monitor.

### **3.1.2 Grading**

Grading shall be required when existing topography does not permit equipment to operate safely and does not provide access or an efficient work area. Sharp topographic irregularities shall be graded to ensure efficient and safe passage of equipment and work crews. Rock outcrops, ridges, boulders and tree stumps shall be removed from the work area during grading. Grading shall be performed by bulldozers equipped with ripper and grading blades. The following general construction methods will be employed during grading:

## Removal and Disposal of Tree Stumps

Cut and removed trees and brush shall be disposed of in one of the following ways as approved by the Chief Environmental Inspector:

- **Brush Piles**

- a. Brush shall be piled along the inside of the right-of-way edge to provide filter strips, wildlife habitat, or sediment barriers.
- b. All wood trimmings will be removed from wetland areas.

- **Chipping**

Slash and brush may be chipped. Chips can be left on the right-of-way in a layer no thicker than 5 cm, to prevent inhibiting revegetation.

- **Burying**

Cleared materials may not be buried in wetlands or agricultural lands. Stumps removed on the right-of-way will be buried in upland areas.

- **Burning**

Burning of brush should be avoided (Secretariat of the Environment, letter of 19 Sept. 1997, in lit.), and alternative methods of disposal should be used.

- **Off-Site Disposal**

- a. Shall be done only when brush piles, chipping or burying are not permitted.
- b. An attempt will be made to find a market for any useable materials.
- c. Woody materials will be restricted to the edge of the right-of-way.

Tree stumps are normally removed along the entire width of the right-of-way to allow adequate clearance for the safe operation of the vehicles and equipment. Exceptions include:

1. Stumps may be evenly distributed along the right-of-way except in wetlands and cultivated agricultural lands, in accordance with license or permit conditions.
2. Stumps may be removed from the site and disposed of in a pre-approved site.
3. Stumps may be chipped in upland areas.
4. Stumps may be burned.

### **Rock Disposal**

Rock, including blast rock, shall be used or disposed in one or more of the following ways:

1. Rock can be buried on the right-of-way, however, rock can only be buried to the original rock horizon in wetlands, agricultural lands and residential areas.
2. Rock can be left on the right-of-way in a density and pattern similar to the surrounding terrain or wind-rowed with the landowner's permission.
3. Rock can be used to stabilize side hill cuts and cross right-of-way drainage areas.
4. Rock can be removed from the right-of-way and hauled away to a proper disposal site.
5. Rock can be used as rip-rap for stream bank stabilization where available and warranted by field conditions and approved by the Environmental Inspector.
6. Rock can be used to construct or repair stonewalls or stone fences.



### Water Bars/Terraces (Slope Breakers)

Water bars are small berms (Figure III.2) constructed across sloping right-of-way segments to provide for the short and long term stabilization of the right-of-way. The bars are angled across the right-of-way to direct runoff from the right-of-way thereby preventing erosion development within the right-of-way.

1. Water bars/terraces shall be installed diagonally across the right-of-way on slopes to control erosion by reducing and shortening the length of concentration of runoff.
2. Soil will be slightly excavated and compacted to form a temporary channel with an adjacent down slope berm or ridge of compacted soil.
3. The degree of slope, soil characteristics, runoff area and location of suitable outlets will determine the number and shape of water bars required, however, the minimum guidelines for spacing within the right-of-way are as follows:

<u>Slope %</u>	<u>Spacing</u>
5 - 15	100 meter intervals
16 - 30	65 meter intervals
> 30	30 meter intervals

4. The bar/terrace shall be broad and gradual to permit traffic to move over it safely and without risk of damaging equipment or creating a safety hazard.
5. Water bars/terraces shall be maintained and repaired as necessary during construction and during the post-construction period until they are no longer necessary to ensure slope stability and prevent erosion.

6. Water bars/terraces shall divert water to a well-vegetated area adjacent to the right-of-way. If a vegetated area is not available, erosion control barriers shall be installed to filter the runoff at the outlet of the water bar from the right-of-way.
7. Filter fabric fences or brush piles may be used in place of water bars/terraces at the discretion of the environmental inspector.

### **Erosion Control Barriers/Structures**

Erosion control barriers/structures consist of filter fabric fences (silt screens) (Figure III.3), brush piles or rock rip-rap. Erosion control barriers/structures are required in the following locations:

1. At the outlet of a water bar when vegetation is not adequate to control erosion.
2. Along banks of waterbodies between the graded right-of-way and waterbody after clearing.
3. Down slope of any spoil stockpile in the immediate vicinity of waterbodies and wetlands.
4. At the base of slopes adjacent to road crossings where vegetation has been disturbed.
5. Along the right-of-way edges within active wetland construction areas.

Erosion control barriers/structures must be maintained throughout construction and shall remain in place until permanent revegetation measures have been judged successful. They must be inspected periodically throughout construction, and as soon as possible following a significant rainfall.

### **Filter Fabric Fence Installation**

1. The ground edge of filter fabric fences shall be trenched and imbedded a minimum of approximately 10 centimeters or anchored as site conditions require.
2. The fence shall be installed in compliance with manufacturer's specifications.
3. Accumulated sediment shall be removed regularly and the fence inspected to ensure that the ground edge remains imbedded.
4. A sufficient stockpile of silt fence shall be maintained on site for emergency use.

### **3.2 Erosion and Sedimentation Control and Water Quality Protection**

The objective of the project is to minimize the potential for erosion and sedimentation during pipeline construction and to effectively restore the right-of-way and other disturbed areas. Erosion and sediment control measures utilized by the Construction Contractor during construction must meet or exceed the standards contained in this section. The following general measures will be implemented to avoid, minimize, monitor and mitigate for potential impacts of the project construction on the physical environment.

1. Minimize the quantity and duration of soil exposure.
2. Protect critical areas during construction by reducing the velocity of water and redirecting runoff.
3. Install and maintain erosion and sediment control measures during construction.
4. Establish vegetation as soon as possible following final grading.

5. Inspect the right-of-way and maintain erosion and sediment controls as necessary until final stabilization is achieved.

### 3.2.1 Areas Prone to Erosion

An important component of the standard pipeline construction is the prevention and control of erosion and sedimentation on and off of the right-of-way during and after construction. The water quality degradation which may occur as a result of these events is a secondary impact which can have locally-important adverse effects on aquatic life and wetland functions. Over the length of the pipeline right-of-way there are minimal areas where erosion potential ranges from medium to high as a result of steep grades, sandy soils, seasonally flowing water, and prevailing strong winds.

Elsewhere, the majority of the pipeline right-of-way has low erosion potential, primarily because of level topography. Erosion potential for each pipeline construction segment is listed in Table III.2. Areas prone to erosion are labeled as medium or high erosion potential in the Constraints column of the table. These areas correspond to the steep land grades, sandy soils, flowing water or strong wind areas. Each area has specific erosion control methods designed to meet conditions expected at the time of construction and following construction. These erosion control methods are discussed below.

### 3.2.2 Standard Erosion Control Techniques

Standard erosion control techniques will be used over the length of the project to protect the right-of-way and adjacent wetland and upland habitat areas from water quality degradation, siltation, filling and disruption of biological processes. These standard measures are described as part of the standard construction methodology in this section. Other erosion control methods are described in Sub-Program 2.3: Restoration and Revegetation where these measures are implemented to stabilize the right-of-way and minimize erosion potential. Figure III.4 depicts the standard erosion control design placed along a waterbody, wetland or transportation artery with an adjoining upland slope.

### 3.2.3 Specialized Erosion Control Techniques

Specialized erosion control techniques will be used in areas of the pipeline right-of-way where unusual, adverse, or difficult to control erosion conditions occur. The wetland construction methodologies described in Section 4.4 Wetland Crossings, are depicted on the wetland and waterbody crossing Figures III.5-9. Section 4.0 describes special erosion control methods described to protect the right-of-way in areas of sensitive habitat such as in the Gran Chaco National Park, high wind potential such as at the Río San Miguel, and steep rocky slopes such as at the El Carmen rock outcrops area. Each of these areas has a special application for erosion control including extensive silt screens, pipeline trench protection measures and jute fabric mats.

### 3.2.4 Sedimentation Control

Sedimentation control is first accomplished by erosion control in the pipeline right-of-way and immediately adjacent areas that have been disrupted by construction. All appropriate actions will be taken by the contractor to control and limit erosion and thereby preclude the occurrence of sedimentation over adjacent wetlands including waterbodies and uplands. Particular attention will be given to sloped areas of the right-of-way where erosion and sedimentation are more likely to occur in rainfall events or in the natural flow of waterways such as rivers and creeks.

### 3.2.5 Slope Stabilization

The stabilization of slopes within the right-of-way will be primarily accomplished by revegetation and mulching as determined by the Contractor. Elsewhere, slopes of different degrees will be treated following the guidelines shown in the standard construction methods in Section 3.1. In these areas the existing slope of the right-of-way is used to determine the frequency of water bars or slope breakers.

Along streams and other waterways, slopes will be stabilized by placing a biodegradable jute fabric, rip-rap, mulch or stone as determined necessary by the Contractor and approved by the Environmental Inspector. These areas are expected to experience flowing water and erosive

forces along the restored embankments. These factors will be evaluated before the implementation of slope stabilization measures by the Contractor and Environmental Inspector.

### **3.2.6 Responsibilities, Monitoring, and Schedule**

The Environmental Inspector will perform a regular review of all areas of the right-of-way under construction or restoration. These inspections will be performed regularly during all phases of construction and following restoration and revegetation of the right-of-way.

### **3.2.7 Reporting**

Necessary corrective actions will be evaluated, recorded and reported to the Contractor's Environmental Supervisor for work crew assignments and job priority ranking. All reports will be submitted to the appropriate individuals and will be tracked by the Environmental Inspector to confirm completion of corrective measures and follow-up evaluation of the suitability of measures.

## **3.3 Pipe Preparation**

Pipe preparation involves pipeline assembly activities beginning with the delivery of the pipe segments from the storage yards up to the point of lowering the assembled pipeline into the excavated trench. This process involves the handling, delivery, placement, stringing, bending, welding, welding inspection and weld coating.

### **3.3.1 Transportation**

Pipe segments will be delivered by barge to Puerto Suarez and distributed to the respective storage yards along the right-of-way. The pipe segments will be transported from the storage yards to the right-of-way after the process of double-jointing and concrete-coating.

1. Pairs of pipe segments will have been welded together or double jointed, and concrete-coated as necessary at the storage yards prior to transport to the right-of-way.
2. Transportation will be performed by flatbed trucks with the pipe segments properly chained to the trucks.
3. The trucks will use only designated access roads to reach the pipeline right-of-way and will travel at a safe speed for other traffic and road conditions. The pipeline right-of-way may also be used for transportation of pipe.
4. Unloading of the pipe segments will be performed with proper attention to worker safety and environmental sensitivity to the adjacent habitat areas.

### **3.3.2 Stringing**

At the right-of-way, the pipe segments are unloaded from the trucks and distributed along the alignment. This process is accomplished using cranes and slings to lift the double-jointed pipe segments from the tractor trailer and distribute the segments in a line along the working side of the trench. Stringing occurs within the previously cleared and graded right-of-way so no additional environmental protection measures are required for this process.

### **3.3.3 Bending**

Following the distribution of the pipeline segments to the right-of-way and trench excavation a separate work crew is responsible for bending pipe segments to conform to significant terrain contour changes or turns in the alignment direction. This work is contained within the right-of-way. No additional environmental protection measures are required for this process.

### 3.3.4 Welding and Weld Inspection

Pipe segment welding is performed in conjunction with the pipe gang-line up crew which aligns, rounds and secures the pipe segment ends together in preparation for welding. This operation is accomplished in succession for each weld With the use of a line clamp and sideboom tractors . The pipe segments are then welded together into one continuous pipeline using manual, semi-automatic or automatic welding procedures. Welding inspection is accomplished by x-ray machines or radioisotopes to confirm that the pipe joints have been properly welded. The film negative from the x-ray is developed in the field in portable darkrooms. Unacceptable welds or flawed welds will be cut out, re-welded and re-inspected. This process is contained within the right-of-way and no additional environmental protection measures are required.

### 3.4 Ditching

Ditching or excavation of the pipeline trench follows the right-of-way clearing and grading process. The majority of the excavation will be accomplished by machinery such as a ditch wheel that cuts a 1.2m-wide, vertically-sided trench, approximately two meters deep. In areas where topsoil segregation is recommended, topsoil and subsoil are sidecast to the same side of the trench in a two-stage or two-pass excavation process. The first cut is a shallow excavation that removes the topsoil and spoils it to the far edge of the non-work side of the trench. The second cut is the deeper excavation to two meters that removes the subsoil and also spoils it to the non-work side but immediately adjacent to the trench. This ditching process will be used in all upland areas and seasonally dry wetlands with a low water table such that the trench sides remain stable.

Elsewhere, particularly in wetlands, waterbodies and other seasonally high groundwater table areas, ditching will be accomplished by other trenching equipment such as a trackhoe moving on the substrates or on timber mats or rip-rap. This excavation process may also be necessary in dry sandy soil areas where the trench sides are not stable. The decision for equipment and excavation technique will be made by the contractor with approval by the Chief Environmental Inspector.



### 3.4.1 Topsoil Segregation

The Contractor will be required to segregate the topsoil in some wetlands and cultivated agricultural lands. Topsoil is segregated as part of the ditching procedure for wetlands. In agricultural lands topsoil is segregated prior to ditching.

1. Topsoil and subsoil will be segregated during ditching and stockpiled separately (Figures III.7 and III.8). In the environmentally sensitive areas of the Gran Chaco National Park and the Bañados de Izozog, special topsoil protection measures have been designed and will be implemented during construction despite the absence of organic matter in the soil.
2. If present, topsoil will be removed to its actual depth or to a maximum depth of 30 centimeters as determined by the Environmental Inspector.
3. Topsoil shall not be used for padding, backfill or trench breakers under any circumstances.
4. Topsoil stripping shall be accomplished as follows:
  - a. Cultivated Agricultural areas - topsoil will be stripped over ditch line.
  - b. Wetland areas - topsoil will be stripped over ditch line.
  - c. Forest and other areas - topsoil stripping is not required.
  - d. Aeolic Plain area - topsoil is not present, but the top layer of soil will be stripped over the ditch line to maintain the vegetative matter (seeds, rhizomes, and other propagules) at the soil surface.

### 3.4.2 Temporary Ditch Plugs

Ditch plugs are segments of the ditch which break the continuous open trench. Soft plugs consist of compacted subsoil or sandbags placed across the ditch following excavation. Hard plugs consist of unexcavated portions of the ditch.

On steep slopes plugs serve to reduce water movement within the trench and thereby minimize erosion and sedimentation in the trenchline. This also minimizes dewatering problems at the base of the slope where sensitive environments such as waterbodies and wetlands are frequently located. Plugs located adjacent to wetlands and waterbodies prevent diversion of water into upland portions of the pipeline trench during construction. In addition, plugs also provide access across and out of the ditch for wildlife and livestock. The following guidelines will apply to trench plugs:

1. To guard against failure, soft plugs will be longer along the trenchline than they are tall, constructed of compacted layers and inspected regularly by the contractor to prevent breaching.
2. Installation of plugs will be coordinated with installation of temporary water bars in order to more effectively divert water off the right-of-way.
3. Topsoil will not be used for plugs.
4. When removing plugs located above waterbodies or wetlands, water accumulated behind the plugs will be pumped out onto a well-vegetated area or filtered before the plug is removed (see Section 3.5.1).
5. Plugs may be used for wildlife to escape from the trench and livestock access across the fence. They shall be placed at an interval no greater than 600 m.

### 3.5 Lowering-in/backfilling

Following the trench excavation, pipe stringing and welding, the pipeline will be lowered into the trench and backfilled. During this process the following standard techniques will be used:

#### 3.5.1 Trench Dewatering

Removal of water from the trench, collected due to either rainfall or a high groundwater table, is a potential cause of water quality degradation, erosion and siltation, and erosion of adjacent wetland areas during pipeline construction. The following procedures will be used to minimize the risk of water quality degradation:

1. Hose intakes used to withdraw water from the trench will be floated above the trench bottom to prevent pumping sediments.
2. Hose intakes used to withdraw the water will be screened.
3. The hose discharge point will be equipped with a device to dissipate the water velocity and prevent erosion and scouring.
4. The location of all areas which are to receive water discharged from trenches will be approved by the Environmental Inspector. The discharged water will be filtered by one of the following methods:
  - a. If greater than approximately 30 meters from a wetland or stream bank, the discharge should be directed into a well vegetated area off the right-of-way; or
  - b. If no well-vegetated area is available or the discharge point is less than approximately 30 meters from a wetland or stream bank then the discharge will be directed through a filter bag and/or into areas contained by erosion control barriers.

5. Under no circumstances will trench water or other forms of turbid water be directly discharged onto exposed soil or into any wetland or waterbody.

### 3.5.2 Trench Breakers

Trench breakers (Figure III.5) are used to control open trench areas on slopes after the pipeline has been lowered into the ditch. These areas are primarily located at the eastern extent of the project in the region of El Carmen. In these areas, water accumulation from runoff or a high groundwater table may start water flowing within the ditch and cause erosion. The trench breakers act to stop the movement of water and thereby contain it in stable cells precluding erosion. The following procedures will be implemented in the construction of the trench breakers.

1. Installed in ditch as a permanent measure up to the time of backfilling.
2. Constructed on sloping terrain to control runoff from channeling along the buried pipeline.
3. Consists of sandbags, earth-filled sacks or other approved materials.
4. Topsoil shall not be used to fill the sacks.
5. Must be a minimum of two-sacks wide and should be embedded in the sides of the ditch to create a seal.
6. Installed on slopes including the base of slopes, adjacent to waterbodies and/or wetlands and in agricultural fields and residential areas.
7. Installed at the same spacing as permanent water bars unless otherwise determined necessary.

### 3.5.3 Padding

Placement of a suitable fill material immediately around the pipeline will be used to pad and protect the pipeline during backfilling of the trench. Padding is necessary where abrasive spoil materials may contact the pipeline. The following criteria will be used for padding:

1. Will be used in specific locations where rock, gravel or other materials are expected from the trench so that they will not damage the pipe coating during backfill.
2. Consists of a layer of rock free (less than approximately 4 cm thick) subsoil or sand placed around the pipe.
3. Topsoil will not be used as padding.
4. Use of a borrow site for suitable soil material is not expected, however, if necessary topsoil from a borrow site will be stripped and stockpiled prior to excavation of suitable padding material. All borrow sites will be restored following construction.
5. Rocks up to 15 centimeters in diameter may be placed adjacent to the pipeline outside of the pad areas where a specified rock shield is used to protect the pipe.

### 3.5.4 Backfilling

Replacement of spoil back into the trench to cover the pipeline will use all of the sidecast material. The segregated topsoil will be placed over the subsoil in order to reestablish the soil profile and vegetative groundcover.

1. Subsoil shall be placed directly onto the padding material.

2. Excavated and blasted rock may be used as backfill above the layer of padding in agricultural, wetland and residential areas, up to the level of bedrock. The size and quantity of stones in the top 30 cm of subsoil backfill in agricultural lands shall be consistent with undisturbed soils adjacent to the right-of-way.
3. Heavy, rubber tired equipment may be used to compact the backfilled ditch to minimize settling. A crown of soil may be placed over the pipeline to compensate for any future soil settling which may occur. Openings shall be left in the trenchline crown to allow for lateral surface drainage.
4. Excess or unsuitable material shall be disposed of in accordance with applicable regulations.

### **3.5.5 Use or Disposal of Blast Rock**

1. Excess blast rock will be used as rock walls to prevent unauthorized access to the right-of-way or wind-rowed, as approved by the Environmental Inspector and in accordance with landowner agreements and license requirements.
2. Blast rock which cannot be used shall be removed from the right-of-way and disposed of at an approved location or buried along the right-of-way at locations approved by the Environmental Inspector.

### **3.6 Hydrostatic Testing**

Hydrostatic testing will be conducted to verify the integrity of the pipeline. Integrity is tested by capping pipeline segments with test manifolds and filling the capped segments with water. The water is then pressurized and held for approximately eight hours (four hours for pre-tested, fabricated units and short, visible sections). Any significant loss of pressure indicates that a leak may have occurred and will require further inspection. Once the pipe is installed, hydrostatic testing will be performed in segments, each approximately 32 km long, unless ground elevation

changes require shorter distances. Up to three segments may be tested at one time if necessary and if sufficient water volume is available from the Rio Grande.

The primary source of the water used for the hydrostatic testing will be the Rio Grande. This river is the only waterway which flows year-round and can be expected to supply an adequate volume of water to test the pipeline. It is the Construction Contractor responsibility to perform the necessary studies to determine the appropriate volume and rate of intake of water in order to avoid undue impacts to the hydrology and biology of the river.

Prior to filling the pipeline with water, a test pig will be pushed with air through the proposed test segment to clear the pipeline of any debris. The volume of water used to test each pipeline segment will be pushed by air through the pipeline to each successive pipeline segment. No adverse impacts to the base flow of the Rio Grande River will be allowed. Water will not be withdrawn or the pumping rate from the river will be slowed if such action will adversely impact the biotic systems of the river. This will be partly dependent on seasonal conditions present at the time of the pipeline construction and will be evaluated by the Environmental Inspector.

A possible second option for a supplemental water source is the Rio Otuquis. This river often has a low or non-existent base flow during the dry season and may not provide an adequate volume of water. The potential for environmental impacts from withdrawal and discharge of test water shall be minimized by utilizing the following procedures:

1. Pipeline sections will be hydrotested before installation under major waterbodies.
2. Hydrostatic test manifolds shall be located outside of wetlands and riparian areas to the maximum extent practicable.
3. Withdrawal from and discharge to all water sources will first consider the protection of fisheries and aquatic resources on a case-by-case basis.

4. Dredge and fill activities will be in compliance with any license or environmental requirements.
5. The intake shall be screened to avoid entrainment of fish.
6. Adequate flow rates in the Rio Grande and Rio Otuquis will be maintained to protect aquatic life and provide for downstream water withdrawals by existing users.
7. The discharge pipe shall be secured in place.
8. Test water will be discharged to a suitable receiving body of water, across a well-vegetated upland area or through a filter bag or erosion control barriers. Water quality standards will be maintained.
9. Water discharge into water bodies and cultivated lands will be avoided where possible.
10. Test water will be discharged against a splash plate or other dispersive device in order to aerate, slow and disperse the flow.
11. The rate of discharge shall be controlled in order to prevent flooding or erosion.
12. The Environmental Inspector will take samples of the discharge waters and the receiving waters before and after discharge to ensure no adverse degradation of water quality occurs.
13. The Environmental Inspector will coordinate all hydrostatic test water withdrawal and discharge activities with the Chief Environmental Inspector.



### 3.7 Cathodic Protection of the Pipe

A cathodic protection system will be installed at various points along the pipeline to protect against corrosion and any undetected or subsequent damage to the coal tar enamel and epoxy coatings on the pipeline. The system used for this pipeline will be a mixed type because of the remoteness of areas of the pipeline away from power supplies.

One system will consist of anodic beds made of magnesium and installed at various points along the pipeline. These anodes beds prevent pipeline corrosion by taking the harmful electric current from the pipeline and discharging it to the ground at the magnesium anodes. This will cause corrosion of the sacrificial anode bed instead of the pipeline. This system is expected to be located and designed based on soil chemistry along the pipeline and the unavailability of power. The second system uses a power source to pass an electrical current through the pipeline equal in strength to the harmful current already occurring in the pipeline. In this manner, the harmful current is negated by the introduction of this second current.

### 3.8 Final Clean-up

The final clean-up of the right-of-way occurs after the pipeline has been lowered-in, all tie-in and fabrication connections have been completed and the trench is covered with the stockpiled fill material. The filling of the trench is accomplished to the level of the surrounding ground and the right-of-way is cleared and graded as closely as possible to original condition. Following this operation, the right-of-way is reseeded and restored and fences are repaired as necessary to their previous condition. These actions lead up to and progress into the restoration and revegetation of the right-of-way described in Section 6.0.

## 4.0 SUB-PROGRAM 2.1: SPECIAL AREAS AND SPECIALIZED CONSTRUCTION

### 4.1 Objectives and Responsibilities

The objective of this Special Areas and Specialized Construction Program is to set forth methodologies, requirements, guidelines and monitoring programs for the construction of the pipeline in sensitive wetland areas and problematic upland habitat areas. These special areas have been identified based on the route terrain and environmental surveys, and communication with governmental and lending institution representatives. Each area presents unique physical, climatic or habitat protection requirements that necessitate modification of the standard construction methodologies. These areas are distinguished from the upland segments of the pipeline route which will be constructed with the standard construction methodology described in Section 3.0. Environmental inspection and monitoring during and after construction will be increased and broadened in scope to meet the additional and more stringent requirements for habitat protection in these areas during construction and restoration following pipeline installation.

The responsibility of the pipeline contractor will be to implement and perform the restricted or additional construction techniques in the designated areas. The environmental inspection contractor will be responsible to monitor and advise the contractor of necessary corrective actions in order to accomplish the requirements of the modified construction methodologies and the post-construction restoration of the right-of-way.

### 4.2 Special Areas

The pipeline route crosses five areas designated as sensitive natural habitats or difficult terrain which require specialized or modified construction techniques. These techniques will be used to minimize environmental impacts to wetland and upland vegetative communities and wildlife populations.

After the pre-construction survey, the Construction Contractor may choose to employ a construction method different than that identified here for a given alignment segment. These

modifications should be approved by the Environmental Project Supervisor and local authorities as applicable. Every effort should be made, supported by appropriate documentation, to reduce the width of the right-of-way to the minimum strictly necessary for construction in the special areas described below.

#### 4.2.1 Bañados de Izozog (Río Parapetí)

This expansive system of intermittently flooded lands covers the largest area of the pipeline route and overlaps with the Gran Chaco National Park and the Integrated Management Area for the Gran Chaco National Park. The Bañados de Izozog begins at approximately kilometer marker (KM) 90 and extends eastward to approximately KM 200. In between, at the western and particularly the eastern extent of the wetland system, areas of inundation are variable and frequently transition to uplands as a result of slight increases in elevation. The primary sources of flood waters are rainfall and the Río Parapetí. The western margin of the system is often dry in the winter but the river flows outside its banks producing shallow inundation over the expansive Bañados de Izozog during the rainy season.

Construction is scheduled for the dry season to take advantage of lowered wetland water and groundwater levels. This construction timing will minimize, as weather permits, earthwork difficulties such as right-of-way clearing, trench cutting and backfill, erosion and water quality control, topsoil and vegetation maintenance, and vehicle travel. Standard Construction or Conventional Wetland Construction techniques will be used dependent on conditions within the wetland at the time of construction. The areas and methods of construction are listed in Table III.2.

Reestablishment of the right-of-way vegetation will be accomplished by replacing the wetland topsoil over the pipeline trench to recruit hydrophytic vegetation. The seasonal inundation that follows the construction process will facilitate the reestablishment of the native vegetation. These measures will be monitored regularly to evaluate progress of revegetation and guide the performance of corrective actions as necessary.

#### 4.2.2 Gran Chaco National Park and Integrated Management Area

The pipeline right-of-way marks the northern boundary of the Gran Chaco National Park from approximately KM 119 to approximately KM 238.5. Surrounding the National Park to the west, north and east are the Integrated Management Areas of the Gran Chaco National Park. This protection area extends to the west on the pipeline to approximate KM 106, well to the north of the pipeline, and to the east to approximately kilometer marker 269. This entire area of the pipeline right-of-way includes wetlands and uplands which will be impacted by construction. The wetland areas are described above as part of the Bañados de Izozog. Upland areas are predominately characterized as medium and low dry forest of the Chaco. The woody vegetation is tall, moderately to very dense, and the ground supports little or no topsoil. The pipeline centerline survey and narrow clearing swath performed in 1993 shows slow vegetative regrowth with about 50% of the ground cover having reestablished four years later.

This area supports a number of protected wildlife species and two sensitive and unique upland vegetative habitats. It is also utilized by the three indigenous peoples. The objective of the construction process is to minimize the impacts to the vegetative component of the habitat and in that manner limit effects on the human populations and wildlife species. This will best be accomplished by utilizing a specialized construction methodology throughout the park area and implementing restoration methods that will accomplish revegetation as rapidly as possible. The limiting factors on this revegetation effort are the low nutrient soils including the absence of any organic matter, low annual rainfall, slow vegetative growth rates, and vehicle and human use of the right-of-way.

Special construction methods will be implemented in this area because of the sensitivity of this habitat for wildlife and the overall protected National Park environment. In particular, measures to limit the extent and area of vegetative clearing will be used. These measures include the following techniques.

1. In upland areas, trees on the right-of-way will be cut at ground level. Ground cover vegetation will not be cut or removed from the right-of-way. Stumps located within the right-of-way will not be removed from the ground except in the ditch line.
2. In order to preserve the existing soil and seed bank, the top layer of soil over the pipeline trench in the uplands will be segregated during excavation, stockpiled on the off-side of the trench and replaced over the trench following construction. Some subsoil will be stockpiled on the non-working-side edge of the trench. Other portions of the subsoil will be used for temporary fill placement over the working side of the right-of-way.
3. The right-of-way will be restored by redistributing the subsoil and the top layer of soils to prior locations in the right-of-way. The revegetation process will rely on the groundwater table, rainfall and occasional inundation to continue the natural revegetation processes within the right-of-way.

#### 4.2.3 Río San Miguel Floodplain and Aeolic Plains

Where the pipeline crosses the Rio San Miguel, there is an expansive aeolic plain which extends to the west to approximately KM 251 and to the east to approximately KM 350. This broad area totaling approximately 99 kilometers of pipeline right-of-way supports a limited cover of grasses, and scrubby vegetation to the east, which have been previously established and managed for cattle ranching. The plains are seasonally subjected to persistent strong winds which create a substantial erosive force on the ground cover.

A standard upland construction method will be used in this area; however, it will be modified to help maintain the ground cover vegetation and thereby allow for a more rapid vegetation recovery. Only the rooted vegetation over the pipeline trench will be removed. This excavated topsoil with grasses will be stockpiled on the off-side of the right-of-way. The remaining ground cover vegetation will be maintained except for placement of spoil as necessary to level and stabilize the vehicle and equipment travel lanes within the right-of-way. The vehicles, equipment and fill will temporarily displace the vegetation, but most of these rooted grasses are expected to survive the

construction process. They will begin to reestablish following completion of construction and restoration of the right-of-way.

#### 4.2.4 Bañado de Taquaral

The pipeline crosses a narrow portion of the Bañado Taquaral at approximate KM 525 at the eastern portion of the route. The wetland area impacted lies at the northern extension of the Bañado Taquaral and is approximately two to three kilometers wide draining northward toward the Cañón de la Victoria. This creek and wetland system is part of the larger Pantanal wetland which lies predominately in southwestern Brazil and northeastern Paraguay.

This area is expected to be dry at the time of construction and should require a standard construction method. If the area is inundated at the time of construction a conventional wetland construction method will be used. The narrow and level grade of this wetland will preclude any substantial construction limitations or erosion potential. The top layer of soil over the pipeline trench in the uplands and wetlands will be segregated during excavation, stockpiled and replaced over the trench following construction.

#### 4.2.5 El Carmen Outcrops

The El Carmen Outcrops area lies from approximate KM 526 to approximate KM 555 at the Bolivia-Brazil border. In this area, rock outcroppings are present on the mountains and hillsides. These areas are characterized by occasionally steep side hills with loose gravel and sand at the hilltops and limited vegetation. The rock outcroppings have required evaluation of the potential need for blasting to excavate the pipeline trench. At present, these surveys and terrain assessments have concluded that blasting will not be necessary. In the event that blasting does become necessary, techniques will follow those described for blasting in Section 4.3.1. This process will be followed by special pipeline covering and finish grading processes to restore land contour and vegetation, and minimize wind erosion potential.

This area of the project will use a standard construction methodology, unless otherwise required. As a result of the steep land contours, side cuts and limited vegetation there is a potential for erosion. In addition, following construction the right-of-way will be subjected to wind and some settlement of substrates. Stabilization of these areas is necessary to prevent habitat degradation and initiation of large erosional processes that may compromise the integrity of the right-of-way area.

A heavy biodegradable jute fabric will be anchored on the hillsides as determined necessary by the Environmental Inspector to hold the substrate and rock in place. During trench excavation, fine and coarse sands will be placed at the bottom of the trench to pad and protect the pipeline. The larger material such as stone, gravel and rock will be placed above the pipe to the ground level, which will help stabilize the right-of-way surface.

### **4.3 Specialized Construction Methods**

Specialized construction techniques will be used in certain areas along the pipeline route. These methods will be used as required based on terrain, environmental conditions, weather or other physical features of the right-of-way. Not all of the described techniques are expected to be used for the pipeline construction but are included in case of unforeseen events or conditions. These various methods are described below.

#### **4.3.1 Blasting**

Installing the pipe is not expected to require blasting but, in some areas, particularly those with rock outcrops, it may become necessary. During blasting, contractors will take full precautions to preclude damage to adjacent areas and structures. These precautions include:

1. Installing blasting mats in congested areas, in shallow waterbodies or near structures that could be damaged by discharged rock.
2. Posting warning signals, flags and barricades.

3. Following procedures for safe storage, handling, loading, firing and disposal of explosive materials in accordance with applicable regulations.
4. Manning adjacent pipelines or other utilities at valves and control points for emergency response.

Blasting standards will meet or exceed all applicable governmental requirements covering the use of explosives. Excessive vibration can be controlled by limiting the size of charges and by using charge delays which stagger each charge in a series of explosions.

If the contractor must blast near buildings, a qualified independent contractor will inspect potentially affected structures prior to blasting, either at the construction contractor's request or at the request of the affected landowner. Post-blast inspections by the company's representative will also be performed as warranted. This condition is not expected in Bolivia. All blasting will be performed by registered blasters. During blasting, the contractor will monitor ground vibrations at the nearest structure (or well) that is within 60 meters of the blast site or in accordance with regulations.

If the Contractor has to blast near wells, all wells in potentially affected areas will be inventoried prior to construction. In addition, all wells will be inspected both before and after blasting.

If blasting occurs in wetlands, topsoil along the ditchline will be segregated prior to blasting. Rock removed from the trench will be stored with subsoil material. In order to limit the equipment operating in wetlands and avoid the need to import replacement fill, rock will not be removed from the wetland but will be returned to the trench as subsoil. Surface rock should not exceed pre-construction conditions as directed by the environmental inspector.



### 4.3.2 Two-Tone Approach

When working in areas with homogeneous topography the surface of the working side of the right-of-way is usually leveled at a grade equal to the elevation of the top of the ditch. This facilitates the safe passage of equipment and installation of the pipe. Where the pipeline crosses rugged topography, however, such as steep side slopes, contractors often construct the working side of the right-of-way such that it has two levels or tones that parallel the ditch. The tone closest to the ditch is used for construction while the tone farthest from the ditch is used for travel. The height of the construction tone is usually as close to the height of the ditch as possible. The elevation of the travel tone will be higher or lower than the height of the construction tone depending on the area's natural grade. The two-tone approach reduces the amount of dirt and rock that must be moved.

### 4.3.3 Drag Sections

Drag sections are used when reducing space is necessary to work in a given location. Drag sections are multiple joint sections of pipe which have been pre-assembled (bent, welded, x-rayed, and coated) in a staging area near but not adjacent to the ditch where it will eventually be placed.

Drag sections are used for road crossings, waterbody and wetland crossings, residential areas and other locations. This technique is used when there is insufficient room to assemble the pipe in place or where the obstruction of having the pipe sitting along the ditch for a long period of time, such as a road crossing, is unacceptable. This technique is limited to a length of several joints which can be picked up and carried as one piece into place by the available equipment.

### 4.3.4 Stovepipe

Stovepipe construction is used in congested areas where there is extremely limited work space. This method entails welding together sections of pipe, lowering-in and immediately backfilling the ditch. Simultaneously, the pipeline ditch ahead is being excavated. Only tie-in points will be left excavated during non-working hours and will be fenced and secured.

Stovepipe construction significantly reduces the amount of land disturbed while reducing the length of time the ditch is left open. However, this method typically progresses more slowly than normal construction methods.

#### 4.3.5 Residential Area Construction

The pipeline route in Bolivia does not encounter residential areas, although the following guidelines are provided for informational purposes.

The care exercised by construction crews and the quality of cleanup following construction are paramount concerns of homeowners. The contractor will make every effort to ensure that all construction activities minimize any adverse impacts to residences and that cleanup is quick and thorough.

Throughout construction, access to homes will be maintained except for the brief periods essential for laying the new pipeline. Temporary safety fences may be erected by the contractor in the vicinity of streets and homes to keep the public away from the construction zone. Techniques such as stovepipe and drag section construction may be used in order to minimize the impacts of construction in residential areas on a site-specific basis.

Homeowners will be notified in advance of any scheduled disruption of household utilities and the duration of the interruption will be kept as brief as possible. Representatives of local utility companies will be on-site during construction when necessary. In addition, the contractor should strive to accommodate any special concerns regarding shrubs, trees or structures by avoiding them as long as such avoidances will not unduly interfere with construction and operation of the pipeline. Immediately after backfilling residential areas will be cleaned up and all construction debris will be removed.

#### 4.3.6 Boring

Boring entails drilling a hole below travel arteries such as highways and railroads through which the pipe will pass. This method may be used in sensitive areas where the artery cannot be crossed by conventional open cut methods. Tunneling may be acceptable in some areas.

#### 4.3.7 Jacking

Jacking is similar to boring except that an open-ended casing is forced or jacked through the earth below the artery. The soils are then removed from the casing and the remainder of the installation procedure is identical to that described for boring.

#### 4.3.8 Directional Drilling

Directional drilling requires the drilling of a small diameter hole or pilot hole along a pre-determined design path. The pilot hole is then enlarged sufficiently by a larger diameter drill to accommodate the pipeline to be installed. The pipeline may or may not be installed concurrently with the hole enlargement depending upon the final diameter of the enlarged hole and the soil conditions encountered. This technique is not expected to be used for the pipeline construction but may be used if circumstances or conditions warrant. The following conditions also apply to directional drilling:

1. Excavation of the drill entry and exit locations will be necessary to contain drilling fluids during all phases of the drilling and installation. These fluids and cuttings must be disposed of in an approved manner periodically or at the completion of the crossing installation.
2. The crossing length and cross sectional geometry is dependent upon the pipeline design parameters, the obstacle to be crossed and the subsurface conditions.

3. Additional temporary work space including pipe staging areas and storage areas for drilling mud and borehole cuttings will be located in upland areas outside of wetlands and riparian zones wherever practicable. This method requires a large amount of additional temporary work space and is only used in areas where boring and conventional open cut methods are not suitable.

#### **4.3.9 Equipment Crossovers**

In an equipment crossover the working side of the right-of-way is temporarily shifted to the other side of the right-of-way. Equipment crossovers are used to reduce impacts to sensitive areas such as residential, wetlands and archaeological sites. The use of equipment crossovers will be reserved for extreme circumstances because of the requirements for the construction equipment to work backwards. This technique is not expected to be used for the pipeline construction.

#### **4.3.10 Agricultural Area Construction**

Agricultural areas include crops, orchards and vineyards. Prior to construction, landowners will be contacted to locate any existing and future drainage tiles and irrigation systems. Water flow in crop irrigation systems will be maintained unless shutoff is coordinated with the affected parties.

Wetlands and waterbodies in agricultural areas shall be crossed as specified in Section 4.4 and Section 4.5 of this EMP, respectively. This construction methodology is expected to be used in the agricultural areas crossed by the pipeline.

At a minimum, the following measures will be adopted in actively farmed areas affected by project construction:

## Grading

1. Prior to grading, the environmental inspector will determine the depth of topsoil to be stripped and segregated, and will enter the information into a field book for future reference. The depth to which the topsoil will be stripped will be its actual depth or a maximum depth of approximately 30 centimeters.
2. Natural flow patterns of fields will be maintained by providing breaks in topsoil and subsoil stockpiles.
3. In all actively cultivated agricultural lands including permanent or rotated cropland, hayfields or improved pastures, topsoil stripping over the ditch line shall be used. Additional temporary work space will be used for topsoil storage in agricultural areas.

## Ditching\Lowering\Backfilling

1. It is necessary to maintain flow in drainage systems during construction.
2. All drainage systems shall be inspected to determine if damage has occurred. Any drainage system damaged during construction shall be flagged by the trench inspector and then repaired to its original or better condition.
3. Records of drainage system repairs shall be kept and upon request given to the landowner for future reference upon request.

## Restoration and Revegetation

1. Final grading shall be completed as soon as possible after the ditch is backfilled, weather permitting.

2. Construction debris shall be removed from the right-of-way.
3. Any rutting or compaction shall be repaired prior to revegetating disturbed areas.
4. The right-of-way shall be graded to pre-construction contours except where original contours were irregular and more uniform contours are acceptable.
5. Subsoil compaction shall be relieved using a harrow, para-plow, para-till or other equipment. All stones greater than those in adjacent undisturbed soils which are brought to the surface during the decompaction process shall be removed. Decompaction activities shall be conducted only during periods of relatively low soil moisture to ensure the desired mitigation and prevent additional subsurface compaction. The subsoil shall be decompacted prior to replacement of the segregated topsoil.
6. Topsoil shall be replaced last. Soils shall be crowned along the ditchline to allow for settling unless otherwise directed by the environmental inspector. Openings shall be left in the ditch line crown to allow lateral surface drainage.
7. Size and quantity of stones in the top 30 cm of subsoil backfill shall be consistent with undisturbed soils adjacent to the right-of-way.

#### 4.4 Wetland Crossings

Specialized construction techniques will be required at all wetland crossings along the pipeline route. These areas are expected to present saturated or inundated soil conditions at the time of construction which will require special right-of-way stabilization, equipment work techniques, and ground restoration and stabilization methodologies. These wetland construction segments are described in Table III.2 with a brief description of the terrain, soils, vegetation, wetlands and construction constraints.

The selection of wetland construction techniques has been performed based on pipeline right-of-way surveys and the terrain and environmental surveys previously completed. This process has determined which construction methodologies will be used in the field and what specialized techniques may be necessary at different areas (Table III.2). It is expected that the specialized construction techniques will be limited to the Standard Pipeline Construction Method, Conventional Wetland Construction Method, Push/Pull Wetland Construction Method, Open-Cut Waterbody Construction Method, and Directionally Controlled Horizontal Boring Method or Other Site-Specific Crossing Techniques.

#### 4.4.1 General Measures

Potential adverse impacts to wetlands will be minimized by:

1. Expediting construction in and around wetlands, and limiting the amount of equipment and mainline construction activities within wetlands to reduce disturbance of wetland soils.
2. Restoring wetlands to their original configuration and contour;
3. Stabilizing upland areas near wetlands as required to prevent erosion using control measures and vegetative cover as soon as possible after backfilling.
4. Inspecting the right-of-way periodically during and after construction, and repairing any erosion control or restoration features as needed in a timely manner.

#### 4.4.2 Additional Work Space Areas

The size of staging areas at wetland crossings will be limited to the space necessary for fabricating only those pipe segments required for the crossing. Other additional work spaces, such as for spoil storage, at wetland crossings will also be limited to the size necessary to perform their function. All additional work space areas will be located at least 10 meters from the edge of the

wetland where topographic conditions permit. The wetlands and setbacks will be clearly marked prior to the start of construction.

Extra work space is required at the crossing of the Río Grande, Río Parapetí, Río San Miguel, and Río Otuquis because of the size of the wetland crossing (Figure III.6). The following table shows the requirements at each waterway.

	<u>West Side</u>	<u>East Side</u>
Río Grande	60m x 60m	30m x 60m
Río Parapetí	30m x 30m	30m x 30m
Río San Miguel	30m x 60m	60m x 60m
Río Otuquis	60m x 60m	30m x 30m

In addition, there are at least 27 creeks which will be crossed by the pipeline. These areas are characterized as dry wash ravines with steep embankments which range from four to ten feet in depth and variable width. They will necessitate additional excavation to place the pipeline properly and safely below final land grade.

Additional work space may also be necessary at some of these crossings to allow spoil stockpiling and facilitate construction equipment travel and manipulation. This extra work space requirement will be minimized as much as possible and will be accomplished with the appropriate environmental protection measures.

To avoid contaminants entering the wetland, the Contractor will follow the spill prevention measures described in Section 8.0 of this EMP. Hazardous materials, chemicals, fuels or lubricating oils will not be stored nor will concrete coating activities (excluding field joints) be performed within 15 meters of any water body. If field joints are concrete coated within 15 meters of a wetland, protective ground coverings will be used in the area of coating operation. In addition, construction equipment will not be refueled or serviced within 15 meters of all wetlands. If the equipment cannot be reasonably moved 15 meters or more away from the



wetland without unnecessarily harming the environment, or the equipment being fueled or serviced is mounted on a barge, Contractors will complete such activities in accordance with the measures specified in Section 8.0 of this EMP and supervised by an on-site environmental inspector.

#### 4.4.3 Spoil Pile Placement/Control

Spoil placed up-gradient of wetlands will be contained with sediment control devices as necessary to prevent spoil materials from flowing into wetlands or off of the right-of-way.

#### 4.4.4 Wetland Crossing Procedures

Unless a site-specific method is called out as part of the specialized construction areas, one of the following three methods will be used for crossing wetlands during construction. The three wetland crossing methods are listed and described below.

- METHOD I:** Standard Pipeline Construction  
**METHOD II:** Conventional Wetland Construction  
**METHOD III:** Push/Pull Wetland Construction

This section discusses the objectives and requirements of Methods I, II, and III. The proposed method of crossing each wetland may be modified in the field based on the site conditions at the time of construction.

#### **METHOD I: Standard Pipeline Construction**

Standard Pipeline Construction will be used in wetlands where soils are dry enough at the time of construction to support the weight of heavy equipment. This method will be used when rainfall is at a minimum and the water table is lowest. Most of the pipeline route will be constructed in the dry season and this method is expected to be used in most wetland crossings. This crossing method requires the segregation of topsoil from subsoil and other special techniques as discussed elsewhere in the EMP.

The following mitigative measures will be used for this method:

### Clearing

1. This method requires no special stabilization techniques because conditions can support construction equipment.
2. No equipment with rubber tires will be allowed to work in wetlands unless the equipment will not damage existing root systems and its use is approved by the environmental inspector. Hydro-axes and bulldozers will be used to remove timber, trees or brush.
3. All timber and brush will be removed from the wetland.
4. Contractors will not cut trees located outside of the right-of-way.
5. The environmental inspector will photo-document areas before and after clearing for use in later revegetation/restoration monitoring programs.

### Grading

1. Extensive grading will normally be unnecessary because the topography of most wetlands is level. Grading will be limited to the areas directly over the trenchline, except where topography such as side slopes requires additional grading for safety reasons. Where grading is required, topsoil will be segregated and returned as an even layer to all graded areas.
2. Grading along waterbodies within wetlands will be done according to requirements specified in Section 4.5.

### Trenching

1. The wetland topsoil, to a depth determined by the environmental inspector up to a maximum of 30 cm, will be stripped from over the ditchline and stockpiled separately from subsoil.
2. Following segregation of the topsoil, the remainder of the ditch will be excavated so that the pipe will have a minimum of approximately 1 meter of cover unless otherwise specified.
3. If rock has been removed from the ditch, it will be stored with subsoil material.
4. Spoil will be contained with filter fabric fences or other sediment barriers to prevent the spoil from flowing off of the right-of-way or into waterbodies.

### Lowering-in\Backfilling

1. The trench will be backfilled with subsoil first. After the subsoil has been rough graded, topsoil will be replaced in an even layer. The topsoil contains seeds, rhizomes and other plant propagules which will aid rapid recolonization by pre-existing wetland species.
2. Pipeline padding is usually unnecessary because wetland soils are generally soft and the pipe is concrete coated to provide negative buoyancy.
3. The trench will be dewatered as needed and in accordance with erosion and sediment control specifications detailed in Section 3.5.1
4. Any additional spoil material imported from off the right-of-way must be approved by the environmental inspector.

5. Rock excavated from the trench will not be removed from the wetland but will be returned to the trench with the subsoil in order to limit the equipment operating in wetlands and avoid the need to import replacement fill.
6. Where rock was part of the surface features prior to construction of the pipeline it will be placed back in the wetland in approximately the same configuration as the pre-construction situation.
7. Permanent trench plugs shall be installed at both ends of the wetland where drainage of the wetland along the pipeline trench may occur.

### Cleanup/Restoration

1. All work mats, timber rip-rap and other construction debris shall be removed following backfilling of the pipeline.
2. Once backfilling is complete, the affected areas will be restored to their original contours and flow regimes to the extent practicable with the exception of unnatural features and unstable grades.

### METHOD II: Conventional Wetland Construction

Conventional Wetland Construction (Figure III.7) will be used for crossing wetlands with saturated soils or soils unable to support mainline construction equipment. Because the soils are saturated, there is a need to stabilize the right-of-way during construction. Method II addresses this need for stabilization. This method will be the selected construction technique for all wetland areas which have saturated soil conditions.

The following mitigation measures will be used for this method:

## Clearing

1. The right-of-way will be stabilized by the use of timber rip-rap (corduroy roads), fabricated timber mats or gravel over geo-textile fabric.
2. Contractors will not use soil, rockfill, pulled tree stumps or slash rip-rap to stabilize the travel lane.
3. No equipment with rubber tires will be allowed to work in wetlands unless the equipment will not damage existing root systems and the equipment use is approved by the environmental inspector.
4. All timber and brush will be removed from the wetland.
5. Debris and stumps will not be buried within wetlands but may be buried in the right-of-way outside of wetlands.
6. Contractors will not cut trees located outside of the right-of-way.

## Grading

1. Grading will most likely not be performed because of the construction constraints associated with saturated wetland soils and because of the level ground of these wetlands. Should grading be necessary, it will be limited to the areas directly over the trenchline except where topography requires additional grading for safety reasons. Where grading is required the topsoil will be segregated and returned as an even layer to all graded areas.
2. Grading along waterbodies within wetlands will be done according to requirements specified in Section 4.5 of this EMP.

## Trenching, Lowering-in/Backfilling, Clean-up, and Restoration

### METHOD I:

1. The wetland topsoil will be stripped from over the ditchline to a depth determined by the Environmental Inspector of up to a maximum of 30 centimeters. The topsoil will be stockpiled separately from subsoil removed during trenching except where standing water is present.
2. Following removal and segregation of the topsoil the remainder of the ditch will be excavated so that the pipe will have a minimum of 1 meter of cover unless otherwise specified.
3. Where rock has been removed from the ditch it will be stored with subsoil material.
4. Spoil will be contained with filter fabric fences or other sediment barriers to prevent the spoil from flowing off of the right-of-way or into waterbodies.

### Lowering-in\Backfilling

1. The trench will be backfilled with subsoil first. After the subsoil has been rough graded the topsoil will be replaced in an even layer. The topsoil contains seeds, rhizomes and other plant propagules which will aid in the rapid recolonization by pre-existing wetland species.
2. Pipeline padding is usually unnecessary because wetland soils are generally soft and the pipe is concrete-coated to provide negative buoyancy.
3. The trench will be dewatered as needed and in accordance with erosion and sediment control specifications detailed in Section 3.2.

4. Any additional spoil material imported from off the right-of-way must be approved by the Environmental Inspector.
5. Rock excavated from the trench will not be removed from the wetland but will be returned to the trench with the subsoil in order to limit the equipment operating in wetlands and avoid the need to import replacement fill.
6. Where rock was part of the surface features prior to construction of the pipeline it will be placed back in the wetland in approximately the same configuration as had been the pre-construction situation.
7. Permanent trench plugs shall be installed at both ends of the wetland where drainage of the wetland along the pipeline trench may occur.

### Cleanup/Restoration

1. All work mats, timber rip-rap and other construction debris shall be removed following backfilling of the pipeline.
2. Once backfilling is complete the affected areas will be restored to their original contours and flow regimes to the extent practicable with the exception of unnatural features and unstable grades.

### METHOD III: Push/Pull Wetland Construction

Push/Pull Wetland Construction (Figure III.8) entails pushing or pulling a floating section of pre-assembled pipe into position over an inundated trench. The floats are removed and the concrete-coated pipe sinks into the trench. The section of pipeline to be floated into place must be straight or nearly straight to be able to float within the confines of the excavated ditch. This method should be used in large wetland areas where water levels are high enough at the time of construction to float the pipeline into the trench and where such levels can be maintained without damming.

Impacts to the wetland are minimized through the use of this crossing method. The Push/Pull Method requires less clearing than Methods I and II because construction space is only required to allow the backhoe to traverse the wetland and to stockpile excavated soil. All equipment will be allowed to pass through wetlands as necessary but only equipment needed to clear, excavate, and backfill will be permitted to work in the wetland area. This technique will not require work space adjacent to the trench to operate sidebooms because the pipe will be assembled outside the wetland. Additional work space may be needed adjacent to the wetland boundaries for pipe fabrication.

The following impact minimization measures will be followed when using the Push/Pull Method of construction:

### Clearing

1. Clearing within the wetland will be limited to only that necessary to install the pipeline.
2. Trees and brush will be cleared using low ground pressure or pontoon mounted equipment or with equipment supported by timber work mats.
3. No rubber tired equipment will be allowed to work in wetlands.
4. All timber and brush will be removed from the wetland.
5. Debris and stumps will not be buried within wetlands but may be distributed within the right-of-way outside of wetlands.
6. Trees located outside of the right-of-way shall not be cut.
7. The environmental inspector will photo-document areas before and after clearing.



## Grading

1. Grading in inundated wetlands will be held to a minimum and generally will not be necessary because of the typically level topography and the absence of rock outcrops.

## Trenching

1. Amphibious excavators (pontoon-mounted backhoes) or tracked backhoes (supported on fabricated timber work mats or floats) will be used to dig trenches.
2. If fabricated timber work mats are used for stabilization, the backhoe will gradually move across the wetland by removing the mat from immediately behind the backhoe to the front of the backhoe's path. This "leap frog" process minimizes impact to the wetland by distributing the weight of the backhoe, reducing the number of passes through the wetland and minimizing the area covered by timber mats at any given time. Amphibious excavators and float-supported backhoes are self-supporting and do not require the use of timber mats.
3. The wetland topsoil will be stripped from over the ditchline and stockpiled separately from the subsoil removed during trenching, if possible. The depth of this excavation, up to a maximum of 30 cm, will be determined by the environmental inspector. This process will not be used in submerged areas unless the environmental inspector determines that segregation is feasible.
4. Following segregation of the topsoil, the remainder of the ditch will be excavated so that the pipe will have a minimum of approximately 1 meter of cover unless otherwise specified.
5. Where rock is removed from the ditch, it will be stored with the subsoil material.

**Lowering-in**

1. Each pipeline section will be floated and pushed or pulled through the trench in the wetland. Once the appropriate location is reached the floats will be released and the concrete-coated pipe will sink to the bottom of the trench.

**Backfilling**

1. Backfilling will be performed with a tracked backhoe or amphibious excavator and obtaining finish grade elevations will be done in one pass. Mats will be required. The previously excavated material will be used to backfill the trench.
2. The trench will be backfilled with subsoil first wherever topsoil and subsoil have been segregated. Topsoil will be replaced in an even layer after the subsoil has been rough graded. The topsoil contains seeds, rhizomes and other plant propagules which will aid in the rapid recolonization by pre-existing wetland species.
3. Pipeline padding is usually unnecessary because wetland soils are generally soft and the pipe is concrete-coated to provide negative buoyancy.
4. The trench will be dewatered as needed and in accordance with erosion and sediment control specifications detailed in Section 3.5.1.
5. Permanent trench plugs shall be installed at both ends of the wetland where drainage of the wetland along the pipeline trench may occur.

## Cleanup/Restoration

1. All work mats, timber rip-rap and other construction debris shall be removed following backfilling of the pipeline.
2. Once backfilling is complete the affected area's original contours and flow regimes will be restored to the extent practicable with the exceptions of unnatural features and unstable grades.

## 4.5 Waterbody Crossings

Construction techniques for waterbody crossings are generally open cut methods, particularly for the rivers, creeks, ponds and small lakes that will be encountered by the pipeline. These methods may be modified as site conditions require and include a combination of methods previously described and those described below.

### 4.5.1 General Measures

The contractor shall protect and minimize potential adverse impacts to waterbodies, namely creeks and small lakes or ponds, by implementing a number of protection and procedural measures during construction. These contractor measures include:

1. Expediting construction and limiting the amount of equipment and mainline construction activities within waterbodies (this will minimize disturbance to streambeds and adjacent soils thereby minimizing the amount of suspended sediments in the water column and the extent of revegetation necessary following construction.).
2. Reducing the area of clearing as much as possible and leaving in place as many trees and as much shoreline vegetation as possible on stream banks.

3. Constructing waterbody crossings as perpendicular to the axis of the waterbody channel as engineering and routing conditions allow in order to minimize the area of wetland impact.
4. Maintaining ambient downstream flow rates throughout the construction process as much as possible to preclude adverse effects to fauna and flora.
5. Removing all materials and structures used for construction from the waterbody and substrate after construction.
6. Restoring stream channels and bottoms to their original configurations and depths following construction.
7. Stabilizing stream banks and adjacent upland areas permanently using erosion control measures and vegetative cover as soon as possible after construction.
8. Inspecting right-of-way periodically during and after construction, repairing erosion control measures and performing restoration, as needed, in a timely manner.

#### 4.5.2 General Procedures

The following general conditions apply to all waterbody crossings:

##### Schedule

Construction across waterbodies should be completed in the shortest amount of time possible to minimize the duration of potential adverse impacts. If site-specific physical conditions make these time restrictions impractical, then a site-specific plan will be developed before work is initiated.

### **Additional Work Space Areas**

Construction staging areas for waterbody crossings will be as small as possible while still allowing for safe working conditions and prefabrication of pipeline segments that will be installed in the waterbody. Other additional work spaces such as additional spoil storage areas at waterbody crossings will also be limited to the size necessary to perform the required function. All additional work space areas will be located approximately 10 meters from the stream banks where topographic conditions permit. Four river crossings require extra work space for spoil storage including the Rio Grande, Rio Parapeti, Rio San Miguel and Rio Otuquis. Dimensions of these work spaces on each side of the rivers range from 30 to 60 meters (see Section 4.4.2).

To minimize the potential for contaminants entering the waterbody contractors will follow the spill prevention measures described in Section 8.0. Hazardous materials, chemicals, fuels, or lubricating oils will not be stored nor will concrete coating activities be performed within 15 meters of stream banks. In addition, construction equipment will not be refueled or serviced within 15 meters of stream banks except in absolutely necessary circumstances. Such activities will be performed according to the spill prevention measures described in Section 8.0 unless 1) the equipment cannot be reasonably moved 15 or more meters away from the stream banks without unnecessarily harming the environment or 2) the equipment being fueled or serviced is mounted on a barge.

### **Spoil Pile Placement/Control**

Trench spoil will be stored at least three meters back from stream banks at waterbody crossings where possible. Spoil placed up-gradient of stream banks will be contained with sediment control devices to prevent spoil materials from flowing into waterbodies or off of the right-of-way.

### **Equipment Crossings**

Construction of equipment crossings will occur during the clearing and grading process. Protective measures will include the use of 1) timber mats laid adjacent to and across streambeds

if banks are high enough, 2) flume pipes covered or 3) portable bridges approved by the environmental inspector. The size and number of the flume pipes will be sufficient for the maximum stream flows anticipated.

If fill for equipment crossings includes soil or other material which could erode into the waterbody then sandbags will be used on both sides of the crossing. Sandbags will be placed in the waterbody at the upstream and downstream ends of the crossing to stabilize and seal any flume pipes used. To prevent erosion, sandbags will be placed high enough along both sides of the equipment crossing to contain the fill material during construction.

#### 4.5.3 Waterbody Crossing Procedures

There is one primary construction method which will be applied to waterbodies for this project, namely Open-Cut Construction. The specific procedures implemented will be based on the waterbody size, inundation level, flow rate and environmental sensitivity. Although Directionally Controlled Horizontal Drilling is not expected to be used on this project there may be circumstances such as environmental conditions or time constraints that require it.

**METHOD I:** Open-Cut Waterbody Construction

**METHOD II:** Directionally Controlled Horizontal Boring Construction

#### **METHOD I: Open-Cut Waterbody Construction**

Open-Cut Wetland Construction (Figure III.9) will be used to cross the larger rivers and standing water wetlands along the project. This method uses wetland trenching techniques in deeper or flowing waterbody wetlands as site conditions require at the time of construction.

#### **Clearing/Grading**

1. Clearing crews may cross waterbodies once prior to installing equipment crossings. Clearing crews may construct temporary crossings by using timber mats or

occasionally logs. Temporary crossings may not be used by work crews. Clearing crews will be responsible for constructing the long-term equipment crossing.

2. The construction of the equipment crossing will use 1) timber mats with or without flume pipe(s), 2) clean fill and flume pipe(s) or 3) a Flexi-float or portable bridge.
3. Contractors will install flume pipes as necessary in the waterbody for the equipment crossing in order to maintain the existing flow and course of the waterway. The size and number of the flume pipes will be sufficient for anticipated flows.
4. If it is likely that more than one week will pass between the time when the area is cleared and when the pipe is installed then the clearing crew may install sediment barriers at the top of the stream bank if no vegetative strip is left.
5. Contractors will implement erosion and sedimentation controls, and bank stabilization procedures at all stream banks as described in Section 3.2.

#### **Trenching/Lowering-in/Backfilling**

1. If mainline ditching crews excavate waterbody crossings then the ditching, lowering-in, backfilling, and restoration will be completed within the shortest time possible. If ditching, lowering-in, backfilling, and restoration of the waterbody crossing cannot be completed in a short time frame, then a site-specific work plan will be developed for approval by the environmental inspector.
2. If blasting is required, then the banks of the waterbody will be left intact (hard plugs). If soft plugs must be installed then the pipe installation shall be completed as soon as possible upon completion of the blasting.

3. Contractors will use a backhoe or dragline to excavate the trench across the waterbody. Equipment used to excavate the trench will work from the waterbody banks or equipment crossings, or by straddling the trenchline when the width of the waterbody prohibits excavations solely from the banks. The depth of trench will be sufficient to allow a minimum of 1½ meter of cover over the pipeline below the streambed unless otherwise specified.
4. Where necessary, the grade of the stream banks will be reduced to form a gradual slope, and soil will be pushed or pulled away from the waterbody to minimize siltation.

#### **Cleanup/Restoration**

1. Stream channels will be backfilled, re-contoured and restored immediately.
2. Flume pipes, sand bags and other material used for the waterbody crossing will be removed during restoration. To the extent practical, the stream bottom and banks will be restored to their preconstruction contours or better.
3. Equipment crossings will be left in place if they are determined to be needed for access.
4. Jute thatching, rip-rap or other erosion control matting or material will be used to stabilize the waterbody banks where necessary.

#### **METHOD II: Directionally Controlled Horizontal Boring or Other Site-Specific Crossing Techniques**

Directionally Controlled Horizontal Boring is referenced as a possible construction method if site conditions and time constraints require its use. However, the method is not expected to be used in the Bolivian Sector of this project. Details of this method are provided in Section 4.3



### Specialized Construction Procedures.

Site-specific crossing techniques will be developed for unexpected or adverse conditions at individual rivers, ponds and lakes which cannot be crossed by Method I. These techniques will be drawn from the methods described above and will be developed based on the experience of the construction management team. The environmental inspector will review the selected waterbody crossing technique.

#### **4.5.4 Combined Wetland/Waterbody Crossings**

Wetlands and waterbodies are commonly found together as one ecosystem. The selection of construction crossing methods will be based on field conditions and requirements to protect both resources equally. It is essential that individual construction methods be assigned to the different contiguous wetland and the waterbody areas to protect the entire resource. Site-specific crossing methods will be designed for complex systems.

## 5.0 SUB-PROGRAM 2.2: WASTE MANAGEMENT

### 5.1 Objectives

The objective of this sub-program is to minimize any adverse impacts to the environment, and limit risk exposure by providing guidance in the management of wastes. Moreover, key technical requirements aimed at ensuring compliance with Bolivian regulations and World Bank guidance documents are mentioned throughout this section. Bolivia's environmental regulating body, at the national level, is the Ministerio de Desarrollo Sostenible y Medio Ambiente (MDSMA). The Waste Management Sub-Program has been designed to assist the Construction Contractor in achieving the following waste management goals:

- Identify and classify wastes.
- Minimize the generation of wastes to be treated and/or disposed.
- Select appropriate treatment/disposal alternatives.
- Document all aspects of the waste management process.
- Achieve proper final closure and/or final disposal to all waste streams.
- Ensure regulatory compliance in waste management practices.

### 5.2 Organization

The Waste Management Sub-Program has been organized into three distinct components requiring specialized waste handling and disposal protocols. These components are the following:

- Solid Waste Management.
- Sanitary Waste (i.e., wastewater) Management.
- Hazardous Waste Management.

The Contractor shall designate the necessary staff to implement an environmentally safe program within each construction spread. The designated staff shall include, at a minimum, a Waste Management Coordinator who will respond to the Environmental Manager on each of the waste

management categories throughout the duration of the project. The Coordinator will delegate daily waste management responsibilities to key staff stationed at work camps, storage yards, transportation routes, and pipeline construction right-of-way. Daily waste management activity logs shall be maintained by these individuals. The Coordinator shall compile the data from these logs and provide weekly summary reports to the project's Environmental Supervisor on each of the primary components (solid waste, sanitary waste, and hazardous waste). Concurrently, the Environmental Inspection staff will oversee and record waste management practices at their designated work area(s) and report all non-compliance to the project's Environmental Supervisor.

The EPC Contractor's Environmental Manager shall have authority to stop all inappropriate waste management activities and to require immediate restoration for any environmental damage. The environmental inspectors will report any significant environmental damage as soon as possible, to the Environmental Supervisor, who has the authority to request cessation of inappropriate activity, if necessary. Non-compliance will be reported to the Environmental Committee by the Environmental Supervisor. The EPC Contractor shall be responsible for all fines, penalties and claims resulting from improper waste management practices by his staff and/or his sub-contractors at work camps, right-of-way vehicle transportation routes, and storage yards.

### **5.3 Solid Waste Management**

#### **5.3.1 Introduction**

Personnel residing in work camps will produce significant amounts of domestic garbage, which shall be properly disposed of in MDSMA-approved landfills or onsite landfills. In terms of existing landfills, for example, the Contractor may investigate the possibility of utilizing an existing sanitary landfill in Santa Cruz (i.e., the Normandia or the Proyecto Montero landfills). If onsite landfills are constructed, the Contractor shall design and construct these in accordance with minimum design standards described herein and under all applicable regulatory guidelines. If offsite landfills are utilized, the Contractor shall still be responsible for proper management of all wastes generated by the project.

### 5.3.2 Objectives

The objectives of this Solid Waste Management Program are to:

- Avoid generation of solid wastes (i.e., source reduction).
- Find other uses for waste products (i.e., reuse).
- Send materials to re-cycling centers, if one is available.
- Properly dispose of or landfilling the remaining solid wastes.

Source reduction and reuse are usually preferable to recycling. Therefore, the solid waste management hierarchy is generally: source reduction, re-use, recycling, treatment, and disposal. Due to the project's limited ability to reduce/reuse waste streams, and the absence of recycling centers and local disposal facilities in these remote areas, it is anticipated that on-site landfilling (i.e., at work camps) will have to be performed. As such, this section describes minimum design, construction, operation, and closure standards for the onsite landfills. Nevertheless, the Contractor is encouraged to pursue alternate external means of managing the solid wastes in an environmentally safe manner.

### 5.3.3 Sources of Solid Wastes

The following table presents the primary solid waste sources, the types of waste generated, and the anticipated quantities that will be generated by each:

Source of Solid Waste	Description of Types of Solid Waste Products Generated by this Source	Anticipated Percentage of Total Quantity of Solid Wastes from this Source (%)	Anticipated Total Quantity of Monthly Wastes from this Source (Tonnes/month)
Work Camps	Food Service Wastes	25	5
	Office papers	20	4
	Moisture	15	3
	Metals	10	2
	Plastics	10	2
	Glass	5	1
	Other combustibles	5	1
	Other non-combustibles	5	1
	Grounds Maintenance	5	1
		TOTAL <sup>1</sup>	100
Right-of-Way	Pipe Liner - Heat Shrink Wrappers <sup>2</sup>	37	14
	Welding Rods Stubs <sup>3</sup>	18	7
	Metal Band Bevel Protectors <sup>4</sup>	32	12
	Paper/plastic/other	13	5
		TOTAL	100
<p><b>Notes:</b> 1) Calculated based on a 700 workers per camp, multiplied times a domestic waste per worker ratio of 0.91 kg/day, times 31 days/month;</p> <p>2) Estimated based on 48,260 joints, times 2 joints per pipe, multiplied times 1.3 kg/joint, over 9 months of construction;</p> <p>3) Estimated based on 48,260 joints times 6.3 kg/joint multiplied times 20% waste over 9 months of construction;</p> <p>4) Estimated based on 48,260 joints, times 2 joints per pipe, multiplied times 1.14 kg/joint, over 9 months of construction;</p>			

### 5.3.4 Solid Waste Classification Procedures

Solid wastes shall be classified as either hazardous or non-hazardous. In general, the steps involved in identifying hazardous wastes are as follows:

- Determine whether the material is listed as a hazardous waste.
- If not, then perform characteristic identification tests.

A solid waste containing any of the hazardous constituents is considered hazardous unless the Contractor can prove otherwise. A complete characterization of the waste shall include determination of physical and chemical properties. Some details on classifying hazardous wastes are provided in Section 5.5.

Infectious wastes (i.e., biohazardous wastes) are not included in this discussion. The Contractor must include infectious wastes in the Waste Management Plan. The Contractor shall proceed to properly identify biohazardous wastes by consultation with work camp medical staff and local authorities. Under no circumstance shall biohazardous wastes be placed or mixed with non-hazardous or hazardous wastes.

### 5.3.5 Solid Waste Management Principles

Solid waste management will be implemented based on the following principles:

- Training workers on solid waste management principles.
- Proper distribution and labeling of solid waste receptacles.
- Minimize waste generation.
- Maximize recycling and reusing.
- Dispose wastes properly.

The Contractor shall provide a site-specific Waste Management Plan for each facility, and the appropriate solid waste management staff and facilities to implement these principles during the construction phase.

### **5.3.6 Solid Waste Training**

A key element in achieving proper solid waste management will be training of all staff members on safe waste management practices. Worker awareness of proper waste management practices will generally produce good results and savings to the Contractor. For example, if arrangements with local recycling centers are made, the workers will be of great assistance in segregating materials rather than combining them with landfill materials. The Contractor shall include a brief course on the advantages of responsible waste disposal practices. Worker incentives should also be implemented to encourage participation in the program.

### **5.3.7 Solid Waste Receptacles**

Solid waste receptacles shall be located within the work camps and storage yards to encourage proper disposal. These shall be widely spread throughout these areas and labeled as plastics, metals or as any other non-biodegradable material categories.

Portable receptacles (e.g., sacks) shall also be available throughout the working portions of the right-of-way. These receptacles shall be mounted on all track equipment and welding machines, clearly identified as to the type of refuse, and emptied each day. The waste receptacles shall be moved forward simultaneously with right-of-way construction advancement and not left behind on the completed portion of the right-of-way. Under no circumstance shall receptacles containing wastes be left uncovered overnight. Easily bio-degraded materials such as foods may be dropped within the pipeline trench as long as they are covered on the same day. Plastics, metals, and glass used by the workers or resulting from construction operations shall not be discarded within the trench. No plastics or synthetic polymer materials shall be burned anywhere on the project.

### 5.3.8 Solid Waste Generation Minimization Procedures

Solid waste minimization procedures shall include both source reduction and reuse. Source reduction shall involve preparing strategies to reduce the quantities of materials that are brought to work camps, work sites, and the right-of-way. The Contractor shall prepare a *Source Reduction Plan* which considers the following elements:

- Purchase products with minimal packaging (e.g., food and paper products).
- Use products with greater durability and repair-ability (e.g., durable work tools, appliances).
- Substitute reusable products for disposable single-use products (e.g., reusable pipe skids).
- Use fewer resources (e.g. two-sided photocopying).
- Increase the recycled materials content of products (e.g., investigate items readily accepted by local recycling centers).

The Contractor should also investigate local opportunities for reusing products (e.g., appliances, furniture) rather than discarding them. The environmental inspectors will review the Contractor's Source Reduction Plan and verify compliance with its objectives throughout the duration of the project.

### 5.3.9 Solid Waste Recycling Procedures

Recycling will be performed whenever possible. The Contractor shall contact local authorities and verify the existence or absence of local recycling centers at the onset of the project. If these are located and contracted, all paper, wood, plastics and other dry refuse shall be collected in clearly identifiable receptacles and stored to be taken to recycling centers whenever possible.

Large tires (i.e., approximately 1.2 meters feet diameter) are used by 18-wheel construction materials hauling trucks. It is estimated that approximately 35 tires per week will blow-out and need to be discarded. For an estimated nine month construction period, this would result in approximately 1,300 tires. It is recommended that these be given or sold at a minimal price to



local companies for retreading or recycling. Under no circumstance shall tires be burned or discarded in the landfill.

### 5.3.10 Guidelines for Onsite Landfill Design

All non-recyclable solid wastes must be transported to existing and pre-approved landfills whenever possible. In the event that suitable landfills are not available, the Contractor will be allowed to operate properly designed and constructed landfills at the work camps. Such landfills must meet acceptable technical standards and all local and national laws prior to their construction. Before constructing an onsite landfill, the Contractor shall prepare Landfill Design Guidelines for his staff to follow. Minimal technical design specifications for the onsite landfills shall include:

- Observing minimum distance threshold values.
- Landfill siting investigation.
- Detailed sizing calculations (i.e., if waste quantities differ from those anticipated herein).
- Sub-base and base barrier isolation.
- Leachate collection system.
- Passive Gas Venting System.
- Daily operations standards manual, including daily refuse coverage plans, rodent control, aesthetics, odor control, and perimeter security.

#### Minimum Distance Criteria

In lieu of additional site specific criteria, the Contractor shall observe, at a minimum, the following distance threshold values in designing the landfills:

Description of Surface Feature	Minimum Distance Criteria (Meters)
Wetland, lake, or pond	1000
River	1000
Flood Plain (100 year storm)	≥6 meters above
Major Highways	300
Public Areas (e.g., parks, schools)	300
Critical Habitat Area	2500
Landing Strips	1500
Water supply wells (Work camps)	150
Other water supply wells	400

The Contractor shall locate each landfill in areas meeting the above criteria and offering minimal risk to humans, wildlife, and natural systems.

### Preliminary Site Evaluation Parameters

A qualitative analysis of parameters that may potentially impact the level of protection required at each onsite landfill should be performed. These parameters should at least include: 1) soil types, 2) flooding potential, and 3) environmental sensitivity.

### In-Situ Data Collection Program

A basic in-situ data collection program should include, at a minimum, 1) a geotechnical testing program, 2) a flood potential analysis, and 3) an assessment of the environmental sensitivity of the area.

Geotechnical characteristics of field materials (e.g., subsurface soils) should be verified prior to final site selection and landfill design. The geotechnical investigation should

include at least two boreholes to a minimum depth of seven (7) meters per landfill site. Data should be obtained on both field and laboratory hydraulic conductivity, subsurface material descriptions, Atterberg limits of fine grain materials, grain size distribution curves, clay strata thickness data, natural moisture content, and degree of saturation. At sites where the water table may reach within the upper 10 meters, the borings should be continued until penetrating the water table. Additionally, an assessment of flooding potential for each site should be performed. In the absence of historical water level data, other data sources such as topographic maps, satellite maps, field observations, and interviews with neighbors should be reviewed. A field reconnaissance for sensitive receptors (e.g., water bodies, wetlands, wildlife, neighboring residents) within two km of each landfill site should also be performed. Moreover, potential stormwater and treated sewage water discharge routes and receiving bodies should be identified.

#### Preliminary Landfill Sizing Parameters

Each landfill should be designed to contain all of the non-hazardous solid wastes produced during the project, assuming each work camp will be used for approximately two-and-one-half months. In the absence of additional data, the Contractor may use the following table to size a landfill:

Landfill Sizing Assumptions and Calculations	
Assumption Type	Parameter
a) Work Camp Population (Note: for Work Camp No. 1 use 120 workers)	700 workers
b) Solid waste per worker generation rate (kg)	0.91kg/worker
c) Daily solid waste generation per Work Camp (a * b)	637 kg/day
d) Maximum Work Camp operating period	75 days
e) Weight of solid waste generated in operating period © * d)	47,775 kg
f) Weight of solid wastes generated at the right-of-way (2.5 months)	102,000 kg
g) Total Weight generated at right-of-way and Work Camp (e + f)	150,275 kg
h) Assumed density of solid waste	130 kg/m <sup>3</sup>

Landfill Sizing Assumptions and Calculations	
Assumption Type	Parameter
i) Estimated volume of solid wastes generated in 61 days (g ÷ h )	1156 m <sup>3</sup>
j) Assumed ratio to account for daily soil coverage requirements	1.25
k) Estimated area needs for solid waste landfilling @ each work Camp (Note: Assumes 2 meters deep pit above sub-base available for landfilling - closure cap excluded) (g ÷ 2 meters )	722 m <sup>2</sup>

Based on the above Table's assumptions and calculations, the minimal dimensions for each landfill should be on the order of 27 meters wide by 27 meters long, and 3 meters deep including approximately 1 meter for closure cap (Figure III.10). A factor of safety (e.g., 1.4) may be added to the area requirement to account for unforeseen solid waste sources. Moreover, if the anticipated waste from the right-of-way is anticipated or observed to be higher than that estimated, a larger area should be used. Experience gained from solid waste management at the first full-size work camp should be helpful in sizing subsequent landfills. Adjustments to the design may be made based on these data. A suggested location for the landfill just outside the work camp's area is presented in Figure III.11. If the work camp area allows, however, the landfill should be located further away from the workers' living and entertainment quarters. Special attention should be given to preserving the minimum distance requirements from the landfill to onsite water supply wells.

### Preliminary Design of Landfill Sub-base and Base

The sub-base for a liner system refers to the ground on which the liner is constructed. The sub-base, soil liner, geosynthetic liners, and tile drain (see Figure III.12) shall be designed and constructed to prevent leachate from reaching the underlying native soils below the refuse. The sub-base materials should be compacted to 90% or 95% modified Proctor density. Liner materials may include clay, bentonite-amended soil, synthetic clay liner, and synthetic membrane. Varying degrees of construction methodologies and quality control measures may be applied depending on the Contractor's choice of base materials.

A simple, but effective system consisting of one layer of geosynthetic liner, one layer of low permeability material, a second layer of a geosynthetic liner and a drainage layer below the refuse (Figure III.12a) should be adequate for most of the landfill sites.

### **Preliminary Design of Leachate Collection System**

The leachate collection system shall consist of a leachate trench and pipe, leachate line clean-out ports, a leachate collection pump and a leachate storage tank. The storage tank may not be necessary if the system is designed to be discharged to an onsite package wastewater treatment plant (Section 5.4). Several components of a leachate collection system are shown on Figures III.13a and III.13b. A detailed design of the leachate collection system should be performed prior to landfill construction.

### **Preliminary Design of Passive Gas Venting System**

The passive gas venting system used at each landfill shall consist of isolated gas vents (Figure III.14). One or two vents per site should be sufficient for the anticipated size of these landfills. The vents may be connected through a perforated pipe (Figure III.14a) or a gravel and dirt cap trench (Figure III.14b).

### **Guidelines on Daily Operating Standards**

The Contractor shall prepare Landfill Operations Guidelines establishing standards on daily operating procedures at the landfills. These standards shall include, at a minimum, the following elements: a) staff's landfill construction and operating responsibilities; b) daily coverage procedures; c) degree of compaction to attain; d) weather considerations; e) record-keeping; f) control of odors, dust, rodents, insects and birds; g) perimeter fencing requirements; h) safety and warning signs installation; i) handling of special wastes; and j) information on waste unloading area protocol. The Contractor's Waste Management coordinator shall oversee that the standards in the *Landfill Operations Guidelines* are implemented.

### 5.3.11 Guidelines on Solid Waste Transportation Procedures

Transporting solid waste from the right-of-way and storage yards will be necessary during the construction phase of the project. The Contractor shall prepare Solid Waste Transportation Guidelines for staff and solid waste haulers describing proper solid waste transportation procedures. The guidelines shall include, at a minimum, the following elements:

- Solid waste vehicle drivers are to avoid making un-authorized and unjustified stops along the transport route.
- Solid waste vehicles must be equipped with the following features.
  - a) Enclosures (e.g., covers) to prevent dropping and blow-away of solids along the route.
  - b) Mechanically capable of performance under adverse weather conditions.
  - c) Must meet the design loaded capacity and not be overfilled.
  - d) Must be properly and frequently sanitized to avoid undesirable odors.
- A schedule of solid waste collections for each vehicle must be proposed.

The Contractor shall be responsible for proper execution of all aspects of the solid waste transportation procedures. It is imperative that the Contractor educate the solid waste haulers on proper procedures to provide an environmentally safe transport from point of collection to the final

destination. The Contractor shall secure all licenses and permits for waste transport and oversee that staff abides by all laws and regulations for safe transport of solid waste in Bolivia (MDSMA Regulations No. 1333, Title IV, Chapter VI).

### 5.3.12 Solid Waste Final Disposal Procedures

The Contractor shall perform all necessary procedures for final disposal and closure of all solid waste generated, collected, and landfilled as a result of project construction. The Contractor shall guarantee in writing that all waste management activities and closure have been performed in a technical, legal, sanitary, and environmentally acceptable manner. Any claims resulting from

improper solid waste management closure shall be the responsibility of the Contractor and the EPC Contractor. Minimum criteria for closure has been provided below:

- Hazardous materials must not be contained within the onsite landfill.
- Excavated soils and rock materials from offsite locations (e.g., right-of-way) must not be placed in the landfill.
- All landfill components (e.g., base layers, leachate collection, gas collection, etc.) must have been properly designed, constructed, and operated prior to closure.
- All necessary permits and consent agreements from land owners must be on file and available for review by the environmental inspectors prior to closure.
- A landfill final cover must be designed, constructed, and inspected by the Contractor. Environmental inspectors shall observe the landfill closure operations.

The primary purpose of the landfill final cover is to minimize post-closure leachate resulting from percolation of rainfall and to convert the percolation into surface runoff and/or evapotranspiration without causing erosion to the cover. The Contractor shall select design components and corresponding building materials to meet this primary objective. Other objectives of the landfill cover design shall include:

- Allow the landfill site to return to some beneficial use.
- To make the site aesthetically acceptable.
- Prevent blowing of litter and dust unto adjacent properties.
- Suppress fire dangers.
- Contain gases and vapors.

Minimal design criteria for the final cover's layered system (Figure III.12) shall include the following components:

- **Compaction of refuse layer:** Compaction of the refuse shall be performed using a D-8 dozer or equal for, at least, four passes.

- Layer 1 (Grading Layer): This layer shall consist of coarse grained materials and shall be constructed to a thickness of no less than 20 cm;
- Layer 2 (Barrier Layer): This layer provides a barrier against infiltration. Materials used for this layer shall be either low permeability clays or synthetic membranes. The thickness of the layer may vary (e.g., by combining synthetic and natural materials) as long as the design specifications are technically acceptable.
- Layer 3 (Protective Layer): This layer provides protection against desiccation cracks and a medium for root growth to occur. The thickness of this layer should be at least 30 cm.

The Contractor may select an alternate final cover design as long as the design meets or exceeds acceptable technical engineering practice standards and Bolivian laws and regulations governing the matter. In any event, the environmental inspector must approve the design and construction of the final cover.

## **5.4 Domestic and Sanitary Waste**

### **5.4.1 Introduction**

Sanitary waste (i.e., sewage or wastewater) will be generated as a result of human activities at the work camps and on the right-of-way. Due to the project's remoteness, there will be little opportunity for raw or partially treated wastewater to be released to municipal or external sanitary waste systems. As such, the Contractor must devise plans and build the infrastructures to properly manage these wastes. The Contractor shall manage the sanitary waste in accordance with design guidelines presented herein and with all appropriate Bolivian Laws and Regulations on Water Resources (e.g., MDSMA No. 1333; Reglamento en Materia de Contaminación Hídrica).

### **5.4.2 Objectives**

The sanitary waste management component is designed to:

1. Collect and transport all sanitary wastes to onsite treatment facilities.



2. Treat all sanitary waste streams to appropriate government standards and World Bank standards, whichever is stricter.
3. Discharge the resulting treated effluent in a legal and environmentally safe manner.
4. Monitor water quality parameters and flows of the effluent and receiving body. In areas where a receiving surface water body is unavailable, the Contractor shall design and build the necessary land percolation and irrigation system to discharge the treated effluent. Some of the key legal and technical requirements are included in this section. It is the Contractor's responsibility to follow these and any other requirements imposed as a result of permit conditions by the MDSMA and local government agencies.

#### 5.4.3 Sources of Sanitary Wastes

Approximately 700 workers will be stationed at work camps throughout the duration of the project. At least one work camp will be active at all times. Sanitary waste will be treated by a package wastewater treatment plant. Table III.3 presents guidance on estimating wastewater flows generated by various types of facilities. Considering the anticipated work camp activities such as food services, laundry, sanitation worker showers, clinical, and office facilities, an estimated flow rate of 85 gallons per day per worker or 60,000 gallons/day (230 m<sup>3</sup>-day) for each work camp has been calculated. These values are provided as general guidance. The Contractor, however, shall determine and provide the equipment necessary to handle all sanitary waste generated throughout the construction phase.

The resulting sludge may be buried in the sanitary landfill as long as hazardous materials are not mixed with the wastewater. Sanitary waste generated at the right-of-way shall be disposed in specially dug pits throughout the right-of-way. These will not be transported back to the work camps as the distances will be excessive.

#### 5.4.4 Sanitary Waste Treatment Procedures

Treatment of sanitary waste in the work camps shall be performed using portable extended-aeration package wastewater treatment plants. The extended aeration process purifies the wastewater by destroying the organic compounds and using air to mix and oxidize the volatile materials into gas, water, and sludge. By continued aeration of these concentrated solids, fungus and bacteria grow into colonies. These colonies will attach themselves to the volatile materials breaking it down into water, carbon dioxide and ash. The result is a clear and odor-free effluent. There are several commercially available systems from which the Contractor may choose. Some of the most popular models, contact information, and their features are provided in Table III.4. The information is provided in the form of guidance and not as an endorsement of any particular product. Typical arrangements for two commercially available plants are provided on Figures III.15 and III.16.

It is suggested that parallel systems be chosen, whenever possible, rather than using only one unit to provide greater transportability and system reliability in the event that a unit breaks down. Specification tables on several models are available. Treated effluent shall be discharged nearby surface water bodies or to onsite percolation ponds created by the Contractor. Under no circumstance shall effluent be discharge directly to surface water bodies or percolation ponds without approval from the environmental inspector.

#### 5.4.5 Wastewater Treatment and Effluent Discharge Laws and Regulations

This section provides a summary of the key rules and regulations affecting wastewater treatment plants (WWTP) and the subsequent discharge into water bodies. Nevertheless, all the laws pertinent to wastewater management are not included here. As such, the Contractor is referred to Bolivian Law No. 1333 and corresponding section on "Reglamento en Materia de Contaminación Hidrica" (i.e., the Water Pollution Regulations section of the law) for further information. The primary areas of regulations related to wastewater management discussed herein include:

- Treatment system requirements.
- Legal and technical requirements on effluent discharge.
- Limiting conditions on discharge water quality parameters.
- Limiting conditions on flow rates to receiving bodies.

**Treatment System requirements .** Some of the key requirements related to the operations and security that must be implemented at the onsite wastewater treatment facility are provided below:

1. **Responsible Parties:** The treatment system shall operate under the direct responsibility and supervision of the Contractor or his legal representatives. The Contractor shall ensure that personnel are properly trained to operate and maintain the WWTP system.
2. **MDSMA Authority:** If wastewater treatment standards are not met, the MDSMA reserves the right to require modifications to the system, operations, and maintenance until satisfactory conditions are met.
3. **Access to Plant:** To minimize contamination risks, access to unauthorized persons to the treatment system is prohibited. The Contractor shall also take all necessary safety measures to prevent wildlife from entering the facility.
4. **Flow Measurement Requirements:** Normally, MDSMA requires that treated effluent discharge to a receiving water body exceeding 5 l/s be monitored by direct methods (e.g., flow meters). In this case, due to the transient nature of the work camp facilities, it is possible that the MDSMA will allow for indirect measurements such as the use of a V-notch weir.
5. **Partial or Complete Plant Shut-Down:** In case of a temporary need to shut-down the treatment plant, the Contractor must contact the appropriate governmental agencies immediately. In such cases, flows shall be temporarily diverted to an onsite emergency overflow tank or lined pond until the problem is resolved. In the event that additional time is needed, the Contractor shall contact the Environmental Manager to request authorization

from authorities to discharge raw or partially treated effluent for a specified period. The Contractor shall also present, in writing, an action plan for repair or replacement of the unit(s) and take all necessary measures to re-start the plant as soon as possible.

**Legal and Technical Requirements on Effluent Discharge.** With respect to discharge to Water Bodies, the Contractor shall recognize the following Articles from Law No.1333's Water Pollution Regulations section:

1. Authorization to discharge effluent to surfacewater bodies shall be included as part of the Declaración de Impacto Ambiental (i.e., "DIA" or Environmental Impact Declaration), the Declaración de Adecuación Ambiental (i.e., "DAA" or Environmental Compliance Declaration), and the agency's Certificate of Authorization (Article 16).
2. The DIA, DAA, and Certificate of Authorization shall include a commitment on the part of the Contractor or his legal representative to submit water quality reports, as performed by an authorized laboratory, on characterizing the effluent. The reports shall include analyses on those parameters for which the agency has established fixed limits (Table III.5).
3. The discharge of treated effluent to a receiving water body shall be limited by the following criteria:
  - Under no circumstance shall raw (untreated) wastewater be released to a water body or land surface. Instantaneous discharge of large volumes of treated effluent to a river shall be prohibited. Discharge rates of treated effluent shall be controlled not to exceed 1/3 of the receiving body's flow rate (Article 44).
  - Discharge of treated effluent which exceeds 20% of the receiving water body's minimum flow rate shall be performed in a manner as to avoid: 1) erosion problems, deterioration of the receiving body, or damages to third parties, 2) must not affect the water body's water quality beyond the parameters established for its

class, and 3) the average daily rate for the treated effluent shall be less than 20% of the minimum daily flow rate of the receiving river for a return period of five years (Article 45).

