

ENVIRONMENTAL IMPACT STUDY (EIA-RIMA)

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Page 1

LD Celulose S/A

Dissolving Pulp Mill in Indianópolis and Araguari - MG

PBA VOLUME

Content	1	INTRODUCTION
	2	ENVIRONMENTAL CONSTRUCTION PROGRAM (PAC)
	3	OPERATION ENVIROMENTAL MANAGEMENT SYSTEM PROGRAM
	4	SOLID WASTE MANAGEMENT PROGRAM (PGRS)
	5	INDUSTRIAL LIQUID EFFLUENT MONITORING PROGRAM
	6	SURFACE WATER QUALITY MONITORING PROGRAM
	7	GROUNDWATER QUALITY MONITORING PROGRAM
	8	ATMOSPHERIC EMISSION MONITORING PROGRAM
	9	AIR QUALITY MONITORING PROGRAM
	10	NOISE MONITORING PROGRAM
	11	FLORA MONITORING PROGRAM
	12	FAUNA MONITORING PROGRAM
	13	AQUATIC FAUNA MONITORING PROGRAM
	14	SOCIAL COMMUNICATION PROGRAM (PCS)
	15	ENVIRONMENTAL EDUCATION PROGRAM (PEA)
	16	ENVIRONMENTAL COMPENSATION PROGRAM

Annexes

Distribution

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SUMMARY

1	INTRODUCTION.....	8
2	ENVIRONMENTAL CONSTRUCTION PROGRAM (PAC).....	9
2.1	Justification.....	9
2.2	Objectives and Goals.....	9
2.3	Subprograms.....	9
2.3.1	Water Consumption Monitoring Subprogram.....	9
2.3.2	Liquid Effluent Monitoring Subprogram.....	10
2.3.3	Solid Waste Management Subprogram.....	12
2.3.4	Dust control and Black Smoke Subprogram.....	16
2.3.5	Environmental Noise Monitoring Subprogram.....	18
2.3.6	Vegetation Suppression Subprogram.....	20
2.4	References.....	21
3	OPERATION ENVIRONMENTAL MANAGEMENT SYSTEM PROGRAM.....	22
3.1	Justification.....	22
3.2	Objectives and Goals.....	22
3.3	Methodology.....	23
3.3.1	Environmental Leadership and Policy.....	23
3.3.2	Identification and Evaluation of Environmental Aspects and Impacts.....	23
3.3.3	Operational Control.....	23
3.3.4	Monitoring, measurement, analysis and evaluation.....	24
3.3.5	Critical Analysis by Operation.....	24
3.3.6	Noncompliance and Corrective Actions.....	24
3.3.7	Preventive Action and Continuous Improvement.....	25
3.4	Compliance with legal requirements.....	25
3.5	Schedule.....	25
3.6	Program Responsibility.....	25
3.7	References.....	25
4	SOLID WASTE MANAGEMENT PROGRAM (PGRS).....	26
4.1	Justification.....	26
4.2	Objectives and Goals.....	26
4.3	Methodology.....	26
4.3.1	Management System.....	26
4.3.2	Solid Waste Characterization.....	26
4.3.3	Segregation and Mixing of Solid Residues.....	28
4.3.4	Conditioning and Treatment / Final Disposal.....	29
4.3.5	Procedures.....	32
4.4	Compliance with legal requirements.....	33
4.5	Schedule.....	33
4.6	Program Responsibility.....	34
4.7	References.....	34
5	INDUSTRIAL LIQUID EFFLUENT MONITORING PROGRAM.....	34
5.1	Justification.....	34
5.2	Objectives and Goals.....	34
5.3	Methodology.....	35
5.3.1	Characterization of Industrial Effluents.....	35

5.3.2	Effluent Treatment Plant	35
5.3.3	Sample location.....	35
5.3.4	Sample Procedure.....	35
5.3.5	Parameters and Sampling Frequency	36
5.3.6	Reports and Certifications	37
5.4	Compliance with legal requirements.....	37
5.5	Schedule.....	37
5.6	Program Responsibility	37
5.7	References.....	37
6	SURFACE WATER QUALITY MONITORING PROGRAM	38
6.1	Justification	38
6.2	Objectives and Goals.....	38
6.3	Methodology	38
6.3.1	Monitoring Points Location	38
6.3.2	Collection, Preservation and Analysis Procedure.....	39
6.3.3	Analysis Parameters	39
6.3.4	Sampling Frequency.....	39
6.3.5	Reports and Certifications	40
6.4	Compliance with legal requirements.....	40
6.5	Schedule.....	40
6.6	Program Responsibility	40
6.7	References.....	40
7	GROUNDWATER QUALITY MONITORING PROGRAM.....	41
7.1	Justification	41
7.2	Objectives and Goals.....	41
7.3	Methodology	41
7.3.1	Monitoring Points Location	41
7.3.2	Collection, Preservation and Analysis Procedure.....	42
7.3.3	Analysis Parameters	42
7.3.4	Sampling Frequency.....	43
7.3.5	Reports and Certifications	43
7.4	Compliance with legal requirements.....	43
7.5	Schedule.....	43
7.6	Program Responsibility	43
7.7	References.....	43
8	ATMOSPHERIC EMISSION MONITORING PROGRAM.....	44
8.1	Justification	44
8.2	Objectives and Goals.....	44
8.3	Methodology	44
8.3.1	Sources.....	44
8.3.2	Measurement Location	44
8.3.3	Measurement Procedures and Parameters	44
8.4	Compliance with legal requirements.....	46
8.5	Schedule.....	46
8.6	Program Responsibility	46
8.7	References.....	46
9	AIR QUALITY MONITORING PROGRAM	47
9.1	Justification	47
9.2	Objectives and Goals.....	48
9.3	Methodology	48
9.3.1	Monitoring Points Location	48

9.3.2	Analysis Parameters	48
9.3.3	Sampling Procedure	49
9.3.4	Sampling Frequency	51
9.4	Compliance with legal requirements	51
9.5	Schedule.....	51
9.6	Program Responsibility	51
9.7	References.....	51
10	NOISE MONITORING PROGRAM.....	52
10.1	Justification	52
10.2	Objectives and Goals.....	52
10.3	Methodology	52
10.3.1	Measurement Location	52
10.3.2	Measurement Procedure	53
10.3.3	Analysis Parameters	54
10.3.4	Reports and Certifications	54
10.4	Compliance with legal requirements	54
10.5	Schedule.....	54
10.6	Program Responsibility	54
10.7	References.....	54
11	FLORA MONITORING PROGRAM	55
11.1	Justification	55
11.2	Objectives and Goals.....	55
11.3	Methodology	55
11.3.1	Sampling sites	55
11.3.2	Methodology	56
11.3.3	Sampling Frequency	56
11.4	Schedule.....	56
11.5	Program Responsibility	56
11.6	References.....	56
12	FAUNA MONITORING PROGRAM.....	56
12.1	Justification	56
12.2	Objectives and Goals.....	57
12.3	Methodology	57
12.3.1	Sampling sites	57
12.3.2	Sampling Procedures.....	57
12.3.3	Monitoring groups.....	59
12.3.4	Monitoring Frequency	59
12.4	Compliance with legal requirements	59
12.5	Schedule.....	59
12.6	Program Responsibility	59
12.7	References.....	59
13	AQUATIC FAUNA MONITORING PROGRAM	59
13.1	Justification	59
13.2	Objectives and Goals.....	59
13.3	Methodology	60
13.3.1	Monitoring sites	60
13.3.2	Sampling Procedure	60
13.3.3	Sampling Frequency	61
13.3.4	Reports and Certifications	61
13.4	Compliance with legal requirements	61
13.5	Schedule.....	61

13.6	Program Responsibility	61
13.7	References.....	61
14	SOCIAL COMMUNICATION PROGRAM (PCS)	61
14.1	Justification	61
14.2	Objectives and Goals.....	62
14.3	Methodology	62
14.4	Compliance with legal requirements.....	62
14.5	Schedule.....	62
14.6	Program Responsibility	62
14.7	References.....	62
15	ENVIRONMENTAL EDUCATION PROGRAM (PEA)	62
15.1	Introduction.....	63
15.2	Target Audience	64
15.3	Objective.....	64
15.4	Justification	65
15.5	Methodology	65
15.6	Expected Results	65
15.7	References.....	66
16	ENVIRONMENTAL COMPENSATION PROGRAM	67
16.1	Justification	67
16.2	Objective.....	67
16.3	Methodology	67
16.3.1	Component: Relevance factor.....	69
16.3.2	Component: Time Factor.....	77
16.3.3	Component: Factor of Coverage	77
16.3.4	Degree of Significant Environmental Impact – GI	78
16.3.5	Environmental Compensation (CA).....	78
16.4	Registration Form.....	78
16.5	Responsible	79
16.6	Schedule.....	79
16.7	References.....	79

FIGURE LIST

Figure 1 – Location map of the 8 measurement points of the ambient sound pressure level.	
Source: Adapted from Google Earth (2018).	19
Figure 2 – Soil acidity correction basic flowchart.	32
Figure 3 – Location of surface water quality monitoring points. Source: Adapted from Google Earth (2018).	39
Figure 4 – Location of groundwater quality monitoring points. Source: Adapted from Google Earth (2018).	42
Figure 5 – Location of air quality monitoring points (P01). Source: Adapted from Google Earth (2017)	48
Figure 6 –Location of the 8 noise pressure level measuring points map. Source: Adapted de Google Earth (2018).	53
Figure 7 – General location of the sampling sites for ichthyofauna, phytoplankton, zooplankton and zoobenthos, with the following coordinates (Point 1: 7913960.00 m S, 804317.00 m E; and Point 2: 7915521.00 m S, 804317.00 m E).	60
Figure 8 – Location map of LD Celulose mil. Source: Google Earth (2018).	63

TABLE LIST

Table 1 – Parameters applicable to sewage	11
Table 2 –Characterization of the solid residues that will be generated in the construction of the mill	12
Table 3 – Color standard for selective collection of solid waste.....	13
Table 4 – Ways of packaging solid waste in the generating areas	14
Table 5 – Forms of treatment and/or disposal of the solid waste generated at the site.....	14
Table 6 –Description of the ambient sound pressure level measurement sites	18
Table 7 – Industrial solid wastes (values in m³ / year)	27
Table 8 – Estimated volumes of non-industrial waste (values in t / year)	27
Table 9 – Color standard for selective collection of solid waste from administrative and operational collectors	28
Table 10 – Color standard for selective collection of solid waste from stationary buckets	28
Table 11 – Ways of packaging solid waste in the generating areas	29
Table 12 – Forms of treatment and / or disposal of solid waste in generating areas	30
Table 13 –Frequency of sampling and parameters analyzed at the entrance of effluent treatment.....	36
Table 14 – Frequency of sampling and parameters analyzed at the exit of effluent treatment	36
Table 15 – Coordinates of surface water quality monitoring points	39
Table 16 – Coordinates of groundwater quality monitoring points	41
Table 17 –Parameters monitored by generating source.....	45
Table 18 – Frequency of monitoring atmospheric emissions.	45
Table 19 – Parameters, equipment, methodologies, collections and duration of the air quality monitoring campaign	51
Table 20 – Description of the ambient sound pressure level measurement sites.....	52

1 INTRODUCTION

This document presents the Basic Environmental Programs (PBA) regarding LD Celulose dissolving pulp mill implementation and operation.

PBA is composed of the programs presented below.

- Environmental Construction Program (PAC)
- Operation Environmental Management System Program
- Solid Waste Management Program (PGRS)
- Industrial Liquid Effluent Monitoring Program
- Surface Water Quality Monitoring Program
- Groundwater Quality Monitoring Program
- Atmospheric Emission Monitoring Program
- Air Quality Monitoring Program
- Noise Monitoring Program
- Flora Monitoring Program
- Fauna Monitoring Program
- Aquatic Fauna Monitoring Program
- Social Communication Program (PCS)
- Environmental Education Program (PEA)
- Environmental Compensation Program

For each PBA is presented: justification, objectives and goals, methodology, meeting the legal requirements, schedule, program responsibility and references.

2 ENVIRONMENTAL CONSTRUCTION PROGRAM (PAC)

2.1 Justification

This program is necessary to control and monitor possible impacts due to the mill construction, generated by environmental aspects such as: water consumption, liquid effluent generation, solid waste, atmospheric emissions and noise.

It should be noted that the dissolving pulp mill construction schedule is 24 to 28 months, involving approximately 6,500 workers in the peak period of the construction and assembly.

2.2 Objectives and Goals

The Environmental Construction Program (PAC) aims to carry out the environmental monitoring and control of activities related to the project implementation, in order to meet the legal requirements and applicable standards.

The main controls are related to the following environmental aspects:

- Water consumption
- Sanitary sewage
- Solid Waste
- Black Dust and Smoke
- Noise
- Vegetation Suppression

2.3 Subprograms

The Environmental Construction Program is divided into specific subprograms for each identified environmental aspect.

2.3.1 Water Consumption Monitoring Subprogram

2.3.1.1 Methodology

The main uses of water during the construction of the mill are: sanitary, concrete preparation and various uses.

At the beginning of the construction (earthworks phase and infrastructure installation), the water supply will be by water truck, complying with legal regulations and ensuring compliance with Consolidation Ordinance of the Ministry of Health n° 05/2017, which consolidates the norms on actions and health services of the Unified Health System.

After the initial phase of the construction, artesian wells will be installed to supply water to the site. The water will be filtered and will receive chlorination, followed by its storage in the reservoir, for later distribution to the users. At first, this system should provide a flow of the order of 150 m³/h, which should meet the maximum population of 6,500 employees (peak during the construction) and also for the preparation of concrete.

After the underground wells installation, the quality of the water will be monitored at the outlet of the treated water tank.

The samples will be collected and preserved according to the methodologies of the National Standard for the Examination of Water and Wastewater, 23 rd Edition (APHA) and National Guide for Collection and Preservation of Water, Sediment, Water Communities and Liquid Effluents (ANA / CETESB) , in containers suitable for each parameter, and preserved, preferably, at low temperature. After these procedures, the samples will be sent for analysis, respecting the holding-time of the parameters.

The parameters to be analyzed are those required by Consolidation Ordinance of the Ministry of Health n° 05/2017.

Considering the importance of minimizing consumption and raising awareness about water use, LD Celulose will monitor and record water consumption during the mill construction.

2.3.1.2 Compliance with legal requirements

The main legal requirement applicable to this Subprogram is:

- Consolidation Ordinance of the Ministry of Health n° 05/2017.

2.3.1.3 Schedule

The schedule of planned activities during the mill construction phase is indicated below:

- | | |
|--|----------|
| – Campaign to monitor water consumption | Monthly |
| – Audits and inspections by the EMS team of LD Celulose: | Semester |
| – PAC monitoring reports delivery to the environmental agency: | Semester |

2.3.1.4 Program Responsibility

LD Celulose.

2.3.2 Liquid Effluent Monitoring Subprogram

2.3.2.1 Methodology

At the beginning of the construction (earthworks phase and infrastructure installation), chemical toilets will be used, and these will be removed by clean pit trucks type, transported and arranged by companies accredited in licensed landfills. The chemical toilets and other facilities at the construction site shall be installed in accordance with NR 18 - "Conditions and Working Environment in the Construction Industry". Once the installation is completed, the chemical toilets will be deactivated and returned to the company that has leased them.

After the site construction, the sanitary sewage generated will be collected and treated in a treatment system consisting of aerated lagoon and polishing pond. The properly

treated sanitary sewage will be removed by trucks and sent as reuse water in the Duratex forests.

The treatment system will be the biological type, which will work with microorganisms that will degrade the organic matter present in the sewage (expressed in terms of BOD - Biochemical Oxygen Demand) through an aerobic process.

The average sanitary sewage generated during the mill construction will be approximately 100 m³/h (90% of the water supply), considering the peak of 6,500 workers.

The treated sewage must comply with the parameters emission standards established by CONAMA Resolution No. 430/2011 and Joint Normative Resolution COPAM / CERH-MG No. 1/2008. In summary, the main parameters to be followed that are applicable to this type of effluent (sanitary sewage) are:

Table 1 – Parameters applicable to sewage

Parameter	Unit	Legal limits
pH	-	5,0 a 9,0
Temperature	°C	< 40
Sedimented solids	ml/l	< 1,0
DBO	mg/L	< 60 or
	% remove	min 60% e ≤70% (annual average)

Source: CONAMA Resolution No. 430/2011 and Joint Normative Resolution COPAM / CERH-MG No. 1/2008.

2.3.2.2 Compliance with legal requirements

The main legal requirements applicable to this Subprogram are:

- CONAMA Resolution No. 430/2011
- Normative Resolution COPAM / CERH-MG No. 1/2008

2.3.2.3 Schedule

The schedule of planned activities during the mill's implementation phase is indicated below:

- Liquid effluent monitoring: Monthly
- Audits and inspections by the EMS team of LD Celulose: Semester
- PAC monitoring reports delivery to the environmental agency: Semester

2.3.2.4 Program Responsibility

LD Celulose.

