

ENVIRONMENTAL IMPACT STUDY FOR THE RUMICHACA – PASTO DUAL  
CARRIAGEWAY, PEDREGAL – CATAMBUCO SECTION, UF. 4 AND UF. 5.1, CONCESSION  
CONTRACT UNDER SCHEME APP NO. 15 OF 2015



Géminis Consultores Ambientales



Environmental consultant

Chapter 11.2.1. Investment Plan 1%

San Juan de Pasto, March 2017

	<p>ENVIRONMENT EFFECT INVESTIGATION</p>	<p>CSH-4-AM-AM-EIA2-GG-0013-7</p>
		<p>March 2017</p>
		<p>Page 0</p>

## TABLE OF CONTENTS

11.2.1.	1% INVESTMENT PLAN .....	3
11.2.1.1.	Legal framework.....	4
11.2.1.2.	Objectives .....	6
11.2.1.3.	Scope.....	6
11.2.1.4	Project Location.....	7
	Functional unit UF-4 Pedregal -Tangua:.....	8
	Functional unit UF-5 Tangua-Pasto:.....	8
11.2.1.5	Basins associated with the-Al road project area of influence.....	10
	Hydrographic subzone Guáitara River .....	11
	Hydrographic subzone Juanambú River.....	12
	Hydrographic Unit Level I – Bobo River .....	15
	Hydrographic Unit Level I - Río Pasto. ....	15
11.2.1.6	Key Features of water sources subject to use by road project activities .....	16
	Bobo River.....	16
	Chaquita Stream .....	17
	La Magdalena Stream .....	17
	La Marqueza Stream .....	18
11.2.1.7	Environmental problems associated with water sources subject matter of the uptake.....	19
	Extension of the agricultural frontier .....	19
	Extension of the livestock border.....	20
	Landscape degradation.....	21
	Slash and burn deforestation .....	22
	Biodiversity loss and alteration of natural ecosystems .....	23
11.2.1.8	Activities established in Chapter 3 of Decree 1076 of 2015 and Decree 1900 of 2006, for investment of economic resources such as 1%investment .....	26
11.2.1.9	Projects developed by municipal entities managing water resources .....	27
11.2.1.10	Selecting fundable investment intervention lines as 1% investment and correspondence with Article 2.2.9.3.1.4 of Decree 1076 of 2015 and Decree 1900 of 2006, for the Rumichaca - Pasto dual carriageway road project, Ipiiales –Catambuco span, Pedregal-Catambuco section. ....	39
11.2.1.11	Development of activities proposed for selection of intervention areas..	41
11.2.1.10	Estimated amount of investment.....	42
11.2.1.11	Pre-operative investment recommendation.....	44

11.2.1.12	Technical Aspects of water sources object of the uptake .....	45
11.2.1.13	Activities proposed to run as 1% investments .....	47
11.2.1.13.1	Development of the proposed activities .....	47

### INDEX OF TABLES

Table 11.2.1.1:	Legal framework.....	4
Table 11.2.1. 2:	Information functional units .....	7

### 11.2.1. 1% INVESTMENT PLAN

The Colombian law stipulates that any project using water uptake directly from natural sources and requiring an environmental license, must invest at least 1% of the project value for the recovery, conservation, preservation and monitoring of the watershed feeding the respective water source. The relevant definition and of greater impact of such investments is proposed from criteria established in light of existing rules for consultation and coordination with the administrations of the municipalities located in the area of influence of the project.

The Rumichaca - Pasto road corridor, Pedregal-Catambuco section in the department of Nariño includes the construction of a 32,760 km road corridor and associated ZODMES and camps infrastructure. For implementation and operation of the project, the Concesionaria Vial Unión del Sur S.A.S. hereby requested uptake strips on water bodies located in the abiotic area of influence of the hydrological component for development of industrial and domestic activities. In keeping with the aforesaid, a 1% investment of plan has been prepared, based on provisions of Article 4 of Decree 1900 of June 12, 2006.

The activities outlined in the investment plan were formulated from the conditions identified in the characterization of the area of influence of the project, as well as management activities contemplated by the entities responsible for management and regulation of water resources in the municipalities related with the project.

In this regard, the 1% Investment Plan proposes the following:

- Develop protection and recovery activities of the basin and micro-basins of the Bobo River, La Magdalena Stream, La Marqueza Stream, La Chiquita Stream or those directly associated therewith.
- Acquire properties for isolation activities, reforestation and / or plant recovery in riparian corridor areas and / or intakes of the Bobo River, La Magdalena Stream, La Marqueza Stream, La Chiquita Stream basins and micro-basins or those directly associated therewith.

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 3

- Offer environmental training to the community associated to the basins of the water sources subject of uptake activities including educational institutions and environmental promoters.

### 11.2.1.1. Legal framework

**Table 11.2.1.1: Legal framework**

NORMATIVITY	DESCRIPTION
<b>Law 99 of 1993 Article 43</b>	On fees for water use, its paragraph stipulates that "Any project that involves in its execution the use of water, taken directly from natural sources, either for human consumption, recreation, irrigation or other industrial or agricultural activity shall allocate not less than 1% of the total investment for recovery, preservation and surveillance of the watershed that feeds the respective water source. The project owner must invest this 1% in the works and actions of recovery, preservation and conservation of the basin to be determined in the environmental license for the project." In addition to the mandatory investment for water use and in activities aimed at recovery, preservation and conservation of the basin, the law establishes that the area in which investments must be made is the watershed. To note that conservation objects are not here made explicit.
<b>Decree 1729 of August 6, 2002</b>	Article 1 defines watersheds as follows. "A basin or hydrographic area is understood as the surface water or groundwater that discharges into a natural network with one or more natural streams, with continuous or intermittent flow, which flows into a greater water body that, in turn, can lead to a main river in a natural reservoir of water in a swamp or directly into the sea.
<b>Law 812 of 26/06/2003</b>	Whereby the National Development Plan 2003-2006 is approved toward a common State. Its Article 89 amends Article 16 of Law 373 of 1997, which reads as follows: "Article 16. Prepared and submitted program must indicate the moor, cloud forests and areas of influence aquifer fountainheads and river stars to be acquired or protected as a priority by environmental authorities and local authorities in the relevant jurisdiction, which will conduct the necessary studies to establish their true capacity to supply environmental goods and services, to initiate a recovery, protection and conservation process.

NORMATIVITY	DESCRIPTION
<p><b>Decree 1729 of August 6, 2002</b></p>	<p>The decree determines that watersheds must be environmentally managed by developing and implementing a plan, function assigned to the environmental authority or joint committee, as applicable. Article 6. Subject to plan activities. Perform activities associated with the use and / or effect on renewable natural resources of the basin, will be subject to provisions of the Planning and Management of Watersheds Plan. Article 17, hierarchy of norms, the second paragraph warns that plans and schemes of the territory planning under Article 10 of Law 388 of 1997 are subject to the planning plan and management of a watershed. Article 19 stipulates that "the respective competent environmental authority or the joint commission, as appropriate, will be responsible for preparing the watershed plan management plan". "The coordination and implementation of the management plan will be the responsibility of environmental authorities that make up the joint commission and, in other cases, the respective competent environmental authority."</p>
<p><b>Decree 1900 of 2006</b></p>	<p>Article 1 thereof again specifies the scope, as follows: "Any project involving in its execution using water taken directly from natural sources and subject to obtaining an environmental license, must allocate 1 % of the total investment for recovery, maintenance, and monitoring of the watershed feeding the respective water source; in accordance with paragraph of Article 43 of Law 99 of 1993 " Article 2 of this same decree, defines that projects that are bound to the forced 1% investment of are those meeting all of the following conditions: the water is taken directly from a natural source, both surface and groundwater; the project requires an environmental license; the project, work or activity uses water in the implementation stage, being understood as, the activities of construction and operation processes; water taken is used in any of the following: human drinking, recreation, irrigation or other industrial or agricultural activity "</p>

NORMATIVITY	DESCRIPTION
<p><b>Decree 1076 of 2015</b> "Whereby the Sole Regulatory Decree is issued for the Environment and Sustainable Development Sector"</p>	<p>Chapter 3, forced 1% investment Section 1: Article 2.2.9.3.1.4. Allocation of resources. Resources that the chapter refers to is devoted to the recovery, preservation, maintenance and monitoring of the watershed that feeds the water source in accordance with respective Management Plan and Basin Management or the development and adoption of the Plan.</p>

### 11.2.1.2. Objectives

- General objective

Establish the 1% investment plan and the guidelines for implementation thereof in the Rumichaca Pasto road corridor, pursuant to Chapter 3 of Decree 1076 of 2015 "Whereby the Sole Regulatory Decree of the Environment and Sustainable Development Sector is issued".

- Specific objectives
  - Define the management process to be executed by the Concesionaria Vial Unión del Sur S.A.S. to implement the 1% plan, with prior approaches with municipal and regional environmental institutions.
  - Establish the activities to be undertaken by the Concesionaria Vial Unión del Sur S.A.S. under the 1% plan investment to help recovery, protection and conservation of water resources processes of the basins related to the area of influence.
  - Establish approximate costs and method of investment to develop the activities covered by this 1% investment plan.

### 11.2.1.3. Scope

The scope of the investment plan was defined based on the conditions identified in the area of project influence as well as the actions to be undertaken by the Concesionaria Vial Unión del Sur S.A.S.

In this regard, the following aspects of the investment plan scope were considered:

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 6

- Coordinate with local authorities or entities the activities proposed in this plan in connection with the management, use and conservation of water resources.
- Establish implementation schedules for each measure once approved by the environmental authority.
- Execute the activities of the 1% investment plan according to the parameters defined in the management phase and depending on the specific schedule for each activity to be executed.

#### 11.2.1.4 Project Location

The "Rumichaca - Pasto" road project Pedregal-Catambuco section runs in the east-central and south-central direction of the department of Nariño. The corridor is conceived as the international hub linking Colombia with Ecuador, connecting the major cities of southern Colombia.

This road has an estimated length source – destination of 83.24 Km of which 32,760 Km corresponding to the Pedregal sector Municipality of Tangua to Catambuco of the City of Pasto, being a part of functional units 4 and 5.1, and 60 meters of functional unit 5.2 as follows:

**Table 11.2.1. 2: Information functional units**

Functional unit	Start			End			Total length	Sector
	PK	Coordinates*		PK	Coordinates*			
		N	E		N	E		
UF4	PK 0 + 000	606,679.90	957,013.40	PK 15 + 750	613,384.73	966,117.87	15.75 km	Pedregal-Tangua
UF5.1	PK 15 + 750	613,384.73	966,117.87	PK 32 + 700	619,975.18	975,562.48	16,95 km	Tangua-Catambuco
UF5.2	PK 32 + 700	619,975.18	975,562.48	PK 32 + 760	620,032.38	975,567.83	0.060 km	Pasto Catambuco

\* Planar coordinates Magna SIRGAS origin West

Source: Gemini Environmental Consultants, 2016

Currently, the existing road has sections with steep longitudinal gradients, small radii of curvature and poor visibility where the speed of heavy vehicles is substantially affected, even stopping at the entrance of the curves, which is detrimental to road speed and significantly increases unsafe conditions.

*Functional unit UF-4 Pedregal -Tangua:*

The Pedregal-Tangua UF-4 corridor is between PK 00 + 000 to PK 15 + 750 of national route 2501 for a 15.75 Km total road, which runs through a topography with high longitudinal and transverse slopes. PK 0 + 000 of this functional unit is located about 1.6 km before crossing the town center of Pedregal, municipality of Imués and ends at K15 + 750.