- Discharge of treated effluent to natural wetlands is restricted, as the law (Article 51) requires the establishment of special protection schemes for these. As such, it is recommended that such discharges be avoided.
  - Prior to discharge, all raw or partially treated effluent must be treated to a level that shall not exceed the water quality standards for the receiving water body. The law allows for a mixing zone in the receiving body ranging from 50 to 100 meters from the point of discharge. The EPC Contractor's Environmental Manager shall develop a water quality testing program to establish background parameters (i.e., those listed on Table III.5 and any other water quality parameter suspected to be exceeded by the effluent) for each receiving water body prior to discharge.
4. The Contractor shall perform monthly water quality parameter testing on the treated effluent, as per parameters listed on Table III.5, for samples taken during peak effluent discharge hours. Two independent tests on background water quality of the receiving body shall be performed. In case any of the parameters exceed established limits, the Contractor shall proceed to take a second sample, also during a peak discharge period, for analysis. The results shall be submitted to the Environmental Supervisor for further steps to follow. All sampling and chemical analyses shall be performed by an MDSMA authorized laboratory.

### **Effluent Discharge Violations**

Article 99, Title IX, Chapter 3 of Law No. 1333 establishes a listing of administrative violations for the following reasons:

- Temporarily or permanently altering or modifying the treatment plant violating compliance with Articles 56 or 57 of the Water Pollution Regulations.
- Exceeding the maximum allowable effluent discharge values (Table III.5) once dilution has occurred in the receiving body for a specified period.
- Discharging of radioactive substances to sanitary collector or water bodies.
- Failing to notify the environmental authorities in the event of a partial or total interruption of the wastewater treatment system due to equipment failure.
- Releasing effluent, whether raw or partially treated, without obtaining a license or discharge permit.
- Releasing effluent, whether raw or partially treated, with water quality parameters exceeding values established by Table III.5 or the discharge permit.
- Releasing effluent, whether raw or partially treated, in massive and instantaneous flow rates to a river.
- Releasing stormwater to the wastewater system or releasing wastewater, raw or partially treated, to a stormwater collection system.
- Failing to plug abandoned wells.
- Contaminating water bodies with hydrocarbons.
- Falsifying information or water quality reports.
- Presenting effluent water quality reports in an untimely manner or violating reporting requirements.

## 5.5 Hazardous Waste

### 5.5.1 Objectives

The Contractor shall manage all hazardous wastes in an environmentally safe manner. All hazardous wastes shall be collected, inventoried, and properly contained in temporary storage areas at work camps or at designated locations along the pipeline route. Final disposal shall be at authorized hazardous waste disposal facilities or recycling centers. Before filling out a Transport Manifest for final disposal or recycling of hazardous wastes to these facilities, the Contractor shall pack and label all hazardous wastes in a safe and secure manner.

### 5.5.2 Sources of Hazardous Wastes During Construction

The following table presents a listing of the anticipated hazardous waste sources, types and quantities to be generated at each of the project facilities or areas:

Source of Hazardous Wastes	Anticipated Types of Hazardous Waste	Anticipated Quantities of Hazardous Wastes
<b>Heavy Construction Equipment: Track Equipment</b> (assumes 55 units will be used for both spreads)	Used Oil <sup>1</sup>	8250 gallons
	Used Oil Filters <sup>2</sup>	110 filters
	Used Batteries <sup>3</sup>	25 batteries
<b>Heavy Construction Equipment: Welding Machines</b> (assumes 60 units will be used for both spreads)	Used Oil <sup>4</sup>	675 gallons
	Used Filters <sup>5</sup>	540 filters
	Used Batteries <sup>6</sup>	30 batteries
<b>Vehicles (Small-25 units- Each Using 1.25 gallons of oil per change)</b>	Used Oil <sup>7</sup>	281 gallons
	Used Filters <sup>5</sup>	225 filters
	Used Batteries <sup>6</sup>	12 batteries
<b>Vehicles (Trucks-35 units - Each Using 3.00 gallons of oil per change)</b>	Used Oil <sup>7</sup>	945 gallons
	Used Filters <sup>5</sup>	315 filters
	Used Batteries <sup>6</sup>	15 batteries
<b>Vehicles (Pipe Flat Bed Trucks-40 units - Each Using 4.50 gallons of oil per change)</b>	Used Oil <sup>7</sup>	1620 gallons
	Used Filters <sup>5</sup>	360 filters
	Used Batteries <sup>6</sup>	20 batteries
<p>Notes: 1) Calculated based on 55 units needing an oil change three (3) times per unit during the construction phase, times 50 gallons per oil change for each unit.</p> <p>2) Calculated based on 55 units needing an oil filter change 3 times/unit during the construction phase.</p> <p>3) Assumes that half of the batteries will need to be change during the construction phase.</p> <p>4) Calculated based on all units needing an oil change once a month during a nine-month construction phase times 1.25 gallons per oil change for each unit.</p> <p>5) Calculated based on all units needing an oil filter change once a month during a nine-month construction phase.</p> <p>6) Assumes that half of units will need batteries changed during the construction phase.</p> <p>7) Calculated based on all units needing an oil change once a month during a nine-month construction phase.</p> <p>8) Calculated based on 25 units needing an oil filter change once a month during a nine-month construction phase.</p> <p>9) Assumes (conservatively) that half of units will need batteries changed during construction phase.</p>		



As per the above table, approximately 11,770 gallons of used oil, 1550 used oil filters, and 100 used batteries will be generated by the construction activities. When an oil change is required, the used oil will be collected and temporarily stored on-site in appropriate containers until disposal at an approved facility can be scheduled. If 55-gallon drums are used, then it will take approximately 215 drums to store the used oil. These waste drums will be properly transported and disposed of in accordance with the Project Sponsor's Waste Management Plan.

Air filters used by the vehicles may be discarded in the onsite landfills. Cleansers and solvents may be used on a limited basis for the routine cleaning of equipment and parts. No significant quantities of cleansers or solvents or solutions containing cleansers or solvents will be generated. Any such wastes will be properly disposed of in accordance with the Construction Contractor's Waste Management Plan.

### 5.5.3 Hazardous Waste Classification Procedures

Hazardous substances are those established by Bolivian Law No. 1333's "Reglamento para Actividades con Sustancias Peligrosas" (i.e., Regulations on Hazardous Material Activities). By definition, any substance can be considered hazardous which presents one or more of the following characteristics:

- **Flammability:** If the waste is liquid, other than an aqueous solution containing less than 24% alcohol by volume, and has a flash-point below 60° C as determined by ASTM tests, it is characterized as flammable waste. Examples: solvents and thinners.
- **Corrosivity:** If the waste is aqueous, has pH < 2 or > 12.5 and corrodes plain carbon steel at the rate of 6.35 mm or greater per year, the waste is characterized as corrosive. Examples: acids and alkalis.
- **Reactivity:** A waste is characterized as reactive if it is normally unstable and undergoes violent change without detonating or reacts violently with water, or forms a potentially

explosive mixture with water or generates significant quantities of toxic gas when mixed with water. Examples, percolates, peroxides, and sulfhydrates.

- Toxicity: A TCLP test is performed on the waste. It is potentially dangerous because it contains high concentrations of metal (e.g., As, Pb, Cr), pesticides or organic chemical products. If the materials are not easily classifiable, samples must be sent for analysis to a laboratory.

#### 5.5.4 Hazardous Waste Management Procedures

Hazardous waste must be segregated (solvents, acids, and caustics) so as to avoid reaction from incompatibility. In general terms the following procedures should be observed:

- If the hydrocarbon contaminant is above the limits established by tests, do not mix them in the gathering system with other hydrocarbons.
- Hydrocarbons within the established limits can be used as fuel or be burned.

The Contractor may choose to recycle used oils. The choice of a company to treat or recycle the used oil is an important consideration because the Contractor will be responsible for the dangerous residues generated. Therefore, the Contractor must ensure that the transport, recycling or disposal is performed according to current hazardous materials regulations (e.g., Law No. 1333, "Reglamento para Actividades con Sustancias Peligrosas").

Management of each of the anticipated waste types from motor vehicle maintenance should be performed in the following manner:

- Used oil: Used oil must be gathered in drums or in used-oil gathering tanks. These must be placed in secondary containment zones within the work camp's hazardous waste storage area until final transport.

- Used batteries: Whenever batteries are replaced, used batteries shall be transported to the place of the replacement battery purchase. Used batteries must be stored in an enclosed facility.
- Used filters: Whenever filters are replaced, used filters shall not be discarded at the onsite landfill without being certain that they are not contaminated with hydrocarbons or other substances considered hazardous. Contaminated filters must be transported to an authorized hazardous waste facility.
- Used tires: Whenever tires are replaced, the used tires shall be transported to the place of replacement tire purchase. Tires existing in plants or bases should be eliminated in authorized dumps.
- Dirty rags: Dirty rags or other material contaminated with hydrocarbons should be gathered and incinerated.

As part of the Hazardous Waste Management program, the Contractor must be committed to 1) waste reduction and require this commitment of the workers, 2) establishing training programs for workers on waste reduction, hazardous waste handling, and emergency response, 3) establishing incentive programs for workers to design and use new waste reduction ideas, and 4) performing hazardous waste assessments to list the sources, type, and quantities of hazardous waste sources being generated and to pinpoint potential reduction areas. The Contractor's guidelines to the workers shall make the following statements:

- "Good housekeeping" is the easiest and often the cheapest way to reduce wastes.
- Hazardous wastes shall be maintained in designated weather-protected storage areas.
- All fluid containers must be labeled and covered to prevent contact with rainfall.
- Using "first in, first out" inventory control for hazardous wastes will keep containers from becoming too old.
- Importance of waste stream segregation and maintaining non-hazardous materials from being contaminated.

- Importance of preventing spill and leaks and learning containment procedures.

### 5.5.5 Hazardous Waste Storage Areas and Containers

The Contractor shall construct an area within work camps and storage yards for hazardous waste storage. The storage areas shall be furnished with emergency response and fire fighting equipment. The facility shall have enclosed storage areas and open storage areas with secondary containment (e.g., earth dikes) depending on the materials being stored. Additionally, the Contractor shall develop Hazardous Waste Storage Guidelines for staff to follow. The Contractor must address, at a minimum, the following elements in developing the Hazardous Waste Storage Guidelines:

- Location of Hazardous Waste: Waste must be stored in drums with compatible products. Drum plugs must be tightened with the proper tools (e.g., do not allow plugs to be hand-tightened). Waste must be placed in appropriate containers (i.e., in case of doubt, do not put the product in the drum).

Temporary storage areas will be sited away from surface waters, wetlands, and agricultural areas. Such waste will be transported to a central location for collection and disposal. One person (or one person at each collection/disposal facility) will be responsible for collecting, inventorying, and disposing of hazardous waste. The management and disposal of hazardous waste will be conducted and documented in accordance with Bolivian regulations and/or World Bank guidelines.

- Containers for Hazardous Waste Storage: The Contractor shall establish a procedure for safe practices for the storage of hazardous wastes in Above-Ground Storage Tanks (AST's). Minimum procedures to be followed with regards to AST's are as follows:

- The ASTs construction material must be compatible with the material to be stored.
  - All ASTs with more than 1,000 liters capacity must have a secondary containment system with 110% capacity of the total volume of the largest tank contained therein.
  - The secondary containment area must have a permeability less than  $1 \times 10^{-5}$  cm/sec to contain spilled oil.
  - ASTs must be inspected weekly. The liquid level must be checked to ensure safe containment levels.
  - Inspections and tests must be properly documented. Copies of the certifications and test results must be kept on file for the environmental inspectors' review.
  - The contents of all ASTs must be clearly labeled in letter size of at least 150 millimeters.
  - ASTs must be provided with a statement about the product for which it was built.
  - ASTs shall be designed at least according to the following specifications: a) API 12D "Specifications for a vessel welded on the job for the storage of construction liquids", b) API 650 "Welded steel tanks for the storage of petroleum", and c) API 620 "Design and construction of large tanks of welded steel, for low pressure storage ASME VIII.
  - Underground storage tanks shall not be permitted at any of the project areas during construction.
- Inspection of Hazardous Waste Storage Area: Drums and containers used to store hazardous wastes must be inspected for leakage, deterioration or human errors that could lead to spills. These inspections must be carried out according to current legislation and any deficiency must be immediately corrected. The Contractor's Waste Management coordinator and his subordinates must make regular inspections of the drums and containers used to hold waste and the area where they are deposited. At a minimum, the following criteria on inspection frequency should be stated in the guidelines:

- a. An inventory of all drums and containers located in the hazardous waste (HAZWASTE) storage area must be recorded on a permanent log form.
- b. The data on the log form must be verified during the daily inspection.
- c. No drum or container located in the HAZWASTE storage area can remain there for more than two months.
- d. Inspection records must be held on file by the Contractor for three (3) years from the inspection date.
- e. A report of action taken to correct deficiencies found in the storage area must be attached to the report on the problem. This record is also to be held for three (3) years.
- f. Drum and container areas will be inspected daily for:
  - leaks and deterioration of the leak-containment system;
  - insure that the drums are stored on pallets or stands;
  - insure that all drum openings are closed, and likewise the blockage valves of the spill containment system if there is one, and
  - insure that contained rain water is not contaminated before its discharge.
- g. Inspection records must include the date and time of the inspection, the inspector's name and remarks about the inspection and measures to be taken.
- h. If a drum or container is found to be leaking, record the fact and proceed with the cleanup according to established procedures (see Section 8).

### 5.5.6 Hazardous Waste Transportation

The Contractor shall use drums in good condition with all previous identification removed. All waste liquids must be stored in closed drums. These shall not be completely filled, leaving a 10 cm space for expansion. Solid or semi-solid waste must be contained in open drums.

All containers must be identified using labels approved by the environmental inspector. Only waste materials considered hazardous must be identified as such on the upper part of the drum. All hazardous waste material containers transported outside the camps or from work sites must be identified and transported according to the Title IV, Chapter V of the Regulations on

Hazardous Activities (Law No. 1333). Records of all containers transported to or from the sites must be maintained in the Waste Transport Manifest. Such records must include at a minimum the following information:

- Registered Transporter information (e.g., Company name, Hauler Registration Number, drivers name),
- Date and elimination procedure,
- Number of containers and volumes of wastes,
- Quality of waste,
- Place of final elimination,
- Description of incineration operation.

All hazardous wastes transported beyond the limits of a work camp or storage yard for its later treatment or disposal must be documented in a Transport Manifest. Copies of the Transport Manifest shall be sent to MDSMA and to the Environmental Manager within seven working days after the shipping date, according to the Regulation on the Environment of Law No. 1333.

#### **5.5.7 Hazardous Waste Training**

The Contractor shall be required to establish a training and information program for workers who may be exposed to hazardous materials. The workers performing hazardous waste operations must be informed as to the level and degree of exposure they are likely to encounter. The training program shall include all the elements appropriate for each assigned position. Workers shall not work in un-supervised positions prior to completing the hazardous materials handling course. Training shall include, at a minimum, the following elements:

- Procedures for inspecting, repairing and replacing hazardous waste containers.
- Communication and alarm systems.
- Response to fires and explosions.
- Response to soil or groundwater contamination incidents.
- Procedures for shutting down equipment.

Workers who receive training shall be issued a written certificate upon successful completion of the course. A Material Safety Data Sheet (MSDS) shall be provided to the worker(s) and maintained on file for all chemicals and hazardous waste products. The MSDS sheets shall contain the following data:

- Name and manufacturer of the product.
- Hazardous ingredients and identity.
- Physical and chemical characteristics.
- Fire and explosion Data.
- Physical hazards of the product (e.g., reactivity).
- Health Hazards.
- Special precautions and spill and leak procedures.
- Special protection (information and control measures).

In addition to the information on the MSDS sheet, the Contractor must explain to the worker(s) how to identify and interpret chemical container labels. Labels, for example, might contain the following information:

- Identification: chemical code number, chemical or trade name.
- Signal word: indicates the degree of hazard associated with the product.
- Hazard statement: for example, "extremely flammable" or "harmful if inhaled".
- Precautions: indicates how to avoid injuries or illness such as "Avoid Inhaling" or "Wash Thoroughly After Handling".
- Instructions in case of exposure: provides first aid information on exposure.
- Antidotes: provides measures to counteract the effects of chemical exposure.
- Fire, spill, leak instruction: provides information on how to put out or control fires, and cleanup leaks and spills.
- Notes to Physicians: provides information to physicians in case a worker is exposed to a chemical.



- Handling and Storage Instructions: provides special procedures for handling and storing chemicals.

A good hazardous waste training program must include how to handle chemicals safely and how to use personal protective equipment. It should also explain basic emergency procedures for each of the hazardous waste chemicals. Workers must know the location of first aid kits and communications procedures (e.g., emergency contact agencies, hospitals, persons, and their phone numbers).

## **6.0 SUB-PROGRAM 2.3: RESTORATION AND REVEGETATION**

### **6.1 Objectives**

The objective of this sub-program is to accomplish the rapid, efficient and environmentally sound restoration and revegetation of the pipeline construction right-of-way, particularly along the boundaries of the Gran Chaco National Park and Integrated Management Areas. Specific objectives include:

1. Restoration of native vegetation along the pipeline right-of-way, and in affected adjacent areas, such as abandoned camp sites and areas where material is extracted.
2. Minimization of the impact of permanent installations related to the pipeline (i.e. compressor stations) on adjacent vegetation by revegetating these areas with native species.
3. Creation of a communal greenhouse to ensure the growth of native species which can be utilized for revegetation.

### **6.2 Organization and Responsibilities**

The sub-program will be carried out by CABI, with the collaboration of their consultants, who are experienced in Chaco vegetation and its dynamics. Little is known about regeneration processes in the Bolivian Chaco; therefore, the greenhouse component of this program represents a contribution to the increase in both basic and applied knowledge about Chaco successional dynamics and forestry and medicinal plant management.

### **6.3 Description**

The areas in the Gran Chaco National Park vicinity which are most susceptible to impacts from the gas pipeline are located at the two extremes of the pipeline, where there are marshlands (bañados) associated to the Río Parapetí on the west, and a system of small creeks and sandy areas

associated with the Río San Miguel on the east. These areas are particularly fragile, as they host the greatest concentration of endemic species in the Gran Chaco. Therefore, revegetation efforts will be concentrated on the first and last 30 km of the pipeline right-of-way along the National Park area.

Given the little knowledge on the regeneration capacity of the vegetation in the area, or the suitability of particular native species for effective replanting, the project will sponsor an applied research effort, which will include the following tasks:

1. **Analysis of Vegetation Types Present Along the Pipeline Right-of-way.** This involves evaluation of the restoration potential, the natural succession of regeneration, and the length of time necessary for each vegetation type to regenerate. This will include field work along areas at different stages of succession to identify pioneer species which are most likely to colonize newly open spaces.

The result of this task will be the selection of species deemed suitable for rapid propagation under controlled conditions, which can be used for revegetation.

2. **Collection of Native Vegetation and Strengthening of Communal Greenhouses.** This involves the collection of cuttings and stems of native vegetation to be planted directly or to be taken to a greenhouse prior to planting. During this phase a communal greenhouse will also be established.

The communal greenhouse will serve, not only to advance efforts related to revegetation along the right-of-way, but also to advance the knowledge of the reproduction of forestry species and medicinal plants. This effort will respond to a request from the indigenous communities to promote their capability to manage their natural resources. The creation of the communal greenhouse will also be part of the program on the sustainable management of natural resources of the IPDP (see Chapter IV of the IPDP).

3. **Site Preparation for Revegetation.** Prior to revegetation, the land affected will be prepared. This involves manual or mechanical decompaction keeping the root stock in

place; leveling of ground surfaces, eliminating obstacles to drainage and surface flow; and restoration of topsoil and organic material, particularly in areas of great ecological importance. This activity will be overseen by CABI personnel and carried out by the Construction Contractor, as part of the final clean-up activities.

4. Direct revegetation, which will be accomplished in two ways:

- Direct planting of native pioneer species of rapid growth. This will be done at the beginning of the rainy season.
- Direct planting of cuttings and/or stems from native trees that propagate quickly. This will be done during the mid-rainy season in areas where there is pioneer vegetation coverage.

Some trees of ecologic importance used for revegetation will be grown in a greenhouse, particularly species with slow growth rates. If the trees are grown from seed, they will remain in the greenhouse for at least a year before being planted in areas of ecological importance. If the trees are grown from cuttings or stems, they will remain in the greenhouse for at least six months before being used for revegetation efforts. These trees will be planted during the mid-rainy season.

## **7.0 SUB-PROGRAM 2.4: PROTECTION OF FLORA AND FAUNA**

### **7.1 Objectives**

The objective of this sub-program is to provide measures to protect the flora and fauna adjacent to the pipeline construction areas, including the right-of-way, workers camps, storage yards, and access roads. Faunal species will also be protected within the right-of-way during construction, with particular attention given to protected species. This plan will be accomplished through the education (Section 12) and management of all workers and the control of all aspects of the pipeline construction, from initial site clearing and pipeline installation, to final restoration.

Specific objectives of the sub-program include:

1. Protection of rare, threatened or endangered species.
2. Minimization of disturbance to fauna, flora and habitat during construction.
3. Avoidance of additional hunting pressure on protected and other faunal species.
4. Restoration of disturbed right-of-way areas to the maximum extent practicable as quickly as feasible to prevent long-term impacts to floral and faunal populations.

### **7.2 Protection of Flora and Fauna**

The following measures will be applied:

1. Avoid disturbance to areas outside of the approved construction zones.
2. Limit vehicle and worker access only to construction areas or associated project facilities and activities.

3. Inform workers of the status and protection level of all wildlife and plants, and the penalties for infractions.
4. Provide workers with pamphlets depicting protected species which must not be harmed or harassed. This pamphlet will also depict poisonous animals which may be encountered along the right-of-way to increase worker safety. It is the Construction Contractor's responsibility to provide this material to the workers.
5. Instruct workers on appropriate protocols in the event of accidental injury or mortality to wildlife.
6. Strictly prohibit hunting or harassing any wildlife species.
7. Possession of weapons, especially firearms, and hunting, collecting or killing of any wildlife by workers will be grounds for immediate dismissal.
8. Access to adjacent habitat areas will be limited in all areas during construction to further minimize animal and plant hunting and collection pressures.
9. If a protected species is encountered, injured or killed during construction the environmental inspector will be notified immediately. The animal will not be moved or handled until approved by the environmental inspector. If an animal(s) is/are obstructing construction, then it will be allowed or encouraged to leave the right-of-way with direct supervision of the environmental inspector.
10. The Contractor shall provide devices to allow the escape of animals that may fall in the open trench. These devices may consist of dirt piles, stumps, or ramps placed at intervals not exceeding 600 m. The environmental monitor will periodically check for animals in the trench. In the case of small mammals and reptiles, nets may be used to assist the animal's escape. In case of large or dangerous animals, a temporary device may be put in place and removed after the animal has escaped.

## 8.0 SUB-PROGRAM 2.5: SPILL PREVENTION, CONTROL AND CONTAINMENT PLAN (SPCCP)

### 8.1 Objectives

The objective of this sub-program is to minimize the possibility of a containment discharge from a project facility reaching the soil or a surface water body. In order to achieve this objective, the Contractor shall prepare a *Spill Prevention, Control and Containment Plan* (SPCCP) to be used, as needed, at all construction facilities (i.e., work camps and storage yard). The Contractor's SPCCP must involve several critical elements such as:

- Operating Procedures that prevent spills.
- Installation of Control Measures to prevent a spill from reaching soils or water.
- Countermeasures to contain, clean up, and mitigate the effects of a spill.

### 8.2 Organization

The Contractor shall be responsible for preparing an SPCCP document that includes the appropriate operating procedures, installation of spill control measures, and spill countermeasures which address actions used to prevent spills and measures which should be taken should any spills occur. The proper development and implementation of an SPCCP document will aid the Contractor in achieving these goals. The SPCCP must also include an educational component to train the Contractor's Spill Response Personnel. The Environmental Supervisor and environmental inspectors will oversee the Contractor's efforts with regards to the SPCCP. The Contractor must keep these individuals aware of any changes or events affecting the SPCCP. The resulting SPCCP document must contain at least the following components:

- Spill prevention and containment measures.
- Preparedness and prevention measures.
- Emergency response measures.
- Spill incident response procedures.

- SPCCP security provisions.
- SPCCP employee training provisions
- A controlled SPCCP document distribution list.

### 8.3 Spill Prevention and Containment Measures

As part of the standard operating procedure during construction, the Contractor shall take special precautions to prevent a spill or release of oil or hazardous materials from reaching surface water bodies or contaminating the soils. The following sections identify the minimum spill prevention and containment measures that shall be implemented by the Contractor at every facility during the construction phase:

#### 8.3.1 Materials Inventory

For each of the products stored at a facility, Material Safety Data Sheets (MSDS) and/or chemical analyses shall be made available at the facility's office, as well as at the storage areas to provide information on the products chemical hazards. It is anticipated that the facilities will handle the following types of products on-site:

MATERIAL/PRODUCT TYPE	ANTICIPATED VOLUMES TO BE STORED AT EACH WORK CAMP
Diesel fuel	15,000 gallons
Oils	12,000 gallons
Gasoline	500 gallons
Cleaning Agents	200 gallons

The Contractor shall prepare a table detailing all hazardous materials stored, in quantities greater than household levels, and their storage locations. Details on Aboveground Storage Tanks (ASTs) and 55-gallon drums and their contents shall also be identified for each of the project facilities (i.e., work camps and storage yards).



### 8.3.2 Storage Areas and Storage Tanks

At a minimum, the Contractor shall adhere to the following specifications and operational standards in storing hazardous materials at a facility:

**Facility Drainage Identification.** The Contractor shall identify the general drainage patterns for each facility. The general drainage patterns shall be shown on a site plot plan. Drainage from diked storage areas shall be restrained by valves or other positive means to prevent a spill or other excessive leakage of oil into the drainage system. Valves used for the drainage of diked areas shall be of the manual type and open-and-close design. Drainage systems shall be adequately engineered to prevent oil from reaching surface waters in the event of equipment failure or human error.

**Bulk Storage Tanks.** No tank shall be used for the storage of oil unless its material and construction are compatible with the type of materials to be stored and storage conditions (e.g., pressure and temperature). All bulk storage tank installations shall be constructed such that a secondary means of containment is provided for the entire contents of the largest single tank plus sufficient freeboard to allow for precipitation. Diked areas shall be sufficiently impervious to contain spilled oil or other fluids. The installation of oil tanks, as far as practical, shall be fail-safe engineered to avoid spills.

**Storage Area Drainage.** Storage containment areas will not have drains, unless such drains lead to a containment area or vessel where the entire spill can be recovered.

**Fuels and Lubricating Oil Storage.** The potential for large spills exists wherever fuels and hydraulic fluids are stored. The Contractor shall take precautions in areas where trucks carrying fuel are loaded and areas where oil drums are loaded and shall implement special measures to prevent spills in these areas. Containment equipment must be kept close to tanks and drums to minimize spill response time and must include absorbent pads or mats. The quantity and capabilities of the mats must be sufficient to capture the largest foreseeable spill, given right-of-way characteristics and crankcase and other fuel vessel capacities.

**Secondary Containment Structures.** In order to prevent the release of oil or hazardous waste into the environment the Contractor shall provide secondary containment structures for the aboveground tanks. These structures shall be designed to collect releases and accumulated liquids until the material is removed. Spills or leaks and any accumulation of precipitation shall be removed in as timely a manner as possible to prevent harm to human health or the environment.

Earth embankments with gravel-filled bottoms shall provide the secondary containment for the lubricating oil and used oil tanks. Any leaks or spills must be cleaned-up and collected in 55-gallon drums until arrangements are made for proper off-site disposal. Drainage of rainwater from the diked areas will be acceptable if:

- The drainage valve is normally sealed closed.
- Inspection of the run-off rainwater ensures compliance with applicable water quality standards and will not cause a harmful discharge.
- The drainage valve is opened and resealed following drainage under responsible supervision.

Drums and diesel tank stored within the work camps and storage yards shall be located in covered areas with low permeability earth dikes and the ground serving as the secondary containment. Leaks or spills from this area will discharge directly to the ground as asphalt or concrete pavement will be too difficult to construct in these remote areas. As such, spills shall be promptly contained, cleaned up and collected in 55-gallon drums for off-site disposal.

### 8.3.3 Refueling Operations

The Contractor shall ensure that all equipment is refueled and lubricated within the right-of-way and at least 15 meters away from all waterbodies and wetlands with the following exceptions:

1. Areas such as rugged terrain or steep slopes where movement of equipment to refueling stations would cause excessive disturbance to the surface of the right-of-way.

2. Areas where removing equipment from a wetland for servicing would increase adverse impacts to the wetland.
3. Construction sites where moving equipment to refueling stations from pre-fabricated equipment pads is impracticable or where there is a natural barrier from the waterbody or wetland (i.e., road or railroad).
4. Locations where the waterbody or wetland is located adjacent to a road crossing (from which the equipment can be serviced).
5. Areas where flotation equipment will be used to support equipment which will be refueled at designated docking locations.
6. Refueling of immobile equipment including, but not limited to, bending and boring machines, air compressors, padding machines and hydrostatic test fill pumps. In these areas, auxiliary fuel tanks will be used to reduce the frequency of refueling operations and in no case will refueling take place within 30 meters of any known potable water wells.

The Contractor shall ensure that all refueling be performed pursuant to the following minimum conditions:

1. Mitigation measures and equipment shall be sufficient to prevent discharged fluids from leaving the right-of-way or reaching wetlands or waterbodies and be readily available for use. These will include some combination of the following:
  - a. Dikes, berms or retaining walls sufficiently impervious to contain spilled oil.
  - b. Sorbent and barrier materials in quantities determined by the Contractor to be sufficient to capture the largest reasonably foreseeable spill.
  - c. Disposable drums or containers suitable for holding and transporting contaminated materials.
  - d. Curbing.

- e. Culverts, gutters, or other drainage systems.
  - f. Weirs, booms, or other barriers.
  - g. Spill diversion or retention ponds.
  - h. Sumps and collection systems.
2. The Contractor shall prepare a list of the type, quantity and the storage location of containment and clean up equipment to be used during construction. The list must include the procedures and impact minimization measures to be used in case of a spill.
  3. The Contractor shall prepare a pre-job, written inventory of lubricants, fuel and other materials which could be accidentally discharged during construction.
  4. All spills shall be cleaned up immediately. In no case shall containment equipment be used for the storage of contaminated equipment.

#### 8.4 Preparedness and Prevention Measures

Preparedness and prevention is the preferred alternative for controlling common, small spills that often occur when crankcase oil is changed, hydraulic lines are repaired and coolants are added to equipment. Absorbent pads and mats shall be placed on the ground beneath equipment before refueling and maintenance. Sorbent materials must be carried in each piece of equipment by maintenance personnel. Equipment that will be stored on site for routine refueling and maintenance shall include small sorbent kits (or their functional equivalent). Each facility and work area shall be adequately equipped to meet preparedness and prevention goals established herein. Routine inspections (i.e., daily) must be performed on storage tanks and loading and unloading areas. Records of such inspections must be maintained by the Contractor for a minimum of three years from the date of the inspection. At minimum, the following elements shall be required for a proper Preparedness and Prevention Plan:

### 8.4.1 Design and Operation of Work Camps

The work camps shall be designed, constructed, maintained, and operated to minimize the possibility of fire, explosion, or any unplanned release of oil, hazardous waste or hazardous waste constituents to the air, soil or surface water which could threaten human health or the environment.

### 8.4.2 Fire Equipment

Each facility shall be capable of responding immediately to an emergency, when manned, utilizing the equipment described below:

1. Fire extinguishing systems must be available at each facility to respond to fires.
2. Fire detection systems should be incorporated in facility structures (e.g., trailers) and storage areas. A warning horn should be sounded to announce a spill or accumulation of oil inside diked areas.

### 8.4.3 Loading and Unloading Facilities

Loading and unloading areas at each facility will be used to load and unload diesel, lubricating oil or used oil. Secondary containment shall be provided for the loading and unloading areas. All areas shall utilize drip pans at the hose connection while loading or unloading the liquids. The Contractor's personnel shall be present during all loading and unloading operations. All outlets of the tank trucks shall be inspected prior to leaving the loading and unloading area to prevent possible leakage from a truck while in transit. As a precaution, all valves at the transfer point of the loading or unloading connection shall be inspected prior to leaving the area following a material transfer. If a leak or spill occurs, then the loading or unloading operation shall be stopped and the spill will be contained, cleaned up and collected prior to continuing the operation. The Contractor shall provide the Environmental Supervisor with a plot plan of the loading and unloading areas for each facility.

#### **8.4.4 Aboveground Storage Tank Inspections**

Bladder tanks will serve as aboveground storage tanks to contain diesel fuel at the work camps. The capacities of these tanks usually range from 10,000 to 15,000 gallons. These shall be inspected daily by the Contractor's staff for signs of deterioration, leaks which might cause a spill, or accumulation of oil inside diked areas.

#### **8.4.5 Spill Control Equipment**

Each facility shall maintain an adequate supply of equipment for spill control. These shall include earth moving equipment such as tractors with front end loader, absorbent materials, shovels, rakes, pumps, empty drums and spill absorbent booms. The absorbent material shall be used to recover materials released to the soil or surface waters. Spill kit drums shall be located in the storage areas. Shovels, rakes and pumps may be used to collect any waste material released to the soil or surface waters. They may also be used in constructing a terrace, dam or ditch to stop the flow of a spilled material.

#### **8.4.6 Communication and Alarm Systems**

The internal and external communication equipment shall consist of at least two-way radios and horns. The two-way radios may be used as part of the internal and external communication system at the work camps. Radios shall also be located in all trucks.

#### **8.4.7 Miscellaneous Equipment**

Each work camp must also maintain first aid kits. The first aid kits shall be located in every building and in all trucks.

#### **8.4.8 Testing and Maintenance of Equipment**

Work Camp personnel shall routinely inspect, test and maintain the emergency equipment to ensure its proper operation. Two-way radios, phone systems, horns and whatever communication system is used should be tested daily. The fire extinguishing equipment should be inspected monthly.

#### **8.4.9 Access to Communications or Alarm Systems**

Whenever oils or hazardous materials are being handled, facility personnel involved in the operation shall have immediate access to radios and telephones, either directly or through visual or voice contact with another employee.

#### **8.4.10 Required Aisle Spacing**

Each facility shall maintain adequate aisle spacing to allow unobstructed movement of personnel, fire protection equipment, spill-control equipment, and decontamination equipment as necessary between structures.

#### **8.4.11 Arrangements with Local Authorities**

The Contractor shall attempt to make all the necessary arrangements with the police, fire departments and emergency response teams. Local hospitals and clinics shall be informed of the properties of the hazardous waste materials handled at the facilities and the types of injuries or illnesses that may result from fires or explosions. Local authorities should be invited to inspect the facilities. If they decline to enter into such an arrangement, the Contractor shall document the refusal in the Hazardous Materials Management Records.

### 8.4.12 Emergency Equipment

The Contractor shall prepare a list of the type, quantity and location of storage or containment and clean up equipment to be used in the work camps, storage yards, and construction sites. This list shall include the procedures and impact minimization measures to be used in response to a spill. The Contractor's choice of mitigation measures and equipment shall be tailored to meet the characteristics of the affected terrain as well as the types and amounts of material that could potentially be spilled. At a minimum, the Contractor shall provide equipment for spill containment and cleanup as follows:

#### Terrestrial Areas Equipment.

- a. Sorbents including pillows, socks, and wipe sheets for containment and pick up of spilled liquids.
- b. Commercially available spill kits (or a functional equivalent) that are self-contained and pre-packaged with a large variety of sorbents for both small to large spills.
- c. Structures such as gutters, culverts, and dikes for immediate spill containment, where available and appropriate.
- d. Shovels and backhoes for excavating contaminated materials.
- e. Sumps and collection systems.
- f. Drums, barrels and temporary storage bags to clean up and transport contaminated materials.

**Waterbody and Wetland Crossing Equipment.** For each waterbody and wetland crossed, the equipment listed below will be available in addition to that needed for terrestrial construction. This equipment will be stored close to the water or wetland to minimize response time and will include:

- a. Oil containment booms and the related equipment needed for rapid deployment.
- b. Equipment to remove oils from water, such as oleophilic and hydrophobic absorbent booms and mats, or mechanical skimmers.



**Equipment Inspection and Maintenance.** The Contractor shall inspect and maintain the emergency equipment that must be fueled and lubricated according to a strict schedule. The Contractor shall submit to the environmental inspectors for approval, written documentation of the methods used and work performed. All containers, valves, pipelines and hoses will be examined regularly to assess their general condition. All leaks will be promptly corrected and/or repaired.

**Equipment Failure.** Spills can result from unforeseen events such as the rupturing of fuel tanks, radiators and hydraulic lines. Kits with the capacity of absorbing up to 20 liters of liquid can fit beneath the operator's seat on construction equipment.

**Training.** The Contractor will instruct construction personnel on the operation and maintenance of construction equipment to prevent the accidental discharge or spill of fuel, oil and lubricants. Personnel must also be made aware of the pollution control laws, rules and regulations applicable to their work.

Spill prevention briefings with the construction crew shall be scheduled and conducted by the environmental inspector at intervals frequent enough to assure adequate understanding of spill prevention measures. These briefings will highlight the following:

- Precautionary measures to prevent spills.
- Sources of spills, such as equipment failure or malfunction.
- Standard operating procedures in case of a spill.
- Equipment, materials, and supplies available for clean-up of a spill.
- A list of known spill events.
- Emergency equipment.
- Communications and alarm system.
- Arrangements with local authorities.

## 8.5 Emergency Response Measures

Within the context of the SPCCP, the Contractor shall prepare a Spill Emergency Response Measures to minimize hazard to construction personnel and the environment from any unplanned release of hazardous materials to air, soil, or water. For the purposes of the plan, an emergency is defined as the release of hazardous materials that could threaten human health or the environment. The provisions of the plan must be carried out whenever an emergency situation occurs. At a minimum, the plan's provisions shall include the following components:

### 8.5.1 Emergency Measures

The following elements are essential to the emergency procedures plan:

**Containment.** Containment is the immediate priority in the case of a spill. A spill shall be contained on the property or right-of-way if possible.

**Clean up.** Clean up procedures shall begin immediately after a spill is contained. In no case shall containment equipment be used to store contaminated material. A list of equipment that will be used to facilitate cleanup and minimize damage to the environment must be maintained.

**Notification.** In case of a spill, the Contractor shall notify the Emergency Response Team and the appropriate environmental inspector.

**Excavation and Disposal.** Excavation and disposal of spilled material shall be performed in one of the following manners:

- *Small Spills:* If the Contractor determines that a spill is small enough such that the construction crew can safely handle it, the crew will use construction equipment to containerize all spilled material, contaminated soil and sorbent material in a manner consistent with the spilled materials' characterization.

- *Large Spills:* If the Contractor determines that a spill cannot be adequately excavated and disposed of by the construction crew alone, the Contractor will follow procedures outlined in the Contractor's Waste Management Plan.

### 8.5.2 Emergency Coordinators Duties

The Contractor shall provide a list of personnel qualified to act as Emergency Coordinators at each facility and work area. The work camp's Superintendent may be designated as the Primary Emergency Coordinator for a facility. Alternate Emergency Coordinators shall also be selected and listed in the Contractor's Emergency Response Guidelines. These employees shall also be knowledgeable of the responsibilities of an Emergency Coordinator and shall assist the Primary Emergency Coordinator as required. The mode of contacting each coordinator shall be posted on a list at the office, work areas and storage facilities. At all times, one of the emergency coordinators on the list shall be on the premises or on call (i.e., available to respond to an emergency by reaching a facility or work area within a short period of time) with the responsibility for coordinating all emergency response measures. These employees shall be thoroughly familiar with all aspects of the Contractor's Contingency Plan, including all operations and activities at the facilities, the location and characteristics of wastes handled, the location of the records and the facility layout. Additionally, they shall have the authority to commit the resources necessary to carry out the Contingency Plan.

### 8.5.3 Evacuation Procedures

The Contractor shall provide an Evacuation Plan to each facility's Emergency Coordinators and environmental inspectors. It is highly unlikely that a spill or release of oil or hazardous material at the facilities or work areas would result in the need for evacuation. The potential for such occurrences may be minimized by: 1) adequate spill prevention and control facilities maintenance; and b) routine visual inspections of aboveground tanks, equipment and drum storage areas.

The Contractor's Emergency Coordinator shall determine if a facility has had a release or fire that could threaten human health or the environment. If so, the Coordinator shall direct the

Contractor's employees to take the necessary actions to eliminate, isolate or minimize the conditions causing or contributing to the emergency. If the release or fire requires immediate evacuation of the premises, the Contractor's Evacuation Plan must be implemented. Good judgement must be used in evacuation procedures to avoid placing people in greater danger.

## **8.6 Spill Incident Response Procedures**

### **8.6.1 Procedures**

As part of the SPCCP, the Contractor shall develop Spill Incident Response Procedures that, at a minimum, contain the following elements:

#### **Methods to Stop Operations of the Affected Equipment**

- a. Close valves.
- b. Stop leaks.
- c. Issue warnings using the air horn.

#### **Methods to Contain a Spill**

- a. If on water, deploy spill boom across the path of the floating oil.
- b. If on land, construct a terrace, dam, or ditch to stop the flow of the spill material or other containment method as appropriate. Scatter sorbent material if it is approved.

**Notification Procedures.** Follow notification procedures and immediately notify the appropriate parties on the Contractor's Emergency Contact List. Continue down the list until someone is reached.

**Emergency Response Contractors.** Use Emergency Response Contractors if necessary to control and contain the spill. The Contractor shall maintain a list of Emergency Response Contractors readily available.

**Spill Cleanup.**

- a. Recover spilled material with the use of pumps and sorbent material until all material is removed from the water.
- b. Continue the use of pumps, trucks, and sorbent material until all the spill material is removed from land.
- c. Remove all soaked dirt and sorbent material.
- d. Use rags and cleaning agents to remove excess spill material from equipment.

**Storage and Treatment of Released Materials.**

- a. Contain the contaminated material.
- b. Place in pre-approved containers for temporary storage.
- c. Label the containers in accordance with pre-approved labeling system.
- d. Transport the containers to a temporary designated storage area.
- e. Store waste until arrangements for transport are made for disposal at a facility approved by the EPC Contractor's Environmental Manager.
- f. The Emergency Coordinator shall ensure that the released materials are stored or located in areas where all materials are compatible.

**Disposal.**

- a. All contaminated materials and spill cleanup debris must be contained and disposed of at a disposal facility approved by the EPC Contractor's Environmental Manager. Hazardous waste must be disposed of within 90 days of the date of accumulation
- b. Coordination of disposal activities is the responsibility of the Contractor's Emergency Coordinator.

**Post Emergency Maintenance.**

- a. After the spilled material is cleaned up, the Emergency Coordinator shall ensure that all emergency equipment used has been decontaminated.
- b. If the equipment cannot be properly cleaned or placed in good working order, it must be properly disposed and replacement equipment obtained.

**Duties and Responsibilities of the Designated Emergency Coordinator.** The Contractor's Emergency Coordinator shall be responsible for coordinating and directing emergency spill response measures and should be thoroughly familiar with gas pipeline operations and activities, the location and characteristics of all materials handled, the location of records within the station, the general layout of the area and all aspects of this contingency plan. Whenever there is an imminent emergency situation, the Emergency Coordinator shall immediately:

- a. Notify facility personnel of the incident.
- b. Notify the Environmental Manager.
- c. If deemed necessary, applicable local authorities will be notified by the EPC Contractor's Environmental Manager.

In the event of a fire, explosion or an accidental release of a toxic or hazardous materials, the employee observing the incident shall immediately notify the Emergency Coordinator, and if possible, proceed to eliminate the spill source.

The Emergency Coordinator shall then immediately assess the hazard and identify the character and specific source of the spill. Most releases are likely to be minor and to require only cleanup and disposal of small quantities of materials. However, if there is an immediate threat to human health and the environment, evacuation and notification of the appropriate authorities may be necessary. Appropriate authorities should include local police, fire departments and hospitals. Good judgment must be used in evacuation procedures to avoid placing people in greater danger. If no immediate threat exists, the Emergency Coordinator shall continue to direct emergency

response clean up activities and notify the Environmental Manager or his designee by telephone or two-way radio of the incident and report the following:

- a. Name of the person reporting the incident.
- b. Site name and location.
- c. Telephone number where the person reporting the spill can be reached.
- d. Date, time and location of the incident.
- e. A brief description of the incident, nature of the material or waste involved, extent of any injuries and possible hazards to human health or the environment.
- f. The estimated quantity of the materials or wastes spilled.
- g. The extent of contamination of land, water, or air, if known.

When determining the possible hazards to human health and/or the environment that may result from an incident, the Emergency Coordinator must:

1. Consider both the direct and indirect effects of the release, fire or explosion.
2. Assess the possible effect of any toxic irritating, or asphyxiating gases that are generated.
3. Determine the effects of any hazardous runoff from water or chemical agents used to control fire and heat-induced explosions. Material Safety Data Sheets (MSDS) shall be available in the facility's office to provide information on the chemical hazards.

The Emergency Coordinator shall take all reasonable measures necessary to ensure that the fire, explosion or discharge does not reoccur or spread to other materials or waste at the facility. These measures include stopping operations, collecting and containing released materials or wastes and removing or isolating containers. The Emergency Coordinator must ensure that all waste materials which are handled are compatible.

### 8.6.2 Spill Reporting Procedures

Each facility must have a system in place to maintain Spill Incident Reports describing the time date and details of each spill incident and the corrective action that was taken in response to a spill event. This report shall be completed by the Emergency Coordinator with information gathered at the scene. Copies of such reports must be kept in the files located at the facility and submitted to the Environmental Project Supervisor and the Environmental Inspector.

The following describes the type of notification and reporting procedures for oil spills, fires, explosions or hazardous material releases that should be followed by the Contractor:

**Report Contents and Initial Notification.** If any hazardous substance is accidentally discharged in quantities or concentrations that may result in damage to land, water or any natural resource, or poses risks to the public health or welfare, then the facility Emergency Coordinator shall immediately notify the EPC Contractors's Environmental Manager. The Environmental Project Supervisor shall notify the MDSMA and local agencies by telephone and provide the following data:

- a. Name and telephone number of person reporting the incident.
- b. Type of substance involved.
- c. Estimated quantity discharged.
- d. Location of the discharge.
- e. Proposed actions to contain, clean-up, and remove the substance, as necessary.
- f. Any other information concerning the discharge requested at the time of notification.
- g. The circumstances that caused the spill.
- h. A list of waterbodies affected or potentially affected by the spill.
- i. A statement verifying whether a sheen is present.
- j. The size of the affected area.
- k. An estimate of the depth that the material has reached in water or on soil.
- l. A determination of whether the spill will migrate off the right-of-way.
- m. A determination of whether the spill is under control.



- n. Person notified and time notified.

**Written Report to the Ministry.** Submit written confirmation within seven days after giving the initial verbal notification to the MDSMA and corresponding local agencies. Written confirmation should include, at least, the following elements:

- a. A description of the discharge incident.
- b. The source of the discharge.
- c. A description of the measures taken to clean up and remove the discharge.
- d. Any steps planned or already taken to prevent a recurrence of the discharge incident.
- e. Description of the immediate actions that have been taken and the estimated quantity and disposition of recovered material that resulted from the incident.
- f. Provide an implementation schedule for undertaking suggested measures to eliminate the problem.

### **8.6.3 Arrangements with Police, Fire Departments, and Hospitals**

The Contractor shall attempt to make the necessary arrangements to familiarize police, fire departments and hospitals with the layout of the facilities (i.e., work camps and storage yards), properties of the materials handled and associated hazards, places where facility personnel are normally working, entrances to and from the facilities and possible evacuation routes. Cooperation and teamwork between the employees and emergency response personnel are essential to minimizing injuries and property damage during a crisis.

### **8.7 SPCCP Security Provisions**

The Contractor shall develop and implement security measures for each facility (i.e., work camps and storage yards). All facilities must be totally surrounded by a wire fence. All access to the facility will be controlled. All visitors must sign a register at the main gate. A plot plan showing the locations of fences and gates shall be developed and provided to the EPC Contractor's Environmental Project Supervisor and the environmental inspector.

The facilities shall have adequate lighting to provide good visibility. Warning signs shall also be posted on the fence lines. These signs shall read "Private Property-No Trespassing" in English, Spanish, and Portuguese. The legend shall be legible from a distance of at least 10 meters.

### **8.8 SPCCP Employee Training Program.**

Work camp and storage yard personnel shall have training in hazardous waste management which will enable them to respond effectively to emergencies by familiarizing them with emergency procedures, emergency equipment and emergency communication. Personnel who handle, sample or come in direct contact with oils or hazardous materials shall undergo training that stresses pollution control. Spill prevention control procedures shall be thoroughly explained during on-the-job training sessions. Other items to discuss during training sessions shall include hazardous waste identification procedures, station generation, hazardous waste and other toxic substances handling, proper storage, transportation and disposal of hazardous waste and sample collection procedures.

All employees must be trained on, or prior to, their first week at the project site. Training records on employees shall be maintained at each facility and must be kept for three years from the date the employee last worked for the Contractor.

### **8.9 Controlled SPCCP Document Distribution List**

The Contractor shall provide copies of the SPCCP document to the Environmental Project Supervisor, environmental inspectors and all the appropriate organizations. The Contractor shall ensure that copies of the SPCCP and all its revisions be managed in the following manner:

1. Maintained at the work camps and storage facilities.
2. Submitted to local police departments, fire departments and hospitals that will be called upon to provide emergency services.

3. Prepared, modified and distributed to the EPC Contractor's Environmental Manager. The Environmental Manager will also responsible for ensuring the accuracy of the plan and ensuring that all holders receive all amendments.

## **9.0 SUB-PROGRAM 2.6 - PROTECTION OF HISTORICAL AND ARCHAEOLOGICAL RESOURCES**

### **9.1 Objectives**

The primary objective of this sub-program is the protection of historical and archaeological resources that may occur along the pipeline right-of-way and associated facilities. The sub-program sets forth requirements, procedures and reporting mechanisms in the event of the discovery of historical or archaeological resources. These measures will be coordinated with the National Directorate of Archaeological Resources and any other non-governmental entity which requests appropriate involvement with the discovery. Provisions will be made to facilitate the rapid assessment, collection and recording of discovered resources so that the pipeline construction will continue without undue interruption.

The measures described herein are based on knowledge of the socioeconomic and ecological history of the project area and the previous studies performed for the Environmental Impact Study (Dames & Moore, 1996). The sub-program includes a pre-construction archaeological survey. Any field-survey discoveries will be evaluated to establish requirements for the pipeline construction within the designated right-of-way.

### **9.2 Pre-Construction Archaeological Prospection**

A detailed pre-construction archaeological prospection will be conducted by the Project Sponsors within and immediately adjacent to the pipeline right-of-way. This work will supplement the previous investigations conducted as part of the Environmental Impact Study in 1996. The prospection will be accomplished by a reconnaissance level field survey that addresses all scientific and environmental review requirements and is acceptable to the National Directorate of Archaeological Resources. The survey work includes the following steps:

1. Additional literature search.
2. Prepare and submit a Survey Plan to the National Directorate of Archaeological Resources for their concurrence.
3. Field work.
4. Reporting.

Previous literature search of archaeological investigations has identified the presence of several sites of varied importance in the project's area of influence. Each of these sites is located in proximity to the National Highway and current population centers. The site locations range from five to 80 kilometers from the pipeline right-of-way and are considered either very remote or adequately far from construction activities. These sites are summarized in the following descriptions (Dames & Moore, 1996).

1. The Pailón site, well north of the pipeline right-of-way, has consisted of exploratory test pits which have encountered ceramic remains from the period of 800 AD to 1000 AD.
2. The San Jose Cathedral, completed in 1754, is one of the oldest Jesuit churches in America and lies 80 km north of the pipeline right-of-way.
3. The Santa Cruz la Vieja National Park is the first settlement site of the city of Santa Cruz, founded in 1561. This site lies 60 km north of the pipeline right-of-way.
4. The Quimome Site, north of the pipeline right-of-way, where a human skeleton and ceramic remains were found in exploratory pits.
5. The Robore Site 1, approximately 45 km north of the right-of-way, represents exploratory test pits where ceramic remains were encountered.

6. The Robore Site 2, approximately 45 km north of the right-of-way includes animal paintings using red pigment which were drawn directly on exposed bedrock.
7. The Santiago Site, an old Jesuit settlement with paintings of humans, animals and a variety of geometric figures.
8. The Yoroba Site, located within the Chiquitanos settlement of the same name, presents paintings of animals, geometric figures and humans.

No other cultural or archaeological resources are known from the "Ethnic, Territorial and Archaeological Map of Bolivia," nor from any other source encountered during the preparation of the Environmental Impact Statement or this Environmental Management Plan.

The exploratory sites included above suggest the types of additional historical and archaeological resources which may be discovered in the pre-construction prospection. In particular, the pre-construction surveys will supplement field surveys previously completed on other elements of the pipeline right-of-way investigations. The most likely type of discovery will be ceramic, pottery or stone materials, and paintings which would indicate a level of previous human occupation and land use in the vicinity of the pipeline. If discovered, these findings will be reported immediately to the National Directorate of Archaeological Resources. Throughout the prospection and the construction phase of the project, the project sponsors will maintain coordination with the National Directorate of Archaeological Resources.

### 9.3 Accidental Discovery Plan During Construction

This sub-program establishes procedures to protect and recover historical and archaeological resources, and human remains, to the extent practicable during construction in the event of accidental discovery. This plan will 1) satisfy the requirements of the National Directorate of Archaeological Resources, 2) accomplish standard and efficient recovery of archaeological resources, and 3) consider the economic limitations and construction scheduling requirements of the project sponsors. An outline of the plan is described below.

If unidentified archaeological or historical resources are discovered in spite of previous literature searches, surveys and avoidance measures the following steps will be taken.

1. The environmental inspector will stop activities in the immediate area of the discovery, make reasonable efforts to avoid or minimize damage to the cultural resource, and characterize the discovery for immediate reporting to the Environmental Project Supervisor.
2. The National Directorate of Archaeological Resources and local authorities will be contacted by the Environmental Manager and advised of the nature of the discovery.
3. As much information as possible concerning the cultural resource, such as resource type, location, size and potential significance will be provided with the report of the Environmental Monitor.

The project sponsors, in consultation with the National Directorate of Archaeological Resources will order a technical reconnaissance to define the importance or merit of the discovery. The Environmental Manager will consult a qualified archaeologist and draw up a certificate that will record the discovery, specifications and conditions of the objects encountered. Construction activities will not resume in the discovery area until approval is received from the Environmental Manager.

If the site requires special treatment, a mitigation plan will be prepared in concert with the National Directorate of Archaeological Resources. Whenever feasible, preservation of the resource in-place shall be the preferred treatment. Resources may be avoided through the following measures.

1. Project design changes such as realignments and shifts in the pipeline right-of-way as technically feasible.
2. Shifts in the locations of the above-ground facilities to avoid the resource.

3. Shifts in the location of construction staging areas, extra work spaces, disposal areas or other support areas.
4. The use of temporary fencing or barricades to protect the resource so that it will not be disturbed during and after construction or until the resource is adequately excavated, preserved or protected.

Special design changes may include, in extraordinary circumstances, the following measures.

1. Directional drilling or boring beneath the land in order to avoid the resource entirely and allow construction to proceed.
2. Specialized mitigation measures or construction techniques such as matting to protect the resource coupled with a concurrent plan for monitoring the effects of construction and a data recovery plan.
3. Data recovery of the resource to properly qualify and quantify the discovery.

If data recovery is determined to be the most feasible and prudent treatment option, the project sponsors will develop a data recovery plan in consultation with the National Directorate of Archaeological Resources. Reasonable effort will be made to avoid further impacts to the resource until a formal data recovery mitigation plan is approved and implemented. Any archaeological artifacts encountered will be presented to the nearest jurisdictional authority. The authority will then remit the artifacts to the National Directorate of Archaeological Resources.

The discovery or disturbance of human remains will be properly and sensitively addressed if the situation arises. If human remains are discovered inadvertently or cannot be avoided such as an unmarked grave or cemetery then the following guidelines will apply:

1. In the event that human remains are discovered during the preconstruction prospection the Environmental Manager will consult with the National Directorate of Archaeological



- Resources, local authorities or appropriate interested parties to determine which groups or representatives should be notified of the discovery.
2. If human remains are discovered during construction then the work in that location will be stopped immediately and the Environmental Inspector will take steps to protect and avoid damage to those remains.
  3. The Environmental Manager will notify local authorities and the National Directorate of Archaeological Resources as soon as practical after learning of the presence of human remains.
  4. If the remains are of archaeological importance, the National Directorate of Archaeological Resources and local authorities will be asked to provide technical assistance in the preparation of a plan for 1) the avoidance of further impact on the discovered human remains or 2) the mitigative excavation, re-interment, or a combination of these treatments, as appropriate. The Environmental Manager will be responsible for the implementation of such a plan.
  5. The EPC Contractor will provide a qualified professional archaeologist to investigate the reported discovery if necessary. In addition, alternative work areas that will avoid any further affect on the burial site will be evaluated, if necessary.
  6. The project sponsors or its agent will treat all discovered human remains with dignity and respect until they are re-interred. Any costs that accrue as a result of consultation, treatment, or re-interment will be the responsibility of the project sponsors.

#### **9.4 Reporting and Coordination**

As described in the preceding section, the Contractor and Project Sponsors will report and coordinate the discovery of all historical and archaeological resources during pipeline construction

with the National Directorate of Archaeological Resources and local entities as required or recommended by appropriate agencies.

## 10.0 SUB-PROGRAM 2.7 - AIR QUALITY PROTECTION AND NOISE CONTROL

### 10.1 Air Quality

The following measures will be applied to prevent or minimize impacts to air quality.

1. All engines will be properly maintained to maximize combustion efficiency and minimize emissions of contaminants.
2. A schedule for the operation of engines will be established to minimize to the extent practicable the time of operation of combustion engines.
3. If water is available for wetting of the right-of-way it will be used to minimize dust dispersion.
4. Avoid exposure of employees to inhalation, ingestion, skin absorption, or contact with any gas, vapor, fume, dust, or mist at a concentration above safe levels.
5. Face masks will be made available to workers when dust from construction activities becomes an annoyance or health hazard.
5. Design engineers will consider modifications to stack height and other parameters related to the operation of the compressor stations to ensure compliance with applicable regulations.

### 10.2 Noise Control

Noise impacts are expected to be less than significant. Workers who are exposed to noise generators such as compressors or heavy machinery will be provided with hearing protection appropriate for the noise level and time-weighted exposure.

Additional guidance is provided by the following criteria:

1. Protection against the effects of noise exposure shall be provided when the sound levels exceed safe levels.
2. When employees are subjected to sound levels exceeding safe levels, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound levels within safe levels, personal protective equipment shall be provided and used to reduce sound levels to within safe levels.
3. If the variations in unsafe noise levels reaches a maximum of intervals of 1 second or less the noise is to be considered continuous.
4. In all cases where the noise exceeds safe levels a continuing, effective hearing conservation program shall be put in place.
5. When the daily noise exposure is composed of two or more periods of noise exposure of different levels their combined effect should be considered.
6. Exposure to impulsive or impact noise should not exceed 140 db peak sound pressure level.

## 11.0 SUB-PROGRAM 2.8: WORKERS ACTIVITIES

### 11.1 Objectives

The objective of the workers activities program is to provide organization and protocol for the maintenance of a healthy, safe and comfortable environment for workers during pipeline construction. The workers health and safety during active pipeline construction is addressed in Section 9.0, Sub-Program 2.6 of this plan. This plan addresses the code of behavior that will rule the relationship between the workers and the local communities.

### 11.2 Code of Conduct

The workers will be required to observe the following directives:

- All workers are expected to conduct themselves professionally and with respect to all individuals they encounter.
- Prostitution and/or promiscuity or sexual relations of any kind will be prohibited around the camps or work areas.
- Episodes of drunkenness or disruptive behavior, such as fights, harrassment, or physical abuse will be grounds for immediate dismissal. This applies both for the construction areas and the interaction with the communities.
- Any coordination that the contractor's personnel will need with the communities should be conducted through the Environmental Supervisor and the community representative, with the approval of the Project's Sponsors.
- Comply with sanitation and solid waste containment and disposal procedures implemented in the camps, on access roads and along the pipeline right-of-way.
- No worker will be allowed to carry or possess firearms during his employment as a construction worker and presence on any stage of the construction site. Any worker who is discovered with a firearm will be released from employment.
- No worker will be allowed to harass, harm or kill wildlife or disturb the natural habitats which surround the pipeline right-of-way. Use of a firearm in these activities will be

evaluated by the contractor and the owner to determine whether grounds for criminal prosecution are present.

- Utility knives for use during the construction of the pipeline will be acceptable in the camp sites and on the right-of-way. Inappropriate-sized knives such as for personal defense or for use as weapons or for the butchering of wildlife will not be allowed on the job site. Any such inappropriate knife observed by a member of the contractors management team will be reason for confiscation of the instrument by the contractor for the duration of the workers' employment on the job. The inappropriate use of any knife such as during worker confrontations, for wildlife harassment, killing or butchering, or for plant collection will be grounds for immediate dismissal of the worker from the job site.
- Workers will not be allowed to leave the right-of-way and travel by vehicle or foot through the Gran Chaco National Park or Integrated Management Area or any of the other sensitive habitats or specialized construction areas.
- Speeding when operating company vehicles will be strictly prohibited.
- Live plant collection for the purpose of decoration or transport from the project site will not be allowed. Violation of these rules will be reported, reviewed and judged by the contractor and owner for the severity of the offense and determination of penalty which may range from a warning to dismissal from the job site.
- Workers will not be allowed to sell or trade plants, animals and other objects or services pertaining to members of the local communities.
- The use of illegal drugs in any construction area will be strictly prohibited and will be grounds for immediate dismissal.
- The workers will be restricted to their work areas and camps until they need to take their leave, at which time they will be transported to Santa Cruz.

### 11.3 Penalties

Dependent on the severity of the violation of the workers code of conduct, penalties will include warnings, fines and/or dismissal from employment. These violations and penalties will be explained as part of the workers training program described in Section 12.0 Workers Environmental Training. The relationship of 1) the protected and endangered wildlife and plants,

2) the Gran Chaco National Park and the Integrated Management Area and 3) the indigenous Indian populations, with worker performance and code of conduct will be clearly described to the workers particularly with regard to the human interaction, environmental sensitivity and importance of the lands surrounding the pipeline right-of-way.

#### **11.4 Monitoring and Reporting**

In the event of problems with a worker's job performance or conduct certain monitoring, reporting and judgement procedures will be established in order to properly review individual cases as they occur. A report of all incidents of worker incompetence, negligence or willful misconduct will be completed by the workers' supervisor and submitted to the appropriate inspector and manager.

There will be set procedures and complaint forms for the community to submit grievances regarding violations of the code of conduct and penalties, which will in turn be considered by the worker's supervisor, the relevant inspector and manager. An example of a grievance form is attached to the end of this chapter. All investigations will be carried out quickly, completely and fairly and the conclusions reported to the appropriate managers. The worker will be given an opportunity to respond in writing or to speak in a private meeting with the contractor representative regarding his conduct or performance. The owner will be entitled by written notice to the contractor to object to any representative or person employed by the contractor who is reasonably judged to be incompetent, negligent or engaged in willful misconduct. The contractor will promptly investigate the owners objection and if the worker is found to have behaved in such a manner the contractor will remove the person from the job and appoint a suitable replacement. During the investigation the worker will be removed from the job site.

## 12.0 SUB-PROGRAM 2.9: WORKERS ENVIRONMENTAL TRAINING

### 12.1 Objectives

The objective of the Workers Environmental Training program will be to teach, show, indoctrinate and provide tools for all managers, inspectors and workers to comply with all environmental protection measures required for pipeline construction. The program will be initiated before the start of construction and will cover all environmental issues, requirements and potential problems from construction start to finish. All environmental issues addressed in this Environmental Management Plan will be discussed. The program method will be to use a firm, clear and succinct presentation of all environmental requirements and the application of corresponding protection, restoration, mitigation and correction measures in the field. The program will be presented in Portuguese, Spanish or English depending on the workers first language.

Environmental and community relations training will be required of all employees prior to commencement of their work on the pipeline. New workers brought to the project after the initiation of project activities will receive the training as soon as is practicable following their arrival and prior to any work on the pipeline construction. Training will include the following topics:

- Right-of-way
- Community relations
- Erosion control
- Wetlands
- Creeks and waterbodies
- Water withdrawal and discharge
- Spill prevention, control and containment
- Protected flora and fauna
- Cultural resources
- Contingency plan



- Air quality and noise

A formal training program will be developed consisting of a written and pictorial or video presentation covering all environmental and cultural topics. Verbal instruction of all topics will be used to direct and summarize the important points on all topics.

## 12.2 Organization and Responsibilities

The Workers Environmental Training program will be organized based on the standard practices and chronology of the pipeline construction. A video will introduce the procedures and requirements of each construction activity. The primary emphasis and content of the program will be environmental and community/cultural issues. It will be the responsibility of the Contractor to prepare and present this program to all workers. The program will be reviewed by the Project Environmental Supervisor and by the Project Sponsors' Environmental Committee prior to use for the workers training.

The role of the environmental inspectors will be described with particular attention given to responsibilities and authority. Requirements for documenting and reporting compliance and non-compliance with environmental protection measures will be discussed. The responsibilities of each spread worker and his respective speciality will be itemized, discussed and presented in a hand-out.

## 12.3 Scope of Environmental Training

The scope of the training will be comprehensive and will include video tape, discussion, handouts and a pocket-size pamphlet of environmental guidelines for use throughout the project construction. The training is targeted to require one-half day to one-full day dependent on the extent of materials to be presented. Specifically, the presentation will discuss the following matters.

### 12.3.1 Right-of-Way

All workers will be advised of the right-of-way alignment, configuration and restrictions regarding construction activities and travel to from the job sites. Other topics to be described include right-of-way limits and dimensions, work activity limits, clearing and grading activities, erosion control installation and maintenance, waterbody crossings, fences, topsoil and subsoil separation, slope breakers and restoration following construction. Description of public and private road use and maintenance of these areas will be described.

### 12.3.2 Community Relations

All workers will be advised of the code of conduct regarding worker performance and contact with the communities and people surrounding the pipeline right-of-way. Dependent on the work schedule established by the Contractor, the travel of all workers particularly on non-work days to the towns will have certain conduct requirements. Professional, respectful, courteous and safe interactions with all individuals surrounding the pipeline will be stipulated and required. The measures of conduct and penalties for inappropriate or unallowable actions will be described.

Related to community relations and health, the workers will be instructed about sexually transmitted diseases. Hygiene and safe practices will be emphasized.

### 12.3.3 Erosion Control

All workers will be informed that the goals of the erosion protection procedures are 1) to prevent soil erosion or sedimentation within and adjacent to the right-of-way, 2) to provide undisturbed restoration of the right-of-way and 3) to assist long-term maintenance of the area to ensure reestablishment of vegetation. To accomplish these objectives, silt fences, slope breakers, trench breakers and rip-rap will be installed prior to and during construction activities as appropriate. Appropriate control and discharge methods for water within the right-of-way will be shown. All erosion control devices will be inspected periodically to ensure that they remain effective, are

undisturbed and are repaired immediately when damaged. At the end of construction, restoration areas will be inspected to maintain protection devices so that new vegetative growth can establish.

#### 12.3.4 Wetlands

All workers will be allowed to use only authorized access roads through wetlands. Staging, spoil storage and additional work areas must be properly set back from the wetland. Only proper materials such as silt screens, rip-rap and fabrics are authorized to stabilize the right-of-way. In standing water or heavily saturated soils only low-ground weight equipment or timber rip-rap may be used to access the wetland. Work must be completed as quickly as possible. Trench breakers must be constructed at wetlands to prevent wetland de-watering. Fueling, equipment maintenance, fuel and chemical storage must occur in safe areas outside the wetland. Temporary sediment-filter devices will be used to prevent sediments from flowing off the right-of-way into wetlands. All stabilization materials will be removed after construction following stabilization of the right-of-way. Permanent slope and trench breakers will be installed between wetlands and adjacent to disturbed areas to prevent erosion and sedimentation into the wetlands.

#### 12.3.5 Creeks and Waterbodies

All workers will be advised that the primary goal at waterway crossing is to minimize the area of impact and to control erosion and turbidity. Crossings will be performed as close to perpendicular to the waterway as possible. Clearing crews may cross a waterbody before equipment bridges are in place. All other equipment must use bridges. Waterway flows must be maintained. Turbidity must be contained and controlled as best as possible. Appropriate erosion control devices must be constructed. Work schedules must be compressed. A proper depiction of the different types of acceptable waterway crossing methods and their maintenance will be shown. Fueling, equipment maintenance, fuel and chemical storage must occur in safe areas outside the waterway, except in rare circumstances.

### **12.3.6 Water withdrawal and discharge procedures**

All workers will be informed of methods for withdrawal of water from waterbodies. This will include screened intake hoses to prevent fish entrainment, insignificant interference with stream flow rates, and hydrostatic test manifold locations outside of waterbodies as much as possible. All workers will be shown how to evacuate standing water from trenches and how to discharge water from the newly-installed pipeline following construction. In particular, discharge rates will be regulated and energy dissipation devices will be used in uplands at the discharge points.

### **12.3.7 Spill Prevention, Containment and Control Plan**

All workers will be advised that all refueling and lubricating of vehicles and all equipment, and storage of fuels, lubricating oils, chemicals or other toxic materials must be completed in specified areas at least 30 meters from waterbodies and wetlands. Special refueling procedures for necessary waterborne or water-dependent equipment will be described to the workers. Specific clean-up procedures will be given to the workers. Details of this plan are provided elsewhere in this plan and will be supplied to all workers, particularly the environmental inspectors, prior to the start of construction activities.

### **12.3.8 Protected Flora and Fauna**

All workers will be advised that no flora or fauna may be collected, nor any animal molested, harmed or killed on or off of the right-of-way. No animal should be touched except to save its life. A picture of each protected species will be provided in the pamphlet for accurate identification. The relationship of the protected species to the rare and endangered habitat surrounding the pipeline will be explained. Any encounter, harm or death of a protected animal will be reported to the Environmental Inspector.

### 12.3.9 Cultural resources

All workers will be educated regarding the type, importance and care necessary in the event that cultural resources, human remains, historic sites or artifacts are found along the pipeline route. All finds are to be reported immediately to the environmental inspector, and work that would disturb the artifacts. will be stopped

### 12.3.10 Air Quality

All workers will implement measures to reduce emissions from equipment by limiting unnecessary idling and maintaining all combustion engines at top efficiency. Also measures to reduce dust emissions resulting from construction activities will be implemented. The construction during the dry season is expected to increase these emissions. Reasonable activities such as water spraying of the right-of-way in upland areas will be used. Burning of cleared vegetative material will be used as a last resort, particularly because many areas of the right-of-way surface will be protected with the redistributed cleared vegetation.

## 12.4 Schedule

The EPC Contractor will develop a comprehensive training program that addresses all of these matters and other specific requirements presented throughout the Environmental Management Plan for presentation to the pipeline contractor workers and environmental inspection teams. The training program will use video tapes, discussions, questions and answers and educational pamphlets administered to all workers. It will be the responsibility of the EPC Turn-Key Contractor to present this training session to the workers. The workers will be given this training prior to initiating their individual construction responsibilities. All workers will be required to attend the training in its entirety. The environmental inspectors and managers will be required to understand this information and become familiar with the special construction requirements at different locations along the pipeline. Following the initial training all workers will be required to present their pamphlets prior to initiating any particular activity at the environmental inspectors' request. The workers will also be responsible for describing a construction activity to an

environmental inspector prior to it being undertaken. Individuals who are not diligent in the execution of these environmental protection measures will be reported by the Environmental Inspector, given a warning and if the actions persist will be reported and dismissed from the job site.

### **12.5 Monitoring and Reporting**

The environmental inspector will monitor and report the satisfactory completion of the training program for each worker. Following the start of construction the Environmental Inspector will oversee the work of all employees and report incidents of non-compliance and the actions of any negligent employee. Proper employee management will be an integral part of this training program and the attendant safeguards. Re-education regarding the goals and methods of the environmental management plan will be required of each employee who is negligent. The half-day retraining will be performed without pay to the employee.

## 13.0 SUB-PROGRAM 2.10: WORKER'S HEALTH AND SAFETY

### 13.1 Objectives

Worker's health and safety is of paramount concern in this project. In order to minimize or eliminate the potential for accidents or unsafe practices, a Construction Safety Plan has been developed. The purpose of each of these documents is to assign responsibilities, establish personnel protection standards and mandatory health and safety practices and procedures, and provide for contingencies that may arise during project operations. The provisions of the plans are mandatory for all project personnel, including contractors and subcontractors who are engaged in construction activities including, but not limited to, clearing, grading, pipe stringing, pipe bending, welding, ditching, lowering-in/backfilling, hydrostatic testing, and final clean-up. The emphasis on health and safety has been and will remain a focus in all development plans covering the entire life of the project, from preliminary design to operation and maintenance. The main objective of these plans is to operate accident-free throughout the project.

### 13.2 Health Plan

The Workers Health Plan has been developed to meet the expected and emergency health care needs of all project personnel during pipeline construction. Along with the Health Advisory: Tropical Diseases, this plan provides for health maintenance, minor injury care and emergency care of all workers. The primary responsibilities for this element of the plan are placed on the Contractor. The Contractor will be required to accomplish the following minimum worker health care preparations prior to initiation of project construction. Particular attention is given in this plan for those health situations that cannot be treated in the camps such as fractures, major cuts and burns, heat stroke, dehydration, diseases, poisonous animal bites, lightening strikes and other health dangers that require a professional doctors care.

The Contractor will maintain a list of all hospitals and health posts in the vicinity of the project corridor which can provide minor injury and emergency health care for workers. This list shall rank hospitals based on:

- a. Types of injury or emergency care provided.
- b. Proximity to region of the pipeline right-of-way.
- c. Number of doctors and beds available.
- d. Poisonous-bite emergency services.

The list of all hospitals will include telephone numbers, emergency telephone numbers, addresses with local map depicting location, doctor specialities and unique resources present on site, and helicopter emergency services, if available.

The Contractor shall be responsible for the staffing, supplying, and maintenance of a small medical facility at each camp site for the care of minor injuries and ailments of the workers. Staffing shall consist of a trained professional to administer to the supply of bactericides, bandages, topical ointments, disinfectants, and other non-prescription items to workers. At least one professional should be able to advise the worker as to the severity of his ailment and recommend types of treatment.

The Contractor will be responsible to secure the arrangements for a helicopter during project construction in the event of a life-threatening worker emergency requiring immediate hospitalization.

The Contractor's professional should regularly evaluate the condition of the camp grounds and facilities to determine if any health-related hazards are present such as standing water, unsanitary waste disposal practices, un-maintained or dis-repaired insect screens, unsafe equipment storage and any other items that merit attention.

The Contractor will be responsible for conducting the complete vaccination of all workers associated with the project construction. Valid immunization or vaccination cards will be the only acceptable means of exemption for any worker from this program. The list of diseases and vaccinations will be drawn from the World Health Organization and the appropriate Bolivian governmental agency charged with disease control.



### 13.3 Health Advisory: Tropical Diseases

In addition to the construction safety plan, a Health Advisory: Tropical Diseases has been developed to aid project personnel in the implementation of health guidelines for the protection against diseases associated with the tropics (e.g., yellow fever, malaria, cholera, etc.). The health advisory on tropical diseases has been prepared to inform all personnel, including employees, contractors, and subcontractors, of the various tropical diseases endemic to this area and best available procedures for prevention. This health advisory does not cover all possible tropical diseases that may be present in the project area, but focuses on those known to be present or known for outbreaks.

As most of the tropical diseases are transmitted through the bite of infected insects such as mosquitoes, flies, fleas, ticks, and lice, it is important that project personnel be adequately protected by wearing proper clothing, using bednets, applying an insect repellent to exposed skin and clothing (e.g., DEET and Permethrin), and, if possible, avoiding high risk situations (e.g., outdoor activities during night time hours from dusk to dawn when mosquitoes bite, unscreened living accommodations, etc.). The use of prophylaxis should also be considered for diseases such as yellow fever, malaria, and typhoid fever, however, its implementation should be under the strict guidance of a physician.

In order to reduce the risk of infection, personnel travelling to the project area must:

1. Protect themselves from insects;
2. Ensure the quality of their food and drinking water; and
3. Be knowledgeable about potential diseases in the region.

#### 13.3.1 Diseases Transmitted by Insects

Many diseases are transmitted through the bite of infected insects such as mosquitoes, flies, fleas, ticks, and lice. In general, personnel must protect themselves from insect bites by wearing proper clothing, using bednets, applying an insect repellent to exposed skin and clothing, and if possible,

avoiding high risk situations (i.e., outdoor activities during night time hours from dusk to dawn when mosquitoes bite, unscreened living accommodations, etc.). Additionally, the contractor shall keep to a minimum or eliminate the potential breeding grounds of disease vectors (e.g., mosquitoes), by not allowing the accumulation of standing water in exposed containers (e.g., tires) and minimizing the accumulation of garbage.

**Malaria.** Malaria is a serious parasitic infection transmitted to humans by a mosquito. These mosquitoes bite at night from dusk to dawn. Symptoms range from fever and flu-like symptoms, to chills, general achiness, and tiredness. If left untreated, malaria can cause anemia, kidney failure, coma, and death. Drugs are available to prevent a malaria infection, however, no antimalarial prophylaxis regimen gives complete protection. Malaria may be contracted despite taking antimalarial prophylaxis. The Construction Contractor should establish a mandatory test for malaria for all workers and arrange for treating those that are positive.

*Risk.* Malaria exists throughout the year in many parts of the tropical South American countries including some urban areas. *Plasmodium falciparum* (the most dangerous type), which has been reported to be resistant to the drug chloroquine, has been confirmed in most of these countries. In Bolivia, malaria is a risk in rural areas only, except in the highland areas.

*Prevention.* Protection from biting mosquitos is the first line of defense against malaria (and other mosquito-transmitted diseases) in endemic areas. The following measures are effective in reducing the risk of mosquito bites:

1. If possible, avoid going out between dusk and dawn when mosquitos commonly bite;
2. Wear long sleeve clothing and long trousers when going out at night and avoid dark colors, which attract mosquitoes;
3. Apply insect repellent to exposed skin, choosing one with  $\leq 30\%$  DEET (N,N-diethyl meta-toluamide) or dimethyl phthalate;

4. Use anti-mosquito sprays or insecticide dispensers that contain tablets impregnated with pyrethroids, or burn pyrethroid mosquito coils in living quarters;
5. For greater protection, clothing and bednets can be soaked in or sprayed with Permethrin, which is an insect repellent licensed for use on clothing. If applied according to the directions, Permethrin will repel insects from clothing for several weeks.

In addition, malaria prophylaxis may be prescribed to protect against clinical symptoms. Mefloquinone may be taken to prevent malaria. This drug is marketed in the United States under the name Lariam™ (a physician should be consulted prior to taking any drugs).

**Yellow Fever.** Yellow fever is a viral disease transmitted to humans by a mosquito bite. The mosquitoes are most active during the evening hours. Symptoms range from fever, chills, headache, and vomiting to jaundice, internal bleeding, and kidney failure. There is no specific drug to treat an infection of yellow fever, therefore prevention of infection is important.

*Risk.* Outbreaks of yellow fever have occurred in Bolivia.

*Prevention.* All construction workers must have a yellow fever vaccination. Yellow fever vaccine is a live virus vaccine. A single dose confers long-lived immunity lasting 10 years or more. A physician should be consulted prior to getting a yellow fever vaccine.

**Dengue Fever.** Dengue fever is a viral infection transmitted by mosquito bites in residential areas. The mosquitoes are most active during the day, especially around dawn and dusk, and are frequently found in or around human habitations. The illness is flu like and characterized by sudden onset, high fever, severe headaches, joint and muscle pain, and rash. Since there is no vaccine or specific treatment available, prevention is important.

*Risk.* Dengue fever occurs throughout tropical South America with recent epidemics in tropical Bolivia.

*Prevention.* There is no vaccine for dengue fever so the only prevention is to avoid mosquito bites.

**American Trypanosomiasis (a.k.a. Chagas Disease).** The parasite is transmitted to man by blood-sucking reduviid bugs, also known as kissing bugs due to their predilection for feeding on the faces of their victims. Unlike malaria and leishmaniasis, the parasites are not injected during feeding; rather, they are deposited by defecating bugs. The parasite enters the host through the eyes, nose or mouth, or through breaks in the skin. Symptoms appear as acute disease shortly after infection or as chronic disease years later. Acute disease involves fever, swelling of the lymph nodes and, sometimes, inflammation of the heart muscle and of the brain.

*Risk.* The original landscape of human Chagas disease in all Latin America is composed of rural areas with huts covered by grass or palm leaves and constructed with mud, stones or wood cracked walls where colonies of hundreds of individuals (*Trypanosoma cruzi*, a.k.a. kissing bugs), or even thousands, can be found. Other species are strictly inhabitants of different wild ecotopes and never invade houses. Between the two polar categories there is yet an important number of sylvatic species which leave their natural habitat and invade the domestic space and eventually transmit the parasite to man and/or domestic mammals.

*Prevention.* Control measures rely on limiting contact with infected bugs, because prophylaxis and drug treatment are not effective. Vector control methods involve insecticide spraying and eliminating the breeding grounds of the bugs.

### 13.3.2 Diseases Transmitted through Food and Water

Food and waterborne diseases are very common in tropical South America. They can be caused by viruses, bacteria, or parasites which are found universally throughout the region. Transmission is most often through contaminated food or water. Infections may cause diarrhea and vomiting (e.g., typhoid fever, cholera, and parasites), liver damage (e.g., hepatitis), or muscle paralysis (e.g., polio).

**Cholera.** Cholera is an acute, diarrheal illness caused by infection of the intestine with the bacterium *Vibrio cholera* which is most often found in contaminated water and shellfish and produces a toxin that upsets the biochemical balance of cells lining the intestine. The infection is often mild or without symptoms, but sometimes it can be severe.

*Risk.* A recent epidemic of cholera has swept through the entire tropical South American area.

*Prevention.* Avoid eating high-risk food, especially fish and shellfish, potentially contaminated water and raw vegetables. One cholera vaccine, administered with 2 injections, is currently licensed in the United States. However, it confers only brief and incomplete immunity.

**Typhoid Fever.** Typhoid fever is a bacterial infection transmitted through contaminated food and/or water, or directly between people. Symptoms of typhoid fever include headaches, tiredness, loss of appetite, and constipation. Typhoid fever can be treated effectively with antibiotics.

*Risk.* Typhoid fever is present in rural areas in South America.

*Prevention.* Drinking only bottled water or boiled beverages and eating only thoroughly cooked food lowers the risks of infection. Currently available vaccines have been shown to protect 70-90% of the recipients. Two recommended vaccines provide equivalent protection against typhoid fever. The oral vaccine consists of 4 capsules taken every other day over a seven day period and requires a booster every 5 years. The new, injectable ViCPS vaccine consists of 1 shot and requires a booster every 2 years.

**Parasites.** Parasitic infections are acquired by eating or drinking contaminated food or water, through direct contact with soil or water containing parasites or their larva, or by contact with biting insects. Symptoms and evidence of infection may include, but are not limited to fever,

swollen lymph nodes, rashes or itchy skin, digestive problems such as abdominal pain or diarrhea, eye problems, and anemia.

*Risk.* There are many types of parasites and infection may occur in several ways: by eating undercooked meats infected with parasites or their larva; by eating food or drinking water contaminated with parasites or their eggs; by contact with soil or water infected with parasites; or through insect bites. Several types of parasites can penetrate intact skin so it is advised to always wear shoes and avoid swimming, wading, or washing in fresh water.

*Prevention.* Eat only thoroughly cooked food, drink safe water, wear shoes, refrain from swimming in fresh water, and avoid contact with insects, particularly mosquitoes, biting flies, gnats, and midgits.

### 13.3.3 Sexually Transmitted Diseases

Sexually transmitted diseases can be prevented by avoiding promiscuity and applying safe sex practices, such as monogamy, the use of condoms, and maintaining good personal hygiene. If feasible, a pre-hiring testing may provide useful background information to implement code of conduct or hygiene measures.

The health facilities at the camps will be stocked with condoms, which will be provided to workers on request.

### 13.4 Construction Safety Plan

The Construction Safety Plan delineates the safety procedures to be used and implemented during the project. Some components of the plan (e.g., hazard communication) are procedural specifications, while others (e.g., blasting and the use of explosives) are technical specifications. The components of the construction safety plan are:

- Safety Policy
- General Instructions
- Responsibilities
- Construction Safety Program for Contractors and Subcontractors
- Accident Prevention
- Hazard Communication
- Safety Training and Education
- Personal Protective Equipment
- First Aid
- Good Housekeeping
- Drinking Water
- Sanitation
- Occupational Noise Exposure
- Radiation
- Gases, Vapors, Fumes, Dusts and Mists
- Ventilation
- Respiratory Protection
- Fire Protection and Prevention
- Flammable and Combustible Liquids
- Signs, Signals and Barricades
- Tools - Hand and Power Operated
- Blasting and the Use of Explosives
- Welding
- Rigging Equipment for Material Handling
- Automotive Equipment
- Material Handling Equipment
- Working Over or Near Water
- Construction Guidelines
- Spill Response

### 13.4.1 Safety Policy

It is the policy of the Bolivia-Brazil Gas Pipeline Project Sponsors to conduct operations in a manner that protects the safety and health of employees, contractors and the general public. Accordingly, the project organization will:

1. Comply fully with all applicable health and safety laws and regulations.
2. Provide a professional staff to develop and support risk management activities and enforce adherence to safety rules and regulations.
3. Endorse safety and health methods which will control human loss and protect the project's physical and financial resources.
4. Rank safety and health equally with economic objectives.
5. Consider safety, health, and environmental criteria in awarding contracts.
6. Provide appropriate training for employees, contractors and subcontractors to ensure all personnel are properly trained in matters pertaining to health, safety, and protection of the environment.
7. Assess progress toward safe systems and a safe and healthy work environment.
8. Design facilities with high safety standards, and operate facilities with best safety and health practices.

### 13.4.2 General Instructions

These instructions have been prepared to inform all personnel, including employees, contractors and subcontractors of the safety requirements of the project and the rules governing the work to



be performed. These instructions cannot cover every situation that will arise on a job. Accordingly, it will be necessary for all personnel to use good judgment and follow acceptable construction practices at all times.

The rules and regulations contained in this manual will be applicable to Project Sponsors' personnel as well as all contractors and subcontractors involved in the project.

### **13.4.3 Responsibilities**

All employees, contractors and subcontractors will share the responsibility for eliminating injuries, promoting maximum efficiency, and effecting savings by avoiding unplanned business interruptions from occupational accidents during construction. The effectiveness in accomplishing these goals will depend upon the participation and cooperation of construction management, supervisors, and employees, and the coordination of efforts in carrying out their assigned duties. All managers, supervisors and employees will be advised of their responsibilities and performance will be regularly measured. General responsibilities are summarized as follows:

#### **Managers/Supervisors.**

1. Plan all work to minimize personal injury, property damage and loss of productive time.
2. Maintain a system for review and correction of procedures, practices and unsafe conditions.
3. Make available and enforce the use of personal protective equipment and mechanical guards where required.
4. Provide appropriate tools and establish an effective inspection and maintenance program for tools and equipment.

5. Investigate all accidents to determine cause, and take prompt and necessary corrective action.
6. Hold and document regular safety and environmental meetings.
7. Communicate and enforce rules and minimum safety standards for employees and contractors.

**Employees.**

1. Comply with all rules, regulations and standards in performance of assigned duties.
2. Participate in safety and environmental meetings.
3. Report all incidents, injuries, and spills immediately.
4. Assist in health, safety and environmental investigations.

**Contractors**

1. Ensure that all employees and subcontractors are properly trained in safety and health requirements of the project and their specific jobs.
2. Comply with all project rules and local regulations.
3. Report injuries, spills and accidents immediately to project management.
4. Hold pre-job meetings and other safety meetings during the job.

### 13.4.4 Construction Safety Program For Contractors And Subcontractors

#### Contractor Record-Keeping Requirements.

1. Maintain accurate injury and illness records.
2. Send Incident Report to Sponsor representative on-site.

#### Contractor and Subcontractor Safety and Health Responsibilities.

1. Designate an individual as Safety Inspector and First Aid Attendant.
2. Hold safety meetings for supervisors on a monthly basis. Include safety on agenda at all supervisor's meetings.
3. Hold employee safety orientations before work starts and periodically throughout the life of the project.
4. Personal protective equipment requirements:
  - a. Safety Shoes - Required based on job exposure.
  - b. Hard Hats - Required in all areas posted.
  - c. Eye Protection - Required, based on job exposure as determined by construction superintendent.
  - d. Hearing Protection - Required, based on job exposure as determined by construction superintendent.
  - e. Personnel Safety Harnesses - Required, based on job exposure as determined by construction superintendent.
  - f. Respirators - Required, based on job exposure as determined by construction superintendent.
  - g. Welders' Helmets - Required, based on job exposure as determined by construction superintendent.

5. The construction chief or his designated representative will make a monthly inspection of contractor equipment.
6. Make accident investigations by contractor's representative for the following:
  - a. First Aid Injuries - Description, cause and prevention. Keep report form on-site.
  - b. Doctor's Care Injuries - Description, cause and prevention. Send report form to Sponsors' representative on the site.
  - c. Equipment Damage - Description, cause and prevention. Send report form to Sponsor representative on-site.
  - d. Forward copies of the Incident Report to Sponsor representative on-site.
7. Perform and document facility inspection of premises monthly by contractor and construction superintendent or designated representative.
8. Provide fire protection equipment with trained personnel. Test equipment monthly.
9. Post the following emergency telephone numbers:
  - a. Doctor (nearest to project location)
  - b. Hospital (nearest to project location)
  - c. Police
10. Require that safety review meetings be held with construction groups as needed (subcontractors) by construction chief or designated representative.
11. Require subcontractors to hold weekly tool box meetings for their employees.
12. Perform equipment inspections (personal protective equipment and hand tools) on a monthly basis.
13. Store flammable liquids in accordance with Section 14.4.19.

14. Erect scaffolds in accordance with applicable industry standards.
15. Use manufactured wood and/or metal ladders that are in proper working condition and suitable for the assigned task. The use of ladders with broken or missing rungs or steps, broken or split side rails, or other faulty or defective construction is prohibited.
16. Develop emergency procedures pertaining to fire, medical assistance or equipment failure.
17. Give names and telephone numbers of contractor and subcontractor supervisors to Sponsor's on-site representative for posting in the Sponsor office.
18. Each contractor shall read, understand and use this construction safety manual as a basic minimum guideline for use in each respective operation.

#### 13.4.5 Accident Prevention

1. It shall be the responsibility of the contractor to initiate and maintain such programs as may be necessary to comply with project policies, applicable laws and regulations.
2. Such programs shall provide for frequent and regular inspections of the job sites, materials and equipment to be made by competent persons designated by the employers.
3. The use of any machinery, tool, material or equipment which is not in compliance with general industry construction safety standards is prohibited. Such machine, tool, material or equipment shall either be identified as unsafe by tagging and locking the controls to render them inoperable or shall be physically removed from its place of operation.
4. The contractor shall permit only those employees qualified by training or experience to operate equipment and machinery.

