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ENVIROMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

Date 31.07.2021

Reference N. 109002841-001-0000-E-1500

PARACEL

EUCALYPTUS PLANTATION
Departments of Concepción and Amambay – Paraguay

VOLUME II – BASELINE CONDITIONS

TOMO I – PHYSICAL ENVIRONMENT

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SUMMARY

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5 OUTCOME OF SCOPING

5.1 Spatial Scope

The Spatial Scope considered the influence areas of the PARACEL Eucalyptus Plantation, for the physical and biotic environment. This areas are divided into Indirect (IIA), Direct (DIA) and Directly Affected Area (DAA).

5.1.1 Indirect Influence Area (IIA)

It corresponds to a regional territorial share, which can advance to 100km from the edges of the premises. For the PARACEL Eucalyptus Plantation, considering that best management practices will have to be applied, it is estimated that the 100km range is sufficient to cover indirect impacts under knowledge and relative control.

The area considered is the same as that of the socioeconomic environment, since it covers the hydrographic basins where the properties are located. The hydrographic basins are related to the indirect bio-physical impacts of the project.

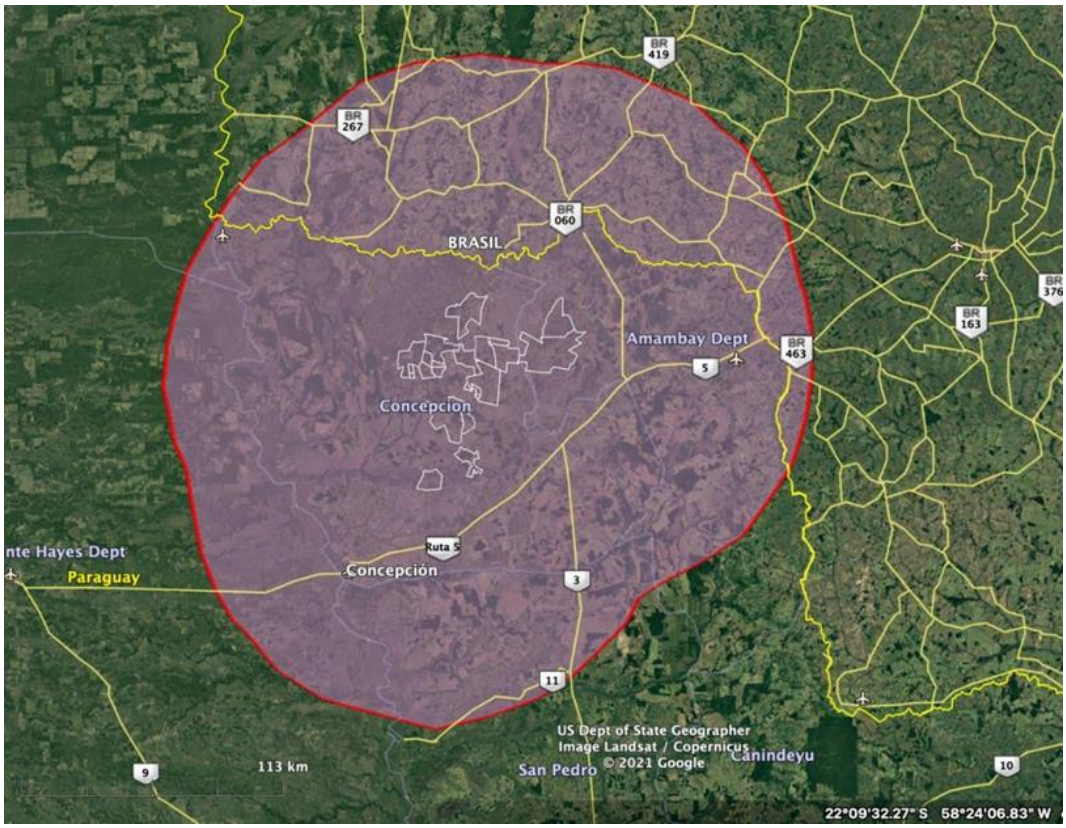

Figure 1 – Area of indirect bio-physical influence of the PARACEL Eucalyptus Plantation (buffer 100 km)

5.1.2 Direct Influence Area (DIA)

It corresponds to the nearest area of the boundaries or perimeters of the premises. The bio-physical dimensions and complexities of each property are the determining factors of its area of direct influence. However, it can be determined that the direct influence of plantation activities on the bio-physical environment generally is only 10 km away.

The area considered is the same as that of the socioeconomic environment, since it comprises the micro basins where the properties are located. The micro basins are related to the direct bio-physical impacts of the project.

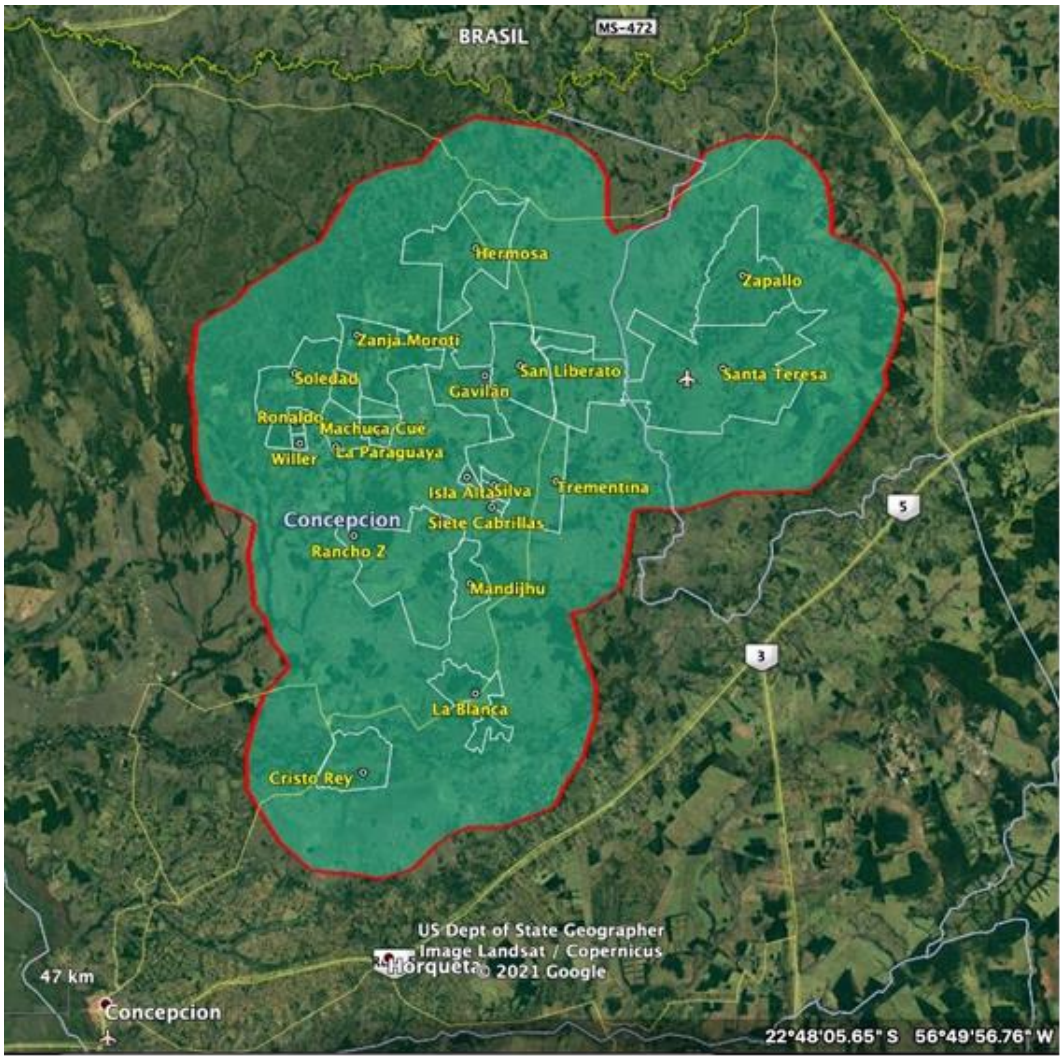

Figure 2 – Direct bio-physical influence of the PARACEL Eucalyptus Plantation (Buffer 10km)

5.1.3 Directly Affected Area (DAA)

It corresponds to the areas destined for PARACEL Eucalyptus Plantation, as illustrated below.

Figure 3 – Directly affected area of the PARACEL Eucalyptus Plantation

5.2 Temporal Scope

The Temporal Scope it was considered the entire period of operation of the evaluated ventures (in their different phases of planning, installation and operation).

5.3 Technical Scope

In the next topics, aspects related to the physical, biotic and socioeconomic aspects of the areas of influence of the PARACEL Eucalyptus Plantation will be evaluated.

6 BASELINE CONDITIONS

6.1 Physical Environment

The diagnosis of the physical environment allows us to observe the current states of climate, geology, geomorphology, topography, seismicity and hydrology (surface and underground water resources) of the areas of influence and thus obtain an adequate evaluation of the environmental impacts related to the PARACEL Eucalyptus Plantation.

For the compilation of primary and secondary data, the areas of influence were previously considered.

6.1.1 Climate

The climate type in Paraguay is tropical to subtropical, governed by tropical air mass and polar air mass, with hot and rainy summers and low and less rainy winters. The average annual temperature is 23°C and the average annual maximum is 29°C. There is a marked difference between the distribution of rainfall in the two regions into which the country is divided. In the Eastern Region, the average annual temperature ranges from 21°C to 23°C. In the Western Region, the average annual temperature is 24°C. The average recorded rainfall is 1,700 mm in the eastern region and 400 mm in the western region, near the border with Argentina and Bolivia (DGEEC, 2011).

According to Grassi et al. (2005), the Eastern Region, has an undulating and humid feature confined between the Paraguay and Paraná rivers, has a rugged topography with good drainage and a growing rainfall regime to the east and where the climate varies from humid sub-humid to humid, in the same orientation, giving rise to the large subtropical forests of the Atlantic basin.

According to this classification Pasten et al. (2011), the Eastern Region is defined with two types of climates:

- Tropical Shroud/Dry Winter (Aw): covers much of the department of Concepción and a small portion of northwest San Pedro;
- Temperate/No Dry Season/Hot Summer (Cfa) includes the departments of Amambay, Canindeyú, Central, Cordillera, Caaguazú, Alto Paraná, Paraguarí, Guairá, Ñeembucú, Misiones Itapúa and much of San Pedro.

The result of Köppen's climate classification, which can be seen in the Figure below, determined that in Paraguay there are three types of climate: tropical savannah with dry winter (Aw), semi-arid (Steppe) warm during all year (Bsh) and temperate climate, without dry season and hot summer (Cfa), this is the predominant climate in much of Paraguay (Pasten et al. 2011).

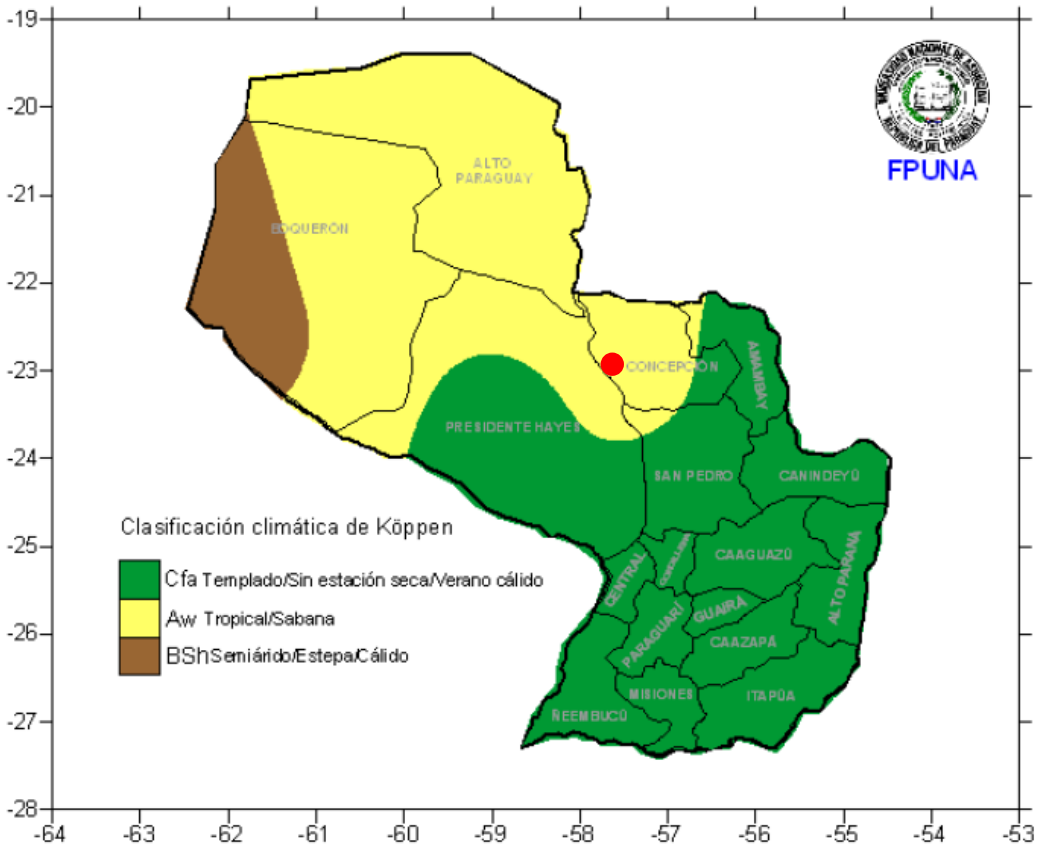

Figure 4 - Climate Classification of Köppen (1971-2010). Source: Pasten et al. (2011)

In the Figure below you can see the result of Thornthwaite's climate classification, where it’s possible to observe the 5 different types of climate of Paraguay.

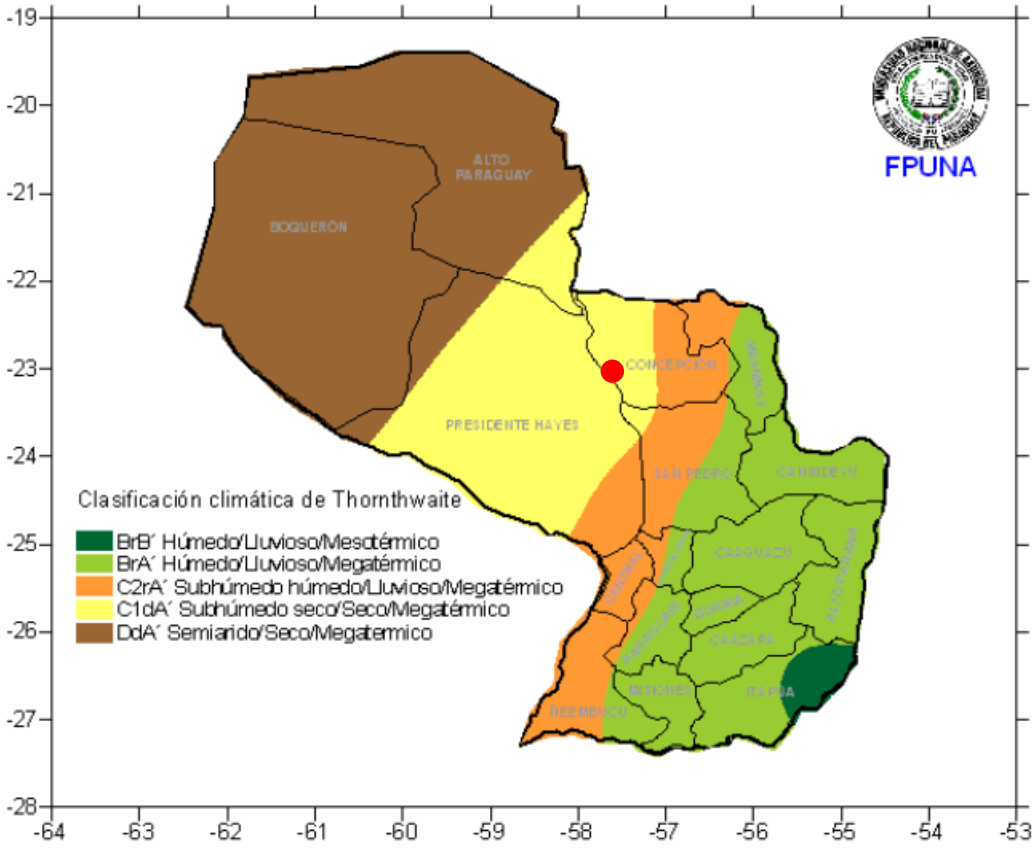

Figure 5 - Thornthwaite climate classification (1971-2010). Source: Pasten et al. (2011)

According to Pasten et al. (2011), the Western Region is defined considering four types of climate:

- Dry sub-humid/dry/megathermal (C1dA'): it includes the western part of the department of Concepción and a small portion of the department of San Pedro;
- Humid sub-humid/rainy/megathermal (C2rA'): covers the east of Concepción, a strip of San Pedro, Central department, west of Cordillera and west of Ñeembucú;
- Wet/Rain/Megathermal (BrA'): includes the departments of Canindeyú, Alto Paraná, Guairá, Caazapá, Misiones, east of Amambay, southeast of San Pedro, east of Cordillera, east of Ñeembucú and a large part of Itapúa;
- Wet/Rain/Mesothermal (BrB'): includes only a small part of Itapúa.

6.1.1.1 Methodology

The climatic characterization of the region where the PARACEL Eucalyptus Plantation is located considered the analysis of the following parameters: temperature, relative humidity, wind direction and speed, precipitation, solar radiation and water balance.

The meteorological and climatic information presented comes from the Climatological and Meteorological Study, carried out by the Company "CATAVENTO

AMBIENTALE METEOROLOGIA E MEIO AMBIENTE", the data were obtained by surface meteorological stations approved in the region of the company. The following information has been extracted from the Pulp Mill and Port Environmental Impact Study & Report (EIAp/RIMA): Book I - Environmental Diagnosis Of The Physical Environment (PÖYRY, 2020).

The data used for the study of the region's climate were obtained from the Integrated Surface Database (ISD), which can be consulted on the website of the National Oceanic and Atmospheric Administration (NOAA). Four surface weather stations were chosen for the analysis of climate conditions in the region, which were more representative of the project area, as shown below.

- Puerto Casado (USAF:860860/ICAO:SGLV), installed in the coordinates 22°16'58.80 "S / 57°55'58.80 "W. The data series examined is composed of 7 years (from 01/01/2013 to 31/12/2019);
- Pozo Colorado (USAF: 861280/ICAO: SGPC), at coordinates 23°30'0.00 "S / 58°46'58.80 "W. The data series examined is composed of 7 years (from 01/01/2013 to 31/12/2019);
- San Pedro (USAF: 861850/ICAO: SGSP), located at coordinates 24° 4'1.20 "S / 57° 4'58.80 "W The data series examined is composed of 7 years (from 01/01/2013 to 31/12/2019);
- Teniente Coronel Carmelo Peralta (USAF: 861340/ICAO: SGCO), used as a reference station for the region, located at coordinates 23°26'31.20 "S e 57°25'37.20 "W. The data series examined is composed of 10 years (from 01/01/2010 to 31/12/2019).

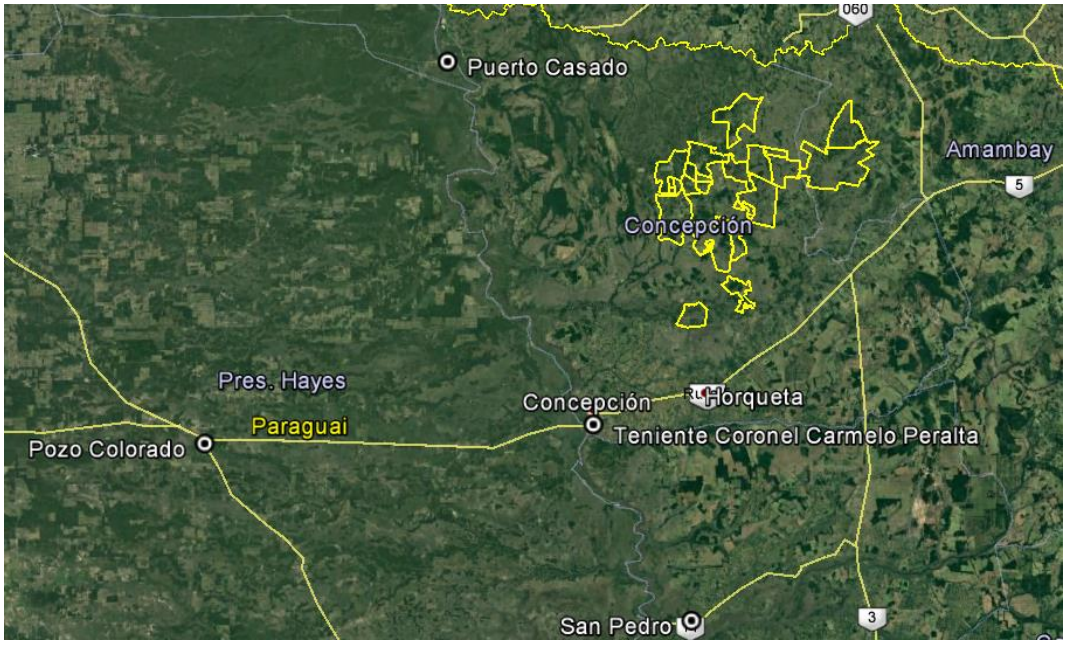

Figure 6 - Map of the location of the weather stations distant from the project. Source: Google Earth, 2020

6.1.1.2 Rainfall precipitation

No rainfall data are available in the database used for the study. Therefore, the study of rainfall precipitation was carried out by consulting the bibliography with information from previous studies of the region and the country.

Most of the country's rainfall is convective, produced by isolated storms or lines of instability that are frequent in spring and autumn. The average annual precipitation shows a great spatial variation. The greatest amplitude is towards the south of the country, varying zonally from 400 mm in the northwest of the Chaco to more than 1,800 mm in the Eastern Region.

The Paraná River basin is the wettest, with annual averages above 1800 mm, while the Paraguay River basin receives maximums of 1600 mm in the eastern region. Rainfall also shows great seasonal variability. They are lowest in July and August, and the average of the least rainy month usually does not reach 5% of the annual total. The highest volumes of precipitation occur during the months of October to April and are generally recorded in the form of storms or rainfall, as a result of atmospheric instability caused by strong warming of the lower layers of the atmosphere (Mayeregger and Romero 2017).

The highest precipitation rates in the region of Concepción occur in the summer. The month with the lowest rates is August, with an average of 28mm. In February and November, precipitation reaches its highest levels, between 128 and 152 mm on average. The average annual rainfall is approximately 1,190 mm[1].

[1] Source: https://es.weatherspark.com/

6.1.1.3 Atmospheric pressure

At the Puerto Casado station, the atmospheric pressure varied between 1,001.4 and 1,004.9 hPa, while the average for the period from 2013 to 2019 was 1,002.9 hPa.

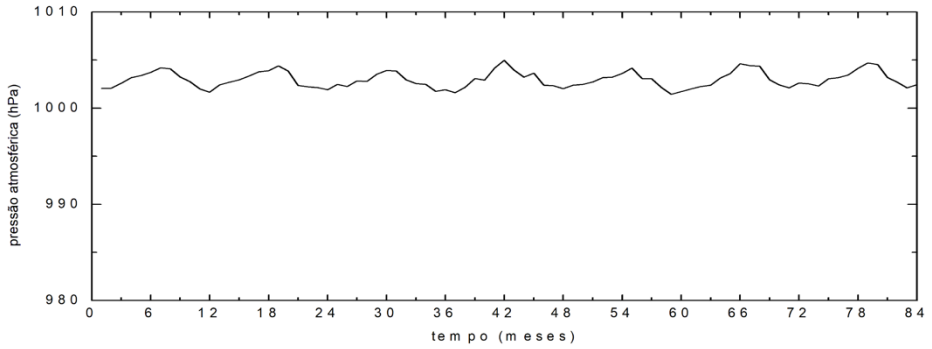

Figure 7 – Average monthly atmospheric pressure at the Puerto Casado station

At the Pozo Colorado station, the atmospheric pressure varied between 999.4 and 1,002.7 hPa, while the average for the period from 2013 to 2019 was 1,000.8 hPa.

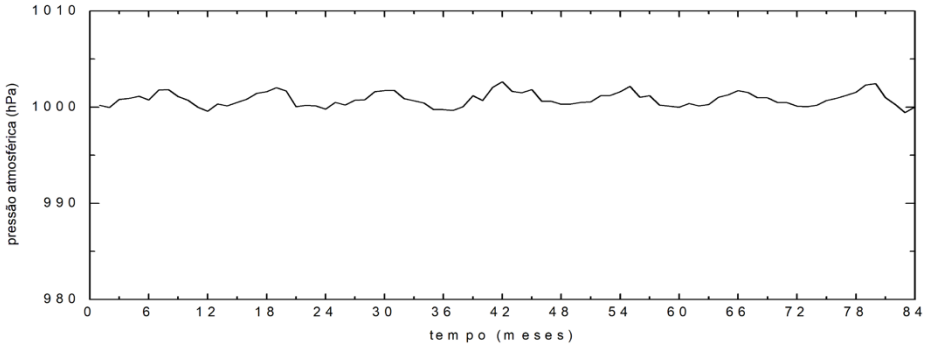

Figure 8 – Average monthly atmospheric pressure at the Pozo Colorado station

At the San Pedro station, the atmospheric pressure varied between 1,002.1 and 1,005.5 hPa, while the average for the period from 2013 to 2019 was 1,003.6 hPa.

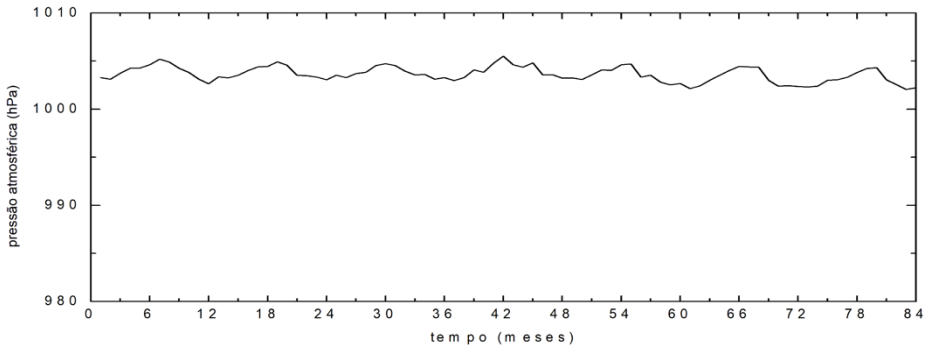

Figure 9 – Average monthly air pressure at San Pedro station

At the Lieutenant Colonel Carmelo Peralta station, the atmospheric pressure varied between 1,001.5 and 1,007.5 hPa, while the provisional average climate for the period from 2010 to 2019 was 1,003.9 hPa.

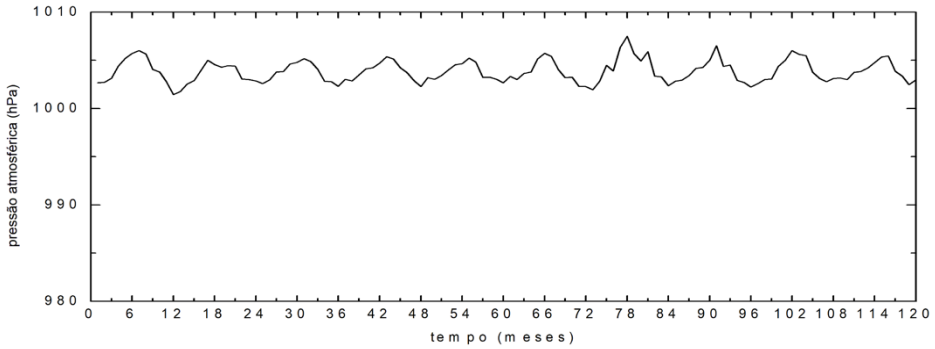

Figure 10 – Average monthly atmospheric pressure at the Teniente Coronel Carmelo Peralta station

Although the four weather stations cover a relatively large area and are separated by considerable distances, the atmospheric pressure behavior was similar in all stations and the average for the region was 1,002.8hPa.

6.1.1.4 Air temperature

At the Puerto Casado station, the average monthly temperature varied between 16.9˚C and 31˚C, while the average for the period from 2013 to 2019 was 25.7˚C.

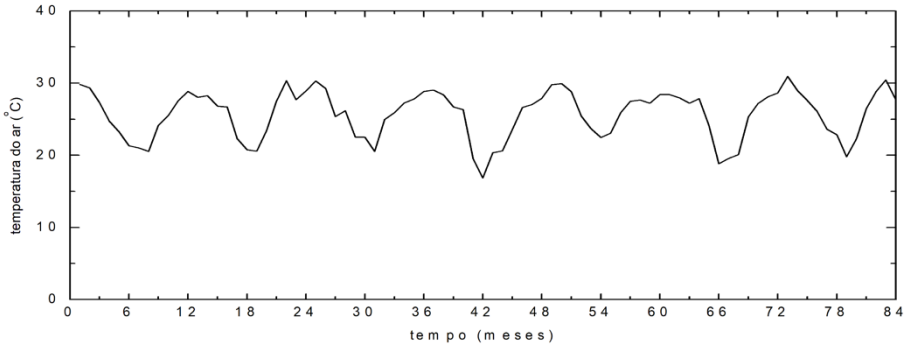

Figure 11 – Average monthly temperature at Puerto Casado station.

At Pozo Colorado station, the monthly average temperature varies between 15,5˚C and 31,2˚C, while the average for the period from 2013 to 2019 was 24.7˚C.

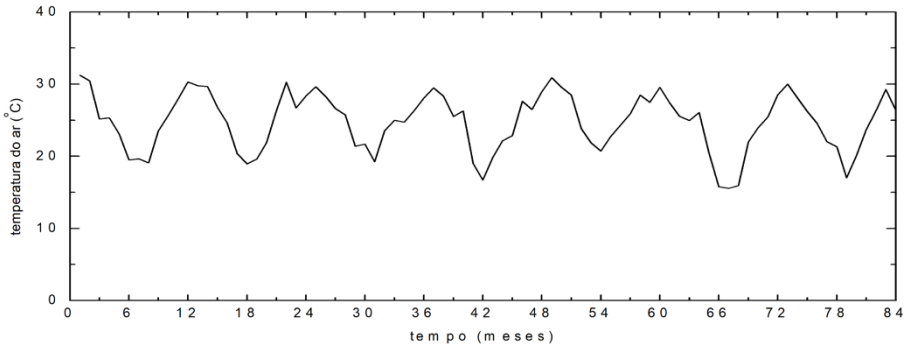

Figure 12 – Average monthly temperature at Pozo Colorado station

At the San Pedro station, the average monthly temperature varied between 16.5˚C and 30.5˚C, while the average climate for the period from 2013 to 2019 was 24.1˚C.

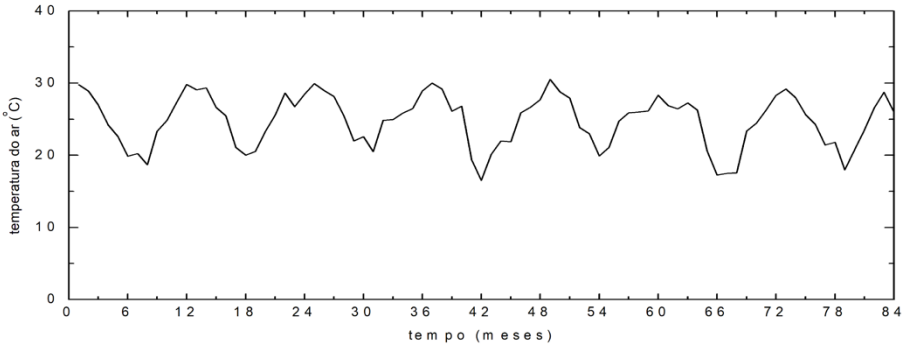

Figure 13 – Average monthly temperature at San Pedro station

At Teniente Coronel Carmelo Peralta station, the average monthly temperature varied between 15.5˚C and 29.6˚C, while the provisional average climate for the period from 2010 to 2019 was 24.3˚C.

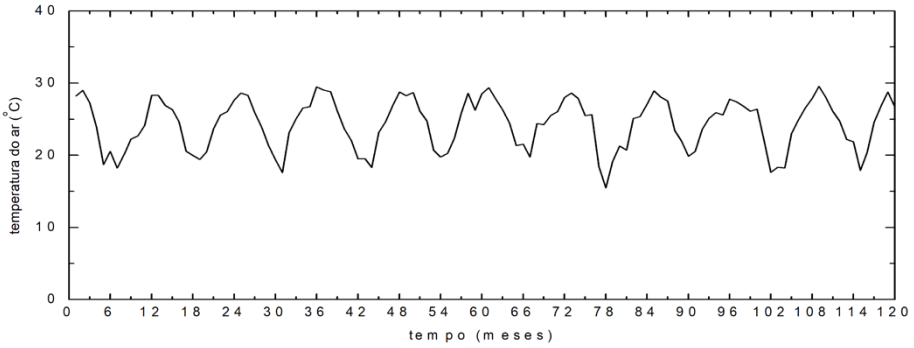

Figure 14 – Average monthly temperature at station Teniente Coronel Carmelo Peralta

The air temperature in the region is defined by the effect of continentality and topographic uniformity, presenting a great amplitude. In summer, as it is a tropical region, the maximum temperatures can exceed 30˚C, and in winter frost phenomena can be registered as a consequence of the entry of cold fronts.

The average temperatures are very similar in all the weather stations, from 24.1˚C in the San Pedro station, which is further south, to 25.7˚C in the Puerto Casado station, located further north. In the large region analyzed, the average temperature was 24.7˚C.

6.1.1.5 Relative humidity

At the Puerto Casado station, the monthly relative humidity varied between 46.7% and 79.6%, while the average for the period from 2013 to 2019 was 63%.

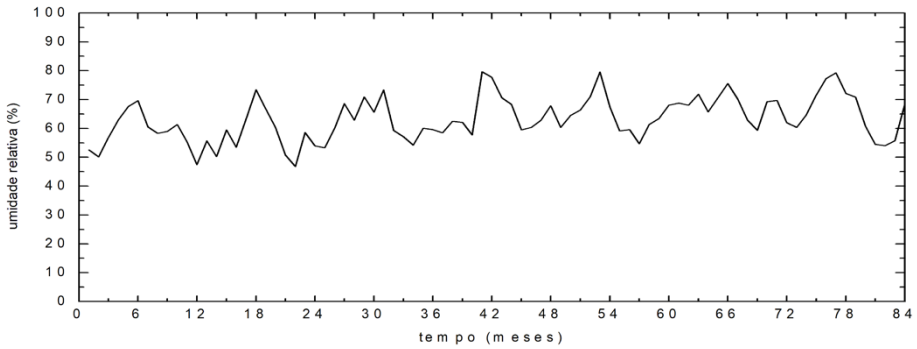

Figure 15 – Average monthly relative humidity at Puerto Casado station

At the Pozo Colorado station, the monthly relative humidity varied between 51.7% and 83.6%, while the average for the period from 2013 to 2019 was 70.2%.

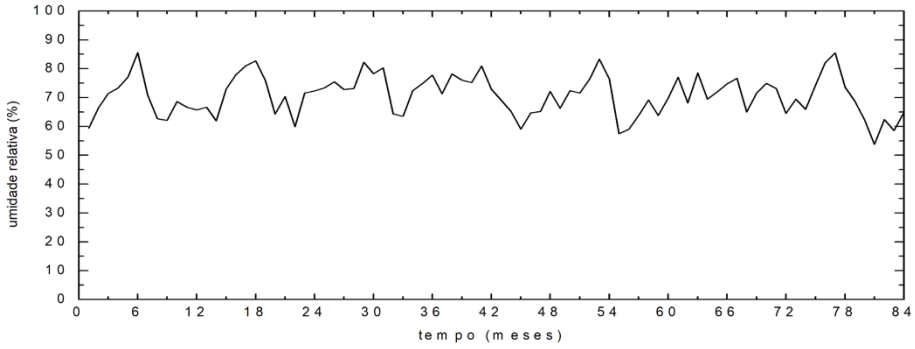

Figure 16 – Average monthly relative humidity at station Pozo Colorado

In the San Pedro station, the monthly relative humidity varied between 56.1% and 85.4%, while the average for the period from 2013 to 2019 was 70.5%.

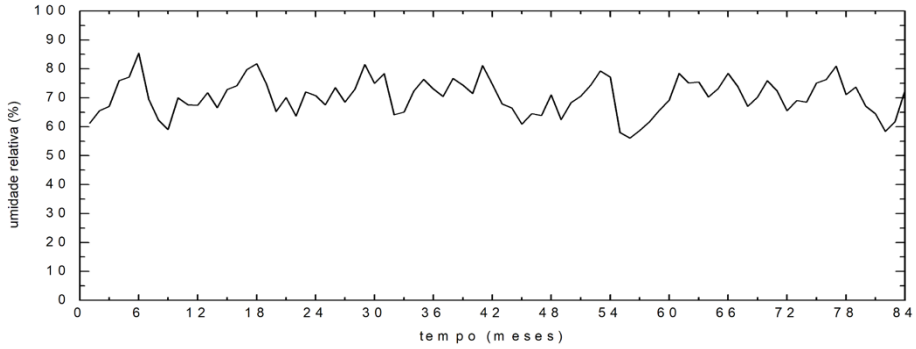

Figure 17 – Average monthly relative humidity at San Pedro station

At Teniente Coronel Carmelo Peralta station, the monthly relative humidity varied between 51.4% and 85.5%, while the provisional average for the period from 2010 to 2019 was 70.9%.

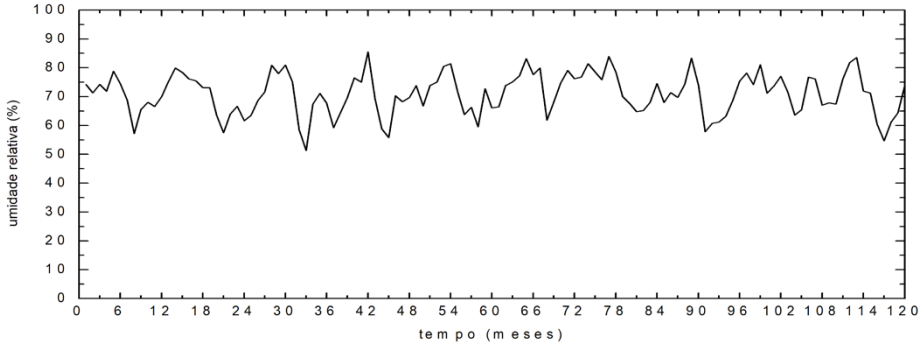

Figure 18 – Average monthly relative humidity at station Teniente Coronel Carmelo Peralta

The relative humidity at the Puerto Casado station, has an average relative humidity of 63%. The other regions presented values between 70.2% and 70.9%, the highest value

being at the station of Lieutenant Colonel Carmelo Peralta. This difference is due to the variability of rainfall among the regions.

6.1.1.6 Wind

At the Puerto Casado station, the average monthly wind speed varied between 0.76 and 2.49 m/s, while the average for the period from 2013 to 2019 was 1.47 m/s. The wind rose generated with the data obtained at the Puerto Casado station proves the predominance of south and north winds.

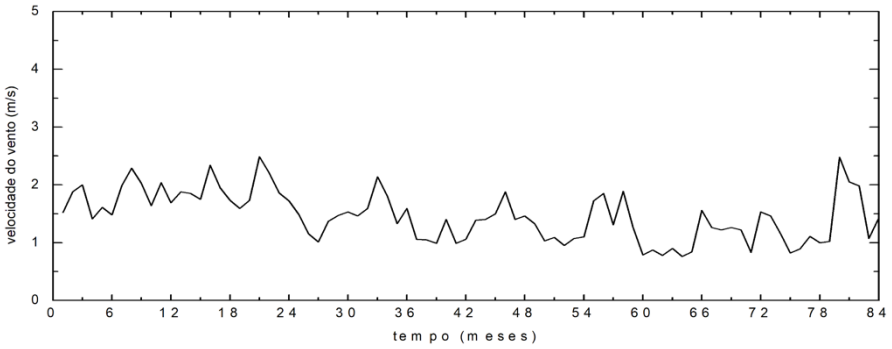

Figure 19 – Average wind speed at Puerto Casado station.

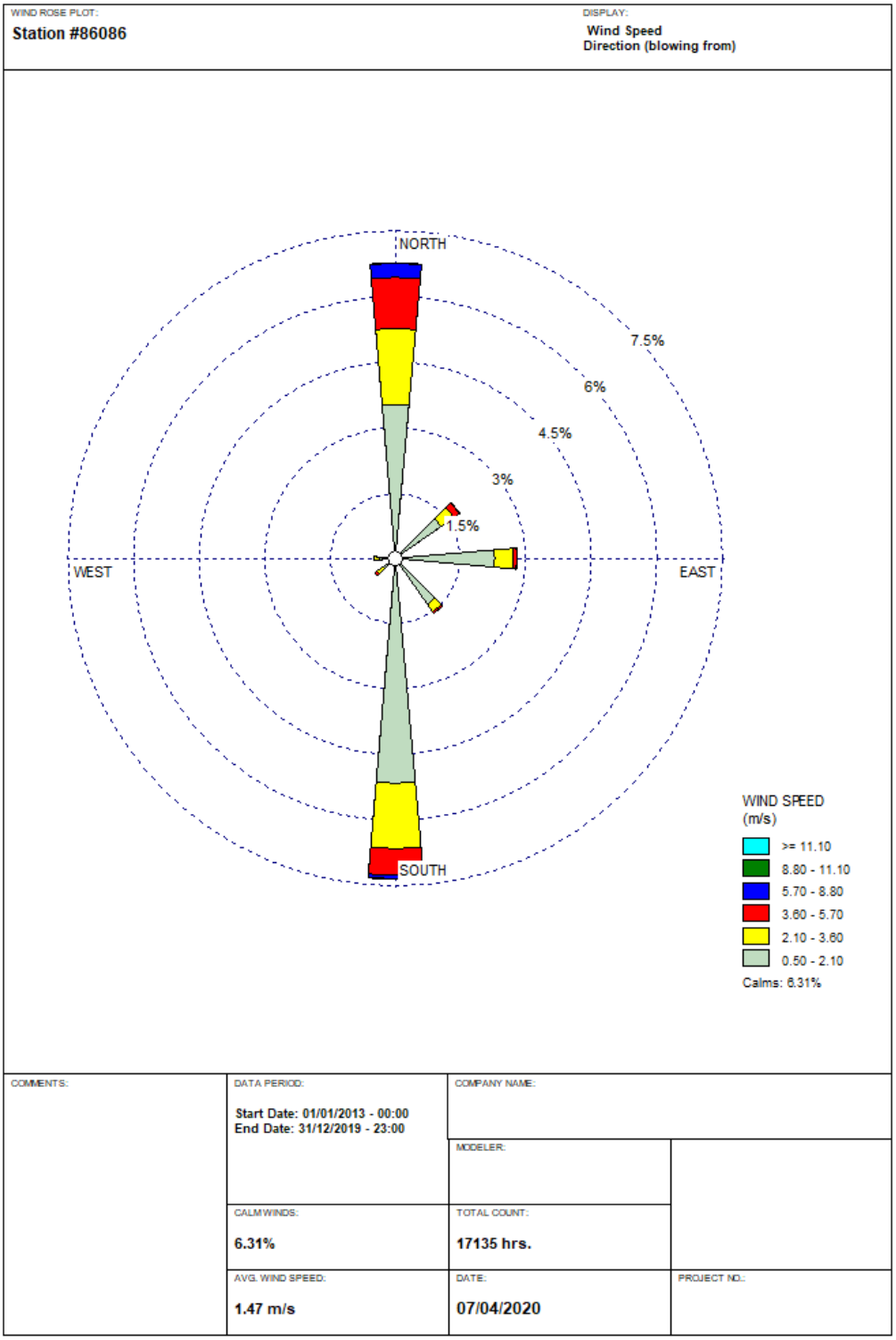

Figure 20 – Wind rose observed at the station Puerto Casado

At the Pozo Colorado station, the average monthly wind speed varied between 0.7 and 5.0 m/s, while the average for the period from 2013 to 2019 was 2.5 m/s. The wind rose generated with the data observed at the Pozo Colorado station proves the predominance of south and north winds, with important components from the northeast and east.

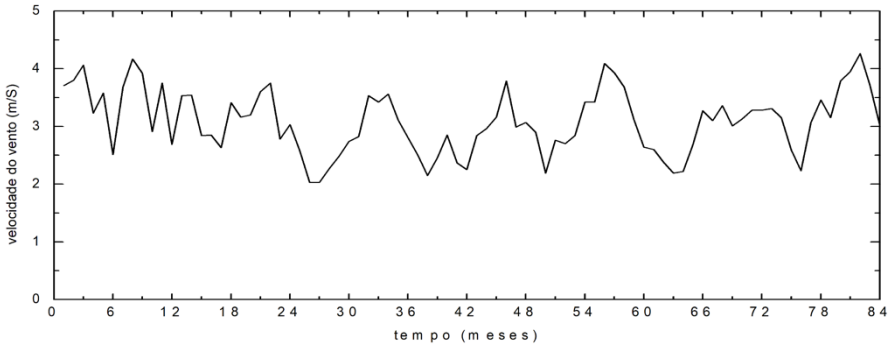

Figure 21 – Average wind speed at station Pozo Colorado

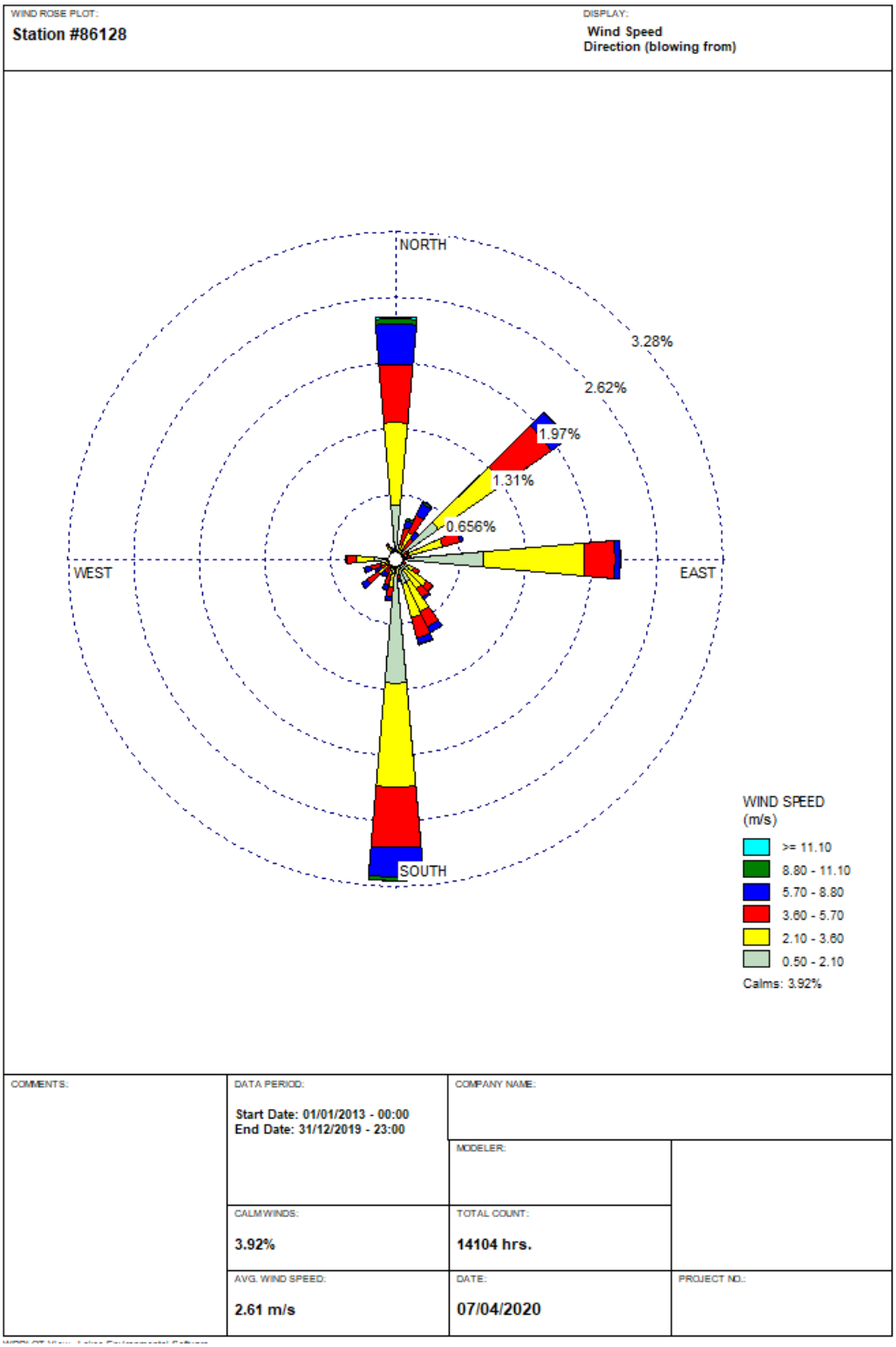

Figure 22 – Wind rose observed at Pozo Colorado station

At the San Pedro station, the average monthly wind speed varied between 0.5 and 3.7 m/s, while the average for the period from 2013 to 2019 was 1.9 m/s. The wind rose generated with the data observed at the San Pedro station proves the predominance of two winds from the south and north, followed by winds from the east.

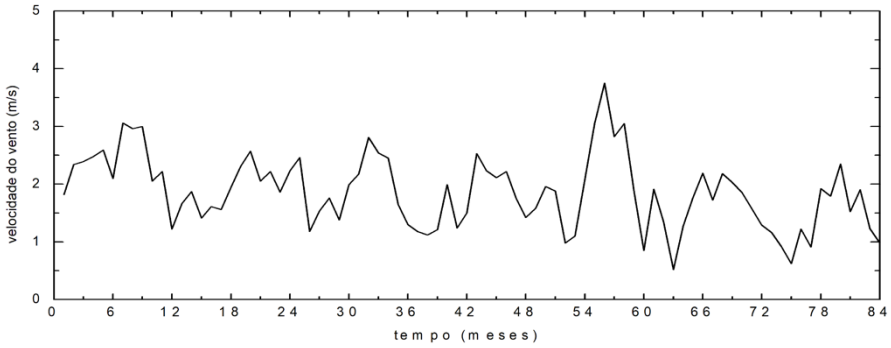

Figure 23 – Average wind speed at the station San Pedro

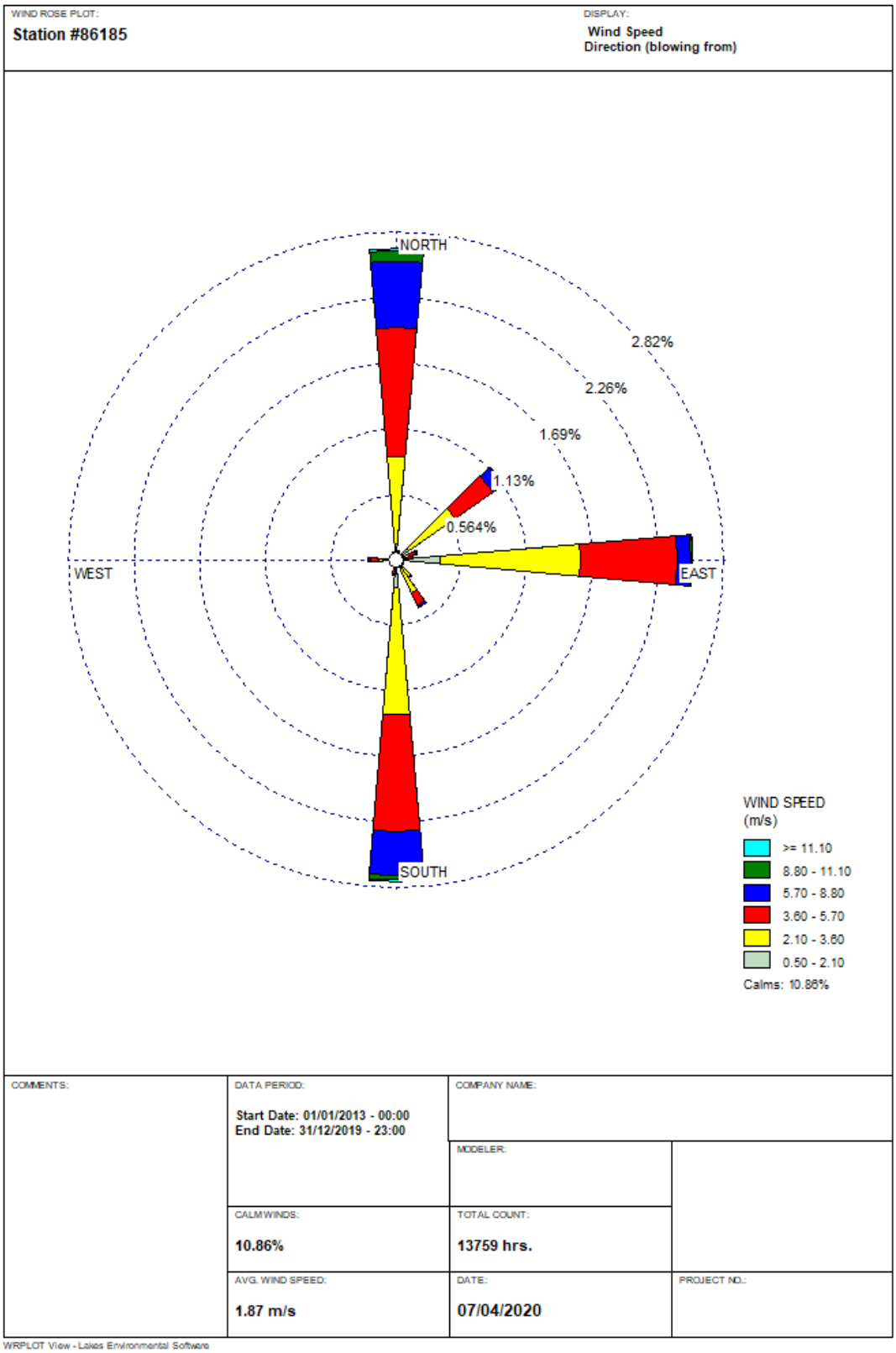

Figure 24 – Wind rose observed at the station San Pedro

At the Teniente Coronel Carmelo Peralta station, the average monthly wind speed varied between 1.8 and 4.9 m/s, while the provisional average for the period from 2010 to 2019 was 3.2 m/s.

The wind rose generated with the data observed at the Teniente Coronel Carmelo Peralta station proves the predominance of two winds from the south, followed by northeast and east, and with a less important component from the southeast.

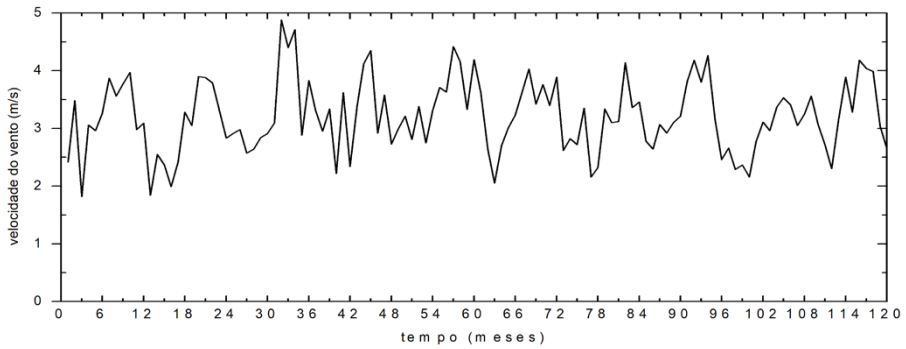

Figure 25 – Average wind speed at the station Teniente Coronel Carmelo Peralta

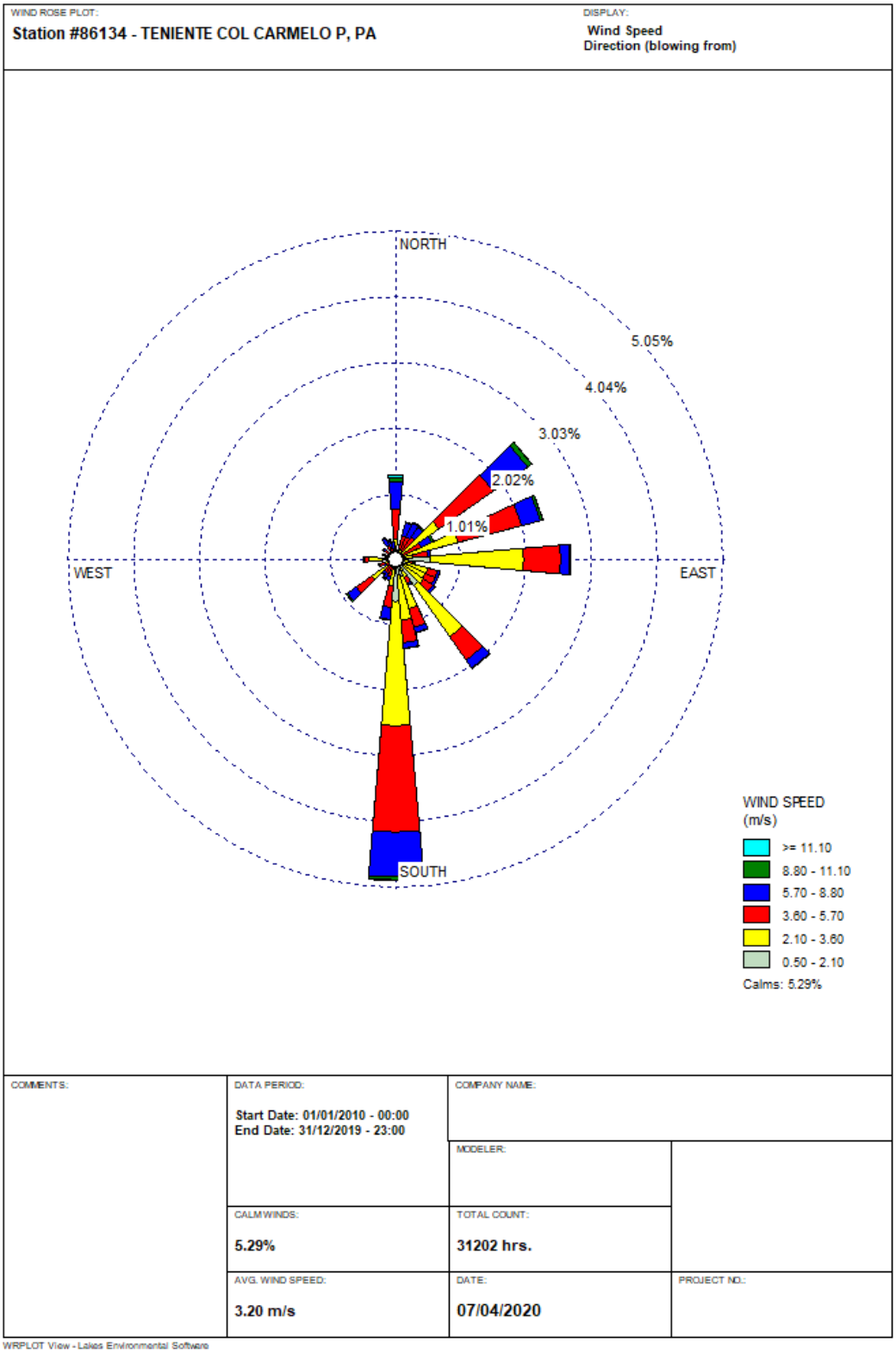

Figure 26 – Wind rose observed at the station Teniente Coronel Carmelo Peralta

The wind intensities in all regions are very similar and can be classified as weak winds, between 1.4 and 3.2 m/s. The highest wind speeds were registered at Teniente Coronel

Carmelo Peralta station. The predominant wind directions are north and south, followed by northeast and east winds.

6.1.2 Air Quality

This item presents the Air Quality Monitoring Report results of PARACEL pulp mill in the Municipality of Concepción, Department of Concepción, Paraguay, as reference, considering air quality should be similar in all area of the eucalyptus plantation.

The monitoring objective is to verify the air quality before the implementation and operation of the pulp mill (background).

The air quality monitoring was carried out through 2 campaigns, the first in the period from September 25 to October 16, 2019, and the second in the period from February 12 to March 4th, 2020.

This report was prepared using SEAM Resolution No. 259/2015, which establishes the air quality standard.

6.1.2.1 Collection points

Three different points were defined to evaluate the air quality in the region where the PARACEL factory is installed, which are:

- Point 01 – SENACSA/ Departmental Animal Health Commission

  Address: Calle Gral. Díaz c/ Rufino Spika – Concepción/Paraguay

  Coordinates: UTM 21K 0454572 - 7410810

- Point 02 – Loreto Municipality/ Paraguay

  Address: Av. Eusebio Ayala Y Centro Corá – Loreto/Paraguay

  Coordinates: UTM 21K 0466753 - 7426022

- Point 03 – National Police Station – Comisaría nº18 Col. Roberto L. Petit

  Address: Puesto Policial Nacional – Comisaría nº18 – Col. Roberto L. Petit – Concepción/Paraguay

  Coordinates: UTM 21K 0457325 – 7434506

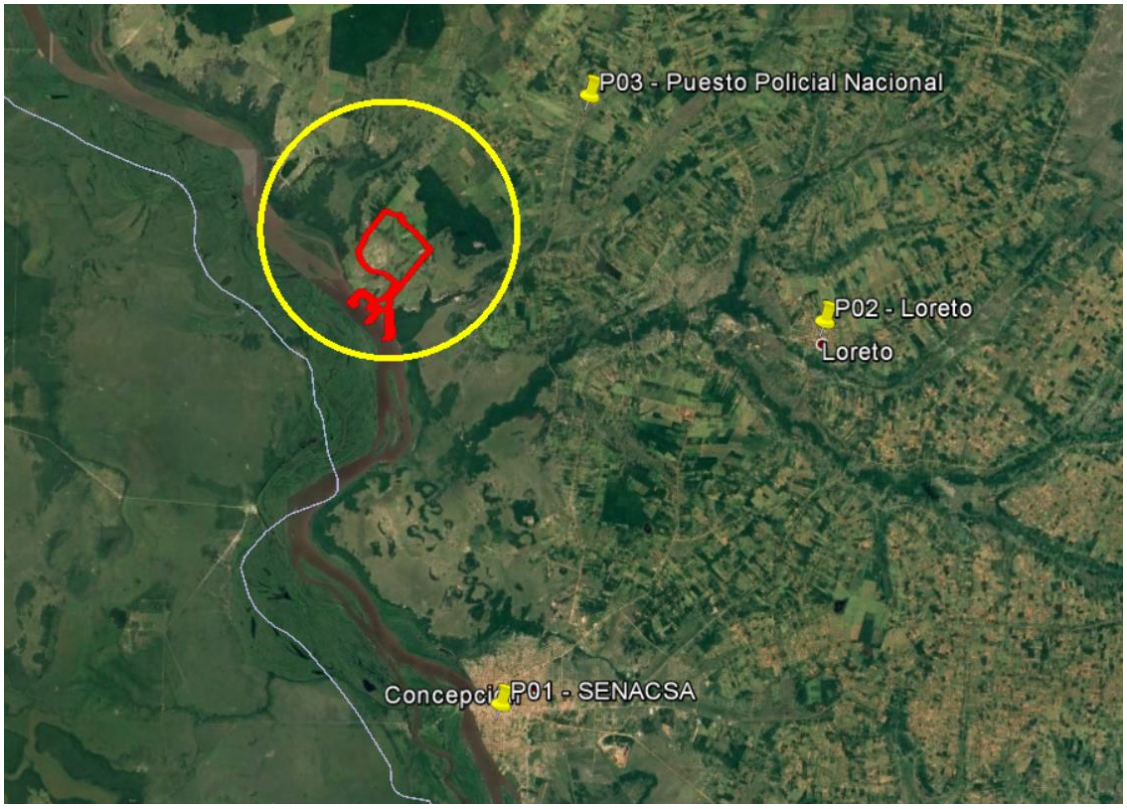

Figure 27 – Location of campaign monitoring points. Source: Pöyry Tecnologia (2020)

Figure 28 – Point P01. Source: Geoavaliar (2020)

Figure 29 – Point P02. Source: Geoavaliar (2020)

Figure 30 – Point P03. Source: Geoavaliar (2020)

6.1.2.2 Parameters

To monitor the current air conditions, the parameters were considered: Total Suspended Particles (TSP), Inhalable Particles (IP - PM_{10}), Respirable Particles (RP - $PM_{2.5}$), Nitrogen Dioxide (NO_2), Sulfur Dioxide (SO_2), Total Reduced Sulfur (TRS), Carbon Monoxide (CO), Ozone (O_3), Hydrogen Sulfide (H_2S) and Volatile Organic Compounds (VOC).

6.1.2.3 Methods

The samples were taken at 3 points, and 7 collections occurred at each of the sampling locations (points), with an approximate duration of 24 hours for the parameters Total Suspended Particles (TSP), Inhalable Particles (IP - PM_{10}), Respirable Particles (RP - $PM_{2.5}$), Nitrogen Dioxide (NO_2), Sulfur Dioxide (SO_2), Ozone (O_3), Hydrogen Sulfide (H_2S); approximately 1 hour for Total Reduced Sulfur (TRS) and Carbon Monoxide (CO) parameters; 20 minutes for Volatile Organic Compounds (VOC).

The references of the methodologies used are presented below.

- 40 CFR Appendix B to Part 50 - Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere (High-Volume Method);
- 40 CFR Appendix J to Part 50 - Reference Method for the Determination of Particulate Matter as PM_{10} in the Atmosphere;
- 40 CFR Appendix L to Part 50 - Reference Method for the Determination of Fine Particulate Matter as $PM_{2.5}$ in the Atmosphere;
- ISO 4220:1983 - Ambient air — Determination of a gaseous acid air pollution index — Titrimetric method with indicator or potentiometric end-point detection;
- US EPA METHOD Nº QN 1277:1977 - Sodium Arsenite Method for the Determination of Nitrogen Dioxide in the Atmosphere/
- EQOA-0206-148 - Environment S.A Model O342M UV Photometric Ozone Analyzer;

- US EPA EMC Conditional Test Method (CTM-030) - Determination of Nitrogen Oxides, Carbon Monoxide, and Oxygen Emissions from Natural Gas-Fired Engines, Boilers and Process Heaters Using Portable Analyzers;
- US EPA Method 16A - Total Reduced Sulfur – Impinger – Adapted Method for Air Quality Monitoring;
- US EPA Method 11 — Determination Of Hydrogen Sulfide Content Of Fuel Gas Streams In Petroleum Refineries – Adapted Method for Air Quality Monitoring;
- US EPA Method 18 - Volatile Organic Compounds by Gas Chromatography

In order to compare and assess the results registered, the limits stated by SEAM Resolution n. 259/2015 were considered and also the limits of the air quality standards presented by the US EPA - Environmental Protection Agency.

6.1.2.4 Results

The results are presented in the table below.

Table 1 – Results of first air quality campaign

Resultados del Análisis Concentración de Setiembre - Octubre/2019																					
Estación de Monitoreo	Colecta	Resultado del Monitoreo										En acuerdo con la Resolución SEAM nº 259 del 3 de júlio de 2015 (µg/m3)								CETESB	
		PTS (MP) µg/m³ (24 horas)	PI (PM10) µg/m³ (24 horas)	PI (PM2,5) µg/m³ (24 horas)	SO_2 µg/m³ (24 horas)	NO_2 µg/m³ (1 hora)	VOC µg/m³ (20 minutos)	O_3 µg/m³ (8 horas)	CO µg/m³ (8 horas)	TRS µg/m³ (1 hora)	H_2S µg/m³ (24 horas)	PTS	PI (PM10)	PI (PM2,5)	SO_2	NO_2	VOC	O_3	CO	TRS	H_2S
Punto 01 - Senacsa/ Comision Departamental de Salud Animal	1ª	69,37	42,39	31,96	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
	2ª	136,99	70,90	56,31	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
	3ª	201,09	93,51	65,84	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
	4ª	150,55	78,23	58,41	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
	5ª	113,27	53,59	42,82	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
	6ª	130,91	64,34	52,52	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
	7ª	178,64	63,88	50,36	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
Punto 02 - De Municipalidad de Loreto/ Paraguay	1ª	55,11	32,91	28,36	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
	2ª	66,04	37,92	30,49	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
	3ª	64,06	31,36	27,99	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
	4ª	8,36	5,40	4,72	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.		150	30	20	200		120	10	6,55	6,55
	5ª	23,00	11,72	9,10	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
	6ª	36,15	20,27	16,49	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
	7ª	38,72	21,79	18,52	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
Punto 03 - Posto Policial Nacional - Comsaria nº18 Col. Roberto L. Petit	1ª	54,55	29,33	21,27	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
	2ª	32,05	20,30	14,26	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	98,98										
	3ª	34,87	26,89	16,30	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	98,68										
	4ª	40,75	27,70	18,48	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
	5ª	35,89	25,65	16,12	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	99,06										
	6ª	23,87	17,01	11,43	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	100,49										
	7ª	16,96	7,39	5,45	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	25,14										

Table 2 – Results of second air quality campaign

Resultados del Análisis Concentraciones de Febrero-Marzo/2020																					
Estación de Monitoreo	Colecta	Resultado del Monitoreo										En acuerdo con la Resolución SEAM nº 259 del 3 de júlio de 2015 (µg/m3)								CETESB	
		PTS (MP) µg/m³ (24 horas)	PI (PM10) µg/m³ (24 horas)	PI (PM2,5) µg/m³ (24 horas)	SO_2 µg/m³ (24 horas)	NO_2 µg/m³ (1 hora)	VOC µg/m³ (20 minutos)	O_3 µg/m³ (8 horas)	CO µg/m³ (8 horas)	TRS µg/m³ (1 hora)	H_2S µg/m³ (24 horas)	PTS	PI (PM10)	PI (PM2,5)	SO_2	NO_2	VOC	O_3	CO	TRS	H_2S
Punto 01 - Senacsa/ Comision Departamental de Salud Animal	1ª	59,93	34,35	23,95	17,63	1,09	N.D.	N.D.	N.D.	N.D.	N.D.										
	2ª	64,74	32,77	25,38	19,48	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
	3ª	53,56	34,77	21,81	16,82	N.D.	0,18	N.D.	N.D.	N.D.	N.D.										
	4ª	48,89	29,94	19,18	13,28	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
	5ª	49,91	27,52	16,79	12,46	N.D.	0,11	N.D.	N.D.	N.D.	N.D.										
	6ª	70,10	36,31	23,16	14,14	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
	7ª	56,08	30,55	17,31	11,94	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
Punto 02 - De Municipalidad de Loreto/ Paraguay	1ª	42,31	25,48	19,54	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
	2ª	70,43	38,33	29,94	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
	3ª	67,22	27,47	30,34	N.D.	N.D.	0,15	N.D.	N.D.	N.D.	N.D.										
	4ª	76,89	43,09	35,94	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.		150	30	20	200	20	120	10	6,55	6,55
	5ª	40,11	26,30	20,66	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
	6ª	59,36	26,96	20,74	N.D.	N.D.	0,38	N.D.	N.D.	N.D.	N.D.										
	7ª	60,93	30,70	23,28	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
Punto 03 - Estación de Policía Nacional - Comisária nº18 Col. Roberto L. Petit	1ª	107,18	38,13	27,37	N.D.	N.D.	0,01	N.D.	N.D.	N.D.	N.D.										
	2ª	83,68	29,73	20,09	N.D.	N.D.	0,21	N.D.	N.D.	N.D.	N.D.										
	3ª	165,03	58,49	44,16	N.D.	N.D.	0,18	N.D.	N.D.	N.D.	N.D.										
	4ª	103,01	42,58	25,62	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.										
	5ª	133,13	49,92	27,51	N.D.	N.D.	0,18	N.D.	N.D.	N.D.	N.D.										
	6ª	74,95	31,48	19,22	N.D.	N.D.	0,24	N.D.	N.D.	N.D.	N.D.										
	7ª	132,30	45,49	26,11	N.D.	N.D.	0,15	N.D.	N.D.	N.D.	N.D.										

Nota 1. Límite establecido por medio de la Resolución SEAM 259/2015

Nota 2. No Existe límite en establecido en la Resolución SEAM 259/2015 para Compuestos Orgánicos Volatiles (COV). Asimismo, empleose el límite de exposición fijados por base horaria (TWA) por la "American Conference of Governmental Industrial Hygienists (ACGIH)" para Tolueno, el COV identificado en el análisis.

Nota 3. No existe límite para comparación fijados por la Resolución SEAM n 259/2015, para los parámetros TRS e H_2S. Asimismo, se empleo el límite de percepción del olor para H_2S presente en la FISPQ del producto.

PTS - Total Suspended Particles

Considering Resolution n. 259/2015, there is no limit for Total Suspended Particles (TSP), being therefore in charge of the environmental body the interpretation of the reported results.

Inhalable Particles (IP - PM_{10})

Considering the limit established by Resolution n. 259/2015, whose maximum permitted 24-hour concentration of Inhalable Particles (PM_{10}) is 150 µg/m^3, after comparing the results obtained in the two monitoring campaigns, it was confirmed that in the monitored period all data collections were below the limit established in the regulations.

Respirable Particles (PR - $PM_{2.5}$)

Considering the limit established in Resolution n. 259/2015, whose maximum concentration in the 24-hour period of Respirable Particles ($PM_{2.5}$) is 30 µg/m^3, after comparing the data obtained in the two monitoring campaigns, it was revealed that all the collections of Point 01, and one collection of Point 02, presented concentrations above the regulations. It is possible that this is material associated with re-suspension of particulate matter from unpaved roads and emissions from vehicles running on diesel fuel. Other data obtained showed concentrations below the limit established by the aforementioned resolution in the monitoring period.

According to GEOAVALIAR, the difference observed in the premises has its origin in circumstances around Point 01, in Concepción, Paraguay. That monitoring point has unpaved public roads and is largely diesel-fueled vehicles. Thus, the phenomenon of re-suspension of particulates and vehicle emissions contribute by the addition in the analyses performed, since Points 02 and 03 are located respectively in a small jurisdiction and rural area and show little or no influence on the events verified.

SO_2 - Sulfur Dioxide

Considering the limit established by Resolution n. 259/2015, and the maximum permitted 24-hour concentration of Sulfur Dioxide (SO_2) of 20 µg/m^3, after comparing the results obtained in the two monitoring campaigns, the concentration below the regulatory limit was verified, because it was not detected.

NO_2 - Nitrogen Dioxide

Considering the limit established by Resolution n. 259/2015, and the maximum permitted 1 (one) hour concentration of Nitrogen Dioxide (NO_2) of 200 µg/m^3, after comparing the data obtained in the two monitoring campaigns, it was verified that all data collected were presented below the limit, once the parameter was not detected.

O_3 - Tropospheric Ozone

It is verified that the data obtained in the two monitoring campaigns presented data below the limit established in Resolution n. 259/2015 whose average concentration of 8 (eight) hours is 120 µg/m^3.

CO – Carbon Monoxide

The results obtained in the two monitoring campaigns were below the limit established by Resolution n. 259/2015, whose 8 (eight) hour average concentration is 10 µg/ m^3.

H_2S - Total Reduced Sulfur and Hydrogen Sulfide

There is no reference to emission limits for these parameters in the technical literature. Therefore, the control body must establish a comparison between the data obtained and international environmental regulations.

According to Geoavaliar, in Point 03 of the first campaign, possible sources of hydrogen sulfide pollutant emissions through lagoons and water wells containing vegetation in the process of eutrophication and putrefaction were verified in the location near the monitoring equipment and devices. From that consideration it's possible to consider the emission of hydrogen sulfide originated from the Anaerobic Digestion process (process of conversion of organic matter in conditions of absence of oxygen), are employed inorganic electron acceptors such as NO_3 (reduction of Nitrate), SO_4 (reduction of Sulfate) or methane formation (CH_4). Anaerobic digestion can be considered as an ecosystem of different groups of microorganisms that are in interaction to convert complex organic matter into methane, carbon gas, water, hydrogen sulphide and ammonia gas, and other new bacterial cells. It should be noted that the results obtained are expressed in micrograms per cubic meter of air collected, and any source of contribution in the vicinity is capable of significantly altering the results.

In the second campaign, it was observed that the contaminants Hydrogen Sulfide and Total Reduced Sulfur are below the odor perception limit for H_2S by the IFCS (6.55 $\mu g/m^3$).

VOCs - Volatile Organic Compounds

The results obtained are significantly below the American Conference of Governmental Industrial Hygienists (ACGIH) average daily value for toluene exposure of 20 ppm. The comparative value was adopted since Resolution n. 259/2015 does not state a standard for that contaminant.

6.1.3 Noise

PARACEL will carry out a Noise Monitoring for the area surrounding the plantations, in order to verify the environmental sound pressure level present in the area, prior to the project implementation and operation (background levels).

The sound pressure level will be compared with the limits established by the Law for the Prevention of Noise Pollution (Law n. 1,100/97).

Law n. 1,100/1997 aims to prevent noise pollution on public roads, squares, parks, sidewalks, exhibition halls, meeting centers, sports and social clubs and in all public and private activities that produce noise pollution in Paraguay.

Article 9^{th} of the aforementioned law establishes the noise limits, according to the type of environment, as shown in the table below.

Table 3 – Noise limits established by Law 1100/97 (in decibel "A" dB (A))

Environment	Night (20:00 – 07:00)	Day (07:00 – 20:00)	Day (Occasional peak) (07:00 – 12:00 / 14:00 – 19:00)
Residential areas, specific use, public spaces: recreation areas, parks, squares and public roads	45	60	80
Hybrid areas, transition areas, city center areas, specific programs, service areas and public buildings	55	70	85
Industrial area	60	75	90

In addition, it should be noted that the PARACEL project will be based on international standards, such as noise level guidelines from the General EHS Guidelines of IFC, as shown in the table below.

Receptor	Day 07:00 to 22:00	Nightime 22:00 to 07:00
	One Hour $L_{Aeq\ (dBA)}$	
Residential; institutional; educational	55	45
Industrial; commercial	70	70

Source: General EHS Guidelines: Environmental - Noise Management by IFC, 2007.

6.1.4 Geology

From a geological point of view, Paraguay is located on two different formations: the Brazilian shield and the Andean Depression, which largely correspond to the regions already mentioned. The eastern region is more diverse in its origin, with formations originating in the Mesozoic, Paleozoic and even the Agnostozoic, one of the oldest formations, while the whole of the Chaco territory, with few exceptions, corresponds to Tertiary layers, with relatively recent geological ages between two and 65 million years (DBEnvironnement, 1999).

The following figure presents a synthesis of the geology of Paraguay and the stratigraphic column of the geology of Paraguay. The regional geological characterization and the areas of influence of PARACEL Eucalyptus Plantation are presented below, with data from the website of the Vice-Ministry of Mines and Energy.

The following information has been extracted from the Pulp Mill and Port Environmental Impact Study & Report (EIAp/RIMA): Book I - Environmental Diagnosis Of The Physical Environment (PÖYRY, 2020).

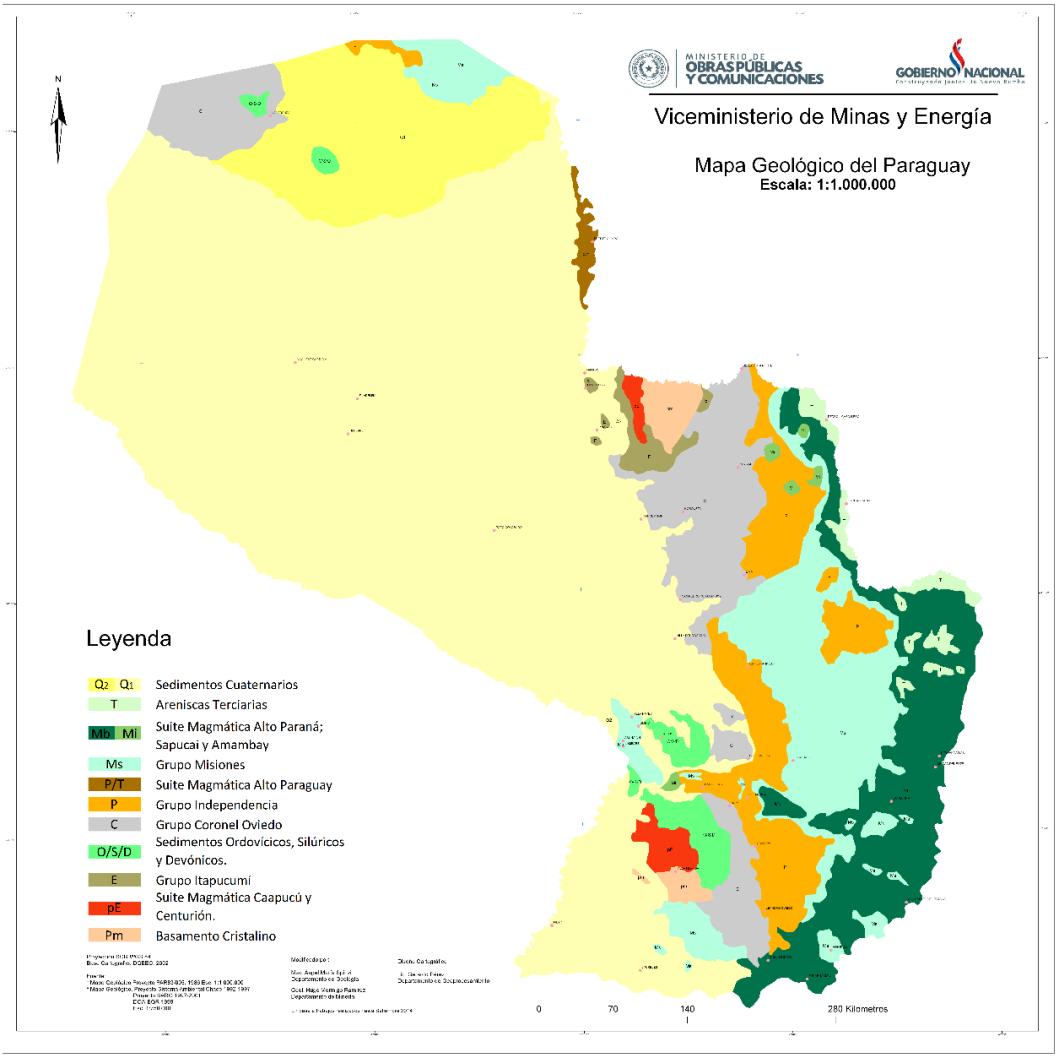

Figure 31 – Synthesis of the Geology of Paraguay. Source: González, 2000

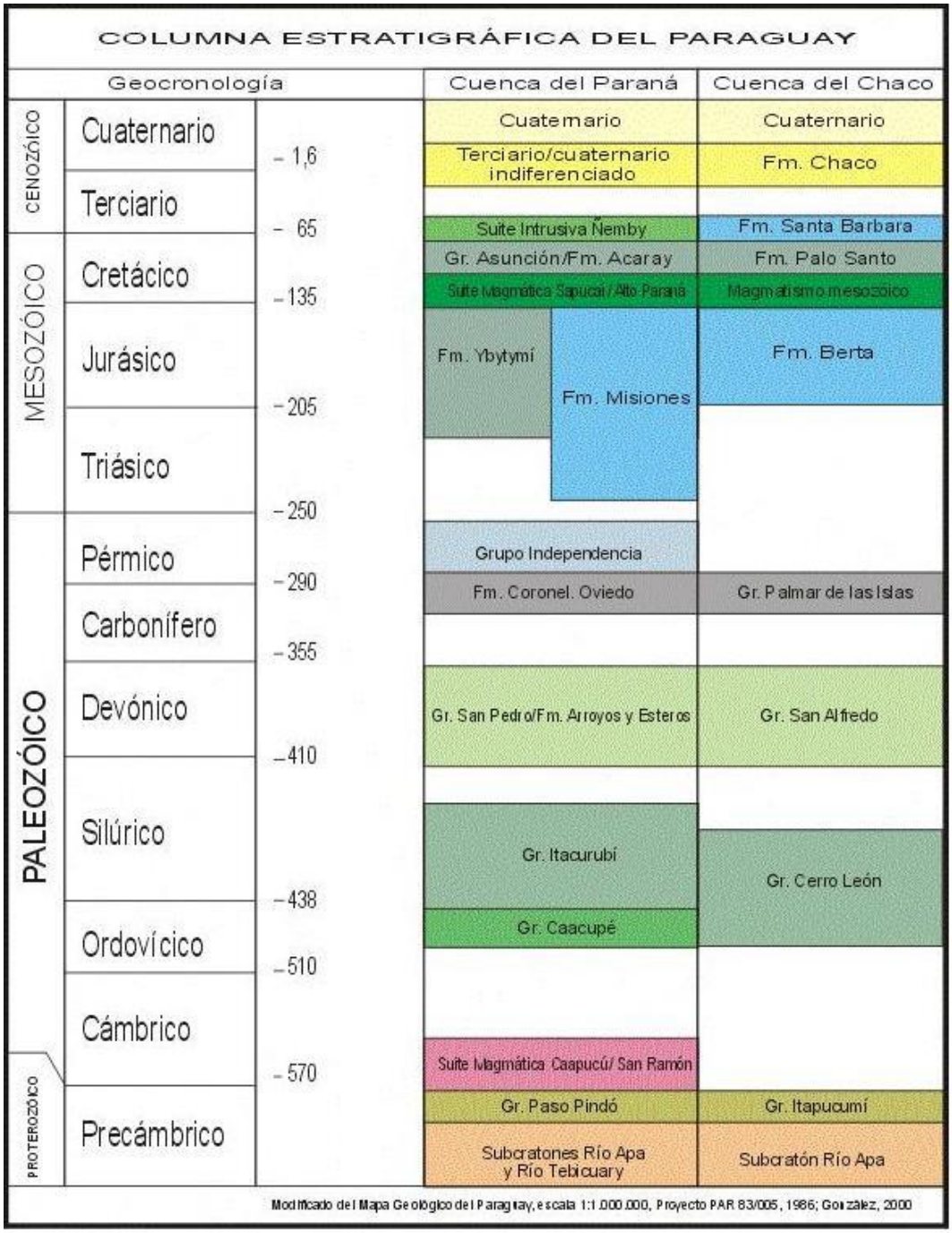

Figure 32 – Tectonic-Stratigraphic Column of Paraguay. Source: González, 2000

6.1.4.1 Regional Characterization (IIA)

6.1.4.1.1 Chratonical Provinces

The Chrathonic Provinces of Paraguay are located mainly in the Eastern Region and occur in two distinct areas. One to the north in the border area with Brazil, called the Province of Rio Apa and the other, the Province of Rio Tebicuary in the Central-South.

Both provinces are formed by chronic blocks that include the oldest units with Paleoproterozoic ages, Meso Proterozoic Folded Belts and Neoproterozoic-Eocambrian platform units.

The Apa River Block is made up of the homonymous complex and is represented mainly by gneiss, mafic and leukocratic, granite-gneiss, metasediments and granitic-pegmatic intrusives of Lower to Middle Proterozoic age and the Centurion Magmatic Suit corresponding to thick granite-type plutonic-volcanic rocks, sometimes porphyritic and acidic to intermediate pyroclastic metavolcanic rocks, of Middle Proterozoic age (K/Ar 1,650 ± 63 Ma).

The Apa River Complex is disproportionately covered by carstic metasedimentites of the San Luis Group, in its western portion, while in the eastern part it is superimposed by carbonate-classic rocks of the Itapucumi Group of Vendian age. Both units, in turn, are intruded by plutonic igneous and intermediate acidic volcanic rocks called San Ramon Magmatic Suites. This last magmatism is considered a non-detectonic event of the Brasiliano Cycle.

The Province of Rio Apa is mainly a producer of limestone, calcite, dolomitic and marble. It also presents anomalies of metallic minerals such as Ag-Pb-Zn and tin; in addition, there are quartz veins, pegmatites carrying large sheets of muscovite and other pegmatites carrying tourmaline and beryl.

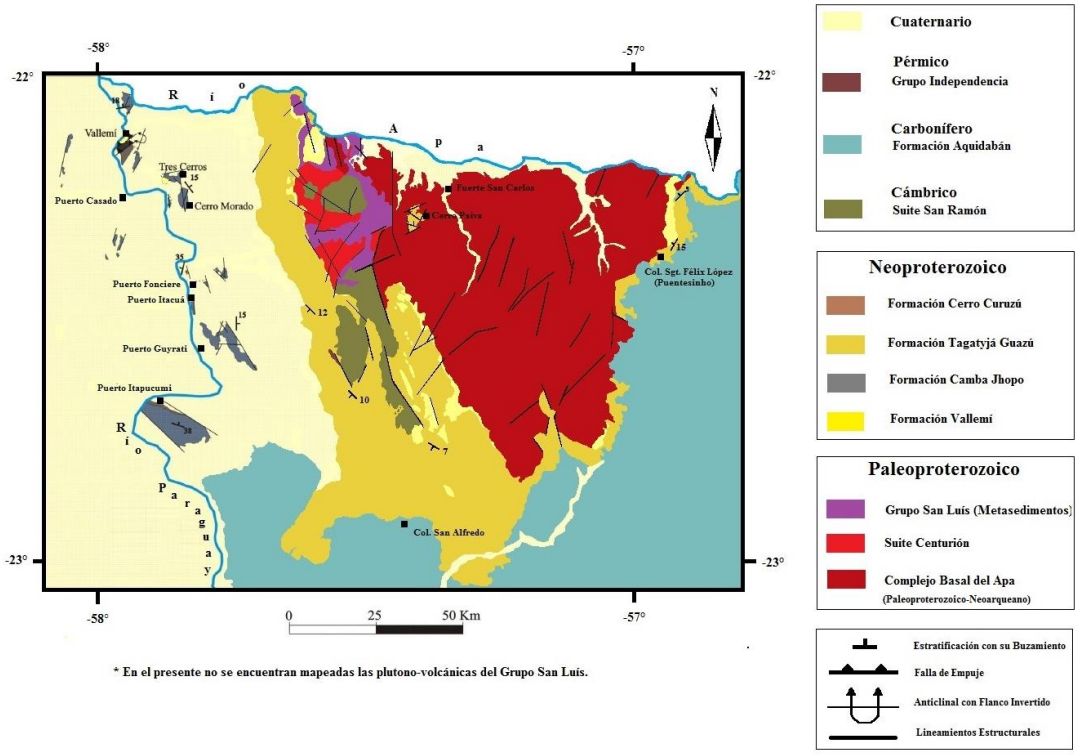

Figure 33 – Craton of Apa river. Source: website Geología del Paraguay

The Rio Tebicuary Block located southeast of Asuncion is represented by three lithostratigraphic units: Rio Tebicuary Complex, Paso Pindó Group and the Caapucu Magmatic Suite.

The Tebicuary River Complex includes two units: the Villa Florida Metamorphic Suite and the Centu-Cué Granodiorite. The first one gathers a set of crystalline rocks affected by regional metamorphism of medium to high degree, within the amphibolite and granulite facies, of Lower Proterozoic age, Transamazonian Cycle (2,000 ± 200 Ma).

Lithologically, this unit is constituted by paragneis and orthogneis, associated with quartzite, chalcosilicate, marble, amphibolite and ultrabasic rocks, transformed into talc shale and serpentinite. On the other hand, the second unit is represented by intruded porphyritic acid rock in the gneisses. This last event evidences intense deformations during the synthetodetectonic phase of the Trans-Amazonian Cycle, generating folding, migmatization and fracturing.

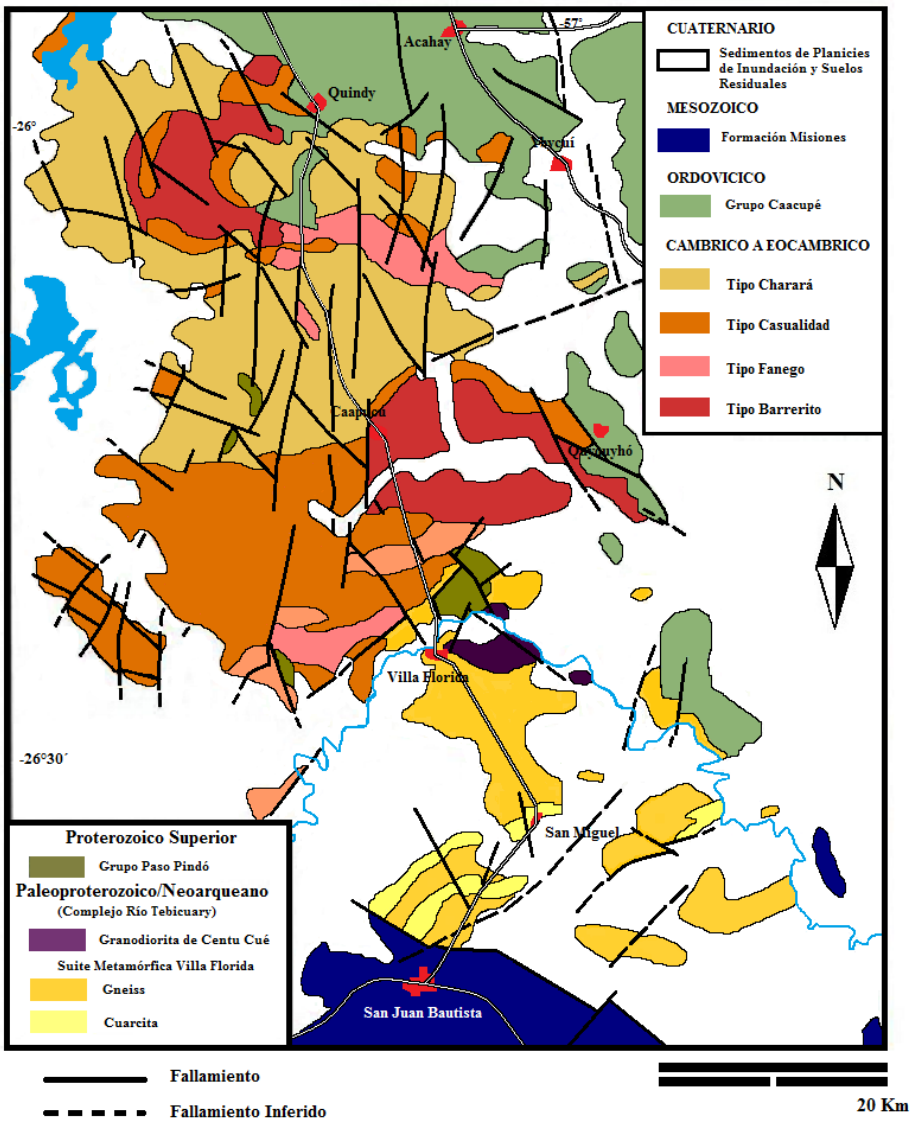

Figure 34 – Craton of Tebicuary river. Source: website Geología del Paraguay

The Paso Pindó Group takes a divergent position on the Tebicuary River Complex. This unit, made up of silica sediments and volcanic-clastic sediments, has been affected by a low grade metamorphism (easy from green shales), during the Brasiliano Cycle, in the Upper Proterozoic (± 600Ma).