*Functional unit UF-5 Tangua-Pasto:*

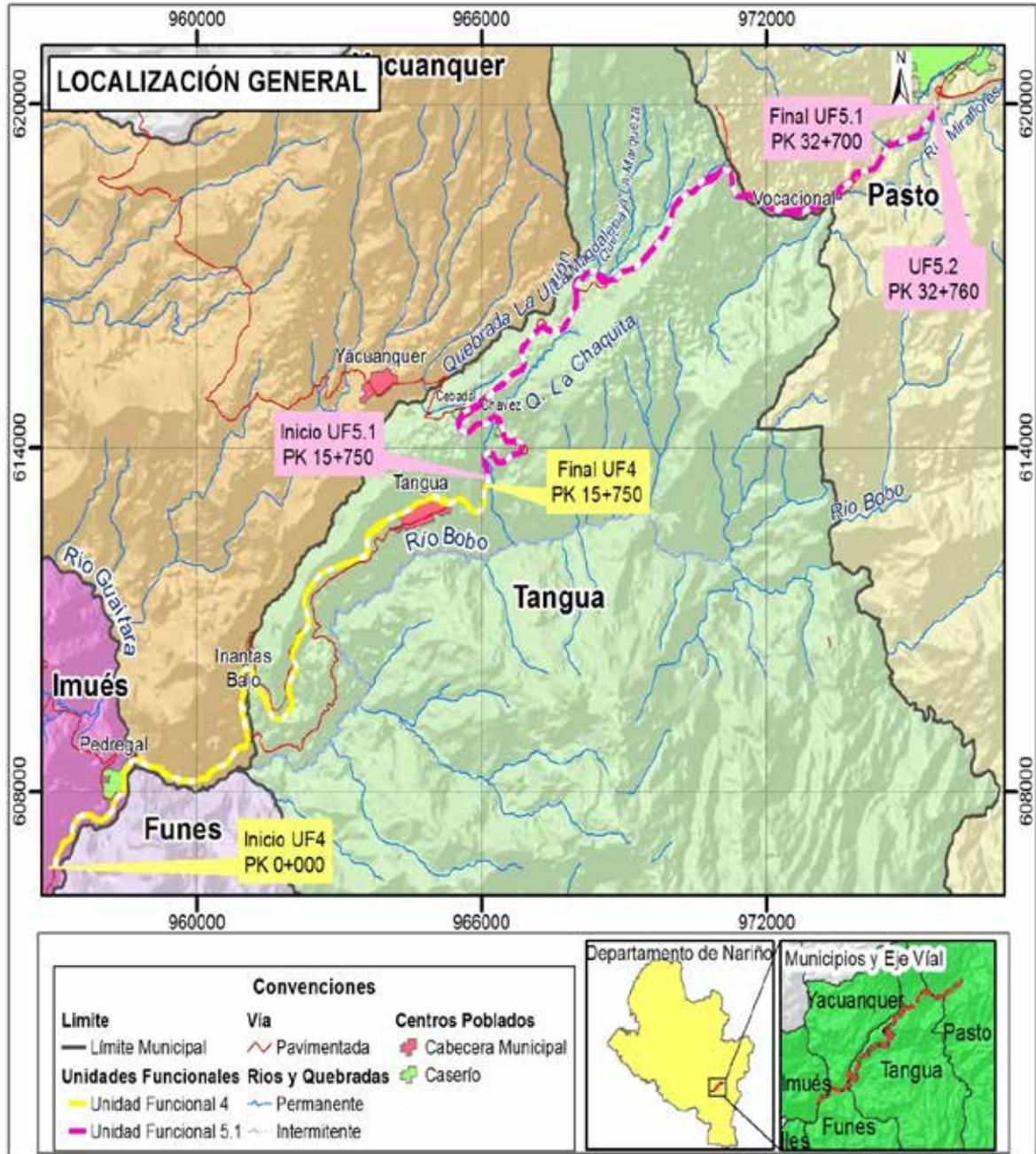
The Tangua-Pasto UF-5 corridor comprises 17.55 Km, starting at PK 15 + 750 to PK 32 +760. Subsectors 1 and 2 are part of this section. Its layout shows topography with high sharp longitudinal slopes, small radii curvatures and low visibility where the speed of heavy vehicles is substantially affected.

- Subsector 1 of functional unit 5

Subsector 1 of functional unit 5 comprises 17.49 Km, starting at PK 15 + 750 to PK + 32 700.

- Subsector 2 of functional unit 5

Subsector 2 of functional unit 5 comprises 0,060 meters, starting at PK 32 + 700 to PK 32+760.



**Figure 11.2.1.1 General Pedregal -Catambuco sector location map**

Source: Gemini Environmental Consultants, 2016

### 11.2.1.5 Basins associated with the-AI road project area of influence

The " Rumichaca-Pasto dual carriageway road project, Pedregal-Catambuco section" is within the Guáitara River Basin, which is cross-border between the department of Nariño (Colombia) and the province of Carchi (Ecuador).

In the area of influence of the project, the main stream is the Guáitara River, with a South – North direction between western and central mountains being effluent of the Patia River, one of the main water sources of the department, covering 33 municipalities corresponding to 51.6% of all 64 municipalities in the department.

The following table shows the ranking of the hydrographic network of watersheds in the area of influence of the Rumichaca - Pasto dual carriageway road project, Pedregal – Catambuco sector obtained from the Management Plan and handling of the Guaitara river basin 2007.

**Table 11.2. 1 Ranking of the hydrographic basins network related to the AI intervention area Rumichaca - Pasto dual carriageway road project, Pedregal- Catambuco sectopm.**

Hydrographic Area	Hydrographic Zone	Hydrographic subzone	Hydrographic Unit Level I	Hydrographic Unity Level II (Micro-basin)
Order 0	Order 1	Order 2	Order 3	Order 4
Pacific	Patia River	Guáitara River	Direct tributaries	
			Bobo River	La Union Stream El Quelal Stream
		Juanambú River	Pasto River	Miraflores River (Guachucal Stream)

Source: Plan and Watershed Management POMCAs, Regional Autonomous Corporation, 2007

*Hydrographic subzone Guáitara River*

The Guáitara River watershed or Hydrographic subzone Order 2 is a transboundary basin located between Colombia and Ecuador. In Colombia, it is located in the department of Nariño, with an area of 364.045.43 ha. equivalent to approximately 91% of the total area of the basin. In Ecuador, it is located in the province of Carchi. (See Figure 11.2.1.1 ).

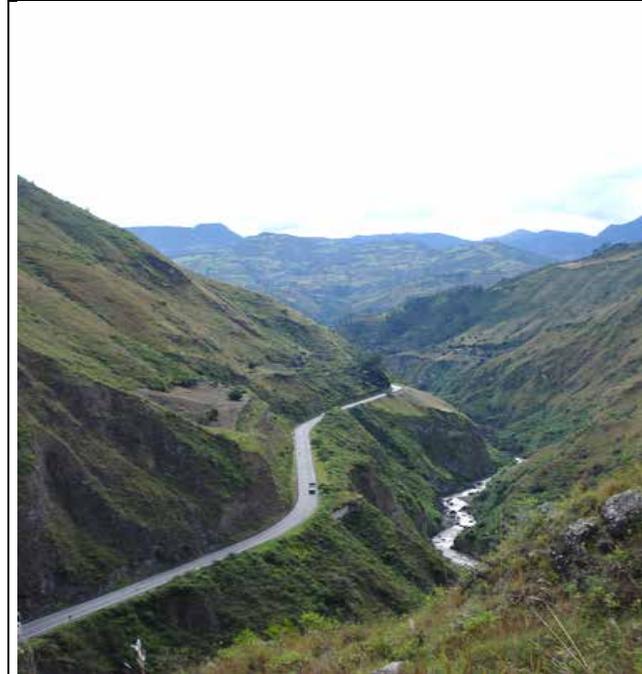
The Guáitara River watershed is in the jurisdiction of 33 municipalities of Nariño: Ancuya, Aldana, Consacá, Contadero, Córdoba, Cuaspud, Cumbal, El Penol, El Tambo, Funes, Guachucal, Guaitarilla, Gualmatán, Iles, Imués, Ipiales, La Florida, La Llanada, Linares, Los Andes, Ospina, Pasto, Potosi, Providencia, Puerres, Pupiales, Samaniego, Sandoná, Santacruz of Guachavez, Sapuyes, Tangua, Túquerres and Yacuanquer; corresponding to 51.6% of the 64 municipalities of the department (CORPONARIÑO, 2009).



**Photograph 11.2.1.2 Guáitara River**

Source: Google Earth. 2013.

The Guaitara River, given of its canyon characteristic has been used as a collector of all solid and liquid waste produced by the city of Ipiales and some municipal capitals it crosses, presenting a high degree of water contamination (see Photograph 11.2.1.1, Photograph 11.2.1 and Figure 211.2.1.2).



**Photograph 11.2.1.2 Guaitara River**

Source: Google Earth. 2013.

*Hydrographic subzone Juanambú River*

The Juanambú River originates in the area known as Cascabel in the Central Highlands and has an area of 19,519 ha. The Juanambú basin is formed by the Alto Juanambú sub-basin, Buesaquito River sub-basin, Ijaguí River sub-basin and Bajo Juanambú River sub-basin. The Alto Juanambú River sub-basin covers an area of 19,519 ha (see Figure 11.2.1.3 and 11.2.1.3).

The Juanambú Alto River sub-basin is in highly affected due to the use of firewood for cooking food and is formed by the Black River river micro-basin, Runduyaco River, San Pablo River, Sara -Concha River, Tambillo River, Buesaquito River, Negro River, Chicajo River, Panacas River and Buesaquito Bajo River.

The lower part of this watershed is 70% deforested, its land has been mainly used for intensive agriculture and livestock activities. Moreover, because of the slope observed in the environment, erosion processes mild to severe are present. It consists of the