5. In the event of an emergency requiring immediate medical attention (beyond first aid treatment), the contractor shall be responsible for implementation of an emergency plan that will adequately address, as a minimum, the following:
  - a. Treatment to be provided to affected personnel (i.e., heart attacks, amputations, major lacerations, head injuries, etc.) until professional medical attention is provided;
  - b. Stabilization of vital signs of affected personnel; and
  - c. Emergency transportation to hospital (e.g., helicopter).

#### 13.4.6 Hazard Communication

1. Multi-employer workplaces. Employers who produce, use, or store hazardous chemicals at a workplace in such a way that the employees of other employer(s) may be exposed (for example, employees of a construction contractor working on-site) shall additionally ensure that the hazard communication programs developed include the following:
  - a. The methods the employer will use to provide the other employer(s) on-site access to material safety data sheets for each hazardous chemical the other employer(s)' employees may be exposed to while working;
  - b. The methods the employer will use to inform the other employer(s) of any precautionary measures that need to be taken to protect employees during the workplace's normal operating conditions and in foreseeable emergencies; and
  - c. The methods the employer will use to inform the other employer(s) of the labeling system used in the workplace.
2. Employers shall provide employees with effective information and training on hazardous chemicals in their work area at the time of their initial assignment, and whenever a new physical or health hazard the employees have not previously been trained about is introduced into their work area. Information and training may be designed to cover categories of hazards (e.g., flammability, carcinogenicity) or specific chemicals. Chemical-specific information must always be available through labels and material safety data sheets.

- 3 Information. Employees shall be informed of:
  - a. Any operations in their work area where hazardous chemicals are present; and
  - b. The location and availability of the required list(s) of hazardous chemicals, and material safety data sheets required by this section.
  
4. Training. Employee training shall include at least:
  - a. Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);
  - b. The physical and health hazards of the chemicals in the work area;
  - c. The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.

#### 13.4.7 Safety Training And Education

1. The contractor shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his or her work environment to control or eliminate any hazards or other exposure to illness or injury.
  
2. Employees required to handle or use hazardous materials shall be instructed regarding the safe handling and use, and be made aware of the potential hazards, personal hygiene and personal protective measures required.
  
3. In job site areas where harmful plants or dangerous animals are present, employees who may be exposed shall be instructed regarding the potential hazards, how to avoid injury and the first aid procedures to be used in the event of injury.

4. All employees required to enter into confined or enclosed spaces shall be instructed as to the nature of the hazards involved, necessary precautions to be taken and the use of protective and emergency equipment required. The employer shall comply with any specific regulations that apply to work in dangerous or potentially dangerous areas.
5. Every contractor must keep occupational injury and illness records for their employees in the establishment at which his employees usually report to work.
6. Every contractor must maintain in each establishment:
  - a. A log of recordable occupational injuries and illnesses.
  - b. Supplementary records of each occupational injury or illness.
7. Every contractor must keep records up to date, have them available to authorized government representatives or other authorities, and publish a summary of all occupational injuries and illnesses at the conclusion of the calendar year.
8. To keep these records, the Incident Report Form must be completed.

#### **13.4.8 Personal Protective Equipment**

Contractors are responsible for requiring the wearing of appropriate personal protective equipment in all operations where there is an exposure to hazardous conditions.

1. **Foot Protection.** Safety shoes must be worn by employees exposed to potential foot hazards. Canvas or weave type shoes are not allowed on construction sites.
2. **Head Protection.** Employees working in areas where there is a possible danger of head injury from impact or from falling or flying objects, or from electrical shock and burns, shall wear protective helmets.



## 3. Hearing Protection.

- a. Whenever it is not feasible to reduce excessive noise levels or duration of exposure, hearing protective devices shall be provided.
- b. Hearing protective devices inserted in the ear shall be fitted or determined individually by competent persons. Plain cotton is not an acceptable protective device.

## 4. Eyes and Face Protection.

- a. Employees shall be provided with eye and face protection equipment when machines or operations present potential eye or face injury from physical, chemical or radiation agents.
- b. Employees whose vision requires the use of corrective lenses in spectacles shall be protected by goggles or spectacles of one of the following types:
  - Spectacles whose protective lenses provide optical correction.
  - Goggles that can be worn over corrective spectacles without disturbing the adjustment of the spectacles.
  - Goggles that incorporate corrective lenses mounted behind the protective lenses.
  - The following information shall be used as a guide in the selection of face and eye protection for the hazards and operations noted.

RECOMMENDED EYE AND FACE PROTECTION		
Operation	Hazards	Recommended Protectors
Acetylene - Burning Acetylene- Cutting Acetylene - Welding	Sparks, harmful rays, molten metal, flying particles	7,8,9
Chemical Handling	Splash, acid burns, fumes	2, 10 (For severe exposure add 10 over 2)
Chipping	Flying particles	1, 3, 4, 5, 6, 7A, 8A
Electric (arc) welding	Sparks, intense rays, molten metal	9, 11 (11 in combination with 4, 5, 6, in tinted lenses, advisable)

RECOMMENDED EYE AND FACE PROTECTION		
Operation	Hazards	Recommended Protectors
Grinding - Light	Flying particles	1, 3, 4, 5, 6, 10
Grinding - Heavy	Flying particles	1, 3, 7A, 8A (For severe exposure add 10)
Machining	Flying particles	1, 3, 4, 5, 6, 10
Molten metals	Heat, glare, sparks, splash	7, 8 (10 in combination with 4, 5, 6, in tinted lenses)
Spot welding	Flying particles, sparks	1, 3, 4, 5, 6, 10

Source: 29 CFR Part 1926

#### Legend:

- |   |   |
|---|---|
| 1. Goggles, flexible fitting, regular ventilation     | 7. Welding goggles, eyecup type, tinted lenses            |
| 2. Goggles, flexible fitting, hooded ventilation      | 7A. Chipping goggles, eyecup type, clear safety lenses    |
| 3. Goggles, cushioned fitting, rigid body             | 8. Welding goggles, coverspec type tinted lenses          |
| 4. Spectacles, metal frame, with side shields         | 8A. Chipping goggles, coverspec type, clear safety lenses |
| 5. Spectacles, plastic frame, with side shields       | 9. Welding goggles, coverspec type, tinted plate lens     |
| 6. Spectacles, metal-plastic frame, with side shields | 10. Face shield (Available with plastic or mesh window)   |
|   | 11. Welding helmets                                       |

### 13.4.9 First Aid

Provisions for prompt medical care and first aid services shall be made prior to commencement of the project for every employee. First aid is the immediate and temporary care given the victim of an accident or sudden illness until the services of a doctor can be obtained. Often an accident victim is hurt rather than helped by persons who want to do something, but do not know how to give first aid properly. Only people qualified in first aid should be permitted to attend an injured person. All construction crews shall be provided with a First Aid Kit, which shall be on the supply truck of the crew. A qualified first aid person shall be placed in charge of that particular kit.

1. The First Aid Kit shall consist of material approved by a consulting physician in a weatherproof container with individual sealed packages for each type of item. The contents of the first aid kit shall be checked by the employer before being sent out on each job to ensure that any expended items have been replaced.
2. Telephone numbers of physician(s) and hospital(s) shall be conspicuously posted.
3. The foreman of each construction crew is responsible for first aid treatment and should have a person qualified to render first aid in his crew.
4. An injured employee shall immediately report an injury to his foreman, regardless of how small.
5. All accidents shall be reported to the field office by the foreman, and the foreman shall see that a proper accident report is made regarding this injury.
6. The contractor shall be responsible for developing and implementing an emergency plan for major medical emergencies (e.g., heart attacks, amputations, major lacerations, head injuries, etc.) which shall describe in detail procedures to be followed for the initial treatment and stabilization of affected personnel until professional medical treatment is provided and emergency transportation to nearest hospital qualified to handle the emergency.

#### **13.4.10 Good Housekeeping**

Good housekeeping is the first law of accident prevention and shall be of primary concern to all construction personnel. Good housekeeping practices shall be planned at the beginning of the job by supervisory personnel and carefully supervised through the final clean up of the job.

1. During the course of construction keep work areas clean of scrap and debris of all kinds.
2. Rubbish debris, waste and useless materials constitute fire and accident hazards and shall be removed from the work area as fast as they accumulate. This applies in particular to field warehouse and field shop areas where operations remain at one place over a period of time. Machinery, particularly draglines and backhoes, should be checked to be sure all oil has been wiped off from areas where employees may step in order to prevent the employee from slipping on that surface.

#### **13.4.11 Drinking Water**

Typhoid fever, dysentery, cholera, and other diseases are often the result of contaminated drinking water and lack of proper sanitation on the job. Pipeline work requires the job to be constantly moving so the source of water supply is important.

1. An adequate supply of potable water shall be provided in all work areas.
2. Portable containers used to dispense drinking water shall be capable of being tightly closed, and equipped with a tap. Water shall not be dipped from the container.
3. Any container used to distribute drinking water shall be clearly marked as to the nature of its contents and not used for any other purpose.
4. The common drinking cup is prohibited.
5. Where single service cups (to be used but once) are supplied, both a sanitary container for the unused cups and a receptacle for disposing of the used cups shall be provided.

### 13.4.12 Sanitation

Toilets at construction job sites shall be provided for personnel according to the following table:

SANITATION FACILITIES	
Personnel	Minimum Number of Facilities
20 or less	1 toilet seat
20 to 199	1 toilet seat and 1 urinal per 40 workers
200 or more	1 toilet seat and 1 urinal per 50 workers

### 13.4.13 Occupational Noise Exposure

1. Protection against the effects of noise exposure shall be provided when the sound levels exceed those shown in the following table of this section when measured on the A-scale of a standard sound level meter at slow response.
2. When employees are subjected to sound levels exceeding those listed in the following table, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound levels within the levels of the table, personal protective equipment shall be provided and used to reduce sound levels within the levels of the table.
3. If the variations in noise level reaches the maximum at intervals of 1 second or less, it is to be considered continuous.
4. In all cases where the sound levels exceed the values shown herein, a continuing, effective hearing conservation program shall be administered.

PERMISSIBLE NOISE EXPOSURES	
Duration per day, hours:	Sound level DB slow response
8	90
6	92
4	95
3	97
2	100
1-1/2	102
1	105
1/2	110
1/4 or less	115

5. Exposure to impulsive or impact noise should not exceed 140 DB peak sound pressure level.

#### 13.4.14 Ionizing Radiation

In construction and related activities involving the use of sources of ionizing radiation, the pertinent provisions of the Atomic Energy Commission's Standards for Protection against Radiation, relating to protection against occupational radiation exposure, shall apply.

Any activity which involves the use of radioactive materials or X-rays, shall be performed by competent persons especially trained in the proper and safe operation of such equipment.

#### 13.4.15 Illumination

Construction areas, corridors, offices, shops and storage areas shall be lighted to not less than the minimum illumination intensities listed in the following table any work is in progress.

MINIMUM ILLUMINATION INTENSITIES IN FOOT-CANDLES	
Foot-Candles	Area of Operation
5	General construction area lighting
3	General construction areas, concrete placement, excavation and waste areas, accessways, active storage areas, loading platforms, refueling and field maintenance areas
5	Indoors; warehouse, corridors, hallways and exit-ways
5	Tunnels, shafts and general underground work areas; (Exception: minimum of 10 foot-candles is required at tunnel and shaft heading during drilling, mucking and scaling).
10	General construction plant and shops (e.g., batch plants, screening plants, mechanical and electrical equipment rooms, carpenter shops, rigging lofts and active storerooms, barracks or living quarters, locker or dressing rooms, mess halls, and indoor toilets and workrooms)
30	First aid stations, infirmaries and offices

#### 13.4.16 Gases, Vapors, Fumes, Dusts and Mists

1. Exposure of personnel to inhalation, ingestion, skin absorption or contact with any material or substance at a concentration above those which might be hazardous to human health shall be avoided.
2. Administrative or engineering controls may be implemented if indicated. When such controls are not feasible, protective measures shall be used to keep the exposure of employees to air contaminants within acceptable limits. Any equipment and technical measures used for this purpose must first be approved for each particular use by a competent industrial hygienist or other technically qualified person. Whenever respirators are used, their use shall comply with Table 6 under Section XIX Respirator Protection.

#### 13.4.17 Ventilation

1. General. Whenever hazardous substances such as dust, fumes, mists, vapors or gases exist or are produced in the course of construction work, their concentrations shall not exceed

the limits, which might be hazardous to human health. When ventilation is used as an engineering control method, the system shall be installed and operated according to the requirements of this section.

2. Local Exhaust Ventilation. Local exhaust ventilation when used as described in (1) shall be designed to prevent dispersion into the air of dusts, fumes, mists, vapors and gases in concentrations causing harmful exposure. Such exhaust systems shall be so designed that dusts, fumes, mists, vapors or gases are not drawn through the work area of employees.
3. Design and Operation. Exhaust fans, jets, ducts, hoods, separators and all necessary appurtenances, including refuse receptacles, shall be so designed, constructed, maintained and operated as to ensure the required protection by maintaining a volume and velocity of exhaust air sufficient to gather dusts, fumes, vapors or gases from said equipment or process, and to convey them to suitable points of safe disposal, thereby preventing their dispersion in harmful quantities into the atmosphere where employees work.
4. Duration of Operation.
  - a. The exhaust system shall be in operation continually during all operations which it is designed to serve. If the employee remains in the contaminated zone, the system shall continue to operate after the cessation of said operations, the length of time depends upon the individual circumstances and effectiveness of the general ventilation system.
  - b. Since dust capable of causing disability is, according to the best medical opinion, of microscopic size, tending to remain for hours in suspension in still air, it is essential that the exhaust system be in continuous operation for a time after the work process or equipment served by the same shall have ceased, in order to ensure the removal of the harmful elements to the required extent. Employees wearing respiratory equipment should not remove the respirator until the atmosphere seems clear.



5. Disposal of Exhaust Material. The air outlet from every dust separator, and the dusts, fumes, mists, vapors or gases collected by an exhaust or ventilation system shall discharge to the outside atmosphere. Collecting systems which return air to work areas may be used if concentrations which accumulate in the work area air do not result in harmful exposure to employees. Dust and refuse discharged from an exhaust system shall be disposed in such a manner that it will not result in harmful exposure to employees.

#### 13.4.18 Respiratory Protection

1. In emergencies, or when controls are required to prevent harmful exposure to personnel appropriate respiratory protective devices shall be provided by the contractor and shall be used.
2. Respiratory protective devices shall be those tested and certified by the National Institute for Occupational Safety and Health (NIOSH) and/or the Mine Safety and Health Administration (MSHA), or equivalent agency(ies), for the specific contaminant to which the employee is exposed.
3. The chemical and physical properties of the contaminant, as well as the toxicity and concentration of the hazardous material, shall be considered in selecting the proper respirators.
4. The nature and extent of the hazard, work requirements, and conditions, as well as the limitations and characteristics of the available respirators, shall also be factors considered in making the proper selection.
5. Personnel required to use respiratory protective equipment shall be instructed in the use and limitations of such equipment.
6. Personnel required to wear a respirator should have a lung function test to be sure they are physically capable to use one.

7. All personnel subject to respirator protection must have a fit test conducted with the type of respirator they will be using.
8. Respiratory protective equipment shall be inspected regularly and maintained in good condition. Gas mask canisters and chemical cartridges shall be replaced as necessary so as to provide complete protection. Mechanical filters shall be cleaned or replaced as necessary so as to avoid undue resistance to breathing.
9. Respiratory protective equipment which has been previously used shall be cleaned and disinfected before it is issued by the contractor to another person. Emergency rescue equipment shall be cleaned and disinfected immediately after each use.
10. The following table lists the types of respirators required for protection in dangerous atmospheres:

<b>SELECTION OF RESPIRATORS</b>	
<b>Hazard</b>	<b>Respirator (See Note)</b>
Oxygen deficiency	Positive Pressure, Self-contained breathing apparatus. A combination airline respirator with auxiliary self-contained air supply or an air-storage receiver with alarm.
Gas and vapor contaminants immediately dangerous to life and health.	Positive Pressure, Self-contained breathing apparatus. Self-rescue mouthpiece respirator (for escape only). Combination airline respirator with auxiliary self-contained air supply or an air-storage receiver with alarm.
Not immediately dangerous of life and health.	Airline respirator. Air-purifying, half-mask or mouthpiece respirator with chemical cartridge.
Particulate contaminants immediately dangerous to life and health.	Positive Pressure, Self-contained breathing apparatus. Self-rescue mouthpiece respirator (for escape only). Combination airline respirator with auxiliary self-contained air supply or an air-storage receiver with alarm.
Not immediately dangerous to life and health.	Air-purifying, half-mask or mouthpiece respirator with filter pad or cartridge. Airline respirator. Airline abrasive-blasting respirator.

SELECTION OF RESPIRATORS	
Hazard	Respirator (See Note)
Combination gas, vapor, and particulate contaminants immediately dangerous to life and health.	Positive Pressure, Self-contained breathing apparatus. Self-rescue mouthpiece respirator (for escape only). Combination air-line respirator with auxiliary self-contained air supply or an air-storage receiver with alarm.
Not immediately dangerous.	Airline respirator. Air-purifying, half-mask or mouthpiece respirator with chemical cartridge and appropriate filter.

Note: For the purpose of this part, "immediately dangerous to life and health" is defined as a condition that poses either an immediate threat to life and health or an immediate threat of severe exposure to contaminants, such as radioactive materials, which are likely to have adverse delayed effects on health.

### 13.4.19 Fire Protection and Prevention

#### 1. Fire protection.

- a. The contractor shall be responsible for the development and maintenance of an effective fire protection and prevention program at the job site throughout all phases of the construction work and shall ensure the availability of the fire protection and suppression equipment required.
- b. Access to all available firefighting equipment shall be maintained at all times.
- c. All firefighting equipment shall be conspicuously located.
- d. All firefighting equipment shall be periodically inspected and maintained in operating condition. Defective equipment shall be immediately replaced.
- e. As warranted by the project, the contractor shall provide a trained and equipped firefighting organization (Fire Brigade) to assume adequate protection for life and property.
- f. A fire extinguisher, rated not less than 20 ABC, shall be provided within 15 meters of wherever more than 25 liters of flammable or combustible liquids or 3 kg of flammable gas are being used on the job site. This requirement does not apply to the integral fuel tanks of motor vehicles.
- g. Carbon tetrachloride and other toxic vaporizing liquid fire extinguishers are prohibited.

- h. The following table may be used as a guide for selecting the appropriate portable fire extinguishers.

Fire Extinguishers Data					
Class	Water Type	Foam	Carbon Dioxide	Sodium or Potassium Bicarbonate	Multi-Purpose ABC
A Wood, Paper, Trash Having Glowing Embers	YES	YES	NO	NO	YES
B Flammable Liquids, Gasoline, Oil, Paints, Grease, Etc.	NO	YES	YES	YES	YES
C Electrical Equipment	NO	NO	YES	YES	YES

Source: 29 CFR Part 1926

## 2. Fire Prevention.

- a. Electrical wiring and equipment for light, heat or power purposes shall be installed in compliance with the requirements of applicable country codes.
- b. Smoking shall be prohibited at or in the vicinity of operations which constitute a fire hazard, and shall be conspicuously posted: "No Smoking or Unauthorized Ignition Sources."
- c. Open Yard Storage.
  - Combustible materials shall be piled with due regard to the stability of piles and in no case higher than 6 meters.
  - Driveways between and around combustible storage piles shall be at least 5 meters wide and maintained free from rubbish, equipment, or other articles or materials. Driveways shall be so spaced that a maximum grid system of 15 meters by 45 meters is produced.
  - The entire storage site shall be kept free from accumulation of unnecessary combustible materials. Weeds and grass shall be kept down and a regular procedure provided for the periodic cleanup of the entire area.

- Method of piling shall be solid wherever possible and in orderly and regular piles. No combustible material shall be stored outdoors within 3 meters of a building or structure.
  - Portable fire extinguishing equipment, suitable for the fire hazard involved, shall be provided at convenient, conspicuously accessible locations in the yard area.
  - Portable fire extinguishers, rated not less than 2A, shall be placed so that maximum travel distance to the nearest unit shall not exceed 30 meters.
- d. Indoor Storage.
- Storage shall not obstruct, or adversely affect, means of exit.
  - All materials shall be stored, handled and piled with due regard to their fire characteristics.
  - Non-compatible materials, which may create a fire hazard, shall be segregated by a barrier having a fire resistance of at least 1 hour.
  - Materials shall be piled to minimize the spread of fire internally and to permit convenient access for firefighting. Stable piling shall be maintained at all times. Aisle space shall be maintained to safely accommodate the widest vehicle that may be used within the building for firefighting purposes.
  - Clearance shall be maintained around lights and heating units to prevent ignition of combustible materials.
- e. Right-of-Way and Access Roads. The preservation of wildlife, vegetation and human resources is an important aspect of the endeavor. Following simple and effective methods of prevention and control by personnel operating equipment in the area will assure land preservation. The following requirements must be included as part of each employee's daily operation.

Due to the low amount of precipitation, drought conditions may be existent before and during the construction period. Help prevent the ignition source that could devastate the area by following these mandatory precautions:

- Catalytic mufflers on passenger cars and trucks are sources of ignition. Vehicle operators must be aware of the environment and not drive into a high grassy area unless the area has been cleared or wet down.
- Four wheel drive vehicles are preferred on the right-of-way because of the distance between the ground and the muffler.
- Exhaust and mufflers on trucks should be extended up the side of the vehicle, where possible.
- A major source of rangeland fires can be attributed to cigarettes being flipped out an open window. Avoid this habit and dispose of the cigarettes in the ashtray of the automobile in which you are riding.
- Right-of-Way and Access Roads. Fire extinguishers are to be carried in all vehicles that are required to be on the ROW where dry foliage conditions exist. 5# ABC units are preferred.
- Extreme caution must be taken while smoking on the ROW. Dispose of cigarettes or other smoking material in designated containers.
- No open fires will be allowed.
- Cooking on the ROW will not be allowed.
- Where designated parking areas exist, park only in these areas where the grass and other vegetation has been cut or wet down to avoid ignition.
- Should access continuously be required across high foliage areas and during dry conditions, four-wheel drive vehicles equipped with a 100 liter water tank and pressure pump must be available on the site.

#### 13.4.20 Flammable and Combustible Liquids

1. Only approved containers and portable tanks shall be used for storage and handling of flammable and combustible liquids. Approved metal safety cans shall be used for the handling and use of flammable liquids in quantities greater than one gallon, except that this shall not apply to those flammable liquid materials which are highly viscid (extremely hard to pour), which may be used and handled in original shipping containers. For quantities

of one gallon or less, only the original container or approved metal safety cans shall be used for storage, use and handling of flammable liquids.

2. Storage areas shall be kept free of weeds, debris and other combustible material not necessary to the storage.
3. At least one portable fire extinguisher having a rating of not less than 20-ABC units shall be located not less than 8 meters, nor more than 24 meters, from any flammable liquid storage area located outside.
4. At least one portable-fire extinguisher having a rating of not less than 20-ABC units shall be provided on all tank trucks or other vehicles used for transporting and/or dispensing flammable or combustible liquids.
5. There shall be no smoking or unauthorized ignition sources in areas used for fueling, servicing fuel systems for internal combustion engines, receiving or dispensing of flammable or combustible liquids.
6. Conspicuous and legible signs prohibiting smoking shall be posted.
7. The motors of all equipment being fueled shall be shut off during the fueling operation.

#### 13.4.21 Signs, Signals, and Barricades

1. Signs and symbols required for accident prevention shall be visible at all times when work is being performed, and shall be removed or covered promptly when the hazards no longer exist.
2. Accident prevention tags shall be used as a temporary means of warning employees of an existing hazard, such as defective tools, equipment, etc.

3. Construction areas shall be posted with visible and legible traffic signs at points of hazards.
4. When operations are such that signs, signals and barricades do not provide the necessary protection on or adjacent to a highway or street, flaggers or other appropriate traffic controls shall be provided.
5. Hand signaling by flaggers shall be by use of red flags at least 1/2 meter square or sign paddles, and in periods of darkness, red lights.
6. Flaggers shall be provided with and shall wear a red or orange warning garment while flagging. Warning garments worn at night shall be of reflectorized material.
7. The flaggers shall stand on the shoulder of the road next to the lane of traffic being controlled, NEVER on the road itself unless flaggers are behind barricades.
8. Be sure the flaggers are far enough ahead of the place where the work is so motorists can slow down and stop safely.
9. The flaggers should always face the traffic being controlled but be sure the flaggers can also see what is going on where the workers are working, or, if the flaggers cannot, they should have direct and continuous communication with the place where fellow workers are, such as two-way radio or telephone.

#### **13.4.22 Tools - Hand and Power Operated**

1. General requirements.
  - a. All hand and power tools and similar equipment, whether furnished by the contractor or the employee, shall be maintained in a safe condition.
  - b. When power operated tools are designed to accommodate guards, they shall be equipped with such guards when in use.



2. Hand Tools.
  - a. Contractors shall not issue or permit the use of unsafe hand tools.
  - b. Wrenches, including adjustable pipe, end and socket wrenches shall not be used when jaws are sprung to the point that slippage occurs.
  - c. Impact tools, such as drift pins, wedges and chisels, shall be kept free of mushroomed heads.
  - d. The wooden handles of tools shall be kept free of splinters or cracks and shall be kept tight in the tool.
  
3. Power-operated hand tools.
  - a. Electric power operated tools shall either be of the approved double-insulated type or grounded.
  - b. Extension cords used with portable electric tools and appliances shall be of three-wire type.
  - c. The use of electric cords for hoisting or lowering tools shall not be permitted.
  - d. Pneumatic power tools shall be secured to the hose or whip by some positive means to prevent the tool from becoming accidentally disconnected.
  - e. All hoses exceeding 1 1/2 centimeter inside diameter shall have a safety device at the source of supply or branch line to reduce pressure in case of hose failure.
  - f. The fluid used in hydraulic powered tools shall be fire-resistant, and shall retain its operation characteristics at the most extreme temperatures to which it will be exposed.
  - g. The manufacturer's safe operating pressures for hoses, valves, pipe filters and other fittings shall not be exceeded.
  - h. Only personnel who have been trained in the operation of Power-Actuated Tools shall be allowed to operate that particular tool.
  - i. The tool shall be inspected each day before loading to see that safety devices are in proper working condition.
  - j. Any tool found not in proper working order, or that develops a defect during use, shall be immediately removed from service and not used until properly repaired.

- k. Tools shall not be loaded until just prior to the intended firing time. Neither loaded nor empty tools are to be pointed at any employees. Hands shall be kept clear of the open barrel end.
  - l. Loaded tools shall not be left unattended.
  - m. Tools shall not be used in an explosive or flammable atmosphere.
  - n. All tools shall be used with correct shields, guard or attachment recommended by the manufacturer.
4. Abrasive wheels and tools.
- a. All grinding machines shall be supplied with sufficient power to maintain the spindle speed at safe levels under all conditions of normal operation, and shall be equipped with safety guards.
  - b. Floor and bench-mounted grinders shall be provided with work rests which are rigidly supported and readily adjustable. Such work rests shall be kept at a distance not to exceed one-eighth from the surface of the wheel.
  - c. All employees using abrasive wheels shall be protected by eye protection equipment.
5. Woodworking tools.
- a. All fixed power driven woodworking tools shall be provided with a disconnect switch that can either be locked or tagged in the off position.
  - b. All portable, power driven circular saws shall be equipped with guards above and below the base plate or shoe.
5. Jacks-lever and ratchet, screw, and hydraulic tools.
- a. The manufacturer's rated capacity shall be legibly marked on all jacks and shall not be exceeded.
  - b. All jacks shall have a positive stop to prevent overtravel.

### 13.4.23 Blasting and the Use of Explosives

#### 1. General

- a. The contractor shall permit only authorized and qualified persons to handle and use explosives.
- b. Smoking, firearms, matches, open flame lamps, and other fires, flame or heat producing devices and sparks shall be prohibited in or near explosive magazines or while explosives are being handled, transported or used.
- c. No person shall be allowed to handle or use explosives while under the influence of intoxicating liquors, narcotics, or other dangerous drugs.
- d. All explosives shall be accounted for at all times. Explosives not being used shall be kept in a locked magazine, unavailable to persons not authorized to handle them. The contractor shall maintain an inventory and use record of all explosives. Appropriate authorities shall be notified of any loss, theft, or unauthorized entry into a magazine.
- e. No explosives or blasting agents shall be abandoned.
- f. No fire shall be fought where the fire is in imminent danger of contact with explosives. All personnel shall be removed to a safe area and the fire area guarded against intruders.
- g. Original containers, or Class I magazines, shall be used for taking detonators and other explosives from storage magazines to the blasting area.
- h. When blasting is done in congested areas or in proximity to a structure, railway, or highway, or any other installation that may be damaged,
  - the requisite authority to blast, if required, shall have been obtained.
  - the blaster shall take special precautions in the loading, delaying, initiation, and confinement of each blast with mats or other methods so as to control the throw of fragments, and thus prevent bodily injury to employees or damage to buildings, etc.
- i. Personnel authorized to prepare explosive charges or conduct blasting operations shall use every reasonable precaution including, but not limited to, visual and audible warning signals, flags, or barricades, to ensure employee safety.

- j. Blasting operations above ground shall be conducted between sunup and sundown.
  - k. Due precautions shall be taken to prevent accidental discharge of electric blasting caps from current induced by radar, radio transmitters, lightning, adjacent power lines, dust storms, or other sources of extraneous electricity.
  - l. Empty boxes and paper and fibre packing materials, which have previously contained high explosives, shall not be used again for any purpose, but shall be destroyed by burning at an approved location.
  - m. Explosives, blasting agents, and blasting supplies that are obviously deteriorated or damaged shall not be used.
  - n. Delivery and issue of explosives shall only be made by and to authorized persons and into authorized magazines or approved temporary storage or handling areas.
  - o. Blasting operations in the proximity of overhead power line communication lines, utility services, or other services and structures shall not be initiated until the operators and/or owners have been notified and measures for safe control have been taken.
  - p. The use of black powder shall be prohibited.
  - q. All loading and firing shall be directed and supervised by competent persons thoroughly experienced in this field.
2. Blaster qualifications.
- a. A blaster shall be able to understand and give written and verbal orders.
  - b. A blaster shall be in good physical condition and not be addicted to narcotics, intoxicants, or similar types of drugs.
  - c. A blaster shall be qualified, by reason of training, knowledge, or experience, in the field of transporting, storing, handling, and the use of explosives, and have a working knowledge of the laws and regulations which pertain to explosives in the country in which the work is being carried out.
  - d. Blasters shall be required to furnish satisfactory evidence of competency in handling explosives and performing in a safe manner the type of blasting that will be required.

- e. The blaster shall be knowledgeable and competent in the use of each type of blasting method used.
3. Transportation of explosives.
- a. Transportation of explosives shall meet the provisions of local regulations.
  - b. Motor vehicles or conveyances transporting explosives shall only be driven by, and be in the charge of, a licensed driver who is physically fit. He shall be familiar with local regulations governing the transportation of explosives.
  - c. No person shall smoke, or carry matches or any other flame producing device, nor shall firearms or loaded cartridges be carried while in or near a motor vehicle or conveyance transporting explosives.
  - d. Explosives, blasting agents, and blasting supplies shall not be transported with other materials or cargoes. Blasting caps (including electric) shall not be transported in the same vehicle with other explosives.
  - e. Vehicles used for transporting explosives shall be strong enough to carry the load without difficulty, and shall be in good mechanical condition.
  - f. When explosives are transported by a vehicle with an open body, a Class II magazine or original manufacturer's container shall be securely mounted on the bed to contain the cargo.
  - g. All vehicles used for the transportation of explosives shall have tight floors and any exposed spark-producing metal on the inside of the body shall be covered with wood, or other non-sparking material, to prevent contact with containers of explosives.
  - h. Every motor vehicle or conveyance used for transporting explosives shall be marked or placarded on both sides, the front, and the rear with the word "EXPLOSIVES" in red letters, not less than four inches in height, on white background. In addition to such marking or placarding, the motor vehicle or conveyance may display in such a manner that it will be readily visible from all directions, a red flag, 18 inches by 30 inches, with the word "EXPLOSIVES" painted, stamped, or sewn thereon, in white letters, at least six inches in height.

- i. Each vehicle used for transportation of explosives shall be equipped with a fully charged fire extinguisher, in good condition. The driver shall be trained in the use of the extinguisher on his vehicle.
  - j. Motor vehicles or conveyances carrying explosives, blasting agents, or blasting supplies, shall not be taken inside a garage or shop for repairs or servicing.
  - k. No motor vehicle transporting explosives shall be left unattended.
4. Storage of explosives and blasting agents.
- a. Explosives and related materials shall be stored in approved facilities.
  - b. Blasting caps, electric blasting caps, detonating primers, and primed cartridges shall not be stored in the same magazine with other explosives or blasting agents.
  - c. Smoking and open flames shall not be permitted within 30 meters of explosives and detonator storage magazine.
4. Loading of Explosives
- a. Procedures that permit safe and efficient loading shall be established before loading is started.
  - b. All drill holes shall be sufficiently large to admit freely the insertion of the cartridges of explosives.
  - c. Tamping shall be done only with wood rods or plastic tamping poles without exposed metal parts, but non-sparking metal connectors may be used for jointed poles. Violent tamping shall be avoided. The primer shall never be tamped.
  - d. No holes shall be loaded except those to be fired in the next round of blasting. After loading, all remaining explosives and detonators shall be immediately returned to an authorized magazine.
  - e. Drilling shall not be started until all remaining butts of old holes are examined for unexploded charges, and if any are found, they shall be refired before work proceeds.
  - f. No person shall be allowed to deepen drill holes which have contained explosives or blasting agents.
  - g. No explosives or blasting agents shall be left unattended at the blast site.

- h. Machines and all tools not used for loading explosives into bore holes shall be removed from the immediate location of holes before explosives are delivered. Equipment shall not be operated within 50 feet of loaded holes.
- i. No activity of any nature other than that which is required for loading holes with explosives shall be permitted in a blast area.
- j. Power lines and portable electric cables for equipment being used shall be kept a safe distance from explosives or blasting agents being loaded into drill holes. Cables in the proximity of the blast area shall be de-energized and locked out by the blaster.
- k. Holes shall be checked prior to loading to determine depth and conditions. Where a hole has been loaded with explosives but the explosives have failed to detonate, there shall be no drilling within 50 feet of the hole.
- l. When loading a long line of holes with more than one loading crew, the crews shall be separated by practical distance consistent with efficient operation and supervision of crews.
- m. No explosive shall be loaded or used underground in the presence of combustible gases or combustible dusts.
- n. All blast holes in open work shall be stemmed to the collar or to a point which will confine the charge.
- o. Warning signs, indicating a blast area, shall be maintained at all approaches to the blast area. The warning sign lettering shall not be less than four inches in height, RED on a contrasting background.
- p. A bore hold shall never be sprung when it is adjacent to or near a hole that is loaded. Flashlight batteries shall not be used for springing holes.
- q. Drill holes which have been sprung or chambered, and which are not water-filled, shall be allowed to cool before explosives are loaded.
- r. No loaded holes shall be left unattended or unprotected.
- s. The blaster shall keep an accurate, up to date record of explosives, blasting agents, and blasting supplies used in a blast and shall keep an accurate running inventory of all explosives and blasting agents stored on the operation.

5. Initiation of explosives charges - electric blasting.
  - a. Electric blasting caps shall not be used where sources of extraneous electricity make the use of electric blasting caps dangerous. Blasting cap leg wires shall be kept short-circuited (shunted) until they are connected into the circuit for firing.
  - b. Before adopting any system of electrical firing, the blaster shall conduct a thorough survey for extraneous currents, and all dangerous currents shall be eliminated before any holes are loaded.
  - c. In any single blast using electric blasting caps, all caps shall be of the same style or function, and of the same manufacture.
  - d. Electric blasting shall be carried out by using blasting circuits or power circuits in accordance with the electric blasting cap manufacturer's recommendations, or an approved contractor or his designated representative.
  - e. When firing a circuit of electric blasting caps, care must be exercised to ensure that an adequate quantity of delivered current is available, in accordance with the manufacturer's recommendations.
  - f. Connecting wires and lead wires shall be insulated single solid wires of sufficient current carrying capacity.
  - g. Bus wires shall be solid single wires of sufficient current-carrying capacity.
  - h. When firing electrically, the insulation on all firing lines shall be adequate and in good condition.
  - i. A power circuit used for firing electric blasting caps shall not be grouted.
  - j. In underground operations when firing from a power circuit, a safety switch shall be placed in the permanent firing line at intervals. This switch shall be made so it can be locked only in the "Off" position and shall be provided with a short-circuiting arrangement of the firing lines to the cap circuit.
  - k. In underground operations there shall be a "lightning" gap of at least 1 1/2 meters in the firing system ahead of the main firing switch; that is, between the switch and the source of power. This gap shall be bridged by a flexible jumper cord just before firing the blast.
  - l. When firing from a power circuit, the firing switch shall be locked in the open or "Off" position at all times, except when firing. It shall be so designed that the



- firing lines to the cap circuit are automatically short-circuited when the switch is in the "Off" position. Keys to this switch shall be entrusted only to the blaster.
- m. Blasting machines shall be in good condition and the efficiency of the machine shall be tested periodically to make certain that it can deliver power at its rated capacity.
  - n. When firing with blasting machines, the connections shall be made as recommended by the manufacturer of the electric blasting caps used.
  - o. The number of electric blasting caps connected to a blasting machine shall not be in excess of its rated capacity. Furthermore, in primary blasting, a series circuit shall contain no more caps than the limits recommended by the manufacturer of the electric blasting caps in use.
  - p. The blaster shall be in charge of the blasting machines, and no other person shall connect the leading wires to the machine.
  - q. Blasters, when testing circuits to charged holes, shall use only blasting galvanometers equipped with a silver chloride cell especially designed for this purpose.
  - r. Whenever the possibility exists that a leading line or blasting wire might be thrown over a live power line by the force of an explosion, care shall be taken to see that the total length of wires are kept too short to hit the lines, or that the wires are securely anchored to the ground. If neither of these requirements can be satisfied, a non-electric system shall be used.
  - s. In electrical firing, only the man making leading wire connections shall fire the shot. All connections shall be made from the bore hole back to the source of firing current, and the leading wires shall remain shorted and not be connected to the blasting machine or other source of current until the charge is to be fired.
  - t. After firing an electric blast from a blasting machine, the leading wires shall be immediately disconnected from the machine and short-circuited.

6. Use of safety fuse.
  - a. Safety fuses shall only be used where sources of extraneous electricity make the use of electric blasting caps dangerous. The use of a fuse that has been hammered or injured in any way shall be forbidden.
  - b. The hanging of a fuse on nails or other projections which will cause a sharp bend to be formed in the fuse is prohibited.
  - c. Before capping safety fuse, a short length shall be cut from the end of the supply reel so as to assure a fresh cut end in each blasting cap.
  - d. Only a cap crimper of an approved design shall be used for attaching blasting caps to safety fuse. Crimpers shall be kept in good repair and accessible for use.
  - e. No unused cap or short capped fuse shall be placed in any hole to be blasted; such unused detonators shall be removed from the working place and destroyed.
  - f. No fuse shall be capped, or primers made up, in any magazine or near any possible source of ignition.
  - g. No one shall be permitted to carry detonators or primers of any kind on his person.
  - h. The minimum length of safety fuse to be used in blasting shall be less than 75 centimeters.
  - i. At least two persons shall be present when multiple cap and fuse blasting is done by hand lighting methods.
  - j. Not more than 12 fuses shall be lit by each blaster when hand lighting devices are used. However, when two or more safety fuses in a group are lighted as one by means of igniter cord, or other similar fuse-lighting devices, they may be considered as one fuse.
  - k. The so-called "drop fuse" method of dropping or pushing a primer or any explosive with a lighted fuse attached is forbidden.
  - l. Cap and fuse shall not be used for firing mud cap charges unless charges are separated sufficiently to prevent one charge from dislodging other shots in the blast.
  - m. When blasting with safety fuses, consideration shall be given to the length and burning rate of the fuse. Sufficient time, with a margin of safety, shall always be provided for the blaster to reach a place of safety.

8. Use of detonating cord.
  - a. Care shall be taken to select a detonating cord consistent with the type and physical condition of the bore hole and the type of explosive used.
  - b. Detonating cord shall be handled and used with the same respect and care given other explosives.
  - c. The line of detonating cord extending out of a bore hole or from a charge shall be cut from the supply spool before loading the remainder of the bore hole or placing additional charges.
  - d. Detonating cord shall be handled and used with care to avoid damaging or severing the cord during and after loading and hooking-up.
  - e. Detonating cord connections shall be made in accordance with approved and recommended methods. Knot-type or other cord-to-cord connections shall be made only with detonating cord in which the explosive core is dry.
  - f. All detonating cord trunklines and branch lines shall be free of loops, sharp kinks, or angles that direct the cord back toward the oncoming line of detonation.
  - g. All detonating cord connections shall be inspected before firing the blast.
  - h. When detonating cord millisecond delay connectors or short interval delay electric blasting caps are used with detonating cord, the practice shall conform strictly to the manufacturer's recommendations.
  - i. When connecting a blasting cap or an electric blasting cap to detonating cord, the cap shall be taped or otherwise attached securely along the side or the end of the detonating cord, with the end of the cap containing the explosive charge pointed in the direction in which the detonation is to proceed.
  - j. Detonators for firing the trunk-line shall not be brought to the loading area nor attached to the detonating cord until everything else is in readiness for the blast.
  
9. Firing the blast.
  - a. A code of warning signals as set out in 4. below shall be posted on one or more conspicuous places at the operation, and all employees shall be required to familiarize themselves with the code and conform to it. Danger signs shall be placed at suitable locations.

- b. Before a blast is fired, a loud warning signal shall be given by the blaster in charge, who has made certain that all surplus explosives are in a safe place and all personnel, vehicles and equipment are at a safe distance, or under cover.
  - c. Flaggers shall be safely stationed on highways which pass through the danger zone so as to stop traffic during blasting operations.
  - d. It shall be the duty of the blaster to fix the time of blasting.
    - Warning Signal. A 1 minute series of long audible warning signals 5 minutes prior to the blast signal and the waving of a red flag.
    - Blast Signal. A series of short audible warning signals 1 minute prior to the shot and the waving of a red flag.
    - All Clear Signal. A prolonged audible signal following the inspection of the blast area and the waving of a green flag.
10. Inspection after blasting.
- a. Immediately after the blast has been fired, the firing line shall be disconnected from the blasting machine, or where power switches are used, they shall be locked open or in the off position.
  - b. Sufficient time shall be allowed, for the smoke and fumes to leave the blasted area before returning to the shot. An inspection of the area and the surrounding rubble shall be made by the blaster to determine if all charges have been exploded before personnel are allowed to return to the operation.
11. Misfires
- a. If a misfire is found, the blaster shall provide proper safeguards excluding all personnel from the danger zone.
  - b. No other work shall be done except that necessary to remove the hazard of the misfire and only personnel necessary to do the work shall remain in the danger zone.
  - c. No attempt shall be made to extract explosives from any charged or misfired hole; a new primer shall be put in and the hole re-blasted. If re-firing of the misfired

hole presents a hazard, the explosives may be removed by washing out with water or, where the misfire is under water, blown out with air.

#### 13.4.24 Welding

##### 1. Gas welding and cutting.

###### a. Transporting, moving and storing compressed gas cylinders.

- Valve protection caps shall be in place and secured.
- When cylinders are hoisted, they shall be secured on a cradle, sling board or pallet. They shall not be hoisted or transported by means of magnets or choker slings.
- Cylinders shall be moved by tilting and rolling them on their bottom edges. They shall not be intentionally dropped, stuck or permitted to strike each other violently.
- When cylinders are transported by powered vehicles, they shall be secured in a vertical position.
- Valve protection caps shall not be used for lifting cylinders from one vertical position to another. Bars shall not be used under valves or valve protection caps to pry cylinders loose when frozen. Warm, not boiling, waters shall be used to thaw cylinders loose.
- Unless cylinders are firmly secured on a special carrier intended for this purpose, regulators shall be removed and valve protection caps put in place before cylinders are moved.
- Suitable cylinder truck, chain or other steadying device shall be used to keep cylinders from being knocked over while in use.
- When work is finished, when cylinders are empty, or when cylinders are moved at any time, the cylinder valve shall be closed.
- Compressed gas cylinders shall be secured in an upright position at all times except, if necessary, for short periods of time while cylinders are actually being hoisted or carried.

- Oxygen cylinders in storage shall be separated from fuel gas cylinders or combustible materials (especially oil or grease), a minimum distance of six meters or by a non-combustible barrier at least 1 1/2 meters high having a fire-resistance rating of at least one half hour.
- b. Placing cylinders.
- Cylinders shall be kept far enough away from the actual welding or cutting operation so that sparks, hot slag or flame will not reach them. When this is impractical, fire resistant shields shall be provided.
  - Cylinders shall be placed where they cannot become part of an electrical circuit. Electrodes shall not be struck against a cylinder to strike an arc.
  - Fuel gas cylinders shall be placed with valve end up whenever they are in use. They shall not be placed in a location where they would be subject to open flame, hot metal or other sources of artificial heat.
  - Cylinders containing oxygen or acetylene or other fuel gas shall not be taken into confined spaces.
- c. Treatment of cylinders.
- Cylinders, whether full or empty, shall not be used as rollers or supports.
  - No person other than the gas supplier shall attempt to mix gases in a cylinder. No one except the owner of the cylinder or person authorized by owner, shall refill a cylinder. No one shall use a cylinder's contents for purposes other than those intended by the supplier.
  - No damaged or defective cylinder shall be used.
- d. Use of fuel gas. The contractor shall thoroughly instruct personnel in the safe use of fuel gas, as follows:
- Before a regulator to a cylinder valve is connected, the valve shall be opened slightly and closed immediately. (This action is generally termed "cracking" and is intended to clear the valve of dust or dirt that might otherwise enter the regulator.) The person cracking the valve shall stand to one side of the outlet, not in front of it. The valve of a fuel gas cylinder shall not be cracked where the gas would reach welding work, sparks, flame or other possible sources of ignition.

- The cylinder valve shall always be opened slowly to prevent damage to the regulator. For quick closing, valves on fuel gas cylinders shall not be opened more than 1-1/2 turns. When a special wrench is required, it shall be left in position on the stem of the valve while the cylinder is in use so that the fuel gas flow can be shut off quickly in case of an emergency. In the case of manifolded or coupled cylinders, at least one such wrench shall always be available for immediate use. Nothing shall be placed on top of a fuel gas cylinder, when in use, which may damage the safety device or interfere with the quick closing of the valve.
  - Fuel gas shall not be used from cylinders through torches or other devices which are equipped with shutoff valves without reducing the pressure through a suitable regulator attached to the cylinder valve or manifold.
  - Before a regulator is removed from a cylinder valve, the cylinder valve shall always be closed and the gas released from the regulator.
  - If, when the valve on a fuel gas cylinder is opened, there is found to be a leak around the valve stem, the valve shall be closed and the gland nut tightened. If this action does not stop the leak, the use of the cylinder shall be discontinued, and it shall be properly tagged and removed from the work area. In the event that fuel gas should leak from the cylinder valve, rather than from the valve stem, and the gas cannot be shut off, the cylinder shall be properly tagged and removed from the work area. If a regulator attached to a cylinder valve will effectively stop a leak through the valve seat, the cylinder need not be removed from the work area.
  - If a leak should develop at a fuse plug or other safety device, the cylinder shall be removed from the work area.
- e. Hose
- Fuel gas hose and oxygen hose shall be easily distinguishable from each other. The contrast may be made by different colors or by surface characteristics readily distinguishable by the sense of touch. Oxygen and fuel gas hoses shall not be interchangeable. A single hose having more than one gas passage shall not be used.

- When parallel sections of oxygen and fuel gas hose are taped together, not more than 10 centimeters out of 30 centimeters shall be covered by tape.
- All hoses in use, carrying acetylene, oxygen, natural or manufactured fuel gas, or any gas or substance which may ignite or enter into combustion, or be in any way harmful to personnel, shall be inspected at the beginning of each working shift. Defective hose shall be removed from service.
- Hose which has been subject to flashback, or which shows evidence of severe wear or damage, shall be tested to twice the normal pressure to which is it subject, but in no case less than 300 p.s.i. Defective hose, or hose in doubtful condition shall not be used.
- Hose couplings shall be of the type that cannot be unlocked or disconnected by means of a straight pull without rotary motion.
- Boxes used for the storage of gas hose shall be ventilated.
- Hoses, cables and other equipment shall be kept clear of passageways, ladders and stairs.

f. Torches

- Clogged torch tip openings shall be cleaned with suitable cleaning wires, drills or other devices designed for such purposes.
- Torches in use shall be inspected at the beginning of each working shift for leaking shutoff valves, hose couplings and tip connections. Defective torches shall not be used.
- Torches shall be lighted by friction lighters or other approved devices, and not by matches or from hot work.

g. Regulators and gauges.

Oxygen and fuel gas pressure regulator, including their related gauges, shall be in proper working order while in use.

h. Oil and grease hazards.

Oxygen cylinders and fittings shall be kept away from oil or grease. Cylinders, cylinder caps and valves, couplings, regulators, hose and apparatus shall be kept free from oil or greasy substances and shall not be handled with oily hands or



gloves. Oxygen shall not be directed at oily surfaces, greasy clothes, or storage tank or vessel.

2. Arc welding and cutting

a. Manual electrode holders.

- Only manual electrode holders which are specifically designed for arc welding and cutting, and are of a capacity capable of safely handling the maximum rated current required by the electrodes, shall be used.
- Any current-carrying parts passing through the portion of the holder which the arc welder or cutter grips in their hand, and the outer surfaces of the jaws of the holder, shall be fully insulated against the maximum voltage encountered to ground.

b. Welding cables and connectors.

- All arc welding and cutting cables shall be completely insulated, flexible type, capable of handling the maximum current requirements of the work in progress, taking into account the duty cycle under which the arc welder or cutter is working.
- Only cable free from repair or splices for a minimum distance of three meters from the cable end to which the electrode holder is connected shall be used, except that cables with standard insulated connectors or with splices whose insulating quality is equal to that of the cable are permitted.
- When it becomes necessary to connect or splice lengths of cable one to another, substantial insulated connectors of a capacity at least equivalent to that of the cable shall be used. If connections are effected by means of cable lugs, they shall be securely fastened together to give good electrical contact, and the exposed metal parts of the lugs shall be completely insulated.
- Cables in need of repair shall not be used. When a cable, other than the cable lead referred to in Subparagraph (B) of this section, becomes worn to the extent of exposing bare conductors, the portion thus exposed shall be

protected by means of rubber and friction tape or other equivalent insulation.

c. Ground returns and machine grounding.

- A ground return cable shall have a safe current carrying capacity equal to or exceeding the specified maximum output capacity of the arc welding or cutting unit which it services. When a single ground return cable services more than one unit, its safe current-carrying capacity shall equal or exceed the total specified maximum output capacities of all the units which it services.
- Pipelines containing gases or flammable liquids, or conduits containing electrical circuits, shall not be used as a ground return.
- When a structure or pipeline is employed as a ground return circuit, it shall be determined that the required electrical contact exists at all joints. The generation of an arc, sparks or heat at any point shall cause rejection of the structures as a ground circuit.
- When a structure or pipeline is continuously employed as a ground return circuit, all joints shall be bonded, and periodic inspections shall be conducted to ensure that no condition of electrolysis or fire hazard exist by virtue of such use.
- The frames of all arc welding and cutting machines shall be grounded either through a third wire in the cable containing the circuit conductor or through a separate wire which is grounded at the source of the current. Grounding circuits, other than by means of the structure, shall be checked to ensure that the circuit between the ground and the grounded power conductor has resistance low enough to permit sufficient current to flow to cause the fuse or circuit breaker to interrupt the current.
- All ground connections shall be inspected to ensure that they are mechanically strong and electrically adequate for the required current.

d. Operating Instructions. Contractors shall instruct personnel in the safe means of arc welding and cutting as follows:

- When electrode holders are to be left unattended, the electrodes shall be removed and the holders shall be so placed or protected that they cannot make electrical contact with personnel or conducting objects.
  - Hot electrode holders shall not be dipped in water, to do so may expose the arc welder or cutter to electric shock.
  - When the arc welder or cutter has occasion to leave their work or to stop work for any appreciable length of time, or when the arc welding or cutting machine is to be moved, the power supply switch to the equipment shall be opened.
  - Any faulty or defective equipment shall be reported to the supervisor.
- e. Shielding.
- Whenever practicable, all arc welding and cutting operations shall be shielded by noncombustible or flameproof screens which will protect employees and other persons working in the vicinity from the direct rays of the arc.

### 3. Fire prevention.

- a. When practical, objects to be welded, cut or heated shall be moved to a designated safe location or, if the objects to be welded, cut or heated cannot be readily moved, all movable fire hazards in the vicinity shall be taken to a safe place, or otherwise protected.
- b. If the object to be welded, cut or heated cannot be moved and if all the fire hazards cannot be removed, positive means shall be taken to confine the heat, sparks, and slag, and to protect the immovable fire hazards from them.
- c. No welding, cutting or heating shall be done where the application of flammable paints, or the presence of other flammable compounds, or heavy dust concentrations create a hazard.
- d. Suitable fire extinguishing equipment shall be immediately available in the work area and shall be maintained in a state of readiness for instant use.
- e. When the welding, cutting or heating operation is such that normal fire prevention precautions are not sufficient, additional personnel shall be assigned to guard.

against fire while the actual welding, cutting or heating operation is being performed, and for a sufficient period of time after completion of the work to ensure that no possibility of fire exists. Such personnel shall be instructed as to the specific anticipated fire hazards and how the firefighting equipment provided is to be used.

- f. Drums, containers or hollow structures which have contained toxic or flammable substances shall, before welding, cutting or heating is undertaken on them, either be filled with water or thoroughly cleaned of such substances and ventilated and tested.
  - g. Before heat is applied to a drum, container or hollow structure, a vent or opening shall be provided for the release of any built-up pressure during the application of heat.
4. Ventilation and protection in welding, cutting and heating.
- a. Mechanical Ventilation: For purposes of this section, mechanical ventilation shall meet the following requirements:
    - Mechanical ventilation shall consist of either general mechanical ventilation systems or local exhaust systems.
    - General mechanical ventilation shall be of sufficient capacity and so arranged as to produce the number of air changes necessary to maintain welding fumes and smoke within safe limits, as defined in the section under ventilation.
    - Local exhaust ventilation shall consist of freely movable hoods intended to be placed by the welder or burner as close as practicable to the work. This system shall be of sufficient capacity and so arranged as to remove fumes and smoke at the source and keep the concentration of them in the breathing zone within safe limits, as defined in the section under ventilation.
    - Contaminated air exhausted from a working space shall be discharged into the open air or otherwise clear of the source of intake air.
    - All air replacing that withdrawn shall be clean and respirable.

- Oxygen shall not be used for ventilation purposes, comfort cooling, blowing dust from clothing or for cleaning the work area.
- b. Welding, cutting and heating in confined spaces.
- Except as provided in Subparagraph (b) of this paragraph either general mechanical or local exhaust ventilation meeting the requirements of Paragraph (A) of this section shall be provided whenever welding, cutting or heating is performed in a confined space.
  - When sufficient ventilation cannot be obtained without blocking the means of access, employees in the confined space shall be protected by airline respirators and an employee on the outside of such a confined space shall be assigned to maintain communication with those working within it and to aid them in an emergency.
  - Where a welder must enter a confined space through a manhole or other small opening, means shall be provided for quickly removing him in case of emergency. When safety belts and lifelines are used for this purpose, they shall be so attached to the welder's body that his body cannot be jammed in a small exit opening. An attendant with a pre-planned rescue procedure shall be stationed outside to observe the welder at all times and be capable of putting rescue operations into effect.
- c. Welding, cutting, or heating of metals of toxic significance
- Welding, cutting, or heating in any enclosed spaces involving zinc-bearing base or filler metals, or metals coated with zinc-bearing materials; lead base metals; cadmium-bearing filler materials; or chromium-bearing metals or metals coated with chromium-bearing materials shall be performed with either general mechanical or local exhaust ventilation meeting the requirements of Paragraph A of this section.
  - Welding, cutting, or heating in any enclosed spaces involving metals containing lead, other than as an impurity, or metals coated with lead-bearing materials; cadmium-bearing or cadmium-coated base metals; metals coated with mercury-bearing materials; or beryllium-containing base or filler metals shall be performed with local exhaust ventilation in

accordance with the requirements or paragraph A of this section, or employees shall be protected by air line respirators. Because of its high toxicity, work involving beryllium shall be done with both local exhaust ventilation and air line respirators.

- Employees performing such operations in the open air shall be protected by filter-type respirators in accordance with the requirements of Section XIX of this part, except that employees performing such operations on beryllium-containing base or filler metals shall be protected by air line respirators.
- Other employees exposed to the same atmosphere as the welders or burners shall be protected in the same manner as the welder or burner.

d. Inert-Gas Metal-Arc Welding.

- Since the inert-gas metal-arc welding process involves the production of ultraviolet radiation of intensities of 5 to 30 times higher than that produced during shielded metal-arc welding, the decomposition of chlorinated solvents by ultraviolet rays, and the liberation of toxic fumes and gases, employees shall not be permitted to engage in, or be exposed to the process until the following special precautions have been taken:
  - i) The use of chlorinated solvents shall be kept at least 60.6 meters, unless shielded from the exposed arc, and surfaces prepared with chlorinated solvents shall be thoroughly dry before welding is permitted on such surfaces.
  - ii) Employees in the area not protected from the arc by screening shall be protected by filter lenses meeting the requirements under eye protection of this Manual. When two or more welders are exposed to each other's arc, filter lens goggles of a suitable type, meeting the requirements of eye protection of this Manual shall be worn under welding helmets. Hand shields to protect the welder against flashes and radiant energy shall be used when either the helmet is lifted or the shield is removed.

- iii) Welders and other personnel who are exposed to radiation shall be suitably protected so that the skin is covered completely to prevent burns and other damage by ultraviolet rays. Welding helmets and hand shields shall be free of leaks and openings, and free of highly reflective surfaces.
  - When inert gas metal-arc welding is being performed on stainless steel, the requirements of paragraph 3.B. above shall be met to protect against dangerous concentrations of nitrogen dioxide.
- e. General welding, cutting and heating.
  - Welding, cutting and heating, not involving conditions described in Paragraph (2) or (3) of this section, may normally be done without mechanical ventilation or respiratory protective equipment, but where, because of unusual physical or atmospheric conditions, an unsafe accumulation of contaminants exists, suitable mechanical ventilation or respiratory protective equipment shall be provided.
  - Personnel performing any type of welding, cutting or heating shall be protected by suitable eye protective equipment.
  - Necessary precautions shall be taken by the welder to protect their ears when welding in a bellhole.
  - Eye protection shall be worn by all personnel doing any buffing or grinding work.
  - Welding trucks shall be equipped with approved fire extinguishers, first aid materials, etc.
- 5. Welding, cutting, and heating on preservative coatings.
  - a. Before welding, cutting or heating is commenced on any surface covered by a preservative coating whose flammability is not known, a test shall be made by a competent person to determine its flammability. Preservative coatings shall be considered to be highly flammable when scrapings burn with extreme rapidity.

- b. Precautions shall be taken to prevent ignition of highly flammable hardened preservative coatings. When coatings are determined to be flammable, they shall be stripped from the area to be heated to prevent ignition.
- c. Protection against toxic preservative coatings.
  - In enclosed spaces, all surfaces covered with toxic preservatives shall be stripped of all toxic coatings for a distance of at least 4 inches from the area of heat application, or the employees shall be protected by airline respirators.
  - In the open air, personnel shall be protected by a respirator, in accordance with requirements of Table 6 of this Manual (Section XIX).
  - The preservative coatings shall be removed a sufficient distance from the area to be heated to ensure that the temperature of the unstripped metal will not be appreciably raised. Artificial cooling of the metal surrounding the heating area may be used to limit the size of the area required to be cleaned.

#### 13.4.25 Rigging Equipment for Material Handling

##### 1. General.

- a. Rigging equipment for material handling shall be inspected prior to use on each shift and as necessary during its use to ensure that it is safe. Defective rigging equipment shall be removed from service.
- b. Rigging equipment shall not be loaded in excess of its recommended safe working load.
- c. Rigging equipment, when not in use, shall be removed from the immediate work area so as not to present a hazard to personnel.
- d. Special custom design grabs, hooks, clamps, or other lifting accessories, shall be marked to indicate the safe working loads and shall be proof-tested prior to use to 125% of their rated load.



## 2. Alloy steel chains

- a. Welded alloy steel chain slings shall have permanently affixed durable identification stating size, grade, rated capacity and sling manufacturer.
- b. Hooks, rings, oblong links, pear-shaped links, welded or mechanical coupling links, or other attachments, when used with alloy steel chains, shall have a rated capacity at least equal to that of the chain.
- c. Job or shop hooks and links, or makeshift fasteners, formed from bolts, rods, etc., or other such attachments, shall not be used.
- d. Rated capacity (work load limits) for alloy steel chain slings shall conform to the specified standard and/or manufacturer's recommendations.
- e. Whenever wear at any point of any chain link exceeds that set out in the specified standard and/or manufacturer's recommendations, the assembly shall be removed from service.

## 3. Wire rope.

- a. Refer to the manufacturer's recommendations as to the safe working loads, classifications, and grades for steel wire rope and slings with various terminations. The safe working load recommended by the manufacturer shall be followed, provided that a safety factor of not less than 5 is maintained.
- b. Protruding ends of strands in splices on slings and bridles shall be covered or blunted.
- c. Wire rope shall not be secured by knots.
- d. The following limitations shall apply to the use of wire rope:
  - An eye splice made in any wire rope shall have not less than four full tucks. However, this requirement shall not operate to preclude the use of another form of splice or connection which can be shown to be as efficient and which is not otherwise prohibited.
  - Except for eye splices in the ends of wires and for endless rope slights, each wire rope used in hoisting or lowering, or in pulling loads, shall consist of one continuous piece without knot or splice.

- Eyes in wire rope bridles, slings or bull wires shall not be formed by wire rope clips or knots.
- Wire rope shall not be used if, in any length of eight diameters, the total number of visible broken wires exceeds 10 percent of the total number of wires, or if the rope shows other signs of excessive wear, corrosion or defect.
- When U-Bolt wire rope clips are used to form eyes, the following table shall be used to determine the number and spacing of clips.

NUMBER AND SPACING OF U-BOLT WIRE ROPE CLIPS			
NUMBER OF CLIPS			
Improved plow steel, rope diameter inches	Drop forged	Other material	Minimum spacing (inches)
1/2	3	4	3
5/8	3	4	3 3/4
3/4	4	5	4 1/2
7/8	4	5	5 1/4
1	5	6	6
1 1/8	6	6	6 3/4
1 1/4	6	7	7 1/2
1 3/8	7	7	8 1/4
1 1/2	7	8	9

Source: 29 CFR Part 1926

- When used for eye splices, the U-Bolt shall be applied so that the "U" section is in contact with the dead end of the rope.

### 13.4.26 Automotive Equipment

#### 1. General.

- a. No contractor shall allow the use of any motor vehicle equipment having an obstructed view to the rear unless:
  - The vehicle has a reverse signal alarm audible above the surrounding noise level or;
  - The vehicle is backed up only when an observer signals that it is safe to do so.
- b. All vehicles in use shall be inspected at the beginning of each shift to assure that the following parts, equipment and accessories are in safe operating condition and free of apparent damage that could cause failure while in use: service brakes, including trailer brake connections; parking system (hand brakes); emergency stopping system (brakes); tires; horn; steering mechanism; coupling devices; seat belts; operating controls; and safety devices. All defects shall be corrected before the vehicle is placed in service. These requirements also apply to equipment such as lights, reflectors, windshield wipers, defroster, fire extinguishers, etc., where such equipment is necessary.
- c. The winch-block used on trucks or tractors shall have a safety brindle on the hook.
- d. Cables and hoisting equipment shall be inspected daily. Damaged cable or hoisting equipment shall be replaced or repaired immediately.
- e. The use or possession of alcoholic beverages on company property or during work hours is strictly prohibited.
- f. Never stop in the center of the road. Always pull over to one side before stopping. If a breakdown occurs at night and the vehicle lights go out, protect the truck with appropriate signals until aid is secured.
- g. Before stopping or attempting to turn, always give proper signal to vehicle approaching from rear.
- h. The driver should look both ways before crossing railroad tracks, and should put the truck in low until the tracks are crossed.

- i. The driver must stop and look in both directions before driving onto a major highway from a minor road.
  - j. The driver shall slow down and sound horn of the vehicle when approaching a blind curve.
  - k. Drive as close to the right-hand side of the road as safety permits.
  - l. Do not fail to slow down the moment children are seen on the sidewalk or roadway. Drivers must stop when school buses are loading or unloading children.
  - m. Keep rear view mirror in good condition and use it for purposes intended. Make it as easy as possible for the approaching traffic to pass. Do not monopolize the highway.
  - n. The drivers of all trucks loaded with employees or materials, when starting down a steep hill shall shift gears to such a position as is necessary to insure complete control.
  - o. Truck and car drivers shall report all accidents involving personal injury or property damage to their supervisor immediately.
  - p. All trucks operating in a convoy shall travel a minimum of 100 meters apart.
  - q. All truck drivers shall be responsible for the safety of employees on their trucks, for compliance with safety regulations and for speed limits set by host country laws.
2. Transportation of personnel.
- a. Vehicles used to transport personnel shall have seats firmly secured and adequate for the number of employees to be carried.
  - b. Seat belts shall be installed and worn in all motor vehicles.
  - c. Tools and materials shall be secured to prevent movement when transported in the same compartment with personnel.
  - d. Personnel shall not ride with their arms or legs outside of the truck body, in standing position, on running boards, seated on fenders, or seated on or in trucks with loads.
  - e. The driver of a crew truck shall require that personnel not unload until the truck has come to a complete stop.

- f. Truck drivers shall not drive faster than the speed prescribed by the local laws and shall have the vehicle under control at all times.
  - g. Drivers must not permit non-employees to operate company equipment or vehicles.
  - h. No flammable liquids or loose materials of any kind shall be permitted in the compartment where people are riding.
3. Transportation of materials.
- a. All pipe loads shall be boomed with not less than three chains, and the chains shall not be less than 1 centimeter, good quality, with adequate strength for application. Loose end of boomer chains shall not be allowed to drag. Boomer handles shall be operated from the ground and on the right side of the vehicle. Employees should never stand over a boomer when releasing or taking up on loads.
  - b. All haulage vehicles, whose pay load is loaded by means of cranes, power shovels, loaders or similar equipment, shall have a cab shield and/or canopy adequate to protect the operator from shifting or falling materials.
  - c. Operating levers controlling hoisting or dumping devices on haulage bodies shall be equipped with a latch or other device which will prevent accidental starting or tripping of the mechanism.
  - d. Leather or leather-palm gloves shall be worn by employees when unloading pipe.
  - e. The load shall be examined carefully to see that stakes on both sides of the truck or wagon bed are securely set to prevent pipe from rolling when the boomers are released.
  - f. A power line pole should not be used as a snub for a winch when materials are moved or truck is pulled when stuck, as there is a danger of shorting the wires when the strain is taken off the pole.
  - g. Skids shall be properly placed when handling pipe or heavy materials.
  - h. Hooks or calipers on "A" frame of trucks shall be securely fastened to prevent swinging when not in use. Never stand under "A" frame.
  - i. Trailers being pulled by king pins shall have a safety chain of sufficient size to hold load should the king pin break.
  - h. Materials shall be properly loaded to prevent shifting or falling while in transit.

- i. Loads extending beyond the rear of the bed should be protected by red flags during the day and red lights at night. Over width loads shall not be permitted except when necessary, and then shall travel only during the day with necessary warning flags.
- j. Overhead clearance and width shall be checked before passing under low wires, cables, underpasses and bridges.
- k. When vehicles are parked, engines shall be stopped and emergency brakes set.

#### 13.4.27 Material Handling Equipment

##### 1. General

- a. Only qualified personnel shall be assigned as operators. Proper regard for safety of employees and the public shall be shown by contractors.
- b. All equipment shall be inspected daily and maintained in good working condition. An inspection report shall be given to the supervisor immediately upon completion.
- c. All equipment shall be driven off roads or highways at night. Where any portion of any machine or equipment projects into the road it shall be marked by red lights or flares.
- d. Operators shall not permit oiling or greasing, refueling or repairs until motors on the vehicles have been stopped.
- e. All drive chains, sprockets, gears, V-belts, and open shafting shall be properly guarded and guards shall be kept in position when the machine is in operation.
- f. Personnel sleeping or resting under equipment during rest periods shall be prohibited.
- g. If there is any question as to visibility, or when working close to people on the ground, the operator should get a signal from an employee or foreman before moving.
- h. Persons shall not be permitted to ride on equipment unless it is suitably equipped for such transport.

- i. Personnel shall not go in between to hitch or unhitch tractor or other equipment such as trailers, dope pots and sleds until they have been stopped and the operator shall not move equipment until the employee is clear of the equipment.
  - j. All machine operators shall familiarize themselves with safety rules for "Road and Railroad Crossings" of this manual.
  - k. All blades and booms shall be lowered when equipment is not in use.
  - l. Workers shall not ride pipe except for balancing pipe in line up and then not in standing position.
  - m. Workers shall not ride boom lines, crane hooks, headache balls.
  - n. Pipe lines being constructed in the vicinity of high tension power lines shall be properly grounded at all times.
  - o. Whenever equipment is parked, the parking brake must be set. In addition, equipment parked on inclines shall have the wheels chocked.
  - p. Do not move construction equipment or vehicles upon any access roadway or grade unless the access roadway or grade is constructed and maintained to accommodate safely the movement of equipment and vehicles involved.
2. Lifting equipment.
- a. The contractor shall comply with the manufacturer's specifications and limitations applicable to the operation of any and all cranes. Where manufacturers' specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a qualified engineer competent in this field and such determinations will be appropriately documented and recorded. Attachments used with cranes shall not exceed the capacity, rating or scope recommended by the manufacturer.
  - b. Rated load capacities, and recommended operating speeds, special hazard warnings or instructions, shall be conspicuously posted on all equipment. Instructions or warnings shall be visible to the operator while at their control station.
  - c. Hand signals to crane operators shall be those prescribed by the applicable ANSI standard for the type of crane in use. An illustration of the signals shall be posted at the job site.

- d. The contractor shall designate a competent person who shall inspect all machinery and equipment prior to each use, and during use, to make sure it is in safe operating condition. Any deficiencies shall be repaired, or defective parts replaced, before continued use.
- e. A thorough, annual inspection of the hoisting machinery shall be made by a competent person. The contractor shall maintain a record of the dates and results of inspections for each hoisting machine and piece of equipment.
- f. Wire rope shall be taken out of service when any of the following conditions exist:
- In running ropes, six randomly distributed broken wires in one lay or three broken wires in one strand in one lay.
  - Wear of one-third the original diameter of outside individual wires. Kinking, crushing, bird caging or any other damage resulting in distortion of the rope structure.
  - Evidence of any heat damage from any cause.
  - Reductions from nominal diameter of more than 1/64" for diameters up to and including 5/16"; 1/32" for diameters 3/8" to and including 1/2"; 3/64" for diameters 9/16" to and including 3/4"; 1/16" for diameters 7/8" to 1-1/8" inclusive; 3/32" for diameters 1-1/4" to 1-1/2" inclusive.
  - In standing ropes, more than two broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection.
  - Wire rope safety factors shall be in accordance with American National Standards Institute B30.5-1968 or SE J959-1966.
- g. Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains or other reciprocating, rotation, or other moving parts or equipment shall be guarded if such parts are exposed to contact by employees, or otherwise create a hazard. Guarding shall meet the requirements of the latest American National Standards Institute B15.1, Safety Code for Mechanical Power Transmission apparatus.
- h. Accessible areas within the swing radius of the rear of the rotating superstructure of the crane, either permanently or temporarily mounted, shall be barricaded in



such a manner as to prevent an employee from being struck or crushed by the crane.

- i. All exhaust pipes shall be guarded or insulated in areas where contact by personnel is possible in the performance of normal duties.
- j. Whenever internal combustion engine powered equipment exhausts in enclosed spaces, tests shall be made and recorded to see that employees are not exposed to unsafe concentrations of toxic gases or oxygen deficient atmosphere.
- k. All windows in cabs shall be of safety glass, or equivalent, that introduces no visible distortion that will interfere with the safe operation of the machine.
- l. Where necessary for rigging or service requirements, a ladder, or steps shall be provided to give access to a cab roof.
- m. Guardrails, handholds and steps shall be provided on cranes for easy access to the car and cab, conforming to the American National Standards Institute B30.5.
- n. Platforms and walkways shall have anti-skid surfaces.
- o. Fuel tank filler pipe shall be located in such a position, or protected in such a manner, as to not allow spill or overflow to run onto the engine, exhaust or electrical equipment of any machine being fueled.
- p. An accessible fire extinguisher of 5BC rating, or higher, shall be available at all operator stations or cabs of equipment.
- q. Except where electrical distribution and transmission lines have been de-energized and visibly grounded at point of work or where insulating barriers, not a part of or an attachment to the equipment or machinery, have been erected to prevent physical contact with the lines, equipment or machines shall be operated proximate to power lines only in accordance with the following:
  - For lines rated 50 KV or below, minimum clearance between the lines and any part of the crane or load shall be 3 meters.
  - For lines rated over 50 KV, minimum clearance between the lines and any part of the crane or load shall be 3 meters plus 1 centimeter for each 1 KV over 50 KV, or twice the length of the line insulator, but never less than 3 meters.

- In transit with no load and boom lowered, the equipment clearance shall be a minimum of 1 meter for voltages less than 50 KV, and 3 meters for voltages over 50 KV, up to and including 345 KV, and 5 meters for voltages up to and including 750 KV.
  - A person shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means.
  - If the boom or cables accidentally come into contact with an energized wire, the operator should swing the crane to get clear. If the crane cannot be cleared, the operator should stay on the crane and remain calm.
- r. All employees shall be kept clear of loads about to be lifted and of suspended loads.

3. Earthmoving equipment.

- a. These rules apply to the following types of earthmoving equipment: scrapers, loaders, crawler or wheel tractors, bulldozers, off-highway trucks and graders.
- b. Seat belts shall be provided on all equipment covered by this section.
- c. Seat belts need not be provided for equipment which is designed only for stand-up operation.
- d. Seat belts need not be provided for equipment which does not have rollover protective structure (ROPS) or adequate canopy protection.
- e. No contractor shall move or cause to be moved construction equipment or vehicles upon any access roadway or grade unless the access roadway or grade is constructed and maintained to accommodate safely the movement of the equipment and vehicle involved.
- f. Every emergency access ramp and berm used by a contractor shall be constructed to restrain and control runaway vehicles.
- g. All earthmoving equipment mentioned in this section shall have a service braking system capable of stopping and holding the equipment fully loaded.
- h. All bidirectional machines, such as rollers, compactors, front-end loaders, bulldozers and similar equipment, shall be equipped with a horn, distinguishable

from the surrounding noise level, which shall be operated as needed when the machine is moving in either direction. The horn shall be maintained in an operative condition.

- i. No contractor shall permit earthmoving or compacting equipment which has an obstructed view to the rear to be used in reverse gear unless the equipment has in operation a reverse signal alarm distinguishable from the surrounding noise level or an employee signals that it is safe to do so.
- j. Scissor points on all front-end loaders, which constitute a hazard to the operator during normal operation, shall be guarded.

4. Ditching machines.

- a. All machine guards shall be properly maintained and kept in position when the ditching machine is in operation.
- b. The machine operator shall be held responsible for maintaining the machine and equipment in a safe and satisfactory operating condition.
- c. Cleaning rocks, roots, or dirt from buckets on digging wheel or conveyor shall not be done while machine is in motion.
- d. Cables and fastenings shall be checked daily on digging wheel, and conveyors and brakes shall be checked before operating machine on inclines.
- e. Operator shall demand that all employees or public stand in the clear of the conveyor as well as the digging wheel while machine is in operation.
- f. Operator shall make sure that all employees are clear of the machine, and that all persons employed in the operation have been located or accounted for before operator moves the machine or engages the clutch of the digging wheel.
- g. Employees shall stand clear of skids or timbers placed under the ditcher tracks.
- h. In addition to the requirement specified in the preceding paragraphs, all of the requirements under Material Handling Equipment in this manual shall be followed and observed.

## 5. Bulldozers

- a. All steps, tracks or any surface used to mount the rig shall be clean, dry, free of grease, oil, mud or dirt.
- b. All controls are properly set for start-up and all guards and safety devices are in place and working.
- c. The bulldozer operator shall make certain that all employees are off and completely clear of the bulldozer before any operations are initiated.
- d. Bulldozers shall be equipped with headache racks or protective cover constructed of material sufficiently strong to protect operator when they are used in clearing operations.
- e. The bulldozer shall not be operated on right-of-way unless the brush crew is in the clear.
- f. Operators shall make certain that helpers are in the clear when stumps are pulled by winch and cable.
- g. Operator shall never attempt to make any repairs or adjustments or grease machine without first disengaging clutch, and shutting machine down.
- h. Substantial cribbing should be provided if necessary to work on or under the raised blade.
- i. In addition to the requirements specified in the preceding paragraphs, all of the requirements under Material Handling in this manual shall be followed and observed.

## 6. Sidebooms and tow tractors

- a. Before operating a sideboom or tow tractor, operator shall make sure everyone is in the clear. Workers shall not stand beneath tractor boom when lifting or lowering.
- b. No tractor or sideboom shall be operated until all controls have been inspected, tested and are in good working order.
- c. Operators are responsible for winch brakes, cable and pipe on side booms. Faulty winch brakes must be repaired before using tractor.

- d. Personnel shall not stand directly in front of cable hitches, tractors and pipe during "bending" operations or moving of pipe.
  - e. Personnel shall not pass under or work under a suspended load inside the angle of winch line, or near a cable, chain or rope.
  - f. Pipe shall never be picked up or lowered while any personnel are between the tractor and the pipe, and pipe shall never be carried over heads of personnel.
  - g. No one should give signals, directions or other instructions to an equipment operator unless they have been trained, authorized and directed to do so.
  - h. No operator shall leave their operating position while a load is hanging or held up by the sideboom without blocking under the load.
  - i. Operator shall not allow anyone to ride on the machine unless specific preparation is made for such transport.
  - j. All sideboom hooks shall be equipped with a safety catch or lock to prevent cable slipping out.
  - k. A chain shall be attached to each sideboom and belt or line chained to boom when tractor is not carrying a load and is moving along the right-of-way.
  - l. A tractor or sideboom shall not be run across a ditch until it has been ascertained that no injury can result if ground does cave in.
  - m. When dozing sides of ditch or backfilling, no workers shall be in the ditch.
  - n. In addition to the requirements specified in the preceding paragraphs, all of the requirements under Material Handling in this manual shall be followed and observed.
7. Fueling of equipment.
- a. Tank trucks used to transport split loads of gasoline, diesel and other fuels shall be the type provided with double bulkheads and drainage between compartments to prevent contamination from leaks. A separate pump shall be used for gasoline only, and there shall be no connecting lines between compartments.
  - b. The dome openings and draw-off faucets shall be painted identifying colors such as red for gasoline; green for kerosene; and black for diesel fuel. The dome

- openings for the tank trucks compartments shall have the names of the products stenciled around them.
- c. An outer shield shall be placed over the muffler on all fuel trucks. The tail pipe shall be extended to a safe point clear of the unloading connections and the pump.
  - d. Each fuel truck shall be provided with at least one approved fire extinguisher, such as a seven kilogram dry chemical type.
  - e. Motors on equipment shall be stopped and burners on dope pots extinguished before refueling.
  - f. Smoking within 30 meters shall be prohibited while equipment is being fueled and in the case of gasoline, there shall be no open fires, welding or burning in the nearby area.
  - g. Care shall be taken not to overfill any equipment with fuel. If fuel is spilled the engine or burner shall not be started.
  - h. In fueling equipment, the metal fill nozzle shall be kept in contact with the lip of the tank opening to eliminate any static accumulation.
  - i. Gasoline shall never be handled in open containers, and safety cans shall be used when handling small quantities.
  - j. The washing of equipment parts, hands or any object with gasoline shall be prohibited, and fuel truck drivers shall not dispense it for that purpose. A standard solvent, kerosene or diesel fuel shall be used for washing equipment parts. Hands can be cleaned with water less, grease removing creams and/or soap and water.
  - k. Fuel trucks shall be equipped with reflectors or approved dry cell battery type warning lights for emergency highway use.
  - l. Stationary storage fuel tanks shall be vented and entirely clear of buildings or equipment at the warehouse. If the tanks are not buried, they shall be grounded and properly vented.
  - m. The fill nozzle opening on all equipment shall have a fastened cap in place except when the tank is being filled.
  - n. Fueling equipment shall be equipped with grounding wire that will be attached to the equipment it is serving to eliminate static electrical charges.

8. Maintenance, repairs, and servicing
  - a. No service, repairs or maintenance shall be done on any machine or equipment until it has been moved to a place where the machine will not be exposed to vehicle or equipment traffic and out of the work area unless and until proper barricades and guards have been set up to provide a safe working area.
  - b. No work shall be done on any machines or equipment for any purpose until and unless the equipment has been shut down and locked out, brakes set, and all blades, buckets, etc., have been lowered completely to the ground or properly blocked.
  - c. Machine parts shall not be washed in gasoline; either kerosene, diesel oil, or a safety solvent shall be used.
  - d. Suspended motors or machinery, etc., beneath which mechanics must work shall be blocked or cribbed.
  - e. Hoisting equipment shall be carefully examined before using on heavy loads.
  - f. All guards should be replaced after repairs have been completed.
  - g. New parts for installation and old parts removed from a machine must be placed in the clear.
  - h. Tools, such as hammers, chisels and wrenches, shall be kept in safe workable condition and each employee shall be responsible for the condition of that equipment and tools which he uses.
  - i. Employees shall wear goggles when using buffers, emery wheels and grinders, and while chipping and cutting.
  - j. Do not strike two hardened metal surfaces together, such as a ball peen hammer against a shaft. Use a wooden block between high carbon surfaces, or a soft-headed hammer.
  - k. All electrical equipment shall be adequately grounded. Extension cords and outlets shall be kept in good repair.
  - l. Mechanics' truck shall have at least one 15-pound dry chemical fire extinguisher.
  - m. No welding, brazing, or cutting should be done on any tank or vessel which has contained flammable liquids unless it has been gas freed and/or thoroughly washed and completely filled with water.

- n. Drivers of fuel trucks shall be required to keep the equipment in good condition and such drivers shall follow all applicable rules under "Operation of Automotive Equipment."

#### 13.4.28 Working Over or Near Water

1. Personnel safety.
  - a. Employees working over or near water, where the danger of drowning exists, shall be provided with life jackets or buoyant work vests.
  - b. Prior to and after each use, the buoyant work vests or life preservers shall be inspected for defects which would alter their strength or buoyancy. Defective units shall not be used.
  - c. Ring buoys with at least 25 meters of line shall be provided and readily available for emergency rescue operations. Distance between ring buoys shall not exceed 60 meters.
  - d. At least one lifesaving skiff shall be immediately available at locations where employees are working over or adjacent to water.
  
2. Material handling operations
  - a. Ramps for access of vehicles to or between barges shall be of adequate strength, provided with side boards, well maintained and properly secured.
  - b. Unless personnel can step safely to or from the wharf, float, barge or river towboat, either a ramp, or a safe walkway, shall be provided.
  - c. When the upper end of the means of access rests on or is flush with the top of the bulwark, substantial steps, properly secured and equipped with at least one substantial handrail approximately 80 centimeters in height, shall be provided between the top of the bulwark and the deck.
  - d. Obstructions shall not be laid on or across the gangway.
  - e. Unless the structure makes it impossible, the means of access shall be so located that the load will not pass over employees.



- f. Only experienced and qualified personnel shall be allowed to handle boats of any type.
- g. Every launch or motor boat shall be equipped with two oars and shall never leave dock without them.
- h. Each boat, barge and dredge shall be equipped with sufficient fire extinguishers to control fires, and with other appropriate marine safety equipment.
- i. A spare motor of sufficient power shall be provided for each boat for emergency use.
- j. Boats and work barges shall never be overloaded either with personnel and/or equipment and/or supplies. The load shall be properly distributed to prevent capsizing.
- k. Fuel supply shall not be kept on work barges or dredges because of the fire hazard.
- l. When a dragline is used on a barge for digging, it shall be firmly secured to the barge.

3. Working surfaces or barges.

- a. Only authorized personnel shall be allowed on barges and dredges.
- b. Personnel shall not be permitted to walk along the sides of covered lighters or barges with coamings more than 1 1/2 meters high, unless there is a 1 meter clear walkway, or grab rail, or taut handline is provided.
- c. Decks and other working surfaces shall be maintained in a safe condition.
- d. Personnel shall not be permitted to pass fore and aft, over, or around deckloads, unless there is a safe passage.
- e. Personnel shall not be permitted to walk over deckloads from rail to coaming unless there is a safe passage. If it is necessary to stand at the outboard or inboard edge of the deckload where less than 60 centimeters of bulwark, rail coaming, or other protection exists, all employees shall be provided with a suitable means of protection against falling from the deckload.
- f. The contractor shall ensure that there is in the vicinity of each barge in use at least one 7 1/2 meter lifering with not less than 25 meters of line attached, and at least one portable or permanent ladder which will reach the top of the apron to the

surface of the water. If the above equipment is not available at the pier, the employer shall furnish it during the time that he is working the barge.

- g. Employees walking or working on the unguarded decks of barges shall be protected with work vests or buoyant vests.

#### 13.4.29 Construction Guidelines

##### 1. Clearing and grading.

- a. Employees engaged in site clearing shall be protected from hazards of irritant and toxic plants and suitably instructed in the first aid treatment available.
- b. All equipment used on site or right-of-way clearing operations shall be equipped with rollover guards. In addition, rider operated equipment shall be equipped with an overhead and rear canopy guard meeting the following requirements.
  - The overhead covering on this canopy structure shall be of not less than 1/4 centimeter steel plate or 1/2 centimeter woven wire mesh with openings no greater than 1 inch, or equivalent.
  - The opening in the rear of the canopy structure shall be covered with not less than 1/2 centimeter woven wire mesh with openings no greater than 2 1/2 centimeters.
- c. Timber clearing and felling shall be done under the direction of an experienced and competent person familiar with safe practices necessary in these operations.
- d. The contractor shall provide and assure that each employee who operates a chain saw wears leg protection constructed with cut-resistant material, such as ballistic nylon. The leg protection shall cover the full length of the thigh to the top of the boot on each leg to protect against contact with a moving chain saw. Exception: This requirement does not apply when an employee is working as a climber if the employer demonstrates that a greater hazard is posed by wearing leg protection in the particular situation, or when an employee is working from a vehicular mounted elevating and rotating work platform.
- e. Employees cutting underbrush shall be well ahead of the tree felling operations.

- f. Axes shall be carried at the side with the hand grasping the axe handle close to the axe head.
- g. Power saw operators shall stay back of the saw and not reach in front of it to untangle vines, etc., while the saw is in motion.
- h. All cutting tools shall be sharpened regularly and inspected daily for defects. Double bitted axes shall not be used where there is much heavy underbrush and vines. Employees shall be spaced well apart so there will be no danger of one person hitting another.
- i. Care shall be taken to keep legs and feet out of the line of swing of the axe in case it glances off timber.
- j. Fellers or buckers shall not be placed on hillsides immediately below each other where there is danger from skidding or rolling timber.
- k. Fellers shall give timely warning to buckers and other persons in the vicinity where trees are being felled so they are not only out of the reach of the tree, but are also out of danger of possible sidewinders, snags, or other trees which may be knocked by the tree being felled.
- l. The following precautions shall be taken at all times:
  - Watch out for loose limbs and bark on all snags and trees; particularly if previously felled trees have struck them.
  - Watch out for kickbacks of saplings and kickbacks from butts of felled trees.
  - All dangerous snags shall be felled.
  - Put large undercuts on heavy leaners.
  - Do not trust "holding wood" on the trees with heavy center rot.
  - Prior to felling any tree, brush or other potential obstacles which might interfere with cutting the tree or the retreat path shall be removed.
  - Employees in charge of cutting crews shall be careful when approaching a set of fellers.
- m. Fellers and buckers shall not work if the wind is strong enough to prevent the falling of trees in the direction desired.

- n. All work shall terminate and each employee shall move to a place of safety when environmental conditions, such as but not limited to, electrical storms, strong winds which may affect the fall of a tree, heavy rain, extreme cold, dense fog, fires, mudslides, and darkness, create a hazard for the employee in the performance of the job.
  - o. Buckers shall not stand on the lower side of the log unless the log has been chocked.
  - p. Buckers shall not work alone.
  - q. At all power line crossings, the "Danger-Power Line" signs shall be installed immediately after clearing has been completed. These signs shall be placed approximately one hundred feet on each side of the power line and in a position where the sign will be seen by all vehicles traveling the right-of-way.
  - r. Slash and small timber shall be piled and burned in a clearing of sufficient size to prevent the spread of fire.
  - s. Where there may be danger of fire spreading to adjacent standing timber or ripe grain fields or grass lands, a safety strip of sufficient width shall be plowed.
  - t. Fire fighting equipment shall be on hand whenever brush or other materials are to be burned.
  - u. Long handle torches shall be used in firing piles.
  - v. A check shall be made to see that all fires are out before leaving the area.
  - w. Each chain saw shall be equipped with a chain brake and must be operated and adjusted in accordance with the manufacturer's instructions.
2. Excavation and shoring.
- a. Specific Excavation Requirements
    - If warranted, prior to starting an excavation, effort shall be made to determine whether underground installation ( i.e., sewer, telephone, water, pipelines, etc.), will be encountered, and if so, where such underground installations are located. When the excavation approaches the estimated locations of such an installation, the exact location shall be determined and when it is uncovered, proper supports shall be provided for the existing

installation. Utility companies shall be contacted and advised of proposed work prior to the start of actual excavation.

- Trees, boulders and other surface encumbrances, located so as to create a hazard to employees involved in excavation work or in the vicinity thereof at any time during operations, shall be removed or made safe before excavating is begun.
- The walls and faces of all excavations in which employees are exposed to danger from moving ground shall be guarded by a shoring system, sloping of the ground, or some other equivalent means, or by a combination of such means.
- Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.
- Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.
- The determination of the angle of repose and design of the supporting system shall be based on careful evaluation of pertinent factors such as: depth of cut; possible variation in water content of the material while the excavation is open; anticipated changes in materials from exposure to air, sun, water or freezing; loading imposed by structures, equipments, overlying material or stored material; and vibration from equipment, blasting, traffic or other sources.