2.3.3 Solid Waste Management Subprogram

2.3.3.1 Methodology

The management of solid waste generated during the work of the LD Celulose mill will contemplate the best practices, as described in Federal Law 12305/2010, among which the following stand out:

- Reduce solid waste through the use of the 3R's principle (Reduce, Reuse, Recycle);
- Solid waste segregation, according to the color standard established by CONAMA Resolution No. 275/2001;
- Solid waste collection, packaging, storage and transport, in accordance with current legislation;
- Environmentally appropriate final destination (reuse, recycling, composting, energy use, etc.) and / or environmentally adequate disposal of the solid waste generated in the project.

In the construction phase, there will be a Temporary Storage Center for Solid Waste that will be managed by a company that specializes in this service. This company will be responsible for receiving, storing and disposing of all solid waste generated during the construction phase.

All companies contracted to implement the various process islands, as well as all other companies contracted to perform any other service during the construction phase, will be responsible for the collection, segregation, packaging and disposal of their solid waste to the Central of Temporary storage of solid waste.

Solid Waste Characterization

In the implementation of the LD Celulose mill, several types of waste will be generated.

Standard NBR 10.004 / 2004 classifies solid wastes into Hazardous Waste (Class I), Non-Hazardous and Non-Inertial Waste (Class IIA) and Non-Hazardous and Inherent Waste (Class IIB).

CONAMA Resolution No. 307/2002 establishes guidelines, criteria and procedures for the management of construction waste.

The following table shows the solid waste generated, its classification according to NBR 10,004 / 2004, its class according to CONAMA Resolution no. 307/2002 and the estimated quantity.

Table 2 –Characterization of the solid residues that will be generated in the construction of the mill

Solid waste	ABNT NBR 10.004/2004 ¹	RES. CONAMA n° 307/2002	Estimated Amount
Debris of works (block, concrete, brick, wood)	II-A	Classe A/B	2.600 m ³ / month
Scrap metal	II-A	Classe B	125 t/ month

Solid waste	ABNT NBR 10.004/2004 ¹	RES. CONAMA n° 307/2002	Estimated Amount
Paper / cardboard	II-A	Classe B	10 t/ month
Plastics	II-A	Classe B	15 t/ month
Rubber / Tires	II-A	Classe B	30 unit/ month
Glass	II-B	Classe B	2 t/ month
Fluorescent lamps	I	Classe D	0,5 t/ month
Batteries	I	Classe D	10 kg/ month
Health Services Waste	I	Classe D	200 kg/ month
Equipment maintenance wastes (lubricating oil)	I	Classe D	3,5 m ³ / month
Organic waste (leftovers)	II-A	-	280 m ³ / month

¹ I – Hazardous waste, II-A Non-Hazardous Waste, not inert, II-B Non-Hazardous Waste, Inert.

Solid Waste Segregation

Segregation of solid waste will be performed according to the color standard for selective collection, established by CONAMA Resolution No. 275/2001, as presented in the following table.

Table 3 – Color standard for selective collection of solid waste.

Solid waste	Color
Metal	Yellow
Paper / cardboard	Blue
Plastic	Red
Glass	Green
Hazardous waste	Orange
General non-recyclable waste	Silver
Health Service	White
Wood	Black
Organic	Brown

Packaging

Solid waste packaging will be carried out in suitable collectors in such a way as to eliminate risks to human health and the environment. The packaging will be in accordance with the Standards ABNT NBR 11,174 - Storage of waste IIA classes - inert and IIB - inert, ABNT NBR 12.235 - Storage of Hazardous Solid Waste, CONAMA Resolution No. 358/2005, as well as ANVISA RDC No. 306/2004.

Health service waste will be collected, conditioned, stored and transported in accordance with the ABNT NBR Regulations 12809 - Handling of health care waste -

Procedure, ABNT NBR 12.810 - Collection of health services waste - Procedure and Resolution CONAMA No 358/05.

In the Table below, the ways of packaging solid waste in the generating areas are presented.

Table 4 – Ways of packaging solid waste in the generating areas

Solid waste	Packaging Description
Debris of works (block, concrete, brick, wood)	Bulk, in stationary soil / bucket
Scrap metal	Stationary Bucket
Paper / cardboard	Stationary Bucket
Plastics	Stationary Bucket
Rubber / Tires	Stationary Bucket
Glass	Stationary Bucket
Fluorescent lamps	Specific container for lamp
Batteries	Drum
Health Services Waste	Specific collection box
Equipment maintenance wastes (lubricating oil)	Drum
Organic waste (leftovers)	Drum, Collector or Stationary Bucket

Solid Waste Quantification

The quantitative control of the exit and stock of the solid waste will be sent monthly to the responsible area through a worksheet called "Inventory of Solid Waste".

Transport

Documentation as transport manifest and licenses related to the transportation and disposal of solid waste will be required during the contracting of the companies that will provide such services or will be obtained by LD Celulose.

Treatment and Final Disposal

The solid waste generated in the construction phase will have an environmentally appropriate final destination, that is, they will be destined for reuse, recycling, incineration, coprocessing, etc; as described in the following table.

Table 5 – Forms of treatment and/or disposal of the solid waste generated at the site

Solid Waste	Treatment and Final Disposal
Debris of works (block, concrete, brick, wood)	Recovery and / or recycling

Solid Waste	Treatment and Final Disposal
Scrap metal	Recycling
Paper / cardboard	Recycling
Plastics	Recycling
Rubber / Tires	Recycling
Glass	Recycling
Fluorescent lamps	Decontamination and recycling
Batteries	Recycling
Health Services Waste	Decontamination / incineration
Equipment maintenance wastes (lubricating oil)	Rerrefino / incineration / coprocessing
Organic waste (leftovers)	Landfill of third party or municipal duly licensed

Debris is classified according to ABNT Standard NBR 10.004 as non-hazardous and inert waste (Class II-B), consisting mainly of: wood, metal / scrap, and concrete / masonry remnants.

These debris will be properly segregated and will have different treatments or destinations considering their characteristics:

- Wood will be separated and destined for companies that can use them for energy use (incineration);
- Debris of the concrete / masonry parts will be crushed, being separated into: metal parts (hardware) and crushed concrete, where:
 - Metal / scrap will be sent to companies for reuse as raw material;
 - Concrete / masonry debris may be used as a base layer / support for access roads and small roads.

The organic solid wastes generated in the implantation phase will basically come from the kitchen and refectory (waste from food processing, catering waste, napkins and the like) and toilets (toilet paper). According to Standard ABNT NBR 10.004, these wastes are classified as non-hazardous and non-inert waste (Class II-A). During the construction phase of the industry (24 months), it is expected to generate 6,800 m³ of organic waste. These figures were based on data from recent projects and similar works in the pulp area in Brazil.

Solid Waste Management Companies Inspection

The environmental area shall perform an inspection of the equipment / vehicles of the transport companies and places of destination and final disposal of solid waste in compliance with legal requirements.

2.3.3.2 Compliance with legal requirements

The main legal requirements applicable to this Subprogram are:

- Federal Law No. 12,305 / 2010
- CONAMA Resolution No. 275/2001

- CONAMA Resolution 307/2002
- CONAMA Resolution No. 358/2005
- Resolution ANVISA RDC no. 306/2004
- Standard NBR 10.004 / 2004
- Standard NBR 11.174 / 1990
- Standard NBR 12.235 / 1992
- Standard ABNT 12,809 / 2013
- Standard ABNT 12.810 / 2016

2.3.3.3 Schedule

The schedule of planned activities during the plant's implementation phase is indicated below:

- | | |
|--|----------|
| – Solid waste management | Monthly |
| – Audits and inspections by the EMS team of LD Celulose: | Semester |
| – PAC monitoring reports delivery to the environmental agency: | Semester |

2.3.3.4 Program Responsibility

LD Celulose.

2.3.4 Dust control and Black Smoke Subprogram

2.3.4.1 Methodology

In the implantation of the dissolving pulp mill, dust generation may occur, especially in the initial phase of the implementation, especially the earthmoving, vehicle movement, machinery and equipment operations, handling and transportation of materials (such as sand and gravel). etc. Therefore, during the works, the soil of accesses, roads, construction sites and other surfaces that can generate fugitive emissions of dust will be humidified with periodic spraying.

Trucks that carry soil, rocks and all powder will have their cargo covered, preventing the release of particles and dust.

The use of vehicles and equipment with combustion engines in the phase of implementation of the works will generate combustion gases and will result in a non significant increase in air quality, which will not change the quality standards of the region.

Parameters Samples

Parameters analyzed will be dust and black smoke.

Sampling Site

The dust control will be performed when there is activity execution with emission of significant amount of dust.

Black smoke control will be performed on vehicles and equipment powered by diesel oil.

Frequency of Sampling

The frequency of dust control will be daily and black smoke monitoring will be quarterly.

Measurement Method

The dust will be measured visually and the black smoke will be measured according to the procedure described in Standard NBR 6016/2015 and Ordinance MINTER n° 100/1980.

Meeting the Legal Limits

The black smoke will be controlled according to the limit established by Ordinance MINTER n° 100/1980, as follows.

"The smoke emission by diesel-powered vehicles in any working regime shall not exceed Standard No. 2 (two) on the Ringelman Scale when tested in a location situated up to 500 (five hundred) meters above sea level and to standard No. 3 (three), on the same scale, to a location situated above that altitude. "

2.3.4.2 Compliance with legal requirements

The main legal requirements applicable to this Subprogram are:

- Standard NBR 6.016 / 2015
- Ordinance Minter 100/1980

2.3.4.3 Schedule

The schedule of planned activities during the plant's implementation phase is indicated below:

- | | |
|--|-----------|
| – Black Smoke Control Campaign | quarterly |
| – Audits and inspections by the EMS team of LD Celulose: | Semester |
| – PAC monitoring reports delivery to the environmental agency: | Semester |

2.3.4.4 Program Responsibility

LD Celulose.

2.3.5 Environmental Noise Monitoring Subprogram

2.3.5.1 Methodology

The noise generation during the construction phase will be due to the movement of vehicles and the operation of machines and equipment, as well as typical noises of civil works such as drills, sanders, electric saws, among others.

Periodic maintenance of equipment and vehicles will be carried out, as it plays a fundamental role in noise control and safety, as well as increasing the useful life of the machinery. The causes of the machines noises are: wear of gears, bearings and bearings, poor lubrication, imbalance of rotating elements, obstructions in air pipes, non-sharp cutting devices, clogged and damaged silencers, device removal noise attenuator, etc. (BISTAFA, 2011).

Monitoring Location

Noise monitoring will be carried out at 8 different points, around the area of the dissolving pulp mill of LD Celulose, as described in the Table below.

Table 6 –Description of the ambient sound pressure level measurement sites

Point	Location	Coordinator	
		Latitude	
P01	Near the fence of the eucalyptus farm	18°49'55,87"S	P01
P02	Near the fence of the eucalyptus farm	18°50'18,98"S	P02
P03	Near the railway line	18°49'50,84"S	P03
P04	Near the railway line	18°49'45,52"S	P04
P05	Near the railway line	18°49'45.99"S	P05
P06	In the middle of the eucalyptus plantation	18°50'24.89"S	P06
P07	In the middle of the eucalyptus plantation	18°50'19.79"S	P07
P08	Close to native vegetation	18°50'20.23"S	P08

The following figure shows the map with the location of the 8 measuring points.

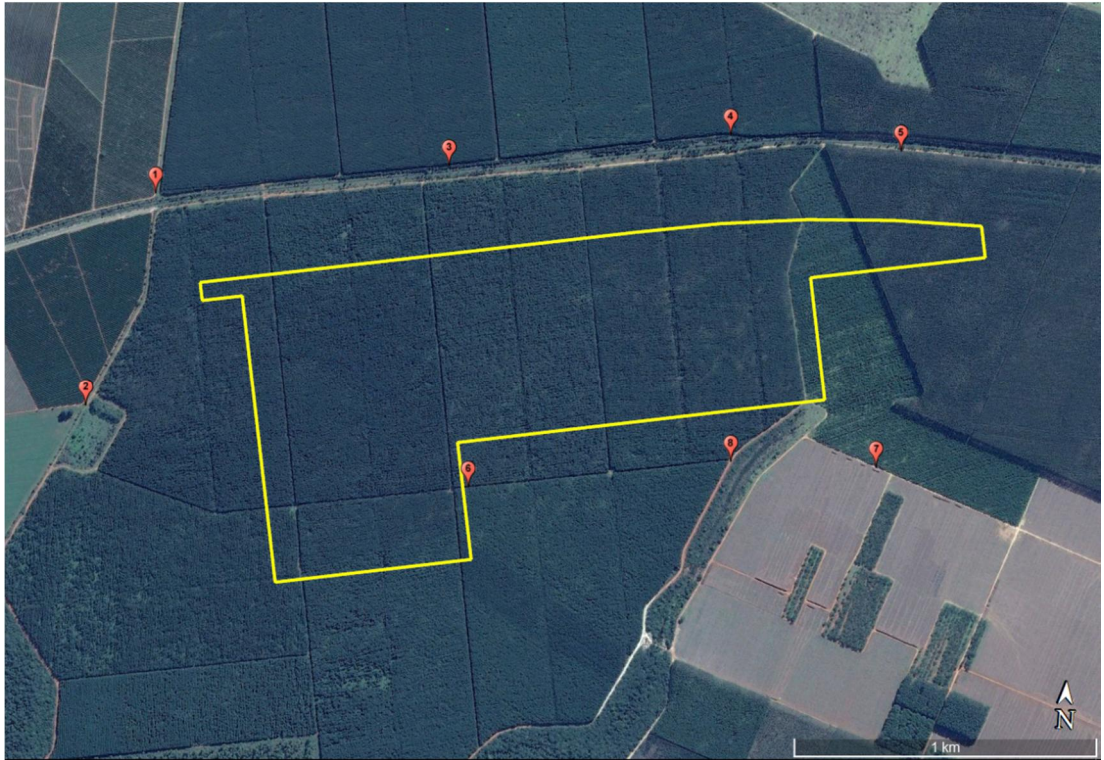


Figure 1 – Location map of the 8 measurement points of the ambient sound pressure level. Source: Adapted from Google Earth (2018).

Measurement Procedure

The measurement methodology will be based on the instructions of the Standard NBR 10.151 / 2000, which is regulated by CONAMA Resolution 01/1990.

The evaluation method involves measurements of the equivalent sound pressure level (LAeq) in "A" weighted decibels, commonly called dB (A), as recommended in item 1.3 of NBR 10.151 / 2000.

Measurements shall be made at points distant approximately 1.2 m from the floor and at least 2 m from the property boundary and from any other reflecting surface, such as walls, walls, etc.

The measurement time of the sound pressure level will be 2 minutes for each sampling point.

During the measurements will be used microphone wind shield.

The evaluation of the sound pressure level will be performed in the two periods recommended by NBR 10.151 / 2000, that is, daytime and night.

Measurements will not be made in the presence of audible interferences of phenomena of the nature (for example, thunder, heavy rains, etc.).

Measurement Parameters

In noise monitoring the equivalent sound pressure level (LAeq) shall be measured, in "A" weighted decibels [dB (A)]. If the equipment does not perform the automatic measurement of the LAeq, it must be calculated according to the procedure presented in Annex A of NBR 10.151 / 2000.

Reports and Certifications

The calibration and calibration equipment must have a calibration certificate of the Brazilian Calibration Network (RBC) or the National Institute of Metrology, Standardization and Industrial Quality (INMETRO).

2.3.5.2 Compliance with legal requirements

The main legal requirements applicable to this Subprogram are:

- Standard NBR 10.151 / 2000
- CONAMA Resolution No. 01/1990

2.3.5.3 Schedule

The schedule of planned activities during the plant's implementation phase is indicated below:

- | | |
|--|----------|
| - Campaign for noise monitoring: | Semester |
| - Audits and inspections by the EMS team of LD Celulose: | Semester |
| - PAC monitoring reports delivery to the environmental agency: | Semester |

2.3.5.4 Program Responsibility

LD Celulose.

2.3.6 Vegetation Suppression Subprogram

2.3.6.1 Methodology

Previously to the earthworks activities of the site area is expected to suppress existing vegetation, which in this case is composed of eucalyptus plantation of the company itself. In addition, in the areas of abstraction and discharge of effluents, highway and towers of the transmission line will also suppress vegetation.

Vegetation suppression activities should follow the following basic operating controls and criteria described below:

- Carry out the Forest Inventory of the interest area;
- Start only after obtaining the Suppression Authorization from the responsible environmental agency;
- Perform picketing to mark the area to be suppressed;
- Use team with experience in this activity;
- Adequately dispose of organic wastes and vegetation from the suppression activity;
- Store in an appropriate place, the top organic layer of the soil, for later reuse;

- Perform environmental compensation, as established in the Suppression Authorization;
- Implement the Wildlife Monitoring Program;
- Perform supervision and environmental monitoring of the work;
- Prohibit the use of fire for the suppression of vegetation.