The Caapucu Magmatic Suite intrudes in the post-tectonic phase of the Brasiliano Cycle to the Tebicuary River Complex and the Paso Pindó Group. This acidic magmatic event is constituted by rocks with several emplacement levels (plutonic, hypoabyssal and effusive), mainly from coarse to porphyritic granites, granite/rhyolite porphyry and rhyolite, of Rb/Sr 531 ± 5 age (Cubas et al. 1997).

Small isolated occurrences of granitic rocks in the Caapucu Magmatic Suite, occur in the center of the Eastern Region, associated with the structuring of the Asuncion Rift.

With regard to tectonics, the Tebicuary River Block can be divided into two main events: the Trans-Amazonian Cycle (Tebicuary River Complex) and the Brazilian Cycle (Paso Pindó Group and Caapucú Magmatic Suite).

6.1.4.1.2 Phanerozoic Basin

The Phanerozoic in Paraguay is represented by two large basins: Chaco Basin and Parana Basin. In them, sedimentary sequences of ages: Ordovisic/silurian constitute the deposition base, in the marginal zone of the Paleo-Pacific Plate, before the subduction with the Gondwana continent.

6.1.4.1.2.1 Paraná Basin

The Paraná River Basin covers a vast area of the South American continent, approximately 1,500,000 km^2, occupying parts of southern Brazil, northeastern Argentina, eastern Paraguay and northern Uruguay. With its major axis oriented in the NNE-SSW direction and its structural depocenter located along the Paraná River, with a record of sedimentary and volcanic rocks, whose total thickness exceeds 7,000 meters.

In Eastern Paraguay, six wide-scale sedimentary sequences or super sequences are recognized, separated from each other by regionally discordant surfaces (MILANI, 1997).

The first super sequence of Ordovician/Silurian age is found in discordant contact on the crystalline basement, observed east of Asunción, in the Acahay Valley and bordering the northeast of the Tebicuary River Block. This is a group of sedimentary rocks deposited in a continental environment that is morphologically abrupt, in lateral contact with a transgressive sea, which reaches the maximum flooding in the Lower Silurian. In its coastal environment it deposits conglomerates, interspersed with conglomerate sandstones, which gradually turn into sandstones, forming a group of thick clastic rocks called the Caacupé Group. Concurrently, the sequence continues with clastic rocks of the Itacurubi Group, mainly made up of fine sandstones, shales and claystones, highly fossiliferous, constituting the geochronological supports of the sequence, with the inferior Silurian llandover age.

Devonian-age rocks are arranged in discordance with the previous one, in continental and marine deposits. Rocks of marine origin were not directly observed in the field, being identified only in the Asunción 1 and 2 exploratory wells (PECTEN, 1982), in which about 450 meters of these sediments were described. Those of continental origin rest in erosive discordance on the Silurian fossiliferous units. These have been first identified in wells and called Santa Elena Formation (GONZÁLEZ ET AL., 1994), later geological mapping works defined coarse sandstones as belonging to this unit, calling them Arroyos and Esteros Formation (DIONISI, 1999).

The deposition of the Devonian sequence is interrupted by continental readjustment tectonism (Eoherceric Orogenia). This event is responsible for the restructuring of the basin in the Lower Carboniferous, with sedimentation resuming from the Upper Carboniferous (Stephaniano), as the third Carboniferous/Permian super sequence. It is environmentally influenced by very varied climatic conditions, beginning under glacial and periglacial dominance, depositing the Aquidaban and Coronel Oviedo formations, as a succession of continental and marine clastic sediments. The Permian deposits, in regional agreement, sediments of continental wind and fluvial, coastal and marine

environments, which in a lithologic point of view are characterized by sandstones, siltstones, claystones and limestones, which agglutinate in the Independencia Group.

The continentalization of the Paraná Basin from the Upper Permian, in the Triassic, deposited continental fluvial and eolian sandstones, called Misiones Formation. This group is distributed in a north-south strip, deposited in discordance on carboniferous/Permian rocks.

The Misiones Formation windsand sandstones are characteristically quartz sandstone, homogeneous, with little clayey material as a matrix, little cemented, friable, saccharine and locally silicified. Overlying and interspersed with the aeolian sandstones there are intrusions and extrusions of basaltic rocks of the Upper Parana Magmatic Suite. These are presented as lava spills, sills and dikes in sediments of the pre-existing units, in preferential northwest-southeast directions. Petrographically the basaltic rocks show a subophytic texture, joint crystallization of pyroxene and plagioclase, of age between 127 and 108 million years. The upper divergent contact of the suite is deposited sandstones of the Acaray Formation and/or quaternary sediments.

6.1.4.1.2.2 Del Chaco Basin

The Chaco Basin is bounded on the west by the Andes Mountains and on the east and northeast by the Brazilian shield; it occupies an area of 246,725 km^2, in the Western Region of Paraguay. It is a pericratonic basin, formed by several depocenters or sub-basins separated by structural highs, each one of them with a unique tectonic-sedimentary record. To the NW the Curupayty and Carandayty sub-basins are accommodated, both representing areas with well-developed Paleozoic sequences. On the other hand, Mesozoic-Cenozoic subsidence areas occur mainly in the Pirity and Pilar sub-basins. The tectonic style of the Chaco Basin is characterized by the presence of NW and NE structural guidelines of Brazilian age. Later reactivations of these structures, during the Paleozoic, result in the characterization of four subsidence cycles: Lower Paleozoic, Upper Paleozoic, Upper Mesozoic and Cenozoic. The phases are separated by erosive discordances or absence of sedimentation.

The sedimentary cycle of the Lower Paleozoic is represented by continental and marine clastic deposits of Ordovician, Silurian and Devonian ages. The Ordovician-age sediments (Cerro León Group) are preserved in depth in the Carandayty sub-basin. In contrast, occurrences of sedimentary rocks attributed to the Silurian and Devonian are presented in the northwestern portion, associated with high structures (Cerro León and San Alfredo Range).

The sedimentary cycle of the Upper Paleozoic, carboniferous/permian sequence, constitutes the Group “Palmar de las Islas”, mainly composed of deposits in the Carandayty and Curupayty sub-basins, as well as some outcrops in the northern portion of the Chaco, associated with the Alto de Lagerenza. The Carboniferous age sediments are composed of two units, a lower one or San José Formation, made up of sandstones combined with claystones, sticks and diamictites. The upper unit or Cabrera Formation, starts with local conglomerates and mainly sandstones, with higher levels of clay and oolitic limestone.

The Mesozoic/Cenozoic unit, called the Adria Jara formation, is composed of sandstones with conglomerate levels and claystone, found mainly in the Curupayty sub-basin, in erosive discordance on carboniferous sediments.

On the other hand, the Mesozoic-Cenozoic sediments in the Pirity sub-basin comprise three formations: Berta, Palo Santo and Santa Barbara. The first is made up of

sandstones interspersed with claystone, the second is made up of intercalations of conglomerate sandstones, sandstones, claystones, marls and evaporites; finally, the Santa Bárbara Formation consists of sandstones, siltstones, claystones, evaporites and calcareous.

In the Pirity sub-basin there are magmatic rocks of basaltic composition of Lower Cretaceous age (128 ±5 Ma).

During the Lower to Middle Eocene, between 500 and 1,000 meters of continental sediments were deposited in several depots of the Chaco Basin, in marine parts, called Chaco Formation. In general, this formation consists of alternating sandstones, silts and claystones.

The Quaternary period in the Chaco Basin is a continuity of the Chaco Formation sedimentation, with heterogeneous continental deposits.

6.1.4.1.3 Alkaline Magmatism

The alkaline rocks of Paraguay occur in various parts of Eastern Paraguay distributed in six provinces: Alto Paraguay, Rio Apa, Amambay, Central, Asuncion and Misiones, these rocks are tectonically associated with extensional structures (continental rifts, intersection of structural lines and lines in areas of chronic margins), which affected the western portion of the Parana Basin in the Mesozoic. The alkaline provinces of Paraguay differ from each other in their petrographic, chemical, geochronological and tectonic characteristics.

The petrographic composition of these rocks presents great variation, with greater predominance of alkaline silica rocks, unlike carbonatite rocks which are restricted to only one province (Amambay Province). Chemically, the silicatic lithologies vary from ultrabasic to acidic and in general represent differentiated petrographic terms. As for the Na/K ratio they can be differentiated in sodium alkaline provinces and potassium alkaline provinces.

Evidence from geology and geophysics indicates that the conditions of alkaline rocks in Paraguay are strongly controlled by a distensional tectonics developed during the Mesozoic, related to the fragmentation of the Gondwana and opening of the South Atlantic

In terms of geochronology, these rocks cover a wide age spectrum extending from 255 million years to 39 million years.

In general, alkaline rocks are associated with Paleozoic-Mesozoic sediments and are covered by recent alluvial deposits.

The mode of occurrence is also quite diversified and varies from province to province. The intrusive forms appear as annular complexes (Alkaline-Carbonate Complex) and stocks. The extrusive forms include lavas, domes and plug and the hypoabyssal forms generally in the form of embankments or swarms of embankments.

6.1.4.2 Local Characterization (DIA)

The PARACEL Eucalyptus Plantation is inserted in 4 different groups, which are E – Itapacumi Group, Pc – Caacupé Group, C - Coronel Oviedo and Q1 - Quaternary Sediments

6.1.4.2.1 E- Itapacumi Group

The group rests on the previous units in strong angular unconformity. In Cerro Paiva, near the San Luís stay, it is located directly over the Basal Complex and has continuity towards the E under the youngest sedimentary cover, of Permo-Carboniferous age (Aquidabán Formation), as can be seen to the W of the Santa Luisa Ranch. on the Bella Vista - San Carlos Route. It occupies an area of 2,075 km^2 in the eastern region of the country and 45 km^2 in the western part, in isolated outcrops near the Paraguay River.

The group begins with a shallow basal conglomerate, progressing to an arcosic and sandy sequence. However, it is predominantly made up of calcareous with oolitic layers, finely laminated layers, clay banks and probable stromatolytic and marble levels (Wiens, 1982). Locally there are brecciated layers whose fragments are made up of the limestone itself. Wiens (1986) calls this sequence "Itapucumi Group" from the Itapucumi series.

The age of the Itapucumi Group is from the Upper Proterozoic (Vendian) to the Lower Cambrian (Zaine and Firchild, 1985) according to determinations made on the fossil content in the northern part of Brazil (Corumbá Group).

6.1.4.2.2 Pc – Caacupé Group

It outcrops NE of Asunción, in the Cordillera de los Altos, from the Ypacaraí valley to the homonymous city. To the south of Asunción there is an extensive band of outcrop, from Roque González de Santa Cruz to Quiindy, Quyquyhó and Mbuyapey. The group is divided into three formations: Fm.Paraguarí, Fm.Cerro Jhú and Fm.Tobatí and its deposition probably begins in the Upper Ordovician.

6.1.4.2.3 C – Coronel Oviedo Group (Independencia Group)

The group is made up of the San Miguel and Tacuary formations, of Permian age, which emerge in Eastern Paraguay in an area of 7,996 km^2. The name Independencia Serie was used by Harrington (1980), to designate the sedimentary layers of the upper Permian. In 1956, the same author designated the same unit of the Independencia Formation, (ECKEL, 1959) he again used the denomination Independencia Series in a Gondwana or Santa Catarina system. Putzer (1962) called the Permian age layers the Passa Dois Serie.

In the description of the geology of grid 41, Coronel Oviedo (ANONYMOUS, 1966), the lower and middle Permian-age layers are called the Ybytyruzú Series, divided into the Pañetey and Independencia Formations. Wiens (1982) proposes for the Permian the division into San Miguel, Tacuary, Tapytá and Cabacuá formations. In the preliminary adaptation of the stratigraphic column of Paraguay, for the PAR-83/005 Project, these formations were gathered in the Independencia Group. In this explanatory text the Independencia Group is divided into the San Miguel and Tacuary formations with the elimination of the Tapytá and Cabacuá formations which, in reality, belong to the base of the Triassic/Jurassic age unit.

The group emerges maintaining the direction of the so-called Gondwanic layers, N-S/NNW-SSE, with dipping towards the E, in areas that are frequently faulty. North of the Jejuí/Aguaray Guazú Fault zone, in the Alto Apa, the Group is absent due to erosion in the Lower Triassic. The formations of the group are correlated with the units of the groups Guatá and Passa Dois, in the Paraná Basin, in Brazil.

6.1.4.2.4 Q1 – Quaternary Sediments

The accumulated sediments are grouped here, near the area of the Paraguay River and its tributaries, which are at a lower elevation of 70 meters, in the eastern region of the country. It covers an area of 60,782 km^2. It is made up of a light creamy sandstone, of medium to coarse granulation with scattered gravel, interspersed with shales. The sandstones, in contact with these shales, present clay clasts. There are also layers of clayey sandstones up to 1.5 metres thick. The sedimentation environment is essentially water-based (fluvial).

In Candú Creek, on the property of Señor Virgilio Larrea, there are vertebrate fossils that were described by Presser and Crosa (1984). These fossils found in the described place, in the locality of Ytororó, are contained in a sedimentary succession described by the mentioned authors as:

- Blue-green sediments, with good selection, predominance of medium-grained sands, apparently solid, associated with clay sheets;
- Poorly selected sediments with a predominance of medium to thick sand and secondary layers of clay. They present levels with fossils in contact with the previous sequence and;
- Spotted sediments, with good selection, with medium grain sands and subordinate fine sands and clay. Apparently massive.

According to the same authors, the fossils found are typical of a Pleistocene fauna and present three species of Glyptodonts, two of Lestodontes and one of Megatherion associated with other vertebrates not clearly systematized.

The name San Antonio formation is formally proposed for the lithostratigraphic designation of these sediments, based on a proposal by Palmieri and Velazquez (1982). In the valleys of the current drainage network of Eastern Paraguay, from the Apa River in the north to the Paraná River in the south and east, and the Paraguay River in the west, there is an extensive deposition of Holocene age sediments.

6.1.5 Geomorphology and Topography

The Paraguay River divides the country into two distinct regions: the Gran Chaco or Western Region in the west and the Jungle or Eastern Region in the east, which is considerably mountainous. The Gran Chaco is part - except for the western end - of an alluvial plain that extends from Paraguay to the bordering countries and is covered with grasslands, swamps and bushes. The jungle is formed mainly by the southern portion of the Paraná plateau, at an elevation of 305 to 610 m, which constitutes a basin where numerous tributaries of the Paraguay and Paraná rivers originate; and by the gentle mountain ranges that are part of the Brazilian system that penetrate this area, creating wild valleys.

To the west, the plain drops precipitously into a region of hills covered with fertile pastureland that ends at the Paraguay River. The main mountain system is made up of the Amambay, Mbaracayú and Caaguazú mountain ranges, which have altitudes that rarely exceed 800 meters. Another secondary mountain system, located in the center of the country, is formed by the Cordillera de los Altos, Ybytypanema and the so-called Cordillerita. Among the most outstanding peaks are the Tres Kandú (842 m), Capii (816 m) and Peró (815 m) mountains, all in the department of Guairá. Some authors consider, however, that Paraguayan territory is structured in three regions: the aforementioned

Chaco and Selva regions, and the region known as Campo, which extends through the most depressed sector of the Paraguayan valley and the final stretch of the river courses that drain into it, that is, the central and southern area of the country.

The following is a geomorphological characterization of the influence areas of the PARACEL Eucalyptus Plantation. The following information has been extracted from the Pulp Mill and Port Environmental Impact Study & Report (EIAp/RIMA): Book I - Environmental Diagnosis Of The Physical Environment (PÖYRY, 2020).

6.1.5.1 Regional Characterization (IIA)

Most of the Eastern region has a slightly undulating topography, with an elevation that varies between 50 and 750 meters above sea level. Its major orographic systems are the Amambay, Mbaracayú, Ybytyrusú and Caaguazú mountain ranges. The highest point is Cerro Pero (Cerro Tres Kandu), with 842 meters, located in the IV Department of Guairá.

The following figure shows the topography map of Paraguay, highlighting the points of highest elevation.

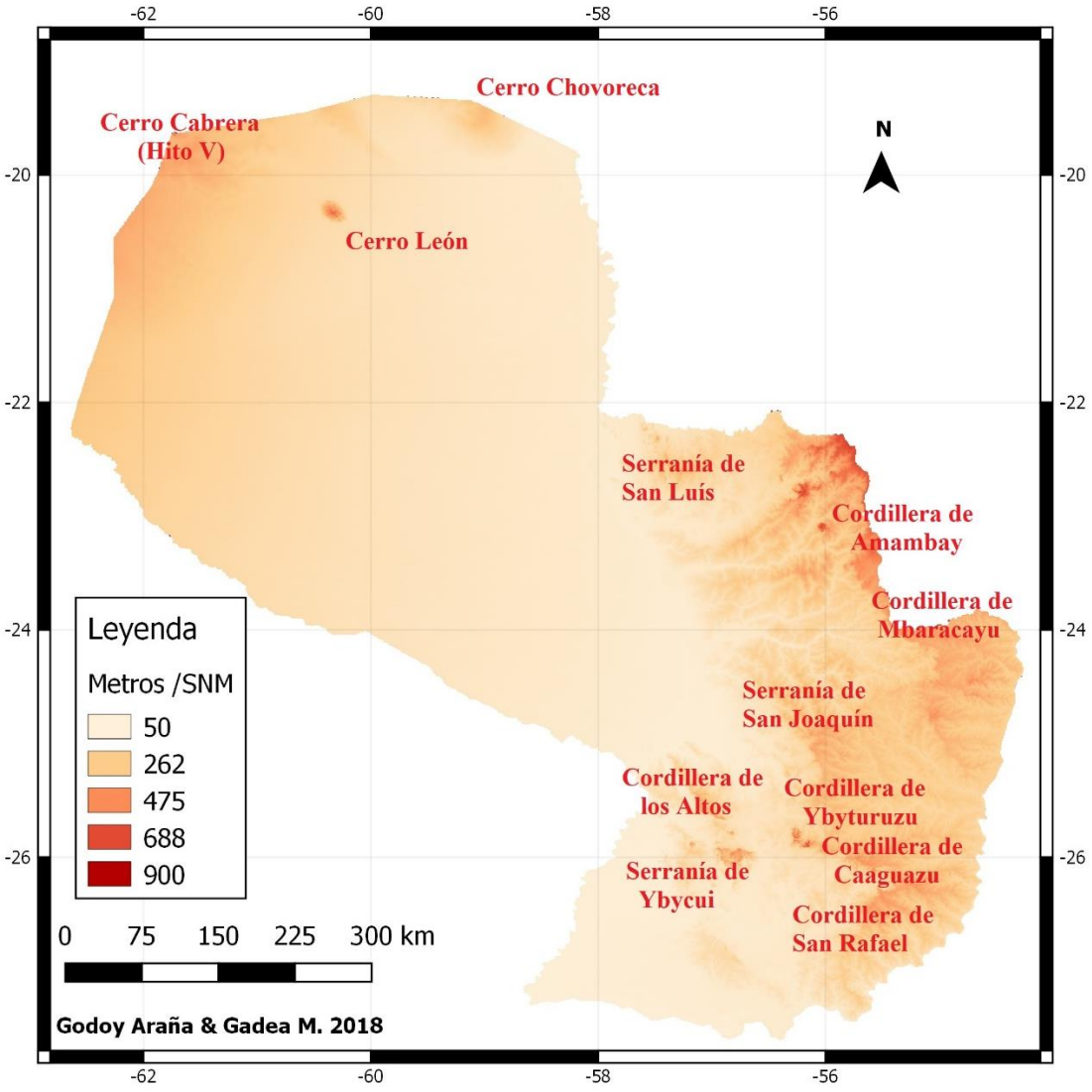

Figure 35 – Map of Topography and Orography of Paraguay. Source: Godoy Araña & Gadea (2018)

6.1.5.2 Local Characterization (DIA and DAA)

The topography of the areas of influence of the PARACEL Eucalyptus Plantation has plateaus and valleys, which are flat to almost flat lands that receive the drainage water from the high places, which are the hills and mountains.

The valley is flanked by higher places and is narrower than it is long, while the plain, also called the "llanura", is a large area both wide and long (flatlands), further away from the high places.

According to the Geology of Paraguay site, in the Departments of Concepción and Amambay, you can see Cerro Memby, Vallemi, Aceite, Akangue, Alambique, Guazu, Muralla and Sarambi.which geomorphologically, according to its characteristics, would be assigned the name of Butte (isolated hills with cliffs). It is constituted essentially by red sandstones of the Triassic - Jurassic known as the sandstones of the Misiones Formation. To acquire this form, an intense material removal (erosion) had to have occurred in the course of geological time.

6.1.6 Seismicity

Paraguay, located in the south-central part of the South American Plate between the Andean Orogen and the Paraná Basin, presents low to moderate seismicity, compared to the countries of the Andean region.

Knowledge of the seismic activity of Paraguay is in its initial stages, not having a bibliographic and / or reference documentary base on the subject, as an initial activity a data bank has been organized resorting to the compilation of isolated information of macrosisms in the files found in the written press from the 1950s that refer to "tremors" felt in the country and with seismic data provided by news agencies in neighboring countries.

Reliable data on seismic activity in Paraguay began to be compiled in 1979 with the installation around Lake Itaipu, on the border between Paraguay and Brazil, a seismic network composed of eight seismographs to cover an area of 14,500 km^2 to monitor the seismicity of the mega dam built between the two countries.

At the beginning of the nineties, through a scientific and technological cooperation agreement between the Government of Paraguay and that of the United States of America, one of the seismic stations of the Global Telemetered Seismographic Network was installed in the national territory, (GTSN), a three-component primary seismic station that provides data on local and regional seismic events, helping to improve knowledge of Paraguay's seismicity.

During the last years the continuous monitoring of seismic events has evidenced the occurrence of earthquakes with magnitudes ranging between 2.5 to 5.6 mb. The Paraguay River represents a North-South orientation fault, which separates the western block (Chaco Basin) with a higher occurrence of seismic activity than the more stable eastern block (Parana Basin) from the seismic point of view of the country.

The analysis of the Catalog of seismic events and distribution of the epicenters in the geological-structural map of Paraguay, suggests a correlation with the geological and tectonic characteristics of the region.

The seismic activity in Paraguay is related to two seismogenic zones: (Berrocal, J., and Fernández, C., 1991) the seismic activity that occurs in the western block related to the subduction of the Nazca Plate with the South American Plate and earthquakes occurring

in the eastern region related to shallow intraplate events, probably caused by rearrangement of local geological structures.

Finally, although Paraguay is located in a region not prone to earthquakes, with a moderate to low seismicity that should not be ignored, considering the historical seismicity data. The figure below shows that within the catalog of seismic events available in Paraguay, there were no events within influence areas of the PARACEL Eucalyptus Plantation.

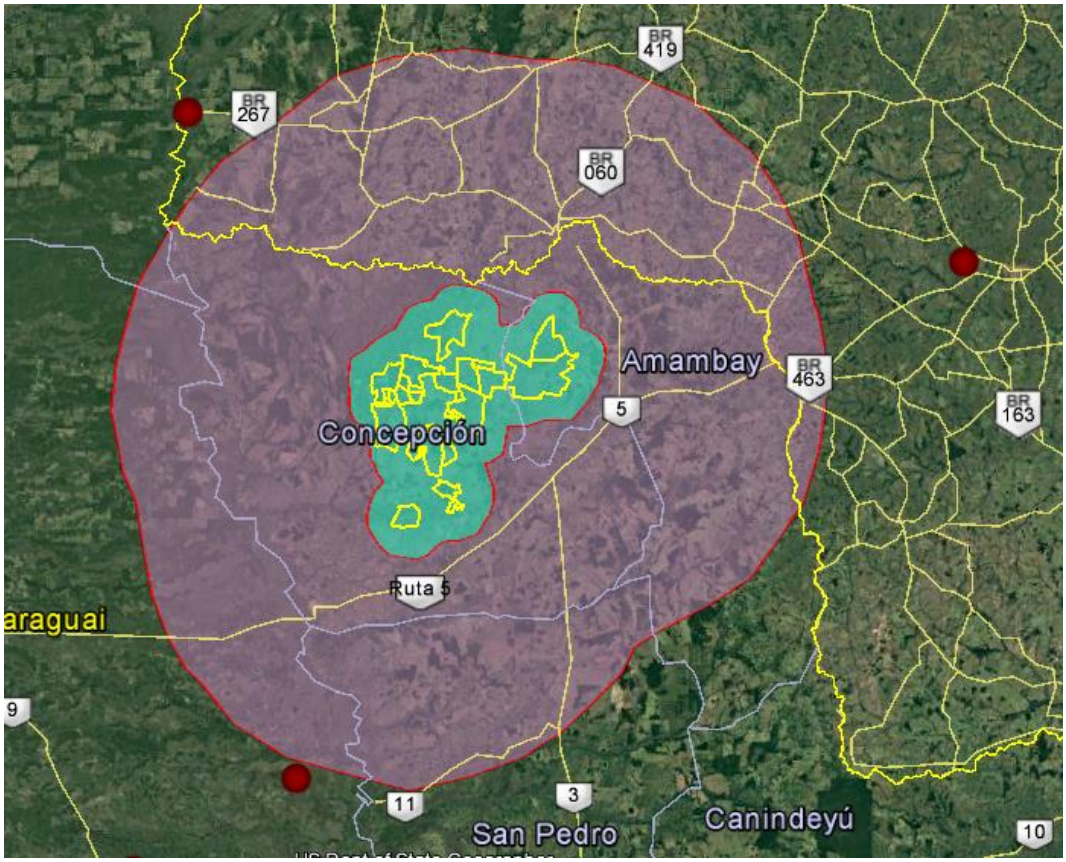

Figure 36 – Epicenters of nearby seismic events in PARACELs influence areas of Eucalyptus Plantation. Source: Berrocal, J., and Fernández, C., 1991

6.1.7 Current use of soil/land use

Although about a fifth of Paraguay's total area is suitable for intensive cultivation, only a small part of it is used constantly, and practically everything is in the Eastern Region (BRITANNICA, 2021).

The western region over the centuries was a sparsely populated area, representing 60% of the territorial area and with only 2% of the population (MOLINAS et al, 1995). From 1995 onwards, a more intense territorial occupation started by cattle ranchers for meat production (COSTA; MORETTI, 2016), which is still their main land use until today. However, the main economic activities in the country occur in the eastern region of Paraguay, including agricultural and forestry activities (GOROSTIAGA et al, 1995).

Agriculture occupies approximately 34% of the territory, as shown in the table below.

Table 4 – Distribution of land use types in Paraguay

Types of use	Surface (km^2)	%
Native Forest	36,834	23.5
Agriculture	53,113	33.9
Pasture	19,745	12.6
Flooded Area	39,832	25.4
Others	7.275	4.6
Total	**156,799**	**100.0**

Official information on Paraguay's land use dates back to 1995 and with incipient information about land use for planted forests. No specific surveys were found for the influence areas of the PARACEL Eucalyptus Plantation.

6.1.8 Hydrology

Paraguayan territory belongs entirely to the great basin of the River Plate, one of the largest rivers in the American hemisphere, as well as in the whole world, due to the extension, the flows it produces, and its natural resources (PMCIC, 2014).

The basin of the Plata is, by its geographical extension and the flow of its rivers, one of the most important in the world. Its importance also lies in the fact that it is a territory shared by five countries (CIC, 2020).

With its 3.1 million square kilometers, the Plata Basin occupies one fifth of South America, including territories of Argentina, Bolivia, Brazil, Paraguay and Uruguay, as seen in the following figure (CIC, 2020).

The waters of two large rivers converge in the Río de la Plata: the Paraná and the Uruguay, both of which, by their turn, collect the flow of other very important rivers, such as the Paraguay, the Bermejo, the Pilcomayo and the Iguazú, among many others (CIC, 2020).

Through its wide estuary in the Atlantic Ocean, the Plata Basin delivers a flow of 25,000 m^3/s to the sea.

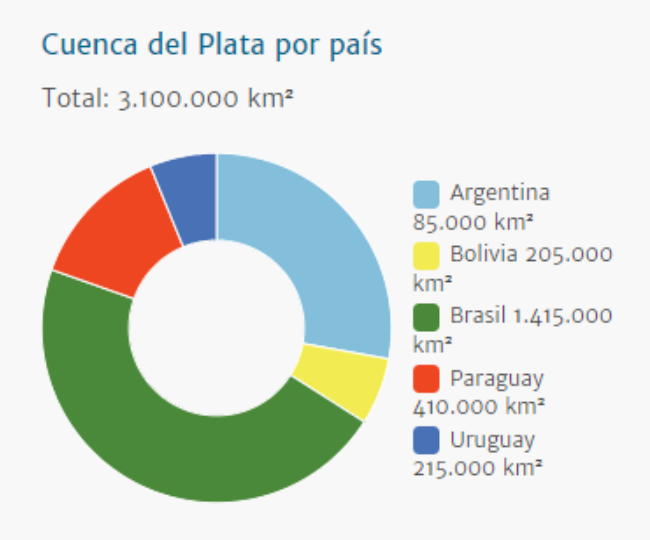

Figure 37 – Basin of the Plata by country. Source: CIC (2020)

Water resources management

Thus, in Paraguay, there is concern about water resources highlighted by the extensive legal framework, among which are SEAM Resolution n. 222/2002 (Standard of Water Quality in the Entire National Territory), SEAM Resolution n. 50/2006 (National Water Resources Management), SEAM Resolution n. 255/2006 (Classification of All Waters of Paraguay in Class 2) and Law n. 3239/2007 (Water Resources of Paraguay).

In accordance with Law n. 3239/2007, the integrated and sustainable management of Paraguay's water resources is governed by the following principles:

a) Water, whether surface or underground, is the public property of the State and its ownership will not be subject to any form of limitation.

b) Access to water for the satisfaction of basic needs is a human right and must be guaranteed by the State, in adequate supply and with appropriate quality

c) Water resources have multiple uses and functions and this characteristic must be adequately addressed, respecting the hydrological cycle and always favoring, in the first place, the use for consumption by the human population.

d) The hydrographic unit is the basic unit for water resources management.

e) Water is a natural good that conditions the survival of all living beings and the ecosystems that shelter them.

f) Water resources are a finite and vulnerable good.

g) Water resources have a social, environmental and economic value.

h) Water resources management should be carried out within the framework of sustainable development, and should be decentralized, participatory and gender-sensitive.

i) The Paraguayan State possesses the non-transferable and non-delegable function of property and guardianship of national water resources.

The management of water resources in Paraguay occurs through the hydrographic units, which are the basic management units, according to Law n. 3239/2007.

In Paraguay, there are 19 Hydrographic Units (Figure above) classified in two regions: the Western Region and the Eastern Region, according to Resolution n. 376/2012.

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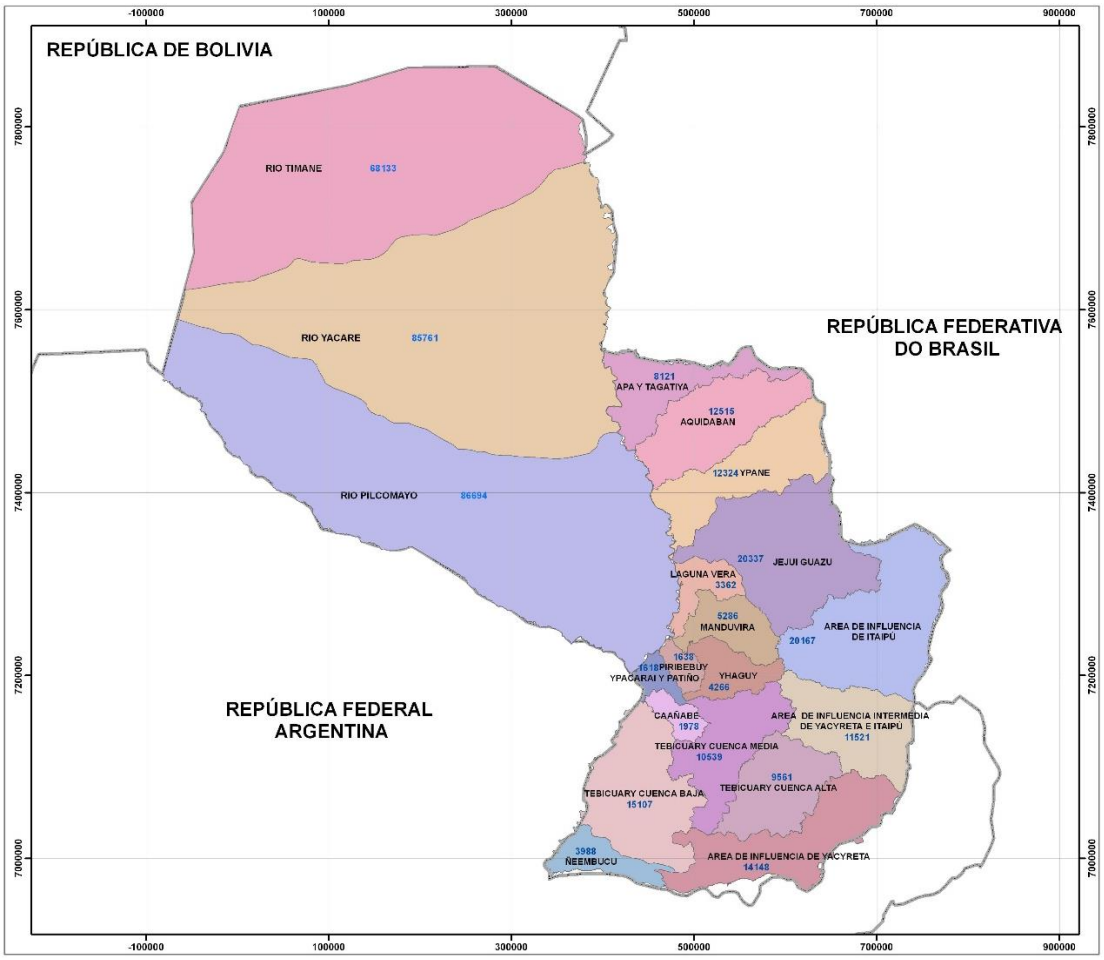

Figure 38 – Hydrographic Units of Paraguay. Source: MADES (2020)

The following table presents the characteristics (region, name and area) of the Hydrographic Units of Paraguay.

Table 5 – Hydrographic Units of Paraguay

Region	Name	Area (km²)
Eastern	Apa and Tagatiya	8,121
	Aquidabán	12,515
	Area of Intermediate Influence of Yacyreta and Itaipu	11,521
	Influence Area of Itaipu	20,167
	Influence Area of Yacyreta	14,148
	Caanabe	1,978
	Jeiui Guazu	20,337
	Laguna Vera	3,362
	Oriental Manduvirá	~ 5,286
	Neembucú	~ 3,988
	Piribebuy	1,638
	Tebicuary Cuenca Alta	9,561
	Tebicuary Cuenca Baja	15,107
	Tebicuary Cuenca Media	10,539
	Yhaguy	4,266
	Ypacaraí and Patinc	1,618
	Ypané	12,324
Western	Rio Pilcomayo	86,694
	Rio Yacaré	85,761
	Rio Timme	68,133

Source: Resolution SEAM n. 376/2012.

The influence areas of the PARACEL Eucalyptus Plantation encompass the Aquidabán Hydrographic Basin. Thus, these hydrographic unit will be addressed in this chapter on water resources.

The following information has been extracted from the Pulp Mill and Port Environmental Impact Study & Report (EIAp/RIMA): Book I - Environmental Diagnosis Of The Physical Environment (PÖYRY, 2020).

6.1.8.1 Aquidabán Hydrographic Basin

The Aquidabán River basin has an area of approximately 1,254,812 ha (SEAM & DIGESA, 2006), within the departments of Amambay and Concepción, and flows into the Paraguay River north of the city of Concepción, as illustrated in the figure below.

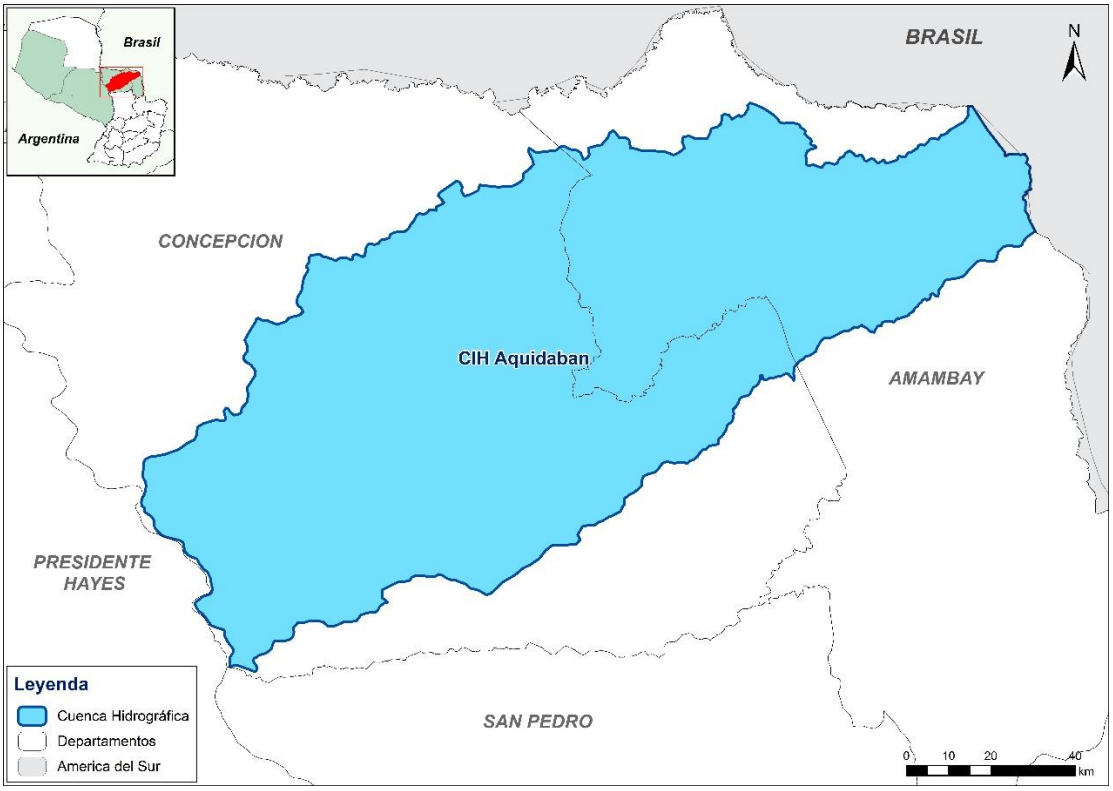

Figure 39 – Map of the Hydrographic Basin of Aquidabán

The basin is 59.3% occupied by cattle and 28.6% by forest, which includes approximately 87.9% of the entire basin area. Small rural producers occupy 7.6% of the basin area, mechanized cultivation 2.6%, flooded areas 1.6% and water and city occupy approximately 0.1%, as presented in the following table.

With respect to pollution loads, there are three districts with a total population of 36,150 inhabitants, of which 19% reside in urban areas, which constitutes the potential contributor to sanitation loads. The diffuse load from agricultural areas is 2 to 10 times higher than the sanitary load. With regard to industrial loads, there are no significant sources in this basin (SEAM & DIGESA, 2006).

Table 6 – Aquidabán River Basin Occupations

Mechanized cultivation	Cattle raising	Forest	Water	Small area ranchers	Flood	City	Total
32,408	744,261	359,133	1,810	95,613	20,042	1,810	1.254,812
2.6%	59.3%	28.6%	0.1%	7.6%	1.6%	0.1%	100.0%

Source: SEAM & DIGESA (2006).

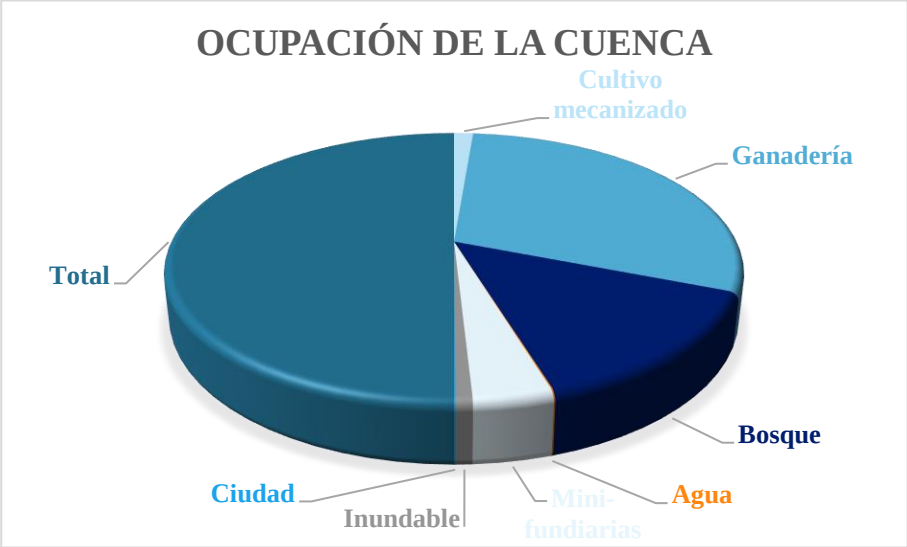

Figure 40 – Aquidabán River Basin Occupations

The Aquidabán River rises in the Amambay mountain range after traveling approximately 250 km through the departments of Amambay and Concepción, in an east-west direction. This river is a tributary of the Paraguay River and its mouth occurs north of the city of Concepción, 35 km from the central region. Its main tributaries are the Trementina and Negla Rivers.

The Aquidabán River as well as all surface water resources in Paraguay are classified as a Class 2 river, according to SEAM Resolution n. 255/2006.

The relevant characteristic of this river's water is the relatively high concentration of total and dissolved solids, depending on the time of collection, and the presence of significant nutrient contents. The cause of the high solids value can be attributed, mainly, to the recurrent diffuse loads of agricultural activities, also carrying nitrogen and phosphorus that are components of chemical fertilizers. The variation in concentration, especially of solids, is closely correlated to the recorded precipitation (SEAM & DIGESA, 2006).

6.1.8.2 Paraguay River

Paraguay has a very important and extensive hydrographic network throughout its territory. In fact, the Paraguay river separates and limits two natural regions with very different natural and socioeconomic characteristics (MADES, 2020).

The hydrography of the River Plate Basin is made up of three large water systems: the Paraná, Paraguay and Uruguay, in addition to the River Plate itself, into which some smaller rivers flow. Paraguay is a tributary of the Paraná, while the latter joins with Uruguay to form the Plata river. The drainage areas of each of them form the main sub-basins of the system (CIC, 2020).

The Paraguay River Basin has an area of 1,095,000 km², which covers about 35% of the entire area of the Plata Basin, which is 3,100,000 km², as illustrated in the figure below.

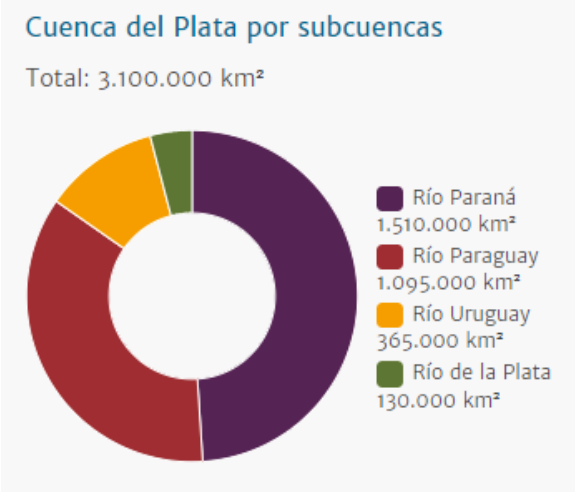

Figure 41 – The Plata Basin by sub-basin. Source: CIC (2020)

The Paraná and Paraguay rivers run from north to south and form an axis that divides the Basin into two parts: to the east there is a dense river network with abundant rivers, while to the west the contributions are from flatlands with low flow (CIC, 2020).

One third of the basin of the Paraguay river corresponds to Brazil (370,000 km²), another third to Paraguay (355,000 km²) and the rest is divided between Argentina (165,000 km²) and Bolivia (205,000 km²) as illustrated in the figure below. Almost all of it extends over a vast alluvial plain, with very little slope and extensive flood plains (CIC, 2020).

Figure 42 – Distribution of Paraguay river basin among the countries. Source: CIC (2020)

The Plata Basin can be subdivided into 7 sub-basins, among which the Upper Paraguay sub-basin and the Middle and Lower Paraguay (where are located the influence areas of the PARACEL Eucalyptus Plantation sub-basin are located in Paraguay (CIC, 2017), as shown in the figure below.

Figure 43 – Map of Plata sub-basins. Source: CIC (2017)

The Middle and Lower Paraguay Sub-basin (Figure below) is defined from the estuary of the Apa river to the confluence with the Paraná river. The Paraguay river, in spite of the contributions it receives in its upper basin, would present a negative water balance in part of this section, if only its right bank tributaries were considered, since its overflows do not return to the main channel, recharging lateral depressions in which water is retained until it evaporates. However, its left bank tributaries - Aquidabán, Jejui, Aguaray and Tebicuary- generate important contributions. Along the main course of Paraguay, the city of Asunción is located in the sub-basin, affected by frequent flooding. This section is an important part of the Paraguay-Paraná Waterway and receives, on its right bank, two tributaries: the lower Pilcomayo and Bermejo rivers.

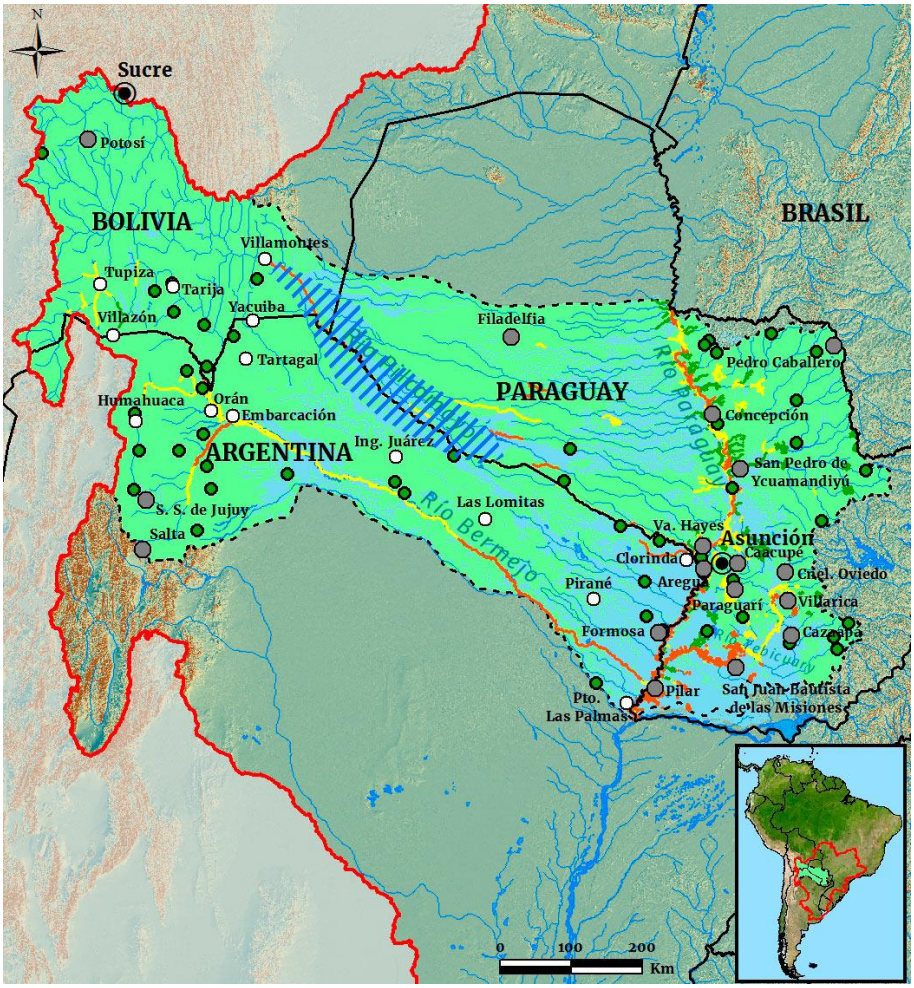

Figure 44 – Map of sub-basins of Middle and Lower Paraguay. Source: CIC (2017)

6.1.8.3 Surface Water Quality

This item presents the results of the First Monitoring Campaign of Surface and Groundwater Quality Monitoring, prepared by TECNOAMBIENTAL – Inginiería y Consultoría, in last February.

The purpose of this document is to establish a baseline of the surface quality int the project´s area of influence before the conversions to industrial zone and plantation forestry respectively occur.

The main objectives of the monitoring are the following:

- Obtain quantitative information of the River Paraguay´s water quality at 2 points located near the future industrial plant, before and after the treated effluents discharge point from the future factory located 20 km upstream port of the city of Concepción; and
- Obtain quantitative information of the surface water quality (streams and rivers running through the so-called “Farm Zone” in the Departments of Concepción and Amambay) at 18 monitoring stations.

The sampling take place in two campaigns covering the dry and rainy seasons. The preliminary results are presented here.

PARACEL selected and provided the monitoring points that correspond to sites of interest where land-use changes occur in the short term, mainly the transformations of pasture for livestock converted to and industrial zone or forest plantations as the case may be.

6.1.8.3.1 Monitoring Points

According to TECNOAMBIENTAL (2021), PARACEL provided the coordinates of the 20 monitoring point for the surface waters; 18 points are existing watercourses located in the so-called “Farm Zone” of the project´s and 2 points are on the River Paraguay. The number of samplings points is detailed below, according to the denominations given to the surface waters.

- One point, corresponds to the Hermosa stream, a tributary of the Apa River;
- One point corresponds to the Napegue stream, a tributary of the Negla steam;
- One point is on the Negla steam, a tributary of the Aquidaban River;
- Ten points are on the Trementina steam, a tributary of the Aquidaban River;
- One point is on an unnamed stream, a tributary of the Aquidaban River;
- Two point are on the Aquidaban River;
- One point corresponds to the Laguna Penayo stream;
- One point corresponds to the Pitanohaga steam;
- Two point are on the Paraguay River, at the future´s industrial plant.

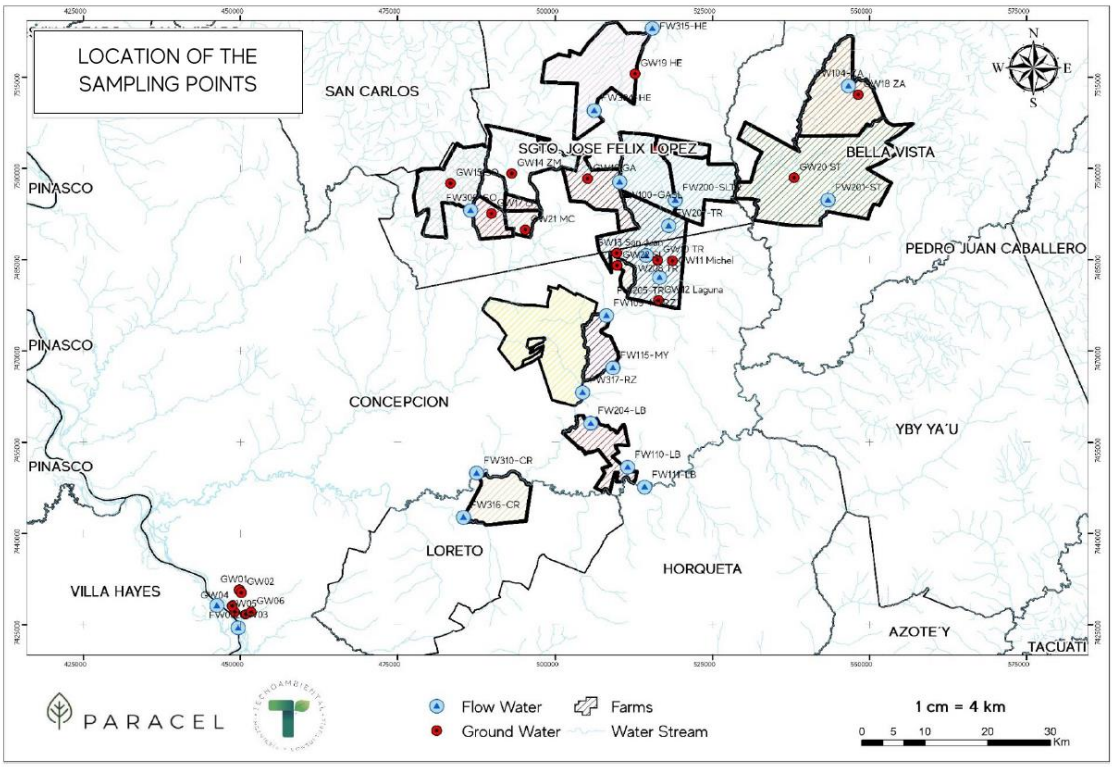

Figure 45 – Location of the sampling points. Source: TECNOAMBIENTAL (2021)

6.1.8.3.2 Results

Based in the document prepared by TECNOAMBIENTAL (2021), the main findings for surface water were:

- Of the 26 physicochemical and bacteriological parameters evaluated, 20 have limits established in the current regulations, and 6 do not have defined limits;
- Of the 20 parameters with defined limits, 11 (55%) do not show and deviation from the current regulations and 9 parameters (45%) show values above the maximum allowed at least one monitoring point;
- The parameters that do not show any deviation are pH, floating materials, Total Dissolved Solids (TDS), oils and fats, nitrites, hardness, sulphate, cyanides, sodium and copper;
- The parameters that show some degree of deviation are total phosphorus, total nitrogen, dissolved oxygen turbidity, BOD5, ammonia, soluble iron, faecal coliforms and total coliforms;
- The parameters that most frequently present deviations in the 19 point sampled are total phosphorus (52% of the points sampled), total coliforms (73%), faecal coliforms (84%), soluble iron (100%) and ammonia (100%).

The following table show a summary of the results obtained for each parameter analyzed in surface water, highlights the points that present some deviation and the percentage of monitoring points that complies with the SEAM n°222/02.

TABLE 9. SUMMARY OF SURFACE WATER QUALITY ANALYSIS							
Nº	**PARAMETER**	**AVERAGE**	**MONITORING POINTS WITH DEVIATIONS**	**COMPLY WITH THE LIMITS**		**BEYOND THE LIMITS**	
				Nº	**%**	**Nº**	**%**
1	Temperature	24,5 ºc	No limits				
2	pH	6,9	FW317-RZ FW 11-LB	17	89,5%	**2**	**10,5%**
3	Electrical conductivity	121,9 µS/.cm	No limits				
4	Dissolved oxygen	5,8 mg O2/L	FW 207-TR FW 208-TR FW 115-MY FW 110-LB FW 109-MYRZ	14	73,7%	**5**	**26,3%**
5	Turbidity	147,1 NTU	FW 200-SLTR FW 205-TR FW 111-LB FW 310-CR	15	78,9%	**4**	**21,1%**
6	Floating materials	53,3	No limits				
7	Total dissolved solids (TDS)	164,5	All the points complies with the limits	19	100,0%	**0**	**0,0%**
8	Oil and grease	9,1 mg/L	No limits				
9	COD	77,2 mg O_2/L	No limits				
10	BOD5	3,1 mg O_2/L	FW 205-TR FW 310-TR FW 316-CR	16	84,2%	**3**	**15,8%**
11	Total phosphorus	0,1 mg/l	FW 315-HE FW 304-HE FW 207-TR FW205-TR FW 109-MYRZ FW 115-MY FW 110-LB FW 111-LB FW310-CR FW01	9	48%	**10**	**52%**
12	Total nitrogen	0,2 mg/l	FW 315-HE FW 208-TR FW 316-CR	16	84,2%	**3**	**15,8%**
13	Nitrates	2,1 mg/L	All the points complies with the limits	19	100,0%	**0**	**0,0%**
14	Ammonia	0,1 mg/L	All the points exceeds the maximum limits	0	0,0%	**19**	**100 %**
15	Nitrites	0,0 mg/L	All the points complies with the limits	19	100,0%	**0**	**0,0%**
16	Hardness	25,5 mg CaCO3/L	All the points complies with the limits	19	100,0%	**0**	**0,0%**
17	Sodium	7 mg/L	All the points complies with the limits	10	100%	**0**	**0,0%**
18	Sulphates	>2 mg/L	All the points are under the limits of quantification in water; therefore complies with the limits	19	100,0%	**0**	**0,0%**
19	Cyanides	>0,02 mg/L	All the points are under the limits of quantification in water; therefore complies with the limits	19	100,0%	**0**	**0,0%**
20	Copper	>0,02 mg/L	All the points are under the limits of quantification	19	100%	**0**	**0%**
21	Soluble iron	1,3 mg/L	All the points exceeds the maximum limits	0	0,0%	**19**	**100 %**

** Table refers to limits from SEAM n°222/02. There are no water quality limits stablished in IFC EHS Guidelines, only for effluents.*

TABLE 9. SUMMARY OF SURFACE WATER QUALITY ANALYSIS							
Nº	PARAMETER	AVERAGE	MONITORING POINTS WITH DEVIATIONS	COMPLY WITH THE LIMITS		BEYOND THE LIMITS	
				Nº	%	Nº	%
22	Fipronil	>LOQ	All the points are under the limits of quantification in water except for F.W315-HE **There are no limits for this parameter.**				
23	Faecal coliforms	3677,4 NMP/100 mL	Acorde en los puntos: FW 316-CR, FW01 y FW02. En todo los demás puntos de aguas superficiales, este parámetro se encuentra fuera del límite.	3	15,8%	**16**	**84,2%**
24	Total coliforms	9129,6 NMP/100 mL	FW104-ZA, FW315-HE, FW304-HE, FW200-SLTRE, FW207-TR, FW208-TR, FW205-TR, FW109-MYRZ, FW115-MY, FW317-RZ, FW204-LB, FW110-LB, FW310-CR	6	31,6%	**13**	**68,4%**

** Table refers to limits from SEAM n°222/02. There are no water quality limits stablished in IFC EHS Guidelines, only for effluents.*

Complete information about this campaign, as methodology and detailed results are presented in **ANNEX I**.

6.1.9 Hydrogeology

Paraguay not only has extensive natural surface water resources, but also a wealth of groundwater. Groundwater is the most important water resource in Paraguay, because of its easy access and availability in terms of quality and quantity (PMCIC, 2014).

Paraguay has great potential in terms of groundwater, which is contained in aquifers that are strategic for the country's socioeconomic development and for the social well-being of its inhabitants (PMCIC, 2014).

Paraguay's main aquifers are located in the subsoil of the country's two regions, the Eastern Region and the Western Region. Some of these aquifers are locally distributed and are restricted to the national territory, as is the case with the following aquifers: Patiño, Caacupé, Arroyos and Esteros, Itacurubí, while others, such as the Guaraní (Misiones aquifer), Yrendá, Independencia, Col. Oviedo, Alto Paraná, Pantanal and Acaray, are shared with neighbouring countries and have been classified as transboundary aquifers (PMCIC, 2014).

The Plata Basin is also rich in groundwater resources. It largely coincides with the Guarani Aquifer System (SAG in Spanish), one of the largest groundwater reservoirs in the world, with an area of 1,190,000 km². To the west of the Basin is the Yrendá-Toba-Tarijeño Aquifer System (SAYTT), which in the majority is located in the semi-arid zone of the Basin, the Gran Chaco American Biome, with an area of 410,000 km² (CIC, 2017).

The following figure shows the map of the transboundary aquifers of the Plata Basin.

Figure 46 – Map of the transboundary aquifers of the Plata Basin. Source: CIC (2017)

In the La Plata Basin, the natural development of urban and rural populations, associated with the strong increase in agricultural and industrial activities, has significantly increased the use of water resources, particularly those of underground origin. This growth, as expected, in addition to demographic parameters, is due to the intrinsic characteristics of the aquifers, such as the occurrence of potentially productive units and the quality of the groundwater (CIC, 2017).

In Paraguay, too, groundwater is widely used for human and industrial supply, as for example in the outskirts of its capital, Asunción. In other regions, it is mainly used for livestock and for public supply in dispersed locations (CIC, 2017).

The following figure shows the annual volumes of groundwater exploited in the Basin.

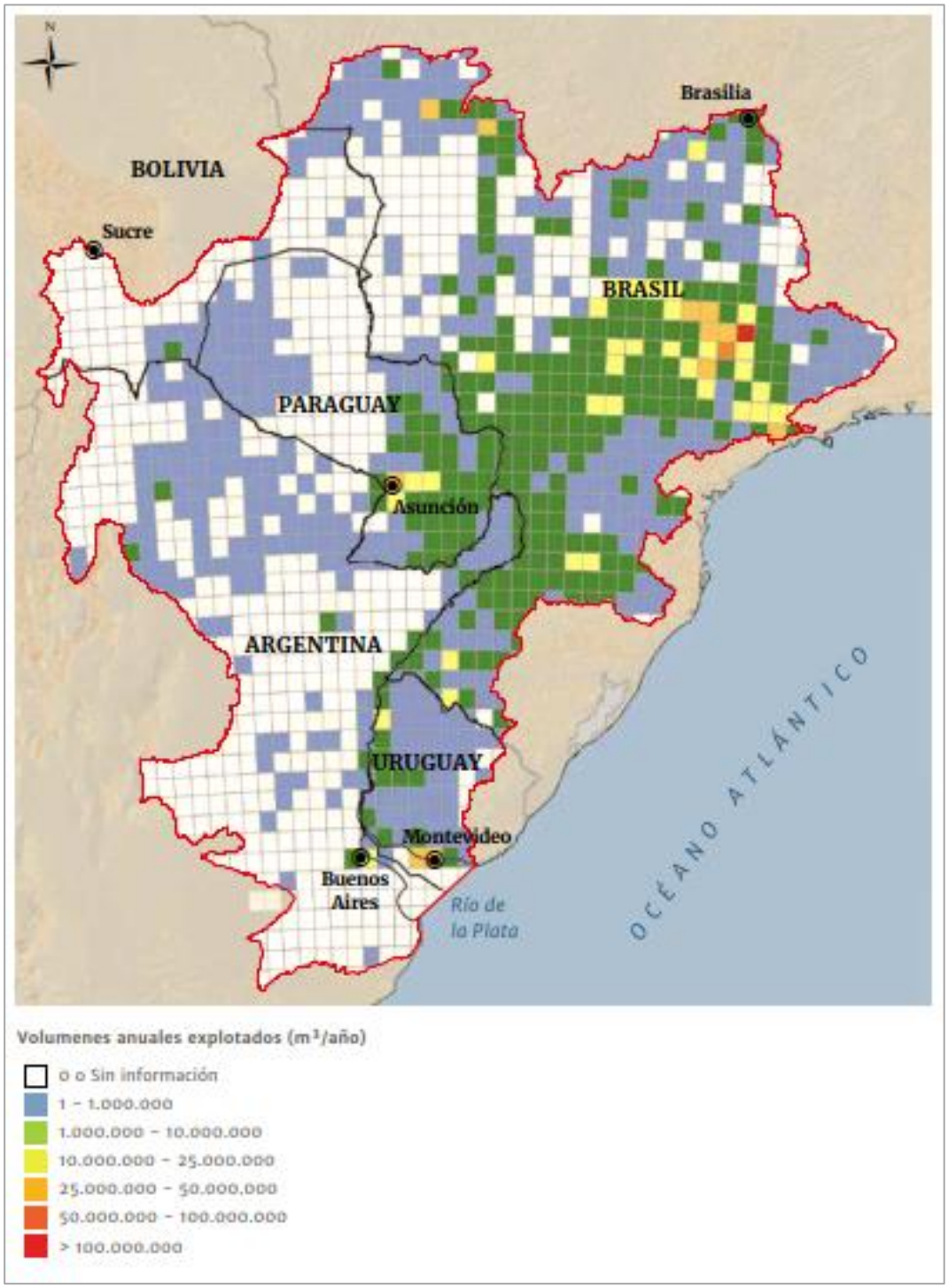

Figure 47 – Volumes of groundwater exploited annually. Source: CIC (2017)

The potability of the groundwater in the Basin was analyzed, in terms of salinity, taking into account the values of the electrical conductivities of the samples analyzed, given that they represent an approximation of the total dissolved salt content.

The concentrations of these salts, expressed in µS/cm were arranged in regular intervals distributed throughout the area of the Basin, and present the following results:

- 0 – 100 µS/cm – Registered only in the extreme North and Northeast regions of the Brazilian territory;
- 100 – 500 µS/cm – Widely predominant throughout the Basin, mainly in the Paraná Sub-basin in Brazil, and smaller portions in other countries;
- 500 – 1000 µS/cm – This interval occurs as strips aligned in a north-south direction, separating the Paraná Basin from those located further west in the region, also extending over part of Bolivian territory, the Brazilian Pantanal area and the eastern and western regions of Argentina;
- 1000 – 3000 µS/cm – This concentration interval, which marks the beginning of the occurrence of waters with inadequate quality for human health, is available in the Argentine and Paraguayan Chaco, in addition to the central and southern portion of Argentina;
- 3000 µS/cm – the area of occurrence of this interval of highly saline waters is restricted to a region of the Paraguayan and Argentine Chaco, corresponding to the fraction of the area of occurrence of the SAYTT Aquifer.

The following figure shows the geographical distribution of occurrence of these intervals.

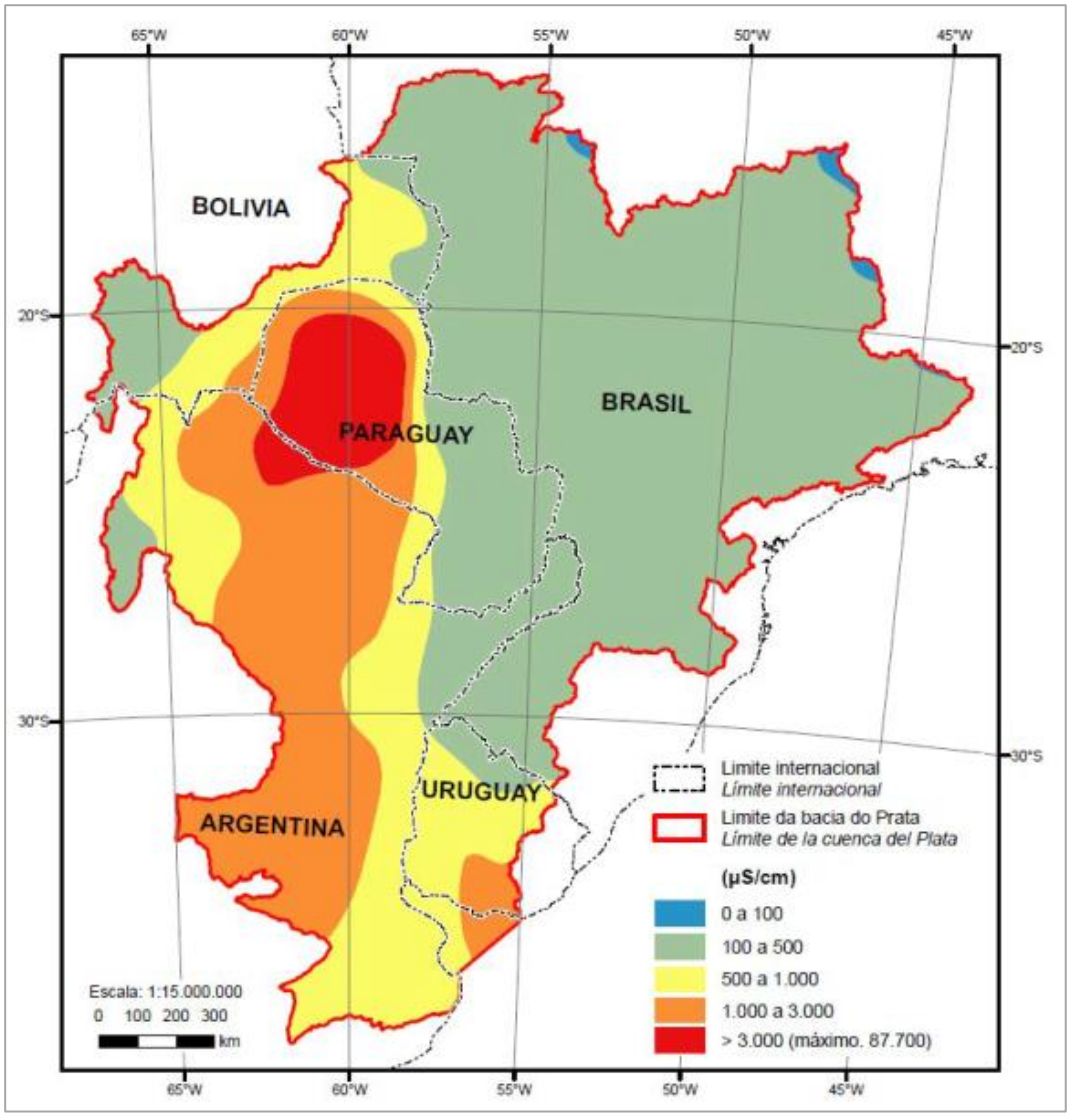

Figure 48 – Groundwater salinity distribution. Source: Diniz *et al.* (2015)

The natural vulnerability of groundwater is presented in the figure below. The lower regions or those with more dense drainage, such as the Chaco, Pantanal and the main drainage areas, present high to extreme vulnerabilities. The compartment represented by the Paraná Sedimentary Basin has medium to low vulnerability in relation to the others and high portions such as the Bolivian Andes present Low vulnerability index.

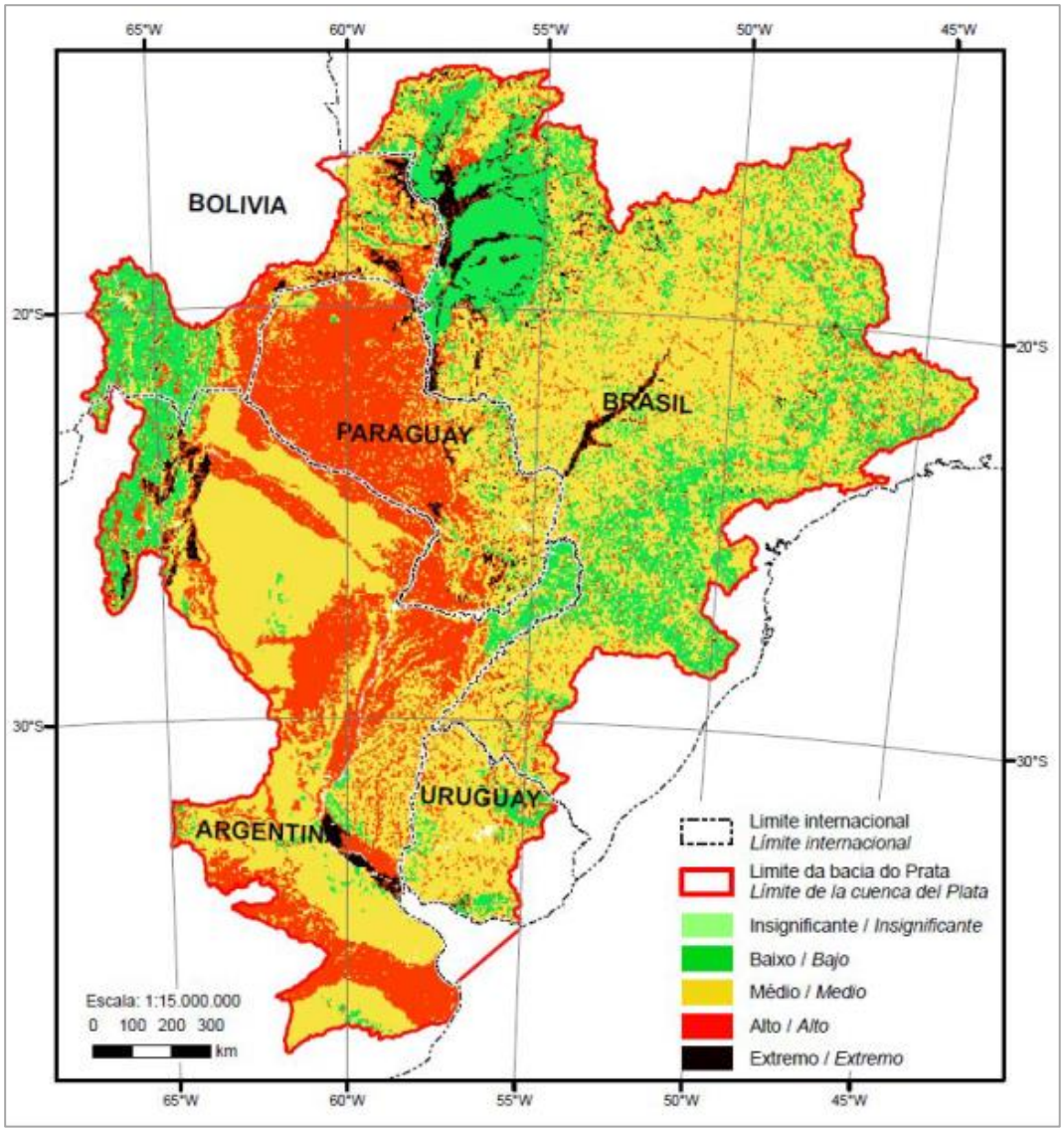

Figure 49 – Natural vulnerability of the groundwater of the Plata Basin. Source: Diniz *et al.* (2015)

The aquifers present in the influence areas of the PARACEL Eucalyptus Plantation will be addressed in this chapter on groundwater.

The following information has been extracted from the Pulp Mill and Port Environmental Impact Study & Report (EIAp/RIMA): Book I - Environmental Diagnosis Of The Physical Environment (PÖYRY, 2020).

6.1.9.1 Aquifer System Yrendá-Toba-Tarijeño - SAYTT

According to CIC (2015), the SAYTT is shared by the three countries of the South American Gran Chaco, which are Argentina, Bolivia and Paraguay. Each of the countries that contain the aquifer has given it a name to identify it within its territory. So we have to: Argentina: Acuífero Toba (T), Bolivia: Acuífero Tarijeño (T) and Paraguay: Acuífero Yrendá (Y).

The SAYTT is an aquifer system of great regional importance due to the existing expectations in a region with water shortage, semi-arid climate and with other aquifers where its supply is brackish or salt water, not suitable for human consumption or agricultural production. Its knowledge and subsequent sustainable management would favor a correct management of the soil, which, undeniably, the services provided by both natural resources are integrated for the development of the region.

The rocks assigned to the Quaternary that appear in the SAYTT region extend over some 521,904 km^2, distributed among the following countries in order of surface area: Argentina: 303,220 km^2 (58.1%), Paraguay: 196,988 km2 (37.7%) and Bolivia 21,696 km2 (4.2%) (GULISANO 2014).

In Paraguay the Yrendá Aquifer System is located in three departments (Boquerón, Pte. Hayes and Alto Paraguay).

The most important river in the SAYYT, in Paraguay, is the Pilcomayo river, with an area of 272,000 km^2 (approx. 8.4% of the Plata basin). It is the natural border between Argentina - Bolivia and Argentina - Paraguay. This river is characterized by its permanent wandering due to the large volume of sediments it carries. This has created through thousands of years a great continental delta, with apex in the triple border and its maximum opening on the Paraguay River from Bahía Negra in Paraguayan territory, to Route 81 in the province of Formosa, which has remained practically as a division of the Pilcomayo and Bermejo basins.

This gigantic alluvial fan could be divided into two types of morphology. To the north in Paraguayan territory, a dense network of deactivated-clogged paleo-catchment areas has been formed, which today constitutes one of the sources of water supply for human consumption. These paleo-channels present a direct recharge of rainwater and since a few decades ago the artificial recharge of this phreatic aquifer, superimposed on the SAY, has been carried out in the area. On the other hand, towards the south there is a series of streams and rivers that constitute the active network of paleo-catchment areas and new channels. All the watercourses finally discharge into the Paraguay River which is the great receiver of all the waters that descend from the Andes. The surface of this great continental paleo-delta is about 200,000 km^2, located almost entirely in Paraguayan territory.

According to CIC (2015), in Paraguay, the compilation of data from the Yrendá aquifer (SAY), in Paraguayan territory, presented 382 deep wells in Excel spreadsheets and 227 wells with less than 50 meters deep in SISAG origin sheets. A map of the location of the wells was presented where the quality of the water is defined according to its salinity (fresh, brackish and salty, as well as dry wells), in addition to a sheet with physical-chemical data of some wells.

Under the denomination of SAY, it is understood that confined and/or semi-confined aquifers extend throughout the Chaco at various levels and at different depths, constituting multi-layer systems, formerly called the Yrendá Aquifer Complex (GODOY, 1990), constituting at the regional level a single hydrogeological system,

although differences in detail may occur at the local level, occupied by different groundwater flow systems. South of the 20th parallel, the SAY is below a depth of 50 m to the west, bordering Bolivia, and below 5 - 3 m to the east, in the Humid Chaco, even overcoming the phreatic level near the Paraguay River, causing the flow of the aquifers to be confined to the phreatic level. The piezometric levels range from 25 m to close to rising, in the channels that run in a west-east direction, tributaries of the Paraguay River.

In the area between the Bolivian Sub-Andean and the Parapetí River, the permeability (K) of the deep aquifers varies from 8.6 - 17.3 m/day; the transmissibility (T) from 1,075 - 2,150 m^2/day and the storage coefficient (S) from 5.10-4 - 6. 10-6; in the Bolivian-Paraguayan border area permeability varies from 6 to 8 m/day and transmissibility from 400 to 200 m^2/day and in the central Paraguayan Chaco permeability varies from 0.3 to 8.0 m/day and transmissibility from 50 to 100 m^2/day. The wells that capture these aquifers have specific flows that vary from 2.0 to 3.6 m^3/h/m. Their maximum total porosity is 40% and the effective porosity is between 7 and 10%. The actual underground flow rate varies from approximately 20 m/year to 46 m/year. (GODOY V. EUGENIO, 1990).

The large hydraulic load of the confined aquifers indicates that the recharge zone is at a much higher level than the land where the well is located, and as the area is semi-arid with a strong water deficit it is difficult for these aquifers to receive fresh water by direct infiltration of rainfall. As well, the isolated freatic aquifers are insufficient to feed the deep aquifers that contain large volumes of fresh water. It is strong to think that the recharge is produced by infiltration of rainfall and rivers in Bolivian territory, mainly along a strip of thick piedmont sediments about 15 to 20 km wide, which runs parallel to the sub-Andean mountain ranges, as well as by infiltration of the Pilcomayo River during floods through its alluvial fan. (GODOY V. EUGENIO, 1990).

In times of low water, the salinity of the surface courses and wetlands increases, indicating a subterranean source of water. The discharge zone is characterized by the occurrence of brackish to salty wetlands in the direction of underground flow. The formation of evaporative minerals in discharge areas produced by regional flow systems of mineralized (salt) groundwater is a characteristic of the area.

6.1.9.2 Guaraní Aquifer System (Sistema Aquifero Guarani – SAG, in Spanish)

According to CIC (2015), the transboundary Guarani Aquifer System (SAG) has an area of 1,087,879.15 km^2, extending over the Chaco - Paranaense sedimentary basin. It is the most important hydro-stratigraphic unit in the southern portion of the South American continent, and is associated with the siliciclastic rocks of the Plata Basin (Brazil and Paraguay), the Chaco - Paranaense Basin (Argentina) and the Northern Basin (Uruguay), which represent an evolutionary history common to the eastern portion of the Bolivian Chaco (FRANCA ET AL, 1995).

The regional climate in its area of occurrence is characterized as humid, with rainfall ranging from 1,200 to 1,500 mm/year.

Its waters are widely used for human and industrial supply and for thermal tourism, due to their thermal properties in the places where the aquifer is confined by the basalts of the Serra Geral formation.

The Guarani Aquifer System is formed by sandstones of the Jurassic period (Brazil), of the Tacuarembó formation (Uruguay), Misiones (Paraguay) and by the fluvio-lake sandstones of the Piramboia/Rosario do Sul formation (Brazil) and Rivera (Uruguay).

Outcrop zones occur in two bands located to the west and east of the zone of occurrence and correspond to approximately 10% of the total area of the aquifer, being confined to 90%.

The average thickness is 250 meters and the flows vary between 60 and 200 m^3/h in areas close to the outcropping zones and from 200 to 400 m_3/h in the confined areas. Locally it can present much lower values in the outcrop areas.

The waters are calcium and magnesium bicarbonate near the outcropping areas and sodium in the deeper areas. The pH is alkaline and dry residue values vary from 200 to 600 mg/l. The temperature varies from 18 to 63°C, depending on the depths of occurrence of the aquifer.

This aquifer system is of great importance at the regional and transnational level, representing a fundamental resource for socioeconomic development and in the operation and maintenance of associated ecosystems.

6.1.9.3 Groundwater water quality

This item presents the results of the First Monitoring Campaign of Surface and Groundwater Quality Monitoring, prepared by TECNOAMBIENTAL – Inginiería y Consultoría, in last February.

The purpose of this document is to establish a baseline of the groundwater quality int the project´s area of influence before the conversions to industrial zone and plantation forestry respectively occur.

The main objectives of the monitoring are the following:

- Measure the groundwater level and analyze the groundwater quality of 6 existing monitoring wells in the future BKP cellulose pulp manufacturing plant´s;
- Analyze and, where technically feasible, measure the groundwater level of 14 artesian wells distributed in the “Farm Zone” of the departments of Concepción and Amambay.

The sampling take place in two campaigns covering the dry and rainy seasons. The preliminary results are presented here.

PARACEL selected and provided the monitoring points that correspond to sites of interest where land-use changes occur in the short term, mainly the transformations of pasture for livestock converted to and industrial zone or forest plantations as the case may be.

6.1.9.3.1 Monitoring Points

According to TECNOAMBIENTAL (2021), PARACEL provided the coordinates of the 20 monitoring point for the groundwaters, detailed below:

- Fourteen points are deep tubular wells located in the “Farm Zone”, these wells are currently in service. Their waters are extracted with submersible pumps and are used to supply drinking water to the area´s human populations;

- Six points are located in the future industry and relate to deep tubular wells built exclusively for groundwater quality monitoring;

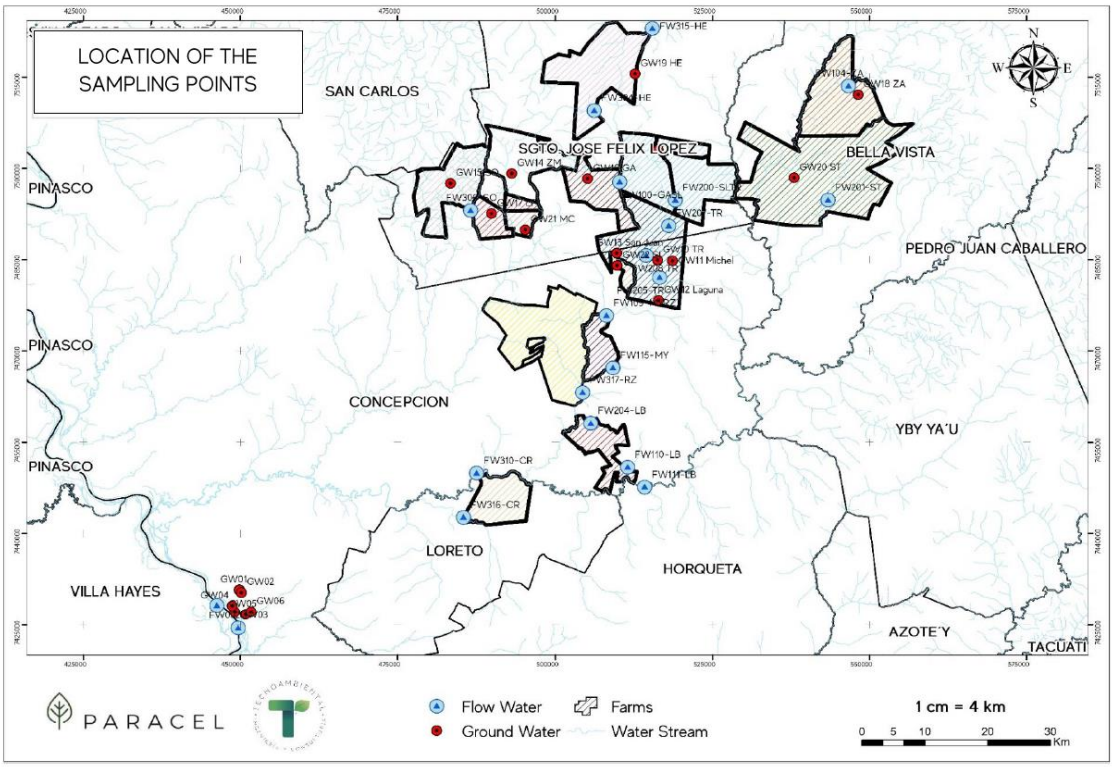

Figure 50 – Location of the sampling points. Source: TECNOAMBIENTAL (2021)

6.1.9.3.2 Results

Based in the document prepared by TECNOAMBIENTAL (2021), the main findings for groundwater were:

- Of the 23 physicochemical and bacteriological parameters evaluated, 18 have limits established in the current regulations, and 5 do not have defined limits;
- Of the 18 parameters with defined limits, 11 (61%) do not show and deviation regarding current regulations and 7 parameters (39%) show values above the maximum permitted in at least one monitoring point;
- The 11 parameters that do not show any deviation in the 14 wells evaluated are electrical conductivity, total dissolved solids, hardness, total nitrogen, chlorides, sulphates, sodium, potassium, calcium, magnesium, fluoride and E. coli;
- The parameters that show some degree of deviation are pH, total phosphorus, nitrates, alkalinity, fecal coliforms and total coliforms;
- The parameters that most frequently present deviations in the 14 sampled wells are Nitrates (42%), total phosphorus (71%), fecal coliforms (92%) and total coliforms (100%).

The following table show a summary of the results obtained for each parameter analyzed in groundwater, highlights the points that present some deviation and the percentage of monitoring points that complies with the SEAM n°222/02.

N°	PARAMETER	AVERAGE	MONITORING POINTS WITH LIMIT DEVIATIONS	COMPLY WITH THE LIMITS		BEYOND THE LIMITS	
				N°	%	N°	%
1	Temperature	24,5 °C	No limits				
2	pH	6.6	GW 20-ST GW 23-SL GW 11-MICHEL GW 22-SI	10	71%	**4**	**29%**
3	Electrical conductivity	257.8 µS/.cm	All groundwater points comply with the limits established by regulation NP 2400180	14	100%	**0**	**0%**
4	Dissolved solids	252.4 mg/L	GW 15-SO	13	93%	**1**	**7%**
5	Organic matter	0.67 mg O_2/L	No limits				
6	Hardness	49.12 mg $CaCO_3$/L	All groundwater points comply with the Regulation	14	100%	**0**	**0%**
7	Total phosphorus	0.2 mg/L	GW 18-10 GW 19-ST GW 23-SL GW 11-MICHEL GW 10-TR GW 13-SL GW 12-LAGUNA GW 14-ZM GW 15-SO GW 17-LP GW 21-MC	3	21%	**11**	**79%**
8	Total nitrogen	2 mg/L	GW 15-SO	13	93%	**0**	**0%**
9	Nitrates	34.5 mg/L	GW 13-SAN JUAN GW 22-SILVA GW 15-SO GW 17-LP	10	71%	**4**	**29%**
10	Chlorides	12.9 mg/L	All groundwater points comply with the Regulation	14	100%	**0**	**0%**
11	Alkalinity	82 mg $CaCO_3$/L	GW 15-SO	13	93%	**1**	**7%**
12	Bicarbonates	57.86 mg $CaCO_3$/L	No limits				
13	Carbonates	0 mg $CaCO_3$/L	No limits				
14	Sulphates	4.0 mg/L	All groundwater points comply with the Regulation	14	100%	**0**	**0%**
15	Sodium	32 mg/l	All groundwater points comply with the Regulation	14	100%	**0**	**0%**
16	Potassium	1.5 mg/l	All groundwater points comply with the Regulation	14	100%	**0**	**0%**
17	Calcium	13.0 mg/L	GW 15-SO	13	93%	**1**	**7%**
18	Magnesium	56.3 mg/L	All groundwater points comply with the Regulation	14	100%	**0**	**0%**
19	Fluorine	2.6 mg/L	No limits				
20	Boron	1.2 mg/l	All points complies with the Regulation	14	100%	**0**	**0%**
21	Faecal coliforms	15.9 NMP/100mL	Only GW16-GA comply with the Regulation	0	0%	**14**	**100%**
22	Total coliforms	>21 NMP/10mL	All points complies with the Regulation	0	0%	**14**	**100%**
23	*E Coli*	Absent	All points complies with the Regulation	14	100%	**0**	**0%**

Complete information about this campaign, as methodology and detailed results are presented in **ANNEX I**.

6.1.10 Natural disasters

Floods are the most common natural disasters that occur in areas of influence areas of the PARACEL Eucalyptus Plantation.

Fluvial Floods are natural phenomena due to the natural flooding of a river that conditions the formation of alluvial plains, close to periodically flooded water courses.

Rain floods are those that are produced by the accumulation of rainwater, snow or hail in areas of flat topography, which are normally dry, but which have reached their maximum degree of infiltration.

According to DOMECQ et al (2016), in Paraguay, these two types of floods occur: river-river floods, mainly due to the seasonal and extraordinary floods of the Paraná and Paraguay rivers.

The origin of these floods due to the Paraguay River, are actually presented as a consequence of the seasonal rainfall that accumulates in the Pantanal and that, due to the geographical characteristics of the area, it acts as a natural reservoir, where the water from the floods it accumulates slowly and progressively and then delivers them regularly to the Paraguay riverbed for six months (April to September), becoming a regulator of its hydraulic regime.

Floods of pluvial origin (urban) arise as a result of intense rainfall (severe storms) in cities and the alteration of the basin as a result of uncontrolled urbanization.

Ordinary floods occur in the summer months (February-March) and the dry season is centered in winter (July-August). However, extraordinary floods can occur at any time of the year, with all-time highs being recorded between May and July.

The hydrological region of the Paraguay River is characterized by a module of 3000m^3/s, with maximum flows of the order of 12000m^3/s and minimums of the order of 800m^3/s. The annual cycle presents extreme flood wave peaks between June and July, with minimums from December to February. The flows are associated with the variability of rainfall, increasing strongly with the occurrence of “El Niño”.

The figures below shows the hydrometric levels of annual maximums of the Paraguay River in Asunción from 1904 to 2015 and the chronological years of occurrence attending to the same maximum hydrometric levels of the Paraguay River corresponding to the estimated period of 1904-2015.