- Supporting systems ( i.e., piling cribbing, shoring, etc.), shall be designed by a qualified person and meet accepted engineering requirements. When tie rods are used to restrain the top of sheeting or other retaining systems, the rods shall be securely anchored well back of the angle of repose. When tight sheeting or sheet piling is used, full loading due to ground water table shall be assumed, unless prevented by weep holes or drains or other means. Additional stringers, ties and bracing shall be provided to allow for any necessary temporary removal of individual supports.
- All slopes shall be excavated to at least the angle of repose except for areas where solid rock allows for line drilling or pre-splitting.
- The angle of repose shall be flattened when an excavation has water conditions, silty materials, loose boulders and areas where erosion, deep frost action and slide planes appear.
- In excavations which are being hand excavated or where employees may be required to enter, excavated or other material shall be effectively stored and retained at least 1/2 meter or more from the edge of the excavation.
- If it is necessary to place or operate equipment, or other heavy objects on a level above and near an excavation, the side of the excavation shall be sheet-piled, shored and braced as necessary to resist the extra pressure due to such superimposed loads.
- Adequate barrier physical protection shall be provided, and where personnel or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided.
- Workers directing clam or bucket operations shall stand clear of edge of ditch because of danger of cave-ins.

b. Specific Trenching and Shoring Requirements

- Banks more than 1 1/2 meters high shall be shored, laid back to stable slope or some other equivalent means of protection shall be provided where employees may be exposed to moving ground or cave-ins. Trenches less than 1 1/2 meters in depth shall also be effectively protected when

examination of the ground indicates hazardous ground movement may be expected.

- Sides of trenches in unstable or soft material, 1 1/2 meters or more in depth, shall be shored, sheeted, braced, sloped, or other wise supported by means of sufficient strength to protect the employees working within them.
- Sides of trenches in hard or compact soil, including embankments, shall be shored or otherwise supported when the trench is more than 1 1/2 meters in depth and 2.4 meters or more in length. In lieu of shoring, the sides of the trench above the 1 1/2 meter level may be sloped to preclude collapse, but shall not be steeper than a 30 centimeter rise to each 15 centimeter horizontal.
- Materials used for sheeting and sheet piling, bracing, shoring and underpinning, shall be in good serviceable condition, and timbers used shall be sound and free from large or loose knots, and shall be designed and installed so as to be effective to the bottom of the excavation.
- Additional precautions by way of shoring and bracing shall be taken to prevent slides or cave-ins when excavations or trenches are made in locations adjacent to backfilled excavations, or where excavations are subjected to vibrations from railroad or highway traffic, the operation of machinery or any other source.
- When employees are required to be in trenches 1 meter deep or more, an adequate means of exit, such as ladders or steps, shall be provided and located so as to require no more than 8 meters of lateral travel.
- Bracing or shoring of trenches shall be carried along with the excavation.
- Cross braces or trench jacks shall be placed in true horizontal position, be spaced vertically and be secured to prevent sliding, falling or kickouts.
- Portable trench boxes or slinging trench shields may be used for the protection of personnel in lieu of shoring system or sloping. Where such trench boxes or shields are used, they shall be designed, constructed and maintained in a manner which will provide a protection equal to or greater than the sheeting or shoring required for the trench.

- Backfilling and removal of trench supports shall progress together from the bottom of the trench. Jacks or braces shall be released slowly and, in unstable soil, ropes shall be used to pull out the jacks or braces from above after employees have cleared the trench.
3. Unloading and stringing pipe.
- a. Care shall be taken to keep personnel in the clear when cutting steel bands securing pipe to the railroad car.
  - b. Extreme care shall be exercised in spotting the lifting equipment at a railroad siding when unloading pipe so that there is adequate clearance of overhead wires, particularly of high voltage electric power lines.
  - c. The tail rope shall be of sufficient length to enable the man hooking the pipe to stand in the clear while guiding the pipe.
  - d. Where ramp skids are used, they shall be of ample size, sound hardwood, securely fastened, and shall have a gradual incline. Long ramp skids shall be supported. Pipe shall extend three or four feet over each end, and employees shall work at the ends of the pipe to avoid being caught between two sections or joints.
  - e. Each tier of pipe shall be scotched when spacers are used in racking pipe.
  - f. A red flag shall be placed at the rear end of trucks hauling pipe.
  - g. Fence gaps shall be kept closed and trucks shall stay on the right-of-way.
  - h. Suitable signs or flags shall be placed on highways at points where trucks are turning off to string pipe.
4. Bending and cutting.
- a. All personnel shall stand in the clear when actual bending operations are in progress.
  - b. The bending machine operator shall be held responsible for making daily inspection of all cables, cable clamps, brakes, etc., and any defects discovered shall be corrected immediately and reported to the supervisor.
  - c. Swamper or helper shall not ride pipe being moved to and from the bending machine.



- d. Pipe shall be adequately supported in pipe cutting operations; where short sections are cut off, employees shall be in the clear of falling pipe.
- e. Rules on tractor operations and power machinery shall be applied to all power equipment used in pipe bending.
- f. In addition to the requirements specified in the preceding paragraphs, all of the requirements under Material Handling Equipment (Section 13.4.27) shall be followed and they shall be observed.

#### 5. Pipe laying

- a. Employees guiding pipe shall handle it from the side and not place hands over the ends.
- b. Care shall be taken to see that pipe is securely set on skids. Pipe shall be scotched at intervals and at all loose ends to prevent moving.
- c. All skids shall be of a size adequate for the load.
- d. All skid material shall be carefully inspected by workers on skid trucks, and any defective and broken skids shall be rejected and destroyed.
- e. Employees handling skids shall wear leather or leather-pad gloves.
- f. Workers shall move from under the boom after the caliper or cable has been secured.
- g. No more than 3 or 4 skids shall be placed together. If more skids are needed, a four square crib shall be built to support the pipe.
- h. Skids being transported shall be securely boomed to the truck bed.
- i. Care shall be taken in the use of hammers to prevent injuries to other employees.

#### 6. Cleaning, coating and wrapping.

- a. Employees handling or working around hot dope or primer shall wear top shoes or boots with trouser legs on the outside and have full length sleeves extending over the top of gloves.
- b. Employees engaged in cleaning, priming, or doping operations, where fumes, rust, dust, and other particles are excessive, shall wear safety goggles and respirators.

- c. Where fumes from hot dope cause irritation to the face and neck a protective cream shall be provided and applied before work is started.
- d. Buckets shall never be filled over two-thirds capacity to prevent hot dope splashing over the edge of the bucket. Defective buckets shall not be used.
- e. Employees engaged in cutting the dope and charging dope kettles shall wear suitable goggles.
- f. Burners on dope kettles shall be cleaned and inspected at regular intervals to keep them in good condition, and kettle firemen shall be cautioned about "flashbacks."
- g. Dope kettles shall be equipped with down spouts, and cut off valves shall be of the quick-closing type.
- h. When small hot dope kettles are being moved, lids shall be closed and the fire shall be cut down and employees warned to stay in the clear of splashing.
- i. Always remove caps or plugs from primer or cold dope carefully as pressure often builds up in the drum.
- j. Employees shall not place body over the outrigger pole in balancing the cleaning or wrapping machine, due to the possibility of a "kick." The pole shall be grasped in the hands.
- k. In addition to the requirements specified in the preceding paragraphs, all of the requirements under Head Protection, Hearing Protection, Eye and Face Protection, Respiratory Protection, Fire Protection, Fire Prevention, and Flammable and Combustible Liquids shall be followed and they shall be observed.

## 7. Lowering-in and tie-in

- a. Lowering shall be directed by the foreman in charge. Signals and other orders to the tractor operators must come from the foreman only.
- b. No employee shall be in the ditch, or on the pipe, or between the pipe and ditch along the entire length of the continuous section of the line while pipe is in process of being lowered.
- c. All belt slings and wire rope connection shall be checked before each lowering operation, and the belt slings and boom lines should not be hooked to the boom while the tractor is moving.

- d. Bell holes shall be of adequate size and properly sloped to enable the welders to work without danger of cave-ins.
- e. Adequate preparations shall be taken to prevent sideboom tractor from falling into ditch while lowering pipe.

In addition to the requirements specified in the preceding paragraphs, all of the requirements under Signaling, Material Handling Equipment, Specific Excavation Requirements, and Specific Trenching Requirements shall be followed and they shall be observed.

8 Backfill and clean up.

- a. The machine operator shall be careful to keep his machine on the right-of-way and not damage crops or other property over the designated right-of-way lines.
- b. The clean up crew shall be careful to see that all dynamite wrappers, chunks of dope, and miscellaneous metal and glass are removed so that animals will not be injured by eating or walking on same.

9. Roadway and railway crossings.

- a. Be sure any necessary permits have been obtained before cutting or boring any railroad or road. Any host country regulations relative to cutting, backfilling and compaction shall also be observed.
- b. Check with proper authorities to determine if any lines are located under or near railroad or highway to be bored or cut.
- c. Barricades, warning signs, etc., shall be erected on each side of the road before excavation is started.
- d. On heavily traveled primary roads, adequate warning signs shall be placed at intervals of 60, 120, and 180 meters from the center line of the pipe line ditch. Flashers shall be placed at signs at night for illumination.
- e. On secondary roads, adequate warning signs shall be placed 60 meters from the center line of the pipe line ditch, with flashers at each sign for illumination at night.

- f. Hoe, dragline and ditching machine operators shall instruct oilers to inspect ditch for any sign of uncharted lines, drain tiles, etc.
- g. Flaggers shall be stationed 60 meters on each side of the center line of the ditch when equipment is being moved across a highway.
- h. A watchman shall make the rounds at night to see that "flashers" are being used and that they are in proper location and operating satisfactorily.
- i. Temporary bridges with guardrails on each side shall be constructed over excavations crossing secondary highways. Materials used shall be satisfactory to handle load to cross bridge.
- j. No cleated equipment shall be driven across hard surfaced highways without protecting the surface of the highway.
- k. Warning signs and flashers shall not be removed until road crossings are properly tamped, leveled, shoulders repaired and drainage ditches cleared.
- l. One rail shall always be covered before crossing mainline railroads with tractors, sleds or other equipment which might create a short in the signal equipment.
- m. Equipment shall not cross railroad tracks until flaggers have indicated that it is safe to do so.
- n. Care shall be taken in crossing railroad tracks that all mud, broken skids, planks, etc., are clear of the rail before leaving the crossing.
- o. Supervisors shall make an inspection of the rails and/or ties immediately after crossing equipment to be certain the rails and/or ties have not been damaged.
- p. If damage is discovered to the rails, ties or any part of the railroad, two flaggers shall be stationed, one on each side at least 100 meters in each direction, of the damaged point, to stop all trains. Notify the nearest railroad agent immediately so that the damage can be repaired.
- q. Where there is doubt as to soil conditions, especially when boring under highways and railroads, proper shoring shall be provided or the ditch sloped well back because of the danger of vibration from moving traffic.
- r. Material from ditch shall be recast a safe distance from edge so the ditch wall is not overloaded and in danger of caving in.

- s. Extreme caution shall be used to protect against ditch caving when bottom soil condition is wet or rain has occurred overnight.
  - t. Moving parts of the road boring equipment shall be well guarded and protection provided to keep employees clear of snatch blocks and cables under strain.
  - u. In addition to the requirements specified in the preceding paragraphs, all of the requirements under Accident Prevention, Signs and Barricades, Material Handling Equipment, Specific Excavation Requirements, and Specific Trenching Requirements shall be followed and they shall be observed.
10. Unloading and setting mainline valves.
- a. Extreme caution must be followed in unloading main line valves due to their weight.
  - b. A competent person must determine soil conditions in and around the ditch for the purpose of evaluating soil compactness or cave-in potential due to weight.
  - c. Keep unauthorized personnel away from the lift area during the lifting.
  - d. Hand lines should be used for the condition of the sling and proper sizing.
  - e. Under no circumstances shall a valve be winched from a low boy or trailer.
  - f. Properly designed cribbing must be used for storage or valves.

#### 13.4.30 Spill Response

1. Employees should be informed of the hazards of a release or spill of any hazardous substance present at the construction sites.
2. The contractor should designate the type of equipment, personal protective equipment that needs to be used in the event of a spill or release of a hazardous substance.
3. Qualified employees should be instructed in the procedures to be used to control and/or clean up the hazardous spill or release.

Table III.1 Summary of roads to be upgraded in Bolivia for the gas pipeline project.

LOCATION	DISTANCE OF ROAD TO BE UPGRADED	ALTERATIONS
- Portion of the road to Rio Grande Gas Plant starting at YPF's refinery extending to gas plant.	52 kms	- Motor graders used to complete work on road which is basically gravel.
- Road to pipeline paralleling Rio Grande on east side, which commences at Pailon and traverses due south to the pipeline right-of-way.	75.7 kms	- Portion of road still requiring upgrading will be corrected with motor grader and bad spots repaired with backhoes, front end loaders, compactors, dozers and dump trucks.
- Road to Isla Verde, commencing from the road described above, 3 km south of Pailon. The road traverses in a south-easterly direction until it intersects with the "L" road which traverses south from the Tres Cruces region. It continues on the "L" road until it intersects with the pipeline road, by the abandoned compressor station terminating in the Isla Verde area.	125.5 kms	- Extensive motor grader and dozer work required. Loose material will be removed in severely deteriorated areas with backhoe and replaced with clean material and compacted. (Seventeen drainage ditches require 30" or 36" culverts which will be placed simultaneously with the road upgrade operation.)
- Road due south from San Jose de Chiquitos to the pipeline ROW commencing at YPF's petroleum distribution yard.	78.05 kms	- Portion of road will be widened at three sharp curves in the mountains. Culverts installed. - Filling of low areas, and cutting of brush and second growth timber. - Motor graders, dozers, front end loaders, backhoes, compactors and dump trucks will be used.

Table III.1 continuation...

LOCATION	DISTANCE OF ROAD TO BE UPGRADED	ALTERATIONS
- Road southwesternly from Roboré to pipeline right-of-way.	42.1 kms	<ul style="list-style-type: none"> <li>- Small river bridge in the first 8 kilometers will be reinforced to withstand the increased traffic brought about by the project construction. (The method is to drive a piling on each side of the bridge then weld a crossbeam to the driven piling immediately under the bridge deck.)</li> <li>- Another small creek bridge will be improved by removing the deck and replacing it with large diameter culverts and fill in over the culverts.</li> <li>- Section from Roboré to the intersection with the road to the right-of-way has several bad areas which will require excavating, filling with clean material and compacting, extensive motor grade work with dozer, front loader, backhoe, compactor and dump trucks; total distance improved - 19.5 km.</li> <li>- Section from road intersection of the Roboré-San Jose de Chiquitos road to the pipeline will be upgraded with motor grader. Two locations where large diameter culverts will be replaced with a 30" or 36" culvert and roadway reshaped. There are five locations where 20" diameter culverts will be installed; total distance improved - 22.6 kms.</li> <li>- Right-of-way grade operation involved on section from the road to the crossing of the Rio San Miguel. Temporary bridge may need to be installed at the Rio San Miguel to accomodate equipment movement along the right-of-way.</li> </ul>
- Road due south from El Carmen to right-of-way	1.5 kms	<ul style="list-style-type: none"> <li>- Trees will be removed to widen the road to allow for two-lane traffic, using a motor grader.</li> <li>- This road passes a cemetery on the east side and should consider rerouting the road straight south from storage yard to a point west and south of the cemetery.</li> </ul>

Table III.1 continuation...

LOCATION	DISTANCE OF ROAD TO BE UPGRADED	ALTERATIONS
- Access from El Carmen/Puerto Suarez to Right-of-way at pipeline, approximately K.P. 530.	6.85 kms	- Road improved with motor graders and D- 6 dozer.
- Access road from El Carmen/Puerto Suarez to right-of-way at pipeline, approximately K.P. 533.	5.75 kms	- Road improved with motor grader and one D- 6 dozer.
- Road from Puerto Suarez to El Carmen Frontera	19.8 kms	- A motor grader to clean out ditches and reshape roadway in the first 14.2 kms required. - From this point to El Carmen de la Frontera, total distance of 5.6 kms, road will require excavating, replacing with good fill material and compacting, and installation of eleven 30" culverts at various locations along this 5.6 km section, requiring backhoes, motor graders, dozers, front end loader, compactors and dump trucks.
- Road between Puerto Suarez and El Carmen de la Frontera	100.6 kms	- Section between Puerto Suarez and Yacuces has a total length of 44.3 kms. This section will be upgraded at five locations which have depressions to ground level where a bridge or culvert was once located. Bridges or culverts will be replaced at each location. Many areas in the section between Yacuces and El Carmen will be excavated, fill imported and compacted. This 56.3 kilometer section will require 21 culverts of 30" diameter. Additional upgrading will be done with motor graders, backhoes, front end loaders, dozers, compactors, and dump trucks. Work will include installation, repair of bad areas with imported fill, establishing drainage ditches, cutting water turnouts and reshaping roadway.



Table III.2 Environmental description, construction methodology, and protection measures along the pipeline alignment

Segment No.	Segment	Altitude Range	Environmental Description	Constraints	Construction Methodology and Environmental Protection Measures
1	0+000km to 4+280km	340m to 341m	Flat, nearly level. Sandy loam. Brush and small scrubby trees. No wetlands.	Low erosion potential. No construction limitations. No wetlands.	Standard construction methods to be used.
2	4+280km to 7+031km	340m to 340m	Irregular alluvial floodplain. Medium to thick texture soils. No vegetation, areas with some scrub. Wetlands. Rio Grande and floodplain.	High erosion potential. River flows 42cms to 1106cms. Dry season construction recommended. Alluvial floodplain.	Waterbody construction techniques to be used in dry season.
3	7+031km to 11+718km	335m to 343m	Level with choppy hills and many side cuts. Loam, very sandy in spots. Solid trees, medium height and density. Wetlands likely at westerly portions of Rio Grande floodplain.	High erosion potential. Alluvial floodplain.	Standard construction methods to be used.
4	11+718km to 19+885km	333m to 341m	Flat, gradual decline to east. Sandy loam. 90% timber, medium to tall height, medium density, heavy underbrush. No wetlands.	Low erosion potential. No construction limitations. No wetlands.	Standard construction methods will be used.
5	19+885km to 25+595km	332m to 333m	Slightly irregular, descending to east. Sandy loam to loam. 90% timber, medium to tall height, medium density, heavy underbrush. Wetlands.	Low erosion potential. Wetlands. Dry season construction recommended.	Standard construction methods to be used, if dry. If wet or inundated then wetland construction techniques required. Bank stabilization required at arroyo and quebradas.

Table III.2 continuation...

Segment No.	Segment	Altitude Range	Environmental Description	Constraints	Construction Methodology and Environmental Protection Measures
6	25+595km to 37+010km	324m to 333m	Slightly irregular, descending to east. Sandy loam to loam. 90% timber, medium to tall height, medium density, heavy underbrush. No wetlands. Three crossings of Arroyo Hondo (dry creeks).	Low erosion potential. No wetland. Dry season construction recommended.	Standard construction methods to be used.
7	37+010km to 52+250km	314m to 324m	Slightly irregular, descending to east. Sandy loam to loam. 90% timber, medium to tall height, medium density, heavy underbrush. Crossing of Arroyo Palo Cortado and two tributaries (dry creeks). Wetlands.	Low erosion potential. Wetlands. Dry season construction recommended.	Standard construction methods to be used, if dry. If wet or inundated then wetland construction techniques required. Bank stabilization required at arroyo and quebradas.
8	52+250km to 55+750km	314m to 319m	Slightly irregular. Loam to heavy loam to clay loam. Timber medium to tall height, medium density, heavy underbrush. No wetlands.	Low erosion potential. No wetlands. Dry season construction recommended.	Standard construction methods to be used.
9	55+750km to 59+000km	313m to 314m	Slightly irregular. Loam to heavy loam to clay loam. Timber medium to tall height, medium density, heavy underbrush. Wetlands.	Low erosion potential. Wetlands. Dry season construction is recommended.	Standard construction methods to be used, if dry. If wet or inundated then wetland construction techniques required. Bank stabilization required at arroyo and quebradas.

Table III.2 continuation...

Segment No.	Segment	Altitude Range	Environmental Description	Constraints	Construction Methodology and Environmental Protection Measures
10	59+000km to 60+250km	314m to 316m	Slightly irregular. Loam to heavy loam to clay loam. Timber medium to tall height, medium density, heavy underbrush. No wetlands.	Low erosion potential. No wetlands. Dry season construction is recommended.	Standard construction methods to be used.
11	60+250km to 61+500km	309m to 316m	Slightly irregular. Loam to heavy loam to clay loam. Timber medium to tall height, medium density, heavy underbrush. Wetlands. Quebrada Posamo (dry creek).	Low erosion potential. Wetlands. Dry season construction recommend.	Standard construction methods to be used, if dry. If wet or inundated then wetland construction techniques required. Bank stabilization required at arroyo and quebradas.
12	61+500km to 72 + 500km	310m to 315m	Slightly irregular. Loam to heavy loam to clay loam. Timber medium to tall height, medium density, heavy underbrush. No wetlands. Quebrada Del Ensebada.	Low erosion potential. No wetlands. Dry season construction recommended.	Standard construction methods to be used.
13	72 + 500kn to 75 + 200km	309m to 310m	Slightly irregular. Loam to heavy loam to clay loam. Timber medium to tall height, medium density, heavy underbrush. Wetlands.	Low erosion potential. Wetlands. Dry season construction recommended.	Standard construction methods to be used, if dry. If wet or inundated then wetland construction techniques required. Bank stabilization required at arroyo and quebradas.
14	75+200km to 81+ 394km	309m to 311m	Slightly irregular. Loam to heavy loam to clay loam. Timber medium to tall height, medium density, heavy underbrush. No wetlands. One quebrada.	Low erosion potential. No wetlands. Dry season construction recommended.	Standard construction methods to be used.

Table III.2 continuation...

Segment No.	Segment	Altitude Range	Environmental Description	Constraints	Construction Methodology and Environmental Protection Measures
15	81+394km to 83+400km	308m to 311m	Slightly irregular. Loam to heavy loam to clay loam. Timber medium to tall height, medium density, heavy underbrush. Wetlands. Quebrada Las Cattreras.	Low erosion potential. Wetlands. Dry season construction recommended.	Standard construction methods to be used, if dry. If wet or inundated then wetland construction techniques required. Bank stabilization required at arroyo and quebradas.
16	83+400km to 88+200km	306m to 311m	Slightly irregular. Loam to heavy loam to clay loam. Timber medium to tall height, medium density, heavy underbrush. No wetlands.	Low erosion potential. No wetlands. Dry season construction recommended.	Standard construction methods to be used.
17	88+200km to 97+800km	302m to 306m	Flat, slightly irregular. Loam to clay loam. Large trees, medium density, heavy underbrush. Wetlands. Quebrada Cañada La Carreta, Bañados Del Izozog.	Low erosion potential. Dry season construction recommended.	Wetland construction methods to be used. Bank stabilization required at quebradas.
18	97+800km to 102+770km	300m to 304m	Flat. Loam. Large trees, medium density, heavy underbrush. No wetlands.	Low erosion potential. No construction limitations. No wetlands.	Standard construction methods to be used.
19	102+770km to 107+598km	297m to 300m	Flat, slightly irregular. Heavy loam. Large trees, medium density. Wetlands. Rio Parapetí and Bañados Del Izozog. Rice farming at west side of Rio Parapetí.	Low erosion potential. Wetlands. Wetland construction technique required. Swamp. River flows range 12.2 cms to 157 cms.	Wetland construction technique to be used in dry season. River bank stabilization required at Río Parapetí.

Table III.2 continuation...

Segment No.	Segment	Altitude Range	Environmental Description	Constraints	Construction Methodology and Environmental Protection Measures
20	107+598km to 151+250km	297m to 285m	Flat. Heavy loam. Trees medium to tall height, heavy underbrush. Wetlands. Bañados Del Izozog, Quebrada Tucavaca.	Low erosion potential. Construction in dry season required. Swamp. Wetlands.	Standard construction methods to be used in dry season.
21	151+250km to 182+000km	281m to 285m	Flat. Loam. Trees medium to tall height, density medium, heavy underbrush. No wetlands.	Low erosion potential. No construction limitations. No wetlands.	Standard construction methods will be used
22	182+000km to 199+160km  rise at 193+150km to 195+160km	281m to 279m  max. 289m	Flat. Loam. Trees medium to tall height, density medium, heavy underbrush. Wetlands. Bañados Del Izozog.	Low erosion potential. Wetlands. Construction in dry season recommended. Forested.  Medium erosion potential on rise requires more frequent water breaks.	Standard construction methods to be used in dry season.
23	199+160km to 226+357km  rise at 217+000km to 224+453km	273m to 301m  min. 276m max. 301m	Mostly flat, draining toward center at Quebrada Tucavaca, rising to east. Loam. Timber medium to tall height, medium density, heavy underbrush. No wetlands.	Low erosion potential. No construction limitations. Forested.  Medium erosion potential on rise requires more frequent water breaks.	Standard construction methods to be used.
24	226+357km to 246 + 000km	289m to 320m	Mostly flat, rising to east. Sandy loam. Trees medium height, density medium or less, heavy undergrowth. Many small creeks with small wetlands feed Quebrada Los Ciro.	Medium erosion potential. Special attention required for small creeks and wetlands. Creeks and tributaries with wetlands.	Standard construction methods to be used.

Table III.2 continuation...

Segment No.	Segment	Altitude Range	Environmental Description	Constraints	Construction Methodology and Environmental Protection Measures
25	246+000km to 251+500km  significant quebrada at 250+870km	313m to 329m  min. 316m	Mostly flat, rising to east. Sandy loam with sand becoming higher percentage. Trees begin to thin from previous segment.	Medium to high wind erosion potential.	Standard construction methods to be used.
26	251+500km to 262+500km	321m to 364m	Basically flat, rising to east. Sandy. Trees non-existent. Cattle ranch. Pothole wetlands (5), 20m-50m wide.	High wind erosion potential. Small pothole wetlands.	Standard construction methods to be used. Wetland construction technique required in pothole wetlands if inundated.
27	262+500km to 273+000km	342m to 379m	Flat. Sandy. Trees non-existent. Cattle ranch. Small wetland bordering Quebrada Avaroa.	High wind erosion potential. No construction limitation. One small wetland.	Standard construction methods to be used.
28	273+000km to 294+330km	285m to 382m	Mostly flat, declining to east. Very sandy. Trees non-existent. Cattle ranch.	High wind erosion potential. No construction limitation.	Standard construction methods to be used.
29	294+330km to 294+510km	284m to 285m	Alluvial. Sandy. Rio San Miguel.	Water moving below surface through sand. Alluvial floodplain. River flow between 0.43cms to 2.76cms.	Wetland construction technique to be used. Sidecast spoil to downstream side with silt screen. Segregate topsoil with grass from subsoil.
30	294+510km to 321+300km	285m to 447m	Generally flat, small slope rising to east. Very sandy. Trees intermittent and small, undergrowth with small bushes and plants. No wetlands.	Medium erosion potential. High wind erosion potential. No construction limitation. No wetland.	Standard construction methods to be used. Slope breaker required.

Table III.2 continuation...

Segment No.	Segment	Altitude Range	Environmental Description	Constraints	Construction Methodology and Environmental Protection Measures
31	321+300km to 327+250km	303m to 357m	Sloping ground. Sandy loam with high sand content. Trees medium height, becoming more dense, occasionally big. Small pothole wetlands in quebradas contribute to Quebrada Pituca.	Very erosive soil. High wind erosion potential. No construction limitation. Pothole wetlands.	Standard construction methods to be used. Wetland construction technique required in pothole wetlands.
32	327+250km to 341+560km	233m to 303m	Relatively flat, declining to east. Sandy loam with high sand content. Trees previously cleared for ranching, few more present than previous section. Pothole wetlands more common.	Very erosive soil. High wind erosion potential. Pothole wetlands.	Standard construction methods to be used. Wetland construction technique required in pothole wetlands. Slope breaker required.
33	341+560km to 349+760km	217m to 233m	Flat, declining to east. Sandy loam with high sand content. Trees previously cleared for ranching; as many present as previous section. Pothole wetlands common and some persistent in dry season.	Very erosive soil. High wind erosion potential. Pothole wetlands may require special construction techniques. Pothole wetlands.	Standard construction methods to be used. Wetland construction technique required in pothole wetland.
34	349+760km to 400 + 000km	159m to 217m min. 159m	Gradient sloping gently downward to east. Sandy loam. Trees medium height, density sparse, small trees and bushes prevalent. Large potholes, some with water persistent, Quebrada El Curichon, Lagunas El Porvenir, Lagunas Del Abayoy.	Low erosion potential because of high sand content. Dry season construction required with high water table throughout. Pothole and open water wetlands.	Standard construction methods to be used. Wetland construction technique required in pothole wetlands.

Table III.2 continuation...

Segment No.	Segment	Altitude Range	Environmental Description	Constraints	Construction Methodology and Environmental Protection Measures
35	400+000km to 417+300km	142m to 166m	Flat, declining to east. Sandy loam. Trees medium height, size medium, density medium, underbrush not heavy. Pothole wetlands.	Low erosion potential. Pothole wetlands.	Standard construction methods to be used. Wetland construction technique required in pothole wetlands.
36	417+300km to 425+500km	135m to 146m	Flat. Loam. Trees medium to tall, size medium to large, density heavy. Rio Otuquis floodplain. No wetlands.	Low erosion potential except river bank. River floodplain.	Standard construction methods to be used in dry season. River banks require stabilization.
37	425+500km to 439+000km	132m to 167m	Flat, slightly sloping. Loam. Trees medium to large height, size and density. No wetlands.	Low erosion potential. No construction limitations. No wetlands	Standard construction methods to be used.
38	439+000km to 447+750km	130m to 139m	Flat. Heavy loam. Trees average size and density. Brush and undergrowth very heavy. Wetlands. Tributary to Laguna Curiche Grande, Quebrada Santa Elena.	Low erosion potential. Extensive and multiple floodplain swamps ranging 0.3km to 1.75km width.	Wetland construction technique recommended. Dry season construction techniques recommended.
39	447+750km to 453+000	132m to 145m	Flat, slightly sloping. Heavy loam. Trees medium to large height and size, medium density. Wetlands (3).	Low erosion potential. No construction limitations. Forested.	Standard construction methods to be used. Wetland construction technique recommended in wetlands.
40	453+000km to 463+750km	122m to 145m	Flat, slightly sloping. Sandy loam. Trees medium height, medium density with heavy underbrush. Wetlands (3). Swamps.	Low erosion potential. Wetland swamps.	Standard construction methods to be used. Wetland construction technique recommended in wetlands.



Table III.2 continuation...

Segment No.	Segment	Altitude Range	Environmental Description	Constraints	Construction Methodology and Environmental Protection Measures
41	463+750km to 485+000km	106m to 122m	Flat and low. Heavy loam. Trees large, medium density with light undergrowth. Wetlands (1 large, 2 small). Swamps.	Low erosion potential. Wetland swamp. High ground water table.	Standard construction methods to be used. Wetland construction technique recommended in wetlands.
42	485+000km to 507+750km	96m to 109 m	Flat. Heavy loam. Trees large and dense, medium undergrowth. Wetlands (2).	Low erosion potential. Wetland swamps.	Standard construction methods to be used. Wetland construction technique recommended in wetlands.
43	507+750km to 523+600km	90m to 96m	Terrain becomes choppy hills. Gravel on surface of hills. Heavy loam between hills. Trees medium height, density medium. No wetlands.	High erosion potential on choppy hills and side hill cuts. Small amount of rock excavation possible. No wetlands.	Standard construction methods to be used in dry season. Silt fence required on hilly areas.
44	523+600km to 526+500km	90m to 98m	Flat. Very heavy loam, clay-like. Trees are palm and hardwood mix, density medium. Wetland. Upper reach of Bañados Taquaral; flows to Cañon La Victoria.	Low erosion potential. Dry season construction is recommended.	Standard construction methods to be used in dry season. Wetland construction technique recommended.
45	526+500km to 555+926	88m to 174m	Choppy rolling hills. Loam, gravel at tops of hills. Trees heavy and large, underbrush heavy. No wetlands, Quebrada Serrita, Quebrada San Cirilo.	High erosion potential on choppy hills and side hill cuts. Small amount of rock excavation possible. No wetlands.	Standard construction methods to be used in dry season. Silt fence required on hilly areas.

Table III.3 Wastewater Treatment Plant - Sewage Estimation Design Aid (Metric Units).

Type of Facility	Category	Estimated Sewage Flow Rate (M <sup>3</sup> /Day)
Apartments	one bedroom	.95
	two bedroom	1.14
	three bedroom	1.32
Assembly Halls	n/a	0.076 per seat
Churches	small	0.11 per sanctuary seat
Churches	large with kitchen	0.18 per sanctuary seat
Country Clubs	n/a	0.19 per member
Factories	no showers	0.09 per employee
Factories	with showers	0.13 per employee
Food Service Operations	Ordinary Restaurant (not 24-hour)	0.13 per seat at 400 ppm*
	24-hour restaurant	0.19 per seat at 400 ppm*
	Banquet Rooms	0.019 per seat at 400 ppm*
	Restaurant Along Freeway	0.38 per seat at 400 ppm*
	Curb Service (drive-in)	0.19 per seat at 400 ppm*
	Vending Machine Restaurants	0.38 per seat at 200 ppm*
Homes in subdivisions	n/a	1.51 per dwelling
Hospital	no resident personnel	1.14 per bed
Institutions	residents	0.38 per person
Laundries	coin operated	1.51 per std. size machine
Mobile Home Parks	n/a	1.14 per home space
Motels	n/a	0.38 per unit
Office Buildings	n/a	0.076 per employee
Retail Store	n/a	0.075 per employee
Schools	High and Junior High level	0.076 per pupil

Table III.3 continuation...

Type of Facility	Category	Estimated Sewage Flow Rate (M <sup>3</sup> /Day)
Service Stations	n/a	3.79 first bay, 500 each addtl.
Youth and Recreation Camps	n/a	0.19 per person

Source: Tipton Environmental International, Inc., 1997

Table III.4 Commercial Sources of Package Wastewater Treatment Plants.

Product Name	Vendor Contact Information	Product Description	Model Features
Purestream Package Wastewater Treatment Plant (Various models to choose from. Recommend Model PT-25 (3-units) or Model PT-30 (2-units))	Purestream, Inc. P.O. Box 68 Florence, KY 41022-0068 Telephone: (606) 371-9898 Facsimile: (606) 371-3577 Contact: Roger A. Beiting	This product is best described as an "extended aeration" treatment system. It works by providing ideal "living conditions" for aerobic bacteria and other micro-organisms; These micro-organisms then decompose the sewage.	It is a complete pre-fabricated package unit. Models PT-25 and PT-30 can handle flow capacities of 25,000 gpd and 30,000 gpd, respectively. The weight of the units are approx. 23,500 lbs and 30,500 lbs, respectively. Their lengths are 31 feet and 37 feet, respectively. The width of each unit is approx. 12 feet.
TE-II Package Wastewater Treatment System (Various models to choose from. Recommend either Model T-250 (3-units) or Model PT-300 (2-units))	Tipton Environmental, Inc. 2002 Ford Circle - Suite G Milford, OH 45150 Telephone: (513) 248-4067 Facsimile: (513) 248-5922 Contact: Fred D. Tipton	This product is a biological treatment system for domestic wastes using the "extended aeration" concept. The basic design is an extended aeration period that is approximately 24 hours, coupled with a defined settling period of four hours.	The TE-II system is compact and self-contained. It can be installed both below or above grade with a minimum of installation expense. The units are portable and reusable and can be expanded for additional capacity. Models T-250 and T-300 can handle flow capacities of 25,000 gpd and 30,000 gpd, respectively. The length of the units are 30 feet and 36 feet, respectively. The width of each unit is approx. 8 feet. Other features of the TEII system include: 1) High degree of treatment (85-90% X BOD <sub>5</sub> removal); 2) low maintenance cost; 3) Ease of installation.

Table III.4 continuation...

Product Name	Vendor Contact Information	Product Description	Model Features
Flofilter Package Wastewater Treatment plant (Prototype unit)	PURAC Engineering, Inc. 4550 New Linden Hill Rd. Suite 500 Wilmington, DE 19808 Telephone: (302) 996-0545 Facsimile: (302) 996-0544 Contact: Ronald H. Hartman	This product combines flocculation, flotation and filtration in an compact, pre-engineered unit. The heart of the treatment process is flotation, a phenomena in which suspended particles rise to the surface of a liquid as a result of density differences. In Dissolved Air Flotation (DAF), the technique used by this system, microscopic bubbles are released into the liquid. The bubbles attach themselves to particles, forming a solid aggregate, which rises quickly to the top.	The fundamental advantage between a DAF unit and conventional sedimentation units is the rate of separation. Flotation offers a separation rate of 5 to 10 times faster than sedimentation. A DAF pilot plant may be specifically designed and built for the project. The prototype units have been designed for nominal flow rates of 52,000 gpd. These have been designed as self-contained units with quick hook-up and disconnect in 28 feet by 8 feet trailers.
DAVCO Field Erected Wastewater Treatment System	U.S. Filter/DAVCO 1828 Metcalf Avenue Thomasville, GA 31792 Telephone: (912) 226-5733 Facsimile: (912) 228-0312 Contact: Michael Bennett	This product is a field erected contact stabilization/extended aeration unit which includes clarifiers and a settling tank. It is constructed in two concentric tanks. Influent enters the aeration tank along with the return sludge from the clarifier. The combined matter is aerated and mixed thoroughly by steel diffusers. After aeration, the mixed liquor flows into a settling tank influent pipe which transfers it to the clarifier. In the clarifier, solids settle to the bottom of the tank allowing the clear water to pass over a weir and into the chlorination tank.	Although this type of unit may be field erected, it may be too large for the project needs. That is, the smallest unit built to date handles approximately 100,000 gpd. The unit produces a 5 day BOD of approximately 170 lbs/day. The diameters of the external extended aeration tank and of the internal clarifier tank are 40 feet and 16 feet, respectively.

Source: Dames &amp; Moore, 1997

Table III.5 Proposed permissible discharge limits for treated wastewater effluent parameters as per Bolivian Regulations.

Standard Parameter	Proposed Maximum Threshold Values	
	Daily	Monthly
Copper	1.0	0.5
Zinc	3.0	1.5
Lead	.6	0.3
Cadmium	.3	0.15
Arsenic	1.0	0.5
Chromium <sup>+3</sup>	1.0	0.5
Chromium <sup>+6</sup>	0.1	0.05
Mercury	0.002	0.001
Iron	1.0	0.5
Antimony	1.0	N/A
Tin	2.0	1.0
Cyanide	0.2	0.10
pH	6.9	6.9
Temperature*	±5°C	±5°C
Phenolic Compounds	1.0	0.5
Total Suspended Solids	60.0	N/A
Fecal Coliform (MPN/100ml)	1000	N/A
Oil and grease	10.0	N/A
BOD <sub>5</sub>	80.0	N/A
COD	250.0	N/A
Ammonium as N	4.0	2.0
Sulfur	2.0	1.0

\*Allowable range based on Average Temperature of receiving water body.

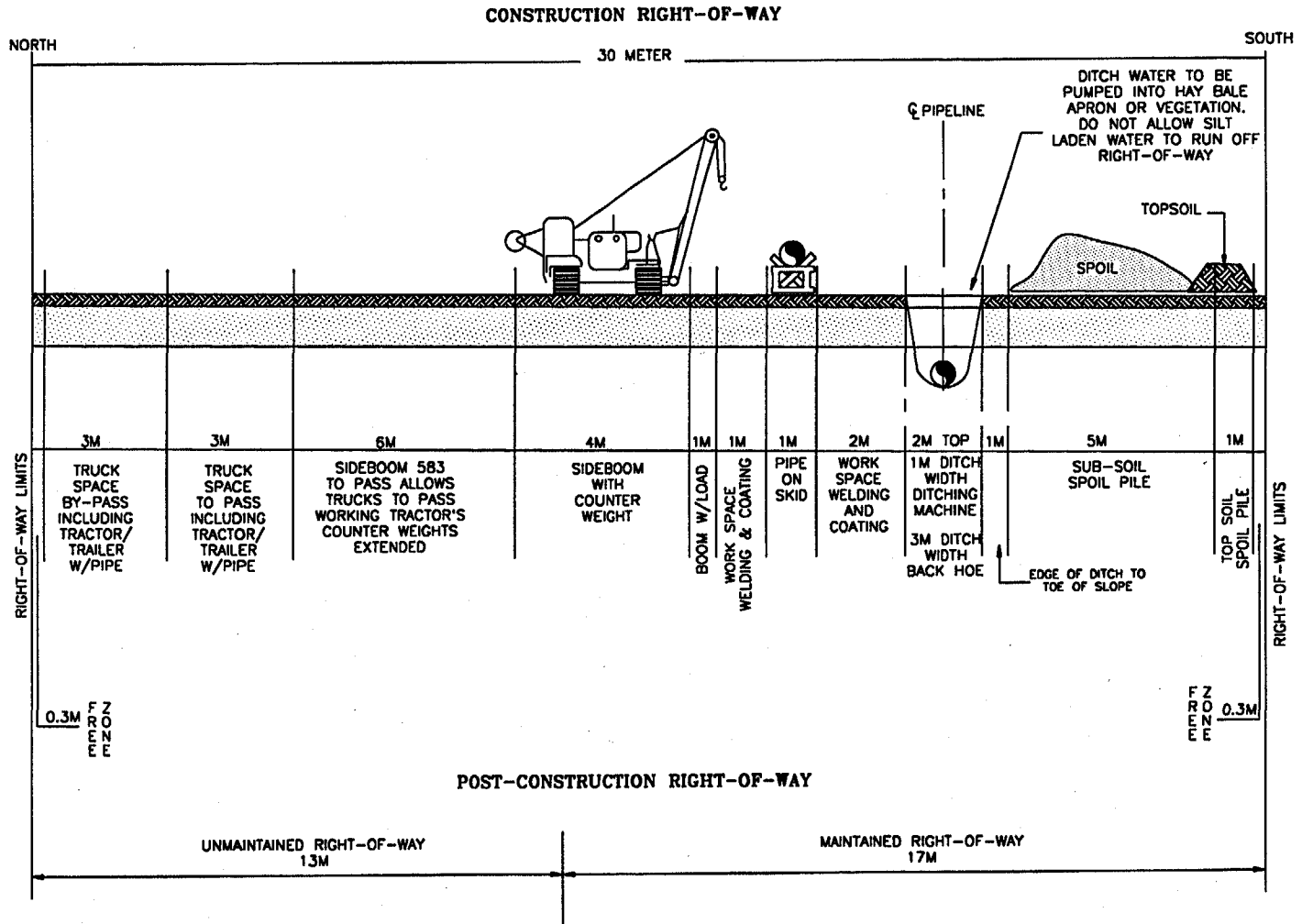
Source: Ministerio de Desarrollo Sostenible y Medio Ambiente, 1995

GROUP



**BOLIVIA-BRAZIL GAS PIPELINE  
(BOLIVIAN PORTION)  
ENVIRONMENTAL MANAGEMENT PLAN**

**FIGURE III.1  
30M WIDE RIGHT-OF-WAY**



DITCH WATER TO BE PUMPED INTO HAY BALE APRON OR VEGETATION. DO NOT ALLOW SILT LADEN WATER TO RUN OFF RIGHT-OF-WAY

TOPSOIL  
SPOIL

RIGHT-OF-WAY LIMITS

RIGHT-OF-WAY LIMITS

0.3M FENCE

0.3M FENCE

3M  
TRUCK SPACE BY-PASS INCLUDING TRACTOR/TRAILER W/PIPE

3M  
TRUCK SPACE TO PASS INCLUDING TRACTOR/TRAILER W/PIPE

6M  
SIDEBOOM 583 TO PASS ALLOWS TRUCKS TO PASS WORKING TRACTOR'S COUNTER WEIGHTS EXTENDED

4M  
SIDEBOOM WITH COUNTER WEIGHT

1M  
BOOM W/LOAD  
WORK SPACE WELDING & COATING

1M  
PIPE ON SKID

2M  
WORK SPACE WELDING AND COATING

2M TOP  
1M DITCH WIDTH DITCHING MACHINE  
3M DITCH WIDTH BACK HOE

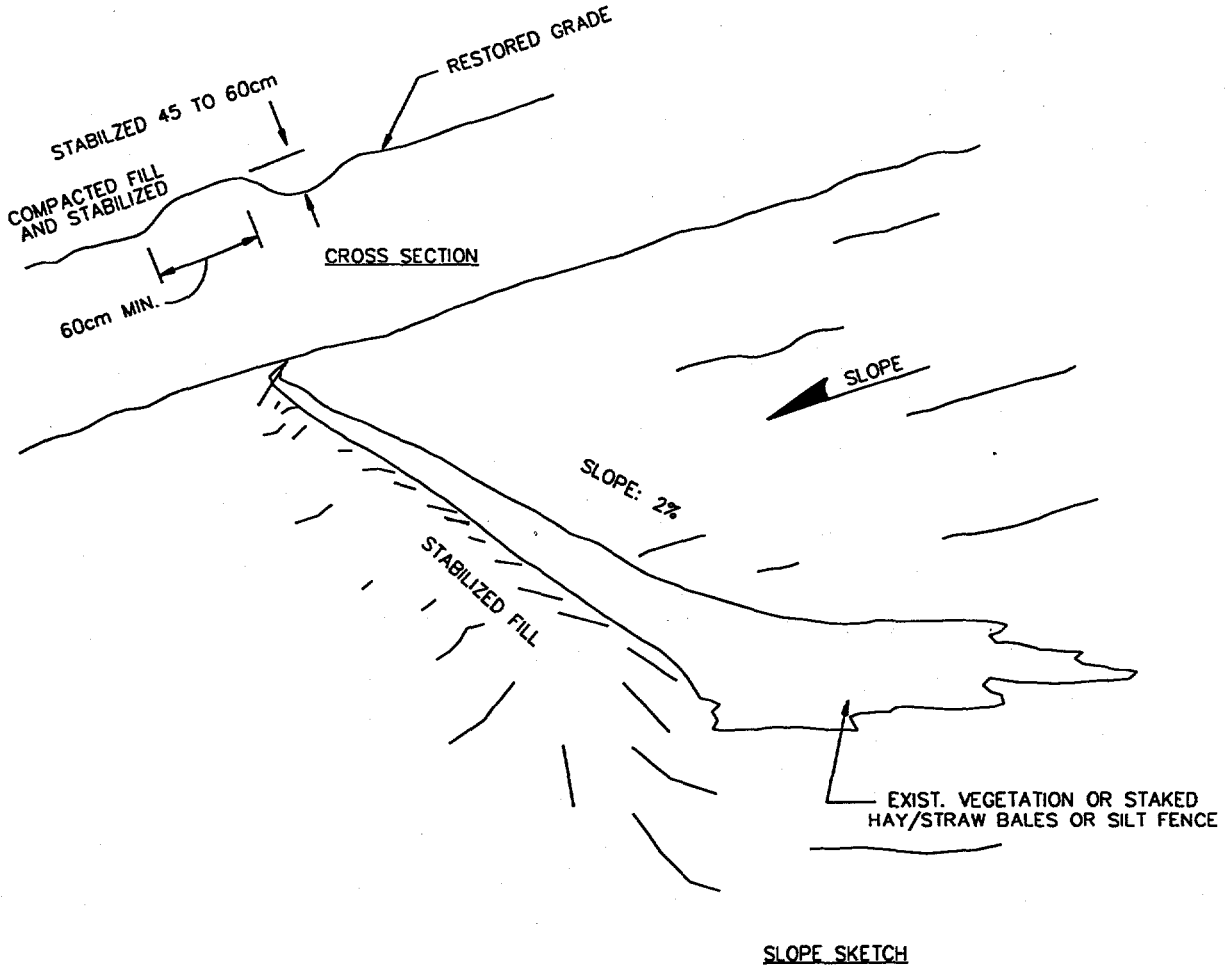
1M  
EDGE OF DITCH TO TOE OF SLOPE

5M  
SUB-SOIL SPOIL PILE

1M  
TOP SOIL SPOIL PILE

DWG. SCALE: N.T.S.  
DWG. DATE: 6-97

FILE NAME: 3-10.DWG  
DRAWN BY: TEM



NOTES:

1. INSTALL ON SLOPING TERRAIN AS REQUIRED
2. MAINTAIN THROUGHOUT CONSTRUCTION AND REPAIR AT THE END OF EACH DAY.
3. OUTLET INTO AREAS STABILIZED BY EXISTING VEGETATION OR INSTALL STAKED HAY/STRAW BALES OR SILT FENCE.
4. CONTOUR TO ALLOW PASSAGE OF CONSTRUCTION EQUIPMENT.
5. MINIMUM 2% LATERAL SLOPE.
6. TERRACES SHOULD BE LOCATED AT INTERVALS NOT TO EXCEED 4.5m IN VERTICAL ELEVATION.



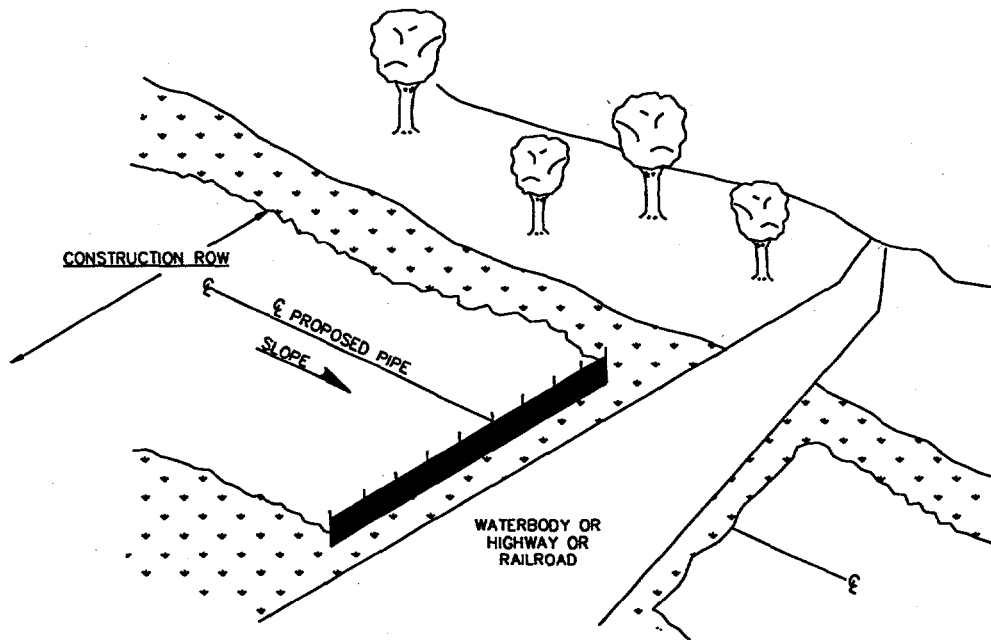
BOLIVIA-BRAZIL GAS PIPELINE  
(BOLIVIAN PORTION)  
ENVIRONMENTAL MANAGEMENT PLAN

FIGURE III.2  
PERMANENT WATER BARS  
OR TERRACES



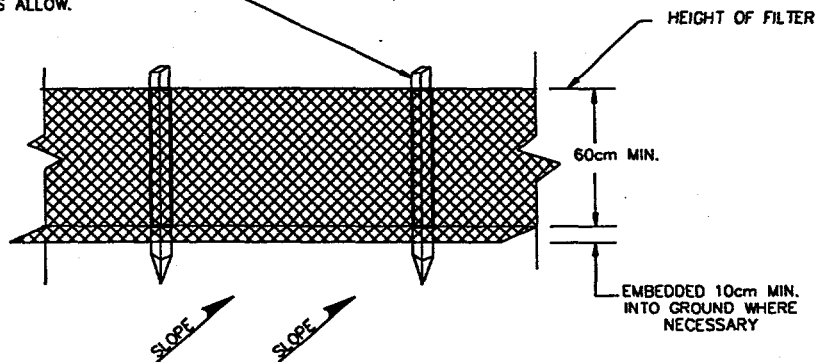
DWG. SCALE: N.T.S.  
DWG. DATE: 6-97

FILE NAME: 3-8.DWG  
DRAWN BY: TEM

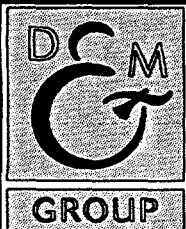


1 METER MIN. FENCE POSTS, ARE DRIVEN  
MIN. 40cm INTO GROUND AS SITE  
CONDITIONS ALLOW.

**PROFILE**



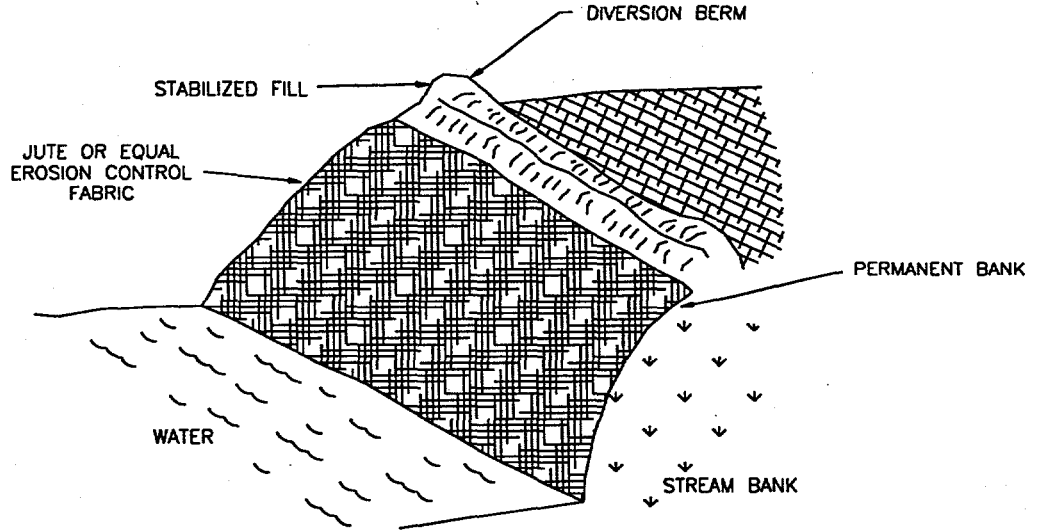
**NOTE:**  
FENCE SHOULD BE INSTALLED SO POSTS  
ARE ON THE DOWNSLOPE SIDE OF THE FABRIC



**BOLMIA-BRAZIL GAS PIPELINE  
(BOLIVIAN PORTION)  
ENVIRONMENTAL MANAGEMENT PLAN**

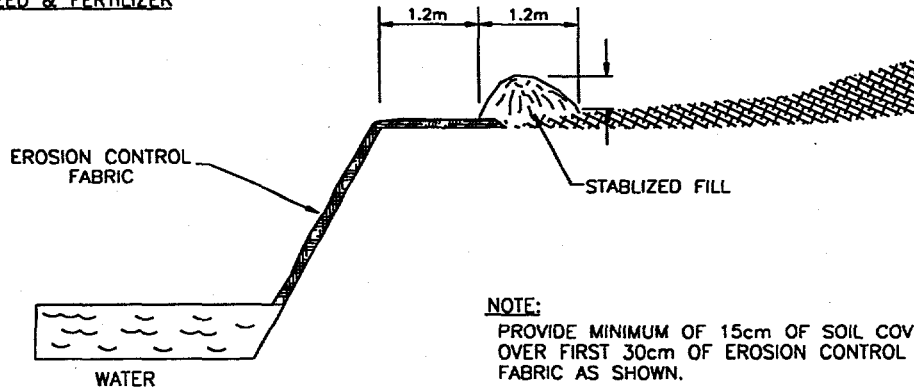
**FIGURE III.3  
FILTER FENCE  
CONSTRUCTION DESIGN**

STAKE TO THE SLOPE WITH WOOD PEGS OR STAPLE PER MANUFACTURERS SPECIFICATION



**SLOPE SKETCH**

STRAW MULCH OR EQUAL OVER SEED & FERTILIZER



**SLOPE SECTION**

DWG. SCALE: N.T.S.  
 DWG. DATE: 6-97

FILE NAME: 3-12.DWG  
 DRAWN BY: TEM



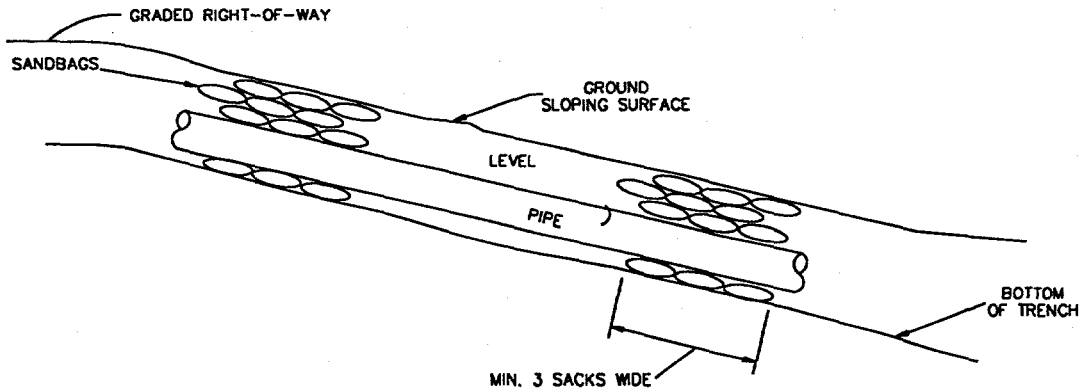
**BOLIVIA-BRAZIL GAS PIPELINE  
 (BOLIVIAN PORTION)  
 ENVIRONMENTAL MANAGEMENT PLAN**

**FIGURE III.4**  
 TYPICAL EROSION CONTROL  
 FABRIC CONFIGURATION

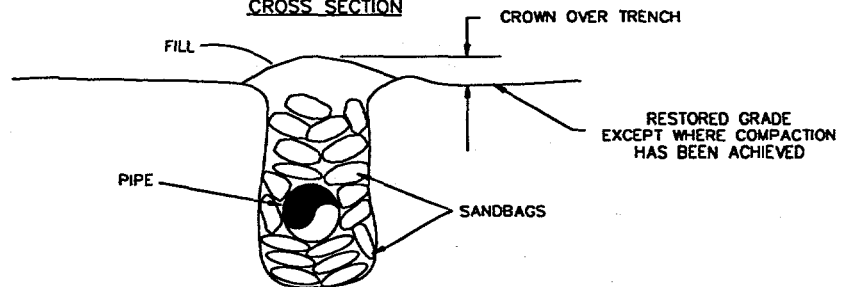
DWG. SCALE: N.T.S.  
DWG. DATE: 6-97

FILE NAME: 3-9.DWG  
DRAWN BY: TEM

PROFILE



CROSS SECTION



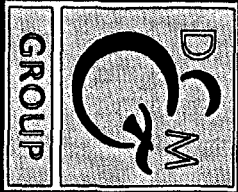
NOTE:

1. CONSTRUCT ON SLOPING TERRAIN.
2. PRIOR TO LOWERING-IN PIPE, REMOVE ALL DECOMPOSABLE MATERIAL AND LARGE ROCKS.
3. BREAKERS MAY BE COMPOSED OF SANDBAGS OR OTHER APPROVED MATERIAL.

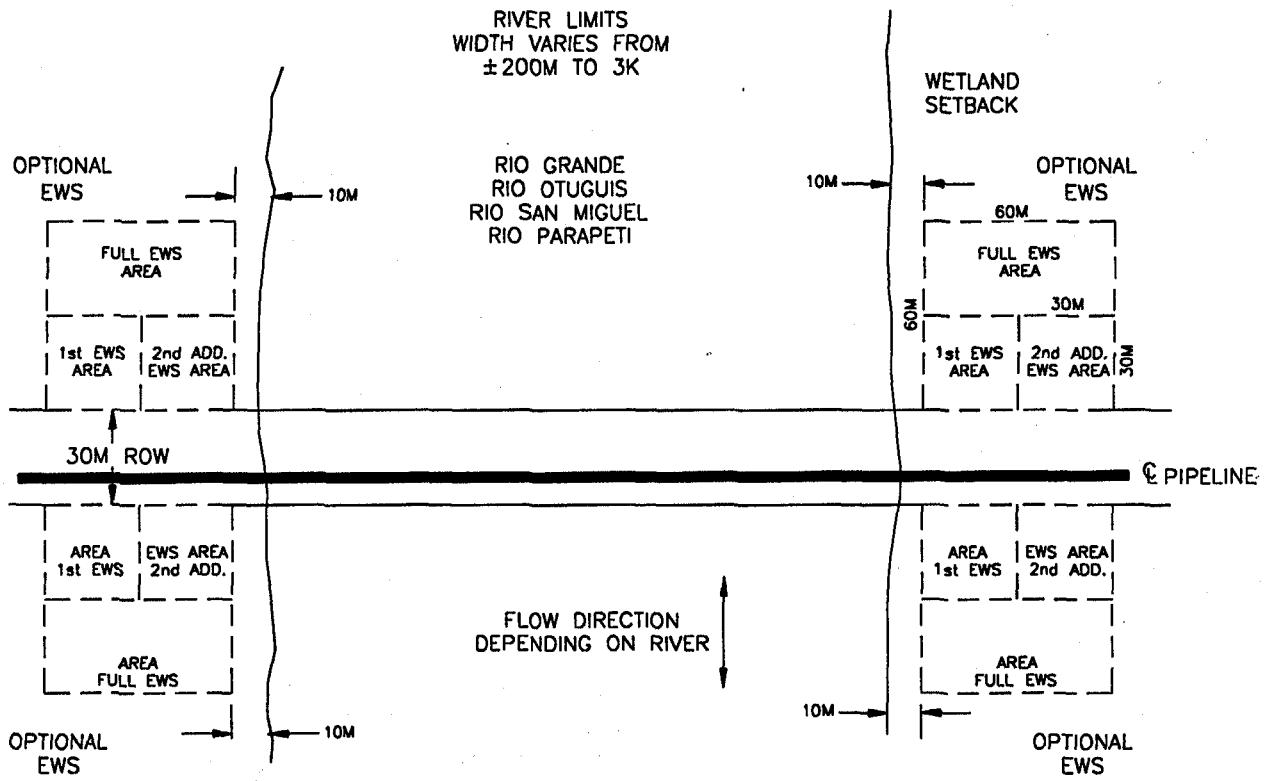


BOLIVIA-BRAZIL GAS PIPELINE  
(BOLIVIAN PORTION)  
ENVIRONMENTAL MANAGEMENT PLAN

FIGURE III.5  
TYPICAL TRENCH BREAKERS



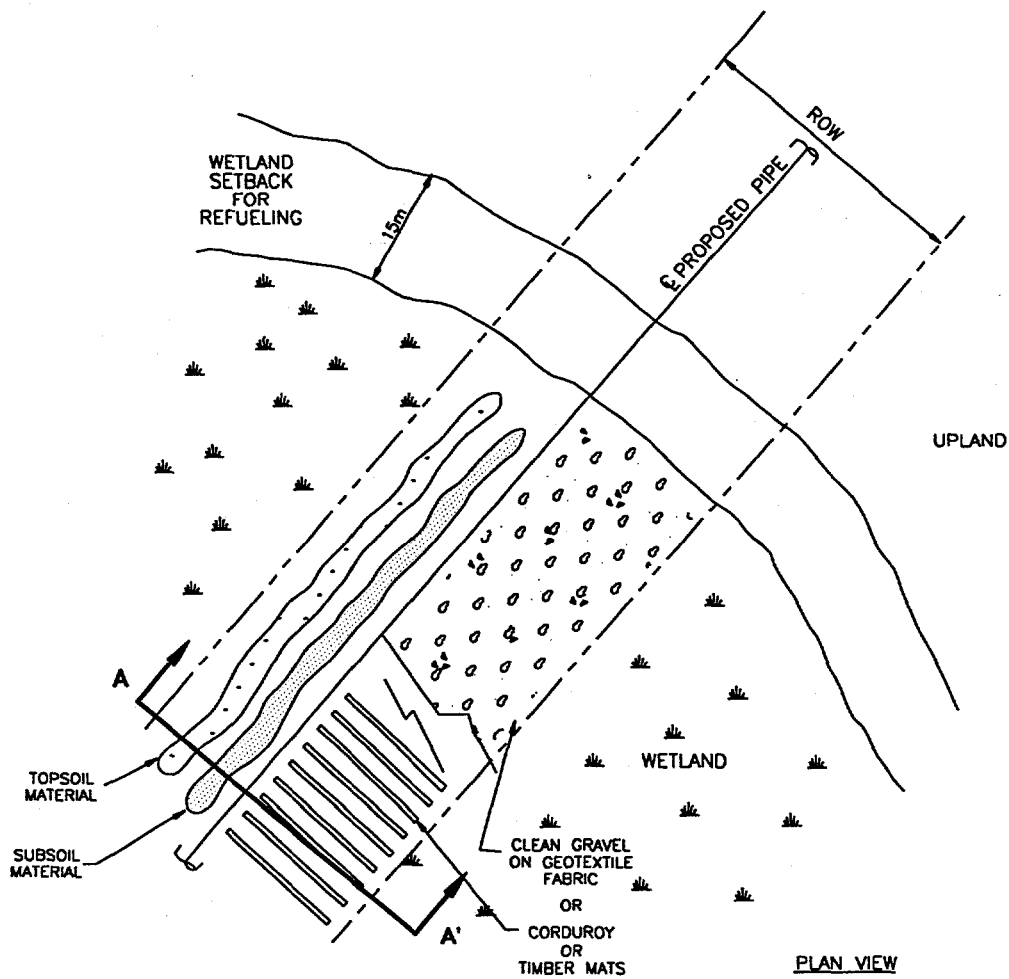
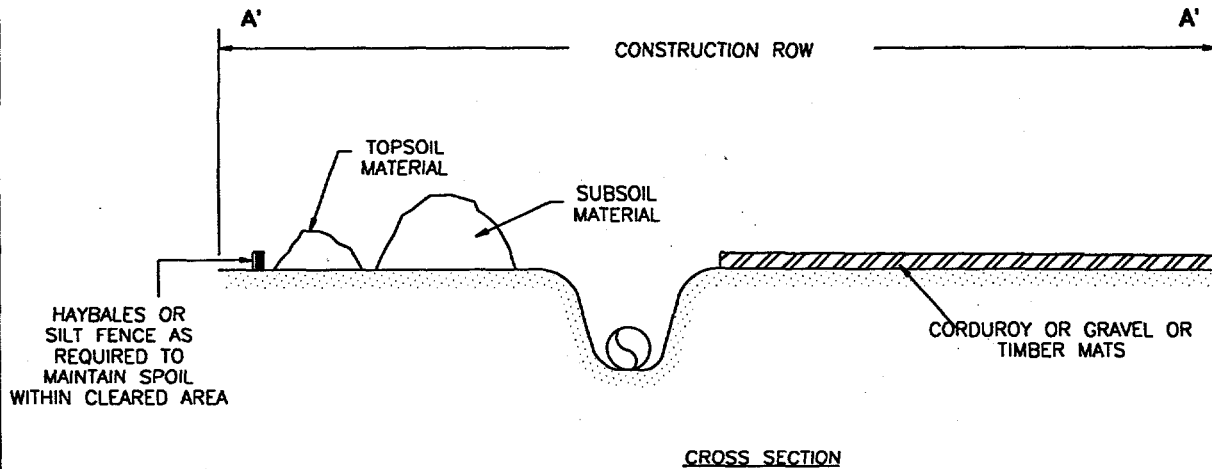
**BOLIVIA-BRAZIL GAS PIPELINE  
 (BOLIVIAN PORTION)  
 ENVIRONMENTAL MANAGEMENT PLAN**



**NOTE:**  
 EXTRA WORK SPACE (EWS) AREA VARIES: 30x30, 30x60  
 OR 60x60 DEPENDING ON RIVER.

NOT TO SCALE

**FIGURE III.6**  
 TYPICAL PLAN VIEW OF  
 EXTRA WORK SPACE



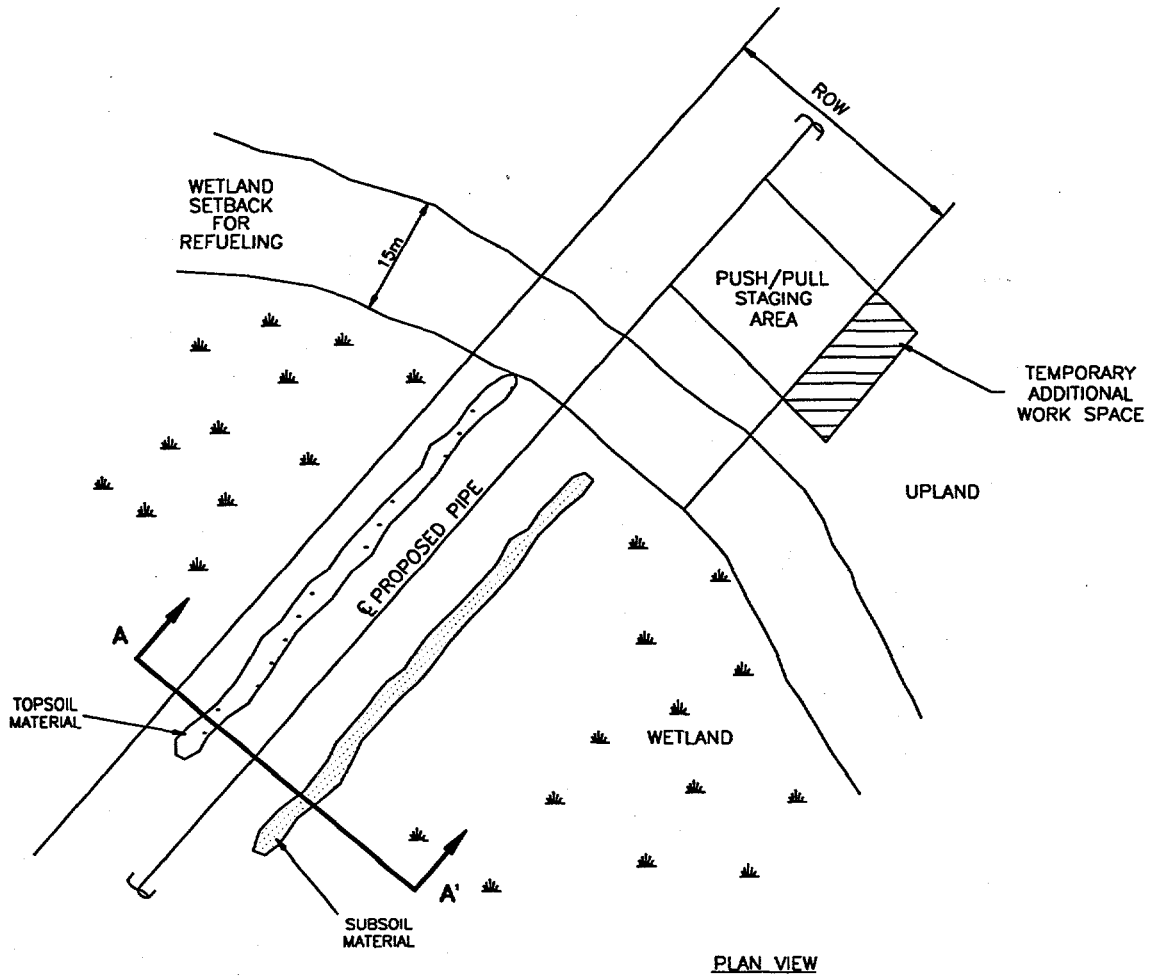
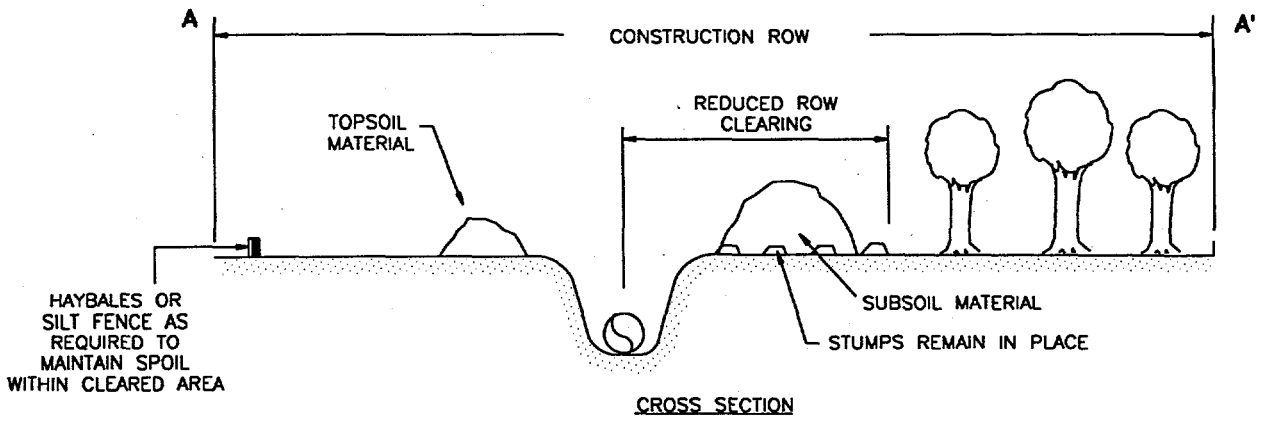
DWG. SCALE: N.T.S.  
 DWG. DATE: 6-97

FILE NAME: 3-13.DWG  
 DRAWN BY: TEM



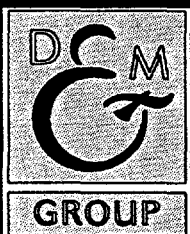
**BOLIVIA-BRAZIL GAS PIPELINE  
 (BOLIVIAN PORTION)  
 ENVIRONMENTAL MANAGEMENT PLAN**

**FIGURE III.7**  
 CONVENTIONAL WETLAND  
 CONSTRUCTION PROCEDURE  
 (METHOD II)



DWG. SCALE: N.T.S.  
 DWG. DATE: 6-97

FILE NAME: 3-13A.DWG  
 DRAWN BY: TEM

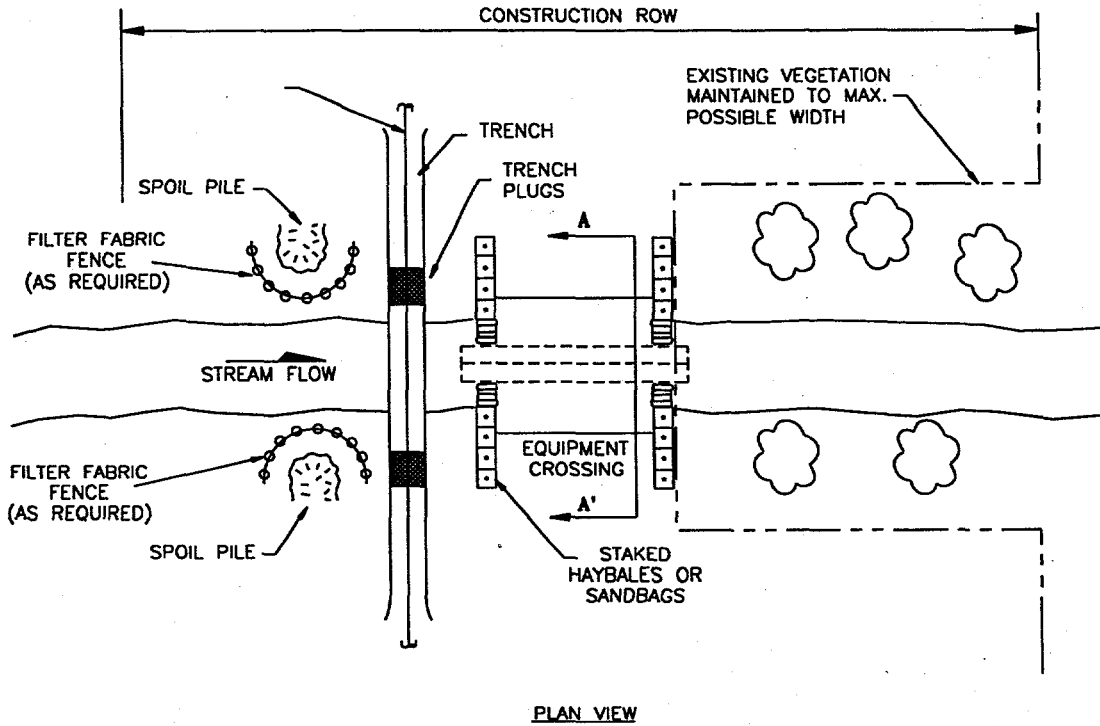


**BOLIVIA-BRAZIL GAS PIPELINE  
 (BOLIVIAN PORTION)  
 ENVIRONMENTAL MANAGEMENT PLAN**

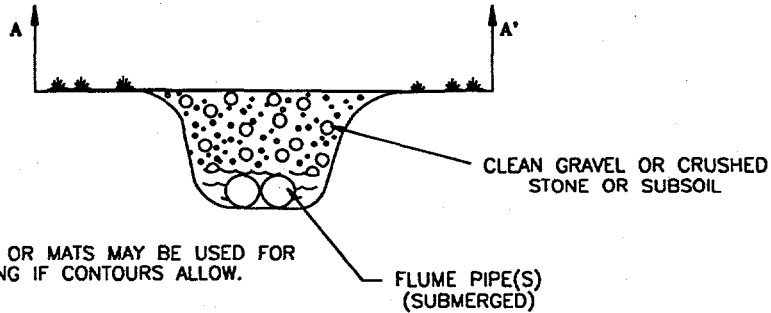
**FIGURE III.8**  
 PUSH/PULL WETLAND  
 CONSTRUCTION PROCEDURE  
 (METHOD III)

DWG. SCALE: N.T.S.  
 DWG. DATE: 6-97

FILE NAME: 3-15.DWG  
 DRAWN BY: TEM



PLAN VIEW



CROSS-SECTION

NOTE:  
 PORTABLE BRIDGES OR MATS MAY BE USED FOR  
 EQUIPMENT CROSSING IF CONTOURS ALLOW.



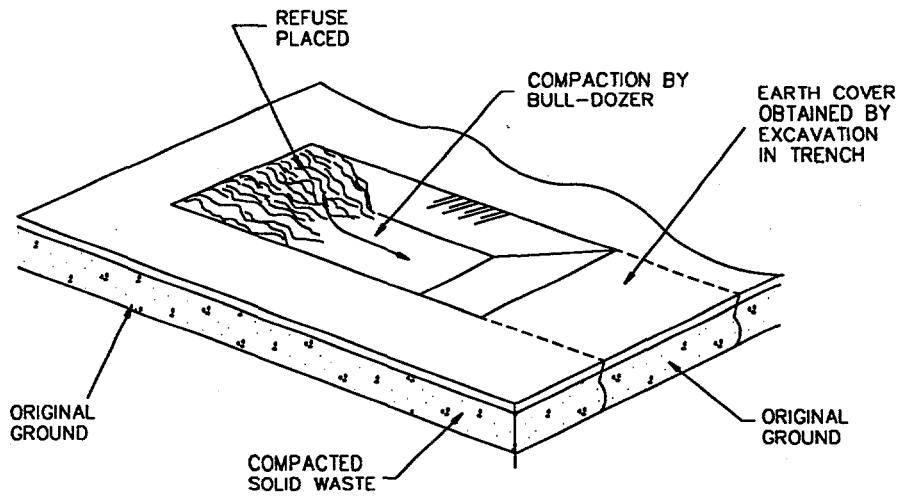
**BOLIVIA-BRAZIL GAS PIPELINE  
 (BOLIVIAN PORTION)  
 ENVIRONMENTAL MANAGEMENT PLAN**

**FIGURE III.9**  
 OPEN-CUT WATERBODY  
 CONSTRUCTION PROCEDURE  
 (METHOD 1)

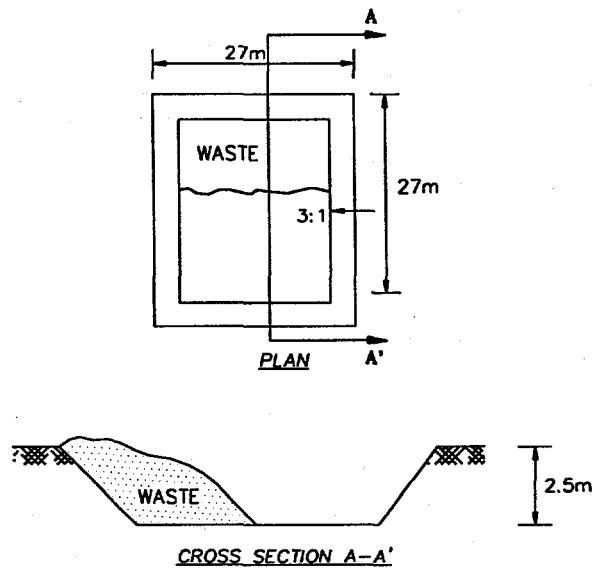
DWG. SCALE: N.T.S.  
DWG. DATE: 6-97

FILE NAME: 3-5.DWG  
DRAWN BY: TEM

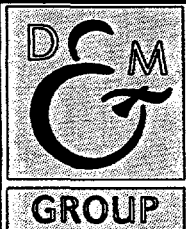
SOURCE: McBEAN, 1995.



A) TRENCH METHOD OF SANITARY LANDFILLING



B) AREA METHOD OF LANDFILLING



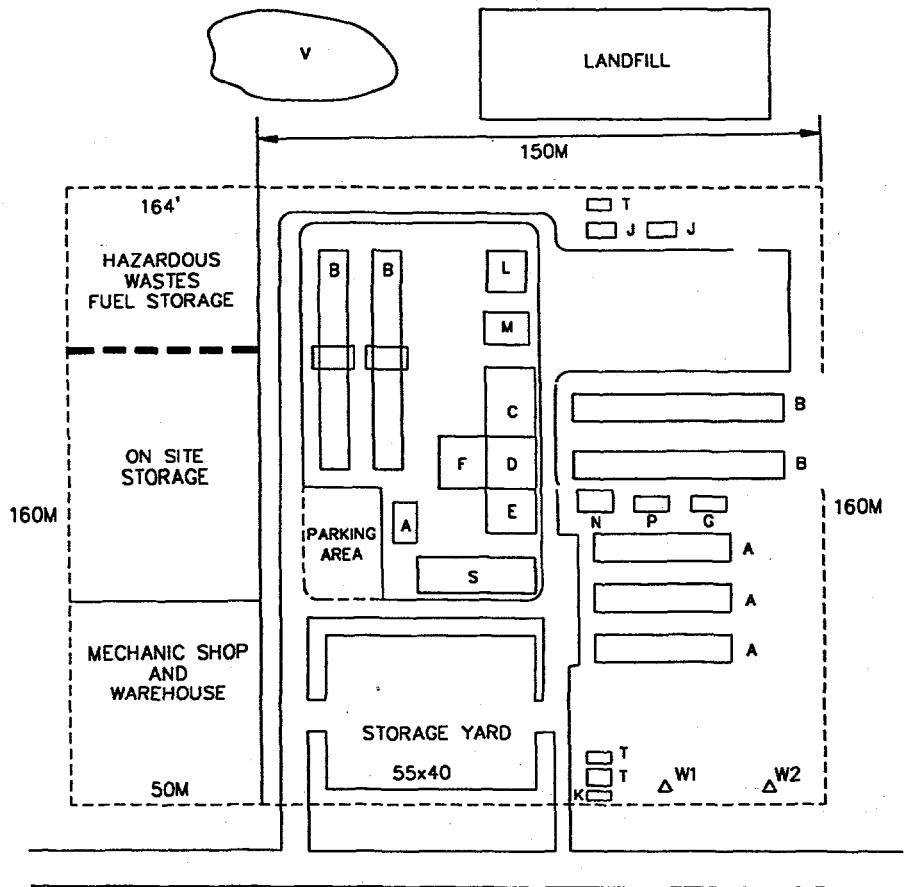
BOLIVIA-BRAZIL GAS PIPELINE  
(BOLIVIAN PORTION)  
ENVIRONMENTAL MANAGEMENT PLAN

FIGURE III.10  
LANDFILLING METHODS



DWG. SCALE: N.T.S.  
 DWG. DATE: 6-97

FILE NAME: 3-1.DWG  
 DRAWN BY: TEM



- A-SLEEPERS EXP. SINGLE ROOM W/BATH TOTAL=72 MEN
- B-SLEEPERS NAT. 4EA ROOM 128 MAN TOTAL=512 MEN
- C-DINING NAT. 50'X120'
- D-KITCHEN
- E-DINING EXPAT.
- F-COLD/DRY STORAGE
- G-MEDIC NAT.
- M-RECREAT NAT.
- N-RECREAT EXPAT.
- P-LAUNDRY EXPAT.
- J-PACKAGE WASTEWATER TREATMENT PLANT
- K-WATER PLANT
- T-GENERATOR
- S-SITE OFFICE
- V-ON-SITE PERCOLATION POND FOR WASTEWATER PLANT TREATMENT EFFLUENT
- W-POTABLE WATER SUPPLY WELLS (No.1 & No.2)

NOTE: WATER SUPPLY WELLS SHOULD BE LOCATED AS FAR FROM LANDFILL AND PERCOLATION POND AS LAND ACCESS ALLOWS.

CAMP SITE AREA:  
 AREA=160X200=32,000M<sup>2</sup>  
 =3.2 HECTARES  
 (7.90 ACRES)

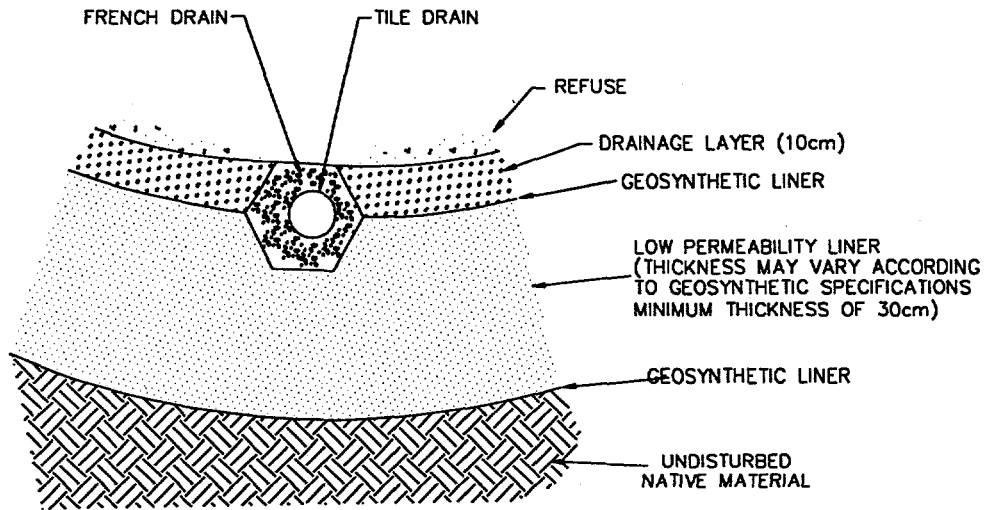


**BOLIVIA-BRAZIL GAS PIPELINE  
 (BOLIVIAN PORTION)  
 ENVIRONMENTAL MANAGEMENT PLAN**

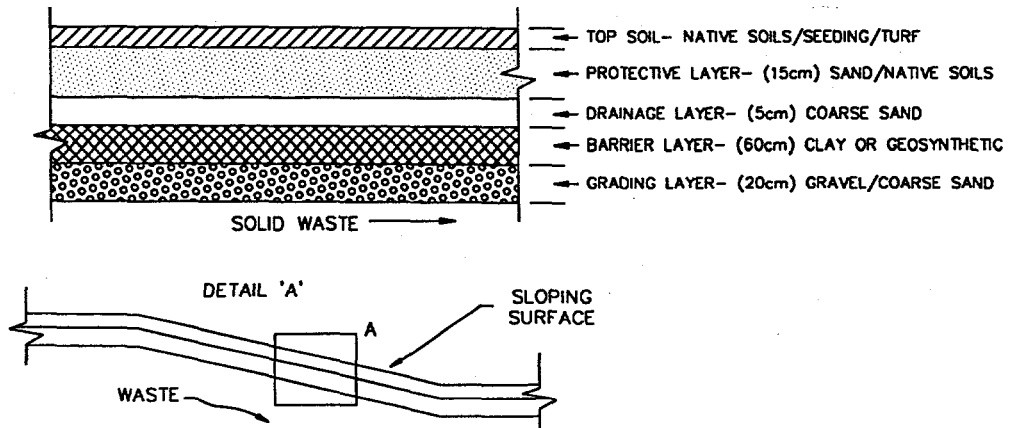
**FIGURE III.11**  
 LOCATION OF PROPOSED  
 WASTE MANAGEMENT  
 FACILITIES AT CAMP SITES

DWG. FILE: N.T.S.  
DWG. DATE: 6-97

FILE NAME: 3-4.DWG  
DRAWN BY: TEM

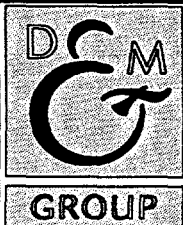


A) SUB-BASE MATERIALS AND COLLECTION TILE DESIGN ELEMENTS



B) FINAL COVER DESIGN ELEMENTS

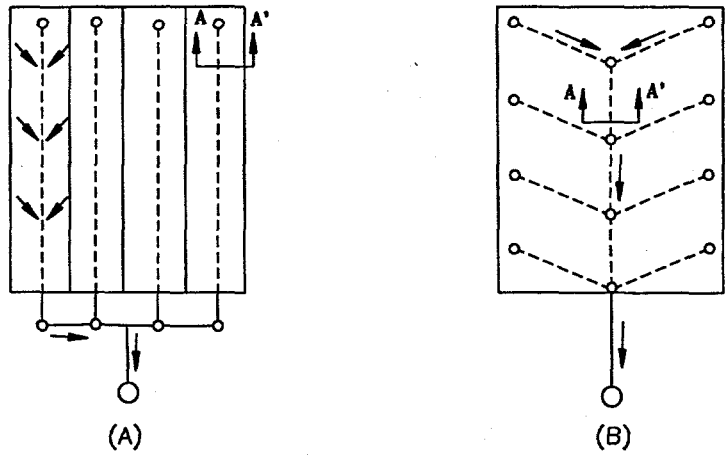
•MINIMUM THICKNESSES ALLOWABLE ARE SHOWN  
SOURCE: McBEAN, et al., 1995.