2.3.6.2 Compliance with legal requirements

The main legal requirements applicable to this Subprogram are:

- Ordinance IEF/MG n° 02/2009
- Law 20.308/2012

2.3.6.3 Schedule

The schedule of planned activities during the plant's implementation phase is indicated below:

- | | |
|--|--------------------|
| - Campaign to monitor plant suppression | Construction phase |
| - Audits and inspections by the EMS team of LD Celulose: | Semester |
| - PAC delivery monitoring reports to the environmental agency: | Semester |

2.3.6.4 Program Responsibility

LD Celulose.

2.4 References

ABNT. NBR 10.004 / 2004 - Solid waste - Classification.

ABNT. NBR 11.174 / 1990 - Storage of waste classes II - not inert and III - inert - Procedure.

ABNT. NBR 12.235 / 1992 - Storage of hazardous solid waste - Procedure.

ABNT. Norma NBR 10.151 / 2000 - Evaluation of noise in inhabited areas, aiming at the comfort of the community - Procedure.

ABNT. Standard NBR 6.016 / 2015 - Diesel engine exhaust gas. Evaluation of soot content with the Ringelmann scale.

ABNT. Norma NBR 12,809 / 2013 - Waste of health services. Waste management of intra-health health services.

ABNT. Standard NBR 12.810 / 2016 - Waste collection of health services.

ANVISA. Resolution RDC No. 306/2004 - Provides for the Technical Regulation for the management of waste of health services.

BISTAFA, S. R. Acoustics applied to noise control. 2ª Ed. São Paulo: Blucher, 2011. 380 p.

BRASIL. Lei n° 12.305/2010 – Estabelece a Política Nacional de Resíduos Sólidos.

MMA. CONAMA Resolution 01/1990 - Provides criteria for noise emission standards arising from any industrial, commercial, social or recreational activities, including those for political propaganda.

MMA. CONAMA Resolution No. 275/2001 - Establishes the color code for the different types of waste, to be adopted in the identification of collectors and transporters, as well as information campaigns for selective collection.

MMA. CONAMA Resolution No. 430/2011 - Provides for conditions and standards for effluent releases, complements and amends Resolution 357.

MMA. CONAMA Resolution No. 307/2002 - Establishes guidelines, criteria and procedures for the management of construction waste.

MMA. CONAMA Resolution No. 358/2005 - Provides for the treatment and final disposal of waste from health services and provides other measures.

MMA. Ordinance MINTER n° 100/1980 - Provides for the emission of smoke by vehicles moved with diesel oil.

MINAS GERAIS. Joint Regulatory Deliberation COPAM / CERH-MG n ° 1/2008 - Provides for the classification of water bodies and environmental guidelines for their classification, as well as establishing the conditions and standards for effluent releases, and other measures.

MINAS GERAIS. Law 20,308 / 2012 - Declaration of permanent preservation, of common interest and immune of court, in the state of Minas Gerais.

MINAS GERAIS. Ordinance IEF / MG n ° 02/2009 - Creates the Authorizing Document for Environmental Intervention.

MS. Ordinance MS No. 2.914 / 2011 - Provides for the procedures of control and monitoring of the quality of water for human consumption and its standard of potability.

3 OPERATION ENVIROMENTAL MANAGEMENT SYSTEM PROGRAM

3.1 Justification

The Environmental Management System Program implementation at LD Celulose reinforces the company's commitment to the preservation of natural resources and the reduction of environmental impacts related to liquid effluents, solid wastes and atmospheric emissions.

The Environmental Management System Program is established in accordance with environmental objectives and targets. Through it is established the management of continuous improvement, preventive and corrective actions to guarantee environmental quality standards for compliance with the Environmental Policy of LD Celulose.

3.2 Objectives and Goals

The Environmental Management System Program objective is to provide the enterprise with efficient mechanisms that guarantee the execution and control of the actions planned in the basic environmental programs, and the proper conduct, with

respect to environmental procedures, maintaining a high standard of quality in the operating phase.

3.3 Methodology

3.3.1 Environmental Leadership and Policy

The Senior Management of LD Celulose must establish, implement and maintain an environmental policy that, within the scope defined in its environmental management system:

- is appropriate to the purpose and context of the organization, including the nature, scale and environmental impacts of its activities, products and services;
- provide a framework for setting environmental objectives;
- include a commitment to the protection of the environment, including pollution prevention and other specific commitment (s) relevant to the context of the organization;
- include a commitment to meet your legal requirements and other requirements;
- include a commitment to continuous improvement of the environmental management system to increase environmental performance.

The environmental policy shall be maintained as documented information communicated to the organization and shall be available to interested parties.

3.3.2 Identification and Evaluation of Environmental Aspects and Impacts

LD Celulose will determine the environmental aspects of its activities and products, which it can control and those it can influence, and their associated environmental impacts.

In determining environmental aspects, changes shall be taken into account, including planned or new developments, and new or modified activities, products and services; and abnormal conditions and reasonably foreseeable emergency situations.

In determining its environmental aspects, LD Celulose will consider:

- Atmospheric emissions;
- Liquid effluents emissions;
- Solid waste generation;
- Use of natural resources;
- Energy use;
- Noise generation;
- others.

3.3.3 Operational Control

LD Celulose will define the type of operational control method necessary to certify that the process is effective and achieve the desired result. Methods will include: designing processes to avoid errors and ensuring consistent results; use technology to

control processes and avoid adverse outcomes, use competent personnel to ensure desired results; execute processes in a specified way; monitor for results; and determine the use and amount of documented information required.

In determining the type and extent of operational control, LD Celulose will consider some factors, such as:

- Environmental aspects and impacts;
- Rich and opportunities associated with your product;
- Legal requirements and other company requirements.

3.3.4 Monitoring, measurement, analysis and evaluation

LD Celulose will monitor, measure, analyze and evaluate its environmental performance. To do so, you will determine:

- What needs to be monitored and measured;
- Monitoring, measurement, analysis and evaluation methods;
- Criteria for assessing environmental performance and indicators;
- When performing monitoring and measurement;
- When to analyze and evaluate monitoring results.

LD Cellulose shall ensure that the monitoring and measuring equipment is calibrated or verified, as appropriate.

3.3.5 Critical Analysis by Operation

Senior management should review the company's environmental management system periodically and critically, to ensure its continued suitability, sufficiency and effectiveness. The critical analysis will consider:

- Situations of actions from previous critical analyzes;
- Changes;
- Extent to which environmental objectives were achieved;
- Information on environmental performance;
- Sufficiency of resources;
- Communication with stakeholders, including complaints;
- Opportunities for improvement.

3.3.6 Noncompliance and Corrective Actions

In the event of non-compliance, LD Celulose will:

- React to non-compliance, as applicable:
 - o Take action to control and correct o
 - o Deal with the consequences, including mitigating adverse environmental impacts.

- Assess the need for action to eliminate the causes of non-compliance, so that it does not recur or occur elsewhere;
- Implement any necessary action;
- Critically analyze the effectiveness of any corrective action taken;
- Make changes to the environmental management system, when necessary.

Corrective actions should be appropriate to the significance of the effects of nonconformities encountered, including environmental impacts.

3.3.7 Preventive Action and Continuous Improvement

LD Celulose should continuously improve the adequacy, sufficiency, and effectiveness of the environmental management system to increase environmental performance.

The company should consider the results of the analysis and evaluation of environmental performance, evaluation of compliance with legal requirements and other requirements, internal audits and management review by taking action for improvement.

Examples of improvement include corrective action, continuous improvement, innovation and reorganization.

One of the main proposals of an environmental management system is to act as a prevention tool.

3.4 Compliance with legal requirements

LD Celulose will establish, implement and maintain the processes required to meet legal requirements and other requirements.

For this you will:

- Determine the frequency with which compliance with legal requirements and other requirements will be assessed;
- Evaluate compliance with legal requirements and other requirements and take action, if necessary;
- Maintain the knowledge and understanding of the service situation and its legal requirements.

3.5 Schedule

Permanent, starting in the phase of operation and lasting the entire useful life.

3.6 Program Responsibility

LD Celulose.

3.7 References

ABNT. Norma ABNT NBR ISO 14001: 2015 - Environmental Management Systems.

4 SOLID WASTE MANAGEMENT PROGRAM (PGRS)

4.1 Justification

In the operation of the dissolving pulp mill, solid waste will be generated consisting of administrative and maintenance waste (paper and cardboard, plastic, metal, nonrecyclable, lamp, lubricating oil, oil contaminated waste, etc.) and industrial waste from the production process (wood residues, ash, dregs and grits, sludge, etc.).

4.2 Objectives and Goals

The PGRS aims to establish the criteria for the management of solid waste generated in the operation of the enterprise, guiding the identification, handling, packaging, temporary storage, transportation and environmentally adequate disposal of solid waste.

The present Program aims to comply with the guidelines established by the National Solid Waste Policy (Law no. 12305/2010), as well as other applicable laws and regulations.

4.3 Methodology

4.3.1 Management System

Solid waste management is generated in accordance with best practices, based on Federal Law No. 12,305 / 2010, among which the following stand out:

- Minimization of waste generation through the use of the 3R's principle (Reduce, Reuse, Recycle);
- Segregation of solid waste, according to the color standard established by CONAMA Resolution No. 275/2001;
- Collection, packaging, storage and transport of solid waste, in accordance with current legislation;
- Environmentally appropriate final destination (reuse, recycling, composting, energy use, etc.) and / or environmentally adequate disposal of the solid waste generated in the project.

4.3.2 Solid Waste Characterization

In the dissolving pulp mill, during the operation phase, industrial and non-industrial solid waste will be generated.

Industrial Solid Waste

The industrial solid waste generated by the pulp production process will come from the areas of wood handling, causticizing, boiler and water and effluent treatment plants.

The following main residues are included in this category:

- Wastes from wood preparation;
- Biomass boiler ash;

- Dregs, grits and lime mud;
- Sludge from the water treatment plant; and,
- Primary and secondary sludge from the effluent treatment plant.

The volumes of industrial waste considered for the sizing are shown in the following Table.

Table 7 – Industrial solid wastes (values in m³ / year)

Solid waste	Source	Estimated Amount
Wood waste + sand	Wood yard	11,300
Dregs and Grits	Caustification	6,900
Lime mud	Lime kiln	4,700
Precipitator lime	Lime kiln	7,200
ash + sand	Biomass Boiler	14,700
Primary sludge	effluent treatment plant	24,300
Biological sludge	effluent treatment plant	36,000
Sludge	water treatment plant	4,500
TOTAL	-	102,400

Non-Industrial Solid Waste

Non-industrial solid waste corresponds to all materials discarded by the administrative and operational support activity that covers the activities of offices, cafeteria and maintenance places.

The following main residues are included in this category:

- Paper / Cardboard;
- Plastics;
- Metallic Scrap;
- Waste from maintenance;
- Restaurant waste;
- Waste from health services; and,
- Fluorescent lamps, batteries and batteries.

Non-industrial waste volumes are shown in the following Table.

Table 8 – Estimated volumes of non-industrial waste (values in t / year)

Solid waste	Estimated volume
Metallic Scrap	155

Solid waste	Estimated volume
Paper / cardboard	30
Plastic	25
Glass	5
Organic waste	290
Waste from health services	2
Contaminated waste	80
Waste from maintenance (oil)	35

4.3.3 Segregation and Mixing of Solid Residues

The mill must have a System of Selective Collection that aims to separate previously in the source the materials with similar characteristics.

In the case of administrative and operational collectors, the color standard follows CONAMA Resolution No. 275/2001, as presented in the Table below.

Table 9 – Color standard for selective collection of solid waste from administrative and operational collectors

Solid Waste	Color
Metal	Yellow
Paper / cardboard	Blue
Plastic	Red
Glass	Green
Hazardous waste	Orange
General non-recyclable waste	Silver
Health Service	white
Wood	Black
Organic	Brown

In the case of stationary buckets the color pattern is shown in the table below.

Table 10 – Color standard for selective collection of solid waste from stationary buckets

Solid Waste	Color
Ferrous and non-ferrous scrap, electric cables, wires, copper materials, metal parts and pipes, aluminum and iron cans not contaminated with oil, wire and rubber	Yellow

Solid Waste	Color
	Yellow
Paper / cardboard, plastic and glass	Blue
Hazardous waste and chemicals	Orange
General non-recyclable waste	Silver
Wood	Black
Organic / food	Brown

4.3.4 Conditioning and Treatment / Final Disposal

The packaging of solid waste will be carried out in suitable collectors in such a way as to eliminate risks to human health and the environment. The packaging will be in accordance with the Standards ABNT NBR 11,174 - Storage of IIA Classes - non inert and IIB - inert and ABNT NBR 12.235 - Storage of Hazardous Solid Waste, and CONAMA Resolution No. 358/2005, as well as ANVISA RDC No. 306 / 2004.

The following table shows the ways of packaging solid waste in the generating areas.

Table 11 – Ways of packaging solid waste in the generating areas

Solid waste	Description of Packaging
Wood waste + sand	Stationary Bucket
<i>Dregs/ grits</i>	Stationary Bucket
Lime mud	Stationary Bucket
Precipitator lime	Stationary Bucket
Ash + sand	Stationary Bucket
Primary sludge from effluent treatment	Stationary Bucket
Biological sludge from effluent treatment	Stationary Bucket
Sludge from water treatment	Stationary Bucket
Metal scrap	Collector and / or stationary bucket
Paper / cardboard	Collector and / or stationary bucket
Plastic	Collector and / or stationary bucket
Glass	Collector and / or stationary bucket
Organic	Drum and / or Collector
Non-recyclable	Stationary bucket and / or bucket with lid
Health Service	Specific collection box
Contaminated	Drum and / or stationary bucket
Lubricant	Drum

Solid wastes will be destined for treatment and / or final disposal, as described in the Table below.

Table 12 – Forms of treatment and / or disposal of solid waste in generating areas

Solid Waste	Treatment	Destination or Final Disposition
Wood waste + sand	Composting / incineration in the biomass boiler	Third-party forest / landfill application
<i>Dregs/ grits</i>	Corrective Soil Acidity	Third-party forest / landfill application
Lime mud	Corrective Soil Acidity	Third-party forest / landfill application
Precipitator lime	Corrective Soil Acidity	Third-party forest / landfill application
Ash + sand	Corrective Soil Acidity	Third-party forest / landfill application
Primary sludge from effluent treatment	Composting / incineration in the biomass boiler	Third-party forest / landfill application
Biological sludge from effluent treatment	Composting / incineration in the biomass boiler	Third-party forest / landfill application
Sludge from water treatment	Composting / incineration in the biomass boiler	Third-party forest / landfill application
Metal scrap	-	Recycling
Paper / cardboard	-	Recycling
Plastic	-	Recycling
Glass	-	Recycling
Organic	Composting	Third-party forest / landfill application
Non-recyclable	-	Landfill of third party or municipal duly licensed
Health Service	-	Incineration
Contaminated	-	Incineration / coprocessing
Lubricant	-	Rerrefino

Composting

Objectives of Composting

The composting process has the following main objectives:

- Properly recycle, through an efficient composting system, the waste generated and likely to be used;
- To systematize and homogenize the return of nutrients contained in the residues to the forest plantations, making fertilizations with the compound produced;
- Improve nutritional status and soil physical parameters by adding organic matter;
- Promote the partial substitution of fertilizers and chemical correctives used, with environmental and economic gains; and,
- Ensure adequate disposal of waste generated by industry to the current technical standards and environmental legislation.

Composting System

Residues generated in pulp production processes, such as bark and waste from the wood yard, primary and secondary sludge from the treatment of liquid effluents, as well as the ashes of the biomass boiler may be previously submitted to the composting process by accelerated fermentation.

This process, in which the microorganisms transform the initially found Carbon / Nitrogen ratio of 120/1 to below 26/1, will result in excellent quality material for agricultural purposes.

The process will start with the proper mixing of the residues in a row, where the microorganisms responsible for the fermentation will be inoculated.

These patios will be constructed with compacted clay forming an inclined plane towards the system of collecting percolates with slope, that allows the rapid drainage of rainwater, aiming to minimize the drag of solid material.

The composting lines shall be assembled from the material unloaded by the trucks in parallel lines until they occupy the entire length of the respective yard. After all the loads have been deposited, the material will be reassembled with the aid of a loader or hydraulic excavator, forming a trapezoidal shaped belt. These lines will be made alternately with spacing between them to allow the transit of trucks, the revolving with mechanical equipment.

The percolated liquids will be collected by a drainage network, will go to a leach tank and will then be sent to the effluent treatment at the mill.

In the final stage, nutrients will be added to complete the necessary balancing of the soil to which it is intended.

The product obtained has uniform granulometry, which will facilitate the application to the soil, proven agronomic characteristics and possibility of registration with the Ministry of Agriculture.

Soil Acidity Corrective Production

Inorganic waste from causticizing (dregs / grits, lime sludge, precipitator lime) and biomass boiler (ash) will be used to produce a soil acidity corrector.

Depending on its composition, lime sludge and ash may be used individually as a soil acidity corrector.

Lime mud and dregs with grits are basically carbonated alkaline by-products, which have a high concentration of nutrients such as calcium and magnesium and have high neutralization capacity.