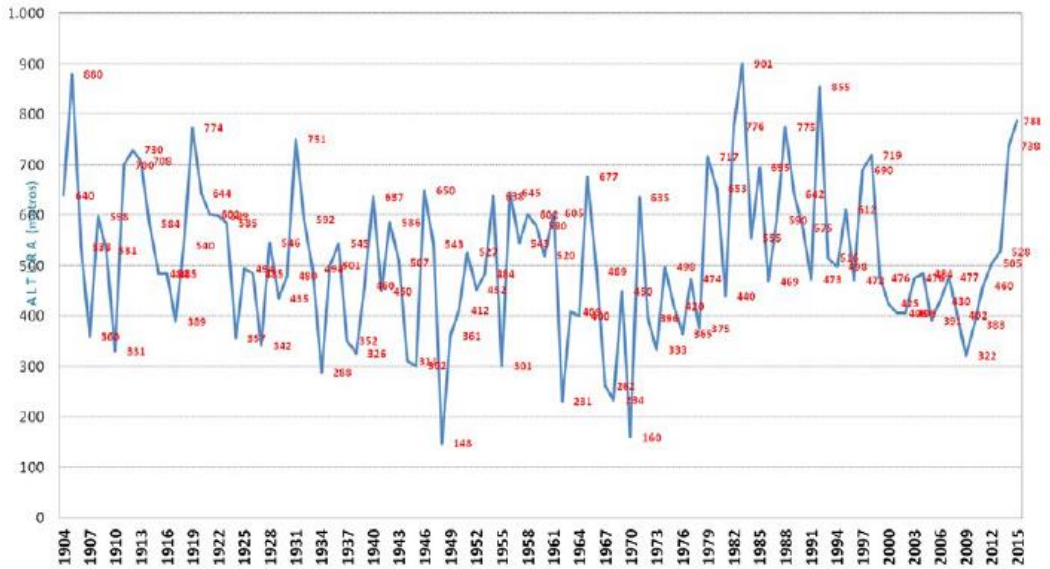

Figure 51 – Hydrometric levels of the Paraguay River 1904/2015 - Asunción - Annual Highs. Source: DOMECQ et al (2016)

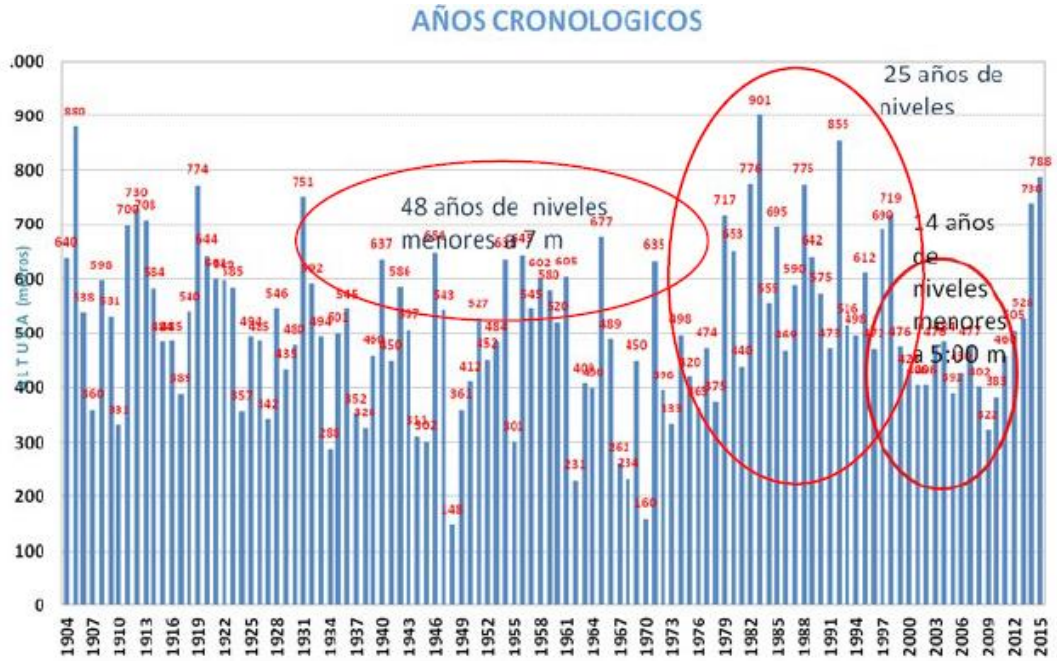

Figure 52 – Hydrometric levels of annual maximums of the Paraguay River - Asunción - 1904/2015 - Chronological years. Source: DOMECQ et al (2016)

6.1.10.1 River Floods and Urban Drainage

Floods in Paraguay acquired relevance in urban areas from the 70s, when the processes of land occupation related to the natural flood plains of rivers and banks of urban streams intensified. In the years 1982/83 this occupation of territory worsened in the country, associated with the climatic event "El Niño" when the Paraguay River reached extraordinary levels, with little recorded history to date. Considering this event, the riverside population occupies higher spaces almost always linked to water courses, with an impact on the entire city due to the occupation of public spaces, improvised shelters on public and private lands and the environmental and sanitary effects that this situation brings with it. .

The floods that occur in urban areas are not only consequences of the overflowing of rivers and streams, but are also linked to severe storms that normally occur in the months of October and April, this together with the concentration of population in the centers. urban areas and the weak rainwater evacuation infrastructure. The effects of this event are translated into the deterioration of the pavement that is systematically worn by the absence of rain drainage, absenteeism from work and school, stagnant waters that generate deterioration in the environment and in the health of people, among others. In this case, the streams become rainwater evacuators, which overflows from its natural channel dragging all kinds of solid waste that is finally deposited on the banks of the Paraguay River, causing an environmental impact on the body of water.

In Paraguay, to date, the construction of urban drainage infrastructures is insufficient and in some cases they are reduced to specific solutions in the main cities of the country. These refer to sanitary drainage (sewer network and storm drainage), which are conceived as independent systems.

In figure below, the area's most vulnerable to rain floods linked to urban drainage are presented. The department of Concepción and Amambay stands out, where they are located the influence areas of the PARACEL Eucalyptus Plantation.

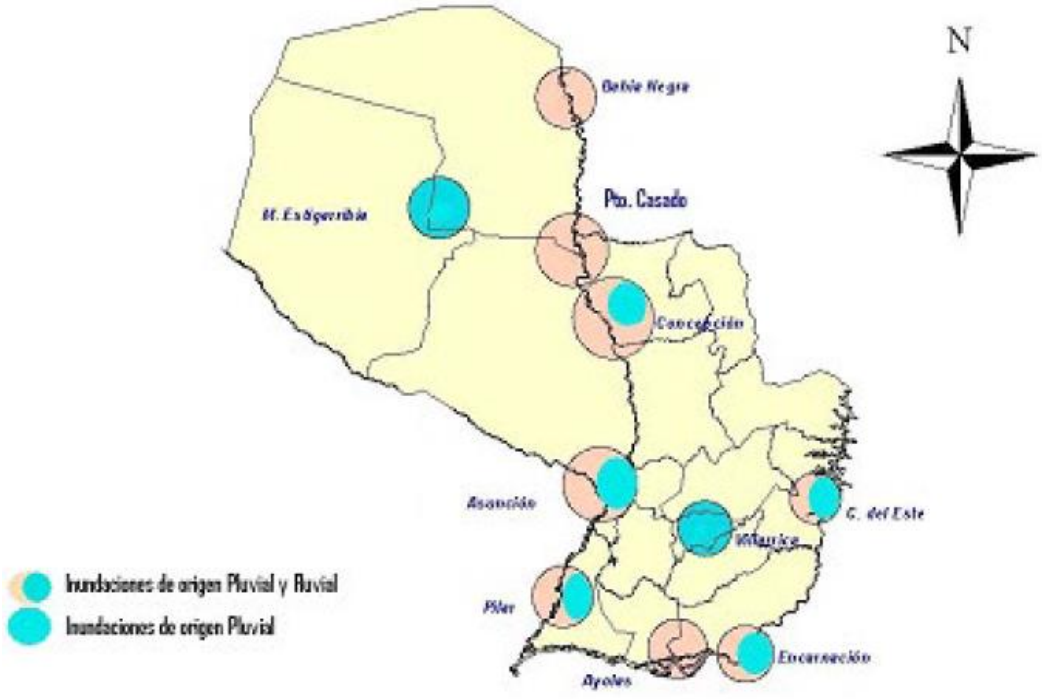

Figure 53 – Most vulnerable areas to flooding in urban centers. Source: DOMECQ et al (2016)

Urban drainage coverage in Paraguay has a deficit. The storm drain system in Asunción is installed in the downtown area and along a few other roads, which are connected to streams, this implies that rainwater runs through most of the road surfaces and obstructs the flow of traffic when Rains.

Rainwater runs off within 1 to 2 hours due to topographic undulations, however it tends to erode base course materials, an action that damages the pavement.

Regarding the sanitary sewer system, it is observed that 100% of the discharges are conducted to water channels, be they streams or the Paraguay River. As for the pluvial drainage in other cities, on the Paraguay River, the only cities on this river that have sanitary sewers are: Villeta and Pilar. On the Paraná River, Ciudad del Este and Encarnación lack storm sewers. Encarnación also has sanitary sewer lines.

6.1.10.2 Water Network of Paraguay

According to DOMECQ et al (2016), Paraguay is fully inserted in the Río de la Plata basin, two of the main tributaries of the basin are linked to Paraguayan territory, the Paraguay and Paraná rivers.

The Paraguay River is the most important tributary of the Paraná River, and is considered the second most important river system in South America, containing in its basin and system the largest wetland in the world, the Pantanal.

The Paraguay river basin covers 1,095,000 km^2, and in the national territory, this river has an extension of 1,250 km^2. Its banks are located in important urban centers such as: Concepción, Pilar and Asunción. The section of the same begins in Bahía Negra to Asunción, according to image below where the section of the Paraguay River is shown.

Figure 54 – Sections of the Paraguay River. Source: DOMECQ et al (2016)

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ANNEX I

FIRST WATER MONITORING CAMPAING REPORT

SURFACE AND GROUNDWATER QUALITY MONITORING

TECNOAMBIENTAL
•INGENIERÍA Y CONSULTORÍA•

1ST MONITORING CAMPAIGN REPORT

CONTRACTING COMPANY:	PARACEL SA.
DEPARTMENT:	CONCEPCIÓN AND AMAMBAY
DISTRICTS:	CONCEPCIÓN, SGTO. JOSÉ FELIX LÓPEZ, LORETO AND BELLA VIST
CONSULTANT:	TECNOAMBIENTAL S.R.L.
REPORTED PERIOD:	RAINY SEASON (JANUARY-FEBRUARY)

APRIL 2021

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I. INTRODUCTION

The terms of reference of the water quality monitoring consulting service prepared by PARACEL SA defines this report's guidelines. The firm is in charge of the project "Construction and operation of a plant for the manufacture of BKP cellulose pulp on the Paraguay River", which is developing approximately 15 km north of the city Concepción. This report also responds to the International Finance Corporation (IFC) environmental requirements, the financing entity, that requires a baseline of the environmental conditions before implementing the project to collect useful data to monitor potential changes resulting from the project's implementation.

The purpose of this document is to establish a baseline of the surface and groundwater quality in the project's direct area of influence (DAI) and indirect area of influence (IAI) before the conversions to industrial zone and plantation forestry respectively occur.

The main objectives of the monitoring are the following:

- Obtain quantitative information of the River Paraguay's water quality at 2 points located in DAI of the future Industrial plant, before and after the treated effluent's discharge point from the future factory located 20 km upstream port of the city of Concepción.
- Measure the groundwater level and analyse the groundwater quality of 6 existing monitoring wells in the future BKP cellulose pulp manufacturing plant's DAI.
- Obtain quantitative information of the surface water quality (streams and rivers running through the so-called "Farm Zone" in the Departments of Concepción and Amambay) at 18 monitoring stations.
- Analyse and, where technically feasible, measure the groundwater level of 14 artesian wells distributed in the "Farm Zone" of the Departments of Concepción and Amambay.

The samplings take place in two campaigns covering the dry and rainy seasons. The preliminary results presented in this report belong to the latter.

PARACEL SA selected and provided the monitoring points that correspond to sites of interest where land-use changes will occur in the short term, mainly the transformations of pastures for livestock converted to an industrial zone or forest plantations as the case may be.

A certified laboratory, the Multidisciplinary Centre for Technological Research (CEMIT) of the National University of Asunción (UNA), analysed the samples. CEMIT's calibrated equipment and standardised procedures were used during sampling and transporting samples.

The National Accreditation Body (ONA), dependent on the National Council of Science and Technology (CONACYT), accredited the CEMIT's laboratory.

II. METHODOLOGY

2.1 General information about the study area

This section collects some data mentioned in the environmental impact assessment report of the future industry prepared by the consultancy POYRY in 2020 and aims to establish the hydrological and hydrogeological context in which the monitoring carries out.

The project's location is in the city of Concepción; therefore, the surface and groundwater monitored are part of the Aquidabán River Basin. This basin has an approximate area of 1,254,812 ha and flows into the River Paraguay to the north of Concepción. Its main tributaries are the Trementina and Negla streams, and it is characterised by its relatively high concentration of total and dissolved solids, depending on the time of collection and the presence of significant nutrient contents.

2.1.1 Surface water

The future factory's location is in the Middle and Lower Paraguay sub-basin, which is part of the hydrographic units mentioned above.

In the area of direct influence is the River Paraguay, from which raw water is to be collected and which is the main body of surface water to receive the wastewater treated and generated by the project, in a stretch of approximately 1 km, through a submarine wastewater discharge pipe.

Dispersion of treated effluents in the River Paraguay expects to occur very close to the discharge point between 0.37 and 0.42 m upstream of the factory's water intake.

In the AII is the Tinfunqué Ramsar site, which is 235 km from the future factory. Likewise, the Estero Milagro Ramsar site is 35 km away but outside the area of indirect influence.

Hydrographically, the most critical watercourses for the present study are the Trementina stream, Napegue stream, Negla stream, Hermosa stream, Pitanohaga stream, Aquidabán River and Paraguay River.

2.1.2. Groundwater

Regarding the hydrogeological characteristics, the factory is in the Aquidauana-Aquidabán Aquifer System.

This system is in the River Paraná basin, covering approximately 27,000 km^2, of which 12,300 km^2 are in Paraguay and the rest in Brazilian territory. It is used mainly for human and animal supply in both countries.

The aquifer is a semi-confined type, made up of glaciomarine sediments with significant facies variations, and has very dispersed flows rates with average values ranging between 10-20 m^3/h/ well.

The water's chemical characteristics are very variable also.

2.2 Location and details of monitoring points

There are 40 sampling points selected to monitor water quality in the DAI and IAI, 20 of which are surface watercourses and 20 are groundwater.

As for the political-administrative limits of the study area, 4 points are in the district of Bella Vista in the Department of Amambay and 36 points are distributed in the districts of Concepción, Sgt José Felix López and Loreto in the Department of Concepción.

PARACEL provided the coordinates of the 20 monitoring points for surface waters; 18 points are existing watercourses located in the so-called "Farm Zone" of the project's AII, and 2 points are on the River Paraguay in the DAI of the future industry. The number of sampling points is detailed below, according to the denominations given to the surface waters:

- One point corresponds to the Hermosa stream, a tributary of the Apa River.
- One point corresponds to the Napegue stream, a tributary of the Negla stream.
- One point is on the Negla stream, a tributary of the Aquidabán River.
- Ten points are on the Trementina stream, a tributary of the Aquidabán River.
- One point is on an unnamed stream, a tributary of the Aquidabán River.
- Two points are on the Aquidabán River.
- One point corresponds to the Laguna Penayo stream.
- One point corresponds to the Pitanohaga stream.
- Two points are on the Paraguay River at the DAI of the future's industrial plant.

Regarding groundwater monitoring points:

- Fourteen points are deep tubular wells located in the "Farm Zone", these wells are currently in service. Their waters are extracted with submersible pumps and are used to supply drinking water to the area's human populations.
- Six points are located in the future industry's DAI and relate to deep tubular wells built exclusively for groundwater quality monitoring.

In the existing properties in the so-called "Farm Zone", the land use is changing from cattle pasture to *Eucalyptus sp.* plantation while in the DAI from floodplain pasture to an industrial zone.

The 40 monitoring points were selected to verify the existing surface, and groundwater quality in the DAI and the "Farm Zone" (IAI) before land-use conversions occur due to project implementation.

The following map shows the properties' boundaries and the spatial distribution of the monitoring points, classifying between surface water and groundwater points. The hydrography layer of the study area is also displayed.

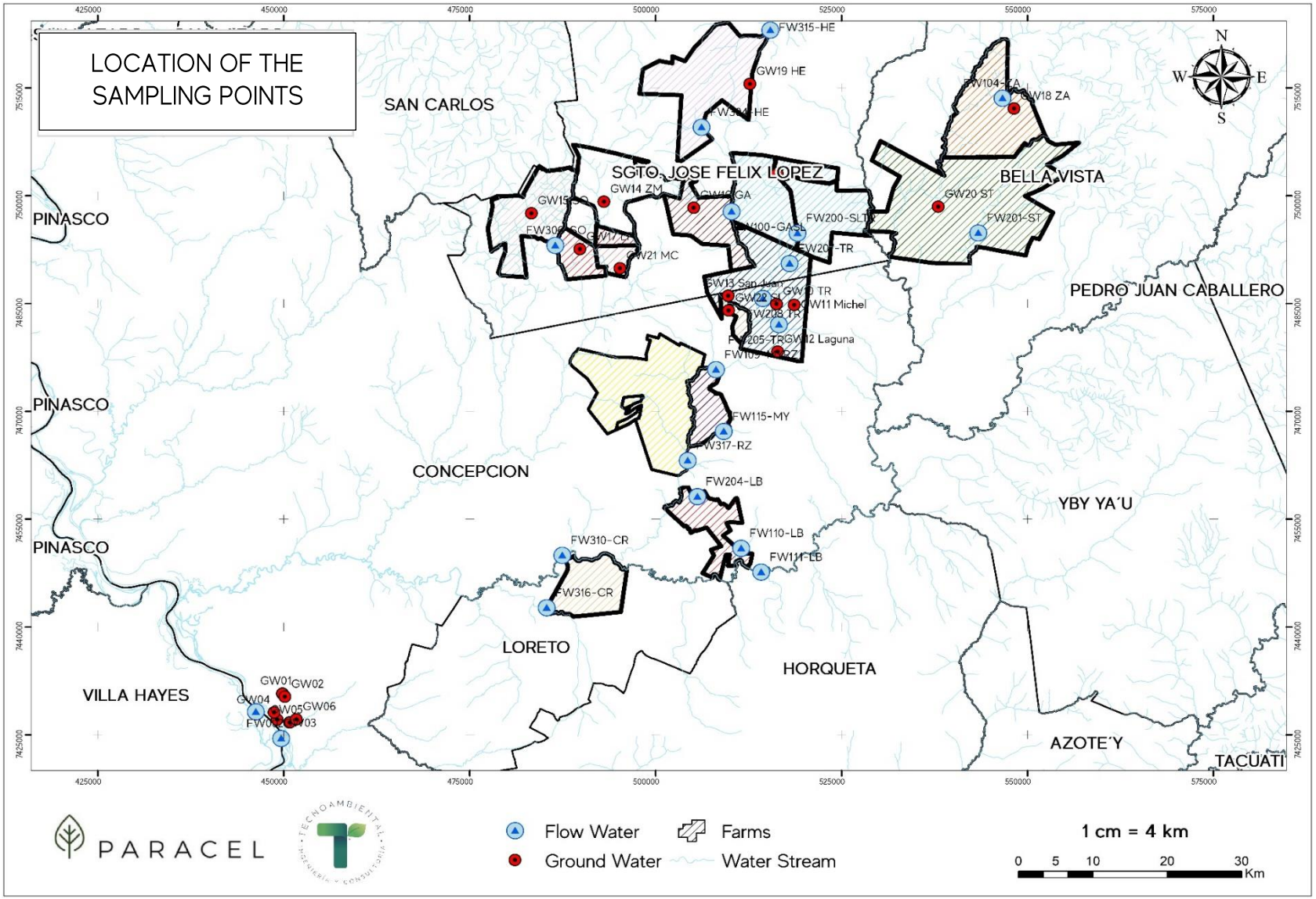

LOCATION OF THE SAMPLING POINTS
SAN CARLOS
SGTO. JOSE FELIX LOPEZ
BELLA VISTA
PINASCO
PINASCO
PINASCO
CONCEPCION
PEDRO JUAN CABALLERO
YBY YA´U
LORETO
HORQUETA
VILLA HAYES
AZOTE´Y
TACUATI
FW315-HE
GW19 HE
GW14 ZM
GW15
GW21 MC
FW104-ZA
GW18 ZA
GW20 ST
FW201-ST
FW200-SLT
FW207-TR
GW13 San Juan
GW10 TR
GW11 Michel
GW12 Laguna
FW115-MY
FW317-RZ
FW204-LB
FW110-LB
FW111-LB
FW310-CR
FW316-CR
GW01
GW02
GW04
GW05
GW06
FW03
N
S
W
E
425000
450000
475000
500000
525000
550000
575000
7515000
7500000
7485000
7470000
7455000
7440000
7425000
PARACEL
Flow Water
Ground Water
Farms
Water Stream
1 cm = 4 km
0 5 10 20 30
Km

TABLE 1. SAMPLING POINTS						
	Nº	CODE	UTM COORDINATES	TYPE OF SAMPLE	MONITORED PARAMETERS	LOCATION, DESCRIPTION, OBJECTIVES
NEGLA STREAM MICRO-WATERSHED	1	FW 104 - ZA	21K 546639,23 mE 7513553,82 mS	F.W.	Described in Table 2	Negla stream – Upper part of the micro-watershed – Determine the surface water quality of the Farm "Zapallo".
	2	G.W. 18-ZA	21K 548201.00 mE 7512128.00 mS	G.W.	Described in Table 3	Headquarters of the "Zapallo" farm – Deep tubular well used for water drinking supply - Determine the groundwater quality of Farm "Zapallo".
	3	F.W. 201-ST	21K 543911.54 mE 7497910.60 mS	F.W.	Described in Table 2	Napague stream - Upper middle part of the Negla stream micro-watershed - Determine Farm "Santa Teresa's surface water quality.
	4	G.W. 20-ST	21K 537999.00 mE 7498476.00 mS	G.W.	Described in Table 3	Headquarters of the "Santa Teresa" farm - Deep tubular well used for drinking water supply - Determine the groundwater quality of Farm "Santa Teresa".
HERMOSA STREAM MICRO-BASIN	5	FW 315-HE	21K 515424,99 mE 7523026,00 mS	F.W.	Described in Table 2	"Hermosa" stream - Upper watershed of the "Hermosa" creek micro-watershed - Determine the surface water quality at the outlet of Farm "Hermosa".
TREMENTINA. STREAM MICRO-WATERSHED	6	GW 19-HE	21K 512695.00 mE 7515558.00 mS	G.W.	Described in Table 3	Headquarters of the "Hermosa" farm - Deep tubular well for drinking water supply - Determine the current groundwater quality of Farm "Hermosa".
	7	FW 304-HE	21K 506172,99 mE 7509505,00 mS	F.W.	Described in 2	Trementina stream – Upper watershed of the Trementina stream micro-watershed – Determine surface water quality at the outlet of Farm "Hermosa."
	8	G.W. 23-SL	21K 516367.00 mE 7503054.00 mS	G.W.	Described in 3	Headquarters of the "San Liberato" farm – Deep tubular well for water provision for human consumption – Determine groundwater's current quality in the "San Liberato" farm.
	9	G.W. 16-GA	21K 505125.00 m E 7498320.00 m S	G.W.	Described in 3	Headquarters of the "San Gavilán" farm at 200 metres from *Eucalyptus sp.* plantations – Deep tubular well to provide water for human consumption – Determine the current groundwater quality of the "Gavilán" farm.
	10	FW 100-GASL	21K 510205.03 mE 7497780.65 mS	F.W.	Described in 2	Trementina stream – Middle/upper catchment of the Trementina stream micro-watershed runs through approximately 7 km of *Eucalyptus sp.* plantations – Determine the surface water quality at the plantation's exit.
TREMENTINA STREAM MICRO-WATERSHED	11	FW 200-SL	21K 519072.00 mE 7494784.00 mS	F.W.	Described in 2	Tributary of the Trementina stream at the southeast of the headquarters of the "San Liberato" farm – middle catchment of the Trementina stream – Determine surface water quality at the outlet of Farm "San Liberato".
	12	F.W. 207-TR	21K 518004.00 mE 7490567.00 mS	F.W.	Described in 2	Tributary of the Trementina stream, 5 km at the north of the headquarters of the "Trementina" farm – middle catchment of the Trementina stream – Determine the current surface water quality of the property.
	13	F.W. 208-TR	21K 514416.00 mE 7485700.00 mS	F.W.	Described in 2	Trementina stream, 2 km northwest of the Trementina farm's headquarters – Middle catchment of the Trementina stream – Determine the property's current surface water quality.
	14	GW 11-MICHEL	21K	GW	Described in 3	Deep tubular wells located in new plantations of *Eucalyptus sp* – Middle basin

TABLE 1. SAMPLING POINTS						
	Nº	**CODE**	**UTM COORDINATES**	**TYPE OF SAMPLE**	**MONITORED PARAMETERS**	**LOCATION, DESCRIPTION, OBJECTIVES**
			518643.00 mE 7484801.00 mS			of the Trementina stream – Well for water for human consumption.
	15	G.W. 10-TR	21K 516254.00 mE 7484946.00 mS	G.W.	Described in 3	Trementina farm headquarters –Middle basin of the Trementina stream, dairy farm and corrals within 200 metres of the All of the well, use for drinking water supply – Determine current groundwater quality.
	16	G.W. 13-SAN JUAN	21K 509767.00 mE 7486076.00 mS	G.W.	Described in 3	"San Juan" farm, the middle basin of the Trementina stream – Well for drinking water supply – Determine the "San Juan" farm's current groundwater quality.
	17	G.W. 22-SILVA	21K 509830.00 m E 7484037.00 m S	G.W.	Described in 3	"Silva" farm, the middle basin of the Trementina stream – Well for drinking water supply – Determine current groundwater quality of the "Silva" farm.
	18	F.W. 205-TR	21K 516574.00 mE 7482061.00 mS	F.W.	Described in 2	Trementina stream, 2.7 km east of the Trementina farm headquarters, middle catchment of the Trementina stream micro-catchment – Determine the property's current surface water quality.
	19	G.W. 12-Laguna	21K 516419.00 mE 7478307.00 mS	G.W.	Described in 3	"Laguna" farm, the middle basin of the Trementina stream micro-basin – Well for drinking water supply and irrigation of seedlings, currently developing a forest nursery and plantation of new crops of *Eucalyptus sp* – Determine the current quality of groundwater in the "Laguna" farm.
TREMENTINA STREAM MICRO-WATERSHED	20	F.W. 109-MYRZ	21K 508110.00 mE 7475784.00 mS	F.W.	Described in 2	Trementina stream, point located between the "Mandyju" and "Rancho Z" property boundaries – middle catchment of the "Trementina" stream micro-watershed – Determine the current surface water quality of the property.
	21	F.W. 115-MANDYJU	21K 509155.00 mE 7467194.00 mS	F.W.	Described in 2	Trementina stream, a point located 11 km southeast of the "Rancho Z" forest plantations – middle catchment of the Trementina stream micro-watershed – Determine Mandyju's ranch current surface water quality.
	22	F.W. 317-RZ	21K 503324.00 mE 7459243.00 mS	F.W.	Described in 2	Trementina stream – lower catchment of the Trementina stream micro-catchment – Determine the current surface water quality at the exit of "Rancho Z".
	23	F.W. 204-LB	21K 498840.00 mE 7451514.00 mS	F.W.	Described in 2	Trementina stream point located 5 km upstream of the outflow point of the Trementina stream to the Aquidabán River – The lower watershed of the "Trementina" stream micro-watershed – Representative point of the quality of water discharging from the Trementina stream into the Aquidabán River.
REPRESENTATIVE POINTS OF THE RIVER AQUIDABÁN	24	FW 110-LB	21K 511487.00 mE 7450940.00 mS	F.W.	Described in 2	Unnamed Stream – Tributary of the Aquidabán River – Determine surface water quality.
	25	F.W. 111-LB	21 K 514185.37 mE 7447625.56 mS	F.W.	Described in 2	Aquidabán River – Lower-middle basin of the Aquidabán River catchment – Determine the current surface water quality.
	26	F.W. 310-CR	21 K 487444.00 mE 7449950.00 mS	F.W.	Described in 2	Aquidabán River – Lower basin of the Aquidabán River catchment – Determine the current Surface water quality in the All of the "Cristo Rey" farm.

TABLE 1. SAMPLING POINTS						
	Nº	CODE	UTM COORDINATES	TYPE OF SAMPLE	MONITORED PARAMETERS	LOCATION, DESCRIPTION, OBJECTIVES
	27	F.W. 316-CR	21K 485341.00 mE 7442662.00 mS	F.W.	Described in 2	"Laguna Penayo" stream – Lower basin of the Aquidabán River – Determine the "Soledad" farm's surface water quality.
PITANOHAGA STREAM MICRO-WATERSHED	28	G.W. 14-ZM	21K 493064.00 mE 7499176.00 mS	G.W.	Described in 3	Headquarters of the "Zanja Morotĩ" farm - Deep tubular well for drinking water supply – Determine the current groundwater quality of the "Zanja Morotĩ" farm.
	29	G.W. 15-SO	21K 483316.00 mE 7497562.00 mS	G.W.	Described in 3	Headquarters of the "Soledad" farm - Deep tubular well for drinking water supply – Determine the current quality of the groundwater of the "Soledad" farm.
MICROCUENCA DEL AO PITANOHAGA	30	FW 306 -SO	21K 486496.00 mE 7493077.00 mS	FW	Described in 2	Tributary of the Pitanohaga stream– Upper catchment of the Pitanohaga stream micro-watershed – Determine the surface water quality of the Soledad farm.
	31	G.W. 17-LP	21K 489833.00 mE 7492572.00 mS	G.W.	Described in 3	Headquarters of "La Paraguaya" farm - Deep tubular well for water provision for human consumption – Determine the current quality of the farm's groundwater.
	32	G.W. 21-MC	21K 495202.00 mE 7489899.00 mS	G.W.	Described in 3	Headquarters of the "Machuca-cue" farm - Deep tubular well for drinking water supply – Determine the farm's groundwater's current quality.
ADA	33	GW 01	21K 449839.00 mE 7430729.00 mS	GW	Described in 3	The directly affected area by the future PARACEL industry, currently a floodable grassland area – Deep tubular wells built exclusively for the periodic and systematic monitoring of the groundwater quality of the aquifer, to detect possible chemical alterations of the water as a consequence of the implementation and operation of the industrial plant.
	34	GW 02	21K 450165.00 mE 7430301.00 mS			
	35	GW 03	21K 449136.00 mE 7427123.00 mS			
	36	GW 04	21K 448716.00 mE 7428109.00 mS			
	37	GW 05	21K 450803.00 mE 7426714.00 mS			
	38	GW 06	21K 451708.00 mE 7427153.00 mS			
	39	F.W. 01	21K 446252.08 mE 7428199.87 mS	F.W.	Described in 4	Paraguay River – Project's ADA – To monitor a point located 2.5 km upstream before the effluent discharge point.
	40	F.W. 02	21K 449651.97 mE 7424489.86 mS			Paraguay River – Project's ADA – To monitor point located 2.5 km downstream of the effluent discharge point.

2.3 Monitored parameters determined by sample type

The table below shows the monitored parameters for each sample or monitoring points according to terms of reference. It was analysed 67 parameters (physicochemical, agrochemical, hydrobiological and bacteriological) for 18 surface water points.

TABLE 2. MONITORED PARAMETERS FOR SURFACE WATER	
IN SITU MONITORING PARAMETERS	
1- Water temperature	4- Dissolved oxygen
2- Hydrogen potential	5- Turbidity
3- Electrical conductivity	

PHYSICO-CHEMICAL ANALYTICAL DETERMINATIONS			
PARAMETERS INCLUDED IN THIS REPORT		**PARAMETERS THAT INCLUDES THE FINAL REPORT OF THE FIRST CAMPAIGN**	
6- Suspended sediments	14- Ammonia	22- Aluminium	30- Selenium
7-Total dissolved solids	15- Nitrites	23- Cadmium	31- Zinc
8- Oil and grease	16- Hardness	24- Hexavalent chromium	32- Arsenic
9- COD (oxygen demand chemical)	17- Sodium	25- Trivalent chromium	33- Barium
10- BOD5 (oxygen demand biochemical)	18- Sulphates	26- Tin	34- Total mercury
11- Total phosphorus	19- Cyanides	27- Nickel	
12- Total nitrogen	20- Copper	28- Manganese	
13- Nitrates	21- Soluble iron	29- Lead	
AGROCHEMICALS			
35- Glyphosate	43- DDE	51- 2,4-D	59- Imidacloprid
36- AMPA	44- DDD	52- Lambda-cyhalothrin*	60- Methyl-paraoxon
37- Aldrin	45- Atrazine	53- Bifenthrin	61- Thiamethoxam*
38- Endrin	46- Simazine	54- Cypermethrin	62- Sulfluramide*
39- Dieldrin	47- Carbaryl	55- Chlorpyrifos	63- Fipronil*
40- Lindane	48- Carbofuran	56- Dichlorvos	
41- Chlordane	49- Heptachlor	57- Methamidophos	
42- DDT	50- Methomyl	58- Tebuconazole	
*Notes: This document does not report the following parameters: Lambda-cyhalothrin, Thiamethoxam, and Sulfluramide.			
HYDROBIOLOGICAL PARAMETERS			
64- Phytoplankton diversity: ▪ Genus ▪ Species composition ▪ Dominance		65- Zooplankton diversity: ▪ Genus ▪ Species composition ▪ Dominance	
BACTERIOLOGICAL PARAMETERS			
66- Faecal coliforms		67- Total coliforms	

TABLE 3. PARAMETERS DETERMINED FOR GROUNDWATER

IN SITU MONITORING PARAMETERS		
1- Water temperature		3- Electrical conductivity.
2- Hydrogen potential		
PHYSICO-CHEMICAL ANALYTICAL DETERMINATIONS		
4- Total dissolved solids	10- Bicarbonates	16- Total phosphorus
5- Organic matter	11- Carbonates	17- Total nitrogen
6- Hardness	12- Sulphates	18- Sodium
7- Nitrates	13- Calcium	19- Potassium
8- Chlorides	14- Magnesium	20- Boron
9- Alkalinity	15- Fluorine	
BACTERIOLOGICAL PARAMETERS		
21- Faecal coliforms	21- Total coliforms	23- *Escherichia coli*

Table 3 shows the parameters analysed for groundwater monitoring that are 23 determinations for the twenty samples extracted from the artesian and monitoring wells.

The two sampling points on the Paraguay River are crucial monitoring points for the PARACEL's future industry. According to POYRY's environmental impact assessment report (2020), this river will work as a waterway to transport raw materials, chemical inputs, and products.

The future industry's port will be on the Paraguay River (All). At the same time, raw water will be extracted from this river for treatment and use in the industrial processes and will also be the receiving body for the treated effluents generated at the paper mill.
Given the particular importance of the points on the River Paraguay, 68 analytical determinations, including a broader range of agrochemicals and halogenated organic compounds (AOX), were carry out in points F.W01 and F.W02. Table 4 shows in detail the parameters determined for these points.

TABLE 4. PARAMETERS DETERMINED FOR THE PARAGUAY RIVER

IN SITU MONITORING PARAMETERS

1- Water temperature		4- Dissolved oxygen	
2- Hydrogen potential		5- Turbidity	
3- Electrical conductivity			
PHYSICO-CHEMICAL ANALYTICAL DETERMINATIONS			
PARAMETERS INCLUDED IN THIS REPORT		**PARAMETERS THAT INCLUDES IN THE FINAL REPORT OF THE FIRST CAMPAIGN**	
6- Floating materials	16- Hardness	25- Aluminium	34- Zinc
7- Total dissolved solids	17- Sodium	26- Cadmium	35- Arsenic
8- Oil and grease	18- Sulphates	27- Hexavalent chromium	36- Barium
9- COD (oxygen demand chemical))	19- Cyanides	28- Trivalent chromium	37- Total mercury
10- BOD5 (oxygen demand biochemical	20- Copper	29- Trivalent chromium	
11- Total phosphorus	21- Soluble iron	30- Tin	
12- Total nitrogen	22- Colour	31- Manganese	
13- Nitrates	23- Phenols index	32- Lead	
14- Ammonia	24-PCBs (Polychlorinated Biphenyls)	33- Selenium	
15- Nitrites			
AGROCHEMICALS			
38- Glyphosate	46- DDE	54- 2,4-D	62- Imidacloprid
39- AMPA	47- DDD	55- Lambda-cyhalothrin*	63- Methyl-paraoxon
40- Aldrin	48- Atrazine	56- Bifenthrin	64- Thiamethoxam*
41- Endrin	49- Simazine	57- Cypermethrin	65- Sulfluramide*
42- Dieldrin	50- Carbaryl	58- Chlorpyrifos	66- Fipronil*
43- Lindane	51- Carbofuran	59- Dichlorvos	
44- Chlordane	52- Heptachlor	60- Methamidophos	
45- DDT	53- Methomyl	61- Tebuconazole	
*Notes: This document does not report the following parameters: Lambda-cyhalothrin, Thiamethoxam, and Sulfluramide.			
BATERIOLOGICAL PARAMETERS			
67- Faecal coliforms		68- Total coliforms	

2.4. Sample collection procedures

2.4.1 Surface water (FW.)

In situ measurements were performed (pH, temperature, conductivity and dissolved oxygen) and were collected samples for the rest parameters to be analysed in the laboratory (Tables 1 and 3) by immersing plastic containers to a depth of 30 cm below the surface of the water. For bacteriological sampling, a sterile sampling cup was submerged to a depth of 30 cm, fill it with water and closing it tightly underwater to avoid external contamination.

The cups, duly identified, were placed in coolers with ice to avoid altering the samples' composition before analysis. The surface sampling procedure and the preservation of the samples until they arrived at the laboratory (Table 5), for each point, was based on the Standard Methods 22nd. Ed. For surface water (Tables 6, 7 and 8).

2.4.2 Groundwater (GW.)

Groundwater samples were taken to determine physicochemical and bacteriological parameters in the laboratory (Table 2). On the other hand, parameters as pH, temperature and conductivity were measured on-site.

2.4.3 Sample containers and preservatives

Table 5 details all the parameters, sample containers, volumes and preservatives applied according to the parameter's analysis method.

TABLE 5. FLASKS AND PRESERVATIVES PER SAMPLE TYPE						
SAMPLE CONTAINER	**MATERIAL**	**VOLUME**	**PRESERVATIVE**	**PARAMETERS**	**FW**	**GW**
Bacteriology	Plastic	100 mL	s/p	Total coliforms Faecal coliforms *Escherichia coli*	✓	✓
BOD5	Plastic	1L	s/p	COD, BOD5	✓	
CF	Plastic	2L	s/p	Solids, Turbidity, Alkalinity, Nitrite, Nitrate, Colour, Chloride, Magnesium, Calcium, Sulphate	✓	✓
Phenols	Plastic	1L	H_2SO_4 1+1, up to pH<2	Phenols, Cr^{+6}	✓F W PY	
Metals	Plastic	1L	HNO_3 1+1, up to pH<2	CrT, Hg, Zn, Cd, Pb, Se, Sn, Al, Cu, Mn, Ni	✓	✓
NTK	Plastic	1L	H_2SO_4 1+1, hasta pH<2	P.T., NTK, N-NH_3	✓	✓
Iron	Plastic	250 mL	HCl 1+1, up to pH<2	Iron, sodium, potassium	✓	
Sulphides	Plastic	500 mL	Zn acetate + NaOH up to pH>9	Sulphur	✓	
Multi-waste	Amber glass	1L	s/p	Multi-waste	✓	
Sulphuramid and lambda-cyhalothrin	Amber glass	1L	s/p	Sulphuramid and Lambda-cyhalothrin	✓	
Bifenthrin y Thiamethoxam	Plastic	1L	s/p	Bifenthrin y Thiamethoxam	✓	
Glyphosate and AMPA	Plastic	1L	s/p	Glyphosate and AMPA	✓	
Fipronil	Amber glass	1L	s/p	Fipronil	✓	
PCBs	Amber glass	1L	s/p	PCBs	✓ FW PY	
FITO	Plastic	250 mL	Lugol	Phytoplankton	✓*	
ZOO	Plastic	100 L	Formaldehyde 10%	Zooplankton	✓*	

Sample collection and preservation conditions. Ref.: s/p (Without preservative), BOD5 (Biochemical Oxygen Demand); COD (Chemical Oxygen Demand); FQ (Some Physicochemical parameters); NTK (Total Nitrogen Kjeldahl); CrT (Total Chromium) and AMPA (α-Amino-3-hydroxy-5-methyl-4-isoxazole propionic acid), FITO (Phytoplankton) y ZOO (Zooplankton).

2.5 Applied analytical methods

The tables below detail the analytical methods applied for the determination of each parameter.

TABLE 6. METHODS FOR HYDROBIOLOGICAL-BACTERIOLOGICAL PARAMETERS			
HYDROBIOLOGICAL			
PARAMETERS	**METHODS**	**LIMITS OF QUANTIFICATION IN WATER**	**PERMISSIBLE LIMITS AS PER SEAM REGULATION 222/02 CLASS 2**
Phytoplankton	Phytoplankton counting techniques - SM 10200 F	<100 Cells	No limits

Zooplankton	Zooplankton counting techniques – SM 10200 G	Not applicable	No limits
MICROBIOLOGICAL PARAMETERS - GROUNDWATER			
PARAMETERS	**METHODS**	**LIMITS OF QUANTIFICATION IN WATER**	**PERMISSIBLE LIMITS AS PER NP REGULATION 2400180**
Total coliforms	Standard fermentation technique for Total coliforms SM 9221 B Bacterial density estimation SM 9221 C	>23 NMP/100mL	<1,1 NMP/100mL
Faecal coliforms	Standard fermentation technique for Total coliforms SM 9221 B Bacterial density estimation SM 9221 C	>23 NMP/100mL	<1,1 NMP/100mL
E. coli	Escherichia coli SM 9260 F	Presence/100mL	Absence/100mL
MICROBIOLOGICAL PARAMETERS – SURFACE WATER			
PARAMETERS	**METHODS**	**LIMITS OF QUANTIFICATION IN WATER**	**PERMISSIBLE LIMITS AS PER SEAM REGULATION 222/02 CLASS 2**
Faecal coliforms	Standard fermentation technique for Total coliforms SM 9221 B Bacterial density estimation SM 9221 C	>160.000 NMP/100mL	≤ 1.000 NMP/100mL
Total coliforms	Standard fermentation technique for Total coliforms SM 9221 B Bacterial density estimation SM 9221 C	>160.000 NMP/100mL	Not applicable

TABLE 7. METHODS APPLIED TO PHYSICO-CHEMICAL PARAMETERS				
PARAMETERS	**METHODS**	**MONITORING EQUIPMENT**	**LIMITS OF QUANTIFICATION IN WATER**	**PERMISSIBLE LIMITS AS PER SEAM REGULATION 222/02 CLASS 2**
Water temperature	Laboratory and field methods SM-2550 B	Conductimeter/Oximeter/pHmeter WTW MULTI 350	Not applicable	No limits
Dissolved oxygen	Membrane electrode method SM-4500-O G	Conductimeter/Oximeter/pHmeter WTW MULTI 350	0,10 mg O2/L	No less than 5 $mg.L^{-1}$
pH	Electrometric method SM-4500 - H^+	Conductimeter/Oximeter/pHmeter WTW MULTI 350	0 a 14	6 a 9
Conductivity	Laboratory method SM-2510 -B	Conductimeter/Oximeter/pHmeter WTW MULTI 350	0 a 199,9 mS/cm	No limits
Alkalinity	Titration method SM-2320 B	Current calibrated glass material	1,0 $mg.L^{-1}$	No limits
Turbidity	Nephelometric method SM-2130 B	THERMO ORION AQ 4500 Turbidimeter	0,10 NTU	100 NTU
Floating materials	Visual	Not applicable	Not applicable	Visually absent
Oil and grease	Method SM 5520-B	QUIMIS 01317M-53 stove and rotary evaporator EYELA SB1000	0,020 $mg.L^{-1}$	Visually absent
Total phosphorus	Ascorbic acid method SM-4500-P E	Schimadzu - UV Spectrophotometer 1700	0,025 mg $PO4^{-3}.L^{-1}$	0,05 $mg.L^{-1}$
NTK	Macro-Kjeldahl SM-4500-N B; phenate method SM-4500 F	Gerhardt Turbosog/ Schimadzu Digester - UV Spectrophotometer 1700	0,025 mg $N.L^{-1}$	0,6 $mg.L^{-1}$
Nitrate nitrogen	AOAC Official Method 973.50 Brucine Colorimetric Method	Schimadzu - UV Spectrophotometer 1700	0,10 mg $N(NO3^-).L^{-1}$	10 $mg.L^{-1}$
Nitrite nitrogen	Colorimetric method SM-4500 ($NO2^-$) B	Schimadzu - UV Spectrophotometer 1700	0,0025 mg $N\text{-}NO2^-.L^{-1}$	1,0 $mg.L^{-1}$
Ammonia nitrogen	Phenol salt method SM-4500 (NH3) F	Schimadzu - UV Spectrophotometer 1700	0,015 mg $N\text{-}NH3.L^{-1}$	0,02 $mg.L^{-1}$
BOD5	5-day BOD test - SM-5210 B	WTW OXI 3310 Oximeter	0,10 mg $O2.L^{-1}$	5 $mg.L^{-1}$
COD	Closed reflux, colorimetric method - SM-5220 D	Schimadzu - UV Spectrophotometer 1700	5,0 $mgO2.L^{-1}$	SLE
Dissolved solids totals	Gravimetric method SM-2540 C	Sartorius Analytical Balance / Stove QUIMIS 0317M-S3	2,0 $mg.L^{-1}$	500 $mg.L^{-1}$
Colour	Visual comparison method SM-2120 B	Schimadzu - UV Spectrophotometer 1700	5 mg $Pt.L^{-1}$	75 $mgPt.L^{-1}$
Trivalent chromium	Calculation method (Total chromium – Hexavalent chromium)	Not applicable	0,05 $mg.L^{-1}$	0,5 $mg.L^{-1}$
Hexavalent chromium	Colorimetric method (SM-3500-Cr B)	Schimadzu - UV Spectrophotometer 1700	0,05 $mg.L^{-1}$	0,05 $mg.L^{-1}$
Copper	AAS-Air-Acetylene Flame (SM-3111-B)/GFA (SM-3113)	AA-7000 Shimadzu / GFA -7000	0,05 $mg.L^{-1}$	1,0 $mg.L^{-1}$
Arsenic	Colorimetric method (SM-3500-As B)	Schimadzu - UV Spectrophotometer 1700	<0,01 $mg.L^{-1}$	0,01 $mg.L^{-1}$
Boron	Colorimetric method (SM-4500-B C)	Schimadzu - UV Spectrophotometer 1700	1,0 $mg.L^{-1}$	No limits
Manganese	AAS- Air-Acetylene Flame (SM-3111-B)/GFA (SM-3113)	AA-7000 Shimadzu	0,05 $mg.L^{-1}$	0,1 $mg.L^{-1}$
Nickel	AAS- Air-Acetylene Flame (SM-3111-B)/GFA (SM-3113)	AA-7000 Shimadzu	0,010 $mg.L^{-1}$	0,025 $mg.L^{-1}$
Zinc	AAS- Air-Acetylene Flame (SM-3111-B)	AA-7000 Shimadzu	0,05 $mg.L^{-1}$	3,0 $mg.L^{-1}$
Cadmium	AAS-GFA (SM-3113)	AA-7000 Shimadzu / GFA -7000	0,0008 $mg.L^{-1}$	0,001 $mg.L^{-1}$
Lead	AAS-GFA (SM-3113)	AA-7000 Shimadzu / GFA -7000	0,002 $mg.L^{-1}$	0,01 $mg.L^{-1}$
Selenium	AAS-GFA (SM-3113)	AA-7000 Shimadzu / GFA -7000	0,005 $mg.L^{-1}$	0,01 $mg.L^{-1}$
Tin	AAS-GFA (SM-3113)	AA-7000 Shimadzu / GFA -7000	1,0 $mg.L^{-1}$	2,0 $mg.L^{-1}$
Aluminium	AAS-GFA (SM-3113)	AA-7000 Shimadzu / GFA -7000	0,10 $mg.L^{-1}$	0,2 $mg.L^{-1}$

TABLE 7. METHODS APPLIED TO PHYSICO-CHEMICAL PARAMETERS				
PARAMETERS	**METHODS**	**MONITORING EQUIPMENT**	**LIMITS OF QUANTIFICATION IN WATER**	**PERMISSIBLE LIMITS AS PER SEAM REGULATION 222/02 CLASS 2**
Fluorine	Method SM 4500 F C Ion-selective electrode	Multiparameter with selective fluoride electrode OAKTON	0,05 $mg.L^{-1}$	No limits
Phenols	Direct photometric method SM-5530 D	Schimadzu - UV Multiparameter with selective fluoride electrode OAKTON 1700	0,04 $mg.L^{-1}$	No limits
Total hardness	EDTA titrimetric method - SM-2340 C	Current calibrated glass material	1,0 $mg.L^{-1}$	300 $mgCa.L^{-1}$
Chlorides	Argentometric SM-4500 -Cl^- B	Current calibrated glass material	0,5 mg $Cl^-.L^{-1}$	No limits
Magnesium	Calculation method SM-3500 B	Not applicable	0,2 mg $Mg.L^{-1}$	No limits
Calcium	EDTA titrimetric method SM-3500 B	Current calibrated glass material	0,4 $mg.L^{-1}$	No limits
Potassium	AAS-Flame nitrous oxide-acetylene (SM-3111-D)/GFA (SM- 3113)	AA-7000 Shimadzu	0,25 $mg.L^{-1}$	No limits
Sodium	AAS-Air-acetylene flame (SM-3111-B)	AA-7000 Shimadzu	0,25 $mg.L^{-1}$	200 $mg.L^{-1}$
Soluble iron	Phenanthroline method SM-3500-Fe B	Schimadzu - UV Spectrophotometer 1700	0,05 mg $Fe.L^{-1}$	No limits
Sulphates	Turbidimetric method SM-4500 - $SO4^{-2}$ E	THERMO ORION AQ 4500 Turbidimeter	1,0 mg $SO4^{-2}.L^{-1}$	250 $mg.L^{-1}$
Cyanides	SM 4500-CN E – Standard method – Standard methods used to analyse drinking and wastewater, 17th Edition (APHA-AWWA-WPCF).	Thermo Scientific Evolution 60S UV-Visible Spectrophotometer	0,02 mg. L^{-1}	0,07 mg. L^{-1}
PCB	Determination of PCBs residues in an aqueous matrix by GC-ECD *Gas Chromatography - Electron Capture Detector*	Gas Chromatography	0,2237 mg. L^{-1}	0 (zero)
Total mercury	Method ICP/MES *"Inductively Coupled Plasma Mass Spectrometry"*	Spectrophotometer.	0,05 mg. L-1	No limits
Barium	Method icp/mes *"inductively coupled plasma mass spectrometry"*	Spectrophotometer.	<0,001 mg. L-1	2 mg. L^-

TABLE 8. APPLIED METHODS FOR THE DETERMINATION OF AGROCHEMICALS			
AGROCHEMICALS			
PARAMETERS	**METHODS**	**LIMITS OF QUANTIFICATION IN WATER**	**PERMISSIBLE LIMITS AS PER REGULATION 222/02 SEAM CLASS 2**
OC- Aldrin	Extraction US-EPA 8081B and 3510 with modifications. Quantification by EPA 608.1 with modifications - GC-MS/MS	<1,00	No limits
OC-Endrin		<1,25	2
OC-Dieldrin		<1,50	No limits
2,4-D		<2,50	30
Atrazine		<2,00	3
Carbaryl		<3,50	No limits
Carbofuran		<3,00	40
Cypermethrin		<1,20	No limits
Chlordane		<0,9	0
Chlorpyrifos		<5,00	No limits
DDD		<2,00	No limits
DDE	Extraction US-EPA 8081B and 3510 with modifications. Quantifications by EPA 608.1 with modifications - GC-MS/MS	<2,00	No limits
DDT		<2,00	2
Dichlorvos		<10,0	10
Heptachlor		<1,50	0
Imidacloprid		<5,00	No limits
Lindane		<0,200	0,2
Methamidophos		<25,0	No limits
Methylparaoxon		<25,0	No limits
Methomyl		<25,0	No limits
Simazine		<2,50	4
Tebuconazole		<2,00	No limits
Sulfluramid	*		No limits
Lambdacyalothrin	*		No limits
Lambdacyalothrin	*		No limits
Thiamethoxam	*		No limits
Glyphosate/AMPA in water	Extraction: In-house method (According to Amarante, J. et al; 2002) Quantification by HPLC/FLD	0,3 µg/L	0,7
Fipronil	Method: LC-MS/MS *Liquid Chromatography Mass Spectrometry*	0,0100 mg. L^{-1}	

***Notes:** Due to the pandemic, the suppliers of the reagents and laboratory chemicals necessary to determine Sulfluramid, Lambdacyalothrin, Lambdacyalothrin and Thiamethoxam, have not yet been delivered causing delays in the determination of these agrochemicals (Appendix E. Supplier's note).

2.6 Data quality control

As established in the National Water Quality Standard (Regulation SEAM No. 222/02 – Art. 13), the sampling techniques and respective analysis were carried out according to the internationally recognised methodology: The Standard Methods – To examine water and wastewater – APHA – AWWA – WPCF. Tables 6, 7 and 8 show the methods and equipment used for each parameter's analytical determination.

A team of technicians from the CEMIT's laboratory and TECNOAMBIENTAL performed the field sampling. The samples were taken according to the methodology previously described, ensuring the correct application of procedures, flasks, preservatives and cold chain maintenance from the sampling site to the laboratories.

Using a "field blank" eliminates the possibility that the flasks are a source of contamination. Field blanks are containers filled with deionised water free of the analyte in question and are preserved and analysed in the same wat as any other sample for the same determination.

If the analytical determinations made on the field blanks show results close to zero (0), the flasks did not contaminate during the trip, and the samples are representative of the points analysed.

The CEMIT Water Quality Laboratory, which belongs to the National University of Asunción (UNA), has been accredited since 2015 by the Paraguay National Accreditation Body (ONA). The professional responsible for the processing and analysis of the results is the chemist Claudia Ávalos de Enciso.

Other laboratories also accredited by the ONA analysed the following parameters; Total mercury, Barium, Cyanides, Fipronil and PCBs.

ANALITICA SA tested Total mercury and Barium. This laboratory is also accredited by the ONA, according to Standard NP-ISO/EIC 17025:2018.

The Water Quality Laboratory of the Faculty of Exact and Natural Sciences of the National University of Asunción (FACEN-UNA) analysed Cyanides.

Eco Natura laboratory, which is part of the MULTI LAB group, analysed FIpronil and PCBs. This institute is accredited according to NO-ISO/EIC 17025:2018 by the ONA.

2.7 Data interpretation models

The steps followed for the presentation and interpretation of the results of the analytical determinations are the following:

- Processing the results and comparing with the limits established in Regulation SEAM No. 222/02 "By which the water quality standard is established in the national territory" for Class 2, a category in which all surface waters are classified.
- The series of determinations at the different sampling points are shown on graphs and descriptive statistics for each parameter. The sampling point's parameters that are out of range are reported.
- For each point, the percentage of parameters that complies and does not comply with Regulation SEAM No. 222/02 was determined.

III. RESULTS

3.1 General performance of surface water's parameters

Table 9 shows a summary of the results obtained for each parameter analysed in surface water; it also highlights the points that present some deviation and the percentage of monitoring points that complies with Regulation SEAM No. 222/02 "Establishing the water quality standard in the national territory" and those beyond the permissible limits.

TABLE 9. SUMMARY OF SURFACE WATER QUALITY ANALYSIS

Nº	PARAMETER	AVERAGE	MONITORING POINTS WITH DEVIATIONS	COMPLY WITH THE LIMITS		BEYOND THE LIMITS	
				Nº	%	Nº	%
1	Temperature	24,5 ºc	No limits				
2	pH	6,87	FW317-RZ, FW 11-LB	18	90%	2	10%
3	Electrical conductivity	130,50 µS/.cm	No limits				
4	Dissolved oxygen	5,7 mg O2/L	FW 207-TR, FW 208-TR, FW 115-MY, FW 110-LB FW 109-MYRZ	15	75%	5	25%
5	Turbidity	140,154 NTU	FW 200-SLTR, FW 205-TR FW 111-LB, FW 310-CR	16	80%	4	20%
6	Floating materials	51,36	No limits				
7	Total dissolved solids (TDS)	161,7	All the points complies with the limits	20	100%	0	0%
8	Oil and grease	8,78 mg/L	No limits				
9	COD	78,2 mg O_2/L	No limits				
10	BOD5	3,15 mg O_2/L	FW 205-TR, FW 310-TR, FW 316-CR	16		3	
11	Total phosphorus	0,07 mg/L	FW 315-HE, FW 304-HE, FW 207-TR, FW205-TR, FW 109-MYRZ, FW 115-MY FW 110-LB, FW 111-LB FW310-CR, FW01	9	45%	11	55%
12	Total nitrogen	0,77 mg/L	FW 315-HE, FW 208-TR FW 316-CR	16	80%	4	20%
13	Nitrates	2,7 mg/L	All the points complies with the limits	20	100%	0	0%
14	Ammonia	0,12 mg/L	All the points exceeds the maximum limits	0	0%	20	100%
15	Nitrites	0,12 mg/L	All the points complies with the limits	20	100%	0	0%
16	Hardness	30,70 mg CaCO3/L	All the points complies with the limits	20	100%	0	0%
17	Sulphates	>2 mg/L	All the points complies with the limits	20	100%	0	0%
18	Sodium	7,42 mg/L	All the points are under the limits of quantification in water; therefore complies with the limits	20	100%	0	0%
19	Aluminium	--	All the points are under the limits of quantification (LOQ=0,1)	20	100%	0	0
20	Cadmium	---	All the points are under the limits of quantification (LOQ=0,0008)	20	100%	0	0
21	Hexavalent chromium	--	All the points are under the limits of quantification (LOQ=0,0500)	20	100%	0	0%
22	Trivalent chromium	--	All the points are under the limits of quantification (LOQ=0,0500)	20	100%	0	0%
23	Copper	--	All the points are under the limits of quantification	20	100%	0	0%
24	Tin		All the points are under the limits of quantification (LOQ=1)	20	100%	0	0

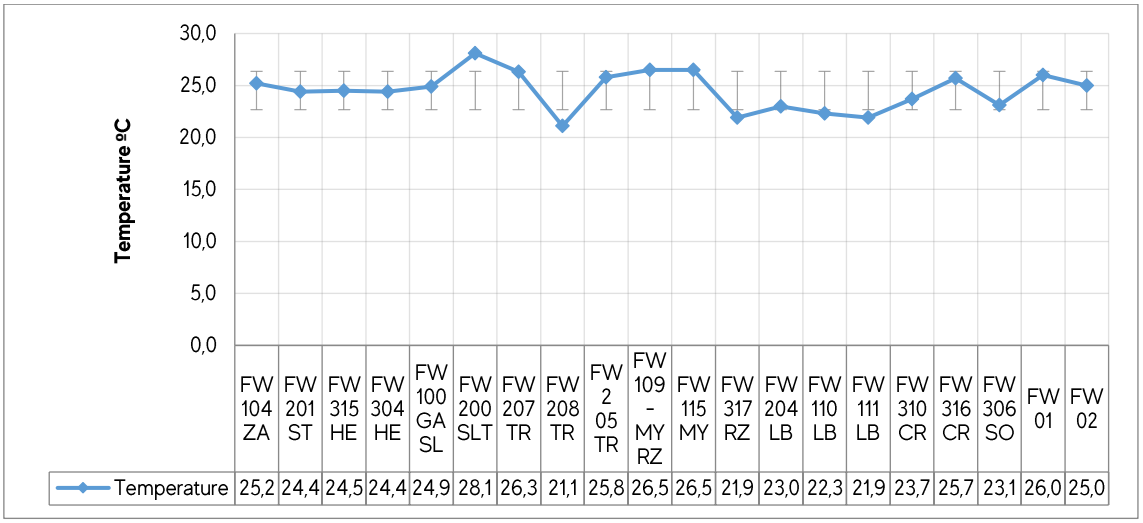
TABLE 9. SUMMARY OF SURFACE WATER QUALITY ANALYSIS							
Nº	PARAMETER	AVERAGE	MONITORING POINTS WITH DEVIATIONS	COMPLY WITH THE LIMITS		BEYOND THE LIMITS	
				Nº	%	Nº	%
25	Nickel	0,098 mg/L	18 points under the limits of quantification and only 2 determinations beyond the limits	18	90%	2	10%
26	Manganese	0,207 mg/L	FW315-HE, FW205-TR FW110-LB, FW111-LB FW310-CR, FW01, FW02	13	65%	7	35%
27	Lead	0,0118 mg/L	FW317-RZ, FW316-CR FW306-SO	17	85%	3	15%
28	Selenium	--	All the points are under the limits of quantification (LOQ=1)	20	100%	0	0
29	Zinc	0,14 mg/L	-	20	100%	0	0%
30	Arsenic	--	-	20	100%	0	0%
31	Soluble iron	1,3 mg/L	All the surface water sampling points exceeds the maximum limits	0	0%	20	100%
32	Total mercury	--	All the points are under the limits of quantification (LOQ=0,001)	20	100%	0	0%
33	Barium	0,139 mg/L	All the points are under the limits of quantification	20	100%	0	0%
34	Cyanides	>0,02 mg/L	All the points complies with the limits and are under the limits of quantification	20	100%	0	0%
35	Faecal coliforms	3677,4 NMP/100 mL	All points are beyond the limits except FW 316-CR, FW01 and FW02.	4	20%	16	80%
36	Total coliforms	9129,6 NMP/100 mL	FW104-ZA, FW315-HE, FW304-HE, FW200-SLTRE, FW207-TR, FW208-TR, FW205-TR, FW109-MYRZ, FW115-MY, FW317-RZ, FW204-LB, FW110-LB, FW310-CR	6	30%	14	70%

3.2 Analysis and interpretation of results

The next graphs show each parameter's behaviour determined at the 19 monitoring points, contrasting them with limits established by Regulation SEAM No. 222/02, according to the objectives.

Details per sampling point are in Appendix C.

3.2.1 Water temperature

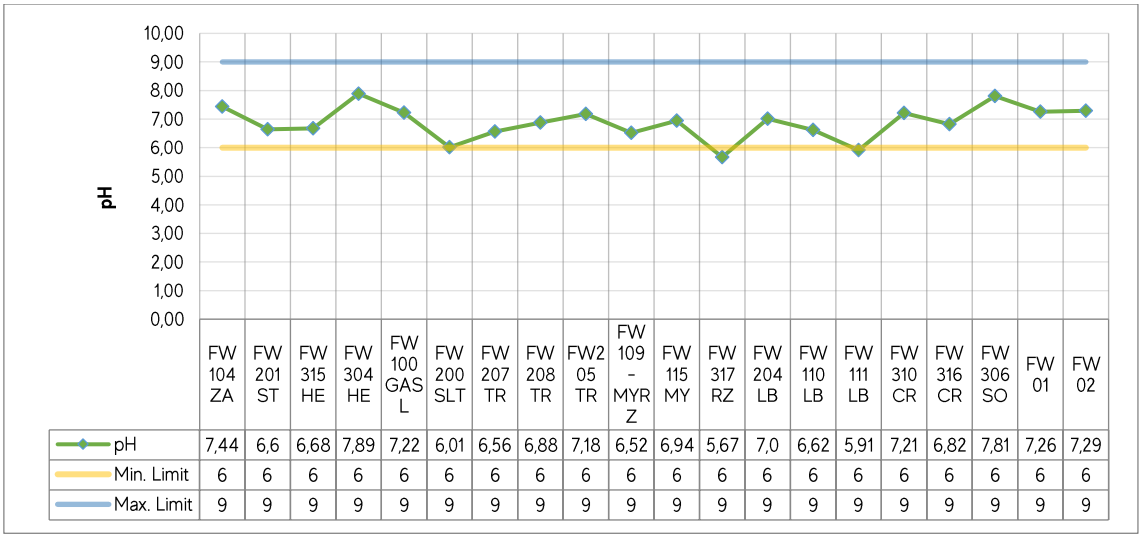


	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Temperature	25,2	24,4	24,5	24,4	24,9	28,1	26,3	21,1	25,8	26,5	26,5	21,9	23,0	22,3	21,9	23,7	25,7	23,1	26,0	25,0

Figure 1. Comparative analysis of water temperature at monitoring points

SEAM Regulation No. 222/02 does not establish limit values for the temperature of Class water 2; only for effluents discharge to water bodies, whose limit value is 40 ºC. The average water temperature recorded in the first campaign was 24.5 ºC. The maximum value was measure at the point FW200-SLTR (28.1 ºC) and the minimum at FW208-TR (21.1 ºC).

3.2.2 Hydrogen potential (pH)



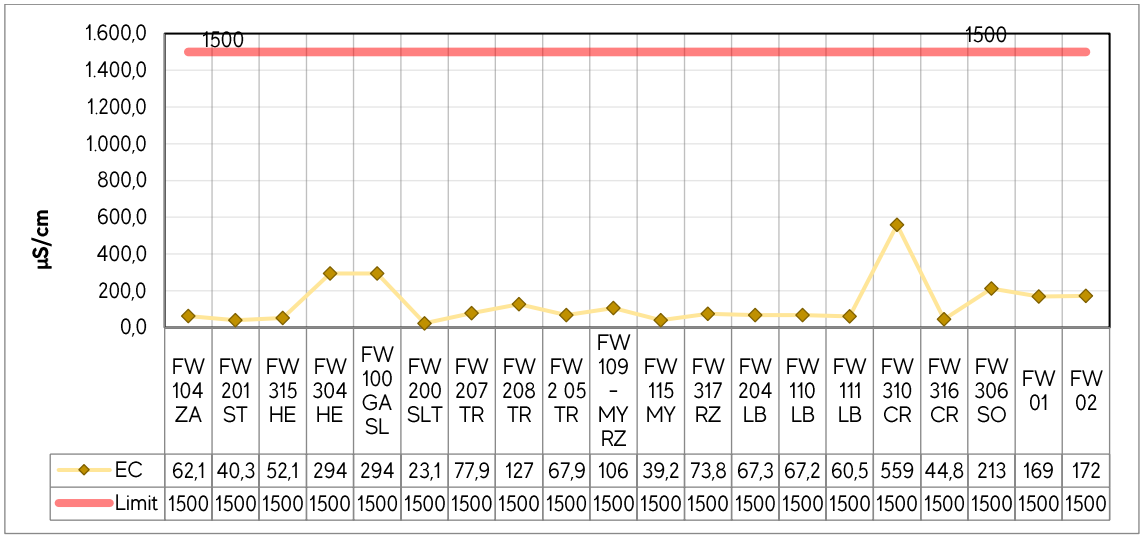
	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GAS L	FW 200 SLT	FW 207 TR	FW 208 TR	FW2 05 TR	FW 109 - MYR Z	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
pH	7,44	6,6	6,68	7,89	7,22	6,01	6,56	6,88	7,18	6,52	6,94	5,67	7,0	6,62	5,91	7,21	6,82	7,81	7,26	7,29
Min. Limit	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Max. Limit	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9

Figure 2. Comparative analysis of pH values at different monitoring points

The SEAM Regulation No. 222/02 establishes a minimum and maximum limit of 6 and 9. Figure 2 shows that none point exceeds the upper limit; as for the lowest, points FW317-RZ and FW111-LB show slightly acid pH values.

The 90% of the points comply with Regulation 222/02. The average pH magnitude in the first campaign is 6.8 which is very close to the ideal value of 7.

3.2.3 Electrical conductivity



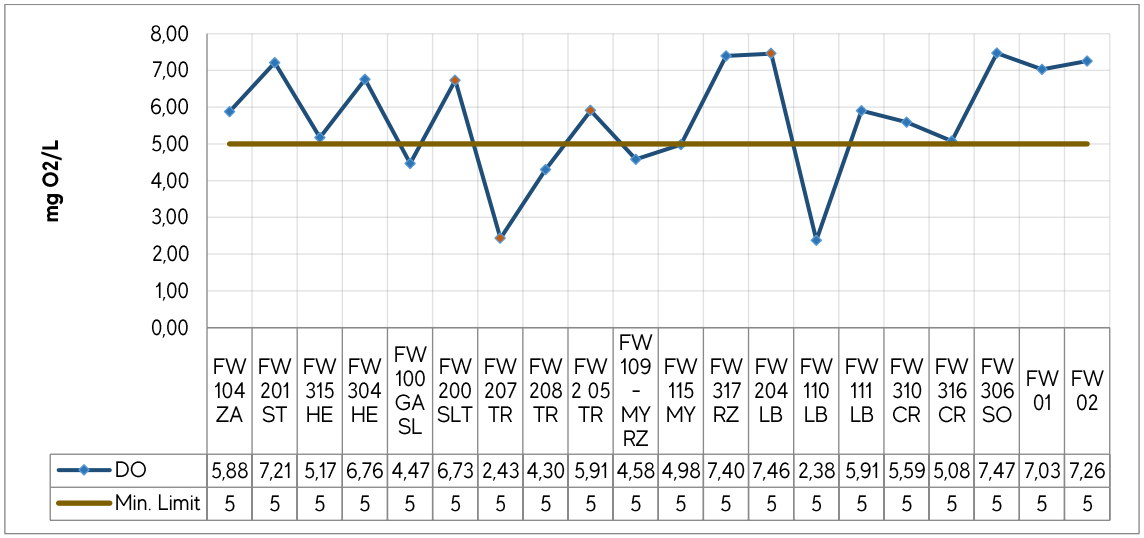
	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
EC	62,1	40,3	52,1	294	294	23,1	77,9	127	67,9	106	39,2	73,8	67,3	67,2	60,5	559	44,8	213	169	172
Limit	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500

Figure 3. Comparative analysis of electrical conductivity values at different monitoring points

Regulation 222/02 does not set any limit for the electrical conductivity parameter for Class 2 water. The limit of 1500 µS/cm established in the regulation NP 24 001 80 "General requirements for drinking water" is taken as a reference. None determination carried out exceeds the mentioned number.

The average value of the parameter evaluated in the first campaign was 130,5 µS/cm. The point FW316-CR has the maximum value which is at the "Laguna Penayo" stream.

3.2.4 Dissolved oxygen



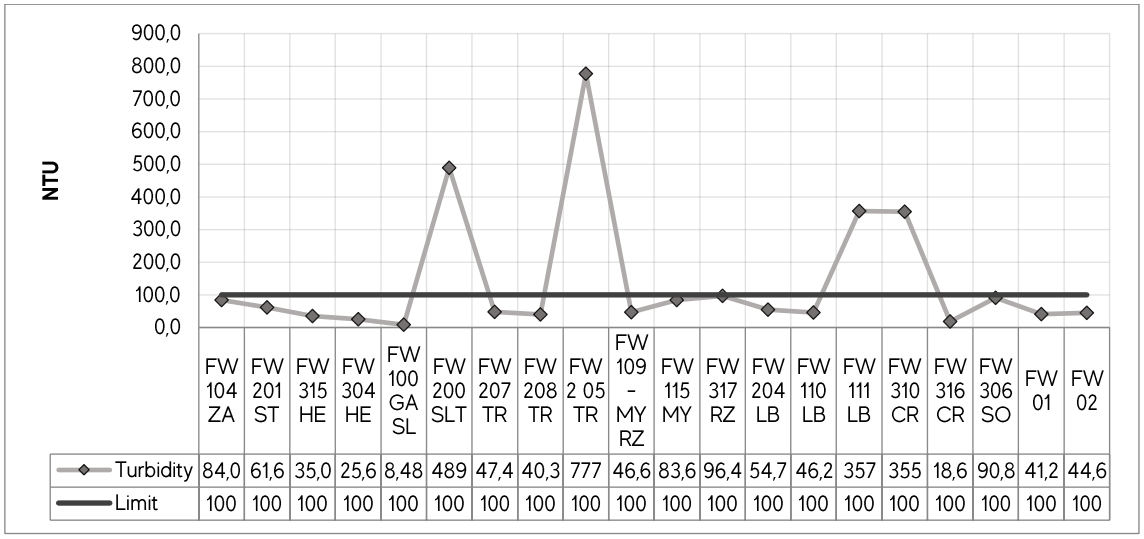
	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
DO	5,88	7,21	5,17	6,76	4,47	6,73	2,43	4,30	5,91	4,58	4,98	7,40	7,46	2,38	5,91	5,59	5,08	7,47	7,03	7,26
Min. Limit	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

Figure 4. Comparative analysis of dissolved oxygen at different monitoring points

According to Regulation 222/02, dissolved oxygen of waters classify as Class 2 should not be less than five (5 mg O_2/l). At points FW207-TR, FW208-TR, FW115-MY, FW110-LB and FW109-MYRZ, the value is lower.

The 74% of the 19 points comply with the regulation. The average DO in the first campaign is 5.8 mg O_2/l.

3.2.5 Turbidity



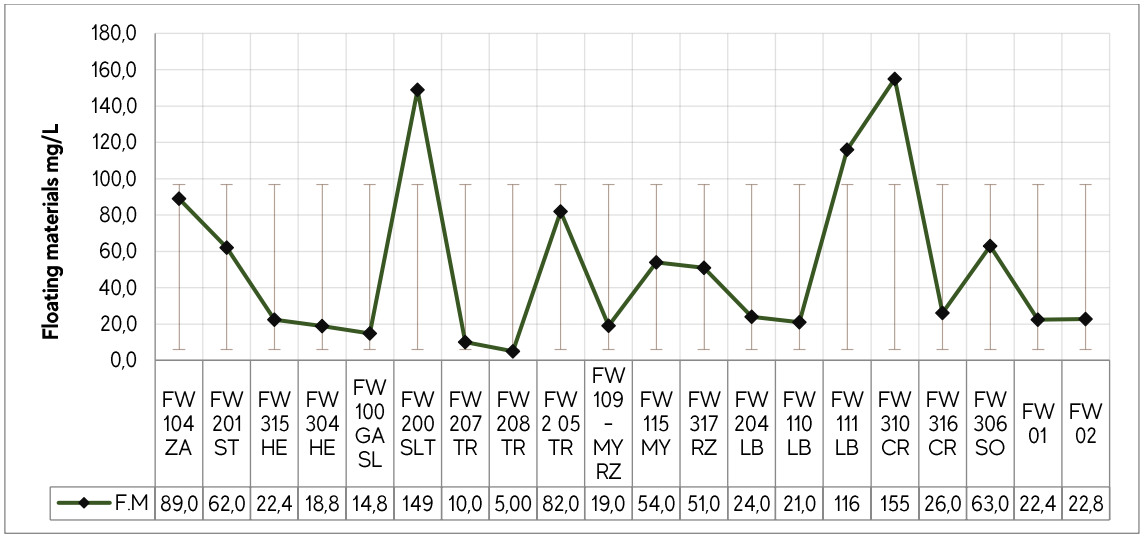
	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Turbidity	84,0	61,6	35,0	25,6	8,48	489	47,4	40,3	777	46,6	83,6	96,4	54,7	46,2	357	355	18,6	90,8	41,2	44,6
Limit	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Figure 5. Comparative analysis of turbidity at different monitoring points

The maximum value established in Regulation 222/02 for Class 2 watercourse's NTU is 100. The results of the points FW200-SLTR, FW205-TR, FW111-LB and FW316-CR exceed the permissible limit.

The presence of chlorophyll and sediments may influence high turbidity values; the average value measured for this parameter in the first campaign is 140,154 NTU.

3.2.6 Floating materials



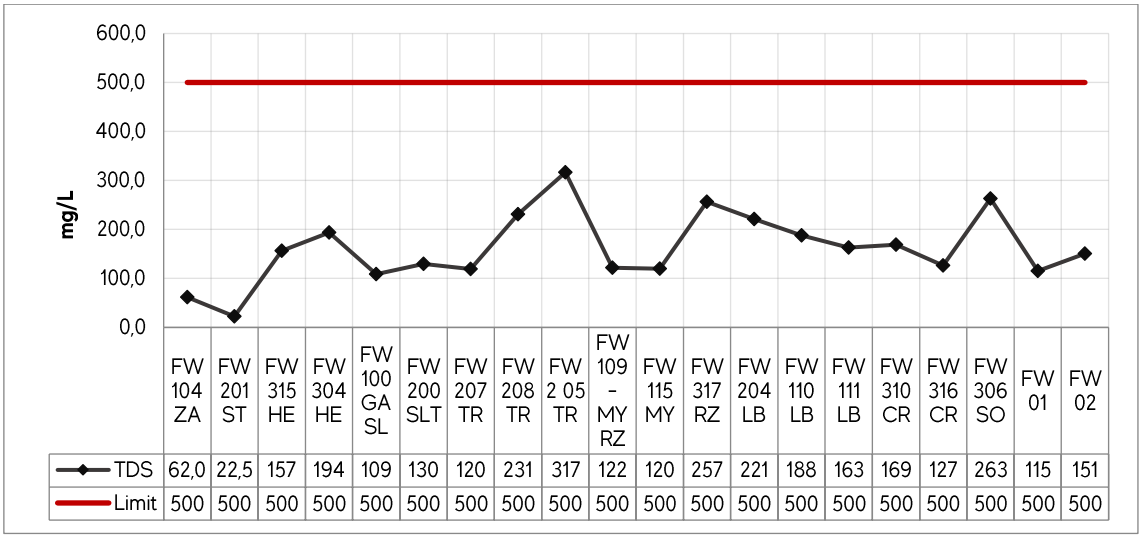
	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
F.M	89,0	62,0	22,4	18,8	14,8	149	10,0	5,00	82,0	19,0	54,0	51,0	24,0	21,0	116	155	26,0	63,0	22,4	22,8

Figure 6. Comparative analysis of the presence of floating materials at different monitoring points

The national Regulation 222/02 does not set limits for this parameter but indicates that it should be virtually absent.

According to the results, the parameter's average is 51,36 mg/l. The points FW200 SL-TR, FW111-LB and FW310-CR show values higher than the mean's standard deviation even without established limits. The presence of floating material may be influence by the principal livestock activity in the area.

3.2.7 Total dissolved solids

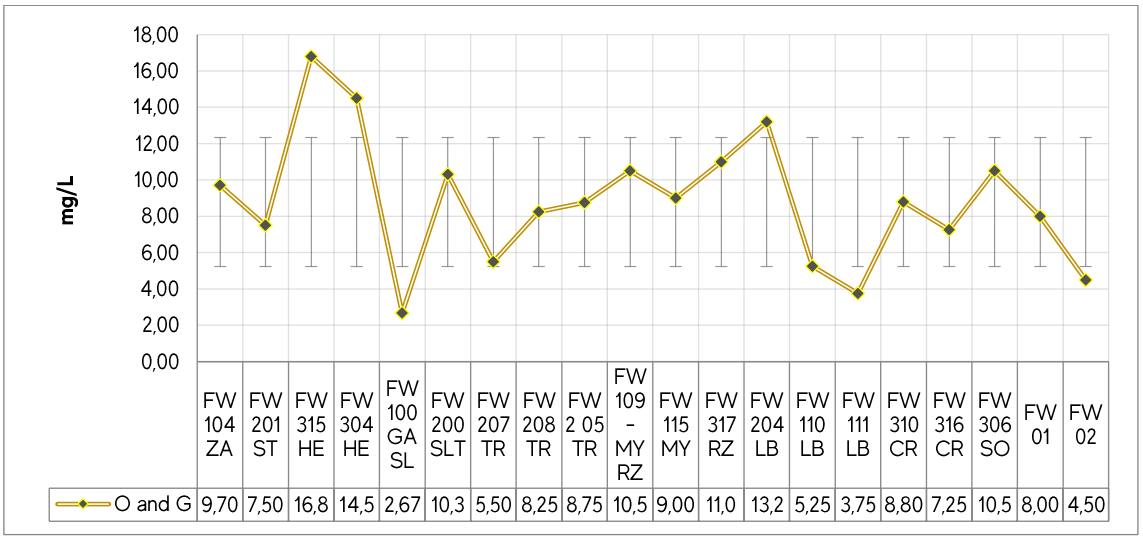


	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
TDS	62,0	22,5	157	194	109	130	120	231	317	122	120	257	221	188	163	169	127	263	115	151
Limit	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500

Figure 7. Comparative analysis of total dissolved solids (TDS) at different monitoring points

The permissible limit established in the national regulation is 500 mg/l which none monitoring point exceeded in this campaign. The average TDS value is 161,7 mg/l.

3.2.8 Oil and grease



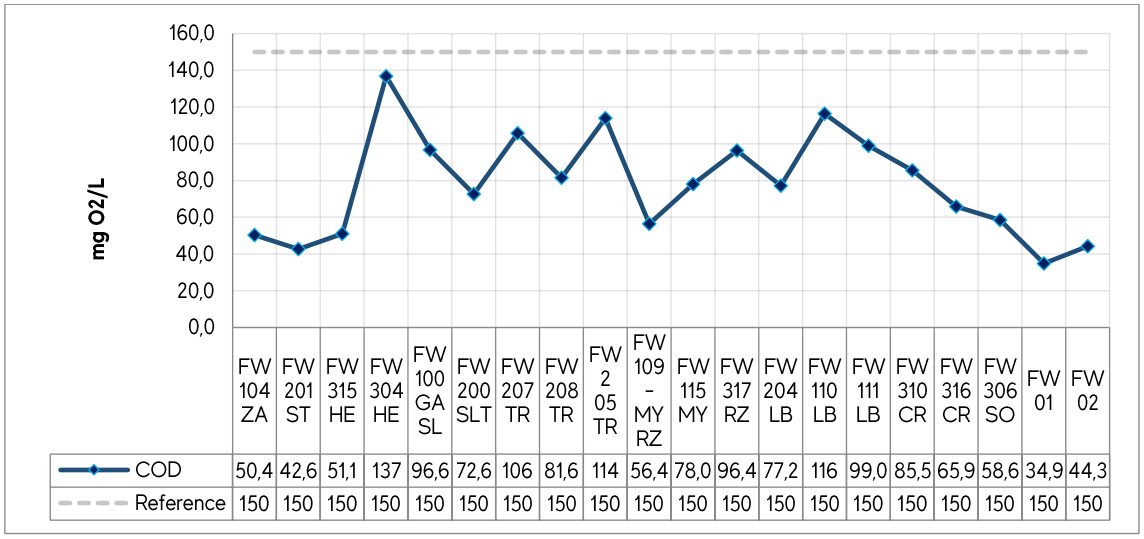
	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
O and G	9,70	7,50	16,8	14,5	2,67	10,3	5,50	8,25	8,75	10,5	9,00	11,0	13,2	5,25	3,75	8,80	7,25	10,5	8,00	4,50

Figure 8. Comparative analysis of oil and grease at different monitoring points

For waters Class 2, the national regulation does not establish a limit; it only indicates that it must be virtually absent. For effluent discharges to water bodies, the maximum limits are 20 mg/l for mineral oils and grease and 50 mg/l for animal or vegetable oils and grease.

The average parameter in the first campaign is 8,7 mg/l. The value indicated in FW315-HE is the maximum value measured with 16.8 mg/l. This point's location is close to the departmental route D001 which can be related the higher value.

3.2.9 Chemical oxygen demand

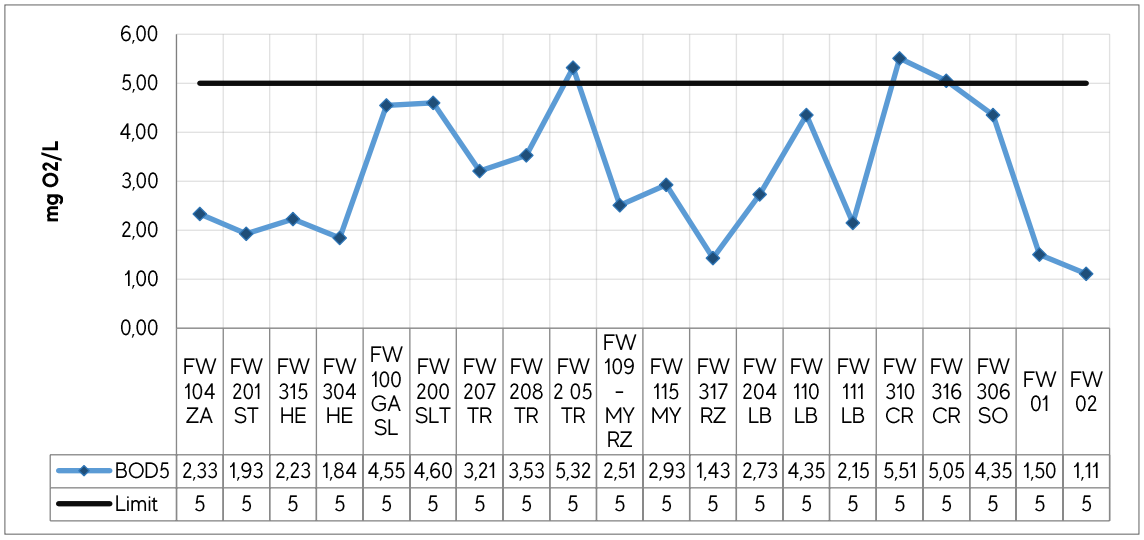


	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 – MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
COD	50,4	42,6	51,1	137	96,6	72,6	106	81,6	114	56,4	78,0	96,4	77,2	116	99,0	85,5	65,9	58,6	34,9	44,3
Reference	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150

Figure 9. Comparative analysis of COD at different monitoring points

Regulation 222/02 does not establish a permissible limit for water classified as Class 2. It is only defined in Art. 7 a maximum value of 150 mg O_2/l for effluents discharge in water bodies. The average COD measured is equivalent to 78,19 mg O_2/l.

3.2.10 Biological oxygen demand

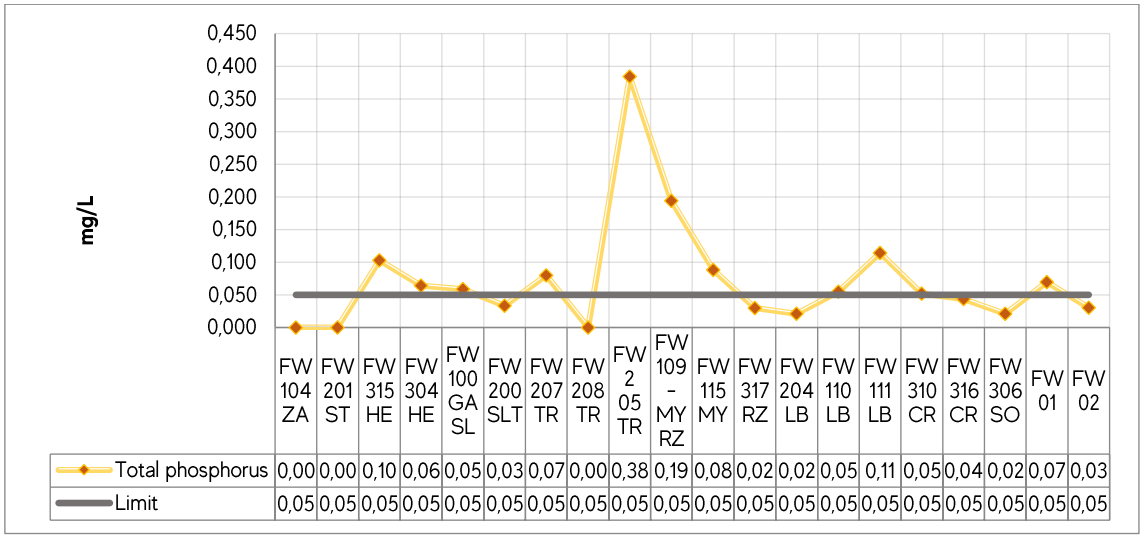


	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 – MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
BOD5	2,33	1,93	2,23	1,84	4,55	4,60	3,21	3,53	5,32	2,51	2,93	1,43	2,73	4,35	2,15	5,51	5,05	4,35	1,50	1,11
Limit	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

Figure 10. Comparative analysis of BOD5 at different monitoring points

Regulation 222/02 sets a maximum of 5 mg O_2/l for the BOD5 parameter. A percentage of 84 of the monitored points comply with the limits, and the 3 points that slightly exceed it are FW205-TR, FW310-CR and FW316-CR. The BOD5 average in the first campaign is 3,158 mg O_2/l.

3.2.11 Total phosphorus



	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Total phosphorus	0,00	0,00	0,10	0,06	0,05	0,03	0,07	0,00	0,38	0,19	0,08	0,02	0,02	0,05	0,11	0,05	0,04	0,02	0,07	0,03
Limit	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05

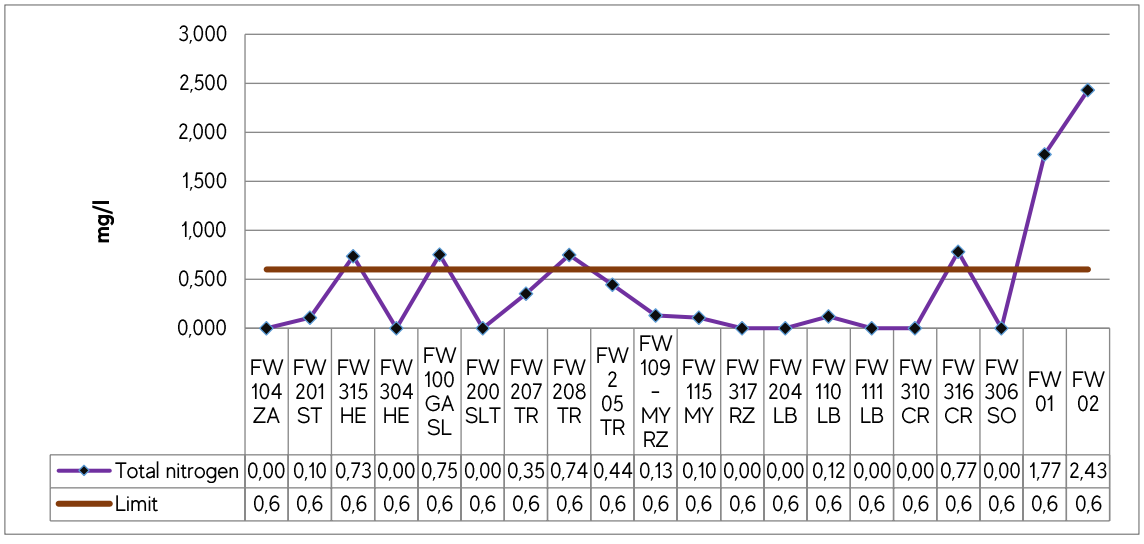
Figure 11. Comparative analysis of total phosphorus at different monitoring points

The presence of phosphorus in water is usually related to the use of organic or synthetic fertilisers. When excesses in the application of fertilisers or agrochemicals happen, it is usual that a fraction that the vegetation doesn't absorb infiltrates into the soil, reaching groundwater and surface water.

The legislation of reference establishes the presence of phosphorus in water to a maximum of 0.05 mg/L.

As shown in figure 11, this parameter's levels exceeded the limit at points FW 315-HE, FW 304-HE, FW 207-TR, FW 205-TR, FW 109-MYRZ, FW 115-MY, FW 110-LB, FW11-LB, FW 310-CR and FW01.

3.2.12 Total nitrogen



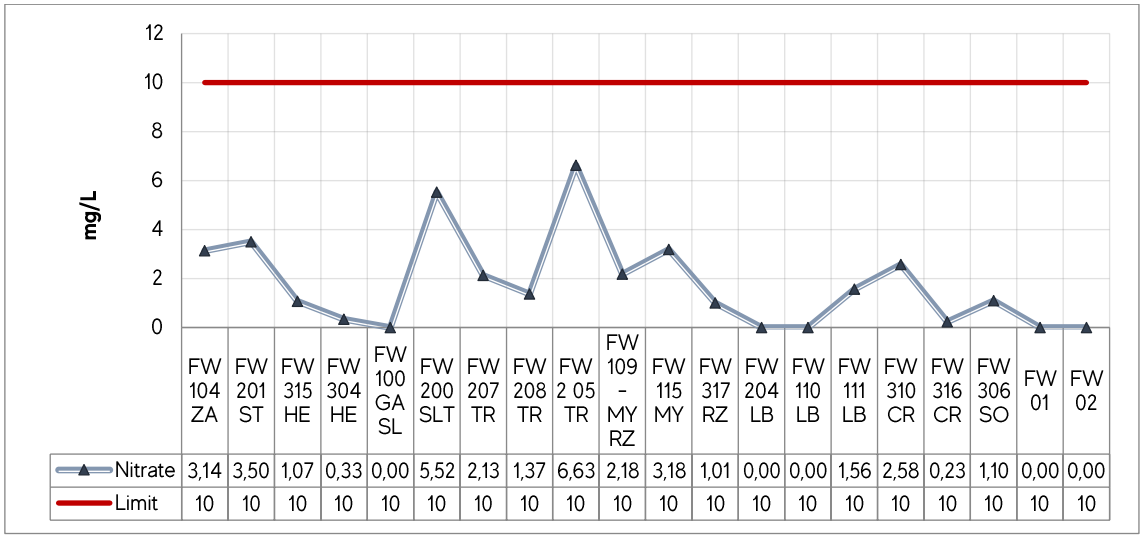
	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Total nitrogen	0,00	0,10	0,73	0,00	0,75	0,00	0,35	0,74	0,44	0,13	0,10	0,00	0,00	0,12	0,00	0,00	0,77	0,00	1,77	2,43
Limit	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6

Figure 12. Comparative analysis of total nitrogen at different monitoring points

The limit set by the national water standard for total nitrogen is 0.6 mg/l; the points exceeding the maximum are FW 315-HE, FW 100-GASL, FW 208-TR and FW 316-CR.

The median for this parameter is 0.7 mg/L. A percentage of 70% of the monitoring points shows values under the range.

3.2.13 Nitrate



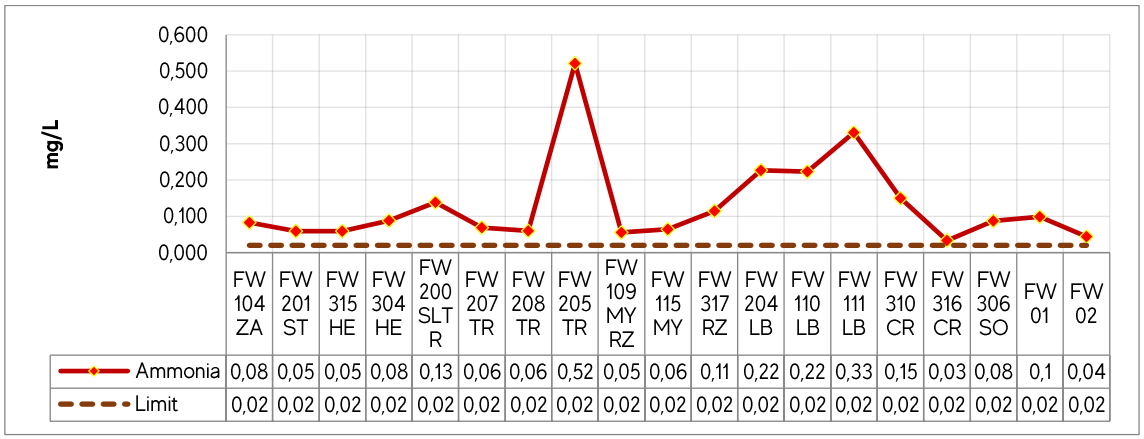
	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Nitrate	3,14	3,50	1,07	0,33	0,00	5,52	2,13	1,37	6,63	2,18	3,18	1,01	0,00	0,00	1,56	2,58	0,23	1,10	0,00	0,00
Limit	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

Figure 13. Comparative analysis of nitrate levels at different monitoring points

The legislation established a maximum of 10 mg/l for nitrates. None of the points exceeds this value except for point FW205-TR that reaches the maximum result with 6.63 mg/l.

The nitrate's results average is 2.7 mg/l, far below the limit.