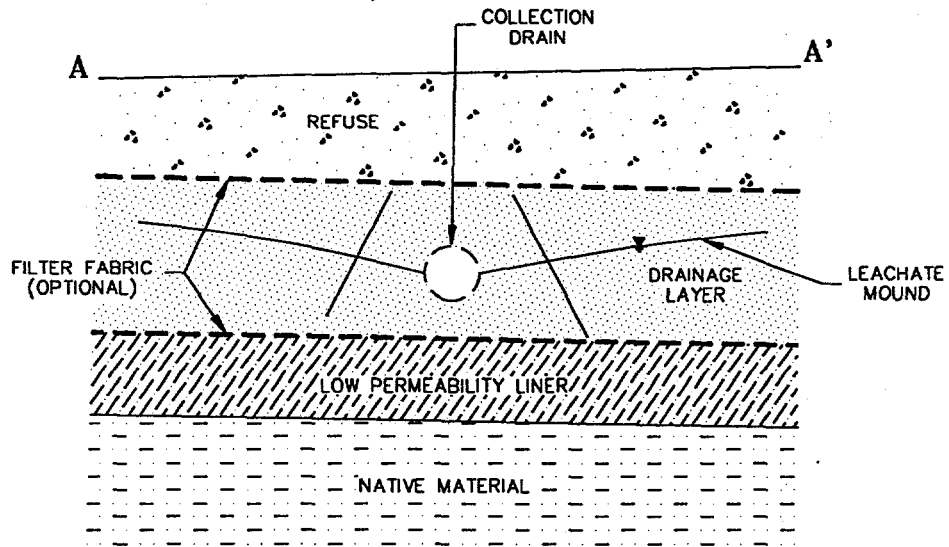
**BOLVIA-BRAZIL GAS PIPELINE  
(BOLIVIAN PORTION)  
ENVIRONMENTAL MANAGEMENT PLAN**

**FIGURE III.12**  
SUB-BASE AND FINAL  
COVER DESIGN ELEMENTS

DWG. FILE: N.T.S.  
DWG. DATE: 6-97



A) EXAMPLES OF LEACHATE COLLECTION PIPE LAYOUTS



B) COMPONENTS OF LEACHATE COLLECTOR SYSTEM

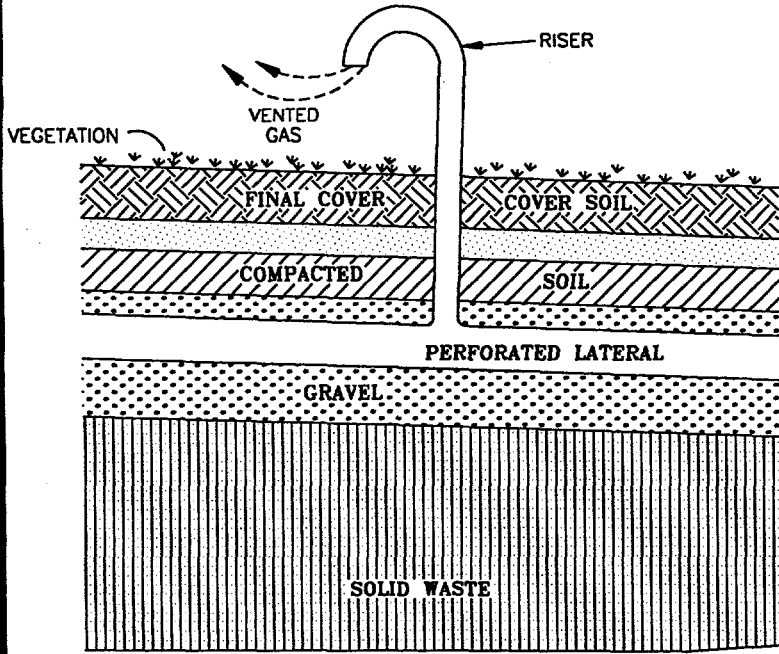
SOURCE: BAGCHI, 1994.

FILE NAME: 3-2.DWG  
DRAWN BY: TEM

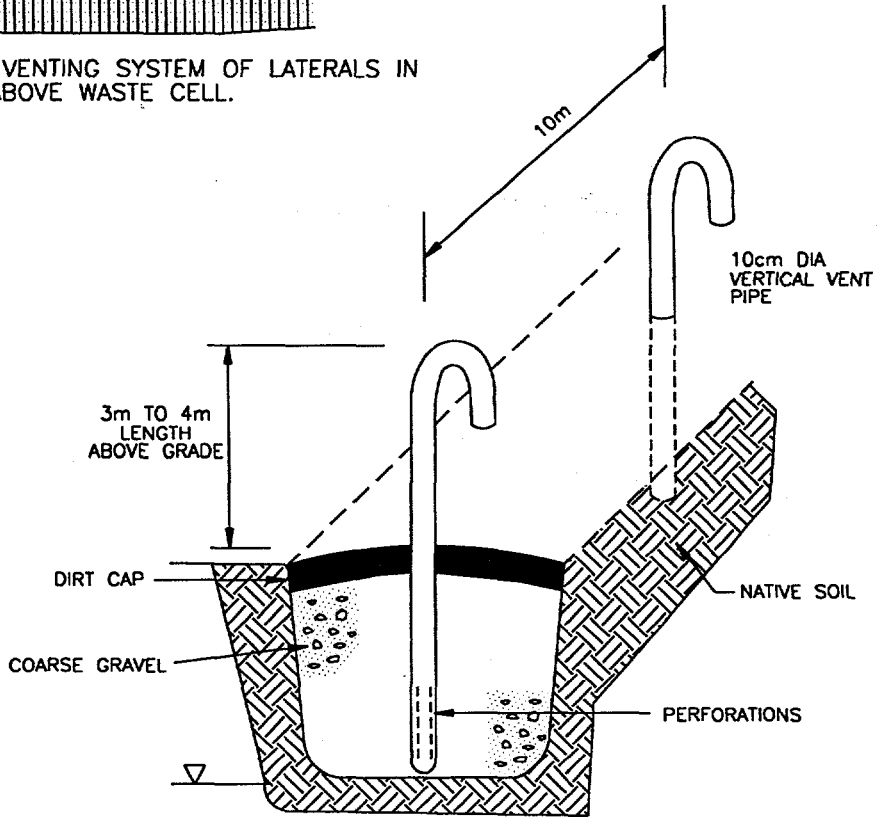


BOLIVIA-BRAZIL GAS PIPELINE  
(BOLIVIAN PORTION)  
ENVIRONMENTAL MANAGEMENT PLAN

FIGURE III.13  
LEACHATE COLLECTION SYSTEM  
COMPONENTS



A) PASSIVE GAS COLLECTING AND VENTING SYSTEM OF LATERALS IN GRAVEL TRENCHES ABOVE WASTE CELL.

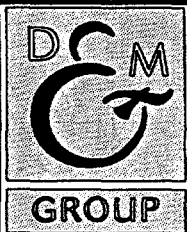


B) GRAVEL AND DIRT CAP TRENCH WITH VERTICAL VENT PIPES.

SOURCE: McBEAN et.al., 1995.

DWG. FILE: N.T.S.  
 DWG. DATE: 6-97

FILE NAME: 3-3.DWG  
 DRAWN BY: TEM



**BOLIVIA-BRAZIL GAS PIPELINE  
 (BOLIVIAN PORTION)  
 ENVIRONMENTAL MANAGEMENT PLAN**

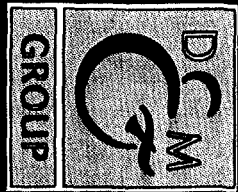
**FIGURE III.14**  
 GAS COLLECTION  
 SYSTEM COMPONENTS

FILE NAME: III-15.DWG

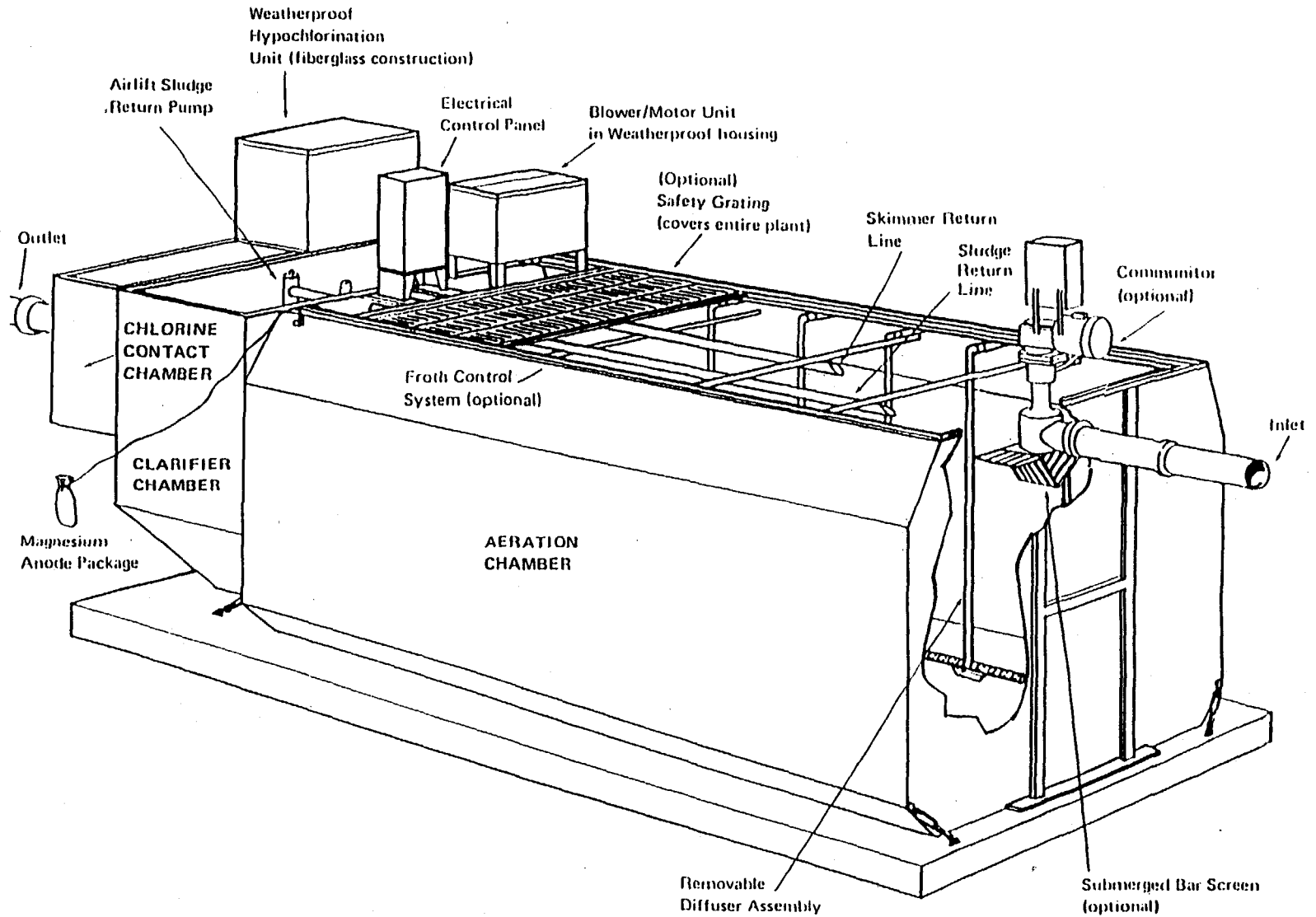
DWG. SCALE: N.T.S.

DRAWN BY: TEM

DWG. DATE: 6-97



**BOLIVIA-BRAZIL GAS PIPELINE  
(BOLIVIAN PORTION)  
ENVIRONMENTAL MANAGEMENT PLAN**



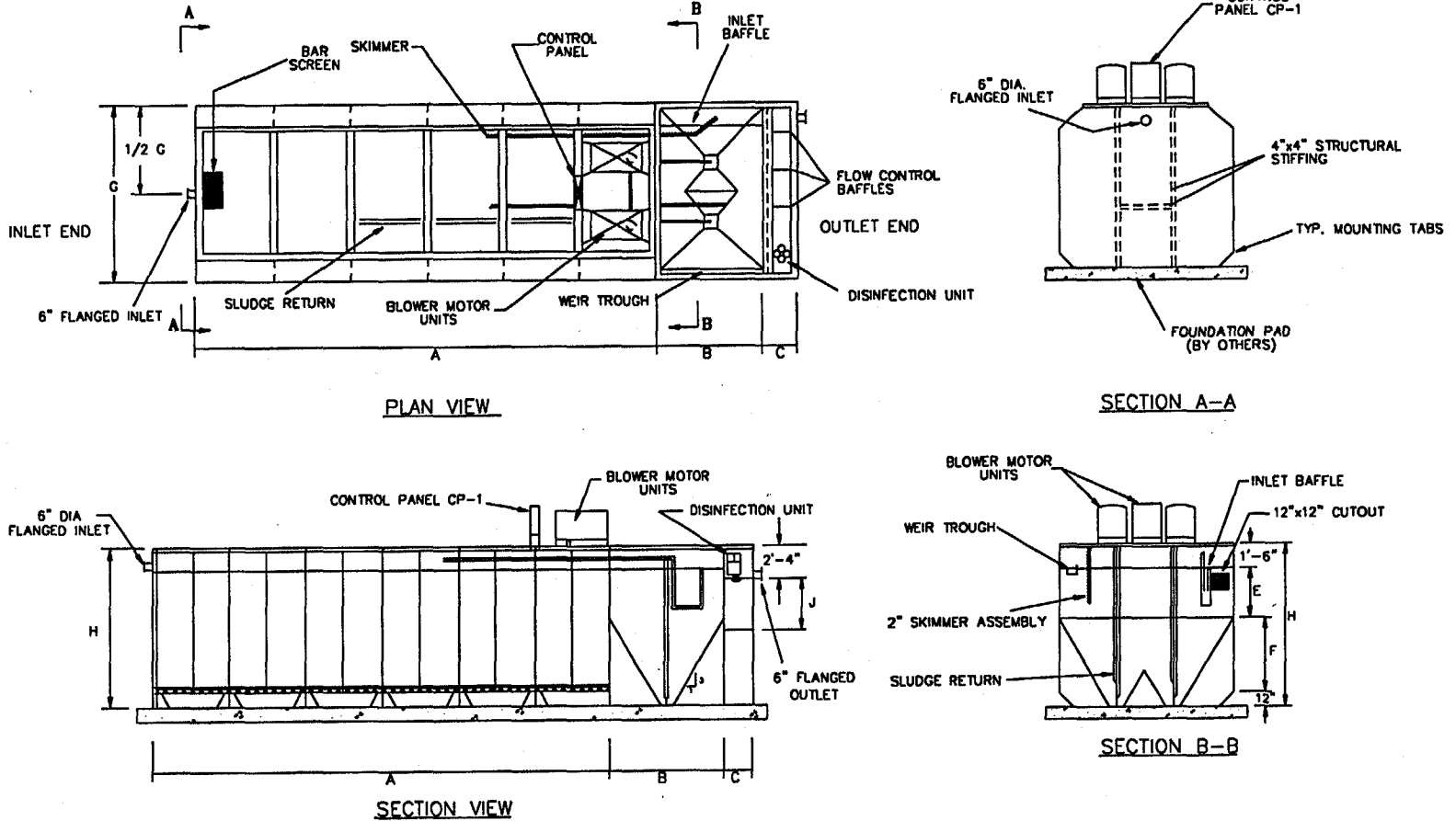
**FIGURE III.15**  
TYPICAL ARRANGEMENT OF  
THE PURESTREAM PACKAGE  
WASTEWATER TREATMENT PLANT

GROUP



SOURCE: Tipton Environmental, 1997.

BOLIVIA-BRAZIL GAS PIPELINE  
 (BOLIVIAN PORTION)  
 ENVIRONMENTAL MANAGEMENT PLAN



MODEL NUMBER	DESIGN FLOW GPD.	AERATION VOLUME	CLARIFIER VOLUME	C.C.T. VOLUME	SHT VOLUME	A	B	C	D	F	G	H	I	J	K
* T-250	25,000	25,000	4,167	621	1,875	29'-10"	8'-0"	2'-0"	2'-3"	3'-7"	5'-11"	11'-11"	11'-0"	3'-0"	42'-1" 3 UNITS
T-260	26,000	26,000	4,340	542	---	31'-0"	8'-0"	3'-0"	---	3'-6"	8'-0"	11'-11"	11'-0"	2'-0"	42'-0"
T-270	27,000	27,000	4,5000	563	---	32'-3"	8'-0"	3'-0"	---	3'-6"	6'-0"	11'-11"	11'-0"	2'-1"	43'-5"
T-280	28,000	28,000	4,670	585	---	33'-5"	8'-0"	3'-0"	---	3'-6"	8'-0"	11'-11"	11'-0"	2'-2"	44'-5"
T-290	29,000	29,000	4,850	604	---	34'-7"	8'-0"	3'-0"	---	3'-6"	6'-0"	11'-11"	11'-0"	2'-3"	45'-7"
* T-300	30,000	30,000	5,000	625	---	35'-10"	8'-0"	3'-0"	---	3'-6"	8'-0"	11'-11"	11'-0"	2'-4"	46'-10"
T-325	32,500	32,500	5,416	677	---	38'-9"	10'-0"	3'-0"	---	1'-8"	7'-10"	11'-11"	11'-0"	2'-7"	51'-9"

• RECOMMENDED MODELS FOR ESTIMATED VOLUMES

FIGURE III.16  
 TYPICAL ARRANGEMENT OF  
 THE II PACKING  
 WASTEWATER TREATMENT  
 PLANT

**BOLIVIA TO BRAZIL GAS PIPELINE  
ENVIRONMENTAL INSPECTION**

**GRIEVANCE FORM**

**Person's Name/Affiliation:** \_\_\_\_\_

**Contact Address:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Nature of Grievance:** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Immediate Action(s) Taken:** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Follow-up Action(s) Required:** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**DISTRIBUTION:**  
Field Notebook: \_\_\_\_\_  
Office Notebook: \_\_\_\_\_  
Proj. Env. Supervisor: \_\_\_\_\_

## CHAPTER IV

### PROGRAM No. 3:

### ENVIRONMENTAL OPERATIONS PLAN

#### 1.0 OBJECTIVES AND ORGANIZATION

The main objective of the Environmental Operations Plan is to establish measures to ensure that the project continues in compliance with all environmental regulations and requirements during its operation phase. While the main environmental impacts of the project are likely to occur during construction, secondary impacts may occur during operations. The main potential impacts during the operation phase include:

- Potential for erosion on the right-of-way.
- Potential undesirable uses of the right-of-way, including traffic and induced colonization.
- Potential emission of air contaminants at levels above permitted concentrations at the compressor station.

The Environmental Operations Plan considers activities related to the right-of-way and the compressor station separately.

The operator of the pipeline, Gas Transboliviano, S.A. is responsible for all environmental monitoring, maintenance and remediation activities that may be needed for the pipeline.



## **2.0 RIGHT-OF-WAY MONITORING, CONSERVATION, AND CONTROL**

### **2.1 Allowable Uses of the Right-of-Way**

The 17-m wide permanent right-of-way is intended to serve as an easement to allow access to the pipeline utility for maintenance, repairs, and other routine activities related to the operation of the pipeline. Outside the Gran Chaco National Park, the pipeline right-of-way is intended to be used only for activities directly related to the operation of the pipeline. In general, the right-of-way is not intended to be used as an access route for people not associated with the pipeline. However, in agricultural areas, normal activities related to crop production or farming may continue on the right-of-way.

Within the Gran Chaco National Park, the right-of-way will also be used by park personnel to access areas within the park and the Integrated Management Areas. For security reasons, vehicular traffic on the right-of-way by park personnel will be limited to the portion of the permanent right-of-way outside the pipeline centerline. This right-of-way will be protected and controlled by locked steel gates located at regular intervals (see below). The two-track unimproved road will be used for limited park access by park personnel only.

### **2.2 Access Restrictions and Control**

Access to the right-of-way by unauthorized persons will be discouraged and restricted mainly by means of signs and gates. Signs will serve a two-fold purpose: to alert the population of the potential danger of digging in the right-of-way and to inform them about access restrictions. Signs will be located at every road and railroad crossing, all rivers and streams, and every valve and fence crossing. Additionally, signs will be placed at a minimum of every 2.0 km along the alignment.

There will be a total of 40 gates along the right-of-way, with the heaviest concentration in the Gran Chaco National Park area. Gates will be supplemented by a metal still-post fence, which will extend 50 m into the adjacent area on either side of the right-of-way (Figure IV.1). Outside

the Gran Chaco National Park, the same gate-fence system will be installed at the intersection of local roads and the right-of-way. Gates will be placed at the intersection of the right of way with all access roads.

Additional access control will be provided by periodic operations inspections of the pipeline, metering stations and valves.

## **2.3 Monitoring Scope and Schedule**

### **2.3.1 Right-of-Way Overflights**

The right-of-way will be visually inspected quarterly via helicopter overflight. The overflight will allow for identifying areas subject to erosion, scouring along river banks, or with evidence of unauthorized intrusion. The inspector will write a report describing the findings. The environmental inspection will be supplemented with information gathered during routine ground inspections of the right-of-way, valves, and metering stations.

### **2.3.2 Satellite Image Analysis**

To determine whether the project is likely to influence colonization in the area, satellite images (SPOT) will be acquired and analyzed at years 0, 2, 5, and 10, with year 0 being at pre-construction. The analysis of the satellite images will assist in determining whether human settlement is occurring in the vicinity of the pipeline, as well as provide a regional perspective of changes in land use in the area of influence of the project. The results of the bi-annual satellite image analysis will be distributed to local government and CABI and CIDOB for their reference.

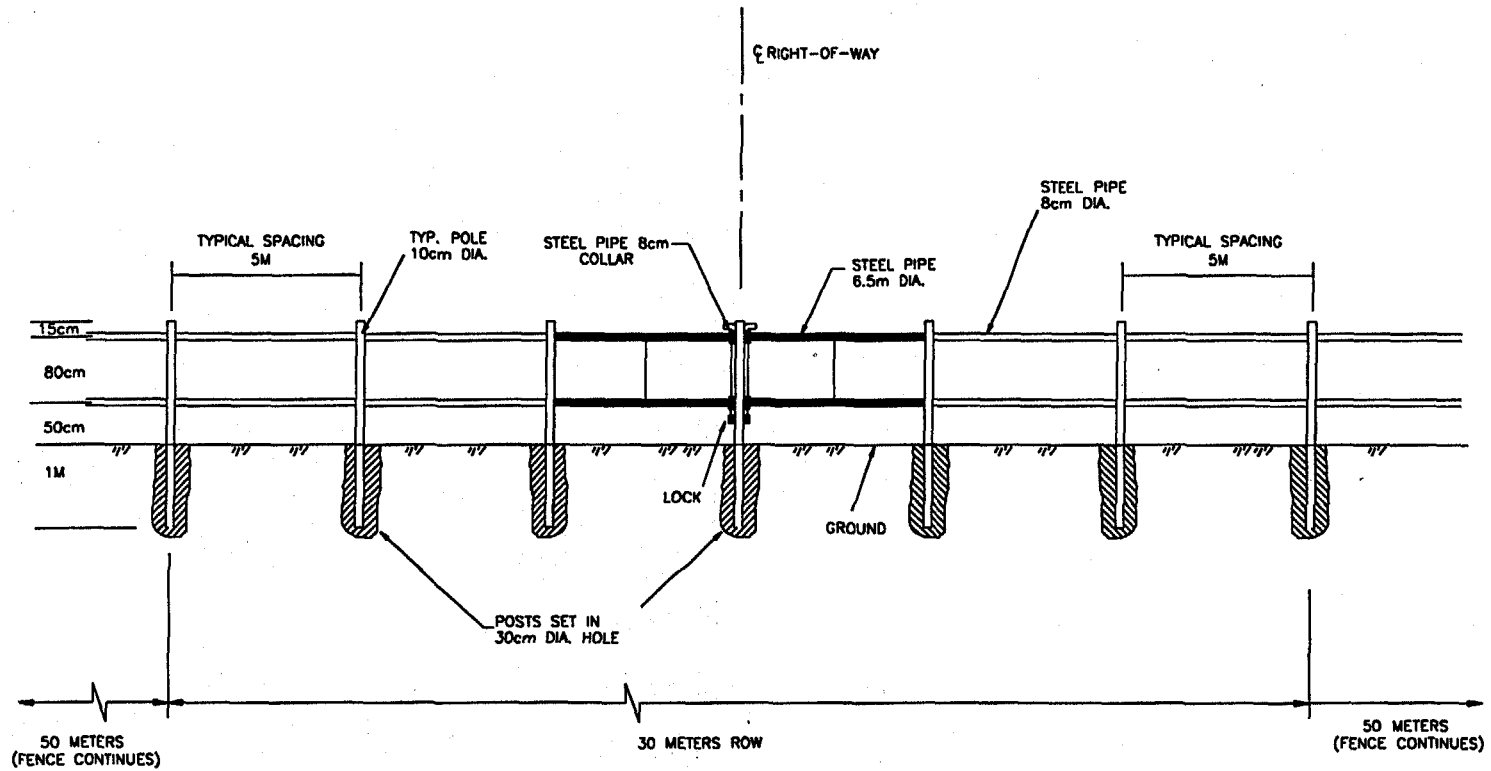
### **3.0 COMPRESSOR STATION**

Once the compressor station is in operation, the air contaminant emissions will be estimated annually based on actual operating conditions and manufacturer's pollutant emission rates to determine whether emissions remain within the Bolivian and World Bank Standards. The results will be compared to the applicable emission standards. Exceedances will be reported to the Ministry of the Environment and a plan will be developed to bring the emission within acceptable limits.

GROUP



**BOLIVIA-BRAZIL GAS PIPELINE  
(BOLIVIAN PORTION)  
ENVIRONMENTAL MANAGEMENT PLAN**



**NOTES:**

- 1.) ALL CONNECTIONS TO BE WELDED;
- 2.) PIPELINE BARRIER GATE TO BE LOCATED ACROSS 30M RIGHT-OF-WAY AND EXTENDED 50M BEYOND BOTH EDGES; AND
- 3.) CENTRAL HORIZONTAL PIPES (6.5cm) RETRACT INTO ADJACENT PIPES (8cm DIA.) FOR GATE OPENING.

**FIGURE IV1**

TYPICAL PIPELINE  
RIGHT-OF-WAY BARRIER GATE

## **CHAPTER V**

### **PROGRAM No. 4: COMPENSATION PLAN**

#### **1.0 OBJECTIVES AND ORGANIZATION OF THE PROGRAM**

The Compensation Program is intended to provide due compensation and assistance to non-indigenous communities in the area of influence of the project. The structure of the compensation measures was designed as a response to concerns and requests gathered during the public consultation process carried out for the EIS (Dames & Moore, 1996, Chapter 8).

The main objective of the program is to implement a package of improvements to the communities as a contribution of the project to their development. These measures mainly include specific infrastructure support to assist the communities with current deficiencies, such as water and electric energy shortage.

## **2.0 SUB-PROGRAM 4.1 - INDEMNIFICATION TO AFFECTED POPULATIONS AND ECONOMIC UNITS**

### **2.1 Objectives and Organization**

The objective of this sub-program is to provide indemnification to all populations, economic units and property owners directly or indirectly or directly affected by the project. This sub-program describes the process for the legal expropriation or purchase of land for pipeline right-of-way and facilities easements.

Compensation measures for indigenous peoples are described in the Indigenous Peoples Development Plan attached. For the purchase of land easements, the plan establishes procedures for the assessment, negotiation and payment to individual land owners. In case of expropriation, the plan complies with Bolivian law for oil transportation, namely the Hydrocarbon Law Provisions For Expropriation and Rights-of-Way Purposes, Title II and Title VIII. These procedures are described below.

### **2.2 Right-of-Way Acquisition**

The right-of-way acquisition for the pipeline project is following a specific methodology set forth by the sponsors in Bolivia. This methodology complies with Bolivian law and satisfies the intent and concerns of the World Bank and International Lending Institutions. The initial stages of this acquisition procedure are currently underway. The procedure includes the following steps:

1. Identify all property owners along the pipeline route. This activity was accomplished by contracting with the Instituto Geografico Militar (IGM) of Bolivia. A centerline survey of the pipeline route was completed and the property lines of individual ownerships were identified. This work has confirmed 81 different owners along the pipeline. Summary information about these owners is included in the table attached to the end of this chapter.

2. Contact the Ministerio de Asuntos Campesinos y Agropecuarios (MACA) which is the governmental department responsible for land valuation. This process was conducted to establish a fair and equitable price for the land parcels over the length of the pipeline.
3. Contact the Cámara Agropecuaria del Oriente (CAO) to establish construction damage values on the land parcels. These damages consider the disruption of lands in crop production such as soybeans, rice or corn. The value of individual items and known Bolivian products has been established in consultation with CAO. In addition, the commercial value of forestry products and their disposition has been defined.

Related to this activity was the consultation with the Bolivian Cattle Ranchers Association. This private group assisted in establishing the price of grazing land. They also provided guidance on the time periods required for full revegetation of the grass types used in grazing areas crossed by the pipeline.

4. Negotiate the price of the land for the easement and the price on any damages based on the above investigations with individual land owners. Following successful negotiations, agreements will be signed by all parties recording that the right-of-way has been purchased. Payments to landowners will be made based on any schedules required by Bolivian law or the purchase agreement.

If negotiations are not successful then the procedures for expropriation of rights-of-way will be followed as set forth by Bolivian law. This process is clearly described by the Hydrocarbon Law Provisions For Expropriation and Rights of Way Purposes, Titles II and VIII, of Bolivia.

5. Filing of the signed and duly notarized easement with the proper governmental agency thereby establishing a legally binding instrument. Copies of this instrument will be filed with the sponsors and the land owner for all future reference.

### 2.3 Other Affected Parties

The project sponsors have acknowledged the rights and claims of the affected parties regarding the effects of construction and operation of the pipeline. These parties are primarily the indigenous peoples communities that are settled in the area of influence of the project. These groups have a common interest, primarily in the consolidation of their rights over their territories, but also in the natural resources which support their way of life. Compensation measures for indigenous peoples are described in the Indigenous Peoples Development Plan.

### 2.4 Compensation for Non-Indigenous Communities

Based on the results of the Public Consultation Program carried out during the environmental impact study, the following compensatory measures will be provided:

1. For the town of Pailón:

- A contribution of US\$30,000 for the construction of the headquarters for the teachers association.

2. For each of the towns of San José de Chiquitos, Roboré, and El Carmen:

- A water well, equipped with a pump, as well as training for maintenance personnel.
- A generator, including training for maintenance personnel.
- A health post, including an allowance for medicine and an itinerant doctor for two years.



## **2.5 Organization**

These contributions to the towns of Pailón, San José de Chiquitos, Roboré and El Carmen will be provided under agreements with the local authority, who will have administrative authority over the contribution.

Water wells and generators will be used to support project activities. They will be donated to the community after the construction of the pipeline or the use of the facility has finalized. Training will be provided by the operator of the pipeline, Gas TransBoliviano.

GAS TRANSBOLIVIANO S.A. & BOLINTER LTDA. - CATASTRO										FECHA:	20/08/97	
FILE : EXCEL .UNICO 4 - UNICO 1/97												
LIST OF THE DAMAGES OWNERS BY THE R.O.W. BOLIVIA - BRASIL												
N°	NAME OF PROPERTY	SIDE	UBICATION	ESTACAS	AREA (Has.)	VEGETATION	%	OWNER	ADDRESS	FONOS	NOTE	ASSIGNED
1	BAÑ. RIO GRANDE	RIO GRANDE	57 Km. AL SUR DE E-RIO GRANDE	R 642- D 015	12,00	MONTE BAJO	100%	PLANTA DE RIO GRANDE - Y.P.F.B. (ANDINA S.A.)			UNA SEMANA PARA LA ENTREGA DE DOCUMENTOS	NO
			METTERING STATION (000 + 500)					RICARDO BALUAB	SCZ	620011	A NOMBRE DE ANDINA S.A. TRANSFERUDA POR Y.P.F.B.	
2	SAN JOAQUIN	BAJO IZOZOG	N- CORECHIS S- SAN JOAQUIN II E-CARR. PAILON-IZOZOG	F004	1,16	MONTE ALTO	100%	ADALID CABRERA GONZALES	ORURO	62814	MANDAR AL NOTARIO PARA FIRMA DE G.T.B.	OK
			O-RIO GRANDE					(MAMA)	SANAT CRUZ	461087		
3	SAN JOAQUIN II	BAJO IZOZOG	N-SAN JOAQUIN S-BRECHA 11 E-CARR IZOZOG O-RIO GRANDE	F004-F003	8,67	MONTE ALTO	100%	PLACIDO SANCHES MONTENEGRO	SANTA CRUZ	628767	MANDAR AL NOTARIO PARA FIRMA DE G.T.B.	OK
4	POZO ABEJAS	BAJO IZOZOG	N-BRECHA 10 S- ENR. TERCEROS E-GIL MELGAR O-CARR IZOZOG	F003-D014	28,69	MONTE ALTO	100%	PEDRO ROMERO DIAZ 8 HERMANOS RAUL ROMERO DIAZ	SANTA CRUZ		MANDAR AL NOTARIO PARA FIRMA DE G.T.B.	OK
5	MERCEDES	BAJO IZOZOG	70.4 Km SUR DE	F0012	0,91	MONTE ALTO	100%	AMERICO SILES ROJAS ANGELICA SILES ROJAS(HNA.)	SANTA CRUZ	632240	MANDAR AL NOTARIO PARA FIRMA DE G.T.B.	OK
6	DON CIRILO	BAJO IZOZOG	N-BRECHA COL. E S-BRECHA 10 E- GUILLERMO PINTO O-SEGUNDO SILES	D011-D012	1,76	MONTE ALTO	100%	CIRILO BELTRAN MAMANI	PAILON		MANDAR AL NOTARIO PARA FIRMA DE G.T.B.	OK
7	LA ESPERANZA	BAJO IZOZOG	N-BRECHA COL. E S-BRECHA 10 E-PABLO RIOS O-CIRLO BELTRAN	D011-D010	0,91	MONTE ALTO	100%	GUILLERMO RODRIGUEZ SERNA	COL. ESPERANZA		MANDAR AL NOTARIO PARA FIRMA DE G.T.B.	OK
8	PABLO COLONIA LA ESPERANZA	BAJO IZOZOG	N-COL. ESPERANZA S-BRECHA 10 E-ABEL CERON O-GUILLERMO RODRIGUEZ	D010-D008	4,06	MONTE ALTO	100%	PABLO RIOS VILLALBA	SANTA CRUZ		MANDAR AL NOTARIO PARA FIRMA DE G.T.B.	OK
9	ABEL COLONIA LA ESPERANZA	BAJO IZOZOG	N-BRECHA COLON S-BRECHA 10 E-NESTOR RIOS O-PABLO RIOS	D007-D008	0,93	MONTE ALTO	100%	JULIAN RIOS VILLALBA	BAJO IZOZOG COL. LA ESPERANZA		MANDAR AL NOTARIO PARA FIRMA DE G.T.B.	OK
10	NESTOR COLONIA LA ESPERANZA	BAJO IZOZOG	N-HITLER S-BRECHA 10 Y GIL MELGAR E-BERTHY ALMENDRAS O-ABEL CERON	D003-D007	0,97	MONTE ALTO	100%	NESTOR RIOS VILLALBA			MANDAR AL NOTARIO PARA FIRMA DE G.T.B.	OK
11	BERTY	BAJO IZOZOG	N-HITLER S-BRECHA 10 E- EL PORVENIR O-NESTOR RIOS	D003-D004	3,74	MONTE ALTO	100%	JUAN RODRIGUEZ	SANTA CRUZ	466000 464588	MANDAR AL NOTARIO PARA FIRMA DE G.T.B.	OK
12	EL POVENIR	BAJO IZOZOG	N. S-BRECHA 10 E-EL CARMEN O-BERTHY MELENDRES	D004-D002	2,62	MONTE ALTO	100%	SIMON COLQUE	SANTA CRUZ	470169	NO EXISTE	

EL CARMEN	BAJO IZOZOG	N-SARAVI HITLER S-BRECHA 10 E-HUGO ENCINAS O-EL PORVENIR	D002-D001	2,28	MONTE ALTO	100%	JUAN RODRIGUEZ	SCZ	466000 464598	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
LOS REYES	BAJO IZOZOG	N-MAGNOEL LOPE S-BRECHA 10 E-CONCILIA COLANZZI O-BERNARDINO TOMICHA	D001-F001	23,08	MONTE ALTO	100%	HUGO ENCINAS LANDIVAR CARLOS E. FUCHTNER SORJCO	SANTA CRUZ	345161 342805 621366 - DOM.	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
EL SICARE	BAJO IZOZOG	N-ENR. ROMULO O S-BRECHA 10 E-FORTALEZA O-LOS REYES	F001-R001	7,68	MONTE ALTO	100%	HUGO ENCINAS LANDIVAR CECILIA COLANZZI RUIZ ZURITA	SANTA CRUZ	345161 342805 621366 - DOM.	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
FORTALEZA	BAJO IZOZOG	N-JUSTO OYOLA E S-BRECHA 10 E-JUAN PEREZ O-CECILIA COLANZZI	R002-F002	9,25	MONTE ALTO	100%	HUGO ENCINAS LANDIVAR ANA MARIA PEREYRA SORUCO	SANTA CRUZ	345161 342805 621366 - DOM.	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
SAN JORGE	BAJO IZOZOG	N-PROP. SN S-BRECHA 10 E-EL TREBOL O-ANA MARIA PEREIRA	D029-F002	14,38	MONTE ALTO	100%	JUAN PEREZ PEINADO MARIO BRAVO HURTADO (APODERA) GLADIS TOLEDO (ESPOSA) CARLOS SAVIO	SANTA CRUZ	422238 472238	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
EL TREBOL II	BAJO IZOZOG	N-SONOMURA S-M.SONOMURA E-SAN JOAQUIN O-T FISCALES	D029-D028	21,08	MONTE ALTO PASTO	99% 1%	RICARDO KIYOSHI SONOMURA REPRESENTANTE: MOTOHARO SONOMURA	SANTA CRUZ	641984	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
EL TREBOL III	BAJO IZOZOG	N-RIC.SONOMURA S-T. FISCALES E-ELENA - PIYOS O-T FISCALES		10,06	MONTE ALTO PASTO	90% 10%	MASSANORI SONOMURA	SANTA CRUZ	641984	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
BANDURRIA CIAGRO	BAJO IZOZOG	N-BRAVARIA S-CIRCULO H E-2 HNOS. - EL ENCANTO O-EL TREBOL	D028-D026	33,62	MONTE ALTO	100%	Dr. JAIME ZAGAL PEPE FIGLIOSI JACK	SANTA CRUZ	426273	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
12 HERMANOS	CAMPO TITA	N-EL ENCANTO S-CIRCULO H E-EL JOHICHI O-BRECHA A TITA	D026-D025	10,53	MONTE BAJO	100%	ROBERTO HURTADO CUELLAR AROLDO HURTADO CUELLAR ORLANDO HURTADO CUELLAR	SANTA CRUZ	463773 426405	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
CIRCULO H	CAMPO TITA	N-2 HERMANOS S-EL PINTAO E-EL JOHICHI O-BARBERY SIARONI	D025-D023	13,82	MONTE BAJO	100%	RAFAEL HERRAN SAAVEDRA	SANTA CRUZ	426859 426859	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
EL JOHICHI	CAMPO TITA	N-EL ENCANTO S-EL PINTADO E-EL ENCANTO O-CIRCULO H	D023-D024	1,28	MONTE BAJO	100%	JUAN CRESPO LUERON	SANTA CRUZ	429436	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
EL PINTADO	CAMPO TITA	N-EL JOHICHI S-NUEVA ESPERANZA E-JAVIER ROCA MONJE O-LA UNION	D024-F011	23,30	MONTE BAJO PASTO	84% 14%	BALDEMAR OLIVEIRA ARIAS JULIA SANDOVAL D E OLIVEIRA	SANTA CRUZ	368072	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
NUEVA ESPERANZA	CAMPO TITA	N- S-BRECHA A TITA E-EL ALAMO O-EL PINTADO	F011-G025	8,45	MONTE BAJO	100%	FERNANDO ABUDINE	SANTA CRUZ	462971	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
EL ALAMO	CAMPO TITA	N- S-CAMINO A CAMPO TITA	G025-G024	22,61	MONTE BAJO	100%	ROSA ISABEL ARCE DE SAUCEDO	SANTA CRUZ	626966	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK



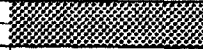
36	COOPERATIVA CHOVORECA	38.4 Kms. AL SUR DE ROBORE	N-ORLANDO JUSTI S-T.FISCAL E-T.FISCAL O-T.FISCAL	R011-D018	49,41	MONTE BAJO	100%	ROLANDO TERRAZAS CASTRO	SANTA CRUZ	460318 466628	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
37	POTRERON SAN SILVESTRE	43 Kms. AL SUD ESTE DE ROBORE	N-SAN JOAQUIN S-T.FISCAL E-LOS TAJIBOS O-T.FISCAL	D019-	11,74	MONTE BAJO	100%	ALICIA LANDIVAR MENACHO GERMAN LANDIVAR MENACHO	ROBORE CALLE LIBERTAD N° 133 SANTA CRUZ	2146 634664	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
38	LOS TAJIBOS	30 Kms. AL SUD ESTE DE ROBORE	N-SAN JOAQUIN S-T.FISCAL E-TIERRAS FISCALES O-POTRERON	D019-S/N	10,60	MONTE BAJO	100%	ALICIA LANDIVAR MENACHO GERMAN LANDIVAR MENACHO	ROBORE CALLE LIBERTAD N° 133 SANTA CRUZ	2146 634664	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
			TIERRAS FISCALES		250,00	MONTE BAJO	100%	COMPRESSOR STATION (364 + 000)			NO EXISTE DUEÑO	
39	SANTA FE	15 Kms AL SUD OESTE DE LA ESTACION NARANJOS	N-RIO Y AGUAS CA S-T.FISCALES E-CELSO CASTEDO O-ELPORVENIR	G021	7,63	MONTE BAJO	100%	IRME MENACHO RIVERO	ROBORE CALLE INGAVI 3 N° 3		MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
40	LA CRUZ	13.5 Kms AL SUR DE LA LOCALIDAD DE NARANJOS	N-RIO AGUAS CALI S-T.FISCALES E-LAGUNA NEGRA O-SANTA FE	G021-G019	16,30	MONTE BAJO	100%	CELSO CASTEDO SUAREZ	QUIJARRO	0978 2074	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
41	LAGUNA NEGRA	A 10 Kms AL SUR DE NARANJOS	N-AGUAS CALIENTE S-T. FISCALES E-GUMERCINDO GUTIERRES O-CELSO CASTEDO SUAREZ	G020-G019	19,36	MONTE BAJO	100%	CARLOS LOPEZ CABEZAS PANFILO ROJO GUZMAN	SANTA CRUZ CASILLA 1263	332008 623279 9221067	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
42	LA ESCOBITA	SANTA ANA DE CHIQUITOS	N- S-PROF.CELSO GRINALDI E-HECHADERO O-EL RECREO	V005-V010	10,63	MONTE BAJO	100%	ANA VIRREIRA PESSOA Dr. HERNAN SALAS VIREIRA	SANTA ANA DE CHIQUITOS QUIJARRO		MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
43	CONCEPCION	15 KmS. AL SUD ESTE DE NARANJOS	N-RIO AGUAS CALI S-T.BALDIOS E-MOTOHOE O-LAGUNA NEGRA	G020-V011	23,41	MONTE BAJO	100%	GUMERCINDO GUTIERRES SALAS PAOLA GUTIERRES (HIJA)	SANTA CRUZ C/VASQUEZ M.	624704	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
44	MOTOYOE	15 Kms. AL SUD ESTE DE NARANJOS	N-SAN TA MARIA S-T. FISCALES E- O- CONCECION	V011-V012	0,76	MONTE BAJO	100%	JORGE CUELLAR LINA ESCOBAR LIND (MUJER)	FALLECIDO SCZ	+ 627644	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
45	EL REMANZO	10 Kms. AL SUD ESTE DE NARANJOS	N-RIO TUCAVACA S-T. FISCALES E-L PINTO O-T. FISCALES	V012-V002	9,90	MONTE BAJO	100%	AURELIO PINTO VIRREIRA	CORUMBA		MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
46	SAN MIGUEL	5 Kms. AL SUD ESTE DE CALENDARIA	N- S- E- O-	V002-V004	10,99	MONTE BAJO	100%	ABELARDO GONZALES M. ELSA JUSTINIANO VDA. DE GONZALES	FALLECIDO SCZ		MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
47	SANTA MARIA	SUD ESTE DE CALENDARIA	N- S- E- O-	V004-V006	16,12	MONTE BAJO		LAURO PINTO ELIAS	SANTA CRUZ	461396	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
48	SAN CRISPIN	A 3 Kms D E	N-CERRANIA	V006-V005	14,09	MONTE BAJO		LUIS ALBERTO ORTIZ SALDAÑA	SANTA CRUZ	461093 462048	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK

49	LAS LAJITAS	SANTA ANA DE	S-RIO TACUARA TUQUIS	20,83	MONTE BAJO	LUIS ALBERTO ORTIZ SALDAÑA	SANTA CRUZ	461093 462048	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
60	EL RECREO	CHIQUITOS	E-LA ESCOBITA O-SAN ANTONIO	4,02	MONTE BAJO	LUIS ALBERTO ORTIZ SALDAÑA	SANTA CRUZ	461093 462048	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
61	EL HECHADERO	AL SUR DE SANAT ANA CHIQUITOS	N-VIA FERREA SC V010-V008 S-CELSO GRIMALDI E-GILBERTO BANEGAS O-LA ESCOBITA	11,72	MONTE BAJO	MEDARDO ALEGRE ZURITA	PUERTO SUAREZ PLAZA PRINCIPAL SN		MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
62	TODOS SANTOS	EL CARMEN RIVERO TORREZ	N- S-GUAYACAN E-FF.CC. O.	6,04	MONTE BAJO Y PASTO CULTIVADO	GILBERTO BANEGAS	PTO. QUIJARRO	9762194	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
63	EL ORIENTE - SAN ANTONIO	A 14 5 Kms AL NOROESTE DE CARMEN RIVERO	N-FF.CC S-GUAYACANES E-GUAYACANES-TABORGA O-GILBERTO BANEGAS	11,96	MONTE BAJO	CELSO GRIMALDOS DURAN	SANTA CRUZ	466790 464905	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
64	LAS PIEDRITAS	11 Kms AL NOROESTE DE CRMEN RIVERO	N-T. TISCALES S-FF.CC. E-EL PUQUIO O-BANEGAS-GRIMALDOS	2,54	MONTE BAJO	FEDERICO TABORGA VACA	CARMEN RIVERO TORREZ BARRIO FATIMA	9119064	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
65	GUAYACANES	A 5 Kms DE NOROESTE DE CARMEN RIVERO	N-FF.CC. S-VIL DOMINGUEZ E-ROGELIO COSTAS O-FEDERICO TABORGA	24,87	MONTE BAJO	RANDY BROOCKS HUGO MONTERO	SANTA CRUZ SIRARI	641249 637439 0911 2663	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
66	SAN SILVESTRE	2.8 Kms DE C CARMEN RIVERO	N-GUAYACAN S-ISIDRO ROJAS E-FF.CC. O-OSWALDO L.RIVERO	1,78	MONTE BAJO	SABINO BUSTILLOS PEREZ	CARMEN RIVERO CI RENE MORENO	9119064	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
67	PALMARITO	EL CARMEN RIVERO TORREZ	N-BUSTILLOS Y FF S-VIL DOMINGUEZ E-CARLOS RIVERO O-VIL DOMINGUEZ	1,61	MONTE BAJO	ISIDRO ROJAS SUAREZ	CARMEN RIVERO CR-TORREZ ESQ. FERROVIARIA	9119064	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
68	AGUA LINDA	1.5 Kms AL SUD OESTE DE C. RIVERO	N-LINEA FERREA S-COM LOS TABOS E-CONSTANTINA MEDEZ O-OSWALDO RIVERO	1,00	MONTE BAJO	CARLOS RIVERO COSTAS	CARMEN RIVERO A.FATIMA ENTEL	9119064	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
69	OSWALDO L. RIVERO TOMICHA	2.3 Kms AL NORTE DE CARMEN RIVERO	N-PEDRO EGUEZ S-CONST. MENDEZ E-PEFRO EGUEZ O-CARLOS RIVERO	0,28	MONTE BAJO	OSWALDO L. RIVERO TOMICHA	CARMEN RIVERO A.FATIMA	9119064	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
60	EL RECREO	2.2 Kms AL NOR OESTE DE CARMEN RIVERO	N-LEANDRO RIVER S-AQUINO MENDEZ E-FF.CC. O-AQUINO MENDEZ	0,60	MONTE BAJO	CONSTATINA MENDEZ VDA. PESOA	CARMEN RIVERO	9119064	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK
61	JALISCO	A 1 Km DE CARMEN RIVERO	N-CONSTANZA ME S-ROGER MERCADO PESOA E-CARLOS RIVERO O-CARLOS RIVERO	1,75	FRUTALES	AQUINO MENDEZ SAUCEDO	CARMEN RIVERO FERROVIARIA ENTEL	9119064	MANDAR AL NOTARIO PARA FIRMA DE G.T.B	OK

62	EL POTRERO	A 1 Km. DE	N-JALISCO	Nº002-Nº003	0,39	PASTO CULTIVAD	50%	ROQUE MERCADO PESOA	CARMEN RIVERO	MANDAR AL NOTARIO	OK
		CARMEN RIVERO	S-GERARDO VARGAS			MONTE BAJO	50%		C/ RENE MORENO	PARA FIRMA DE G.T.B	
			E-LINO SOCORE						ESQ. ROSENHAM.		
			O-JALISCO						ENTEL	9119064	
63	LA FINCA	A 1.5 Km. DE	N-Av AYACUCHO	Nº003-Nº004	0,73	PASTO CULTIVAD	50%	ROLANDO PEREIRA	CARMEN RIVERO	MANDAR AL NOTARIO	OK
		CARMEN RIVERO	S-EL POTRERO			MONTE BAJO	50%		A. AYACUCHO	PARA FIRMA DE G.T.B	
			E-CRUZ DEL SUR						ENTEL	9119064	
			O-LINO SOCORI								
64	CRUZ DEL SUR	A 1.5 Km. DE	N-HELENO CONCE	Nº004-Nº005	0,14	MONTE BAJO	100%	HERMES MENDEZ VACA	CARMEN RIVERO	MANDAR AL NOTARIO	OK
		CARMEN RIVERO	S-T. BALDIO						C/ RENE MORENO	PARA FIRMA DE G.T.B	
			E-EL CEMENTERIO								
			O-ROLANDO PEREIRA						ENTEL	9119064	
65	JANDUIR	A 1.5 Km. DE	N-T. BALDIO	Nº006-Nº007	1,22	MONTE BAJO	100%	JANDUIR ESTIGARRIBIA	CARMEN RIVERO	MANDAR AL NOTARIO	OK
		CARMEN RIVERO	S-						PTO. SUAREZ	0976-2238 OFICINA	PARA FIRMA DE G.T.B
			E-LA VICTORIA							0976-2768 DOM.	
			O-CRUZ DEL SUR					NICOLAS JUSTINIANO (CUÑADO)	SCZ	489084	
66	LA VICTORIA	V. FERROVIARIA	N-AREA FERROVIARIA	Nº007-Nº008	0,69	FRUTALES		IGNACIO CHORE YOBIO	CARMEN RIVERO	MANDAR AL NOTARIO	OK
		CARMEN RIVERO	S-WILFREDO COSTAS						FERROVIARIA	PARA FIRMA DE G.T.B	
			E-ANGELA AGUILERA						ENTEL	9119064	
			O-CEMENTERIO								
67	SAN JORGE	A 1.9 Km. DE	N-T. BALDIOS	Nº008-Nº009	2,20	MONTE BAJO	100%	JUAN COSTAS SAUCEDO	CARMEN RIVERO	MANDAR AL NOTARIO	OK
		CARMEN RIVERO	S-T BALDIOS							9119064	PARA FIRMA DE G.T.B
			E-ABRAHAM ROMERO					ELENO CONCEPCION		351144	
			O-LA VICTORIA								
68	ANGEL AGUILERA	A 2.3 Km DE	N-ADERITO DA SILVA	Nº009-Nº012	1,19	MONTE BAJO	100%	ANGEL AGUILERA B.	CARMEN RIVERO	MANDAR AL NOTARIO	OK
		CARMEN RIVERO	S-CLEMENTE SURUBI							9119064	PARA FIRMA DE G.T.B
			E-CRISTOBAL CENTENARIO								
			O-ADERITO DA SILVA								
69	EL CURICHE	A 3 Km. DE	N-ABRAHAM ROMERO	Nº012-Nº014	1,83	MONTE BAJO	100%	CRISTOBAL CENTENARIO	CARMEN RIVERO	MANDAR AL NOTARIO	OK
		CARMEN RIVERO	S-CLEMENTE SURUBI							346764	PARA FIRMA DE G.T.B
			E-OSCAR VACA VACA							11630691	
			O-TI. BALDIAS								
70	OSCAR VACA	A 2.5 Km DE	N-	Nº014-Nº015	2,20	MONTE BAJO	100%	OSCAR VACA VACA	SANTA CRUZ	MANDAR AL NOTARIO	OK
		CARMEN RIVERO	S-							9119064	PARA FIRMA DE G.T.B
			E-ANGEL AGUILERA COSTAS								
			O-CRISTOBAL CENTENARIO								
71	SAN LUISITO I	A 6 Km. DE	N-	Nº015-Nº016	7,71	MONTE BAJO	100%	ANGEL AGUILERA BIRAKAUJE	CARMEN RIVERO	MANDAR AL NOTARIO	OK
		CARMEN RIVERO	S-							9119064	PARA FIRMA DE G.T.B
			E- SAN LUISITO								
			O-OSCAR VACA VACA								
72	SAN LUISITO II	A 7.5 Km. DE	N-BERNARDO MAC	Nº016-Nº017	6,07	PASTO CULTIVAD	50%	ANGEL AGUILERA BIRAKAUJE	CARMEN RIVERO	MANDAR AL NOTARIO	OK
		CARMEN RIVERO	S-FLORINDA COSTA			MONTE BAJO	50%			9119064	PARA FIRMA DE G.T.B
			E-EST. CIENTO CINCO								
			O-ANGEL AGUILERA								
73	GUAPURUCITO (105)	A 9.5 Km. DE	N-	Nº017-Nº018	19,60	PASTO CULTIVAD	40%	ODARCILIO ALVEZ DE QUEIROZ	3 CRUSES	MANDAR AL NOTARIO	OK
		CARMEN RIVERO	S-			MONTE BAJO	60%		BRASIL	067-521-3942	PARA FIRMA DE G.T.B
			E-COM. PLMITO							067-521-2724	
			O-SAN LUISITO								
74	COM. PALMITO	COM. PALMITO	N-JOQUIN AGUIRRE	Nº019-Nº020	29,67	MONTE BAJO	100%	ORLANDO BEJAR PEREZ	PUERTO SUAREZ	MANDAR AL NOTARIO	OK
			S-ARNALDO AGUILERA P.						COM. EL PALMITO	PARA FIRMA DE G.T.B	
			E-LA ESPERANZA					COMPRESSOR STATION (486 + 800)			
			O-ESTANCIA 105								
75	LA ESPERANZA	A 8 Kms. DE	N-LINEA FERREA	Nº020-Nº021	17,70	PASTO CULTIVAD	50%	LUIS MANGUERI FILHO	CAMPO GRANDE	MANDAR AL NOTARIO	OK
		JACUSES	S-T. BALDIO			MONTE BAJO	50%	ANTONIO MANGERI	BRASIL	PARA FIRMA DE G.T.B	

			E-T BALDIOS						YOLANDA AIDE PRANTEL DE MANGERI		006567-787-2796		
			O.COM.PALMITO						Dr. HUMBERTO MEDRANO	0978-2277	Pto. QUIJARRO		
76	COTTY	A 5 Kms. DE JACUSES	N- S- E-RADIO URBANO JACUSES O-LA ESPERANZA	Nº021-Nº022	9,96	MONTE BAJO	100%		FERNANDO TUMA	PTO. QUIJARRO	0978 2160	MANDAR AL NOTARIO	OK
									LIC EDITH PEDRAZA	SCZ	013 95387	PARA FIRMA DE G.T.B	
										SANTA CRUZ	367789		
77	EL CERRO	A 2.1 Kms. DE JACUSES	N- S- E-RADIO URBANO JACUSES O-COTTY	Nº022-Nº023	11,96	MONTE BAJO	100%		ENRIQUE MENACHO	ARROYO CON- CEPCION	0978 2160	MANDAR AL NOTARIO	OK
										SCZ	529270	PARA FIRMA DE G.T.B	
78	COMUNIDAD JACUSES		N- S-T. BALDIOS E- O-EL CERRO	Nº023-Nº024	9,32	PASTO CULTIVAD MONTE BAJO	20% 80%		Arq. MANUEL CHAZANES ALCALDE DE Pto SUAREZ	PTO. SUAREZ	0976 2166	MANDAR AL NOTARIO	OK
												PARA FIRMA DE G.T.B	
79	COMUNIDAD CAMPESINA SANTA MARTHA	SANTA MARTHA	N.F.F. CC. S-TIERRAS FISCALES E-SAN ANTONIO O- ENFE	Nº024-Nº025	14,81	MAIZ MANUAL MONTE BAJO	66% 34%		DINA GONZALES SAMUEL LOPEZ VASVALDO	PTO. QUIJARRO	0978 2716	MANDAR AL NOTARIO	OK
												PARA FIRMA DE G.T.B	
80	SAN ANTONIO I	A 6 Kms. AL OESTE DE JACUSES	N-LINEA FERREA S-T. BALDIAS E-COM.TACUARAL O-COM.SANTA MARTHA	Nº025-Nº026	8,72	PASTO CULTIVAD MONTE BAJO	50% 50%		EULALIA MERCADO VDA. CUELLAR ENESTO CUELLAR	CARMEN RIVERO CELULAR		MANDAR AL NOTARIO	OK
											013-21176	PARA FIRMA DE G.T.B	
81	SAN ANTONIO II	A 6 Kms. AL OESTE DE JACUSES	N-LINEA FERREA S-T. BALDIAS E-COM.TACUARAL O-COM.SANTA MARTHA	Nº025-Nº026	19,62	PASTO CULTIVAD MONTE BAJO	50% 50%		EULALIA MERCADO VDA. CUELLAR ENESTO CUELLAR	CARMEN RIVERO CELULAR		MANDAR AL NOTARIO	OK
											013-21176	PARA FIRMA DE G.T.B	
82	LA ENCRUCJADA	FF.CC. (Km. 612)	N-LINEA FERREA S-T. BALDIAS E- O-		17,44	MONTE BAJO			OSVALDO MONASTERIO NIEME Dr. HENRY BRUCKNER	SCZ		MANDAR AL NOTARIO	OK
							100%				367666	PARA FIRMA DE G.T.B (EN REVISION)	
83	EL ENCANTO	FF.CC. (Km. 614)	N-LINEA FERREA S-T. BALDIAS E- O-		6,12	MONTE BAJO			OSVALDO MONASTERIO NIEME Dr. HENRY BRUCKNER	SCZ		MANDAR AL NOTARIO	OK
							100%				367666	PARA FIRMA DE G.T.B (EN REVISION)	
84	MONTE SINAI	A 13 Kms. DE LA CARRET. A L MUTUN	N-LUIS YABETA S-LUSIANO CUELLAR E-CAMINO MUTUN O-SERRANIA	Nº027-Nº028	11,12	PASTO CULTIVAD MONTE BAJO	50% 50%		ERNESTO CORDERO GALARZA HOTEL JENECHERU	PUERTO SUAREZ SCZ		MANDAR AL NOTARIO	OK
											457600 469229	PARA FIRMA DE G.T.B	
85	COSTA RICA Y LA ESPERANZA	A 15 Kms. DE LA CARRET. A L MUTUN	N-HERNAN LEIGUE S-SAN ANTONIO E-GABINA TORRICO O-ERNESTO CORDERO	Nº028-Nº029	1,78	PASTO CULTIVAD MONTE BAJO	50% 50%		LUCIANO CUELLAR SALAZAR	ARROYO CON- CEPCION		MANDAR AL NOTARIO	OK
										0978 2179		PARA FIRMA DE G.T.B	
86	PARCELAS	A 17 Kms. DE PUERTO SUAREZ	N-LA ESPERANZA S-HUMBERTO CARVAJAL E- O-LUCIANO CUELLAR S.	Nº029-Nº030	3,66	MONTE BAJO	100%		GABINA TORRICO CORDOBA	QUIJARRO	0978 2536	MANDAR AL NOTARIO	OK
												PARA FIRMA DE G.T.B	
87	LAGUNILLA	CARMEN DE LA FRONTERA (100 mts.)	N- CAMINO MUTUN S-T. BALDIO E-CARMELO CUELLAR O-GABINA TORRICO	Nº031-Nº032	2,04	PASTO CULTIVAD MONTE BAJO	50% 50%		CANDIDO POÑE TASEO	EL CARMEN DE LA FRONTERA		MANDAR AL NOTARIO	OK
												PARA FIRMA DE G.T.B	
88	SAN VICENTE (COMUNIDAD)	CARMEN DE LA FRONTERA A 500 mts. SUD-	N- S- E-	Nº032-Nº033	6,04	PASTO CULTIVAD MONTE BAJO	80% 20%		CARMELO CUELLAR Dr. ROQUE UREY	SCZ	013 95268	MANDAR AL NOTARIO	OK
												PARA FIRMA DE G.T.B	



	OESTE DE CARNO-	METTERING STATION (555 + 600)							
	DE LA FRONTERA								
			1713.88	HECTAREAS					

## CHAPTER VI

### ENVIRONMENTAL MANAGEMENT PLAN COST

This chapter presents the cost and schedule of specific sub-programs of the EMP. Many of the sub-programs described in the EMP will be funded directly through the Construction Contractor's contract and are thus not reflected here. The cost detailed in this chapter includes items directly related with environmental protection and mitigation which go above and beyond the Construction Contractor's scope.

Four tables detail the costs associated to the environmental strategy for the project. Table VI-1 is a summary of the costs of the EMP and IPDP programs (the latter is detailed in the IPDP section of this document), as well as additional costs associated to environmental issues of the project, such as the cost of an Environmental Auditor and environmental plans and studies carried out by private consultants and CABI. Table VI-2 summarizes the cost of the EMP by program; these costs are detailed in Table VI-3. Finally, Table VI-4 details costs associated to the Environmental Project Manager and Environmental Auditor positions.

The cost items included in the budget of the EMP (Tables VI.1-4) are as follows:

#### **Program No. 1 - Environmental Management System**

- Sub-Program 1.4 - Environmental Inspection, Monitoring and Auditing. While the environmental inspection will be the responsibility of the Construction Contractor, the costs for the environmental monitoring and auditing functions are presented.

#### **Program No. 4 - Compensation Plan**

- Costs are presented for the compensation measures described in Chapter IV.

<b>TABLE VI.1 - SUMMARY OF COSTS - ENVIRONMENTAL AND SOCIAL PROGRAMS (IN \$US)</b>		
Environmental Management Plan (EMP)	1,897,253	
Indigenous People Development Plan (IPDP)	2,716,039	
<b>Subtotal EMP and IPDP</b>		<b>4,613,292</b>
Sponsors Environmental Manager	107,000	
Sponsors Environmental Auditor	96,500	
EMP and IPDP Studies (Dames & Moore)	340,600	
Risk Analysis (PMT)	81,000	
Archeological Assessment (Dames & Moore)	100,000	
Revegetation and Biodiversity Assessment (CABI)	9,100	
Revegetation (CABI)	276,480	
Biodiversity Baseline Study (CABI)	32,320	
<b>Subtotal</b>		<b>1,043,000</b>
<b>GRAND TOTAL</b>		<b>5,656,292</b>

**TABLE VI.2 - SUMMARY OF COSTS - ENVIRONMENTAL MANAGEMENT PLAN - EMP (\$US)**

TOTAL 1.0 - ENVIRONMENTAL MANAGEMENT SYSTEM	814,250
TOTAL 2.0 - ENVIRONMENTAL PROTECTION & MITIGATION DURING CONSTRUCTION *	0
TOTAL 3.0 - ENVIRONMENTAL OPERATION PLAN	98,000
TOTAL 4.0 - COMPENSATION PLAN	985,003
<b>TOTAL EMP</b>	<b>1,897,253</b>

\* This cost is included in a separate budget.

**TABLE VI.3 - ENVIRONMENTAL MANAGEMENT PLAN (EMP)**

Item	Description	Unit	Unit Cost (\$us)	Quantity	Total (\$us)
<b>1.0 ENVIRONMENTAL MANAGEMENT SYSTEM</b>					
<b>1.1 ENVIRONMENTAL COORDINATION PLAN</b>					
1.1.1	Environmental Coordination Plan				0
	Subtotal				0
<b>TOTAL 1.1 - ENVIRONMENTAL COORDINATION PLAN</b>					<b>0</b>
<b>1.2 SPONSORS' ENVIRONMENTAL MANAGEMENT DURING CONSTRUCTION</b>					
1.2.1	Management				
1.2.1.1	Sponsor's Manager Included in Management & Auditing Budget				0
	Subtotal				0
<b>TOTAL 1.2 - ENVIRONMENTAL MANAGEMENT DURING CONSTRUCTION</b>					<b>0</b>
<b>1.3 MONITORING, INSPECTION AND AUDITING</b>					
1.3.1	Environmental Monitoring - Labor				
1.3.1.1	EMP Manager	month	18,000	15	270,000
1.3.1.2	Chief Inspector - 1	month	9,000	10	90,000
1.3.1.3	Chief Inspector - 2	month	9,000	10	90,000
1.3.1.4	Inspector - 1	month	7,000	10	70,000
1.3.1.5	Inspector - 2	month	7,000	10	70,000
1.3.1.6	Clerical	hour	25	800	20,000
	Subtotal				610,000
1.3.2	Environmental Monitoring - Expenses				
1.3.2.1	Vehicle - Toyota Land Cruiser	month	3,000	15	45,000
1.3.2.2	Vehicles, Pickup Truck - 1 (50% cost split with IPDP)	lump sum	30,000	0.5	15,000
1.3.2.3	Vehicles, Pickup Truck - 2 (50% cost split with IPDP)	lump sum	30,000	0.5	15,000
1.3.2.4	Vehicles, Pickup Truck - 3 (50% cost split with IPDP)	lump sum	30,000	0.5	15,000
1.3.2.5	Vehicles, Pickup Truck - 4 (50% cost split with IPDP)	lump sum	30,000	0.5	15,000
1.3.2.6	Fuel & Maintenance	month/truck	750	55	41,250
1.3.2.7	International travel	trips	1,500	4	6,000
1.3.2.8	Local travel	trips	200	50	10,000
1.3.2.9	Off camp subsistence	day	40	200	8,000
1.3.2.10	Off camp hotel	day	60	200	12,000
1.3.2.11	Communication	month	1,200	10	12,000
1.3.2.12	Reproduction	month	1,000	10	10,000
	Subtotal				204,250
1.3.3	INSPECTION				
1.3.3.1	Constructors inspection (included in Construction Contract)				0
	Subtotal				0
1.3.4	SPONSORS' ENVIRONMENTAL AUDITING				
1.3.4.1	Auditor's Manager Included in Management & Auditing Budget				0
	Subtotal				0
<b>TOTAL 1.3 - ENVIRONMENTAL MONITORING</b>					<b>814,250</b>
<b>TOTAL 1.0 - ENVIRONMENTAL MANAGEMENT SYSTEM</b>					<b>814,250</b>

**TABLE VI.3 - ENVIRONMENTAL MANAGEMENT PLAN (EMP)**

Item	Description	Unit	Unit Cost (\$us)	Quantity	Total (\$us)
<b>2.0 ENVIRONMENTAL PROTECTION &amp; MITIGATION DURING CONSTRUCTION</b>					
<b>2.1 EROSION CONTROL &amp; REVEGETATION</b>					
<b>2.1.1 Erosion Control &amp; Revegetation</b>					
2.1.1.1	Erosion Control Included in Construction Contract				0
2.1.1.1	Revegetation Included in Separate Budget				0
	<b>Subtotal</b>				<b>0</b>
<b>TOTAL 2.1 - EROSION CONTROL &amp; REVEGETATION</b>					<b>0</b>
<b>TOTAL 2.0 - ENVIRONMENTAL PROTECTION &amp; MITIGATION DURING CONSTRUCTION</b>					<b>0</b>

**TABLE VI.3 - ENVIRONMENTAL MANAGEMENT PLAN (EMP)**

Item	Description	Unit	Unit Cost (\$us)	Quantity	Total (\$us)
<b>3.0 ENVIRONMENTAL OPERATION PLAN</b>					
<b>3.1 PROTECTION OF WILDLIFE AND RIGHT-OF-WAY</b>					
3.1.1	Signs, Barriers & Gates				
3.1.1.1	Signs	unit	100	560	56,000
3.1.1.2	Barriers & Gates	unit	1,400	30	42,000
Subtotal					98,000
<b>TOTAL 3.1 - PROTECTION OF WILDLIFE AND RIGHT-OF-WAY</b>					<b>98,000</b>
<b>TOTAL 3.0 - ENVIRONMENTAL OPERATION PLAN</b>					<b>98,000</b>

TABLE VI.3 - ENVIRONMENTAL MANAGEMENT PLAN (EMP)

Item	Description	Unit	Unit Cost (Sus)	Quantity	Total (Sus)
<b>4.0 COMPENSATION PLAN</b>					
<b>4.1 PUBLIC EDUCATION AND COMMUNICATION PROGRAM</b>					
4.1.1	<b>Labor</b>				
4.1.1.1	Public Education Chief	day	120	100	12,000
4.1.1.2	Public Communication Chief	month	2,000	24	48,000
4.1.1.3	Trainer 1	day	80	100	8,000
4.1.1.4	Trainer 2	day	80	100	8,000
	<b>Subtotal</b>				<b>76,000</b>
4.1.2	<b>Expenses</b>				
4.1.2.1	Supplies	lump sum	12,500	1	12,500
4.1.2.2	Brochures	unit	2	3,000	6,000
	<b>Subtotal</b>				<b>18,500</b>
<b>TOTAL 4.1 - PUBLIC EDUCATION AND COMMUNICATION PROGRAM</b>					<b>94,500</b>



**TABLE VI.3 - ENVIRONMENTAL MANAGEMENT PLAN (EMP)**

Item	Description	Unit	Unit Cost (\$us)	Quantity	Total (\$us)
<b>4.2 ASSISTANCE TO NON INDIGENOUS COMMUNITIES</b>					
<b>4.2.1</b>	<b>Pailón</b>				
4.2.1.1	Teachers' Association building	lump sum	30,000	1	30,000
	<b>Subtotal</b>				<b>30,000</b>
<b>4.2.2</b>	<b>San José de Chiquitos</b>				
4.2.1.1	Well	unit	70,000	1	70,000
4.2.1.2	Pump and equipment	unit	25,000	1	25,000
4.2.1.3	Generator	unit	76,000	1	76,000
4.2.1.4	Maintenance Personnel Training	lump sum	5,000	1	5,000
4.2.1.5	Tools and Transportation	lump sum	17,500	1	17,500
4.2.1.6	Maintenance Staff	month	250	24	6,000
4.2.1.7	Clinic	lump sum	17,940	1	17,940
4.2.1.8	Medicine	lump sum	32,750	1	32,750
4.2.1.9	Doctor (33% cost split with other 5 clinics)	month	578	24	13,860
4.2.1.10	Vehicle - Doctor (33% cost split with other 5 clinics)	lump sum	27,500	0.33	9,075
4.2.1.11	Vehicle Maintenance - (33% cost split with other 5 clinics)	month	99	24.00	2,376
	<b>Subtotal</b>				<b>275,501</b>
<b>4.2.3</b>	<b>Roboré</b>				
4.2.3.1	Well	unit	70,000	1	70,000
4.2.3.2	Pump and equipment	unit	25,000	1	25,000
4.2.3.3	Generator	unit	76,000	0	0
4.2.3.4	Maintenance Personnel Training	lump sum	5,000	1	5,000
4.2.3.5	Tools and Transportation	lump sum	17,500	1	17,500
4.2.3.6	Maintenance Staff	month	250	24	6,000
4.2.3.7	Clinic	lump sum	17,940	1	17,940
4.2.3.8	Medicine	lump sum	32,750	1	32,750
4.2.3.9	Doctor (33% cost split with other 5 clinics)	month	578	24	13,860
4.2.3.10	Vehicle - Doctor (33% cost split with other 5 clinics)	lump sum	27,500	0.33	9,075
4.2.3.11	Vehicle Maintenance - (33% cost split with other 5 clinics)	month	99	24.00	2,376
	<b>Subtotal</b>				<b>199,501</b>
<b>4.2.4</b>	<b>El Carmen</b>				
4.2.4.1	Well	unit	70,000	1	70,000
4.2.4.2	Pump and equipment	unit	25,000	1	25,000
4.2.4.3	Generator	unit	93,000	2	186,000
4.2.4.4	Maintenance Personnel Training	lump sum	5,000	1	5,000
4.2.4.5	Tools and Transportation	lump sum	17,500	1	17,500
4.2.4.6	Maintenance Staff	month	250	24	6,000
4.2.4.7	Clinic	lump sum	17,940	1	17,940
4.2.4.8	Medicine	lump sum	32,750	1	32,750
4.2.4.9	Doctor (33% cost split with other 5 clinics)	month	578	24	13,860
4.2.4.10	Vehicle - Doctor (33% cost split with other 5 clinics)	lump sum	27,500	0.33	9,075
4.2.4.11	Vehicle Maintenance - (33% cost split with other 5 clinics)	month	99	24.00	2,376
	<b>Subtotal</b>				<b>385,501</b>
<b>TOTAL 4.2 - ASSISTANCE TO NON INDIGENOUS COMMUNITIES</b>					<b>890,503</b>
<b>TOTAL 4.0 - COMPENSATION PLAN</b>					<b>985,003</b>
<b>GRAND TOTAL - EMP</b>					<b>1,897,253</b>

**TABLE VI.4 - SPONSORS' ENVIRONMENTAL MANAGER AND AUDITOR**

Description	Unit	Cost Split	Unit Cost (\$us)	Quantity	Total (\$us)
<b>Environmental Manager</b>					
Environmental Manager (25% cost split with Brazilian Portion)	month	25%	10,000	18	45,000
International travel	trips	100%	1,000	10	10,000
Local travel	trips	100%	200	20	4,000
Off camp subsistence	day	100%	60	200	12,000
Off camp hotel	day	100%	90	200	18,000
Communication	month	25%	2,000	18	9,000
Reproduction	month	25%	2,000	18	9,000
<b>Total</b>					<b>107,000</b>
<b>Environmental Auditor</b>					
Environmental Auditor (25% cost split with Brazilian portion)	month	25%	10,000	15	37,500
International travel	trips	100%	1,000	10	10,000
Local travel	trips	100%	200	20	4,000
Off camp subsistence	day	100%	60	200	12,000
Off camp hotel	day	100%	90	200	18,000
Communication	month	25%	2,000	15	7,500
Reproduction	month	25%	2,000	15	7,500
<b>Total</b>					<b>96,500</b>

**BOLIVIA-BRAZIL GAS PIPELINE PROJECT  
(BOLIVIAN PORTION)**

**INDIGENOUS PEOPLES DEVELOPMENT PLAN  
(IPDP)**

---

**TABLA DE CONTENIDO**

**CAPITULO I - ORGANIZACION Y GESTION DEL PLAN DE DESARROLLO DE  
PUEBLOS INDIGENAS**

1.0	INTRODUCCION .....	I-1
2.0	CONSULTA PARA LA ELABORACION DEL PLAN .....	I-3
3.0	ORGANIZACION DEL PDPI .....	I-6
4.0	GESTION DEL PDPI .....	I-8
4.1	Sistema de Gestión .....	I-8
4.2	La Gerencia .....	I-9
4.3	El Comité Directivo .....	I-9
4.4	Las Unidades Operativas .....	I-9
4.5	Las Comunidades Indígenas .....	I-10
4.6	Seguimiento y evaluación .....	I-11
5.0	RELACION CON OTROS PROYECTOS EN EL AREA .....	I-12
6.0	PAPEL DE LA MUJER EN EL PDPI .....	I-13

**CAPITULO II - DIAGNOSTICO SOCIOECONOMICO DE LOS PUEBLOS  
INDIGENAS EN EL AREA DEL PDPI**

1.0	LOCALIZACION Y POBLACION .....	II-1
1.1	Localización de los Pueblos Izoceños/Guaraní .....	II-1
1.2	Localización de los Pueblos Chiquitanos .....	II-1
1.3	Localización de los Pueblos Ayoreos .....	II-2
1.4	Población .....	II-3
2.0	ESTRATEGIAS INDIGENAS DE SUBSISTENCIA .....	II-4
2.1	Introducción .....	II-4
2.2	Sistema Productivo Izoceño/Guaraní .....	II-4
2.2.1	Agricultura .....	II-4
2.2.2	Sistema Pecuario .....	II-5
2.2.3	Otras Actividades Productivas .....	II-6
2.3	Sistema Productivo Ayoreo .....	II-6

2.3.1	Agricultura	II-6
2.3.2	Sistema Pecuario	II-7
2.3.3	Otras Actividades Productivas	II-8
2.4	Sistema Productivo Chiquitano	II-9
2.4.1	Agricultura	II-9
2.4.2	Sistema Pecuario	II-9
2.4.3	Otras Actividades Productivas	II-10
3.0	TENENCIA Y PROBLEMÁTICA DE LA TIERRA	II-12
3.1	Izoceños/Guaraní	II-12
3.2	Chiquitanos	II-12
3.3	Ayoreos	II-13
4.0	ORGANIZACIONES INDÍGENAS	II-15
4.1	Confederación de Pueblos Indígenas de Bolivia Fortalecidos en la Unidad (CIDOB)	II-15
4.2	Coordinadora de los Pueblos Étnicos de Santa Cruz (CPESC)	II-15
4.2.1	Organización Indígena Izoceño/Guaraní	II-16
4.2.2	Organización Indígena Chiquitana	II-16
4.2.3	Organización Indígena Ayorea	II-18
5.0	LEGISLACION APLICABLE A LOS PUEBLOS INDÍGENAS	II-20
5.1	Constitución Política del Estado	II-20
5.2	Régimen Agrario y Campesino, Título Tercero	II-20
5.3	Ley No. 1715-Instituto Nacional de Reforma Agraria (INRA) del 18 de octubre de 1996	II-21
5.4	Código Civil del 2 de Abril de 1976	II-22
5.5	La Propiedad Agraria, Capítulo VII. Arts. 210-215	II-23
5.6	Ley No. 1257 del 11 de julio de 1991	II-23
5.7	Ley de Vida Silvestre Parques Nacionales Caza y Pesca. Decreto Ley N° 12301	II-24
5.8	Ley Forestal N° 1700 del 12 de julio de 1996	II-25
5.9	Ley del Medio Ambiente N° 1333 del 27 de abril de 1992	II-26
5.10	Decreto Supremo 24122 del 21 de septiembre de 1995. Creación del Parque KAA-IYA Gran Chaco	II-27
5.11	Otros Decretos Supremos y Resoluciones	II-28
6.0	INSTITUCIONES PÚBLICAS Y ORGANIZACIONES NO GUBERNAMENTALES	II-30
6.1	Organización Estatal	II-30
6.2	Organismos Gubernamentales	II-31
6.3	Organizaciones No Gubernamentales	II-33

### CAPITULO III - PROGRAMA No. 1: INTERACCION CON LA COMUNIDAD

1.0	ANTECEDENTES	III-1
-----	--------------	-------

2.0	DESCRIPCION DEL PROGRAMA .....	III-3
2.1	Información .....	III-3
2.2	Resolución de Conflictos .....	III-4
2.3	Asistencia a la Salud Pública de las Comunidades .....	III-5

**CAPITULO IV - PROGRAMA No. 2: ASISTENCIA AL MANEJO SOSTENIBLE DE LOS RECURSOS NATURALES**

1.0	ANTECEDENTES Y JUSTIFICACION .....	IV-1
2.0	OBJETIVOS Y ESTRATEGIA .....	IV-3
2.1	Objetivos .....	IV-3
2.2	Estrategia del Programa .....	IV-3
3.0	ETAPAS DEL PROGRAMA .....	IV-4
3.1	Etapa I .....	IV-4
3.2	Etapa II .....	IV-5
4.0	ESTRATEGIA POR SUB-AREA DEL PROGRAMA .....	IV-7
5.0	DESCRIPCION DE LOS SUB-PROGRAMAS .....	IV-10
5.1	Sub-Programa de Capacitación, Formación y Asistencia Técnica .....	IV-10
5.1.1	Objetivo .....	IV-10
5.1.2	Capacitación .....	IV-10
5.1.3	Formación .....	IV-12
5.1.4	Asistencia Técnica .....	IV-13
5.1.5	Estudios .....	IV-14
5.2	Sub-Programa Fondo de Apoyo a las Iniciativas Productivas .....	IV-15
5.2.1	Objetivo .....	IV-15
5.2.2	Descripción .....	IV-15
6.0	ORGANIZACION .....	IV-18
7.0	CRITERIOS DE EVALUACION .....	IV-19
8.0	MONITOREO E INFORMES .....	IV-21

**CAPITULO V - PROGRAMA No. 3: ASISTENCIA A LA TITULACION DE TIERRAS COMUNITARIAS DE ORIGEN**

1.0	INTRODUCCION .....	V-1
2.0	PROCEDIMIENTO DE TITULACION DE TIERRAS COMUNITARIAS DE ORIGEN .....	V-3
3.0	IDENTIFICACION DE LAS DEMANDAS DE TIERRAS COMUNITARIAS DE ORIGEN .....	V-6
4.0	SITUACION DE LAS DEMANDAS DE TCO EN EL AREA DE INFLUENCIA DEL PROYECTO .....	V-7
5.0	RELACION CON OTROS PROYECTOS QUE SE EJECUTAN EN EL AREA DE INFLUENCIA DEL PDPI .....	V-9
6.0	DESCRIPCION DEL PROGRAMA .....	V-10

6.1.	Objetivo .....	V-10
6.2	Descripción .....	V-10
6.3	Descripción del Programa .....	V-11
6.4	Organización del Programa .....	V-13
6.5	Supervisión .....	V-13
6.6	Evaluación .....	V-13

## **CAPITULO VI - PROGRAMA 4: ASISTENCIA AL MANEJO DEL PARQUE NACIONAL GRAN CHACO**

1.0	OBJETIVOS .....	VI-1
2.0	ORGANIZACION .....	VI-1

## **CAPITULO VII - COSTOS DEL PLAN DE DESARROLLO DE PUEBLOS INDIGENAS .....**

VII-1

### **LISTA DE TABLAS**

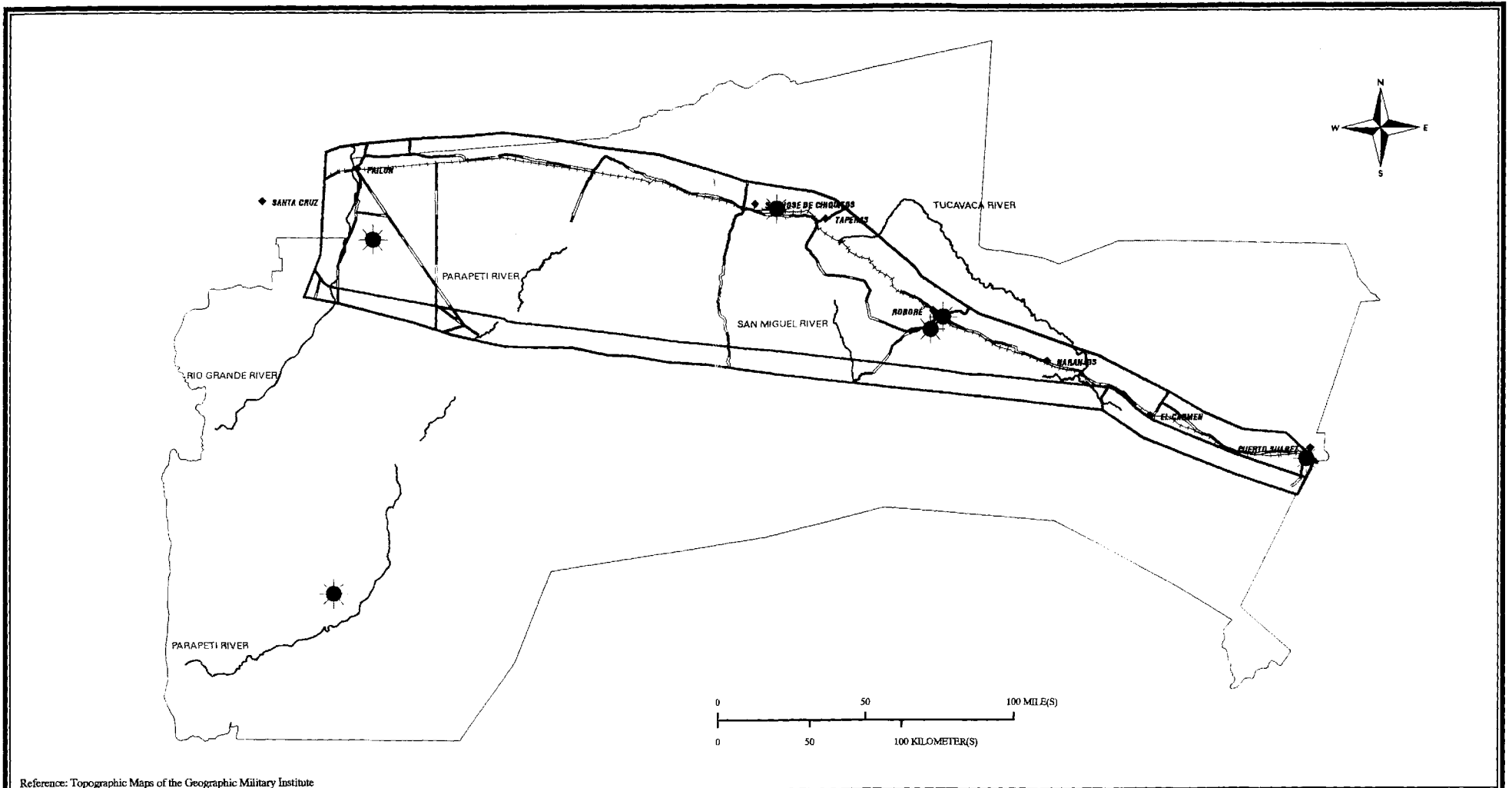
Tabla II.1	Resumen Socio-cultural y Económico de los Tres Pueblos Indígenas del Area del PDPI.
Tabla II.2	Recursos Productivos en las Comunidades Indígenas del PDPI .
Tabla II.3	Autoridades Provinciales y Cantonales dentro del Area de Influencia del PDPI.
Tabla IV.1	Especies Vegetales Según su Función y Uso. Comunidades Izoceñas/Guaraní.
Tabla IV.2	Especies Nativas Vegetales Más Importantes por su Uso Múltiple. Comunidades Izoceñas/Guaraní.
Tabla IV.3	Especies Vegetales Según su Función y Uso. Comunidades Chiquitanas.
Tabla IV.4	Especies Nativas Más Importantes por su Uso Múltiple. Comunidades Chiquitanas.
Tabla V.1	Identificación de Necesidades.
Tabla V.2	Requerimientos Financieros para la Titulación de las Demandas Prioritarias (en US\$).
Tabla V.3	Requerimientos Financieros para la Participación Indígena en la Titulación (US\$).
Tabla VII.1	Resumen de Costos - Programas Ambientales y Sociales.
Tabla VII.2	Resumen de Costos - Plan de Desarrollo de Pueblos Indígenas.
Tabla VII.3	Detalle de Costos del PDPI

### **LISTA DE FIGURAS**

Figura I.1	Study Area.
Figura I.2	Organigrama del PDPI.
Figura I.3	Plan de Desarrollo de Pueblos Indígenas
Figura II.1	Location of Indigenous Communities (and Planned Land Use).

## APENDICES

- Apendice A Reuniones con CABI, CIDOB, WCS y USAID.
- Apendice B Otras Reuniones.
- Apendice C Población de las Comunidades Indígenas del Area de Influencia del PDPI.
- Apendice D Estado de Titulación de Tierras en las Comunidades Indígenas del Area del PDPI.



Reference: Topographic Maps of the Geographic Military Institute

### Legend

- Major Roads
- Railroad
- Study Area \*

- Rivers
- Gas Pipeline
- Major Towns

- Provinces
- Cordillera
  - Chiquitos
  - German Busch

- Concentrations of Indigenous Communities
- Ayoreo
  - Chiquitano
  - Izoceño Guaraní

### Study Area (Project Base Map)

Figure 1.1



DAMES & MOORE

\* The study area includes 23 Izoceño Guaraní communities located along the Parapeti River

Date: 07/01/97



# CAPITULO I

## ORGANIZACION Y GESTION DEL PLAN DE DESARROLLO DE PUEBLOS INDIGENAS

### 1.0 INTRODUCCION

El Plan de Desarrollo de Pueblos Indígenas (PDPI) para el Proyecto del Gasoducto Bolivia-Brazil (Sector Boliviano) ha sido desarrollado a requerimiento de las instituciones financieras internacionales y de acuerdo a los lineamientos contemplados en la Directiva Operacional 4.20 del Banco Mundial (DO 4.20). La directiva describe las políticas y procedimientos del Banco para proyectos que afectan pueblos indígenas. Los lineamientos presentados en la DO 4.20 tienen dos objetivos principales:

1. Asegurar que los pueblos indígenas se beneficien de los proyectos de desarrollo apoyados por el Banco.
2. Evitar o mitigar los efectos negativos potenciales que proyectos apoyados por el Banco puedan tener sobre pueblos indígenas.

El área de influencia del sector boliviano del Gasoducto Bolivia-Brasil fue definida en el estudio de impacto ambiental del Proyecto (Dames & Moore, 1996) como el área comprendida dentro de una línea imaginaria localizada a 10 km al norte y paralelo a la línea férrea Pailón-Puerto Suárez, y otra línea 10 km al sur y paralela al alineamiento del derecho de vía del gasoducto. Para el PDPI, el área de influencia ha sido expandida para incluir a las 23 comunidades izoceñas/guaraní en las riberas del río Parapetí. El área de influencia así definida, incluye zonas habitadas por tres pueblos indígenas: Izoceño-Guaraní, Chiquitano y Ayoreo (Figura I.1). Estos grupos difieren en sus niveles de organización social, cultural y política, así como en su forma y nivel de articulación con la economía nacional. El PDPI responde a las necesidades y expectativas específicas de cada grupo.

El PDPI se ha desarrollado en base a los siguientes principios:

1. Considerar a los tres grupos indígenas de una manera equitativa.
2. Buscar una correspondencia entre los impactos anticipados del Proyecto y los programas propuestos del PDPI.
3. Incorporar a las comunidades indígenas, por medio de sus dirigentes y representantes, en la elaboración de propuestas específicas a ser implementadas con los recursos técnicos y financieros establecidos dentro de cada programa del PDPI.
4. Apoyar y promover oportunidades a las iniciativas de autodesarrollo de los pueblos indígenas.
5. Promover oportunidades para fortalecer las capacidades técnicas e institucionales de los indígenas para asegurarse que los beneficios del plan serán a largo plazo.
6. Incorporar un elemento de participación informada de los pueblos indígenas en cada programa del PDPI.
7. Diseñar una organización sencilla para la gestión y ejecución del PDPI, la cual maximice la inversión de recursos en lograr de metas específicas.
8. Establecer objetivos específicos y realistas para cada programa, de manera que el PDPI pueda evaluar el éxito de los programas al término de los mismos.
9. Fijar un tiempo de dos años, asociado al cronograma de construcción del gasoducto, para la ejecución de los programas.

10. Apoyar propuestas que promuevan el mejoramiento de técnicas tradicionales de manejo de recursos sin desdeñar la aplicación de metodologías modernas, para garantizar que las propuestas sean viables desde el punto de vista cultural y técnico.