The ash, in spite of the low neutralization capacity, presents concentration of macronutrients such as phosphorus, potassium, calcium and magnesium that enrich the corrective acidity of the soil. These nutrients are important for plant development.

The following figure shows the basic flowchart for soil acidity correction.

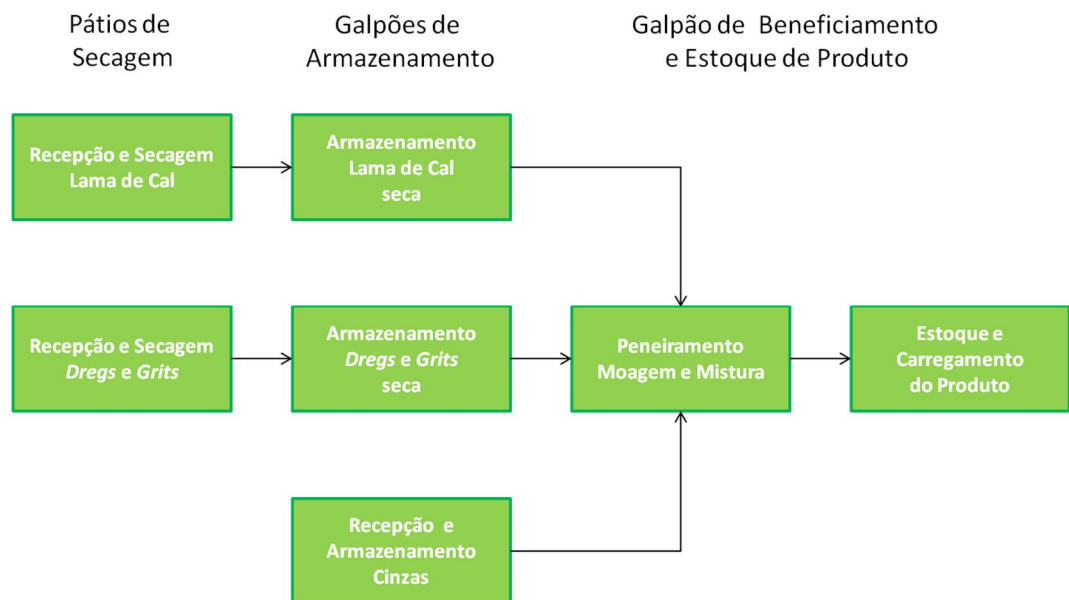


Figure 2 – Soil acidity correction basic flowchart.

4.3.5 Procedures

Waste Inspection

Stationary Buckets

The area responsible for the collection of the buckets will inspect through visual evaluation discarded. When any deviation is identified, it will be recorded and collection will not be performed until the waste is properly segregated.

Administrative Collectors

The area responsible for the collection of administrative collectors will inspect through visual evaluation discarded. When any deviation is identified, it will be suitable and registered for later disposal in the corresponding stationary buckets.

Inspection of Solid Waste Management Companies

The Environment area shall carry out an inspection of the equipment / vehicles of the transport companies and places of destination and disposal of solid waste in compliance with legal requirements.

Quantification of Solid Residues

The quantitative control of the exit and stock of the solid waste will be sent monthly to the Environment area through a worksheet called "Inventory of Solid Waste".

Transport of solid waste

For all cargo of hazardous and non-hazardous waste a Transport Manifesto and exit invoices will be generated. In the case of Hazardous Waste (Class I), all waste must be broken down in the invoice, in accordance with Federal Decree No. 96.044 / 1988 and ANTT Resolution No. 5,232 / 2016. Companies contracted for transportation services, disposal and / or external disposal of solid waste must contain a valid Operation License with the state environmental agency, the Manifesto for the Transport of Hazardous Wastes, as well as any specific legal requirements regarding the transportation, destination and / or provision (Sanitary Surveillance, INMETRO, etc.).

4.4 Compliance with legal requirements

The main legal requirements applicable to this Program are:

- Federal Law No. 12,305 / 2010
- CONAMA Resolution No. 275/2001
- Standard NBR 10.004 / 2004 - Standard NBR 11.174 / 1990
- Standard NBR 12.235 / 1992
- Federal Decree No. 96.044 / 1988
- ANTT Resolution No. 5232/2016
- Resolution RDC No. 306/2004
- Standard ABNT 12,809 / 2013
- Standard ABNT 12.810 / 2016

4.5 Schedule

The Schedule of the planned activities during the plant's operation phase is indicated below:

- | | |
|---|----------|
| – Quantification of Solid Residues | Monthly |
| – Audits and inspections by the EMS team of LD Celulose: | Semester |
| – Delivery of follow-up reports to the environmental agency | Annual |

4.6 Program Responsibility

LD Celulose.

4.7 References

ABNT. NBR 10.004 / 2004 - Solid waste - Classification.

ABNT. NBR 11.174 / 1990 - Storage of waste classes II - not inert and III - inert - Procedure.

ABNT. NBR 12.235 / 1992 - Storage of hazardous solid waste - Procedure.

ABNT. Norma NBR 12,809 / 2013 - Waste of health services. Management of residues of health services.

ABNT. Standard NBR 12.810 / 2016 - Waste collection of health services.

ANTT. Resolution No. 5,232 / 2016 - Approves the Supplementary Instructions to the Terrestrial Regulations for the Transport of Dangerous Goods, and takes other measures.

BRAZIL. Law No. 12,305 / 2010 - Establishes the National Policy on Solid Waste.

BRAZIL. Federal Decree 96.044 / 1988 - Approves the Regulations for Road Transport of Dangerous Goods and other measures.

MMA. CONAMA Resolution No. 275/2001 - Establishes the color code for the different types of waste, to be adopted in the identification of collectors and transporters, as well as information campaigns for selective collection.

MMA. Resolution RDC No. 306/2004 - Provides for the Technical Regulation for the management of waste of health services.

5 INDUSTRIAL LIQUID EFFLUENT MONITORING PROGRAM

5.1 Justification

In the operation of the dissolving pulp mill, industrial effluents will be treated at the Effluent Treatment Station (ETE), and after treatment, will be launched in the Araguari River.

5.2 Objectives and Goals

The objective of this program is to establish the criteria for the monitoring of the raw and treated effluent, with respect to monitoring sites, parameters analyzed, frequency, etc.

This Program is intended to comply with the guidelines established by CONAMA Resolution No. 430/2011 and COPAM Resolution No. 1/2008, as well as other norms and laws in force.

5.3 Methodology

5.3.1 Characterization of Industrial Effluents

Basically, the sources of liquid effluent generation that will correspond to the activities of the cellulose manufacturing process and other support activities are as follows:

- Effluents from the wood preparation area;
- Effluents from the cooking and washing area of brown pulp; Alcal Acid alkaline filtrates and bleaching filtrates;
- Effluent drying machine;
- Effluents from evaporation and recovery;
- Effluents from the causticizing area and lime kiln;
- Contaminated condensates;
- Sanitary sewers;
- Contaminated rainwater; and,
- Miscellaneous (spills, leaks, cleaning of areas, etc.).

5.3.2 Effluent Treatment Plant

LD Celulose effluent treatment system will be in two steps: solids removal and organic load removal. The main equipment of this treatment is described as follows.

The main effluent treatment process steps are:

- Railing;
- Primary clarifier;
- Emergency pond;
- Neutralization;
- Cooling;
- Activated sludge - aeration tank;
- Secondary clarifier; and,
- Emissary.

5.3.3 Sample location

Effluent quality monitoring will be carried out at the entrance (raw effluent) and at the outlet (treated effluent) of the plant's effluent treatment plant, prior to the launch on the Araguari river.

5.3.4 Sample Procedure

The samples will be collected and preserved according to Methodologies included in the Standard Methods for Examination of Water and Wastewater, 23rd Edition (APHA) and the National Guide for Collection and Preservation of Water, Sediment,

Water Communities and Liquid Effluents from ANA / CETESB (2011). After these procedures, the samples will be sent for analysis, respecting the holding-time of each parameter.

Depending on the type of analysis, the sampling will be simple (instantaneous collection) or composed for a period of 24 hours per auto sampler.

5.3.5 Parameters and Sampling Frequency

The parameters to be analyzed, in effluents, type of sampling and frequency of sampling are presented, in the following tables.

Table 13 –Frequency of sampling and parameters analyzed at the entrance of effluent treatment

Parameter	Frequency	Sampling type
Flow	Online	Simple
pH	Online	Simple
Conductivity	Online	Simple
Temperature	Online	Simple
Suspended solids	Daily	Simple
Color	Daily	Composed
DBO _{5,20}	2 X/week	Composed
DQO total	5 X/ week	Composed

Table 14 – Frequency of sampling and parameters analyzed at the exit of effluent treatment

Parameter	Frequency	Sampling type
Flow	Online	Simple
pH	Online	Simple
Temperature	Online	Simple
Suspended solids	Daily	Simple
Sedimented solids	Daily	Simple
Color	Daily	Composed
DBO _{5,20}	2 X/ week	Composed
DQO	5 X/ week	Composed

Parameter	Frequency	Sampling type
P total	Monthly	Composed
N total	Monthly	Composed

The other parameters included in CONAMA Resolution 430/2011 and COPAM / CERH-MG Normative Decree No. 1/2008 will be analyzed annually only at the exit of effluent treatment.

5.3.6 Reports and Certifications

The analyzes will be carried out by accredited laboratories, according to the requirements established in the norm NBR ISO / IEC 17.025 / 2005.

The reports with the results of the analyzes must be signed by the responsible professional.

5.4 Compliance with legal requirements

The main legal requirement applicable to this Program is:

- CONAMA Resolution No. 430/2011
- Normative Resolution COPAM / CERH-MG n ° 1/2008

5.5 Schedule

The Schedule of the planned activities during the plant's operation phase is indicated below:

- Effluent monitoring According to table 13 and 14
- Audits and inspections by the EMS team of LD Celulose: Semester
- Delivery of follow-up reports to the environmental agency: Semester

5.6 Program Responsibility

LD Celulose.

5.7 References

ABNT. Standard NBR ISO / IEC 17.025 / 2017 - General requirements for the competence of testing and calibration laboratories.

MMA. CONAMA Resolution No. 430/2011 - Provides for conditions and standards for effluent releases, complements and amends Resolution 357.

MINAS GERAIS. Joint Regulatory Deliberation COPAM / CERH-MG n ° 1/2008 - Provides for the classification of water bodies and environmental guidelines for their classification, as well as establishing the conditions and standards for effluent releases, and other measures.

Standard Methods for Examination of Water and Wastewater. American Public Health Association. 22nd edition.

National Guide for Collection and Preservation of Samples: Water, Sediment, Water Communities and Liquid Effluents / Environmental Company of the State of São Paulo; Organizers: Carlos Jesus Brandão et al. São Paulo: CETESB; Brasília: ANA, 2011. 326 p., 2011.

6 SURFACE WATER QUALITY MONITORING PROGRAM

6.1 Justification

In the operation of the dissolving pulp mill, there will be capture of raw water and the discharge of treated effluents in the river Araguari.

The program is necessary in order to verify the quality of the surface water to supply the pulp mill as well as to identify any changes that can be attributed to the launch of treated liquid effluents from LD Celulose.

6.2 Objectives and Goals

The objective of this program is to establish the criteria for the monitoring of surface water quality, with regard to the location of the monitoring points, collection procedure, preservation and analysis of samples, definition of analysis parameters, frequency of monitoring, reports and certifications.

In addition, it aims to verify the conditions of classification of the Araguari river in the intake and discharge region of liquid effluents, according to the standards established for Class 2 river of CONAMA Resolution No. 357/2005 and COPAM Resolution 1/2008.

6.3 Methodology

6.3.1 Monitoring Points Location

The monitoring of surface water quality will be carried out in 2 (two) points on the Araguari river. The points were selected based on the location of water abstraction and effluent releases and where samples were already collected for the present Environmental Impact Study (EIA) (before the implementation of the project), which will be used as a reference for the quality conditions of the bodies of water.

The samples collected at the upstream points should serve as an indication of the water quality of the site without interference from the plant being implanted. While the samples collected at the downstream points are subject to identify any impact from treated effluents.

The coordinates of these points are shown in the following table and the location in the following figure.

Table 15 – Coordinates of surface water quality monitoring points

Points	Coordinates	
	Latitude	Longitude
P01	18°50'17.83"S	48° 6'12.98"O
P02	18°49'43.91"S	48° 5'38.75"O


Figure 3 – Location of surface water quality monitoring points. Source: Adapted from Google Earth (2018).

6.3.2 Collection, Preservation and Analysis Procedure

Samples will be collected and preserved according to the methodology included in the Standard Methods for Examination of Water and Wastewater, 23rd Edition "(APHA, 2017), in an appropriate bottle for each parameter, and preserved initially at low temperature. After these procedures, the samples will be sent for analysis, respecting the time limit of preservation of the parameters.

6.3.3 Analysis Parameters

Samples should be sent to a laboratory for analysis of all the parameters of CONAMA Resolution 357/05 and COPAM / MG Normative Resolution No. 01/08. The results should be compared with the respective legislations considering the classification of the river, Class 2.

6.3.4 Sampling Frequency

The monitoring of surface water quality will be carried out on a quarterly basis.

6.3.5 Reports and Certifications

The analyzes will be performed by accredited laboratories, according to the requirements established in the norm NBR ISO / IEC 17.025 / 2017.

The reports with the results of the analyzes must be signed by the responsible professional.

6.4 Compliance with legal requirements

The main legal requirement applicable to this Program is:

- CONAMA Resolution No. 357/2005
- Normative Resolution COPAM / MG n ° 01/2008

6.5 Schedule

The Schedule of the planned activities during the plant's operation phase is indicated below:

- | | |
|--|-----------|
| – Collection and analysis of surface water samples: | Quarterly |
| – Audits and inspections by the EMS team of LD Celulose: | Semester |
| – Delivery of follow-up reports to the environmental agency: | Annual |

6.6 Program Responsibility

LD Celulose.

6.7 References

ABNT. Standard NBR ISO / IEC 17.025 / 2017 - General requirements for the competence of testing and calibration laboratories.

MMA. CONAMA Resolution No. 357/2005 - Provides for the classification of water bodies and environmental guidelines for their classification, as well as establishing the conditions and standards for effluent releases.

MINAS GERAIS. Joint Regulatory Deliberation COPAM / CERH-MG n ° 1/2008 - Provides for the classification of water bodies and environmental guidelines for their classification, as well as establishing the conditions and standards for effluent releases, and other measures.

Standard Methods for Examination of Water and Wastewater. American Public Health Association. 22nd edition.

National Guide for Collection and Preservation of Samples: Water, Sediment, Water Communities and Liquid Effluents / Environmental Company of the State of São Paulo; Organizers: Carlos Jesus Brandão et al. São Paulo: CETESB; Brasília: ANA, 2011. 326 p., 2011.

7 GROUNDWATER QUALITY MONITORING PROGRAM

7.1 Justification

This program is necessary so that it is possible to identify any changes in the quality of these waters arising from accidental spills or spills from the operation of the LD Celulose mill. These spills may be associated with the process, storage and handling of raw materials, products used, and liquid effluents and waste generated.

It should be noted that there is a whole product protection and recovery system in the event of accidental spills / spills inside the LD Celulose plant.

7.2 Objectives and Goals

The main objective is to verify and monitor the quality of groundwater for possible contamination by accidental spills / spills of effluents and chemical substances, even with any soil and groundwater protection system to be implemented by the LD Celulose plant.

The objective of this program is to establish the criteria for groundwater quality monitoring, in relation to the location of the monitoring points, collection procedure, preservation and analysis of samples, definition of parameters of analysis, frequency of monitoring, reports and certifications.

7.3 Methodology

7.3.1 Monitoring Points Location

Groundwater quality monitoring shall be carried out at 6 (six) points within the area of the enterprise, three (3) upstream and three (3) downstream of the groundwater flow direction.

The points were selected according to the layout of the plant and where a large part of the samples of the present Environmental Impact Study (EIA) were already collected (before the implementation of the project), which will be used as reference of the quality conditions.

The samples collected at the upstream points should serve as an indication of the water quality of the site without interference from the plant being implanted. While the samples collected at the downstream points are subject to intercept any contamination from the area of the enterprise.

The coordinates of these points are shown in the following table and the location in Figure below.

Table 16 – Coordinates of groundwater quality monitoring points

Points	Coordinates	
	Latitude	Longitude
P01	18°49'53.85"S	47°54'44.72"O
P02	18°50'0.17"S	47°55'19.22"O
P03	18°50'32.73"S	47°55'13.71"O

P04	18°50'13.12"S	47°54'41.04"O
P05	18°50'9.49"S	47°54'21.22"O
P06	18°49'50.48"S	47°54'21.24"O



Figure 4 – Location of groundwater quality monitoring points. Source: Adapted from Google Earth (2018).

7.3.2 Collection, Preservation and Analysis Procedure

The collection of groundwater samples will be carried out through the low flow method, according to ABNT - NBR 15847/2010 "Groundwater sampling in monitoring wells: purge methods".

Monitoring of water quality indicators (pH, electrical conductivity, temperature, redox potential and dissolved oxygen) will be performed directly in the field.

