

## II. Applicable Legislation

### 1. Introduction

This chapter presents the structure of Brazilian Environmental Legislation, focusing on regulations that are more directly applicable to the Macaé Merchant Power Plant. When pertinent, international standards are presented for comparison with Brazilian laws.

### 2. Brazilian Legislation

The National Environment Policy Act (Law 6938/81) established the National Environmental System (SISNAMA), which consists of Federal, State and Municipal Government agencies and entities that are responsible for the protection and control of environmental quality. The Brazilian Constitution empowers State and Local Governments to legislate on environmental matters in a complementary manner. The Federal Government has established the basic requirements that are applicable across the board, while the State and Local Agencies introduce specific requirements and standards that may be even more rigorous than the Federal rules, except in areas assigned to exclusive Federal jurisdiction such as nuclear and off-shore activities. The establishment of environmental regulations at the Federal level takes place through either the National Congress or the National Environment Council (CONAMA), which is the core agency of

Brazil's National Environment System (SISNAMA).

In Rio de Janeiro, the state agency responsible for environmental controls is the State Environmental Engineering Foundation (FEEMA). Its legal provisions are quite extensive, as this was the first State to enact laws on environmental licensing and pollution control, even before the National Environment System (SISNAMA) was established.

Defining environmental impacts, CONAMA Resolution N° 001/86 provides a list of activities that depend on the preparation of an Environmental Impact Assessment (EIA) for environmental licensing purposes, including “any power generation plant with a capacity of over 10 MW.” More recently, CONAMA Resolution N° 237/97 established a clearer definition of Federal and State jurisdiction for licensing purposes and introduced the concept of environmental assessment studies, of which the Environmental Impact Assessment (EIA) is the more sophisticated version.

The licensing process established by the National Environmental Policy (as regulated by Federal Decree N° 9,9274/90) consists of three phases: (i) Preliminary License (LP), required during the planning stage and issued on the basis of an environmental assessment study, i.e. an Environmental Impact Assessment (EIA) or similar type of study; (ii) Installation License (LI), required prior to construction through submitting the “Projeto Básico Ambiental – PBA”, i.e. an Environmental Control and Management Plan

(EMCP), detailing all the environmental control systems and monitoring programs (iii) Operating License (LO), issued after the completion of construction and inspection of the facilities, complying with all the requirements in the Installation License, prior to start-up of plant operations.

Under CONAMA Resolution 237/97, the State authorities may set the validity of permits as follows: (i) Preliminary License (LP) – up to five years; (ii) Installation License (LI) – up to six years; (iii) Operating License (LO) - no less than four years and up to ten years. The duration of the Preliminary and Installation Licenses may be extended, provided that they do not exceed the maximum limits mentioned above.

Once its Environmental Impact Assessment (EIA) was approved, the Macaé Merchant Power Plant was granted Preliminary License (LP) N° 013/2001, valid until March 3, 2003. Subsequently, El Paso prepared an Environmental Control and Management Plan (ECMP), and was granted Installation License (LI) N° 125/2001, expiring in April 2006. For Phases I through IV (16 turbines), the Macaé Merchant Power Plant was granted Operating License (LO) N° 439/2001, valid through October 2006.

For Phase V, Macaé Merchant required approval for modifying the original project, in order to expand its capacity in four turbines, and FEEMA agreed, according to Notification 403.971 and 403.972. The Operating License was extended on June 22, 2002 to cover Phase V.

All applicable Federal, State and Municipal legislation for the main aspects of this project are presented in the next section, compared to international standards when relevant.

### 3. Relevant Legislation

#### 3.1 Atmospheric Emissions

- Federal CONAMA Resolution N° 005/89** Establishes the National Air Quality Program (PRONAR) and sets the Air Quality Policy criteria.
- Federal CONAMA Resolution N° 003/90** Sets the primary and secondary quality standards as shown in Table II.1 below.

Table II.1 Ambient Air Quality Standards

		CONAMA Res. No. 003/90			World Bank Guidelines *		
		primary		secondary			
	24 Hs	240 µg/m <sup>3</sup>	(1)	150 µg/m <sup>3</sup>	(1)	230 µg/m <sup>3</sup>	(4)
	annual	80 µg/m <sup>3</sup>	(2)	60 µg/m <sup>3</sup>	(2)	80 µg/m <sup>3</sup>	(4)
	24 hs	150 µg/m <sup>3</sup>	(1)	100 µg/m <sup>3</sup>	(1)		
	annual	60 µg/m <sup>3</sup>	(3)	40 µg/m <sup>3</sup>	(3)		
	24 Hs	150 µg/m <sup>3</sup>	(1)	150 µg/m <sup>3</sup>	(1)	150 µg/m <sup>3</sup>	
	annual	50 µg/m <sup>3</sup>	(3)	50 µg/m <sup>3</sup>	(3)	50 µg/m <sup>3</sup>	
	24 Hs	365 µg/m <sup>3</sup>	(1)	100 µg/m <sup>3</sup>	(1)	150 µg/m <sup>3</sup>	
	Annual	80 µg/m <sup>3</sup>	(3)	40 µg/m <sup>3</sup>	(3)	80 µg/m <sup>3</sup>	
	1 Hs	40 mg/m <sup>3</sup> (35 ppm)	(1)	40 mg/m <sup>3</sup> (35 ppm)	(1)		
	8 hs	10 mg/m <sup>3</sup> (9 ppm)	(1)	10 mg/m <sup>3</sup> (9 ppm)	(1)		
O <sub>3</sub>	1 hs	160 µg/m <sup>3</sup>	(1)	160 µg/m <sup>3</sup>	(1)		
	1 hs	320 µg/m <sup>3</sup>	(1)	190 µg/m <sup>3</sup>	(1)		
	24 hs					150 µg/m <sup>3</sup>	
	annual	100 µg/m <sup>3</sup>	(3)	100 µg/m <sup>3</sup>	(1)	100 µg/m <sup>3</sup>	

Notes:

1. These limits are to be used only for carrying out an environmental assessment in absence of local ambient standards. They do not substitute in any way for local ambient air quality standards.