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 12

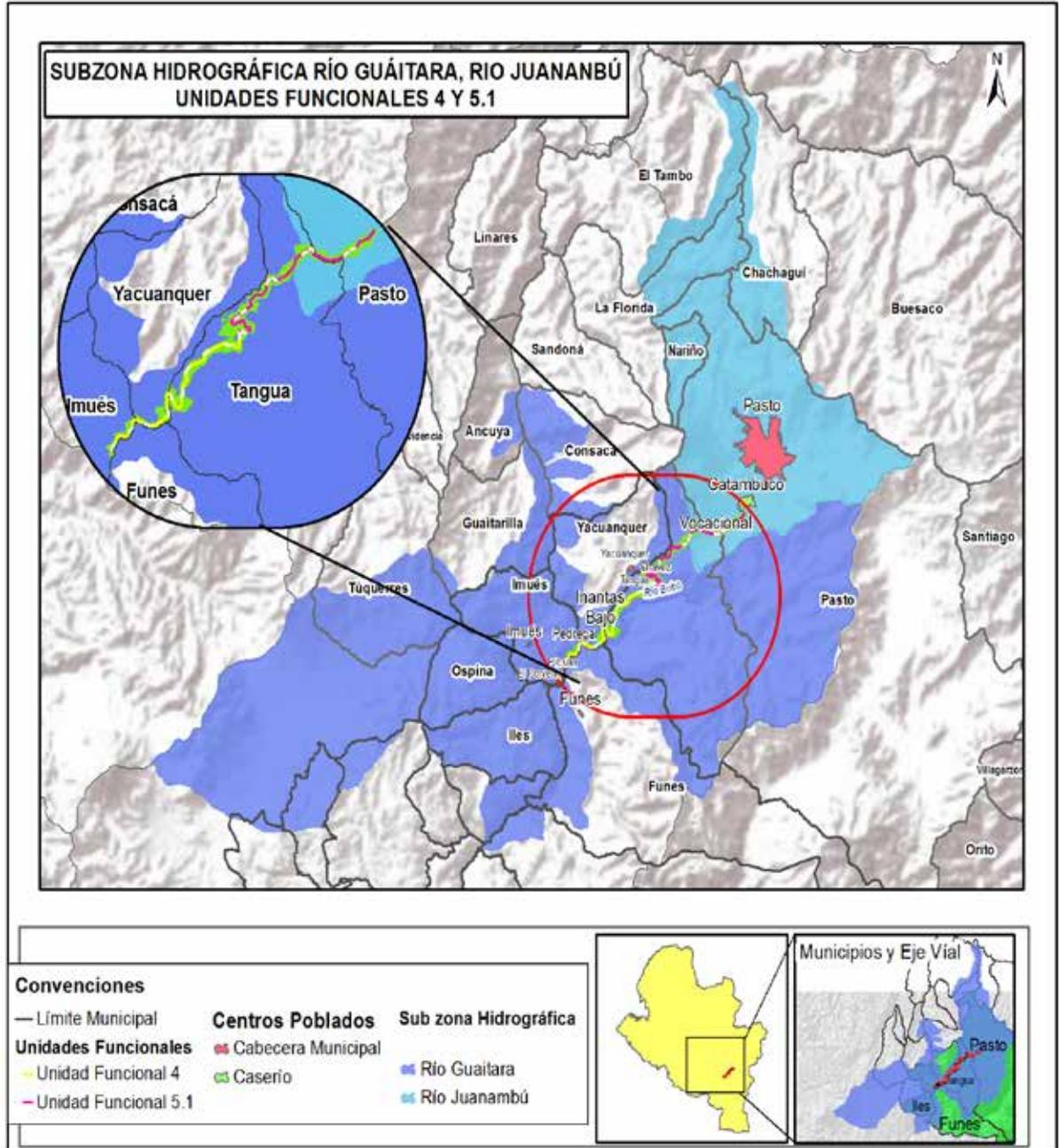
Ijagui River sub-basin, Alto Ijaguí River, Sacha River, Ijaguí Medio, Ijaguí Bajo, among others.

Most micro-basins mentioned flow through areas of slopes exceeding 40% of deep and shallow soils dedicated to growing corn, vegetables and grasses. The top of this sub-basin is large water reserve, while the intermediate part presents edaphologic limitations for agricultural use.



**Photograph 11.2.1.3 Juanambú River**

Source: Google Earth. 2013.



**Figure 11.2.1.2 Guaitara and Juanambú River Hydrographic Subzone**

Source: Gemini Environmental Consultants, 2016

*Hydrographic Unit Level I – Bobo River*

The Bobo River is located 25 kilometers from Pasto, half an hour from the site of origin in kilometer 10 of the road south direction on an unpaved road. It is part of the Patia River basin, with waters flowing into the Guaitara River (western slope of Nariño). It limits the north with the Pasto River Basin to the northeast with the Guamués River, south with the Alisales River, west with the Totoral Stream and south with the Curiaco Lake.

It consists of two sub-basins: the Bobo river sub-basin located in the municipality of Pasto is important because the Bobo River Reservoir is located here, and the Opongoy River sub-basin that is part of the municipalities of Pasto and Tangua. The Bobo River basin is because a dam is built there that supplies the aqueduct of the city of Pasto and generates energy for regional use and with tourism potential and water sports that have not yet developed.

The following great sceneries are highlighted in the Bobo River Basin: mountainous and volcanic relief represented in high reliefs with steep slopes and well-formed and representative slopes.

*Hydrographic Unit Level I - Río Pasto.*

The hydrographic unit of the Pasto River is basically formed by the Cubijan micro-basin born in the Negra Lake, which is located in the "Galeras Wildlife Sanctuary" National Park at 3600 meters above sea level; it also receives a small tributary called the Zanjón on the side of the palisade. There are countless streams and underground springs in this basin that bring incalculable benefits for human needs.

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 15

### 11.2.1.6 Key Features of water sources subject to use by road project activities

The main characteristics of water bodies subject to uptake for development of road project related activities.

#### *Bobo River*

The Bobo River high basin is composed of two order four basins; the Bobo River Reservoir basin, located in the municipality of Pasto and the Opongoy River basin located in the municipalities of Pasto and Tangua; this upper basin covers an area of 22,571 ha and is part of the order two basin of the Guáitara River emptying its waters to the Guáitar River on the eastern side (Corponariño, Management Plan and Basin Rio Bobo, 2009).

The upper basin of the Bobo River is distributed between coordinates 599,740.86 m and 621,258.77 m from south to north and 971,435.56 m and 987,866.23 m from west to east. The basin bounds on the north with the Pasto River basin, northeast with the Guamuéz River basin, to the southwest with the Alisales River, west with the Totoral Stream and south with the Curíaco Lake drainage system (Corponariño, Management Plan and Basin Rio Bobo, 2009) (see 11.2.1.3 photograph ).



**Photograph 11.2.1.3 Bobo River**

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 16

Source: Gemini Environmental Consultants, 2016

The following is identified in the basin: Heterogeneous Agricultural areas with an area of 711.6 hectares corresponding to 31.5% of the total area; this system is developed between 2,200 and 3,200 meters above sea level; the reservoirs and artificial water bodies of the Bobo River reservoir with an area of 295.7 hectares representing 1.3% of the total area of the basin. Natural dense forest coverage is also identified corresponding to 31.8% of its total area (Corponariño, Management Plan and Basin Rio Bobo, 2009).

### *Chaquita Stream*

The Chaquita Stream has a flow rate of 2.2 l / s. and is located in the Chavez county of the Tangua municipality at 2686 meters over sea level.

The upper part of the stream is mostly dedicated to maintenance of miscellaneous crops (potatoes, wheat, barley, corn, grasses). The middle zone is identified with high stubble, reaching the bottom where low stubble is found.

Its main use is for agriculture and livestock.

### *La Magdalena Stream*

The upper reaches of the La Magdalena micro-basin is located in the Galeras Flora and Fauna Sanctuary National Park. The stream is born in the Mejía Lake at 3600 meters above sea level in jurisdiction of the La Aguada County. One of the major tributaries in the upper part is the La Aguada Stream, which increases the flow rate and its Hydric offer satisfies the needs required by the urban municipality of Yacuanquer and the population settlements of the Aguada, Mejia and Estancia counties.

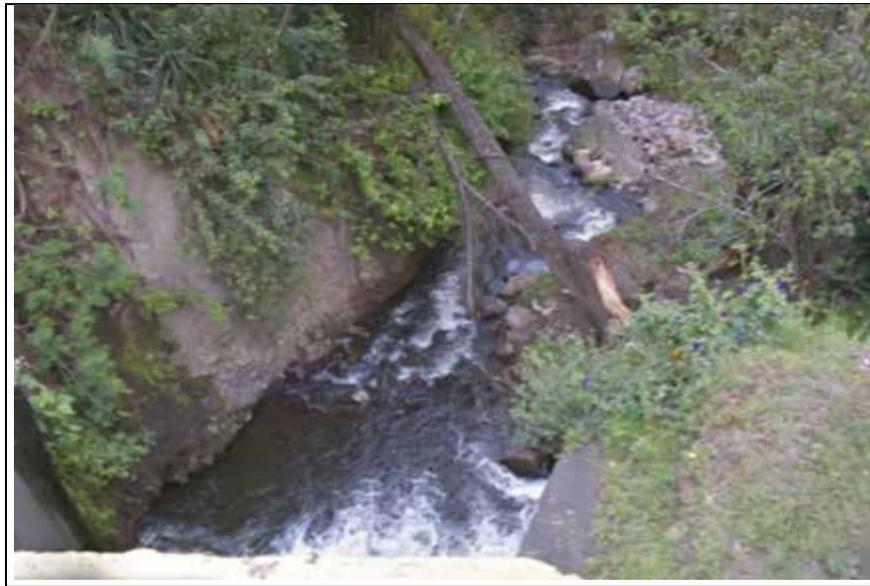
The micro-basin has an area of 17 km ending at the Bobo River in the El Placer sector of the Inantas Bajo county, which borders the municipality of Tangua. Its catchment area is 1492.56 ha (See Photo 11.2.1.6).

There are other important tributaries for the La Magdalena micro-basin that allows increasing its flow for the benefit of the inhabitants of the middle and lower part, which

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 17

also born in the reserve area at an altitude of 3500 meters in the municipality of Tangua, these are the Los Lirios Stream, Los Ajos Stream, La Marqueza Stream, El Establo Stream (PSMV, 2010).

It intersects with the Pedregal - Catambuco section road design at PR 7 + 000. The possible point of water uptake for industrial use is located approximately 800 meters on the left side of the layout.



**Photograph 11.2.1.4 La Magdalena Stream**

Source: Gemini Environmental Consultants, 2016

### *La Marqueza Stream*

The La Marqueza stream is located in the El Tambor County, Municipality of Tangua, Nariño Department. It has a flow rate of about 2.4 L / s.

It is located between 1000 and 2000 meters above sea level, with a bio-temperature between 12 ° C in the upper area and more than 24 ° C in its lower part, with slopes of 25% to 50% mainly.

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 18

The upper area of the stream is especially dedicated to miscellaneous crops (potato, wheat, barley, maize), paddocks for livestock and low stubble. In the middle area high stubble and weedy grasses are identified.

### 11.2.1.7 Environmental problems associated with water sources subject matter of the uptake

#### *Extension of the agricultural frontier*

One of the environmental problems identified with water sources subject matter of the uptake is the establishment of Semi-intensive crops (barley, wheat, quinoa and vegetables), Intensive (potato), Semi-permanent and permanent intensive (peas and beans) in large tracts of land.

This situation has generated significant fragmentation in vegetation cover and therefore in natural ecosystems, going from riparian forests to mosaic of crops.



**Photograph 11.2.1.8 Established crops associated to the La Magdalena stream**

Source: Gemini Environmental Consultants, 2016

Associated therewith, environmental problems are also identified in connection with:

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 19

- a) Landscape degradation due to deforestation (slash and burn) and change in land use.
- b) Loss of habitats and loss of diversity of species from monocultures
- c) Soil contamination from accumulation of chemicals and organic waste.
- d) Reduced soil productivity due to degradation processes from loss of organic matter, water retention, erosion and / or compaction.
- e) Siltation and unstable land on the slopes,
- f) Water pollution from agricultural chemicals and organic waste, disposed of in adjacent water bodies.

*Extension of the livestock border*

Establishment of livestock in large tracts of land is another important environmental problem identified with the water sources subject matter of the uptake.

Vegetal covers with clean grasslands and weedy pastures for grazing activities stand out.



**Photograph 11.2.1.9 Establishment of extensive livestock associated to the La Magdalena Stream**

Source: Gemini Environmental Consultants, 2016

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 20

Associated therewith, environmental problems are also identified in connection with:

- a) Landscape degradation
- b) Deforestation form indiscriminate slash and burn.
- c) Loss of biodiversity by presenting alteration in natural ecosystems.
- d) Health problems from vectors due to improper handling of organic waste.
- e) Water pollution from runoff to adjacent water bodies.
- f) Air pollution from CO<sub>3</sub>, CH<sub>4</sub>, NH<sub>3</sub>, etc. emissions and noise. (FAO)

*Landscape degradation*

Given that the floor is an essential part of the landscape, the environmental problems associated with landscape degradation of water sources subject matter of the uptake, are related to the development of a set of anthropogenic actions that significantly and negatively modify land use and hence the vegetation cover, the quantity and quality of water resources and in turn the diversity of fish and terrestrial fauna.