Aliquots of the water samples for analysis of dissolved metals will be field filtered through the use of 0.45 µm (pore size) filters.

All groundwater samples will be properly identified and kept refrigerated in thermal boxes until arrival at the laboratory, where they will be analyzed to determine the concentrations of the parameters of interest.

The samples will be analyzed in laboratories certified by NBR-ISO / IEC 17025: 2005 and the analytical procedures will follow the standards described by ABNT or "Standard Methods for the Examination for Water and Wastewater".

7.3.3 Analysis Parameters

Samples should be sent to a laboratory for analysis of all parameters listed in the list of groundwater research values - Annex II of CONAMA Resolution 420/2009 and COPAM Normative Resolution No. 166/2011.

Besides these parameters, physical chemical parameters will also be analyzed: pH, electrical conductivity, temperature, redox potential and dissolved oxygen, directly in the field.

7.3.4 Sampling Frequency

The monitoring of groundwater quality will be carried out every six months.

7.3.5 Reports and Certifications

The analyzes will be performed by accredited laboratories, according to the requirements established in the norm NBR ISO / IEC 17.025 / 2017.

The reports with the results of the analyzes must be signed by the responsible professional.

7.4 Compliance with legal requirements

The main legal requirement applicable to this Program is:

- Resolution CONAMA 420/2009
- Normative Resolution COPAM No. 166/2011.

7.5 Schedule

The Schedule of the planned activities during the plant's operation phase is indicated below:

- | | |
|--|----------|
| – Audits and inspections by the EMS team of LD Celulose: | Semester |
| – Collection and analysis of groundwater samples: | Semester |
| – Delivery of follow-up reports to the environmental agency: | Annual |

7.6 Program Responsibility

LD Celulose.

7.7 References

ABNT. Standard NBR ISO / IEC 17.025 / 2017 - General requirements for the competence of testing and calibration laboratories.

MMA. CONAMA Resolution 420/2009 - Provides criteria and guiding values of soil quality for the presence of chemical substances and establishes guidelines for the environmental management of areas contaminated by these substances as a result of anthropic activities.

MINAS GERAIS. Joint Legislative Resolution COPAM / CERH-MG No. 166/2011 - Alters Annex I of the Joint Normative Resolution COPAM CERH No. 2 of September 6, 2010, establishing the Soil Quality Reference Values.

Standard Methods for Examination of Water and Wastewater. American Public Health Association. 23rd edition.

8 ATMOSPHERIC EMISSION MONITORING PROGRAM

8.1 Justification

In the operation of the dissolving pulp mill there will be atmospheric emissions from the recovery boiler, lime kiln and biomass boiler, which generate atmospheric pollutants: MP (Particulate Material); TRS (reduced sulfur compounds); SO_x (Sulfur Oxides); NO_x (Nitrous Oxides) and CO (Carbon Monoxide).

The program is necessary so that it is possible to verify the effectiveness of the pollution control equipment with regard to the minimization of emission of pollutants and compliance with the legal standards of atmospheric emission.

8.2 Objectives and Goals

The main objective of the proposed Atmospheric Emission Monitoring Program is to ensure that the operation of the air emission sources and their respective pollution control equipment comply with the emission limits established by CONAMA Resolution 382/2006, as well as the Deliberation COPAM Regulation 187/2013.

This program also aims to establish the criteria for the monitoring of the atmospheric emissions generated in the operation of the enterprise, with respect to the analyzed variables, frequency, etc.

8.3 Methodology

8.3.1 Sources

The main sources of atmospheric emissions from the plant will be generated from the following equipment:

- Recovery Boiler;
- Lime Kiln; e,
- Biomass Boiler.

8.3.2 Measurement Location

The emissions from the Recovery Boiler, Lime Kilns and Biomass Boiler will be conducted by individual and independent pipelines until the emission to atmosphere. These independent ducts will be wrapped in a single concrete body, that is, a chimney of adequate height for atmospheric dispersion.

Therefore, the sampling points of atmospheric emissions will be in the chimney in each of the respective ducts.

8.3.3 Measurement Procedures and Parameters

Online Monitoring

The gas monitoring system has real-time control in order to quickly identify and correct operational disturbances.

As part of the monitoring, an automatic management and control system will be installed, based on the use of microprocessor-coupled integration. Its function will be

to maintain the operational conditions of the electrostatic precipitators in the ideal ranges of operation.

The following Table shows the sources and parameters that will be monitored online.

Table 17 –Parameters monitored by generating source.

Source	Online monitoring parameters
Recovery Boiler	Particulate matter, TRS, NO _x , SO _x , CO e O ₂
Lime Kiln	Particulate matter, TRS, NO _x , SO _x e O ₂
Biomass Boiler	Particulate matter, NO _x , SO _x e O ₂

In order to monitor the thermal oxidation efficiency of the GNCC and GNCD gases, the project contemplates the installation of TRS analyzers that will continuously sample the combustion gases of each of the equipment responsible for thermal oxidation (recovery boiler, biomass boiler and flare).

Periodic Monitoring (offline)

In addition to online measurements, periodic (offline) evaluations of all sources of atmospheric emissions through outsourced companies will be conducted on a semiannual basis.

These periodic evaluations shall be carried out by means of determination of the concentration and quantity of pollutants emitted. This procedure is carried out by determinations of the concentration and quantity of the pollutants emitted.

These measurements are fundamental for the calculation of the efficiency of control equipment, design parameters, information for atmospheric dispersion study, mass balances and verification of compliance with emission standards.

Sampling will be performed by determining the gas emissions in the chimney (MP, TRS, SO_x, NO_x, CO and O₂), as well as the measurement of flow rate, humidity and temperature.

The analysis reports shall be duly signed by the responsible technician, indicating the Methodologies and their limits of detection and name of the company responsible for sampling and analysis.

Table 18 – Frequency of monitoring atmospheric emissions.

Sources	Parameters	Frequency
Recovery Boiler, Lime Kiln and Biomass Boiler	MP (Particulate Matter) TRS (reduced sulfur compounds) SO _x (sulfur oxides) NO _x (nitrogen oxides) CO (carbon monoxide) Pressure Speed and volumetric flow	Semester

Sources	Parameters	Frequency
	Oxygen Gas temperature Humidity	

For the comparison of the results from the recovery boiler and lime kiln, ANNEX VII of CONAMA Resolution No. 382/2006 and ANNEX IV of DN COPAM No. 187/2013, which define the emission limits of atmospheric pollutants from processes of pulp manufacturing.

And, for comparison of the results from the biomass boiler, reference will be made to ANNEX IV of CONAMA Resolution No. 382/2006 and ANNEX ID of COPAM N ° 187/2013, which establish emission limits for heat generation processes from the external combustion of wood derivatives.

8.4 Compliance with legal requirements

The main legal requirement applicable to this Program is:

- CONAMA Resolution No. 382/2006
- Normative Resolution COPAM n° 187/2013

8.5 Schedule

The Schedule of the planned activities during the plant's operation phase is indicated below:

- | | |
|--|----------------------|
| – Collection and analysis of samples: | Online e
Semester |
| – Audits and inspections by the EMS team of LD Celulose: | Semester |
| – Delivery of follow-up reports to the environmental agency: | Semester |

8.6 Program Responsibility

LD Celulose.

8.7 References

ABNT. Standard NBR 12.019 / 1990 - Gaseous effluents in pipelines and stationary stacks - Determination of particulate matter.

ABNT. Standard NBR 12.827 / 1993 - Gaseous effluents with the filter system inside the duct or chimney of stationary sources - Determination of particulate material - Test method.

ABNT. Technical Standard CETESB L9.229 / 1992 - Pipes and chimneys of stationary sources - determination of nitrogen oxides: test method.

ABNT. Standard NBR 11,505 / 1989 - Determination of nitrogen dioxide content.

ABNT. Standard NBR 12.021 / 1990 - Gaseous effluents in pipelines and stationary stacks - Determination of sulfur dioxide, sulfur trioxide and sulfuric acid mists (CETESB L9.228);

ABNT. Technical Standard CETESB L9.228 / 1992 - Ducts and chimneys of stationary sources - determination of sulfur dioxide and sulfuric acid and sulfur trioxide fumes: test method.

ABNT. Standard NBR 10,702 / 1989 - Prescribes method of determining the dry base molecular mass and the excess air of the gaseous stream in ducts and chimneys of sources.

ABNT. Technical Standard CETESB L9.227 / 1993 - Pipes and stationary source chimneys: total reduced sulfur (ERT) determination - test method.

CETESB. Technical Standard L9.210 / 1990 - Analysis of combustion gases through the Orsat apparatus - Test method.

MMA. CONAMA Resolution No. 382/2006 - Establishes the emission limits of atmospheric pollutants for fixed sources.

MINAS GERAIS. COPAM Resolution 187/2013 - Establishes maximum emission limits and conditions for atmospheric pollutants for fixed sources and makes other provisions.

USEPA. Method n ° 5 and 17 - Determination of particulate emissions from stationary sources.

USEPA. Method 7E - Determination of emissions of nitrogen oxides from stationary sources.

USEPA. Method 8 - Determination of sulfuric acid and sulfur dioxide emissions from stationary sources.

USEPA- CTM Method 30 - Determination of Nitrogen Oxides, Carbon Monoxide and Oxygen Emissions from Natural Gas Engines, Boilers and Process Heaters Using Portable Analyzers.

USEPA- Method # 15 - Determination of emissions of hydrogen sulphide, carbonyl sulphide and disulfide from stationary sources.

9 AIR QUALITY MONITORING PROGRAM

9.1 Justification

During the operation there will be atmospheric emissions from the industrial process of the LD Celulose plant. In this way, the air quality standards in the region should be monitored in order to verify compliance with the limits established by CONAMA Resolution 003/1990.

It is important to note that the sources of atmospheric emissions from the plant rely on control equipment to minimize the impact on air quality, in addition to meeting the emission limits established in CONAMA Resolution No. 382/2006 and COPAM Normative Resolution No. 187 / 2013.

9.2 Objectives and Goals

The main objective of this program is to monitor the air quality of the region, in compliance with the limits established by the legislation, so as to accompany and ensure that there is no inconvenience to the surrounding population.

This program also aims to establish the criteria for the monitoring of air quality, regarding the location of the monitoring point, definition of parameters of analysis, frequency of monitoring, reports and certifications.

9.3 Methodology

9.3.1 Monitoring Points Location

One (1) point was defined for air quality monitoring near the project, which is the same point used in the EIA / RIMA campaign (coordinates 18 ° 53'58.36 "S and 47 ° 53'20.21" W), as presented in the Figure below.



Figure 5 – Location of air quality monitoring points (P01). Source: Adapted from Google Earth (2017)

9.3.2 Analysis Parameters

The parameters measured in the air quality monitoring are:

- Air quality:
 - Total Suspended Particles (PTS);
 - Inhalable particles (PM10);
 - Nitrogen Oxides (NO_x);
 - Sulfur Dioxide (SO₂);

- Reduced Sulfur Compounds (TRS);
- Hydrogen Sulfide (H₂S);
- Carbon monoxide (CO);
- Ozone (O₃).

9.3.3 Sampling Procedure

The methods used to measure each parameter are presented below.

Total Suspended Particles (PTS)

The determination of the Total Suspended Particle (PTS) concentration will be performed according to the NBR Standard 9547.

For collection, a large volume air sampler (HighVol), properly installed at a measurement site, will be used to draw a certain amount of ambient air through a filter inside a covered shelter during a sampling period of 7 (seven) consecutive days, during 24 h / day. The filter will be weighed (after moisture balance) before and after collection in order to determine the net gain in mass. The volume of air sampled, corrected for standard conditions, will be determined from the measured flow rate and sampling time.

The dry mass will be determined in analytical balance by weighing the filter, which will be performed by laboratories accredited according to the ISO / IEC 17025/2005 standard.

Inhalable particles (MP₁₀)

The determination of the concentration of Inhalable Particles (MP10) will be performed according to the NBR 13412 standard, which defines the Methodology for determination of the mass concentration inhalable particulate material suspended in the atmosphere with aerodynamic diameter less than or equal to 10 µm (MP10).

For collection, a large volume air sampler (HighVol) coupled to an inertial particle separator will be used. The sampling period will be 7 (seven) consecutive days, for 24 hours / day. The filter will be weighed (after moisture balance) before and after collection in order to determine the net gain in mass. The volume of air sampled, corrected for standard conditions, will be determined from the measured flow rate and sampling time.

The dry mass will be determined in analytical balance by weighing the filter, which will be performed by laboratories accredited according to the ISO / IEC 17025/2005 standard.

Ozone (O₃)

The determination of the concentration of the ozone parameter (O₃) will be performed considering a sample period of 7 (seven) consecutive days, during 24 hours / day, and for its analysis, equipment based on the ultra violet radiation absorption technique (UV) and are in accordance with US EPA 901-O₃, or US EPA-EQOA-0206-148.

Sulfur Dioxide (SO₂)

The determination of the sulfur dioxide (SO₂) concentration shall be carried out according to Standard NBR 12979, which prescribes the method for the determination of sulfur dioxide present in the atmosphere by the hydrogen peroxide method, with indicator.

The sulfur dioxide present in the atmosphere will be collected a sampling period of 7 (seven) consecutive days, for 24 h / day, being aspirated by a sampler of small volumes and absorbed by bubbling by the solution of hydrogen peroxide, and will be quantified in laboratory. Preservation of SO₂ samples requires refrigeration.

The analysis of sulfur dioxide may use the ultraviolet (UV) fluorescent method and will be performed by accredited laboratories according to the ISO / IEC 17025/2005 standard.

Nitrogen dioxide (NO₂)

The determination of nitrogen dioxide (NO₂) concentration will be performed considering a sampling period of 7 (seven) consecutive days, during 24 h / day, being aspirated by a sampler of small volumes and absorbed by bubbling by the arsenite solution of sodium.

Nitrogen dioxide analysis may use equipment based on the chemiluminescence method and in accordance with EPA Standard EQN-1277-026, or US EPA-RFNA-0202-146.

Reduced sulfur compounds (TRS)

The concentration determination of the TRS parameter will be performed considering a sampling period of 7 (seven) consecutive days, during 3 h / day, being aspirated by a small volume sampler, passing through a citrate buffer solution in the first bubbler, then to an oven at 800 ° C (oxidizing the TRS in SO₂) and then to a second bubbler containing hydrogen peroxide solution.

The analysis of the TRS will be performed by accredited laboratories according to the Standard ABNT NBR ISO / IEC 17025/2005.

Hydrogen Sulfide (H₂S)

The concentration determination of the Hydrogen Sulphide (H₂S) parameter will be performed considering a sampling period of 7 (seven) consecutive days, during 1 h / day, and for its analysis, accredited laboratories will be used according to the ABNT NBR ISO Standard / IEC 17025/2005.

Carbon Monoxide (CO)

The concentration determination of the parameter Carbon Monoxide (CO) will be performed considering a sampling period of 7 (seven) consecutive days, during 1 h / day, and for its analysis, will be used laboratories accredited according to the Norm ABNT NBR ISO / IEC 17025/2005.

Summary of Methodology to be Employed

The parameters, equipment, methodologies, collections and duration of the monitoring campaign are summarized.

Table 19 – Parameters, equipment, methodologies, collections and duration of the air quality monitoring campaign

Parameter	Initials	Equipment	Methodology	Collect	Duration
Total Suspended Particles	PTS	AGV ¹	NBR 9547	24 h/day	07 consecutive days
Inhalable particles	MP10	AGV ¹ MP10	NBR 13.412		
Ozone	O ₃	2B Technologies	US EPA 901-O3 Model 202		
Sulfur Dioxide	SO ₂	APV ² Trigás	NBR 12.979		
Nitrogen dioxide	NO ₂		EPA EQN-1277-026		
Reduced sulfur compounds	TRS		EPA 15A / 16A		
Hydrogen Sulfide	H ₂ S	GfG460	ISO 17025		
Carbon Monoxide	CO				

1 - AGV – Large Volume Sampler; 2- APV – Small Volume Sampler

9.3.4 Sampling Frequency

Air quality monitoring will be conducted annually.

9.4 Compliance with legal requirements

The main legal requirement applicable to this Program is:

- CONAMA Resolution No. 03/1990

9.5 Schedule

The Schedule of the planned activities during the plant's operation phase is indicated below:

- Collection and analysis of air quality sample: Annual
- Audits and inspections by the EMS team of LD Celulose: Semester
- Delivery of follow-up reports to the environmental agency: Annual

9.6 Program Responsibility

LD Celulose.

9.7 References

Standard NBR ISO / IEC 17.025 / 2017 - General requirements for the competence of testing and calibration laboratories.

ABNT. Technical Standard NBR 9547/1997 - Particulate matter suspended in ambient air - Determination of the total concentration by the large volume sampler method.

ABNT. Technical Standard NBR 13412/1995 - Suspended particulate matter in the atmosphere - Determination of the concentration of inhalable particles by the high volume sampler method coupled to an inertial particulate separator - Test method.