(1) not to exceed once per year

(2) annual geometric mean

(3) annual arithmetic mean

(4) Measurement of PM<sub>10</sub> is preferable to measurement of TPM, as recommended by World Bank Guidelines.

2. Primary standards are meant to prevent harm to public health. Secondary standards are thresholds above which there might be harm to the environment. The primary air quality standards are applicable until States designate Air Quality Classes within their territory.

(\*) Pollution Abatement handbook, World bank, July, 1998

- Federal CONAMA Resolution N° 008/90** Sets the national maximum limits for atmospheric emissions from new stationary sources burning oil or coal. The Macaé Merchant Power Plant has a total installed capacity of 895 MW, with twenty sources of under 70 MW. The limits are linked to Class I, II and III atmospheric areas, which should be designated by the State authorities. Until such designation is made, the Macaé Merchant Power Plant is in a Class II zone.

**Table II.2 Air Emission Standards CONAMA 03/90**

Pollutants	Classes of Areas			
	Class I (Conservation Units)	Other Class I (resort areas)	Class II	Class III
<b>Sources with less than 70 Mw</b>				
SO <sub>2</sub>	NA	2,000g/10 <sup>6</sup> Kcal	5,000g/10 <sup>6</sup> Kcal	5,000g/10 <sup>6</sup> Kcal
Total particulate matter	NA	120g/10 <sup>6</sup> Kcal	350g/10 <sup>6</sup> Kcal - oil 1,500 g/10 <sup>6</sup> Kcal - coal	350g/10 <sup>6</sup> Kcal - oil 1,500 g/10 <sup>6</sup> Kcal - coal
Smoke ( Opacity )	NA	20% Ringelman 01	20% Ringelman 01	20% Ringelman 01
<b>Sources with more than 70 Mw</b>				
SO <sub>2</sub>	NA	NA	2,000g/10 <sup>6</sup> Kcal	2,000g/10 <sup>6</sup> Kcal
Total particulate matter	NA	NA	120g/10 <sup>6</sup> Kcal - oil 800g/10 <sup>6</sup> Kcal - coal	120g/10 <sup>6</sup> Kcal - oil 800g/10 <sup>6</sup> Kcal - coal
Smoke ( Opacity )	NA	NA	20% Ringelman 01	20% Ringelman 01

**Table II.2a Comparison of Air Emission Standards – Brazil and WB**

Bases	CONAMA	World Bank (*)
TPM	120g/10 <sup>6</sup> Kcal-oil	50 mg/Nm <sup>3</sup>
SO <sub>2</sub>	2,000g/10 <sup>6</sup> Kcal	0.20 tons per day (tpd) per MWe of capacity for the first 500 MWe plus 0.10 (tpd) for each additional MWe of capacity over 500 Mwe concentration should not exceed 2,000 mg/Nm <sup>3</sup> , with a maximum emission level of 500 tpd Construction of two or more plants in the same airshed to circumvent this cap is not acceptable
Smoke (opacity)	20% Ringelman	NR
		320 mg/Nm <sup>3</sup> (86 ppb) or 155 ppm for oil combustion

NA – not allowed

NR – not regulated

(\*) Pollution Abatement Handbook, World Bank, July, 1998

**NT 603 FEEMA Rio de Janeiro**

Establishes standards and frequency for monitoring air pollutants

**CECA Nº 021/78**

Establishes mandatory self-controlled atmospheric pollution programs and approves NT 603

**CECA Nº 935/86**

Establishes mandatory self-controlled atmospheric pollution programs and approves DZ-545.

### 3.2 Environmental Liabilities and Crimes

<b>Federal Law N° 6.938/81</b>	Establishes the principle that those responsible for damage to the environment or any portion of it shall be held liable and be obliged to repair such damages.
<b>Federal Law N° 7,347/85</b>	Regulates Public Civil Suits ( <i>Ação Civil Pública</i> ) involving responsibility for damages to the environment, stipulating the value of damages and requiring environmental reclamation.
<b>Federal Constitution/88</b>	Establishes Popular Suits ( <i>Ação Popular</i> ) as a legal tool for defending public assets; through these suits, the public can request that acts damaging public assets be nullified or declared void and that the authorities be held personally responsible.
<b>Federal Law N° 9605/98 and Federal Decree N° 3179/99</b>	Establishes and regulates the principle that Companies, Owners and Managers/Employees responsible for damages to the environment or any of its parts shall be sued for criminal action, irrespective of civil liability and fines, with sentences including compulsory community service, cancellation of rights (including plant shutdown) ban of on entering into contracts with the Government, and up to five years in jail for persons found guilty.

### 3.3 Water / Wastewater

**Federal Law N° 9,433/97**  
**Federal CONAMA Resolution N° 020/86**

Establishes Brazil's Water Resources Policy and creates the National Water Resource Management System. Two types of standards are introduced by this Resolution. One sets water quality standards for water bodies by their proposed use, classifying inland waters into seven types. The Macaé River is Class II, which means it can be used for commercial shipping, scenic harmony and secondary contact recreation. The standards for Class II waters are presented in Table II.3. The effluent discharge standards are presented in Table II.4. It should be noted that even if the liquid wastes meet these standards, they are nevertheless non-compliant if they alter the receptor body outside the mixing zone in such a way that its water quality exceeds the parameters established for its Class.