Within this set of actions the following are listed:

- a) Establish crops and extensive livestock which leads to problems of soil erosion and desertification.
- b) Population growth
- c) Deforestation



**Photograph 11.2.1.10. Landscape degradation associated with La Marqueza Stream.**

Source: Gemini Environmental Consultants, 2016

*Slash and burn deforestation*

Deforestation is part of the most significant environmental problems in water sources subject of water uptake due to the expansion of the agricultural frontier, which has led to the loss of protective forests, biodiversity of fish and land fauna, as well as the quality and quantity of the resource.



**Photograph 11.2.1.11. Slash and burn vegetation associated with La Magdalena stream**

Source: Environmental Consultants Gemini 2016

*Biodiversity loss and alteration of natural ecosystems*

The effects of biodiversity loss and alteration of natural ecosystems are the result of various anthropogenic activities developed in the water sources object of the uptake.

These include expansion of the agricultural frontier, changing land use and degradation of the landscape, including slash and burn of the existing protective vegetation.

Follows the percentage of environmental impact on water sources object of the uptake.

The result was obtained from delimiting the total area of the basin and the area of the existing natural cover versus mosaics cover of pasture, crops and natural areas, the latter being living fences of tree and shrub type.

This was done considering the hydrological map of water sources, overlapped with anthropogenic intervention areas (see Table 11.2.2)

**Table 11.2. 3 Environmental problems identified with water sources uptake object**

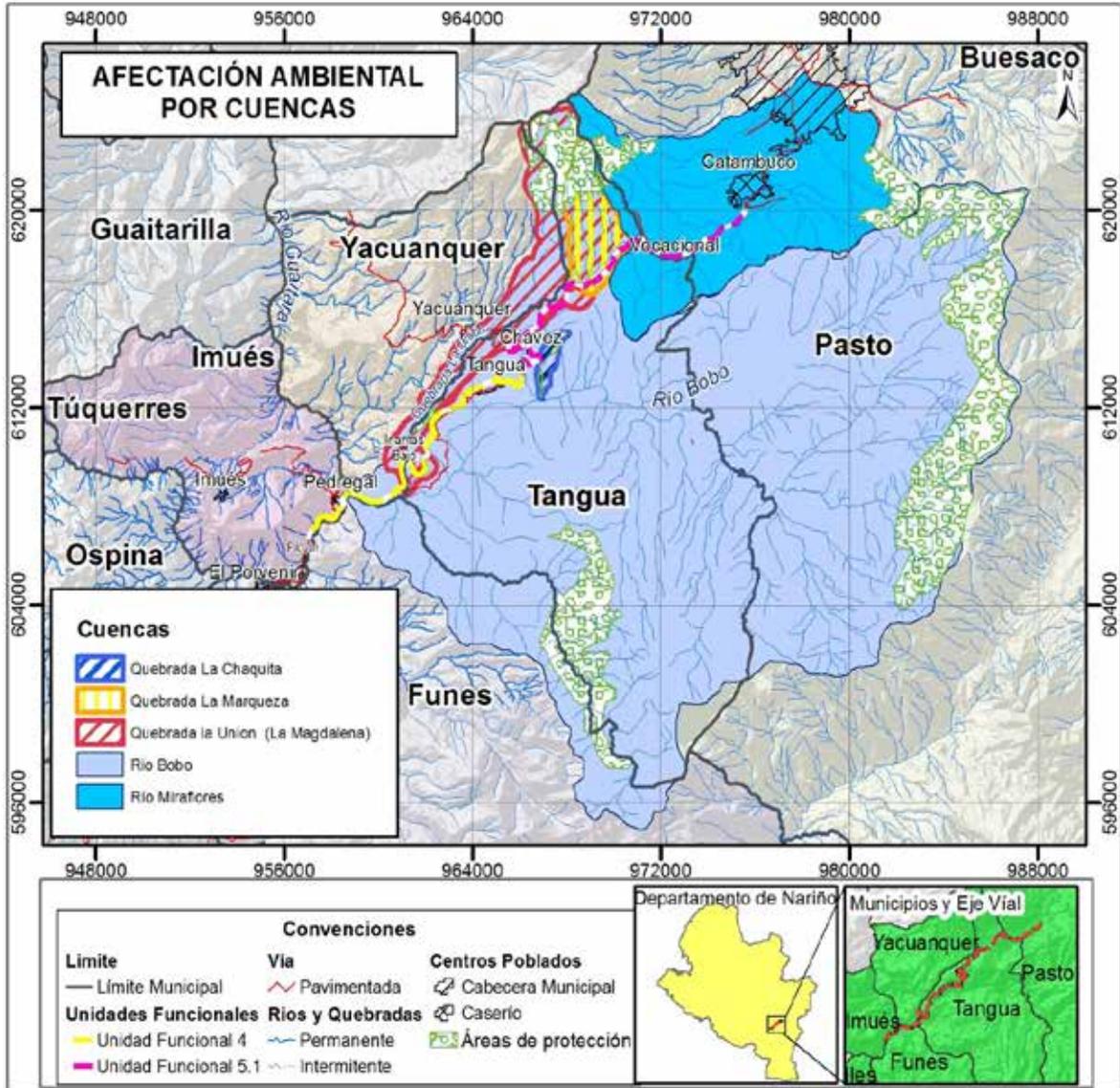
Environmental problem identified	Affected water source	Municipality associated with the water source	Percentage of basin effect
Expansion of agricultural and livestock frontier - landscape degradation – deforestation from slash and burn - biodiversity loss and alteration in natural ecosystems	Bobo River	Yacuanquer	96.43%
	La Chaquita Stream	Tangua	84.70%
	La Magdalena Stream	Yacuanquer	84.93%
	La Marqueza Stream	Tangua	75.89%

Source: Gemini Environmental Consultants, 2016

The water source with the greatest influence is the Bobo River with 96.43% human intervention, followed by the La Magdalena and Chiquita Streams with 84.93% and 84.70% respectively.

The degree of water sources impact is very high, because in all mosaic covers with crops and pastures exceed 70% of its total area.

Follows a graph listing the basins subject matter of the uptake and existing natural cover protection (see Annex 1: map of basins Esc. 1: 25,000).



**Figure 11.2.1.3 Environmental impact of water sources subject matter of the uptake**

Source: Gemini Environmental Consultants, 2016

### 11.2.1.8 Activities established in Chapter 3 of Decree 1076 of 2015 and Decree 1900 of 2006, for investment of economic resources such as 1% investment

Section 2.2.9.3.1 of Decree 1076 of 2015 and Article 3 of Decree 1900 of 2006 establish that settlement of the 1% investment should be made taking into account the following:

- a) Acquisition of land and property;
- b) Civil works;
- c) Acquisition and renting of machinery and equipment used in civil works and water works.
- d) Construction of easements.

Article 2.2.9.3.1.4, and 5 respectively establish that allocation of resources may be invested in some of the following works or activities:

- a) Management Plan and Handling of the Watershed by a percentage established by the Ministry of Environment, Housing and Territorial Development.
- b) Restoration, preservation and protection of the vegetal cover, vegetable enrichments and isolation of areas to facilitate natural succession
- c) Acquisition of land and / or improvements in areas of moors, cloud forests and fountainheads and groundwater recharge, river star and riparian corridors. In this case the environmental authorities will be title holders of the land and / or improvements;
- d) Implementation and monitoring of water resources;
- e) Limnological and hydrobiological monitoring of the water source;
- f) Construction of facilities and activities for flow control, correction and management of rivers, runoff control, erosion control, geotechnical works and other works and biomechanical activities for managing soil, water and vegetation;
- g) Interceptors and treatment systems for domestic wastewater. To carry out the respective studies, up to 10% of the total value of this investment can be invested therein. In this case the be municipalities or districts as appropriate will be the title holders of the works and studies;
- h) Environmental training for community promoters in topics related in aforesaid paragraphs, to assist in the environmental management of the watershed;
- i) Preservation and conservation of the National Park System located inside the respective basin according to management plans.

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 26

Having identified the activities that can be executed in water sources subject matter of the environmental license by the road project, the secondary information began review in order to meet environmental and water projects developed by companies managing the resource and municipal administrations, environmental authorities and other entities responsible for protecting and conserving natural ecosystems at local and regional level. Related information in paragraph 11.2.1.9.

Likewise, meetings were held with municipal authorities of the towns that are part of the uptake area of the road corridor, including entities such as CORPONARIÑO Pasto, CORPONARIÑO Ipiales, Municipal Technical Assistance Agricultural Units UMATA, Municipal Planning Secretaries and Agriculture secretaries, in order to validate both the secondary information consulted and the current status of identified projects. Such information is listed in numeral 11.2.1.10.

#### 11.2.1.9 Projects developed by municipal entities managing water resources

In order to identify activities and projects developed by local and regional government agencies and environmental organizations, responsible for managing and promoting actions in defense of water resources, the secondary information set out in the territorial planning plans-POT and the territorial planning schemes-EOT of the Municipalities of Tangua, Yacuanquer and Pasto as well as the management plans and watershed handling-POMCH, management plans of water resource-POHR, Sanitation plans and management of discharges-PSMV of the sources subject matter of the water uptake due to development of the road project.

**Table 11.2.4. POMCH identified projects in the Guaitara River**

Activity or project under POMCH
Environmental education and training on water heritage.
Preservation and participatory ecological restoration of mountain ecosystems in areas of water recharge and supply sources of aqueducts and irrigation systems.
Control and monitoring of water heritage, and technical, financial and scientific

Activity or project under POMCH
support on the implementation of the PUEAA and PSMV.
Formulation and implementation of management plans and water resource management in municipal aqueducts supply basins, and implementing units for the planning and management of water resources and sustainable production - UPOMRHPS.
Preservation of areas for conservation of biodiversity and ecosystem and implementation of mitigation, containment, protection and sustainable actions on buffer areas.
Control and monitoring of natural ecosystems and especially of protected areas and their zones of influence.
Participatory ecological restoration of natural ecosystems and landscape management.
Environmental education and training with relevance on integrated biodiversity management
Environmental education and training on soil resources.

Source: POMCH Guaitara River 2009

**Table 11.2.5. POMCH identified projects in the Bobo River projects 2010**

Activity or project under POMCH
Environmental education and training on water heritage.
Preservation and participatory ecological restoration of mountain ecosystems in areas of water recharge and supply sources of aqueducts and irrigation systems
Construction of basic sanitation units, consisting of sanitary unit and septic tank.
Technical, scientific and financial support for the implementation of the PUEAA, the PSMV and PGIRS.
Preservation of areas for conservation of biodiversity and ecosystem representativeness and implementation of mitigation, containment, protection and sustainable development actions in buffer areas.
Biodiversity inventory Bobo river basin.

Activity or project under POMCH
Environmental training on biodiversity.
Establish protective-producing forests.
Establish hedgerows.

Source: POMCH Bobo River 2009

Follows the list of programs and projects established in the development plan of the Municipality of Tangua.

**Table 11.2.6. Projects identified in the development plan of the Municipality of Tangua.**

Development Plan Activities Municipality of Tangua, 2015
Purchase land for watershed conservation
Campaigns on rational use of water.
Reforestation and protection of 2 hectares in the La Magdalena micro-basin and its tributaries, sowers of life program.

Source: Municipality Development Plan Tangua, 2015

For its part, the Development Plan of the City of Pasto has an integrated water management and urban, rural and suburban basic sanitation program.

