

FIRST LINE OF THE BOGOTÁ METRO



## EXECUTIVE SUMMARY - ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN FOR THE CONSTRUCTION OF THE BRIDGES OF AVENIDA PRIMERO DE MAYO WITH AVENIDA 68

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### **1** INTRODUCTION

This PMAS applies to the area of intervention defined on Avenida Primero de Mayo between Carrera 68D and Carrera 52C in the city of Bogotá, Colombia, including the eastern and western zones of the interior of the Avenida 68 traffic circle, where two (2) vehicular bridges of three (3) lanes each will be built, where vehicles will travel (in each direction) over Avenida Primero de Mayo, in order to replace the existing vehicular bridge which will be demolished, since it generates interference with the layout of the PLMB infrastructure. In addition, this includes the public space works in the intervention area described in Chapter 7.1.

The project is located on towns of: Kennedy and Puente Aranda, with an approximate intervention area of 5.11 Ha. In general, an estimated duration of 36 months is projected, however, if there are variations in this schedule, the PMAS will remain operational according to such variations. In this sense, the PMAS can be divided into two (2) main stages, as described in section 7.1.4 Schedule of activities:

- Silvicultural management activities and start of construction activities of the north bridge in the phase prior to the construction of the viaduct: September 24, 2022, to January 7, 2023.
- Construction activities of the north bridge, demolition of the existing bridge and construction of the south bridge in viaduct construction phase: January 8, 2023, to October 13, 2025.

The silvicultural management activities are planned to begin on September 24, which, as indicated, is a process approved by the Environmental Authority and managed within the framework of the Network PMAS. It is also proposed to move forward with the location and staking activity, identifying it as a non-impacting activity. Although these activities are planned, in no way will it be possible to move forward with other work activities without obtaining the NO OBJECTION from the Multilateral Bank.

The Safeguard Policies of the Multilateral Banking related in the Figure 1. See Methodology in Annex L1T1-CON-AMB-PN-0016\_A03.



Figure 1 Policies of safeguards of the Multilateral Bank subject to compliance in the PLMB

Source: Multilateral Banking, 2022



The application of each Policy will be addressed in each of the chapters of this study. The following clarifications are provided below:

- Involuntary resettlement is not foreseen due to the activities of this PMAS, since there will be no land acquisition, identifying that the planned activities will be carried out on existing public space such as sidewalks and vehicular traffic routes in the city of Bogota. However, the resettlement policy applies in the context of loss of assets or access to assets and loss of income sources or livelihoods, whether those affected must relocate. If necessary, the policy should be applied in accordance with Resolution 190 of 2021 "Whereby the General Resettlement Plan for the First Line of the Bogotá Metro is adopted".
- In relation to the Natural Habitats Policy, which aims to support the protection, maintenance and rehabilitation of natural habitats and their functions by applying a preventive approach to the management of natural resources, to ensure opportunities for environmentally sustainable development. Thus, the application of the policy was evaluated within the framework of this study; however, no vulnerable natural habitats that maintain their ecological functions were identified within the study area, considering that the project is being developed in highly intervened and anthropically intervened areas.<sup>1</sup>

The technical references established in the general EHS guidelines of the International Finance Corporation (IFC and the World Bank Group) were considered.

Subsequently, the definition of preliminary areas of influence was carried out, from which the abiotic, biotic, and socioeconomic environments were characterized; while the demand, use, exploitation and/or affectation of natural resources by the project was defined and identified

The following is a list of the permits processed to date by Concessionaire ML1:

- Silvicultural treatment permit: There is Resolution 03464 of August 3, 2022 issued by the SDA, which authorizes silvicultural treatments in public spaces and adopts other determinations. This permit will be executed within the framework of the Networks PMAS at the start of construction activities.
- Landscape design approval act: There is Act WR 1225 of 2022 in which the Botanical Garden approves the designs. This record corresponds only to the landscape design approved within the framework of the development of the PMAS for the construction of the bridges on Av. 68 with Primera de Mayo.
- Wildlife Management Plan: This document is approved by the SDA through Radicado 2022EE168423 dated July 7, 2022. This management plan will be executed within the framework of the development of the entire project in general, i.e. it will be applied within the framework of the PMAS for the relocation, protection, relocation and/or management of PLMB networks, the

<sup>&</sup>lt;sup>1</sup> The Resettlement Plan is available on the Metro de Bogotá website at the following link:

https://www.metrodebogota.gov.co/sites/default/files/GS-DR-001-Politica-de-reasentamiento-y-gestion-social-para-el-proyecto-PLMB\_V.02.pdf



PMAS for the construction of the Bridges on Avenida Primero de Mayo with Avenida 68 and the ESIA of the first line of the Bogotá metro (PLMB).