Table II.3 – Class II Bodies of Fresh water - Water Quality Standards

PARAMETER	CONCENTRATION/DESCRIPTION
pH	6.0 < pH < 9.0
Oil and greases	Virtually absent
DBO (Oxygen demand)	< 3 mg/l
Aluminum	< 0.1 mg/l
NH <sub>4</sub>	< 0.02 mg/l
Arsenic	< 0.05 mg/l
Barium	< 1.0 mg/l
Benzene	< 0.01 mg/l
Boron	< 0.75 mg/l
Cadmium	< 0.001 mg/l
Lead	< 0.03 mg/l
Cyanide	< 0.01 mg/l
Copper	< 0.02 mg/l
Hexavalent Chromium	< 0.05 mg/l
Chloride	< 250 mg/l
Tin	< 2.0 mg/l
Phenol	< 0.001 mg/l
Soluble Iron (Fe <sup>2+</sup> )	< 0.3 mg/l
Fluoride	< 1.4 mg/l
Manganese	< 0.1 mg/l
Mercury	< 0.0002 mg/l
Nickel	< 0.025 mg/l
Silver	< 0.01 mg/l
Selenium	< 0.01 mg/l
Sulfite	< 0.002 mg/l
Phosphate	< 0.025 mg/l
Nitrate	< 10.0 mg/l
Trichorethylene	< 0.003 mg/l
Vanadium	< 0.18 mg/l
Tetrachlorinated carbon	< 0.01 mg/l
DDT	< 0.005 mg/l
PCB's	< 0.1 µg/l
Zinc	< 0.01 mg/l

Table II.4 Effluent Discharge Standards, relevant parameters – mg/l except where indicated

Federal CONAMA  
Resolution N° 020/86  
cont.

PARAMETER	Conama 20/86 limits	World Bank limits(*)
pH	5.0 < pH < 9.0	6-9
Temperature	< 40.0°C (not to generate a variation of more than 3°C)	(not to generate a variation of more than 3°C)
Settling matter	1.0 in 1 hour " Imhoff" test	50
Oil and Grease (mineral)	20	10
DBO (Oxygen demand)	60	50
Residual Chlorine	NR	0.2
Total phosphates	NR ( but not to exceed 0.025 P outside the mixing zone )	NR
Nitrates	10	NR
NH <sub>4</sub>	5.0	10
Cadmium	0.2	0.1
Lead	0.5	0.1
Copper	1.0	0.5
Hexavalent Chromium	0.5	0.1
Chromium	2.0	0.5 (total))
Phenol	0.5	0.5
Soluble Iron (Fe <sup>2+</sup> )	15.0	3.5
Fluoride	10.0	20
Soluble Manganese (Mn <sup>2+</sup> )	1.0	NR
Nickel	2.0	0.5
Sulfite	1.0	NR
Zinc	5.0	1

NR = not regulated

<b>SEMA NT-202</b>	Determines water body Classes and classifies the Macaé River. Defines the maximum discharge limits for certain parameters in water bodies.
<b>CECA N° 1007/86</b>	Approves NT-202
<b>NT-943</b>	Establishes the frequency of measurements, collection of samples and analysis
<b>CECA N° 044/79</b>	Approves NT-943
<b>CECA N° 1079/87</b>	Establishes directions for Industrial Effluents Control
<b>CECA N° 1995/90</b>	Establishes directions for the Effluents Self-Control Program
<b>Macaé Organic Municipal Law, Article 158</b>	Requires industrial effluents to be discharged upstream from water uptake points .

### 3.4. Solid waste

<b>Federal Minter Resolution N° 053/79</b>	Establishes that projects for the final treatment and disposal of solid wastes are subject to approval by the competent State Agency.
<b>Federal CONAMA Resolution N° 006/88</b>	Creates 3 classes of residues: Class I – hazardous, Class II – non-inert and Class II - inert, using NBR 10004 for technical support; establishes solid wastes inventories to be submitted to the environmental authorities for both new (since the environmental licensing stage) and existing activities.
<b>ABNT Standard NBR N° 10.004/87</b>	Classifies solid wastes as Class I (Hazardous), Class II (Non-Inert) and Class III (Inert), according to their potential risks to the environment and public health, ensuring proper handling and disposal of these solid wastes. This standard also includes definitions used during the classification process.
<b>ABNT Standard NBR N° 10.005/87</b>	Establishes requirements for toxicity leaching tests for classifying solid wastes.
<b>ABNT Standard NBR N° 10,006/87</b>	Establishes the requirements for differentiating between non-inert (Class II) and inert (Class III) wastes, applicable only to wastes in a solid state.
<b>ABNT Standard NBR N° 10,007/87</b>	Establishes the solid wastes sampling requirements.
<b>ABNT Standard NBR N° 10,157/87</b>	Establishes the requirements for the design and operation of hazardous wastes landfills.
<b>World Bank Group</b>	Stipulates that solid wastes may be dumped in landfills or at other disposal sites provided that they do not affect neighboring water-bodies. Where toxic or other contaminants are expected to leach out, they should be treated by appropriate methods.
<b>FEEMA DZ – 1310 / CECA N° 673/85</b>	Implements the Industrial Wastes Manifest System, as part of the Pollutant Activities Licensing System (SLAP), in order to prevent improper shipment and disposal of solid wastes.
<b>FEEMA DZ – 1311 / CECA N° 3327/94</b>	Establishes the lines for licensing the disposal of solid, semi-solid and liquid wastes
<b>FEEMA DZ-949 / CECA N° 307/82</b>	Approves the Solid Wastes Market Program (an inter-industry solid wastes bourse).

### 3.5 Noise Emissions

**Federal  
CONAMA  
Resolution N°  
001/90**

Defines nationwide noise emissions evaluation criteria, according to ABNT Standards 10.151 and 10.152:

**Table II. 4 Noise Level Limits (Maximum Acceptable  $L_{eq}^*$  per period)**

Area classification	Day	Night
<b>Brazilian NBR 10.151</b>		
urban residential area	50dB(A)	45 dB(A)
industrial area	70 dB(A)	60 dB(A)
<b>World Bank</b>		
Residential/institutional/ educational	55 dB(A)	45 dB(A)
Industrial/commercial	70 dB(A)	70 dB(A)
<b>US Export-Import Bank</b>		
Residential	60 dB(A)	55 dB(A)
Commercial	65 dB(A)	60 dB(A)
Industrial	75 dB(A)	75 dB(A)

\* $L_{eq}$ - Equivalent Noise Level, defined as constant noise levels with same acoustic energy as level of the real noise level non-stable, varying during the time of measurement

**Note: if background noises exceed the acceptable criteria in Table III.4 they become the basis for noise impact evaluation**

**Federal  
CONAMA  
Resolution N°  
002/90  
State Law N°  
126/77**

Establishes the National Silence Program and empowers the State and Municipal Government to impose stricter limits on noise emissions.