3.2.14 Ammonia



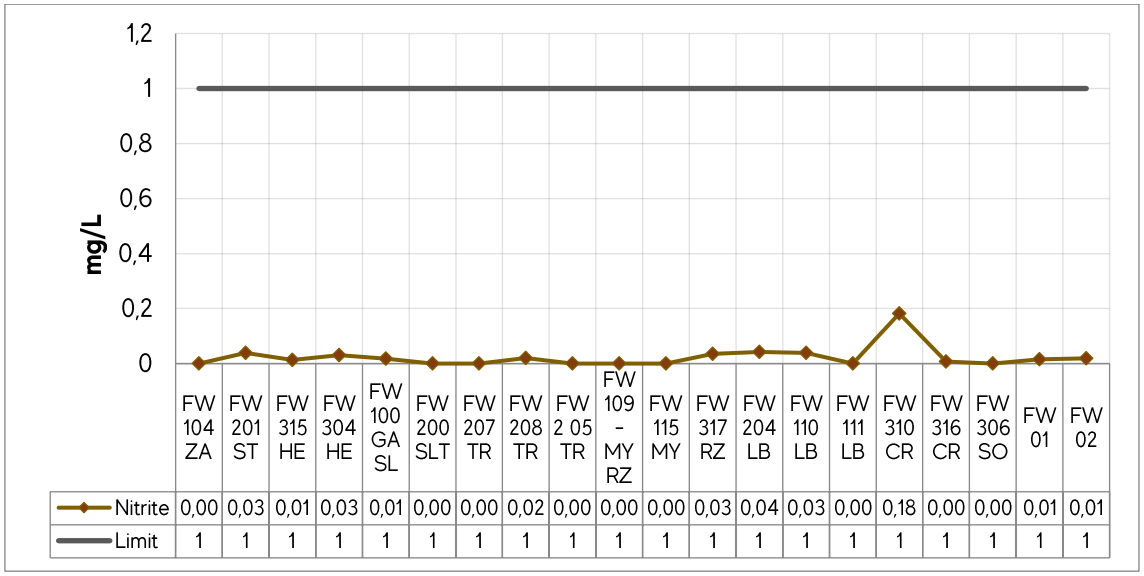
	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 200 SLT R	FW 207 TR	FW 208 TR	FW 205 TR	FW 109 MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Ammonia	0,08	0,05	0,05	0,08	0,13	0,06	0,06	0,52	0,05	0,06	0,11	0,22	0,22	0,33	0,15	0,03	0,08	0,1	0,04
Limit	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02

Figure 14. Comparative analysis of ammonia levels at monitoring points

The ammonia levels exceed at all the points with an average value of 0.12 mg/l, which is five times higher than the maximum reference value.

In water bodies that don't receive industrial effluents and are in agro livestock's areas, the primary source of ammonia comes from the degradation of organic matter, specifically the decomposition of faecal matter which can explain the values obtained.

3.2.15 Nitrite

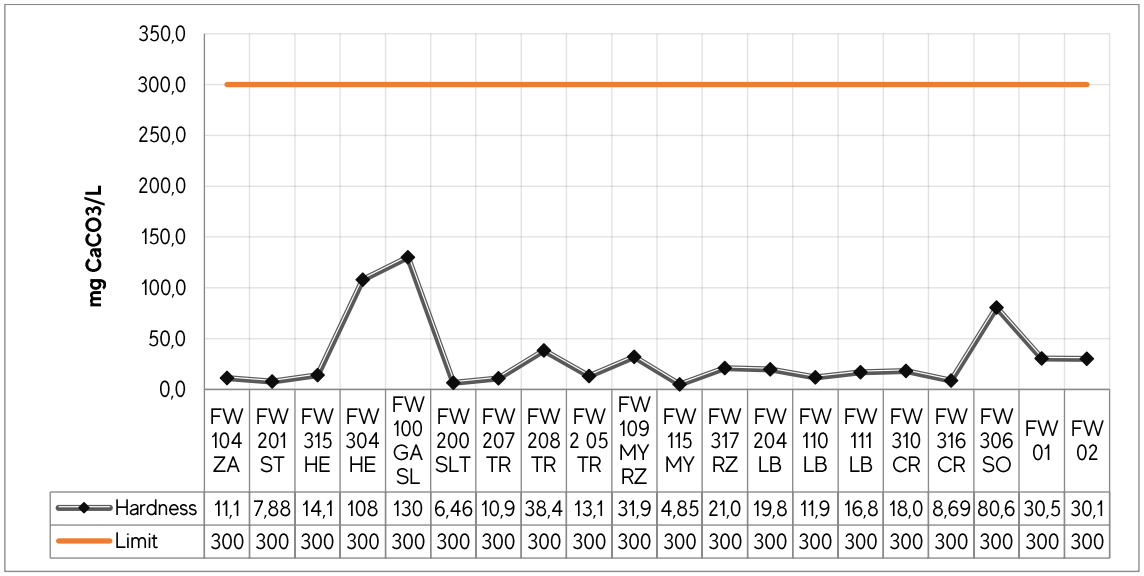


	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Nitrite	0,00	0,03	0,01	0,03	0,01	0,00	0,00	0,02	0,00	0,00	0,00	0,03	0,04	0,03	0,00	0,18	0,00	0,00	0,01	0,01
Limit	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Figure 15. Comparative analysis of nitrite levels at monitoring points

For nitrate levels, the maximum established by Regulation 222/02 is 1 mg/l. All monitored points comply with the permissible limit with an average result of 0.024 mg/l.

3.2.16 Hardness

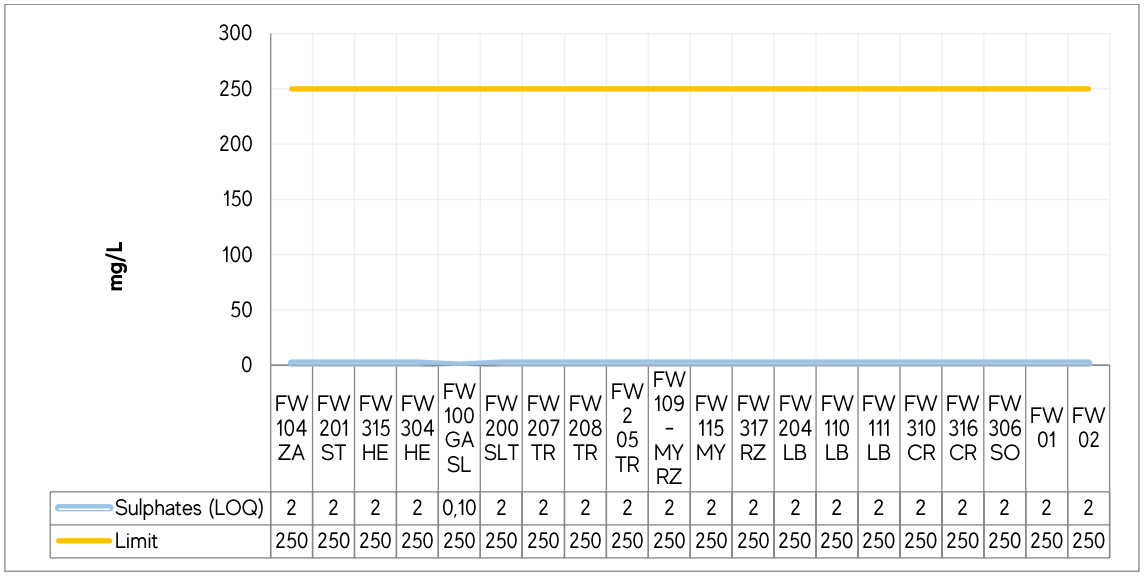


	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Hardness	11,1	7,88	14,1	108	130	6,46	10,9	38,4	13,1	31,9	4,85	21,0	19,8	11,9	16,8	18,0	8,69	80,6	30,5	30,1
Limit	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300

Figure 16. Comparative analysis of hardness levels at monitoring points

Hardness is a water quality parameter mainly influence by the geological formations of the hydrological area in which a given watercourse is located. Regulation 222/02 stipulates a maximum level of 300 mg/l for this parameter; none result yielded a value higher than limits. The average result in the first campaign is 30.7 mg $CaCO_3$/l.

3.2.17 Sulphates

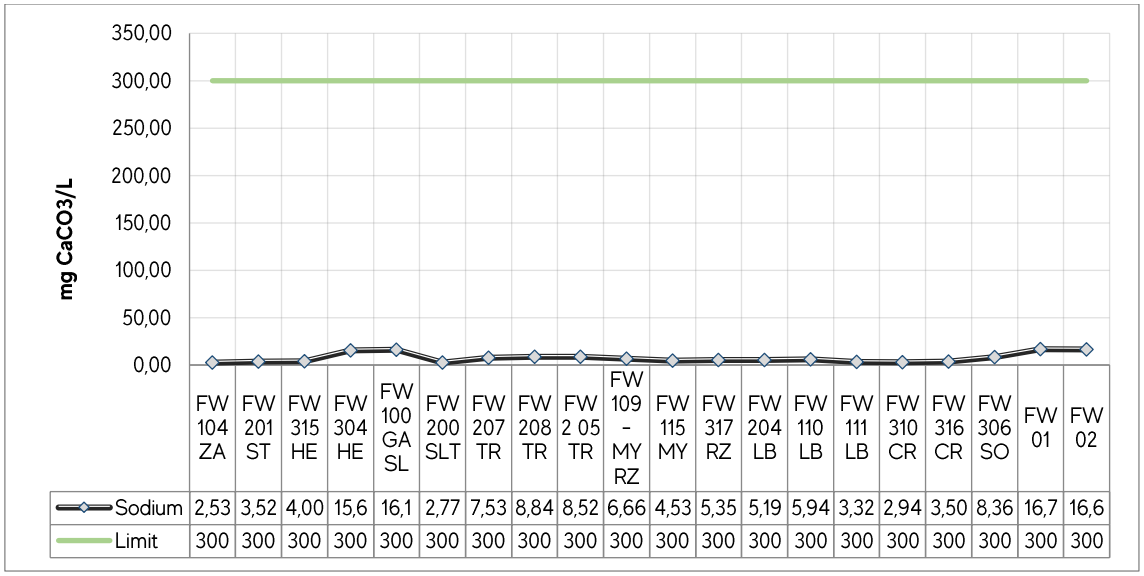


	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Sulphates (LOQ)	2	2	2	2	0,10	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Limit	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250

Figure 17. Comparative analysis of sulphates levels at monitoring points

All the 19 samples were below the detection limit of the turbidimetric method SM-4500, equal to 2 mg/l. Figure 17 shows a flat line with no points exceeding the permissible limit defined in Regulation 222/02, up to 250 mg/l.

3.2.18 Sodium

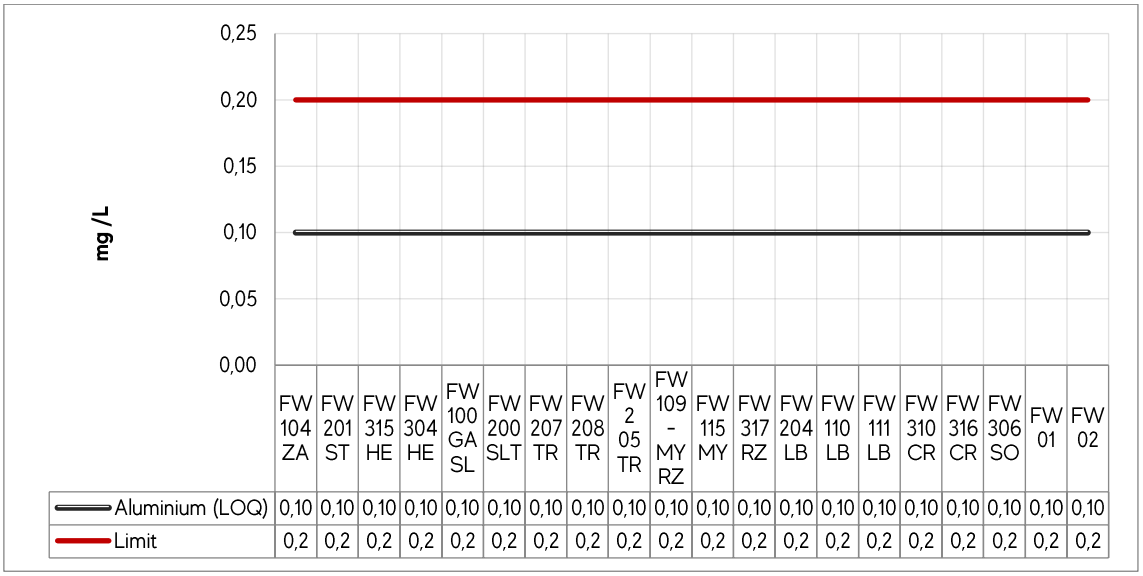


	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Sodium	2,53	3,52	4,00	15,6	16,1	2,77	7,53	8,84	8,52	6,66	4,53	5,35	5,19	5,94	3,32	2,94	3,50	8,36	16,7	16,6
Limit	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300

Figure 18. Comparative analysis of sodium levels at monitoring points

The highest values of sodium are measured at FW 304-HE ("Hermosa" stream), FW 100-GASL ("Trementina stream") and at the points of the Paraguay River (FW01 and FW02). Even the points with the highest concentrations are less than the limit established by Regulation 222/02.

3.2.19 Aluminium



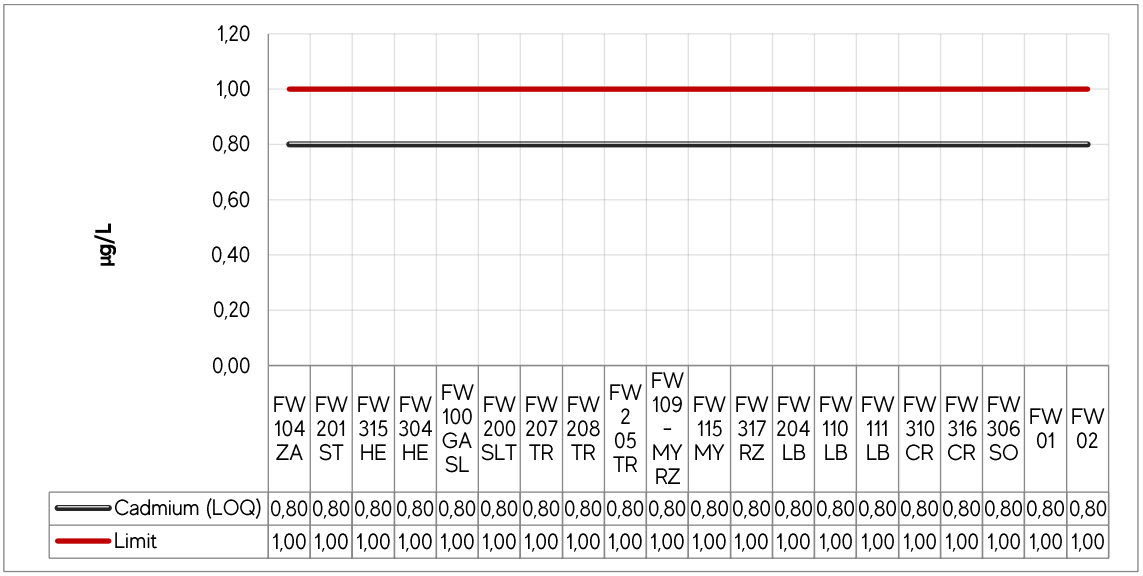
	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Aluminium (LOQ)	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10
Limit	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2

Figure 19. Comparative analysis of aluminium levels at monitoring points

Aluminium levels was measured with AAS-GFA method (SM-3113). The limit of quantification (LOQ) of this method is 0.2 mg/l. According to Regulation 222/02 the permissible limits of aluminium in surface water is 0.1 mg/l.

Figure 19 shows that at all monitoring points the aluminium levels are below the LOQ. In conclusion, all the points comply with the water standard limits for this parameter.

3.2.20 Cadmium



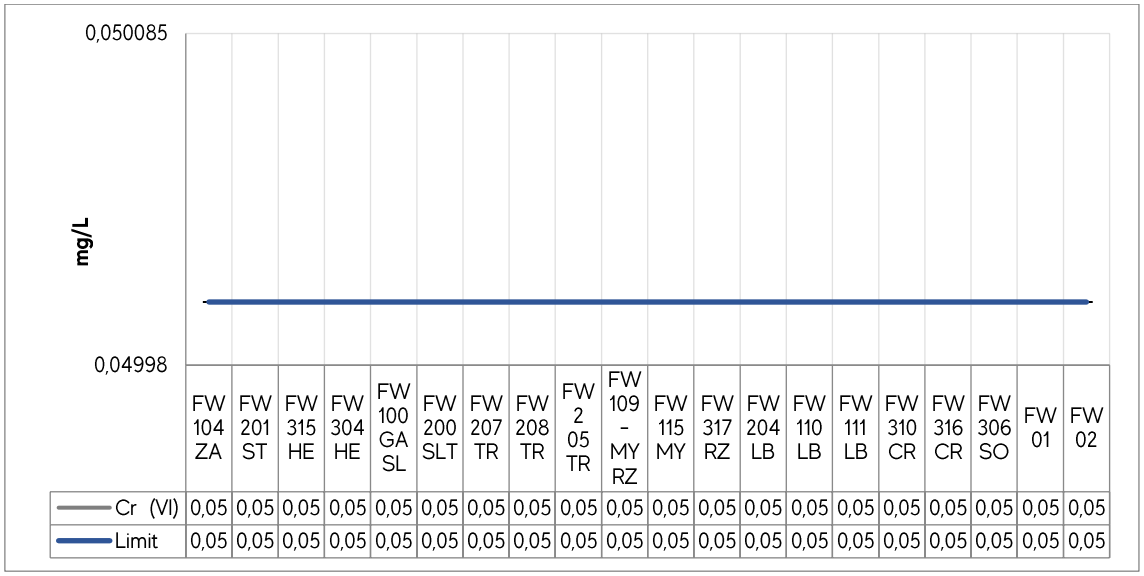
	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Cadmium (LOQ)	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80	0,80
Limit	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00

Figure 20. Comparative analysis of cadmium levels at monitoring points

Cadmium levels was measured with AAS-GFA method (SM-3113). The limit of quantification (LOQ) of this method is 0.8 µg/ for cadmium. According to Regulation 222/02 the permissible limits of aluminium in surface water is 1 µg/L

All monitoring points have levels of aluminium below the LOQ. In conclusion, all the points comply with the water standard limits for this parameter.

3.2.21 Hexavalent chromium



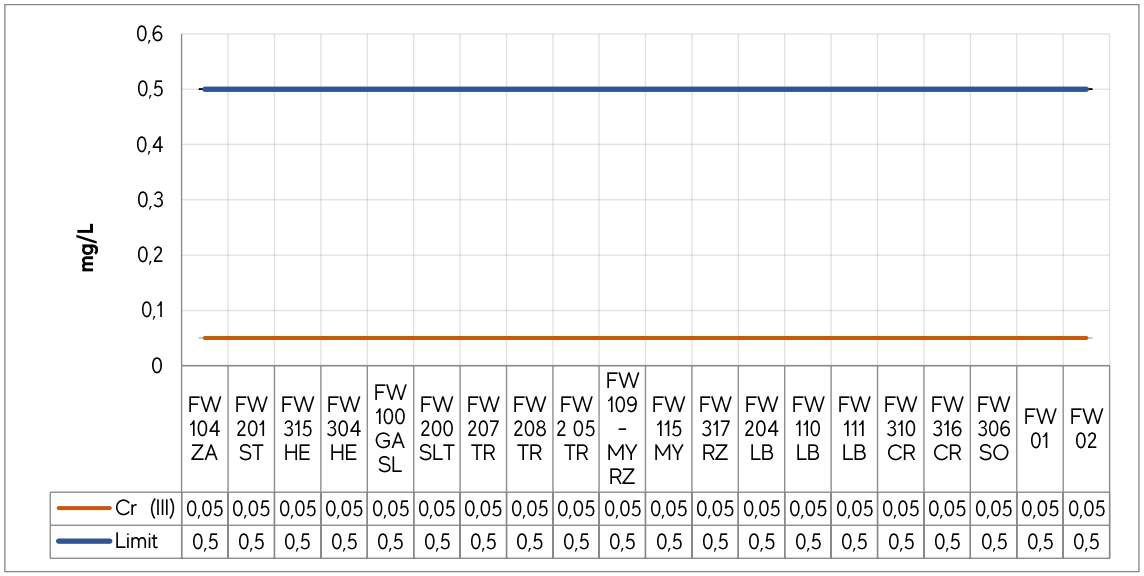
	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Cr (VI)	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05
Limit	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05

Figure 21. Comparative analysis of hexavalent chromium levels at monitoring points

The colorimetric method (SM-3500-Cr B) was used to determine the levels of this parameter. The limit of quantification (LOQ) in aqueous matrix is 0.05 mg/l. The hexavalent chromium at all sampling points was below the LOQ.

Under those circumstances, all the points are in accordance with the water standard limits for this parameter.

3.2.22 Trivalent chromium



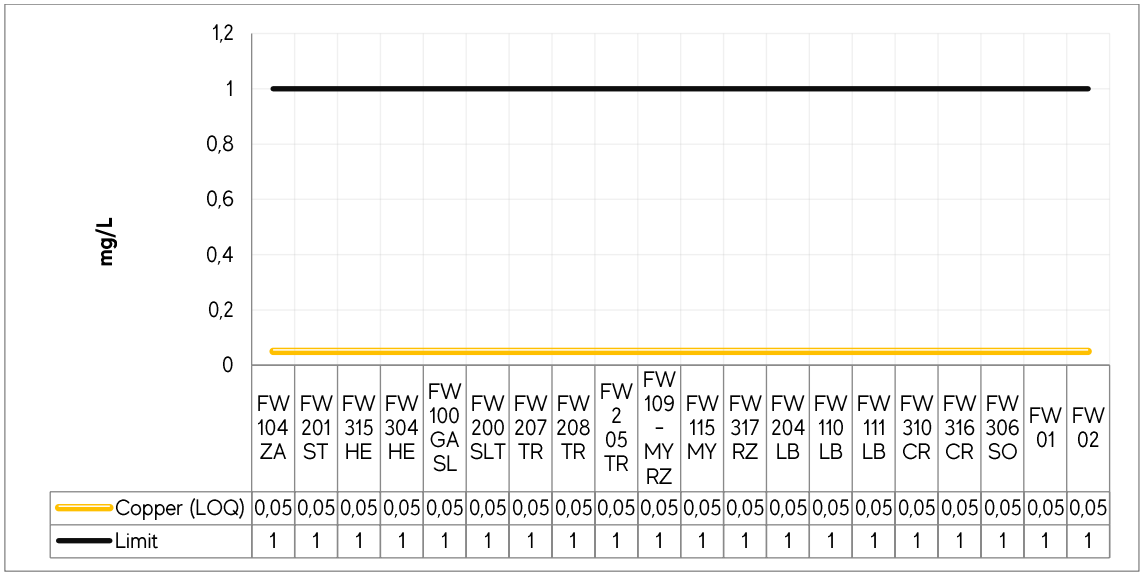
	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Cr (III)	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05
Limit	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5

Figure 22. Comparative analysis of trivalent chromium levels at monitoring points

For this determination, the calculation method (Total Chromium - Hexavalent Chromium) was used. The limit of quantification (LOQ) is 0.05 mg/l. The flat line on the graph shows that the 20 points analysed are below the LOQ.

It is important to note that the maximum permissible value according to the national water standard is 10 times higher than the limit of quantification.

3.2.23 Copper



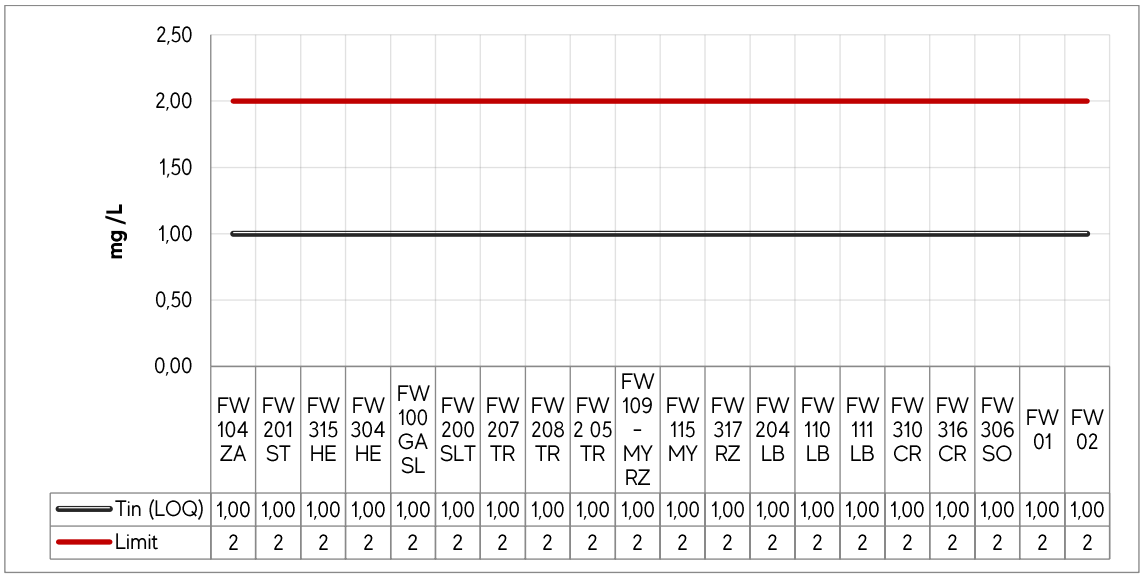
	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Copper (LOQ)	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05
Limit	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Figure 23. Comparative analysis of copper levels at monitoring points

The copper determinations method is AAS-Air-Acetylene Flame (SM-3111-B)/GFA (SM-3113), which has a sensitivity or limit of quantification in the water of 0.05 mg/l. For this parameter, there are no detectable and quantifiable copper concentrations in any of the 20 samples.

The fact that all samples were below the detection limit explains the flat line in figure 23; 100% of the monitored points are within the range for this parameter.

3.2.24 Tin

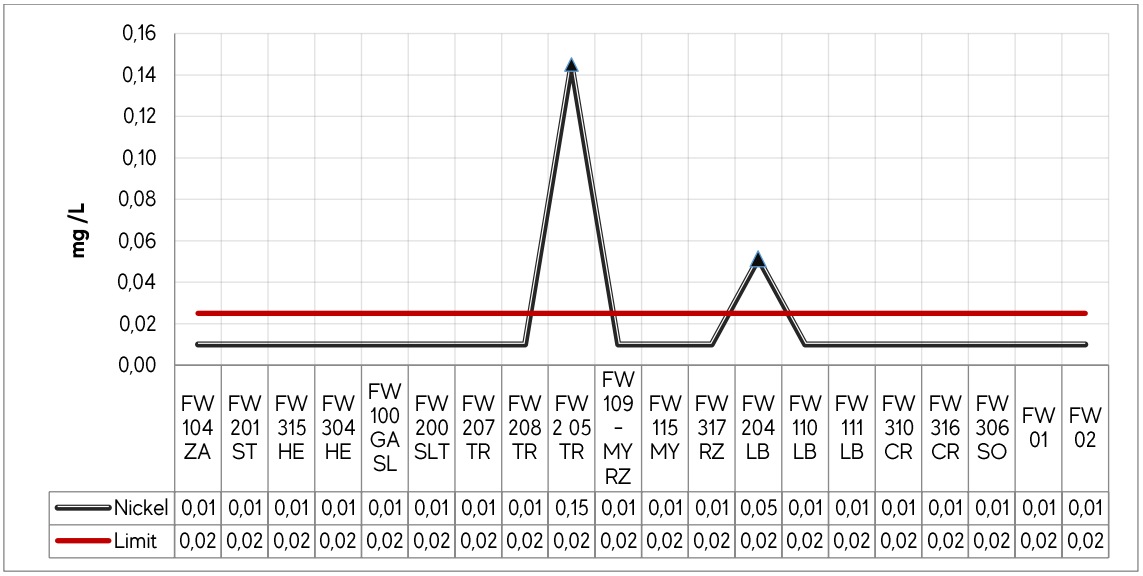


	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Tin (LOQ)	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Limit	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Figure 24. Comparative analysis of tin levels at monitoring points

At all points the concentrations of tin were below the limit of quantification. Since the LOQ (1 mg/l) is lower than the maximum allowed by the water standard regulation (2 mg/l), it is deducted that all the monitoring points comply with the regulation's limits.

3.2.25 Nickel

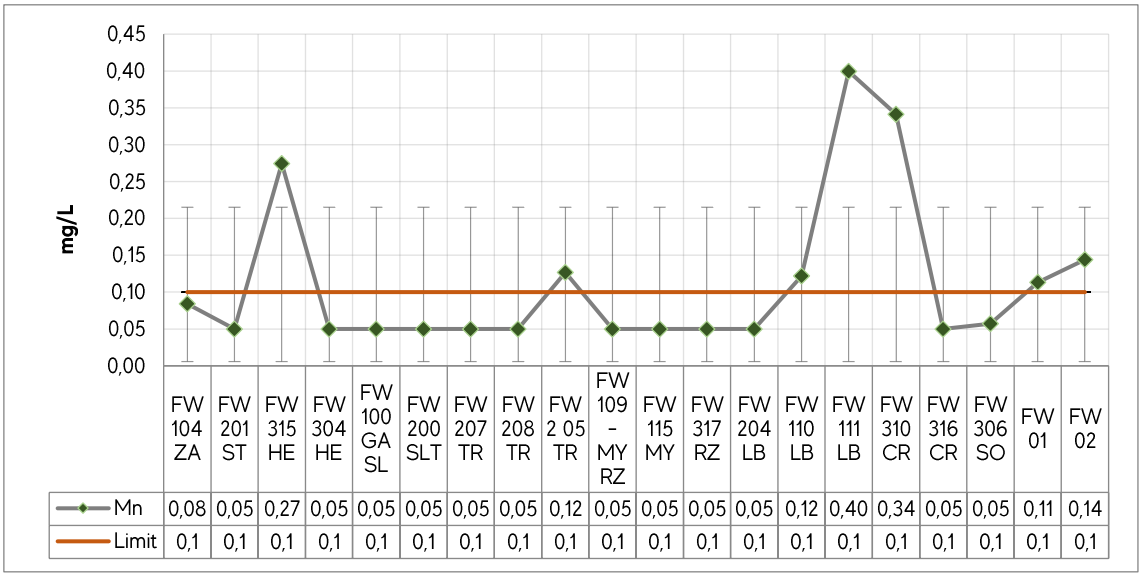


	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Nickel	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,15	0,01	0,01	0,01	0,05	0,01	0,01	0,01	0,01	0,01	0,01	0,01
Limit	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02

Figure 25. Comparative analysis of nickel levels at monitoring points

The results of nickel at 18 monitoring points are below the limit of quantification (LOQ= 0.01 mg/L). However, in FW 208-TR and FW 204-LB the values are higher than the limit established by the water standard regulation, which is 0.025 mg/L.

3.2.26 Manganese

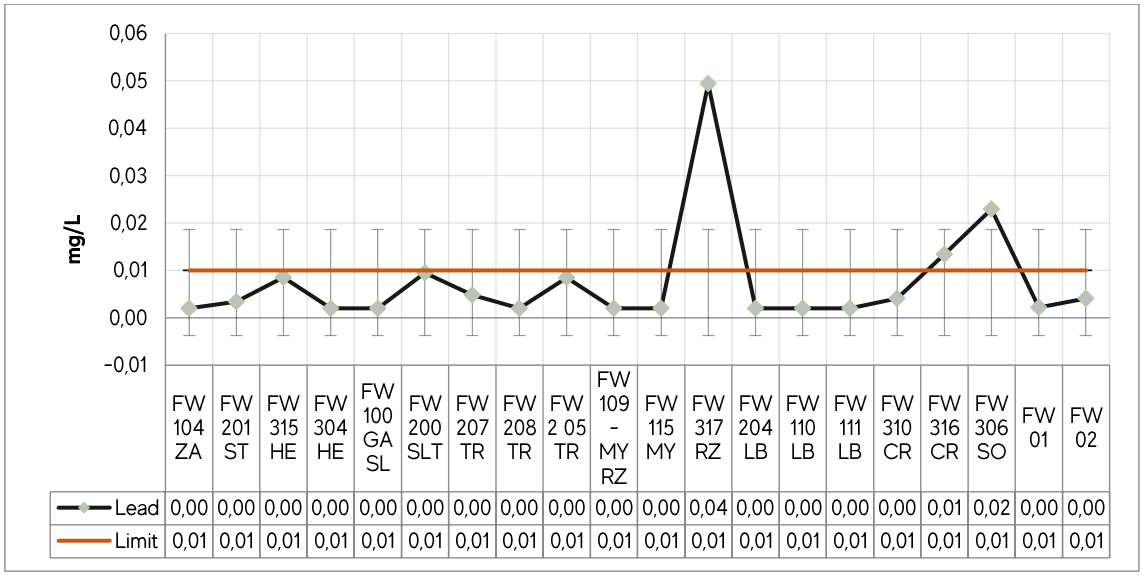


	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Mn	0,08	0,05	0,27	0,05	0,05	0,05	0,05	0,05	0,12	0,05	0,05	0,05	0,05	0,12	0,40	0,34	0,05	0,05	0,11	0,14
Limit	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1

Figure 26. Comparative analysis of manganese levels at monitoring points

The graph shows that points FW 315-HE, FW 205-TR, FW 110 LB, FW 111 LB, FW 310 CR and the two points on the Paraguay River (FW 01 and FW 02) have higher values than the maximum established for waters classify as Class II by the Regulation. The maximum permissible value for this element is 0.1 mg/L and the limit of quantification (LOQ) of the method used to measure is 0.05 mg/L.

3.2.27 Lead

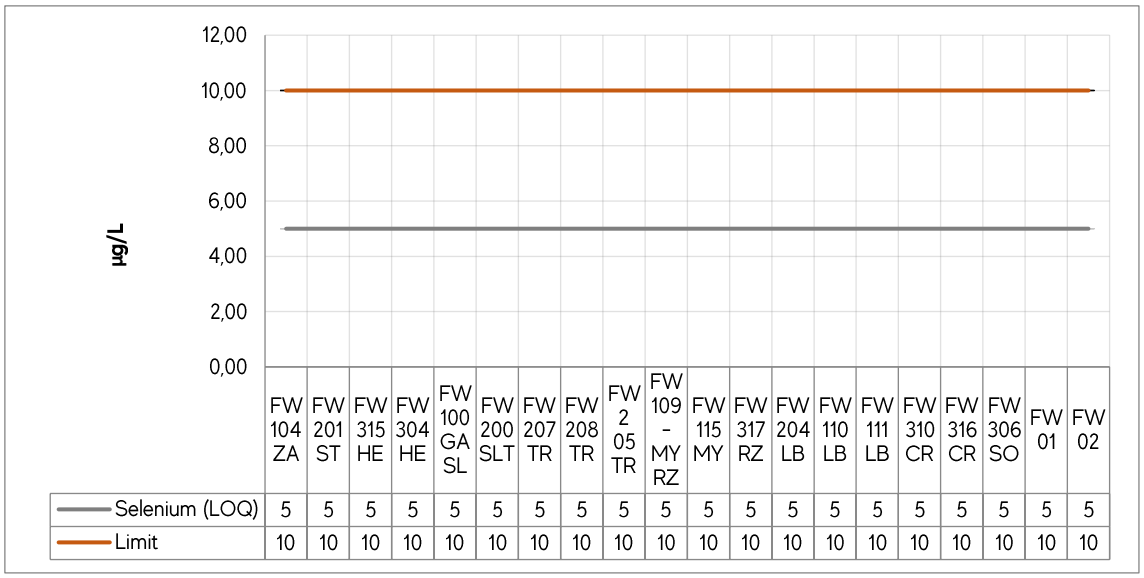


	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Lead	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,04	0,00	0,00	0,00	0,00	0,01	0,02	0,00	0,00
Limit	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01

Figure 27. Comparative analysis of lead levels at monitoring points

The method used to determine lead levels is AAS-GFA (SM-3113). The limit of quantification (LOQ) is 0.002 mg/l. The figure 27 reveals that in 9 points the levels were below the LOQ but in 3 points with quantifiable values, the values exceed the water standard limits (0.01 mg/L).

3.2.28 Selenium

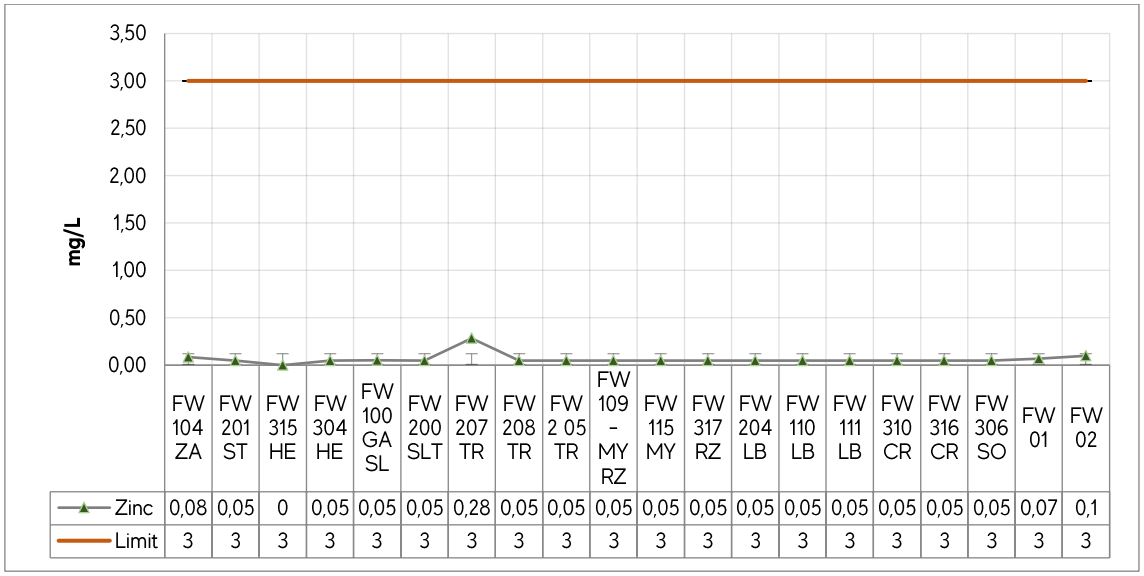


	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Selenium (LOQ)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Limit	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

Figure 28. Comparative analysis of selenium levels at monitoring points

At all sampling points selenium concentrations were below the limit of quantification (LOQ= 5 µg/L). According to Regulation 222/02 the maximum permissible level is 10 µg/L. Therefore, it can be deduced that all points are in accordance with the reference legislation.

3.2.29 Zinc

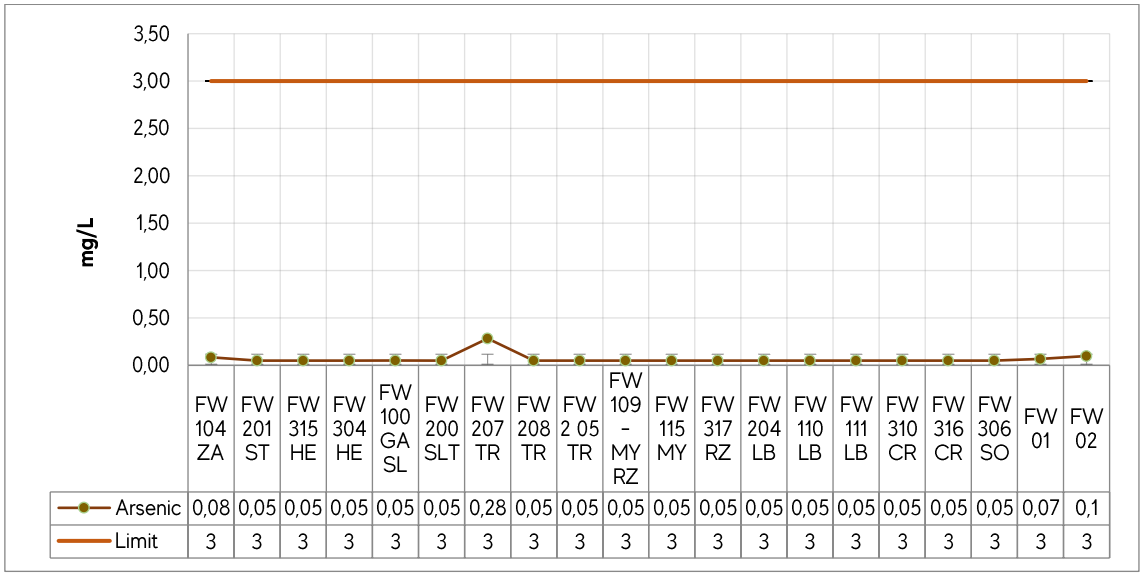


	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Zinc	0,08	0,05	0	0,05	0,05	0,05	0,28	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,07	0,1
Limit	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Figure 29. Comparative analysis of zinc levels at monitoring points

Zinc concentrations are below the maximum limit established in the water regulation at all points. Even in 75% of the sampled points the zinc levels were under the limit of quantification (LOQ=0.05).

3.2.30 Arsenic

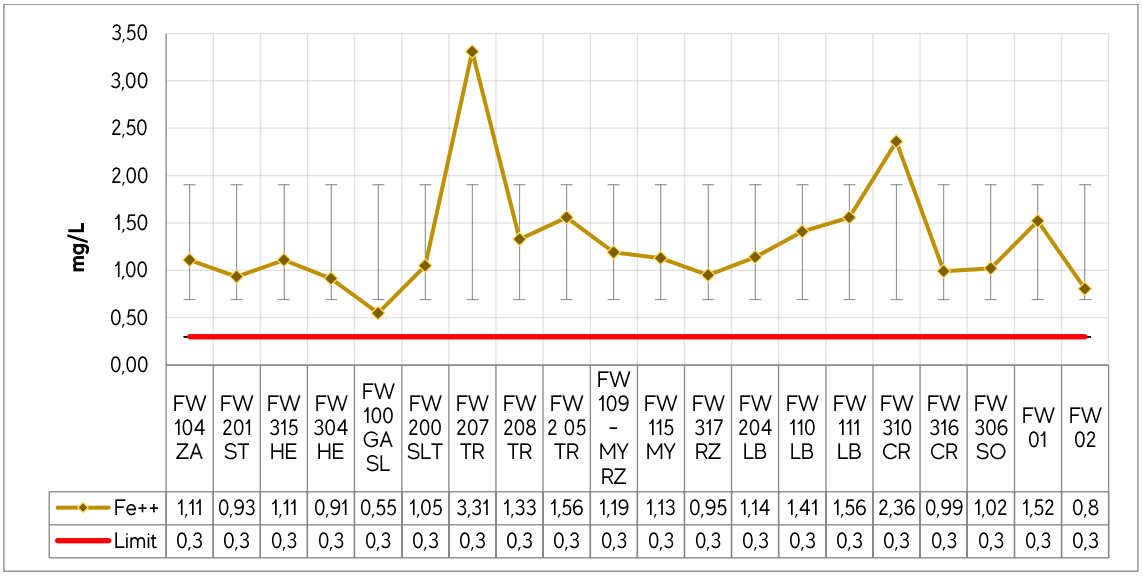


	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Arsenic	0,08	0,05	0,05	0,05	0,05	0,05	0,28	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,07	0,1
Limit	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Figure 30. Comparative analysis of zinc levels at monitoring points

As figure 30 illustrates, the arsenic concentrations in all the points are below the maximum defined by the national regulation. In 85% of them, the values are not detectable by the method used to measure; which is LOQ=0.05.

3.2.31 Soluble iron



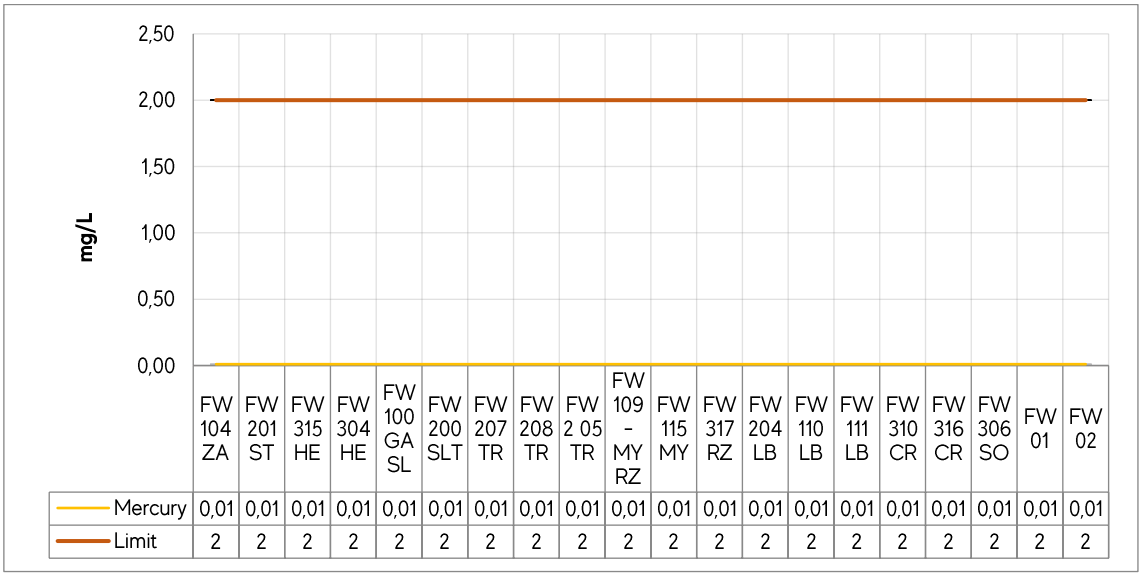
	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Fe++	1,11	0,93	1,11	0,91	0,55	1,05	3,31	1,33	1,56	1,19	1,13	0,95	1,14	1,41	1,56	2,36	0,99	1,02	1,52	0,8
Limit	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3

Figure 31. Comparative analysis of soluble iron levels at monitoring points

The geological formations of a river basin determine the presence of iron in the water. Regulation 222/02 determines a maximum level of 0.3 mg/l for this element.

In the first monitoring campaign, all 20 points reach levels higher than the maximum permissible for waters classify as Class 2 according to the regulation. The average value is up to 1.3 mg/l which is four times higher than the limit.

3.2.32 Total mercury

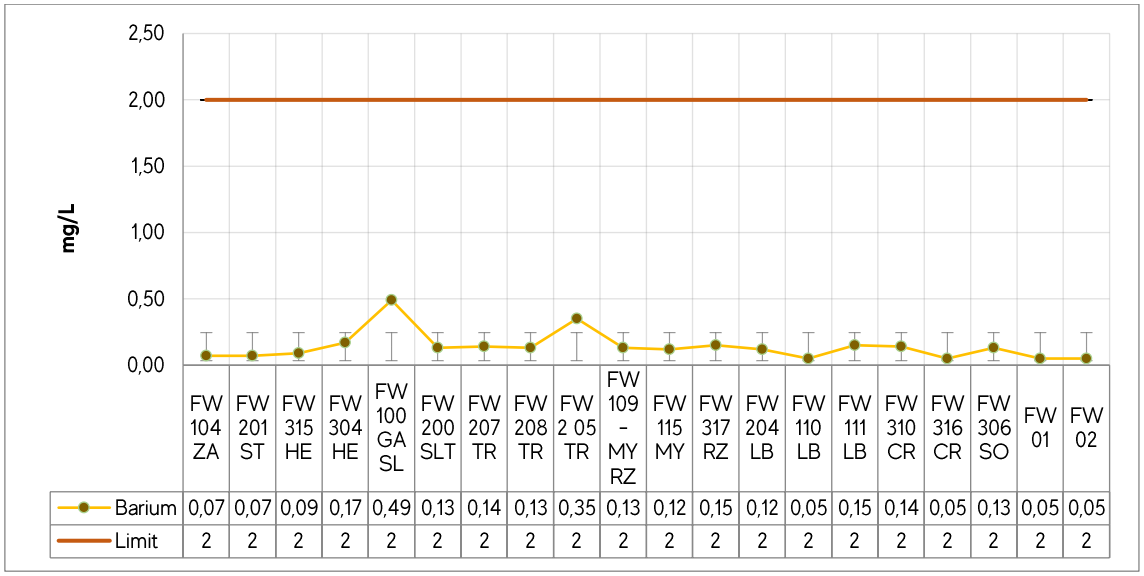


	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Mercury	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
Limit	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Figure 32. Comparative analysis of total mercury levels at monitoring points

Levels of mercury were not detected at any of the 20 points. The national water regulation establishes a limit of 2 mg/l for this parameter. Regarding to the limit of quantification for the method used to analyse the samples is 0.01 mg/l.

3.2.33 Barium

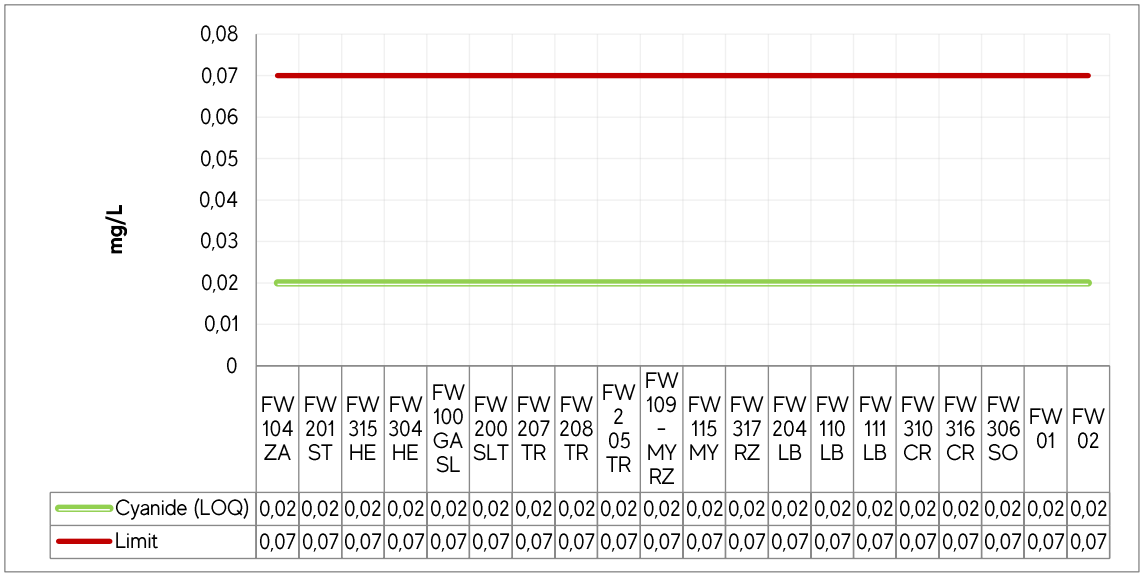


	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Barium	0,07	0,07	0,09	0,17	0,49	0,13	0,14	0,13	0,35	0,13	0,12	0,15	0,12	0,05	0,15	0,14	0,05	0,13	0,05	0,05
Limit	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Figure 33. Comparative analysis of barium levels at monitoring points

All the values measured are within the permissible limit established by the Regulation 222/02. The highest value recorded belongs to the point FW 100 GASL and it is approximately 4 times lower than the maximum defined by the mentioned legislation.

3.2.34 Cyanide



	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT	FW 207 TR	FW 208 TR	FW 2 05 TR	FW 109 - MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Cyanide (LOQ)	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02
Limit	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07

Figure 34. Comparative analysis of cyanides levels at monitoring points

The SM 4500 CN E method used for cyanides determinations has a limit of quantification (LOQ) equal to 0.02 mg/l, which was not detected in all the sampling points. The regulation establishes a limit 3.5 times higher than LOQ; therefore, it is inferred that the 20 samples comply with the reference regulation.

3.2.35 Glyphosate

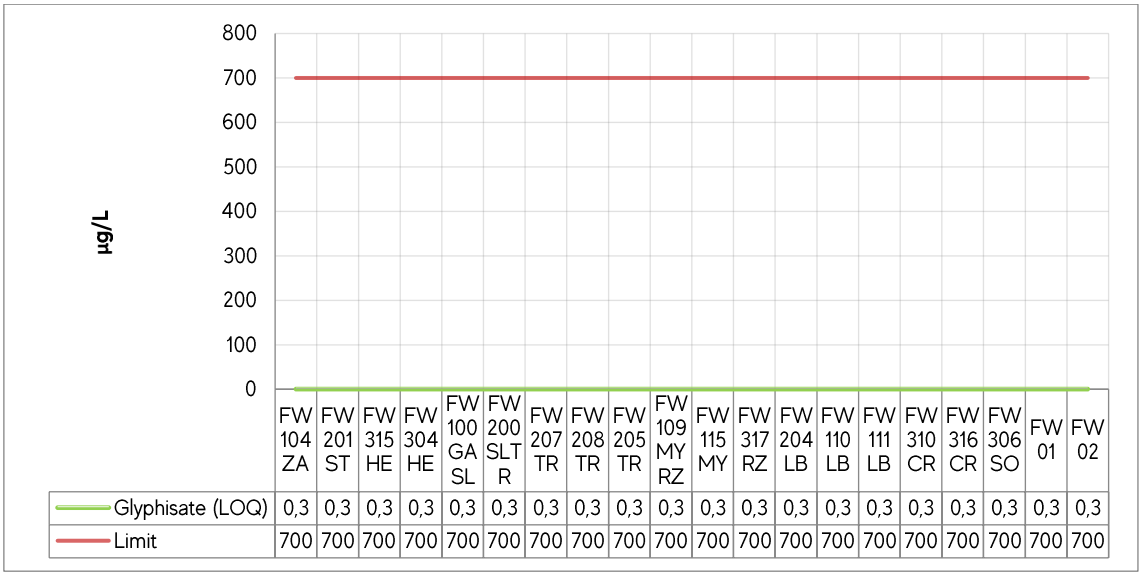


Figure 35. Comparative analysis of glyphosate levels at monitoring points

Glyphosate is a systemic herbicide ($C_3H_8NO_6P$) marketed under the name Round-up, widely used in agricultural and forestry activities.

The water regulation establishes a limit up to 700 µg/l for this substance. The limit of quantification in aqueous matrix is 0.3 µg/l which is not detected in any of the surface water sampling points.

3.2.36 AMPA

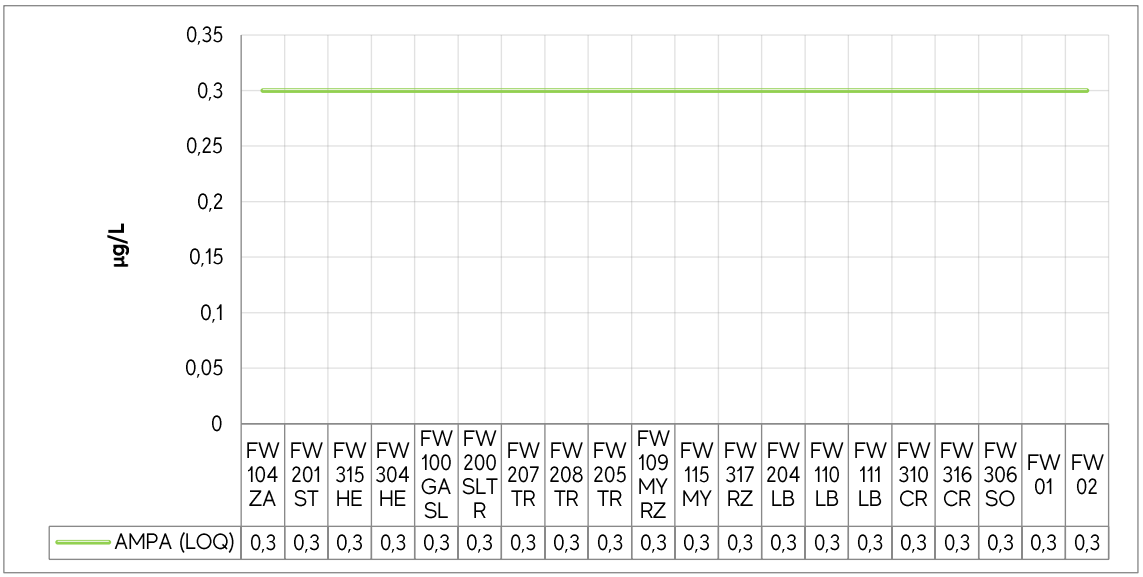


Figure 36. Comparative analysis of AMPA levels at monitoring points

The main metabolite of glyphosate is AMPA (amino-methyl phosphoric acid), which, due to its high solubility, can contaminate surface water.

The national water regulation does not establish limits for this substance.

The limit of quantification of the method used to determine this parameter is 0.3 µg/l. In any of the sampling points were detected levels of AMPA during the first campaign.

3.2.37 Aldrin

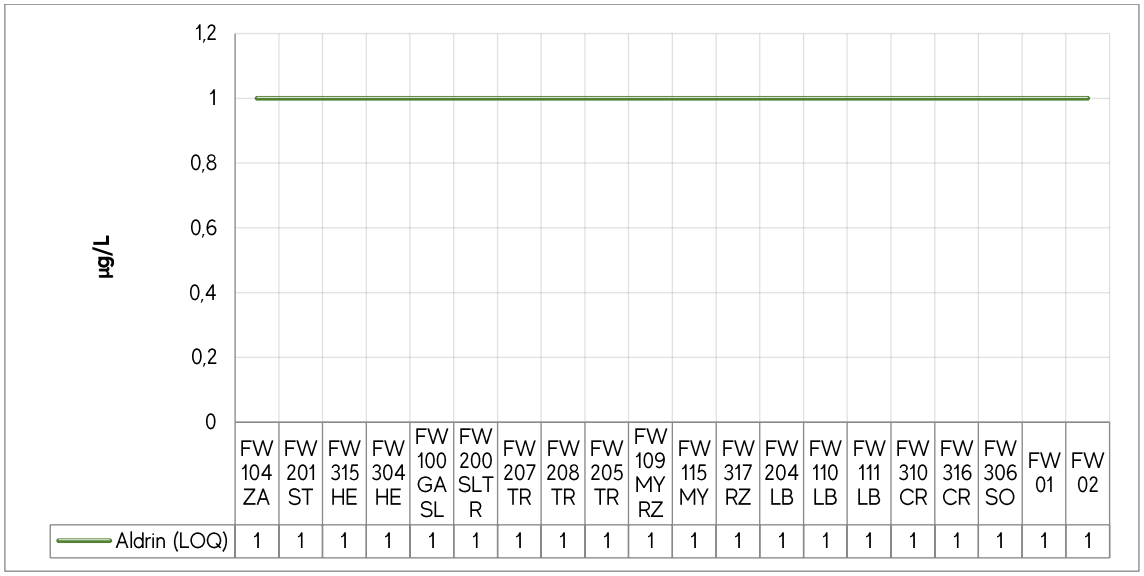


Figure 37. Comparative analysis of Aldrin levels at monitoring points

Aldrin is a non-systemic insecticide which has no maximum limit established by the national water regulation. At none of the samples were was detected levels of this substance. The limit of quantification of the method used to measure this parameter is 1 µg/L.

3.2.38 Endrin

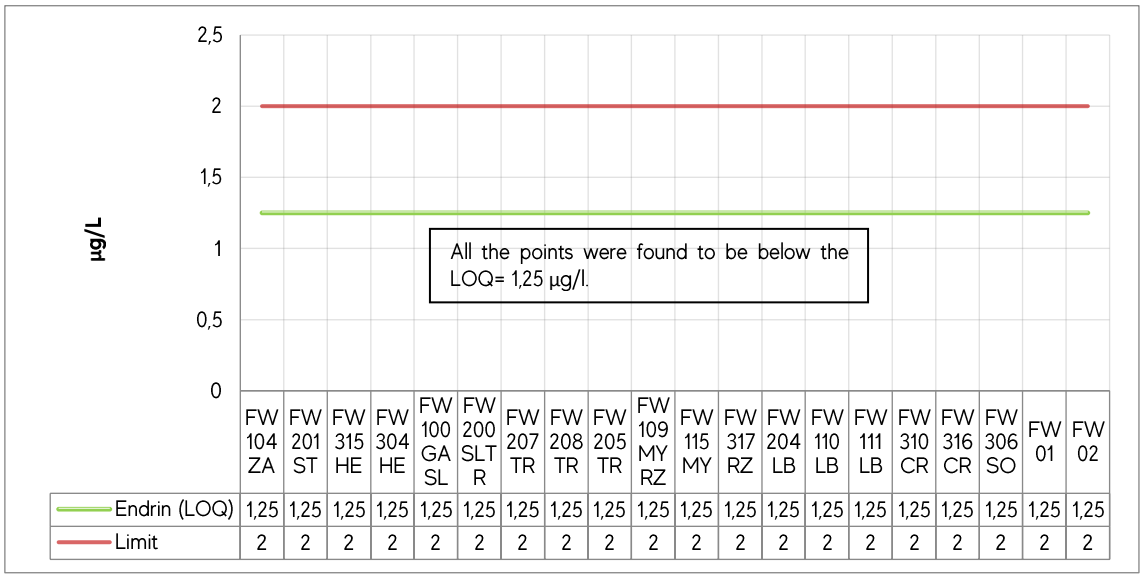
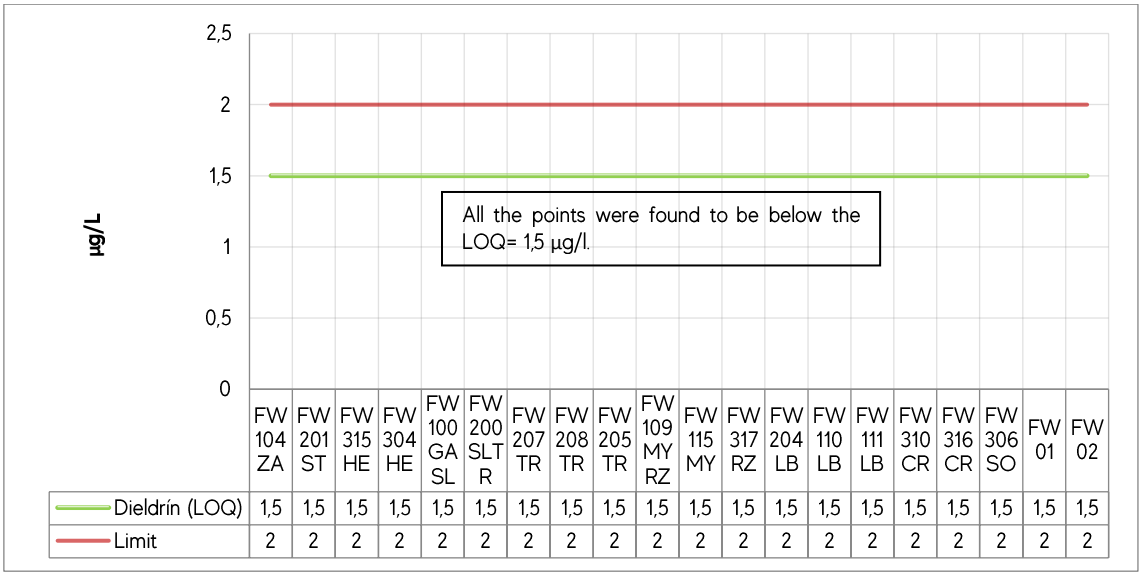


Figure 38. Comparative analysis of Endrin levels at monitoring points

Endrin ($C_{12}H_8Cl_6O$) is an insecticide and rodenticide. Regulation 222/02 establishes a maximum admissible value for waters Class II up to 2 µg/L. The limit of quantification of the method used to measure this parameter is 1.25 µg/L.

There were not detected levels of Endrin in the samples analysed.

3.2.39 Dieldrin



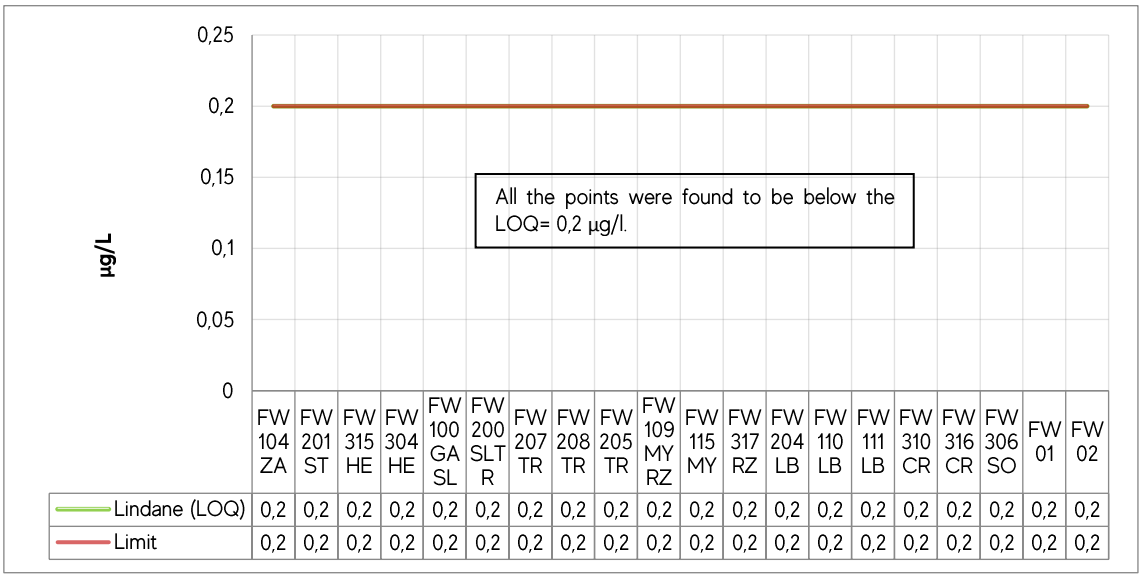
	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT R	FW 207 TR	FW 208 TR	FW 205 TR	FW 109 MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Dieldrín (LOQ)	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5
Limit	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Figure 39. Comparative analysis of Dieldrin levels at monitoring points

Dieldrin (C12H8Cl6O) is an insecticide. The national water regulation sets a maximum limit for this substance of 2 µg/l.

The method's limit of quantification is 1.5 µg/L. It was not detected this agrochemical at any of the sampling points.

3.2.40 Lindane

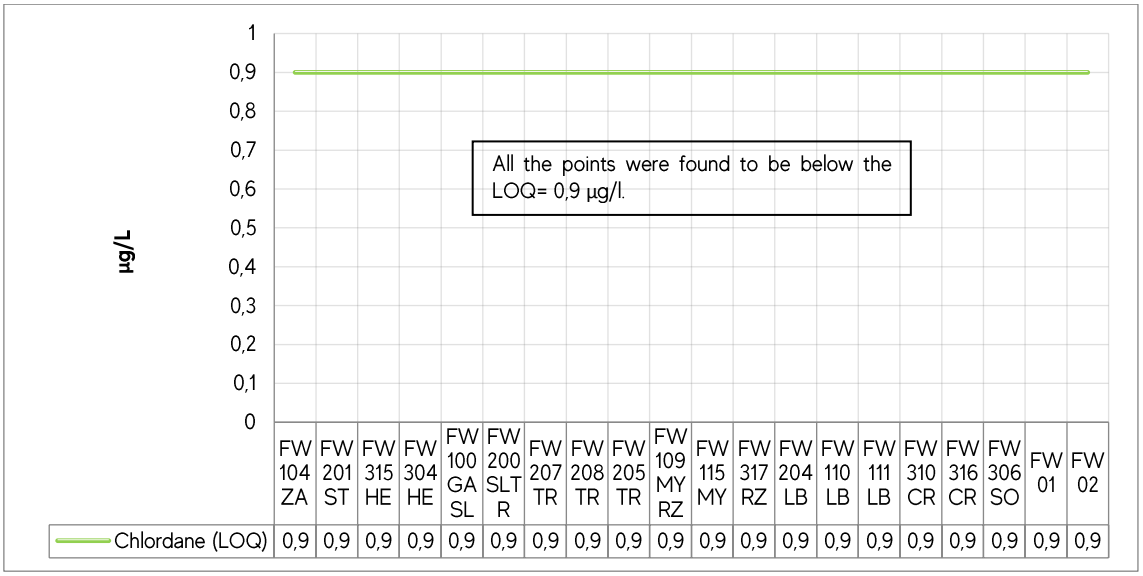


	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT R	FW 207 TR	FW 208 TR	FW 205 TR	FW 109 MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Lindane (LOQ)	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2
Limit	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2

Figure 40. Comparative analysis of Lindane levels at monitoring points

Lindane (C6H6CL6) is an insecticide distributed under the trade name Gamexane. Both the permissible limit established by the water regulation and method's LOQ sets a value of 0.2 µg/l. Lindane was not detected at the sampling points.

3.2.41 Chlordane

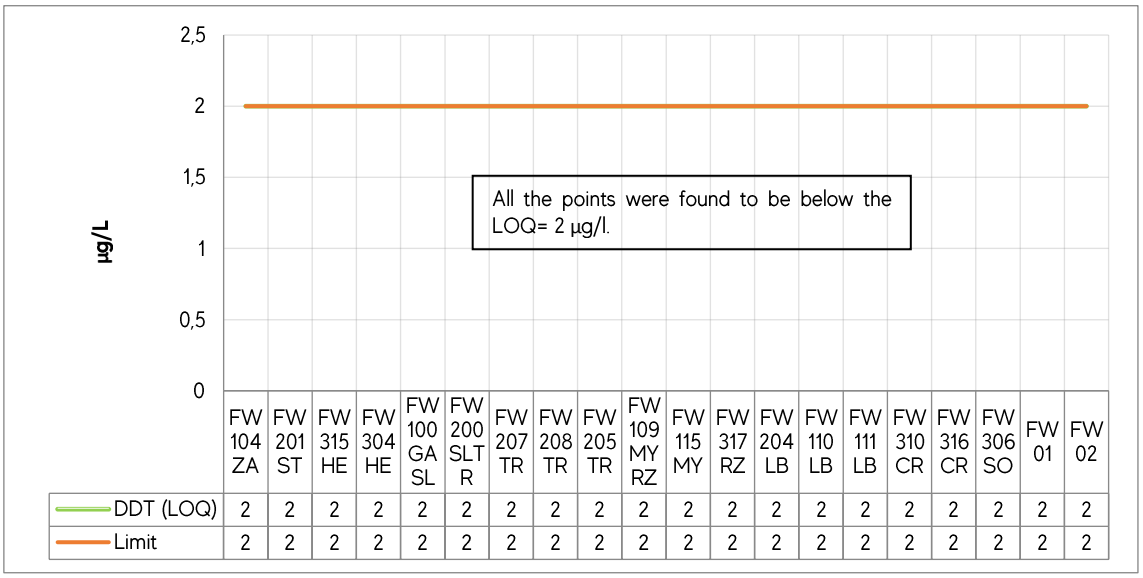


	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT R	FW 207 TR	FW 208 TR	FW 205 TR	FW 109 MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Chlordane (LOQ)	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9	0,9

Figure 41. Comparative analysis of chlordane levels at monitoring points

Chlordane ($C_{10}H_6Cl_8$) is an insecticide with no limit established in the national water regulation. The limit of quantification of this parameter is 0.9 µg/L. At all sampling points, chlordane levels was below the LOQ.

3.2.42 DDT



	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT R	FW 207 TR	FW 208 TR	FW 205 TR	FW 109 MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
DDT (LOQ)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Limit	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Figure 42. Comparative analysis of DDT levels at monitoring points

DDT ($C_{14}H_9Cl_{5)}$ is an insecticide. According to the national water regulation, the maximum permissible concentration in Class II surface water is 2 µg/L.

The limit of quantification of this parameter is 2 µg/L. DDT levels were below LOQ at all the 20 monitoring points.

3.2.43 DDE

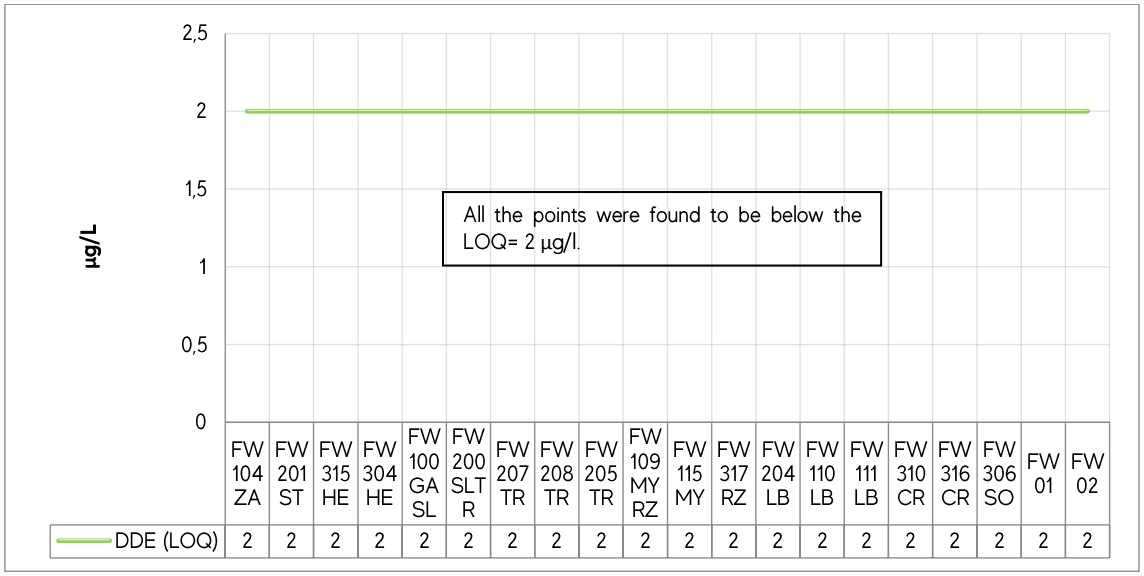


Figure 43. Comparative analysis of DDE levels at monitoring points

Likewise, other pesticides, no evidence of DDE was found in surface water. In all cases the DDE concentrations were below the method's limit of quantification which is LOQ= 2 µg/l.

The national water regulation does not establish maximum limits for this substance.

3.2.44 DDD

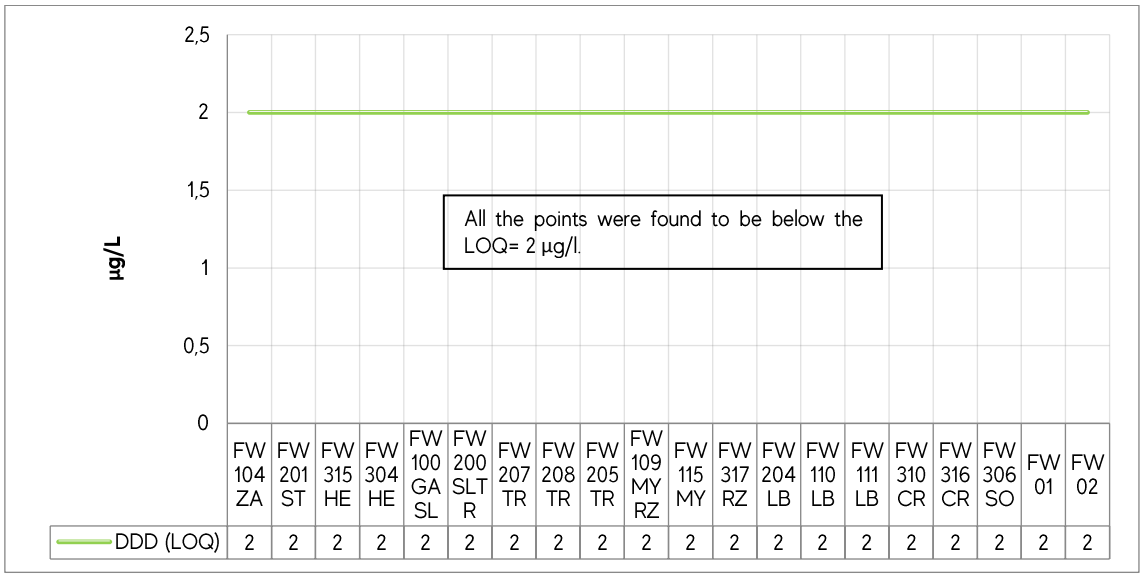


Figure 44. Comparative analysis of DDD levels at monitoring points

DDD is a metabolite resulting from the degradation of the insecticide DDT. The national water regulation does not establish a maximum limit for this parameter.

There is no evidence of DDD in the samples analysed during the first campaign. The method's limit of quantification is 2 µg/ which is not exceeded at any sampling point.

3.2.45 Atrazine

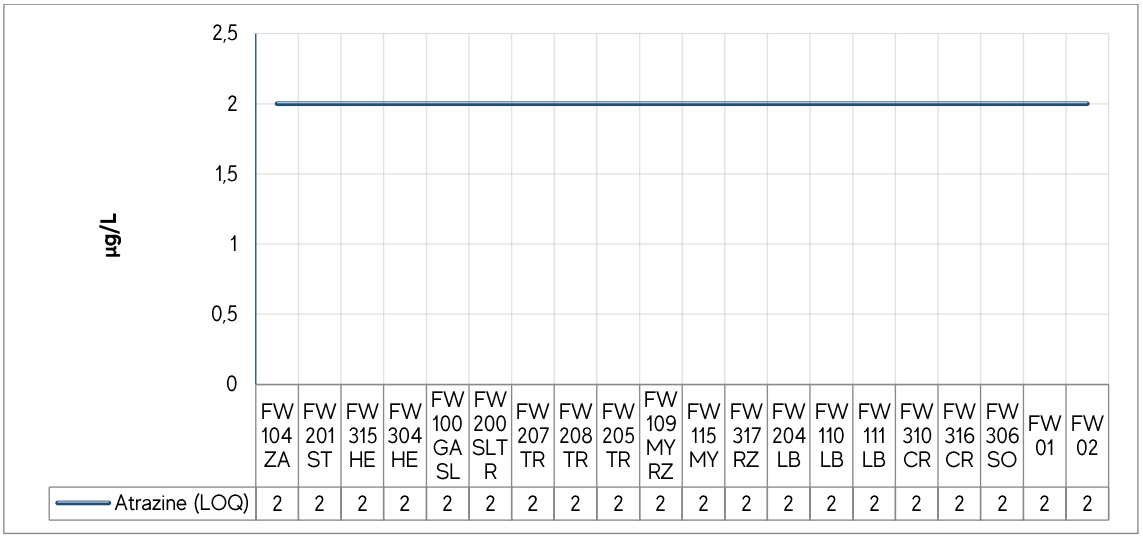


Figure 45. Comparative analysis of atrazine levels at monitoring points

Atrazine ($C_8H_{14}ClN_5$) is an herbicide distributed under the trade names Atramyl or Atraplex. The water standard regulation does not establish limits for this substance.

During the first monitoring campaign, there was no evidence of atrazine in surface waters. The limit of quantification is LOQ= 2 µg/L. None of the 20 samples exceeded this value.

3.2.47 Simazine

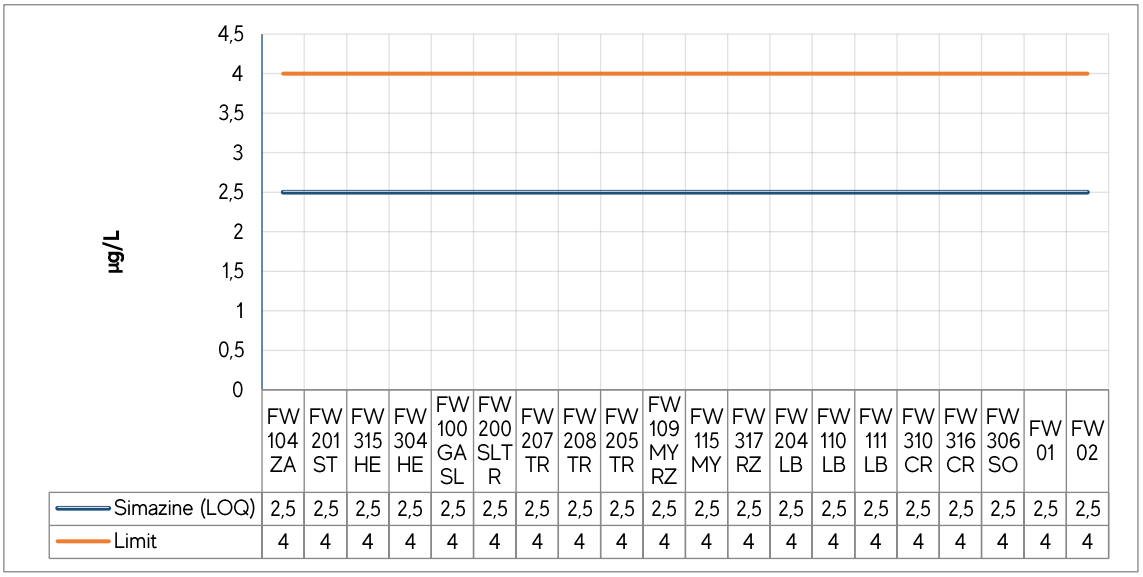


Figure 46. Comparative analysis of simazine levels at monitoring points

Simazine ($C_7H_{12}ClN_5$) is an herbicide distributed under the trade name SIMAPLEX. Regulation 222/02 establishes a maximum of 4 µg/l for this substance.

The analytical method used has a limit of quantification equal to 2.5 µg/l which none of the samples reached. All the monitoring points comply with the established limits.

3.2.48 Carbaryl

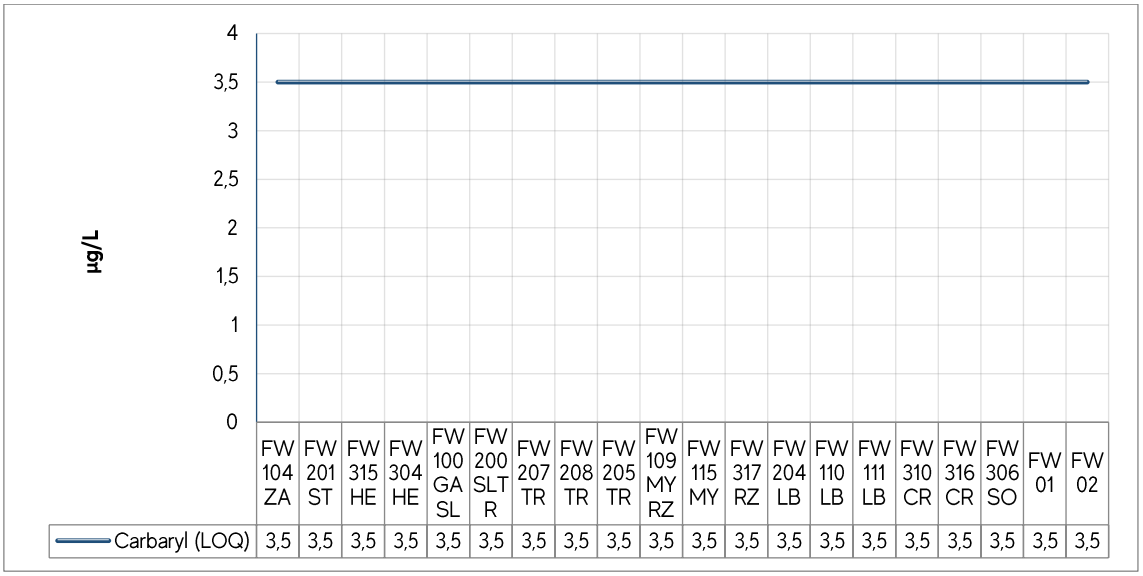


Figure 47. Comparative analysis of Carbaryl levels at monitoring points

Carbaryl ($C_{12}H_{11}NO_2$) is an insecticide used to control insects and ectoparasites. It is distributed under the trade names HORTEVI and CARBARYL.

The analytical method used has a limit of quantification equal to 3.5 µg/L. It was not detected quantifiable levels at any of the points.

3.2.49 Heptachlor

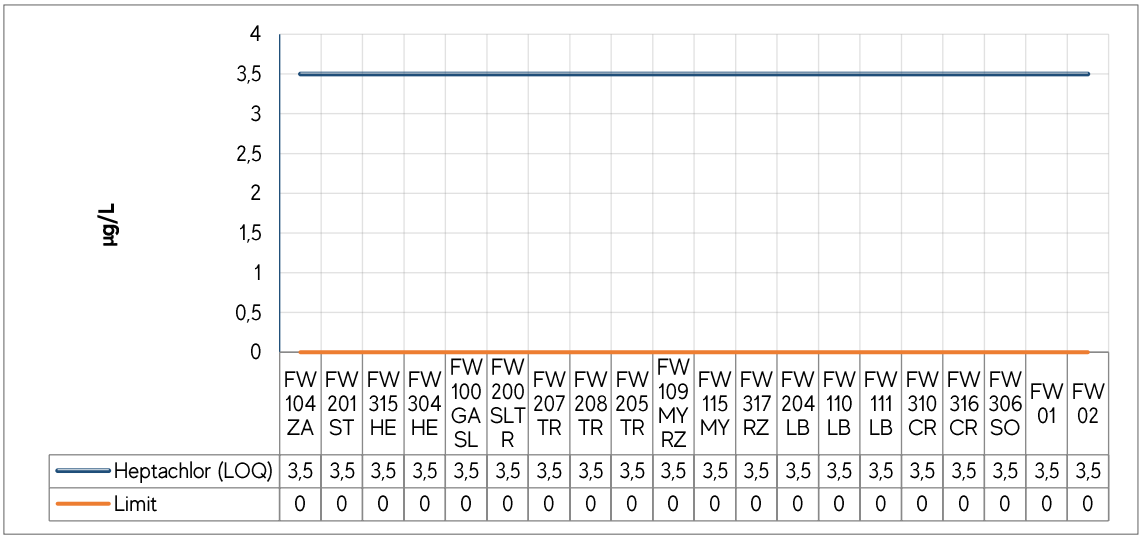


Figure 48. Comparative analysis of heptachlor levels at monitoring points

Heptachlor ($C_{10}H_5Cl_7$) is an insecticide used to control ants and termites. The national water regulation establishes that the concentration of this substance in the aqueous matrix must be 0 µg/L (zero).

The limit of quantification is higher than the maximum permissible by the water regulation (LOQ = 3.5 µg / L), which is why none of the points are within the limits but it is not detected quantifiable values of Heptachlor.

3.2.50 Methomyl

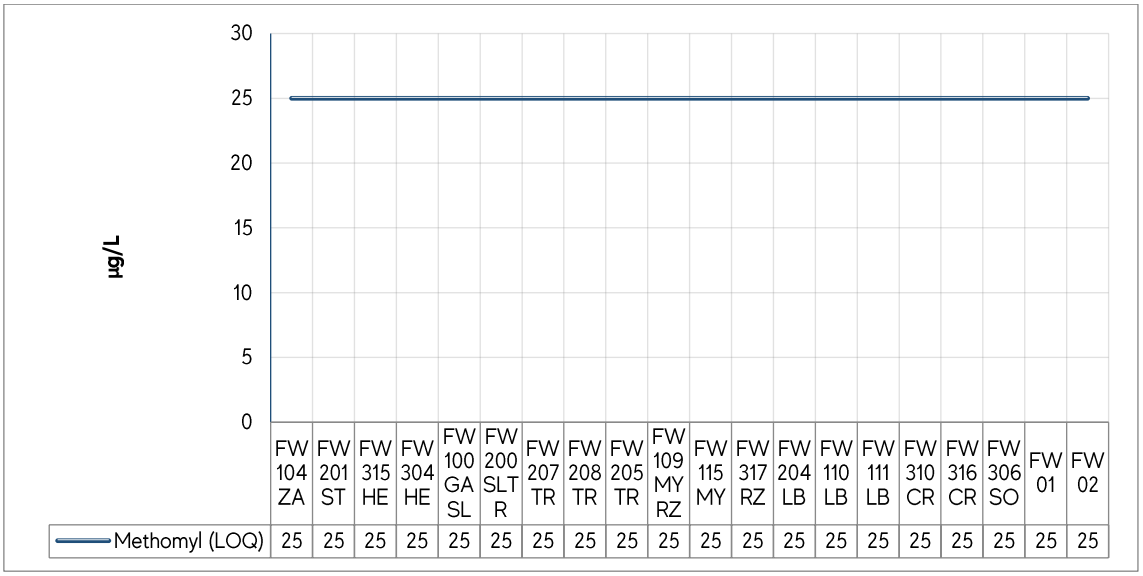


Figure 49. Comparative analysis of Methomyl levels at monitoring points

Methomyl ($C_5H_{10}N_2O_2S$) is an insecticide marketed under the name Lannate®BR. The national water regulation does not establish limits for this pesticide.

The limit of quantification is 25 µg/L and none of the samples exceeded this value.

3.2.51 2,4 D

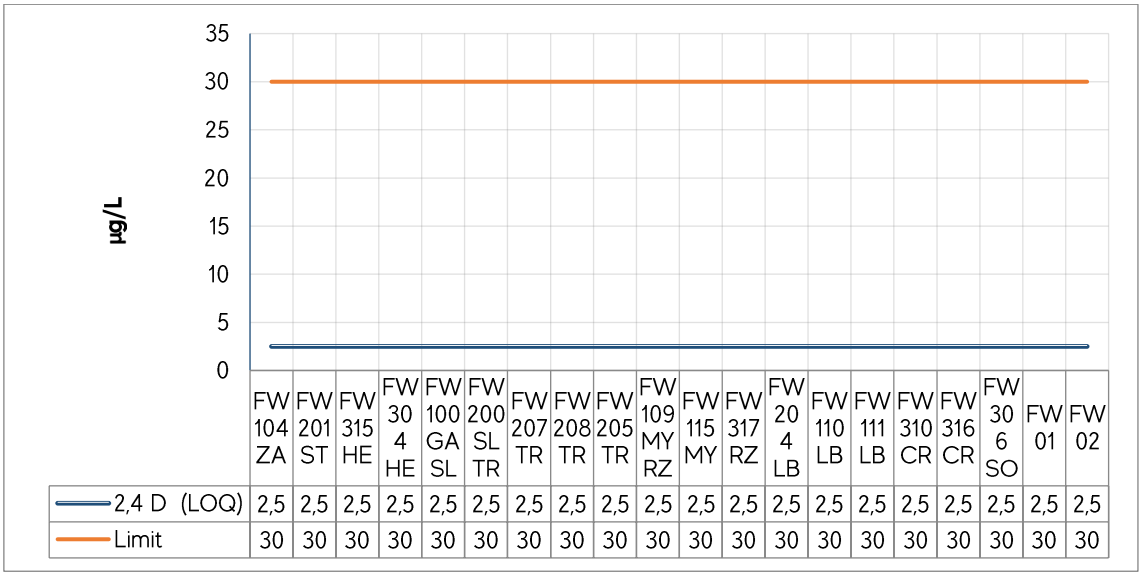


Figure 50. Comparative analysis of 2,4 D levels at monitoring points

2,4 D ($C_8H_6Cl_2O_3$) is an herbicide distributed under the trade names DMA® 6 and Cleanspray (among others). According to Regulation 222/02, the concentration of this herbicide in surface water must not exceed 30 µg/L.

The analytical method used has a limit of quantification of 2.5 µg/L None of the samples exceeds this threshold; therefore, all samples are within the limit established by the water regulation.

3.2.52 Cypermethrin

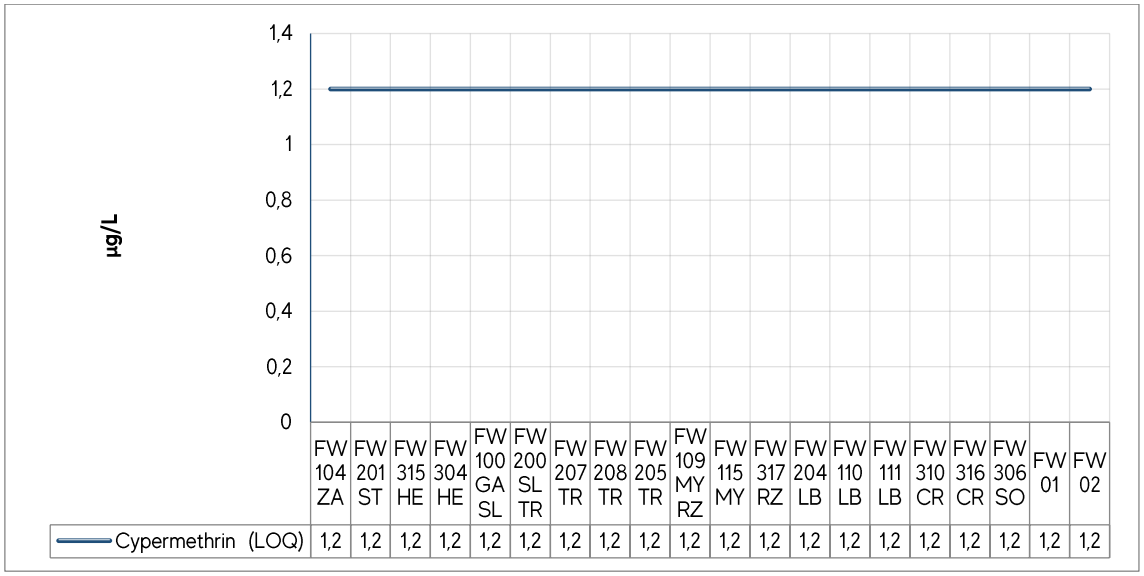


Figure 51. Comparative analysis of Cypermethrin levels at monitoring points

Cypermethrin ($C_{22}H_{19}Cl_2NO_3$) is an insecticide and acaricide distributed in the market under the trade names Trine-aktra and SUPERMYL among others. The water regulation does not establish limits for this pesticide.

As for the analytical results obtained, no quantifiable levels of Cypermethrin were detected in any sample. The limit of quantification is 1.2 µg/L.