**Table 11.2.7. Projects established by the Development Plan of the Municipality of Pasto**

Activities Development Plan Municipality of Pasto, 2015
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	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 29

Integrated water management and urban, rural and suburban basic sanitation
Integrated recovery of watersheds
Ecological restoration of the Pasto River Basin.
Environmental education for the use and management of natural resources
Identify, propose, develop, establish and declare areas for biodiversity protection, strategic ecosystems and natural resources

Source: Municipality Development Plan Tangua, 2015

**Table 11.2.8. Projects identified in the Land Management Scheme of Yacuanquer**

<b>Land Management Scheme Yacuanquer 2012</b>
Establish sanitary units
Training and environmental education
Establish community nurseries for reforestation activities in the area
Reforestation with native forest species protecting fountainheads and banks of streams in the districts
Buy land surrounding fountainheads and banks of streams to develop reforestation and water conservation
Silvopastoral training systems and sustainable management technique of paddocks

Source: Land Management Scheme Yacuanquer 2012

**Table 11.2.9. Projects identified in the sanitation and management of discharges Plan-PSMV municipality of Yacuanquer.**

<b>Sanitation plan and management of discharges-PSMV municipality of Yacuanquer</b>
Environmental awareness
Basic sanitation alternative solutions

Source: PSMV Municipality of Yacuanquer 2012

**Table 11.2.11. Projects identified in the zoning and water-resource management Plan POHR La Magdalena Stream**

<b>Projects identified in the zoning and water-resource management Plan PORH La Magdalena Stream</b>
Awareness and environmental education

Protection and conservation of the quality of La Magdalena stream
Institutional strengthening

Source: PORH La Magdalena Stream 2014

### 11.2.1.10 projects being implemented by administering authorities of hydric resources of water sources subject matter of the uptake

In order to see the projects or activities currently being carried out by companies or administrative agencies of water resources, a meeting was held in each municipality that are part of the area of influence of the road corridor, including entities such as CORPONARIÑO Pasto, CORPONARIÑO Ipiales, Municipal Technical Agricultural Assistance Units UMATA, Municipal Planning secretaries, Agriculture secretaries, among others. The meetings helped to identified that few projects to protect and / or recovery water bodies are underway. (See Annex 11.2.1.b).

Follows the list of meetings held and environmental projects underway.

**Table 11.2.103. List of meetings held with entities responsible for managing water resources.**

Municipality	Meeting date	Participating entity	Projects formulated and implemented	Activity location
Tangua	09/07/2016	Municipality of Tangua	Restoration and reforestation Monitoring study of flora and fauna	Isabel, Cebadal, Magdalena and Ajos Streams
Yacuanquer	09/07/2016	Municipality of Yacuanquer	No current projects of this type underway, and formulated: purchase of land and reforestation	In formulation
Imués	08/09/2016	Planning Department	Ecological restoration	Bellavista, Bellavista Alto, Camuestes, Cuarchu, Cuarchu Alto and Bajo, El Carmen and El Tablón
Contadero	09/09/2016	Department of Public Works, City Hall, Secretary of Government	Ecological restoration, purchase of land.	Paja Blanca Moor, Maria. hamlet
Pasto	09/10/2016	Environmental management secretary SGA of the City of Pasto.	Purchase of land, planting 1,000 trees and ecological restoration in agreement with CORPONARIÑO, EMPOPASTO	In formulation

			and EMAS	
Iles	09/14/2016	Infrastructure and planning secretary, secretary of agriculture and rural development.	Protection of properties acquired by the enclosure and planting plant material	In formulation
Ipiales	09/14/2016	CORPONARIÑO Ipiales	Purchase of land, environmental education, rehabilitation and reforestation.	Paja Blanca Moor, Cerro Troya, La Quintafth and Cerro Negro.
Pasto	09/09/2016	CORPONARIÑO Pasto	Preparation POMRH phase Guaitara River, Delimitation of the Cocha-Patascoy moors, Declaratory Studies Cerro Negro-San Francisco, BankCO2, PREAES and PRAU project	Nariño department activities PRAES, PRAU and BanCO2, area of municipalities in the area of influence of the Guaitara river

Source: Gemini Environmental Consultants, 2016

### Meeting Municipality of Tangua

The meeting in the municipality of Tangua was held on 07 September of this year with officials of the municipal government, in order to know of environmental projects in development and / or formulated with regard to local conservation and protection of both water resources and biodiversity (see Annex 11.2.1.b). During the meeting, representatives of the Ministry of rural development and planning, reported that currently there are two projects in their early stage (formulation): restoration and reforestation, and monitoring study of flora and fauna in the area of influence of the Isabel, Cebadal, Magdalena and Ajos Streams, including among others, the purchase of land, but no defined implementation schedule. In this regard, detailed information of the projects was requested in order to evaluate if they could become a part of the project with executable actions in the 1% investment plan.



**Photograph 11.2.1.12. Meeting with officials Municipality of Tangua**

Source: Gemini Environmental Consultants, 2016

### Meeting Municipality of Yacuanquer

The meeting with officials of the municipal government of Yacuanquer took place on 07 September of this year. They reported not having any current ongoing environmental project, nevertheless they plans to develop ecological and environmental programs related to the improvement of watersheds and land acquisition for the enrichment of riparian corridors. Such programs are included in the municipal development plan.

On the other hand they reported having carried out a project on livestock, social management, basic sanitation in construction of treatment plants, renewal of water supply networks, purchase of land to recover riparian corridors mainly in the Mejia, Santa Rosa , Rabrija, Ancuaran and Chapacal counties (Annex 11.2.1.b).



**Photograph 11.2.1.14. Meeting with officials Municipality of Yacuanquer**

Source: Gemini Environmental Consultants, 2016

### Meeting Municipality of Imués

Regarding the meeting in the municipality of Imués which took place on 08 September of this year with officials of the municipal government, in order to know of environmental projects in development and / or formulated with regard to conservation and protection of both local water resources and biodiversity (see Annex 11.2.1.b). They informed that to date they have acquired seven important properties for the conservation of water sources that supply county and municipality aqueducts. Likewise, they reported being currently developing an ecological restoration project, which aims to ensure the restoration and recovery of water sources that supply aqueducts of the main micro-basins of the municipality with native species, reaching maximum recovery of more than 100 hectares. In this regard, 326.54 hectares have been registered for a total of 182 users located in the Bellavista, Bellavista Alto, Camuestes, Cuarchu, Cuarchu Alto and Bajo, El Carmen and El Tablón counties.

### Municipality of El Contadero

The meeting in the municipality of El Contadero took place on 09 September of this year with officials of the municipal government, in order to know of environmental projects

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 34

in development and / or formulated with regard to the conservation and protection of both local water resources and biodiversity (see Annex 11.2.1.b). They reported that there are 468 hectares of land that are part of the Paja Blanca Moorland Park, including an ecological restoration project formulated by the Government of Nariño and CORPONARIÑO. Likewise, they are buying land in areas of fountainheads and reforesting 20Km of riparian water corridors together with educational institutions.



**Photograph 11.2.1.15. Meeting with officials Municipality of Contadero**

Source: Gemini Environmental Consultants, 2016

### Meeting City Hall of Pasto

The meeting in city hall of the city of Pasto was held on September 10 this year, in order to know of environmental projects in development and / or formulated with regard to the conservation and protection of both local water resources and biodiversity (see Annex 11.2.1.a). Participating officials reported that an agreement with the utility services of Pasto-EMPOPASTO SA ESP and the company EMAS PASTO SAESP intended to carry out development projects related to reforestation of degraded areas located in areas of fountainheads by planting 1,000 trees, as well as the purchase of land in water rounds. In this regard, detailed information of the projects was requested in order to evaluate if they could become a part of the project with executable actions in the 1% investment plan.

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 35



**Photograph 11.2.1.16. Meeting with officials city hall of Pasto**  
Source: Gemini Environmental Consultants, 2016

### Meeting town hall of Iles

Meeting with officials of the town hall of Iles took place on 14 September of this year. They reported that there are not current environmental projects underway, nevertheless they plans to develop ecological and environmental programs related to the improvement of watersheds and land acquisition for the enrichment of water rounds. Such programs are included in the municipal development plan (see Annex 11.2.1.b). In this regard, detailed information of the projects was requested in order to evaluate if they could become a part of the project with executable actions in the 1% investment plan.

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 36



**Photograph 11.2.1.17. Meeting with officials town hall of Iles**

Source: Gemini Environmental Consultants, 2016

### Meeting CORPONARIÑO Ipiales

The meeting with CORPORARIÑO Ipiales took place on 14 September of this year with Mr Manuel Moreno. The purpose of the meeting was to know of conservation projects and protection of both water resources and biodiversity formulated or under development by the environmental authority. In this regard, the official said they have prioritized the purchase of environmentally strategic land on the Paja Blanca moor, Cerro Troya, La Quinta and Cerro Negro. They also conduct educational workshops for the educational communities as well as those located in areas of riparian corridors, in order to minimize deforestation activities in water bodies (anexo11.2.1.b). In this regard, detailed information of the projects was requested in order to evaluate if they could become a part of the project with executable actions in the 1% investment plan.

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 37



**Photograph 11.2.1.17. CORPONARIÑO meeting Ipiales**

Source: Gemini Environmental Consultants, 2016

### **CORPONARIÑO meeting Pasto**

Meeting with officials from CORPORARIÑO Pasto took place on 09 September of this year with the participation of Mr. Hernán Rivas deputy Intervention and Environmental Sustainability-SISA, Mrs. Natalia Moreno SUBCEA contractor, an environmental professional and the environmental coordinator of the la Concesionaria vial unión del sur-CVUS and professionals from HVM supervisors. The purpose of the meeting was to know of conservation projects and protection of both water resources and biodiversity, formulated or developed by the environmental authority.

In this regard, the CORPONARIÑO assistants reported that currently the corporation is developing activities related to formulation of the Management Plan of the Guaitara River Basin -POMCH, particularly with the readiness phase, which is the initial step in the formulation of the plan. In this process, they have approached ethnic communities, including pre-consultation processes (by Prohumedales).

In addition to the formulation of the readiness phase of the Guaitara River, they also plan to delimit all the Cocha-Patascoy and Chiles-Cumbal moors and the POMCH of the Juanambú River. All the aforesaid in its final phase by 2017.

On the other hand, through an interagency agreement made between the Interior Department and the municipalities of Puerres, Potosi, Córdoba, the indigenous council of Males and the University of Nariño, studies are being conducted to declare the Cerro Negro-San Francisco moor. Likewise, currently they are conducting ecological restoration activities that include purchasing land. This is being done in the area of influence of the Guaitara River.

Regarding the development of innovative projects, the corporation is implementing a BanCO2 program, by identifying and characterizing families in areas of ecological conservation, who are given a financial incentive so that through this initiative important ecologically ecosystems are conserved on private lands. Within the processes of biodiversity conservation, a management plan for raptors and endemic species of toucan is being conducted, as well as for spectacled bears. Regarding the PRAES and PRAU, they are currently developing environmental education activities at the departmental level.

**11.2.1.10 Selecting fundable investment intervention lines as 1% investment and correspondence with Article 2.2.9.3.1.4 of Decree 1076 of 2015 and Decree 1900 of 2006, for the Rumichaca - Pasto dual carriageway road project, Ipiales –Catambuco span, Pedregal-Catambuco section.**

Having identified the environmental problems of water sources subject matter of the uptake, as well as formulated and implemented projects by companies and entities responsible for managing the resource at local and regional level, and fundable activities identified in the 1% investment plan laid down in Article 2.2.9.3.1.4., decree 1076 of 2015 and Article 5 of decree 1900 of 2006, a correlation between them was conducted in order to prioritize needs and identify possible lines of execution.

In this regard, it was determined that all municipalities, companies and entities responsible for managing water resources at local and regional levels, have formulated and ongoing projects related to purchase of lands reforestation, environmental training,

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 39

and protection of natural parks mainly; therefore, the lines of intervention will be focused on identified priority programs, i.e. conservation and watershed management, environmental education, protection and conservation of groundwater recharge areas and reforestation.