Rules on protection against sound pollution.

### 3.6 Storage of Hazardous Materials

**NRs Labor Ministry  
Technical  
Standards**

Based on best practices, the concepts of adequate storage for hazardous materials in order to protect workers and the environment are stipulated in Brazil's National Environmental Policy Act, as well as the standards issued by the Ministry of Labor.

**IFC (World Bank)**

Establishes the Hazardous Materials Management Guideline, applicable to facilities and activities involving the shipment, production, handling, storage, and disposal of hazardous materials

### 3.7 Transportation of Hazardous Materials

<b>Federal Decree N° 96.044/88</b>	Regulates road shipments of hazardous materials and establishes that: <ul style="list-style-type: none"> <li>• Any vehicle carrying a hazardous substance shall avoid thoroughfares running through densely populated areas or protected areas encompassing water sources, water reservoirs, or forest or ecological reserves or areas lying close to any of these.</li> <li>• The issuer shall annually inform the National Highway Department (DNER) of the flow of hazardous materials shipped on a regular basis.</li> <li>• Should the origin or destination of a hazardous cargo require the use of a restricted roadway, the shipper shall prove this fact to the authority with jurisdiction over said roadway, whenever requested to do so.</li> <li>• The shipping contract should assign responsibility for emergency expenses and costs, in order to provide technical support in case of accident</li> </ul>
<b>Federal CONAMA Resolution N° 001A/86</b>	Rules that the State Environmental Agency and Traffic Department should define specific local transportation rules.
<b>IFC (World Bank)</b>	Establishes Guidelines for Hazardous Materials Management, applicable to facilities and activities involving the shipment, production, handling, storage, and disposal of hazardous materials

### 3.8 Protected Areas

<b>Federal Law No 4.771/65</b>	Establishes the new Forest Code and deals with areas deemed subject to permanent preservation, including forests and other forms of plantlife located along rivers.
<b>Federal Decree N° 86,176/81</b>	Describes the conception of Areas of Special Interest to Tourism ( <i>Áreas Especiais de Interesse Turístico</i> ), and deals with Location.
<b>Federal Decree No 89.336/84</b>	Deals with Ecological Reserves and Areas of Relevant Ecological Interest ( <i>Áreas de Relevante Interesse Ecológico</i> ) and ranks Ecological Reserves as Permanent Preservation Areas ( <i>Áreas de Preservação Permanente</i> ), other than those set up by the government as Ecological Stations.
<b>Federal Law No 7.754/89</b>	Stipulates measures for protecting forests and other types of vegetation surrounding wellsprings which are subject to permanent preservation, pursuant to the Forest Code.
<b>Federal Decree No 99.274/90</b>	Regulates the policy for Ecological Stations and Special Interest Areas and their implementation criteria.
<b>Federal CONAMA Resolution No 002/96</b>	Stipulates the establishment of conservation units in the public domain for indirect use, preferably an Ecological Station, by the entity or company responsible for any venture that harms or destroys forests or other ecosystems.
<b>State Law No 650/83</b>	Establishes the Rio de Janeiro State Policy protecting lakes and river basins
<b>State Decree No 2330/79</b>	Establishes the Lakes and Water-Bodies Protection System (SIPROL).
<b>Macaé Organic Municipal Law, Article 157</b>	Ranks the following as Permanent Preservation Areas: <ul style="list-style-type: none"> <li>I – mangrove swamps lining the Macaé River and its estuary</li> <li>II – sand-spit vegetation</li> <li>III – springs and banks protecting surface waters</li> <li>IV – plantcover stabilizing slopes subject to erosion and land-slips</li> </ul>

### 3.9 Occupational Health and Safety Regulations

Below is the list of applicable federal regulations (Regulatory Norms – “NRs”, established by the Brazilian Ministry of Labor), governing those aspects of occupational health and safety pertinent to activities carried out at the Macaé Merchant Power Plant. Full compliance with the following standards is necessary at the Plant:

- NR-01 – General Dispositions
- NR-02 – Prior Inspection
- NR-03 – Embargo and Interdiction
- NR-04 – “Serviço Especializado em Segurança e Medicina do Trabalho – SSMT” (Specialized Occupational Health and Safety Service)
- NR-05 – “Comissão Interna de Prevenção de Acidentes – CIPA” (Internal Accident Prevention Commission)
- NR-06 – Personal Protection Equipment - PPE
- NR-07 – Medical Examinations
- NR-08 – Buildings
- NR-09 – Environmental Risks
- NR-10 – Electrical Work and Facilities
- NR-11 – Transport, Movement, Storage and Handling of Materials
- NR-12 – Equipment and Machinery
- NR-13 – Pressurized Vessels
- NR-14 – Furnaces
- NR-15 – Unhealthy Operations and Activities
- NR-16 – Hazardous Operations and Activities
- NR-17 – Ergonomics
- NR-18 – Construction, Demolition and Repair Work
- NR-19 – Explosives
- NR-20 – Liquid and Inflammable Fuels
- NR-21 – Open-air Work
- NR-23 – Fire Protection
- NR-24 – Healthy Conditions in the Workplace
- NR-25 – Industrial Waste Materials
- NR-26 – Safety Signs
- NR-27 – Professional Registration
- NR-28 – Inspections and Penalties

### 3.9 License Requirements

A copy of the LO - Operating License is included in the Appendix.