## 2.0 CONSULTA PARA LA ELABORACION DEL PLAN

Para la preparación del Plan de Desarrollo de Pueblos Indígenas se continuó el proceso de consulta con los pueblos indígenas que se inició durante la etapa del estudio de evaluación de impacto ambiental en 1996. Entre mayo y septiembre de 1997, se llevó a cabo una serie de consultas con CABI y CIDOB con el objetivo fundamental de elaborar el convenio tripartito promotores-CABI-CIDOB que regirá la ejecución del IPDP.

La consulta pública realizada durante el Estudio de Impacto Ambiental se describió en el Capítulo 8 del estudio (Dames & Moore, 1996) e incluyó las siguientes reuniones y actividades:

- **Agencias Gubernamentales:**
  - Ministerio de Desarrollo Humano, Secretaría Nacional de Asuntos Etnicos, de Género y Generacionales (15 de mayo de 1996).
  - Ministerio del Desarrollo Sostenible y Medio Ambiente, Dirección Nacional para la Biodiversidad (15 de mayo de 1996).
  - Ministerio de Desarrollo Sostenible y Medio Ambiente, Secretaría Nacional de Desarrollo Sostenible y Medio Ambiente (16 de mayo de 1996).
  - Ministerio de Desarrollo Humano, Secretaría Nacional de Cultura, Instituto Nacional de Arqueología-INAR (15 de mayo de 1996).
- **Organizaciones No Gubernamentales:**
  - Liga por la Defensa del Medio Ambiente - LIDEMA (16 de abril de 1996).
  - Asociación Ecológica del Oriente Boliviano - ASEO (18 de abril de 1996).
  - Fundación Amigos de la Naturaleza - FAN (16 de abril de 1996).

- Organizaciones Indígenas:
  - Confederación Indígena del Oriente Boliviano - CIDOB (18 de mayo de 1996).
  - Capitanía del Alto y Bajo Izozog - CABI (19 de mayo de 1996).
  
- Reuniones públicas en los siguientes pueblos:
  - Pailón (17 de mayo de 1996).
  - San José de Chiquitos (20 de mayo de 1996).
  - Roboré (21 de mayo de 1996).
  - El Carmen (22 de mayo de 1996).
  - Puerto Suárez (23 de mayo de 1996).
  - Puerto Quijarro (23 de mayo de 1996).

En la preparación del PDPI, se llevaron a cabo las siguientes reuniones (ver Apéndice A para un resumen de lo discutido en cada reunión):

- CABI, el 9 de mayo y 5 de junio de 1997. En la reunión del 9 de mayo de 1997, se discutieron los pasos a seguir en la preparación del PDPI y se reanudó oficialmente la consulta con la CABI. En la reunión del 5 de junio, se solicitó la colaboración de la CABI en la preparación de los planes de revegetación de porciones del derecho de vía y la actualización de la línea base de biodiversidad en el área del Parque Nacional KAA-IYA Gran Chaco, preparada para el estudio de impacto ambiental. Se discutió la naturaleza y contenido de un convenio maestro con la CABI que establece las bases para la ejecución de los programas del PDPI para el pueblo izoceño/guaraní.
  
- CIDOB, el 10 y el 23 de mayo de 1997. Como en la reunión con la CABI el día anterior, el 10 de mayo de 1997 se reanudó el proceso de consulta con la CIDOB. El día 23 de mayo se realizó un taller de un día de duración con representantes de los tres pueblos indígenas, durante el cual se presentó la estructura propuesta del PDPI y sus programas y se recogieron los comentarios y sugerencias de los representantes de los pueblos indígenas acerca del contenido y alcance de los programas.

- Wildlife Conservation Society (WCS) y United States Agency for International Development (USAID), el 29 de mayo de 1997. En esta reunión se discutieron comentarios y observaciones que el WCS y USAID habían emitido acerca del estudio de impacto ambiental y de la estrategia ambiental del Proyecto. Como resultado de esa reunión, se introdujeron elementos específicos en el PDPI para responder a las consideraciones de ambas organizaciones.
  
- Entre junio y septiembre de 1997, se realizaron múltiples reuniones con CABI y CIDOB para afinar los detalles del convenio para la ejecución del PDPI.
  
- Otras reuniones realizadas en la elaboración del plan incluyen (Apéndice B):
  - Programa de Desarrollo de Comunidades Rurales (8 de mayo de 1997).
  - Dirección de Planificación de la Prefectura de Santa Cruz (8 de mayo de 1997).
  - Centro de Comunicación Rural (8 de mayo y 4 de junio de 1997).
  - Ministerio de Desarrollo Sostenible y Medio Ambiente, Dirección Nacional de Conservación de la Biodiversidad (8 de mayo de 1997).
  - Ministerio de Desarrollo Sostenible y Medio Ambiente, Subsecretaría de Recursos Naturales (8 de mayo de 1997).
  - Proyecto de Tierras Bajas, financiado por el Banco Mundial (9 de mayo de 1997).
  - Instituto para la Planificación de Proyectos (9 de mayo y otras).
  - Sociedad Boliviana de Medicina Tradicional (9 de mayo de 1997).
  - Centro de Investigación para el Campesino (10 de mayo de 1997).
  - Dirección del Parque Nacional KAA-IYA Gran Chaco (10 de mayo de 1997).
  - Sub-Secretaría Nacional de Asuntos Etnicos (19 y 24 de mayo de 1997).
  - Centro Jurídico de Investigación Social (9 de mayo de 1997).
  - Instituto Nacional de Reforma Agraria (19 de mayo de 1997).

La preparación y la gestión del PDPI ha contado con el aporte de los grupos indígenas a través de una serie de consultas progresivas.

### 3.0 ORGANIZACION DEL PDPI

Durante la preparación del PDPI, y en consulta con los tres pueblos indígenas, se identificaron cuatro aspiraciones fundamentales de los pueblos: 1) la comunicación y consulta con las comunidades acerca del proyecto y sus actividades, 2) la consolidación de sus territorios, 3) el manejo sostenible de sus recursos naturales y 4) la consolidación del Parque Nacional KAA-IYA Gran Chaco. Para responder a estas aspiraciones, el PDPI incorpora cuatro programas:

Programa No. 1: Interacción con la Comunidad, el cual establece el mecanismo de interacción del Proyecto con las comunidades indígenas en el área de influencia del mismo. El programa se enfoca en mantener la comunicación entre el proyecto y las comunidades y en evitar o resolver conflictos que aparezcan como consecuencia del proyecto.

Programa No. 2: Asistencia al Manejo Sostenible de Recursos Naturales, el cual establece un mecanismo para identificar aspectos específicos de manejo de los recursos naturales que puedan ser abordados por el programa.

Programa No. 3: Asistencia al Proceso de Demarcación y Titulación de Territorios Indígenas dentro del área de influencia del proyecto. Este programa establece un marco de asistencia técnica y financiera para la titulación de territorios indígenas.

Programa No. 4: Asistencia al Manejo del Parque Nacional KAA-IYA Gran Chaco. Este programa incluye el establecimiento de un programa de asistencia financiera, en la forma de un fondo de fideicomiso cuyos intereses serán utilizados para apoyar al manejo de las áreas del Parque a ser afectadas por la construcción y operación del gasoducto.

Los programas No. 2 y 3 se llevarán a cabo en dos etapas. En la primera etapa, se realizará una evaluación de la situación actual y se apoyará a las comunidades en la elaboración de propuestas

específicas a ser ejecutados en la segunda etapa. Dichas propuestas deberán maximizar el uso efectivo de los recursos asignados a los programas. De esta manera se garantizará la participación activa e informada de las comunidades en los programas.

#### 4.0 GESTION DEL PDPI

El PDPI se ejecutará bajo una estructura organizativa y de gestión sencilla, la cual incluye el establecimiento de tres oficinas con personal a tiempo completo, quienes constituirán el equipo de gestión del PDPI. La ubicación y organización de estas tres oficinas serán las siguientes (Figura I-2):

**Santa Cruz:** En Santa Cruz se establecerá una oficina que servirá como el centro principal de operaciones del PDPI. El gerente del PDPI se ubicará en Santa Cruz y será responsable de gestionar todos los programas del PDPI y de asegurarse que las comunidades se mantengan informadas acerca del progreso del Proyecto.

**La Brecha:** En la comunidad de La Brecha se establecerá una oficina que tendrá un coordinador del PDPI, un promotor indígena en representación del pueblo Izoceño/Guaraní y un asistente administrativo. El coordinador será responsable de representar al Proyecto ante las comunidades izoceñas/Guaraní, así como coordinar los programas del PDPI que tienen a los izoceños como beneficiarios. El promotor indígena, que será designado por las organizaciones indígenas, apoyará al coordinador en la identificación de las necesidades propuestas por interacción con las comunidades izoceñas/Guaraní, así como en la preparación y ejecución de los planes de acción, pertinentes a ellas.

**San José:** En San José de Chiquitos se establecerá una organización similar a la de La Brecha, con dos promotores indígenas, designadas por las organizaciones chiquitanas y ayoreas, respectivamente.

#### 4.1 Sistema de Gestión

El PDPI desarrollará un sistema integrado de gestión, el cual articula una capacidad financiera, una capacidad operativa y una capacidad técnica, las mismas que se irán desarrollando y afianzando durante el proceso del mismo. Las instancias de gestión del programa serán las siguientes:



## 4.2 La Gerencia

Será el ente asesor y fiscalizador del PDPI. Entre sus funciones estará la de movilizar los recursos necesarios, así como efectuar la evaluación al más alto nivel de las acciones desarrolladas por el PDPI para determinar si el impacto logrado es adecuado a los objetivos planteados y a los recursos utilizados.

El Gerente se reunirá por lo menos cuatro veces al año con los coordinadores de las Unidades Operativas y los promotores indígenas con la finalidad de: 1) evaluar el desempeño de cada Unidad Operativa; y 2) analizar los planes operativos y su cumplimiento.

Asimismo, el gerente del PDPI será responsable de coordinar con el gerente del proyecto USAID para garantizar que ambos proyectos se complementen y maximizen su beneficio conjunto.

## 4.3 El Comité Directivo

El Comité Directivo será un órgano ad-honorem, formado por un representante de los promotores, uno de CABI, y uno de CIDOB. Este Comité será una instancia de dirección estratégica y de evaluación del programa que asistirá al gerente del PDPI a priorizar acciones y establecer procedimientos. El Comité se reunirá cada tres meses, o más a menudo si es necesario.

## 4.4 Las Unidades Operativas

Las Unidades Operativas (UO) estarán localizadas en La Brecha y en San José de Chiquitos. Cada UO estará conformada por un coordinador, uno o dos promotores indígenas y un apoyo contable-administrativo.

Los miembros de las UO permanecerán en el campo, por lo menos nueve meses al año cada uno. El trabajo de campo lo deberán desarrollar de manera coordinada los integrantes de la UO.

Entre las principales funciones que las UO desarrollarán estará la elaboración de los planes operativos semestrales, asistir a las comunidades y a sus organizaciones en la suscripción de los convenios y/o contratos de capacitación, formación, asistencia técnica, estudios puntuales, gestión organizativa y otros.

#### 4.5 Las Comunidades Indígenas

CABI y CIDOB han asignado la responsabilidad de la consulta y participación de las comunidades Izoceña/Guaraní, Chiquitanas y Ayoreas al Comité de Gestión del Parque Nacional Kaa Iya del Gran Chaco. Este comité está constituido por representantes de los pueblos izoceño/guaraní, chiquitanos y ayoreos, instituciones locales y nacionales, y organizaciones internacionales.

Las comunidades indígenas y sus organizaciones discutirán el conjunto de necesidades y propuestas de solución de sus problemas lo cual será facilitado por el Comité de Gestión. Como resultado de esta discusión los miembros de la comunidad llegarán a un paquete de prioridades por consenso. Para cada propuesta, se identificarán los potenciales beneficiarios y se definirán las "reglas del juego". Para llevar a cabo este proceso, las comunidades contarán con la asesoría de los coordinadores y los promotores indígenas de las Unidades Operativas. El Comité de Gestión será responsable de presentar las propuestas a ser financiadas y velará porque los beneficios del IPDP se distribuyan equitativamente entre los tres pueblos.

Estas propuestas serán la base para la elaboración de los planes operativos a nivel de cada sub-área del Proyecto. Estos planes operativos fortalecerán las capacidades técnicas e institucionales de los indígenas y asegurarán la sostenibilidad de este plan, produciendo beneficios a largo plazo.

Cada actividad podría tener varios actores que tomarían responsabilidad en su ejecución. Primero serían los beneficiarios (familias, grupos de familias, comunidad, multicomunal) que reciban el apoyo. Segundo, la responsabilidad de administrar los apoyos económicos. Finalmente, las organizaciones, a través del Comité de Gestión, jugarán un rol importante en cuanto a la credibilidad y cumplimiento de los compromisos adquiridos por los beneficiarios.

#### 4.6 Seguimiento y evaluación

La gerencia y los coordinadores del PDPI desarrollarán un sistema de seguimiento y monitoreo permanente para las diversas actividades contenidas en los cuatro programas.

Los trabajos de evaluación serán realizados por el Comité Directivo establecido por la CIDOB, la CABI y los Promotores del Proyecto. El Comité de Gestión de Parque Nacional Kaa Iya del Gran Chaco trabajará en conjunto con la CIDOB, el Supervisor Ambiental, el Gerente de Compensación, la gerencia, y los coordinadores del PDPI para el seguimiento y monitoreo de los programas del PDPI. Las evaluaciones se realizarán antes, durante y al finalizar las intervenciones del PDPI.

Los patrocinadores del PDPI visitarán eventualmente el Proyecto y solicitarán a la gerencia la información necesaria sobre la marcha del mismo.

Para la ejecución de los programas del PDPI, se firmará un convenio marco con la CABI y CIDOB para establecer las bases de la ejecución de los programas en los pueblos izoceño/Guaraní (CABI), chiquitano y ayoreo (CIDOB).

## 5.0 RELACION CON OTROS PROYECTOS EN EL AREA

El gerente del PDPI deberá promover la comunicación con los gerentes de otros proyectos activos en el área, especialmente el Proyecto USAID, el cual incorpora componentes similares al IPDP. El gerente del IPDP tendrá reuniones con los gerentes de los proyectos presentes en el área del estudio cada tres meses, particularmente con el gerente del proyecto USAID. Los objetivos de estas reuniones serán:

1. Comparar el avance de los proyectos;
2. Explorar oportunidades de acciones conjuntas o complementarias entre los proyectos; y
3. Verificar que no existen conflictos o contradicciones entre los proyectos.

Se anticipa que el Comité de Gestión, el cual se encuentra relacionado al Proyecto USAID, servirá de catalizador para la concertación de los dos proyectos.

## 6.0 PAPEL DE LA MUJER EN EL PDPI

A nivel familiar, las decisiones importantes que comprometen al pueblo indígena no prescinden de la opinión de la mujer. Generalmente, en las reuniones comunales los hombres y las mujeres se agrupan en lugares diferentes y son los hombres los que más hablan. Sin embargo, cuando llegan a sus casas discuten los temas tratados y la mujer sugiere alternativas que son tomadas en cuenta por el hombre.

En un programa o plan con pueblos indígenas no se puede dejar de considerar la participación de la mujer en la vida familiar y comunal. La mujer es un elemento clave en la sostenibilidad de los recursos naturales y la cultura.

A la mujer le están asignadas un conjunto de actividades tales como: la crianza de los hijos, la conservación de la lengua a través de la educación oral, el tratamiento de las enfermedades, la recolección de plantas y semillas, las labores artesanales, la siembra y la cosecha en el "chaco" familiar, la crianza de animales menores, la preparación de bebidas y alimentos, etc.

Las propuestas específicas del PDPI en relación con el rol de la mujer expresadas a nivel familiar, comunal o intercomunal son las siguientes:

- Rescate de la medicina tradicional a través de un inventario de sus plantas y una mejor administración de sus bosques primarios. Apoyo en la capacitación de parteras (parto limpio) para reducir la mortalidad posnatal y la difusión de los programas básicos de vacunación contra enfermedades como: tos convulsiva, difteria, TBC y otras, para los cuales no existe alternativa en la medicina tradicional indígena.
- Mejora de sus trabajos artesanales; reforestación con bejucos, palmeras y otras especies, en zonas cercanas a las comunidades para mejorar la disponibilidad de materia prima para la confección de canastos, bolsos, collares, adornos y otras artesanías.

- Talleres de costura donde puedan confeccionar sus vestimentas típicas que, como muchas veces señalan, son más cómodas, son prácticas, duran más y tendrían un costo menor respecto a las que se compran fuera de la comunidad.

El objetivo del PDPI en relación al rol de la mujer será el de apoyarlas con recursos humanos y económicos en lo que ellas ya saben hacer y no en inventarles trabajos alternativos.

Figura I.2  
Organigrama del Plan de Desarrollo de Pueblos Indigenas

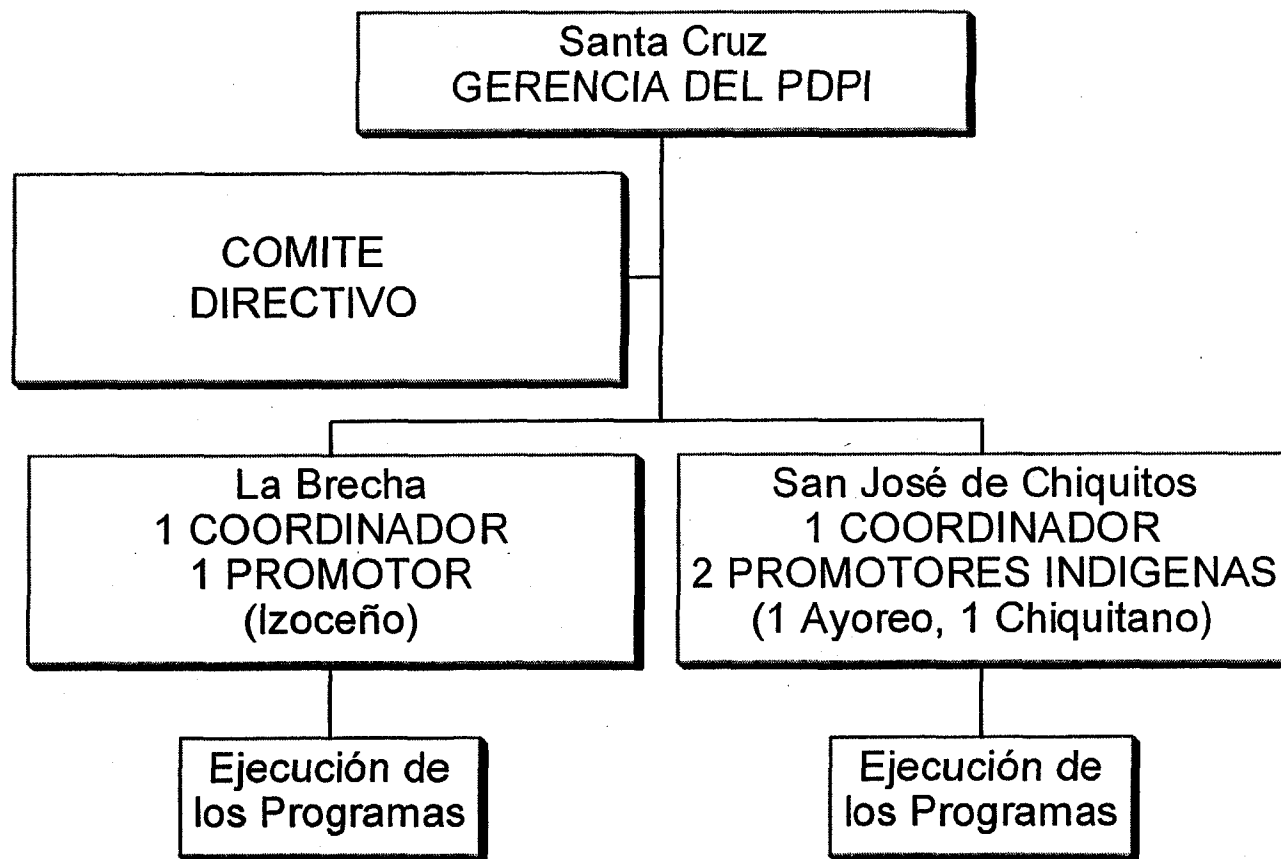


Figura I.3  
Componentes del Plan de Desarrollo de Pueblos Indígenas

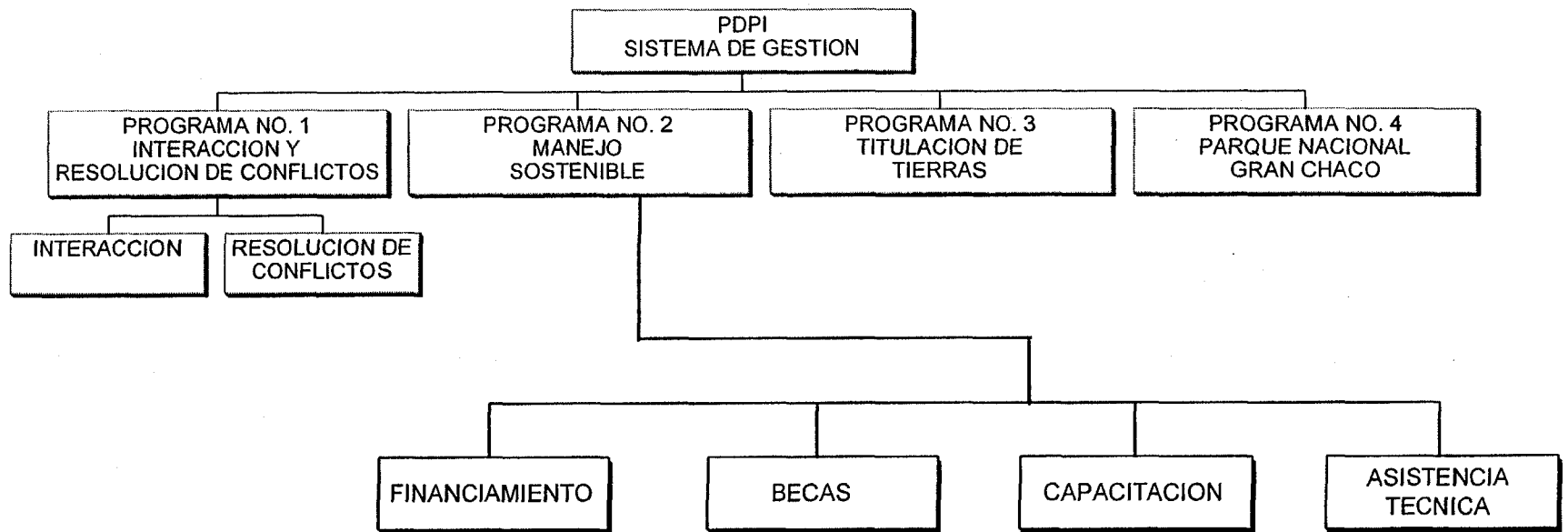




Figura I.2  
Organigrama del Plan de Desarrollo de Pueblos Indigenas

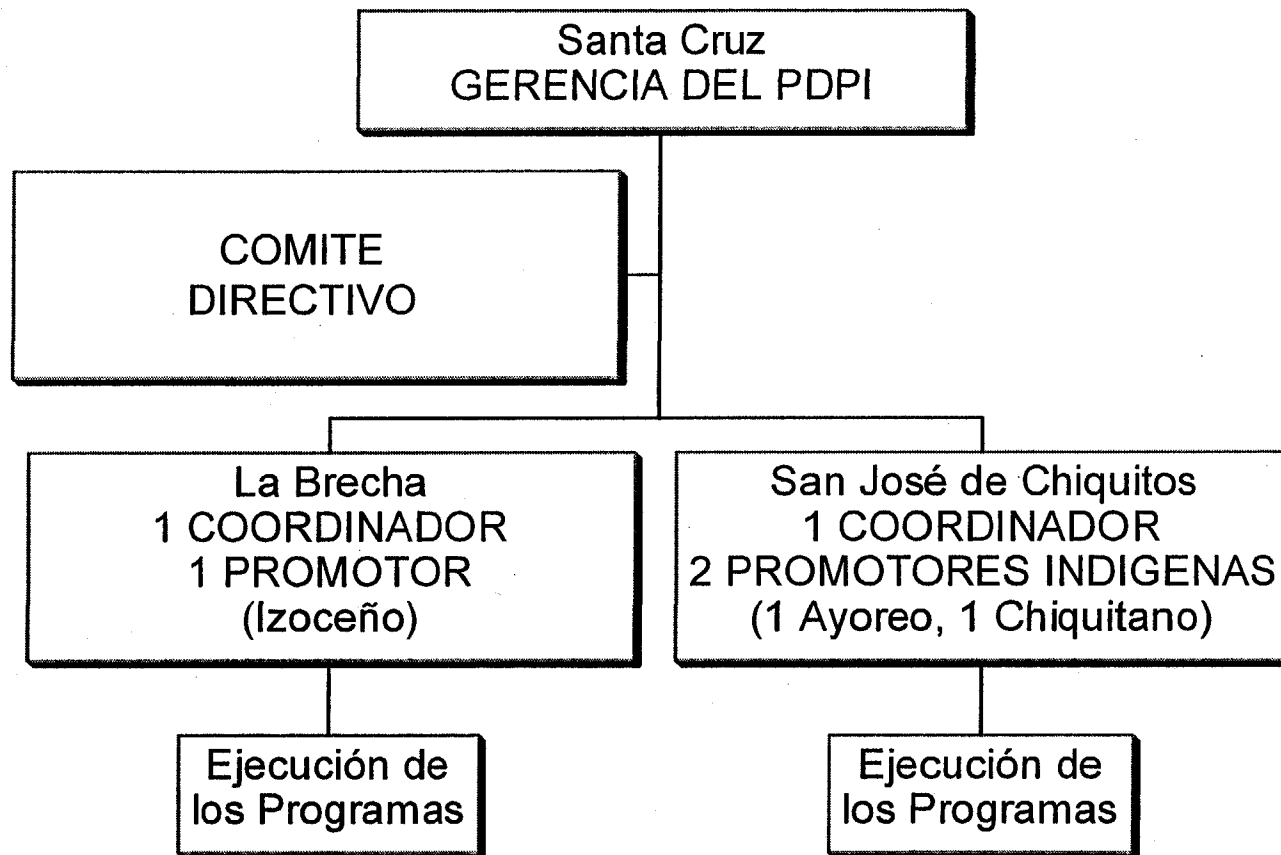
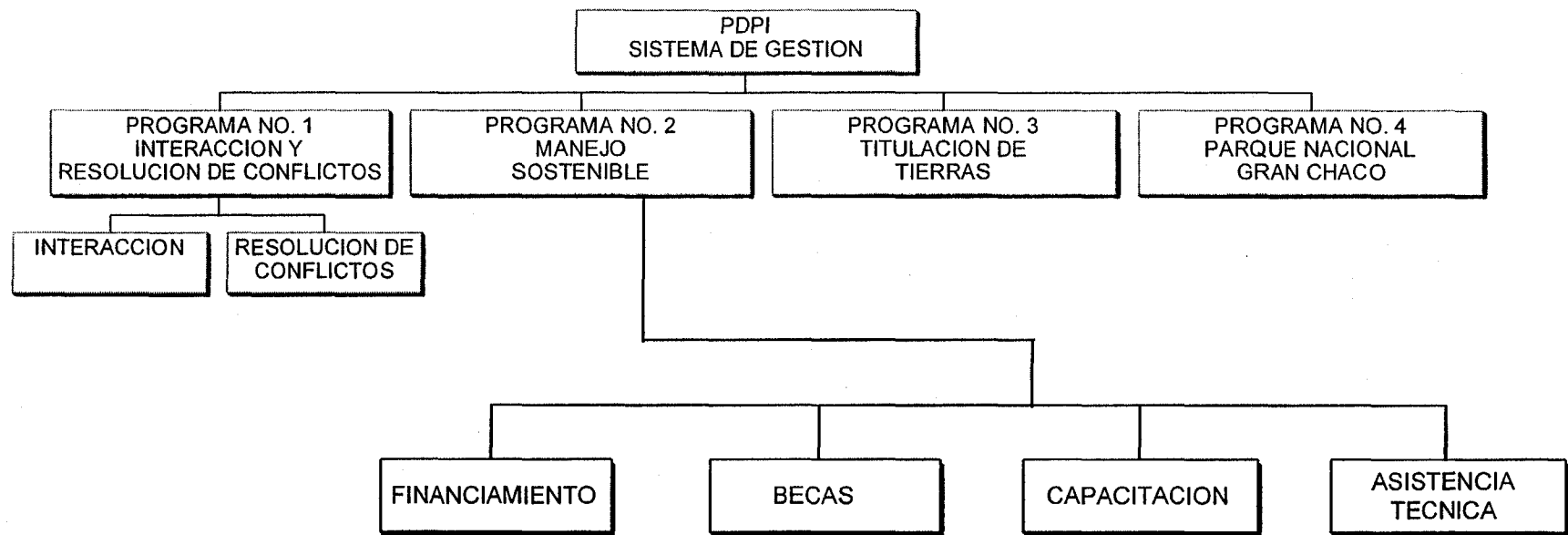


Figura I.3  
Componentes del Plan de Desarrollo de Pueblos Indígenas



## CAPITULO II

### DIAGNOSTICO SOCIOECONOMICO DE LOS PUEBLOS INDIGENAS EN EL AREA DEL PDPI

#### 1.0 LOCALIZACION Y POBLACION

##### 1.1 Localización de los Pueblos Izoceños/Guaraní

El territorio étnico izoceño/guaraní denominado "İvi-Iyambae" Primer Distrito Municipal Izoceño, está ubicado en la provincia Cordillera,, situado aproximadamente a 360 km al sur de la ciudad de Santa Cruz de la Sierra. Geográficamente, el pueblo izoceño/Guaraní se encuentra ubicado en los 18°00'00" de Latitud Sur y 63°15' 00" de Longitud Oeste. Sus límites al sur son la frontera con la República de Paraguay; al oeste, la frontera agrícola/ganadera; al este el Area Natural de Manejo Integrado del Izozog y el Parque Nacional KAA IYA Gran Chaco; y al Norte, la frontera ganadera y comunal de Chiquitos. Las 23 comunidades izoceñas/Guaraní se encuentran asentadas a lo largo de las riberas del río Parapetí, y se extienden por más de 100 km, desde Yande Yari en el norte hasta Isiporenda en el sur.

Las comunidades izoceñas/Guaraní comprenden: Isiporenda, Caraparí, Copere Guazú, Copere Montenegro, Copere Brecha, Copere Loma, Capeatindi, Yapiroa, Ibasiriri, Tamachindi, Rancho Nuevo, Mini, Yuqui, San Silvestre, Tamane, Cuarirenda, Aguaraty, Coropo, Yobi, Aguariga, Rancho Viejo, Yande Yari y La Brecha, que es el poblado más grande (ver Figura II.1).

##### 1.2 Localización de los Pueblos Chiquitanos

Actualmente los chiquitanos están asentados en las provincias Ñuflo de Chávez, Velasco, San Ignacio, Chiquitos y Germán Busch. Sin embargo, solamente las comunidades de Chiquitos y Germán Busch se encuentran en el área del PDPI. En Chiquitos, los chiquitanos están dispersos en pequeñas comunidades, ranchos y estancias. Las asociaciones chiquitanas más importantes en el área de influencia son Turubó en San José de Chiquitos y Amanecer en Roboré.

Las 42 comunidades chiquitanas en el área del proyecto del gasoducto comprenden (ver Figura II.1):

- En el Cantón San José: El Cerro, Pozo del Cura, Pororó, Dolores, Ramada Entre Ríos, El Tinto, Quimome, Piococa, Natividad, Los Siros, Entre Ríos, Taperita, Taperas Agua Brava, Taperas Los Bibosi, San Juan del Norte, Cruz Blanca, y Motacusito.
- En el Cantón Roboré: El Portón, Chochis, Limoncito, Los Sotos, San Pedro, Cupesí, Gavetita, San Rafael, Santiagoma, Yororoba, Quitunuquiña, Aguas Calientes, San Lorenzo Nuevo, San Lorenzo Viejo, Potrero, y Motacusito.
- En la Provincia Germán Busch: Santa Ana, El Carmen Viejo, El Salao, San Salvador, San Pedrito, El Carmen de la Frontera, Colonia Warnes, San Juan del Mutún, Candelaria, y El Carmen Rivero Torres.

### 1.3 Localización de los Pueblos Ayoreos

Las comunidades ayoreas están agrupadas en tres categorías (ver Figura II.1):

- Las comunidades en la zona oeste, Poza Verde y "Guidai Ichai", que actualmente representan la zona de agro-exportación ubicadas en las cercanías de Pailón.
- Las comunidades que se encuentran en zonas más o menos aisladas y a distancias considerables de otros poblados: Tobité y Santa Teresita (este-central).
- Las comunidades que se hallan ubicadas a lo largo de la línea férrea Santa Cruz-Corumbá: Urucú (en Roboré), Villa Bethel/Santiago (dentro del radio de Chiquitos), Motacucito (en Motacú, cerca a Puerto Suárez) y El Carmen (en El Carmen Rivero Tórres), (Heijdra 1997).

Las comunidades ayoreas en el área de influencia del Proyecto son ocho: Guidai-Ichai, Motacusito, Santa Teresita, Tobité, Poza Verde, Urucú, Villa Bethel/Santiago y El Carmen. Las distancias entre estas comunidades y los centros poblados más próximos varían entre 135 km (Tobité respecto a San José de Chiquitos) y 1 km (asentamiento cercano a El Carmen). En general, sin embargo, estas comunidades están bastante alejadas y no cuentan con infraestructura vial adecuada ni transporte (CUMAT,1990).

#### 1.4 Población

El Proyecto está ubicado en el Departamento de Santa Cruz, el cual tiene una población de 1.364.389 habitantes y una tasa de crecimiento anual de 4.16%. El crecimiento urbano es 6.15% anual y el rural es 0.82%. La población de las Provincias de Chiquitos, Cordillera y Germán Busch suman un total de 156.573 habitantes (urbana 74.054 y rural 82.519). La población considerada económicamente activa (15 a 64 años) representa el 53.59%. El área total de estudio del PDPI cubre cinco cantones de las provincias Cordillera, Chiquitos y Germán Busch con una población total de 41.101 habitantes (Censo INE,1992), de los cuales 12.502 indígenas (ver Apéndice C). La distribución étnica de la población se presenta en la siguiente tabla:

Población de los Pueblos Indígenas del Area del PDPI

Pueblo	Población	Fuente
Izoceños/Guaraní	6.649	Censo Nacional, 1992
Chiquitanos	4.902	Censo Indígena, 1994 - 1995
Ayoreos	951	Censo Indígena, 1994 - 1995
<b>Total</b>	<b>12.502</b>	

## 2.0 ESTRATEGIAS INDIGENAS DE SUBSISTENCIA

### 2.1 Introducción

En el área del PDPI, los pueblos indígenas izoceño/Guaraní, chiquitano y ayoreo desarrollan diferentes estrategias de subsistencia basados en sus características culturales propias, conocimientos, habilidades, disponibilidad de tierras y grado de articulación a la economía nacional (ver Tabla II.1 y II.2):

### 2.2 Sistema Productivo Izoceño/Guaraní

#### 2.2.1 Agricultura

La principal diferencia de la región del Izozog con respecto a la llanura chaqueña es que está atravesada por el río Parapetí, el cual ha permitido que se desarrolle un sistema de riego, con tecnología y conocimiento indígena, que cubre más de 1.000 ha con 14 canales maestros y 53,5 km de acequias, además de los canales de distribución. En las 23 comunidades izoceñas a lo largo del río Parapetí las actividades de producción agrícola se realizan con fines de subsistencia.

Los suelos del Izozog tienen texturas que varían entre franco arenoso, francos y franco limosos. El desarrollo de la estructura de la capa superior es algo deficiente, sin embargo, la porosidad, la aereación y el drenaje son en su mayor parte favorables, así como también la capacidad de retención de humedad del suelo. Los suelos son moderadamente fértiles, y su aptitud agrícola es bastante restringida por factores climáticos, tales como los fuertes vientos, que llegan a sobrepasar en algunos casos los 50 km/h, y la baja precipitación pluvial.

Esta zona sufre inundaciones durante la época de lluvias y sequías acompañadas de erosión eólica el resto del año. Pese a tener un importante sistema de riego, el agua es un recurso escaso la mayor parte del año, y durante la época lluviosa resulta difícil de captarlo por los cambios constantes del curso del río, debido principalmente al mal manejo en las partes más altas de la cuenca del río Parapetí. El agua subterránea está a una profundidad de 20 a 25 m en la mayor

parte de la región, siendo en general buena en calidad y apropiada para el riego. La profundidad de los pozos está entre los 70 m en la comunidad sureña de Isiporenda y los 95 m en Kuarirenda al norte.

La superficie cultivada en el Bajo Izozog es de 564 ha (promedio de 1,5 ha/familia), y 461 ha (promedio de 1,2 ha/familia) en el Alto Izozog. El sistema es diversificado, con una variedad amplia de cultivos, para así minimizar los riesgos de sequía, plagas u otros. Los izoceños/Guaraní desmontan y queman para abonar la tierra y utilizan los troncos del desmonte para construir las cercas. Luego de tres a cinco años de producción, las parcelas son abandonadas dando lugar al proceso de regeneración natural de la vegetación, el cual es lento. Las áreas agrícolas que dejan en barbecho por más de 10 años tienen una vegetación pobre, debido al daño causado por el ganado vacuno y caprino. La degradación ecológica actualmente incluye la pérdida de la cobertura vegetal, erosión del suelo, pérdida de ciertas especies de flora y fauna y un incremento de enfermedades y plagas en sus sistemas de producción agrícola y pecuaria (Zolezzi 1993).

Las migraciones a la zafra y la cosecha del algodón determinaron que los izoceños hayan cambiado su época de siembra de medio año, por sólo la siembra de fin de año en los meses de noviembre y diciembre. Sin embargo, algunos agricultores mantienen la época de siembra de mediados de año en parcelas reducidas, conocidas como de "socorro". Actualmente la agricultura se mantiene en base al maíz y el arroz, la yuca (mandioca) dulce y otros cultivos como camote, zapallo, "joco", cumanda, etc. Existen en la zona experiencias con productos como trigo, papa, cebolla, ajo y varias hortalizas y frutas, aunque en pequeña escala.

### **2.2.2 Sistema Pecuario**

La explotación pecuaria en la zona del Izozog es a nivel de subsistencia. La ganadería de pequeña escala es fundamental para el Izoceño, debido a la pobreza de los suelos del Izozog y la escasez de pastos. Algunos crían el ganado vacuno, pero en la mayoría de los casos, el sistema gira en torno a cabras cuya carne no es apreciada, y ovejas principalmente para la lana. Para el pastoreo a campo abierto se requieren entre 7 a 8 ha por cabeza de ganado y de 12 a 14 ha en campos de

ramoneo (Riester y Zarzycki, 1985). La falta de agua potable para el ganado, suministrada generalmente a razón de 50 litros por día por cabeza de ganado mayor, es otro factor limitante en el desarrollo de la cría de ganado en la zona.

### 2.2.3 Otras Actividades Productivas

**Caza.** La cacería es importante en la dieta y, eventualmente, como fuente de ingresos.

**Pesca.** El pescado es esencial en la dieta por las proteínas que posee. Los izoceños pescan en la época seca, en las lagunas que se forman en los Bañados del Izozog y en el Río Parapetí, utilizando redes pequeñas de fibras vegetales.

**Recolección.** Los izoceños recolectan plantas silvestres principalmente desde noviembre a enero, cuando escasean los productos agrícolas. Las principales especies son el cupesí, guasuquea, tusca, mistol, urucú y para usos artesanales la tutuma o mate. A pesar de la degradación general del medio ecológico, el Izozog es rico en hierbas medicinales tradicionales y en miel de abeja.

**Recursos Forestales.** Debido a que los cambios de curso en el Río Parapetí, afectan la disponibilidad de las tierras, APCOB realiza la reforestación y el control de cuencas. Los izoceños dan muchos usos a estas especies como: madera de construcción, postes, leña, forrajes, medicinas, jabón, tintes, hilado, fibras.

## 2.3 Sistema Productivo Ayoreo

### 2.3.1 Agricultura

La agricultura, junto con la recolección, constituyen la base de la economía de los ayoreos (Bórmida y Califano, 1978). Sus suelos son arenosos y en las zonas deprimidas cerca de los bañados, son arcillo-arenosos.



Los ayoreos cultivan maíz, porotos, zapallo, calabaza, y tabaco, entre otros. Todas estas especies, menos el tabaco, se cosechan una sola vez al año. Otros cultivos son el arroz, el "joco", zapallo, sandía, yuca, camote, guineo, plátano, papaya, maní, limón, naranja, toronja, ají y caña. El policultivo es común. La preparación de la chacra (parcela) empieza con roce o chaqueo. Una vez seca la vegetación abatida, se quema y luego se siembra. Con los palos del desmonte se "empalea" la parcela para que no entre el ganado. Normalmente se utiliza la parcela por dos o tres años y luego se le hace descansar por cinco a 15 años.

Los ayoreos no consideran la agricultura en términos potenciales de mercado, ya que es común que después de haber invertido trabajo y dinero en sus cultivos, el ayoreo los abandone para realizar otro trabajo fuera del área (Heijdra, 1997). La mayoría de sus cultivos son cosechados con fines subsistencia, con excepción de las comunidades de Santiago y Santa Teresita donde el maíz y el arroz además de ser consumidos, tienen un fin comercial (CUMAT, 1990). Cultivos como el guineo, plátano y "hualele" tienen un consumo significativo. Dentro de la comunidad se vende yuca, camote, sandía y otros. Aparte del maíz y el poroto (frijol) que se conservan secos, los demás son consumidos poco después de ser cosechados, una excepción es el zapallo que puede conservarse mediante la desecación a fuego lento. La sandía, "joco" y zapallo son productos típicos para el primer año, mientras que la yuca, camote, papaya, guineo, plátano y "hualele" se siembran en chacos viejos (Heijdra, 1987). Las parcelas se siembran en diferentes partes, minimizando así el riesgo de las inundaciones, la sequía y la entrada del ganado.

### 2.3.2 Sistema Pecuario

La Misión Sur Americana (MSA) introdujo la cría de ganado porcino y gallinas entre los ayoreos. La intención final era la de sembrar pasto en las parcelas después de dos o tres años de producción, e introducir poco a poco el ganado vacuno (Heijdra, 1997). La ganadería requiere permanencia en la comunidad por lo que los ayoreos hasta el momento no han logrado mantener ganado por tiempos prolongados. Por otro lado, la ganadería es la actividad económica más importante en la zona y como actividad complementaria a la agricultura cumple la función de

seguro de contratiempos. Los ayoreos están concientes de ésto y en varias comunidades se ven esfuerzos para reintroducir la ganadería (Heijdra, 1997).

### 2.3.3 Otras Actividades Productivas

**Recolección.** Los ayoreos recolectan miel de unas 15 especies de abejas. Recogen el polen, también las larvas, las pupas y la cera. Los hombres se dedican a cosechar la miel. La recolección de los vegetales es tarea prevalentemente femenina.

**Caza.** Además de su importancia alimenticia, la caza es una manera de obtener dinero. Los ayoreos limitan su consumo de vertebrados al oso hormiguero, al tatú y al pecarí, y a tortugas terrestres. El tapir les provee de cuero para fabricar las "abarcas"; el tigre, el mono aullador, el gato onza y otros mamíferos les proporcionan la piel con la que fabrican el "ayói" o adorno tradicional para la cabeza en forma de gorro. De algunos roedores, así como del pecarí, se utilizan los dientes para elaborar instrumentos cortantes para trabajar la madera (Bórmida y Califano, 1978).

**Pesca.** La pesca es esporádica. Consumen principalmente 10 especies, entre las cuales las más importantes son: el ventón, el bagre, el cayd y dos clases de anguila. Los hombres entran al agua, juntan los peces y luego los agarran con canastas.

**Recursos Forestales.** Algunas familias ayoreas reciben ingresos por la venta de postes y estacas de madera. La madera es propiedad de la comunidad. Hay convenios comunales para pagar "impuestos" a la caja comunal si un individuo quiere vender estacas o postes. Actualmente solo Zapocó tiene suficiente superficie para generar ingresos anuales considerables sin poner en peligro el futuro del bosque. Los ayoreos también extraen leña de los bosques para el uso propio y materiales de construcción (Heijdra 1997).

## 2.4 Sistema Productivo Chiquitano

### 2.4.1 Agricultura

El sistema agrícola chiquitano se basa en:

- El corte y quema con períodos de uso intensivo, extensivo y de descanso;
- El manejo de chacos pequeños, dispersos, la diversificación y la asociación de cultivos para evitar el riesgo de sequías y plagas.
- El intercambio de la semilla entre familias; y
- El control comunal sobre la tierra.

Además de la rotación, los chiquitanos hacen siembras asociadas de distintos cultivos en la misma parcela.

En la Sección Municipal de San José, los agricultores a nivel comercial utilizan maquinarias que causan erosión del suelo. La agricultura de los pequeños productores que utilizan el "chaqueo", degrada menos a los suelos, ya que el área cultivada es mucho menor (Municipio San José, 1995).

### 2.4.2 Sistema Pecuario

Muchos chiquitanos no tienen ganado vacuno y algunos tienen pocas cabezas. En algunos sectores, como San José y San Ignacio, se ha empezado a introducir "módulos ganaderos" por parte de PRODESA y PLADERVE, pero hasta ahora no han logrado un impacto significativo.

Aproximadamente un 10% de los porcinos y un 60% de la producción de aves está destinado al autoconsumo. El resto se vende principalmente en las mismas comunidades.

### 2.4.3 Otras Actividades Productivas

**Pesca.** La pesca es la actividad más importante después de la agricultura.

**Caza.** La caza sigue siendo importante. En las últimas décadas, la destrucción del bosque redujo la caza. Las comunidades quedaron encerradas en medio de propiedades ganaderas, las empresas madereras saquearon el bosque y la construcción de carreteras permitió la expansión de la ganadería.

**Recolección.** La riqueza del bosque con variedades de hierbas, frutos, raíces, hojas y cáscaras es aprovechada junto con los animales silvestres por la medicina tradicional y complementación de la dieta familiar (Riester, 1976). Existen por lo menos 25 especies de abejas y avispa silvestres, cuya miel ha sido tradicionalmente aprovechada por los chiquitanos. Además producen miel de abejas domésticas (Schwarz, 1994).

**Recursos Forestales.** El bosque chiquitano está interrumpido por sabanas y terrenos en barbecho. Los chiquitanos explotan las islas del bosque para la agricultura, la madera y la ganadería. Por todo ello, es sobre todo el bosque secundario que cubre una buena parte de la región y donde, en general, están presentes las mismas especies, pero más pequeñas que en bosque primario. Los chiquitanos usan ciertas especies como: el cuchi, jichituriqui, verdolago, cuta, y curupaú, para la construcción (Municipio San José, 1995). Tradicionalmente el bosque sustentaba, exclusivamente la demanda de las comunidades chiquitanas. Con la penetración de los aserraderos y la dotación de concesiones forestales por el Centro de Desarrollo Forestal (CDF) a empresas madereras, se introdujo la comercialización de la madera. El diagnóstico sobre la economía chiquitana es el siguiente (Schwarz, 1994):

"La agricultura y la ganadería se expanden irracional y desequilibradamente agotando la reserva espacial, compitiendo cada vez más con la caza y la explotación sostenida de los recursos forestales. La pesca, la caza y la recolección están en recesión dándose cada vez menos acceso al agua y el bosque. La explotación del bosque es irracional y

desequilibrada deteriorándose el monte. Debido al deterioro de los recursos naturales, los chiquitanos venden su mano de obra, sobre todo en los meses secos (junio a agosto) que son los meses de chequeo".

### **3.0 TENENCIA Y PROBLEMÁTICA DE LA TIERRA**

#### **3.1 Izoceños/Guaraní**

Los izoceños habitan un territorio uniforme a orillas del río Parapetí. Las mayores presiones las sufren de parte de sectores ganaderos en el norte de su territorio. Las tierras comunales están saneadas de acuerdo a la Ley de Reforma Agraria y se encuentra en tránsito para ser convertidas en TCO. Son responsables de la administración del Parque Nacional KAA-IYA Gran Chaco, que tiene más de 3.4 millones de ha. La estrategia de administración territorial de la CABI fue la de constituirse en un Distrito Municipal Indígena lo que le otorga tuición sobre un territorio más extenso.

#### **3.2 Chiquitanos**

Las comunidades chiquitanas en el área de influencia del Proyecto, con o sin dotaciones de tierra legalmente respaldadas, se encuentran dispersas y rodeadas de propiedades ganaderas. En pocas partes existe una forma de contigüidad de propiedades comunales, como en el caso de Lomerío, lo cual es una excepción. Existen varias propuestas de parte de las organizaciones chiquitanas para consolidar territorios más amplios y contiguos. Las más importantes son la propuesta de TCO para definir 293.000 ha en Lomerío como territorio indígena y la propuesta de las organizaciones de Concepción y San Javier para consolidar un área de 1.161.559 ha en la zona norte, conocida como Monte Verde, pero éstas se encuentran fuera del ámbito de influencia del proyecto.

### 3.3 Ayoreos

Hasta principios de la década de 1980, los alrededores de los territorios ayoreos se encontraban baldíos y libres de explotación, pudiendo los ayoreos aprovechar los recursos de un área más amplia para sus actividades de caza y recolección. Pero a partir del año 1980, al producirse la expansión de la frontera agrícola en la zona, las comunidades ayoreas han visto cada vez más limitadas sus posibilidades de acceso a estos amplios territorios y sus recursos forestales de flora y de fauna. La expansión y pérdida de tierras fue más drástica en la zona oeste del territorio colindante con la expansión de la frontera de la soya y donde se ubican los territorios más fértiles.

En 1987, en su afán por consolidar los últimos terrenos baldíos en la zona de expansión agrícola, un grupo de ayoreos de Poza Verde y Puesto Paz, se asentaron al sur de la última colonia menonita y así fundaron la comunidad de Guidai Ichai ("campamento nuevo"). En 1989, con apoyo de la CIDOB y las ONGs, APCOB y CEJIS, la recién formada organización intercomunal de los ayoreos, CANOB, inició un trámite legal ante la oficina de Reforma Agraria solicitando el reconocimiento de una superficie de 25.000 ha para los ayoreos de la zona. Durante el tiempo de la preparación y ejecución del Componente Indígena del Proyecto Tierras Bajas del Este, esta solicitud y los innumerables problemas que surgieron a raíz de ella, fueron una muestra de enorme discrepancia entre el discurso oficial y la cruda realidad de la consolidación de tierras indígenas. Cinco años después de haber iniciado la solicitud, casi toda el área ha quedado en manos de grandes agricultores y colonizadores menonitas, que han desmontado gran parte del área. Los ayoreos de Guidai Ichai han quedado con una franja de 7 km por 1 km, es decir, con 700 ha, y ni siquiera tienen títulos legales de ésta propiedad.

En forma global las comunidades ayoreas se pueden agrupar en tres niveles:

- Las comunidades de la zona oeste, actualmente zona productiva para la agro-exportación (Pailón): Las comunidades de Poza Verde y "Guidai Ichai".

- Las comunidades que se encuentran en zonas más o menos aisladas y a una distancia considerable de otros poblados: Zapocó (en el norte), Tobité y Santa Teresita (este-central), y Rincón del Tigre (en el extremo este).
- Las comunidades representadas por barrios de poblados no-ayoreos ubicados a lo largo de la línea férrea Santa Cruz-Corumbá son: Urucú (en Roboré), Motacucito (en Motacú, cerca a Puerto Suárez, y El Carmen en El Carmen Rivero Torres (Heijdra 1997).

En estas comunidades existen cuatro demandas de TCOs presentadas al gobierno boliviano, dos en el área del proyecto: Santa Teresita por 48.736 ha y Tobité por 20.374 ha además de las dos fuera del área: Rincón del Tigre, por 99.288 ha y Zapocó por 29.061 ha.

La situación legal de las tierras indígenas en el área cubierta por el PDPI se resume en la siguiente tabla y en el Apéndice D:

Resumen de la Situación Legal de la Tenencia de la Tierra

Nombre de la Comunidad	Hectáreas Tituladas	Hectáreas en Trámite
Izoceño/Guaraní	46.716	12.044
Chiquitanas:		
San José	48.870	N/D
Roboré	N/D	N/D
Germán Busch	N/D	N/D
Ayoreas	19.687	600
<b>Total</b>	<b>115.273</b>	<b>12.644</b>

N/D - No Disponible



## 4.0 ORGANIZACIONES INDIGENAS

### 4.1 Confederación de Pueblos Indígenas de Bolivia Fortalecidos en la Unidad (CIDOB)

La CIDOB fue creada en 1982 como la "Central de Pueblos y Comunidades del Oriente Boliviano", conformada por los pueblos indígenas guaraní, chiquitano, guarayo y ayoreo. Todos ellos están en el Departamento de Santa Cruz. En 1989 la CIDOB pasó a ser una organización que toma la representatividad de todos los pueblos indígenas del Oriente y la Amazonía boliviana. En este proceso, la CIDOB mantiene las mismas siglas pero cambia su significado por "Confederación de Pueblos Indígenas de Bolivia Fortalecidos en la Unidad". La CIDOB es la organización de pueblos indígenas de más alto nivel en Bolivia. En esta organización están representadas las organizaciones de pueblos indígenas como: CIRABO, CPIB, y CPESC, entre otras.

### 4.2 Coordinadora de los Pueblos Etnicos de Santa Cruz (CPESC)

Como resultado de la transformación de la CIDOB en una organización nacional, los pueblos indígenas del Departamento de Santa Cruz crearon en el año 1994 la "Coordinadora de los Pueblos Etnicos de Santa Cruz". En esta organización, están representadas las organizaciones indígenas como: OICH, CANOB, COPNAG y APG. Cada una de estas organizaciones representa a varias otras de menor nivel, por ejemplo:

- OICH representa a CICOL, CICC, CIPSJ, CICHAR, MINGA, CIRPAS, CICH-T, CCISM;
- APG representa a CABI, Kaipipendi-Karabaicho y Kaami;
- CANOB representa a 12 consejos comunales de las comunidades ayoreas;

- COPNAG representa a seis centrales de pueblos guarayos (Urubichá, Salvatierra, Ascención, San Pablo, Yagurú y Yotaú).

#### 4.2.1 Organización Indígena Izoceño/Guaraní

La Capitanía del Alto y Bajo Izozog (CABI) es una organización de base conformada por las Autoridades Originarias del Izozog, reconocida por el Estado como autoridad política y administrativa del pueblo Izoceño/Guaraní. CABI tiene personería jurídica y representa a 23 comunidades izoceñas-guaraní ubicadas en la cuenca del Río Parapetí.

La organización política de los izoceños se basa en el sistema tradicional guaraní de las capitanías, cuyo jefe político es el "Mburuvixa-guásu" o Gran Capitán. CABI es una de las organizaciones indígenas más fuertes del oriente boliviano y tiene su brazo ejecutivo y técnico en la Fundación Ìwì-Iyambae, que cumple funciones en beneficio de las comunidades y tiene personería jurídica. Cada una de las 23 comunidades tiene su capitán; los capitanes reunidos conforman la Asamblea del Alto y Bajo Izozog.

El concepto de autoridad se ha transformado en la historia y el Capitán Grande, más que cualquier autoridad local, tiene que moverse entre el mundo guaraní y el mundo de los "karaí" o blancos, que incluye el sistema estatal. Sin embargo, dentro de la comunidad, la asamblea de comunidades y sus respectivos capitanes es la máxima autoridad.

#### 4.2.2 Organización Indígena Chiquitana

La Organización Indígena Chiquitana, fue creada en 1995 a nivel departamental. Aglutina a ocho organizaciones intercomunales de base: CICOL, CICC y CIPSJ en la provincia Ñuflo de Chávez; CIRPAS en la provincia Angel Sandoval; CICHAR y CCICH-T en la provincia Chiquitos; MINGA y CCISM en la provincia Velasco, Amanecer-Roboré, Surcos-San Matías y Turubó-San José.

Durante la época de las reducciones jesuitas (1692-1767; ver Thiele y Nostas, 1994) la organización social y política de cada pueblo era el cabildo. Luego de la crisis de la misión, en el proceso de desplazamiento desde los pueblos al área rural, se formaron las comunidades, que hasta hoy mantienen relación con el pueblo no sólo para fines de servicios o de intercambio comercial, sino por razones religioso-festivas. Actualmente hay diferentes organizaciones: grupos de productores, de padres de familia, de mujeres, y de jóvenes, entre otros. La articulación de la comunidad con las instancias oficiales se da a través del alcalde político, que es nombrado por el subprefecto. En las cinco provincias con población chiquitana, las siguientes organizaciones, asociadas a la CIDOB, representan a las comunidades:

- Central Intercomunal de Concepción (CICC);
- Central Intercomunal de Lomerío (CICOL);
- Asociación Campesina Paiconeca, San Javier (ACP-SJ);
- Asociación de Grupos Mancomunados de Trabajo (MINGA), Provincia Velasco;
- Asociación de Grupos Mancomunados de Trabajo (TURUBÓ), San José;
- AMANECER, Roboré;
- SURCOS, San Matías.

En los últimos años, hubo una gran expansión de la frontera agrícola con cultivos como la soya con capitales extranjeros, principalmente de menonitas y brasileños, la cual ha provocado flujos de migración y el despojo de la mayoría de los chiquitanos de su territorio. Otros procesos asociados son:

- Migración por falta de tierra y recursos naturales;
- Desvirtuación del sistema ritual autóctono;
- Transculturación (afectando sobre todo el idioma);
- Explotación económica;
- Desarticulación del sistema productivo;

En los últimos años surgieron nuevas autoridades que representan al Estado, que normalmente son elegidos por los comunarios. En San José, élites cruceñas expropiaron el territorio chiquitano. Los chiquitanos se trasladaron a las orillas del ferrocarril y las carreteras, desarticulando su identidad étnica, minando la cohesión y la solidaridad de las sociedades regionales y debilitando sus organizaciones políticas.

#### 4.2.3 Organización Indígena Ayorea

Luego de un proceso lento y frágil de organización, que empezó en 1987, los ayoreos se han organizado en la Central de Ayoreos Nativos del Oriente Boliviano (CANOB) que está afiliada a la CIDOB. Esta organización representa a 11 comunidades indígenas ubicadas en su mayor parte al sur-este del Departamento de Santa Cruz.

La sociedad ayorea tradicionalmente se fundó en la institución llamada *hogasui*, que era la familia extensiva, cuya figura principal era el *asuté* (jefe). El *asuté*, quien tenía la función de sostener y defender el conjunto del *hogasui* (Bórmida y Califano, 1978), merecía el reconocimiento de su pueblo por su valentía en la caza o la guerra (Heijdra, 1997). La autoridad de los ayoreos estaba dividida entre el poder político del *asuté* o jefe y la influencia religiosa que los chamanes o *daihsnáí* ejercían sobre la comunidad. Hay que aclarar que en un *gidái* (campamento) no existía un solo *asuté*, sino varios de diferente importancia. Aunque los *asuté* tenían influencia en las decisiones del grupo, ellos siempre requerían del consenso general. Hasta ahora no hay entre los ayoreos un consejo formalizado que decida acerca de las actividades o destinos del *gidái*. Lo único que existe es la consulta informal entre los individuos de mayor prestigio, hecho relacionado a menudo con el estado de *asuté* o con la edad.

Los ayoreos se integraron a la sociedad nacional a través del trabajo de misioneros católicos y evangélicos. En los primeros años de las misiones (década de los 1950), sus jefes (*asutés*) conservaron su influencia sobre la comunidad, pero el proceso de formación de los "nuevos líderes" fue estimulado por política de las misiones. Al principio, las misiones tenían suficiente trabajo y contrataban a los ayoreos como peones, pero después las misiones no podían ofrecer

suficiente trabajo. Entonces, algunos ayoreos (especialmente los jóvenes) buscaron trabajos asalariados y muchas formas de organización perdieron su razón de existencia. Las personas que podían solucionar los nuevos problemas y dar una garantía en la nueva situación eran los misioneros y aquellos indígenas que se habían integrado más a la sociedad nacional. Las salidas a trabajar y el papel de contratista en la zafra y el corte de madera de los "hombres fuertes" han dado como resultado un sistema de clientismo.

## 5.0 LEGISLACION APLICABLE A LOS PUEBLOS INDIGENAS

La legislación internacional relativa a los pueblos nativos está dada por el Convenio 169 de la OIT sobre Pueblos Indígenas y Tribales en Países Independientes, suscrito en 1989 y ratificado por Ley 1257 en 1991.

La base legal para el plan de desarrollo de los pueblos indígenas a nivel nacional está establecida fundamentalmente en la Constitución Política del Estado vigente y la Ley del Servicio Nacional de Reforma Agraria (INRA). Sin embargo, otros instrumentos legales que son relativos a los pueblos indígenas están asociados con las áreas protegidas, parques nacionales, medio ambiente, la vida silvestre y forestación.

### 5.1 Constitución Política del Estado

Artículo. 1º: Se reconoce a Bolivia como un país multiétnico y pluricultural.

Artículo 96: Atribuciones al Presidente de la República: Autoridad máxima del Instituto Nacional de Reforma Agraria (INRA). Otorgar títulos ejecutoriales de acuerdo a la redistribución de tierras conforme a la Ley de Reforma Agraria y Colonización.

Artículo 136: Son de dominio originario del Estado el suelo y el subsuelo con todas sus riquezas naturales.

### 5.2 Régimen Agrario y Campesino, Título Tercero

Artículos 165 al 176 establecen que:

Las tierras son de dominio originario de la nación y que corresponde al estado la distribución, reagrupamiento y redistribución de la propiedad agraria conforme a las necesidades económico - sociales y de desarrollo rural.

- El trabajo es la fuente fundamental para la adquisición y conservación de la propiedad agraria y se establece el derecho del campesino a la dotación de tierras.

El Estado no reconoce el latifundio. Se garantiza la existencia de las propiedades comunitarias, cooperativas y privadas.

- El Estado reconoce y garantiza la existencia de las organizaciones sindicales campesinas.

El INRA tiene jurisdicción en todo el territorio de la República. Los TÍTULOS EJECUTORIALES son definitivos, causan ESTADO y no admiten ulterior recurso, estableciendo perfecto y pleno derecho de propiedad para su inscripción definitiva en el Registro de Derechos Reales.

- No corresponde a la Justicia Ordinaria revisar, modificar y menos anular las decisiones de la Judicatura Agraria, cuyos fallos constituyen verdades jurídicas, comprobadas, cambiables y definitivas.

### **5.3 Ley No. 1715 - Instituto Nacional de Reforma Agraria (INRA) del 18 de octubre de 1996.**

La Ley INRA tiene por objeto, entre otros, establecer el régimen de distribución de tierras; garantizar el derecho propietario sobre la tierra y regular el saneamiento de la propiedad agraria.

- Se garantiza la existencia de las propiedades comunarias, los derechos de los pueblos y comunidades indígenas y originarias sobre sus tierras. La distribución y redistribución para el uso y aprovechamiento individual y familiar al interior de la tierras comunarias de origen y comunales tituladas colectivamente se regirán por las reglas de la comunidad. Igualmente se garantizan los derechos de las comunidades campesinas y pueblos indígenas sobre la tierra, respetando sus usos y costumbres.

En la aplicación de las leyes agrarias y sus reglamentos, en relación a los pueblos indígenas y originarios, deberá considerarse sus costumbres o derecho consuetudinario, siempre que no sean incompatibles con el sistema jurídico nacional.

- Dota de nuevas tierras a título gratuito a las comunidades indígenas y campesinas.

Respetar la función social de las tierras, el solar campesino, la pequeña propiedad, las tierras comunarias de origen, que son no embargables, indivisibles, y por tanto no pueden ser revertidas.

Establece la titulación de las tierras comunarias de origen.

#### 5.4 Código Civil del 2 de Abril de 1976

El Código Civil Boliviano establece que:

El régimen jurídico en lo referente a la propiedad es bastante claro y que la propiedad privada es susceptible de ser enajenada y puede sufrir modificaciones, por lo que el carácter de "imprescriptible, intangible e inalienable", se refiere únicamente al área en su globalidad y no así a sectores delimitados como propiedades privadas en el interior de las mismas.



- Los derechos sobre la tierra y la reglamentación de actividades permitidas y prohibidas dentro de las áreas protegidas no presentan normas claras ni coherentes. En general el tema de tenencia de la tierra es tratado de manera muy superficial.

### 5.5 La Propiedad Agraria, Capítulo VII. Arts. 210 - 215

Los artículos 210 a 215 de este capítulo se refieren a:

- Dominio originario de las tierras y facultad de distribución.
- Modos de adquirir la propiedad agraria.
- Conservación de la propiedad agraria.
- No se reconoce el latifundio ni el minifundio.

Prohibición de explotar la tierra indirectamente. La propiedad agraria se rige por las leyes especiales que le conciernen.

### 5.6 Ley No. 1257 del 11 de julio de 1991

Esta ley ratifica el Convenio 169 de la Organización Internacional del Trabajo sobre Pueblos Indígenas y Tribales en la que:

- Se otorgan garantías constitucionales a los pueblos indígenas concernientes a contar con su propio territorio, gobierno interno, manejo y administración de sus recursos naturales, empleo y educación y salud.
- La utilización del término *pueblos* en este Convenio, no deberá interpretarse en el sentido de que tenga implicación alguna en lo que atañe a los derechos que pueda conferirse a dicho término en el derecho internacional (Art. 1 inciso 3).

La definición de pueblos en el Convenio 169, está subdividida en dos categorías: tribales e indígenas. Sobre éstos últimos se observa lo siguiente:

- Considerados indígenas por el hecho de descender de poblaciones que habitaban en el país o en una región geográfica a la que pertenece al país en la época de la conquista o colonización o del establecimiento de las actuales fronteras estatales y que, cualquiera que sea su situación jurídica, conservan todas sus propias instituciones sociales, económicas, culturales y políticas o parte de ellas.
- Muchas de las disposiciones del convenio de la OIT están concebidas en la forma de obligación para los Estados miembros. Por ello deben, por ejemplo, desarrollar un sistema a favor de los pueblos indígenas, y con la participación de éstos, para proteger sus derechos. Por lo cual, la legislación confiere los mismos derechos y posibilidades a los indígenas que a los otros ciudadanos, haciéndose efectivos sus derechos sociales, económicos y culturales. Asimismo, en la aplicación de las disposiciones del Convenio, los Estados también deben asegurar la participación y consulta de los pueblos indígenas.

#### **5.7 Ley de Vida Silvestre Parques Nacionales Caza y Pesca. Decreto Ley N° 12301**

La Ley de Vida Silvestre contiene normas generales y con diferentes grados de detalle para la protección, investigación y aprovechamiento de la fauna silvestre; entre ellos tenemos:

- El derecho de caza doméstica establecido para fines de subsistencia de las tribus nativas y pobladoras permanentes. Por el contrario, en el caso de los colonizadores y los contratos temporales de las empresas de cualquier índole, la caza doméstica deberá ser reglamentada y requiere de licencias respectivas.

La declaración de una región como parque nacional o reserva equivalente corresponde al Ministerio de Asuntos Campesinos y Agropecuarios, previo el estudio e informes del Centro de Desarrollo Forestal.

- No podrá reducirse la extensión de los parques, reservas, refugios y santuarios o destinarse parte de ellos para fines distintos a los establecidos en su declaratoria sin previa aprobación de la autoridad competente.

En los parques, reservas, refugios o santuarios de vida silvestre, no podrán realizarse actividades que vayan contra los fines para los cuales fueron creados, ni podrán ser colonizados o fragmentados conforme a lo que determine el reglamento de esa ley y demás disposiciones legales.

#### **5.8 Ley Forestal N° 1700 del 12 de julio de 1996**

Esta ley tiene por objeto normar la utilización sostenible y la protección de los bosques y tierras forestales en beneficio de las generaciones actuales y futuras, armonizando el interés social económico y ecológico del país. Esta ley:

- Autoriza el aprovechamiento de tierras de propiedad privada y de tierras comunitarias de origen.
- Garantiza a los pueblos indígenas la exclusividad en el aprovechamiento forestal en las tierras comunitarias de origen debidamente reconocidas de acuerdo al artículo 171 de la Constitución Política del Estado y a la Ley No. 169 de la Organización Internacional del Trabajo. El área intervenida anualmente está sujeta a pago de la patente de aprovechamiento forestal mínima. Son aplicables a estas autorizaciones las normas establecidas en el párrafo IV del artículo anterior.

- No requiere autorización previa el derecho al uso tradicional y doméstico, con fines de subsistencia, de los recursos forestales por parte de las poblaciones rurales en las áreas que ocupan, así como de los pueblos indígenas dentro de sus tierras forestales comunitarias de origen. Asimismo se garantiza a los propietarios este derecho dentro de su propiedad para fines no comerciales. La reglamentación determinará los recursos de protección contra el abuso de este derecho.

### **5.9 Ley del Medio Ambiente N° 1333 del 27 de abril de 1992**

La presente ley tiene por objeto la protección y conservación del medio ambiente y los recursos naturales, controlando las acciones del hombre con relación a la naturaleza y promoviendo el desarrollo sostenible con la finalidad de mejorar la calidad de vida de la región.

Esta es una ley marco, lo cual significa que contiene principios y disposiciones generales que deben ser detallados en una reglamentación y en otras leyes más específicas. Este marco legal era muy necesario en el campo de los asuntos medioambientales, porque las normas legales relevantes actualmente están repartidas en un sinnúmero de leyes, sin que exista ningún tipo de coordinación.

Una de las bases formuladas en el contexto de la política ambiental es relevante para los indígenas en cuanto obliga a tomar en cuenta la diversidad cultural del país en la promoción del desarrollo sostenible con equidad y justicia social (Art. 5 inc. 2).

En el título sobre medio ambiente y población se prevé la participación de las comunidades tradicionales y pueblos indígenas en los procesos de desarrollo sostenible y uso racional de los recursos naturales renovables. Esta debe realizarse considerando sus particularidades sociales, económicas y culturales. Luego el Estado debe garantizar “el rescate, difusión y utilización de los conocimientos sobre uso y manejo de recursos naturales con la participación directa de las comunidades tradicionales y pueblos indígenas” (Art. 78).

Los aspectos sociales, económicos y culturales también deben ser tomados en cuenta en las normas que regularán los derechos del uso de los recursos naturales renovables, cada cual en una ley especial.

Los conocimientos de los indígenas se vuelven a tocar una vez más en la disposición que pretenden conservar las tecnologías tradicionales (Art. 85 inc. b). Con relación a la declaratoria de áreas protegidas, se establece la compatibilidad con la existencia de indígenas, considerando los objetivos de la conservación y sus planes de manejo (Art. 64). Finalmente, en el pequeño capítulo sobre flora y fauna silvestre, se menciona que el Estado promoverá programas de desarrollo para las comunidades que tradicionalmente utilizan estos recursos para su subsistencia (Art. 56).

Después de más de tres años de la aprobación de esta Ley, se han formulado varios proyectos de reglamentos. Entre éstos se encuentra el de Prevención y Control Ambiental, que incluye, entre otras cosas, procedimientos de Evaluaciones de Impacto Ambiental. En el título sobre participación ciudadana en la gestión ambiental, se incorpora la "infraestructura" que ofrece la Ley de Participación Popular. El Artículo 67 del Reglamento, por ejemplo, dice que cualquier ciudadano, a través de su Organización Territorial de Base, podrá participar en procesos de decisión, presentando iniciativas. Los gobiernos municipales tienen que cumplir las tareas de inspección y vigilancia. Los demás reglamentos contienen poca relevancia sobre los indígenas.

#### **5.10 Decreto Supremo 24122 del 21 de septiembre de 1995. Creación del Parque KAA-IYA Gran Chaco**

Se declara Parque Nacional y Área Natural de Manejo Integrado KAA-IYA ("Amos Míticos del Monte") del Gran Chaco, con una superficie de 3,4 millones de ha y conformadas por las categorías de manejo que lo componen.

Se ha comprobado la presencia de grupos familiares libres de la etnia ayorea, habitando parte del área protegida, con actividades de recolección. Es necesario preservar y garantizar la presencia y libre actividad en el régimen tradicional de este grupo indígena al interior del área protegida.

### 5.11 Otros Decretos Supremos y Resoluciones

DS: 23112 del 9 de abril de 1992.	Reconoce Territorio Indígena Chiquitano No. 1
RS: 207346 del 9 de marzo de 1990.	Reconoce la personería jurídica de la Confederación Indígena del Oriente Boliviano (CIDOB).
RS: 209300 del 20 de junio de 1991.	Autoriza la partida para la demarcación de Territorios Indígenas Multiétnicos.
RM: 071/93 de 23 de marzo de 1993.	Reconoce la Asamblea del Pueblo Guaraní (APG).
RM: 129/93 de 26 de julio de 1993.	Reconoce la Central Indígena de las Comunidades de Concepción (CICC).
RM: 134/93 de 26 de julio de 1993.	Reconoce la Central de Organizaciones de los Pueblos Nativos Guarayos (COPNAG)
RM: 135/93 de 26 de julio de 1993.	Reconoce a la Central Ayoreo Nativa del Oriente Boliviano (CANOB).

En cada uno de estos decretos supremos resoluciones supremas y resoluciones ministeriales se conceden determinadas áreas a grupos indígenas, con una gran variedad en el contenido de disposiciones sobre propiedad de la tierra, aprovechamiento de los recursos naturales y prohibiciones o derechos de terceros.

Muchos territorios han sido reconocidos en propiedades agrarias ya dotadas a los mismos indígenas, y han sido delimitados como áreas con límites externos de las mismas propiedades, pero con propiedades y concesiones de otras personas más. Un ejemplo es el Territorio Chiquitano N°1 donde la mencionada circunscripción territorial ha causado graves problemas.

El significado del término "territorio" en los decretos supremos corresponde a la definición usada en la Resolución Suprema 205862. A pesar de que esta resolución fue dictada para la situación concreta de los chimanes (en el Departamento de Beni), y debe su fama a la declaración, por primera vez, de la necesidad nacional y social del "reconocimiento, asignación y tenencia de áreas territoriales en favor de grupos selvícolas y comunidades originarias del Oriente y la Amazonía boliviana" (Art. 1 R.S.). De acuerdo a la terminología, que se emplea en esta resolución suprema, se considera un espacio socioeconómico indígena:

"Una determinada área geográfica, tradicionalmente ocupada y poseída por los grupos étnicos originarios, que constituya un factor básico para su sobrevivencia y desarrollo económico, social y cultural, tomando en cuenta sus patrones tradicionales de asentamiento y sus propios sistemas productivos, y en el que realicen actividades de aprovechamiento integral de los recursos naturales, manteniendo el equilibrio de la naturaleza y conservando sus ecosistemas" (Art. 3 R.S.).

Para que los pueblos indígenas puedan defender los recursos naturales renovables dentro de sus territorios, se creó una Guardia Forestal Indígena, (en vez de un decreto de 1970 que establecía un cuerpo de guardas especiales de miembros de tribus selvícolas y comunidades campesinas), en coordinación con las organizaciones indígenas con jurisdicción y competencia sobre los territorios indígenas (Art. 1 D.S. 23107). No solamente pueden hacer control y protección, sino también, en caso de infracción, sancionar e imponer multas (Art. 2 D.S. 23107).

## 6.0 INSTITUCIONES PUBLICAS Y ORGANIZACIONES NO GUBERNAMENTALES

### 6.1 Organización Estatal

La Constitución Política del Estado establece dentro el Título Segundo, Capítulo III, Régimen Interior, artículos 108 - 109 y 110 que el territorio de la República se divide políticamente en departamentos, provincias, secciones de provincias y cantones. En cada departamento, el Poder Ejecutivo está a cargo y es administrado por un Prefecto. Las provincias están a cargo de los Subprefectos y los cantones están a cargo de los Corregidores (ver Tabla No. II.3). Dentro de cada departamento existe un Consejo Departamental, el cual se encuentra presidido por el Prefecto.

**Gobierno Municipal.** El gobierno y la administración de los municipios están a cargo de los Gobiernos Municipales Autónomos y de igual jerarquía. En los cantones existen Agentes Municipales Cantonales que están bajo la supervisión y el control del Gobierno Municipal de su jurisdicción. El Gobierno Municipal está a cargo de un Alcalde y de un Concejo. Cada Municipio tiene una jurisdicción territorial continua determinada por ley. La jurisdicción territorial de los Gobiernos Municipales es la Sección de Provincia. Existe un solo Gobierno Municipal en cada Sección de Provincia. La jurisdicción Municipal en las capitales de Departamentos, corresponde a su respectiva Sección de Provincia.

**Agentes Municipales Cantonales y Sub-Alcaldes.** Los Agentes Municipales Cantonales, miembros de la comunidad y residentes de lugar, tienen las siguientes atribuciones:

- Apoyar a las Organizaciones Territoriales de Base del Cantón, rurales y urbanas, en el ejercicio de los derechos y deberes establecidos en la presente Ley.
- Ejercer las funciones delegadas por el Alcalde Municipal a nivel del Cantón.



- Responder a la demanda y control de las Organizaciones Territoriales de Base del Cantón de conformidad con los derechos y deberes que les reconoce la presente Ley.

Los sub-alcaldes urbanos son designados por el Alcalde Municipal como responsables administrativos del Distrito que se les asigne y deben ser residentes de este Distrito. En los lugares que exista una unidad geográfica socio-cultural, productiva o económica, menor o mayor a un Cantón, el Gobierno Municipal aprobará la creación de un Distrito Municipal y la designación de un sub-alcalde. Dentro del Municipio de Charagua, el primer Distrito Municipal Indígena en Bolivia fue el Territorio del Alto y Bajo Izozog creado mediante la Ley 1551 ordenanza municipal 011/94 del 26 de julio de 1994, decreto supremo 22124 del 23 de septiembre de 1995, mediante el cual se constituye la jurisdicción territorial del Alto y Bajo Izozog como área de posesión, disfrute y control de la sub-alcaldía.

**Organizaciones Territoriales de Base (OTB).** Las OTBs son producto de la nueva Ley de Participación Popular y están expresadas en las comunidades campesinas, pueblos indígenas y juntas vecinales, organizadas según sus usos, costumbres o disposiciones estatutarias. Sus representantes son hombres, mujeres, capitanes, jilacatas, curacas, mallcus, secretarios generales y otros, designados según sus usos, costumbres y disposiciones estatutarias. Se reconoce personalidad jurídica a las OTBs que representen a toda la población urbana o rural de un determinado territorio, correspondiente en el área urbana a los barrios determinados por los Gobiernos Municipales y en el área rural a las comunidades existentes. Esta personalidad jurídica otorga capacidad legal a sus titulares para ser sujetos de los derechos y obligaciones emergentes de todos los actos civiles definidos por el ordenamiento jurídico nacional.

## 6.2 Organismos Gubernamentales

Los Organismos Gubernamentales más importantes descentralizadas y/o dependientes directos que desarrollan sus acciones en el área del PDPI, son las siguientes:

**Centro de Investigación Agrícola Tropical (CIAT).** Institución técnica agropecuaria autónoma y semiautárquica. Su ámbito de acción es el universo rural del departamento de Santa Cruz. Su objetivo es el de desarrollar y validar tecnologías y difundir las mismas a los productores a través de organismos que realizan investigación en las zonas rurales, a través de los CRI (Centros Regionales de Investigación).

**Universidad Autónoma Gabriel René Moreno (UAGRM).** Provee apoyo técnico, investigación, capacitación y formación, en desarrollo ambiental y manejo sostenible de los recursos, a través de sus labores académicas.

**Instituto Geográfico Militar (IGM).** Institución del Estado responsable de las cartografía a nivel nacional. Tienen personal especializado, de instrumentos y equipos de geodesia, fotogrametría, cartografía, laboratorios y artes gráficas. Las operaciones que realiza el IGM son de campo y de gabinete. Desarrolla actividades vinculadas a la evaluación de recursos naturales a través de mapas temáticos con distintos propósitos tales como: uso del suelo, edafológicos, uso potencial de la tierra, geomorfológicos, hidrográficos y otros; catastro nacional a nivel urbano y rural y reproducciones cartográficas a diferentes escalas que permiten conocer medidas de terrenos, distancias aéreas, desniveles y pendientes, rasgos naturales y culturales de cada zona geográfica que enmarcan cada mapa y/o carta.

**Centro de Desarrollo Forestal (CDF).** Se encarga de mantener en permanente estado de producción el patrimonio forestal, la caza y la pesca en todas las regiones del país y de realizar la clasificación de bosques y tierras y de racionalizar el aprovechamiento de los recursos naturales renovables; optimizando el manejo de los mismos e incentivando su conservación.

**Fondo Nacional para el Medio Ambiente (FONAMA).** Depende del Ministerio de Desarrollo Sostenible y Medio Ambiente y se encarga de organizar todas las inversiones ambientales y de administrar los fondos provenientes de diversas fuentes e integrar en su gestión a ONGs y comunidades indígenas.

**Centro de Comunicación Rural (CECOR).** Es un proyecto de FAO-Prefectura de Santa Cruz-CIAT-UNICRUZ-UAGRM, dedicado a la comunicación popular para el desarrollo. La metodología de pedagogía audiovisual que aplica le permite apoyar procesos de enseñanza-aprendizaje para adultos, hombres y mujeres, especialmente del área rural para indígenas y campesinos.

**Secretaría de Asuntos Etnicos, de Género y Generacionales del Ministerio de Desarrollo Humano.** En relación al tema de pueblos indígenas (etnias), sus objetivos generales son la formulación de políticas indígenas y la regulación de las actividades de los pueblos indígenas. Trabaja en las áreas socioeconómicas, educativa, territorial y jurídico-legal.

### 6.3 Organizaciones No Gubernamentales

Entre las de mayor relevancia para el área del PDPI, se presentan las siguientes:

**Apoyo para el Campesino Indígena del Oriente Boliviano (APCOB).** Contribuye al desarrollo socioeconómico de los pueblos indígenas, mediante la implementación de proyectos de desarrollo, asuntos de género, autogestión, manejo integral, sostenible y diversificado de los recursos naturales, consolidación de sus territorios. Su objetivo es el de fortalecer el movimiento indígena de las tierras bajas de Bolivia, apoyando los procesos organizativos comunales e intercomunales de sus pueblos y desarrollando programas acordes a sus culturas e identidad con asistencia de equipos interdisciplinarios, de investigación y asesoramiento técnico y social, por medio de publicaciones y la utilización de medios de comunicación masiva.

**Centro de Investigación y Promoción del Campesinado (CIPCA).** Apoya al campesinado para la toma de decisiones a nivel nacional, en los aspectos económicos, demográficos, históricos y culturales para lograr cambios en el modo de producción. Promueve el fortalecimiento de las organizaciones campesinas e indígenas.

**Centro de Promoción Agropecuaria Campesina (CEPAC).** Promueve al pequeño campesino agricultor como sujeto de su transformación socio-económica, fortaleciendo las organizaciones rurales. Incentiva la participación y desarrollo de la mujer y promueve la preservación de los suelos y el medio ambiente.

**Comité Interinstitucional de Capacitación Agropecuaria (CICA).** Promueve la capacitación de capacitadores y base de datos departamental y apoya la formación de mano de obra calificada del sector agropecuario.

**Fundación Amigos de la Naturaleza (FAN).** Promueve la conservación de la biodiversidad en Bolivia, la protección de los Parques Nacionales, la investigación científica, la implementación de programas, la educación ambiental y la dotación de infraestructura.

**Asociación Ecológica del Oriente (ASEO).** Promueve la conservación del medio ambiente y los recursos naturales renovables y la educación y concientización ambiental.

**Centro de Estudios Jurídicos e Investigación Social (CEJIS).** Apoya con asesoría legal a comunidades indígenas organizadas, para los trámites de titulación y solución de conflictos.

**Liga de Defensa del Medio Ambiente (LIDEMA).** Fue fundada el 26 de agosto de 1985, en la ciudad de La Paz y tiene como actividades principales la coordinación de sus 22 instituciones miembros especializadas en diferentes campos de la planificación y acción ambiental, la colaboración técnica con instituciones gubernamentales, el financiamiento internacional para la ejecución de programas y proyectos de sus instituciones miembros, estudios de investigación; diagnósticos de áreas protegidas; programas de comunicación y educación ambiental y estudios de evaluación de impacto ambiental. Su objetivo principal es contribuir a la defensa del medio ambiente y conservación de la biosfera, promoviendo el acceso equitativo de la población a una mejor calidad de vida.

Tabla II.1. Resumen socio-cultural y económico de los tres pueblos indígenas del área del PDPI

Indicadores	Grupo Indígena		
	Izoceño-Guaraníes	Chiquitanos	Ayoreos
<i>Población</i>	6.649 habitantes en 23 comunidades	4.902 habitantes en 49 comunidades ubicadas en el área de influencia del proyecto	951 habitantes en 8 comunidades ubicadas en el área de influencia del proyecto
<i>Historia</i>	Pueblo guerrero que combatió contra los incas y españoles permanentemente. No hubo misión en la época colonial y la iglesia sólo tuvo influencia a partir de la segunda mitad de este siglo.	Durante la colonia fue zona de misión de los jesuitas. Luego de su expulsión y con mayor intensidad en la república, los grupos mestizos nacionales invadieron el territorio y lo apropiaron para estancias ganaderas.	Pueblo de cazadores-recolectadores que se integró a la sociedad nacional por medio de los misioneros a partir de 1948.
<i>Organización Social</i>	Comunidades con acceso colectivo a la tierra y mecanismos de cooperación en el trabajo.	La organización tradicional comunal ha cambiado a favor de la producción individual	Acceso colectivo a la tierra basado en la familia extensa, en proceso de desestructuración.

Tabla II.1 continuación...

Indicadores	Grupo Indígena		
	Izoceño-Guaraníes	Chiquitanos	Ayoreos
<i>Estructura Política</i>	La autoridad máxima es la Asamblea comunal. Las funciones de mediación interna y relación con la sociedad nacional están en manos de los capitanes, <i>Mburuvixas</i> , de cada comunidad, aunque, en el caso del Izozog, la máxima autoridad política es el Gran Capitán, <i>Mburuvixa Guásu</i> , Bonifacio Barrientos hijo. La autoridad religiosa, de gran importancia en la toma de decisiones, es el <i>Ipaye</i> o Chamán.	Organizados en cabildos durante las misiones jesuitas, actualmente hay algunos cabildos, aunque su rol se ha reducido a aspectos festivos. Las nuevas organizaciones surgen en torno a aspectos productivos y son denominados "grupos de trabajo intercomunal" o "centrales indígenas" que en algunos casos tienen la forma moderna de los sindicatos impulsados por el MNR desde 1952.	La estructura de poder tradicional está constituida por el poder político del <i>Asute</i> (Jefe) y el poder religioso del <i>Daihsnái</i> o Chamán. Sin embargo, en las condiciones socio económicas actuales, han surgido los nuevos líderes en forma de representantes comunales o "alcaldes".
<i>Religión</i>	El máximo dios es <i>Yanderu Tumpa</i> , la Vía Lactea. Sin embargo, cada animal tiene su <i>Tumpa</i> , su dador de vida. Los <i>Kaaiya Reta</i> , son los mediadores entre la divinidad y los hombres y los que cuidan que no se sobre-explote la naturaleza y a quienes los guaraníes piden permiso para cazar o pescar.	<i>Nirri Tuúrr</i> , amo del agua, es el más importante dios, debido a la importancia de la pesca en la vida chiquitana. Su cultura tiende a lograr la regeneración de los recursos naturales. Todo lo viviente tiene su <i>Jichu</i> , dios protector a quien se debe pedir permiso para actividades como pescar o cazar.	La religión abarca la totalidad de la existencia humana y sus relaciones con el mundo y no se pueden separar de ella las relaciones económicas, productivas y sociales. Un sistema de prohibiciones, <i>puyák</i> o tabúes regula el acceso a los recursos naturales y permite una adecuación al frágil equilibrio ecológico de la zona.

Tabla II.1 continuación...

Indicadores	Grupo Indígena		
	Izoceño-Guaraníes	Chiquitanos	Ayoreos
<i>Manejo del Espacio</i>	En torno a los asentamientos permanentes a orillas de Río Parapetí donde realizan una agricultura de subsistencia y se dedican en menor escala a la ganadería extensiva, los izoceños acceden a recursos naturales del monte por medio de la recolección, la caza y la pesca.	En general viven al lado de los ríos; la pesca es importante en su economía. Están rodeados de propiedades ganaderas, que ha reducido mucho el territorio.	Tradicionalmente habitaban el campamento permanente en la época de lluvias y siembra, para recorrer el territorio el resto del año dedicado a la recolección y la caza. Actualmente, a pesar de su sedentarización, los ayoreos todavía llegan a los bañados del Izozog y Otuquis en búsqueda de recursos naturales.
<i>Sistema de Parentesco</i>	Las aldeas son dispersas, generalmente compuestas por familias extensas. Las parejas jóvenes vivían con los padres de la novia, aunque actualmente tienden a formar sus propios hogares.	Actualmente la nueva pareja va a vivir a una nueva casa.	En la familia extensiva se producen los bienes y herramientas. La nueva pareja va a vivir con los padres de la mujer. Actualmente, hay tendencia a fundar una nueva residencia para las parejas jóvenes.
<i>Calendario</i>	La cosecha del maíz marca el comienzo de una época denominada <i>mbaepiru</i> o estación seca del año. En la época de lluvias ( <i>ara ama</i> ) se siembra y al final de ella se recolectan frutas silvestres. La estación húmeda es señalada por el rebrote del algarrobo.	Un calendario lunar influye en toda la lógica reproductiva tanto a nivel humano como a nivel ecológico y del sistema productivo.	El ciclo anual se divide en <i>eápi-puyái</i> , monte o mundo <i>puyák</i> , que comprende los meses de mayo a agosto y era cuando los antiguos ayoreos cazaban y recolectaban, <i>eápi-uomí</i> , mundo libre no <i>puyák</i> , que abarca el período de siembra entre septiembre y abril.

Tabla II.1 continuación...