3.2.53 Chlorpyrifos

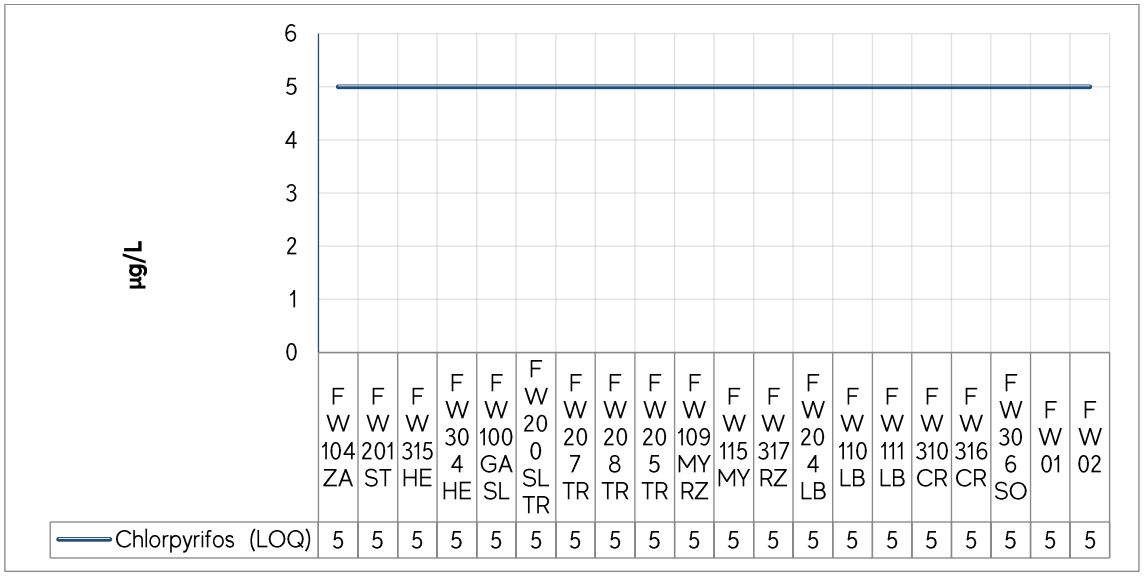


Figure 52. Comparative analysis of Chlorpyrifos levels at monitoring points

Chlorpyrifos ($C_9H_{11}Cl_3NO_3PS$) is an insecticide commonly called CLORFOS and BRONCO®. The national water regulation does not establish a limit for this pesticide.

In none of the samples taken during the first campaign are quantifiable levels of Chlorpyrifos. The limit of quantification of the method used to analyse is 5 µg/L.

3.2.54 Dichlorvos

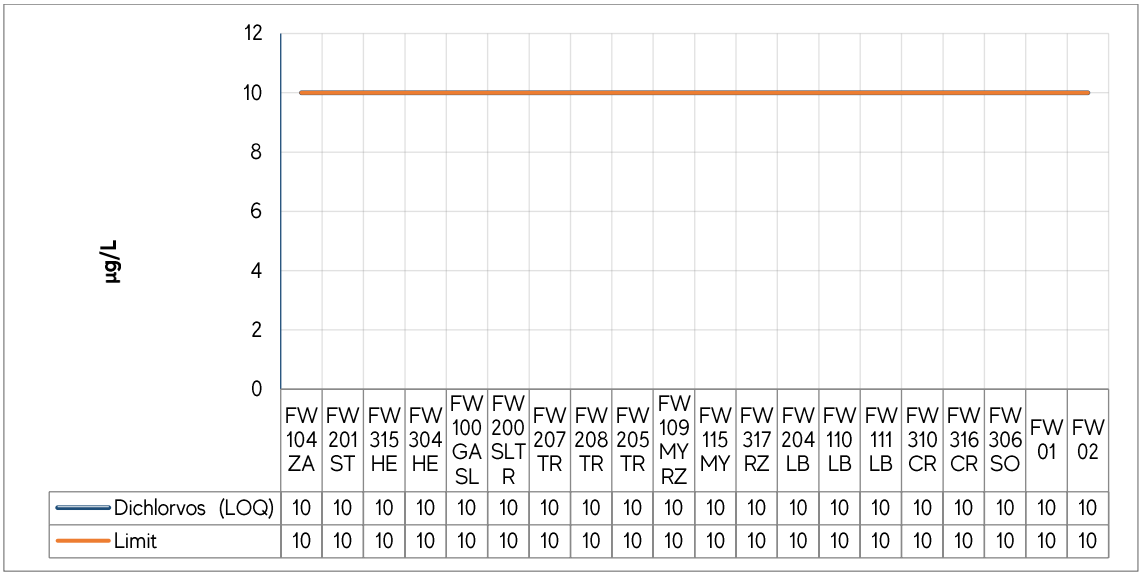


Figure 53. Comparative analysis of Dichlorvos levels at monitoring points

Dichlorvos ($C_4H_7Cl_2O_4P$) is an insecticide and arachnicide trade under commercial names such as Diclovan. According to the national surface water regulation, the maximum concentration allowed for this pesticide is 10 µg/L.

The limit of quantification of the method used to analyse the samples is 10 µg/L (equal to the maximum permissible). No quantifiable levels of Dichlorvos are detected in any sample.

3.2.55 Methamidophos

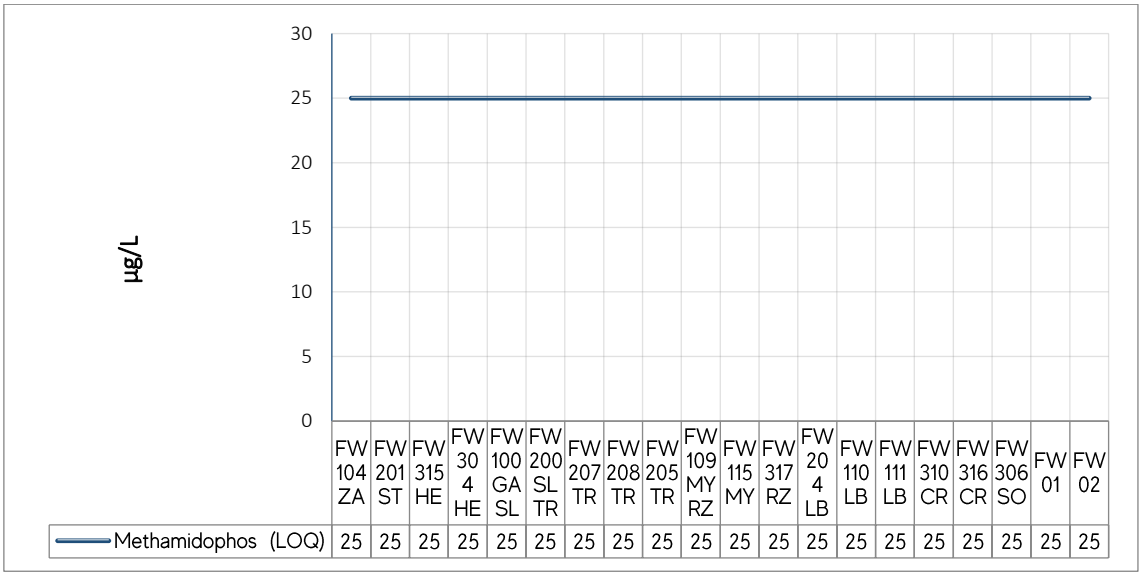


Figure 54. Comparative analysis of Methamidophos levels at monitoring points

Methamidophos ($C_2H_8NO_2PS$) is an insecticide and acaricide. This pesticide does not have limits established in the national water regulation.

The method's limit of quantification is 25 µg/L and none of the samples exceeds this value.

3.2.56 Tebuconazole

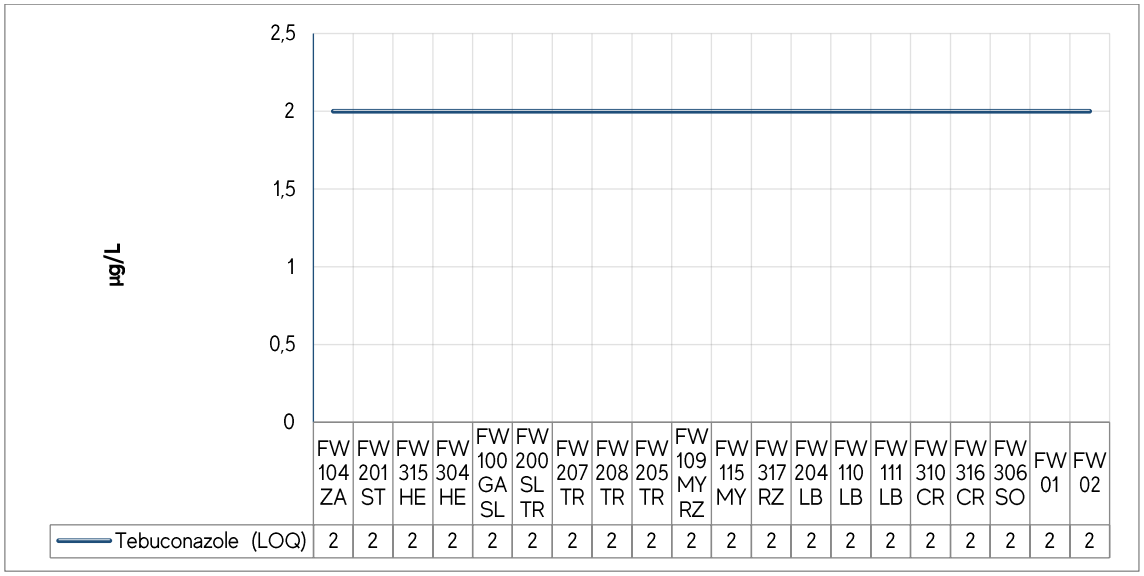


Figure 55. Comparative analysis of Tebuconazole levels at monitoring points

Tebuconazole ($C_{16}H_{22}ClN_3O$) is a fungicide trade under the name Folitra Max among others. It is use mainly in the prevention and eradication of fungi that attack horticultural crops. The water standard regulation does not establish a limit for this parameter.

As for the results, there is no evidence of Tebuconazole in surface waters of the area of study. The limit of quantification is 2 µg/L which no sample exceeds.

3.2.57 Imidacloprid

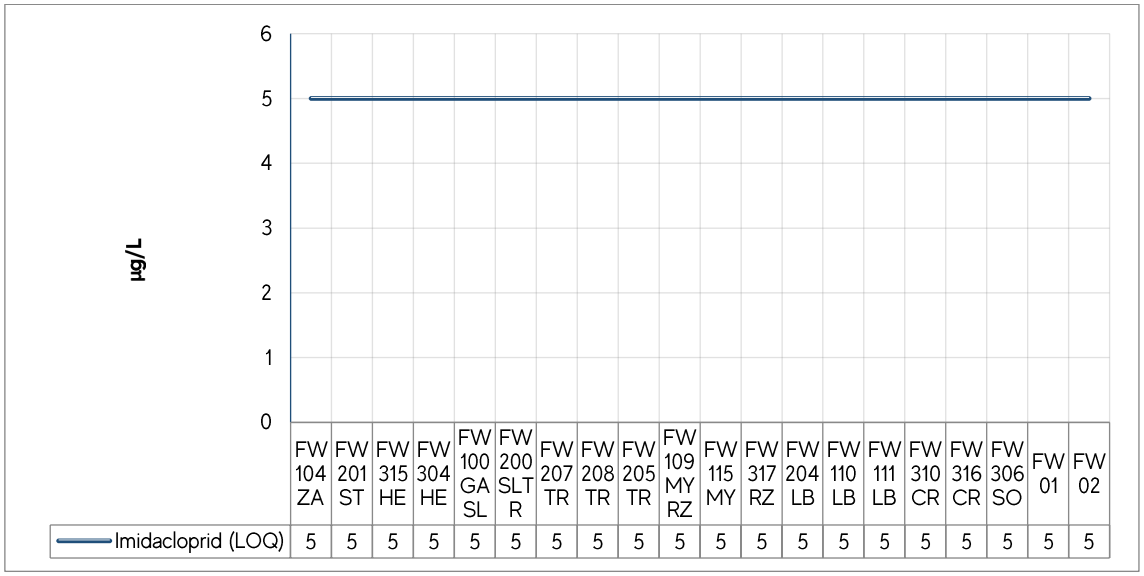


Figure 56. Comparative analysis of Imidacloprid levels at monitoring points

Imidacloprid ($C_9H_{10}ClN_5O_2$) is a systemic insecticide used to control insects, aphids and thrips in various crops. Its commercial name is Dagger or Hephaestus among others.

This pesticide is not detected in any of the points. The limit of quantification is 5 µg/L, and the national regulation does not establish a maximum permissible level for this parameter.

3.2.58 Methyl paraoxon

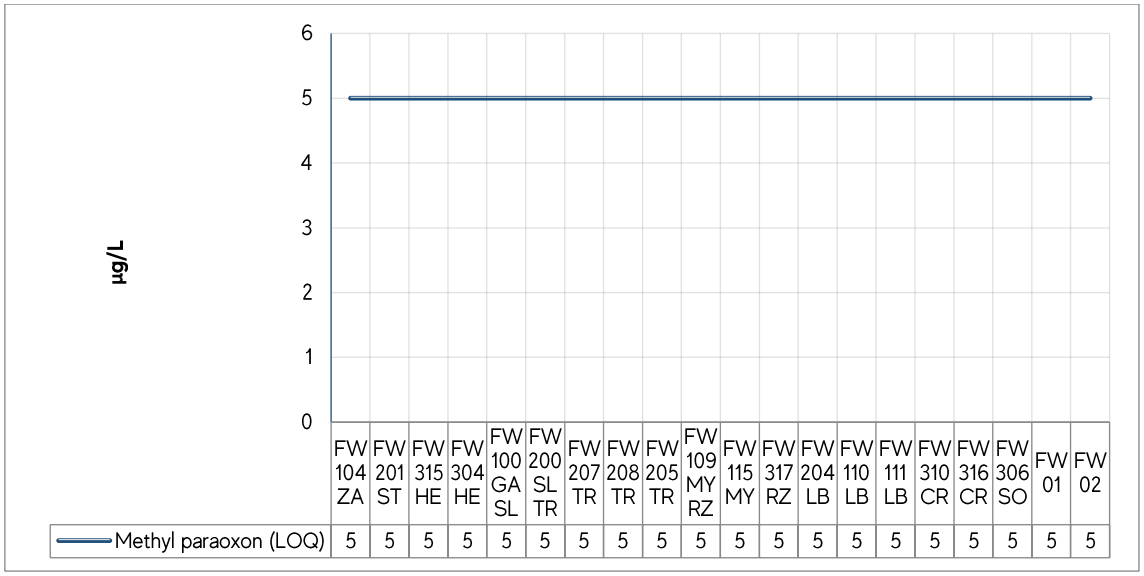


Figure 57. Comparative analysis of methyl paraoxon levels at monitoring points

Methyl Paraoxon ($C_8H_{10}NO_6P$) is a non-systemic and broad-spectrum insecticide. The national water regulation does not establish limits for this pesticide.

No quantifiable levels of this substance is found in any sample. The limit of quantification of the method used is 5 µg/L.

3.2.58 Fipronil

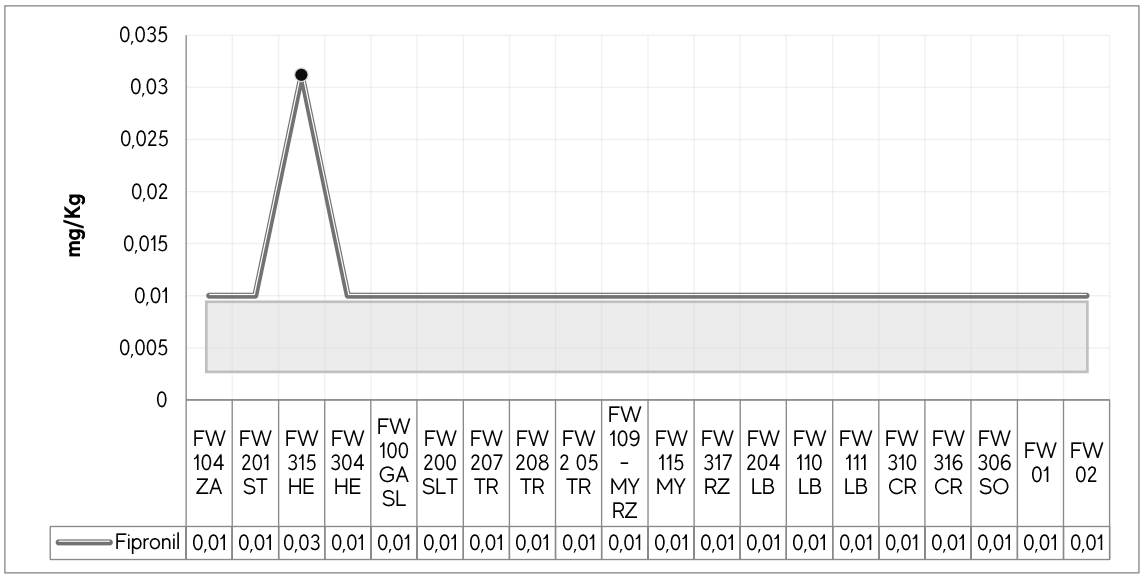
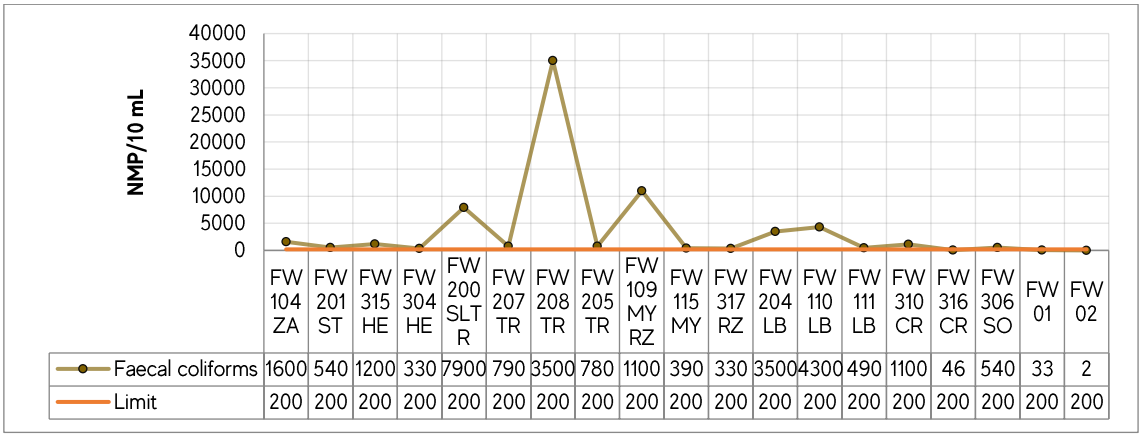


Figure 58. Comparative analysis of Fipronil levels at monitoring points

Regulation 222/02 does not establish a limit for Fipronil concentrations in surface water. The method used to determine Fipronil has a limit of quantification (LOQ) up to 0.01 mg/kg that is not detected in any sample points but FW 315-HE with 0.03113 mg/kg.

3.2.59 Faecal coliforms



	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 200 SLT R	FW 207 TR	FW 208 TR	FW 205 TR	FW 109 MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Faecal coliforms	1600	540	1200	330	7900	790	3500	780	1100	390	330	3500	4300	490	1100	46	540	33	2
Limit	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200

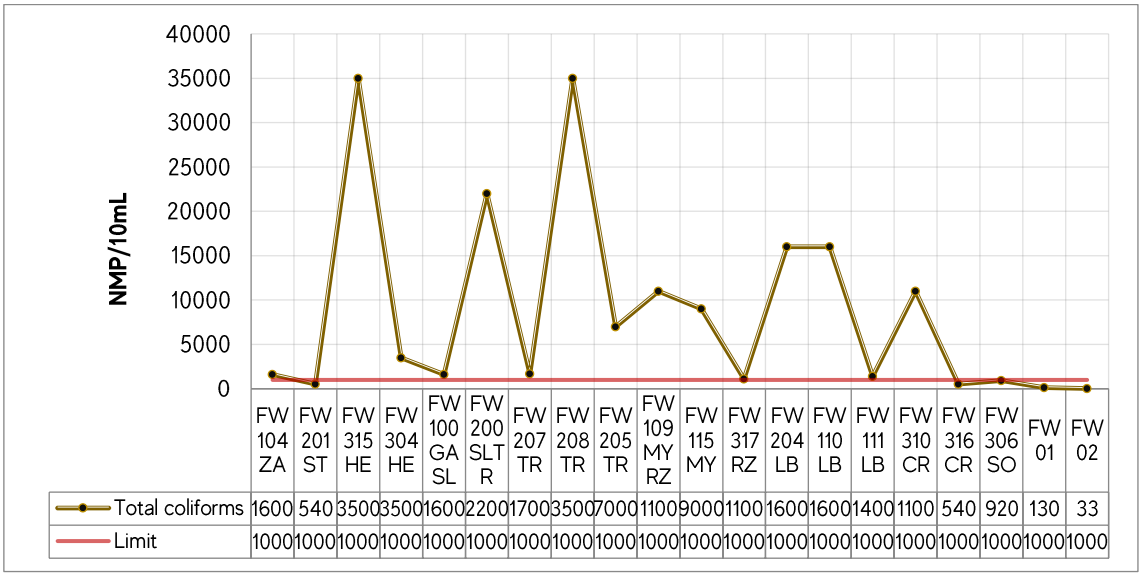
Figure 59. Comparative analysis of faecal coliforms levels at monitoring points

According to the water regulation, in those classify as Class 2, the presence of faecal coliforms must be less than 200 NMP/100ml.

All samples values are beyond the established limits except from the Paraguay River monitoring points (FW01 and FW02) and FW316-CR ("Laguna Penayo" stream).

A percentage of 84% of the samples have values above the maximum permissible. The average for this parameter is 3677 NMP/100ml.

3.2.60 Total coliforms

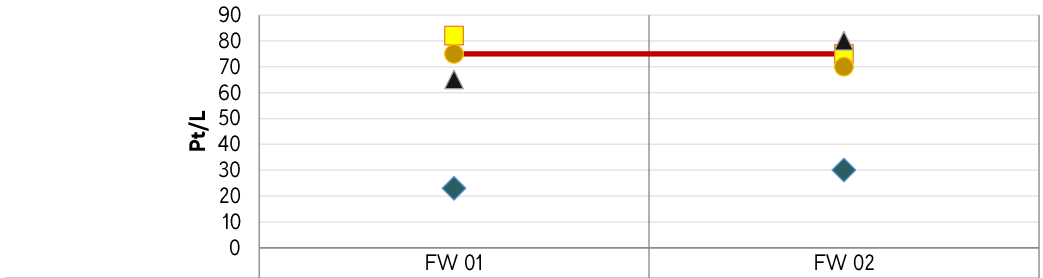


	FW 104 ZA	FW 201 ST	FW 315 HE	FW 304 HE	FW 100 GA SL	FW 200 SLT R	FW 207 TR	FW 208 TR	FW 205 TR	FW 109 MY RZ	FW 115 MY	FW 317 RZ	FW 204 LB	FW 110 LB	FW 111 LB	FW 310 CR	FW 316 CR	FW 306 SO	FW 01	FW 02
Total coliforms	1600	540	3500	3500	1600	2200	1700	3500	7000	1100	9000	1100	1600	1600	1400	1100	540	920	130	33
Limit	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Figure 60. Comparative analysis of total coliforms levels at monitoring points

According to the water regulation, the permissible limit for this parameter is 1000 NMP/ml. Figure 60 shows that only 5 points are under this value while 75% of the points exceeds.

3.2.61 Colour



	FW 01	FW 02
Colour	23	30
3º campaign PYORY	82	75
2º campaign PYORY	65	80
1º campaign PYORY	75	70
Limit	75	75

Figure 61. Comparative analysis of colour at two points of the Paraguay River and three previous monitoring campaigns

Comparing to the values obtained in previous campaigns performed by POYRY (2020) for the project's environmental impact assessment, in the current campaign, the colour is within the range recommended by Regulation 222/02; in comparison with the background results that were close to or exceeded the limit of 75Pt/l.

The colour variations depend on the flow and sediment dragging variations, which relates to climate's conditions. In this case, the values are representative of the rainy season.

3.2.62 Phenols index

TABLE 10. COMPARATIVE ANALYSIS OF PHENOLS INDEX AT DIFFERENT SAMPLING POINTS

	PHENOLS INDEX (mg/L)	
	FW01	**FW02**
Current campaign	<0,0005 ND	<0,0005 ND
3° Campaign PYORY	<0,024 ND	<0,024 ND
2° Campaign PYORY	<0,024 ND	<0,024 ND
1° Campaign PYORY	<0,024 ND	<0,024 ND

In all campaigns, phenol at both points is below the limit of quantification (LOQ) therefore not detected. It is essential to mention that the current method is more sensitive than the ones used by POYRY.

The maximum value established by the national water regulation is 0.05 mg/L. None of the 2 points nor the 4 monitoring campaigns exceeds this limit.

3.2.63 PCBs

TABLE 11. COMPARATIVE ANALYSIS OF PCBs INDEX AT DIFFERENT SAMPLING POINTS

	PCB (µg/L /L)	
	FW01	**FW02**
Current campaign	<10 µg/L ND	<10µg/L ND
3° Campaign PYORY	<0,2 µg/L ND	<0,2 µg/L ND
2° Campaign PYORY	<0,2 µg/LND	<0,2 µg/L ND
1° Campaign PYORY	<0,2 µg/L ND	<0,2 µg/L ND

The method used during the first, second and third campaigns is more sensitive than the current one. Nevertheless, in all campaigns, PCB levels is below the limit of quantification (LOQ) and so, not detected.

According to Regulation 222/02, the presence of PCBs in waters classified as Class 2 should be zero.

3.3 General performance of groundwater parameters

Table 12 summarises the results obtained for each parameter analysed in groundwater; it also highlights the points that are beyond the established limits and the percentage of monitoring points that comply with regulations.

Regulation 222/02 "Establishing the water quality standard in the national territory" and NP 2400180 established the limits of the analysed parameters and were used to compare the results.

Nº	PARAMETER	AVERAGE	WITHIN THE LIMITS		BEYOND THE LIMITS	
			Nº	%	Nº	%
1	Temperature	23,58 ºC				
2	pH	6,72	15	79%	**4**	**21%**
3	Electrical conductivity	640,1 µS/.cm	17	89%	**2**	**11%**
4	Dissolved solids	422,31 mg/L	16	84%	**3**	**16%**
5	Organic matter	1,7 mg O_2/L				
6	Hardness	100.5 mg $CaCO_3$/L	14	73%	**5**	**27%**
7	Total phosphorus	0,908 mg/L	4	21%	**15**	**79%**
8	Total nitrogen	1,335 mg/L	16	84%	**3**	**26%**
9	Nitrates	37,2 mg/L	15	79%	**4**	**21%**
10	Chlorides	60,82 mg/L	17	89%	**2**	**11%**
11	Alkalinity	109.12 mg $CaCO_3$/L	16	84%	**3**	**16%**
12	Bicarbonates	53,17 mg $CaCO_3$/L				
13	Carbonates	0 mg $CaCO_3$/L				
14	Sulphates	44,53 mg/L	18	94%	**1**	**6%**
15	Sodium	67,9 mg/L	17	89%	**2**	**11%**
16	Potassium	3,66 mg/L	18	94%	**1**	**6%**
17	Calcium	26,3 mg/L	18	94%	**1**	**6%**
18	Magnesium	10,1 mg/L	18	94%	**1**	**6%**
19	Fluorine	0,52 mg/L				
20	Boron	1,84 mg/L	19	100%	**0**	**0%**
21	Faecal coliforms	15,9 NMP/100mL	1	7%	**13**	**93%**
22	Total coliforms	>21 NMP/10mL	2	10%	**17**	**90%**
23	*E Coli*		14	73%	**5**	**27%**

3.4 Comparative analysis of the groundwater's parameters

The following graphs provide each parameter's results determined in the 19 wells sampled on the first monitoring campaign.

3.4.1 Temperature

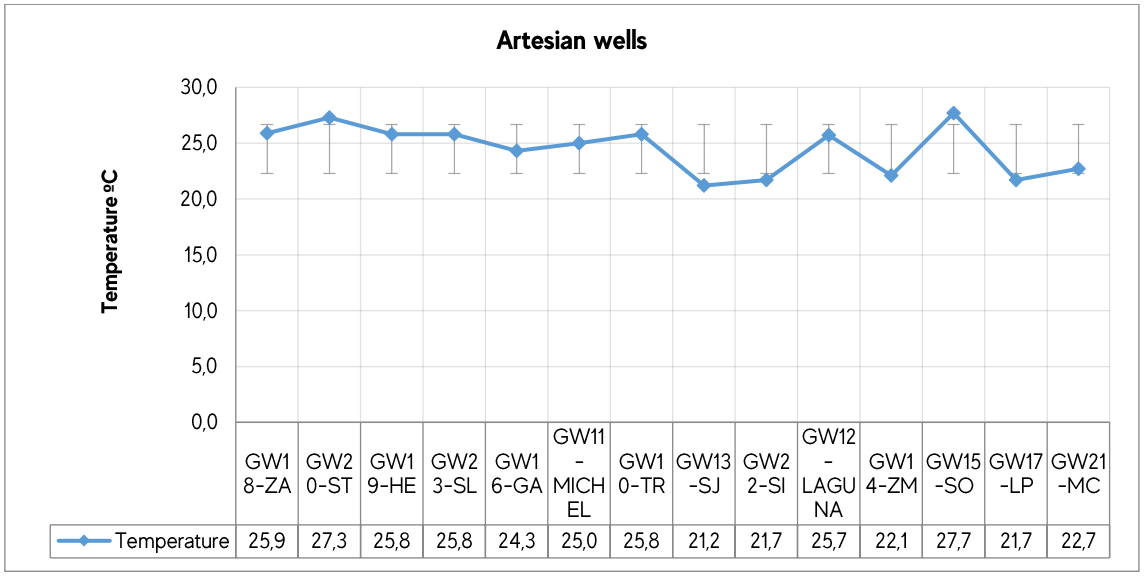


Figure 62. Comparative analysis of temperature measured in artesian wells at the forest plantation area

The artesian wells that provide drinking water to the local population of the "Farm zone" are the monitored points in which the average temperature is 24.5 ºC. The regulations do not establish a limit to analyse this parameter.

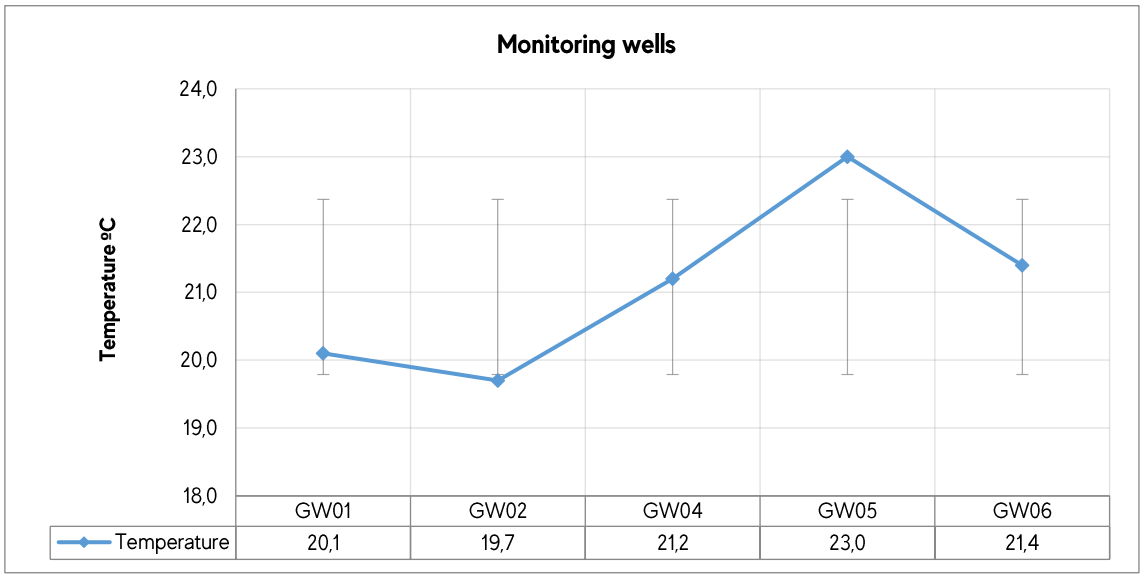
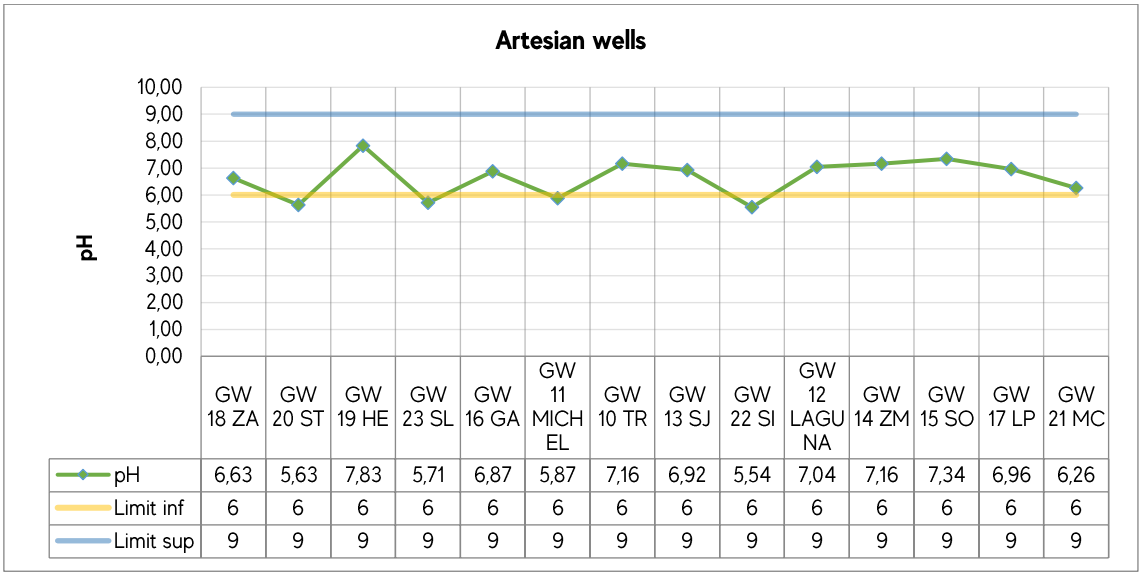


Figure 63. Comparative analysis of temperature measured in monitoring wells at the DAI

The average temperature of the water extracted from the monitoring wells located in the AID of the future industrial plant is 21.08 ºC.

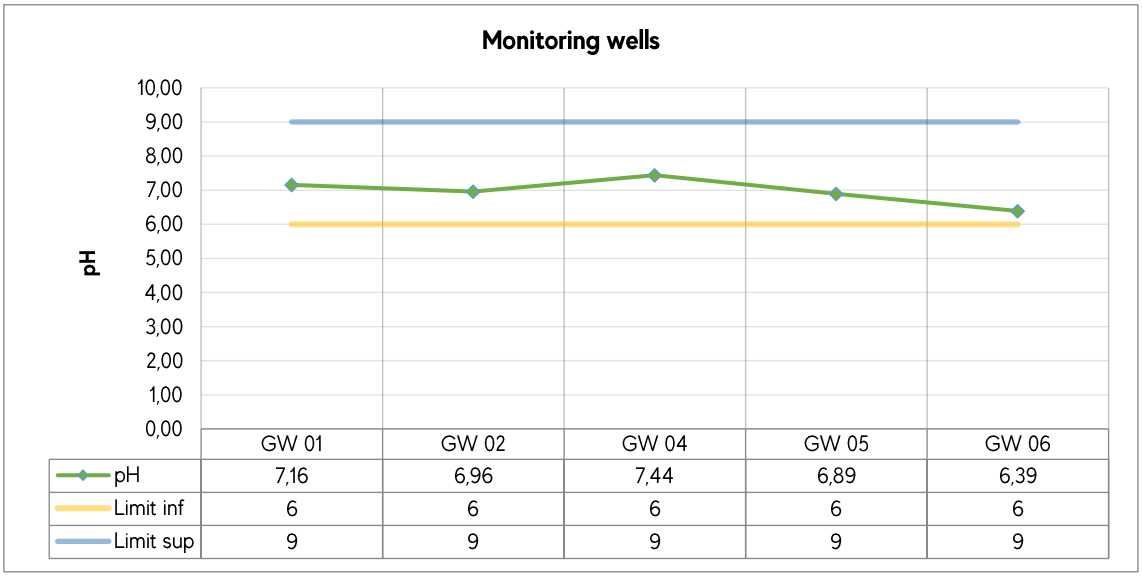
3.4.2 Hydrogen potential



	GW 18 ZA	GW 20 ST	GW 19 HE	GW 23 SL	GW 16 GA	GW 11 MICHEL	GW 10 TR	GW 13 SJ	GW 22 SI	GW 12 LAGUNA	GW 14 ZM	GW 15 SO	GW 17 LP	GW 21 MC
pH	6,63	5,63	7,83	5,71	6,87	5,87	7,16	6,92	5,54	7,04	7,16	7,34	6,96	6,26
Limit inf	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Limit sup	9	9	9	9	9	9	9	9	9	9	9	9	9	9

Figure 64. Comparative analysis of pH measured in artesian wells at the forest plantation area

The pH parameter was measured in situ. Regulation 222/02 establishes a limit of range between 6 and 9. Figure 64 shows that none of the points exceeds the upper limit; as for the lower limit, GW20-ST, GW23-SL, GW11-MICHEL and GW22-SILVA show slightly acid pH values.

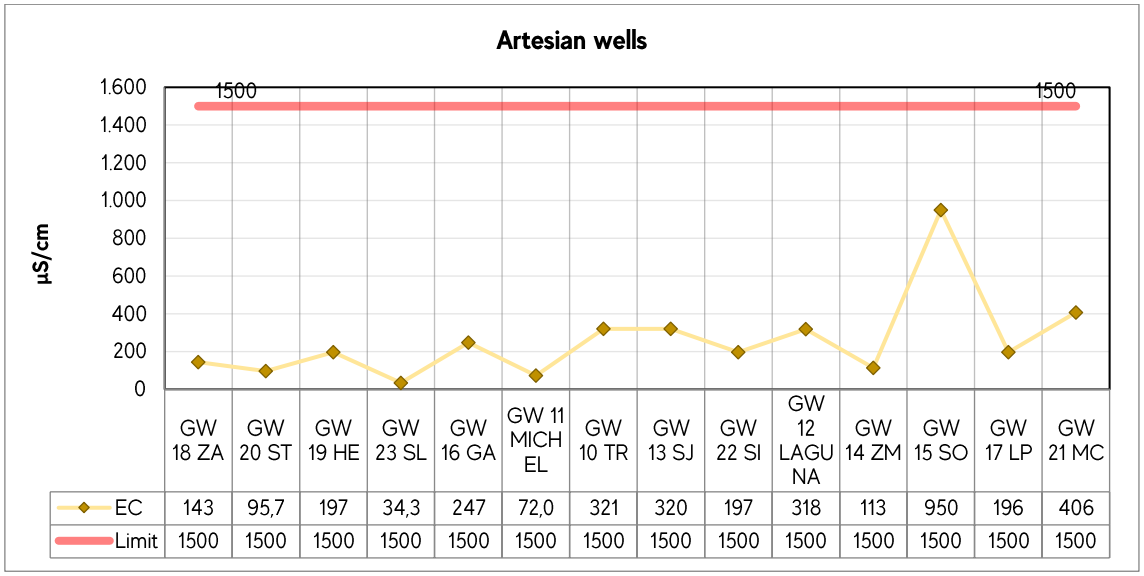


	GW 01	GW 02	GW 04	GW 05	GW 06
pH	7,16	6,96	7,44	6,89	6,39
Limit inf	6	6	6	6	6
Limit sup	9	9	9	9	9

Figure 65. Comparative analysis of pH measured in monitoring wells at the DAI

In the DAI's monitoring wells, all pH values are within the range established in the water regulation.

3.4.3 Electrical conductivity

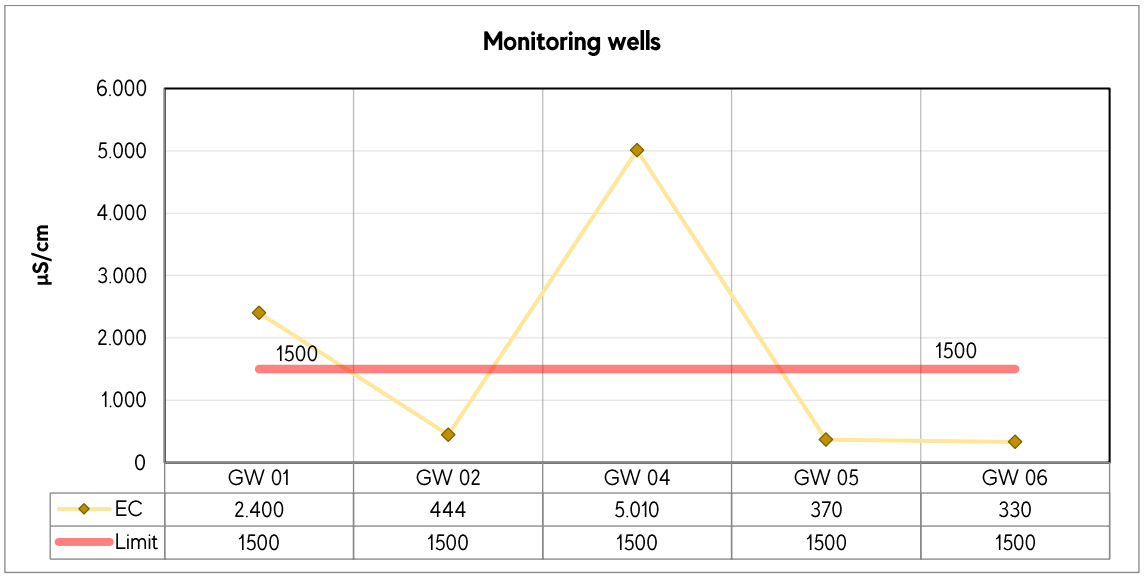


	GW 18 ZA	GW 20 ST	GW 19 HE	GW 23 SL	GW 16 GA	GW 11 MICH EL	GW 10 TR	GW 13 SJ	GW 22 SI	GW 12 LAGU NA	GW 14 ZM	GW 15 SO	GW 17 LP	GW 21 MC
EC	143	95,7	197	34,3	247	72,0	321	320	197	318	113	950	196	406
Limit	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500

Figure 66. Comparative analysis of EC measured in artesian wells at the forest plantation area

For Class 2 water, Regulation 222/02 does not set any limit for the electrical conductivity. The limit of 1500 µS/.cm established in NP 2400180 "General Requirements for drinking water" is taken as a reference. None determination carried out exceeds the limit mentioned.

The average value is 257.8 µS/cm for the forestry area. The maximum value measured belongs to GW15-SW which represents to the farm "Soledad".

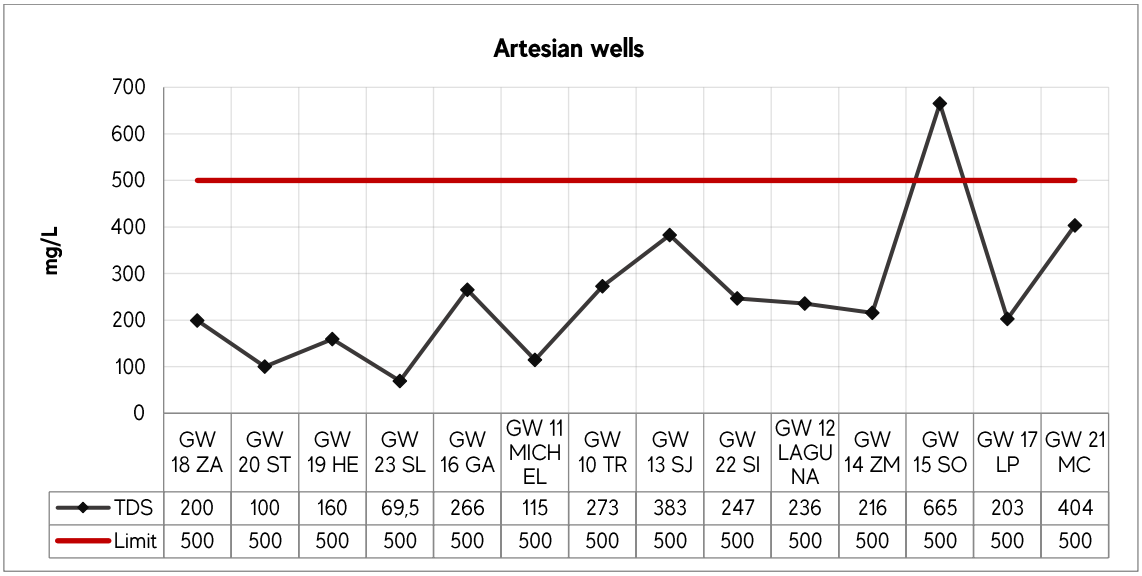


	GW 01	GW 02	GW 04	GW 05	GW 06
EC	2.400	444	5.010	370	330
Limit	1500	1500	1500	1500	1500

Figure 67. Comparative analysis of EC measured in monitoring wells at the DAI

Compared to the forest plantation zone, higher electrical conductivity values are recorded in the DAI zone. The average EC value from the monitoring wells is 1710 µS/cm and the points GW01 and GW04 exceed the maximum values.

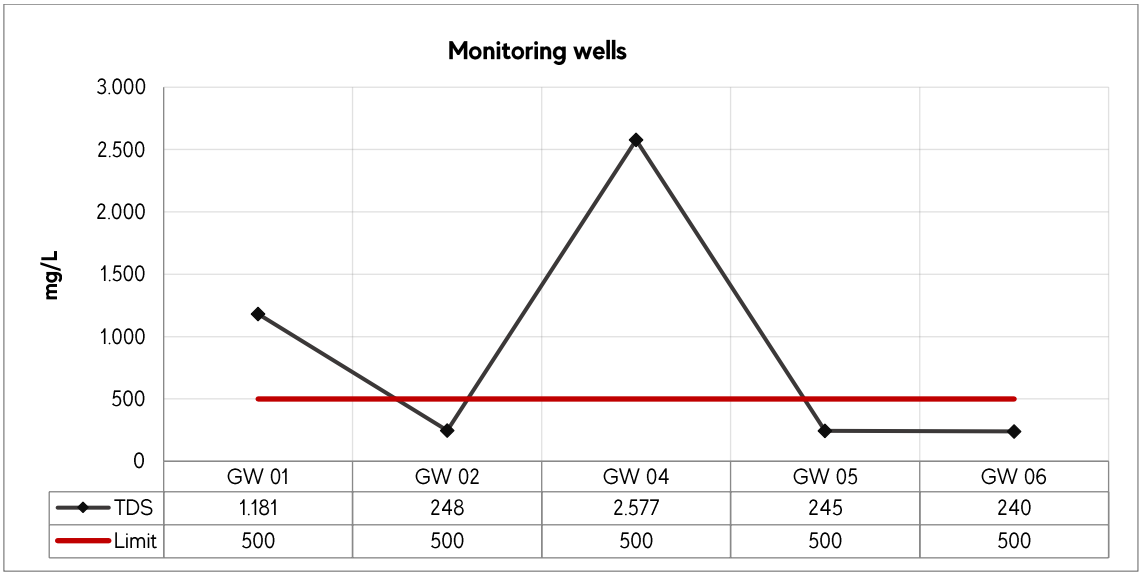
3.4.4 Total dissolved solids (TDS)



	GW 18 ZA	GW 20 ST	GW 19 HE	GW 23 SL	GW 16 GA	GW 11 MICH EL	GW 10 TR	GW 13 SJ	GW 22 SI	GW 12 LAGU NA	GW 14 ZM	GW 15 SO	GW 17 LP	GW 21 MC
TDS	200	100	160	69,5	266	115	273	383	247	236	216	665	203	404
Limit	500	500	500	500	500	500	500	500	500	500	500	500	500	500

Figure 68. Comparative analysis of TDS measured in artesian wells at the forest plantation area

The national water regulation establishes a limit of 500 mg/l for this parameter. In the first monitoring campaign, the average TDS value is 252.4 mg/l where only GW 15-SW exceeds the limit.

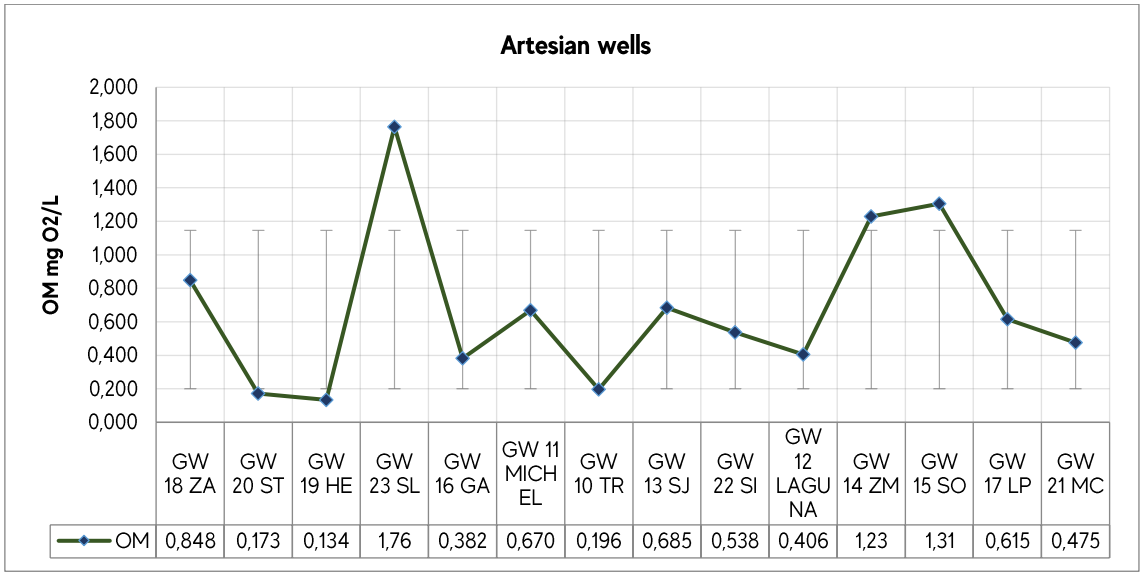


	GW 01	GW 02	GW 04	GW 05	GW 06
TDS	1.181	248	2.577	245	240
Limit	500	500	500	500	500

Figure 69. Comparative analysis of TDS measured in monitoring wells at the DAI

The average TDS value is 898.2 mg/l in the DAI zone, which is considerably higher compared to the TDS in the forest plantation area.

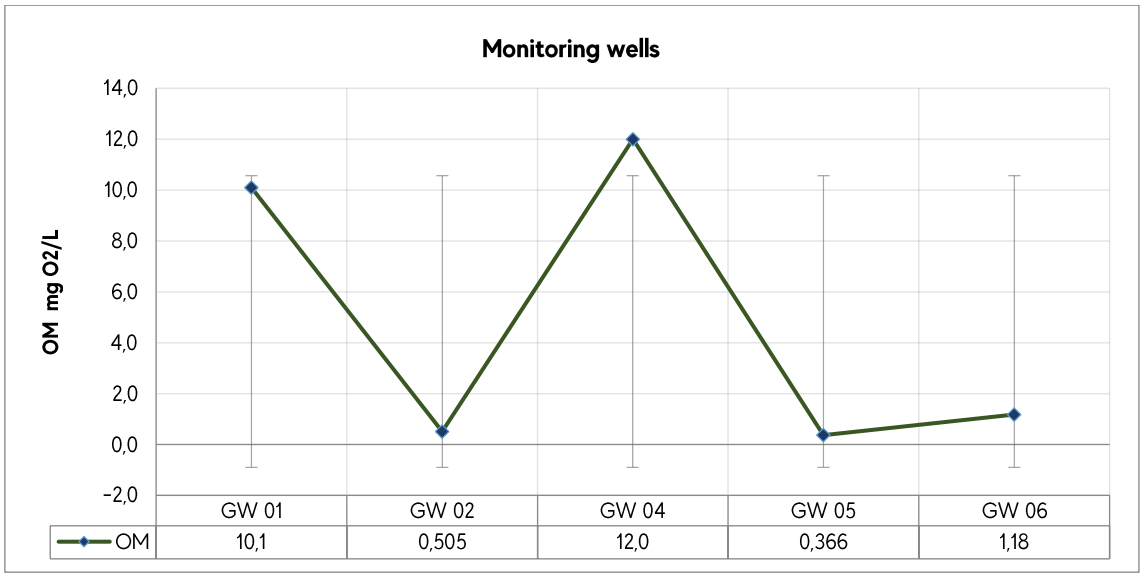
3.4.5 Organic matter



	GW 18 ZA	GW 20 ST	GW 19 HE	GW 23 SL	GW 16 GA	GW 11 MICHEL	GW 10 TR	GW 13 SJ	GW 22 SI	GW 12 LAGUNA	GW 14 ZM	GW 15 SO	GW 17 LP	GW 21 MC
OM	0,848	0,173	0,134	1,76	0,382	0,670	0,196	0,685	0,538	0,406	1,23	1,31	0,615	0,475

Figure 70. Comparative analysis of OM measured in artesian wells at the forest plantation area

Regulation 222/02 does not determine a maximum concentration for organic matter. The average result is 0.7 mg O_2/l. But, GW23-SL, GW14-ZM and GW15-SO shows values above the standard deviation.

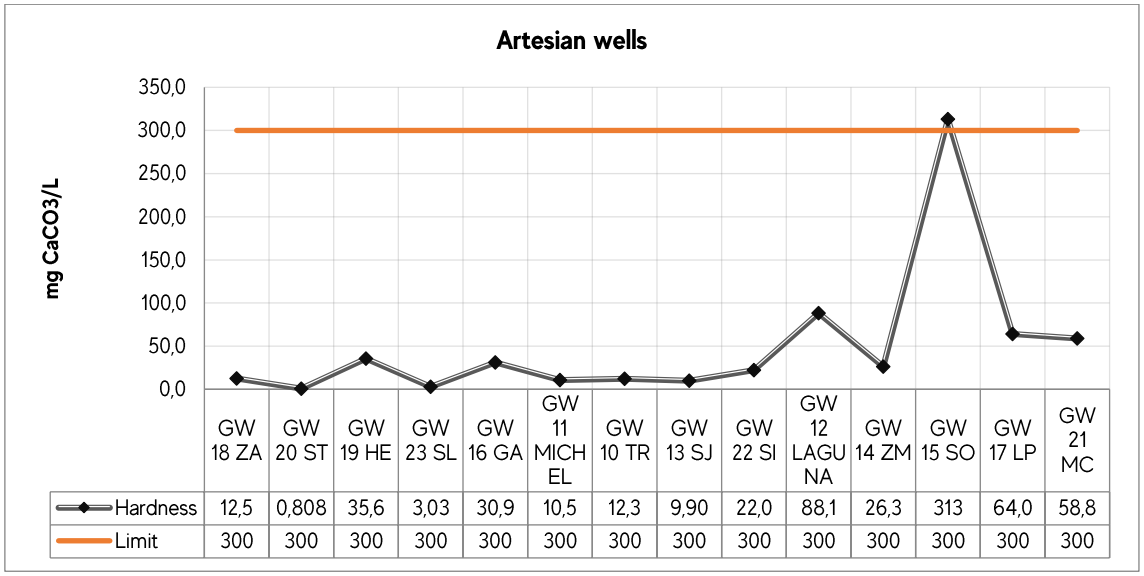


	GW 01	GW 02	GW 04	GW 05	GW 06
OM	10,1	0,505	12,0	0,366	1,18

Figure 71. Comparative analysis of OM measured in monitoring wells at the DAI

The average value of OM at the DAI area is 4.8 mg O2/l, which is significantly higher than the average obtained in the forest plantation zone.

3.4.6 Hardness

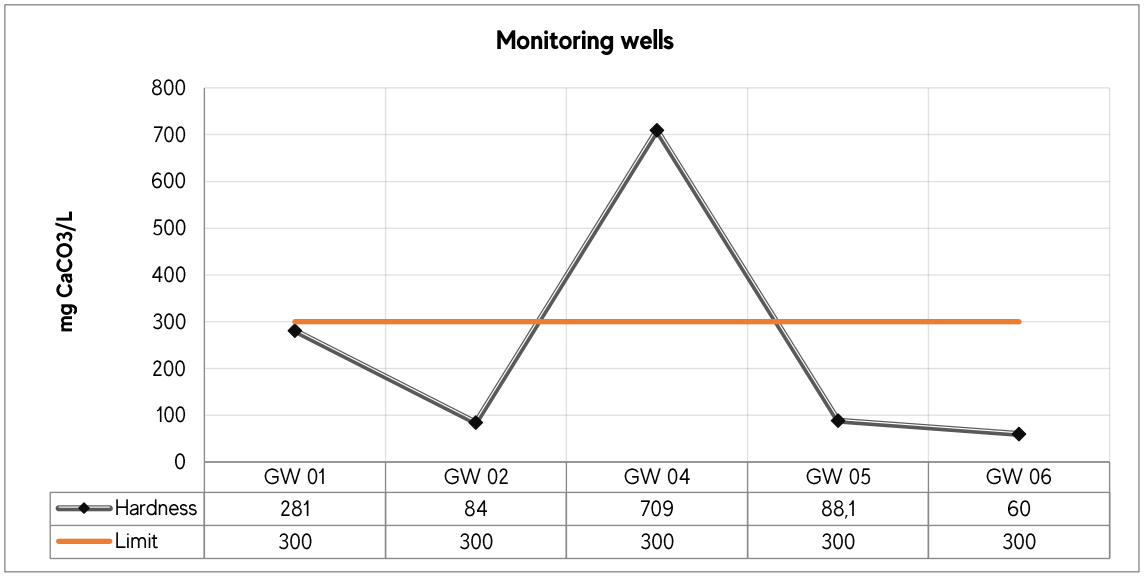


	GW 18 ZA	GW 20 ST	GW 19 HE	GW 23 SL	GW 16 GA	GW 11 MICHEL	GW 10 TR	GW 13 SJ	GW 22 SI	GW 12 LAGUNA	GW 14 ZM	GW 15 SO	GW 17 LP	GW 21 MC
Hardness	12,5	0,808	35,6	3,03	30,9	10,5	12,3	9,90	22,0	88,1	26,3	313	64,0	58,8
Limit	300	300	300	300	300	300	300	300	300	300	300	300	300	300

Figure 72. Comparative analysis of hardness levels measured in artesian wells at the forest plantation area

Hardness is a water quality parameter influenced by the hydrological area's geological formations in which a well is located. Regulation 222/02 stipulates a maximum of 300 mg/l for this parameter.

The average hardness value in this first campaign is 49.1 mg $CaCO_3$/l. In the forest plantation area, only GW15-SO has a higher result than the permissible limit.

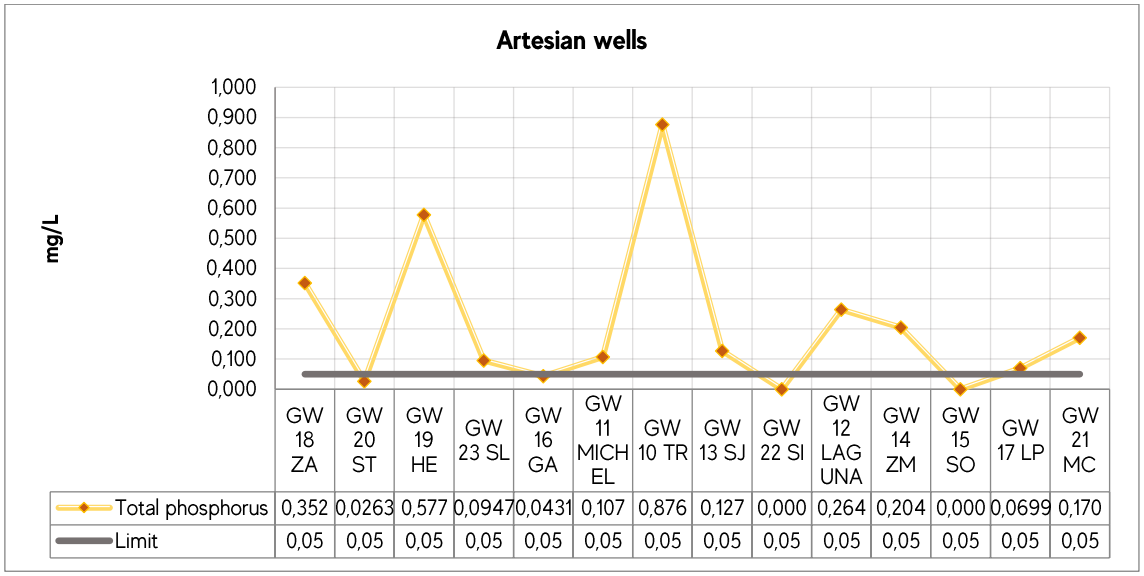


	GW 01	GW 02	GW 04	GW 05	GW 06
Hardness	281	84	709	88,1	60
Limit	300	300	300	300	300

Figure 73. Comparative analysis of hardness levels measured in monitoring wells at the DAI

In the DAI zone, the average hardness value is 244.46 mg CaCO3/l. Only the value measured at the monitoring well GW04 is above the limit.

3.4.7 Total phosphorus

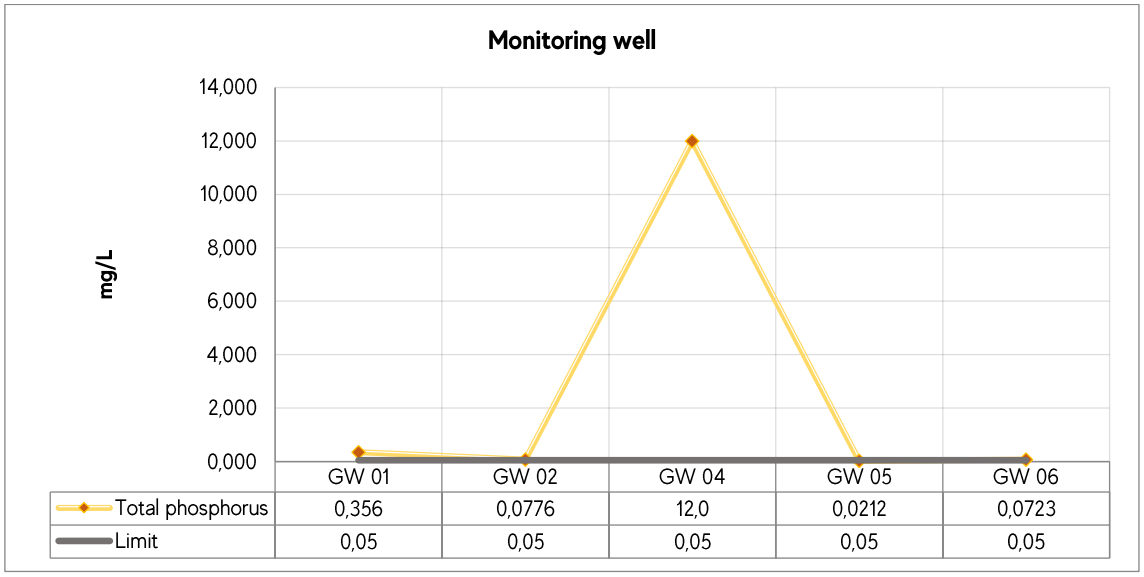


	GW 18 ZA	GW 20 ST	GW 19 HE	GW 23 SL	GW 16 GA	GW 11 MICHEL	GW 10 TR	GW 13 SJ	GW 22 SI	GW 12 LAGUNA	GW 14 ZM	GW 15 SO	GW 17 LP	GW 21 MC
Total phosphorus	0,352	0,0263	0,577	0,0947	0,0431	0,107	0,876	0,127	0,000	0,264	0,204	0,000	0,0699	0,170
Limit	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05

Figure 74. Comparative analysis of total phosphorus levels measured in artesian wells at the forest plantation area

Over-fertilisation causes that a fraction of phosphorus not assimilated by the vegetation to infiltrate into the soils and reach groundwater or surface water, which can explain the high phosphorus concentrations.

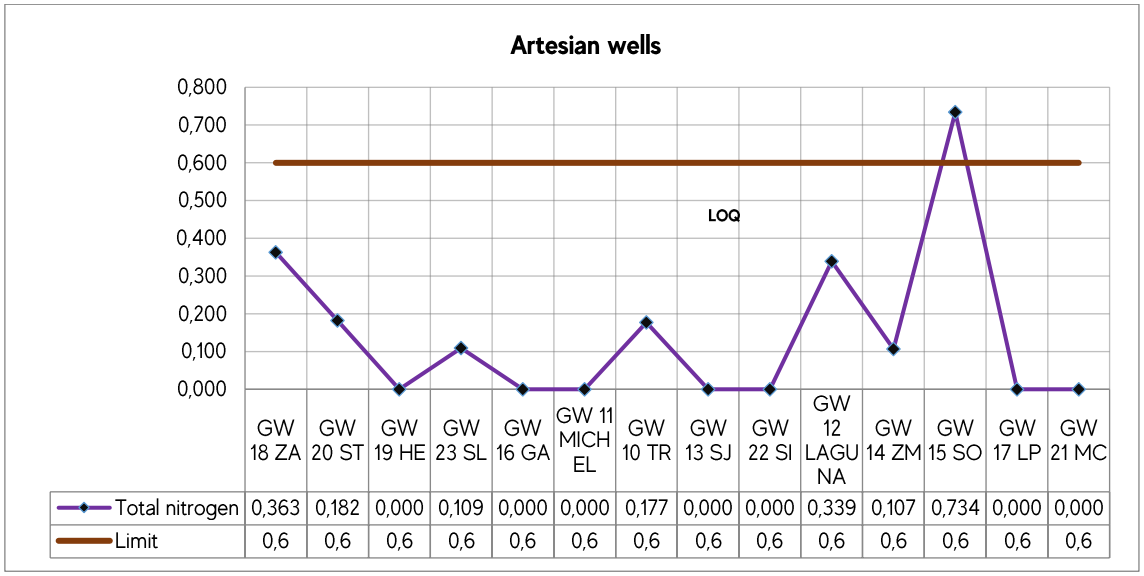
Figure 74 shows that only 4 wells of the forestry area comply with the regulation's established limit. In the remaining 10 wells, the limits exceed up to 17 times the maximum recommended by the national water regulation (0.05 mg/L).



	GW 01	GW 02	GW 04	GW 05	GW 06
Total phosphorus	0,356	0,0776	12,0	0,0212	0,0723
Limit	0,05	0,05	0,05	0,05	0,05

Figure 75. Comparative analysis of total phosphorus levels measured in monitoring wells at the DAI

3.4.8 Total nitrogen

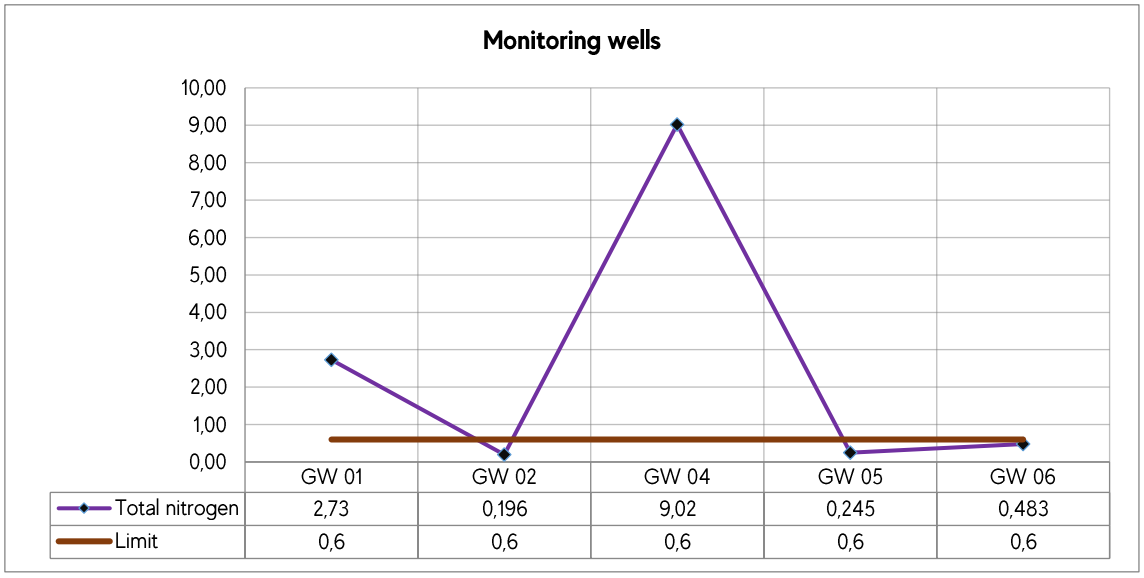


	GW 18 ZA	GW 20 ST	GW 19 HE	GW 23 SL	GW 16 GA	GW 11 MICHEL	GW 10 TR	GW 13 SJ	GW 22 SI	GW 12 LAGUNA	GW 14 ZM	GW 15 SO	GW 17 LP	GW 21 MC
Total nitrogen	0,363	0,182	0,000	0,109	0,000	0,000	0,177	0,000	0,000	0,339	0,107	0,734	0,000	0,000
Limit	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6

Figure 76. Comparative analysis of total nitrogen levels measured in artesian wells at the forest plantation area

Figure 76 shows that the limit of quantification (LOQ) for total nitrogen equals 1 mg/l. At points, GW 19-HE, GW 16-GA, GW 11-MICHEL, GW 13-SAN JUAN, GW 22-SILVA, GW 14-ZM, GW 17-LP and GW 21-MC, the concentrations of total nitrogen are lower than the LOQ.

GW 15-SO is the only point that exceeds LOQ with a value of 0.734 mg/l.

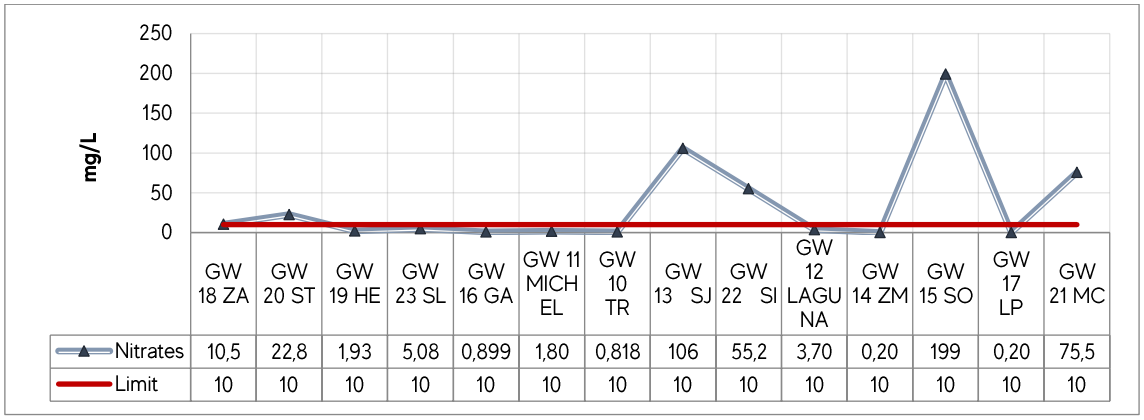


	GW 01	GW 02	GW 04	GW 05	GW 06
Total nitrogen	2,73	0,196	9,02	0,245	0,483
Limit	0,6	0,6	0,6	0,6	0,6

Figure 77. Comparative analysis of total nitrogen levels measured in monitoring wells at the DAI

GW01 and are the two monitoring wells in the DAI with values above the limit. The average value of nitrogen in groundwater future industrial plant zone is 2.5 mg/L.

3.4.9 Nitrates

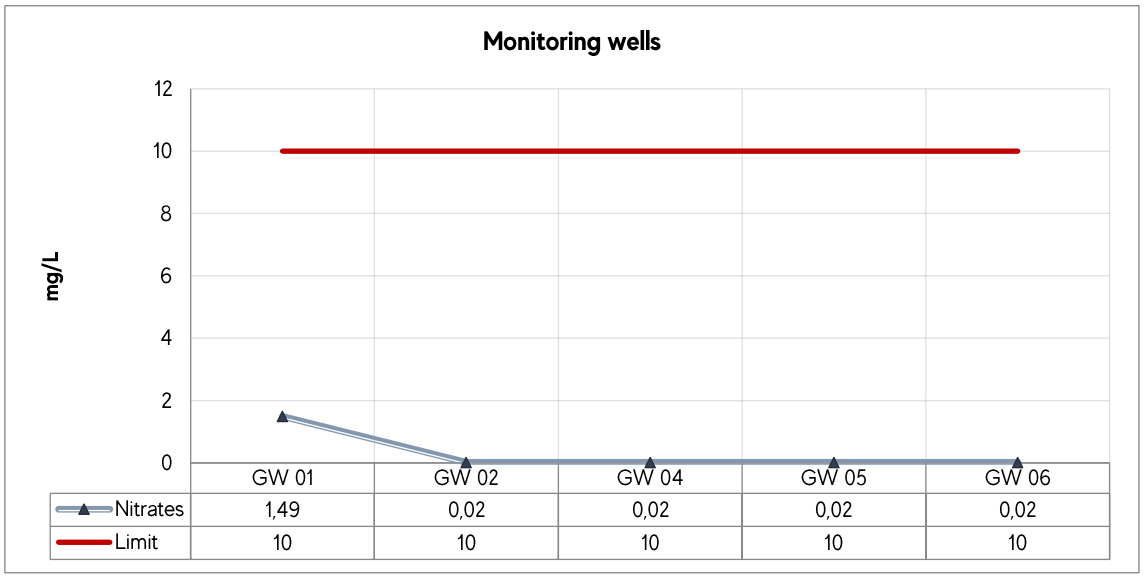


	GW 18 ZA	GW 20 ST	GW 19 HE	GW 23 SL	GW 16 GA	GW 11 MICH EL	GW 10 TR	GW 13 SJ	GW 22 SI	GW 12 LAGU NA	GW 14 ZM	GW 15 SO	GW 17 LP	GW 21 MC
Nitrates	10,5	22,8	1,93	5,08	0,899	1,80	0,818	106	55,2	3,70	0,20	199	0,20	75,5
Limit	10	10	10	10	10	10	10	10	10	10	10	10	10	10

Figure 78. Comparative analysis of nitrate levels measured in artesian wells at the forest plantation area

For nitrates, the maximum level established by the legislation is 10 mg/l. GW 18-ZA. GW 20-ST, GW-13 San Juan, GW 22-Silva, GW 15-SO and GW 21- MC exceed the maximum limit.

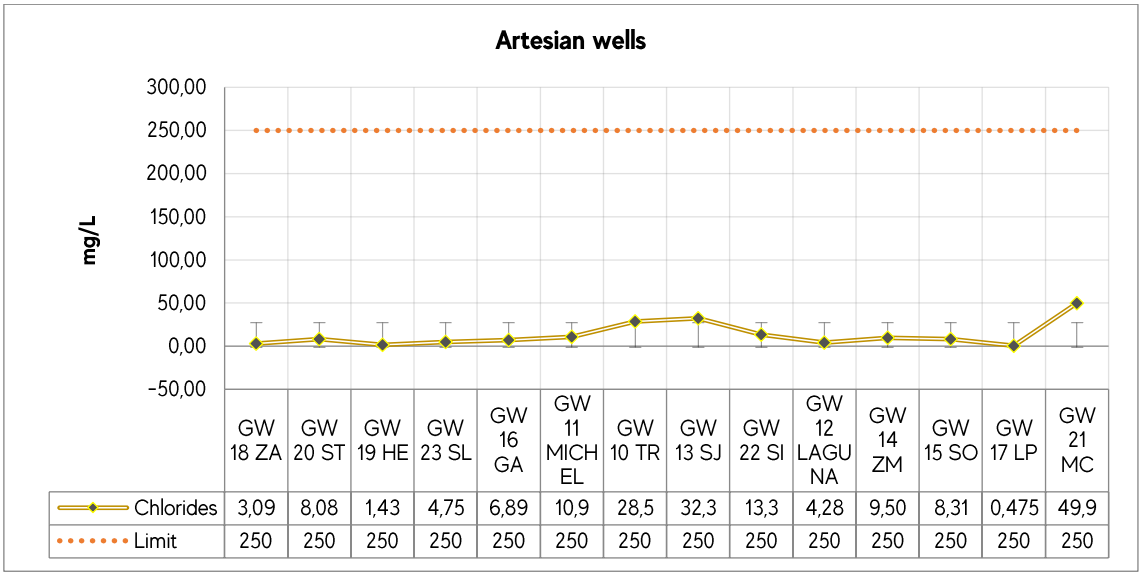
Statistically, 79% of wells are within the range while 21% are beyond the limits. The average value of nitrates is 37.2 mg/l.



	GW 01	GW 02	GW 04	GW 05	GW 06
Nitrates	1,49	0,02	0,02	0,02	0,02
Limit	10	10	10	10	10

Figure 79. Comparative analysis of nitrate levels measured in monitoring wells at the DAI

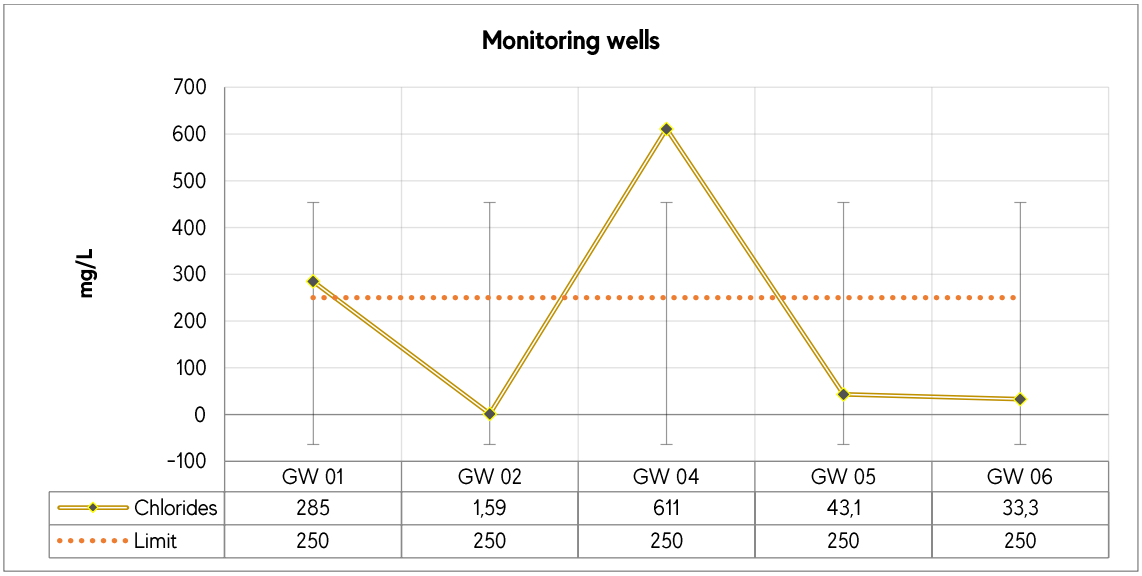
3.4.8 Chlorides



	GW 18 ZA	GW 20 ST	GW 19 HE	GW 23 SL	GW 16 GA	GW 11 MICHEL	GW 10 TR	GW 13 SJ	GW 22 SI	GW 12 LAGUNA	GW 14 ZM	GW 15 SO	GW 17 LP	GW 21 MC
Chlorides	3,09	8,08	1,43	4,75	6,89	10,9	28,5	32,3	13,3	4,28	9,50	8,31	0,475	49,9
Limit	250	250	250	250	250	250	250	250	250	250	250	250	250	250

Figure 80. Comparative analysis of chloride levels measured in artesian wells at the forest plantation area

According to Law 1614/2000, Chloride's permissible limit is 250 mg/l. None well exceeds this maximum limit. The average chloride value is 12.9 mg/l.

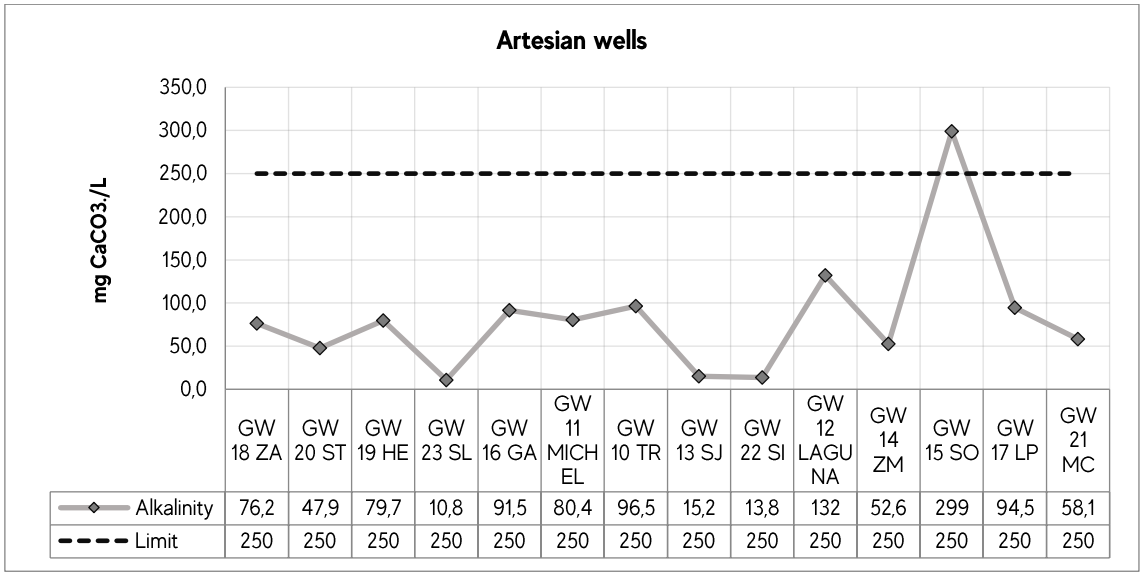


	GW 01	GW 02	GW 04	GW 05	GW 06
Chlorides	285	1,59	611	43,1	33,3
Limit	250	250	250	250	250

Figure 81. Comparative analysis of chloride levels measured in monitoring wells at the DAI

In the DAI, the monitoring wells GW01 and GW04 show values above the established limit. The average result of the parameter is 194.7 mg/l.

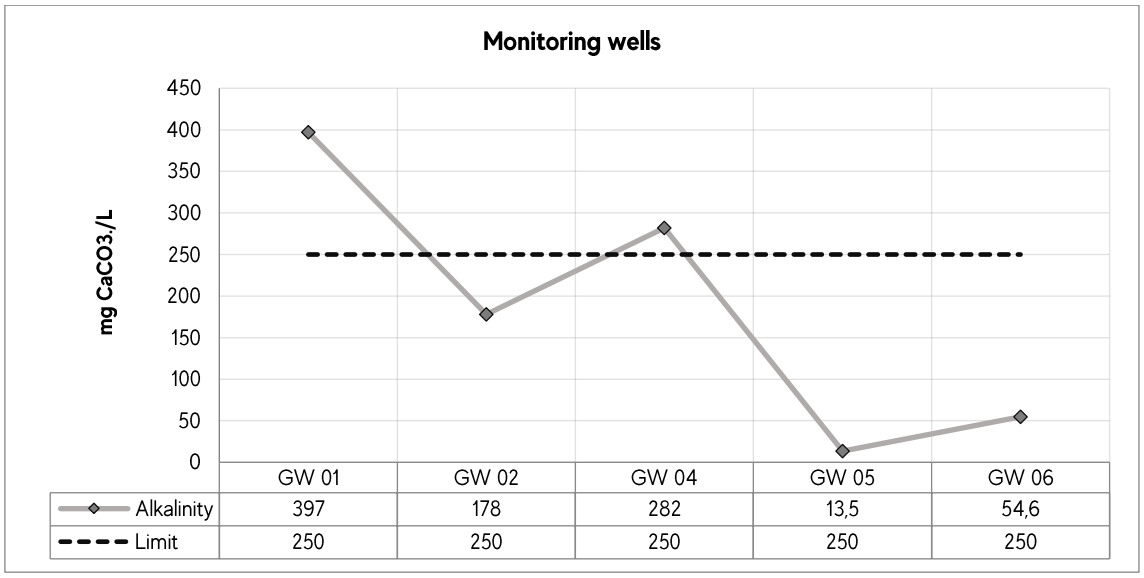
3.4.9 Alkalinity



	GW 18 ZA	GW 20 ST	GW 19 HE	GW 23 SL	GW 16 GA	GW 11 MICHEL	GW 10 TR	GW 13 SJ	GW 22 SI	GW 12 LAGUNA	GW 14 ZM	GW 15 SO	GW 17 LP	GW 21 MC
Alkalinity	76,2	47,9	79,7	10,8	91,5	80,4	96,5	15,2	13,8	132	52,6	299	94,5	58,1
Limit	250	250	250	250	250	250	250	250	250	250	250	250	250	250

Figure 82. Comparative analysis of alkalinity levels measured in artesian wells at the forest plantation area

The Law 1614/2000 establishes a maximum value of 250 mg $CaCO_3$/l. Figure 82 shows that only well GW15-SO exceeds the limit. The average alkalinity concentration is 82 mg $CaCO_3$/l.



	GW 01	GW 02	GW 04	GW 05	GW 06
Alkalinity	397	178	282	13,5	54,6
Limit	250	250	250	250	250

Figure 83. Comparative analysis of alkalinity levels measured in monitoring wells at the DAI

In the DAI, monitoring wells GW01 and GW04 have concentrations above the limit. The average is 185.02 mg CaCo3/l.

3.4.10 Bicarbonates

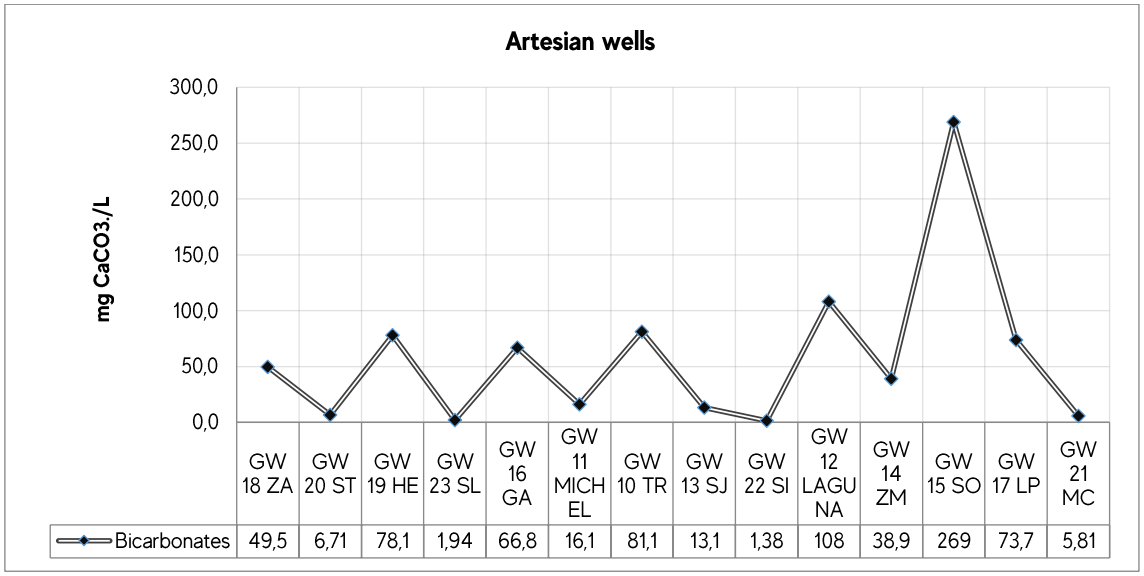


Figure 84. Comparative analysis of bicarbonate levels measured in artesian wells at the forest plantation area

Bicarbonate is a water quality parameter with no set limit. The types of minerals in the geological formation where the wells are, influence the concentrations of this parameter. The average value of bicarbonates is 57.9 mg CaCO3/l.

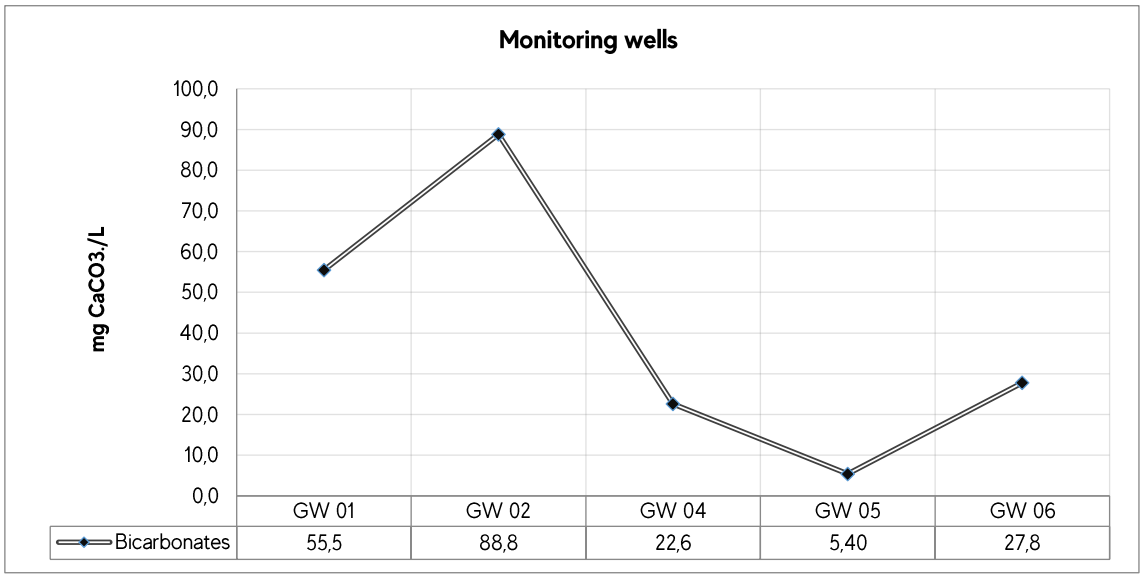


Figure 85. Comparative analysis of bicarbonate levels measured in monitoring wells at the DAI

In the DAI zone, the average bicarbonate concentration is 40.02 mg CaCo3/l.

3.4.11 Carbonates

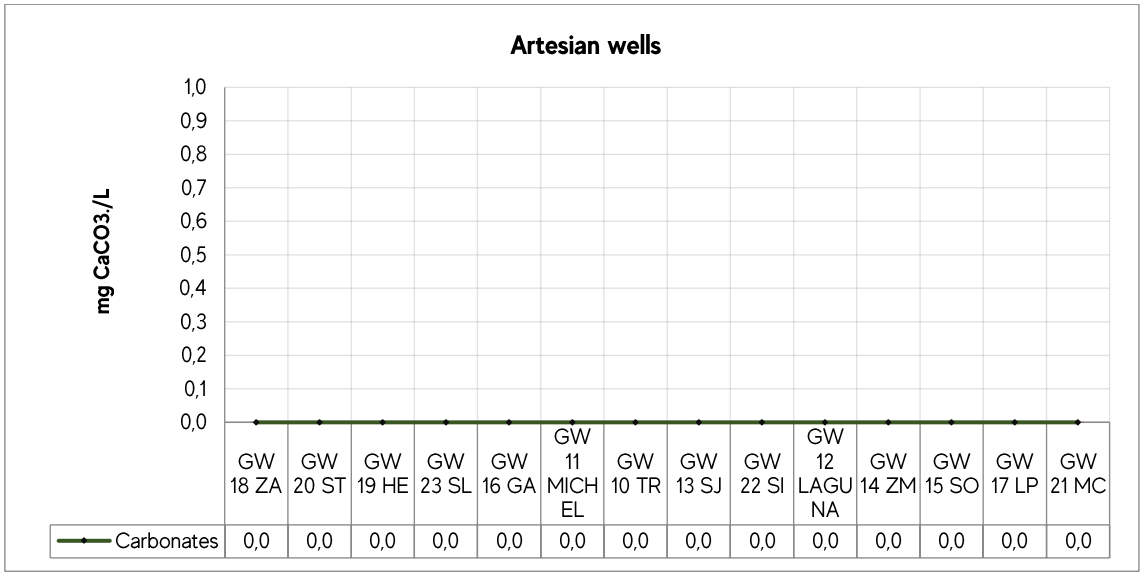


Figure 86. Comparative analysis of carbonate levels measured in artesian wells at the forest plantation area

Carbonate is a water quality parameter with no set limit. According to the laboratory results, there is no presence of this parameter in any sample.