### III. Organization and Responsibilities

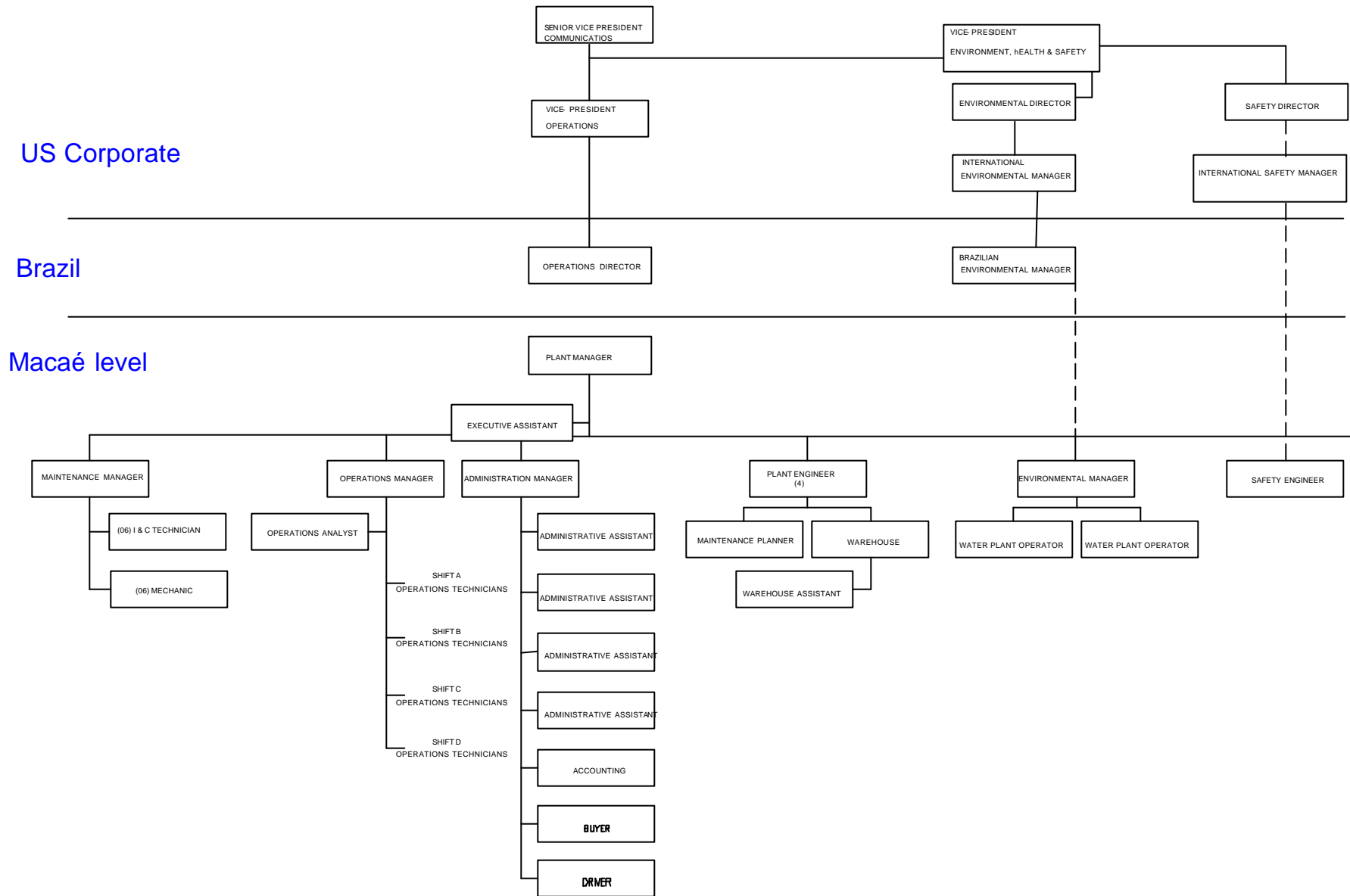
#### 1. Company Organization

The Macaé Merchant Power Plant is a facility run by El Paso Rio Claro Ltda, a subsidiary of El Paso Corporation.

The complete organizational structure of the El Paso Corporation for the environmental management of El Paso Rio Claro and the relevant corporate links are presented in Figure III -1.