ABNT. Technical Standard NBR 12979/1993 - Determination of the sulfur concentration by the hydrogen peroxide method - Test method.

MMA. CONAMA Resolution No. 03/1990 - Provides for air quality standards.

MINAS GERAIS. COPAM Resolution 187/2013 - Establishes maximum emission limits and conditions for atmospheric pollutants for fixed sources and makes other provisions.

USEPA. Method EQOA-0206-148 - Ozone analyzer. Automated equivalent method.

USEPA. Method RFNA-0202-146 - Chemiluminescence nitrogen oxide analyzer.

10 NOISE MONITORING PROGRAM

10.1 Justification

During the operation of the dissolving pulp mill there will be noise generation from the various industrial production equipment, such as the area of receiving logs, wood choppers and pulp preparation.

10.2 Objectives and Goals

The main objective of the Noise Monitoring Program is to verify the sound emission levels of the plant's operation at the main receiver points, in compliance with the levels established by CONAMA Resolution 01/1990 and Standard NBR 10.151 / 2000, as well as other standards and legislation in force.

This program also aims to establish the criteria for monitoring the environmental noise generated in the operation of the enterprise, with respect to monitoring sites, frequency, etc.

10.3 Methodology

10.3.1 Measurement Location

The noise monitoring will be carried out in 8 different points, around the area of influence of the LD cellulose.

EIA monitoring points will preferably be maintained to be used as a reference for noise conditions prior to the factory operation, but may be subject to minor variations due to compliance with standards after the implementation of the project.

Table 20 – Description of the ambient sound pressure level measurement sites

Point	Local	Coordinates	
		Latitude	Longitude
P01	Near the fence of the eucalyptus farm	18°49'55,87"S	47°55'32,29"O
P02	Near the fence of the eucalyptus farm	18°50'18,98"S	47°55'38,49"O

Point	Local	Coordinates	
		Latitude	Longitude
P03	Near the railway line	18°49'50,84"S	47°54'59,59"O
P04	Near the railway line	18°49'45,52"S	47°54'28,22"O
P05	Near the railway line	18°49'45.99"S	47°54'8.98"O
P06	In the middle of the eucalyptus plantation	18°50'24.89"S	47°54'54.95"O
P07	the middle of the eucalyptus plantation	18°50'19.79"S	47°54'9.36"O
P08	Close to native vegetation	18°50'20.23"S	47°54'25.69"O

The following figure shows the map with the location of the 8 measuring points

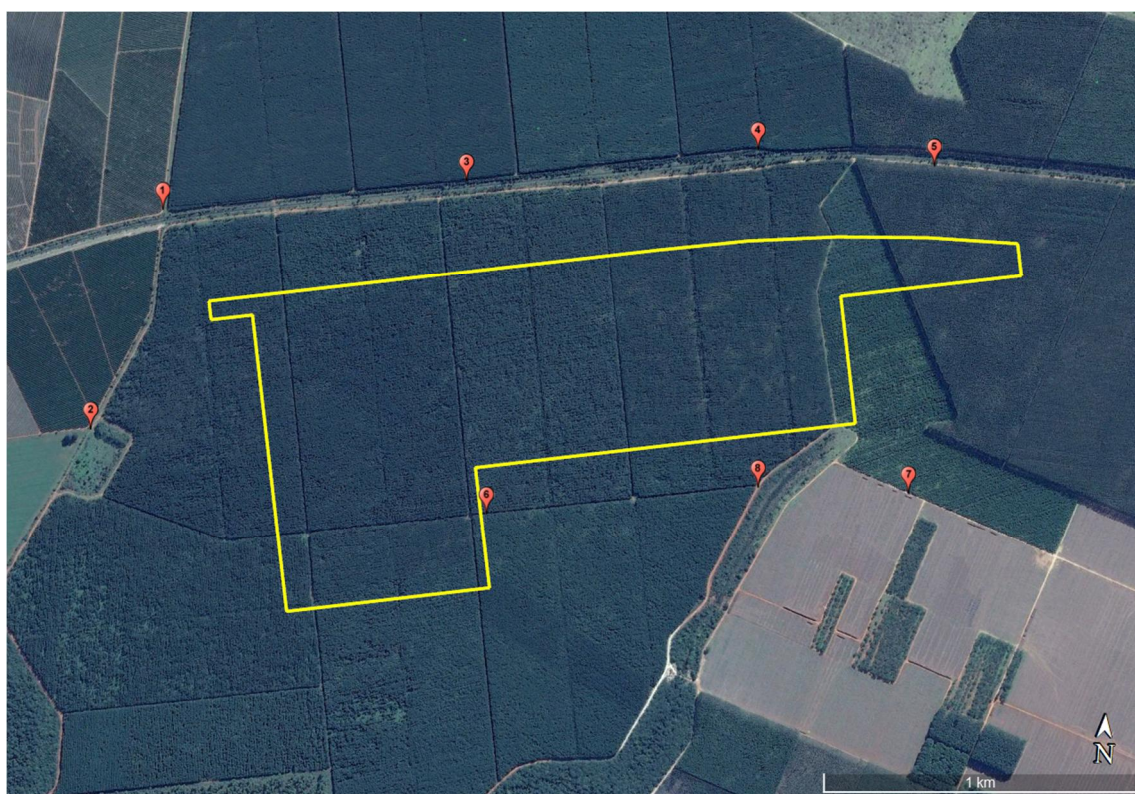


Figure 6 –Location of the 8 noise pressure level measuring points map. Source: Adapted de *Google Earth* (2018).

10.3.2 Measurement Procedure

The measurement methodology will be based on the instructions of Standard NBR 10.151 / 2000, a standard that is regulated by CONAMA Resolution 01/1990.

The evaluation method involves measurements of the equivalent sound pressure level (LAeq) in "A" weighted decibels, commonly called dB (A), as recommended in item 1.3 of NBR 10.151 / 2000.

Measurements shall be made at points distant approximately 1.2 m from the floor and at least 2 m from the property boundary and from any other reflecting surface, such as walls, walls, etc.

The measurement time of the sound pressure level will be 2 minutes for each sampling point.

During the measurements will be used microphone wind shield.

The evaluation of the sound pressure level will be performed in the two periods recommended by NBR 10.151 / 2000, that is, daytime and night.

Measurements will not be made in the presence of audible interferences of phenomena of the nature (for example, thunder, heavy rains, etc.).

10.3.3 Analysis Parameters

In noise monitoring the equivalent sound pressure level (LAeq) shall be measured, in "A" weighted decibels [dB (A)]. If the equipment does not perform the automatic measurement of the LAeq, it must be calculated according to the procedure presented in Annex A of NBR 10.151 / 2000.

10.3.4 Reports and Certifications

The calibration and calibration equipment must have a calibration certificate of the Brazilian Calibration Network (RBC) or the National Institute of Metrology, Standardization and Industrial Quality (INMETRO).

10.4 Compliance with legal requirements

The main legal requirement applicable to this Program is:

- Standard NBR 10.151 / 2000
- CONAMA Resolution No. 01/1990

10.5 Schedule

The Schedule of the planned activities during the plant's operation phase is indicated below:

- | | |
|--|----------|
| – Audits and inspections by the EMS team of LD Celulose: | Semester |
| – Campaign for noise monitoring: | Annual |
| – Delivery of follow-up reports to the environmental agency: | Annual |

10.6 Program Responsibility

LD Celulose.

10.7 References

ABNT. Norma NBR 10.151 - Evaluation of noise in inhabited areas, aiming at the comfort of the community - Procedure.

BISTAFA, S. R. Acoustics applied to noise control. 2^a Ed. São Paulo: Blucher, 2011. 380 p.

MMA. CONAMA Resolution 01/1990 - Provides criteria for noise emission standards arising from any industrial, commercial, social or recreational activities, including those for political marketing.

11 FLORA MONITORING PROGRAM

11.1 Justification

The monitoring of the flora will follow guidelines that will allow the diagnosis of the changes occurring in the ecosystems, followed by systematic and consecutive follow-ups capable of pointing out the possible impacts on the local flora that may result from the installation and / or operation of the enterprise.

11.2 Objectives and Goals

The main objectives of the program are:

- Identify and monitor possible changes in vegetation;
- Monitor the evolution of qualitative and quantitative indicators of the horizontal and vertical structures of the studied ecosystems; and
- Indicate species that can be used as indicators of environmental quality.

This program also aims to establish the criteria for the monitoring of flora, with respect to the sampling site, methodology to be adopted and frequency of sampling.

11.3 Methodology

The actions planned for the monitoring of flora basically comprise the activities listed below

- Definition, characterization and marking of sampling points (plots);
- Marking of arboreal individuals;
- Monitoring of forest fragments;
- Collection of field data;
- Consolidation of sampled data - reports.

11.3.1 Sampling sites

The sampling sites will be around the development. Permanent plots will be adopted in the different phytophysiognomies, in order to carry out the survey and monitoring of possible changes that may occur in the diversity and structure of the vegetation (e).

The amount of permanent plots is determined according to the size of the area.

11.3.2 Methodology

The design and the delimitation of the plots are important for the monitoring of the flora, and it is necessary that these plots are representative of all the phytophysiognomic types in the area of direct influence (AID) of the project (Felfili et al., 2013). For plot sampling, three basic principles should be considered (Felfili & Rezende, 2003):

- Repetition: more than one sample unit should be used to check the variability between them;
- Casualization: the sample units must have the chance to be positioned at any point in the sample universe;
- Control: in different environments there must be stratification to reflect the variability and consequent sample effort.

The estimates of the parameters of the horizontal structure include the frequency, density, dominance and importance value of each species sampled.

11.3.3 Sampling Frequency

The monitoring frequency of flora will be annual.

11.4 Schedule

The Schedule of the planned activities during the plant's operation phase is indicated below:

- | | |
|--|--------|
| – Flora monitoring campaign: | Annual |
| – Delivery of follow-up reports to the environmental agency: | Annual |

11.5 Program Responsibility

LD Celulose.

11.6 References

Not applicable.

12 FAUNA MONITORING PROGRAM

12.1 Justification

The implantation and operation of the pulp mill may interfere with the local fauna, with respect to alteration of biodiversity and other ecological parameters, such as composition, wealth and abundance. In this way, the Wildlife Monitoring Program is important to verify the presence and behavior of local fauna, as well as bioindicator species.

12.2 Objectives and Goals

The main objective of the Fauna Monitoring Program is to carry out the monitoring and evaluation of the biodiversity related to mastofauna, avifauna and herpetofauna in the area of influence of the dissolving pulp mill.

This program also aims to establish the criteria for monitoring, with regard to site, procedures / Methodology and frequency of sampling.

12.3 Methodology

12.3.1 Sampling sites

The monitoring of fauna will be carried out in fragments identified within or near the area of direct influence of the enterprise.

12.3.2 Sampling Procedures

The sampling procedures for each faunal group are presented below.

Mastofauna

For the mastofauna inventory, linear transects have been performed in the previously selected areas. In order to do so, already established tracks will be used that cut the diverse constituent environments of the areas. Whenever possible, with previous authorizations, new trails will be opened to sample the biomes of interest, seeking to cover the greatest possible diversity of habitats, water features and topography (CULLEN, RUDRAN, 2004).

All transects will be traversed. When viewing or identifying the presence of an animal for other types of evidence, such as vocalizations, for example, its registration will be done in a field notebook, as well as the following additional data: georeferencing of the sampled point, day, time, climatic conditions, surrounding biome and any other details that may be observed.

In addition, indirect methods will also be used. At each visit, the transects will be inspected and recorded and / or collected for further identification of all indications of animals, such as footprints, hairs, feces, carcasses and skeletons, footpaths and burrows. Whenever possible, the clues will be photographed. Footprints will be identified according to Becker and Dalponte (1991), as well as forwarded for identification through photographs to specialized researchers.

In addition to transects, other areas near the study area may be randomly scanned for evidence of mammals.

In addition, digital photographic traps will be used to aid in the collection of survey data.

Avifauna

Estimates of abundance, density and population size

To estimate the abundance, density and population size of the species, the linear transects method will be used, which will consist of traversing tracks previously established at constant speed to detect any animal (Burnham et al., 1980, Brockelman

& Ali 1987, Buckland et al., 1993, Peres 1999). When detecting any bird, the following information will be recorded: 1) number of individuals; 2) species sighted; 3) perpendicular distance between the animal and the trail; 4) census start and end time; 5) time of sighting of the animal; 6) coordinates of the point where the animal was sighted, obtained from a GPS; 7) mileage traveled on each transect.

To estimate the density and population size of the species recorded in transects, it will be necessary to consider some premises: 1) all animals in the trail should be detected; 2) all animals will be detected in their initial position; 3) perpendicular animal-trail distances should be measured correctly; 4) the same animal cannot be counted more than once in the same sample effort (Buckland et al., 1993, Bibby et al., 1998). The density and population size will be analyzed with the help of the DISTANCE 5.1 program (Thomas et al., 2006). The abundance will be defined as the total number of records of bird species.

Habitat selection and living area

Habitat selection will be obtained by auditive and visual detection of the bird species at predetermined points within the transects used in the analysis of abundance, density and population size. In the habitat selection analysis, a comparison will be made between the proportion of individuals observed in a given habitat type and the proportion of individuals expected, considering the availability of the habitat in the study area, according to Neu et al. (1974) and Canavelli et al. (2003). In order to determine a possible differentiated habitat use, the proportions of each habitat type with Bailey's confidence interval will be considered (Canavelli et al., 2003).

Population increase and associated factors

The data of abundance, density and population size will be correlated with the reproductive period, time of year (migratory period) and availability of resources in the study area to verify if the increase or not of new individuals in the populations studied may be influenced by these factors.

Herpetofauna

For the registration of amphibians, complementary and simultaneous methods will be used: search at reproductive sites (Scott Jr. & Woodward 1994) and auditory transects (Zimmerman 1994). Active data collection will be done during the vocalization shift starting at dusk. The perimeters of the water bodies will be traversed, estimating the abundance of each species of amphibian through the number of males vocalizing in each sampled site. The individuals just visualized will be added in the final count.

The search for reptiles will be carried out by the visual search limited by time (Campbell & Christman 1982), also called active search, which consists of walking slowly, searching in all microenvironments accessible by specimens hidden under logs, stones, branches, burlap, etc. The active daytime search will be done in the forest fragments during the morning. Specimens found on the roads, anthropic areas, etc., will be recorded as occasional encounters.

As a complementary Methodology, pitfall traps (Cechin & Martins 2000) containing five lines with five buckets of 50 liters, 10 meters apart and connected by plastic fence (black canvas) of 0.8 m in height.

12.3.3 Monitoring groups

The monitoring of fauna will be carried out for the following groups: mastofauna, avifauna and herpetofauna.

12.3.4 Monitoring Frequency

The frequency of wildlife monitoring will be annual.

12.4 Compliance with legal requirements

The main legal requirement applicable to this Program is:

- Law N° 5.197/ 1967

12.5 Schedule

The Schedule of the planned activities during the plant's operation phase is indicated below:

- Fauna monitoring campaign: Annual
- Delivery of follow-up reports to the environmental agency: Annual

12.6 Program Responsibility

LD Celulose.

12.7 References

BRAZIL. Federal Law No. 5.197 / 1967. It deals with the protection of the fauna and gives other measures.

13 AQUATIC FAUNA MONITORING PROGRAM

13.1 Justification

The treated liquid effluents from the pulp mill will be launched on the Araguari river through an underwater emissary, so this program to monitor the quality of aquatic fauna is necessary in order to identify any changes in the local aquatic community that can be attributed to the release of generated liquid effluents, even if properly treated and that comply with the emission standards of the current legislation.

13.2 Objectives and Goals

The main objective of the program is to monitor and evaluate possible changes in the local aquatic fauna.

This program also aims to establish the criteria for the monitoring of aquatic fauna, regarding the location, procedure, variables and frequency of sampling.

13.3 Methodology

13.3.1 Monitoring sites

The monitoring of fauna will be carried out in the Araguari river, in points near the region of release of treated effluents from the pulp mill.

Therefore, sampling and analysis of ichthyofauna, zoobentos, phytoplankton and zooplankton in two (2) points, located in the Araguari River, should be performed, which are presented in the Figure below. The points are the same as those for the EIA campaign, which will be used as a reference for future monitoring.



Figure 7 – General location of the sampling sites for ichthyofauna, phytoplankton, zooplankton and zoobenthos, with the following coordinates (Point 1: 7913960.00 m S, 804317.00 m E; and Point 2: 7915521.00 m S, 804317.00 m E).

13.3.2 Sampling Procedure

A qualitative and quantitative analysis of the aquatic fauna, comprising: ichthyofauna, bentofauna, phytoplankton and zooplankton should be carried out.

For the qualitative analyzes, comparisons with the literature of the area, with respect to orders, families, genera and species present, dominance, frequency of occurrence and feeding habits should be used.

For the quantitative analysis the following indices should be calculated: density, richness, diversity, equitability and dominance. The evaluation of registered species should highlight the species of greater ecological interest, endangered species, exotic species and bioindicators.

For the ichthyofauna survey, the calculation of sample effort and the identification of the species of socioeconomic importance of the region should be carried out.