Follows the lines of fundable intervention and their relation to Article 2.2.9.3.1.4, Decree 1076 of 2015 and Article 5 of Decree 1900 of 2016.

**Table 11.2.11 Eligible intervention lines according to the needs of each water source subject matter of the uptake and its relation to decree 1900 2016.**

Fundable intervention line by the Rumichaca - Pasto dual carriageway road project	Literal corresponding to Section 2.2.9.3.1.4., Decree 1076 of 2015 and 5 of Decree 1900 of 2006, fundable 1% investment plan
Conservation and management of micro-basins	c) Acquisition of land and / or improvements in areas of moorlands, cloud forests and area of influence of fountainheads and groundwater recharge, river stars and riparian corridors. i) Preservation and conservation of the National Park System inside the respective basin according to management plans.
Environmental education	h) Environmental training to train community promoters in topics related in previous paragraphs, to assist in the environmental management of watersheds.
Protection and conservation of recharge areas of aquifers	c) Acquisition of land and / or improvements in areas of moors, cloud forests and areas of influence of fountainheads and groundwater recharge, river stars and riparian corridors. i) Preservation and conservation of the National Park System inside the respective basin according to management plans.
Reforestation	c) Acquisition of land and / or improvements in areas of moors, cloud forests and areas of influence of fountainheads and groundwater recharge, river stars and riparian corridors. i) Preservation and conservation of the National Park System inside the respective basin according to

<b>Fundable intervention line by the Rumichaca - Pasto dual carriageway road project</b>	<b>Literal corresponding to Section 2.2.9.3.1.4., Decree 1076 of 2015 and 5 of Decree 1900 of 2006, fundable 1% investment plan</b>
	management plans

Source: Gemini Environmental Consultants, 2016

### 11.2.1.11 Development of activities proposed for selection of intervention areas.

According to the 4 lines of fundable intervention selected as 1% investment for the Rumichaca-Pasto dual carriageway road project Catambuco Pedregal section and the guidelines set forth in Section 2.2.9.3.1.4., and 5 of Decree 1076 of 2015 1900, 2006 respectively and considering the analysis carried out to the activities proposed by the various entities involved in the conservation of water resources, follows a description of activities to be developed:

- Discussions with agencies that formulate water conservation projects (municipal mayors, environmental organizations etc.)

From the environmental problems identified in water sources and taking into account the programs and projects formulated and implemented by companies and entities responsible for management of water resources, activities framed in the 4 lines of bankable intervention will be selected as shown in Table 11.2.12.

- Planning to develop area selection activities

Having defined projects and activities to develop, their execution will be planned with the actors directly involved and Concesionaria Vial Unión del Sur S.A.S. Planning will include the following:

**Location:** to be defined based the location of implementation areas of the 1% investment plan, according to planning between the environmental authority and the Concesionaria Vial Unión del Sur S.A.S.

**Cost:** to be defined from the amounts set out in this plan (percentage split) and the detailed cost will be established once the activity to be executed is defined with actors

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 41

or competent authority and its location pinpointed, i.e. the costs are subject to modification according to the requirements of each water source.

**Responsible for implementation:** the Concesionaria Vial Unión del Sur S.A.S. will be directly responsible for the activities covered by the 1% investment plan, however they can be run by third parties (contractors), for such end the concessionaire will perform detailed monitoring of progress and results of each activity.

**Activity schedule:** a timely execution schedule is created with detailed starting and ending dates of each activity.

**Implementation of activities:** tentative areas to implement the projects, are not only water sources subject matter of punctual uptake but also the water system associated with each one thereof.

Follows the location of water sources object of environmental license, Table 11.2.136.

**Table 11.2.14 Municipalities associated with water sources object of environmental license for the Rumichaca-Pasto dual carriageway road project, Pedregal-Catambuco section**

ITEM	DEPARTMENT	MUNICIPALITY	SHYDRIC SOURCE NAME	SOURCE TYPE
1	Nariño	Yacuanquer	Bobo	River
2		Yacuanquer	La Magdalena	River
3		Tangua	La Marqueza	Stream
4		Tangua	La Chaquita	Stream

Source: Gemini Environmental Consultants, 2016

#### 11.2.1.10 Estimated amount of investment

The estimated cost of the Rumichaca - Pasto dual carriageway road project Pedregal – Catambuco section is COP is \$ 474,579,727,000 therefore the 1% investment plan f will be executed with an estimated amount of COP \$ 4,745,797,270.

This amount will be distributed among the municipalities that are part of the water sources subject matter of the uptake i.e. Tangua, Yacuanquer and Pasto municipalities and by the representation percentage of water bodies exerting thereon.

Follows itemized costs 1% settlement based according to civil works under the pre-construction and construction stages.

#### 11.2.157 Amount to allocate to the project investment plan

ITEM	DESCRIPTION
Total project cost in Colombian pesos	\$ 474579727000
1%	\$4.745.797.270
<b>RESOURCES FOR INVESTMENT PLAN</b>	<b>\$ 4.745.797.270</b>

Source: Gemini Consultants SAS, 2016

Follows the area of the municipalities that are part of the water sources subject matter of the uptake and the amount of proposed investment.

The percentage was obtained from the total area of each water source, its intervention in the road project and its current ecosystem level of intervention.

**Table 11.2.18 Distribution of resources to the investment line for the 1% investment program**

Basin and / or sub-basins	Associated municipalities	* Area in the municipality (ha)	Percentage (%)	** Estimated investment value (\$)
Bobo	Pasto	18991.6	39	\$ 1,850,860,935
	Tangua	17018.3		
	Yacuanquer	1637.7		
La Magdalena	Tangua	2,443.42	25	\$ 1,186,449,318
La Marqueza (Cubijan)		1,070.07	21	\$ 996,617,427
La Chaquita		156.3	15	\$ 711,869,591
<b>TOTAL</b>			<b>100</b>	<b>\$ 4,745,797,270</b>

Source: Gemini Environmental Consultants, 2016

(\* ) It is important to emphasize that the areas of water sources set out in Table 11.2.18, correspond to path the basin and / or sub-basin exerts on the town, but NOT the total area in which the 1% investment activities are executed. That is, the projects are executed inside these (areas) assuming the estimated value of the investment (\*\* ) for the activities proposed in **Table 11.2.16**.

Follows the list of water sources pickup object of the uptake as established in Table 11.2.18.



**Figure 11.2.1.4 Water sources object of the uptake, Rumichaca-Pasto road project, Pedregal-Catambuco section**

Source: Gemini Environmental Consultants, 2016

### 11.2.1.11 Pre-operative investment recommendation

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 44

As a recommendation the following considerations are presented, which can facilitate and enhance the investments performance:

- For the sake of technical and financial complementarities to enhance the efficiency and effectiveness of the investments, the projects may have co-financing of identified municipalities where water sources are located.
- To become a co-funded project, it is recommended enter into administrative agreements between the co-financing parties.
- To manage the resources, a holding trust is recommended to bring transparency and security to the contributions of each of the parts.
- A committee consisting of representatives of the co-financing parties who may be institutions of regional, national and international levels will supervise.
- Overseers committees must be conformed in each thereof, with representatives of the beneficiary communities, in addition to co-financing parties, who will be the ultimate authority for project development.

The timing of investment must be arranged by the parties, to consider the financial possibilities of each term. Therefore, it is advisable to establish these commitments well in advance of project execution.

#### 11.2.1.12 Technical Aspects of water sources object of the uptake

Before starting investing economic resources, it is important to take into account some technical aspects of water sources object of the uptake including that for development of the activities under the Rumichaca-Pasto road project Pedregal -Catambuco section, the uptake of 1.5 L / s by water source requires approximately (see details in chapter 7 of this study).

Follows the list of required uptake flows in each water body. Chapter 7 of this study lists the details.

**Table 11.2.19 Flow required for industrial use.**

FE	CAMP- WORK FRONTS	PLANAR COORDINATES	ACTIVITY	CONSUMPTION (L / s)	LOSS RATE 25%	TOTAL
4	Tangua camp	E: 965300 N: 613253	Concrete plant Cleaning and wetting activities	6 L / s	1.5 L / s	7.5 L / s
4	Work fronts	E: 960606.820	Wetting	3 L / s	0.75	3.75 L /

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 45

		N: 608226.730				s
5	Cebadal Camp	E: 967268 N: 616101	Concrete plant Cleaning and wetting activities	6 L / s	1.5 L / s	7.5 L / s

Source: (Gemini Environmental Consultants, 2016)

Taking into account the needs of the dual carriageway road project, four (4) water bodies to supply the needs of all industrial processes.

**Table 11.2.20 Uptake water sources Pedregal - Catambuco section**

UF	CAMP-FRONT WORK	SOURCE	LOCATION UPTAKE POINT *	COUNTY	MUNICIPALITY
4	Tangua camp	La Magdalena	E; 965242.186 E: 615216.870	Inantas Alto	Yacuanquer
4		La Chaquita	E: 967129.530 N; 614061.400	Chavez	Tangua
4	Work site	Bobo River	E: 960606.820 N: 608226.730	Inantas Alto	Yacuanquer
5	Cebadal Camp	La Marqueza	E: 968214.070 N: 617010.290	El Tambor	Tangua

\* Plane coordinates Magna Sirgas Origin West  
Source: Gemini Environmental Consultants, 2016

The water concession permits for industrial supply of camps are listed in chapter 7 of this study.

The following table relists the corresponding water sources object of the surface water uptake, according to the project requirements.

It lists among others, the coordinate location of the uptake point, its spatial location within the project and type of water source.

**Table 2.11.21 Water sources and uptake points**

ITEM	DEPT	MUNICIPALITY	COUNTY	NAME	SOURCE TYPE	ELEVATION (Masl)	* COOR_X	* COOR_Y
1	Nariño	Yacuanquer	Inantas Bajo	Bobo	River	1753	960,614.49	608,230.956

2	Yacuanquer	Inantas Alto	La Magdalena	Stream	1990	961,218.70	610,773.57
3	Tangua	El Tambor	La Marqueza (Cubijan)	Stream	2998	968,222.91	614,073.60
4	Tangua	Chávez	La Chaquita	Stream	2686	967,138.50	614,073.60

\*Planar coordinates Marga Sirgas Origin West  
Source: Gemini Environmental Consultants, 2016

### 11.2.1.13 Activities proposed to run as 1% investments

Follows the proposals of proposed activities in compliance with the 1% investment. Such activities are framed in Decree 1900 of 2006 whereby paragraph of Article 43 of Law 99 of 1993 is regulated regarding compensation to be performed in any project that involves in its execution the use of water taken directly from natural sources and is subject to environmental licensing.

#### 11.2.1.13.1 Development of the proposed activities

From the activities proposed by Article 2.2.9.3.1.4. of Decree 1076 of 2015, Article 5 of Decree 1900 and the 4 lines of action from the 1% investment Plan as listed in paragraph 11.2.1.10, the development of the following activities are proposed:

- Activity 1. Preservation and protection of plant cover

- *Line of action pertaining to activity 1*

Conservation and protection of the vegetation cover, vegetable enrichment and isolation of areas to facilitate the natural succession processes.

- *Project characteristics*

Develop actions to restore, preserve and protect vegetation cover distributed in water corridors and margins associated with the Bobo River, L Magdalena, La Marqueza and Chaquita Streams and / or water areas associated their ecosystems.

- *General objective*

Implement reforestation programs with protective-producing species of the region for water bodies object of the concession or hydric areas associated to their ecosystems.