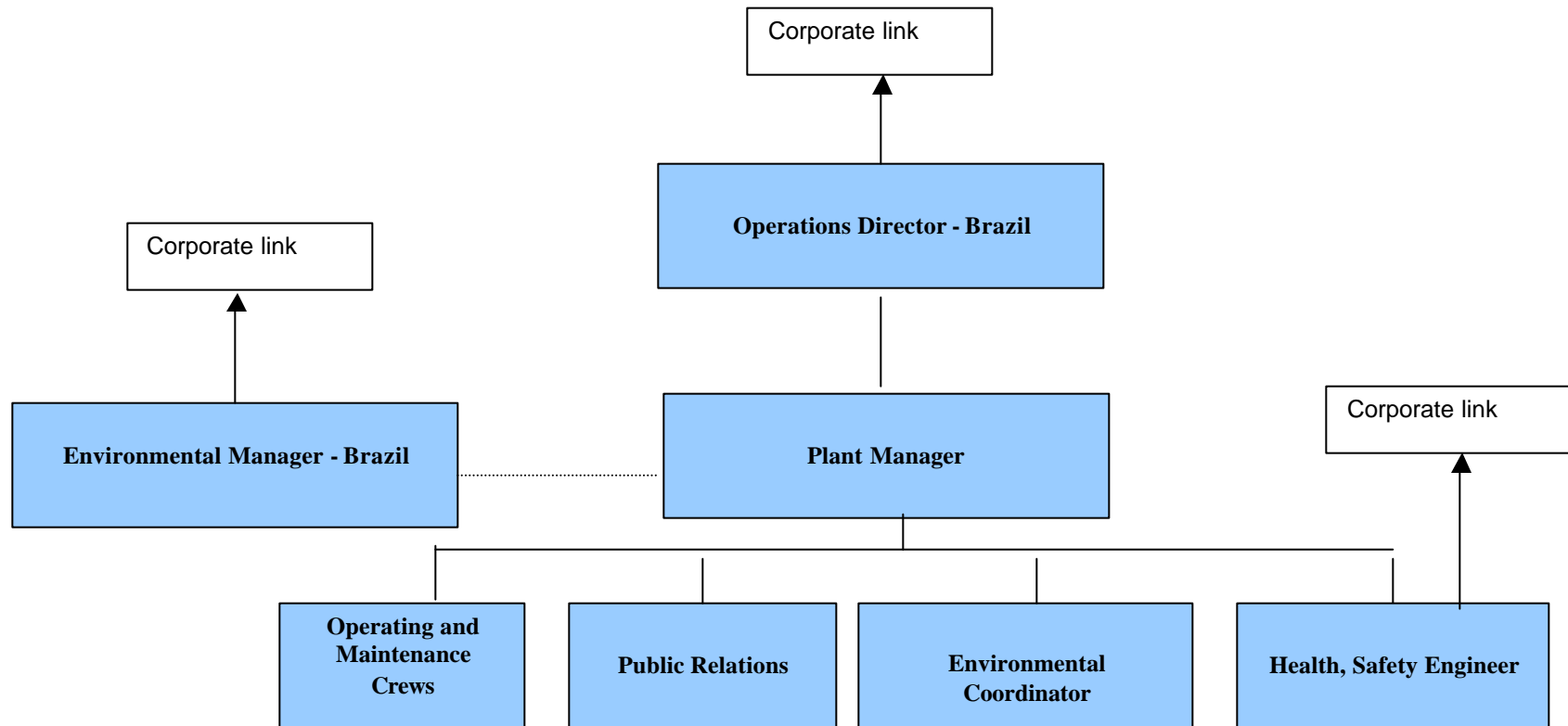
#### 2. EMMP Organization

The specific organization and the key actors for the implementation of the EMMP is given in Figure III.2. El Paso Rio Claro personnel holds routine onsite duties and responsibilities, including inspections that guarantee compliance with the applicable legislation and external communications such as public relations and community outreach. Corporate involvement, required in Government and community relations that may create financial obligations are also shown. The detailed duties and responsibilities of all players involved in the implementation of the EMMP are presented in Table III.1.



**Figure III-2**

**EMMP Organizational Chart for the Operations Phase and Corporate Links**



**Table III-1 Responsibilities and Duties**

NAME/TITLE	RESPONSIBILITY	GENERAL DUTIES AND EMMP DUTIES
Plant Manager	The Plant Manager is ultimately responsible for the entire functioning of the plant in accordance with all the commitments assumed, including the environmental.	<ul style="list-style-type: none"> <li>• Handles administrative matters at the plant</li> <li>• Communicates with the El Paso Technical Director</li> <li>• Reviews EMMP documentation</li> <li>• Approves PAR and CAR</li> <li>• Communicates with Operations Director for Brazil</li> </ul>
Operations Manager	The Operations Manager is responsible for the plant operations.	<ul style="list-style-type: none"> <li>• Manages operating matters at the plant</li> <li>• Communicates with the Plant Manager</li> <li>• Reviews EMMP documentation</li> </ul>
Shift Supervisor	Supervises each operating crew	<ul style="list-style-type: none"> <li>• Plant operations</li> <li>• Responsible for immediate action and communications for all EHS-related operating incidents</li> </ul>
Maintenance Crew	Responsible for maintenance schedules	<ul style="list-style-type: none"> <li>• Plant maintenance</li> <li>• Responsible for immediate action and communications for all maintenance incidents related to EHS</li> </ul>
Health and Safety Engineer	Responsible for health and safety issues	<ul style="list-style-type: none"> <li>• Coordinates all actions related to health and safety</li> <li>• Writes reports and gathers documentation to submit to El Paso</li> <li>• Communicates with corporate Health and Safety Division</li> </ul>
Environmental Coordinator	Responsible for environmental aspects, including relations with Environmental Authorities, licensing, supervising mitigatory measures, preparing monthly reports for the owners, and ensuring the implementation of preventive and compensatory measures.	<ul style="list-style-type: none"> <li>• Coordinates all actions related to EMMP implementation</li> <li>• Writes reports and gathers documentation to submit to El Paso</li> <li>• Holds formal and informal discussions with members of environmental entities</li> <li>• Writes monthly report on environmental aspects to Owners</li> <li>• Performs monthly environmental inspections</li> <li>• Notifies employees / contractors of any conditions that might lead to a non-compliance incident</li> <li>• Registers all incidents and keep the documentation</li> <li>• Records any possible regulatory non-compliance issues</li> <li>• When noting any non-compliance, informs the Plant Manager and the El Paso Environmental Manager</li> <li>• Coordinates the regular formal meeting with El Paso to discuss findings in the audits and inspections</li> <li>• Keeps all records of environmental documentation, such as communication logs, inspection reports, etc.</li> <li>• Responsible for implementing measures to minimize / avoid possible environmental impacts</li> </ul>

Public Relations	Responsible for the all interaction with outsiders, including communities, stakeholders, government, etc.	<ul style="list-style-type: none"> <li>• Monitors social impacts of the plant activities</li> <li>• Develops and updates social communications program</li> <li>• Communicates with local NGOs</li> <li>• Receives inquiries and other communications from outsiders on the Macaé Merchant EMS or environmental performance, then reviews all these communications to determine the most appropriate response</li> <li>• Keeps copies of all other written communications regarding public relations</li> <li>• Sends press release materials (folders, brochures, environmental policy) to stakeholders</li> <li>• In consultation with the Environmental Manager – Brazil, responds to media communications and receives, analyzes and answers complaints and requests from the community.</li> </ul>
Environmental Manager-Brazil	Responsible for the proper adequacy of the plant to the EMMP and manages the implementation of environmental measures.	<ul style="list-style-type: none"> <li>• Authorizes all documentation to be submitted to Environmental Entities</li> <li>• Leads all formal meetings with Environmental Entities</li> <li>• Ensures compliance with proposed preventive, mitigatory and compensatory measures</li> <li>• Heads up regular EMS audits and monitors corrective action plans</li> <li>• Receives communications on environmental issues from representatives of regulatory agencies, stakeholders and the media, and keeps records of all such communication (both incoming and outgoing).</li> <li>• Responsible for determining the need for preparing notifications to regulatory agencies as required.</li> <li>• Should an incident occur, determines which agency(ies) should be notified, based on the amount of the substance spilled/leaked.</li> <li>• Communicates with Corporate Environmental Division</li> </ul>

## IV. Procedures

The Macaé Merchant Power Plant must follow management procedures carefully in order to ensure that its environmental impacts are firmly under control during the operations phase. Several management aspects are identified as critical to Quality Control/Quality Assurance (QA/QC) for the environmental management of this project.