Indicadores	Grupo Indígena		
	Izocéño-Guaraníes	Chiquitanos	Ayoreos
<i>Estructura Económica Productiva</i>	<p>Los principales cultivos son maíz, frijol, maní, "joco" y cumanda, en menor escala arroz, cebollas, yuca. Superficie promedio 1,48 ha/flia. Cría de ganado caprino, porcino, bovino, ovino, y pocas aves de corral. Artesanías: fabricación de hamacas, bolsos, fajas, utensilios domésticos, cerámica. Recolección de plantas medicinales del monte. Limitaciones: capacitación, apoyo técnico y recursos financieros para el desarrollo de sus propuestas.</p>	<p>Cultivos: maíz, arroz, yuca, frijol, "joco", frutales (cítricos, manga, plátano). Superficie promedio 1,7 ha/flia. Ganadería bovina semi-intensiva, porcinos y aves de corral. Artesanías: confección de hamacas, tejidos, sombreros. Recolección de especies forestales para uso y venta. Limitaciones: escasa disponibilidad de tierras, capacitación, apoyo técnico y recursos financieros para el desarrollo de sus propuestas.</p>	<p>Cultivos: maíz, arroz, yuca, "joco", frijol, sandía, plátano, papaya, cítricos. Superficie promedio 0,7 ha/flia. Ganado porcino, algunos bovinos y aves de corral. Artesanías: confección de bolsos, hamacas, alfombras, plumas y semillas. Recolección de miel de abejas silvestres, frutos, especies forestales del monte para artesanías y medicinas. Limitaciones: escasa disponibilidad de tierras, capacitación, apoyo técnico y recursos financieros para el desarrollo de sus propuestas.</p>



Tabla II.2 Recursos productivos en las comunidades indígenas del PDPI

Izoceñas/Guaraní

Caza	Pesca	Recolección	Forestales	Agricultura	Ganadería	Comercialización
Chanco de monte, tatú, urina, jochi.	Sábalo, bagre, ventón, sardina.	Frutas silvestres, plantas medicinales, miel de abeja, mistol	Cupesi, guayacán, tusca, soto, mistol, curusapoi.	Maíz, yuca, camote, zapallo, cumanda, arroz.	Gallinas, caprinos, bovinos.	Maíz, hamacas, bolsas, loros.

Chiquitanas

Caza	Pesca	Recolección	Forestales	Agricultura	Ganadería	Comercialización
Urina, jochi, guaso, tatú, tejón, pejí, chanco de monte, corechi, anta, tigre, torcaz, tortuga mono, taitetú, león, pavo de monte, peta, tropero,	Sábalo, yayú, palometa real, bagre, ventón, sardina, simbado, piraña, surubí, zapato, paleta, boga, dorado.	Copaibo, pesoe, alcornoque, azucena, tipa, anacore, miel de abeja, cupesí, guayacán, guapurú.	Cuchi, cedro, verdolago, roble, cuchi, guayacán, tajibo, chituriqui, ajunau, mora, moradillo, sirori, soto, picana, paquió, curupaú, momoqui, saorico, siroli, tarara, guapurú, chuchi, cusé, motacú, guapá, palo amarillo.	Maíz, arroz, yuca, plátano, frijol, naranja, caña, guineo, maní, limón.	Gallinas, patos, porcinos, caprinos, bovinos, equinos, asinos, pavos.	Hamacas, bolsones, colchas, alforjas, canastas, tejidos de perezosos, jasayes, sombreros, mochilas, esteras, frijol, tejidos de chagua, maíz, tinajas, trabajos de mueblería,

Tabla II.2 continuación...

Ayoreas

Caza	Pesca	Recolección	Forestales	Agricultura	Ganadería	Comercialización
Chancho de monte, tatú, urina, jochi, anta, tortuga, tigre, león.	Sábalo, bagre, ventón, sardina. Yayú, surubí,.	Garabatá, papa y yuca de monte, palmito, miel y cera, frutos de cactáceas, ají, hongos, guapurú, guayabo y matico.	Cuchi, tajibo, verdolago, soto, saorico, moradillo, cedro, tarara, curupaú, cacha, mara.	Maíz, arroz, yuca, zapallo, frijol, joco, camote, plátano, maní, caña.	Gallinas, patos porcinos, bovinos, equinos y asinos.	Bolsones, flechas, arcos, hamacas, sombreros, colchas, maíz, arroz, plátano.

Fuente: Elaboración propia en base a: Bórmida, 1978; Heijdra, 1987; Riestler, 1985; Schwarz 1994.

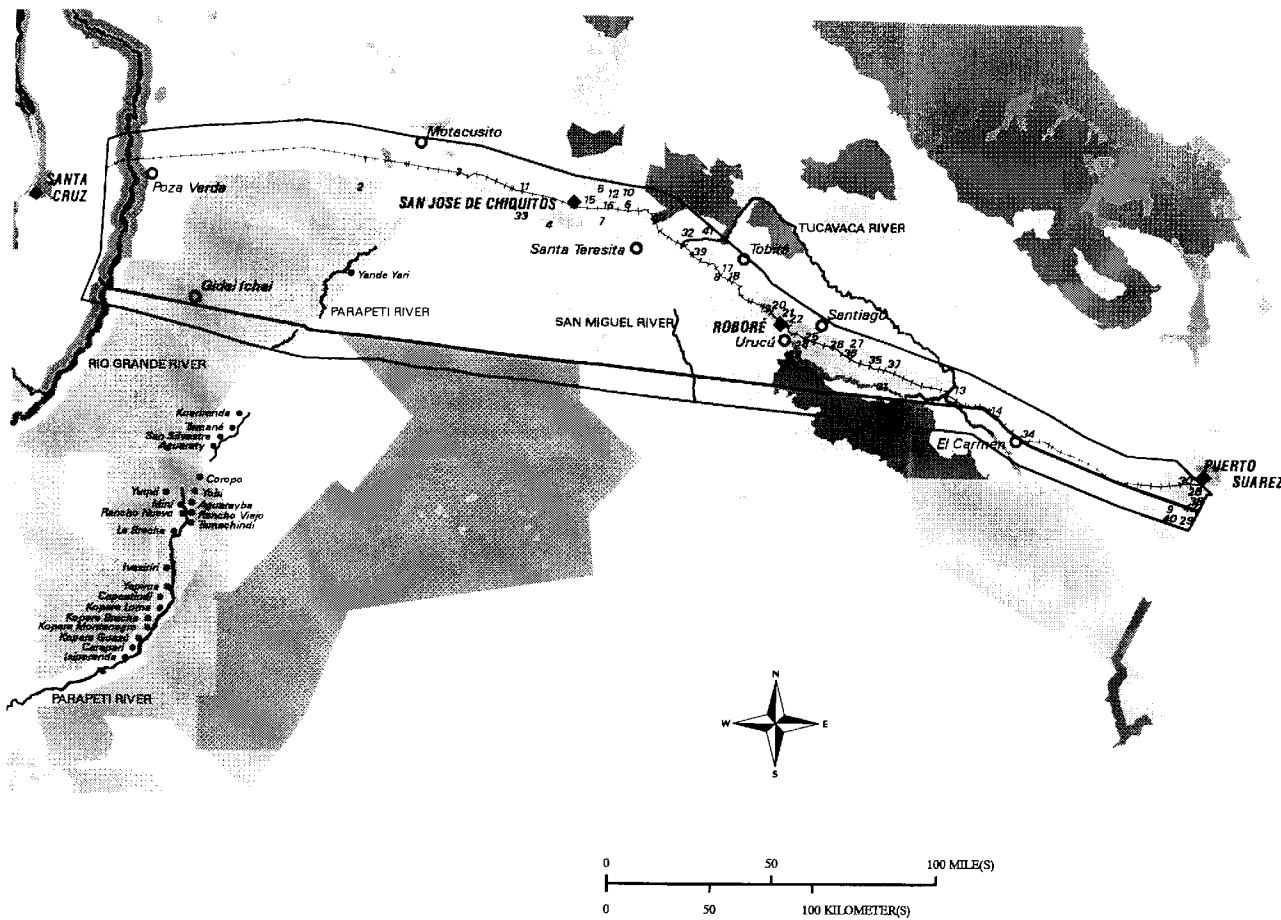
Tabla II.3. Autoridades Provinciales y Cantonales dentro del Area de Influencia del PDPI

Provincia	Sub-Prefecto	Cantón	Corregidor
Cordillera	René Hayes Villaroel	Izozog	N/D
Chiquitos	Hugo Rivero Antelo	Roboré	Juan Arteaga Gualachavo
		San José	Ignacio Céspedes
		San Juan	Miguel Bardas Mendoza
		Cerro de la Concepción	N/D
Germán Busch	Fernando Rau Flores	Puerto Suárez	Marlene Cabrera de Salvatierra
		Santa Ana	N/D

Nota: N/D= No Disponible

# Location of Indigenous Communities (and Planned Land Use)

Figure II.1



## Legend

- Integrated Management Area for the Gran Chaco National Park
- Gran Chaco National Park
- Proposed Biological Reserve in the Santiago Sierra and the Tucavacas Valley
- Intensive agriculture and livestock
- Extensive cattle ranching with forest production
- Extensive cattle ranching and protection
- Extensive cattle ranching and irrigation farming
- Agriculture with irrigation
- Extensive cattle ranching with conservation practices
- Agriculture and livestock; Conservation of Rio Grande banks
- Agroforestry and protection
- Agroforestry
- Intensive cattle ranching
- Extensive cattle ranching, animal production
- Bosque de conservación y de manejo sostenible
- Sustainable production forest, Rio Otucis
- Sustainable production forest and regulated cattle ranching
- Railroad
- Gas Pipeline
- Rivers
- Major Towns
- Study Area \*

### Chiquitano Communities

- |                  |                |                       |                             |
|------------------|----------------|-----------------------|-----------------------------|
| 1 El Cerro       | 12 Dolores     | 23 Gavetita           | 34 El Carmen Viejo          |
| 2 El Tinto       | 13 Candelaria  | 24 San Rafael         | 35 San Lorenzo Viejo        |
| 3 Quimomé        | 14 Santa Ana   | 25 Santiagoma         | 36 Aguas Calientes          |
| 4 Natividad      | 15 Cruz Blanca | 26 Yororoba           | 37 San Lorenzo Nuevo        |
| 5 Pozo del Cura  | 16 Motacusito  | 27 Quitunuquiña       | 38 El Carmen de la Frontera |
| 6 Los Siros      | 17 El Portón   | 28 San Salvador       | 39 Taperas "Los Bibosi"     |
| 7 Pororo         | 18 Chochis     | 29 San Pedrito        | 40 San Juan del Mutun       |
| 8 Motacusito     | 19 Limoncito   | 30 El Salao           | 41 Ramada "Entre Ríos"      |
| 9 Colonia Warnes | 20 Los Sotos   | 31 Potrero            | 42 El Carmen Rivero Torres  |
| 10 San Julián    | 21 San Pedro   | 32 Taperita           | 43 Taperas "Agu Brava"      |
| 11 Piococa       | 22 Cupesi      | 33 San Juan del Norte |                             |

• Izoceño Guaraní Communities

○ Ayoreo Communities

\* The study area includes 23 Izoceño Guaraní communities located along the Parapeti River

## CAPITULO III

### PROGRAMA No. 1:

### INTERACCION CON LA COMUNIDAD

#### 1.0 ANTECEDENTES

Los patrocinadores del Proyecto Gasoducto Bolivia-Brasil (Sector Boliviano) entienden que la construcción y operación del gasoducto causará efectos ambientales y socioeconómicos en su área de influencia y que las comunidades indígenas que habitan el área deben mantenerse informadas acerca del Proyecto y sus efectos. Los impactos ambientales del Proyecto se describen en detalle en el estudio de impacto ambiental (Dames & Moore, 1996).

La interacción con las comunidades indígenas que comenzó durante la elaboración del estudio de impacto ambiental continuará durante las etapas de construcción y operación del Proyecto y cumplirá con los siguientes objetivos:

1. Mantener una política de "puertas abiertas" con las comunidades.
2. Establecer una presencia física de representación del Proyecto durante la construcción en puntos geográficos accesibles a las comunidades o sus representantes.
3. Incorporar a representantes de los tres pueblos indígenas en la estructura organizativa del Plan de Desarrollo de Pueblos Indígenas (PDPI).
4. Mantener una comunicación continua acerca del progreso del Proyecto con las comunidades a través de sus representantes.
5. Informar a las comunidades, con anticipación, sobre el avance de las obras.

6. Prevenir conflictos con las comunidades y establecer mecanismos de respuesta rápida para la solución de conflictos que puedan presentarse como consecuencia del Proyecto.

El programa de interacción con la comunidad servirá como la base organizativa y operacional de todos los programas del PDPI.

## 2.0 DESCRIPCION DEL PROGRAMA

La interacción del Proyecto con las comunidades se mantendrá activa principalmente a través de la presencia de la unidad de gestión en Santa Cruz y las unidades operativas en La Brecha y San José de Chiquitos. Asimismo, las comunidades participarán en la preparación y ejecución de los programas del PDPI, de manera que la interacción con las comunidades será también participativa. El programa de interacción con la comunidad incluye tres componentes: información, resolución de conflictos y un componente de apoyo a la salud. Estos tres componentes establecen las bases de la relación del proyecto con las comunidades indígenas.

### 2.1 Información

La ejecución del proyecto traerá consigo una serie de actividades que temporalmente modificarán el ritmo de vida de algunas comunidades y áreas. Algunas de estas actividades son:

- Aumento localizado y temporal del tráfico de vehículos pesados por la carretera nacional y las carreteras de acceso al derecho de vía.
- Influjo temporal de cientos de trabajadores al área, muchos de los cuales podrán provenir de otras regiones.
- Un frente de construcción de 20 km de largo, el cual puede afectar temporalmente la movilización de indígenas a través del derecho de vía.
- En general, un aumento localizado y temporal de la actividad en el área.

El objetivo principal del componente de información será el de mantener a las comunidades al tanto del avance del Proyecto. La información será transmitida directamente desde los coordinadores a los promotores, quienes serán los responsables de diseminar la información a las comunidades a través del Comité de Gestión del Parque. Esta será una actividad continua, la cual será complementada de la siguiente manera:

1. Antes del inicio de la construcción:

- Una reunión inicial con el Comité de Gestión para dar inicio formal a las actividades del PDPI y establecer los mecanismos de interacción.
- Una reunión en La Brecha, con representantes de las comunidades izoceñas/guaraní.
- Una reunión en San José de Chiquitos, con representantes de las comunidades chiquitanas y ayoreas.
- Una reunión en Santa Cruz con dirigentes de la CABI y CIDOB.

Estas reuniones serán principalmente informativas, y proveerán una oportunidad a las comunidades indígenas para expresar cualquier preocupación adicional acerca del Proyecto.

2. Al final de la construcción, se realizarán reuniones en las tres localidades para evaluar el paso del Proyecto por la zona y cerrar oficialmente el programa de interacción con la comunidad en la etapa de construcción.
3. Preparación y distribución de folletos o cartillas informativas acerca del Proyecto y el avance de los programas del PDPI. Estos materiales se prepararán al comienzo, aproximadamente a la mitad del período de construcción, y al final de la construcción.

## 2.2 Resolución de Conflictos

Se anticipa que, mediante el componente de información de este programa, el extenso proceso de consulta llevado a cabo durante el estudio de impacto ambiental, y la ejecución simultánea de los programas del PDPI, la probabilidad de conflictos con las comunidades indígenas sea mínima. Sin embargo, conflictos entre el Proyecto y las comunidades podrían desprenderse de las siguientes fuentes, entre otras:



- Interacciones indeseables entre trabajadores del Proyecto y miembros de las comunidades indígenas.
- Actividades por parte de los trabajadores del gasoducto que atenten contra los recursos naturales en el Parque Nacional KAA-IYA Gran Chaco o en los territorios indígenas.
- Perturbación significativa de actividades productivas de las comunidades indígenas, como movilización de mercancía o actividades de cacería o recolección, como resultado de las actividades del Proyecto.

De presentarse un conflicto, la primera instancia de resolución será el diálogo directo entre representantes indígenas y los coordinadores y promotores indígenas en La Brecha o San José de Chiquitos. De ser necesario, el Gerente del PDPI en Santa Cruz intercederá por parte de los patrocinadores del proyecto.

En caso de que el conflicto no pueda ser resuelto expeditamente a esa instancia, se procederá a involucrar a un Comité de Arbitraje, formado por tres miembros: un representante del Arzobispado de Santa Cruz, un representante de CIDOB y un representante de alguna institución escogida por los promotores. Las resoluciones del Comité de Arbitraje serán inapelables. Sólo en caso de que el Comité de Arbitraje no sea suficiente para resolver el conflicto, se procederá a utilizar los canales legales ordinarios.

### **2.3 Asistencia a la Salud Pública de las Comunidades**

Se instalarán seis puestos de salud en localidades a ser determinadas en consulta con las comunidades, que cubran los requerimientos de los tres pueblos indígenas. Los puestos de salud serán equipados con medicinas y dos médicos rotatorios, equipados con vehículos 4x4, por un período de dos años. Esta actividad será coordinada estrechamente con los Directorios Locales de Salud (DILOS) en directa dependencia de los municipios provinciales, dependientes a su vez de la Dirección Departamental de Salud.

Las funciones principales de los puestos de salud serán:

1. Promover programas de medicina preventiva, incluyendo vacunaciones.
2. Llevar a cabo chequeos periódicos de miembros de la población.
3. Atender emergencias menores y tratamiento primario de enfermedades comunes.

**CAPITULO IV**  
**PROGRAMA No. 2:**  
**ASISTENCIA AL MANEJO SOSTENIBLE DE**  
**LOS RECURSOS NATURALES**

**1.0 ANTECEDENTES Y JUSTIFICACION**

Durante la elaboración del estudio de evaluación de impacto ambiental del gasoducto Bolivia-Brasil y en el taller participativo realizado en la CIDOB el 23 de mayo de 1997, representantes izoceños/Guaraní, chiquitanos y ayoreos señalaron que la necesidad más sentida de los pueblos indígenas es la demarcación y la titulación de sus territorios. También manifestaron la importancia que tiene para ellos el lograr una mejor concertación con las instancias públicas y privadas para mejorar la administración y aprovechamiento sostenible de los recursos naturales en sus territorios. Finalmente, plantearon la necesidad de contar con apoyo técnico y financiero para lograr sus metas.

La CIDOB, ha indicado que la propuesta indígena está basada en la propia práctica de conservación de sus recursos y sus propios conceptos de sistemas de rotación, manejo, intercambio y diversificación de la producción, para avanzar en sus procesos de desarrollo (Riester y Suaznabar, 1990).

Los pueblos indígenas beneficiarios del Programa de Asistencia al Manejo Sostenible de Recursos Naturales, han demostrado, a pesar de las presiones externas sobre los recursos naturales en sus territorios, ser los mejores guardianes y conocedores de los ecosistemas naturales y han sabido desarrollar ecosistemas artificiales (policultivos) sin destruir la diversidad genética.

Un ejemplo importante de su estrategia de aprovechamiento sostenible es el tamaño de sus campos de cultivos "chacos". El tamaño de los chacos fluctúa entre 1 y 1,5 ha. Esa dimensión, acompañada de la diversidad de cultivos en un mismo chaco, minimiza los riesgos de degradación de los suelos y evita el desarrollo de plagas y la destrucción de la diversidad genética. La

presencia de grandes extensiones de bosque rodeando los chacos hacen las veces de "cinturones" de corta vientos que evitan la erosión de los suelos y preservan los recursos genéticos del área.

El Programa de Asistencia al Manejo Sostenible de Recursos Naturales va a fomentar aquellas iniciativas que representan un fortalecimiento de las técnicas de manejo tradicionales sin destear iniciativas que incorporan elementos de manejo modernos. El objetivo general es de promover iniciativas que son viables desde el punto de vista socio-cultural y de manejo.

La mejora del bienestar de las familias indígenas, tal como ellas lo plantean, se basa en la preservación de los ecosistemas y un aprovechamiento sostenible de sus recursos naturales a largo plazo. La transferencia horizontal de conocimientos, el fortalecimiento de sus organizaciones, el rescate de su cultura, la capacitación y la asistencia técnica, entre otras, juegan un rol central. Este programa tiene la finalidad de ofrecer asistencia para el desarrollo de estas acciones.

El Programa de Asistencia al Manejo Sostenible de Recursos Naturales se orienta a fortalecer esas capacidades y contribuir a revalorizar la cultura de los pueblos indígenas para lograr mejorar sus recursos y conocimientos, así como incrementar sus flujos de bienes y servicios al resto de la sociedad. De esta manera, el PDPI aportaría al avance de los pueblos indígenas en el desarrollo de una alternativa propia para el aprovechamiento sostenible de los recursos naturales a mediano y largo plazo.

La sustentabilidad de las actividades que se propone en los subprogramas del Programa de Asistencia al Manejo Sostenible de los Recursos Naturales está relacionada en forma directa al éxito que se obtenga en la implementación de dichos subprogramas en el transcurso de los dos años propuestos de duración. Se propone que el programa actúe como un "Plan Semilla" durante el tiempo de su duración, y que luego de demostrar los beneficios obtenidos para las comunidades involucradas, pueda ser continuado obteniendo otras fuentes de financiamiento. Se contará con la capacitación institucional del personal de las Unidades Operativas, ya que tanto los coordinadores, como los promotores serán indígenas, y tendrán la necesaria experiencia, para el

## 2.0 OBJETIVOS Y ESTRATEGIA

### 2.1 Objetivos

El objetivo general del programa es apoyar propuestas específicas, preparadas y presentadas por las mismas comunidades a través del Comité de Gestión del Parque Nacional Kaa Iya del Gran Chaco, referentes al manejo sostenible de los recursos naturales en el área de influencia del Proyecto. Para ello se definen los siguientes objetivos específicos:

- Apoyar a las comunidades con asistencia técnica y recursos financieros para promover sus habilidades y tecnologías en el manejo sostenible de sus recursos.
- Contribuir a consolidar el autodesarrollo de los pueblos indígenas a través de la capacitación, formación y apoyo técnico financiero a sus propuestas de manejo sostenible de los recursos naturales, dentro de los recursos asignados al Programa.
- Brindar apoyo a un conjunto de propuestas productivas y/o de servicios planteados por las comunidades indígenas y sus organizaciones.

### 2.2 Estrategia del Programa

La estrategia del Programa es la de involucrar a los pueblos indígenas en las diversas etapas del mismo, de manera que las comunidades tengan la oportunidad de identificar los aspectos específicos a ser abordados para determinar el plan de acción correspondiente.

El Programa es flexible y permitirá a los pueblos indígenas, a través del Comité de Gestión, identificar los proyectos e iniciativas que sean de su prioridad. No se pretende establecer un menú fijo de actividades, sino proveer una estructura base dentro de la cual los pueblos indígenas puedan canalizar sus iniciativas.

Asimismo, el Programa pondrá énfasis en la promoción de iniciativas que fortalezcan las capacidades indígenas para obtener financiamiento a largo plazo. Principalmente, se espera que el Programa contribuya a fortalecer la capacidad organizativa y técnica del Comité de Gestión y de CABI y CIDOB para que éstos puedan ser más efectivos en la captación o generación de recursos financieros a largo plazo.

El Programa contribuirá a la mejora del manejo de recursos naturales a través de dos subprogramas: a) capacitación, formación y asistencia técnica y b) fondo de apoyo a las propuestas de autogestión.

### **3.0 ETAPAS DEL PROGRAMA**

La estrategia para ejecutar el Programa comprende dos etapas, la primera para identificar los aspectos a ser tratados y preparar un plan de acción, y la segunda, para la implementación de dicho plan.

#### **3.1 Etapa I**

En la primera etapa, las actividades del Programa se centrarán en:

- La difusión del Programa, a nivel de las organizaciones y comunidades beneficiarias, en reuniones y pequeños talleres a llevarse a cabo en las comunidades. Se trabajará en conjunto con el Comité de Gestión.
- La evaluación de las experiencias exitosas y no exitosas en relación a la autogestión y el manejo sostenible de sus recursos.
- Recoger, a través del Comité de Gestión, las propuestas iniciales de las comunidades indígenas y sus organizaciones.

- Preparar una evaluación inicial que muestre la situación de partida del Programa (línea base).
- Establecer prioridades de acción en base a las propuestas indígenas.
- Seleccionar, en coordinación con el Comité de Gestión, las propuestas a ser apoyadas.

Esta etapa durará cuatro meses y será realizada entre las Unidades Operativas de cada sub-área, el Comité de Gestión, las organizaciones indígenas y las comunidades.

### 3.2 Etapa II

En la segunda etapa, el Programa apoyará las propuestas específicas de las comunidades indígenas y sus organizaciones en relación a la capacitación o la formación de sus miembros, la asistencia técnica y la elaboración de algunos estudios básicos orientados a la recuperación y/o el aprovechamiento sostenible de sus recursos naturales.

La capacitación será implementada directamente en las comunidades a través de cursos teórico-prácticos con una duración típica de cuatro días. Esta actividad contará con el apoyo de profesionales locales con experiencia de trabajo con pueblos indígenas. La formación se hará por medio de becas otorgadas en competencia, a jóvenes indígenas para que participen en actividades de formación en institutos especializados o escuelas de formación media ubicadas fuera de la comunidad pero dentro del Departamento de Santa Cruz. Estas becas serían para temas afines al Programa y durarían un máximo de un año.

En esta etapa también se contará con el apoyo de expertos profesionales en medio ambiente y desarrollo sostenible, quienes en una tarea conjunta con indígenas, desarrollarán estudios puntuales de interés local para el desarrollo de sus pueblos, los cuales podrían incluir, por ejemplo, la elaboración de estudios específicos vinculados a temas como el etno-ecoturismo, el manejo de recursos hídricos, y mejoramiento de chaco y barbecho.

Finalmente, en la segunda etapa se implementaría el Fondo de apoyo a las propuestas seleccionadas a nivel familiar, grupal o comunal, presentadas por el Comité de Gestión. Esta segunda etapa empezaría el mes cinco y finalizaría el mes 20 del PDPI, con la finalidad de disponer de cuatro meses para la evaluación final, preparación de informes y cierre del Programa. El trabajo de monitoreo o acompañamiento sería permanente y estaría a cargo de las unidades operativas del Programa ubicadas en La Brecha y San José de Chiquitos.



#### 4.0 ESTRATEGIA POR SUB-AREA DEL PROGRAMA

El Programa tendrá tres sub-áreas: Izoceños-Guaraní, Chiquitanos y Ayoreos. Para responder a las necesidades y características específicas de cada grupo indígena, en la Etapa I se evaluará la capacidad de gestión y sostenibilidad de los recursos de las comunidades, en base a los siguientes criterios y a través del Comité de Gestión:

- Seguridad territorial. Se evaluará si la comunidad posee un título sobre sus tierras y si disponen de suficientes tierras para la implementación del Programa.
- Proceso de organización comunal. Se determinará si la comunidad cuenta con mecanismos de organización interna: asamblea comunal, reglamento, estatutos, mecanismos de reciprocidad y redistribución, que permitirían la ejecución eficiente del Programa.
- Administración y control de sus recursos naturales. Se evaluará el estado de sus recursos y las experiencias de manejo sostenible de sus recursos.
- Proyectos comunales. Se determinará si existen y cuál es la importancia de los mismos.
- Experiencias relacionadas. Se recogerán experiencias exitosas y no exitosas sobre el aprovechamiento sostenible de sus recursos naturales.

La estrategia específica para cada sub-área se desarrollará de acuerdo a las propuestas que vayan identificando las comunidades de cada grupo indígena. En base a las reuniones y consultas realizadas con los representantes indígenas, se señalan a continuación algunas características específicas para cada pueblo:

**Izoceños/Guaraní.** En la sub-área de los izoceños, el nivel de organización es relativamente más fuerte tanto a nivel comunal como en sus organizaciones de mayor nivel. Los izoceños/Guaraní están organizados en la Capitanía del Alto y Bajo Izozog.

Los izoceños/Guaraní poseen un complejo y sofisticado sistema de "acequias" o canales para transporte de agua, con una tecnología tradicional. Este sistema activa más de 1.000 ha bajo riego y se sostiene en una compleja estructura socio-política indígena. Los asentamientos izoceños son en su mayoría ribereños a ambos lados del río Parapetí. La extensión promedio del área cultivada por familia es de 1,35 ha. El manejo del bosque parecería ser una necesidad no sentida; sin embargo, las investigaciones participativas de Zolezzi (1993) dan muestra de que los izoceños tienen interés en 39 especies leñosas perennes las que querrían tener en reproducción (Tablas No. IV.1 y IV.2). Su mayor preocupación es el manejo del agua. Los izoceños se hallan vinculados al mercado principalmente a través de la venta de productos agropecuarios comerciales y de autoconsumo.

**Chiquitanos.** En la sub-área de los chiquitanos, se tiene un nivel de organización intermedia. Existen organizaciones intercomunales repartidas en cinco provincias del Departamento de Santa Cruz. En 1995, se creó a nivel departamental la Organización Indígena Chiquitana (OICH) que aglutina a dichas organizaciones intercomunales. La agricultura se realiza en los chacos que en promedio tienen 1,7 ha (CORDECRUZ, 1989). Esta actividad se realiza al interior del bosque.

La actividad bovina y el trabajo temporal como jornalero son las fuentes de ingreso monetario más importantes en la zona. La actividad forestal es a nivel de autoconsumo (Tablas IV.3 y IV.4). Sin embargo, existe una presión externa de parte de las empresas madereras que operan en la zona, las cuales hacen un aprovechamiento no sostenible del recurso forestal.

**Ayoreos.** La sub-área ayoréo tiene el nivel de organización más bajo. Las actividades agrícolas y de recolección son las más importantes. Realizan labores agrícolas en sus chacos sin efectuar muchas veces labores de carpida o deshierbe como en el caso de los izoceños o chiquitanos, logrando por lo tanto rendimientos más bajos. Una fuente de ingreso importante para ellos es la venta de su mano de obra, como jornaleros fuera de la comunidad (Heijdra, 1997).

La explotación de la madera en las comunidades ayoreas es intensiva y para la venta. En la mayoría de las comunidades ya se empieza a sentir la falta de recursos del monte, principalmente leña y materiales de construcción, para el autoconsumo. Tradicionalmente los ayoreos practicaron la apicultura. Según varios autores, los ayoreos conocían más de 30 especies de abejas, cultivadas en sistemas rudimentarios (CUMAT, 1990).

## 5.0 DESCRIPCION DE LOS SUB-PROGRAMAS

Basado en las unidades operativas de La Brecha y San José de Chiquitos, el Programa de Asistencia al Manejo Sostenible de Recursos Naturales comprende dos sub-programas:

- 1) Capacitación, formación y asistencia técnica.
- 2) Fondo de apoyo a propuestas productivas autosostenibles.

### 5.1 Sub-Programa de Capacitación, Formación y Asistencia Técnica

#### 5.1.1 Objetivo

El objetivo de este sub-programa es atender las propuestas indígenas en relación a la capacitación, la formación y la asistencia técnica. Todas las actividades contribuirán al manejo sostenible de los recursos naturales. Serán los propios beneficiarios quienes a través de las reuniones a nivel comunal o intercomunal decidan, en qué, cuándo y a cuántos se debería apoyar dentro de los recursos financieros disponibles en el sub-programa.

#### 5.1.2 Capacitación

La actividad de capacitación dispondrá de un máximo de US\$55.000 para los potenciales beneficiarios de las tres sub-áreas del Programa. El costo promedio estimado de cada curso es de US\$2.750. Esto significa que el Programa estará en capacidad de financiar aproximadamente 20 cursos.

La selección de los cursos a ser implementados será realizada principalmente por las comunidades, quienes presentarán propuestas o solicitudes de cursos en coordinación con el Comité de Gestión las unidades operativas del programa. La tarea de identificación de las propuestas de capacitación será una labor permanente y coordinada de las organizaciones comunales y de las organizaciones de mayor nivel (p.e. CABI, OICH, CANOB) de cada sub-área, canalizada a través del Comité de

Gestión. Dichas organizaciones coordinarán estrechamente con todas las comunidades con la finalidad de que juntos puedan priorizar sus necesidades de capacitación y aquéllas que pudieran tener un mayor impacto en el mejor uso de sus recursos naturales y cubrir un mayor número de beneficiarios.

Las Unidades Operativas del Programa actuarán como apoyo técnico en la elaboración y presentación de las propuestas de capacitación identificadas por los beneficiarios. Este apoyo también regirá para las actividades de formación y asistencia técnica. El Comité de Gestión asistirá en la selección de los cursos a ser aprobados.

Una vez identificado y aprobado un curso en cada sub-área, se contratará a un instructor quien desarrollará los contenidos y los implementará. Los cursos serán desarrollados en las comunidades indígenas y tendrán una duración típica de cuatro días. Esta modalidad asegura una mejor participación de los beneficiarios y los integra alrededor de un problema común que será tratado en sus propios espacios. Las comunidades definirán sus requerimientos e identificarán a sus beneficiarios. Las comunidades deberán brindar hospedaje y alimentación a los beneficiarios.

Los cursos podrán abordar temas como la agroforestería, la crianza de animales (bovinos y menores), la artesanía, la recolección, la pesca, el mejoramiento del chaco tradicional, el control de plagas y enfermedades, la preparación de viveros, o el uso adecuado de herramientas, entre otros.

La dinámica de los cursos de capacitación del Programa será la siguiente:

- El coordinador de cada Unidad Operativa identificará, con apoyo del promotor indígena y el Comité de Gestión, las propuestas de las familias indígenas de las comunidades en relación a sus necesidades de capacitación social, organizativa o técnico-productivas.
- Luego se identificarán los instructores a nivel local o regional que puedan dar los cursos de capacitación requeridos por las comunidades. Los instructores podrán ser identificados

por la Unidad Operativa con apoyo de los beneficiarios y podrán ser personas naturales o adscritas a una organización no gubernamental o institución pública.

- Identificada la persona, se firmará un contrato por servicios no personales entre la persona que proporcione el servicio, un representante de los beneficiarios y el coordinador de la Unidad Operativa. En dicho contrato estará especificado los requerimientos del curso, los productos esperados y los plazos. Asimismo, la persona que proporciona el servicio deberá presentar un informe sobre sus apreciaciones en relación al curso: nivel de participación, metodología del curso, y los diversos aspectos que podrían ser mejorados.
- Los cursos serán dados en las comunidades indígenas y podrán convocar hasta un máximo de 25 participantes procedentes de una o más comunidades.
- El Programa cubrirá los costos del instructor, la preparación del curso, los materiales, herramientas básicas y equipo necesario para un mejor desarrollo del mismo. También cubrirá los costos de alimentación y de transporte de los asistentes indígenas.
- La comunidad anfitriona participará con el hospedaje de los asistentes indígenas al curso y ayudará en la preparación de los alimentos.
- El último día del curso se hará una reunión social con todos los miembros de la comunidad y los asistentes al curso. Estos últimos recibirán un certificado por su asistencia al curso.
- Durante los días que dure el curso, el Coordinador de la Unidad Operativa o el promotor indígena participará como observador, con la finalidad de hacer una evaluación del mismo.

### 5.1.3 Formación

El Programa establecerá un fondo de becas en un monto de US\$45.000 destinados a la implantación de 15 becas a jóvenes indígenas. Se estima que el costo promedio de cada beca será US\$3.000, con lo cual se cubrirá la estadía, alimentación y costo del curso para el becario.

Durante la Etapa I, se diseñará e implementará un sistema sencillo de concurso para seleccionar a los becarios, el cual puede ser administrada por el Comité de Gestión. Por ejemplo, el sistema podría incluir un concurso de ensayos sobre el tema "*Qué haría por mi comunidad si obtengo una beca de formación técnica?*", donde un jurado formado por miembros de las comunidades y/o el Comité de Gestión escojan a los ganadores y los postulen ante la Unidad Operativa para la asignación de la beca. Los alumnos así seleccionados se formarían en Santa Cruz, por un período máximo de un año, en temas de su selección que contribuyan a un manejo sostenido de sus recursos naturales.

Para controlar y garantizar la efectividad de las becas, los alumnos seleccionados deberán firmar un compromiso con sus comunidades. Dicho compromiso obligará al alumno a informar cada dos meses sobre sus avances y rendimiento. En caso de que no se cumpla con este requerimiento, o si el alumno está en una actividad distinta, la beca será suspendida. Al finalizar la formación, el alumno deberá retornar a su comunidad y capacitar a otros por el lapso de un año.

#### 5.1.4 Asistencia Técnica

La actividad de asistencia técnica dispondrá de US\$36.000. El costo promedio de un apoyo técnico estará alrededor de los US\$1.440 mes/persona. Esto significaría la posibilidad de disponer de 25 meses-hombre para cubrir las propuestas de asistencia técnica a ser solicitadas por los beneficiarios del Programa.

En la Etapa I, la Unidad Operativa trabajará con las comunidades y con el Comité de Gestión para identificar las necesidades y asistir en las comunidades en la elaboración de las propuestas o solicitudes de asistencia. Identificadas las necesidades de asistencia técnica por los beneficiarios de cada pueblo indígena, ellos mismos y con apoyo del Comité de Gestión y de la Unidad Operativa identificarán a las personas o instituciones calificadas para brindar dicha asistencia.

La asistencia técnica estará orientada a promover los conocimientos indígenas respecto al uso y/o administración de sus recursos naturales. Para esta actividad se contratarían expertos locales,

nacionales, o de ser necesario internacionales (en ese orden), para atender las propuestas seleccionadas.

El trabajo técnico que dichas personas o instituciones desarrollen en apoyo a los beneficiarios indígenas serán puntuales, responderán a sus necesidades inmediatas (p.e. problemas de plagas, mejoras de sus cultivos, o preparación de viveros), y serán por plazos definidos entre uno a tres meses. Estos apoyos técnicos se concretarán a través de la firma de contratos o convenios que suscriban de manera tripartita los beneficiarios representados por la autoridad comunal (o autoridades comunales en caso de beneficiar a más de una comunidad), los oferentes del servicio y el coordinador de la Unidad Operativa.

### 5.1.5 Estudios

Los estudios que serán financiados por el PDPI constituyen una actividad que, por la dimensión del problema a resolver, demanda una asistencia técnica para desarrollar propuestas cuyas demandas de financiamiento superan el alcance del presente programa. Se anticipa que estos estudios tendrán un horizonte de tiempo de tres meses. Al atender estas propuestas, el programa proporcionará a los grupos indígenas una herramienta técnica que les permita buscar financiamiento para actividades que ayuden a evitar a mediano y largo plazo el deterioro de sus ecosistemas. En reuniones con representantes indígenas, se ha planteado su interés en los siguientes temas: etno-ecoturismo, mejoramiento de "chaco" y barbecho, manejo de recursos hídricos. El monto para esta actividad será de US\$45.000.

Esta actividad se desarrollará sobre la base de un contrato o convenio en los términos expresados líneas arriba. Instituciones locales como el Centro de Investigación Agrícola (CIAT), Apoyo para el Campesino Indígena del Oriente Boliviano (APCOB), Universidad Autónoma Gabriel René Moreno (UAGRM), el Centro de Investigación y Promoción del Campesinado (CIPCA), Wildlife Conservation Society (WCS), el Parque Nacional KAA-IYA Gran Chaco y el Centro de Comunicación Rural (CECOR), entre otras. Además, podrían jugar un papel importante en la capacitación, formación y asistencia técnica que se brindará a las comunidades indígenas.



## 5.2 Sub-Programa Fondo de Apoyo a las Iniciativas Productivas

### 5.2.1 Objetivo

El objetivo del fondo de apoyo a iniciativas productivas es proveer financiamiento no reembolsable a propuestas específicas a nivel familiar, grupal o comunal.

### 5.2.2 Descripción

El Fondo será de US\$100.000. Los montos asignados a nivel individual, grupal y comunal serán: US\$ 200 - 500, 2.000 - 5.000 y 5.000 - 10.000 respectivamente. El fondo será administrado por el Gerente del PDPI. En la Etapa I, las Unidades Operativas trabajarán con el Comité de Gestión y las comunidades para identificar las necesidades específicas y solicitar propuestas a nivel familiar, grupal o comunal. La Unidad Operativa ofrecerá asistencia en la preparación de las propuestas, las cuales serán evaluadas y priorizadas por el Comité de Gestión, con asistencia del promotor indígena del pueblo respectivo. Antes de la presentación de las propuestas se llevarán a cabo eventos de capacitación en las comunidades referidos a la preparación de las propuestas, rendición de cuentas y a la administración del monto asignado para aquellas propuestas financiadas. Las propuestas deberán identificar, como mínimo, el propósito del financiamiento, la base técnica y organizativa sobre la cual se basará la actividad a ser financiada, los resultados esperados, y el cronograma de ejecución.

Este fondo es una alternativa no convencional de financiamiento en la forma de capital "semilla". En los casos en que la recuperación del capital sea viable, los fondos quedarían en manos de las comunidades para apoyar a otras familias. Esta estrategia le otorgaría a las comunidades un incentivo para identificar las mejores propuestas a ser apoyadas por el fondo. Las propuestas serán avaladas por la Asamblea Comunal y presentadas por la comunidad mediante una solicitud específica a la respectiva Unidad Operativa.

Para el caso de las propuestas comunales o multicomunales, las Unidades Operativas programarían con los beneficiarios y los responsables de la comunidad un desembolso en dos o tres partes. Para efectuar los segundos o terceros desembolsos, las Unidades Operativas exigirían a los beneficiarios una rendición de cuentas y una verificación del cumplimiento de los avances acordados. De haber un atraso no justificado o un uso del financiamiento para otros fines, los desembolsos serán suspendidos.

Se anticipa que las actividades de capacitación, formación y asistencia técnica en muchos casos estarán asociadas con propuestas de autogestión. Sin embargo, se podrían encontrar comunidades con experiencia y bien organizadas que estén capacitadas para mejorar su manejo o producción pero que carecen de los fondos necesarios. En este caso, la actividad a ser financiada puede ser ejecutada por el beneficiario sin necesidad de una asistencia técnica simultánea.

Algunas actividades identificadas como apropiadas para ser financiadas con recursos del Fondo incluyen:

- Mejoramiento del "chaco" tradicional.
- Preparación de viveros y/o reforestación con especies forestales de interés.
- Construcción de pozos o atajados grandes para almacenar el agua.
- Actividades primarias de transformación de la producción de alimentos (p.e. harina de pescado, harina de yuca).
- Talleres artesanales: hamacas, tapices, ponchos ("poeké"), bolsos, trabajos en madera.
- Talleres de carpintería y ebanistería.
- Crianza de animales menores y pequeñas granjas pecuarias (zoocriaderos).

- Vacunación de animales bovinos y porcinos.
- Miel de abeja.
- Plantas medicinales.
- Cultivo de frutales .
- Semillas para los chacos.

El Fondo empezará a funcionar a partir del mes 6 y finalizará en el mes 15 del programa. Esto le dará el tiempo necesario al Programa para evaluar, en los últimos meses, el impacto del apoyo brindado a través del Fondo. Las Unidades Operativas organizarán un sistema de administración de las operaciones del Fondo que permitan su monitoreo.

## 6.0 ORGANIZACION

La ejecución del Programa se llevará a cabo a través de las dos Unidades Operativas del Plan. La unidad ubicada en La Brecha atenderá a las 23 comunidades izoceñas ubicadas en la cuenca del río Parapetí. La unidad ubicada en San José de Chiquitos atenderá a las comunidades Chiquitanas y Ayoreas.

Dentro de este programa, las principales funciones del Coordinador en cada Unidad Operativa serán las de recojer y procesar las propuestas indígenas, la asignación de fondos, elaborar planes de trabajo semestralmente, asistir a las comunidades y sus organizaciones conjuntamente con la dirección del PDPI en la suscripción de convenios y/o contratos de capacitación, formación, asistencia técnica, estudios puntuales y otros. También sería el responsable de hacer el monitoreo permanente a las actividades programadas en los planes de trabajo, y la coordinación con la Unidad Ejecutora del PDPI en Santa Cruz. El Comité de Gestión del Parque Nacional Kaa Iya del Gran Chaco servirá como un ente organizador de las propuestas indígenas

El promotor indígena tendría entre sus principales tareas la de vincularse estrechamente con las familias indígenas y apoyar al coordinador en la identificación de demandas indígenas para lograr un manejo sostenible de sus recursos naturales. A partir de esta tarea permanente del promotor, se identificarían con mayor aproximación los estudios puntuales de interés en cada comunidad.

## 7.0 CRITERIOS DE EVALUACION

El Gerente del PDPI evaluará el progreso del Programa al inicio de las actividades, al finalizar el primer año y al final del segundo año. La evaluación del Programa podrá utilizarse en una serie de indicadores como los siguientes:

### **En relación al manejo sostenible de los recursos naturales renovables:**

- Número de becas otorgadas para la formación de indígenas y número de títulos obtenidos.
- Número de comunidades capacitadas y temas tratados.
- Comunidades con actividades de fortalecimiento en manejo de sus recursos renovables.
- Mejoras agregadas al manejo y aprovechamiento sostenible de sus recursos renovables por actividad: forestal, caza, recolección, pesca, agrosilvicultura, "chaco" mejorado.
- Número de hectáreas de barbechos y "chacos" tradicionales mejorados.
- Número de hectáreas reforestadas (palmeras, especies maderables con alto valor comercial, especies forestales importantes para la artesanía y la construcción, frutales y otras especies).

### **En relación al Fondo:**

- Número y tipo de actividades que se hayan implementado en cada sub-área del Programa.
- Solicitudes de financiamiento recibidas por las comunidades, por tipo de línea.
- Solicitudes aceptadas.

- Solicitudes rechazadas.
- Beneficiarios totales del Fondo, por comunidad.
- Monto promedio de los fondos asignados a nivel individual, grupal, comunal.
- Impacto del financiamiento en la economía de la familia a nivel de los ingresos, el empleo, al interior de las comunidades, de la diversificación de actividades, de la especialización.

## **8.0 MONITOREO E INFORMES**

La actividad de monitoreo sería una tarea permanente del Programa y estaría a cargo de los coordinadores de cada sub-área. La función principal del monitoreo sería la de controlar todas las acciones que se desarrollen en el Programa, suministrando información para las evaluaciones.

La recopilación de información a través del monitoreo demandaría un trabajo estrecho con los promotores indígenas, los beneficiarios y las diferentes organizaciones indígenas en cada sub-área. Los coordinadores de cada sub-área elaborarían un conjunto de indicadores y una base de datos para el desarrollo de dicha actividad.

Cada tres meses, los Coordinadores presentarán un informe de avance al Gerente del PDPI, quien a su vez emitirá informes de avance al Comité Ambiental dos veces al año.

Tabla IV. 1 Especies Vegetales según su Función y Uso. Comunidades Izoceñas/Guaraníes

Especie	Nombre científico	Función de Producción Usos						Func.de Protección Usos		
		A	B	C	D	E	F	G	H	I
bambú	<i>Bambusa arundinacea</i>							X		
cacha	<i>Aspidosperma quebracho-blanco</i>	X				X		X		
café	<i>Coffea arabica</i>			X						
cala	<i>Calathea sp.</i>	X							X	
caoba (mara)	<i>Swietenia macrophylla</i>						X			
cítricos	<i>Citrus spp.</i>			X						
cuchi	<i>Astronium urundeuva</i>	X	X							
cupesí	<i>Prosopis chilensis</i>	X	X	X	X		X	X		X
curupaú	<i>Anadenanthera sp.</i>	X	X				X		X	
curusapoi		X				X	X			
cuta	<i>Diplokeleba floribunda</i>	X				X				
chirimoya	<i>Annona sp.</i>			X						
eucalipto	<i>Eucaliptus sp.</i>	X	X			X		X		
guasukea				X		X	X		X	
guayacán colorado	<i>Bulnesia sp.</i>	X	X				X			
guayacán morado	<i>Bulnesia sp.</i>	X	X				X			
guiraguira	<i>Cathartes hurruviaunus</i>			X	X		X			
higo	<i>Ficus carica</i>			X						X
jichituriqui	<i>Aspidosperma cylindrocarpon</i>	X								
juno	<i>Pithecellobium scalare</i>	X					X			
manga	<i>Mangifera indica</i>			X						X
mora	<i>Maclura tinctoria</i>	X							X	X
mistol	<i>Zizyphus mistol</i>			X			X		X	
palta	<i>Persea americana</i>			X						
paraíso	<i>Melia azederach</i>		X						X	X
parajobobo	<i>Tessaria integrifolia</i>	X								
paraparái						X	X			
plátano	<i>Musa sp.</i>			X						
quimori		X			X					
sauce	<i>Salix sp.</i>							X		
soto	<i>Schinopsis sp.</i>	X				X		X		
tajibo	<i>Tabebuia sp.</i>	X								
tamarindo	<i>Tamarindus indica</i>			X						
toborochoi	<i>Chorisia sp.</i>						X			
toco-toco	<i>Tecoma stans</i>	X			X				X	X
tuna	<i>Opuntia ficus-indica</i>			X						
tusca	<i>Acacia aroma</i>	X		X	X	X	X		X	
tutuma	<i>Crescentia cujete</i>						X			
urucú	<i>Bixa orellana</i>			X						
<b>TOTAL</b>		<b>19</b>	<b>7</b>	<b>15</b>	<b>5</b>	<b>8</b>	<b>14</b>	<b>6</b>	<b>8</b>	<b>6</b>

Notas: A: construcción, madera y postes; B: leña; C: alimento; D: forrajes; E: medicinales;

F: artesanales; G: protección de riberas y cauce río; H: rompevientos; I: sombra.

Fuente: Adaptación propia en base a Zolezzi, 1993; y UAGRM, 1996.



**Tabla IV.2 Especies Nativas Vegetales más Importantes por su Uso Múltiple  
Zona Izoceña/Guaraní**

Especie	A	B	C	D	E	F	G	H	I
cupesí	X	X	X	X		X	X		X
tusca	X		X	X	X	X		X	
curupaú	X	X				X		X	
guasukea			X		X	X		X	
toco-toco	X			X				X	X
soto	X				X		X		
guyacán colorado	X	X				X			
guayacán morado	X	X				X			
mistol			X			X		X	
curusapoi	X				X	X			
<b>TOTAL</b>	<b>8</b>	<b>4</b>	<b>4</b>	<b>3</b>	<b>4</b>	<b>8</b>	<b>2</b>	<b>5</b>	<b>2</b>

**Notas:** A: construcción, madera y postes; B: leña; C: alimento; D: forrajes; E: medicinales;

F: artesanales; G: protección de riberas y cauce río; H: rompevientos; I: sombra.

**Fuente:** Zolezzi, 1993

Tabla IV. 3 Especies Vegetales Según Función y Uso. Comunidades Chiquitanas

Especie	Nombre Científico	Función de Producción Usos							Func. de Protección Usos	
		A	B	C	D	E	F	G	H	I
achachairú	<i>Rheedia sp.</i>	X		X		X	X	8		
ajunao	<i>Pterogyne nitens</i>	X	X			X		1,4,5,6	X	
albahaca	<i>Ocimum basilicum</i>	X		X		X	X	8		
alcanfor	<i>Hyptis carpinifolia</i>					X				
alcornoque	<i>Tabebuia aurea</i>					X		11		
algodón	<i>Gossypium barbadense</i>	X	X			X	X			
almondra	<i>Dipteryx alata</i>		X	X		X				
ambaibo	<i>Cecropia sp.</i>		X	X		X		11		
azucaró de monte	<i>Spondias mombin L.</i>		X	X		X		11		
bí	<i>Genipa americana</i>	X	X	X		X		11		
bibosi	<i>Ficus sp.</i>		X	X	X	X	X	1,6,11		
cítricos	<i>Citrus spp.</i>			X		X				
chichapi	<i>Celtis spinosa</i>			X		X				
chirimoya	<i>Annona sp.</i>			X						
chisojo	<i>Terminalia argentea</i>			X		X				
ciruelo brasileiro	<i>Spondias purpurea</i>			X		X				
coca de monte	<i>Esenbeckia almawilla</i>			X		X				
coloradillo	<i>Physocalymma scaberrimum</i>		X			X		1,6		
coquino	<i>Pouteria nemorosa</i>		X	X		X		1,11		
cuchi	<i>Astronium urundeuva</i>	X	X			X		1,6	X	
cupesí	<i>Prosopis chilensis</i>		X	X				1		
curupaú	<i>Anadenanthera sp.</i>		X	X		X		1,4,7,9	X	
cusé	<i>Casearia gossypiosperma</i>		X			X		1		
cusi	<i>Orbignya phalerata</i>	X	X	X		X	X	1	X	
espinó blanco	<i>Acacia albicorticata</i>					X				
gallito	<i>Pogonopus tubulosus</i>	X			X			2		
gargatea	<i>Jacaratia spinosa</i>		X	X		X		11		
guapá	<i>Guadua paniculata</i>				X			1		
guapomó	<i>Salacia elliptica</i>		X	X		X		11		
guapurucillo (I)	<i>Eugenia sp.</i>			X		X				
guayaba	<i>Psidium guajava</i>		X	X		X		11		
jichituriqui	<i>Aspidosperma cylindrocarpon</i>		X					1,6		
lúcuma	<i>Pouteria macrophylla</i>		X	X		X		1,6,11		
manga	<i>Mangifera indica</i>		X	X	X	X				
mapajo	<i>Ceiba sp.</i>							3		
matico	<i>Piper sp.</i>			X		X				
matricaria	<i>Hyptis mutabilis</i>					X				
momoqui	<i>Caesalpinia pluviosa</i>		X			X		1	X	
morado	<i>Machaerium scleroxylon</i>	X	X					1,6	X	
mora	<i>Maclura tinctoria</i>	X	X	X		X		1,8,11	X	
motacú	<i>Scheelea princeps</i>	X	X	X		X	X	1,11		
pacay	<i>Inga sp.</i>		X	X				11		
pachío	<i>Passiflora cinninata</i>			X						
palta	<i>Persea americana</i>		X	X		X				
paquió	<i>Hymenaea courbaril</i>		X	X		X		1,4,5,6	X	
pavi	<i>Sicana odorifera</i>			X		X				
pega pega (IV)	<i>Desmodium sp.</i>					X				
picana	<i>Cordia alliodora</i>	X	X			X		1,6		
pitón	<i>Talisia sp.</i>		X	X		X				
roble	<i>Amburana cearencis</i>		X			X		1,6		
sahuinto (II)	<i>Myrcianthes sp.</i>		X	X		X		11		
tajibo	<i>Tabebuia sp.</i>	X	X			X		1,6	X	X
tarara	<i>Centrobium ochroxylum</i>	X	X			X		1,6	X	
toborocho	<i>Chorisia speciosa</i>							2,3		X
toco	<i>Enterobium contortisiliquium</i>	X		X		X		1,6,10,11	X	
totali	<i>Acrocomia aculeata</i>	X		X	X	X	X	11	X	
tutura	<i>Crescentia cujete</i>	X				X				
urucú	<i>Bixa orellana</i>		X	X		X				
vira vira	<i>Achyrocline satureioides</i>		X	X		X				
<b>Total</b>		<b>17</b>	<b>34</b>	<b>37</b>	<b>5</b>	<b>49</b>	<b>6</b>	<b>66</b>	<b>12</b>	<b>2</b>

Notas: A: construcción, madera y postes; B:leña; C: alimento; D:forrajeras; E:medicinales;F:artesanales;G:otros(1)utensilio;(2)omamental, (3)colchón,(4)trapiche,(5)carretón;(6)muebles;(7)carbón;(8)perfumes;(9)curtido;(10)instr.musicales;(11)alimento para para animales silvestres;H: cercos; I: sombra. Fuente: Adaptación propia en base a Birk, 1995.

**Tabla IV.4 Especies Nativas Vegetales más Importantes por su Uso Múltiple  
Zona Chiquitana**

Especie	A	B	C	D	E	F	G	H	I
ajunao	X		X		X	X	1,4,5,6	X	
curupaú		X	X		X		1,4,7,9	X	
mora	X	X	X		X		1,8,11	X	
paquió		X	X		X		1,4,5,6	X	
toco	X		X		X		1,6,10,11	X	
bibosi		X	X	X	X		1,6,11		
cusi	X	X	X		X	X	1	X	
tajibo	X	X			X		1,6	X	X
total	X		X	X	X	X	11	X	
cuchi	X	X			X		1,6	X	
TOTAL	7	7	8	2	10	3	28	9	1

**Notas:** A: construcción, madera y postes; B: leña; C: alimento; D: forrajes; E: medicinales;

F: artesanales; G: otros: (1) utensilio doméstico, (2) ornamental, (3) colchón, (4) trapiche, (5) carretón, (6) muebles, (7) carbón, (8) perfume, (9) curtir, (10) instrum. musical, (11) alimento para animales silvestres

H: cerco; I: sombra.

**Fuente:** Adaptación propia en base a Birk, 1995

**CAPITULO V**  
**PROGRAMA No. 3:**  
**ASISTENCIA A LA TITULACION**  
**DE TIERRAS COMUNITARIAS DE ORIGEN**

**1.0 INTRODUCCION**

La Ley No. 1715 del 18 de octubre de 1996 (Ley INRA), reconoce a las Tierras Comunitarias de Origen (TCO) entre las distintas formas de propiedad agraria. Las TCO están definidas como espacios geográficos que constituyen el hábitat de los pueblos y comunidades indígenas originarias, a los cuales éstas han tenido tradicionalmente acceso y donde mantienen y desarrollan sus propias formas de organización económica, social y cultural, de modo que aseguran su sobrevivencia y desarrollo.

La ley determina que las Tierras Comunitarias de Origen son inalienables, indivisibles, irreversibles, compuestas por comunidades o mancomunidades indígenas, inembargables e imprescriptibles. De esta manera, la ley garantiza y consolida el derecho propietario de los pueblos y comunidades indígenas sobre su territorio, dándoles seguridad jurídica permanente e inamovible, como respuesta a un largo proceso de desarticulación, desmembramiento y ocupación paulatina de las tierras indígenas.

La aspiración histórica de los pueblos indígenas en general, y en particular de los pueblos ayoreos, chiquitanos e izoceños/Guaraní es la titulación de sus territorios. Este derecho fundamental, no obstante estar reconocido por la Constitución Política del Estado, aún no se encuentra consolidado efectivamente. Sin embargo, la Ley INRA establece el mecanismo legal para dicha consolidación. El derecho a la tierra y al territorio son la base de la preservación y desarrollo de la organización económica y social, así como de la identidad cultural de los pueblos indígenas y por tanto, constituyen la base de otros derechos y aspiraciones.

En consideración a las aspiraciones históricas de los pueblos indígenas de obtener la propiedad de sus territorios, a la existencia de un marco legal que hace posible la titulación de los TCO y al hecho de que si en un plan o proyecto de los pueblos indígenas no se da prioridad a este tema, no sería posible pensar en la sostenibilidad de los recursos naturales de los territorios indígenas a largo plazo. El presente Programa ha presupuestado la suma de US\$500.000 para apoyar el proceso de titulación de las TCOs en el área de influencia del PDPI.

## 2.0 PROCEDIMIENTO DE TITULACION DE TIERRAS COMUNITARIAS DE ORIGEN

De acuerdo con la Ley INRA y con los reglamentos establecidos por la Comisión Interinstitucional creada por Resolución Suprema No. 216790 del 13 de septiembre de 1995, el procedimiento a seguirse para la identificación, saneamiento, delimitación y titulación de las Tierras Comunitarias de Origen es el siguiente:

1. **Demanda.** La demanda de Tierra de Comunidad de Origen es la solicitud formal de territorio, en la cual se especifica su superficie, ubicación geopolítica y límites. La solicitud es presentada por un pueblo o comunidad indígena, sustentada en fundamentos de orden histórico, cultural y legal.

La demanda constituye el acto formal de inicio del procedimiento de titulación. La investigación, georeferenciación y preparación está a cargo del pueblo indígena que presenta la solicitud.

2. **Informe de Caracterización Preliminar de la Demanda.** Presentada la solicitud, la Subsecretaría de Asuntos Etnicos (SAE) y el Instituto Nacional de Reforma Agraria (INRA) elaboran el Informe de Caracterización Preliminar de la Demanda, lo cual se realiza en dos fases:
  - a) La preparación del Informe de Determinación e Identificación Preliminar de los beneficiarios de la demanda, organización y pueblo indígena al que pertenecen, así como la identificación de terceros que ocupan tierra en el área. La preparación de este informe está a cargo de la SAE.
  - b) La evaluación de campo y georeferenciación para determinar la ubicación geográfica, superficie y límites de la tierra objeto del procedimiento, efectuadas en forma conjunta entre el INRA y la SAE.

3. **Resolución de Inmovilización.** El Director Nacional del INRA, en base a la Identificación Preliminar y a la Pericia de Campo, dispondrá la Inmovilización del área individualizada, prohibiendo asentamientos de terceros y transferencia de tierras.

La Resolución de Inmovilización, salvando los derechos de terceros y de reservas fiscales, establecerá la ubicación geográfica de la solicitud, la superficie del área demandada y sus límites. En base a la Identificación Preliminar y a la Pericia de Campo, la Resolución de Inmovilización determina el área a sanear.

4. **Saneamiento de Territorios de Comunidades de Origen.** Esta etapa está a cargo del INRA y consta de las siguientes fases:

- a) Revisión técnica y jurídica en gabinete de los antecedentes. Acumulación de datos sobre el derecho propietario en el área y sus colindancias.
- b) Notificación a interesados mediante una campaña pública.
- c) Levantamiento de datos técnicos y jurídicos.
- d) Evaluación técnica y jurídica comparando los datos obtenidos en el trabajo de campo con la revisión inicial.
- e) Notificación de los resultados.
- f) Informe de Conclusiones.
- g) Resolución de la Dirección del INRA.

El Art. 72 de la Ley INRA establece y garantiza la participación de las comunidades y pueblos indígenas en la ejecución del saneamiento.

5. **Proceso de Identificación de Necesidades.** En forma simultánea a la realización del saneamiento, la SAE deberá presentar el Informe de Necesidades Espaciales, el cual tiene por objeto establecer la superficie efectivamente requerida por el pueblo indígena de acuerdo a su patrón de ubicación y utilización del espacio.

El Informe de Identificación de Necesidades Espaciales toma en cuenta la población en el área a sanear, su crecimiento demográfico, número de comunidades, potencial productivo del área, calidad de suelos, sistemas de producción y manejo de recursos naturales, zonas de preservación, y superficie requerida por los beneficiarios.

El Informe concluye con un dictamen final que determina la superficie requerida por el pueblo demandante. Este informe deberá ser presentado antes del Informe en Conclusiones del Saneamiento.

6. **Titulación.** Es el acto formal en el que concluye la demanda de Tierras Comunitarias de Origen con la entrega a los beneficiarios del título que acredita el derecho propietario del pueblo indígena sobre determinado territorio. Es atribución del Presidente de la República el otorgamiento del título de propiedad sobre las Tierras Comunitarias de Origen.
7. **Conversión de Títulos de Reforma Agraria en Tierras Comunitarias de Origen.** Las comunidades originarias que tienen título de propiedad en proindiviso, otorgado de conformidad a las disposiciones de Reforma Agraria, pueden tramitar la conversión de los mismos en títulos TCO siempre y cuando sus titulares mantengan formas de organización, cultura e identidad propias y así lo soliciten. En estos casos es conveniente la realización previa del procedimiento de saneamiento simple, a fin de detectar y resolver conflictos sobre el derecho propietario. En base a los resultados del saneamiento simple, se tramita ante el INRA el otorgamiento del título TCO de comunidad.



### 3.0 IDENTIFICACION DE LAS DEMANDAS DE TIERRAS COMUNITARIAS DE ORIGEN

En consulta con las organizaciones representativas de los pueblos y comunidades indígenas en el área del Proyecto, sus organismos técnicos, y la Subsecretaría de Asuntos Etnicos, se han identificado las demandas de Tierras Comunitarias de Origen y demandas de conversión en TCO Comunales, cuya titulación se considera de alta prioridad debido a la expansión progresiva de la frontera agrícola y ganadera, y la expansión de la actividad minera y petrolera en la zona. El cuadro siguiente describe las solicitudes de cada pueblo indígena que se consideran prioritarias y urgentes de acuerdo a la percepción de los grupos contactados:

**Demandas TCO y Conversion de Títulos Comunales**

COMUNIDAD	HECTAREAS	BENEFICIARIOS
<u>AYOREOS</u>		
1. Poza Verde (1)	2.500	144
2. Motacú / Motacusito	400	54
3. Urucú (1)	50	108
4. Guidai-Ichai (1)	600	120
5. El Carmen	5	27
6. Tobité (2)	20.374	230
7. Santa Teresita (2)	48.736	250
8. Villa Bethel/Santiago	N/D	18
<u>CHIOUITANOS</u>		
1. Turubó (2)	335.000	1.986
2. Roboré/Amanecer(2)	350.000	1.567
3. Germán Busch (2)	200.000	1.349
<u>IZOCEÑOS/GUARANI</u>		
1. Izozog Norte (2)	350.000	6.649
(1) Trámite de conversión de título comunal a título TCO		
(2) Trámite TCO		N/D - No Disponible

#### 4.0 SITUACION DE LAS DEMANDAS DE TCO EN EL AREA DE INFLUENCIA DEL PROYECTO

El estado de las demandas de territorio y los pasos necesarios para su titulación se resumen a continuación (ver Tabla V-1):

- El INRA no ha recibido aún ninguna demanda de territorio de los pueblos chiquitanos, en gran medida debido a la dispersión espacial, fragilidad y debilidad de su estructura y organización. Entre la Subsecretaría de Asuntos Etnicos y el PLUS se han identificado tres demandas TCO en beneficio de los pueblos chiquitanos. La Asociación Turubó, que cubre un espacio de 335.000 ha, ubicadas en la Provincia Chiquitos; La Asociación Amanecer, que alcanzaría a 350.000 ha ubicada también en la Provincia Chiquitos al norte de Roboré, y Germán Busch localizada en la provincia del mismo nombre cerca de Puerto Suárez, con 200.000 ha.
- El territorio de la comunidad ayorea de Poza Verde ha sido objeto de saneamiento integrado de catastro legal (CAT-SAN) ejecutado de oficio en áreas catastrales, por lo que la superficie, colindancia y límites de dichos territorios se encuentra establecida legalmente. Dicha comunidad sólo requiere tramitar el título de TCO comunal.
- El territorio de las comunidades Motacu/Motacusito y Urucú, requiere saneamiento simple y la conversión de su título en TCO comunal.
- Las comunidades Guidai-Ichai y El Carmen se encuentran en estado de preparación de la demanda, caracterización preliminar, georeferenciación, determinación de inmovilización y saneamiento TCO. Se estima que el territorio a ser demandado en el caso Guidai-Ichai alcanza a 600 ha y en el caso de El Carmen es de 5 ha.
- Las comunidades de Tobité y Santa Teresita ya han presentado sus demandas. Su trámite de TCO se encuentra en etapa de caracterización preliminar. Requieren cumplir con la

georeferenciación, inmovilización y saneamiento TCO a fin de ser tituladas. Tobité demanda 20.374 ha y Santa Teresita 48.736 ha.

## 5.0 RELACION CON OTROS PROYECTOS QUE SE EJECUTAN EN EL AREA DE INFLUENCIA DEL PDPI

Los siguientes proyectos se encuentran en ejecución en el área de influencia del Proyecto:

1. El Proyecto Tierras Bajas del Este (Lowlands), financiado por el Banco Mundial se encuentra en su fase final. En lo relativo a la demarcación de territorios, este Proyecto ha identificado los territorios de las TCO Santa Teresita y Tobité, establecido sus límites, plantado mojones y apertura de sendas. Estas tareas han sido ejecutadas antes de la promulgación de la Ley INRA y requieren, por tanto, seguir un proceso de regularización como TCO.
2. La Subsecretaría de Asuntos Etnicos ha suscrito recientemente un convenio de financiamiento denominado "Pueblos Indígenas: Participación Popular y Descentralización" con la Agencia de Cooperación Danesa (DANIDA). Este convenio tiene por objeto financiar actividades de titulación de Tierras Comunitarias de Origen incluidas en la Ley INRA, por el monto de US\$6.800.000. Este monto cubrirá parcialmente las actividades de procesamiento técnico y jurídico de las demandas de TCO ya presentadas por los pueblos indígenas del Oriente Boliviano, incluidas en la Ley INRA.
2. Consorcio Alemán. El Consorcio Alemán IP/CES/KWS ha suscrito un convenio con la Prefectura del Departamento de Santa Cruz para brindar asistencia técnica y financiera para la identificación, delimitación y consolidación de territorios indígenas en el Departamento de Santa Cruz. Las actividades financiadas con los recursos de dicho convenio se localizan al norte de las Provincias Chiquitos, Ñuflo de Chávez, Sandoval y Velasco.

## **6.0 DESCRIPCION DEL PROGRAMA**

### **6.1. Objetivo**

El objetivo general del programa es asistir a los pueblos izoceño/Guaraní, chiquitano y ayoreo en la consolidación jurídica de sus demandas por territorio financiando las distintas etapas de proceso de titulación de Tierras Comunitarias de Origen a fin de evitar la penetración, desarticulación y ocupación de territorios indígenas como consecuencia de la construcción del Gasoducto Bolivia-Brasil.

El programa también pretende servir como una base organizativa y técnica para la búsqueda y obtención de fondos adicionales para cubrir, en lo posible, las demandas en el área de estudio.

### **6.2 Descripción**

El Programa pretende apoyar la consolidación los derechos de los pueblos y comunidades indígenas por medio del financiamiento de actividades de preparación de demandas de territorio, identificación, saneamiento simple, y saneamiento de las Tierras Comunitarias de Origen en el área de influencia del Proyecto, en beneficio de los pueblos izozeño/Guaraní, chiquitano y ayoreo.

Los recursos del Programa se utilizarán para:

- a) Financiar las siguientes etapas del proceso de titulación: saneamiento simple, caracterización preliminar, georeferenciación, saneamiento de TCO, y saneamiento simple llevadas a cabo por el INRA y la SAE con la directa participación de los pueblos indígenas.
- b) Financiar la capacitación de técnicos indígenas, la investigación de necesidades espaciales, diagnóstico de derechos de terceros, la consulta e información con las comunidades indígenas, la preparación de información topográfica y demandas de TCO y las solicitudes

de conversión de título comunal en título TCO. Estas tareas serán ejecutadas por las organizaciones técnicas y legales de y/o al servicio de los pueblos indígenas.

### 6.3 Descripción del Programa

Se estima que para lograr la titulación de todas las demandas prioritarias en el área de influencia del PDPI se requiere una inversión de US\$1.491.950 (ver Tablas V.2 y V.3). De este monto, la cantidad de US\$1.378.000 está asociada con el financiamiento de la actividades de caracterización preliminar preliminar, georeferenciación y saneamiento llevadas a cabo por el INRA y la SAE. El resto del monto (US\$113.850), se necesita para financiar la participación indígena y el fortalecimiento de la asistencia técnica y legal al servicio de los pueblos indígenas.

El PDPI aportará US\$500,000 para apoyar a la titulación de tierras en el área de influencia del Proyecto. Este aporte financiero, apoyado con la infraestructura organizativa y técnica del PDPI atraerá fondos adicionales para costear, en lo posible, todas las demandas del área.

El Instituto Nacional de Reforma Agraria y la Subsecretaría de Asuntos Etnicos son las instituciones designadas por ley para efectuar, a título oficial, el estudio de caracterización preliminar, georeferenciación, saneamiento y titulación. Las actividades realizadas independientemente de estas instituciones no tendrían reconocimiento oficial y resultarían en un gasto injustificado. Por consiguiente, el Programa de Titulación de tierras para los pueblos indígenas en el área del PDPI incluye la participación de las instituciones señaladas. Asimismo, de conformidad a lo dispuesto por la Ley INRA y en la Resolución Suprema No. 216790 del 13 de septiembre de 1995 el Programa asegura la directa participación de los pueblos indígenas en el saneamiento.

La prioridades en la titulación de tierras indígenas establecidas en el Cuadro de Identificación de Necesidades han sido determinadas consensuando criterios de la Subsecretaría de Asuntos Etnicos (SAE), la Confederación de Pueblos Indígenas de Bolivia, la CABI, CANOB y OICH, las organizaciones indígenas localizadas en el área de influencia del Proyecto, el Centro de

Planificación Territorial Indígena, organismo técnico de la Coordinadora de los Pueblos Etnicos de Santa Cruz.

El financiamiento para las actividades de caracterización preliminar, georeferenciación y saneamiento ha sido asignado en función de los siguientes criterios: 1) extensión del área del territorio a sanear; 2) población beneficiada; 3) existencia de otras fuentes de financiamiento directo.

En la Etapa I, se llevará a cabo un proceso de consulta con los pueblos indígenas, la SAE y el INRA para llegar a un consenso sobre la mejor manera de asignar los fondos aportados por el PDPI. En general, los fondos se podrían utilizar de dos maneras:

1. Como capital "semilla", que facilite la adquisición de fondos complementarios para recabar el monto total necesario para financiar todas las demandas. Esto requeriría la participación activa de los pueblos indígenas, con ayuda de la gerencia del PDPI para identificar fuentes alternas de financiamiento y preparar las propuestas correspondientes. Los fondos complementarios podrían provenir de instituciones internacionales, organizaciones no gubernamentales o el gobierno boliviano.
2. Como financiamiento total para financiar las demandas más prioritarias del área. Este uso de los fondos requiere un consenso y un compromiso firme por parte de los pueblos indígenas y el gobierno boliviano. La titulación efectiva de una o dos demandas específicas, podría servir como un incentivo y un ejemplo para fortalecer el proceso y atraer financiamiento para otras demandas.

En la Etapa II, se utilizarán los recursos destinados para al financiamiento de la participación indígena en el saneamiento y asistencia técnica y legal directa a los pueblos indígenas. Los recursos del Programa serán desembolsados de acuerdo a un Plan de Actividades elaborado por la gerencia del PDPI en la Etapa I, en coordinación con las comunidades beneficiarias.

#### 6.4 Organización del Programa

El organismo ejecutor es la gerencia del PDPI (ver Capítulo I) la cual ejecutará el Programa en base a los lineamientos establecidos en el Convenio y bajo la autoridad de un Directorio cuyas facultades se encuentran determinadas por Reglamento Especial.

El Directorio estará integrado por:

- a) Un representante del Instituto Nacional de Reforma Agraria,
- b) Un representante de la Subsecretaría de Asuntos Etnicos,
- c) Un delegado de la CABI, en representación de los pueblos y comunidades izoceño-guaraní,
- d) Un delegado de las comunidades chiquitanas de la Asociación Turubó,
- e) Un delegado de las comunidades chiquitanas de la Asociación Amanecer,
- f) Un delegado de las comunidades chiquitanas de Germán Bush,
- g) Un delegado de CANOB, en representación de los pueblos y comunidades ayoreas,
- h) Un representante de los Promotores del Proyecto, con derecho a voz, sin voto,
- i) El gerente del PDPI, con derecho a voz, sin voto.

#### 6.5 Supervisión

Los Promotores se reservan el derecho de supervisar la ejecución del Programa en cualquier momento. A este fin, la Gerencia del Plan de Desarrollo de los Pueblos Indígenas además pondrá a disposición de los Promotores o su representante toda la información necesaria. Las actividades de supervisión se concretarán en recomendaciones dirigidas a la Gerencia y al Directorio.

#### 6.6 Evaluación

La Gerencia del PDPI preparará los siguientes informes de evaluación del Programa:



**Informe Inicial.** La gerencia del PDPI, a satisfacción de los Promotores, preparará un Informe Inicial de la ejecución del Programa a los 30 días de finalizada la Etapa I. Dicho informe deberá describir el proceso de consulta realizado con los pueblos indígenas, la SAE y el INRA; presentar y justificar el plan de acción propuesto, y describir el plan de acción, con el detalle de cómo se utilizarán los fondos, el cronograma de desembolso y los objetivos del plan de acción. El Directorio deberá aprobar el plan de acción antes de que éste pueda ser ejecutado.

**Informes de Progreso.** La gerencia del PDPI presentará, cada seis meses, a partir de la fecha del primer desembolso de los recursos del Programa, hasta la terminación del mismo, un Informe de Progreso de la ejecución del Programa. Los informes de progreso deberán ser aprobados por el Directorio.

**Informe Final.** La gerencia del PDPI presentará, dentro de los 60 días de la terminación del Programa, un Informe Final para la aprobación del Directorio. El Informe deberá evaluar las actividades realizadas, los resultados obtenidos y las recomendaciones que consideren oportunas. El Informe Final deberá estar acompañado por el Informe de una firma de auditoría independiente, elegida por los Promotores o su representante sobre la ejecución del presupuesto.

Si el programa tiene éxito en atraer financiamiento adicional, el proyecto consideraría la extensión de la organización establecida de manera de continuar el proceso de titulación más allá de los dos años actualmente concebidos.

Tabla V.1 Identificación de Necesidades

Comunidad	Hectáreas	Saneamiento Simple	Conversión TCO Titulación	Preparación Demanda	Caracterización Preliminar	Georeferenciación	Inmovilización	Saneamiento TCO
<b>AYOREOS</b>								
Poza Verde (1)	5000		X					
Motacú/Motacusito(1)	400	X	X					
Urucú	50	X	X					
Guidai Ichay (1)	600			X	X	X	X	X
El Carmen	5			X	X	X	X	X
Tobité (2)	20374			X	X	X	X	X
Santa Teresita (2)	48736			X	X	X	X	X
Villa Bethel/Santiago	N.D.							
<b>CHIKUITANOS</b>								
Turubó (2)	335000			X	X	X	X	X
Roboré/Amanecer (2)	350000			X	X	X	X	X
Germán Busch (2)	200000			X	X	X	X	X
<b>IZOCENOS</b>								
Izozog Norte (2)	350000				X	X	X	X

Tabla V.2 Requerimientos financieros para la titulación de las demandas prioritarias (en US\$)

Categoría	Monto (US\$)
<b>Saneamiento Simple</b>	
Motacú/Motacusito	1.000
Urucú	<u>500</u>
<b>Sub-total</b>	1.500
<b>Caracterización Preliminar</b>	
Guidai-Ichai	1.250
El Carmen	1.250
Tobité	1.250
Santa Teresita	1.250
Turubó	7.000
Amanecer	7.000
Germán Busch	7.000
Izozog	<u>7.000</u>
<b>Sub-total</b>	33.000
<b>Georeferenciación</b>	
Guidai-Ichai	300
El Carmen	300
Tobité	1.000
Santa Teresita	1.000
Turubó	3.000
Amanecer	3.000
Germán Busch	3.000
Izozog	<u>3.000</u>
<b>Sub-total</b>	14.600
<b>SAN-TCO</b>	
Guidai-Ichai	500
El Carmen	500
Tobité	15.000
Santa Teresita	38.000
Turubó	325.000
Amanecer	350.000
Germán Busch	300.000
Izozog	<u>300.000</u>
<b>Sub-total</b>	1.329.000
<b>TOTAL</b>	1.378.100

Tabla V.3 Requerimientos financieros para la participación indígena en la titulación (en US\$)

Categoría	Monto (US\$)
Capacitación Técnicos Indígenas	15.000
Investigación de Necesidades Espaciales	36.600
Diagnóstico Derechos Terceros	13.600
Consulta e Información	12.650
Elaboración Demandas	16.000
Participación Indígena en el Saneamiento	20.000
<b>SUBTOTAL</b>	<b>113.850</b>

**CAPITULO VI**  
**PROGRAMA 4:**  
**ASISTENCIA AL MANEJO DEL**  
**PARQUE NACIONAL GRAN CHACO**

**1.0 ANTECEDENTES**

El Parque Nacional Gran Chaco es un recurso biológico único por su alta biodiversidad, endemismo, y la gran diversidad de hábitats que lo componen. Los grupos étnicos que habitan este territorio constituyen un patrimonio significativo para Bolivia y el mundo. Mientras que su protección legal consolida su preservación, presiones externas lo amenazan. Los promotores del Proyecto del Gasoducto Bolivia-Brasil (Sector Boliviano), en consulta con la CABI, quien tiene a su cargo la administración del parque y es responsable directo por su preservación y manejo, han acordado un plan que no solo mitiga los impactos del proyecto, sino que también contribuye a la consolidación de su territorio.

Los impactos principales del proyecto sobre el Parque Nacional y sus Area Naturales de Manejo Integrado son dos:

1. Creación del derecho de vía permanente.
2. Potencial de colonización a través del derecho de vía o las vías de acceso.

Estos efectos se manifestarán en un área limitada en las cercanías del derecho de vía, denominada área de afectación. Dicha área de afectación se define como una banda de 20km de ancho, cuyo eje es el derecho de vía del gasoducto.

## 2.0 OBJETIVOS

El objetivo principal de este programa es proveer asistencia financiera y material para atender los esfuerzos de patrullaje y manejo en el área de afectación. Específicamente, se trata de consolidar la presencia de guardaparques a ambos lados del parque en la vecindad del gasoducto, así como asistir a la Dirección del Parque a sufragar los gastos necesarios para patrullar el área de afectación.

## 3.0 DESCRIPCION

### 3.1 Fondo en Fideicomiso

Los promotores del proyecto establecerán un Fondo en Fideicomiso con un capital de US\$1.000.000 cuyas ganancias serán utilizadas para el manejo del área de afectación del proyecto. Dicho fondo será establecido de acuerdo al Convenio Borrador anexo, el cual establece las condiciones para el uso del fondo. CABI, en su papel de administrador del parque, se compromete a utilizar las ganancias del fondo para el manejo sostenible y la protección del área de afectación del proyecto. El Convenio especifica las bases para el uso de los recursos generados por el fondo, incluyendo los mecanismos de auditoría y control para garantizar el uso efectivo de los fondos para cumplir con los objetivos de manejo del parque establecidos en su decreto de creación.

Los aspectos principales del Convenio son los siguientes (Sección 3.3):

- Los dineros generados por el Fondo en Fideicomiso podrán utilizarse para financiar las siguientes actividades, entre otras:
  - a) Sueldos y viáticos para guardaparques asignados al área de afectación del proyecto.
  - b) Labores de manejo y vigilancia del área de afectación.
  - c) Construcción y manejo de puestos de guardaparques, campamentos, o refugios rústicos.

- d) Entrenamiento de guardaparques asignados al área de afectación.
- Las actividades a ser financiadas con los dineros producidos por el Fondo en Fideicomiso serán parte del Plan Operativo del Parque y sujetas a los procedimientos de auditoría establecidos en el Reglamento del Parque.
  - Los dineros producidos por el fondo fiduciario serán administrados directamente por la CABI, a través de la Dirección del Parque.
  - La institución fiduciaria seleccionada deberá ser una sociedad anónima, constituida y legalmente existente de acuerdo con las leyes de Bolivia, cuya organización y funcionamiento se encuentren regulados y autorizados por la Superintendencia de Bancos y Entidades Financieras de Bolivia.
  - Las ganancias generadas por el Fondo en Fideicomiso deberán ser desembolsadas al Director del Parque anualmente, dentro de los 15 primeros días del mes de enero de cada año, comenzando en 1999.
  - El Fiduciario deberá desembolsar la totalidad de las utilidades obtenidas durante el pasado año calendario, con excepción de una reserva del 7.5% de dichas ganancias, la cual deberá capitalizar los recursos del Fondo en Fideicomiso, a fin de disminuir el riesgo cambiario, la devaluación del dólar y el incremento de los costos del Programa.
  - Antes de recibir el primer desembolso, la Dirección del Parque deberá presentar a los Fideicomitentes:
    - a. La documentación que acredita su personería jurídica.
    - b. El Plan de Operaciones para el año 1999.
    - c. El presupuesto para el año 2000
    - d. Las políticas de preservación y protección ambiental a ser financiadas con el fondo.

- e. Un Informe anual de las actividades de la Dirección del Parque realizadas durante 1998.
- Durante los 3 (tres) primeros meses de cada año la Dirección del Parque deberá enviar a los Fideicomitentes o a su representante designado para este efecto los siguientes informes:
  - a. Memoria anual de Operaciones del Parque
  - b. Presupuesto de Gastos para la próxima gestión
  - c. Estimación de ingresos.
  - d. Detalle de los gastos efectuados en la gestión anual precedente.
  - e. Informe de auditoría externa independiente
  - f. Informes de evaluación de las actividades

### 3.2 Asistencia Material

El Fondo en Fideicomiso será suplementado con donaciones materiales destinadas a ayudar a consolidar la presencia de guardaparques en los puntos de acceso al parque por el derecho de vía. La asistencia material constará de:

1. Infraestructura para guardaparques en el lado este del parque. Se anticipa la instalación de un campamento de trabajadores cerca de la intersección entre la carretera desde San José de Chiquitos y el gasoducto. Este es un punto estratégico importante, ya que es la única carretera de acceso al parque por su flanco este, además de estar localizado cerca de la demanda territorial ayorea de Santa Teresita. Una vez finalizado el uso del campamento para la construcción, se hará la donación de dos edificios prefabricados, así como el pozo de agua con su bomba, y un generador, para proveer la infraestructura básica necesaria para establecer una presencia permanente de guardabosques en este punto estratégico del parque.
2. Una vez terminada la construcción, se donarán siete vehículos de doble tracción para ser usados por los guardaparques en sus labores de patrullaje y control del parque. Estos



vehículos triplicarán la flota actual del parque y contribuirán significativamente a aumentar la eficiencia de patrullaje de los guaraparques.

3. Como se describe en el Plan de Manejo Ambiental (Capítulo IV), también se instalará un sistema de trancas para controlar el acceso indeseado al parque. Estas trancas se colocarán en todas las intersecciones de caminos con el derecho de vía del gasoducto.

### 3.3 Borrador de Convenio para Establecer el Fondo en Fideicomiso

#### SEÑOR NOTARIO DE FE PUBLICA

En registro de escrituras pública que corre a su cargo, sírvase insertar un convenio de constitución de fideicomiso, celebrado con sujeción a las cláusulas siguientes:

#### Cláusula Primera: Partes Contratantes

Celebran el presente Convenio las siguientes Partes:

- 1.1. El Consorcio de empresas integrado por Gas TransBoliviano, S.A., Petrobras, y el Grupo BTB, denominado en los sucesivos "Promotores del Plan" o "Fideicomitentes".
- 1.2. La Capitanía del Alto y Bajo Izozog, representada por el Gran Capitán, Sr. Bonifacio Barrientos.

#### Cláusula Segunda: Antecedentes

- 2.1. Los Promotores del Plan llevarán a cabo las obras de construcción de la porción boliviana del Gasoducto Bolivia-Brasil, la cual se extiende desde la Planta de Gas de Río Grande hasta El Carmen de la Frontera, en el Departamento de Santa Cruz, con una longitud de 555 km. Las obras se ejecutarán a partir del agosto de 1997, con una duración máxima estimada de 17 meses.

- 2.2. A fin de evitar, minimizar o mitigar los impactos ambientales del proyecto, la consultora Dames & Moore ha efectuado un estudio de impacto ambiental, preparado de acuerdo a las normas bolivianas y del Banco Mundial (Dames & Moore 1996).
- 2.3. El estudio efectuado por la Consultora Dames & Moore recomienda la asistencia a la protección y preservación de la diversidad biológica, los recursos genéticos, los sistemas primitivos originales, los paisajes naturales, formaciones geomorfológicas del área del Parque Nacional Gran Chaco a ser afectada por el proyecto.
- 2.4. Mediante Decreto Supremo No. 24122 de 21 de Septiembre de 1995, se constituyó el Parque Nacional y Area Natural de Manejo Integrado KAA-IYA del Gran Chaco, en lo sucesivo "Parque Gran Chaco" con una superficie de 3.441.115 hectáreas, el cual se encuentra regido por el Sistema Nacional de Areas Protegidas, bajo jurisdicción del Primer Distrito Municipal Indígena del Izozog ejercido por la Capitanía del Alto y Bajo Izozog.

Son objetivos del Parque Nacional y Area Natural de Manejo Integrado KAA-IYA del Gran Chaco, los siguientes:

- a. Preservar las características geomorfológicas, paisajísticas y la diversidad biológica y cultural del área del Gran Chaco.
- b. Conservar a perpetuidad los procesos ecológicos y evolutivos del ecosistema chaqueño para proteger la mayor extensión de bosque xerofítico bien conservado que queda en el planeta.
- c. Preservar y mantener especies de valor excepcional, amenazadas, endémicas y típicas de este ecosistema.
- d. Promover el aprovechamiento sostenible de los recursos naturales del Area, especialmente por parte de las poblaciones que tradicionalmente lo habitan, con miras a obtener una mejora de su calidad de vida y acceso a los beneficiarios derivados de la conservación y manejo del área.

- e. Promover la utilización y recuperación de tecnologías y sistemas tradicionales de uso de recursos, así como formas alternativas que mejoren la producción y contribuyan al mejoramiento de la calidad de vida de la población local.
  - f. Contribuir al desarrollo local y regional a través de actividades de ecoturismo, recreación en la naturaleza y otras formas que revaloricen las manifestaciones culturales de la población izoño/guaraní.
  - g. Garantizar el uso sostenible de los recursos naturales por la población étnica tradicional del área.
  - h. Asegurar el efectivo desarrollo sostenible de la región mediante la protección adecuada y duradera de los procesos ecológicos del conjunto de la cuenca del Parapetí.
  - i. Promover la investigación científica, en particular aquella que contribuya a mejorar el manejo del Área y los recursos naturales.
- 2.5. Los Promotores del Plan han manifestado su voluntad de establecer un Fondo de Fideicomiso para financiar un programa permanente de preservación y protección del área del Parque Gran Chaco a ser afectada directamente por la construcción y operación del Gasoducto Bolivia-Brasil.
- 2.6. Para efectos de este convenio, dicha área de afectación es el área dentro del Parque Nacional Gran Chaco o sus Áreas Naturales de Manejo Integrado (ANMI) en una franja de 20 km de ancho cuyo eje es el derecho de vía del gasoducto.

### **Cláusula Tercera: Objeto**

- 3.1. Los Fideicomitentes mediante el presente Convenio constituyen en fideicomiso un Fondo de US\$1.000.000 (un millón de dólares de los Estados Unidos de América), denominado en lo sucesivo "Fondo en Fideicomiso", para el financiamiento parcial de las actividades de manejo del área de afectación.

**Cláusula Cuarta: El Programa del Parque y su Administración.**

- 4.1. Los recursos generados por el Capital en Fideicomiso serán utilizados para financiar parcialmente el Programa de Protección y Preservación del Parque Nacional Gran Chaco, en lo que respecta al área de afectación del proyecto.
- 4.2. Los dineros generados por el fondo en fideicomiso podrán utilizarse para financiar las siguientes actividades, entre otras:
  - a. Sueldos y viáticos para guardaparques asignados al área de afectación del proyecto.
  - b. Labores de manejo y vigilancia del área de afectación.
  - c. Construcción y manejo de puestos de guardaparques, campamentos, o refugios rústicos.
  - d. Entrenamiento de guardaparques asignados al área de afectación.
- 4.3. Las actividades a ser financiadas con los dineros producidos por el fondo en fideicomiso serán parte del Plan Operativo del Parque y sujetas a los procedimientos de auditoría establecidos en el Reglamento del Parque.
- 4.4. Los dineros producidos por el fondo fiduciario serán administrados directamente por la CABI, a través de la Dirección del Parque.

**Cláusula Quinta: Del Fiduciario**

- 5.1. Los Fideicomitentes, en el plazo de 3 (tres) meses computable a partir de la fecha de suscripción de la presente minuta, designarán a la institución fiduciaria a cargo de la administración de los recursos del Fondo.
- 5.2. La institución fiduciaria deberá ser una sociedad anónima, constituida y legalmente existente de acuerdo con las leyes de Bolivia, cuya organización y funcionamiento se

encuentren regulados y autorizados por la Superintendencia de Bancos y Entidades Financieras de Bolivia.