- *Specific objectives:*

- Generate ecological connectivity through reforestation in areas associated with patches of natural covers and / or sensitive area.
- Recover degraded areas or ecosystems highly affected by anthropogenic interventions.
- Improve ecological recovery processes in natural ecosystems identified in riparian corridors and water margins of water bodies.

- *Project Scope*

Involve properties located on the banks and riparian corridors of water bodies belonging to the Bobo River, La Magdalena, La Marqueza and Chaquita Streams, in order to recover and / or improve biodiversity and ecological representativeness.

- *Interagency coordination*

The following are possible entities and actors who can intervene at different stages or phases of the project.

o Community involvement:

Involve the community in selected lands and environmental type associations that are part of the area of influence of the project, with whom a training process will be conducted aimed at proposing changes in productive habits that indirectly affect natural resources (water, soil, flora and fauna).

o Institutional participation:

The Concesionaria Vial Unión del Sur S.A.S as guarantor of resources will act as process manager and will implement social and support activities of the project at different stages.

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 48

Entities such as CORPONARIÑO, Municipal Governments, institutions and environmental type organizations that are part of the managers and protectors of water resources as sources of knowledge will provide inter-agency support for the technical adjustment and project advice in selecting the land to reforest.

- *Actions to be undertaken during project implementation*

Reforestation activities are developed according to the ecological approach intended for the selected property, that is, considering a reforestation approach associated with connectivity by establishing hedgerows, enrichment of riparian corridors or margins by focusing reforestation associated with restoration by planting endemic species that favor the ecological or succession process using an approach of regeneration and recovery of degraded lands or devoid of vegetation; for the latter, protective-producing regional type species will be planted .

Follows the proposed project planning stages; however, these may be adjusted during the preliminary phase as approved by the planned mechanisms:

o Phase 1. Scheduling

- Coordinate with environmental type institutions and administrations that are part of the protective and water resource management bodies.
- Identify areas and degraded lands, near water bodies or riparian corridors.
- Define reforestation to be perform according to the ecological approach.
- Sign agreements or administrative acts to begin implementing the activity.
- Define scheduling and detailed costs for the activity based on provisions of this investment plan
- Acquisition of plant material and / establish a temporary forest nursery.
- Plant vegetal material.
- Maintain individuals planted.

o Phase 2. Technical implementation of activities

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 49

The activities to be implemented are mainly related to selecting the area of land to intervene, land isolation or enclosure and establish plant material (layout, hole digging, planting).

Follows the technical characteristics to be developed with project activities.

#### Ü Technical project characteristics

The technical characteristics listed below are globally formulated; however, those activities not set forth herein in will be incorporated in the project's Environmental Management.

**Site preparation:** The space of land where seedlings will be established will be prepared to offer the best conditions for growth and development for the individuals. This activity comprises among others the following:

*Terrain cleaning or weed removal:* corresponds to the removal of existing ground vegetation, in order to reduce or eliminate competition that could prevent the growth of the individuals.

*Eliminate physical obstacles:* that could prevent the growth of trees and / or hinder the weeding operations.

*Layout:* the planting distance between individuals will be 4 by 4 meters, for a total of 625 individuals per hectare.

*Hole digging:* Drilling will take place in the field of 40x40x40 cm deep.

**Fertilization:** The soil will be fertilized according to the results obtained from laboratory samples and nutritional characteristics of the species to be establish.

**Seedling selection:** Planted individuals will be between 40 and 50 cm high, with good lignification on the stem, without physiological defects at the root such as pig tail, gooseneck and / or broken. Likewise, they will be free of pests or diseases. They will have between 4 and 5 leaf floors, good organic content. They will be purchased from

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 50

nurseries certified by the Colombian Agricultural Institute-ICA. It is important to note that species to be established will be native species such as pelotillo, walnut, cedar, guaiac, among others.

**Sowing:** Protective-producer forest species will be sowed. The species will be defined according to soil characteristics and the area landscape. This activity is preferably started during the rainy season to increase the chances of seedling development. Planting density is 625 trees per hectare, with a distance of 4 meters between individuals.

**Terrain isolation:** Fence posts to isolate the areas will be immunized and / or plastic wood obtained from authorized suppliers. When immunized wood is obtained, to ensure vendors guarantee that the product comes from sustainable forests. The props will be distanced 2 meters apart, each with 4 four lines of barbed wire 12 gauge, 20 cm apart.

**Nurseries:** Creating nurseries may be optional as long as the cost analysis is the most appropriate and suitable for investment, i.e., the executor must define the cost / benefit of implementing nurseries, purchasing material in nurseries.

**Material quality:** The plant material will be continuously monitored to ensure its quality from the nursery to planting in the final site. The Environmental Management Project will track individuals without notice.

**Maintenance:** Will be done for a period not exceeding three years, starting six months after the establishment. Maintenance activities and timing may be changed according to the requirements of the species and / or as determined by the environmental authority. During this process operational type work associated with applying fertilizers and / or organic fertilizers to maintain the vigor and growth of trees as well as maintenance pruning and formation pruning, weed removal, irrigation and others, in order to promote good vegetative growth of seedlings.

**Reseeding:** Will start 20 days after the initial seeding of plant material until the first three months. This process will be used for those species that did not survive. The mortality rate may not exceed 10% of individuals established per hectare, reason why

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 51

the plant material will have to be carefully selected, as well as soil characteristics and nutritional requirements before taking the seedlings their final destination.

**Monitoring Reports:** Monthly monitoring reports where in addition to technical details, performance schedules and progress will be presented for both crops and for maintenance.

- Phase 3. Results and Evaluation Phase short- and medium-term

Assess the short and medium term scope of the project and its efficiency for the ecosystem, with the goal to carry out activities of restoration, conservation and protection of plant cover, plant enrichments and isolation of defined areas.

**Table 2.11.22 Follow-up and monitoring indicators**

GOAL	INDICATOR	COMPLIANCE	RECORD
Carry out 100% activities of restoration, conservation and protection of the vegetation, vegetable enrichments and isolation of defined areas for this activity	(Established areas / defined area) * 100	100%	Photographic record and monthly activities report

Source: Gemini Environmental Consultants, 2016

- Phase 4. Results and long-term evaluation

Assess the long-term ecosystem benefit of the species established in both riparian corridors and in protection and / or aquifer recharge areas, for such end, to take into account follow-up and monitoring indicators shown in Table 2.11.22.

- *Schedule of activities*

Follows the implementation schedule of the activities covered by the investment plan for reforestation per hectare:

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 52



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Environmental Impact Study for the dual carriageway road project Rumichaca - Pasto Ipiales section - Catambuco, UF.  
4 And UF. 5.1 concession contract under PPP scheme No. 15 of 2015

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	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 53

**Table 2.11.23 Schedule per hectare of reforestation activities**

STAGE	Years																																				
	Months (year 1)												Months (year 2)												Months (year 3)												
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
<b>Phase 1 Programming</b>																																					
Coordination with environmental type institutions and administrative that are part of the protective and water resource management bodies.																																					
Identify areas and degraded lands, near or on riparian corridors.																																					
Define reforestation according to the ecological approach.																																					
Sign agreements or administrative acts to begin implementing the activity.																																					
Define schedules and adjust detailed costs for the activity based on provisions of this investment plan																																					
<b>Phase 2 Technical implementation of activities</b>																																					
Select areas																																					
Land isolation																																					
Establish plant material (path, hole digging)																																					
Maintenance (reseeding, fertilizing, etc.)																																					
Monitoring Reports																																					
<b>Phase 3. Short and medium term results and evaluation</b>																																					
Evaluation and reports on compliance with follow-up and monitoring indicators.																																					
<b>Phase 4 Results and long-term evaluation</b>																																					
Evaluation and reports on compliance with follow-up and monitoring indicators.																																					

Source: Gemini Environmental Consultants, 2016

Having defined the number of hectares to be reforested, an overall implementation timetable will be established based on the detailed characteristics of the properties, such as weather conditions and availability of supplies.

- *Budget*

To develop this activity approximately 28.7 hectares of land are considered, distributed in the water sources object of uptake, corresponding to 7.47% of the total 1% investment i.e. \$ 354,575,585. However, both the amount and the intervention area will be subject to modifications.

Follows an itemized budget for the 1% investment plan for reforestation per hectare.

The budget is subject to change, depending on execution times of the investment plan.

**Table 11.2.24 Costs for reforestation, isolation and maintenance per hectare activities**

ITEM	UNITY	QUANTITY	V. UNIT	V. TOTAL
<b>COORDINATION</b>				
Forester and / or agroforestry	Technical assistance	5	134000	<b>670,000</b>
<b>WAGES WORKFORCE</b>				
Isolation	Wages	2	35,000	70,000
Cleaning, surface preparation	Wages	3	35,000	105,000
Layout	Wages	3	35,000	105,000
Hole digging	Wages	8	35,000	280,000
Sowing	Wages	6	35,000	210,000
Fertilization and phytosanitary control	Wages	2	35,000	70,000
<b>Subtotal workforce</b>		<b>24</b>		<b>840,000</b>
<b>SUPPLIES</b>				
Sawn poles 10cm diameter, immunized	Unit	160	6,000	960,000
Reinforcement (every 5 props)	Unit	32	6,000	192,000
Barbed wire(350 m, 12 gauge)	Roll	5	150,000	750,000
Cleats	Kilo	8	8,000	64,000
Fertilizers	Package	4	75,000	300,000
Pesticides	Liter	2	25,000	50,000
Tools	Lump sum	Lump sum	Lump sum	100,000
Composted organic fertilizer (1kg x seedling)	Package	12.5	\$ 30,000	375,000

<b>subtotal supplies</b>				<b>2791000</b>
<b>VEGETAL MATERIAL</b>				
Native species seedlings * 5 floors leaf	Unit	625	3000	1,875,000
<b>Subtotal plant material</b>				<b>1,875,000</b>
<b>LABORATORIES</b>				
Soil analysis	Unit	1	250,000	250,000
<b>Subtotal plant material</b>				<b>250,000</b>
<b>OTHER COSTS</b>				
Automotive transportation	Lump sum	Lump sum	Lump sum	700,000
Animal-drawn transport	Lump sum	Lump sum	Lump sum	200,000
<b>Subtotal other costs</b>				<b>900,000</b>
<b>TOTAL COSTS WITHOUT CONTINGENCIES</b>				<b>\$ 7,326,000</b>
Contingencies (10%)				<b>732600</b>
<b>GRAND TOTAL</b>				<b>\$ 8,058,600</b>
<b>Maintenance costs per hectare</b>				
<b>COORDINATION</b>				
Forestry and / or agroforestry professional	Fees / day	3	134,000	402,000
<b>WAGES WORKFORCE</b>				
Cleaning	Wages	2	35,000	70,000
Fertilizing	Wages	1	35,000	35,000
Reseeding	Wages	1	35,000	35,000
<b>Subtotal workforce</b>		<b>10</b>		<b>140,000</b>
<b>SUPPLIES</b>				
Sawn poles 10cm diameter immunized	Unit	16	6,000	96,000
Barbed wire(350 m, 12 gauge)	Roll	1	150,000	150,000
Cleats	Kilo	8	8,000	64,000
Fertilizer (triple 15 x 400 gm seedling)	Package	4	75,000	300,000
Fungicide	Liter	2	25,000	50,000
<b>Subtotal supplies</b>				<b>660,000</b>
<b>VEGETAL MATERIAL</b>				
Native species seedlings 5 floors leaf (10% of total)	Unit	63	3000	315,000

<b>Subtotal plant material</b>				<b>315.000</b>
<b>OTHER COSTS</b>				
Transport	Lump sum	Lump sum	Lump sum	200,000
<b>Subtotal other costs</b>				<b>200,000</b>
<b>TOTAL COSTS WITHOUT CONTINGENCIES</b>				<b>\$ 1,717,000</b>
Contingencies (10%)				<b>171,700</b>
<b>GRAND TOTAL</b>				<b>1888700</b>
<b>ESTABLISHMENT, ISOLATION AND MAINTENANCE COST PER HECTAR</b>				<b>\$ 9,947,300</b>

\* Cost of seedlings obtained from the regional market, subject to market changes.