Ensuring that these management aspects are properly addressed will systematically ensure a high level of environmental performance, minimizing adverse impacts during the operations of the Macaé Merchant Power Plant.

The following procedures were developed for each of these management aspects:

### Documentation Procedures

- Formatting Environmental Procedures and Forms (O-EP 001)
- Document Control and Revision (O-EP 002)
- Environmental Records (O-EP 003)

### Communications Procedures

- Emergency Communications (O-EP 004)
- Internal Communications (O-EP 005)
- Outreach to Stakeholders (O-EP 006)
- Management of Inquiries from Stakeholders (O-EP 007)

### Training Procedures

- Training (O-EP 008)

### Monitoring Procedures

- Monitoring Atmospheric Emissions (O-EP 009)
- Monitoring Air Quality (O-EP 010)
- Monitoring Liquid Effluents (O-EP 011)
- Monitoring the Macaé River (O-EP 012)
- Monitoring Noise (O-EP 013)
- Waste Management (O-EP-014)

### Continuous Improvement Procedures

- Change Management (O-EP 015)
- CEMS Quality Assurance Audit (O-EP 016)
- Environmental Management and Monitoring Plan Audit (O-EP 017)
- Environmental Compliance Audit (O-EP 018)
- Preventive and Corrective Actions (O-EP 019)
- External Inspection Management (O-EP 020)
- Contractors Management (O-EP 021)
- Environmental Performance Evaluation (O-EP 022)

Figure IV.1 shows the overall structure of the Management procedures.

Given their key role in the EMMP, the monitoring programs are summarized in Table IV.1, which includes specific management responsibilities, parameters and applicable limits.

**Fig. IV.1 - Management and Monitoring Procedures**



**Table IV-1 – Summary of Monitoring Programs and Responsibilities**

<b>AIR EMISSIONS x CEMS (1 OUT OF EACH GROUP OF 4 STACKS)</b>				
PARAMETERS	LIMITS	FREQUENCY	EXECUTIVE RESPONSIBILITY	COORDINATING AND REPORTING RESPONSIBILITIES
NOx (expressed as NO <sub>2</sub> )	61 ppmdv, 15% O <sub>2</sub>	CONTINUOUS	MAINTENANCE OR SPECIALIZED THIRD PARTY HIRED BY O&M WITH TECHNICAL SPECIFICATIONS PROVIDED BY ENVIRONMENTAL COORDINATOR	ENVIRONMENTAL MANAGER
CO	50 ppmdv			
O <sub>2</sub> and H <sub>2</sub> O	NA			
Temperature and Flow rates & velocity	NA			
<p><b>NA – not applicable</b></p> <p><b>OPERATING LICENSE - ADDITIONAL REQUIREMENTS:</b> Performance of Emissions Monitoring Manual Rounds for the remaining three stacks of each group, according to the schedule indicated below over a period of twenty-four months. At the end of this period, the monitoring frequency shall be reassessed. The initial monitoring rounds shall be scheduled in the following manner:</p> <ul style="list-style-type: none"> <li>• Round 1: two months after the start-up of operations for each group.</li> <li>• Round 2: three months after completion of the first test.</li> <li>• Round 3: six months after completion of the second test.</li> <li>• Round 4 and subsequent tests: every six months.</li> </ul>				

**Table IV-1 – Summary of Monitoring Programs and Responsibilities**

AIR QUALITY – Primary Standards until Specific Definition of Airshed Class by Environmental Authority				
PARAMETERS	LIMITS	FREQUENCY	EXECUTIVE RESPONSIBILITY	COORDINATING AND REPORTING RESPONSIBILITIES
NO <sub>x</sub> , NO, NO <sub>2</sub>	NO <sub>2</sub> 1 Hour - 390 ? g/m <sup>3</sup> 24 Hours – 150 ? g/m <sup>3</sup> Year – 100 ? g/m <sup>3</sup>	TWO AUTOMATIC CONTINUOUS STATIONS LOCATED AS REQUESTED BY FEEMA	OPERATION OR SPECIALIZED THIRD PARTY HIRED BY O&M WITH TECHNICAL SPECS PROVIDED BY ENVIRONMENTAL COORDINATOR	ENVIRONMENTAL MANAGER
CO	1 Hour – 40,000 ? g/m <sup>3</sup> 24 Hours – 10,000? g/m <sup>3</sup>			
HCT	NR			
O <sub>3</sub>	1 hour – 160 ? g/m <sup>3</sup>			
Temperature, relative humidity, solar radiation, wind direction and speed.	NA			