Methodology should be presented individually and in detail for each study group, informing the form of sampling (locations, periods, methods used and sample effort), species identification procedure (field and laboratory) and protocol for analysis of results (analysis statistics and data processing).

13.3.3 Sampling Frequency

The frequency of monitoring of aquatic fauna will be annual.

13.3.4 Reports and Certifications

To carry out this monitoring it is necessary to obtain authorization from the IEF.

13.4 Compliance with legal requirements

The main legal requirement applicable to this Program is:

- Law No. 5,197, of January 3, 1967. Provides for the protection of fauna and other measures.

13.5 Schedule

The Schedule of the planned activities during the plant's operation phase is indicated below:

- Campaign to monitor aquatic fauna: Annual
- Delivery of follow-up reports to the environmental agency: Annual

13.6 Program Responsibility

LD Celulose.

13.7 References

Law No. 5,197, of January 3, 1967. Provides for the protection of fauna and other measures.

14 SOCIAL COMMUNICATION PROGRAM (PCS)

14.1 Justification

The implantation of the dissolving pulp mill may provoke reactions of the population, both positive for the investment and generation of jobs in the region, and negative, in relation to the enterprise, in case its disclosure is not carried out properly.

When the enterprise is not properly disclosed to the population, the impact becomes negative, since they bring expectations that end up not being demanded.

The PCS will contribute to the community's greater knowledge of the enterprise, to disseminate the real needs of the project regarding the size, number of jobs, specializations required, information about the impacts of the enterprise, among others.

14.2 Objectives and Goals

The general objective of the Social Communication Program (PCS) is to establish a channel of communication between the entrepreneur and the interested parties, in order to inform about the enterprise to be installed, as well as to present the negative and positive impacts generated by the implementation and operation of the LD Celulose plant and, mainly, mitigating measures and environmental and social programs that will be implemented to minimize impacts.

14.3 Methodology

The media program of LD Celulose aims to provide communication in a clear and transparent way between the entrepreneur and the interested parties. Provide reliable and relevant information, ensuring the disclosure of institutional information and clarification of the main stakeholder inquiries, in order to clarify doubts and perceptions about the venture, and provide clear understanding of its main impacts.

Meetings with stakeholders should be initiated prior to the construction period and check the wishes of the local community.

A call center "Disk LD CELULOSE" can also be created to listen to suggestions / complaints from the community and forward them to the program manager, directing them to a better service.

14.4 Compliance with legal requirements

Not applicable.

14.5 Schedule

The PCS must be started before the implementation of the project and will last throughout its useful life

14.6 Program Responsibility

LD Celulose.

14.7 References

Not applicable.

15 ENVIRONMENTAL EDUCATION PROGRAM (PEA)

This specific program was prepared in accordance with the Term of Reference, present in Annex I of COPAM Normative Resolution No. 214/2017, which establishes the guidelines and execution of Environmental Education Programs in the scope of environmental licensing processes in the State of Minas Gerais.

Under the Prior License (LP) the Environmental Education Program (PEA) must present at least the following information:

- Introduction
- Target Audience (internal and external)

- Purpose
- Justification
- Methodology
- Expected Results
- Bibliographic References.

15.1 Introduction

LD Celulose intends to establish a dissolving pulp mill, with a capacity of 540,000 t/year, located mainly in the municipality of Indianópolis (mill site), as well as in Araguari (water intake and treated effluent disposal pipelines), Minas Gerais State. The dissolving pulp will be exported and used as feedstock for manufacture of viscose yarns and others.

The site for the implantation of the LD Celulose plant is shown in Figure below, it is close to Highway BR 365 and 35 km far from Uberlândia.



Figure 8 – Location map of LD Celulose mil. Source: Google Earth (2018).

LD Celulose has a great concern to contribute to the development of the region, so that the awareness and qualification of people is an important aspect for the implantation of its factory, covering all the actions of growth in the region, having its share of responsibility in the search to minimize the environmental and social impacts that the enterprise can cause.

During the construction phase there will be an increase in the population, due to the workforce contracted during the implementation of the project, which will be hosted in the surrounding municipalities or in housing, and consequently will use the infrastructure of these.

In addition, an increase in the traffic of light and heavy vehicles, such as machinery, trucks and buses in the local access routes, is expected, as the enterprise will require a high amount of material, equipment, machinery, various inputs and contracted personnel.

Therefore, LD Celulose will also carry out the work of raising awareness with employees and outsourced companies, in order to guide employees on sustainable consumption, urban infrastructure, defensive driving, traffic safety, environmental education, among others.

During the operation phase of the pulp mill, the main possible impacts on the physical and biotic environment are: alteration of the quality of the Araguari river (where treated effluents from the plant will be launched), alteration of the air quality of the region (due to atmospheric emissions), alteration of soil and groundwater quality, impact on vegetation and scarcity of fauna.

And, with regard to the impacts on the socioeconomic environment, we can mention the generation of jobs, dynamization of the economy, increase in the collection and alteration of the landscape.

In this way, the PEA will be directed to the workers and communities located in the area of direct influence of the enterprise, so that this public understands the social-environmental impacts of the pulp mill and the measures that will be adopted of control and monitoring, guaranteeing the maintenance of the environmental Quality.

The PEA will also serve to raise awareness among the target public about the importance of conserving environmental resources, promoting change of habits, so that they become multipliers of this awareness.

15.2 Target Audience

PEA includes the following public:

- External: population of the municipality of Indianópolis and Araguari (area of direct influence of the enterprise).
- Internal: own employees of LD Celulose and contracted companies that will operate in the dissolving pulp mill.

15.3 Objective

The environmental education program aims to:

- Promote educational actions for the internal and external publics of the enterprise regarding the environmental impacts and risks and the control measures adopted by LD Celulose, allowing public understanding and participation in environmental management;
- Provide environmental education processes aimed at increasing knowledge, skills and attitudes, which contribute to citizen participation in the construction of sustainable societies;
- Apply a teaching-learning process in a critical way that allows all groups involved the full exercise of citizenship, integrated with studies and other environmental programs of the enterprise and the perception of environmental risks;

- Disseminate environmental legislation, through environmental education projects and actions;
- Develop educational activities using different environments and educational methods on the environment, privileging practical activities and local knowledge;
- Ensure the continuity and permanence of environmental education processes, since the process of training individuals is permanent;
- Promote understanding between the environments in the most diverse communities and their interrelations, focusing on the responsible use of natural resources.

15.4 Justification

The Environmental Education Program is necessary due to the possible environmental and social impacts that the implantation and operation of the dissolving pulp mill may cause in the region. This Program will develop actions that will contribute to the environmental preservation and enlightenment to the population regarding the coexistence with enterprise aiming at improving the quality of life of the residents of the surroundings of the enterprise.

15.5 Methodology

The main stages of the PEA are:

- Conducting introductory training that will address the employee's environmental aspect and concept;
- Conducting lectures with adequate training and qualification for workers;
- Involve in the activities the presence of the ludic element (music, theater, dynamics);
- Lectures and events, which will address various environmental and regional issues, with simple and popular vocabulary, using audiovisual resources for the local population;
- Carrying out campaigns on issues related to workers' health and citizenship, such as: alcoholism, illicit drugs, laws and traffic education;
- Carry out program monitoring and monitoring reports.

At the time of the request for the Installation License, the PEA executive project will be presented based on the information collected in the Participative Socio-Environmental Diagnosis to be carried out in the area of influence of the enterprise.

15.6 Expected Results

With the development of the PEA for LD Celulose workers and the local population, it is expected to raise awareness about environmental preservation and clarification regarding the coexistence with the enterprise aiming to improve the quality of life, and that the public involved acquire knowledge and attitudes that contribute to the building a more sustainable society.

15.7 References

MINAS GERAIS. COPAM Normative Resolution n ° 214/2017. Establishes the guidelines for the elaboration and execution of Environmental Education Programs within the ambit of environmental licensing processes in the State of Minas Gerais.

16 ENVIRONMENTAL COMPENSATION PROGRAM

16.1 Justification

The Environmental Compensation Program is necessary due to the environmental licensing of enterprises that cause significant environmental impact, are required by law (federal law 9985/2000 and State Decree 45.175 / 2009), to submit a program, plan or proposal for calculating the value of environmental compensation.

16.2 Objective

The objectives of this program are to comply with the federal and state laws cited, so that the licensing process is fully complied with and complied with.

Likewise, the objective is to offer subsidies to the environmental agency for the process of analysis of the proposal formulated here, and then, to assist the decision-making process for the application of the values derived from the environmental compensation.

16.3 Methodology

The method used to plan and carry out the activities foreseen in this program follows the general principles established in Federal Law 9.985 / 2000, which established the National System of Nature Conservation Units (SNUC), and the specific principles and rules of Decree 45.175 / 2009, in particular the formula for calculating the percentage to be applied to the investment of LD Celulose.

The forms of implementation and execution of this program follow the steps detailed in the federal law cited and specifically in State Decree nº 45.175 / 2009.

Modus Operandi

With the scope of complying with the legislation and offering the clear and justified subsidies to the SEMAD, the proposal for the calculation of the environmental compensation according to the ANNEX of State Decree nº 45.175 / 2009 amended by Decree nº 45.629 / 2011 is presented below.

Initially, the annex is transcribed from said State Decree.

Determination of the Degree of Significant Environmental Impact - GI

The determination of the percentage value of GI was obtained by adding up the relevance factors, plus the values related to the factors temporality and scope, in compliance with Decree 45.175 / 09.

Environmental Compensation Calculation

The value of the environmental compensation was calculated considering the Reference Value of the project and the Degree of Impact - GI, pursuant to Decree 45.175 / 09, as amended by Decree No. 45.629 / 11.

Degree of Significant Environmental Impact - GI: percentage value obtained by sum of factors Relevance, plus values related to factors Temporality and Scope, limited to 0.5%: $GI = FR + (FT + FA)$.

Relevance factor - FR: criteria that allow to evaluate the degree of commitment of the environment by the enterprise, through the identification and valuation of the negative impacts manifested according to Table1 in the ANNEX.

Fatores de Relevância		Valoração
Interferência em áreas de ocorrência de espécies ameaçadas de extinção, raras, endêmicas, novas e vulneráveis e/ou em áreas de reprodução, de pousio e de rotas migratórias		0,0750
Introdução ou facilitação de espécies alóctones (invasoras)		0,0100
Interferência /supressão de vegetação, acarretando fragmentação	ecossistemas especialmente protegidos (Lei 14.309)	0,0500
	outros biomas	0,0450
Interferência em cavernas, abrigos ou fenômenos cársticos e sítios paleontológicos		0,0250
Interferência em unidades de conservação de proteção integral, sua zona de amortecimento, observada a legislação aplicável		0,1000
Interferência em áreas prioritárias para a conservação, conforme "Biodiversidade em Minas Gerais - Um Atlas para sua Conservação"	Importância Biológica Especial	0,0500
Interferência em áreas prioritárias para a conservação, conforme "Biodiversidade em Minas Gerais - Um Atlas para sua Conservação"	Importância Biológica Extrema	0,0450
	Importância Biológica Muito Alta	0,0400
	Importância Biológica Alta	0,0350
Alteração da qualidade físico-química da água, do solo ou do ar		0,0300
Rebaixamento ou soerguimento de aquíferos ou águas superficiais	0,03	0,0250
Transformação ambiente lótico em lêntico	0,05	0,0450
Interferência em paisagens notáveis	0,03	0,0300
Emissão de gases que contribuem efeito estufa	0,03	0,0250
Aumento da erodibilidade do solo	0,03	0,0300
Emissão de sons e ruídos residuais	0,01	0,0100
Somatório Relevância		

Temporality Factor - FT: criterion that allows to evaluate the persistence of the commitment of the environment by the enterprise according to Table2 in the Annex.

Duração	Valoração (%)
Imediata - 0 a 5 anos	0,0500
Curta - > 5 a 10 anos	0,0650
Média - >10 a 20 anos	0,0850
Longa - >20 anos	0,1000

Factor of Coverage - FA: criterion that allows to evaluate the spatial distribution of the commitment of the environment by the enterprise according to Table3 in the Annex.

Localização	Valoração (%)
Área de Interferência Direta (1)	0,03
Área de Interferência Indireta (2)	0,05

16.3.1 Component: Relevance factor

Guiding questions, or verification of actions, without considering the magnitude or importance of the impacts:

a) Interference in areas where endangered, rare, endemic, new and vulnerable endangered species occur and / or in breeding, fallow and migratory areas

The proposed location for the LD Celulose plant was guided by specific criteria in order to generate the least socio-environmental impact.

According to a field survey in the diagnosis of the biotic environment, the high number of species of flora found, together with the presence of seven endangered and two species immune to the cut, show the importance of the remnants in the conservation and preservation of the flora in the surrounding areas of the enterprise. However, in the ADA, few species were recorded, the majority of the individuals belonging to only two of them, besides not harboring flora species threatened with extinction.

The herpetofauna sampled is formed mostly by common species and widely distributed throughout the national territory. Some are probably the most common in practically all biomes (*Dendropsophus minutus*, *D. nanus*, *Leptodactylus fuscus*, *Trachycephalus typhonius* and *Crotalus durissus*). However, the region studied has some endemic species of the Cerrado biome (*Rhinella rubescens*, *Odontophrynus cultripes*, *Barycholos ternetzi* and probably *Mesoclemmys cf. vanderhaegei*), but all have a large occurrence within the biome.

According to Silva & Bates (2002), of the registered species of avifauna, four are classified as endemic to the cerrado biome, being: *Herpsilochmus longirostris* Pelzeln, 1868 (long-billed chorizo); *Antilophia galeata* (Lichtenstein, 1823) (soldier); *Cyanocorax cristatellus* (Temminck, 1823) (crow-of-field); and *Myiothlypis leucophrys* (Pelzeln, 1868) (pula-eyebrow). This shows that the fragments of the

localities have enough resources to maintain a specific fauna that depends on them. Because they are associated exclusively to the Cerrado, these species suffer from the fragmentation and suppression of the native vegetation that occurs in the state of Minas Gerais. Considering all species found in the surveys, 95 species have low sensitivity to environmental changes, 39 have medium sensitivity, and only *Aramides cajaneus* (Statius Muller, 1776) (saracura-three-pots) has high sensitivity (Stotz et al 1996).

The most recorded species of the mastofauna were the white-ear possum (*Didelphis albiventris*), the maned wolf (*Chrysocyon brachyurus*), and the wild dog (*Cerdocyon thous*). They are generalist species and adapted to changes and anthropic environments (Rocha et al., 2008; Srbek & Chiarello, 2013). The maned wolf is a typical Cerrado animal and, therefore, its registration was expected in the region. There are reports of its adaptation to anthropic environments consuming organic waste (Cheida, 2005), but the environmental changes that reduce its prey and the predatory hunting of this animal place the species as "Near Threatened" in the IUCN list and "Vulnerable" in the Brazil and Minas Gerais (COPAM 2010, ICMBio 2016, IUCN 2017).

Other species also recorded were: the paca (*Cuniculus paca*) and the anteater (*Myrmecophaga tridactyla*). Paca is an animal that is increasingly suffering from habitat fragmentation and, mainly, hunting pressure exerted on the species due to the high appreciation of its meat (Fuccio et al., 2003). The species is classified as "In Peril" in the threatened species lists of Rio Grande do Sul and Paraná and as "Vulnerable" in São Paulo and Rio de Janeiro (ICMBio, 2016). In Minas Gerais the species is not listed.

The anteater (*Myrmecophaga tridactyla*) is listed as threatened in the global list (IUCN 2017), national (ICMBIO 2016) and state (COPAM 2010), all in the "Vulnerable" category. Encounters with the species in the region are frequent. It is a species capable of using areas surrounding agricultural crops (Miranda et al., 2015).

Puma concolor (*Puma concolor*) has the largest distribution among mammals in the Americas, extending from northern Canada to the southern tip of South America. Pastures, monocultures, and construction of dams for electric power production have discharged and fragmented habitat of this species. Although presenting a certain plasticity in the occupation of altered habitats, this can generate indirect population impacts (Morato 2009). It is listed as "Vulnerable" in the national (ICMBIO 2016) and state list (COPAM 2010).

The armadillo (*Prionates maximus*) is classified as "Endangered" in Minas Gerais (COPAM 2010) and as "Vulnerable" in Brazil and on a global scale (ICMBIO 2016, IUCN 2017), with loss of habitat, hunting and trade in the illegal market its main threats to the decline in its distribution area (Fonseca & Aguiar 2004). In the study area, the species was recorded only by the encounter of two burrows, one of which was recently excavated. A monitoring of the species has been carried out with photographic traps distributed at Nova Monte Carmelo farm.