Source: Gemini Environmental Consultants, 2016

Maintenance of individuals associated with the execution of operational type tasks on seedlings, mainly fertilizer and / or organic fertilizers application to maintain the vigor and growth of trees, as well as performing maintenance pruning, shaping pruning, weed removal, reseeding, irrigation and others, in order to promote good vegetative growth of seedlings.

Development of these activities will cost \$ 1,888,700 per hectare. It is important to note that reseeding will be during the first three months of having planted the individuals.

Costs are shown in the total activity costs Table 11.2.24. and are subject to change when executing the investment plan.

- Activity 2: land acquisition for recovery, protection of riparian corridors, water banks and recharge areas.

- *Line of action pertaining to activity 2*

Acquisition of land and / or improvements in areas of moors, cloud forests and fountainhead and groundwater recharge areas, river stars and riparian corridors.

Preservation and conservation of the National Park System located inside the respective basin according to management plans.

- *Project characteristics*

Purchase land located in the area of influence of the riparian corridor associated with the Bobo River, La Magdalena La Marqueza and Chaquita Streams and / or water areas associated to their ecosystems. In this case, the ownership of the properties and / or improvements will be handed over to the environmental authority CORPONARIÑO as guarantor of the conservation of regional resources.

- *General objective*

Execute the land purchase program as an activity of restoration, preservation and protection of the vegetation, vegetable enrichments and isolation areas to facilitate natural succession, reforestation with protective-producing regional species for the Bobo River Basin, La Magdalena, La Marqueza, and Chaquita Streams or water areas associated to their ecosystems.

- *Project Scope*

Involve properties located in the area of influence of the project, in the municipalities of Imués, Yacuanquer, Tangua and Pasto, Department of Nariño, which are part of the Bobo River, La Magdalena, La Marqueza, and Chiquita Streams micro-basin to allow recovering and / or improving biodiversity and ecological representativeness.

- *Institutional participation:*

The Concesionaria Vial Unión del Sur S.A.S as guarantor of the resources, will act as process manager and will implement development activities together with the environmental authority CORPONARIÑO and Town Halls and water resources management Institutions that are part of the area of influence of the project by acting as generators of knowledge in the technical adjustment and project consulting when selecting the land.

- o Activities to be developed for land acquisition

- ü Site selection

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 3

According to the provisions of Article 111 of Law 99 of 1993 as amended by section 210 of the Act 1450 of 2011, which states "*public interest areas of strategic importance for conservation of water resources that supply water municipal, regional and district aqueducts*" and furthermore "*the administration of these areas correspond to the respective district or municipality*" will be selected in accordance with the municipal authorities of Tangua, Yacuanquer, Pasto, and / or water resource management companies supplying to ecologically important lands for conservation of water resources.

The land acquired may be donated to water resource management companies, which will have to define conservation under applicable environmental regulations.

The process of buying land for conservation and protection of water sources that supply municipal or county aqueducts or may be executed as follows:

The procedure for land acquisition is as follows:

- a) Site selection
- b) Land inspection visit, environmental analysis and technical feasibility concept.
- c) Analysis and study of the legal situation.
- d) Survey.
- e) Appraisal.
- f) Offer to purchase to the owner.
- g) Receiving owner answer.
- h) Promise of sale contract.
- i) Minutes of sale
- j) Send to Public Notary, where appropriate.
- k) Granting of the public deed of sale.
- l) Payment certification.
- m) Procurement Notice to the Administrative and Financial Branch

#### ü Land acquisition and use

Having acquired the land, the feasibility of developing recovery and rehabilitation projects will be determined by establishing plant material, or whether on the contrary insulation activities will be conducted for their natural recovery.

	ENVIRONMENT EFFECT INVESTIGATION	CSH-4-AM-AM-EIA2-GG-0013-7
		March 2017
		Page 4

- *Schedule of activities*

Follows the detailed schedule to execute land acquisition activities referred to in the investment plan:

**Table 11.2.1.21 Schedule of activities for land acquisition**

ACTIVIDAD	Mes												
	1	2	3	4	5	6	7	8	9	10	11	12	
Selección del predio	■	■	■										
Visita de inspección del predio, análisis ambiental y concepto técnico de viabilidad.			■	■	■								
Análisis de la situación jurídica y estudio de la situación jurídica.				■	■								
Levantamiento topográfico						■	■						
Avalúo								■	■				
Oferta de compraventa al propietario										■			
Recepción de la respuesta del propietario										■			
Contrato de promesa de compraventa.										■			
Minuta de compraventa										■			
Solicitud de reparto de Notaría Pública, cuando corresponda.										■			
Otorgamiento de la Escritura Pública de compraventa.										■			
Certificación de pago.										■			
Aviso de adquisición a la Subdirección Administrativa y Financiera										■			
Adquisición y destinación del predio											■	■	
Entrega del predio												■	

Source: Gemini Environmental Consultants, 2016

- *Budget*

This activity is tentatively proposed to be developed in approximately 83.1 hectares of land, distributed in water sources object of the uptake, corresponding to 91.65% of the total 1% investment, i.e. \$ 4,349,454,000.

However, the value is subject to change when the investment plan activities begin.

Follows the budget for the 1% investment plan for the land Acquisition per hectare activities.

**Table 11.2.1.22 Budget 1% investment plan for land per hectare acquisition**

ACTIVITY	UNIT	QUANTITY	UNIT VALUE	TOTAL VALUE
<b>LAND PURCHASES</b>				
<b>Workforce</b>				
Forestry or agroforestry engineer (1)	month	1	\$ 2,800,000	\$ 2,800,000
Business Administrator (1)	month	1	\$ 2,800,000	\$ 2,800,000
Social professional (1)	month	1	\$ 2,800,000	\$ 2,800,000
Professional GIS (1)	month	1	\$ 2,800,000	\$ 2,800,000
Field assistants (2)	wage	30	\$ 38,000	\$ 1,140,000
<b>Subtotal</b>				<b>\$ 12,340,000</b>
Plot of land and / or property (subject to change according to the value defined by the owners)	Ha	1	\$ 40,000,000 *	\$ 40,000,000
<b>Subtotal</b>				<b>\$ 40,000,000</b>
<b>TOTAL</b>				<b>\$ 52,340,000</b>

\* Average value per ha at local and regional level  
Source: Gemini Environmental Consultants, 2016

Costs related to development of this activity are subject to change at the time of investment plan execution.

- Activity 3: Environmental education
- *Activity 3 action lines*
  - Environmental Education: Environmental Training to train community promoters to assist in the environmental management of watersheds.
  - Environmental education and training on integrated biodiversity management
- *Project characteristics*

Develop environmental training workshops to train community promoters in the conservation and preservation of water bodies in each of the municipalities that are subject matter of the uptake.

- *General objective*

Generate tools to recover, preserve, conserve and monitor ecologically important water sources for communities.

- *Methodology*

The training methodology will be dialogic and participatory where the training process develops through a project formulated by the participants.

Training will be aimed at conservation of natural resources that can generate changes in behavior and attitudes towards their sustainable use.

In this regard, workshops to train environmental promoters will be held, taking into account the guideline established by the office of education and community participation of the Ministry of Environment and Sustainable Development-MADS.

- *Activities during project implementation*

- **Diagnosis:** Before each training session, a diagnosis will be made to meet local environmental problems.
- **Invitation:** Bring together communities in the area of influence of water sources object of the water concession request, under a mechanism to ensure personnel attendance to the workshops. This is done by using communication channels such as radio, flyers, and personalized invitations, among others.
- **Workshop development:** Theoretical Workshop. This activity is related to implementation of education and awareness activities on management of natural resources through lectures, conferences, workshops, brochures and meetings. The aim of this type of workshop is offer participants conceptual elements in citizen participation, participatory planning and implementation of processes in environmental education programs articulated with Municipal, Regional and National Development Plans as well as those by regional

environmental authorities, and national environmental education policy and specifically the protection and conservation of water resources programs.

**Hands-on workshop:** This activity is performed by walking through the zone of influence where climate characteristics of the area will be analyzed, in addition, planting seedlings in one of the properties foreseen for reforestation in order to practice each reforestation need (cleaning, marking, hole digging, planting, weed control, fertilization, among others.)

The talks will be addressed to children, youngsters and adults because a separate workshop will be held for the adult community. Each day a theoretical and practical environmental workshop will be held. At the end of each session the conclusions, recommendations and commitments regarding acquired knowledge will be defined.

The talks will be addressed at the community located on the area of influence of water sources subject matter of the water concession. Media used can be video bean, educational material (booklets, brochures, posters). Hands-on field activities will also be developed.

The activity will be led by professionals experienced in environmental issues and environmental training.

After the activities, a report will be prepared listing the topics covered, to include the attendance list and photographic records.

- *Schedule of activities*

The detailed schedule to implement the activities referred to in the investment plan is as follows:

**Table 11.2.1-19 Schedule of environmental training activities**

ACTIVITY	Weeks													
	1	2	3	4	5	6	7	8	9	10	11	12	13	
Diagnosis														

Invitation																				
Workshop by Municipality																				
Activity report																				

Source: Gemini Environmental Consultants, 2016

- *Budget*

This activity is proposed in the municipalities that are part of the water sources uptake. The activity has a total cost of \$41200000, corresponding to 0.87% of the total 1% investment.

However, this value is subject to change when the activities are implemented.

Follows a list of costs for the 1% investment plan for environmental education activities by municipality.

**Table 11.2.1.20 Budget 1% investment plan for environmental education activities by municipality**

DETAIL	UNIT	QUANTITY	UNIT VALUE	TOTAL VALUE
<b>Workforce</b>				
Forestry, agroforestry or environmental engineer (1)	month	1	\$ 2,800,000	\$ 2,800,000
Environmental assistant (2)	month	1	\$ 2,400,000	\$ 2,400,000
<b>Subtotal</b>				<b>\$ 5,200,000</b>
<b>Materials and supplies</b>				
Stationery	ream	lump sum		\$ 500,000
Photocopies		lump sum		\$ 200,000
Booklets	unity	50	\$ 50,000	\$ 2,500,000
Flyers	unit	500	\$ 2,000	\$ 1,000,000
<b>Subtotal</b>				<b>\$ 4,200,000</b>
<b>Equipment</b>				
Rental video bean	lump sum		\$ 250,000	\$ 250,000

Rental truck transport			\$ 670,000	\$ 670,000
Training room	lump sum		\$ 300,000	\$ 300,000
<b>Subtotal</b>				<b>\$ 1,220,000</b>
<b>refreshments</b>				
Refreshments	lump sum		\$ 350,000	\$ 350,000
<b>Subtotal</b>				<b>\$ 350,000</b>
<b>TOTAL</b>				<b>\$ 10,970,000</b>

Source: Gemini Environmental Consultants, 2016

**Table 11.2.1-2 Consolidated costs by activity**

<b>Activity</b>	<b>Total cost</b>	<b>1% Investment</b>
Activity 1. Preservation and protection of plant cover.	\$ 9,947,300	\$ 354,575,585.
Activity 2. Acquisition of land for recovery, protection of riparian corridors, water banks and areas of recharge.	\$ 52,340,000	\$ 4,349,454,000.
Activity 3. Environmental Education	\$ 10,970,000	\$ 41,200,000

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