- Construction and Demolition Waste Management Plan (PG RCD): This document is approved by the SDA through file number 2022EE75545 dated April 5, 2022. The existing RCD PIN will be used for the Metro works, however, the filing with the SDA with the update of the PG RCD for this PMAS is found in Annex L1T1-CON-AMB-PN-0016\_A10.
- Visual Outdoor Advertising (PEV): By filing 2022ER227523 of September 5, 2022, the SDA granted the registration of visual outdoor advertising type conventional construction site billboard for a term of 2 years or for the duration of the work of this PMAS (in response to request from ML1 to SDA made through communication L1T1- CON-CE-22-2726 of August 16, 2022). Applies to this PMAS.
- Traffic Management Plan: To date, the following TMPs have been approved by the Secretariat of Mobility (SDM), according to the work schedule: COI 39 of September 29, 2022, which authorizes: the entry and exit of dump trucks to the eastern separator eastern side (access by the slow roadway south-northbound), partial closure of eastern separator, entry of dump trucks to the western separator western side (access by the slow roadway north-southbound), partial closure of the western separator eastern separator eastern side (access by the slow roadway north-southbound), partial closure of the western separator, entry and exit of dump trucks to the eastern separator eastern side (access by the slow roadway north-southbound), partial closure of the western separator, entry and exit of dump trucks to the eastern separator eastern side (access by the slow roadway south-northbound) and partial closure of western separator (see Annex L1T1-CON-AMB-PN-0016\_A10 / 10\_4 PMT).
- Archaeological management plan for the specific polygon Bosa-Teusaguillo: By Resolution No. 1483 of September 9, 2022, ICANH approves and authorizes the implementation of the Archaeological Management Plan for a specific polygon. This authorization applies both to part of the ESIA and to this ESMP. On the other hand, Concessionaire ML1 consulted with ICANH to determine the existence of archaeological management plans for other projects that overlap with the First Line of the Bogotá Metro. The ICANH sent a response by radicado 2022152000026871 of March 28, 2022 (see Annex L1T1-CON-AMB-PN-0016 A17 \17 4 Archaeology \17 4 Overlapping), in which it states: "In this way, at the height of Carrera 68 Avenue it was established that there is an overlap with the Preventive Archaeology Program for the Project "Construction for the adaptation to the Transmilenio system of the Eucharistic Congress Avenue (Carrera 68) from Carrera 9 to the southern highway and complementary works in Bogotá D. C. groups 1, 2 and 3", registered through Resolution 1051 of December 11, 2020, and whose Archaeological Management Plan was approved and authorized through Resolution 314 of March 19, 2021 and modified through Resolutions 686 of June 01, 2021 and 923 of July 19, 2021 given the finding of rails reported in the framework of the Preventive Archaeology Program". According to the above, in the area where the two projects overlap, the archaeological management plan already approved by ICANH through Resolution 314 of March 19, 2021 and modified through Resolutions 686 of June 01, 2021 and 923 of July 19, 2021 must be executed.



The following are the environmental permits or procedures required prior to the execution of this EMP and which must be managed by the ML1 Concessionaire in order to obtain a timely response from the authority and comply with the work schedule:

- Management plan for vascular and non-vascular epiphytes: This document was filed on August 22 with number 2022ER213047 of 2022 before the SDA. This management plan will be executed within the framework of the development of the entire project in general, i.e. it will be applied within the framework of the PMAS for the relocation, protection, relocation and/or management of PLMB networks, the PMAS for the construction of the Bridges on Avenida Primero de Mayo with Avenida 68 and the Environmental and Social Impact Study (EIAS) of the first line of the Bogotá Metro (PLMB).
- Night Work Permits: This will be a new permit that ML1 will process before the local mayor's office of Kennedy and the local mayor's office of Puente Aranda.