Finally, ten species of mastofauna found are listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). *Leopardus guttulus* and *Prionates maximus* are listed in Appendix I, which lists the species most threatened with extinction and whose international trade is prohibited. In Appendix II are *Myrmecophaga tridactyla*, *Chrysocyon brachyurus*, *Cerdocyon thous*, *Puma concolor*, *Callithrix penicillata* and *Sapajus libidinosus*. Species at risk are present in this appendix if international trade is not controlled. Already in Appendix III are

present *Cuniculus paca* and *Nasua nasua* that are species that depend on the cooperation of other countries to prevent the unsustainable or illegal exploitation of them. These species listed here are common and abundant species in much of the national territory, whose exploitation in international trade can occur for the use of skin, pets and meat (UNEP-WCMC 2015), a situation that should not occur in the region sampled.

The landscape is generally characterized by an agricultural matrix with a predominance of soybean, sugar cane and coffee plantations. And even so, rare species such as the vinegar dog (*Speothos venaticus*) have already been registered in the region along the banks of the Araguari river (Azevedo et al., 2016), reinforcing the importance of these remnants of vegetation. In addition, the superiority of the number of species of carnivores in relation to the others shows that the landscape still supports populations of fauna that serve as prey to these, and perform other ecological functions. Therefore, it is worth emphasizing the importance of Legal Reserves and Permanent Preservation Areas, since even the most general species registered or were in these areas, or in the matrix in association with more preserved fragments.

The species recorded are widely distributed in the national territory, being found in different ecosystems, both in forested areas and in open areas. The presence of the Araguari river provides areas favorable to the occurrence of mammals such as riparian forests and fragments with connectivity. These areas are enabling the flow of these populations, who need large areas to seek shelter, food and reproduction. The occurrence of threatened species shows the importance of these native areas. These species are of concern because of their threat status and deserve special attention, even if they are widely occurring and with recurrent records in the region.

Although the study area is located in a highly altered region with a predominance of agricultural activities, it still preserves a considerable number of fauna, which is possible thanks to the remnants of vegetation surrounding the future development. However, the impact of these animals on the surrounding road network is remarkable.

Therefore, even of small magnitude, the enterprise may interfere in areas of rare, endemic, new and vulnerable endangered species and / or in areas of breeding, landing and migratory routes.

b) Introduction or facilitation of invasive species

One of the activities required for the operation of the LD cellulose dissolving pulp mill is forestry. It is known that the potential for invasion by seeds produced in eucalyptus plantations is very low, however eucalyptus, in this case *Eucalyptus* spp originates in Australia, so it is an allochthonous species, thus it has great capacity to alter the ecosystem replacing the native vegetation of the field with islands of closed vegetation that is constituted by the eucalyptus forest.

Therefore, even indirectly, the enterprise may introduce or facilitate the planting of invasive species.

c) Interference / suppression of vegetation, leading to fragmentation

The implantation of the dissolving pulp mill itself will occur predominantly in the eucalyptus (*Eucalyptus* sp) planting area. However, for the implementation of the water abstraction pipeline and the emissary of treated effluents that will occur

in a linear tract, there should be some interventions in forest fragments, including in the Permanent Preservation Area of the Araguari river, being considered a specially protected ecosystem (Law 14.309).

According to the two field surveys carried out for this EIA in different parts of the area of influence of the plant, 409 species of vascular flora were registered, as well as three varieties and two subspecies belonging to 94 botanical families and four divisions (or edges). The high number of species found in the diagnosis evidences the importance of the remnants in the conservation and preservation of the flora. However, the Forest Inventory of the intervention area will still be carried out for the passage of the raw water pipes and effluent discharge, and only then will the needs for selective cutting of native vegetation be raised.

As the area suffers a high degree of anthropization, due mainly to the existence of cane, coffee, and silviculture plantations, the majority of the individuals found are habitat-use species that are favored in disturbed and fragmented environments.

After forest inventory of the area of interest, when the needs for selective cutting of native vegetation will be raised, there should be compensation by means of planting and replanting forest species native to the region, in accordance with the procedures established by the environmental agency. The impact can be compensated by means of enrichment and vegetation management in areas of permanent preservation (APP) within and close to the project.

Therefore, the enterprise may interfere / suppress vegetation, leading to fragmentation.

d) Interference in caves, shelters or karstic phenomena and paleontological sites

According to the diagnosis of the physical environment, it was possible to conclude from the methodology used in the survey of the National Center for Studies, Protection and Management of Caves (CECAV, 2018), that according to this database (with last update on 12/15/2017), the occurrence of subterranean cavities was not observed in the AID and ADA of the project. The nearest areas, according to the speleological map presented, are located: northwest (89.6 km of AID), in the municipality of Tupaciguara; and to the northeast (90.2 km of AID) in the municipality of Coromandel.

Therefore, the enterprise will not interfere in caves, shelters or karst phenomena and paleontological sites.

e) Interference in protected areas of integral protection, its zone of damping, observing the applicable legislation

According to a biotic means, no conservation units were identified in the ADA and AID of the project. The nearest conservation unit, PE Pau Furado, is located approximately 23.0 km from the area of the future dissolving pulp mill. In addition to PE Pau Furado, the other conservation units closest to the project are: the RPPN Cachoeira da Sucupira and the RPPN Jacob Reserve are located approximately 30 and 33 km from the project, respectively.

Therefore, the enterprise will not interfere in integral protection conservation units, its zone of damping, observing the applicable legislation.

f) Interference in priority areas for conservation, according to "Biodiversity in Minas Gerais - An Atlas for Conservation"

According to a biotic means, the area of the project is not included in any Priority Area for Biodiversity Conservation.

Therefore, the enterprise will not interfere with priority areas for conservation, according to "Biodiversity in Minas Gerais - An Atlas for Conservation".

g) Alteration of the physical-chemical quality of water, soil or air

Implantation Phase (Works)

At the start of the works, chemical toilets will be used, and the debris will be removed by clean-pit trucks, transported and disposed of properly by accredited companies. The chemical toilets and other facilities at the construction site will be installed in accordance with NR 18. Once the installation of the construction site is completed, the chemical toilets will be deactivated and returned to the company that leased them.

After the installation of the infrastructure, the sanitary sewage generated during the construction of the plant will be collected and treated in a treatment system consisting of aerated lagoon and polishing pond. Subsequently, the treated sewage will be removed by trucks or even piped and sent for use as reuse water in the Duratex eucalyptus forests.

The treated sewage must comply with the emission standards of the parameters established by CONAMA Resolution No. 430/2011 and Joint Normative Resolution COPAM / CERH-MG No. 1/2008.

In the earthworks activities, a balance between landfill and landfill is foreseen, so that the necessary areas of boot-off and loan material are to be minimized at external sites of the site, but if necessary, these areas will be properly licensed. The surface soil removed may be reused as a substrate for any areas that will receive landscaping treatment.

It should be emphasized that the implementation plan also provides preventive measures to protect the land to transport sediment to the surrounding watercourse. Preference is being given to earthworks in non-rainy periods, in order to reduce the possibility of erosive processes due to the susceptibility of the terrain. Temporary drainage construction and structures for containment of material will prevent the eventual drag of solids into the body of water, and no silting should occur. In addition, the minimization of the exposure time of areas without vegetation cover and friable characteristics, and the monitoring and environmental supervision of the works are some of the measures to be adopted during the implementation of the project as impact prevention.

It is expected that during the construction of the project there will be a significant increase in the traffic of light and heavy vehicles such as machinery, trucks and buses in local access routes, as the work will require a quantity of material, equipment, machinery, various inputs and contracted personnel .

Vehicle traffic and the presence of engines, both on the roads leading to the construction site and on the paved roads of the region, during the implementation

phase of the project, may cause an increase in pollutants in the atmosphere due to exhaust fumes from vehicles.

Another vector of impact to vehicular traffic is the generation of dust, related to the traffic in unpaved roads, that can be transported according to the regime of winds of the region.

In addition, trucks transporting earth, rocks and all powdery material will have their cargo covered, preventing the release of particles and dust.

Operation Phase

The generation of liquid effluents from the dissolving pulp mill will correspond to the activities of the cellulose manufacturing process and other support activities.

All the effluents from the L.D Celulose S.A plant will be treated at the ETE, which will have the biological treatment system adopted for activated sludge. The activated sludge process is a technology proven and commonly used in the pulp and paper industries worldwide.

In the dissolving pulp mill, during the operation phase, industrial and non-industrial solid waste will be generated.

All solid waste generated will be collected, conditioned, destined for treatment and / or disposal in an environmentally correct manner.

Most of the residues produced in the cellulose industry are organic and biodegradable, thus allowing the recycling of the same in the soil, in the composting system because they have characteristics that will allow their reuse as a corrective of soil acidity.

The main air pollutants generated by the plant will be: MP (Particulate Material); TRS (reduced sulfur compounds); SO_x (Sulfur Oxides); CO (Carbon Monoxide) and NO_x (Nitrous Oxides).

It is worth mentioning that the production process of Kraft pulp process based on the best available technologies (BAT), which will allow the reduction, control and monitoring of greenhouse gas emissions, will be adopted at the LD Celulose plant.

It is worth mentioning that all emission sources will fully comply with the emission standards according to the limits established in COPAM Normative Resolution 187/2013 and in CONAMA Resolution 382/2006.

In addition, all emission sources will be properly dispersed through a chimney.

Therefore, in spite of adopting measures to mitigate the impacts of the generation of effluents, solid wastes and atmospheric emission in the phases of implantation and operation, the enterprise could alter the physical-chemical quality of the water, soil or air.

h) Lowering or uplift of aquifers or surface waters

The water supply to the construction site will be carried out through artesian wells. The water will be filtered and will receive chlorination, followed by its storage in the reservoir, for later distribution to the users.

The quality required for water should meet the parameters established by the Consolidation Ordinance of the Ministry of Health No. 05/2017, which consolidates the standards on actions and health services of the Unified Health System.

For operation of the plant the water will be captured from the Araguari River, through a system of surface abstraction consisting of channel and railing. It is worth mentioning that the catchment will be of the type water, that is, a dam system will not be built.

Therefore, since the enterprise will use groundwater even if it is temporary and temporary, it can be considered that there will be lowering or uplifting of aquifers or surface waters.

i) Transformation of lotic environment into lentic

The undertaking in question will not transform the Araguari river environment, which may already be considered lentic, due to the existence of dams upstream and downstream of the water catchment and effluent discharge points.

j) Significant landscape interference

The cellulose factory will be composed of buildings, chimney, cooling tower, which will change the landscape where agriculture and livestock predominates.

In addition, the operation of the dissolving pulp industrial unit will require the implementation of an internal and external infrastructure that will include the abstraction of water and disposal of treated effluents that will alter the local landscape. *Therefore, the venture will interfere with remarkable landscapes.*

k) Emission of greenhouse gases

The main air pollutants generated by the plant will be: MP (Particulate Material); TRS (reduced sulfur compounds); SO_x (Sulfur Oxides); CO (Carbon Monoxide) and NO_x (Nitrous Oxides).

It is worth mentioning that the production process of Kraft pulp based on the best available technologies (BAT), which will allow the reduction, control and monitoring of greenhouse gas emissions, will be adopted at the LD Celulose plant.

It is worth mentioning that all emission sources will fully comply with the emission standards according to the limits established in COPAM Normative Resolution 187/2013 and in CONAMA Resolution 382/2006.

Therefore, the dissolving pulp mill will emit gases that contribute to the greenhouse effect.

l) Increase in soil erodibility

In the earthworks activities, the balance between landfill and landfill is foreseen so that the necessary areas of boot-off and loan material are to be minimized in external locations of the plot of land, if necessary these areas will be properly licensed.

The surface soil removed may be reused as a substrate for any areas that will receive landscaping treatment.

Although the project of implantation foresees measures of protection of the ground with preventive character for transport of sediments to the water courses in the

surroundings. Preference is being given to earthworks in non-rainy periods, in order to reduce the possibility of erosive processes due to the susceptibility of the terrain.

Temporary drainage construction, avoiding silting of bodies of water, structures to contain material, minimizing the exposure time of areas without vegetation cover and friable characteristics, monitoring and environmental supervision of the works are some of the measures to be taken during the implementation of the project.

Therefore, in spite of adopting measures to mitigate the impact, there may be an increase in soil erodibility.

m) Emission of sounds and residual noises

Implantation

It is expected that during construction of the project there will be a significant increase in the traffic of light and heavy vehicles, such as machinery, trucks and buses in the local access routes, since the work will require a quantity of material, equipment, machinery, contracted personnel.

An impact resulting from increased traffic on the road refers to the generation of noise.

Periodic maintenance of equipment and vehicles plays a key role in noise control and safety, as well as increasing the useful life of the machinery. The causes of the machines with the highest noise level are: wear of gears, bearings and bearings, poor lubrication, imbalance of rotating elements, obstructions in air pipes, non-sharp cutting devices, clogged and damaged silencers, removal of noise attenuator device, etc. (BISTAFA, 2011).

Noise, both daytime and nighttime, must be within the NBR standard ABNT 10.151.

In the area surrounding the project, agricultural activities predominate. The most immediate presence of population agglomeration is approximately 20 km south, with the urban area of Indianópolis.

Operation

The noise sources of the dissolving pulp mill will come from industrial activity. The following are the noise generating areas of the future factory: Wood patio; Cooking; Line of fibers; Drying of cellulose; Cellulose warehouse; Evaporation; Boiler recovery; Caustification and lime kiln; Chemical products; Water treatment; Water treatment for boilers; Cooling towers; Compressed air plant (compressor); Plant for oxygen production; Ozone production plant; Boiler (biomass); Turbo-generator; Wastewater treatment; Waste treatment area; Playground.

Therefore, the enterprise will emit residual sounds and noises.

Relevance Factor Calculation - FR

Pursuant to Decree 45.175 / 09, as amended by Decree No. 45.629 / 11, for the present project, it was obtained:

Relevance Factor - FR

- A = 0,075
- B = 0,01

- C = 0,05
- D = 0
- E = 0
- F = 0
- G = 0,03
- H = 0,03
- I = 0
- J = 0,03
- K = 0,03
- L = 0,03
- M = 0,01

$$FR = A+B+C+D+E + F + G + H + I + J + K + L + M = 0,295$$

Relevance Factor - FR= 0,295

16.3.2 Component: Time Factor

Duração	Valoração (%)
Imediata - 0 a 5 anos	0,0500
Curta - > 5 a 10 anos	0,0650
Média - >10 a 20 anos	0,0850
Longa - >20 anos	0,1000

The useful life of a dissolving pulp mill is considered to be long, over 20 years. Therefore, FT = 0,1

Time Factor – FT = 0,1

16.3.3 Component: Factor of Coverage

Localização	Valoração (%)
Área de Interferência Direta (1)	0,03
Área de Interferência Indireta (2)	0,05

Pursuant to Decree 45.175 / 09, as amended by Decree No. 45.629 / 11, the following definitions shall apply:

(1) direct interference area - up to 10 km from the perimeter line of the main area of the project, where the impacts are of primary importance; and

(2) area of indirect interference - regional or watershed coverage in which the enterprise is inserted, where the impacts are secondary or tertiary

Coverage Factor – FA = 0,05 Direct Influence Area - AID: A 3 km radius was defined as AID.

Area of Indirect Influence - AII: Taking into account the impacts on the physical and biotic environment, the IIA was considered the Araguari river basin.

Area of Direct Influence for the socioeconomic environment is composed by the municipalities of Indianópolis - MG and Araguari - MG.

Area of Indirect Influence for the socioeconomic environment is composed by the municipalities of Uberlândia - MG and Estrela do Sul - MG.

Considering the impacts that fall on the basin in which the inserted enterprise, due to the development of the activities also in the municipalities of the IIA, for the calculation of the GI, the enterprise was classified as of regional scope.

Therefore, FA = 0.05

Coverage Factor - FA = 0.05

16.3.4 Degree of Significant Environmental Impact – GI

The GI is the percentage value obtained by the sum of the factors Relevance, plus the values related to the factors Temporality and Scope, limited to 0.5%:

$$GI=FR+(FT+FA)$$

$$GI = 0.295+0.1+0.05$$

$$GI = 0.445$$

Degree of Significant Environmental Impact – GI = 0.445%

16.3.5 Environmental Compensation (CA)

Environmental Compensation (CA) is calculated using formula:

$$CA = GI \times \text{Reference value}$$

According to Decree 45.175 / 09, as amended by Decree No. 45.629 / 11, the definition of the **Reference Value** is: *"sum of the investments inherent in the implementation of the enterprise, excluding the investments related to the plans, projects, programs and constraints required in the environmental licensing for mitigation of impacts, environmental licensing analysis costs, investments that enable higher levels of environmental quality to be achieved, as well as the costs and costs of financing the enterprise, including guarantees, and insurance policies and personal and real insurance premiums. "*

It should be noted that, according to Article 7 of Decree 45.175 / 09, as amended by Decree No. 45.629 / 11: *"The establishment of Environmental Compensation and its application are the exclusive competence of CPB-COPAM, pursuant to item IX of art. 18 of Decree n°44.667, of December 3, 2007 "*.

16.4 Registration Form

The program will be properly registered and documented through protocols and documents processing for the licensing process by SEMAD.

16.5 **Responsible**
LD Celulose.

16.6 **Schedule**
This information will be defined by SEMAD.

16.7 **References**
- State Decree 45.175 / 09 amended by Decree No. 45.629 / 11.