- 5.3. Los Fideicomitentes se reservan el derecho de cambiar de institución Fiduciaria, previa notificación a la CABI y al Fiduciario con una anticipación no menor a tres meses.
- 5.4. La CABI podrá solicitar el cambio de institución beneficiaria a los Fideicomitentes, quienes, si lo estiman conveniente podrán ejercer el derecho mencionado en el numeral 5.3.
- 5.5. El Fiduciario está autorizado a invertir los recursos del Fondo y las ganancias generadas por dichos recursos en certificados de depósitos de largo plazo. En la medida que se desarrolle el mercado bursátil de Bolivia, previa consulta con los Fideicomitentes o su representante autorizado, el Fiduciario podrá invertir en los mercados bursátiles en negociables que ofrezcan un prudente nivel de riesgo y en forma diversificada. El Fiduciario no podrá invertir en instrumentos o portafolios que presenten alto riesgo y que sean de naturaleza especulativa. Tampoco podrá invertir en el mercado de bienes.
- 5.6. El Fiduciario deberá enviar a los Fideicomitentes y a la Dirección del Parque informes trimestrales sobre las inversiones efectuadas y el estado de los resultados.
- 5.7. El Fiduciario se obliga a presentar a los Fideicomitentes y a la Dirección del Parque los informes que se le requieran en forma extraordinaria.

#### **Cláusula Sexta: Desembolsos**

- 6.1. Las ganancias generadas por el Fondo de Fideicomiso deberán ser desembolsadas al Director del Parque, en forma anual, permanente y consecutiva, dentro de los 15 (quince) primeros días del mes de enero de cada año. El primer desembolso se efectuará hasta el 15 (quince) de enero de 1999.

- 6.2. El Fiduciario deberá desembolsar la totalidad de las utilidades obtenidas durante el pasado año calendario, con excepción de una reserva del 7.5% de dichas ganancias, la cual deberá capitalizar los recursos del Fondo de Fideicomiso, a fin de disminuir el riesgo cambiario, la devaluación del dólar y el incremento de los costos del Programa.

**Cláusula Séptima: Condiciones Previas al Primer Desembolso**

- 7.1. Antes de recibir el primer desembolso, la Dirección del Parque deberá presentar a entera satisfacción de los Fideicomitentes:
- a. La documentación que acredita su personería jurídica.
  - b. El Plan de Operaciones para el año 1999.
  - c. El presupuesto para el año 2000.
  - d. Las políticas de preservación y protección ambiental a ser financiadas con el fondo.
  - e. Un Informe anual de las actividades de la Dirección del Parque realizadas durante 1998.
- 7.2. Los Fideicomitentes comunicarán al Fideicomisario que la Dirección del Parque ha cumplido con las condiciones previas al primer desembolso, siendo en consecuencia elegible para dicho desembolso.

**Cláusula Octava: Informes**

- 8.1. Durante los 3 (tres) primeros meses de cada año la Dirección del Parque deberá enviar a los Fideicomitentes o a su representante designado para este efecto los siguientes informes:
- a. Memoria anual de Operaciones de las Actividades del Parque.
  - b. Presupuesto de Gastos para la próxima gestión.
  - c. Estimación de ingresos.
  - d. Detalle de los gastos efectuados en la gestión anual precedente.

- e. Informe de auditoría externa independiente.
- f. Informes de evaluación de las actividades efectuadas el año anterior.

Los Fideicomitentes podrán notificar al Fideicomisario que suspendan los desembolsos hasta que la Dirección del Parque presente la documentación o informe debidamente.

#### **Cláusula Novena: Cambios Fundamentales**

- 9.1 La Dirección del Parque deberá informar y obtener de los Fideicomitentes su no objeción a cualquier cambio fundamental en su composición, estructura, organización y funciones.

#### **Cláusula Décima: Naturaleza y Plazo**

- 10.1 El presente convenio ha sido constituido sin fines lucrativos con una vigencia indefinida.

#### **Cláusula Décima Primera: Modificación**

- 11.1 El presente Convenio podrá ser modificado por acuerdo entre los Fideicomitentes y el Beneficiario.

#### **Cláusula Décima Segunda: Normas Aplicables**

- 12.1 Son aplicables al presente Convenio en todo aquello que no se opongan al mismo las disposiciones de disposiciones de la Sección III, Capítulo IV, Título VII, Libro Tercero del Código de Comercio.

## CAPITULO VII COSTO Y CRONOGRAMA DEL PLAN DE DESARROLLO DE PUEBLOS INDIGENAS

### 1.0 COSTO

Salvo los beneficios del Fondo en Fideicomiso para el Parque Nacional Gran Chaco, los cuales se obtendrán a largo plazo, los programas del Plan de Desarrollo de Pueblos Indígenas se ejecutarán en un plazo de dos años, asociado al cronograma de construcción. La inversión total del proyecto para la ejecución del Plan será de US\$2.716.039, la cual se distribuirá entre los cuatro programas descritos en los capítulos precedentes.

Las Tablas VII.1-3 detallan los costos del Plan. La Tabla VII.1 presenta un resumen de los costos de la estrategia global ambiental del proyecto. La Tabla VII.2 resume los costos del Plan por programa. La Tabla VII.3 describe en detalle los ítems de costo de cada programa.

Los costos del Plan se describen brevemente a continuación:

- Aproximadamente, US\$800.000 serán invertidos en la gestión del Plan, incluyendo los componentes básicos de relación con las comunidades y la resolución de conflictos que, aunque no anticipados, se puedan presentar.
- Un total de US\$296,000 serán invertidos en el Programa de Asistencia al Manejo Sostenible de Recursos Naturales, el cual incluye componentes de capacitación, becas, asistencia técnica, estudios, y financiamiento de propuestas.
- El Programa de Asistencia a la Titulación de Tierras contará con una inversión de US\$500.000, lo cual servirá de incentivo para llevar a cabo un esfuerzo de titulación agresivo



que contribuya significativamente a consolidar los territorios indígenas dentro del área de estudio.

- Finalmente, el Programa de Asistencia al Manejo del Parque Nacional Gran Chaco contará con el Fondo en Fideicomiso (US\$1.000.000) y con ayuda material valorada en US\$138.216.

## 2.0 CRONOGRAMA

El cronograma de los programas del PDPI está asociado con el cronograma de construcción (Figura VII.1). Los programas tendrán una duración máxima de 24 meses, con la excepción del Fondo en Fideicomiso.

- La primera actividad a realizar será la contratación del personal de gestión y la instalación de las tres oficinas en Santa Cruz, La Brecha y San José de Chiquitos. Esta tarea se iniciará con anticipación a la construcción, con el propósito de tener la infraestructura organizativa del Plan para el momento en que comience la construcción.
- Los programas de Asistencia al Manejo Sostenible de Recursos Naturales y a la Titulación de Tierras se llevarán a cabo en dos etapas. La Etapa I tendrá una duración de cuatro meses, durante los cuales se elaborarán los planes de acción específicos a ser ejecutados en la Etapa II.
- Los desembolsos estarán asociados a las actividades de los programas, bajo la administración del Gerente del Plan.

<b>TABLA VII.1 - RESUMEN DE COSTOS - PROGRAMAS AMBIENTALES Y SOCIALES (EN \$us)</b>		
Plan de Manejo Ambiental (PMA)	1,897,253	
Plan de Desarrollo de Pueblos Indígenas (PDPI)	2,716,039	
<b>Subtotal PMA y PDPI</b>		<b>4,613,292</b>
Gerente Ambiental de los Auspiciadores	107,000	
Auditor Ambiental de los Auspiciadores	96,500	
Estudios PMA y PDPI (Dames & Moore)	340,600	
Análisis de Riesgo (PMT)	81,000	
Evaluación Arqueológica (Dames & Moore)	100,000	
Evaluación de Revegetación y Biodiversidad (CABI)	9,100	
Revegetación (CABI)	276,480	
Estudio de Línea Base de la Biodiversidad (CABI)	32,320	
<b>Subtotal</b>		<b>1,043,000</b>
<b>GRAN TOTAL</b>		<b>5,656,292</b>

**TABLE VII.2 - SUMMARY OF COSTS - INDIGENOUS PEOPLES DEVELOPMENT PLAN - IPDP (\$US)**

TOTAL 1.0 a - PLAN MANAGEMENT	416,820
TOTAL 1.0 b - COMMUNITY INTERACTION	365,003
TOTAL 2.0 - SUSTAINABLE NATURAL RESOURCES MANAGEMENT	296,000
TOTAL 3.0 - LAND DEMARCATION & TITLING	500,000
TOTAL 4.0 - ASSISTANCE TO ADMINISTRATION OF THE GRAN CHACO NATIONAL PARK	1,138,216
<b>TOTAL IPDP</b>	<b>2,716,039</b>

**TABLE VII.3 - INDIGENOUS PEOPLE DEVELOPMENT PLAN (IPDP)**

Item	Description	Unit	Unit Cost (Sus)	Quantity	Total (Sus)
<b>1.0 PLAN IMPLEMENTATION AND COMMUNITY INTERACTION</b>					
<b>1.1 PLAN IMPLEMENTATION</b>					
<b>1.1.1 Labor</b>					
1.1.1.1	IPDP Manager	month	5,000	24	120,000
1.1.1.2	Coordinator - La Brecha	month	1,000	24	24,000
1.1.1.3	Coordinator - San José	month	1,000	24	24,000
1.1.1.4	Izozeño Representative	month	500	24	12,000
1.1.1.5	Chiquitano Representative	month	500	24	12,000
1.1.1.6	Ayoreo Representative	month	500	24	12,000
1.1.1.7	Secretary - Santa Cruz	month	400	24	9,600
1.1.1.8	Secretary - La Brecha	month	250	24	6,000
1.1.1.9	Secretary - San José	month	250	24	6,000
<b>Subtotal</b>					<b>225,600</b>
<b>1.1.2 Office in Santa Cruz</b>					
1.1.2.1	Office rental - Santa Cruz	month	500	24	12,000
1.1.2.2	Furniture	global	1,200	1	1,200
1.1.2.3	Computers	unit	2,500	2	5,000
1.1.2.4	Printer	unit	600	1	600
1.1.2.5	Copy machine	unit	3,000	1	3,000
1.1.2.6	Telephone	unit	60	24	1,440
1.1.2.7	Fax	unit	300	1	300
1.1.2.8	Communications use	month	300	24	7,200
1.1.2.9	Office supplies	month	300	24	7,200
1.1.2.10	Others	month	300	24	7,200
<b>Subtotal</b>					<b>45,140</b>
<b>1.1.3 Office in La Brecha</b>					
1.1.3.1	Office construction	lump sum	1	6,000	6,000
1.1.3.2	Furniture	global	500	1	500
1.1.3.3	Computers	unit	2,500	1	2,500
1.1.3.4	Printer	unit	600	1	600
1.1.3.5	Copy machine	unit	3,000	1	3,000
1.1.3.6	Telephone	unit	60	24	1,440
1.1.3.7	Fax	unit	300	1	300
1.1.3.8	Communications use	month	200	24	4,800
1.1.3.9	Office supplies	month	200	24	4,800
1.1.3.10	Others	month	200	24	4,800
<b>Subtotal</b>					<b>28,740</b>
<b>1.1.4 Office in San José de Chiquitos</b>					
1.1.4.1	Office rent	month	250	24	6,000
1.1.4.2	Furniture	global	500	1	500
1.1.4.3	Computers	unit	2,500	1	2,500
1.1.4.4	Printer	unit	600	1	600
1.1.4.5	Copy machine	unit	3,000	1	3,000
1.1.4.6	Telephone	unit	60	24	1,440
1.1.4.7	Fax	unit	300	1	300
1.1.4.8	Communications use	month	200	24	4,800
1.1.4.9	Office supplies	month	200	24	4,800
1.1.4.10	Others	month	200	24	4,800
<b>Subtotal</b>					<b>28,740</b>

**TABLE VII.3 - INDIGENOUS PEOPLE DEVELOPMENT PLAN (IPDP)**

Item	Description	Unit	Unit Cost (Sus)	Quantity	Total (Sus)
<b>1.1.5</b>	<b>Transportation Allowance</b>				
1.1.5.1	Manager	month	1,000	24	24,000
1.1.5.2	Coordinators (2)	month	500	24	12,000
1.1.5.3	Indigenous Representatives (3)	month	1,000	24	24,000
1.1.5.4	Others	lump sum	5,000	1	5,000
	<b>Subtotal</b>				<b>65,000</b>
<b>1.1.6</b>	<b>Miscellaneous</b>				
1.1.6.1	Accident Insurance	person/year	300	12	3,600
1.1.6.2	Logistics (Meetings & Newsletters)	lump sum	15,000	1	15,000
1.1.6.3	Contingencies	lump sum	5,000	1	5,000
	<b>Subtotal</b>				<b>23,600</b>
<b>TOTAL 1.1 - MANAGEMENT ORGANIZATION</b>					<b>416,820</b>
<b>1.2</b>	<b>CONFLICT RESOLUTION</b>				
<b>1.2.1</b>	<b>Labor</b>				
1.2.1.1	Mediator (as needed)	day	300	30	9,000
	<b>Subtotal</b>				<b>9,000</b>
<b>1.2.2</b>	<b>Expenses</b>				
1.2.2.1	Trasportation allowance	day	150	30	4,500
	<b>Subtotal</b>				<b>4,500</b>
<b>TOTAL 1.2 - CONFLICT RESOLUTION</b>					<b>13,500</b>
<b>1.3</b>	<b>ASSISTANCE TO INDIGENOUS COMMUNITIES</b>				
<b>1.3.1</b>	<b>Chiquitanos</b>				
1.3.1.1	Well	unit	70,000	0	0
1.3.1.2	Pump and equipment	unit	25,000	0	0
1.3.1.3	Generator	unit	76,000	0	0
1.3.1.4	Maintenance Personnel Training	lump sum	5,000	0	0
1.3.1.5	Tools and Transportation	lump sum	17,500	0	0
1.3.1.6	Maintenance Staff	month	250	0	0
1.3.1.7	Clinic	lump sum	17,940	1	17,940
1.3.1.8	Medicine	lump sum	32,750	1	32,750
1.3.1.9	Doctor (33% cost split with other 5 clinics)	month	578	24	13,860
1.3.1.10	Vehicle - Doctor (33% cost split with other 5 clinics)	lump sum	27,500	0.33	9,075
1.3.1.11	Vehicle Maintenance - (33% cost split with other 5 clinics)	month	99	24.00	2,376
	<b>Subtotal</b>				<b>76,001</b>
<b>1.3.2</b>	<b>Ayoreos</b>				
1.3.2.1	Well	unit	70,000	0	0
1.3.2.2	Pump and equipment	unit	25,000	0	0
1.3.2.3	Generator	unit	76,000	0	0
1.3.2.4	Maintenance Personnel Training	lump sum	5,000	0	0
1.3.2.5	Tools and Transportation	lump sum	17,500	0	0
1.3.2.6	Maintenance Staff	month	250	0	0
1.3.2.7	Clinic	lump sum	17,940	1	17,940
1.3.2.8	Medicine	lump sum	32,750	1	32,750
1.3.2.9	Doctor (33% cost split with other 5 clinics)	month	578	24	13,860
1.3.2.10	Vehicle - Doctor (33% cost split with other 5 clinics)	lump sum	27,500	0.33	9,075
1.3.2.11	Vehicle Maintenance - (33% cost split with other 5 clinics)	month	99	24.00	2,376
	<b>Subtotal</b>				<b>76,001</b>

**TABLE VII.3 - INDIGENOUS PEOPLE DEVELOPMENT PLAN (IPDP)**

Item	Description	Unit	Unit Cost (Sus)	Quantity	Total (Sus)
1.3.3	<b>Izoceños</b>				
1.3.3.1	Well	unit	70,000	1	70,000
1.3.3.2	Pump and equipment	unit	25,000	1	25,000
1.3.3.3	Generator	unit	76,000	0	0
1.3.3.4	Maintenance Personnel Training	lump sum	5,000	1	5,000
1.3.3.5	Tools and Transportation	lump sum	17,500	1	17,500
1.3.3.6	Maintenance Staff	month	250	24	6,000
1.3.3.7	Clinic	lump sum	17,940	1	17,940
1.3.3.8	Medicine	lump sum	32,750	1	32,750
1.3.3.9	Doctor (33% cost split with other 5 clinics)	month	578	24	13,860
1.3.3.10	Vehicle - Doctor (33% cost split with other 5 clinics)	lump sum	27,500	0.33	9,075
1.3.3.11	Vehicle Maintenance - (33% cost split with other 5 clinics)	month	99	24.00	2,376
<b>Subtotal</b>					<b>199,501</b>
<b>TOTAL 1.3 - ASSISTANTE TO INDIGENOUS COMMUNITIES</b>					<b>351,503</b>
<b>TOTAL 1.0 - PLAN MANAGEMENT AND COMMUNITY INTERACTION</b>					<b>781,823</b>

**TABLE VII.3 - INDIGENOUS PEOPLE DEVELOPMENT PLAN (IPDP)**

Item	Description	Unit	Unit Cost (Sus)	Quantity	Total (Sus)
<b>2.0 SUSTAINABLE NATURAL RESOURCES MANAGEMENT</b>					
<b>2.1 TRAINING, GRANTS &amp; TECHNICAL ASSISTANCE</b>					
2.1.1	Training				
2.1.1.1	Training	lump sum	55,000	1	55,000
	<b>Subtotal</b>				<b>55,000</b>
2.1.2	Grants				
2.1.2.1	Grants	unit	3,000	15	45,000
	<b>Subtotal</b>				<b>45,000</b>
2.1.3	Technical Assistance				
2.1.3.5	Technical Assistance	lump sum	36,000	1	36,000
	<b>Subtotal</b>				<b>36,000</b>
<b>TOTAL 2.1 - TRAINING, GRANTS &amp; TECHNICAL ASSISTANCE</b>					<b>136,000</b>
<b>2.2 PROPOSAL FINANCING FUND</b>					
2.2.1	Proposal Financing Fund				
2.2.1.1	Proposal Financing Fund	lump sum	100,000	1	100,000
	<b>Subtotal</b>				<b>100,000</b>
<b>TOTAL 2.2 - PROPOSAL FINANCING FUND</b>					<b>100,000</b>
<b>2.3 STUDIES OF POTENTIAL PROJECTS</b>					
2.3.1	Studies of Potential Projects				
2.3.1.1	Studies of Potential Projects	lump sum	45,000	1	45,000
	<b>Subtotal</b>				<b>45,000</b>
<b>TOTAL 2.3 - STUDIES OF POTENTIAL PROJECTS</b>					<b>45,000</b>
<b>2.4 PROGRAM EVALUATION</b>					
2.2.1	Program Evaluation				
2.2.1.1	Program Evaluation	lump sum	15,000	1	15,000
	<b>Subtotal</b>				<b>15,000</b>
<b>TOTAL 2.4 - PROGRAM EVALUATION</b>					<b>15,000</b>
<b>TOTAL 2.0 - SUSTAINABLE NATURAL RESOURCES MANAGEMENT</b>					<b>296,000</b>



**TABLE VII.3 - INDIGENOUS PEOPLE DEVELOPMENT PLAN (IPDP)**

Item	Description	Unit	Unit Cost (Sus)	Quantity	Total (Sus)
<b>3.0 LAND DEMARCATION &amp; TITLING</b>					
<b>3.1 SANEAMIENTO SIMPLE</b>					
3.1.1	Saneamiento Simple				
3.1.1.1	Motacú/Motacusito	lump sum	1,000	1	1,000
3.1.1.2	Urucú	lump sum	500	1	500
	<b>Subtotal</b>				<b>1,500</b>
<b>TOTAL 3.1 - SANEAMIENTO SIMPLE</b>					<b>1,500</b>
<b>3.2 CARACTERIZACION PRELIMINAR</b>					
3.2.1	Caracterización Preliminar				
3.2.1.1	Guidai-Ichai	lump sum	1,250	1	1,250
3.2.1.2	El Carmen	lump sum	1,250	1	1,250
3.2.1.3	Tobité	lump sum	1,250	1	1,250
3.2.1.4	Santa Teresita	lump sum	1,250	1	1,250
3.2.1.5	Turubó	lump sum	7,000	1	7,000
3.2.1.6	Amanecer	lump sum	7,000	1	7,000
3.2.1.7	German Busch	lump sum	7,000	1	7,000
3.2.1.8	Izozog	lump sum	7,000	1	7,000
	<b>Subtotal</b>				<b>33,000</b>
<b>TOTAL 3.2 - CARACTERIZACION PRELIMINAR</b>					<b>33,000</b>
<b>3.3 GEOREFERENCIAZION</b>					
3.3.1	Caracterización Preliminar				
3.3.1.1	Guidai-Ichai	lump sum	300	1	300
3.3.1.2	El Carmen	lump sum	300	1	300
3.3.1.3	Tobité	lump sum	1,000	1	1,000
3.3.1.4	Santa Teresita	lump sum	1,000	1	1,000
3.3.1.5	Turubó	lump sum	3,000	1	3,000
3.3.1.6	Amanecer	lump sum	3,000	1	3,000
3.3.1.7	German Busch	lump sum	3,000	1	3,000
3.3.1.8	Izozog	lump sum	3,000	1	3,000
	<b>Subtotal</b>				<b>14,600</b>
<b>TOTAL 3.3 - GEOREFERENCIAZION</b>					<b>14,600</b>
<b>3.4 SANEAMIENTO TCO</b>					
3.4.1	Caracterización Preliminar				
3.4.1.1	Guidai-Ichai	lump sum	500	1	500
3.4.1.2	El Carmen	lump sum	500	1	500
3.4.1.3	Tobité	lump sum	15,000	1	15,000
3.4.1.4	Santa Teresita	lump sum	38,000	1	38,000
3.4.1.8	"Seed" Funds	lump sum	396,900	1	396,900
	<b>Subtotal</b>				<b>450,900</b>
<b>TOTAL 3.4 - SANEAMIENTO TCO</b>					<b>450,900</b>
<b>TOTAL 3.0 - LAND DEMARCATION &amp; TITLING</b>					<b>500,000</b>

**TABLE VII.3 - INDIGENOUS PEOPLE DEVELOPMENT PLAN (IPDP)**

Item	Description	Unit	Unit Cost (Sus)	Quantity	Total (Sus)
<b>4.0 ASSISTANCE TO ADMINISTRATION OF THE GRAN CHACO NATIONAL PARK</b>					
<b>4.1 TRUST FUND</b>					
4.1.1	Fund				
4.1.1.1	Fund	lump sum	1,000,000	1	1,000,000
	<b>Subtotal</b>				<b>1,000,000</b>
	<b>TOTAL 4.1 - TRUST FUND</b>				<b>1,000,000</b>
<b>4.2 VEHICLES</b>					
4.2.1	Vehicles				
4.2.1.1	Vehicles, Pickup Truck - 1 (50% cost split with EMP)	lump sum	30,000	0.5	15,000
4.2.1.2	Vehicles, Pickup Truck - 2 (50% cost split with EMP)	lump sum	30,000	0.5	15,000
4.2.1.3	Vehicles, Pickup Truck - 3 (50% cost split with EMP)	lump sum	30,000	0.5	15,000
4.2.1.4	Vehicles, Pickup Truck - 4 (50% cost split with EMP)	lump sum	30,000	0.5	15,000
4.2.1.5	Vehicles, Pickup Truck - 5 (50% cost split with CSP)	lump sum	30,000	0.5	15,000
4.2.1.6	Vehicles, Pickup Truck - 6 (50% cost split with CSP)	lump sum	30,000	0.5	15,000
4.2.1.7	Vehicles, Pickup Truck - 7 (50% cost split with CSP)	lump sum	30,000	0.5	15,000
	<b>Subtotal</b>				<b>105,000</b>
	<b>TOTAL 4.2 - VEHICLES</b>				<b>105,000</b>
<b>4.3 OTHER</b>					
4.3.1	Portable Office Buildings				
4.3.1.1	Two 10' x 30' Portable Office Building	unit	16,608	2	33,216
	<b>Subtotal</b>				<b>33,216</b>
	<b>TOTAL 4.3 - OTHER</b>				<b>33,216</b>
<b>TOTAL 4.0 - ASSISTANCE TO ADMINISTRATION OF THE GRAN CHACO NATIONAL PARK</b>					<b>1,138,216</b>
<b>GRAND TOTAL - IPDP</b>					<b>2,716,039</b>

CSP = Construction Supervision Personnel

## CAPITULO VIII BIBLIOGRAFIA

### 1.0 REFERENCIAS CITADAS

Bormida, M. y M. Califano, 1978. *Los Indios Ayoreos del Chaco Boreal*, Fundación para la Educación, la Ciencia y la Cultura.

CORDECRUZ-CIPCA (Corporación Regional de Desarrollo de Santa Cruz-Centro de Investigación y Promoción del Campesinado), 1986. *Plan de Desarrollo Rural Cordillera, Resumen de Diagnóstico y Estrategia*, Vol. I, Santa Cruz, Bolivia, 89p.

CORDECRUZ (Corporación Regional de Desarrollo de Santa Cruz), 1989. *Proyecto Desarrollo de San José (PRODESA)*, Santa Cruz, Bolivia.

CUMAT (Centro de Investigaciones y Estudio de la Capacidad de Uso Mayor de la Tierra), 1990. *Estudio del Impacto Ambiental para la Construcción del Gasoducto Santa Cruz - Puerto Suárez y Central Termoeléctrica Puerto Suárez*, 188p.

Dames & Moore, 1996. *Environmental Impact Study for Bolivia-Brazil Gas Pipeline Project*.

Heijdra, H., 1987. *La Nueva Gente*, Wageningen.

Municipio San José, 1995. *Plan Participativo de Desarrollo Municipal 1996 - 2000*, CORDECRUZ, IP/GTZ (Corporación Regional de Desarrollo de Santa Cruz, Cooperación Técnica Boliviana Alemana), 92p.

Riester, Jürgen, 1976. *En Busca de la Loma Santa*. Los Amigos del Libro.

Riester, J. y B. Suaznabar, 1990. Diagnóstico del Area III de Santa Cruz, Pueblos Ayoréode-Chiquitano-Guarayo.

Riester, J. Y J. Zarzycki, 1985. *Algunos Aspectos de la Cosmovisión Económica de los Guaraní-Izoceños en Bolivia*, APCOB (Apoyo al Campesino Indígena del Oriente Boliviano).

Schwarz, Burkhard, 1994. *Estrategias Neocoloniales de Desarrollo versus Territorialidad Chiquitana*.

Thiele, Graham & Mercedes Nostas, 1994. "Los Chiquitanos del Sureste: Marginalización y Diferenciación", *América Indígena* 3:9-38.

## 2.0 OTRAS REFERENCIAS CONSULTADAS

Acebey, David, 1978. Una Masacre a los Ayoreos. *Presencia*. Sec. Linterna, Diurna, 8 diciembre, p. 3.

Albó, Xavier, 1990. *La Comunidad Hoy, Los Guaraní Chiriguano*, CIPCA (Centro de Investigación y Promoción del Campesinado).

APCOB (Apoyo Para el Campesino-Indígena del Oriente Boliviano), 1981. *Marco Operacional del Proyecto Ayoréode*, Santa Cruz, Bolivia, 12p.

APCOB, 1994. Población Indígena de las Tierras Bajas de Bolivia, Santa Cruz, Bolivia, 53p.

Arango, Raúl, 1990. *Formulación de Políticas para Poblaciones Indígenas del Trópico Boliviano*, OIT, Lima, Peru, 1990.

Banco Interamericano de Desarrollo (BID)/UNIANDES, 1989. *El Impacto de los Proyectos de Desarrollo sobre la Pobreza, Seminarios del Centro de Desarrollo*, París, Francia.

Banco Mundial, 1984. *Poblaciones Indígenas y Desarrollo Económico, Consideraciones Ecológicas-Humanas*, Washington D.C., EE.UU.

Banco Mundial, 1991. Operational Directive 4.20, Indigenous Peoples. *The World Bank Operational Manual*, World Bank, Washington D.C., EE.UU.

Banco Mundial, 1993. *Natural Resource Management in Bolivia: 30 Years of Experience*, Banco Mundial, Washington D.C., EE. UU.

Banco Mundial, 1996. *Participation in Practice*. Discussion Paper No.33, Washington D.C. EE.UU.

Beasley, Kay y Jim Alexander, 1995. *Bolivia -Brazil Pipeline Project*. Informe sobre una visita de campo del 5 al 25 de agosto de 1995 para TENNECO/BTB y ENRON.

Bentley, J., 1996. ¿Pagan los Pobres la Cuenta del Desarrollo Sostenible?, *Rev. Ceiba*, Vol. 37, No.2, pp.247-251.

Bertoni, Moisés S., 1954. *La Civilización Guaraní*, Editorial Indoamericana.

- Birk, G., 1995. Plantas Útiles en Bosques y Pampas Chiquitanas, Un Estudio Etnobotánico con Perspectiva de Género, APCOB, Santa Cruz, Bolivia. 353p.
- Bormida, Marcelo, 1978. "Ergon y Mito: Una Hermenéutica de la Cultura Material de los Ayoreos del Chaco Boreal," *Revista Scripta Etnológica*, Vol. 1, No. 1.
- CABI (Capitanía del Alto y Bajo Izozog) y DNCB (Dirección Nacional de Conservación de la Biodiversidad), 1996. *Plan Operativo para el Parque Nacional y Area de Manejo Integrado Kaa-Iya del Gran Chaco Boliviano*.
- Califano, Mario, 1978. "Enfermedad y Terapia entre los Ayoreos (Zamuco) del Chaco Boreal", Trabajo presentado en la Reunión Anual de Etnología, La Paz, Bolivia.
- Canavesi Lissette, 1993. Programa Nacional para el Desarrollo Participativo y Armónico de los Pueblos Indígenas del Oriente, Chaco y Amazonía, Vols. I, II & III, IIB/PNUD (Programa de las Naciones Unidas para el Desarrollo), BOL 91/102, La Paz.
- CIDOB, 1988. *Las Culturas de Nuestras Naciones. Historia de los Ayoreos*, Vol 1. N.1 Santa Cruz, Bolivia.
- Combes, Isabelle, 1996. *Iyambae: Historia de la Capitanía del Alto y bajo Izozog*, Fundación Iwi-Iyambae.
- CORDECRUZ, 1989. Diagnóstico Socio-económico y de Recursos Naturales del Area de Roboré. UPRA (Unidad de Programas Rurales y Agropecuarios), Vol. IV, Santa Cruz, Bolivia, 89p.
- CORDECRUZ, 1993. *Delimitación de Areas Especiales de Comunidades Indígenas en el Departamento de Santa Cruz*, Proyecto de Protección de los Recursos Naturales en el Departamento de Santa Cruz.
- CORDECRUZ, IP/GTZ (Corporación Regional de Desarrollo de Santa Cruz, Cooperación Técnica Boliviano Alemana), 1995. *Plan de Desarrollo Microregional de Chiquitos*, Santa Cruz, Bolivia, 74p.
- CORDECRUZ, IP/GTZ (Corporación Regional de Desarrollo de Santa Cruz, Cooperación Técnica Boliviano Alemana), 1996. *Plan de Desarrollo Microregional de Germán Busch*, Santa Cruz, 73p.

- CORDECRUZ-KFW-CONSORCIO IP/CES/KWC (Corporación Regional de Desarrollo de Santa Cruz-Banco Alemán para el Desarrollo-Institut Fur Projektplanung GmbH-Consulting Engineers Salzgitter GmbH-Kirchner & Wolf Consult GmbH), 1995. *Plan de Uso del Suelo PLUS*, Santa Cruz, Bolivia.
- Dinerstein, Eric, David, M. Olson, Douglas J. Graham, et al., 1995. *A Conservation Assessment of the Terrestrial Ecoregions of Latin America and the Caribbean*, World Bank.
- Dixhorn, N., 1996. Manejo de Agua en el Chaco Guaraní, CIPCA (Centro de Investigación y Promoción del Campesinado), SNV-Bolivia (Servicio Holandés de Cooperación al Desarrollo).
- Field, Barry, 1995. *Economía Ambiental*, McGraw-Hill, Bogotá, Colombia.
- Finot, Marthadina, 1996. "Desarrollo Sostenible, Ecología Humana, y Salud," Curso dictado en el Ministerio de Desarrollo Sostenible, La Paz, Septiembre de 1996.
- Gandarilla, E., 1996. Plan Microregional de Desarrollo de Cordillera, CORDECRUZ, IP/GTZ, Santa Cruz, Bolivia. 117p.
- Haenke, Wanda, 1949. "Un Viaje por Chiquitos," *Revista Geográfica Americana*, Vol. 16, No. 31, pp. 342-355.
- Heijdra, Hans 1996. *Participación y Exclusión Indígena en el Desarrollo de los Pueblos Indígenas de las Tierras Bajas*, Banco Mundial/CIDOB (Confederación de Pueblos Indígenas de Bolivia).
- Heidjra, H., 1997. Participación y Exclusión Indígena en el Desarrollo, Banco Mundial, CIDOB (Confederación de Pueblos Indígenas de Bolivia Fortalecidos en la Unidad) y el pueblo Ayoréo en el Proyecto tierras Bajas del Este de Bolivia, Vol. 6, Santa Cruz, Bolivia, 227p.
- Marinissen, Judith, 1995. *Proyecto de Ley Forestal y los Derechos Indígenas*, CEJIS. (Centro de Estudios Jurídicos e Investigación Social)
- MDSMA-DNCB-CABI (Ministerio de Desarrollo Sostenible y Medio Ambiente-Dirección Nacional de Control de la Biodiversidad- Capitanía del Alto y Bajo Izozog), 1996. Plan Operativo Gestión 1996, Parque Nacional y Area de Manejo Integrado KAA-IYA del Gran Chaco Boliviano, 17p.

- Melia, Bartolomeu, 1988. *Los Guaraní Chiriguano: Ñandé Rekó*, CIPCA (Centro de Investigación y Promoción del Campesinado).
- Melia, Bartolomeu, 1989. "La Tierra Sin Mal: Los Guaraníes una Economía y una Profecía," Vol.49, No.3.
- Metraux, Alfred, 1932. "Estado Actual de Nuestros Conocimientos Sobre la Extensión Primitiva de la Influencia Guaraní y Arawak en el Continente Sudamericano," *Actas del XXV Congreso Interamericano de Americanistas*.
- Ministerio de Planeamiento y Coordinación. INE, PNUD, FNUAP, 1993. *Censo Indígena del Oriente, Chaco y Amazonía. Modulo III, Pueblos Chiquitanos, Ayoreos, y Guaraníes*, La Paz, Bolivia.
- Montaño, Mario, 1974. "La Cultura Guaraní" *Las Culturas Bolivianas*, Editorial INDICEP.
- Municipio Robore, 1995. Plan Participativo de Desarrollo Municipal 1996 - 2000, CORDECRUZ, IP/GTZ (Corporación Regional de Desarrollo de Santa Cruz, Cooperación Técnica Boliviano Alemana), 86p.
- Nostas, Mercedes, Roger Vélez y Graham Thiele, 1988. *Informe de una Vista a las Comunidades Ayoreas de Poza Verde y Puesto Paz*, Informe para el CIAT (Centro de Investigación de Agricultura Tropical).
- Otero, Raúl, 1962. "Raza y Tierra Guaraní" *Revista de la Universidad Gabriel René Moreno*. Vol. 9, No. 18.
- Paredes, James, Javier y Emilio Delgadillo, 1993. *Panorama Regional: Diagnóstico del Departamento de Santa Cruz*, SNV (Servicio Holandés de Cooperación al Desarrollo).
- Parejas M. Alcides, 1988. "Las Misiones Jesuíticas de Chiquitos," *Encuentro. Revista Boliviana de Cultura*, Vol.1, No. 2.
- Plaza M., P. y J. Carvajal, 1985. *Etnias y Lenguas de Bolivia*, Instituto Boliviano de Cultura.
- Plaza M., P. y J. Carvajal, 1976. *Historia de Moxos y Chiquitos a Fines del Siglo XVIII*, Instituto Boliviano de Cultura.



- Presidencia de la República- Maca, 1991. *Proyecto de Ley de los Pueblos Indígenas del Oriente Chaco y la Amazonía*, La Paz, Bolivia.
- Riester, Jürgen, 1986. "Aspectos del Chamanismo Izoceño Guaraní," *Revista Suplemento Antropológico*, Vol. 21, No.1.
- Riester, Jürgen, 1984. "Curanderos y Brujos de los Indios Chiquitanos," *Presencia*, 12 octubre, p. 2.
- Riester, Jürgen, 1966. "En el País de los Chiquitos," *Revista de la Universidad René Gabriel Moreno*, Vol. 13, No. 25-26.
- Rioja, G., 1997. "Deuda por Naturaleza: Reserva de la Biósfera, Pueblos Indígenas, Mercado y Ecoturismo", *Rev. Crisálida Ecología-Mercado-Equidad*, No.2, febrero 1997, La Paz, Bolivia. p. 13.
- Rivero Mendez, R., 1996. *Monografía de las Comunidades Ayoreódes en el Departamento de Santa Cruz*, Proyecto de Desarrollo Agropecuario "Tierras Bajas del Este", Santa Cruz, Bolivia, 29p.
- Shelton, Davis, 1993. *Indigenous Views of Land and the Environment*, Banco Mundial.
- Srinivasan, Lyra, 1993. *Instrumentos para la Participación de la Comunidad. Manual para la Capacitación de Capacitadores en Técnicas Participatorias*, PROWESS, PNUD (Programa de las Naciones Unidas para el Desarrollo), Banco Mundial.
- Thiele, Graham, 1988. *Una Breve Historia de Roboré y su Zona de Influencia*.
- Villavicencio, Víctor, 1989. *Nuestra Historia: Los Guaraní-Chiriguano*. CIPCA (Centro de Investigación y Promoción del Campesinado).
- Villarreal, C., 1993. *Desarrollo Productivo Autosostenido y Asistencia Técnica*, Proyecto de Apoyo a los Pueblos Indígenas del Beni.
- Zambrana Sejas, Florencio y Angel Beltrán Blanco, 1996. *Programa Nacional de Lucha contra la Desertificación y la Sequía (PRONALDES)*, Ministerio de Desarrollo Sostenible y Medio Ambiente, Secretaría Nacional de Recursos Naturales y Medio Ambiente.

Zarzycki, A., 1992. *Fichas de Descripción por Comunidades, Provincia Chiquitos, Estudio de Delimitación de Areas Especiales de Comunidades Indígenas en el Dpto. de Santa Cruz*, Proyecto de Protección de los RRNN en el Departamento de Santa Cruz (Componente Tierras Bajas), CORDECRUZ-KfW-CONSORCIO IP/CES/KWC, Santa Cruz, Bolivia.

Zarzycki, A., 1993. *Informe General Pueblo Chiquitano, Estudio de Delimitación de Areas Especiales de Comunidades Indígenas en el Dpto. de Santa Cruz*, Proyecto de Protección de los RRNN en el Departamento de Santa Cruz (Componente Tierras Bajas), CORDECRUZ-KfW-CONSORCIO IP/CES/KWC, Santa Cruz-Bolivia.

Zolezzi, Graciela, 1987 "La Recuperación de los Contactos Entre los Nativos: El Caso de los Izoceños Guaraní," *América Indígena* Vol. 47. No. 3.

**APENDICE A**

**REUNIONES CON CABI, CIDOB, WCS y USAID**

## BOLIVIA TO BRAZIL GAS PIPELINE PROJECT (BOLIVIAN PORTION)

### MEETING MINUTES

**Date:** June 5, 1997  
**Time:** 8:30 to 10:45 am  
**Place:** CABI headquarters  
**Attendees:** Mel Schulze (Gas Transboliviano)  
Ricardo Calvo (Dames & Moore)  
Evelio Arambiza (CABI)  
Juan Aguirre (Gran Chaco National Park)  
Dennis Cortez (CABI)  
Andrew Taber (Wildlife Conservation Society)  
Andy Noss (Wildlife Conservation Society)  
**Purpose:** To discuss CABI's collaboration in the preparation of the EMP

**Notes:** Ricardo Calvo explained that the meeting was a follow-up of the meeting between Dr. Taber, Dr. Yates (USAID), Mr. Schulze and Ms. Kay Beasley (El Paso Energy) held in La Paz on May 29, 1997. The following objectives of the meeting were presented:

1. To solicit CABI's technical participation in the preparation of the biodiversity and revegetation elements of the Environmental Management Plan to be submitted on June 30, 1997.
2. To explore the possibility to hire CABI personnel as guides and assistants for the potential archaeological survey work currently being planned by the project sponsors and Dames & Moore.

For 1 above, it was agreed that CABI was to submit a one-page proposal to prepare the biodiversity and revegetation plans. For the biodiversity plan, it was agreed that the plan itself would rely on existing information, with limited (~2 weeks) field work, and that it would be limited to the national park area. The plan would result in an update of the existing baseline information prepared by Dames & Moore and presented in Chapter 4 of the project EIS.

For the revegetation plan, it was agreed that the plan itself

was not to consider the revegetation of the entire length of the right-of-way. Instead, the plan would consider selective replanting to be performed every 20-30 km to create habitat connections. The plan would consider, particularly, the national park area and the aeolic plains of the San Miguel River. R. Calvo explained that the EIS had already allocated \$180K for revegetation efforts, and that this figure should be used as a reference value for the plan. The plan should identify appropriate species, sources and planting techniques.

For 2 above, CABI indicated that they had people available to assist the archaeological team in the field, and that they would propose a daily salary rate and per diem for up to six people.

The meeting also included the following discussion topics:

1. M. Schulze and Calvo explained that the project sponsors wanted to respond to CABI and CIDOB's concerns regarding the potential lack of participation by the grass-root indigenous organizations. Therefore, the majority of the programs proposed in the Indigenous Peoples Development Plan would involve a preliminary phase (Phase 1) to prepare a detailed action plan for the program in consultation with the communities and participation of CABI representatives. We all agreed that this approach would effectively respond to CABI's concerns.
2. CABI suggested that a master agreement be signed to be used as an umbrella to individual agreements necessary to implement the different programs. R. Calvo and M. Schulze agreed.
3. CABI suggested that they could represent the three indigenous groups before the project sponsors, given their political and legal jurisdiction over a significant portion of the area of influence of the project. R. Calvo indicated that the project sponsors need assurance that the three groups will be fairly represented, and that, while CABI has jurisdiction over a large portion of the area of influence of the project, Chiquitano and Ayoreo communities are

outside of CABI's jurisdiction. M. Schulze indicated that the master agreement would have to contain specific clauses to ensure that Chiquitanos and Ayoreos receive their share of the compensation plans. We explained that the bottom line for the project sponsors is to guarantee a fair participation of all groups.

CABI suggested that they could obtain a "power of attorney" from the other groups to validate their representing them. We indicated that the groups would have to resolve the issue among them.

**Follow Up:**

1. On June 6, 1997, CABI submitted a proposal for ~\$9K to prepare the biodiversity and revegetation plans. The proposal was sent to M. Schulze for review and approval.
2. On June 6, 1997, R. Calvo spoke with Mr. Valentín Muiba (CIDOB) and explained CABI's suggestion regarding representation of the three groups. R. Calvo explained the position of the project sponsors, and emphasized that we need to be assured that Chiquitanos and Ayoreos are fairly represented in the implementation of the Indigenous Peoples Development Plan. Mr. Muiba indicated that they would speak with CABI and reach an agreement.

Reunión con CABI y Dames & Moore, Santa Cruz. Viernes, 9 de mayo de 1997 (9:15 a 11:45 AM).

Asistieron de Dames & Moore:

Fernando González  
Jeffery Bentley  
Jaime Méndez  
Ricardo Calvo  
Fernando Prada  
Cristian Vallejos  
Carlos Quitón  
Julio Andrade

Asistieron de CABI (Capitanía del Alto y Bajo Izozog):

Alejo Zarzycki (asesor, consorcio IP/CES/KWC)  
Evelio Arambiza (coordinador de proyectos, CABI)  
Déniz Cortez (coordinador regional, Parque Nacional Gran Chaco))  
Andy Noss (especialista en el manejo de fauna, WCS)  
Juan Aguirre (director del Parque Nacional Gran Chaco)  
Isabelle Combes (USAID)

Ricardo Calvo explicó el proceso de refinamiento para llegar a un proyecto con planes implementables. Hay que re-evaluar qué proyectos hace CABI, por ejemplo, el Parque Nacional, manejo de recursos naturales etc. El proyecto involucrará: 1) la posibilidad del uso sostenible de recursos naturales en el área del parque y 2) tenencia de tierra. La meta final es tener uno o más convenios con CABI, para el manejo sostenible del parque etc. Calvo pidió información, por ejemplo mapas etc. y otra reunión dentro de dos semanas.

Déniz Cortez y Juan Aguirre dijeron que CABI tiene un mandato legal de controlar el área, y una competencia para hacerlo. CABI tiene personería jurídica a nivel distrital y municipal. Existe demanda territorial de TCO (territorio comunitario de origen). Hay intenciones de delimitar un municipio indígena. El trabajo de la CABI tiene cuatro componentes (con fondos de la USAID para 4 años):

1. fortalecimiento institucional
2. manejo de recursos naturales (Andy Noss)
3. plan de manejo para áreas integradas (Alejo Zarzycki)
4. educación ambiental (Isabel Combes)

La zona de amortiguamiento se maneja con la GTZ. El parque tiene 35,000 km<sup>2</sup>. Hay acceso por tierra y 2 pistas para avionetas. CABI quiere hacer una pista más. Deben haber 3 puestos de control permanentes y 3 ó 4 puestos rústicos a lo largo del corredor.

Ricardo Calvo explicó que el proyecto va a montar un campamento en el borde del parque , el cual

se quedará para los guardaparques. Campo Tita ha sido un campo petrolero por mucho tiempo y hay que hacer un estudio de contaminación antes de habilitarlo. No se va a construir caminos, pero hay que mejorarlos. Habrán trancas y otras medidas para que el corredor no se convierta en un camino. Juan Aguirre dijo que hay 7 propietarios (ganaderos) desde San José al sur en la zona de amortiguamiento, en el noreste del parque. (Se comprometió a pasar un listado de títulos a Dames & Moore). Al oeste está la frontera agrícola de gran capital, mayormente brasileño.

Según Alejo Zarzycki, nadie respeta las áreas de amortiguamiento. No hay líneas sobre la tierra. Lo primero es fijar límites. En INRA hay de todo. Mucha gente tiene títulos replantados. Hay \$10 millones que tiene INRA, pero no para hacer un catastro. Hay que definir límites, pero no hay mecanismos legales, ni recursos. Todo terreno indígena está saneado. Los ayoreos están atendidos por un proyecto del Banco Mundial. Tienen varios trámites. Hay propiedades adentro de su territorio.

Juan Aguirre dijo que las demandas de los ayoreos de Santa Teresita, y los chiquitanos traslapan un poco con CABI. (Está documentado en un mapa de Demandas del Pueblo Guarani).

Andy Noss dijo que hay informes de la universidad sobre fauna, biodiversidad, con el objetivo de hacer un plan de manejo del Izozog. Los izoceños hacen cacería de subsistencia. En el futuro, los cazadores podrían llegar al parque. La cacería se hace afuera del parque. El estudio tiene que ver más con mamíferos y otros vertebrados. Hay especies amenazadas, como una especie de rana, y una especie de culebra (boa). Pasó un informe a Dames & Moore. CABI quiere hacer un campamento para estudiar los animales que más cazan, como las antas.

Noss pretende hacer un estudio de la fauna que cazan, a largo plazo, para comparar la zona de cacería con donde no cazan. Los cazadores apoyan al estudio con datos. Los biólogos son de la Universidad Gabriel René Moreno. Las muestras van al museo local. Pero ya no hay cupo para las muestras.

Alejo Zarzycki dijo que no se sabe qué recursos se pueden manejar sosteniblemente. Hay hasta una farmacia de medicinas tradicionales y una pomada anti-fúngica, desarrollada por la ORSTROM (patente). Llevaron muestras de la pomada a La Paz a la UMSA, pero no pudieron identificar el ingrediente activo. Hay una propuesta para presevar los derechos intelectuales indígenas.

Juan Aguirre dijo que se podría zonificar los ANMIs con el programa de la USAID y hacer programas: 1) asentamientos humanos planificados, en pequeña escala con nativos, 2) aprovechamiento de los recursos a través de medicina tradicional, y 3) turismo controlado.

En el Parque Nacional, hay 5 campamentos rústicos: 1) en Misiones, 2) Yande Yari, 3) San José, 4) otro apoyando a Yande Yari, y 5) Fortín Ravelo. Un campamento cuesta:

\$8,000 materiales

\$3,000 transporte de materiales

pozo de agua, vale \$80 por metro y tienen por lo menos 90 metros

\$11,000 equipo del pozo



**Total** \$35,000 a \$50,000.

Los guardaparques tienen 10 motos y una camioneta. Los guardaparques son funcionarios públicos. Responden al Director del Parque Nacional Gran Chaco, la capitania y al gobierno.

Alejo Zarzycki sugirió poner alambrado por ambos lados del gasoducto, a lo largo del ducto en el parque, para establecer derechos propietarios.

Cristian Vallejos opinó que el alambrado no es necesariamente la respuesta; podría ser letreros.

Alejo Zarzycki dijo que hay que hacer un reglamento contra la cacería de parte de los trabajadores.

Ricardo Calvo respondió que se ha establecido que los trabajadores no tengan armas en el campamento. Añadió que el proyecto incluye un plan para resolver conflictos.

Alejo Zarzycki preguntó ¿cuánto dura el proyecto?

Ricardo Calvo dijo se ha establecida que la construcción durará 9 meses en Bolivia (4 meses en el Parque).

Juan Aguirre preguntó que si es un proyecto de 2 años, ¿cómo se hará con las necesidades de vigilancia?

Ricardo Calvo contestó que se establecerá un fondo para siempre, que puede financiarlo.

Juan Aguirre dijo que los guardaparques necesitan capacitación sobre el proyecto, y su relación con el parque. Por ejemplo, sus obligaciones nuevas.

Alejo Zarzycki dijo que los izoceños tienen sobre-ayuda y los otros grupos están más solos. Podrían ayudar más a los chiquitanos y a los ayoreos.

Durante la reunión, ambos grupos expresaron el deseo de colaborar. Los representantes de CABI quedaron en enviar informes a Dames & Moore, para ayudar el equipo a preparar anteproyectos para el beneficio de CABI.

Reunión con CIDOB y Dames & Moore, Santa Cruz. Sábado, 10 de mayo de 1997 (9:15 AM a 12:15 PM)

Asistieron de Dames & Moore:

Ricardo Calvo  
Fernando González  
Fernando Prada  
Cristian Vallejos  
Jeffery Bentley  
Carlos Quitón  
Jaime Méndez

Asistieron de CIDOB (Confederación de Pueblos Indígenas de Bolivia):

Déniz Cortez (CABI)  
Valentín Muiba (secretario de desarrollo económico, CIDOB)  
Oscar Castillo (Asesor, CIDOB)  
Alberto Rodríguez (CABI)  
Humberto Chiqueno (secretario de economía y desarrollo, CPESC)

Ricardo Calvo brevemente explicó el proyecto.

Valentín Muiba preguntó ¿cómo se va a coordinar el proyecto?

Ricardo Calvo explicó que se ha comenzado la segunda fase hacia la implementación. Dames & Moore está preparando el Plan de Manejo Ambiental, el cual tiene dos elementos:

- 1) El Plan de Manejo Ambiental en si, físico, biológico.
- 2) El Plan de Desarrollo de Pueblos Indígenas. Tiene 4 componentes:
  - 1) Consulta, resolución de conflictos. Participación, capacitación, educación ambiental.
  - 2) Titulación de tierras. Tenencia de tierra.
  - 3) Manejo sostenible de recursos naturales.
  - 4) Asistencia de manejo del Parque Nacional Gran Chaco.

Valentín Muiba dijo que la consulta es muy nueva. Si los indígenas quieren el proyecto o no, es bueno recoger su expectativa. El taller de información fue muy bueno. La participación nos permite comunicar las necesidades del pueblo. La tenencia de tierra es área de conflicto. Es el objetivo original de CIDOB, que representa al pueblo frente al gobierno. Los indígenas quieren desarrollar el manejo sostenible de los recursos naturales: usar lo que se necesita y mantener lo demás para poder sobrevivir mañana.

Oscar Castillo dijo que hay estudios específicos, para desarticulados de territorialidad y hay que establecer retroalimentación y criterios.

Humberto Chiqueno dijo que el pueblo ayoreo está preocupado. A 120 km. de Santa Cruz, otros están arrasando con los recursos naturales. Hace 30 ó 50 años todo esto era de los ayoreos. Ya no hay cacería y el territorio es de los brasileños. La empresa maderera los engañó en Gidai Ichai, dejándolos con solo 700 hectáreas. Los ayoreos trabajan con los chiquitanos. Juan Carlos Durán está dentro de Monte Verde, territorio quitado de los chiquitanos. Con el subprefecto de Santa Teresita hicieron entrar maquinaria. Joaquín Monasterios está acabando con los recursos a 60 km de Santa Cruz.

Humberto Chiqueno y Oscar Castillo explicaron que en Rincón del Tigre (93,000 hectáreas) una concesión minera de Gonzalo Sánchez de Lozada está dentro. Hay una demanda de TCO en proceso de inmovilización. Hay una sobreposición de tierras en San José de Chiquitos, 20,000 hectáreas de territorio ayoreo. El Parque Gran Chaco afectó aproximadamente 20,000 hectáreas de los ayoreos.

En el TCO de Santa Teresita, hay 135,000 hectáreas solicitadas. En Tobité, 11,800 hectáreas. Zapocó, en Ñuflo de Chávez, Monte Verde, y Lomerío son zonas conflictivas con Oswaldo Monasterios. Los TCOs son competencia de los habitantes, al sur de San José de Chiquitos.

Reunión con CIDOB y Dames & Moore, Santa Cruz. Viernes, 23 de mayo de 1997

La reunión era citada para las 8 AM, pero empezó a las 9, cuando llegaron Evelio Arambiza y Andrew Taber.

Listado de asistentes (ver página A-15).

Valentín Muiba abrió la reunión, diciendo que es una oportunidad para los indígenas hacer comentarios y críticas al equipo de consultores.

Carlos Méndez explicó que en mayo de 1996 hubo una reunión con CIDOB y que los indígenas han sido tomados en cuenta para el EIA (estudio de impacto ambiental). El gasoducto transportará gas de Santa Cruz hasta Sao Paulo y Porto Alegre, 3,000 Km., 550 en Bolivia. Diámetro = 80 cm. La tubería estará enterrada para perturbar menos al ambiente. Los promotores del proyecto son YPFB, Enron, Petrobras y BTB (British Petroleum, Broken Hill Properties, El Paso—antiguamente Tenneco). Con la capitalización del YPFB, el trabajo relacionado con los ductos ha pasado a Enron. Firms japonesas y brasileñas harán los tubos. No se han seleccionado las firmas para hacer la vía de acceso, habrán dos segmentos en Bolivia y 10 en el Brasil. Construcción del segmento Bolivia-Sao Paulo empezará entre julio y septiembre de 1997, para terminar en diciembre de 1998. Harán la parte del pantanal en la época seca. Terminarán el segmento a Porto Alegre en diciembre de 1999.

La parte de Bolivia ya tiene financiamiento, por Petrobras, y se empezó a hacer las propuestas técnicas en enero de 1996. Hubo una reunión con CABI y visitas a las comunidades desde San José, Pailón, Roboré etc. donde se presentó el gasoducto a las comunidades. Hubieron reuniones con otros grupos, como el Instituto Nacional de Arqueología. En octubre se terminó la versión en español, para sacar la licencia ambiental en Bolivia y para llenar los requisitos internacionales para el ducto en Brasil. En febrero de 1997 la licencia DIA fue emitida. Se mandaron copias del EIA a organizaciones internacionales (BID etc.) en enero y febrero de 1997. En ese documento se propuso un plan de mitigación ambiental y un nuevo estudio PDPI (Proyecto de Desarrollo para Pueblos Indígenas). Se propusieron 2 programas, uno de consulta pública y otro de asistencia para el manejo del Parque Nacional Gran Chaco. El monto designado al Parque Nacional ha sido aceptado por los bancos. Ahora seguimos trabajando en 2 programas más: territorio indígena y manejo sostenible de recursos naturales, ambos sugeridos por el Banco.

Ricardo Calvo explicó la estructura de los 4 componentes del plan del PDPI. La elaboración del PDPI, ya en su segunda etapa, se basa en la directiva 4.20 del Banco Mundial, que describe como un proyecto de desarrollo debe dejar algo para los indígenas. El área de influencia es desde 10 km al norte del ferrocarril hasta 10 km al sur del gasoducto. El área se expandió para incluir a CABI. Se busca una distribución equitativa entre los izoceños, ayoreos y chiquitanos.

El Programa 1 es la base, porque mantiene la comunicación abierta.

El Programa 2 provee asistencia técnica para el manejo de recursos naturales.

El Programa 3, titulación, demarcación de tierra.

El Programa 4, el Parque Nacional.

Evelio Arambiza preguntó ¿si hay que consultar a las organizaciones de base, según el Banco Mundial y el BID?

Ricardo Calvo contestó que se han seguido los reglamentos.

Valentín Muiba dijo que la política del Banco Mundial antes no quería saber nada de los indígenas. Por el Lowlands, tal vez han invertido su idea.

Preguntó si el equipo de Dames & Moore se había preguntado ¿qué reacción van a tener los indígenas del Altiplano?

Del Programa 4, habría que ver a los demás pueblos.

Muiba estaba sorprendido y contento que se había incluido la idea de la titulación. Preguntó ¿si eso era del Banco Mundial o si salió de una reunión con los indígenas? Dijo que él espera que se cumpla y mencionó que hay superposición del Parque Nacional y de los otros pueblos y que hay que resolverlo.

Carlos Méndez dijo que es un plan para la zona de influencia. Hace un año hablamos de los beneficios para toda Bolivia, especialmente del Bonosol. Van a aumentar fondos. Porque la mitad de lo que era YPFB, que era 60% del ducto, se irá al Bonosol.

El segundo grupo de beneficiarios: al vender gas, los fondos irán a los impuestos (para distribuir a nivel local).

El plan del gasoducto solo es de estos 3 grupos (de indígenas), no del Altiplano. El Banco Mundial se preocupa que todos los indígenas que estén en áreas de influencia se involucren en planes de desarrollo.

El Parque Nacional Gran Chaco no es exclusivo para los izoceños. El propósito es proteger al PN, no dar empleo a más guardaparques. Hay que controlar la posible colonización.

Lisette Canavesi explicó el Programa 1, enfatizando que la idea es buscar líneas de comunicación con los indígenas.

Valentín Muiba preguntó ¿si la capacitación se hace al funcionar el proyecto?

Ricardo Calvo explicó que se llevará en paralelo con la construcción.

Humberto Chiqueno dijo que no tiene preguntas, pero el programa es importante.

Evelio Arambiza dijo que CABI tiene la responsabilidad y la ley de manejar el área (refiriéndose al Parque Nacional, no al Programa que Lissette Canavesi había explicado). CABI se ha reunido con D&M. CABI va a hacer un análisis de su propuesta, pero no lo ha hecho todavía. CABI va a tener un taller interno, con el equipo técnico más las organizaciones de base. En base a eso CABI dará pautas, pero CABI no se ha reunido todavía a nivel interno. Añadió que él y Andrew Taber tenían otra reunión hoy en la tarde, a la cual asistirían en vez del taller hoy con CIDOB y D&M.

Carlos Méndez dijo que es importante que estén en la tarde, porque el trabajo tiene que terminarse hasta el 20 de junio, 5 semanas más. Si CABI no está hoy en la tarde, faltarán muchos puntos. CABI puede hacer una propuesta que D&M llevará al BM. Pidió la colaboración de CABI, y dijo que tenían la responsabilidad de estar hoy en la tarde.

Evelio Arambiza dijo que participe más gente de las bases.

Carlos Méndez dijo que con los bases se habló hace un año y que ahora el BM quiere dos programas más. Lo de CABI ya está. No hay mucha necesidad de bases, sino de técnicos. Si tienen dinero del BM para guardaparques, eso es en base a algún documento. ya no se trata de ir a las bases. CABI sabe muy bien cuánto dinero necesita y que en este momento definamos el número. Estamos contra el tiempo. Méndez dijo que estaba triste por un artículo que salió en el periódico, con el nombre de Arambiza, diciendo que D&M nunca había consultado, lo cual no es cierto. El artículo mencionó que el propósito del presente taller era para estudiar "lagunas" en el EIA, cuando en realidad es para diseñar programas. Méndez recalcó que es importante que los funcionarios de CABI estén en la reunión de la tarde para no perder tiempo.

Evelio Arambiza respondió que se reunieron en el Hotel La Quinta (en 1996) y que CABI entregó un documento a D&M que no fue tomado en cuenta, que en marzo CABI tuvo 2 meses para hacer llegar información, presupuesto etc. y que había que firmar un convenio, pero que eso nunca se hizo.

Carlos Méndez dijo que eso no se quedó en el aire. Gracias a la propuesta de CABI, hay la idea de \$1.000.000 para el Parque Nacional, y que tal vez Arambiza era optimista al pensar que sus ideas se iban a incluir así no más. Hay otros grupos de indígenas que merecen parte del presupuesto. Los promotores del proyecto saben cuánto están dispuestos a donar. D&M no decide; los bancos deciden. El \$1.000.000 en el estudio responde a CABI. Pidió que las declaraciones a la prensa sean en base a la verdad. "Nosotros estamos para ayudarles". Y que por favor se queden en la tarde.

Amalio Siyé dijo que era precipitado de los consultores, querer hacer eso sin mucha participación con las bases. Hay que tomar consultas con los pueblos; que informen a nuestros dirigentes.

CIDOB quería, en una reunión más interna, organizar un comité que represente más. Y en talleres así se podría enfocar en los resultados. Pidió el anterior estudio EIA.

Carlos Méndez dijo que a más tardar el lunes D&M podría hacerlo llegar a la CIDOB.

Jaime Méndez explicó el Programa 2, el cual contempla planes agropecuarios, con consultorías de 3 meses y trabajo de extensionista por 2 años.

Amalio Siyé dijo que hay mucho daño por el lado del sur. Hay agua que no tiene vida. Cuando se muere una vaca, la empresa (YPFB) no paga recompensa. Los indígenas no saben los reglamentos para gas y petróleo.

Carlos Méndez dijo que el ducto no va a causar mucho impacto, porque estará enterrado. La exportación de los recursos naturales tiene impactos negativos. Cada nuevo proyecto tiene que hacer su EIA, sacar licencias etc. La ley ha hecho que las compañías abran sus ojos, que no se puede seguir contaminando así.

Oscar Castillo preguntó ¿si en las 2 sub-sedes, la “consultoría” de (de 3 meses del Programa 2) será un estudio? Añadió que 2 años es mínimo para un proyecto agropecuario.

Jaime Méndez dijo que la comunidad participaría. La consultoría dará pautas de lo que se debe hacer, y un plan piloto para implementar. Usó la imagen de sembrar semillas.

Oscar Castillo dijo que no hay que levantar expectativas, porque se dice “proyecto agropecuario” y se cree que es un gran proyecto.

Carlos Quitón dijo que hay que aprovechar lo que se tiene. Hay un montón de ONGs y hay que dinamizar a los campesinos para que estas organizaciones puedan armonizar y para que el pueblo pueda participar a nivel horizontal.

Hubo otra pregunta de un ayoreo, que no se escuchó por el ruido que hicieron Evelio Arambiza y Andrew Taber al salir de la reunión.

Carlos Méndez dijo que el estudio ambiental fue aceptado por el Ministerio y que los impactos van a ser durante la construcción. La senda será de 30 metros de ancho, y la tubería se enterrará a 1,5 metros bajo tierra. El hueco se tapaná con el mismo material que se saca durante la excavación. Habrá control de erosión. Hay que minimizar la brecha, minimizar la deforestación. Para los trabajadores: cero caza, cero pesca.

Judith Marinissen preguntó ¿si estos programas serían ayudas para fomentar programas? ¿Cuánto dinero hay para cada programa? ¿Y si siembran varias “semillas” y no hay recursos para financiarlo?

Carlos Méndez dijo que el Parque Nacional tiene un fondo fideicomiso de \$1.000.000. No se han definido los montos para los otros 3 programas.

Fernando González describió el Programa 3. Hay demandas de TCOs en Santa Teresita, Tobité e Izozog. El Izozog está todo saneado. De los ayoreos, Santa Teresita es la única sin título.

Un señor pregunta ¿en la Chiquitanía está?

Ricardo Calvo explica que la red de influencia es desde 10 km al norte del ferrocarril y 10 km del gasoducto al sur.

Oscar Castillo dijo que van a hacer un cruce del ducto con las demandas territoriales. Dijo que hay superposición, que CABI y los ayoreos empiecen a solucionarlo.

Fernando González dijo que 2 años es suficiente tiempo para hacer algo preciso (de titulación) y no hay que crear una nueva unidad.

Humberto Chiqueno pregunta ¿como será la forma de participar de los pueblos indígenas?

Fernando Prada contestó.

Humberto Chiqueno dijo que hay otra comunidad que no está adentro, que se debe agregarlo: Gidai Ichai.

Fernando González dijo que el estudio de caracterización está en proceso para Santa Teresita y Tobité, y que cuesta \$10.000 cada uno. En el Izozog no se ha empezado todavía.

Carlos Méndez explicó el programa del Parque Nacional. \$1.000.000 en un fondo fideicomiso dará \$8.000 el mes en intereses, para pagar a guardaparques.

Fernando Prada mencionó que las ANMIs son territorios multi-étnicos.

Fernando González explicó que hay 2 campos que dejarán, más 3 refugios rústicos.

Ricardo Calvo dijo que un campamento de 100 x100 metros se quedará para guardas en Los Siros y en Santa Teresita.

Humberto Chiqueno dijo que tiene que haber otro campamento. De Pailón hay una entrada que hay que controlar. Añadió que el peor problema es los traficantes de tierra dentro del Parque.

Ricardo Calvo dijo que en Campo Tita hay una presencia, y que Los Siros y Santa Teresita ayudarán a cubrir los otros flancos.



Valentín Muiba dijo que la pregunta es, ¿a donde apuntar este gran proyecto? CIDOB siempre ha tenido una política, pero ahora quieren trabajar técnicamente. Después de 15 años de lucha, CIDOB se ha hecho escuchar. En este taller, quiere que todos los programas incluyan todas las ideas que proponemos. Primero quieren territorio. Con Lowlands no les convenía que los indígenas lo manejaban, y casi nada se hizo. Recién a esta hora, en 1996, CIDOB ha dado muchas sugerencias que decimos que se tome en cuenta.

Carlos Méndez explicó que éso será en la tarde, sesiones para que cada grupo haga sugerencias de temas legales, sociales y de recursos naturales.

Después del almuerzo nos dividimos en 3 grupos temáticos (legal, social, recursos naturales), y cada grupo pasó 45 minutos con cada uno de los 3 pueblos indígenas (Ayoreos, Chiquitanos, Izoceños/ Guaraní), donde los indígenas expresaron sus ideas sobre el proyecto.

Clausura:

Valentín Muiba dijo que el plan era muy interesante. En la próxima, que vayan directamente a las comunidades. Pero aquí tenemos un equipo técnico. Lo importante es el cruzamiento de ideas.

Amalio Siyé dijo que el trabajo hizo un poco de daño al inicio. Que D&M respete "la estructura orgánica que tenemos." Trabajar más en las comunidades. Vamos a seguir con talleres, y estamos dispuestos a proporcionarles información con tal que tomen en cuenta las comunidades.

Valentín Muiba sugirió formar un equipo de los 3 pueblos para trabajar con D&M. Pidió que ENRON mande las actas de las reuniones del año pasado.

Carlos Méndez dijo que hemos aprendido mucho y que les enviará el EIA el lunes. El capítulo 8 del EIA describe las reuniones de 1996. Nos encantaría visitar a los sitios, pero no vamos a poder hacerlo. Pero que estemos en contacto aquí en Santa Cruz por teléfono.

Ricardo Calvo dijo que el día comenzó como una presentación y en la tarde nos reunimos y trabajamos como se debe. Dijo que los indígenas funcionan en forma distinta (a los consultores) pero pidió flexibilidad.

Valentín Muiba pidió que toda la información que D&M tenga, que la manden por correo electrónico en los próximos días.



## MEETING MINUTES

**Date:** Thursday, May 29, 1997.

**Place:** Río de Janeiro, Brazil

**Attendees:** Mr. Michael Yates - USAID, Assessor of Environmental Natural Resources  
Dr. Andrew Tabor - Wildlife Conservation Society (WCS)  
Kay Beasley - El Paso Energy  
Mel Shulze - Enron (Bolivia) C.V.

**Objective:** To discuss differences and resolve conflicts between the two above referenced groups and the Pipeline Project with special emphasis on the Environmental Management Plan (EMP) and Indigenous Peoples Development Plan (IPDP).

Dr. Andrew Tabor expressed his concern over the following topics:

- The climate and soils were not correctly stated in the original EIA.
- In the Gran Chaco National Park Area there are seventeen endangered species, none of which were mentioned.
- The indigenous people, especially the Izoceño Tribe which is represented by CABI have not been included in the planning of the project. CABI wants a clear role in the design, implementation and management of the pipeline.
- The list of species present in the project area was inadequate.
- The type of post-construction research planned for environmental monitoring, to identify animal life (numbers, migration).
- Methods included in the project plan to conserve the animal population in the pipeline area.
- Who is responsible for the revegetation plan. Dr. Tabor pointed out that no exotic or non-native grasses or plants should be used. He also stated that CABI and Dr. Gonzalo Navarro would be very helpful in assisting the project with this plan. Dr. Tim Killeen of the Missouri Botanical Garden is another good source of information, but his expertise is outside the ran Chaco area.
- Both CABI and WCS are not opposed to the pipeline and they both want to be included in the planning. They want to ensure that there will be no adverse affects on the environment due to the pipeline project and that the programs are implemented correctly. The greatest concern is over colonization.
- After construction of the pipeline who will be responsible of conducting another biodiversity report.

Dr. Tabor stated the following concerning the Izoceño Indians. The items he brought forward are as follows:

- They are very well organized through CABI.

- They work through the community in the form of community/town meetings.
- CABI is the local government for approximately 75% of the area that is crossed by the pipeline right-of-way. Their authority is that of a local government in the area unless another form of organized, recognized government existed prior to the law being passed in 1994.
- One way to have explained the programs would have been to have Project representatives go to Izozeño communities and have meetings with the local people, but with the EMP and APDP requiring completion and be submitted to the MLA's by 30 June 1997, this is no longer feasible. If necessary, the leader of CABI could summon all community Captains to the area office in Brecha, capitol of the Izozeño having members of the Project explain its objectives at one time to all the local Captains.

Dr. Tabor said the following about the park and other issues:

- Dr. Tabor and Dr. Navarro have been working on establishing the Gran Chaco National park since 1987. In 1991 Mr. Jenkins of the IDB became interested in establishing the park.
- The Wildlife Conservation Society (WCS), a science group for Ecologically Sustainable Life, is the technical scientifically advisor for CABI in regards to the establishing the Gran Chaco National Park.
- The Gran Chaco National Park will officially commence operations in August of 1997.
- Dr. Tabor stressed that it is important to involve the Izozeño in land zoning plans, land tenure, hunting areas for the local people.
- The main concern of the WCS, MLA's and the indigenous people in the area is the colonization of the lands after the pipeline right-of-way has been opened.

M. Shulze stated that the soil is not conducive for farming, but Dr. Tabor indicated that clearing the land for ranching is their main concern.

Mr. Yates first discussed how USAID had become involved in the Pipeline project. In 1993, USAID granted \$400,00 to study the possibility of establishing a park in the Gran Chaco. Secondly, whenever the World Bank, IDB, CAF or any other institution is considering loaning money to a project where the United States is one of the donors, the plans are reviewed by USAID to ensure that it is in accordance with the objectives and laws of the United States.

Mr. Yates is leaving Bolivia for an assignment in the Philippines. His replacement, George Taylor, will not be in Bolivia until August of 1997. The temporary replacement is David Lozano. The two people who are at the agency on a full time basis are Debbie Karo and Oliver Cardena. Mr Yates told us to call upon them for assistance as needed.

Mr. Yates focused on how to set up a trust fund the Project is planning to use as compensation for potential damages to the National Park caused by the Project. It was stated that the current plan is to use the Governmental Agency "Fondo Nacional Medio Ambiente" (FONAMA). He stated that this group is being investigated for misuse of funds. This investigation has been ongoing for the past six (6) months and the report of this investigation will be completed by the end of June 1997. Mr. Yates suggest very strongly that the Project obtain a copy of this report.

Mr. Yates suggested that the project establish a private fund to administer this endowment. He stressed that although the fund can be private, the government has to have representation in the fund, however it can still be private. He suggested that there be a board of seven (7) members consisting of four (4) indigenous people and three (3) representatives from the government. The indigenous people on the board could consist of two Izozeños, one Chiquitano and one Ayoreo. Also Debbie Karo of the USAID has a guideline available for how to establish this type of fund. The Bolivian government is required to have representation on such a board, however it shall have only a minority role.

The Enterprise for America Programs is a NGO which is a watchdog for funds such as those proposed for this project. They advise that the framework for this type of agreement should be specific and independent due to the fact that Bolivia's shortage of money has resulted in funds being appropriated for uses other than their intended use.

USAID funded CABI \$400,000 for a study of the way the indigenous people in the area manage their land and the Gran Chaco National Park. CABI has instituted several programs to promote the sustainable use of their land.

One such program is the Community Mapping Program which mapped the living area, agricultural areas and hunting areas of each Izozeño community. It was suggested that CABI work with the Chiquitanos and Ayoreos to complete similar programs. In closing, Mr. Yates stated that USAID feels so strongly about this program that an additional \$4,000,000 fund has been set up to be spent over the next five (5) years.

## MEETING MINUTES

**Date:** June 6, 1997  
**Place:** Cochabamba (Dames & Moore office)  
**Attendees:** David Lozano (USAID)  
Angela Miller (Dames & Moore)  
Fernando Prada (Dames & Moore)  
Jeff Bentley (Dames & Moore)  
**Objective:** To obtain information concerning how to establish an endowment fund and USAID's past experiences with such funds.

David Lozano provided Dames & Moore with a copy of USAID's guidelines for establishing a fund. Dames & Moore attendees and D. Lozano discussed various experiences in Bolivia with the operation of such funds.

**APENDICE B**

**OTRAS REUNIONES**

## Lista de Reuniones

**Fecha:** El 8 de mayo de 1997  
**Lugar:** Santa Cruz

Reuniones con la Prefectura del Dpto. Ex-CORDECRUZ:

- Participantes: Guadalupe Abregó, Directora del Programa de Desarrollo de Comunidades Rurales (PDCR) y Dames & Moore (Jaime Méndez, Carlos Quitón y Fernando Prada). Se recabó información sobre el Plan Participativo de Desarrollo Municipio de Charagua.
- Participantes: Lic. Julio Maldonado Paredes, Director de Planificación y Dames & Moore (J. Méndez, C. Quitón y F. Prada). El Lic. Julio Maldonado Paredes ofreció los Planes Microregionales de Chiquitos y Germán Busch; el de Cordillera está en borrador, pero prometió prestarlo después.

Centro de Comunicación Rural (CECOR). Participantes: Ivonne Vargas Cuéllar (Responsable del CECOR) y Dames & Moore (C. Quitón). Tienen apoyo de la FAO y coordinan con el CIAT, UAGRM, ONGs y otras instituciones. Prometieron documentos detallados y costos de materiales que producen, cursos etc.

BOLFOR (Proyecto de Manejo Forestal Sostenible del Ministerio de Desarrollo Sostenible y Medio Ambiente). Participantes: Cristian Vallejos (BOLFOR) y Dames & Moore (J. Méndez, C. Quitón y F. Prada). Vallejos se unió al grupo para visitar a la CABI y la CIDOB.

Proyecto de Desarrollo Agropecuario "Tierras Bajas del Este". Participantes: Dr. Oscar Tonelli, Director Ejecutivo del Proyecto de Desarrollo Agropecuario "Tierras Bajas del Este") y Dames & Moore (Carlos Quitón). Se concertó entrevista para el día 09/05 a h. 15:30.

Proyecto de Protección de los Recursos Naturales en el Departamento de Santa Cruz. Participantes: Alejo Zarzycki (jefe del equipo de consultores del Proyecto de Protección de los Recursos Naturales en el Departamento de Santa Cruz) y Dames & Moore (C. Quitón).

**Fecha:** 8 de mayo de 1997  
**Lugar:** La Paz

Ministerio de Desarrollo Sostenible y Medio Ambiente, Subsecretaría de Recursos Naturales. Participantes: Ing. Florencio Zambrana (Director de Conservación de Tierras del Ministerio), Ing. Angela Miller (Dames & Moore). Se obtuvo información sobre programas de conservación existentes en el área del estudio.

Ministerio de Desarrollo Sostenible y Medio Ambiente, Dirección Nacional de Conservación de la Biodiversidad. Participantes: Etelka Debreczmi (Encargada de Turismo, Unidad de Areas Protegidas), Monica Castro Delgadillo (Planificación), A. Miller (Dames & Moore). Se obtuvo información sobre programas de turismo, conservación y otros programas relevantes que han



sido propuestas en el área del estudio del proyecto del gasoducto.

Instituto Nacional de Reforma Agraria (INRA). Participantes: Silvia Urutia (INRA) y A. Miller (Dames & Moore). Se obtuvo información sobre la Ley INRA.

**Fecha:** 9 de mayo de 1997

**Lugar:** Santa Cruz

APCOB (Organización Ayuda para el Campesino del Oriente Boliviano). Participantes: Fernando Prada, Fernando González (Dames & Moore) y Ana Garnica (Socióloga de APCOB) y Gina Ruíz (Responsable del Izozog APCOB).

CEJIS (Centro Jurídico de Investigación Social). Participantes: F. Prada, F. González (Dames & Moore), Henry Scalante (CEJIS), Alberto Maldonado (CEJIS)

**Fecha:** El 9 de mayo del 1997

**Lugar:** Santa Cruz

CIPCA. Participantes: Lic. Ana María Moscoso (Directora Regional del CIPCA) y C. Quitón (Dames & Moore).

Proyecto Desarrollo Agropecuario "Tierras Bajas del Este". Participantes: Dr. Oscar Tonelli (Director Ejecutivo del Proyecto "Tierras Bajas del Este"), Ricardo Calvo, Jaime Mendéz y Carlos Quitón (Dames & Moore)

**Fecha:** 19 de mayo

**Lugar:** La Paz

INRA (Instituto de Reforma Agraria). Participantes: F. González, Lissette Canavesi (Dames & Moore) e Isabel Lavadenz (Directora Nacional del INRA).

SAE (Subsecretaría de Asuntos Etnicos). Participantes: F. Gonzalez, L.M. Calvo (Subsecretaría SAE).

**Fecha:** 19 de mayo de 1997

**Lugar:** Santa Cruz

Cooperación Financiera del Gobierno Alemán (Consortio IP/CES/KWC). Participantes: Fernando Prada (Dames & Moore) y Alejandro Zarzycki (Consortio IP/CES/KWC).

CABI (Capitanía del Alto y Bajo Izozog). Participantes: Fernando Prada (Dames & Moore) y Bonifacio Barrientos (Gran Capitán del Izozog).

**Fecha:** 24 de mayo de 1997

**Lugar:** Santa Cruz

CPTI. Participantes: Fernando González (Dames & Moore) y Judith Marinseen (CPTI), Alberto de Vris (CPTI).

CEJIS. Participantes: Fernando González (Dames & Moore) y Henry Terceros, Alejandro Almananza, y Elba Terceros (CEJIS).

SAE - Consorcio. Participantes: F. Prada, F. González (Dames & Moore).

**Fecha:** 13 de junio de 1997

**Lugar:** Santa Cruz

Consorcio IP/CES/KWC. Participantes: A. Zarzycki (Consorcio), G. Orieda y S. Vidal (Equipo técnico) y F. Prada (Dames & Moore).

SOBOMETRA (Sociedad Boliviana de Medicina Tradicional). Participantes: Sr. Edmundo Ortíz (SOBOMETRA) y Jaime Mendéz (Dames & Moore). Información sobre hierbas medicinales en el territorio de influencia del Proyecto del Gasoducto.

#### **Presentación de Dames & Moore**

**Fecha:** el 22 de Junio de 1997.

**Lugar:** Cochabamba.

**Propósito:** Presentar la estrategia de los planes y recibir comentarios del cliente y del Banco Mundial antes de finalizar el informe.

**Participantes:** Ver siguiente página.

	Name	Institution	Address (Tel/Fax)
1	CARLOS MENDEZ	DAMES & MOORE	591-42-86040/41/42
2	KAY BEASLEY	EL PASO ENERGY / BTB	713-757-4788
3	JAY D. HAIR	CONSULTANT / WORLD BANK	SEATTLE, WA
4	LUKE DANIELSON	CONSULTANT SANTIAGO CHILE	(56-2) 236-0846 F 235-2567
5	LAINIE POWELL	TRANSREDES	591 2 430199
6	MEL SCHULZE	TRANSREDES	591-3-520-600
7	JAI ME MENDEZ	DAMES & MOORE	591-42-86040/41/42
8	CARLOS QUITON P.	DAMES & MOORE	591-42-86040
9	FERNANDO PRADO.	CONSULTOR James Moore	591-42-42758
10	LUIS TELLO CASTELLO	CONSULTOR Dames and Moore	511-461-4388
11	FERNANDO GONZALEZ QUINTANILLA	CONSULTOR DAMES & MOORE	591-42-50183
12	RICARDO N. CALVO	DAMES & MOORE	(305) 441 2355 Miami
13	Jeff Bentley	DAMES & MOORE	591-42-43328
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

**APENDICE C**

**POBLACION DE LAS COMUNIDADES INDIGENAS DEL AREA DE  
INFLUENCIA DEL PDPI**

## APENDICE C

Población regional y de las comunidades indígenas izoceñas/Guaraní dentro del área de influencia del PDPI

Provincia	Habitantes	Sección Cantón	Habitantes	Comunidad	Habitantes
Cordillera	88.628	Segunda	18.769		
		Charagua	5.761		
		Saipurú	2.501		
		Parapetí Grande	2.379		
		Izozog	8.128	Isiporenda	261
				Carapari	160
				Copere	1.046
				Capeatindi	217
				Yapiroa	587
				Ibasiriri	420
				La Brecha	508
				Tamachindi	394
				Rancho Nuevo	736
				Rancho Viejo	228
				Aguaraigua	378
				Yobi	563
				Koropo	317
				San Silvestre	98
Aguarati	301				
Cuarirenda	435				
<b>TOTALES</b>	<b>88.628</b>		<b>37.538</b>		<b>6.649</b>

Nota: Los datos de Copere, incluyen a Copere Brecha, Montenegro, Guazú y Loma.

No se disponen de datos de las comunidades Paraboca, Puesto Yuquí, Mini y Yande Yari.

Fuente: Elaboración propia en base a datos del Plan de Desarrollo Municipal de Charagua, Ministerio de Desarrollo Humano, Secretaría Nacional de Desarrollo Rural, Santa Cruz, 1995.

Población regional y de las comunidades indígenas Chiquitanas dentro del área de influencia del PDPI

Provincia	Habitantes	Cantón	Habitantes	Comunidad	Habitantes		
Chiquitos	42.519	El Cerro Concep.	561	El Cerro	157		
				El Tinto	240		
		San Juan	1.884	Entre Ríos Ramada	146		
		San José	12.206			Dolores	80
						Los Siros	54
						Pororó	75
						Pozo del Cura	38
						Natividad	157
						Piococa	37
						Quimome	364
						Taperita	14
						Taperas	525
						Candelaria	59
						San Juan del Norte	40
						Roboré	12.895
		Chochis	100				
		Limoncito	230				
		Los Sotos	297				
		San Pedro	108				
		Cupesí	100				
Gavetita	62						
San Rafael	100						
Santiagoma	50						
Yororoba	57						
Quitunuquiña	101						
Aguas Calientes	80						
San Lorenzo Nuevo	45						
San Lorenzo Viejo	30						
Potrero	60						
Motacusito	77						
Germán Busch	25.426	Santa Ana, Puerto Suárez; El Carmen	17.494	Santa Ana	210		

Provincia	Habitantes	Cantón	Habitantes	Comunidad	Habitantes
				El Carmen Viejo	45
				El Salao	150
				San Salvador	143
				San Pedrito	20
				El Carmen de la Front.	150
				Colonia Warnes	70
				San Juan del Mutún	111
				Candelaria	150
				El Carmen Riv. Torres	300
<b>Totales</b>	<b>67.945</b>		<b>45.040</b>		<b>4.902</b>

Fuente: Elaboración propia en base a Zarzycki, 1993

Población regional y de las comunidades indígenas Ayoreas dentro del área de influencia del PDPI

Provincia	Habitantes	Cantón	Habitantes	Comunidad	Habitantes
Chiquitos	42.519	San José	12.206	Santa Teresita	250
		Roboré	12.895	Villa Bethel Santiago	18
				Tobité	230
				Urucú	108
		Pailón		Poza Verde	144
				Guidai Ichai	120
Germán Busch	25.426	Puerto Suárez	12.691	Motacusito	54
		El Carmen		El Carmen	27
Totales	67.945		34.964		951

Fuente: Elaboración Propia en base a Zarzycki, 1993



**APENDICE D**

**ESTADO DE TITULACION DE TIERRAS EN LAS COMUNIDADES  
INDIGENAS DEL AREA DEL PDPI**

## APENDICE D

### Estado de titulación de tierras en las comunidades indígenas Izoceñas/Guaraní

Comunidades	Habitantes	Con título	En trámite	Hectáreas	Observaciones
Isiporenda	261	Sí		1.820	Título intercomunal
Carapari	160	Sí			
Copere Brecha	1.046	Sí		13.026	Título intercomunal
Copere Guazú					
Copere Loma					
Copere Montenegro					
Capeatindi	217				
Yapiroa	587				
Ibasiriri	420	Sí		11.159	Título intercomunal
Guirayoasa La Brecha	508	Sí			
Tamachindi	394	Sí			
Rancho Nuevo	736	Sí		5.000	Título intercomunal
Rancho Viejo	228	Sí			
Mini	N.D.	Sí			
Puesto Yuqui	N.D.	Sí			
Aguaraigua	378	Sí		6.775	Título intercomunal
Yobi	563	Sí			
Koropo	317	Sí			
San Silvestre	98		Sí	7.725	
Aguarati	301		Sí	6.260	
Paraboca	N.D.		Sí	4.059	
Cuarirenda	435	Sí		8.936	
Yande Yari (*)	N.D.	N.D.			
<b>TOTAL (parcial)</b>	<b>6.649</b>			<b>64.760</b>	

Nota: El total de ha tituladas es de 46.716, en trámite 18.044.

N.D. = Datos No Disponibles

(\*) En proceso de conformación como Comunidad

Fuente: Elaboración Propia en base a datos de la Subsecretaría de Asuntos Etnicos, 1996:  
y Plan de Desarrollo Municipal de Charagua, Ministerio Desarrollo Humano, Secretaria Nal.  
Des. Rural, Santa Cruz, 1995.

Estado de titulación de tierras en las comunidades indígenas Chiquitanas (Cantón San José)

Comunidades	Habitantes	Con título/D.S.	En trámite	Hectáreas	Observaciones
El Cerro	157		Sí	2.832	
Candelaria	59	Sí		3.393	
Pozo del Cura	38	24/10/91		1.146	
Pororó	75	24/10/91		4.063	
Dolores	80		Sí	2.348	
Ramada "Entre Ríos"	146	Sí		2.871	Título con Entre Ríos
El Tinto	240	N.D.		4.110	
Quimome	364	18/12/91		8.122	
Piococa	37	N.D.		501	
Natividad	157	23/07/91		6.824	
Los Siros	54	N.D.		950	
Taperita	14	Sí		505	
Taperas "Agua Brava"	525	N.D.			
Taperas "Los Bibosi"	N.D.	N.D.			
San Juan del Norte	40	N.D.			
Motacusito	N.D.	N.D.			
Cruz Blanca	N.D.	N.D.			
<b>TOTAL (parcial)</b>	<b>1.986</b>			<b>37.665</b>	

Nota: D.S. = Decreto Supremo, fecha.

N.D. = Datos No Disponibles

Fuente: Elaboración Propia en base a Zarzycki, 1993.

Estado de titulación de tierras en las comunidades indígenas Chiquitanas (Cantón Roboré)

Comunidades	Habitantes	Con título	En trámite	Hectáreas
El Portón	70	N.D.	N.D.	128
Chochis	100	N.D.	N.D.	24.294
Limoncito	230	N.D.	N.D.	1.580
Los Sotos	297	N.D.	N.D.	1.917
San Pedro	108	N.D.	N.D.	967
Cupesí	100	N.D.	N.D.	208
Gavetita	62	N.D.	N.D.	1.033
San Rafael	100	N.D.	N.D.	444
Santiagoma	50	N.D.	N.D.	4.211
Yororoba	57	N.D.	N.D.	330
Quitunuquiña	101	N.D.	N.D.	1.409
Aguas Calientes	80	N.D.	N.D.	213
San Lorenzo Nuevo	45	N.D.	N.D.	280
San Lorenzo Viejo	30	N.D.	N.D.	417
Potrero	60	N.D.	N.D.	N.D.
Motacusito	77	N.D.	N.D.	N.D.
<b>TOTAL (parcial)</b>	<b>1.567</b>			<b>37.431</b>

Nota: N.D. = Datos No Disponibles

Fuente: Elaboración Propia en base a Zarzycki, 1993.

Estado de titulación de tierras en las comunidades indígenas Chiquitanas (provincia Germán Busch)

Comunidades	Habitantes	Con título	En trámite	Hectáreas	Observaciones
Santa Ana	210	N.D.	N.D.	1.267	
El Carmen Viejo	45	N.D.	N.D.	1.277	
El Salao	150	N.D.	N.D.	111	
San Salvador	143	N.D.	N.D.	933	
San Pedrito	20	N.D.	N.D.	536	
El Carmen de la Frontera	150	N.D.	N.D.	33	
Colonia Warnes	70	N.D.	N.D.	1.966	
San Juan del Mutún	111	N.D.	N.D.	475	
Candelaria	150	N.D.	N.D.	2.150	Ocupación
El Carmen Rivero Torres	300	N.D.	N.D.	69.330	
<b>TOTAL (parcial)</b>	<b>1.349</b>			<b>78.078</b>	

Nota: N.D. = Datos No Disponibles

Fuente: Elaboración Propia en base a Zarzycki, 1993.

Estado de titulación de tierras en las comunidades indígenas Ayoreas

Comunidades	Habitantes	Con título	En trámite	Hectáreas	Observaciones
Poza Verde	144	Sí		2.500	
Motacusito	54	Sí		400	
Santa Teresita	250	Sí		8.254	Demanda territorial TCO 48.736 ha
Tobité	230	Sí		8.478	Demanda territorial TCO 20.374 ha
Guidai Ichai	120		Sí	600	
El Carmen	27	Sí		5	
Urucú	108	Sí		50	
Villa Bethel/Santiago	18	N.D.		N.D.	
<b>TOTAL (parcial)</b>	<b>951</b>			<b>20.287</b>	<b>69.110</b>

Nota: N.D. = Datos No Disponibles

Fuente: Elaboración Propia en base a Zarzycki, 1993.