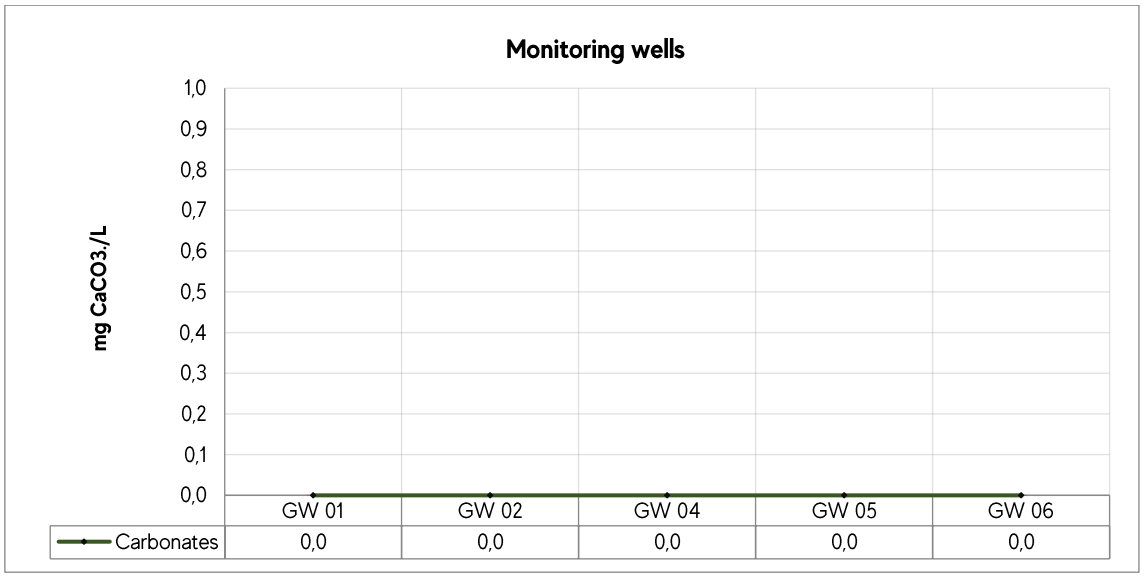
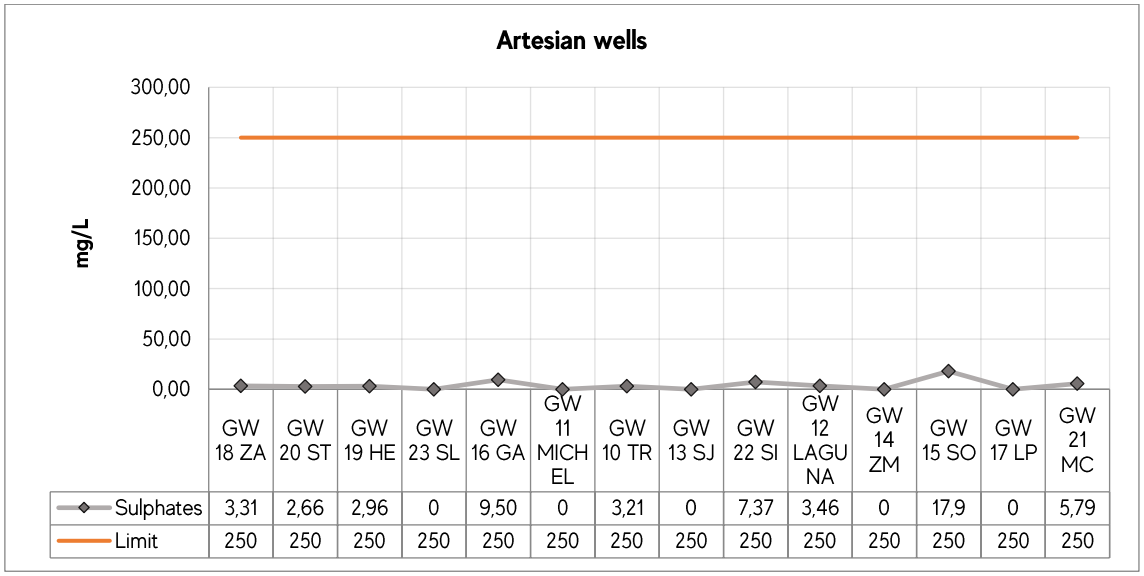


Figure 87. Comparative analysis of carbonate levels measured in monitoring wells at the DAI

As the artesian well's results, the monitoring well's values in the DAI are equal to zero.

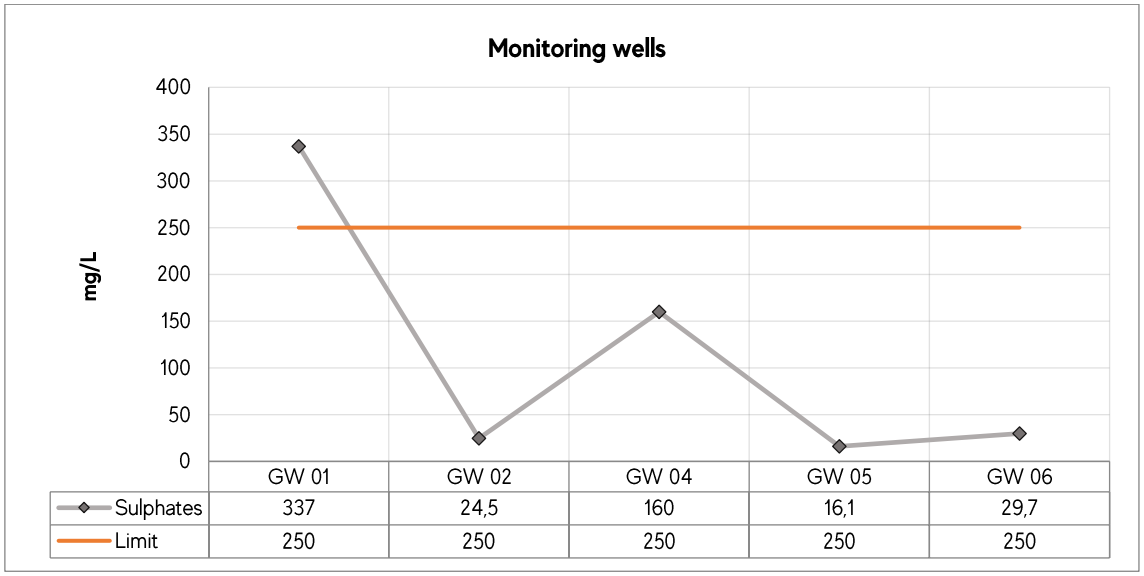
3.4.12 Sulphates



	GW 18 ZA	GW 20 ST	GW 19 HE	GW 23 SL	GW 16 GA	GW 11 MICHEL	GW 10 TR	GW 13 SJ	GW 22 SI	GW 12 LAGUNA	GW 14 ZM	GW 15 SO	GW 17 LP	GW 21 MC
Sulphates	3,31	2,66	2,96	0	9,50	0	3,21	0	7,37	3,46	0	17,9	0	5,79
Limit	250	250	250	250	250	250	250	250	250	250	250	250	250	250

Figure 88. Comparative analysis of sulphate levels measured in artesian wells at the forest plantation area

In contrast to surface water, all the artesian well's monitored points show sulphate concentrations. Regulation 222/02 defines a maximum of 250 mg/l for this parameter, and the highest determination is 17.9 mg/l at point GW18-SO. All the samples are within the range, and the average sulphate value is 4 mg/l.

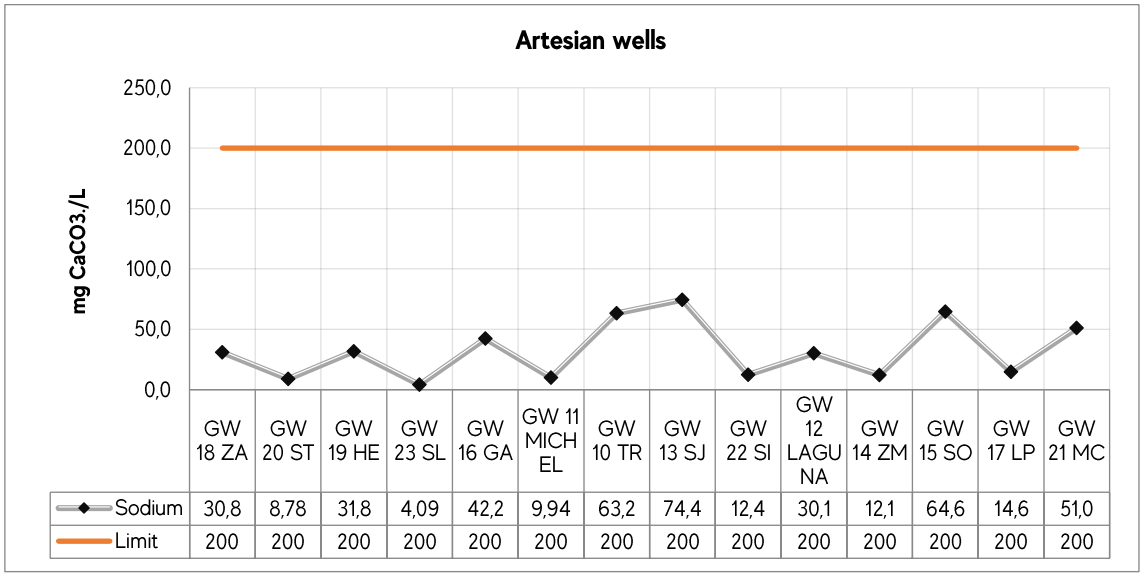


	GW 01	GW 02	GW 04	GW 05	GW 06
Sulphates	337	24,5	160	16,1	29,7
Limit	250	250	250	250	250

Figure 89. Comparative analysis of sulphate levels measured in monitoring wells at the DAI

In the DAI zone, the only well that exceeds the limit is GW01 with 337 mg/L. The average value of sulphates is 113.46 mg/L.

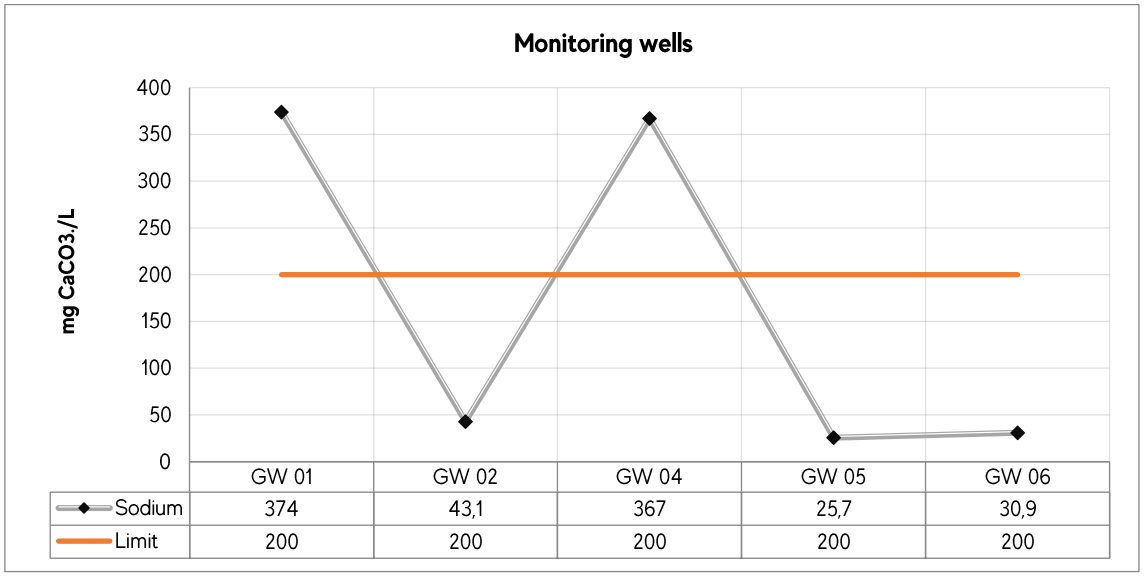
3.4.13 Sodium



	GW 18 ZA	GW 20 ST	GW 19 HE	GW 23 SL	GW 16 GA	GW 11 MICHEL	GW 10 TR	GW 13 SJ	GW 22 SI	GW 12 LAGUNA	GW 14 ZM	GW 15 SO	GW 17 LP	GW 21 MC
Sodium	30,8	8,78	31,8	4,09	42,2	9,94	63,2	74,4	12,4	30,1	12,1	64,6	14,6	51,0
Limit	200	200	200	200	200	200	200	200	200	200	200	200	200	200

Figure 90. Comparative analysis of sodium levels measured in artesian wells at the forest plantation area

In all the sampled wells, the sodium concentrations are lower than the maximum levels established in Regulation 222/02. Statistically, the average sodium concentration in groundwater is 32.14 mg/L.

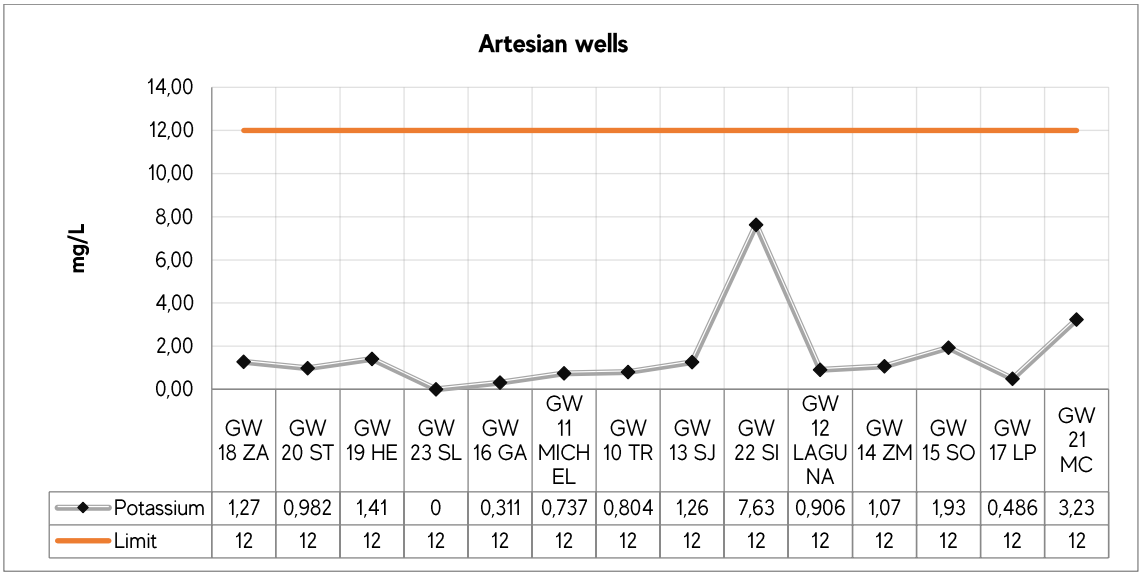


	GW 01	GW 02	GW 04	GW 05	GW 06
Sodium	374	43,1	367	25,7	30,9
Limit	200	200	200	200	200

Figure 91. Comparative analysis of sodium levels measured in monitoring wells at the DAI

In the DAI zone the average sodium concentration is 168.14 mg/l. Only wells GW01 and GW04 have values above the limit.

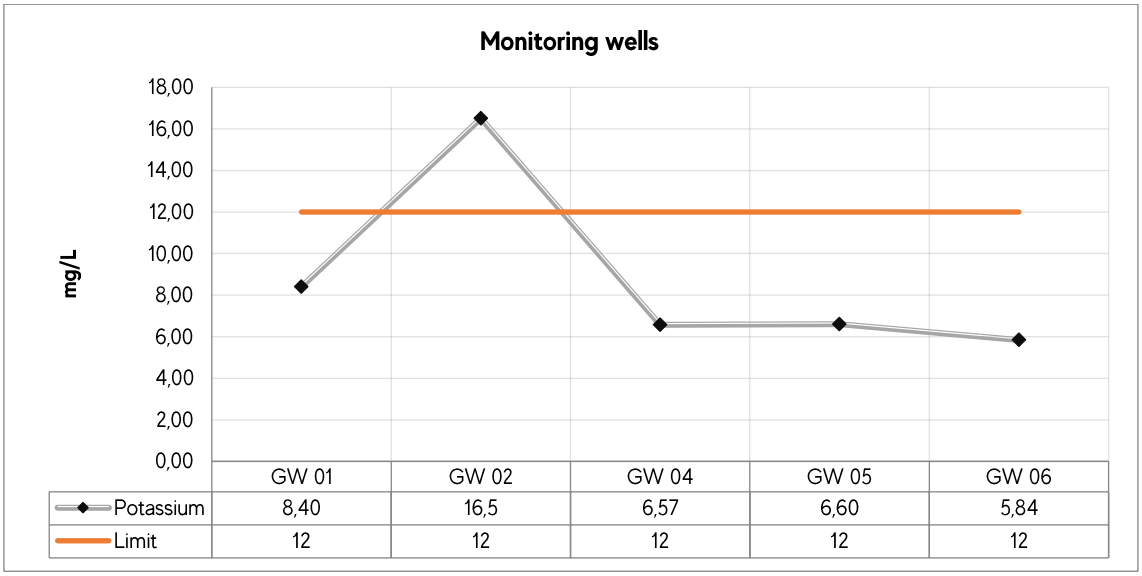
3.4.13 Potassium



	GW 18 ZA	GW 20 ST	GW 19 HE	GW 23 SL	GW 16 GA	GW 11 MICHEL	GW 10 TR	GW 13 SJ	GW 22 SI	GW 12 LAGUNA	GW 14 ZM	GW 15 SO	GW 17 LP	GW 21 MC
Potassium	1,27	0,982	1,41	0	0,311	0,737	0,804	1,26	7,63	0,906	1,07	1,93	0,486	3,23
Limit	12	12	12	12	12	12	12	12	12	12	12	12	12	12

Figure 92. Comparative analysis of potassium levels measured in artesian wells at the forest plantation area

The recommended sodium limits, in Law 1614/2000, is less than 12 mg/L. All the artesian well's results are within this range.



	GW 01	GW 02	GW 04	GW 05	GW 06
Potassium	8,40	16,5	6,57	6,60	5,84
Limit	12	12	12	12	12

Figure 93. Comparative analysis of potassium levels measured in monitoring wells at the DAI

In the DAI zone, monitoring well GW02 exceeds the value established in the reference regulation, the average potassium concentration in groundwater at the future industrial plant zone is 8.7 mg/l.

3.4.14 Calcium

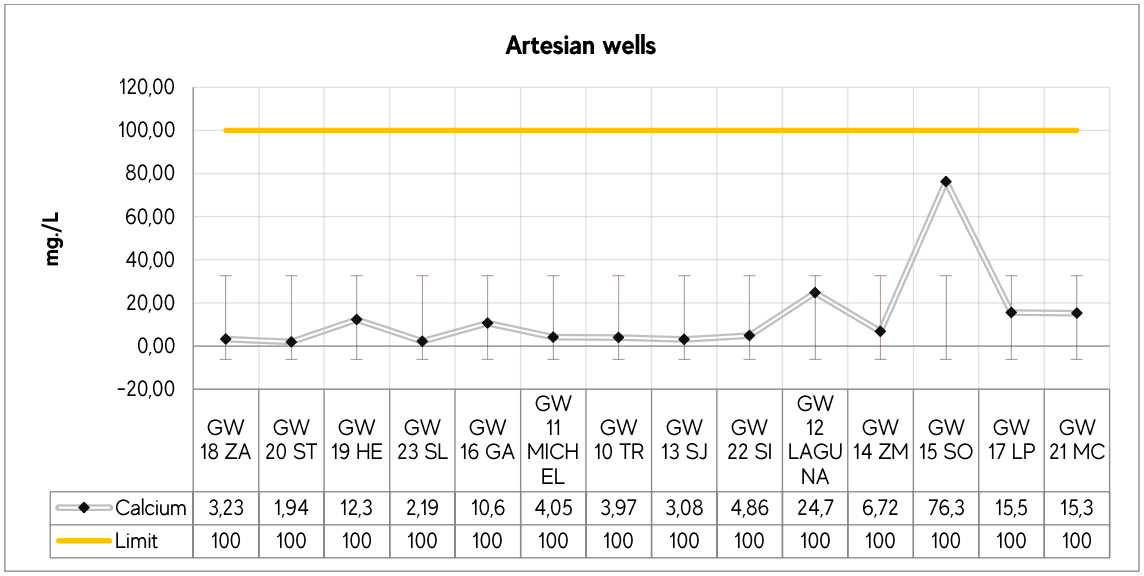


Figure 94. Comparative analysis of calcium levels measured in artesian wells at the forest plantation area

Regulation 222/02 does not establish a maximum value for this parameter; therefore, the limit value considered is 100 mg/l which is set by Law 1614/2000. Figure 94 shows that none points exceed this value. The average result is 13,19 mg/l.

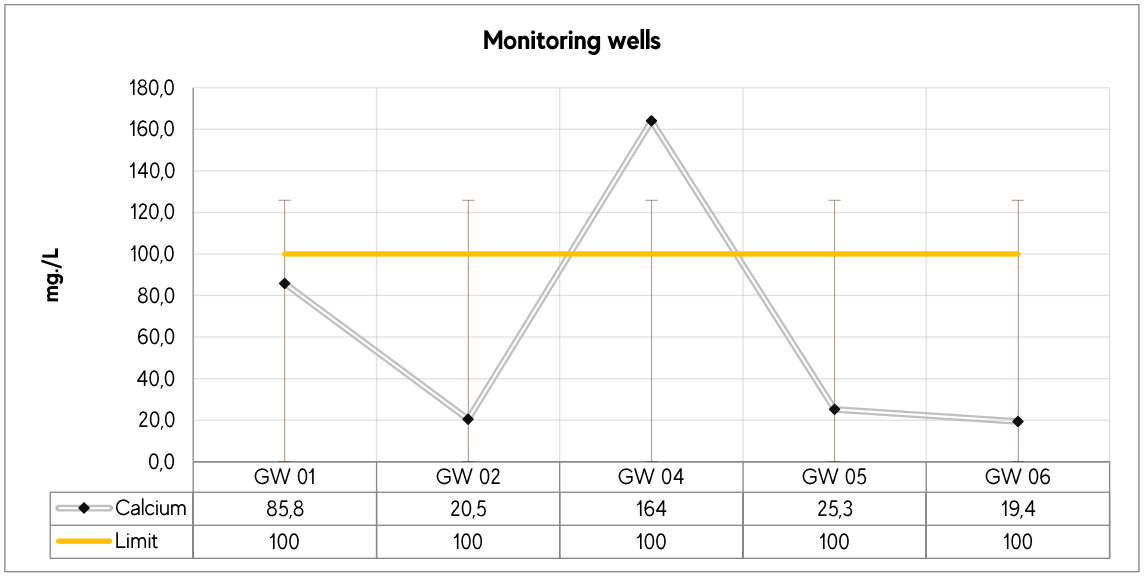
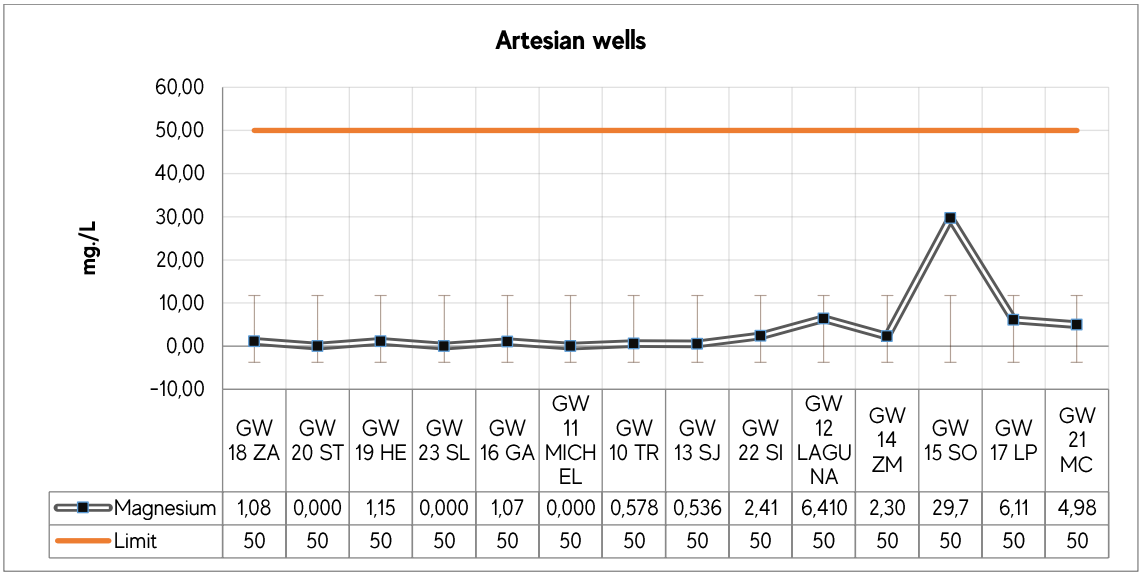


Figure 95. Comparative analysis of calcium levels measured in monitoring wells at the DAI

Figure 95 illustrates that the highest concentrations are recorded in the DAI monitoring wells. GW04 is the only point that exceeds the established limit. The average calcium value in this area is 63 mg/l.

3.4.14 Magnesium

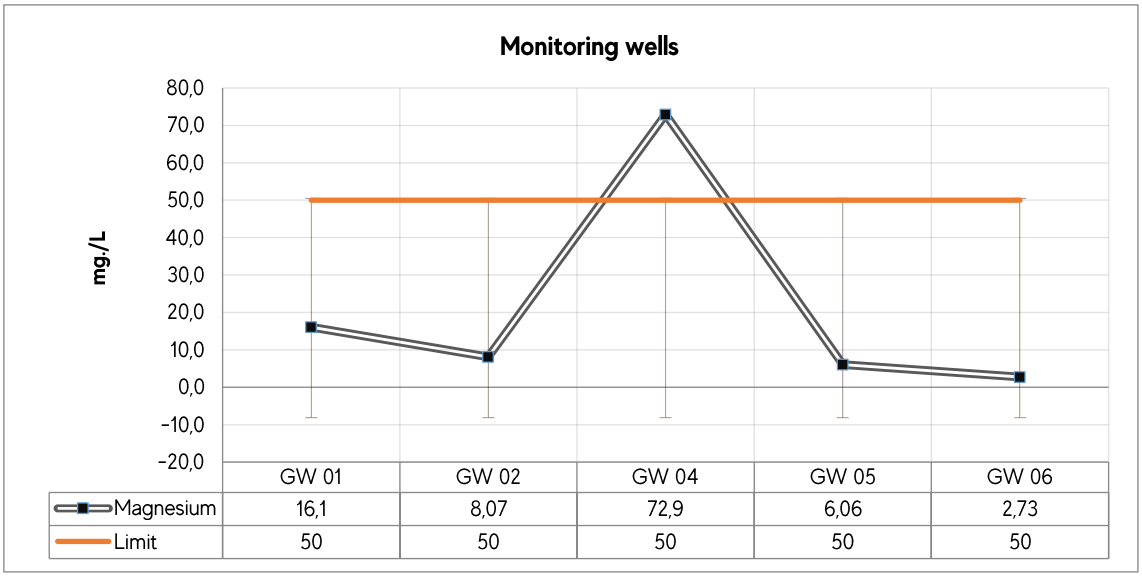


	GW 18 ZA	GW 20 ST	GW 19 HE	GW 23 SL	GW 16 GA	GW 11 MICHEL	GW 10 TR	GW 13 SJ	GW 22 SI	GW 12 LAGUNA	GW 14 ZM	GW 15 SO	GW 17 LP	GW 21 MC
Magnesium	1,08	0,000	1,15	0,000	1,07	0,000	0,578	0,536	2,41	6,410	2,30	29,7	6,11	4,98
Limit	50	50	50	50	50	50	50	50	50	50	50	50	50	50

Figure 96. Comparative analysis of magnesium levels measured in artesian wells at the forest plantation area

The water standard for the national territory does not establish a maximum level for this parameter; thus, Law 1614/2000 is used as a reference and it establishes 50 mg/l for magnesium level.

None point exceeds the reference value in the forest plantation area. The average magnesium value at all points is 5.1 mg/l.



	GW 01	GW 02	GW 04	GW 05	GW 06
Magnesium	16,1	8,07	72,9	6,06	2,73
Limit	50	50	50	50	50

Figure 97. Comparative analysis of magnesium levels measured in monitoring wells at the DAI

In the DAI zone, point GW04 exceeds the limit value established by Law 1614/2000. The average magnesium value in this zone is 21.17 mg/l.

3.4.15 Fluoride

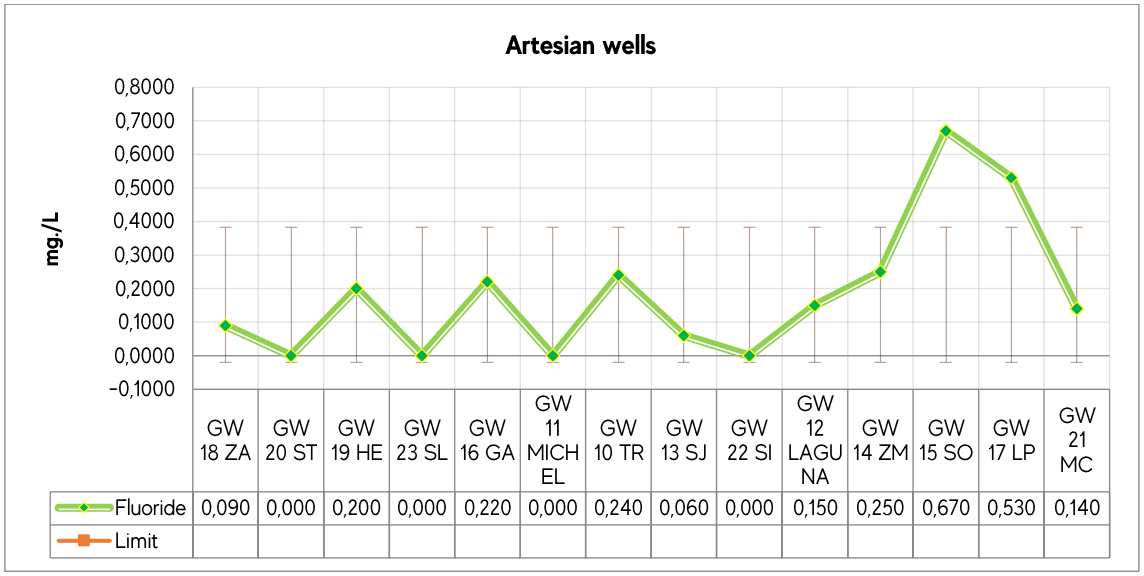


Figure 98. Comparative analysis of fluoride levels measured in artesian wells at the forest plantation area

Fluoride is a parameter with no established limits by the legislation.

The average fluoride value, in the forest plantation area, is 0.2 mg/l.

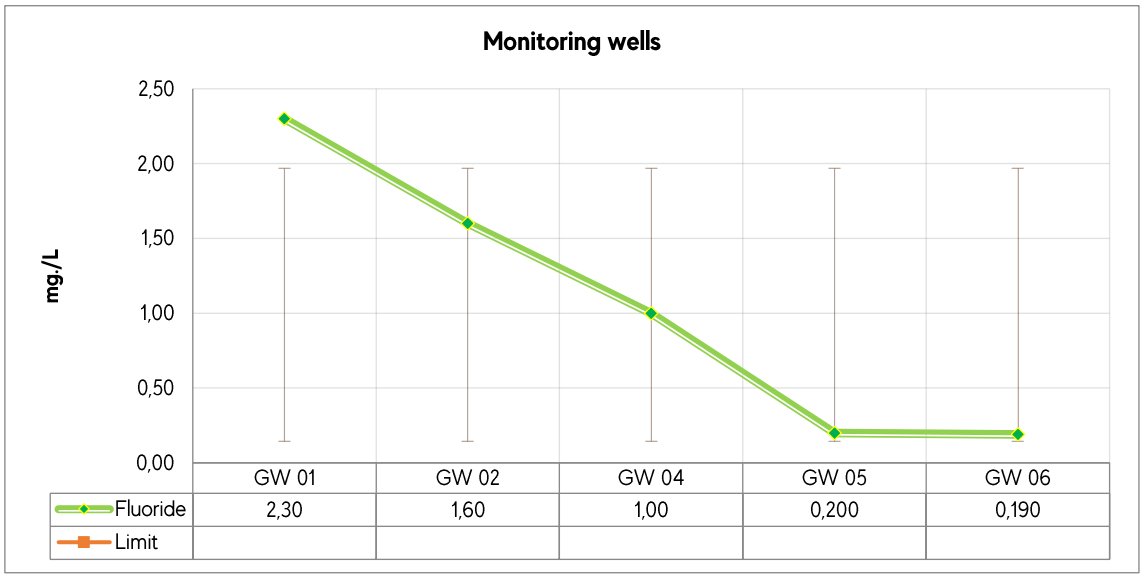
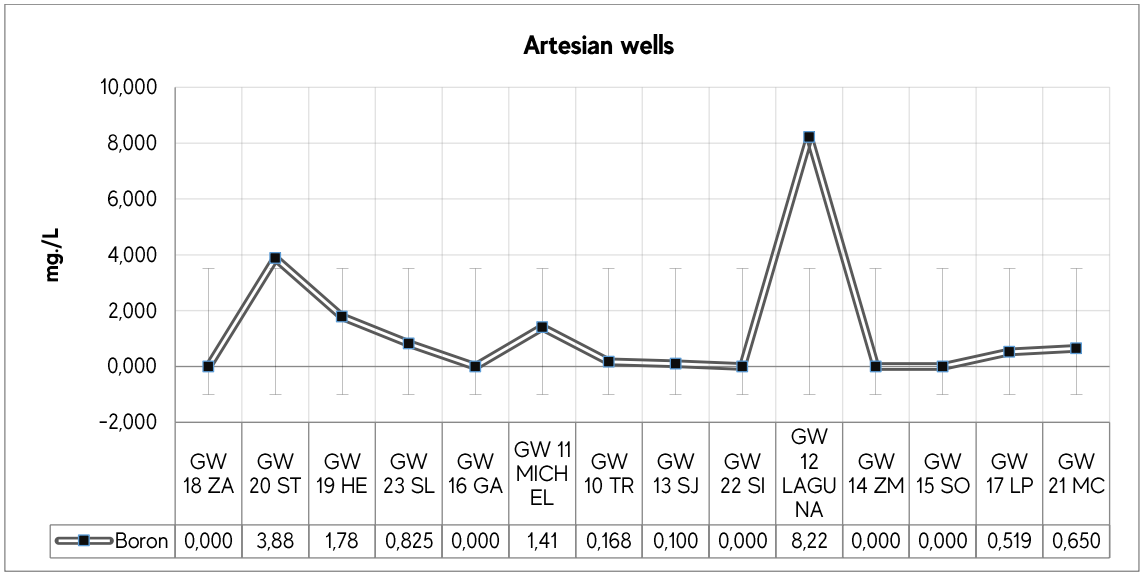


Figure 99. Comparative analysis of fluoride levels measured in monitoring wells at the DAI

In the DAI zone, fluoride has an average concentration of 1.05 mg/l. The highest determination recorded is in well GW01.

3.4.16 Boron

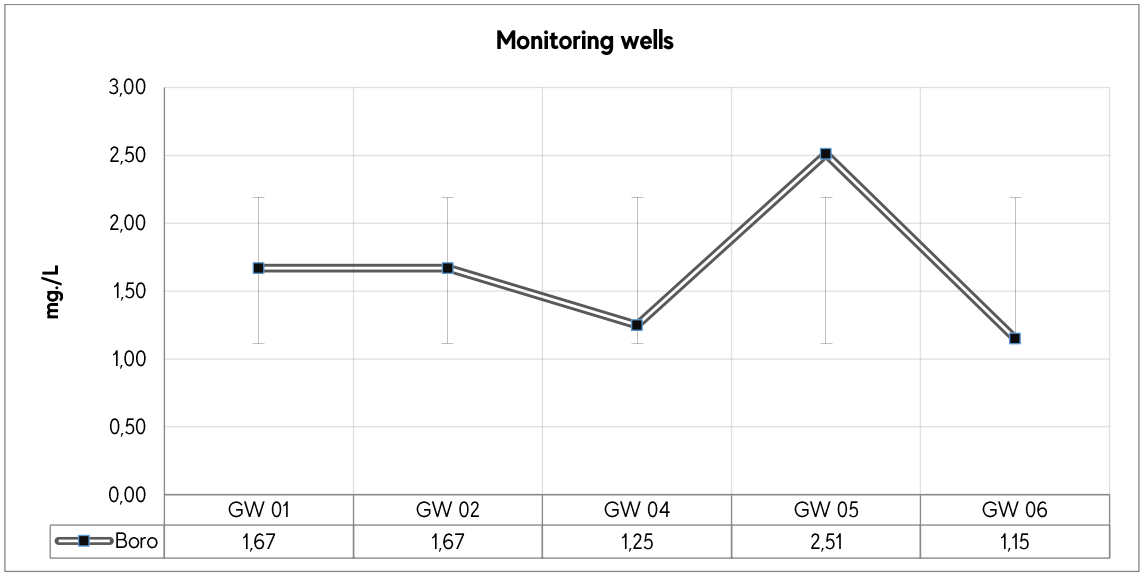


	GW 18 ZA	GW 20 ST	GW 19 HE	GW 23 SL	GW 16 GA	GW 11 MICHEL	GW 10 TR	GW 13 SJ	GW 22 SI	GW 12 LAGUNA	GW 14 ZM	GW 15 SO	GW 17 LP	GW 21 MC
Boron	0,000	3,88	1,78	0,825	0,000	1,41	0,168	0,100	0,000	8,22	0,000	0,000	0,519	0,650

Figure 100. Comparative analysis of boron levels measured in artesian wells at the forest plantation area

In GW 18-ZA, GW 16-GA, GW 13-SJ, GW 22-SI, GW 14-ZM and GW 15-SO, the concentrations of boron are not detectable considering the analytical method's limit of quantification in the water which is 1 mg/L.

The highest result is in well GW 12-LAGUNA; however, this parameter does not have established limits. Statistically, the average boron value is 2 mg/l.

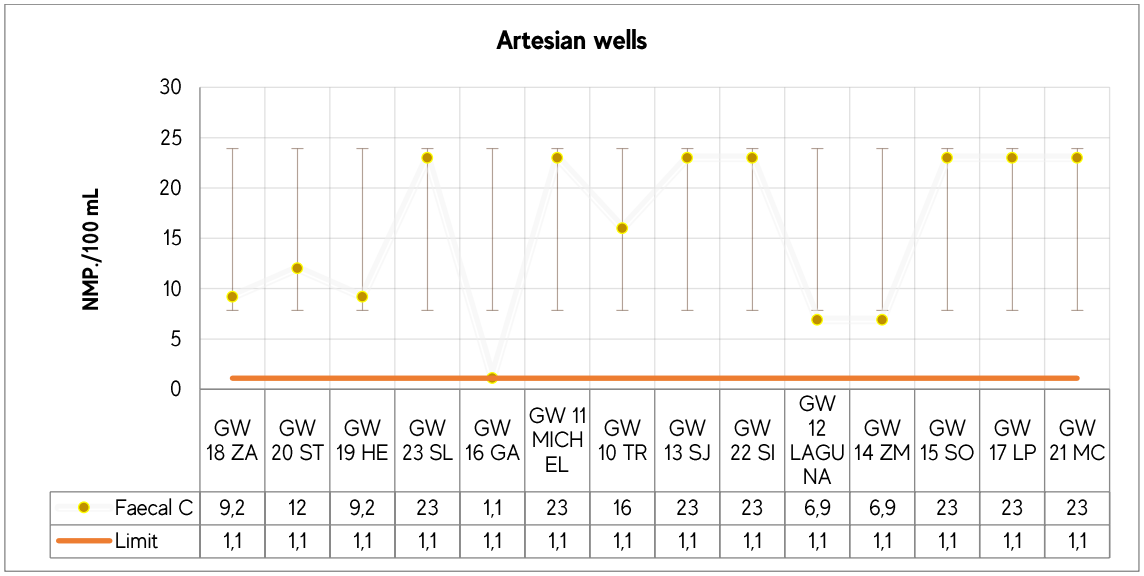


	GW 01	GW 02	GW 04	GW 05	GW 06
Boro	1,67	1,67	1,25	2,51	1,15

Figure 101. Comparative analysis of boron levels measured in monitoring wells at the DAI

In the DAI zone, Boron values obtained from the samples of the monitoring wells has an average value of 1.65 mg/L.

3.4.17 Faecal coliforms

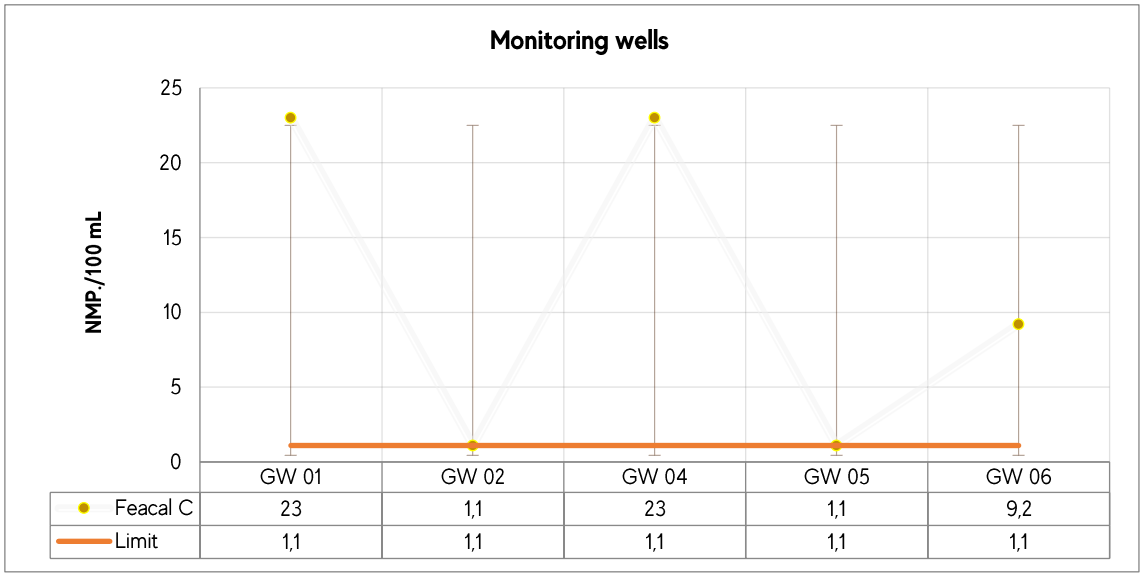


	GW 18 ZA	GW 20 ST	GW 19 HE	GW 23 SL	GW 16 GA	GW 11 MICH EL	GW 10 TR	GW 13 SJ	GW 22 SI	GW 12 LAGU NA	GW 14 ZM	GW 15 SO	GW 17 LP	GW 21 MC
Faecal C	9,2	12	9,2	23	1,1	23	16	23	23	6,9	6,9	23	23	23
Limit	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1

Figure 102. Comparative analysis of faecal coliforms levels measured in artesian wells at the forest plantation area

Since the water of the artesian wells are for human consumption, the results are compared to the maximum limits set in NP 2400180 norm for faecal coliform.

All the wells located at the forest plantation area have concentrations above the established limit in this campaign. Only GW16-GA does not exceed the maximum value of 1.1 NMP/100ml.



	GW 01	GW 02	GW 04	GW 05	GW 06
Feacal C	23	1,1	23	1,1	9,2
Limit	1,1	1,1	1,1	1,1	1,1

Figure 103. Comparative analysis of faecal coliforms levels measured in monitoring wells at the DAI

In the DAI zone, 3 of the monitoring wells, except GW02 and GW05, have faecal coliform concentrations above the limits.

3.4.17 Total coliforms

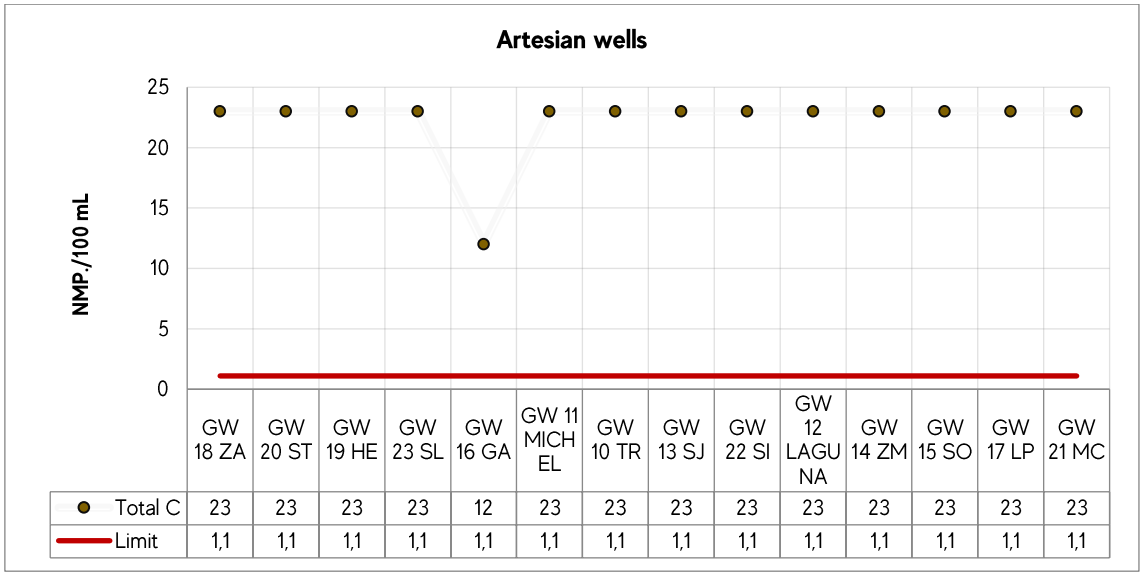


Figure 104. Comparative analysis of total coliforms levels measured in artesian wells at the forest plantation area

Total coliforms values of artesian wells are compared with the limits set by NP 2400180 which establishes a maximum of 1.1 NMP/100ml in water used for human consumption. All the wells art the forest plantation zone exceeds this limit.

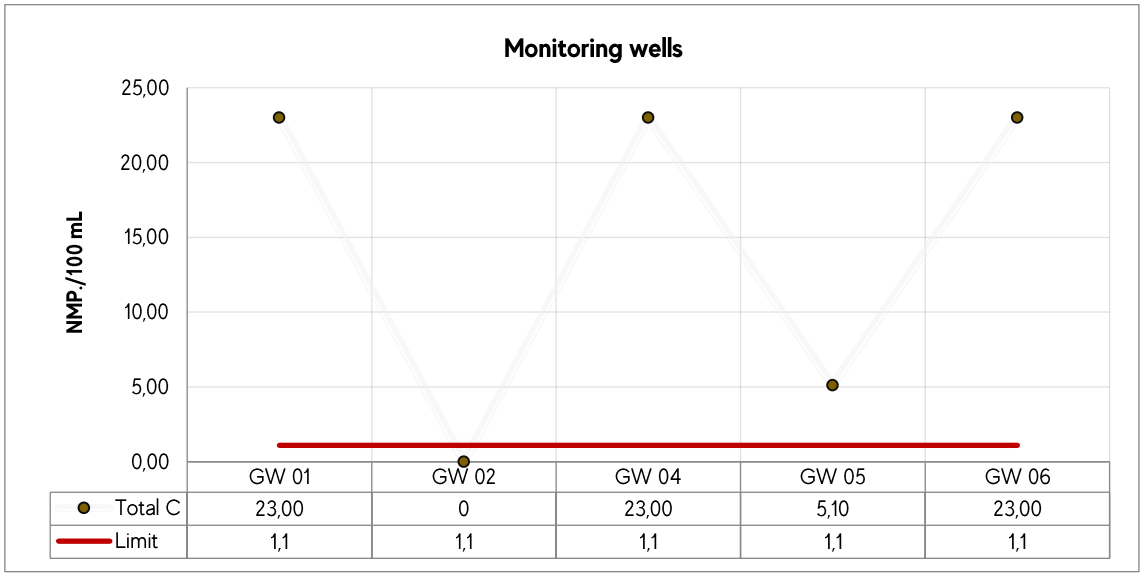


Figure 105. Comparative analysis of total coliforms levels measured in monitoring wells at the DAI

In the DAI zone, all monitoring wells except for GW02 shows concentrations of total coliforms above the established limit.

3.4.18 Escherichia coli

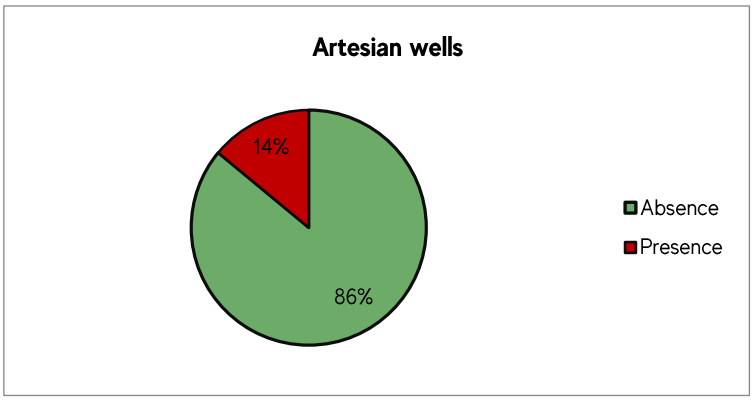


Figure 106. Presence-absence test of *E. coli* in artesian wells at the forest plantation area

According to NP 2400180, *Escherichia coli* bacteria must be absent from water for human consumption. In GW22-SILVA Y GW 23-SL it is found the presence of this bacteria.

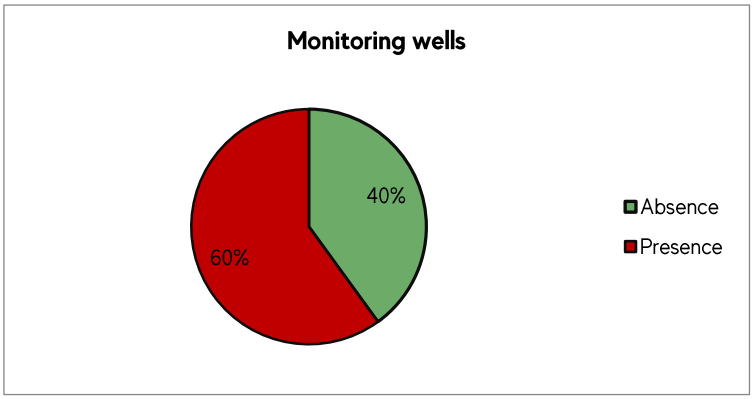


Figure 107. Presence-absence test of *E. coli* in monitoring wells at the DAI

Escherichia coli is found in the following DAI monitoring wells: GW01, GW04, and GW05.

IV. CONCLUSION

This report presents the direct area of influence and indirect area of influence's results of the first water monitoring campaign. According to the consultancy terms, it should be two campaigns to monitor groundwater and surface water quality, one in the rainy season and other in the dry season; the present report corresponds to the first one.

PARACEL provided the coordinates of 40 monitoring points, 20 for surface water and 20 for groundwater. Of the total number, 39 were sampled and analysed and only one monitoring well in the DAI was not sampled since it was not found water (Appendix D. Evidence).

In terms of the parameters defined, a 100% of the parameters for groundwater are reported in this document, as well as 63 of 67 of the parameters established for surface water. Sulfluramide, Bifenthrin, Thiamethoxam y Lambdacyalothrin are the 4 parameters that are not included since these determinations depend on reagents and chemical substances that were not possible to acquire until now due to pandemic (Appendix E. Suppliers note).

According to the terms of reference, Glyphosate, Sulfluramide, Lambdacyhalothrin, Bifenthrin, Thiamethoxam, Carbofuran, Lindane and Fipronil are the parameters to report for the 18 surface water points. However, 22 agrochemicals are included in addition (Table 4).

Laboratories certified by the ONA (National Accreditation Body) are the responsible of the results obtained by analytical determinations. The analysis and evaluation of the results are contrast with the following normative:

- Regulation SEAM Nº 222/02 "BY WHICH THE WATER QUALITY PADRON OF THE NATIONAL TERRITORY IS ESTABLISHED".
- Law 1614/200 - GENERAL LAW ON THE REGULATORY AND TARIFFING FRAMEWORK FOR THE DRINKING WATER AND SANITARY SEWERAGE SERVICE - ANNEX I.
- NP 24 001 80. DRINKING WATER: GENERAL REQUIREMENTS

Regarding the surface water results, the main findings are:

- Of the 63 parameters analysed (physicochemical, agrochemical and bacteriological), 44 have limits established in the regulations while 19 do not.
- Of the 44 parameters with defined limits, 31 (75%) do not show any deviation compared to the regulation's limits and 13 parameters (25%) show values above the maximum allowed in at least one monitoring point.
- During the first monitoring campaign no traces of agrochemicals were found in surface waters. Still, there are pendant determinations as Sulfluramide, Bifenthrin, Thiamethoxam and Lambdacyhalothrin and the only exception is Fipronil at point FW 315-HE.
- The physicochemical parameters that do not have any deviation are (20): floating materials, total dissolved solids (TDS), oils and fats, nitrates, nitrites, hardness, sulphate, sodium, aluminium, cadmium, trivalent chromium, hexavalent chromium, copper, tin, selenium, zinc, arsenic, mercury, barium, cyanide.
- The physicochemical parameters with deviations are (9): pH, Dissolved Oxygen, Turbidity, BOD5, Total Phosphorus, Total Nitrogen, Nickel, Manganese and Lead.

In the case of groundwater, specifically at forest plantation area, the main findings are:

- The 14 artesian wells located in the forest plantation area provides water for human consumption.
- Of the 23 physicochemical and bacteriological parameters evaluated, 18 have limits established in the current regulations, and 5 do not have defined limits.
- Of the 18 parameters with defined limits, 11 (61%) do not show any deviation regarding current regulations and 7 (39%) show values above the maximum permitted in at least one monitoring point.

- The 11 parameters that do not show any deviation in the 14 wells evaluated are electrical conductivity, total dissolved solids, hardness, total nitrogen, chlorides, sulphates, sodium, potassium, calcium, magnesium, fluoride and E coli.
- The parameters deviated from the established limits are pH, total phosphorus, nitrates, alkalinity, faecal coliforms and total coliforms.
- The parameters that most frequently show deviations in the 14 sampled wells are nitrates (42%), total phosphorus (71%), faecal coliforms (92%) and total coliforms (100%).

As for the monitoring wells placed at DAI zone of the future industry, the groundwater main findings are:

- A total of 5 monitoring wells located in the AID were analysed. Unlike the wells in the forest plantation area, these well's purposes are exclusively for monitoring groundwater quality.
- One of the monitoring wells did not have water.
- The parameters results were significantly higher in comparison with the values obtained in the forest plantation zone.

APPENDIX A:
SURFACE WATER
LABORATORY RESULTS

TABLE OF CONTENT

LIST OF TABLES

A.1 Analytical determinations of point FW104-ZA

TABLE 1. PARAMETERS MEASURED ON THE SITE – FW104-ZA			
FW 104-ZA			
SAMPLING POINT DATA			
Sampling time:	18:30	Air temperature:	28,5 ºC
Atmospheric conditions:	Cloudy skies, drizzle	Relative humidity:	60%
UTM coordinates:	21K 546639,23 mE; 7513553,82 mS	Elevation:	190 m

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation2 22/02	**Alternative reference standards ***
1	Water temperature	Tº	ºC	25,2	No limits	
2	Hydrogen potential	pH	---	7,44	6 - 9	
3	Electrical conductivity	σ	µS/cm	62,1	No limits	[2] <1500
4	Dissolved oxygen	DO	mg O_2/L	5,88	> 5 mg O_2/L	
5	Turbidity		m	84,0	100 NTU	

TABLE 2. PHYSICOCHEMICAL PARAMETERS – FW 104-ZA						
FW 104-ZA						
PHYSICOCHEMICAL PARAMETER						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards ***
6	Floating materials			**89,0**	Visually absent	
7	Total dissolved solids	TDS	mg/L	62,0	500	
8	Oil and grease		mg/L	**9,70**	Visually absent	
9	Chemical oxygen demand	COD	mg O_2/L	50,4	No limits	[1] <150
10	Biological oxygen demand	BOD5	mg O_2/L	2,33	5	
11	Total phosphorus	P	mg/L	<0,0200	0,05	
12	Total nitrogen	N	mg/L	<0,100	0,6	
13	Nitrates	NO_{3-}	mg/L	3,14	10	
14	Ammonia	NH_3	mg/L	**0,083**	0,02	
15	Nitrites	NO_{2-}	mg/L	<0,0025	1	
16	Hardness		mg $CaCO_3$/L	11,1	300	
17	Sodium	Na	mg/L	2,53	200	
18	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
19	Cyanides		mg/L	<0,02 LOQ	0,2	
20	Copper	Cu	mg/L	<0,0500	1	
21	Soluble iron	Fe^{++}	mg/L	**1,110**	0,3	
22	Aluminium	Al	mg/L	<0,100	0,2	
23	Cadmium	Cd	µg/L	<0,000800	0,001	
24	Hexavalent chromium	Cr (VI)	mg/L	<0,0500	0,05	
25	Trivalent chromium	Cr (III)	mg/L	<0,0500	0,5	
26	Tin	Sn	mg/L	<1,00	2	
27	Nickel	Ni	mg/L	0,0839	0,025	
28	Manganese	Mn	mg/L	0,0839	0,1	
29	Lead	Pb	mg/L	0,00200	0,01	

30	Selenium	Se	mg/L	0,00500	0,01	
31	Zinc	Zn	mg/L	0,0851	3	
32	Arsenic	As	mg/L	0,0143	0,5	
33	Mercury	Hg	mg/L	0,001	2	
34	Barium	Ba	mg/L	0,07	2	

TABLE 1. TABLE 3. AGROCHEMICAL IN SURFACE WATER – FW 104-ZA

FW 104-ZA

AGROCHEMICAL

GROUP AOX	Nº	**Parameter**	**Chemical formula**	**Unit**	**Measured value**	**Limits**	
						Regulation 222/02	**Alternative reference standards** *
PHOSPHOGLYCINE	35	Glyphosate	C3H8NO6P	µg/L	<0,300	0,7	
	36	AMPA	CH6NO3P	µg/L	<0,300	No limits	
CHLORDANE	37	Aldrin	C12H8Cl6	µg/L	<1,00	No limits	
	38	Endrin	C12H8Cl6O	µg/L	<1,25	2	
	39	Dieldrin	C12H8Cl6O	µg/L	<1,50	No limits	
	40	Lindane	C6H6Cl6	µg/L	<0,2	0,2	
	41	Chlordane	C10H6Cl8	µg/L	<0,90	No limits	
	42	DDT	C10H6Cl8	µg/L	<2,00	2	
	43	DDE	--	µg/L	<2,00	No limits	
	44	DDD	--	µg/L	<2,00	No limits	
TRIAZINE	45	Atrazine	C8H14ClN5	µg/L	<2,00	3	
	46	Simazine	C7H12ClN5	µg/L	<2,50	4	
CARBAMATE	47	Carbaryl	C12H11NO2	µg/L	<3,50	No limits	
	48	Carbofuran	C12H15NO3	µg/L	<3,00	4	
	49	Heptachlor	C10H5Cl7	µg/L	<1,50	0	
	50	Methomyl	C5H10N2O2S	µg/L	<25,0	No limits	
ALKYLCHLORO-PHENOXY	51	2,4 D	C8H6Cl2O3	µg/L	<2,50	30	
PYRETHROIDS	52	Lambdacyalothrin	$C_{23}H_{19}ClF_3NO_3$	µg/L	--	No limits	
	53	Bifenthrin	C23H22 ClF3NO2	µg/L	--	No limits	
	54	Cypermethrin	C22H19Cl2NO3	µg/L	<1,20	No limits	
	55	Chlorpyrifos	C9H11Cl3NO3PS	µg/L	<5,00	No limits	
	56	Dichlorvos	C4H7Cl2O4P	µg/L	<10,0	10	
	57	Methamidophos	C2H8NO2PS	µg/L	<25,0	No limits	
TRIAZOLEE	58	Tebuconazole	C16H22ClN3O	µg/L	<2,00	1	
NEONICOTINOID	59	Imidacloprid	C9H10ClN5O2	µg/L	<5,00	No limits	
	60	Methylparaoxon	C8H10NO6P	µg/L	<25,0	No limits	
	61	Thiamethoxam	C10H6F17NO2S	µg/L	--	No limits	
FLUORATED	62	Sulfluramide	C10H6F17NO2S	µg/L	--	No limits	
PHENYLPYRAZOLES	63	Fipronil	C12H4Cl2F6N4O.	µg/L	<0,01	No limits	

TABLE 4. HYDROBIOLOGICAL AND BACTERIOLOGICAL PARAMETERS – FW104-ZA				
FW 104 – ZA – HYDROBIOLOGICAL PARAMETERS				
(№ 64) PHYTOPLANKTON DIVERSITY				
Type			**Species**	**Measured value**
C Y A N O B A C T E R I A **(805)**			**Cylindrospermum sp.**	805
Presence of organic material	+		TOTAL CELLS/mL	805
Presence of sediment	+++		Abundant/dominant organism	Cylindrospermum sp. 100%
Presence of bacteria	+++		Range of risk	Null
Presence of fungal hyphae	X			
CODES				
+(less than half of the field)	**++** (half of the field)		**+++** (whole field)	**X** (sporadically observed)
Risk level (UNESCO)	Null until 10.000 Cel/mL		Alert I - between 10.000 to 20.000 Cel/mL	Alert II More than 20.000 Cel/mL
(№ 65) ZOOPLANKTON DIVERSITY				
Type			**Species**	**Measured value**
Absence of zooplankton.				
Plant remains	No		TOTAL CELLS /mL	Not applicable
Colour	Yellowish		Abundant/dominant organism	Not applicable
BACTERIOLOGICAL PARAMETERS				
№	**Parameter**	**Unit**	**Measured value**	**Regulation 222/02**
66	Total coliforms	NMP/100mL	1600	1000 NMP/100mL
67	Faecal coliforms	NMP/100mL	1600	200 NMP/100mL

A2 Analytical determinations of point FW 201-ST

TABLE 5. PARAMETERS MEASURED ON THE SITE – FW 201-ST			
FW 201-ST			
SAMPLING POINT DATA			
Sampling time	13:50	Air temperature	26 ºC
Atmospheric conditions	Cloudy sky, drizzle	Relative humidity	58%
UTM coordinates	21K 543911.54 m E 7497910.60 m S	Elevation	179

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards ***
1	Water temperature	Tº	ºC	24,4	No limits	
2	Hydrogen potential	pH	---	6,6	6 – 9	
3	Electrical conductivity	σ	µS/cm	40,3	No limits	[2] <1500
4	Dissolved oxygen	DO	mg O_2/L	7,21	> 5 mg O_2/L	
5	Turbidity		NTU	61,6	100 NTU	

TABLE 6. PHYSICOCHEMICAL PARAMETERS - FW201-ST						
FW 201-ST						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards ***
6	Floating materials			62,0	Visually absent	
7	Total dissolved solids	TDS	mg/L	22,5	500	
8	Oil and grease		mg/L	7,50	Visually absent	
9	Chemical oxygen demand	COD	mg O_2/L	42,6	No limits	[1] <150
10	Biological oxygen demand	BOD5	mg O_2/L	1,93	5	
11	Total phosphorus	P	mg/L	<0,0200	0,05	
12	Total nitrogen	N	mg/L	0,108	0,6	
13	Nitrates	NO_{3-}	mg/L	3,5	10	
14	Ammonia	NH_3	mg/L	0,0594	0,02	
15	Nitrites	NO_{2-}	mg/L	0,0388	1	
16	Hardness		mg $CaCO_3$/L	7,88	300	
17	Sodium	Na	mg/L	2,53	200	
18	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
19	Cyanides		mg/L	<0,02 LOQ	0,2	
20	Copper	Cu	mg/L	<0,0500	1	
21	Soluble iron	Fe^{++}	mg/L	0,935	0,3	
22	Aluminium	Al	mg/L	<0,100	0,2	
23	Cadmium	Cd	µg/L	<0,000800	0,001	
24	Hexavalent chromium	Cr (VI)	mg/L	<0,0500	0,05	
25	Trivalent chromium	Cr (III)	mg/L	<0,0500	0,5	
26	Tin	Sn	mg/L	<1,00	2	
27	Nickel	Ni	mg/L	<0,01	0,025	
28	Manganese	Mn	mg/L	<0,01	0,1	
29	Lead	Pb	mg/L	0,00337	0,01	

30	Selenium	Se	mg/L	<0,005	0,01	
31	Zinc	Zn	mg/L	<0,0500	3	
32	Arsenic	As	mg/L	0,0132	0,5	
33	Mercury	Hg	mg/L	0,001	2	
34	Barium	Ba	mg/L	0,07	2	

TABLE 7. AGROCHEMICALS IN SURFACE WATER – FW201-ST

FW 201-ST

AGROCHEMICAL

GROUP AOX	Nº	**Parameter**	**Chemical formula**	**Unit**	**Measured value**	**Limits**	
						Regulation 222/02	**Alternative reference standards** *
PHOSPHOGLYCINE	35	Glyphosate	C3H8NO6P	µg/L	<0,300	0,7	
	36	AMPA	CH6NO3P	µg/L	<0,300	No limits	
CHLORDANE	37	Aldrin	C12H8Cl6	µg/L	<1,00	No limits	
	38	Endrin	C12H8Cl6O	µg/L	<1,25	2	
	39	Dieldrin	C12H8Cl6O	µg/L	<1,50	No limits	
	40	Lindane	C6H6Cl6	µg/L	<0,2	0,2	
	41	Chlordane	C10H6Cl8	µg/L	<0,90	No limits	
	42	DDT	C10H6Cl8	µg/L	<2,00	2	
	43	DDE	--	µg/L	<2,00	No limits	
	44	DDD	--	µg/L	<2,00	No limits	
TRIAZINE	45	Atrazine	C8H14ClN5	µg/L	<2,00	3	
	46	Simazine	C7H12ClN5	µg/L	<2,50	4	
CARBAMATE	47	Carbaryl	C12H11NO2	µg/L	<3,50	No limits	
	48	Carbofuran	C12H15NO3	µg/L	<3,00	4	
	49	Heptachlor	C10H5Cl7	µg/L	<1,50	0	
	50	Methomyl	C5H10N2O2S	µg/L	<25,0	No limits	
ALKYLCHLORO-PHENOXY	51	2,4 D	C8H6Cl2O3	µg/L	<2,50	30	
PYRETHROIDS	52	Lambdacyalothrin	$C_{23}H_{19}ClF_3NO_3$	µg/L	--	No limits	
	53	Bifenthrin	C23H22 ClF3NO2	µg/L	--	No limits	
	54	Cypermethrin	C22H19Cl2NO3	µg/L	<1,20	No limits	
	55	Chlorpyrifos	C9H11Cl3NO3PS	µg/L	<5,00	No limits	
	56	Dichlorvos	C4H7Cl2O4P	µg/L	<10,0	10	
	57	Methamidophos	C2H8NO2PS	µg/L	<25,0	No limits	
TRIAZOLEE	58	Tebuconazole	C16H22ClN3O	µg/L	<2,00	1	
NEONICOTINOID	59	Imidacloprid	C9H10ClN5O2	µg/L	<5,00	No limits	
	60	Methylparaoxon	C8H10NO6P	µg/L	<25,0	No limits	
	61	Thiamethoxam	C10H6F17NO2S	µg/L	--	No limits	
FLUORATED	62	Sulfluramide	C10H6F17NO2S	µg/L	--	No limits	
PHENYLPYRAZOLES	63	Fipronil	C12H4Cl2F6N4O.	µg/L	<0,01	No limits	

TABLE 8. HYDROBIOLOGICAL AND BACTERIOLOGICAL PARAMETERS – FW201-ST

FW 201-ST – HYDROBIOLOGICAL PARAMETERS			
(Nº 64) PHYTOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
C H L O R O P H Y T A (69)		*Ankistrodesmus sp.*	69
B A C I L L A R I O P H Y T A (46)		*Pennate diatoms*	46
E U G L E N O Z O A (184)		*Euglena sp.*	184
Presence of organic material	+	TOTAL CELLS /mL	**299**
Presence of sediment	+++	Abundant/dominant organism:	*Euglena sp.* 61,5%
Presence of bacteria	+++	Range of risk:	Null
Spicules	X		
CODES			
+(less than half of the field)	++ (half of the field)	+++ (whole field)	**X** (se observa en forma esporádica)
Risk level (UNESCO)	Null until 10.000 Cel/mL	Alert I - between 10.000 to 20.000 Cel/mL	Alert II More than 20.000 Cel/mL
(Nº 65) ZOOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
Absence of zooplankton.			
Plant remains	No	TOTAL CELLS /mL	Not applicable
Colour	Yellowish	Abundant/dominant organism	Not applicable

BACTERIOLOGICAL PARAMETERS				
Nº	**Parameters**	**Unit**	**Measured value**	**Regulation 222/02**
66	Faecal coliforms	NMP/100mL	540	200 NMP/100mL
67	Total coliforms	NMP/100mL	540	1000 NMP/100mL

A3 Analytical determinations of point FW 315-HE

TABLE 9. PARAMETERS MEASURED ON THE SITE – FW315-HE			
FW 315-HE			
SAMPLING POINT DATA			
Sampling time	10:30	Air temperature	25 ºC
Atmospheric conditions	Cloudy, rainy all-day	Relative humidity	78%
UTM coordinates	21K 515424,99mE; 7523026,00 mS	Elevation	184

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards ***
1	Water temperature	Tº	ºC	24,5	No limits	
2	Hydrogen potential	pH	---	6,68	6 - 9	
3	Electrical conductivity	σ	µS/cm	52,1	No limits	[2] <1500
4	Dissolved oxygen	DO	mg O_2/L	5,17	> 5 mg O_2/L	
5	Turbidity		NTU	35,0	100 NTU	

TABLE 10. PHYSICOCHEMICAL PARAMETERS - FW 315-HE						
FW 315-HE						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards ***
6	Floating materials			22,4	Visually absent	
7	Total dissolved solids	TDS	mg/L	157	500	
8	Oil and grease		mg/L	16,8	Visually absent	
9	Chemical oxygen demand	COD	mg O_2/L	51,1	No limits	[1] <150
10	Biological oxygen demand	BOD5	mg O_2/L	2,23	5	
11	Total phosphorus	P	mg/L	0,103	0,05	
12	Total nitrogen	N	mg/L	0,734	0,6	
13	Nitrates	NO_{3-}	mg/L	1,07	10	
14	Ammonia	NH_3	mg/L	0,0587	0,02	
15	Nitrites	NO_{2-}	mg/L	0,0136	1	
16	Hardness		mg $CaCO_3$/L	14,1	300	
17	Sodium	Na	mg/L	4	200	
18	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
19	Cyanides		mg/L	<0,02	0,2	
20	Copper	Cu	mg/L	<0,0500	1	
21	Soluble iron	Fe^{++}	mg/L	1,11	0,3	
22	Aluminium	Al	mg/L	<0,1	0,2	
23	Cadmium	Cd	µg/L	<0,0080	0,001	
24	Hexavalent chromium	Cr (VI)	mg/L	<0,0500	0,05	
25	Trivalent chromium	Cr (III)	mg/L	<0,0500	0,5	
26	Tin	Sn	mg/L	<1,0	2	
27	Nickel	Ni	mg/L	<0,01	0,025	
28	Manganese	Mn	mg/L	0,274	0,1	
29	Lead	Pb	mg/L	0,0085	0,01	
30	Selenium	Se	mg/L	<0,005	0,01	

31	Zinc	Zn	mg/L	<0,0500	3	
32	Arsenic	As	mg/L	<0,0100	0,5	
33	Mercury	Hg	mg/L	0,001	2	
34	Barium	Ba	mg/L	0,09	2	

TABLE 11. AGROCHEMICALS IN SURFACE WATER – FW315-HE							
FW 315-HE							
AGROCHEMICAL							
GROUP AOX	Nº	**Parameter**	**Chemical formula**	**Unit**	**Measured value**	**Limits**	
						Regulation 222/02	**Alternative reference standards***
PHOSPHOGLYCINE	35	Glyphosate	C3H8NO6P	µg/L	<0,300	0,7	
	36	AMPA	CH6NO3P	µg/L	<0,300	No limits	
CHLORDANE	37	Aldrin	C12H8Cl6	µg/L	<1,00	No limits	
	38	Endrin	C12H8Cl6O	µg/L	<1,25	2	
	39	Dieldrin	C12H8Cl6O	µg/L	<1,50	No limits	
	40	Lindane	C6H6Cl6	µg/L	<0,2	0,2	
	41	Chlordane	C10H6Cl8	µg/L	<0,90	No limits	
	42	DDT	C10H6Cl8	µg/L	<2,00	2	
	43	DDE	--	µg/L	<2,00	No limits	
	44	DDD	--	µg/L	<2,00	No limits	
TRIAZINE	45	Atrazine	C8H14ClN5	µg/L	<2,00	3	
	46	Simazine	C7H12ClN5	µg/L	<2,50	4	
CARBAMATE	47	Carbaryl	C12H11NO2	µg/L	<3,50	No limits	
	48	Carbofuran	C12H15NO3	µg/L	<3,00	4	
	49	Heptachlor	C10H5Cl7	µg/L	<1,50	0	
	50	Methomyl	C5H10N2O2S	µg/L	<25,0	No limits	
ALKYLCHLORO-PHENOXY	51	2,4 D	C8H6Cl2O3	µg/L	<2,50	30	
PYRETHROIDS	52	Lambdacyalothrin	$C_{23}H_{19}ClF_3NO_3$	µg/L	--	No limits	
	53	Bifenthrin	C23H22 ClF3NO2	µg/L	--	No limits	
	54	Cypermethrin	C22H19Cl2NO3	µg/L	<1,20	No limits	
	55	Chlorpyrifos	C9H11Cl3NO3PS	µg/L	<5,00	No limits	
	56	Dichlorvos	C4H7Cl2O4P	µg/L	<10,0	10	
	57	Methamidophos	C2H8NO2PS	µg/L	<25,0	No limits	
TRIAZOLEE	58	Tebuconazole	C16H22ClN3O	µg/L	<2,00	1	
NEONICOTINOID	59	Imidacloprid	C9H10ClN5O2	µg/L	<5,00	No limits	
	60	Methylparaoxon	C8H10NO6P	µg/L	<25,0	No limits	
	61	Thiamethoxam	C10H6F17NO2S	µg/L	--	No limits	
FLUORATED	62	Sulfluramide	C10H6F17NO2S	µg/L	--	No limits	
PHENYLPYRAZOLES	63	Fipronil	C12H4Cl2F6N4O.	µg/L	0,03	No limits	

TABLE 12. HYDROBIOLOGICAL AND BACTERIOLOGICAL PARAMETERS – FW 315-HE				
FW 315-HE – HYDROBIOLOGICAL PARAMETERS				
(№ 64) PHYTOPLANKTON DIVERSITY				
Type			**Species**	**Measured value**
CYANOBACTERIA **(395)**			*Pseudanabaena sp.1*	135
			Pseudanabaena sp.2	180
			Pseudanabaena sp.3	80
BACILLARIOPHYTA **(20)**			*Pennate diatoms*	20
EUGLENOZOA **(10)**			*Euglena sp.*	
Presence of organic material		+	TOTAL CELLS /mL	**425**
Presence of sediment		+++	Abundant/dominant organism	Pseudanabaena sp.2 38,9%
Mushroom spores		x	Range of risk	Null
CODES				
+(less than half of the field)		**++** (half of the field)	**+++** (whole field)	**X** (sporadically observed)
Risk level (UNESCO)		Null until 10.000 Cel/mL	Alert I - between 10.000 to 20.000 Cel/mL	Alert II More than 20.000 Cel/mL
(№ 65) ZOOPLANKTON DIVERSITY				
Type			**Species**	**Measured value (Org/m³)**
COPEPODS			*Harpacticoida sp*	20
Plant remains			TOTAL CELLS /mL	20
Colour			Abundant/dominant organism	*Harpacticoida sp 100%*
BACTERIOLOGICAL PARAMETERS				
№	**Parameter**	**Unit**	**Measured value**	**Regulation 222/02**
66	Faecal coliforms	NMP/100mL	1200	200 NMP/100mL
67	Total coliforms	NMP/100mL	35000	1000 NMP/100mL

A4 Analytical determinations of point FW304-HE

TABLE 13. PARAMETERS MEASURED ON THE SITE – FW 304-HE.			
FW 304-HE			
SAMPLING POINT DATA			
Sampling time	11:30	Aire temperature	24 ºC
Atmospheric conditions	Cloudy skies, light rain	Relative humidity	76%
UTM coordinates	21K 506172,99 mE; 7509505,00 mS	Elevation	180

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards ***
1	Water temperature	Tº	ºC	24,4	No limits	
2	Hydrogen potential	pH	---	7,89	6 - 9	
3	Electrical conductivity	σ	µS/cm	294	No limits	[2] <1500
4	Dissolved oxygen	DO	mg O_2/L	6,76	> 5 mg O_2/L	
5	Turbidity		m	25,6	100 NTU	

TABLE 14. PHYSICOCHEMICAL PARAMETERS – FW304-HE						
FW 304-HE						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards ***
6	Floating materials			18,8	Visually absent	
7	Total dissolved solids	TDS	mg/L	194	500	
8	Oil and grease		mg/L	14,5	Visually absent	
9	Chemical oxygen demand	COD	mg O_2/L	137	No limits	[1] <150
10	Biological oxygen demand	BOD5	mg O_2/L	1,84	5	
11	Total phosphorus	P	mg/L	0,0639	0,05	
12	Total nitrogen	N	mg/L	<0,100	0,6	
13	Nitrates	NO_{3-}	mg/L	0,338	10	
14	Ammonia	NH_3	mg/L	0,0880	0,02	
15	Nitrites	NO_{2-}	mg/L	0,0306	1	
16	Hardness		mg $CaCO_3$/L	108	300	
17	Sodium	Na	mg/L	15,6	200	
18	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
19	Cyanides		mg/L	<0,02	0,2	
20	Copper	Cu	mg/L	<0,0500	1	
21	Soluble iron	Fe^{++}	mg/L	0,913	0,3	
22	Aluminium	Al	mg/L	<0,01	0,2	
23	Cadmium	Cd	µg/L	<0,008	0,001	
24	Hexavalent chromium	Cr (VI)	mg/L	<0,0500	0,05	
25	Trivalent chromium	Cr (III)	mg/L	<0,0500	0,5	
26	Tin	Sn	mg/L	<1	2	
27	Nickel	Ni	mg/L	<0,01	0,025	
28	Manganese	Mn	mg/L	<0,0500	0,1	
29	Lead	Pb	mg/L	<0,002	0,01	

30	Selenium	Se	mg/L	<0,005	0,01	
31	Zinc	Zn	mg/L	<0,0500	3	
32	Arsenic	As	mg/L	0,0616	0,5	
33	Mercury	Hg	mg/L	0,001	2	
34	Barium	Ba	mg/L	0,17	2	

TABLE 15. AGROCHEMICALS IN SURFACE WATER - FW 304-HE							
FW 304-HE							
AGROCHEMICAL							
GROUP AOX	№	**Parameter**	**Chemical formula**	**Unit**	**Measured value**	**Limits**	
						Regulation 222/02	**Alternative reference standards***
PHOSPHOGLYCINE	35	Glyphosate	C3H8NO6P	µg/L	<0,300	0,7	
	36	AMPA	CH6NO3P	µg/L	<0,300	No limits	
CHLORDANE	37	Aldrin	C12H8Cl6	µg/L	<1,00	No limits	
	38	Endrin	C12H8Cl6O	µg/L	<1,25	2	
	39	Dieldrin	C12H8Cl6O	µg/L	<1,50	No limits	
	40	Lindane	C6H6Cl6	µg/L	<0,2	0,2	
	41	Chlordane	C10H6Cl8	µg/L	<0,90	No limits	
	42	DDT	C10H6Cl8	µg/L	<2,00	2	
	43	DDE	--	µg/L	<2,00	No limits	
	44	DDD	--	µg/L	<2,00	No limits	
TRIAZINE	45	Atrazine	C8H14ClN5	µg/L	<2,00	3	
	46	Simazine	C7H12ClN5	µg/L	<2,50	4	
CARBAMATE	47	Carbaryl	C12H11NO2	µg/L	<3,50	No limits	
	48	Carbofuran	C12H15NO3	µg/L	<3,00	4	
	49	Heptachlor	C10H5Cl7	µg/L	<1,50	0	
	50	Methomyl	C5H10N2O2S	µg/L	<25,0	No limits	
ALKYLCHLORO-PHENOXY	51	2,4 D	C8H6Cl2O3	µg/L	<2,50	30	
PYRETHROIDS	52	Lambdacyalothrin	$C_{23}H_{19}ClF_3NO_3$	µg/L	--	No limits	
	53	Bifenthrin	C23H22 ClF3NO2	µg/L	--	No limits	
	54	Cypermethrin	C22H19Cl2NO3	µg/L	<1,20	No limits	
	55	Chlorpyrifos	C9H11Cl3NO3PS	µg/L	<5,00	No limits	
	56	Dichlorvos	C4H7Cl2O4P	µg/L	<10,0	10	
	57	Methamidophos	C2H8NO2PS	µg/L	<25,0	No limits	
TRIAZOLEE	58	Tebuconazole	C16H22ClN3O	µg/L	<2,00	1	
NEONICOTINOID	59	Imidacloprid	C9H10ClN5O2	µg/L	<5,00	No limits	
	60	Methylparaoxon	C8H10NO6P	µg/L	<25,0	No limits	
	61	Thiamethoxam	C10H6F17NO2S	µg/L	--	No limits	
FLUORATED	62	Sulfluramide	C10H6F17NO2S	µg/L	--	No limits	
PHENYLPYRAZOLES	63	Fipronil	C12H4Cl2F6N4O.	µg/L	<0,01	No limits	

TABLE 16. HYDROBIOLOGICAL AND BACTERIOLOGICAL PARAMETERS – FW304-HE				
FW 304-HE – HYDROBIOLOGICAL PARAMETERS				
(Nº 64) PHYTOPLANKTON DIVERSITY				
Type			**Species**	**Measured value**
C Y A N O B A C T E R I A **(120)**			*Phormidium sp.*	120
B A C I L L A R I O P H Y T A **(15)**			*Gomphonema sp.*	15
E U G L E N O Z O A **(25)**			*Euglena sp.*	25
Presence of organic material	+		TOTAL CELLS /mL	**160**
Presence of sediment	+		Abundant/dominant organism	*Phormidium sp.* 75,0%
			Range of risk	Null
CODES				
+(less than half of the field)	++ (half of the field)		+++ (whole field)	**X** (sporadically observed)
Risk level (UNESCO)	Null until 10.000 Cel/mL		Alert I – between 10.000 to 20.000 Cel/mL	Alert II More than 20.000 Cel/mL
(Nº 65) ZOOPLANKTON DIVERSITY				
Type			**Species**	**Measured value**
Absence of zooplankton.				
Plant remains	No		TOTAL CELLS /mL	
Colour	Yellowish		Abundant/dominant organism	
BACTERIOLOGICAL PARAMETERS				
Nº	**Parameters**	**Unit**	**Measured value**	**Regulation 222/02**
66	Feacal coliforms	NMP/100mL	330	200 NMP/100mL
67	Total coliforms	NMP/100mL	3500	1000 NMP/100mL

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A.5 Analytical determinations of point FW 100-GASL

TABLE 2. PARAMETERS MEASURED ON THE SITE – FW 100-GASL			
FW 100-GASL			
SAMPLING POINT DATA			
Sampling time		Air temperature	
Atmospheric conditions		Relative humidity	
UTM coordinates		Elevation	

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards***
1	Water temperature	T_{agua}	ºC	24,9	NO LIMITS	
2	Hydrogen potential	pH	---	7,22	6 - 9	
3	Electrical conductivity	σ	µS/cm	294	NO LIMITS	[2] <1500
4	Dissolved oxygen	DO	mg O_2/L	**4,47**	> 5 mg O_2/L	
5	Turbidity		m	8,48	100 NTU	

TABLE 3. PHYSICOCHEMICAL PARAMETERS - FW 100-GASL						
FW 100-GASL						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards***
6	Floating materials			14,8	Visually absent..	
7	Total dissolved solids	TDS	mg/L	109	500	
8	Oil and grease		mg/L	2,67	Visually absent.	
9	Chemical oxygen demand	DQO	mg O_2/L	96,6	NO LIMITS	[1] <150
10	Biological oxygen demand	DBO_5	mg O_2/L	4,55	5	
11	Total phosphorus	P	mg/L	**0,0586**	0,05	
12	Total nitrogen	N	mg/L	**0,750**	0,6	
13	Nitrates	NO_{3-}	mg/L	<0,0200	10	
14	Ammonia	NH_3	mg/L	**0,0457**	0,02	
15	Nitrites	NO_{2-}	mg/L	0,0179	1	
16	Hardness		mg $CaCO_3$/L	130	300	
17	Sulphates	SO_4^{2-}	mg/L	0,102	250	
18	Sodium	Na	mg/L	16,1	200	
19	Aluminum	Al	mg/L	<0,01	0,2	
20	Cadmium	Cd	mg/L	<0,0008	2	
21	Hexavalent chromium	Cr (VI)	mg/L	<0,0500	0,05	
22	Trivalent chromium	Cr (III)	mg/L	<0,0500	0,5	
23	Copper	Cu	mg/L	<0,0500	1	
24	Tin	Sn	mg/L	<1	2	
25	Nickel	Ni	mg/L	<0,01	0,025	
26	Manganese	Mn	mg/L	<0,0500	0,1	

27	Lead	Pb	mg/L	<0,002	0,01	
28	Selenium	Se	mg/L	<0,005	0,01	
29	Zinc	Zn	mg/L	0,0518	3	
30	Arsenic	As	mg/L	0,913	0,5	
31	Soluble iron	Fe^{++}	mg/L	**0,550**	0,3	
32	Mercury	Hg	mg/L	0,001	2	
33	Barium	Ba	mg/L	0,49	2	
34	Cyanides	CN^-	mg/L	<0,02	0,07	

TABLE 4. AGROCHEMICALS IN SURFACE WATER – FW 100-GASL							
AGROCHEMICAL							
GROUP AOX	**Nº**	**Parameter**	**Chemical formula**	**Unit**	**Measured value**	**Limits**	
						Regulation 222/02	**Alternative reference standards***
PHOSPHOGLYCINE	35	Glyphosate	C3H8NO6P	µg/L	<0,300	0,7	
	36	AMPA	CH6NO3P	µg/L	<0,300	No limits	
CHLORDANE	37	Aldrin	C12H8Cl6	µg/L	<1,00	No limits	
	38	Endrin	C12H8Cl6O	µg/L	<1,25	2	
	39	Dieldrin	C12H8Cl6O	µg/L	<1,50	No limits	
	40	Lindane	C6H6Cl6	µg/L	<0,2	0,2	
	41	Chlordane	C10H6Cl8	µg/L	<0,90	No limits	
	42	DDT	C10H6Cl8	µg/L	<2,00	2	
	43	DDE	--	µg/L	<2,00	No limits	
	44	DDD	--	µg/L	<2,00	No limits	
TRIAZINE	45	Atriazine	C8H14ClN5	µg/L	<2,00	3	
	46	Simazine	C7H12ClN5	µg/L	<2,50	4	
CARBAMATE	47	Carbaryl	C12H11NO2	µg/L	<3,50	No limits	
	48	Carbofuran	C12H15NO3	µg/L	<3,00	4	
	49	Heptachlor	C10H5Cl7	µg/L	<1,50	0	
	50	Methomyl	C5H10N2O2S	µg/L	<25,0	No limits	
ALKYLCHLORO-PHENOXY	51	2,4 D	C8H6Cl2O3	µg/L	<2,50	30	
PYRETHROIDS	52	Lambdacialothrin	$C_{23}H_{19}ClF_3NO_3$	µg/L	--	No limits	
	53	Bifenthrin	C23H22 ClF3NO2	µg/L	--	No limits	
	54	Cypermethrin	C22H19Cl2NO3	µg/L	<1,20	No limits	
	55	Chlorpyrifos	C9H11Cl3NO3PS	µg/L	<5,00	No limits	
	56	Dichlorvos	C4H7Cl2O4P	µg/L	<10,0	10	
	57	Methamidophos	C2H8NO2PS	µg/L	<25,0	No limits	
TRIAZOLEE	58	Tebuconazole	C16H22ClN3O	µg/L	<2,00	1	
NEONICOTINOID	59	Imidacloprid	C9H10ClN5O2	µg/L	<5,00	No limits	
	60	Methylparaoxon	C8H10NO6P	µg/L	<25,0	No limits	
	61	Thiamethoxam	C10H6F17NO2S	µg/L	--	No limits	
FLUORATED	62	Sulfluramide	C10H6F17NO2S	µg/L	--	No limits	
PHENYLPYRAZOLES	63	Fipronil	C12H4Cl2F6N4O	µg/L	<0,01	No limits	

TABLE 5. - HYDROBIOLOGICAL PARAMETERS - FW 100-GASL				
(Nº 64) PHYTOPLANKTON DIVERSITY				
Type			**Species**	**Measured value**
Presence of organic material			TOTAL CELLS /mL	
Presence of sediment			Abundant/dominant organism	
			Range of risk	Null
CODES				
+(less than half of the field)	++ (half of the field)		+++ (whole field)	**X** (sporadically observed)
Risk level (UNESCO)	Null until 10.000 Cel/mL		Alert I - between 10.000 to 20.000 Cel/mL	Alert II More than 20.000 Cel/mL
(Nº65) ZOOPLANKTON DIVERSITY				
Type			**Species**	**Measured value**
Absence of zooplankton				
Plant remains			TOTAL CELLS /mL	
Colour			Abundant/dominant organism	
BACTERIOLOGICAL PARAMETERS				
Nº	**Parameters**	**Unit**	**Measured value**	**Regulation 222/02**
66	Feacal coliforms	NMP/100mL	140	200 NMP/100mL
67	Total coliforms	NMP/100mL	1600	1000 NMP/100mL

A.6 Analytical determinations of point FW 200-SLTR

TABLE 6. PARAMETERS MEASURED ON THE SITE – FW 200-SLTR			
FW 200-SLTR			
SAMPLING POINT DATA			
Sampling time	14:30	Air temperature	28 ºC
Atmospheric conditions	Cloudy, light rain	Relative humidity	83%
UTM coordinates	21K 519072.00 m E; 7494784.00 m S	Elevation	173

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards***
1	Water temperature	T_{agua}	ºC	28,1	NO LIMITS	
2	Hydrogen potential	pH	---	6,01	6 - 9	
3	Electrical conductivity	σ	µS/cm	23,1	NO LIMITS	[2] <1500
4	Dissolved oxygen	DO	mg O_2/L	6,73	> 5 mg O_2/L	
5	Turbidity		m	489	100 NTU	

TABLE 7. PHYSICOCHEMICAL PARAMETERS - FW 200-SLTR						
FW 200-SLTR						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards***
6	Floating materials			149	Visually absent	
7	Total dissolved solids	TDS	mg/L	130	500	
8	Oil and grease		mg/L	10,3	Visually absent	
9	Chemical oxygen demand	DQO	mg O_2/L	72,6	No limits	[1] <150
10	Biological oxygen demand	DBO_5	mg O_2/L	4,60	5	
11	Total phosphorus	P	mg/L	0,0334	0,05	
12	Total nitrogen	N	mg/L	<0,100	0,6	
13	Nitrates	NO_{3-}	mg/L	5,52	10	
14	Ammonia	NH_3	mg/L	0,138	0,02	
15	Nitrites	NO_{2-}	mg/L	<0,00250	1	
16	Hardness		mg $CaCO_3$/L	6,46	300	
17	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
18	Sodium	Na	mg/L	2,77	200	
19	Aluminum	Al	mg/L	<0,01	0,2	
20	Cadmium	Cd	mg/L	<0,008	2	
21	Hexavalent chromium	Cr (VI)	mg/L	<0,0500	0,05	
22	Trivalent chromium	Cr (III)	mg/L	<0,0500	0,5	
23	Copper	Cu	mg/L	<0,0500	1	
24	Tin	Sn	mg/L	<1	2	
25	Nickel	Ni	mg/L	<0,01	0,025	
26	Manganese	Mn	mg/L	<0,0500	0,1	

TABLE 7. PHYSICOCHEMICAL PARAMETERS - FW 200-SLTR						
FW 200-SLTR						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured**	**Limits**	
27	Lead	Pb	mg/L	0,00947	0,01	
28	Selenium	Se	mg/L	<0,005	0,01	
29	Zinc	Zn	mg/L	<0,0500	3	
30	Arsenic	As	mg/L	0,0536	0,5	
31	Soluble iron	Fe^{++}	mg/L	1,05	0,3	
32	Mercury	Hg	mg/L	0,001	2	
33	Barium	Ba	mg/L	0,13	2	
34	Cyanides	CN^-	mg/L	<0,02	0,07	

TABLE 8. AGROCHEMICALS IN SURFACE WATER – FW 200-SLTR							
AGROCHEMICALS							
GROUP AOX	Nº	**Parameter**	**Chemical formula**	**Unit**	**Measured value**	**Limits**	
						Regulation 222/02	**Alternative reference standards.***
PHOSPHOGLYCINE	35	Glyphosate	C3H8NO6P	µg/L	<0,300	0,7	
	36	AMPA	CH6NO3P	µg/L	<0,300	No limits	
CHLORDANE	37	Aldrin	C12H8Cl6	µg/L	<1,00	No limits	
	38	Endrin	C12H8Cl6O	µg/L	<1,25	2	
	39	Dieldrin	C12H8Cl6O	µg/L	<1,50	No limits	
	40	Lindane	C6H6Cl6	µg/L	<0,2	0,2	
	41	Chlordane	C10H6Cl8	µg/L	<0,90	No limits	
	42	DDT	C10H6Cl8	µg/L	<2,00	2	
	43	DDE	--	µg/L	<2,00	No limits	
	44	DDD	--	µg/L	<2,00	No limits	
TRIAZINE	45	Atriazine	C8H14ClN5	µg/L	<2,00	3	
	46	Simazine	C7H12ClN5	µg/L	<2,50	4	
CARBAMATE	47	Carbaryl	C12H11NO2	µg/L	<3,50	No limits	
	48	Carbofuran	C12H15NO3	µg/L	<3,00	4	
	49	Heptachlor	C10H5Cl7	µg/L	<1,50	0	
	50	Methomyl	C5H10N2O2S	µg/L	<25,0	No limits	
ALKYLCHLORO-PHENOXY	51	2,4 D	C8H6Cl2O3	µg/L	<2,50	30	
PYRETHROIDS	52	Lambdacialothrin	$C_{23}H_{19}ClF_3NO_3$	µg/L	--	No limits	
	53	Bifenthrin	C23H22 ClF3NO2	µg/L	--	No limits	
	54	Cypermethrin	C22H19Cl2NO3	µg/L	<1,20	No limits	
	55	Chlorpyrifos	C9H11Cl3NO3PS	µg/L	<5,00	No limits	
	56	Dichlorvos	C4H7Cl2O4P	µg/L	<10,0	10	
	57	Methamidophos	C2H8NO2PS	µg/L	<25,0	No limits	
TRIAZOLE	58	Tebuconazole	C16H22ClN3O	µg/L	<2,00	1	
NEONICOTINOID	59	Imidacloprid	C9H10ClN5O2	µg/L	<5,00	No limits	
	60	Methylparaoxon	C8H10NO6P	µg/L	<25,0	No limits	
	61	Thiamethoxam	C10H6F17NO2S	µg/L	--	No limits	
FLUORATED	62	Sulfluramide	C10H6F17NO2S	µg/L	--	No limits	