NR – not regulated  
NA – not applicable

**Table IV-1 – Summary of Monitoring Programs and Responsibilities**

LIQUID EFFLUENTS							
PARAMETERS	APPLICABLE LIMITS -MACAE DISCHARGE	ART.21 RES. CONAMA 20/86	FEEMA NT- 202.R-10	WORLD BANK ENVIRONMENTAL GUIDELINES (NEW THERMAL POWER PLANTS)	WORLD BANK (GENERAL ENVIRONMENTAL GUIDELINES)	FREQUENCY – WORLD BANK	EXECUTING/COORDINATION AND REPORTING RESPONSIBILITIES
Temperature	<40 Celsius	<40 Celsius increase at the edge of mixing zone < 3 Celsius	<40 Celsius increase at the edge of mixing zone < 3 Celsius	Increase at the edge of mixing zone < 3 Celsius	Increase at the edge of mixing zone < 3 Celsius	Continuous (presently on a daily basis )	CERTIFIED LAB / ENVIRONMENTAL COORDINATOR
pH	6-9	5-9	5-9	6-9	6-9	Continuous (presently on a daily basis )	
Oil and grease	10	20	20	10	10	Daily ( presently on a weekly basis for final discharge and monthly for intermediate flows )	
Total Suspended Solids (TSS)	50	NR	NR	50	50		
Total Residual Chlorine	0.2	NR	5	0.2	0.2	Monthly ( presently on a weekly basis for final discharge and monthly for intermediate flows )	
Dissolved Solids	500	NR	NR	NR	NR		
Turbidity	NR	NR	NR	NR	NR		
Settled Solids	< 1ml/l, Imhof text, 1 hour	< 1ml/l, Imhof text, 1 hour	NR	NR	NR		
Dissolved Oxygen	NR	NR	NR	NR	NR		
Metals (total)	10	NR	NR	NR	10		
Chromium (total)	0.5	0.5	0.5	0.5	0.5		
Lead	NR	NR	NR	NR	0.1		
Copper	0.5	1.0	0.5	0.5	0.5		
Iron	1.0	15	15	1.0	3.5		
Manganese	NR	NR	NR	NR	NR		
Aluminum	NR	NR	NR	NR	NR		
Zinc	1.0	5.0	1.0	1.0	2.0		
Conductivity	NR	NR	NR	NR	NR		
Chlorides	750	NR	NR	NR	NR		
Phenol (Phenolic substances C6H6OH)	0.2	0.5	0.2	NR	0.5		
Phosphates (PO4)	6	NR	NR	NR	6		
Sulfates	500	NR	NR	NR			
Sulfides	NR	NR	NR	NR	1.0		
Nitrates	10	10	NR	NR			
Nitrogen (Ammonia)	NR	NR	NR	NR	10 (Ammonia)		
Total Nitrogen	NR	NR	NR	NR	NR		
Total Phosphorus	NR	NR	NR	NR	NR		
Sulfides	NR	NR	NR	NR	NR		
Surfactant substances	NR	NR	NR	NR	NR		
COD	150	NR	150	NR	250		
BOD	15	NR	>80% Reduction	NR	50		
Toxic Organic Compounds – (Chlorinated Organic and Phosforic+PCB)	NR	NR	NR	NR	NR		
Toxicity	NR	NR	NR	NR	NR		
Coliforms	400/100 ml	NR	Controle via DBO	NR	400/100ml		

Notes:

<sup>a</sup> Brazilian Regulations require compliance with the effluent limits established in Article 21 CONAMA Resolution N° 20 dated June 18, 1986 (Federal Regulations) and FEEMA NT-202.R-10 23 (Rio de Janeiro State Regulations). At the same time, effluents may not alter the characteristics of the recipient water-body, as required by article 23 of the CONAMA Resolution 20/86 (Macaé River has been classified as Class II). Given the requirement of project compliance with World Bank Guidelines, the strictest applicable limit shown in the table was used for the discharge flow.

<sup>b</sup> Chlorine shocking may be preferable under certain circumstances. This involves high chlorine levels used for a few seconds rather than a continuous low-level release. The maximum value is 2 mg/L for up to two hours, not to be repeated more frequently than once every 24 hours, with a 24-hour average of 0.2 mg/L (the same limits apply to bromine and fluorine).

<sup>c</sup> The effluent should result in a temperature increase of no more than 3 degrees Celsius at the edge of the zone where initial mixing and dilution takes place. Where the zone is not defined, use 100 meters from the point of discharge when there are no sensitive aquatic ecosystems within this distance.

Units: (mg/l) milligrams per liter, except for pH, bacteria and temperature  
NR – Not regulated

**Table IV-1 – Summary of Monitoring Programs and Responsibilities**

<b>WATER QUALITY – MACAÉ RIVER (*)</b>			
KEY PARAMETERS – UPSTREAM AND DOWNSTREAM	LIMITS – mg/l where pertinent – class 2, art 24 Res. CONAMA 20/86	FREQUENCY ( TECMA PROGRAM )	EXECUTING/COORDINATING AND REPORTI RESPONSIBILITIES
Temperature /Temperature increase	NR/< 3 ° C	3 TIMES A DAY	CERTIFIED LAB / ENVIRONMENTAL COORDINATOR
pH	6-9		
Dissolved oxygen	5		
Total Suspended Solids (TSS)	NR	WEEKLY	
Oil and grease	VA	MONTHLY	
Total Residual Chlorine <sup>b</sup>	0.01		
Chromium (total)	0.55		
Copper	0.02		
Iron - soluble	0.3		
Manganese	0.1		
Phenolic substances	0.001		
Phosphates (PO <sub>4</sub> )	0.025 P ( PO <sub>4</sub> )		
Total Dissolved Solids	500		
Aluminum	0.1		
Ammonia	0.02 NH <sub>3</sub>		
Zinc	0.18		
Nitrates	10		
COD (Chemical Oxygen Demand)	NR		
BOD <sub>5</sub> (Biological Oxygen Demand)	3		
Coliforms	1000 FECAL ( 80 % OF AT LEAST 5 MONTHLY SAMPLES		
<b>(*) Additional river flow and limnological surveys are required: each three months for phyto and zooplankton and for periphyton; each 6 months for zoobenthos; each year for river flow (rainy season)</b>			

**Table IV-1 – Summary of Monitoring Programs and Responsibilities**

<b>NOISE</b>				
<b>FENCE LINE Leq LEVELS</b>	<b>LIMITS – dB(A)</b>	<b>FREQUENCY</b>	<b>EXECUTIVE RESPONSIBILITY</b>	<b>COORDINATION AND REPORTING RESPONSIBILITIES</b>
Day	70	MONTHLY/SEMESTER	SPECIALIZED COMPANY	ENVIRONMENTAL COORDINATOR
Night	60			