TABLE 8. AGROCHEMICALS IN SURFACE WATER – FW 200-SLTR							
AGROCHEMICALS							
GROUP AOX	Nº	**Parameter**	**Chemical**	**Unit**	**Measured**	**Limits**	
PHENYLPYRAZOLES	63	Fipronil	C12H4Cl2F6N4O.	µg/L	<0,01	No limits	

TABLE 9. HYDROBIOLOGICAL PARAMETERS - FW 200-SLTR			
(Nº 64) PHYTOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
CYANOBACTERIA **(276)**		*Pseudanabaena sp.*	276
BACILLARIOPHYTA **(92)**		Diatomeas pennadas	92
EUGLENOZOA **(25)**		*Euglena sp.*	25
Presence of organic material	+	TOTAL CELLS /mL	**393**
Presence of sediment	+++	Abundant/dominant organism	*Pseudanabaena sp.* 70,2%
		Range of risk	Null
CODES			
+(less than half of the field)	++ (half of the field)	+++ (whole field)	**X** (sporadically observed)
Risk level (UNESCO)	Null until 10.000 Cel/mL	Alert I - between 10.000 to 20.000 Cel/mL	Alert II More than 20.000 Cel/mL
(Nº65) ZOOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
Absence of zooplankton			
Plant remains	No	TOTAL CELLS /mL	n/a
Colour	Yellowish	Abundant/dominant organism	n/a

BACTERIOLOGICAL PARAMETERS				
Nº	**Parameters**	**Unit**	**Measured value**	**Regulation 222/02**
66	Feacal coliforms	NMP/100mL	7900	200 NMP/100mL
67	Total coliforms	NMP/100mL	22000	1000 NMP/100mL

A.7 Analytical determinations of point FW 207-TR

TABLE 10. DATOS Y PARAMETERS TOMADOS EN CAMPO FW 207-TR.			
FW 207-TR			
SAMPLING POINT DATA			
Sampling time	15:10	Air temperature	28 ºC
Atmospheric conditions	Cloudy, rainy	Relative humidity	76%
UTM coordinates	21K 518004.00 m E; 7490567.00 m S	Elevation	161

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards***
1	Water temperature	T_{agua}	ºC	26,3	No limits	
2	Hydrogen potential	pH	---	6,56	6 - 9	
3	Electrical conductivity	σ	µS/cm	77,9	No limits	[2] <1500
4	Dissolved oxygen	DO	mg O_2/L	**2,43**	> 5 mg O_2/L	
5	Turbidity		m	47,4	100 NTU	

TABLE 11. PHYSICOCHEMICAL PARAMETERS - FW 207-TR						
FW 207-TR						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards***
6	Floating materials			10,0	Visually absent	
7	Total dissolved solids	TDS	mg/L	120	500	
8	Oil and grease		mg/L	5,50	Visually absent	
9	Chemical oxygen demand	DQO	mg O_2/L	106	No limits	[1] <150
10	Biological oxygen demand	DBO_5	mg O_2/L	3,21	5	
11	Total phosphorus	P	mg/L	0,0796	0,05	
12	Total nitrogen	N	mg/L	0,352	0,6	
13	Nitrates	NO_{3-}	mg/L	2,13	10	
14	Ammonia	NH_3	mg/L	0,0687	0,02	
15	Nitrites	NO_{2-}	mg/L	<0,00250	1	
16	Hardness		mg $CaCO_3$/L	10,9	300	
17	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
18	Sodium	Na	mg/L	7,53	200	
19	Aluminum	Al	mg/L	<0,01	0,2	
20	Cadmium	Cd	mg/L	<0,0008	2	
21	Hexavalent chromium	Cr (VI)	mg/L	<0,0500	0,05	
22	Trivalent chromium	Cr (III)	mg/L	<0,0500	0,5	
23	Copper	Cu	mg/L	<0,0500	1	
24	Tin	Sn	mg/L	<1,00	2	
25	Nickel	Ni	mg/L	<0,001	0,025	
26	Manganese	Mn	mg/L	<0,0500	0,1	

TABLE 11. PHYSICOCHEMICAL PARAMETERS - FW 207-TR						
FW 207-TR						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured**	**Limits**	
27	Lead	Pb	mg/L	0,0048	0,01	
28	Selenium	Se	mg/L	<0,005	0,01	
29	Zinc	Zn	mg/L	0,284	3	
30	Arsenic	As	mg/L	0,0190	0,5	
31	Soluble iron	Fe^{++}	mg/L	3,31	0,3	
32	Mercury	Hg	mg/L	0,001	2	
33	Barium	Ba	mg/L	0,14	2	
34	Cyanides	CN^-	mg/L	<0,02	0,07	

TABLE 12. AGROCHEMICALS IN SURFACE WATER – FW 207-TR							
FW 207 - TR							
AGROCHEMICALS							
GROUP AOX	Nº	**Parameter**	**Chemical formula**	**Unit**	**Measured value**	**Limits**	
						Regulation 222/02	**Alternative reference standards***
PHOSPHOGLYCINE	35	Glyphosate	C3H8NO6P	µg/L	<0,300	0,7	
	36	AMPA	CH6NO3P	µg/L	<0,300	No limits	
CHLORDANE	37	Aldrin	C12H8Cl6	µg/L	<1,00	No limits	
	38	Endrin	C12H8Cl6O	µg/L	<1,25	2	
	39	Dieldrin	C12H8Cl6O	µg/L	<1,50	No limits	
	40	Lindane	C6H6Cl6	µg/L	<0,2	0,2	
	41	Chlordane	C10H6Cl8	µg/L	<0,90	No limits	
	42	DDT	C10H6Cl8	µg/L	<2,00	2	
	43	DDE	--	µg/L	<2,00	No limits	
	44	DDD	--	µg/L	<2,00	No limits	
TRIAZINE	45	Atriazine	C8H14ClN5	µg/L	<2,00	3	
	46	Simazine	C7H12ClN5	µg/L	<2,50	4	
CARBAMATE	47	Carbaryl	C12H11NO2	µg/L	<3,50	No limits	
	48	Carbofuran	C12H15NO3	µg/L	<3,00	4	
	49	Heptachlor	C10H5Cl7	µg/L	<1,50	0	
	50	Methomyl	C5H10N2O2S	µg/L	<25,0	No limits	
ALKYLCHLORO-PHENOXY	51	2,4 D	C8H6Cl2O3	µg/L	<2,50	30	
PYRETHROIDS	52	Lambdacialothrin	$C_{23}H_{19}ClF_3NO_3$	µg/L	--	No limits	
	53	Bifenthrin	C23H22 ClF3NO2	µg/L	--	No limits	
	54	Cypermethrin	C22H19Cl2NO3	µg/L	<1,20	No limits	
	55	Chlorpyrifos	C9H11Cl3NO3P S	µg/L	<5,00	No limits	
	56	Dichlorvos	C4H7Cl2O4P	µg/L	<10,0	10	
	57	Methamidophos	C2H8NO2PS	µg/L	<25,0	No limits	
TRIAZOLE	58	Tebuconazole	C16H22ClN3O	µg/L	<2,00	1	
NEONICOTINOID	59	Imidacloprid	C9H10ClN5O2	µg/L	<5,00	No limits	
	60	Methylparaoxon	C8H10NO6P	µg/L	<25,0	No limits	
	61	Thiamethoxam	C10H6F17NO2S	µg/L	--	No limits	

TABLE 12. AGROCHEMICALS IN SURFACE WATER – FW 207-TR							
FW 207 - TR							
AGROCHEMICALS							
GROUP AOX	Nº	**Parameter**	**Chemical**	**Unit**	**Measured**	**Limits**	
FLUORATED	62	Sulfluramide	C10H6F17NO2S	µg/L	--	No limits	
PHENYLPYRAZOLES	63	Fipronil	C12H4Cl2F6N4O.	µg/L	<0,01	No limits	

TABLE 13. HYDROBIOLOGICAL PARAMETERS - FW 207-TR				
(Nº 64) PHYTOPLANKTON DIVERSITY				
Type			**Species**	**Measured value**
C Y A N O B A C T E R I A **(1150)**			*Pseudanabaena sp.*	1150
C H L O R O P H Y T A **(322)**			*Chlorococcales coccoides*	322
B A C I L L A R I O P H Y T A **(161)**			*Diatomeas pennadas*	161
C R Y P T O P H Y T A **(23)**			*Cryptomonadales sp*	23
E U G L E N O Z O A **(184)**			*Phacus sp.*	115
			Trachelomonas sp.	69
Presence of organic material		+	TOTAL CELLS /mL	**1840**
Presence of sediment		+++	Abundant/dominant organism	*Pseudanabaena sp.* 62,5%
			Range of risk	Null
CODES				
+(less than half of the field)		++ (half of the field)	+++ (whole field)	**X** (sporadically observed)
Risk level (UNESCO)		Null until 10.000 Cel/mL	Alert I - between 10.000 to 20.000 Cel/mL	Alert II More than 20.000 Cel/mL
(Nº65) ZOOPLANKTON DIVERSITY				
Type			**Species**	**Measured value**
Absence of zooplankton.				
Plant remains		No	TOTAL CELLS /mL	n/a
Colour		Yellowish	Abundant/dominant organism	n/a
BACTERIOLOGICAL PARAMETERS				
Nº	**Parameters**	**Unit**	**Measured value**	**Regulation 222/02**
66	Feacal coliforms	NMP/100mL	790	200 NMP/100mL
67	Total coliforms	NMP/100mL	1700	1000 NMP/100mL

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A.8 Analytical determinations of point FW 208-TR

TABLE 14. PARAMETERS MEASURED ON THE SITE - FW 208-TR			
FW 208-TR			
SAMPLING POINT DATA			
Sampling time	7:00	Air temperature	26 ºC
Atmospheric conditions	Sunny with some clouds	Relative humidity	60%
UTM coordinates	21K 514416.00 m E; 7485700.00 m S	Elevation	140

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards***
1	Water temperature	T_{agua}	ºC	21,1	No limits	
2	Hydrogen potential	pH	---	6,88	6 - 9	
3	Electrical conductivity	σ	µS/cm	127	No limits	[2] <1500
4	Dissolved oxygen	DO	mg O_2/L	**4,30**	> 5 mg O_2/L	
5	Turbidity		m	40,3	100 NTU	

TABLE 15. PHYSICOCHEMICAL PARAMETERS - FW 208-TR						
FW 208-TR						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards***
6	Floating materials			5,00	Visually absent..	
7	Total dissolved solids	TDS	mg/L	231	500	
8	Oil and grease		mg/L	8,25	Visually absent.	
9	Chemical oxygen demand	DQO	mg O_2/L	81,6	NO LIMITS	[1] <150
10	Biological oxygen demand	DBO_5	mg O_2/L	3,53	5	
11	Total phosphorus	P	mg/L	<0,0200	0,05	
12	Total nitrogen	N	mg/L	0,748	0,6	
13	Nitrates	NO_{3-}	mg/L	1,37	10	
14	Ammonia	NH_3	mg/L	0,0603	0,02	
15	Nitrites	NO_{2-}	mg/L	0,0203	1	
16	Hardness		mg $CaCO_3$/L	38,4	300	
17	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
18	Sodium	Na	mg/L	8,84	200	
19	Aluminum	Al	mg/L	<0,01	0,2	
20	Cadmium	Cd	mg/L	<0,0008	2	
21	Hexavalent chromium	Cr (VI)	mg/L	<0,0500	0,05	
22	Trivalent chromium	Cr (III)	mg/L	<0,0500	0,5	
23	Copper	Cu	mg/L	<0,0500	1	
24	Tin	Sn	mg/L	<1,00	2	
25	Nickel	Ni	mg/L	<0,001	0,025	

TABLE 15. PHYSICOCHEMICAL PARAMETERS - FW 208-TR						
FW 208-TR						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured**	**Limits**	
26	Manganese	Mn	mg/L	<0,0500	0,1	
27	Lead	Pb	mg/L	<0,002	0,01	
28	Selenium	Se	mg/L	<0,005	0,01	
29	Zinc	Zn	mg/L	<0,0500	3	
30	Arsenic	As	mg/L	0,0359	0,5	
31	Soluble iron	Fe^{++}	mg/L	1,33	0,3	
32	Mercury	Hg	mg/L	0,001	2	
33	Barium	Ba	mg/L	0,13	2	
34	Cyanides	CN^-	mg/L	<0,02	0,07	

TABLE 16. AGROCHEMICALS IN SURFACE WATER – FW 208 TR							
FW 208 TR							
AGROCHEMICALS							
AOX GROUP	Nº	**Parameter**	**Chemical formula**	**Unit**	**Measured value**	**Limites**	
						Regulation 222/02	**Alternative reference standards***
PHOSPHOGLYCINE	35	Glyphosate	C3H8NO6P	µg/L	<0,300	0,7	
	36	AMPA	CH6NO3P	µg/L	<0,300	No limits	
CHLORDANE	37	Aldrin	C12H8Cl6	µg/L	<1,00	No limits	
	38	Endrin	C12H8Cl6O	µg/L	<1,25	2	
	39	Dieldrin	C12H8Cl6O	µg/L	<1,50	No limits	
	40	Lindane	C6H6Cl6	µg/L	<0,2	0,2	
	41	Chlordane	C10H6Cl8	µg/L	<0,90	No limits	
	42	DDT	C10H6Cl8	µg/L	<2,00	2	
	43	DDE	--	µg/L	<2,00	No limits	
	44	DDD	--	µg/L	<2,00	No limits	
TRIAZINE	45	Atriazine	C8H14ClN5	µg/L	<2,00	3	
	46	Simazine	C7H12ClN5	µg/L	<2,50	4	
CARBAMATE	47	Carbaryl	C12H11NO2	µg/L	<3,50	No limits	
	48	Carbofuran	C12H15NO3	µg/L	<3,00	4	
	49	Heptachlor	C10H5Cl7	µg/L	<1,50	0	
	50	Methomyl	C5H10N2O2S	µg/L	<25,0	No limits	
ALKYLCHLORO-PHENOXY	51	2,4 D	C8H6Cl2O3	µg/L	<2,50	30	
PYRETHROIDS	52	Lambdacialothrin	$C_{23}H_{19}ClF_3NO_3$	µg/L	--	No limits	
	53	Bifenthrin	C23H22 ClF3NO2	µg/L	--	No limits	
	54	Cypermethrin	C22H19Cl2NO3	µg/L	<1,20	No limits	
	55	Chlorpyrifos	C9H11Cl3NO3PS	µg/L	<5,00	No limits	
	56	Dichlorvos	C4H7Cl2O4P	µg/L	<10,0	10	
	57	Methamidophos	C2H8NO2PS	µg/L	<25,0	No limits	
TRIAZOLE	58	Tebuconazole	C16H22ClN3O	µg/L	<2,00	1	
NEONICOTINOID	59	Imidacloprid	C9H10ClN5O2	µg/L	<5,00	No limits	
	60	Methylparaoxon	C8H10NO6P	µg/L	<25,0	No limits	

	61	Thiamethoxam	C10H6F17NO2S	µg/L	--	No limits	
FLUORATED	62	Sulfluramide	C10H6F17NO2S	µg/L	--	No limits	
PHENYLPYRAZOLES	63	Fipronil	C12H4Cl2F6N4O.	µg/L	<0,01	No limits	

TABLE 17. HYDROBIOLOGICAL PARAMETERS - FW 208-TR

(Nº 64) PHYTOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
C Y A N O B A C T E R I A **(135)**		*Pseudanabaena sp.*	135
C H L O R O P H Y T A **(50)**		*Monoraphidium sp.*	50
B A C I L L A R I O P H Y T A **(10)**		*Diatomeas pennadas*	10
C R Y P T O P H Y T A **(5)**		*Cryptomonadales sp*	5
Presence of organic material	+	TOTAL CELLS /mL	**200**
Presence of sediment	+++	Abundant/dominant organism	Pseudanabaena sp. 67,5%
		Range of risk	Null
CODES			
+(less than half of the field)	++ (half of the field)	+++ (whole field)	**X** (sporadically observed)
Risk level (UNESCO)	Null until 10.000 Cel/mL	Alert I - between 10.000 to 20.000 Cel/mL	Alert II More than 20.000 Cel/mL

(Nº65) ZOOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
Absence of zooplankton.			
Plant remains	No	TOTAL CELLS /mL	
Colour	Yellowish	Abundant/dominant organism	

BACTERIOLÓGICAL PARAMETERS				
Nº	**Parameters**	**Unit**	**Measured value**	**Regulation 222/02**
66	Feacal coliforms	NMP/100mL	**35000**	200 NMP/100mL
67	Total coliforms	NMP/100mL	**35000**	1000 NMP/100mL

A.9 Analytical determination of point FW205-TR

TABLE 18. PARAMETERS MEASURED ON THE SITE - FW 205-TR.			
FW 205-TR			
SAMPLING POINT DATA			
Sampling time	15:50	Air temperature	26 ºC
Atmospheric conditions	Cloudy, rainy	Relative humidity	80%
UTM coordinates	21K 516574.00 m E; 7482061.00 m S	Elevation	151

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards***
1	Water temperature	T_{agua}	ºC	25,8	No limits	
2	Hydrogen potential	pH	---	7,18	6 - 9	
3	Electrical conductivity	σ	µS/cm	67,9	No limits	[2] <1500
4	Dissolved oxygen	DO	mg O_2/L	5,91	> 5 mg O_2/L	
5	Turbidity		m	77,7	100 NTU	

TABLE 19. PHYSICOCHEMICAL PARAMETERS - FW 205-TR						
FW 205-TR						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards***
6	Floating materials			82,0	Visually absent	
7	Total dissolved solids	TDS	mg/L	317	500	
8	Oil and grease		mg/L	8,75	Visually absent	
9	Chemical oxygen demand	DQO	mg O_2/L	114	NO LIMITS	[1] <150
10	Biological oxygen demand	DBO_5	mg O_2/L	5,32	5	
11	Total phosphorus	P	mg/L	0,384	0,05	
12	Total nitrogen	N	mg/L	0,443	0,6	
13	Nitrates	NO_{3-}	mg/L	6,63	10	
14	Ammonia	NH_3	mg/L	0,521	0,02	
15	Nitrites	NO_{2-}	mg/L	<0,00250	1	
16	Hardness		mg $CaCO_3$/L	13,1	300	
17	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
18	Sodium	Na	mg/L	8,52	200	
19	Aluminum	Al	mg/L	<0,01	0,2	
20	Cadmium	Cd	mg/L	<0,0008	2	
21	Hexavalent chromium	Cr (VI)	mg/L	<0,0500	0,05	
22	Trivalent chromium	Cr (III)	mg/L	<0,0500	0,5	
23	Copper	Cu	mg/L	<0,0500	1	
24	Tin	Sn	mg/L	<1,00	2	
25	Nickel	Ni	mg/L	0,145	0,025	
26	Manganese	Mn	mg/L	0,127	0,1	

TABLE 19. PHYSICOCHEMICAL PARAMETERS - FW 205-TR						
FW 205-TR						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured**	**Limits**	
27	Lead	Pb	mg/L	0,0085	0,01	
28	Selenium	Se	mg/L	<0,005	0,01	
29	Zinc	Zn	mg/L	<0,0500	3	
30	Arsenic	As	mg/L	0,0360	0,5	
31	Soluble iron	Fe^{++}	mg/L	1,56	0,3	
32	Mercury	Hg	mg/L	0,001	2	
33	Barium	Ba	mg/L	0,35	2	
34	Cyanides	CN^-	mg/L	<0,02	0,07	

TABLE 20. AGROCHEMICALS IN SURFACE WATER – FW 205-TR							
FW 205-TR							
AGROCHEMICALS							
GROUP AOX	Nº	**Parameter**	**Chemical formula**	**Unit**	**Measured value**	**Limits**	
						Regulation 222/02	**Alternative reference standards***
PHOSPHOGLYCINE	35	Glyphosate	C3H8NO6P	µg/L	<0,300	0,7	
	36	AMPA	CH6NO3P	µg/L	<0,300	No limits	
CHLORDANE	37	Aldrin	C12H8Cl6	µg/L	<1,00	No limits	
	38	Endrin	C12H8Cl6O	µg/L	<1,25	2	
	39	Dieldrin	C12H8Cl6O	µg/L	<1,50	No limits	
	40	Lindane	C6H6Cl6	µg/L	<0,2	0,2	
	41	Chlordane	C10H6Cl8	µg/L	<0,90	No limits	
	42	DDT	C10H6Cl8	µg/L	<2,00	2	
	43	DDE	--	µg/L	<2,00	No limits	
	44	DDD	--	µg/L	<2,00	No limits	
TRIAZINE	45	Atriazine	C8H14ClN5	µg/L	<2,00	3	
	46	Simazine	C7H12ClN5	µg/L	<2,50	4	
CARBAMATE	47	Carbaryl	C12H11NO2	µg/L	<3,50	No limits	
	48	Carbofuran	C12H15NO3	µg/L	<3,00	4	
	49	Heptachlor	C10H5Cl7	µg/L	<1,50	0	
	50	Methomyl	C5H10N2O2S	µg/L	<25,0	No limits	
ALKYLCHLORO-PHENOXY	51	2,4 D	C8H6Cl2O3	µg/L	<2,50	30	
PYRETHROIDS	52	Lambdacialothrin	$C_{23}H_{19}ClF_3NO_3$	µg/L	--	No limits	
	53	Bifenthrin	C23H22 ClF3NO2	µg/L	--	No limits	
	54	Cypermethrin	C22H19Cl2NO3	µg/L	<1,20	No limits	
	55	Chlorpyrifos	C9H11Cl3NO3PS	µg/L	<5,00	No limits	
	56	Dichlorvos	C4H7Cl2O4P	µg/L	<10,0	10	
	57	Methamidophos	C2H8NO2PS	µg/L	<25,0	No limits	
TRIAZOLE	58	Tebuconazole	C16H22ClN3O	µg/L	<2,00	1	
NEONICOTINOID	59	Imidacloprid	C9H10ClN5O2	µg/L	<5,00	No limits	
	60	Methylparaoxon	C8H10NO6P	µg/L	<25,0	No limits	
	61	Thiamethoxam	C10H6F17NO2S	µg/L	--	No limits	

TABLE 20. AGROCHEMICALS IN SURFACE WATER – FW 205-TR							
FW 205-TR							
AGROCHEMICALS							
GROUP AOX	Nº	**Parameter**	**Chemical**	**Unit**	**Measured**	**Limits**	
FLUORATED	62	Sulfluramide	C10H6F17NO2S	µg/L	--	No limits	
PHENYLPYRAZOLES	63	Fipronil	C12H4Cl2F6N4O.	µg/L	<0,01	No limits	

TABLE 21. HYDROBIOLOGICAL PARAMETERS - FW 205 TR				
FW 205-TR – HYDROBIOLOGICAL PARAMETERS				
(Nº 64) PHYTOPLANKTON DIVERSITY				
Type			**Species**	**Measured value**
B A C I L L A R I O P H Y T A **(146)**			*Navicula sp.*	**146**
Presence of organic material	+		TOTAL CELLS /mL	**146**
Presence of sediment	+++		Abundant/dominant organism	*Navicula sp.* 100%
Insect remains	X		Range of risk	Null
CODES				
+(less than half of the field)	**++** (half of the field)		**+++** (whole field)	**X** (sporadically observed)
Risk level (UNESCO)	Null until 10.000 Cel/mL		Alert I - between 10.000 to 20.000 Cel/mL	Alert II More than 20.000 Cel/mL
(Nº65) ZOOPLANKTON DIVERSITY				
Type			**Species**	**Measured value**
ROTÍFERA **(20)**			*Bdelloidea*	20
Plant remains	No		TOTAL CELLS /mL	**20**
Colour	Yellowish		Abundant/dominant organism	*Bdelloidea* 100%
BACTERIOLOGICAL PARAMETERS				
Nº	**Parameters**	**Unit**	**Measured value**	**Regulation 222/02**
66	Feacal coliforms	NMP/100mL	780	200 NMP/100mL
67	Total coliforms	NMP/100mL	7000	1000 NMP/100mL

A.10 Analytical determinations of point FW 109-MYRZ

TABLE 22. PARAMETERS MEASURED ON THE SITE - FW 109-MYRZ			
FW 109-MYRZ			
SAMPLING POINT DATA			
Sampling time	17:45	Air temperature	28ºC
Atmospheric conditions	Cloduy	Relative humidity	68%
UTM coordinates	21K 508110.00 m E; 7475784.00 m S	Elevation	130

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards***
1	Water temperature	T_{agua}	ºC	26,5	NO LIMITS	
2	Hydrogen potential	pH	---	6,52	6 - 9	
3	Electrical conductivity	σ	µS/cm	106	NO LIMITS	[2]<1250
4	Dissolved oxygen	DO	mg O_2/L	**4,58**	> 5 mg O_2/L	
5	Turbidity		m	46,6	100 NTU	

TABLE 23. PHYSICOCHEMICAL PARAMETERS - FW 109-MYRZ						
FW 109-MYRZ						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards***
6	Floating materials			19,0	Visually absent..	
7	Total dissolved solids	TDS	mg/L	122	500	
8	Oil and grease		mg/L	10,5	Visually absent.	
9	Chemical oxygen demand	DQO	mg O_2/L	56,4	NO LIMITS	[1]<150
10	Biological oxygen demand	DBO_5	mg O_2/L	2,51	5	
11	Total phosphorus	P	mg/L	0,194	0,05	
12	Total nitrogen	N	mg/L	0,132	0,6	
13	Nitrates	NO_{3-}	mg/L	2,18	10	
14	Ammonia	NH_3	mg/L	0,0554	0,02	
15	Nitrites	NO_{2-}	mg/L	<0,0025	1	
16	Hardness		mg $CaCO_3$/L	31,9	300	
17	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
18	Sodium	Na	mg/L	6,66	200	
19	Aluminum	Al	mg/L	<0,01	0,2	
20	Cadmium	Cd	mg/L	<0,0008	2	
21	Hexavalent chromium	Cr (VI)	mg/L	<0,0500	0,05	
22	Trivalent chromium	Cr (III)	mg/L	<0,0500	0,5	
23	Copper	Cu	mg/L	<0,0500	1	
24	Tin	Sn	mg/L	<1,00	2	
25	Nickel	Ni	mg/L	<0,001	0,025	
26	Manganese	Mn	mg/L	<0,0500	0,1	

TABLE 23. PHYSICOCHEMICAL PARAMETERS - FW 109-MYRZ						
FW 109-MYRZ						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured**	**Limits**	
27	Lead	Pb	mg/L	<0,002	0,01	
28	Selenium	Se	mg/L	<0,005	0,01	
29	Zinc	Zn	mg/L	<0,0500	3	
30	Arsenic	As	mg/L	<0,0100	0,5	
31	Soluble iron	Fe^{++}	mg/L	1,19	0,3	
32	Mercury	Hg	mg/L	0,001	2	
33	Barium	Ba	mg/L	0,13	2	
34	Cyanides	CN^-	mg/L	<0,02	0,07	

TABLE 24. AGROCHEMICALS IN SURFACE WATER – FW 109-MYRZ							
FW 109-MYRZ							
AGROCHEMICALS							
GROUP AOX	Nº	**Parameter**	**Chemical formula**	**Unit**	**Measured value**	**Limits**	
						Regulation 222/02	**Alternative reference standards***
PHOSPHOGLYCINE	35	Glyphosate	C3H8NO6P	µg/L	<0,300	0,7	
	36	AMPA	CH6NO3P	µg/L	<0,300	No limits	
CHLORDANE	37	Aldrin	C12H8Cl6	µg/L	<1,00	No limits	
	38	Endrin	C12H8Cl6O	µg/L	<1,25	2	
	39	Dieldrin	C12H8Cl6O	µg/L	<1,50	No limits	
	40	Lindane	C6H6Cl6	µg/L	<0,2	0,2	
	41	Chlordane	C10H6Cl8	µg/L	<0,90	No limits	
	42	DDT	C10H6Cl8	µg/L	<2,00	2	
	43	DDE	--	µg/L	<2,00	No limits	
	44	DDD	--	µg/L	<2,00	No limits	
TRIAZINE	45	Atriazine	C8H14ClN5	µg/L	<2,00	3	
	46	Simazine	C7H12ClN5	µg/L	<2,50	4	
CARBAMATE	47	Carbaryl	C12H11NO2	µg/L	<3,50	No limits	
	48	Carbofuran	C12H15NO3	µg/L	<3,00	4	
	49	Heptachlor	C10H5Cl7	µg/L	<1,50	0	
	50	Methomyl	C5H10N2O2S	µg/L	<25,0	No limits	
ALKYLCHLORO-PHENOXY	51	2,4 D	C8H6Cl2O3	µg/L	<2,50	30	
PYRETHROIDS	52	Lambdacialothrin	$C_{23}H_{19}ClF_3NO_3$	µg/L	--	No limits	
	53	Bifenthrin	C23H22 ClF3NO2	µg/L	--	No limits	
	54	Cypermethrin	C22H19Cl2NO3	µg/L	<1,20	No limits	
	55	Chlorpyrifos	C9H11Cl3NO3P S	µg/L	<5,00	No limits	
	56	Dichlorvos	C4H7Cl2O4P	µg/L	<10,0	10	
	57	Methamidophos	C2H8NO2PS	µg/L	<25,0	No limits	
TRIAZOLE	58	Tebuconazole	C16H22ClN3O	µg/L	<2,00	1	
NEONICOTINOID	59	Imidacloprid	C9H10ClN5O2	µg/L	<5,00	No limits	
	60	Methylparaoxon	C8H10NO6P	µg/L	<25,0	No limits	
	61	Thiamethoxam	C10H6F17NO2S	µg/L	--	No limits	
FLUORATED	62	Sulfluramide	C10H6F17NO2S	µg/L	--	No limits	

TABLE 24. AGROCHEMICALS IN SURFACE WATER – FW 109-MYRZ							
FW 109-MYRZ							
AGROCHEMICALS							
GROUP AOX	Nº	**Parameter**	**Chemical**	**Unit**	**Measured**	**Limits**	
PHENYLPYRAZOLES	63	Fipronil	C12H4Cl2F6N4O.	µg/L	<0,01	No limits	

TABLE 25. HYDROBIOLOGICAL PARAMETERS - FW 109-MYRZ			
(Nº 64) PHYTOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
C Y A N O B A C T E R I A **(322)**		*Pseudanabaena sp.*	322
C H L O R O P H Y T A **(138)**		*Monoraphidium sp.*	138
B A C I L L A R I O P H Y T A **(184)**		*Diatomeas pennadas*	**184**
Presence of organic material	+	TOTAL CELLS /mL	**644**
Presence of sediment	+	Abundant/dominant organism	*Pseudanabaena sp.* 50,0%
Presence of bacterias	+++	Range of risk	Null
CODES			
+(less than half of the field)	++ (half of the field)	+++ (whole field)	**X** (sporadically observed)
Risk level (UNESCO)	Null until 10.000 Cel/mL	Alert I - between 10.000 to 20.000 Cel/mL	Alert II More than 20.000 Cel/mL
(Nº65) ZOOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
Absence of zooplankton.			
Plant remains	No	TOTAL CELLS /mL	n/a.
Colour	Yellowish	Abundant/dominant organism	n/a.

BACTERIOLÓGICAL PARAMETERS				
Nº	**Parameters**	**Unit**	**Measured value**	**Regulation 222/02**
66	Feacal coliforms	NMP/100mL	11000	200 NMP/100mL
67	Total coliforms	NMP/100mL	11000	1000 NMP/100mL

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A.11 Analytical determinations of point FW 115-MY

TABLE 26. PARAMETERS MEASURED ON THE SITE - FW 115-MY			
FW 115-MY			
SAMPLING POINT DATA			
Sampling time	18:40	Air temperature	28,6 ºC
Atmospheric conditions	Cloudy	Relative humidity	70%
UTM coordinates	21K 509155.00 m E; 7467194.00 m S	Eelevation	138

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards***
1	Water temperature	T_{agua}	ºC	26,5	No limits	
2	Hydrogen potential	pH	---	6,94	6 - 9	
3	Electrical conductivity	σ	µS/cm	39,2	No limits	[2] <1500
4	Dissolved oxygen	DO	mg O_2/L	**4,98**	>5 mg O_2/L	
5	Turbidity		m	83,6	100 NTU	

TABLE 27. PHYSICOCHEMICAL PARAMETERS - FW 115-MY						
FW 115-MY						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards ***
6	Floating materials			54,0	Visually absent	
7	Total dissolved solids	TDS	mg/L	120	500	
8	Oil and grease		mg/L	9,00	Visually absent	
9	Chemical oxygen demand	DQO	mg O_2/L	78,0	No limits	[1] <150
10	Biological oxygen demand	DBO_5	mg O_2/L	2,93	5	
11	Total phosphorus	P	mg/L	0,0882	0,05	
12	Total nitrogen	N	mg/L	0,106	0,6	
13	Nitrates	NO_{3-}	mg/L	3,18	10	
14	Ammonia	NH_3	mg/L	0,065	0,02	
15	Nitrites	NO_{2-}	mg/L	<0,00250	1	
16	Hardness		mg $CaCO_3$/L	4,85	300	
17	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
18	Sodium	Na	mg/L	4,53	200	
19	Aluminum	Al	mg/L	<0,01	0,2	
20	Cadmium	Cd	mg/L	<0,0008	2	
21	Hexavalent chromium	Cr (VI)	mg/L	<0,0500	0,05	
22	Trivalent chromium	Cr (III)	mg/L	<0,0500	0,5	
23	Copper	Cu	mg/L	<0,0500	1	
24	Tin	Sn	mg/L	<1,00	2	
25	Nickel	Ni	mg/L	<0,001	0,025	

26	Manganese	Mn	mg/L	<0,0500	0,1	
27	Lead	Pb	mg/L	<0,002	0,01	
28	Selenium	Se	mg/L	<0,005	0,01	
29	Zinc	Zn	mg/L	<0,0500	3	
30	Arsenic	As	mg/L	<0,0100	0,5	
31	Soluble iron	Fe^{++}	mg/L	1,13	0,3	
32	Mercury	Hg	mg/L	0,001	2	
33	Barium	Ba	mg/L	0,12	2	
34	Cyanides	CN^-	mg/L	<0,02	0,07	

TABLE 28. AGROCHEMICALS IN SURFACE WATER – FW 115-MY

FW 115-MY

AGROCHEMICALS

GROUP AOX	№	**Parameter**	**Chemical formula**	**Unit**	**Measured value**	**Limits**	
						Regulation 222/02	**Alternative reference standards***
PHOSPHOGLYCINE	35	Glyphosate	C3H8NO6P	µg/L	<0,300	0,7	
	36	AMPA	CH6NO3P	µg/L	<0,300	No limits	
CHLORDANE	37	Aldrin	C12H8Cl6	µg/L	<1,00	No limits	
	38	Endrin	C12H8Cl6O	µg/L	<1,25	2	
	39	Dieldrin	C12H8Cl6O	µg/L	<1,50	No limits	
	40	Lindane	C6H6Cl6	µg/L	<0,2	0,2	
	41	Chlordane	C10H6Cl8	µg/L	<0,90	No limits	
	42	DDT	C10H6Cl8	µg/L	<2,00	2	
	43	DDE	--	µg/L	<2,00	No limits	
	44	DDD	--	µg/L	<2,00	No limits	
TRIAZINE	45	Atriazine	C8H14ClN5	µg/L	<2,00	3	
	46	Simazine	C7H12ClN5	µg/L	<2,50	4	
CARBAMATE	47	Carbaryl	C12H11NO2	µg/L	<3,50	No limits	
	48	Carbofuran	C12H15NO3	µg/L	<3,00	4	
	49	Heptachlor	C10H5Cl7	µg/L	<1,50	0	
	50	Methomyl	C5H10N2O2S	µg/L	<25,0	No limits	
ALKYLCHLORO-PHENOXY	51	2,4 D	C8H6Cl2O3	µg/L	<2,50	30	
PYRETHROIDS	52	Lambdacialothrin	$C_{23}H_{19}ClF_3NO_3$	µg/L	--	No limits	
	53	Bifenthrin	C23H22 ClF3NO2	µg/L	--	No limits	
	54	Cypermethrin	C22H19Cl2NO3	µg/L	<1,20	No limits	
	55	Chlorpyrifos	C9H11Cl3NO3PS	µg/L	<5,00	No limits	
	56	Dichlorvos	C4H7Cl2O4P	µg/L	<10,0	10	
	57	Methamidophos	C2H8NO2PS	µg/L	<25,0	No limits	
TRIAZOLE	58	Tebuconazole	C16H22ClN3O	µg/L	<2,00	No limits	
NEONICOTINOID	59	Imidacloprid	C9H10ClN5O2	µg/L	<5,00	No limits	
	60	Methylparaoxon	C8H10NO6P	µg/L	<25,0	No limits	
	61	Thiamethoxam	C10H6F17NO2S	µg/L	--	No limits	
FLUORATED	62	Sulfluramide	C10H6F17NO2S	µg/L	--	No limits	
PHENYLPYRAZOLES	63	Fipronil	C12H4Cl2F6N4O.	µg/L	<0,01	No limits	

TABLE 29. HIDROBIOLÓGICAL PARAMETERS - FW 115-MY			
(Nº 64) PHYTOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
C H L O R O P H Y T A **(92)**		*Monoraphidium sp.*	92
B A C I L L A R I O P H Y T A (69)		*Diatomeas pennadas*	69
Presence of organic material	+	TOTAL CELLS /mL	**161**
Presence of sediment	+++	Abundant/dominant organism	*Monoraphidium sp.* 57,1%
Insect remain	X	Range of risk	
CODES			
+(less than half of the field)	++ (half of the field)	+++ (whole field)	**X** (sporadically observed)
Risk level (UNESCO)	Null until 10.000 Cel/mL	Alert I - between 10.000 to 20.000 Cel/mL	Alert II More than 20.000 Cel/mL
(Nº65) ZOOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
Absence of zooplankton.			
Plant remains	No	TOTAL CELLS /mL	n/a.
Colour	Yellowish	Abundant/dominant organism	n/a.

BACTERIOLÓGICAL PARAMETERS				
Nº	**Parameters**	**Unit de Medida**	**Determinación**	**Regulation 222/02**
66	Faecal coliforms	NMP/100mL	390	200 NMP/100mL
67	Total coliforms	NMP/100mL	9000	1000 NMP/100mL

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A.12 Analytical determinations of point FW 317-RZ

TABLE 30. PARAMETERS MEASURED ON THE SITE - FW 317-RZ			
FW 317-RZ			
SAMPLING POINT DATA			
Sampling time	8:20	Air temperature	25,6 ºC
Atmospheric conditions	Partly cloudy	Relative humidity	65%
UTM coordinates	21K 503324.00 m E; 7459243.00 m S	Elevation	116

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limites**	
					Regulation 222/02	**Alternative reference standards ***
1	Water temperature	T_{agua}	ºC	21,9	No limits	
2	Hydrogen potential	pH	---	5,67	6 - 9	
3	Electrical conductivity	σ	µS/cm	73,8	No limits	[2] <1500
4	Dissolved oxygen	DO	mg O_2/L	7,40	> 5 mg O_2/L	
5	Turbidity		m	96,4	100 NTU	

TABLE 31. PHYSICOCHEMICAL PARAMETERS - FW 317-RZ						
FW 317-RZ						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards***
6	Floating materials			51,0	Visually absent..	
7	Total dissolved solids	TDS	mg/L	257	500	
8	Oil and grease		mg/L	11,0	Visually absent.	
9	Chemical oxygen demand	DQO	mg O_2/L	96,4	NO LIMITS	[1] <150
10	Biological oxygen demand	DBO_5	mg O_2/L	1,43	5	
11	Total phosphorus	P	mg/L	0,0299	0,05	
12	Total nitrogen	N	mg/L	<0,100	0,6	
13	Nitrates	NO_{3-}	mg/L	1,01	10	
14	Ammonia	NH_3	mg/L	0,115	0,02	
15	Nitrites	NO_{2-}	mg/L	0,0351	1	
16	Hardness		mg $CaCO_3$/L	21,0	300	
17	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
18	Sodium	Na	mg/L	5,35	200	
19	Aluminum	Al	mg/L	<0,01	0,2	
20	Cadmium	Cd	mg/L	<0,0008	2	
21	Hexavalent chromium	Cr (VI)	mg/L	<0,0500	0,05	
22	Trivalent chromium	Cr (III)	mg/L	<0,0500	0,5	
23	Copper	Cu	mg/L	<0,0500	1	
24	Tin	Sn	mg/L	<1,00	2	
25	Nickel	Ni	mg/L	<0,001	0,025	
26	Manganese	Mn	mg/L	<0,0500	0,1	

TABLE 31. PHYSICOCHEMICAL PARAMETERS - FW 317-RZ						
FW 317-RZ						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured**	**Limits**	
27	Lead	Pb	mg/L	0,0494	0,01	
28	Selenium	Se	mg/L	<0,005	0,01	
29	Zinc	Zn	mg/L	<0,0500	3	
30	Arsenic	As	mg/L	0,0132	0,5	
31	Soluble iron	Fe^{++}	mg/L	0,951	0,3	
32	Mercurio	Hg	mg/L	0,001	2	
33	Mercury	Ba	mg/L	0,15	2	
34	Barium	CN^-	mg/L	<0,02	0,07	

TABLE 32. AGROCHEMICALS IN SURFACE WATER – FW 317-RZ							
AGROCHEMICALS							
GROUP AOX	Nº	**Parameter**	**Chemical formula**	**Unit**	**Measured value**	**Limits**	
						Regulation 222/02	**Alternative reference standards***
PHOSPHOGLYCINE	35	Glyphosate	C3H8NO6P	µg/L	<0,300	0,7	
	36	AMPA	CH6NO3P	µg/L	<0,300	No limits	
CHLORDANE	37	Aldrin	C12H8Cl6	µg/L	<1,00	No limits	
	38	Endrin	C12H8Cl6O	µg/L	<1,25	2	
	39	Dieldrin	C12H8Cl6O	µg/L	<1,50	No limits	
	40	Lindane	C6H6Cl6	µg/L	<0,2	0,2	
	41	Chlordane	C10H6Cl8	µg/L	<0,90	No limits	
	42	DDT	C10H6Cl8	µg/L	<2,00	2	
	43	DDE	--	µg/L	<2,00	No limits	
	44	DDD	--	µg/L	<2,00	No limits	
TRIAZINE	45	Atriazine	C8H14ClN5	µg/L	<2,00	3	
	46	Simazine	C7H12ClN5	µg/L	<2,50	4	
CARBAMATE	47	Carbaryl	C12H11NO2	µg/L	<3,50	No limits	
	48	Carbofuran	C12H15NO3	µg/L	<3,00	4	
	49	Heptachlor	C10H5Cl7	µg/L	<1,50	0	
	50	Methomyl	C5H10N2O2S	µg/L	<25,0	No limits	
ALKYLCHLORO-PHENOXY	51	2,4 D	C8H6Cl2O3	µg/L	<2,50	30	
PYRETHROIDS	52	Lambdacialothrin	$C_{23}H_{19}ClF_3NO_3$	µg/L	--	No limits	
	53	Bifenthrin	C23H22 ClF3NO2	µg/L	--	No limits	
	54	Cypermethrin	C22H19Cl2NO3	µg/L	<1,20	No limits	
	55	Chlorpyrifos	C9H11Cl3NO3PS	µg/L	<5,00	No limits	
	56	Dichlorvos	C4H7Cl2O4P	µg/L	<10,0	10	
	57	Methamidophos	C2H8NO2PS	µg/L	<25,0	No limits	
TRIAZOLE	58	Tebuconazole	C16H22ClN3O	µg/L	<2,00	1	
NEONICOTINOID	59	Imidacloprid	C9H10ClN5O2	µg/L	<5,00	No limits	
	60	Methylparaoxon	C8H10NO6P	µg/L	<25,0	No limits	
	61	Thiamethoxam	C10H6F17NO2S	µg/L	--	No limits	
FLUORATED	62	Sulfluramide	C10H6F17NO2S	µg/L	--	No limits	
PHENYLPYRAZOLES	63	Fipronil	C12H4Cl2F6N4O	µg/L	<0,01	No limits	

TABLE 33. HIDROBIOLÓGICAL PARAMETERS - FW 317-RZ			
(Nº 64) PHYTOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
C Y A N O B A C T E R I A **(192)**		*Pseudanabaena sp.*	192
Presence of organic material	+	TOTAL CELLS /mL	**192**
Presence of sediment	+++	Abundant/dominant organism	*Pseudanabaena sp.* 100%
		Rango de riesgo	Null
CODES			
+(less than half of the field)	++ (half of the field)	+++ (whole field)	**X** (sporadically observed)
Risk level (UNESCO)	Null until 10.000 Cel/mL	Alert I - between 10.000 to 20.000 Cel/mL	Alert II More than 20.000 Cel/mL
(Nº65) ZOOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
Absence of zooplankton.			
Plant remains	No	TOTAL CELLS /mL	n/a.
Colour	Yellowish	Abundant/dominant organism	n/a.
BACTERIOLÓGICAL PARAMETERS			
Nº	**Parameters**	**Unit**	**Measured value**	**Regulation 222/02**
66	Faecal coliforms	NMP/100mL	**330**	200 NMP/100mL
67	Total coliforms	NMP/100mL	**1100**	1000 NMP/100mL

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A.13 Analytical determinations of point FW 204-LB

TABLE 34. PARAMETERS MEASURED ON THE SITE - FW 204-LB			
FW 204-LB			
SAMPLING POINT DATA			
Sampling time	9:30	Air temperature	28 ºC
Atmospheric conditions	Parcialmente nublado	Relative humidity	68%
UTM coordinates	21 K 498840.00 m E; 7451514.00 m S	Elevation	104

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limites**	
					Regulation 222/02	**Alternative reference standards***
1	Water temperature	T_{agua}	ºC	23,0	NO LIMITS	
2	Hydrogen potential	pH	---	7,0	6 - 9	
3	Electrical conductivity	σ	µS/cm	67,3	NO LIMITS	[2] <1500
4	Dissolved oxygen	DO	mg O_2/L	7,46	>5 mg O_2/L	
5	Turbidity		m	54,7	100 NTU	

TABLE 35. PARAMETERS PHYSICOCHEMICAL FW 204-LB						
FW 204-LB						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards***
6	Floating materials			24,0	Visually absent	
7	Total dissolved solids	TDS	mg/L	221	500	
8	Oil and grease		mg/L	13,2	Visually absent	
9	Chemical oxygen demand	DQO	mg O_2/L	77,2	No limits	[1] <150
10	Biological oxygen demand	DBO_5	mg O_2/L	2,73	5	
11	Total phosphorus	P	mg/L	0,0211	0,05	
12	Total nitrogen	N	mg/L	<0,100	0,6	
13	Nitrates	NO_{3-}	mg/L	<0,0200	10	
14	Ammonia	NH_3	mg/L	0,226	0,02	
15	Nitrites	NO_{2-}	mg/L	0,0420	1	
16	Hardness		mg $CaCO_3$/L	19,8	300	
17	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
18	Sodium	Na	mg/L	5,19	200	
19	Aluminum	Al	mg/L	<0,01	0,2	
20	Cadmium	Cd	mg/L	<0,0008	2	
21	Hexavalent chromium	Cr (VI)	mg/L	<0,0500	0,05	
22	Trivalent chromium	Cr (III)	mg/L	<0,0500	0,5	
23	Copper	Cu	mg/L	<0,0500	1	
24	Tin	Sn	mg/L	<1,00	2	
25	Nickel	Ni	mg/L	0,0513	0,025	
26	Manganese	Mn	mg/L	<0,0500	0,1	

TABLE 35. PARAMETERS PHYSICOCHEMICAL FW 204-LB						
FW 204-LB						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured**	**Limits**	
27	Lead	Pb	mg/L	<0,002	0,01	
28	Selenium	Se	mg/L	<0,005	0,01	
29	Zinc	Zn	mg/L	<0,0500	3	
30	Arsenic	As	mg/L	0,0772	0,5	
31	Soluble iron	Fe^{++}	mg/L	1,14	0,3	
32	Mercury	Hg	mg/L	0,001	2	
33	Barium	Ba	mg/L	0,12	2	
34	Cyanides	CN^-	mg/L	<0,02	0,07	

TABLE 36. AGROCHEMICALS IN SURFACE WATER – FW 204-LB							
FW 204-LB							
AGROCHEMICALS							
GROUP AOX	Nº	**Parameter**	**Chemical formula**	**Unit**	**Measured value**	**Limits**	
						Regulation 222/02	**Alternative reference standards***
PHOSPHOGLYCINE	35	Glyphosate	C3H8NO6P	µg/L	<0,300	0,7	
	36	AMPA	CH6NO3P	µg/L	<0,300	No limits	
CHLORDANE	37	Aldrin	C12H8Cl6	µg/L	<1,00	No limits	
	38	Endrin	C12H8Cl6O	µg/L	<1,25	No limits	
	39	Dieldrin	C12H8Cl6O	µg/L	<1,50	No limits	
	40	Lindane	C6H6Cl6	µg/L	<0,2	0,2	
	41	Chlordane	C10H6Cl8	µg/L	<0,90	No limits	
	42	DDT	C10H6Cl8	µg/L	<2,00	2	
	43	DDE	--	µg/L	<2,00	No limits	
	44	DDD	--	µg/L	<2,00	No limits	
TRIAZINE	45	Atriazine	C8H14ClN5	µg/L	<2,00	3	
	46	Simazine	C7H12ClN5	µg/L	<2,50	4	
CARBAMATE	47	Carbaryl	C12H11NO2	µg/L	<3,50	No limits	
	48	Carbofuran	C12H15NO3	µg/L	<3,00	4	
	49	Heptachlor	C10H5Cl7	µg/L	<1,50	0	
	50	Methomyl	C5H10N2O2S	µg/L	<25,0	No limits	
ALKYLCHLORO-PHENOXY	51	2,4 D	C8H6Cl2O3	µg/L	<2,50	30	
PYRETHROIDS	52	Lambdacialothrin	$C_{23}H_{19}ClF_3NO_3$	µg/L	--	No limits	
	53	Bifenthrin	C23H22 ClF3NO2	µg/L	--	No limits	
	54	Cypermethrin	C22H19Cl2NO3	µg/L	<1,20	No limits	
	55	Chlorpyrifos	C9H11Cl3NO3PS	µg/L	<5,00	No limits	
	56	Dichlorvos	C4H7Cl2O4P	µg/L	<10,0	10	
	57	Methamidophos	C2H8NO2PS	µg/L	<25,0	No limits	
TRIAZOLE	58	Tebuconazole	C16H22ClN3O	µg/L	<2,00	1	
NEONICOTINOID	59	Imidacloprid	C9H10ClN5O2	µg/L	<5,00	No limits	
	60	Methylparaoxon	C8H10NO6P	µg/L	<25,0	No limits	
	61	Thiamethoxam	C10H6F17NO2S	µg/L	--	No limits	
FLUORATED	62	Sulfluramide	C10H6F17NO2S	µg/L	--	No limits	

TABLE 36. AGROCHEMICALS IN SURFACE WATER – FW 204-LB							
FW 204-LB							
AGROCHEMICALS							
GROUP AOX	Nº	**Parameter**	**Chemical**	**Unit**	**Measured**	**Limits**	
PHENYLPYRAZOLES	63	Fipronil	C12H4Cl2F6N4O.	µg/L	<0,01	No limits	

TABLE 37. HIDROBIOLÓGICAL PARAMETERS - FW 204-LB			
(Nº 64) PHYTOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
B A C I L L A R I O P H Y T A **(391)**		*Diatomeas pennadas*	115
		Gomphonema sp.	92
		Navicula sp.	184
E U G L E N O Z O A **(46)**		*Euglena sp.*	
Presence of organic material	+	TOTAL CELLS /mL	**437**
Presence of sediment	+++	Abundant/dominant organism	*Navicula sp. 42,1%*
Presence of bacteria	+++	Range of risk	Null
CODES			
+(less than half of the field)	++ (half of the field)	+++ (whole field)	**X** (sporadically observed)
Risk level (UNESCO)	Null until 10.000 Cel/mL	Alert I - between 10.000 to 20.000 Cel/mL	Alert II More than 20.000 Cel/mL
(Nº65) ZOOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
Absence of zooplankton.			
Plant remains	No	TOTAL CELLS /mL	n/a.
Colour	Yellowish	Abundant/dominant organism	n/a.
BACTERIOLOGICAL PARAMETERS			
Nº	**Parameters**	**Unit**	**Measured value**	**Regulation 222/02**
66	Faecal coliforms	NMP/100mL	**3500**	200 NMP/100mL
67	Total coliforms	NMP/100mL	**16000**	1000 NMP/100mL

A.14 Analytical determinations of point FW 110-LB

TABLE 38. PARAMETERS MEASURED ON THE SITE - FW 110-LB			
FW 110-LB			
SAMPLING POINT DATA			
Sampling time	6:50	Air temperature	23,6 ºC
Atmospheric conditions	Partly cloudy	Relative humidity	58%
UTM coordinates	21K 511487.00 m E; 7450940.00 m S	Elevation	122

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limites**	
					Regulation 222/02	**Alternative reference standards***
1	Water temperature	T_{agua}	ºC	22,3	No limits	
2	Hydrogen potential	pH	---	6,62	6 - 9	
3	Electrical conductivity	σ	µS/cm	67,2	No limits	[2] <1500
4	Dissolved oxygen	DO	mg O_2/L	2,38	>5 mg O_2/L	
5	Turbidity		m	46,2	100 NTU	

TABLE 39. PHYSICOCHEMICAL PARAMETERS - FW 110-LB						
FW 110-LB						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards***
6	Floating materials			21,0	Visually absent..	
7	Total dissolved solids	TDS	mg/L	188	500	
8	Oil and grease		mg/L	5,25	Visually absent.	
9	Chemical oxygen demand	DQO	mg O_2/L	116	NO LIMITS	[1] <150
10	Biological oxygen demand	DBO_5	mg O_2/L	4,35	5	
11	Total phosphorus	P	mg/L	0,0548	0,05	
12	Total nitrogen	N	mg/L	0,121	0,6	
13	Nitrates	NO_{3-}	mg/L	<0,0200	10	
14	Ammonia	NH_3	mg/L	0,224	0,02	
15	Nitrites	NO_{2-}	mg/L	0,0394	1	
16	Hardness		mg $CaCO_3$/L	11,9	300	
17	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
18	Sodium	Na	mg/L	5,94	200	
19	Aluminum	Al	mg/L	<0,01	0,2	
20	Cadmium	Cd	mg/L	<0,0008	2	
21	Hexavalent chromium	Cr (VI)	mg/L	<0,0500	0,05	
22	Trivalent chromium	Cr (III)	mg/L	<0,0500	0,5	
23	Copper	Cu	mg/L	<0,0500	1	
24	Tin	Sn	mg/L	<1,00	2	
25	Nickel	Ni	mg/L	<0,001	0,025	
26	Manganese	Mn	mg/L	0,122	0,1	

TABLE 39. PHYSICOCHEMICAL PARAMETERS - FW 110-LB						
FW 110-LB						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured**	**Limits**	
27	Lead	Pb	mg/L		0,01	
28	Selenium	Se	mg/L		0,01	
29	Zinc	Zn	mg/L	<0,0500	3	
30	Arsenic	As	mg/L	<0,0100	0,5	
31	Soluble iron	Fe^{++}	mg/L	1,41	0,3	
32	Mercury	Hg	mg/L	0,001	2	
33	Barium	Ba	mg/L	0,05	2	
34	Cyanides	CN^-	mg/L	<0,02	0,07	

TABLE 40. AGROCHEMICALS IN SURFACE WATER – FW 110-LB							
FW 110-LB							
AGROCHEMICALS							
GROUP AOX	Nº	**Parameter**	**Chemical formula**	**Unit**	**Measured value**	**Limits**	
						Regulation 222/02	**Alternative reference standards***
PHOSPHOGLYCINE	35	Glyphosate	C3H8NO6P	µg/L	<0,300	0,7	
	36	AMPA	CH6NO3P	µg/L	<0,300	No limits	
CHLORDANE	37	Aldrin	C12H8Cl6	µg/L	<1,00	No limits	
	38	Endrin	C12H8Cl6O	µg/L	<1,25	2	
	39	Dieldrin	C12H8Cl6O	µg/L	<1,50	No limits	
	40	Lindane	C6H6Cl6	µg/L	<0,2	0,2	
	41	Chlordane	C10H6Cl8	µg/L	<0,90	No limits	
	42	DDT	C10H6Cl8	µg/L	<2,00	2	
	43	DDE	--	µg/L	<2,00	No limits	
	44	DDD	--	µg/L	<2,00	No limits	
TRIAZINE	45	Atriazine	C8H14ClN5	µg/L	<2,00	3	
	46	Simazine	C7H12ClN5	µg/L	<2,50	4	
CARBAMATE	47	Carbaryl	C12H11NO2	µg/L	<3,50	No limits	
	48	Carbofuran	C12H15NO3	µg/L	<3,00	4	
	49	Heptachlor	C10H5Cl7	µg/L	<1,50	0	
	50	Methomyl	C5H10N2O2S	µg/L	<25,0	No limits	
ALKYLCHLORO-PHENOXY	51	2,4 D	C8H6Cl2O3	µg/L	<2,50	30	
PYRETHROIDS	52	Lambdacialothrin	$C_{23}H_{19}ClF_3NO_3$	µg/L	--	No limits	
	53	Bifenthrin	C23H22 ClF3NO2	µg/L	--	No limits	
	54	Cypermethrin	C22H19Cl2NO3	µg/L	<1,20	No limits	
	55	Chlorpyrifos	C9H11Cl3NO3PS	µg/L	<5,00	No limits	
	56	Dichlorvos	C4H7Cl2O4P	µg/L	<10,0	10	
	57	Methamidophos	C2H8NO2PS	µg/L	<25,0	No limits	
TRIAZOLE	58	Tebuconazole	C16H22ClN3O	µg/L	<2,00	1	
NEONICOTINOID	59	Imidacloprid	C9H10ClN5O2	µg/L	<5,00	No limits	
	60	Methylparaoxon	C8H10NO6P	µg/L	<25,0	No limits	
	61	Thiamethoxam	C10H6F17NO2S	µg/L	--	No limits	
FLUORATED	62	Sulfluramide	C10H6F17NO2S	µg/L	--	No limits	

TABLE 40. AGROCHEMICALS IN SURFACE WATER – FW 110-LB							
FW 110-LB							
AGROCHEMICALS							
GROUP AOX	Nº	**Parameter**	**Chemical formula**	**Unit**	**Measured value**	**Limits**	
PHENYLPYRAZOLES	63	Fipronil	C12H4Cl2F6N4O	µg/L	<0,01	No limits	

TABLE 41. HIDROBIOLÓGICAL PARAMETERS - FW 110-LB			
(Nº 64) PHYTOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
CYANOBACTERIA **(315)**		*Pseudanabaena sp.1*	65
		Pseudanabaena sp.2	250
BACILLARIOPHYTA **(15)**		*Diatomeas pennadas*	15
CRYPTOPHYTA **(15)**		*Cryptomonadales sp*	15
Presence of organic material	+	TOTAL CELLS /mL	350
Presence of sediment	+++	Abundant/dominant organism	*Pseudanabaena sp.2* 71,4%
Protists	X	Range of risk	Null.
Rizhopods	X		
CODES			
+(less than half of the field)	++ (half of the field)	+++ (whole field)	**X** (sporadically observed)
Risk level (UNESCO)	Null until 10.000 Cel/mL	Alert I - between 10.000 to 20.000 Cel/mL	Alert II More than 20.000 Cel/mL
(Nº65) ZOOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
Absence of zooplankton.			
Plant remains	No	TOTAL CELLS /mL	n/a.
Colour	Yellowish	Abundant/dominant organism	n/a.
BACTERIOLOGICAL PARAMETERS			
Nº	**Parameters**	**Unit**	**Measured value**	**Regulation 222/02**
66	Faecal coliforms	NMP/100mL	**4300**	200 NMP/100mL
67	Total coliforms	NMP/100mL	**160000**	1000 NMP/100mL

A.15 Analytical determinations of point FW 111-LB

TABLE 42. PARAMETERS MEASURED ON THE SITE - FW 111-LB			
FW 111-LB			
SAMPLING POINT DATA			
Sampling time	6:00	Air temperature	
Atmospheric conditions	Cloudy	Relative humidity	
UTM coordinates	21 K 514185.37 m E; 7447625.56 m S	Elevation	121

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limites**	
					Regulation 222/02	**Alternative reference standards***
1	Water temperature	T_{agua}	ºC	21,9	No limits	
2	Hydrogen potential	pH	---	5,91	6 - 9	
3	Electrical conductivity	σ	µS/cm	60,5	No limits	[2] <1500
4	Dissolved oxygen	DO	mg O_2/L	5,91	>5 mg O_2/L	
5	Turbidity		m	35,7	100 NTU	

TABLE 43. PHYSICOCHEMICAL PARAMETERS - FW 111-LB						
FW 111-LB						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards***
6	Floating materials			116	Visually absent	
7	Total dissolved solids	TDS	mg/L	163	500	
8	Oil and grease		mg/L	3,75	Visually absent	
9	Chemical oxygen demand	DQO	mg O_2/L	99,0	No limits	[1] <150
10	Biological oxygen demand	DBO_5	mg O_2/L	2,15	5	
11	Total phosphorus	P	mg/L	0,114	0,05	
12	Total nitrogen	N	mg/L	<0,100	0,6	
13	Nitrates	NO_{3-}	mg/L	1,56	10	
14	Ammonia	NH_3	mg/L	0,331	0,02	
15	Nitrites	NO_{2-}	mg/L	<0,00250	1	
16	Hardness		mg $CaCO_3$/L	16,8	300	
17	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
18	Sodium	Na	mg/L	3,32	200	
19	Aluminum	Al	mg/L	<0,01	0,2	
20	Cadmium	Cd	mg/L	<0,0008	2	
21	Hexavalent chromium	Cr (VI)	mg/L	<0,0500	0,05	
22	Trivalent chromium	Cr (III)	mg/L	<0,0500	0,5	
23	Copper	Cu	mg/L	<0,0500	1	
24	Tin	Sn	mg/L	<1,00	2	
25	Nickel	Ni	mg/L	<0,001	0,025	
26	Manganese	Mn	mg/L	0,400	0,1	

TABLE 43. PHYSICOCHEMICAL PARAMETERS - FW 111-LB						
FW 111-LB						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured**	**Limits**	
27	Lead	Pb	mg/L	<0,002	0,01	
28	Selenium	Se	mg/L	<0,005	0,01	
29	Zinc	Zn	mg/L	<0,0500	3	
30	Arsenic	As	mg/L	<0,0100	0,5	
31	Soluble iron	Fe^{++}	mg/L	1,56	0,3	
32	Mercury	Hg	mg/L	0,001	2	
33	Barium	Ba	mg/L	0,15	2	
34	Cyanides	CN^-	mg/L	<0,02	0,07	

TABLE 44. AGROCHEMICALS IN SURFACE WATER – FW 111-LB							
FW 111-LB							
AGROCHEMICALS							
GROUP AOX	Nº	**Parameter**	**Chemical formula**	**Unit**	**Measured value**	**Limits**	
						Regulation 222/02	**Alternative reference standards***
PHOSPHOGLYCINE	35	Glyphosate	C3H8NO6P	µg/L	<0,300	0,7	
	36	AMPA	CH6NO3P	µg/L	<0,300	No limits	
CHLORDANE	37	Aldrin	C12H8Cl6	µg/L	<1,00	No limits	
	38	Endrin	C12H8Cl6O	µg/L	<1,25	2	
	39	Dieldrin	C12H8Cl6O	µg/L	<1,50	No limits	
	40	Lindane	C6H6Cl6	µg/L	<0,2	0,2	
	41	Chlordane	C10H6Cl8	µg/L	<0,90	No limits	
	42	DDT	C10H6Cl8	µg/L	<2,00	2	
	43	DDE	--	µg/L	<2,00	No limits	
	44	DDD	--	µg/L	<2,00	No limits	
TRIAZINE	45	Atriazine	C8H14ClN5	µg/L	<2,00	3	
	46	Simazine	C7H12ClN5	µg/L	<2,50	4	
CARBAMATE	47	Carbaryl	C12H11NO2	µg/L	<3,50	No limits	
	48	Carbofuran	C12H15NO3	µg/L	<3,00	4	
	49	Heptachlor	C10H5Cl7	µg/L	<1,50	0	
	50	Methomyl	C5H10N2O2S	µg/L	<25,0	No limits	
ALKYLCHLORO-PHENOXY	51	2,4 D	C8H6Cl2O3	µg/L	<2,50	30	
PYRETHROIDS	52	Lambdacialothrin	$C_{23}H_{19}ClF_3NO_3$	µg/L	--	No limits	
	53	Bifenthrin	C23H22 ClF3NO2	µg/L	--	No limits	
	54	Cypermethrin	C22H19Cl2NO3	µg/L	<1,20	No limits	
	55	Chlorpyrifos	C9H11Cl3NO3PS	µg/L	<5,00	No limits	
	56	Dichlorvos	C4H7Cl2O4P	µg/L	<10,0	No limits	
	57	Methamidophos	C2H8NO2PS	µg/L	<25,0	No limits	
TRIAZOLE	58	Tebuconazole	C16H22ClN3O	µg/L	<2,00	1	
NEONICOTINOID	59	Imidacloprid	C9H10ClN5O2	µg/L	<5,00	No limits	
	60	Methylparaoxon	C8H10NO6P	µg/L	<25,0	No limits	
	61	Thiamethoxam	C10H6F17NO2S	µg/L	--	No limits	
FLUORATED	62	Sulfluramide	C10H6F17NO2S	µg/L	--	No limits	

TABLE 44. AGROCHEMICALS IN SURFACE WATER – FW 111-LB							
FW 111-LB							
AGROCHEMICALS							
GROUP AOX	Nº	**Parameter**	**Chemical formula**	**Unit**	**Measured value**	**Limits**	
PHENYLPYRAZOLES	63	Fipronil	C12H4Cl2F6N4O.	µg/L	<0,01	No limits	

TABLE 45. HIDROBIOLÓGICAL PARAMETERS - FW 111-LB			
(Nº 64) PHYTOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
B A C I L L A R I O P H Y T A (207)		*Diatomeas pennadas*	207
Presence of organic material	+	TOTAL CELLS /mL	**207**
Presence of sediment	+++	Abundant/dominant organism	*Diatomeas pennadas* 100%
		Rango de riesgo	Null
CODES			
+(less than half of the field)	++ (half of the field)	+++ (whole field)	**X** (sporadically observed)
Risk level (UNESCO)	Null until 10.000 Cel/mL	Alert I - between 10.000 to 20.000 Cel/mL	Alert II More than 20.000 Cel/mL
(Nº65) ZOOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
Absence of zooplankton.			
Plant remains	No	TOTAL CELLS /mL	N/a.
Colour	Yellowish	Abundant/dominant organism	N/a.
BACTERIOLÓGICAL PARAMETERS			
Nº	**Parameters**	**Unit**	**Measured value**	**Regulation 222/02**
66	Faecal coliforms	NMP/100mL	490	200 NMP/100mL
67	Total coliforms	NMP/100mL	1400	1000 NMP/100mL

A.16 Analytical determinations of point FW 310-CR

TABLE 46. PARAMETERS MEASURED ON THE SITE - FW 310-CR			
FW 310-CR			
SAMPLING POINT DATA			
Sampling time	18:20	Air temperature	
Atmospheric conditions	Cloudy	Relative humidity	
UTM coordinates	21 K 487444.00 m E; 7449950.00 m S	Elevation	110

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limites**	
					Regulation 222/02	**Alternative reference standards ***
1	Water temperature	T_{agua}	ºC	23,7	No limits	
2	Hydrogen potential	pH	---	7,21	6 - 9	
3	Electrical conductivity	σ	µS/cm	559	No limits	[2] <1500
4	Dissolved oxygen	DO	mg O_2/L	5,59	> 5 mg O_2/L	
5	Turbidity		m	355	100 NTU	

TABLE 47. PHYSICOCHEMICAL PARAMETERS FW 310-CR						
FW 310-CR						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards***
6	Floating materials			155	Visually absent	
7	Total dissolved solids	TDS	mg/L	169	500	
8	Oil and grease		mg/L	8,80	Visually absent	
9	Chemical oxygen demand	DQO	mg O_2/L	85,5	No limits	[1] <150
10	Biological oxygen demand	DBO_5	mg O_2/L	5,51	5	
11	Total phosphorus	P	mg/L	0,0518	0,05	
12	Total nitrogen	N	mg/L	<0,100	0,6	
13	Nitrates	NO_{3-}	mg/L	2,58	10	
14	Ammonia	NH_3	mg/L	0,150	0,02	
15	Nitrites	NO_{2-}	mg/L	0,182	1	
16	Hardness		mg $CaCO_3$/L	18,0	300	
17	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
18	Sodium	Na	mg/L	2,94	200	
19	Aluminum	Al	mg/L	<0,01	0,2	
20	Cadmium	Cd	mg/L	<0,0008	2	
21	Hexavalent chromium	Cr (VI)	mg/L	<0,0500	0,05	
22	Trivalent chromium	Cr (III)	mg/L	<0,0500	0,5	
23	Copper	Cu	mg/L	<0,0500	1	
24	Tin	Sn	mg/L	<1,0	2	
25	Nickel	Ni	mg/L	<0,01	0,025	
26	Manganese	Mn	mg/L	0,341	0,1	

TABLE 47. PHYSICOCHEMICAL PARAMETERS FW 310-CR						
FW 310-CR						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured**	**Limits**	
27	Lead	Pb	mg/L	0,00407	0,01	
28	Selenium	Se	mg/L	<0,005	0,01	
29	Zinc	Zn	mg/L	<0,0500	3	
30	Arsenic	As	mg/L	<0,0100	0,5	
31	Soluble iron	Fe^{++}	mg/L	2,36	0,3	
32	Mercury	Hg	mg/L	0,001	2	
33	Barium	Ba	mg/L	0,14	2	
34	Cyanides	CN^-	mg/L	<0,02	0,07	

TABLE 48. AGROCHEMICALS IN SURFACE WATER – FW 310-CR							
AGROCHEMICALS							
GROUP AOX	Nº	**Parameter**	**Chemical formula**	**Unit**	**Measured value**	**Limits**	
						Regulation 222/02	**Alternative reference standards ***
PHOSPHOGLYCINE	35	Glyphosate	C3H8NO6P	µg/L	<0,300	0,7	
	36	AMPA	CH6NO3P	µg/L	<0,300	No limits	
CHLORDANE	37	Aldrin	C12H8Cl6	µg/L	<1,00	No limits	
	38	Endrin	C12H8Cl6O	µg/L	<1,25	2	
	39	Dieldrin	C12H8Cl6O	µg/L	<1,50	No limits	
	40	Lindane	C6H6Cl6	µg/L	<0,2	0,2	
	41	Chlordane	C10H6Cl8	µg/L	<0,90	No limits	
	42	DDT	C10H6Cl8	µg/L	<2,00	2	
	43	DDE	--	µg/L	<2,00	No limits	
	44	DDD	--	µg/L	<2,00	No limits	
TRIAZINE	45	Atriazine	C8H14ClN5	µg/L	<2,00	3	
	46	Simazine	C7H12ClN5	µg/L	<2,50	4	
CARBAMATE	47	Carbaryl	C12H11NO2	µg/L	<3,50	No limits	
	48	Carbofuran	C12H15NO3	µg/L	<3,00	4	
	49	Heptachlor	C10H5Cl7	µg/L	<1,50	0	
	50	Methomyl	C5H10N2O2S	µg/L	<25,0	No limits	
ALKYLCHLORO-PHENOXY	51	2,4 D	C8H6Cl2O3	µg/L	<2,50	30	
PYRETHROIDS	52	Lambdacialothrin	$C_{23}H_{19}ClF_3NO_3$	µg/L	--	No limits	
	53	Bifenthrin	C23H22 ClF3NO2	µg/L	--	No limits	
	54	Cypermethrin	C22H19Cl2NO3	µg/L	<1,20	No limits	
	55	Chlorpyrifos	C9H11Cl3NO3P S	µg/L	<5,00	No limits	
	56	Dichlorvos	C4H7Cl2O4P	µg/L	<10,0	10	
	57	Methamidophos	C2H8NO2PS	µg/L	<25,0	No limits	
TRIAZOLE	58	Tebuconazole	C16H22ClN3O	µg/L	<2,00	1	
NEONICOTINOID	59	Imidacloprid	C9H10ClN5O2	µg/L	<5,00	No limits	
	60	Methylparaoxon	C8H10NO6P	µg/L	<25,0	No limits	
	61	Thiamethoxam	C10H6F17NO2S	µg/L	--	No limits	
FLUORATED	62	Sulfluramide	C10H6F17NO2S	µg/L	--	No limits	
PHENYLPYRAZOLES	63	Fipronil	C12H4Cl2F6N4O.	µg/L	<0,01	No limits	

TABLE 49. HYDROBIOLOGICAL PARAMETERS - FW 310-CR			
(Nº 64) PHYTOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
B A C I L L A R I O P H Y T A **(184)**		*Synedra sp.*	184
Presence of organic material	+	TOTAL CELLS /mL	**184**
Presence of sediment	+++	Abundant/dominant organism	*Synedra sp.* 100%
		Range of risk	Null
CODES			
+(less than half of the field)	++ (half of the field)	+++ (whole field)	**X** (sporadically observed)
Risk level (UNESCO)	Null until 10.000 Cel/mL	Alert I - between 10.000 to 20.000 Cel/mL	Alert II More than 20.000 Cel/mL
(Nº65) ZOOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
Absence of zooplankton.			
Plant remains	No	TOTAL CELLS /mL	n/a.
Colour	Yellowish	Abundant/dominant organism	n/a.
BACTERIOLÓGICAL PARAMETERS			
Nº	**Parameters**	**Unit**	**Measured value**	**Regulation 222/02**
66	Faecal coliforms	NMP/100mL	11000	200 NMP/100mL
67	Total coliforms	NMP/100mL	11000	1000 NMP/100mL

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A.17 Analytical determinations of point FW 316-CR

TABLE 50. PARAMETERS MEASURED ON THE SITE - FW 316-CR			
FW 316-CR			
SAMPLING POINT DATA			
Sampling time	18:50	Air temperature	
Atmospheric conditions	Rainy	Relative humidity	
UTM coordinates	21K 485341.00 m E; 7442662.00 m S	Topographical elevation	110

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limites**	
					Regulation 222/02	**Alternative reference standards***
1	Water temperature	T_{agua}	ºC	25,7	No limits	
2	Hydrogen potential	pH	---	6,82	6 - 9	
3	Electrical conductivity	σ	µS/cm	44,8	No limits	[2] <1500
4	Dissolved oxygen	DO	mg O_2/L	5,08	> 5 mg O_2/L	
5	Turbidity		m	18,6	100 NTU	

TABLE 51. PHYSICOCHEMICAL PARAMETERS - FW 316-CR						
FW 316-CR						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards***
6	Floating materials			26,0	Visually absent..	
7	Total dissolved solids	TDS	mg/L	127	500	
8	Oil and grease		mg/L	7,25	Visually absent.	
9	Chemical oxygen demand	DQO	mg O_2/L	65,9	NO LIMITS	[1] <150
10	Biological oxygen demand	DBO_5	mg O_2/L	5,05	5	
11	Total phosphorus	P	mg/L	0,0435	0,05	
12	Total nitrogen	N	mg/L	0,779	0,6	
13	Nitrates	NO_{3-}	mg/L	0,231	10	
14	Ammonia	NH_3	mg/L	0,0331	0,02	
15	Nitrites	NO_{2-}	mg/L	0,00778	1	
16	Hardness		mg $CaCO_3$/L	8,69	300	
17	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
18	Sodium	Na	mg/L	3,50	200	
19	Aluminum	Al	mg/L	<01,00	0,2	
20	Cadmium	Cd	mg/L	<0,0008	2	
21	Hexavalent chromium	Cr (VI)	mg/L	<0,0500	0,05	
22	Trivalent chromium	Cr (III)	mg/L	<0,0500	0,5	
23	Copper	Cu	mg/L	<0,0500	1	
24	Tin	Sn	mg/L	<1,00	2	
25	Nickel	Ni	mg/L	<0,001	0,025	
26	Manganese	Mn	mg/L	<0,0500	0,1	

TABLE 51. PHYSICOCHEMICAL PARAMETERS - FW 316-CR						
FW 316-CR						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured**	**Limits**	
27	Lead	Pb	mg/L	0,0134	0,01	
28	Selenium	Se	mg/L	<0,005	0,01	
29	Zinc	Zn	mg/L	<0,0500	3	
30	Arsenic	As	mg/L	<0,0100	0,5	
31	Soluble iron	Fe^{++}	mg/L	0,991	0,3	
32	Mercury	Hg	mg/L	0,001	2	
33	Barium	Ba	mg/L	0,05	2	
34	Cyanides	CN^-	mg/L	<0,02	0,07	

TABLE 52. AGROCHEMICALS IN SURFACE WATER – FW 316-CR							
AGROCHEMICALS							
GROUP AOX	Nº	**Parameter**	**Chemical formula**	**Unit**	**Measured value**	**Limits**	
						Regulation 222/02	**Alternative reference standards ***
PHOSPHOGLYCINE	35	Glyphosate	C3H8NO6P	µg/L	<0,300	0,7	
	36	AMPA	CH6NO3P	µg/L	<0,300	No limits	
CHLORDANE	37	Aldrin	C12H8Cl6	µg/L	<1,00	No limits	
	38	Endrin	C12H8Cl6O	µg/L	<1,25	2	
	39	Dieldrin	C12H8Cl6O	µg/L	<1,50	No limits	
	40	Lindane	C6H6Cl6	µg/L	<0,2	0,2	
	41	Chlordane	C10H6Cl8	µg/L	<0,90	No limits	
	42	DDT	C10H6Cl8	µg/L	<2,00	2	
	43	DDE	--	µg/L	<2,00	No limits	
	44	DDD	--	µg/L	<2,00	No limits	
TRIAZINE	45	Atriazine	C8H14ClN5	µg/L	<2,00	3	
	46	Simazine	C7H12ClN5	µg/L	<2,50	4	
CARBAMATE	47	Carbaryl	C12H11NO2	µg/L	<3,50	No limits	
	48	Carbofuran	C12H15NO3	µg/L	<3,00	4	
	49	Heptachlor	C10H5Cl7	µg/L	<1,50	0	
	50	Methomyl	C5H10N2O2S	µg/L	<25,0	No limits	
ALKYLCHLORO-PHENOXY	51	2,4 D	C8H6Cl2O3	µg/L	<2,50	30	
PYRETHROIDS	52	Lambdacialothrin	$C_{23}H_{19}ClF_3NO_3$	µg/L	--	No limits	
	53	Bifenthrin	C23H22 ClF3NO2	µg/L	--	No limits	
	54	Cypermethrin	C22H19Cl2NO3	µg/L	<1,20	No limits	
	55	Chlorpyrifos	C9H11Cl3NO3P S	µg/L	<5,00	No limits	
	56	Dichlorvos	C4H7Cl2O4P	µg/L	<10,0	10	
	57	Methamidophos	C2H8NO2PS	µg/L	<25,0	No limits	
TRIAZOLE	58	Tebuconazole	C16H22ClN3O	µg/L	<2,00	1	
NEONICOTINOID	59	Imidacloprid	C9H10ClN5O2	µg/L	<5,00	No limits	
	60	Methylparaoxon	C8H10NO6P	µg/L	<25,0	No limits	
	61	Thiamethoxam	C10H6F17NO2S	µg/L	--	No limits	
FLUORATED	62	Sulfluramide	C10H6F17NO2S	µg/L	--	No limits	
PHENYLPYRAZOLES	63	Fipronil	C12H4Cl2F6N4O.	µg/L	<0,01	No limits	

TABLE 53. HIDROBIOLÓGICAL PARAMETERS - FW 316-CR			
(Nº 64) PHYTOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
C Y A N O B A C T E R I A **(50)**		*Pseudanabaena sp.*	50
C H L O R O P H Y T A **(35)**		*Monoraphidium sp.*	35
B A C I L L A R I O P H Y T A **(10)**		*Diatomeas pennadas*	10
C R Y P T O P H Y T A **(20)**		*Cryptomonadales*	20
Presence of organic material	+	TOTAL CELLS /mL	115
Presence of sediment	+++	Abundant/dominant organism	*Pseudanabaena sp.* 43,5%
Presence of nematodes	X	Range of risk	Null.
CODES			
+(less than half of the field)	++ (half of the field)	+++ (whole field)	**X** (sporadically observed)
Risk level (UNESCO)	Null until 10.000 Cel/mL	Alert I - between 10.000 to 20.000 Cel/mL	Alert II More than 20.000 Cel/mL
(Nº65) ZOOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
Absence of zooplankton.			
Plant remains	No	TOTAL CELLS /mL	n/a.
Colour	Yellowish	Abundant/dominant organism	n/a.
BACTERIOLOGICAL PARAMETERS			
Nº	**Parameters**	**Unit**	**Measured value**	**Regulation 222/02**
66	Faecal coliforms	NMP/100mL	46	200 NMP/100mL
67	Total coliforms	NMP/100mL	540	1000 NMP/100mL

A.18 Analytical determinations of point FW 306-SO

TABLE 54. PARAMETERS MEASURED ON THE SITE FW 306-SO			
FW 306-SO			
SAMPLING POINT DATA			
Sampling time	14:30	Air temperature	
Atmospheric conditions	Cloudy	Relative humidity	
UTM coordinates	21K 486496.00 m E, 7493077.00 m S	Elevation	176

IN SITU MEASUREMENTS

Nº	Parameter	Symbol	Unit	Measured value	Limits	
					Regulation 222/02	Alternative reference standards *
1	Water temperature	T_{agua}	ºC	23,1	No limits	
2	Hydrogen potential	pH	---	7,81	6 - 9	
3	Electrical conductivity	σ	µS/cm	213	No limits	[2] <1500
4	Dissolved oxygen	DO	mg O_2/L	7,47	> 5 mg O_2/L	
5	Turbidity		m	90,8	100 NTU	

TABLE 55. PHYSICOCHEMICAL PARAMETERS - FW 306-SO						
FW 306-SO						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards***
6	Floating materials			63,0	Visually absent..	
7	Total dissolved solids	TDS	mg/L	263	500	
8	Oil and grease		mg/L	10,5	Visually absent.	
9	Chemical oxygen demand	DQO	mg O_2/L	58,6	NO LIMITS	[1] <150
10	Biological oxygen demand	DBO_5	mg O_2/L	4,35	5	
11	Total phosphorus	P	mg/L	0,0208	0,05	
12	Total nitrogen	N	mg/L	<0,100	0,6	
13	Nitrates	NO_{3-}	mg/L	1,10	10	
14	Ammonia	NH_3	mg/L	0,0872	0,02	
15	Nitrites	NO_{2-}	mg/L	<0,00250	1	
16	Hardness		mg $CaCO_3$/L	80,6	300	
17	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
18	Sodium	Na	mg/L	8,36	200	
19	Aluminum	Al	mg/L	<0,01	0,2	
20	Cadmium	Cd	mg/L	<0,0008	2	
21	Hexavalent chromium	Cr (VI)	mg/L	<0,0500	0,05	
22	Trivalent chromium	Cr (III)	mg/L	<0,0500	0,5	
23	Copper	Cu	mg/L	<0,0500	1	
24	Tin	Sn	mg/L	<1,00	2	
25	Nickel	Ni	mg/L	<0,001	0,025	
26	Manganese	Mn	mg/L	0,0571	0,1	

TABLE 55. PHYSICOCHEMICAL PARAMETERS - FW 306-SO						
FW 306-SO						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured**	**Limits**	
27	Lead	Pb	mg/L	0,0229	0,01	
28	Selenium	Se	mg/L	<0,005	0,01	
29	Zinc	Zn	mg/L	<0,0500	3	
30	Arsenic	As	mg/L	0,0539	0,5	
31	Soluble iron	Fe^{++}	mg/L	1,02	0,3	
32	Mercury	Hg	mg/L	0,001	2	
33	Barium	Ba	mg/L	0,13	2	
34	Cyanides	CN^-	mg/L	<0,02	0,07	

TABLE 56. AGROCHEMICALS IN SURFACE WATER – FW 306-SO							
FW 306-SO							
AGROCHEMICALS							
GROUP AOX	Nº	**Parameter**	**Chemical formula**	**Unit**	**Measured value**	**Limits**	
						Regulation 222/02	**Alternative reference standards***
PHOSPHOGLYCINE	35	Glyphosate	C3H8NO6P	µg/L	<0,300	0,7	
	36	AMPA	CH6NO3P	µg/L	<0,300	No limits	
CHLORDANE	37	Aldrin	C12H8Cl6	µg/L	<1,00	No limits	
	38	Endrin	C12H8Cl6O	µg/L	<1,25	2	
	39	Dieldrin	C12H8Cl6O	µg/L	<1,50	No limits	
	40	Lindane	C6H6Cl6	µg/L	<0,2	0,2	
	41	Chlordane	C10H6Cl8	µg/L	<0,90	No limits	
	42	DDT	C10H6Cl8	µg/L	<2,00	2	
	43	DDE	--	µg/L	<2,00	No limits	
	44	DDD	--	µg/L	<2,00	No limits	
TRIAZINE	45	Atriazine	C8H14ClN5	µg/L	<2,00	3	
	46	Simazine	C7H12ClN5	µg/L	<2,50	4	
CARBAMATE	47	Carbaryl	C12H11NO2	µg/L	<3,50	No limits	
	48	Carbofuran	C12H15NO3	µg/L	<3,00	4	
	49	Heptachlor	C10H5Cl7	µg/L	<1,50	0	
	50	Methomyl	C5H10N2O2S	µg/L	<25,0	No limits	
ALKYLCHLORO-PHENOXY	51	2,4 D	C8H6Cl2O3	µg/L	<2,50	30	
PYRETHROIDS	52	Lambdacialothrin	$C_{23}H_{19}ClF_3NO_3$	µg/L	--	No limits	
	53	Bifenthrin	C23H22 ClF3NO2	µg/L	--	No limits	
	54	Cypermethrin	C22H19Cl2NO3	µg/L	<1,20	No limits	
	55	Chlorpyrifos	C9H11Cl3NO3PS	µg/L	<5,00	No limits	
	56	Dichlorvos	C4H7Cl2O4P	µg/L	<10,0	10	
	57	Methamidophos	C2H8NO2PS	µg/L	<25,0	No limits	
TRIAZOLE	58	Tebuconazole	C16H22ClN3O	µg/L	<2,00	1	
NEONICOTINOID	59	Imidacloprid	C9H10ClN5O2	µg/L	<5,00	No limits	
	60	Methylparaoxon	C8H10NO6P	µg/L	<25,0	No limits	
	61	Thiamethoxam	C10H6F17NO2S	µg/L	--	No limits	

TABLE 56. AGROCHEMICALS IN SURFACE WATER – FW 306-SO							
FW 306-SO							
AGROCHEMICALS							
GROUP AOX	Nº	**Parameter**	**Chemical**	**Unit**	**Measured**	**Limits**	
FLUORATED	62	Sulfluramide	C10H6F17NO2S	µg/L	--	No limits	
PHENYLPYRAZOLES	63	Fipronil	C12H4Cl2F6N4O.	µg/L	<0,01	No limits	

TABLE 57. HIDROBIOLÓGICAL PARAMETERS - FW 306-SO			
(Nº 64) PHYTOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
C Y A N O B A C T E R I A (345)		*Pseudanabaena sp.*	345
C H L O R O P H Y T A (184)		*Monoraphidium sp.*	184
B A C I L L A R I O P H Y T A (230)		*Diatomeas pennadas*	230
Presence of organic material	+	TOTAL CELLS /mL	759
Presence of sediment	+++	Abundant/dominant organism	*Pseudanabaena sp.* 45,5%
Fungal spores	X	Range of risk	Null.
CODES			
+(less than half of the field)	++ (half of the field)	+++ (whole field)	**X** (sporadically observed)
Risk level (UNESCO)	Null until 10.000 Cel/mL	Alert I - between 10.000 to 20.000 Cel/mL	Alert II More than 20.000 Cel/mL
(Nº65) ZOOPLANKTON DIVERSITY			
Type		**Species**	**Measured value**
Absence of zooplankton.			
Plant remains	No	TOTAL CELLS /mL	N/a.
Colour	Yellowish	Abundant/dominant organism	N/a.
BACTERIOLOGICAL PARAMETERS			
Nº	**Parameters**	**Unit**	**Measured value**	**Regulation 222/02**
66	Faecal coliforms	NMP/100mL	540	200 NMP/100mL
67	Total coliforms	NMP/100mL	920	1000 NMP/100mL

A.19 Analytical determinations of point FW 01

TABLE 58. PARAMETERS MEASURED ON THE SITE FW 01			
FW 01 - PY			
SAMPLING POINT DATA			
Sampling time	10:20	Air temperature	
Atmospheric conditions	Soleado	Relative humidity	
UTM coordinates	21K 446252.08 m E 7428199.87 m S	Elevation	85

IN SITU MEASUREMENTS

Nº	Parameter	Symbol	Unit	Measured value	Limites	
					Regulation 222/02	Alternative reference standards*
1	Water temperature	T_{agua}	ºC	26,0	No limits	
2	Hydrogen potential	pH	---	7,26	6 - 9	
3	Electrical conductivity	σ	µS/cm	169	No limits	[2] <1500
4	Dissolved oxygen	DO	mg O_2/L	7,03	>5 mg O_2/L	
5	Turbidity		m	41,2	100 NTU	

TABLE 59. PHYSICOCHEMICAL PARAMETERS FW 01						
FW 01 - PY						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards***
6	Floating materials			22,4	Visually absent	
7	Total dissolved solids	TDS	mg/L	115	500	
8	Oil and grease		mg/L	8,00	Visually absent	
9	Chemical oxygen demand	DQO	mg O_2/L	34,9	No limits	[1] <150
10	Biological oxygen demand	DBO_5	mg O_2/L	1,50	5	
11	Total phosphorus	P	mg/L	0,0694	0,05	
12	Total nitrogen	N	mg/L	1,77	0,6	
13	Nitrates	NO_{3-}	mg/L	<0,100	10	
14	Ammonia	NH_3	mg/L	0,0989	0,02	
15	Nitrites	NO_{2-}	mg/L	0,0153	1	
16	Hardness		mg $CaCO_3$/L	30,5	300	
17	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
18	Sodium	Na	mg/L	16,7	200	
19	Aluminum	Al	mg/L	<0,01	0,2	
20	Cadmium	Cd	mg/L	<0,0008	2	
21	Hexavalent chromium	Cr (VI)	mg/L	<0,0500	0,05	
22	Trivalent chromium	Cr (III)	mg/L	<0,0500	0,5	
23	Copper	Cu	mg/L	<0,0500	1	
24	Tin	Sn	mg/L	<1,00	2	
25	Nickel	Ni	mg/L	<0,001	0,025	
26	Manganese	Mn	mg/L	0,113	0,1	

TABLE 59. PHYSICOCHEMICAL PARAMETERS FW 01						
FW 01 - PY						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured**	**Limits**	
27	Lead	Pb	mg/L	0,00219	0,01	
28	Selenium	Se	mg/L	<0,005	0,01	
29	Zinc	Zn	mg/L	0,0694	3	
30	Arsenic	As	mg/L	<0,0100	0,5	
31	Soluble iron	Fe^{++}	mg/L	1,52	0,3	
32	Mercury	Hg	mg/L	0,001	2	
33	Barium	Ba	mg/L	0,05	2	
34	Cyanides	CN^-	mg/L	<0,02	0,07	
ADDITIONAL PARAMETERS DETERMINED IN PARAGUAY RIVER						
35	Colour		Pt/L	23	75	
36	Phenols index		mg/L	<0,00500	0,5	
37	PCBs		mg/L	Not detected.	0	

BACTERIOLOGICAL PARAMETERS				
Nº	**Parameters**	**Unit**	**Measured value**	**Regulation 222/02**
38	Faecal coliforms	NMP/100mL	33	200 NMP/100mL
39	Total coliforms	NMP/100mL	130	1000 NMP/100mL

TABLE 60. AGROCHEMICALS IN SURFACE WATER – FW PY 01							
FW PY 01							
AGROCHEMICALS							
GROUP AOX	Nº	**Parameter**	**Chemical formula**	**Unit**	**Measured value**	**Limits**	
						Regulation 222/02	**Alternative reference standards***
PHOSPHOGLYCINE	40	Glyphosate	C3H8NO6P	µg/L	<0,300	0,7	
	41	AMPA	CH6NO3P	µg/L	<0,300	No limits	
CHLORDANE	42	Aldrin	C12H8Cl6	µg/L	<1,00	No limits	
	43	Endrin	C12H8Cl6O	µg/L	<1,25	2	
	44	Dieldrin	C12H8Cl6O	µg/L	<1,50	No limits	
	45	Lindane	C6H6Cl6	µg/L	<0,2	0,2	
	46	Chlordane	C10H6Cl8	µg/L	<0,90	No limits	
	47	DDT	C10H6Cl8	µg/L	<2,00	2	
	48	DDE	--	µg/L	<2,00	No limits	
	49	DDD	--	µg/L	<2,00	No limits	
TRIAZINE	50	Atriazine	C8H14ClN5	µg/L	<2,00	3	
	51	Simazine	C7H12ClN5	µg/L	<2,50	4	
CARBAMATE	52	Carbaryl	C12H11NO2	µg/L	<3,50	No limits	
	53	Carbofuran	C12H15NO3	µg/L	<3,00	4	
	54	Heptachlor	C10H5Cl7	µg/L	<1,50	0	
	55	Methomyl	C5H10N2O2S	µg/L	<25,0	No limits	
ALKYLCHLORO-PHENOXY	56	2,4 D	C8H6Cl2O3	µg/L	<2,50	30	
PYRETHROIDS	57	Lambdacialothrin	$C_{23}H_{19}ClF_3NO_3$	µg/L	--	No limits	
	58	Bifenthrin	C23H22	µg/L	--	No limits	

TABLE 60. AGROCHEMICALS IN SURFACE WATER – FW PY 01							
FW PY 01							
AGROCHEMICALS							
GROUP AOX	№	**Parameter**	**Chemical**	**Unit**	**Measured**	**Limits**	
			ClF3NO2				
	59	Cypermethrin	C22H19Cl2NO3	µg/L	<1,20	No limits	
	60	Chlorpyrifos	C9H11Cl3NO3PS	µg/L	<5,00	No limits	
	61	Dichlorvos	C4H7Cl2O4P	µg/L	<10,0	10	
	62	Methamidophos	C2H8NO2PS	µg/L	<25,0	No limits	
TRIAZOLE	63	Tebuconazole	C16H22ClN3O	µg/L	<2,00	1	
NEONICOTINOID	64	Imidacloprid	C9H10ClN5O2	µg/L	<5,00	No limits	
	65	Methylparaoxon	C8H10NO6P	µg/L	<25,0	No limits	
	66	Thiamethoxam	C10H6F17NO2S	µg/L	--	No limits	
FLUORATED	67	Sulfluramide	C10H6F17NO2S	µg/L	--	No limits	
PHENYLPYRAZOLES	68	Fipronil	C12H4Cl2F6N4O.	µg/L	<0,01	No limits	

A.20 Analytical determinations of point FW 02

TABLE 61. PARAMETERS MEASURED ON THE SITE - FW02			
FW 02 - PY			
SAMPLING POINT DATA			
Sampling time	9:30	Air temperature	
Atmospheric conditions	Sunny	Relative humidity	
UTM coordinates	21K 449651.97 m E 7424489.86 m S	Elevation	81

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limites**	
					Regulation 222/02	**Alternative reference standards***
1	Water temperature	T_{agua}	ºC	25,0	NO LIMITS	
2	Hydrogen potential	pH	---	7,29	6 - 9	
3	Electrical conductivity	σ	µS/cm	172	NO LIMITS	[2] <1500
4	Dissolved oxygen	DO	mg O_2/L	7,26	> 5mg O_2/L	
5	Turbidity		m	44,6	100 NTU	

.

TABLE 62. PHYSICOCHEMICAL PARAMETERS - FW 02						
FW 02 - PY						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Alternative reference standards***
6	Floating materials			22,8	Visually absent..	
7	Total dissolved solids	TDS	mg/L	151	500	
8	Oil and grease		mg/L	4,50	Visually absent.	
9	Chemical oxygen demand	DQO	mg O_2/L	44,3	NO LIMITS	[1] <150
10	Biological oxygen demand	DBO_5	mg O_2/L	1,11	5	
11	Total phosphorus	P	mg/L	0,0305	0,05	
12	Total nitrogen	N	mg/L	2,43	0,6	
13	Nitrates	NO_{3-}	mg/L	<0,100	10	
14	Ammonia	NH_3	mg/L	0,0441	0,02	
15	Nitrites	NO_{2-}	mg/L	0,0186	1	
16	Hardness		mg $CaCO_3$/L	30,1	300	
17	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
18	Sodium	Na	mg/L	16,6	200	
19	Aluminum	Al	mg/L	<0,01	0,2	
20	Cadmium	Cd	mg/L	<0,0008	2	
21	Hexavalent chromium	Cr (VI)	mg/L	<0,0500	0,05	
22	Trivalent chromium	Cr (III)	mg/L	<0,0500	0,5	
23	Copper	Cu	mg/L	<0,0500	1	
24	Tin	Sn	mg/L	<1,00	2	
25	Nickel	Ni	mg/L	<0,001	0,025	
26	Manganese	Mn	mg/L	0,144	0,1	

TABLE 62. PHYSICOCHEMICAL PARAMETERS - FW 02						
FW 02 - PY						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured**	**Limits**	
27	Lead	Pb	mg/L	0,0041	0,01	
28	Selenium	Se	mg/L	<0,005	0,01	
29	Zinc	Zn	mg/L	0,0983	3	
30	Arsenic	As	mg/L	<0,0100	0,5	
31	Soluble iron	Fe^{++}	mg/L	0,804	0,3	
32	Mercury	Hg	mg/L	0,001	2	
33	Barium	Ba	mg/L	0,05	2	
34	Cyanides	CN^-	mg/L	<0,02	0,07	
ADDITIONAL PARAMETERS DETERMINED IN PARAGUAY RIVER						
35	Colour	--	Pt/L	30,0	75	
36	Phenols index	--	mg/L	<0,00500	0,5	
37	PCBs	--	mg/L	Not detected.	0	

BACTERIOLOGICAL PARAMETERS				
Nº	**Parameters**	**Unit**	**Measured value**	**Regulation 222/02**
38	Faecal coliforms	NMP/100mL	2	200 NMP/100mL
39	Total coliforms	NMP/100mL	33	1000 NMP/100mL

TABLE 63. AGROCHEMICALS IN SURFACE WATER – FW 02 - PY							
FW 02 - PY							
AGROCHEMICALS							
GROUP AOX	Nº	**Parameter**	**Chemical formula**	**Unit**	**Measured value**	**Limits**	
						Regulation 222/02	**Alternative reference standards***
PHOSPHOGLYCINE	40	Glyphosate	C3H8NO6P	µg/L	<0,300	0,7	
	41	AMPA	CH6NO3P	µg/L	<0,300	No limits	
CHLORDANE	42	Aldrin	C12H8Cl6	µg/L	<1,00	No limits	
	43	Endrin	C12H8Cl6O	µg/L	<1,25	2	
	44	Dieldrin	C12H8Cl6O	µg/L	<1,50	No limits	
	45	Lindane	C6H6Cl6	µg/L	<0,2	0,2	
	46	Chlordane	C10H6Cl8	µg/L	<0,90	No limits	
	47	DDT	C10H6Cl8	µg/L	<2,00	2	
	48	DDE	--	µg/L	<2,00	No limits	
	49	DDD	--	µg/L	<2,00	No limits	
TRIAZINE	50	Atriazine	C8H14ClN5	µg/L	<2,00	3	
	51	Simazine	C7H12ClN5	µg/L	<2,50	4	
CARBAMATE	52	Carbaryl	C12H11NO2	µg/L	<3,50	No limits	
	53	Carbofuran	C12H15NO3	µg/L	<3,00	4	
	54	Heptachlor	C10H5Cl7	µg/L	<1,50	0	
	55	Methomyl	C5H10N2O2S	µg/L	<25,0	No limits	
ALKYLCHLORO-PHENOXY	56	2,4 D	C8H6Cl2O3	µg/L	<2,50	30	
PYRETHROIDS	57	Lambdacialothrin	$C_{23}H_{19}ClF_3NO_3$	µg/L	--	No limits	

TABLE 63. AGROCHEMICALS IN SURFACE WATER – FW 02 - PY							
FW 02 - PY							
AGROCHEMICALS							
GROUP AOX	№	**Parameter**	**Chemical**	**Unit**	**Measured**	**Limits**	
	58	Bifenthrin	C23H22 ClF3NO2	µg/L	--	No limits	
	59	Cypermethrin	C22H19Cl2NO3	µg/L	<1,20	No limits	
	60	Chlorpyrifos	C9H11Cl3NO3PS	µg/L	<5,00	No limits	
	61	Dichlorvos	C4H7Cl2O4P	µg/L	<10,0	10	
	62	Methamidophos	C2H8NO2PS	µg/L	<25,0	No limits	
TRIAZOLE	63	Tebuconazole	C16H22ClN3O	µg/L	<2,00	1	
NEONICOTINOID	64	Imidacloprid	C9H10ClN5O2	µg/L	<5,00	No limits	
	65	Methylparaoxon	C8H10NO6P	µg/L	<25,0	No limits	
	66	Thiamethoxam	C10H6F17NO2S	µg/L	--	No limits	
FLUORATED	67	Sulfluramide	C10H6F17NO2S	µg/L	--	No limits	
PHENYLPYRAZOLES	68	Fipronil	C12H4Cl2F6N4O.	µg/L	<0,01	No limits	

*Alternative reference standards refers to other national water quality standards, such as Law 1614/200 and NP 24001/80, as well as IFC EHS Guidelines.

APPENDIX B
GROUNDWATER LABORATORY RESULTS

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LIST OF TABLES

B1. Analytical determinations of the sampling point GW 18-ZA

TABLE 1. PARAMETERS MEASURED ON THE SITE - GW 18-ZA			
GW 18-ZA			
SAMPLING POINT DATA			
Sampling time	15:10	Air temperature	25,9 ºC
Atmospheric conditions	Cloudy, drizzle	Relative humidity	80%
UTM coordinates	21K 548201.00 m E; 7512128.00 m S	Elevation	211
Water level	No data	Water table	No data

IN SITU MEASUREMENT						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
1	Water temperature	Tº	ºC	25,9	No limits	
2	Hydrogen potential	pH		6,63	6-9	
3	Electrical conductivity	σ	µS/cm	143	-	1250

TABLE 2. PHYSICOCHEMICAL PARAMETERS - GW 18-ZA						
GW 18-ZA						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
4	Total dissolved solids	TDS	mg/L	200	500	
5	Organic matter	OM	mg O_2/L	0,848	No limits	
6	Hardness	---	mg $CaCO_3$/L	12,5	300	
7	Total phosphorus	P	mg/L	0,352	0,05	
8	Total nitrogen	N	mg/L	0,363	0,6	
9	Nitrates	NO_{3-}	mg/L	10,5	10	
10	Chlorides	Cl-	mg/L	3,09	-	250
11	Alkalinity	---	mg $CaCO_3$./L	76,2	-	250
12	Bicarbonates	---	mg $CaCO_3$./L	49,5	No limits	
13	Carbonates		mg $CaCO_3$./L	0,00	No limits	
14	Sulphates	SO_4^{2-}	mg/L	3,31	250	
15	Sodium	Na	mg/L	30,8	200	
16	Potasium	K	mg/L	1,27	-	12
17	Calcium	Ca	mg/L	3,23	-	100
18	Magnesium	Mg	mg/L	1,08	-	50
19	Fluorine	F	mg/L	0,09	-	1,5
20	Boron	B	mg/L	<0,100	No limits	

TABLE 3. BACTERIOLOGICAL PARAMETERS				
GW 18-ZA				
BACTERIOLOGICAL PARAMETERS				
Nº	**Parameter**	**Unit**	**Measured value**	**Regulation NP 2400180 limits**
21	Faecal coliforms	NMP/100mL	16	1,1 NMP/100mL
22	Total coliforms	NMP/100mL	>23	1,1 NMP/100mL
23	E. coli	NMP/100mL	Absent	Absent

B2. Analytical determinations of sampling point GW20-ST

TABLE 4. PARAMETERS MEASURED ON THE SITE - GW 20-ST			
GW 20-ST			
SAMPLING POINT DATA			
Sampling time	13:00	Air temperature	28,5 ºC
Atmospheric conditions	Nublado	Relative humidity	60%
UTM coordinates	21K 537999.00 m E; 7498476.00 m S	Elevation	186
Water level	No data	Water table	No data

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
1	Water temperature	Tº	ºC	27,3	No limits	
2	Hydrogen potential	pH	--	5,63	6-9	
3	Electrical conductivity	σ	µS/cm	95,7	-	1250

TABLE 5. PHYSICOCHEMICAL PARAMETERS - GW 20-ST						
GW 20-ST						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
4	Total dissolved solids	TDS	mg/L	100	500	
5	Organic matter	OM	mg O_2/L	0,173	No limits	
6	Hardness	---	mg $CaCO_3$/L	0,808	300	
7	Total phosphorus	P	mg/L	0,0263	0,05	
8	Total nitrogen	N	mg/L	0,182	0,6	
9	Nitrates	NO_{3-}	mg/L	22,8	10	
10	Chlorides	Cl-	mg/L	8,08	-	250
11	Alkalinity	---	mg $CaCO_3$/L	47,9	-	250
12	Bicarbonates	---	mg $CaCO_3$/L	6,71	No limits	
13	Carbonates		mg $CaCO_3$/L	0,00	No limits	
14	Sulphates	SO_4^{2-}	mg/L	2,66	250	
15	Sodium	Na	mg/L	8,78	200	
16	Potasium	K	mg/L	0,982	-	12
17	Calcium	Ca	mg/L	1,94	-	100
18	Magnesium	Mg	mg/L	<0,243	-	50
19	Fluorine	F	mg/L	<0,05	-	1,5
20	Boron	B	mg/L	3,88	No limits	

TABLE 6. BACTERIOLOGICAL PARAMETERS - GW 20-S				
GW 20-ST				
BACTERIOLOGICAL PARAMETERS				
Nº	**Parameter**	**Unit**	**Measured value**	**Regulation NP 2400180 limits**
21	Faecal coliforms	NMP/100mL	12	1,1 NMP/100mL
22	Total coliforms	NMP/100mL	>23	1,1 NMP/100mL
23	E. coli	NMP/100mL	Absent	Absent

B3. Analytical determinations of sampling point GW 19-HE

TABLE 7. PARAMETERS MEASURED ON THE SITE - GW 19-HE			
GW 19-HE			
SAMPLING POINT DATA			
Sampling time	12:20	Air temperature	28 ºC
Atmospheric conditions	Cloudy, drizzle	Relative humidity	76%
UTM coordinates	21K 512695.00 m E; 7515558.00 m S	Elevation	230
Water level	No data	Water table	No data

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
1	Water temperature	Tº	ºC	25,8	No limits	
2	Hydrogen potential	pH		7,83	6-9	
3	Electrical conductivity	σ	µS/cm	197	-	1250

TABLE 8. PHYSICOCHEMICAL PARAMETERS - GW 19-HE						
GW 19-HE						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
4	Total dissolved solids	TDS	mg/L	160	500	
5	Organic matter	OM	mg O_2/L	0,134	No limits	
6	Hardness	---	mg $CaCO_3$/L	35,6	300	
7	Total phosphorus	P	mg/L	0,577	0,05	
8	Total nitrogen	N	mg/L	<0,100	0,6	
9	Nitrates	NO_3-	mg/L	1,93	10	
10	Chlorides	Cl-	mg/L	1,43	-	250
11	Alkalinity	---	mg $CaCO_3$./L	79,7	-	250
12	Bicarbonates	---	mg $CaCO_3$./L	78,1	No limits	
13	Carbonates		mg $CaCO_3$./L	0,00	No limits	
14	Sulphates	SO_4^{2-}	mg/L	2,96	250	
15	Sodium	Na	mg/L	31,8	200	
16	Potasium	K	mg/L	1,41	-	12
17	Calcium	Ca	mg/L	12,3	-	100
18	Magnesium	Mg	mg/L	1,15	-	50
19	Fluorine	F	mg/L	0,20	-	1,5
20	Boron	B	mg/L	1,78	No limits	

TABLE 9. BACTERIOLOGICAL PARAMETERS - GW 19-HE				
BACTERIOLOGICAL PARAMETERS - GW 19-HE				
Nº	**Parameter**	**Unit**	**Measured value**	**Regulation NP 2400180 limits**
2	Faecal coliforms	NMP/100mL	9,2	1,1 NMP/100mL
22	Total coliforms	NMP/100mL	>23	1,1 NMP/100mL
23	E. coli	NMP/100mL	Absent	Absent

B4. Analytical determinations of sampling point GW 23-SL

TABLE 10. PARAMETERS MEASURED ON THE SITE - GW 23-S			
GW 23-SL			
SAMPLING POINT DATA			
Sampling time	13:00	Air temperature	28 ºC
Atmospheric conditions	Cloudy	Relative humidity	76%
UTM coordinates	21K 516367.00 m E; 7503054.00 m S	Elevation	205
Water level	19	Water table	186

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
1	Water temperature	Tº	ºC	25,8	No limits	
2	Hydrogen potential	pH		5,71	6-9	
3	Electrical conductivity	σ	µS/cm	34,3	-	1250

TABLE 11. PHYSICOCHEMICAL PARAMETERS - GW 23-SL						
GW 23-SL						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
4	Total dissolved solids	TDS	mg/L	69,5	500	
5	Organic matter	OM	mg O_2/L	1,76	No limits	
6	Hardness	---	mg $CaCO_3$/L	3,03	300	
7	Total phosphorus	P	mg/L	0,0947	0,05	
8	Total nitrogen	N	mg/L	0,109	0,6	
9	Nitrates	NO_{3-}	mg/L	5,08	10	
10	Chlorides	Cl-	mg/L	4,75	-	250
11	Alkalinity	---	mg $CaCO_3$./L	10,8	-	250
12	Bicarbonates	---	mg $CaCO_3$./L	1,94	No limits	
13	Carbonates		mg $CaCO_3$./L	0,00	No limits	
14	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
15	Sodium	Na	mg/L	4,09	200	
16	Potasium	K	mg/L	<0,250	-	12
17	Calcium	Ca	mg/L	2,19	-	100
18	Magnesium	Mg	mg/L	<0,243	-	50
19	Fluorine	F	mg/L	<0,05	-	1,5
20	Boron	B	mg/L	0,825	NO LIMITS	

TABLE 12. BACTERIOLOGICAL PARAMETERS - GW 23-SL				
GW 23-SL				
BACTERIOLOGICAL PARAMETERS				
Nº	**Parameter**	**Unit**	**Measured value**	**Regulation NP 2400180 limits**
21	Faecal coliforms	NMP/100mL	23	1,1 NMP/100mL
22	Total coliforms	NMP/100mL	>23	1,1 NMP/100mL
23	E. coli	NMP/100mL	Absent	Absent

B5. Analytical determinations for sampling point GW 16-GA

TABLE 13. PARAMETERS MEASURED ON THE SITE - GW 16-GA			
GW 16-GA			
SAMPLING POINT DATA			
Sampling time	13:00	Air temperature	29,6ºC
Atmospheric conditions	Sunny	Relative humidity	65%
UTM coordinates	21K 505125.00 m E; 7498320.00 m S	Elevation	219
Water level	No data	Water table	No data

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
1	Water temperature	Tº	ºC	24,3	No limits	
2	Hydrogen potential	pH		6,87	6-9	
3	Electrical conductivity	σ	µS/cm	247	-	1250

TABLE 14. PHYSICOCHEMICAL PARAMETERS - GW 16-GA						
GW 16-GA						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
4	Total dissolved solids	TDS	mg/L	266	500	
5	Organic matter	OM	mg O_2/L	0,382	No limits	
6	Hardness	---	mg $CaCO_3$/L	30,9	300	
7	Total phosphorus	P	mg/L	0,0431	0,05	
8	Total nitrogen	N	mg/L	<0,100	0,6	
9	Nitrates	NO_{3-}	mg/L	0,899	10	
10	Chlorides	Cl-	mg/L	6,89	-	250
11	Alkalinity	---	mg $CaCO_3$/L	91,5	-	250
12	Bicarbonates	---	mg $CaCO_3$/L	66,8	No limits	
13	Carbonates		mg $CaCO_3$/L	0,00	No limits	
14	Sulphates	SO_4^{2-}	mg/L	9,50	250	
15	Sodium	Na	mg/L	42,2	200	
16	Potasium	K	mg/L	0,311	-	12
17	Calcium	Ca	mg/L	10,6	-	100
18	Magnesium	Mg	mg/L	1,07	-	50
19	Fluorine	F	mg/L	0,22	-	1,5
20	Boron	B	mg/L	<0,100	No limits	

TABLE 15. BACTERIOLOGICAL PARAMETERS - GW 16-GA				
GW 16-GA				
BACTERIOLOGICAL PARAMETERS				
Nº	**Parameter**	**Unit**	**Measured value**	**Regulation NP 2400180 limits**
21	Faecal coliforms	NMP/100mL	<1,1	1,1 NMP/100mL
22	Total coliforms	NMP/100mL	12	1,1 NMP/100mL
23	E. coli	NMP/100mL	Absent	Absent

B6. Analytical determinations for sampling point GW 11-MICHEL

TABLE 16. PHYSICOCHEMICAL PARAMETERS - GW 11-MICHEL			
GW 11-MICHEL			
SAMPLING POINT DATA			
Sampling time	06:50	Air temperature	24,5 ºC
Atmospheric conditions	Cloudy, drizzle	Relative humidity	82%
UTM coordinates	21K 518643.00 m E; 7484801.00 m S	Elevation	182
Water level	No data	Water table	No data

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
1	Water temperature	Tº	ºC	25,0	No limits	
2	Hydrogen potential	pH		5,87	6-9	
3	Electrical conductivity	σ	µS/cm	72,0	-	1250

TABLE 17. PHYSICOCHEMICAL PARAMETERS - GW 11-MICHEL						
GW 11-MICHEL						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
4	Total dissolved solids	TDS	mg/L	115	500	
5	Organic matter	OM	mg O_2/L	0,670	No limits	
6	Hardness	---	mg $CaCO_3$/L	10,5	300	
7	Total phosphorus	P	mg/L	0,107	0,05	
8	Total nitrogen	N	mg/L	<0,100	0,6	
9	Nitrates	NO_{3-}	mg/L	1,80	10	
10	Chlorides	Cl-	mg/L	10,9	-	250
11	Alkalinity	---	mg $CaCO_3$/L	80,4	-	250
12	Bicarbonates	---	mg $CaCO_3$/L	16,1	No limits	
13	Carbonates		mg $CaCO_3$/L	0,00	No limits	
14	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
15	Sodium	Na	mg/L	9,94	200	
16	Potasium	K	mg/L	0,737	-	12
17	Calcium	Ca	mg/L	4,05	-	100
18	Magnesium	Mg	mg/L	<0,243	-	50
19	Fluorine	F	mg/L	<0,05	-	1,5
20	Boron	B	mg/L	1,41	No limits	

TABLE 18. BACTERIOLOGICAL PARAMETERS - GW11-MICHEL				
GW 11-MICHEL				
BACTERIOLOGICAL PARAMETERS				
Nº	**Parameter**	**Unit**	**Measured value**	**Regulation NP 2400180 limits**
21	Faecal coliforms	NMP/100mL	>23	1,1 NMP/100mL
22	Total coliforms	NMP/100mL	>23	1,1 NMP/100mL
23	E. coli	NMP/100mL	Absent	Absent

B7. Analytical determinations for sampling point GW 10-TR

TABLE 19. PARAMETERS MEASURED ON THE SITE - GW 10-TR			
GW 10-TR			
SAMPLING POINT DATA			
Sampling time	7:20	Air temperature	25 ºC
Atmospheric conditions	Cloudy	Relative humidity	81%
UTM coordinates	21K 516254.00 m E 7484946.00 m S	Elevation	157
Water level	No data	Water table	No data

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
1	Water temperature	Tº	ºC	25,8	No limits	
2	Hydrogen potential	pH		7,16	6-9	
3	Electrical conductivity	σ	µS/cm	321	-	1500

TABLE 20. PHYSICOCHEMICAL PARAMETERS - GW 10-TR						
GW 10-TR						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
4	Total dissolved solids	TDS	mg/L	273	500	
5	Organic matter	OM	mg O_2/L	0,196	No limits	
6	Hardness	---	mg $CaCO_3$/L	12,3	300	
7	Total phosphorus	P	mg/L	0,876	0,05	
8	Total nitrogen	N	mg/L	0,177	0,6	
9	Nitrates	NO_{3-}	mg/L	0,818	1	
10	Chlorides	Cl-	mg/L	28,50	-	250
11	Alkalinity	---	mg $CaCO_3$/L	96,5	-	250
12	Bicarbonates	---	mg $CaCO_3$/L	81,1	No limits	
13	Carbonates		mg $CaCO_3$/L	0,00	No limits	
14	Sulphates	SO_4^{2-}	mg/L	3,21	250	
15	Sodium	Na	mg/L	63,2	200	
16	Potasium	K	mg/L	0,804	-	12
17	Calcium	Ca	mg/L	3,97	-	100
18	Magnesium	Mg	mg/L	0,578	-	50
19	Fluorine	F	mg/L	0,24	-	1,5
20	Boron	B	mg/L	0,168	No limits	

TABLE 21. BACTERIOLOGICAL PARAMETERS - GW 10-TR				
GW 10-TR				
BACTERIOLOGICAL PARAMETERS				
Nº	**Parameter**	**Unit**	**Measured value**	**Regulation NP 2400180 limits**
22	Faecal coliforms	NMP/100mL	10	1,1 NMP/100mL
23	Total coliforms	NMP/100mL	>23	1,1 NMP/100mL
24	E. coli	NMP/100mL	Absent	Absent

B8. Analytical determinations for sampling point GW 13-San Juan

TABLE 22. PARAMETERS MEASURED ON THE SITE - GW 13-SAN JUAN			
GW 13-San Juan			
SAMPLING POINT DATA			
Sampling time	8:20	Air temperature	26,5 ºC
Atmospheric conditions	Sunny, disperse clouds	Relative humidity	80%
UTM coordinates	21K 509767.00 m E; 7486076.00 m S	Elevation	184
Water level	No data	Water table	No data

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
1	Water temperature	Tº	ºC	21,2	No limits	
2	Hydrogen potential	pH		6,92	6-9	
3	Electrical conductivity	σ	µS/cm	320	-	1250

TABLE 23. PHYSICOCHEMICAL PARAMETERS - GW 13-SAN JUAN						
GW 13-San Juan						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
4	Total dissolved solids	TDS	mg/L	383	500	
5	Organic matter	OM	mg O_2/L	0,685	No limits	
6	Hardness	---	mg $CaCO_3$/L	9,90	300	
7	Total phosphorus	P	mg/L	0,127	0,05	
8	Total nitrogen	N	mg/L	<0,100	0,6	
9	Nitrates	NO_{3-}	mg/L	106	10	
10	Chlorides	Cl-	mg/L	32,3	-	250
11	Alkalinity	---	mg $CaCO_3$/L	15,2	-	250
12	Bicarbonates	---	mg $CaCO_3$/L	13,1	No limits	
13	Carbonates		mg $CaCO_3$/L	0,00	No limits	
14	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
15	Sodium	Na	mg/L	74,4	200	
16	Potasium	K	mg/L	1,26	-	12
17	Calcium	Ca	mg/L	3,08	-	100
18	Magnesium	Mg	mg/L	0,536	-	50
19	Fluorine	F	mg/L	0,06	-	1,5
20	Boron	B	mg/L	0,100	No limits	

TABLE 24.BACTERIOLOGICAL PARAMETERS - GW 13-SAN JUAN				
GW 13-San Juan				
BACTERIOLOGICAL PARAMETERS				
Nº	**Parameter**	**Unit**	**Measured value**	**Regulation NP 2400180 limits**
22	Faecal coliforms	NMP/100mL	>23	1,1 NMP/100mL
23	Total coliforms	NMP/100mL	>23	1,1 NMP/100mL
24	E. coli	NMP/100mL	Absent	Absent

B9. Analytical determinations for sampling point GW 22-Silva

TABLE 25. PARAMETERS MEASURED ON THE SITE – GW22-SILVA			
GW 22-Silva			
SAMPLING POINT DATA			
Sampling time	8:50	Air temperature	27 °C
Atmospheric conditions	Sunny, disperse clouds	Relative humidity	80%
UTM coordinates	21K 509830.00 m E; 7484037.00 m S	Elevation	179
Water level	No data	Water table	No data

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
1	Water temperature	Tº	ºC	21,7	No limits	
2	Hydrogen potential	pH		5,54	6-9	
3	Electrical conductivity	σ	µS/cm	197	-	1250

TABLE 26. PHYSICOCHEMICAL PARAMETERS - GW 22-SILVA						
GW 22-Silva						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
4	Total dissolved solids	TDS	mg/L	247	500	
5	Organic matter	OM	mg O_2/L	0,538	No limits	
6	Hardness	---	mg $CaCO_3$/L	22,0	300	
7	Total phosphorus	P	mg/L	<0,0200	0,05	
8	Total nitrogen	N	mg/L	<0,100	0,6	
9	Nitrates	NO_{3-}	mg/L	55,2	10	
10	Chlorides	Cl-	mg/L	13,3	-	250
11	Alkalinity	---	mg $CaCO_3$/L	13,8	-	250
12	Bicarbonates	---	mg $CaCO_3$/L	1,38	No limits	
13	Carbonates		mg $CaCO_3$/L	0,00	No limits	
14	Sulphates	SO_4^{2-}	mg/L	7,37	250	
15	Sodium	Na	mg/L	12,4	200	
16	Potasium	K	mg/L	7,63	-	12
17	Calcium	Ca	mg/L	4,86	-	100
18	Magnesium	Mg	mg/L	2,41	-	50
19	Fluorine	F	mg/L	<0,05	-	1,5
20	Boron	B	mg/L	<0,100	No limits	

TABLE 27. BACTERIOLOGICAL PARAMETERS - GW 22-SILVA				
GW 22-Silva				
BACTERIOLOGICAL PARAMETERS				
Nº	**Parameter**	**Unit**	**Measured value**	**Regulation NP 2400180 limits**
21	Faecal coliforms	NMP/100mL	23	1,1 NMP/100mL
22	Total coliforms	NMP/100mL	>23	1,1 NMP/100mL
23	E. coli	NMP/100mL	Absent	Absent

B10. Analytical determinations for sampling point GW 12- Laguna

TABLE 28. PARAMETERS MEASURED ON THE SITE - GW 12-LAGUNA			
GW 12- Laguna			
SAMPLING POINT DATA			
Sampling time	16:30	Air temperature	28,6 ºC
Atmospheric conditions	Cloudy	Relative humidity	79%
UTM coordinates	21K 516419.00 m E; 7478307.00 m S	Elevation	154
Water level	12,3	Water table	183,3

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
1	Water temperature	Tº	ºC	25,7	No limits	
2	Hydrogen potential	pH		7,04	6-9	
3	Electrical conductivity	σ	µS/cm	318	-	1250

TABLE 29. PHYSICOCHEMICAL PARAMETERS - GW 12-LAGUNA						
GW 12- Laguna						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
4	Total dissolved solids	TDS	mg/L	236	500	
5	Organic matter	OM	mg O_2/L	0,406	No limits	
6	Hardness	---	mg $CaCO_3$/L	88,1	300	
7	Total phosphorus	P	mg/L	0,264	0,05	
8	Total nitrogen	N	mg/L	0,339	0,6	
9	Nitrates	NO_{3-}	mg/L	3,70	10	
10	Chlorides	Cl-	mg/L	4,28	-	250
11	Alkalinity	---	mg $CaCO_3$/L	132	-	250
12	Bicarbonates	---	mg $CaCO_3$/L	108	No limits	
13	Carbonates		mg $CaCO_3$/L	0,00	No limits	
14	Sulphates	SO_4^{2-}	mg/L	3,46	250	
15	Sodium	Na	mg/L	30,1	200	
16	Potasium	K	mg/L	0,906	-	12
17	Calcium	Ca	mg/L	24,7	-	100
18	Magnesium	Mg	mg/L	6,410	-	50
19	Fluorine	F	mg/L	0,15	-	1,5
20	Boron	B	mg/L	8,22	No limits	

TABLE 30. BACTERIOLOGICAL PARAMETERS - GW 12-LAGUNA				
GW 12- Laguna				
BACTERIOLOGICAL PARAMETERS				
Nº	**Parameter**	**Unit**	**Measured value**	**Regulation NP 2400180 limits**
21	Faecal coliforms	NMP/100mL	6,9	1,1 NMP/100mL
22	Total coliforms	NMP/100mL	>23	1,1 NMP/100mL
23	E. coli	NMP/100mL	Ausente	Ausencia

B11. Analytical determinations for sampling point GW 14-ZM

TABLE 31. PARAMETERS MEASURED ON THE SITE - GW 14-ZM			
GW 14-ZM			
SAMPLING POINT DATA			
Sampling time	13:40	Air temperature	29,5 º C
Atmospheric conditions	Cloudy, drizzle	Relative humidity	79%
UTM coordinates	21K 493064.00 m E; 7499176.00 m S	Elevation	212
Water level	No data	Water table	No data

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
1	Water temperature	Tº	ºC	22,1	No limits	
2	Hydrogen potential	pH		7,16	6-9	
3	Electrical conductivity	σ	µS/cm	113	-	1250

TABLE 32. PARÁMETROS FISICOQUÍMICOS GW 14-ZM						
GW 14-ZM						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
4	Total dissolved solids	TDS	mg/L	216	500	
5	Organic matter	OM	mg O_2/L	1,23	No limits	
6	Hardness	---	mg $CaCO_3$/L	26,3	300	
7	Total phosphorus	P	mg/L	0,204	0,05	
8	Total nitrogen	N	mg/L	0,107	0,6	
9	Nitrates	NO_{3-}	mg/L	<0,200	10	
10	Chlorides	Cl-	mg/L	9,50	-	250
11	Alkalinity	---	mg $CaCO_3$/L	52,6	-	250
12	Bicarbonates	---	mg $CaCO_3$/L	38,9	No limits	
13	Carbonates		mg $CaCO_3$/L	0,00	No limits	
14	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
15	Sodium	Na	mg/L	12,1	200	
16	Potasium	K	mg/L	1,07	-	12
17	Calcium	Ca	mg/L	6,72	-	100
18	Magnesium	Mg	mg/L	2,30	-	50
19	Fluorine	F	mg/L	0,25	-	1,5
20	Boron	B	mg/L	<0,100	No limits	

TABLE 33. BACTERIOLOGICAL PARAMETERS - GW 14-ZM				
GW 14-ZM				
BACTERIOLOGICAL PARAMETERS				
Nº	**Parameter**	**Unit**	**Measured value**	**Regulation NP 2400180 limits**
22	Faecal coliforms	NMP/100mL	6,9	1,1 NMP/100mL
23	Total coliforms	NMP/100mL	>23	1,1 NMP/100mL
24	E. coli	NMP/100mL	Absent	Absent

B12. Analytical determinations for sampling point GW 15-SO

TABLE 34. PARAMETERS MEASURED ON THE SITE - GW 15-SO			
GW 15-SO			
DATOS DEL PUNTO DE MUESTREO			
Sampling time	12:10	Air temperature	24,8 ºC
Atmospheric conditions	Cloudy, rainy	Relative humidity	60%
UTM coordinates	21K 483316.00 m E, 7497562.00 m S	Elevation	290
Water level	No data	Water table	No data

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
1	Water temperature	Tº	ºC	27,7	No limits	
2	Hydrogen potential	pH		7,34	6-9	
3	Electrical conductivity	σ	µS/cm	950	-	1250

TABLE 35. PHYSICOCHEMICAL PARAMETERS - GW 15-SO						
GW 15-SO						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
4	Total dissolved solids	TDS	mg/L	665	500	
5	Organic matter	OM	mg O_2/L	1,31	No limits	
6	Hardness	---	mg $CaCO_3$/L	313	300	
7	Total phosphorus	P	mg/L	<0,0200	0,05	
8	Total nitrogen	N	mg/L	0,734	0,6	
9	Nitrates	NO_{3-}	mg/L	199	10	
10	Chlorides	Cl-	mg/L	8,31	-	250
11	Alkalinity	---	mg $CaCO_3$/L	299	-	250
12	Bicarbonates	---	mg $CaCO_3$/L	269	No limits	
13	Carbonates		mg $CaCO_3$/L	0,00	No limits	
14	Sulphates	SO_4^{2-}	mg/L	17,9	250	
15	Sodium	Na	mg/L	64,6	200	
16	Potasium	K	mg/L	1,93	-	12
17	Calcium	Ca	mg/L	76,3	-	100
18	Magnesium	Mg	mg/L	29,7	-	50
19	Fluorine	F	mg/L	0,67	-	1,5
20	Boron	B	mg/L	<0,100	No limits	

TABLE 36. BACTERIOLOGICAL PARAMETERS - GW 15-SO				
GW 15-SO				
BACTERIOLOGICAL PARAMETERS				
Nº	**Parameter**	**Unit**	**Measured value**	**Regulation NP 2400180 limits**
22	Faecal coliforms	NMP/100mL	>23	1,1 NMP/100mL
23	Total coliforms	NMP/100mL	>23	1,1 NMP/100mL
24	E. coli	NMP/100mL	Absent	Absent

B13. Analytical determinations for sampling point GW 17-LP

TABLE 37. PARAMETERS MEASURED ON THE SITE - GW 17-LP			
GW 17-LP			
SAMPLING POINT DATA			
Sampling time	14: 50	Air temperature	26,8 ºC
Atmospheric conditions	Sunny, disperse clouds	Relative humidity	60%
UTM coordinates	21K 489833.00 m E, 7492572.00 m S	Elevation	215
Water level	No data	Water table	No data

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
1	Water temperature	Tº	ºC	21,7	No limits	
2	Hydrogen potential	pH		6,96	6-9	
3	Electrical conductivity	σ	µS/cm	196	-	1250

TABLE 38. PHYSICOCHEMICAL PARAMETERS - GW 17-LP						
GW 17-LP						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
4	Total dissolved solids	TDS	mg/L	203	500	
5	Organic matter	OM	mg O_2/L	0,615	No limits	
6	Hardness	---	mg $CaCO_3$/L	64,0	300	
7	Total phosphorus	P	mg/L	0,0699	0,05	
8	Total nitrogen	N	mg/L	<0,100	0,6	
9	Nitrates	NO_{3-}	mg/L	<0,200	10	
10	Chlorides	Cl-	mg/L	0,475	-	250
11	Alkalinity	---	mg $CaCO_3$/L	94,5	-	250
12	Bicarbonates	---	mg $CaCO_3$/L	73,7	No limits	
13	Carbonates		mg $CaCO_3$/L	0,00	No limits	
14	Sulphates	SO_4^{2-}	mg/L	<2,00	250	
15	Sodium	Na	mg/L	14,6	200	
16	Potasium	K	mg/L	0,486	-	12
17	Calcium	Ca	mg/L	15,5	-	100
18	Magnesium	Mg	mg/L	6,11	-	50
19	Fluorine	F	mg/L	0,53	-	1,5
20	Boron	B	mg/L	0,519	No limits	

TABLE 39. BACTERIOLOGICAL PARAMETERS - GW 17-LP				
GW 17-LP				
BACTERIOLOGICAL PARAMETERS				
Nº	**Parameter**	**Unit**	**Measured value**	**Regulation NP 2400180 limits**
21	Faecal coliforms	NMP/100mL	>23	1,1 NMP/100mL
22	Total coliforms	NMP/100mL	>23	1,1 NMP/100mL
23	E. coli	NMP/100mL	Absent	Absent

B14. Analytical determinations for sampling point GW 21-MC

TABLE 40. PARAMETERS MEASURED ON THE SITE - GW 21-MC			
GW 21-MC			
SAMPLING POINT DATA			
Sampling time	15:30	Air temperature	26,5 ºC
Atmospheric conditions	Cloudy	Relative humidity	63%
UTM coordinates	21K 495202.00 m E; 7489899.00 m S	Elevation	177
Water level	10,70	Water table	166,3

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
1	Water temperature	T_{agua}	ºC	22,7	NO LIMITS	
2	Hydrogen potential	pH		6,26	6-9	
3	Electrical conductivity	σ	µS/cm	406	-	1250

TABLE 41. PHYSICOCHEMICAL PARAMETERS - GW 21-MC						
GW 21-MC						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
4	Total dissolved solids	TDS	mg/L	404	500	
5	Organic matter	OM	mg O_2/L	0,475	No limits	
6	Hardness	---	mg $CaCO_3$/L	58,8	300	
7	Total phosphorus	P	mg/L	0,170	0,05	
8	Total nitrogen	N	mg/L	<0,100	0,6	
9	Nitrates	NO_{3-}	mg/L	75,5	10	
10	Chlorides	Cl-	mg/L	49,9	-	250
11	Alkalinity	---	mg $CaCO_3$/L	58,1	-	250
12	Bicarbonates	---	mg $CaCO_3$/L	5,81	No limits	
13	Carbonates		mg $CaCO_3$/L	0,00	No limits	
14	Sulphates	SO_4^{2-}	mg/L	5,79	250	
15	Sodium	Na	mg/L	51,0	200	
16	Potasium	K	mg/L	3,23	-	12
17	Calcium	Ca	mg/L	15,3	-	100
18	Magnesium	Mg	mg/L	4,98	-	50
19	Fluorine	F	mg/L	0,14	-	1,5
20	Boron	B	mg/L	0,650	No limits	

TABLE 42. BACTERIOLOGICAL PARAMETERS - GW 21-MC				
GW 21-MC				
BACTERIOLOGICAL PARAMETERS				
Nº	**Parameter**	**Unit**	**Measured value**	**Regulation NP 2400180 limits**
21	Faecal coliforms	NMP/100mL	>23	1,1 NMP/100mL
22	Total coliforms	NMP/100mL	>23	1,1 NMP/100mL
23	E. coli	NMP/100mL	Absent	Absent

B15. Analytical determinations for sampling point GW 01

TABLE 43. PARAMETERS MEASURED ON THE SITE - GW 01			
GW 01			
SAMPLING POINT DATA			
Sampling time	11:40	Air temperature	29,7 ºC
Atmospheric conditions	Sunny	Relative humidity	64%
UTM coordinates	21K 449839.00 m E 7430729.00 m S	Elevation	123 m
Water level	No data	Water table	No data

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
1	Water temperature	T_{agua}	ºC	20,1	NO LIMITS	
2	Hydrogen potential	pH		7,16	6-9	
3	Electrical conductivity	σ	µS/cm	2.400	-	1250

TABLE 44. PHYSICOCHEMICAL PARAMETERS - GW 01						
GW 01						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
4	Total dissolved solids	TDS	mg/L	1.181	500	
5	Organic matter	OM	mg O_2/L	10,1	No limits	
6	Hardness	---	mg $CaCO_3$/L	281	300	
7	Total phosphorus	P	mg/L	0,356	0,05	
8	Total nitrogen	N	mg/L	2,73	0,6	
9	Nitrates	NO_{3-}	mg/L	1,49	10	
10	Chlorides	Cl-	mg/L	285	-	250
11	Alkalinity	---	mg $CaCO_3$/L	397	-	250
12	Bicarbonates	---	mg $CaCO_3$/L	55,5	No limits	
13	Carbonates		mg $CaCO_3$/L	0,00	No limits	
14	Sulphates	SO_4^{2-}	mg/L	337	250	
15	Sodium	Na	mg/L	374	200	
16	Potasium	K	mg/L	8,40	-	12
17	Calcium	Ca	mg/L	85,8	-	100
18	Magnesium	Mg	mg/L	16,1	-	50
19	Fluorine	F	mg/L	2,30	-	1,5
20	Boron	B	mg/L	1,67	No limits	

TABLE 45. BACTERIOLOGICAL PARAMETERS - GW 01				
GW 01				
BACTERIOLOGICAL PARAMETERS				
Nº	**Parameter**	**Unit**	**Measured value**	**Regulation NP 2400180 limits**
21	Faecal coliforms	NMP/100mL	>23	1,1 NMP/100mL
22	Total coliforms	NMP/100mL	>23	1,1 NMP/100mL
23	E. coli	NMP/100mL	Present	Absent

B16. Analytical determinations for sampling point GW 02

TABLE 46. PARAMETERS MEASURED ON THE SITE - GW 02			
GW 02			
SAMPLING POINT DATA			
Sampling time	9:40	Air temperature	28,5 ºC
Atmospheric conditions	Sunny	Relative humidity	65%
UTM coordinates	21k 450165.00 m E 7430301.00 m S	Elevation	116 m
Water level	No data	Water table	No data

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
1	Water temperature	T_{agua}	ºC	19,7	NO LIMITS	
2	Hydrogen potential	pH		6,96	6-9	
3	Electrical conductivity	σ	µS/cm	444	-	1250

TABLE 47. PHYSICOCHEMICAL PARAMETERS - GW 02						
GW 02						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
4	Total dissolved solids	TDS	mg/L	248	500	
5	Organic matter	OM	mg O_2/L	0,505	No limits	
6	Hardness	---	mg $CaCO_3$/L	84	300	
7	Total phosphorus	P	mg/L	0,0776	0,05	
8	Total nitrogen	N	mg/L	0,196	0,6	
9	Nitrates	NO_{3-}	mg/L	<0,0200	10	
10	Chlorides	Cl-	mg/L	1,59	-	250
11	Alkalinity	---	mg $CaCO_3$/L	178	-	250
12	Bicarbonates	---	mg $CaCO_3$/L	88,8	No limits	
13	Carbonates		mg $CaCO_3$/L	0,00	No limits	
14	Sulphates	SO_4^{2-}	mg/L	24,5	250	
15	Sodium	Na	mg/L	43,1	200	
16	Potasium	K	mg/L	16,5	-	12
17	Calcium	Ca	mg/L	20,5	-	100
18	Magnesium	Mg	mg/L	8,07	-	50
19	Fluorine	F	mg/L	1,60	-	1,5
20	Boron	B	mg/L	1,67	No limits	

TABLE 48. BACTERIOLOGICAL PARAMETERS - GW 02				
GW 02				
BACTERIOLOGICAL PARAMETERS				
Nº	**Parameter**	**Unit**	**Measured value**	**Regulation NP 2400180 limits**
21	Faecal coliforms	NMP/100mL	<1,1	1,1 NMP/100mL
22	Total coliforms	NMP/100mL	<1,1	1,1 NMP/100mL
23	E. coli	NMP/100mL	Absent	Absent

B17. Analytical determinations for sampling point GW 03 (NO WATER)

TABLE 49. PARAMETERS MEASURED ON THE SITE - GW 03			
GW 03			
SAMPLING POINT DATA			
Sampling time	13:30	Air temperature	30,4 ºC
Atmospheric conditions	Sunny	Relative humidity	67%
UTM coordinates	21 k 449680.00 m E 7426904.00 m S	Elevation	83 m
Water level	No data	Water table	No data

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
1	Water temperature	T_{agua}	ºC	-	NO LIMITS	
2	Hydrogen potential	pH		-	6-9	
3	Electrical conductivity	σ	µS/cm	-	-	1250

TABLE 50. PHYSICOCHEMICAL PARAMETERS - GW 03						
GW 03						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
4	Total dissolved solids	TDS	mg/L	-	500	
5	Organic matter	OM	mg O_2/L	-	No limits	
6	Hardness	---	mg $CaCO_3$/L	-	300	
7	Total phosphorus	P	mg/L	-	0,05	
8	Total nitrogen	N	mg/L	-	0,6	
9	Nitrates	NO_{3-}	mg/L	-	10	
10	Chlorides	Cl-	mg/L	-	-	250
11	Alkalinity	---	mg $CaCO_3$/L	-	-	250
12	Bicarbonates	---	mg $CaCO_3$/L	-	No limits	
13	Carbonates		mg $CaCO_3$/L	-	No limits	
14	Sulphates	SO_4^{2-}	mg/L	-	250	
15	Sodium	Na	mg/L	-	200	
16	Potasium	K	mg/L	-	-	12
17	Calcium	Ca	mg/L	-	-	100
18	Magnesium	Mg	mg/L	-	-	50
19	Fluorine	F	mg/L	-	-	1,5
20	Boron	B	mg/L	-	No limits	

TABLE 51. BACTERIOLOGICAL PARAMETERS - GW 03				
GW 03				
BACTERIOLOGICAL PARAMETERS				
Nº	**Parameter**	**Unit**	**Measured value**	**Regulation NP 2400180 limits**
21	Faecal coliforms	NMP/100mL	-	1,1 NMP/100mL
22	Total coliforms	NMP/100mL	-	1,1 NMP/100mL
23	E. coli	NMP/100mL	-	Absent

B18. Analytical determinations for sampling point GW 04

TABLE 52. PARAMETERS MEASURED ON THE SITE - GW 04			
GW 04			
SAMPLING POINT DATA			
Sampling time	10:00	Air temperature	29.7 ºC
Atmospheric conditions	Sunny	Relative humidity	58 %
UTM coordinates	21k 449136.00 m E 7427123.00 m S	Elevation	94 m
Water level	No data	Water table	No data

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
1	Water temperature	T_{agua}	ºC	21,2	NO LIMITS	
2	Hydrogen potential	pH		7,44	6-9	
3	Electrical conductivity	σ	µS/cm	5.010	-	1250

TABLE 53. PHYSICOCHEMICAL PARAMETERS - GW 04						
GW 04						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
4	Total dissolved solids	TDS	mg/L	**2.577**	500	
5	Organic matter	OM	mg O_2/L	12,0	No limits	
6	Hardness	---	mg $CaCO_3$/L	**709**	300	
7	Total phosphorus	P	mg/L	12,0	0,05	
8	Total nitrogen	N	mg/L	9,02	0,6	
9	Nitrates	NO_{3-}	mg/L	<0,0200	10	
10	Chlorides	Cl-	mg/L	**611**	-	250
11	Alkalinity	---	mg $CaCO_3$./L	**282**	-	250
12	Bicarbonates	---	mg $CaCO_3$./L	22,6	No limits	
13	Carbonates		mg $CaCO_3$./L	0,00	No limits	
14	Sulphates	SO_4^{2-}	mg/L	160	250	
15	Sodium	Na	mg/L	**367**	200	
16	Potasium	K	mg/L	6,57	-	12
17	Calcium	Ca	mg/L	**164**	-	100
18	Magnesium	Mg	mg/L	**72,9**	-	50
19	Fluorine	F	mg/L	1,00	-	1,5
20	Boron	B	mg/L	1,25	No limits	

TABLE 54. BACTERIOLOGICAL PARAMETERS - GW 04				
GW 04				
BACTERIOLOGICAL PARAMETERS				
Nº	**Parameter**	**Unit**	**Measured value**	**Regulation NP 2400180 limits**
21	Faecal coliforms	NMP/100mL	**>23**	1,1 NMP/100mL
22	Total coliforms	NMP/100mL	**>23**	1,1 NMP/100mL
23	E. coli	NMP/100mL	Present	Absent

B19. Analytical determinations for sampling point GW 05

TABLE 55. PARAMETERS MEASURED ON THE SITE - GW 05			
GW 05			
SAMPLING POINT DATA			
Sampling time	14:50	Air temperature	31,2 ºC
Atmospheric conditions	Sunny	Relative humidity	52 %
UTM coordinates	21K 450803.00 m E 7426714.00 m S	Elevation	91 m
Water level	No data	Water table	No data

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
1	Water temperature	T_{agua}	ºC	23,0	NO LIMITS	
2	Hydrogen potential	pH		6,89	6-9	
3	Electrical conductivity	σ	µS/cm	370	-	1250

TABLE 56. PHYSICOCHEMICAL PARAMETERS - GW 05						
GW 05						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
4	Total dissolved solids	TDS	mg/L	245	500	
5	Organic matter	OM	mg O_2/L	0,366	No limits	
6	Hardness	---	mg $CaCO_3$/L	88,1	300	
7	Total phosphorus	P	mg/L	0,0212	0,05	
8	Total nitrogen	N	mg/L	0,245	0,6	
9	Nitrates	NO_{3-}	mg/L	<0,0200	10	
10	Chlorides	Cl-	mg/L	43,1	-	250
11	Alkalinity	---	mg $CaCO_3$./L	13,5	-	250
12	Bicarbonates	---	mg $CaCO_3$./L	5,40	No limits	
13	Carbonates		mg $CaCO_3$./L	0,00	No limits	
14	Sulphates	SO_4^{2-}	mg/L	16,1	250	
15	Sodium	Na	mg/L	25,7	200	
16	Potasium	K	mg/L	6,60	-	12
17	Calcium	Ca	mg/L	25,3	-	100
18	Magnesium	Mg	mg/L	6,06	-	50
19	Fluorine	F	mg/L	0,200	-	1,5
20	Boron	B	mg/L	2,51	No limits	

TABLE 57. BACTERIOLOGICAL PARAMETERS - GW 05				
GW 05				
BACTERIOLOGICAL PARAMETERS				
Nº	**Parameter**	**Unit**	**Measured value**	**Regulation NP 2400180 limits**
21	Faecal coliforms	NMP/100mL	**5,1**	1,1 NMP/100mL
22	Total coliforms	NMP/100mL	**1,1**	1,1 NMP/100mL
23	E. coli	NMP/100mL	Present	Absent

B20. Analytical determinations for sampling point GW 06

TABLE 58. PARAMETERS MEASURED ON THE SITE - GW 06			
GW 06			
SAMPLING POINT DATA			
Sampling time	16:00	Air temperature	30,08 ºC
Atmospheric conditions	Sunny	Relative humidity	57 %
UTM coordinates	21k 451708.00 m E 7427153.00 m S	Elevation	90 m
Water level	No data	Water table	No data

IN SITU MEASUREMENTS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
1	Water temperature	T_{agua}	ºC	21,4	NO LIMITS	
2	Hydrogen potential	pH		6,39	6-9	
3	Electrical conductivity	σ	µS/cm	330	-	1250

TABLE 59. PHYSICOCHEMICAL PARAMETERS - GW 06						
GW 06						
PHYSICOCHEMICAL PARAMETERS						
Nº	**Parameter**	**Symbol**	**Unit**	**Measured value**	**Limits**	
					Regulation 222/02	**Annexe I Law 1614/2000.**
4	Total dissolved solids	TDS	mg/L	240	500	
5	Organic matter	OM	mg O_2/L	1,18	No limits	
6	Hardness	---	mg $CaCO_3$/L	60	300	
7	Total phosphorus	P	mg/L	0,0723	0,05	
8	Total nitrogen	N	mg/L	0,483	0,6	
9	Nitrates	NO_{3-}	mg/L	<0,0200	10	
10	Chlorides	Cl-	mg/L	33,3	-	250
11	Alkalinity	---	mg $CaCO_3$/L	54,6	-	250
12	Bicarbonates	---	mg $CaCO_3$/L	27,8	No limits	
13	Carbonates		mg $CaCO_3$/L	0,00	No limits	
14	Sulphates	SO_4^{2-}	mg/L	29,7	250	
15	Sodium	Na	mg/L	30,9	200	
16	Potasium	K	mg/L	5,84	-	12
17	Calcium	Ca	mg/L	19,4	-	100
18	Magnesium	Mg	mg/L	2,73	-	50
19	Fluorine	F	mg/L	0,190	-	1,5
20	Boron	B	mg/L	1,15	No limits	

TABLE 60. BACTERIOLOGICAL PARAMETERS - GW 06				
GW 06				
BACTERIOLOGICAL PARAMETERS				
Nº	**Parameter**	**Unit**	**Measured value**	**Regulation NP 2400180 limits**
21	Faecal coliforms	NMP/100mL	**>23**	1,1 NMP/100mL
22	Total coliforms	NMP/100mL	**9,2**	1,1 NMP/100mL
23	E. coli	NMP/100mL	Absent	Absent

APPENDIX C:
ANALYSIS OF THE RESULTS PER POINT

TABLE OF CONTENT

LIST OF TABLES

C1 FW104-ZA - NEGLA STREAM – UPPER PART OF THE MICRO-WATERSHED

TABLE 1. OUT-OF-RANGE PARAMETERS – FW104-ZA				
COD: FW 104-ZA	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	63	19	40	**4**
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 PERMISSIBLE LIMITS**	
Ammonia	0,083 mg/L		0,02 mg/L	
Soluble iron	1,110 mg/L		0,3 mg/L	
Total coliforms	16000 NMP/100mL		1000 NMP/100mL	
Faecal coliforms	16000 NMP/100mL		200 NMP/100mL	

C2 GW18-ZA – HEADQUARTERS OF "ZAPALLLO" FARM – DEEP TUBULAR WELL USED FOR WATER DRINKING SUPPLY

TABLE 2. OUT-OF-RANGE PARAMETERS – GW18-ZA				
COD: GW 18-ZA	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	23	5	14	**4**
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 LAW 1614/2000 AND NP 24 001 80 LIMITS**	
Total phosphorus	0,352 mg/L		0,05	
Nitrates	10,5 mg/L		10	
Faecal coliforms	16 NMP/100mL		1,1 NMP/100mL	
Total coliforms	>23 NMP/100mL		1,1 NMP/100mL	

C3 FW201-ST – NAPAGUE STREAM – UPPER MIDDLE PART OF THE NEGLA STREAM MICRO-WATERSHED

TABLE 3. OUT-OF-RANGE PARAMETERS – FW201-ST				
COD: FW 201-ST	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	63	19	41	3
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 PERMISSIBLE LIMITS**	
Ammonia	0,0594 mg/L		0,02 mg/L	
Soluble iron	0,935 mg/L		0,3 mg/L	
Faecal coliforms	540 NMP/100mL		200 NMP/100mL	

C4 GW 20-ST - HEADQUARTERS OF THE "SANTA TERESA" FARM - DEEP TUBULAR WELL USED FOR DRINKING WATER SUPPLY

TABLE 4. OUT-OF-RANGE PARAMETERS – GW20-ST				
COD: GW 20-ST	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	23	5	14	4

OUT-OF-RANGE PARAMETER	LABORATORY RESULTS	REGULATION SEAM 222/02 LAW 1614/2000 AND NP 24 001 80 LIMITS
pH	5,63	6-9
Nitrates	22,8 mg/L	10 mg/L
Faecal coliforms	12 NMP/100mL	1,1 NMP/100mL
Total coliforms	>23 NMP/100mL	1,1 NMP/100mL

C5 FW 315-HE - "HERMOSA" STREAM - UPPER WATERSHED OF THE "HERMOSA" CREEK MICRO-WATERSHED

TABLE 5. OUT-OF-RANGE PARAMETERS – FW315-HE				
COD: FW 315-HE	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	63	19	37	7
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 PERMISSIBLE LIMITS**	
Total phosphorus	0,103 mg/L		0,05 mg/L	
Total nitrogen	0,734 mg/L		0,6 mg/L	
Ammonia	0,0587 mg/L		0,02 mg/L	
Manganese	0,274 mg/L		0,1 mg/L	
Soluble iron	1,11 mg/L		0,3 mg/L	
Faecal coliforms	1200		200 NMP/100mL	
Total coliforms	35000		1000 NMP/100mL	

C6 GW 19-HE – HEADQUARTERS OF THE "HERMOSA" FARM - DEEP TUBULAR WELL FOR DRINKING WATER SUPPLY

TABLE 6. OUT-OF-RANGE PARAMETERS – GW19-HE				
COD: GW 19-HE	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	23	5	15	3
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 LAW 1614/2000 AND NP 24 001 80 LIMITS**	
Total phosphorus	0,577 mg/L		0,05 mg/L	
Faecal coliforms	9,2 NMP/100mL		1,1 NMP/100mL	
Total coliforms	>23 NMP/100mL		1,1 NMP/100mL	

C7 GW 304-HE - TREMENTINA STREAM – UPPER WATERSHED OF THE TREMENTINA STREAM MICRO-WATERSHED

TABLE 7. OUT-OF-RANGE PARAMETERS – GW304-HE				
COD: FW 304-HE	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	63	19	39	**5**
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 PERMISSIBLE LIMITS**	
Total phosphorus	0,0639 mg/L		0,05 mg/L	
Ammonia	0,0880 mg/L		0,02 mg/L	
Soluble iron	0,913 mg/L		0,3 mg/L	

Faecal coliforms	330 NMP/100mL	200 NMP/100mL
Total coliforms	3500 NMP/100mL	1000 NMP/100mL

C8 GW 23-SL - HEADQUARTERS OF THE "SAN LIBERATO" FARM – DEEP TUBULAR WELL FOR WATER PROVISION FOR HUMAN CONSUMPTION

TABLE 8. OUT-OF-RANGE PARAMETERS – GW23-SL				
COD: GW 23-SL	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	23	5	14	4
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 LAW 1614/2000 AND NP 24 001 80 LIMITS**	
pH	5,71		6-9	
Total phosphorus	0,0947 mg/L		0,05 mg/L	
Faecal coliforms	23 NMP/100mL		1,1 NMP/100mL	
Total coliforms	>23 NMP/100mL		1,1 NMP/100mL	

C9 GW 16-GA - HEADQUARTERS OF THE "SAN GAVILÁN" FARM AT 200 METRES FROM *EUCALYPTUS SP.* PLANTATIONS – DEEP TUBULAR WELL TO PROVIDE WATER FOR HUMAN CONSUMPTION

TABLE 9. OUT-OF-RANGE PARAMETERS – GW16-GA				
COD: GW 16-GA	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	23	5	17	1
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 LAW 1614/2000 AND NP 24 001 80 LIMITS**	
Total coliforms	12 NMP/100mL		1,1 NMP/100mL	

C10 FW 100-GASL - TREMENTINA STREAM – MIDDLE/UPPER CATCHMENT OF THE TREMENTINA STREAM MICRO-WATERSHED RUNS THROUGH APPROXIMATELY 7 KM OF *EUCALYPTUS SP.* PLANTATIONS

TABLE 10. OUT-OF-RANGE PARAMETERS FW 100-GASL				
COD: FW 100-GASL	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	63	19	38	5
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02**	
Dissolved oxygen	4,47 mg/L		>5 mg/L	
Total phosphorus	0,0586mg/L		0,05 mg/L	
Total Nitrogen	0,750 mg/L		0,6 mg/L	
Ammonia	0,0457 mg/L		0,02 mg/L	
Soluble Iron	0,550 mg/L		0,3 mg/L	

C11 FW 200-SL - TRIBUTARY OF THE TREMENTINA STREAM AT THE SOUTHEAST OF THE HEADQUARTERS OF THE "SAN LIBERATO" FARM – MIDDLE CATCHMENT OF THE TREMENTINA STREAM

TABLE 11. OUT-OF-RANGE PARAMETERS – FW200-SL				
COD: FW 200-SL	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	63	19	39	5
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 PERMISSIBLE LIMITS**	
Turbidity	489 NTU		100NTU	
Ammonia	0,138 mg/L		0,02 mg/L	
Soluble iron	1,05 mg/L		0,3 mg/L	
Faecal coliforms	7900 NMP/100mL		200 NMP/100mL	
Total coliforms	22000 NMP/100mL		1000 NMP/100mL	

C12 FW 207-TR - TRIBUTARY OF THE TREMENTINA STREAM, 5 KM AT THE NORTH OF THE HEADQUARTERS OF THE "TREMENTINA" FARM – MIDDLE CATCHMENT OF THE TREMENTINA STREAM

TABLE 12. OUT-OF-RANGE PARAMETERS – FW207-TR				
COD: FW 207-TR	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	63	19	38	6
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 PERMISSIBLE LIMITS**	
Dissolved oxygen	2,43 mg O_2/L		> 5 mg O_2/L	
Total phosphorus	0,0796 mg/L		0,05 mg/L	
Ammonia	0,0687 mg/L		0,02 mg/L	
Soluble iron	3,31 mg/L		0,3 mg/L	
Faecal coliforms	790 NMP/100mL		200 NMP/100mL	
Total coliforms	1700 NMP/100mL		1000 NMP/100mL	

C13 FW 208-TR - TREMENTINA STREAM, 2 KM NORTHWEST OF THE TREMENTINA FARM'S HEADQUARTERS – MIDDLE CATCHMENT OF THE TREMENTINA STREAM

TABLE 13. OUT-OF-RANGE PARAMETERS – FW208-TR				
COD: FW 208-TR	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	63	19	38	6
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 PERMISSIBLE LIMITS**	
Dissolved oxygen	4,30 mg O_2/L		> 5 mg O_2/L	
Total nitrogen	0,748 mg/L		0,6 mg/L	
Amoniaco	0,0603 mg/L		0,02 mg/L	
Ammonia	1,33 mg/L		0,3 mg/L	
Soluble iron	35000 NMP/100mL		200 NMP/100mL	
Faecal coliforms	35000 NMP/100mL		1000 NMP/100mL	

C14 GW 11-MICHEL - DEEP TUBULAR WELLS LOCATED IN NEW PLANTATIONS OF *EUCALYPTUS SP* – MIDDLE BASIN OF THE TREMENTINA STREAM

TABLE 14. OUT-OF-RANGE PARAMETERS – GW11-MICHEL				
COD: GW 11-MICHEL	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	23	5	14	4
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 LAW 1614/2000 AND NP 24 001 80 LIMITS**	
pH	5,87		6-9	
Total phosphorus	0,107 mg/L		0,05 mg/L	
Faecal coliforms	>23 NMP/100mL		1,1 NMP/100mL	
Total coliforms	>23 NMP/100mL		1,1 NMP/100mL	

C15 GW 10-TR - TREMENTINA FARM HEADQUARTERS –MIDDLE BASIN OF THE TREMENTINA STREAM, DAIRY FARM AND CORRALS WITHIN 200 METRES OF THE AII OF THE WELL, USE FOR DRINKING WATER SUPPLY

TABLE 15. OUT-OF-RANGE PARAMETERS – GW10-TR				
COD: GW 10-TR	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	23	5	15	3
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 LAW 1614/2000 AND NP 24 001 80 LIMITS**	
Total phosphorus	0,876 mg/L		0,05	
Faecal coliforms	10 NMP/100mL		1,1 NMP/100mL	
Total coliforms	>23 NMP/100mL		1,1 NMP/100mL	

C16 GW 13-SAN JUAN - "SAN JUAN" FARM, THE MIDDLE BASIN OF THE TREMENTINA STREAM – WELL FOR DRINKING WATER SUPPLY

TABLE 16. OUT-OF-RANGE PARAMETERS – GW13-SAN JUAN				
COD: GW 13-SAN JUAN	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	26	6	16	4
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 LAW 1614/2000 LIMITS**	
Total phosphorus	0,127 mg/L		0,05 mg/L	
Nitrates	106 mg/L		10 mg/L	
Faecal coliforms	>23 NMP/100mL		1,1 NMP/100mL	
Total coliforms	>23 NMP/100mL		1,1 NMP/100mL	

C17 GW 22-SILVA - "SILVA" FARM, THE MIDDLE BASIN OF THE TREMENTINA STREAM - WELL FOR DRINKING WATER SUPPLY

TABLE 17. OUT-OF-RANGE PARAMETERS – GW22-SILVA				
COD: GW 22-SILVA	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	23	5	14	4
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 LAW 1614/2000 AND NP 24 001 80 LIMITS**	
pH	5,54		6-9	
Nitrates	55,2 mg/L		10 mg/L	
Faecal coliforms	23 NMP/100mL		1,1 NMP/100mL	
Total coliforms	>23 NMP/100mL		1,1 NMP/100mL	

C18 FW 205-TR - TREMENTINA STREAM, 2.7 KM EAST OF THE TREMENTINA FARM HEADQUARTERS, MIDDLE CATCHMENT OF THE TREMENTINA STREAM MICRO-CATCHMENT

TABLE 18. OUT-OF-RANGE PARAMETERS – FW205-TR				
COD: FW 205-TR	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	63	19	36	8
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 PERMISSIBLE LIMITS**	
BOD5	5,32 mg O_2/L		5 mg O_2/L	
Total phosphorus	0,384 mg/L		0,05 mg/L	
Ammonia	0,521 mg/L		0,02 mg/L	
Manganese	0,127 mg/L		0,1 mg/L	
Soluble iron	1,56 mg/L		0,3 mg/L	
Faecal coliforms	780 NMP/100mL		200 NMP/100mL	
Total coliforms	7000 NMP/100mL		1000 NMP/100mL	
Nickel	0,145 mg/L		0,025 mg/L	

C19 GW 12-LAGUNA - "LAGUNA" FARM, THE MIDDLE BASIN OF THE TREMENTINA STREAM MICRO-BASIN - WELL FOR DRINKING WATER SUPPLY AND IRRIGATION OF SEEDLINGS, CURRENTLY DEVELOPING A FOREST NURSERY AND PLANTATION OF NEW CROPS OF *EUCALYPTUS SP*

TABLE 19. OUT-OF-RANGE PARAMETERS – GW12-LAGUNA				
COD: GW 12-LAGUNA	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	23	5	15	3
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 LAW 1614/2000 AND NP 24 001 80 LIMITS**	
Total phosphorus	0,264 mg/L		0,05 mg/L	
Faecal coliforms	6,9 NMP/100mL		1,1 NMP/100mL	
Total coliforms	>23 NMP/100mL		1,1 NMP/100mL	

C20 FW 109-MYRZ – TREMENTINA STREAM, POINT LOCATED BETWEEN THE "MANDYJU" AND "RANCHO Z" PROPERTY BOUNDARIES – MIDDLE CATCHMENT OF THE "TREMENTINA" STREAM MICRO-WATERSHED

TABLE 20. OUT-OF-RANGE PARAMETERS – FW109-MYRZ				
COD: FW 109-MYRZ	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	63	19	38	6
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 PERMISSIBLE LIMITS**	
Dissolved oxygen	4,58 mg O_2/L		> 5 mg O_2/L	
Total phosphorus	0,194 mg/L		0,05 mg/L	
Ammonia	0,055 mg/L		0,02 mg/L	
Soluble iron	1,19 mg/L		0,3 mg/L	
Faecal coliforms	11000 NMP/100mL		200 NMP/100mL	
Total coliforms	11000 NMP/100mL		1000 NMP/100mL	

C21 FW 115-MANDYJU – TREMENTINA STREAM, A POINT LOCATED 11 KM SOUTHEAST OF THE "RANCHO Z" FOREST PLANTATIONS – MIDDLE CATCHMENT OF THE TREMENTINA STREAM MICRO-WATERSHED

TABLE 21. OUT-OF-RANGE PARAMETERS – FW115-MANDYJU				
COD: FW 115- MANDYJU	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	63	19	38	6
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 PERMISSIBLE LIMITS**	
Dissolved oxygen	4,98 mg O_2/L		>5 mg O_2/L	
Total phosphorus	0,0882 mg/L		0,05 mg/L	
Ammonia	0,065 mg/L		0,02 mg/L	
Soluble iron	1,13 mg/L		0,3 mg/L	
Faecal coliforms	390 NMP/100mL		200 NMP/100mL	
Total coliforms	9000 NMP/100mL		1000 NMP/100mL	

C22 FW 317-RZ – TREMENTINA STREAM – LOWER CATCHMENT OF THE TREMENTINA STREAM MICRO-CATCHMENT

TABLE 22. OUT-OF-RANGE PARAMETERS – FW317-RZ				
COD: FW 317-RZ	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	63	19	39	5
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 PERMISSIBLE LIMITS**	
Ammonia	0,115 mg/L		0,02 mg/L	
Soluble iron	0,951 mg/L		0,3 mg/L	
Faecal coliforms	330 NMP/100mL		200 NMP/100mL	
Total coliforms	1100 NMP/100mL		1000 NMP/100mL	
Lead	0,0494 mg/L		0,01 mg/L	

C23 FW 204-LB - TREMENTINA STREAM POINT LOCATED 5 KM UPSTREAM OF THE OUTFLOW POINT OF THE TREMENTINA STREAM TO THE AQUIDABÁN RIVER - THE LOWER WATERSHED OF THE "TREMENTINA" STREAM MICRO-WATERSHED

TABLE 23. OUT-OF-RANGE PARAMETERS – FW204-LB				
COD: FW 204-LB	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	63	19	39	5
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 PERMISSIBLE LIMITS**	
Ammonia	0,226 mg/L		0,02 mg/L	
Soluble iron	1,14 mg/L		0,3 mg/L	
Faecal coliforms	3500 NMP/100mL		200 NMP/100mL	
Total coliforms	16000 NMP/100mL		1000 NMP/100mL	
Nickel	0,0513 mg/L		0,025 mg/L	

C24 FW 110-LB - UNNAMED STREAM – TRIBUTARY OF THE AQUIDABÁN RIVER

TABLE 24. OUT-OF-RANGE PARAMETERS – FW110-LB				
COD: FW 110-LB	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	63	19	37	7
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 PERMISSIBLE LIMITS**	
Dissolved oxygen	2,38 mg O_2/L		>5 mg O_2/L	
Total phosphorus	0,0548 mg/L		0,05 mg/L	
Manganese	0,122 mg/L		0,1 mg/L	
Ammonia	0,224 mg/L		0,02 mg/L	
Soluble iron	1,41 mg/L		0,3 mg/L	
Faecal coliforms	4300 NMP/100mL		200 NMP/100mL	
Total coliforms	160000 NMP/100mL		1000 NMP/100mL	

C25 FW 111-LB - AQUIDABÁN RIVER - LOWER-MIDDLE BASIN OF THE AQUIDABÁN RIVER CATCHMENT

TABLE 25. OUT-OF-RANGE PARAMETERS – FW111-LB				
COD: FW 111-LB	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	63	19	37	7
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 PERMISSIBLE LIMITS**	
pH	5,91		6 - 9	
Total phosphorus	0,114 mg/L		0,05 mg/L	
Ammonia	0,331 mg/L		0,02 mg/L	
Manganese	0,4 mg/L		0,1 mg/L	
Soluble iron	1,56 mg/L		0,3 mg/L	
Faecal coliforms	490 NMP/100mL		200 NMP/100mL	
Total coliforms	1400 NMP/100mL		1000 NMP/100mL	

C26 FW 310-CR - AQUIDABÁN RIVER – LOWER BASIN OF THE AQUIDABÁN RIVER CATCHMENT

TABLE 26. OUT-OF-RANGE PARAMETERS – FW310-CR				
COD: FW 310-CR	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	63	19	36	8
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 PERMISSIBLE LIMITS**	
Turbidity	355 NTU		100 NTU	
BOD5	5,51 mg O_2/L		5 mg O_2/L	
Total phosphorus	0,0518 mg/L		0,05 mg/L	
Ammonia	0,150 mg/L		0,02 mg/L	
Manganese	0,341 mg/L		0,1 mg/L	
Soluble iron	2,36 mg/L		0,3 mg/L	
Faecal coliforms	11000 NMP/100mL		200 NMP/100mL	
Total coliforms	11000 NMP/100mL		1000 NMP/100mL	

C27 FW 316-CR - "LAGUNA PENAYO" STREAM – LOWER BASIN OF THE AQUIDABÁN RIVER

TABLE 27. OUT-OF-RANGE PARAMETERS – FW316-CR				
COD: FW 316-CR	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	63	19	39	5
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 PERMISSIBLE LIMITS**	
BOD5	5,05 mg O_2/L		5 mg O_2/L	
Total nitrogen	0,779 mg/L		0,6 mg/L	
Ammonia	0,0331 mg/L		0,02 mg/L	
Soluble iron	0,991 mg/L		0,3 mg/L	
Lead	0,0134 mg/L		0,01 mg/L	

C28 GW 14-ZM - HEADQUARTERS OF THE "ZANJA MOROTÏ" FARM - DEEP TUBULAR WELL FOR DRINKING WATER SUPPLY

TABLE 28. OUT-OF-RANGE PARAMETERS – GW14-ZM				
COD: GW 14-ZM	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	23	5	15	3
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 LAW 1614/2000 AND NP 24 001 80 LIMITS**	
Total phosphorus	0,204 mg/L		0,05 mg/L	
Faecal coliforms	6,9 NMP/100mL		1,1 NMP/100mL	
Total coliforms	>23 NMP/100mL		1,1 NMP/100mL	

C29 GW 15-SO - HEADQUARTERS OF THE "SOLEDAD" FARM - DEEP TUBULAR WELL FOR DRINKING WATER SUPPLY

TABLE 29. OUT-OF-RANGE PARAMETERS – GW15-SO				
COD: GW 15-SO	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	23	5	11	7
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 LAW 1614/2000 AND NP 24 001 80 LIMITS**	
Total dissolved solids	665 mg/L		500 mg/L	
Hardness	313 mg $CaCO_3$/L		300 mg $CaCO_3$/L	
Total nitrogen	0,734 mg/L		0,6 mg/L	
Nitrates	199 mg/L		10 mg/L	
Alkalinity	299 mg $CaCO_3$./L		250 mg $CaCO_3$./L	
Faecal coliforms	>23 NMP/100mL		1,1 NMP/100mL	
Total coliforms	>23 NMP/100mL		1,1 NMP/100mL	

C30 FW 306-SO - TRIBUTARY OF THE PITANOHAGA STREAM- UPPER CATCHMENT OF THE PITANOHAGA STREAM MICRO-WATERSHED

TABLE 30. OUT-OF-RANGE PARAMETERS – FW306-SO				
COD: FW 306-SO	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	63	19	39	5
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 PERMISSIBLE LIMITS**	
Amoniaco	0,0872 mg/L		0,02 mg/L	
Soluble iron	1,02 mg/L		0,3 mg/L	
Faecal coliforms	540 NMP/100mL		200 NMP/100mL	
Total coliforms	920 NMP/100mL		1000 NMP/100mL	
Lead	0,0229 mg/L		0,01 mg/L	

C31 GW 17-LP - HEADQUARTERS OF "LA PARAGUAYA" FARM – DEEP TUBULAR WELL FOR WATER PROVISION FOR HUMAN CONSUMPTION

TABLE 31. OUT-OF-RANGE PARAMETERS – GW17-LP				
COD: GW 17-LP	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	23	5	15	3
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 LAW 1614/2000 AND NP 24 001 80 LIMITS**	
Total phosphorus	0,0699 mg/L		0,05 mg/L	
Faecal coliforms	>23 NMP/100mL		1,1 NMP/100mL	
Total coliforms	>23 NMP/100mL		1,1 NMP/100mL	

C32 GW 21-MC - HEADQUARTERS OF THE "MACHUCA-CUE" FARM - DEEP TUBULAR WELL FOR DRINKING WATER SUPPLY

TABLE 32. OUT-OF-RANGE PARAMETERS – GW21-MC				
COD: GW 21-MC	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS	BEYOND THE LIMITS
	23	5	14	4
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 LAW 1614/2000 AND NP 24 001 80 LIMITS**	
Total phosphorus	0,170 mg/L		0,05 mg/L	
Nitrates	75,5 mg/L		10 mg/L	
Faecal coliforms	>23 NMP/100mL		1,1 NMP/100mL	
Total coliforms	>23 NMP/100mL		1,1 NMP/100mL	

C.33 FW01 PARAGUAY RIVER – PROJECT'S ADA – POINT LOCATED 2.5 KM UPSTREAM BEFORE THE EFFLUENT DISCHARGE POINT.

TABLE 33. OUT-OF-RANGE PARAMETERS FW 01 – PARAGUAY RIVER				
COD: FW 01	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS.	BEYOND THE LIMITS
	64	15	44	5
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 PERMISSIBLE LIMITS**	
Total phosphorus	0,0694 mg/L		0,05 mg/L	
Ammonia	0,0989 mg/L		0,02 mg/L	
Nitrites	0,01533 mg/L		1 mg/L	
Manganese	0,113 mg/L		0,1 mg/L	
Soluble Iron	1,52 mg/L		0,3 mg/L	

C.34 **FW02 PARAGUAY RIVER – PROJECT'S ADA –POINT LOCATED 2.5 KM DOWNSTREAM OF THE EFFLUENT DISCHARGE POINT**.

TABLA 34. OUT-OF-RANGE PARAMETERS FW 02				
COD: FW 02	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS.	BEYOND THE LIMITS
	64	15	46	3
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 PERMISSIBLE LIMITS**	
Ammonia	0,0441 mg/L		0,02	
Manganese	0,144 mg/L		0,1 mg/L	
Soluble iron	0,804 mg/L		0,3 mg/L	

C.35 MONITORING WELL GW01 LOCATED IN THE ADA OF THE INDUSTRIAL PLANT

TABLA 35. OUT-OF-RANGE PARAMETERS GW 01	
COD:	PARAMETERS

GW 01	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS.	BEYOND THE LIMITS
	23	5	5	13
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 LAW 1614/2000 y NP 24 001 80 PERMISSIBLE LIMITS**	
Electric conductivity	2400		1250	
Total dissolved solids	1.181		500	
Hardness	281		300	
Total phosphorus	0,356		0,05	
Total nitrogen	2,73		0,6	
Chlorides	285		250	
Alkalinity	397		250	
Sulfates	337		250	
Sodium	374		200	
Fluorine	2,30		1,5	
E Coli	Presence		Absent	
Fecal coliforms	>23 NMP/100mL		1,1 NMP/100mL	
Total coliforms	>23 NMP/100mL		1,1 NMP/100mL	

C.36 MONITORING WELL GW02 LOCATED IN THE ADA OF THE INDUSTRIAL PLANT

TABLA 36. OUT-OF-RANGE PARAMETERS GW 02				
COD: GW 02	PARAMETROS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS.	BEYOND THE LIMITS
	23	5	14	4
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**REGULATION SEAM 222/02 LAW 1614/2000 y NP 24 001 80 PERMISSIBLE LIMITS**	
Hardness	84		300	
Total phosphorus	0,0776		0,05	
Potassium	16,5		12	
Fluorine	1,60		1,5	

C.37 MONITORING WELL GW04 LOCATED IN THE ADA OF THE INDUSTRIAL PLANT

TABLA 37. OUT-OF-RANGE PARAMETERS GW 04				
COD: GW 04	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS.	BEYOND THE LIMITS
	23	5	5	13
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**LÍMITS: REGULATION SEAM 222/02 LAW 1614/2000 y NP 24 001 80**	
Electric Conductivity	5.010		1250	
TDS	2.577		500	
Hardness	709		300	
Total phosphorus	12		0,05	
Total nitrogen	9,02		0,6	
Chlorides	611		250	
Alkalinity	282		250	
Sodium	367		200	
Calcium	164		100	

Magnesium	72,9	50
E Coli	Presence	Absent
Fecal coliforms	>23 NMP/100mL	1,1 NMP/100mL
Total coliforms	>23 NMP/100mL	1,1 NMP/100mL

C.38 MONITORING WELL GW05 LOCATED IN THE ADA OF THE INDUSTRIAL PLANT

TABLA 38. OUT-OF-RANGE PARAMETERS GW 05				
COD: GW 05	PARAMETERS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS.	BEYOND THE LIMITS
	23	5	14	4
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**LÍMITS REGULATION SEAM 222/02 LAW 1614/2000 y NP 24 001 80**	
Hardness	88,1		300	
E Coli	Presence		Absent	
Fecal coliforms	1,1 NMP/100mL		1,1 NMP/100mL	
Total coliforms	5,1 NMP/100mL		1,1 NMP/100mL	

C.39 MONITORING WELL GW06 LOCATED IN THE ADA OF THE INDUSTRIAL PLANT

TABLA 39. OUT-OF-RANGE PARAMETERS GW 06				
COD: GW 06	PARAMETROS			
	PARAMETER QUANTITY	NO LIMITS	COMPLY WITH THE LIMITS.	BEYOND THE LIMITS
	23	5	14	4
OUT-OF-RANGE PARAMETER	**LABORATORY RESULTS**		**LÍMITS: REGULATION SEAM 222/02 LAW 1614/2000 y NP 24 001 80**	
Total phosphorus	60 mg/L		0,05 mg/L	
Total nitrogen	0,073 mg/L		0,6 mg/L	
Fecal coliforms	9,2 NMP/100mL		1,1 NMP/100mL	
Total coliforms	>23 NMP/100mL		1,1 NMP/100mL	

APPENDIX D.
PHOTOGRAPHY GALLERY OF THE FIRST MONITORING CAMPAIGN

FW 104 - ZA

GW 18-ZA

FW 201-ST

GW 20-ST

FW 315-HE	
	

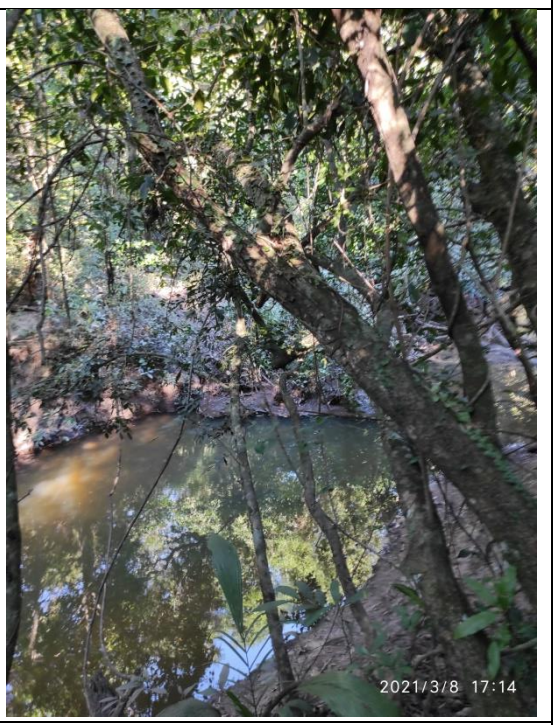
GW 19-HE	
	

FW 304-HE	
	

GW 23-SL	
	

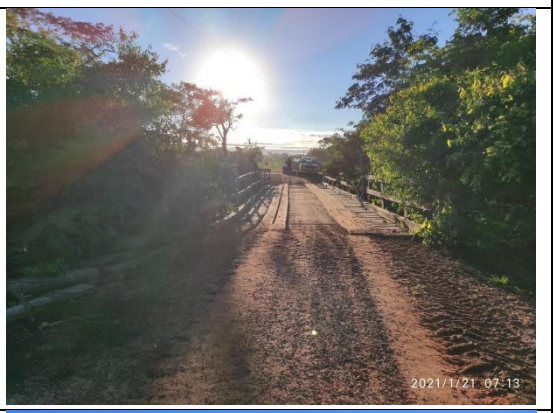
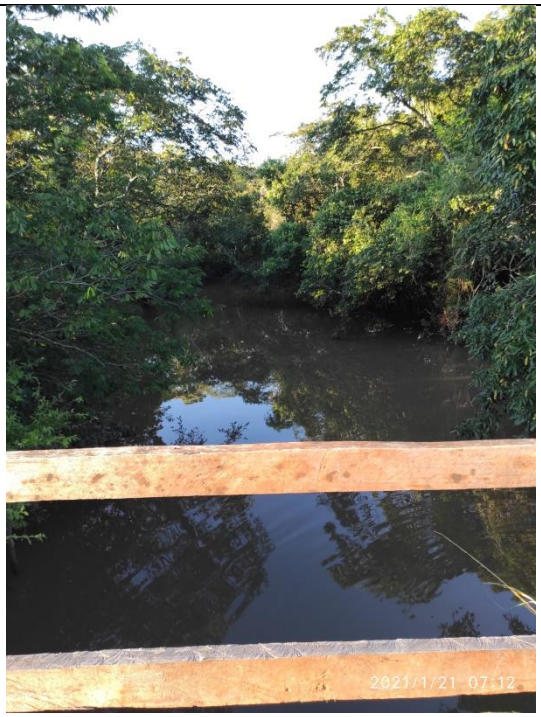
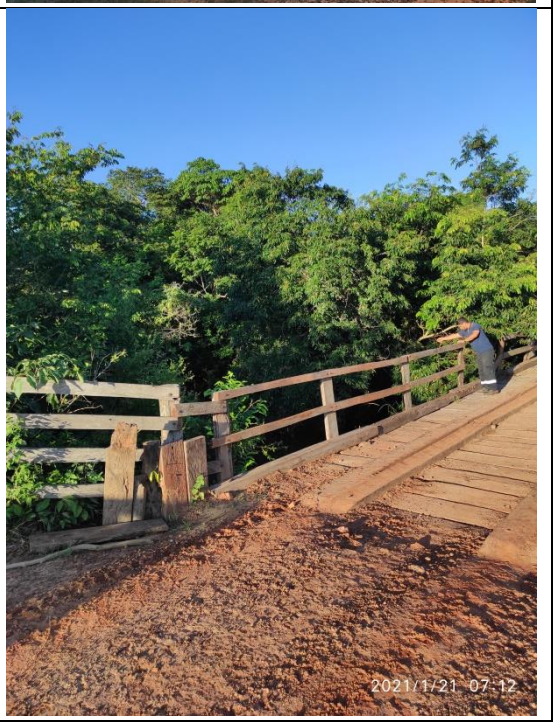
GW 16-GA

FW 100-GASL



FW 200-SL

FW 207-TR	
	

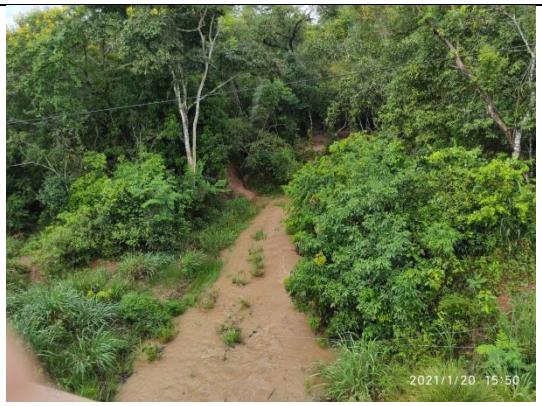
FW 208-TR	
	
	

GW 11-MICHEL

GW 10-TR

GW 13-SAN JUAN

FW 205-TR



GW 12- Laguna	
	

FW 109-MYRZ	
	

FW 115-MANDYJU	
	

FW 317-RZ	
	

FW 204-LB

FW 110-LB

FW 111-LB

FW 310-CR

FW 316-CR	
	

GW 14-ZM	
	

GW 15-SO	
	

FW 306 -SO	
	

GW 17-LP

GW 21-MC

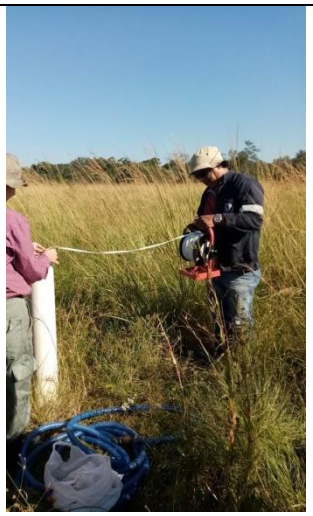
FW 01

FW 02

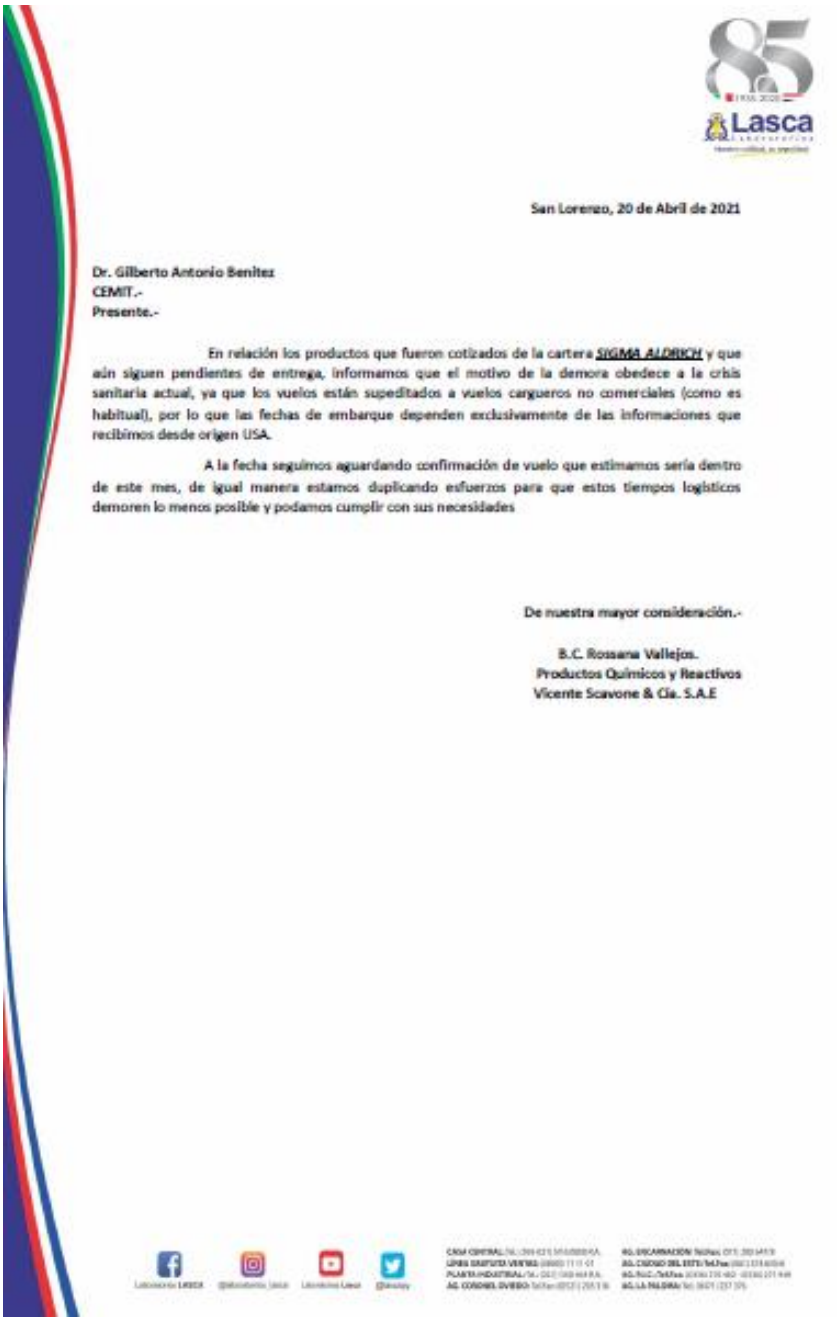
GW 01

GW 02

GW 03

GW 04	
	
GW 05	
	
GW 06	
	

APPENDIX E.
SUPPLIERS NOTE



San Lorenzo, 20 de Abril de 2021

Dr. Gilberto Antonio Benitez
CEMIT.-
Presente.-

En relación los productos que fueron cotizados de la cartera ***SIGMA ALDRICH*** y que aún siguen pendientes de entrega, informamos que el motivo de la demora obedece a la crisis sanitaria actual, ya que los vuelos están supeditados a vuelos cargueros no comerciales (como es habitual), por lo que las fechas de embarque dependen exclusivamente de las informaciones que recibimos desde origen USA.

A la fecha seguimos aguardando confirmación de vuelo que estimamos sería dentro de este mes, de igual manera estamos duplicando esfuerzos para que estos tiempos logísticos demoren lo menos posible y podamos cumplir con sus necesidades

De nuestra mayor consideración.-

B.C. Rossana Vallejos.
Productos Químicos y Reactivos
Vicente Scavone & Cía. S.A.E

TRANSLATION

Note: texts between parenthesis and with different fonts are our comments and they describe certain particularities of the document, such as logos, and others.

(*There is a Logo:* **LASCA laboratory**)

San Lorenzo, 20th April, 2021

Dr. Gilberto Antonio López
CEMIT
Present:

Regarding to the products from SIGMA ALDRICH that are still pending delivery, we inform you that the reason for the delay is due to the current health crisis, since the flights depends on non-commercial cargo flights (as usual), so the shipment dates rest exclusively on the information we receive from the USA.

We are still awaiting confirmation of the flight, which we estimate will be within this month. We are also doubling our efforts so that these logistical issues can be solve as soon as possible so we can meet your needs.

Kind regards,

B.C. Rossana Vallejos
Reagents and chemical products
Vicente Scavone & Cía. S.A.E