Regarding surface water resources, the closest source to the area of intervention of the works of this EMP is more than 600 meters away (Fucha River Canal), therefore, no characterization of surface water sources will be included.

In addition to the air and noise monitoring analyzed in the framework of the ESIA and that were used for the diagnosis in the influence area, the monitoring carried out in the area by the Transmilenio trunk line project on Avenida 68 and by the SDA were analyzed.

Based on this, and the identification of other projects that overlap with the area of influence, the environmental and social impacts and risks were evaluated.

In general, and based on the preparation of this ESMP, a series of reviews have been carried out with entities such as the Multilateral Bank, the Interventory, the EMB, and participation scenarios have been carried out with different stakeholders that have allowed for feedback and improvement of all the content presented here.



### 2 BIOTIC AND ABIOTIC ENVIRONMENTAL DEVELOPMENT

#### 2.1 DESCRIPTION AND LOCATION OF THE WORKS

The work consists of adapting the intersection of Av. 1 de Mayo with Av. 68, through the construction of two vehicular bridges, the existing bridge will be demolished to make way for the construction of the PLMB viaduct, as shown in Figure 2.



Figure 2 Existing vehicular bridge scheme, projected vehicular bridges

#### Font:Subway Line 1 SAS,2022

The PMAS for the construction of the bridges of Av. Primero de Mayo with Av. 68 projects its completion in the year 2025, however, in the year 2028, when the PLMB comes into operation, this work will be interconnected with the Transmilenio mass transit. The works will begin with the construction of the north bridge, later the existing bridge will be demolished, and the construction of the south bridge will be completed.

The north bridge will have an approximate length of 260 m, it will be made up of 6 supports and 5 spans of variable length. Supports 1 and 6 will be located at the ends of the bridge, supports 2 and 5 will be located 29.6 m from supports 1 and 6, supports 3 and 4 will be 50 m from supports 2 and 5, finally, the length of the intermediate span will be 100 m.

Both bridges will have a deep foundation, through the construction of piles grouped in rectangular dice. For supports 2, 3, 4 and 5, rectangular piers of variable height will be built; in the case of the piers of supports 3 and 4 they will be hollow and with a larger area, in the upper part of these piers a voussoir will be built that will be part of the superstructure to form a monolithic element, in supports 2 and 5 they will build solid piers with a smaller area than those projected for the piers of supports 3 and 4, on which a capital beam will be built on which the superstructure will simply be supported by means of elastomeric neoprene supports.

For supports 1 and 6, the construction of an abutment will be carried out on which the superstructure of the bridge will be supported by means of neoprene elastomeric supports, the approach slabs will be built,

which consist of a filling and structure in granular material, the construction of walls of containment on the sides and the wearing course on the structure of granular material.

The superstructure made up of voussoirs built using the successive cantilever method projects a hollow cross-section, with free height that varies depending on its weight and with a top plate that will have a width of 13 m. This construction method will be used for the voussoirs that will be built between supports 2 to 5, the beams at the ends of the bridge will be built on falsework, of which a structural analysis of the supports that are installed must be carried out, considering the elements to be supported during the construction of the box beam.

At the end of the construction of the north bridge, once it meets the necessary conditions to start operating, the demolition and dismantling of the existing vehicular bridge will be carried out.

At the end of the demolition of the existing bridge, the construction of the south bridge will proceed, which will have a length of 306 m and will have a similar distribution to the north bridge, with 6 supports and 5 spans. For the south bridge, supports 1 and 6 will be located at the ends of the bridge, supports 2 and 5 will be located 29.6 m from supports 1 and 6, supports 3 and 4 will be 62.5 m from supports 2 and 5, Finally, the length of the intermediate span will be 125 m.

The construction method of the south bridge will be very similar to that of the north bridge, the distances of the spans and the approach slabs vary, as well as the depth of the piles and the dimensions of the different elements that make up the substructure and the superstructure of the bridge.

The activities to be carried out for the construction of the bridges at Av. 1 de Mayo and Av. 68 and the demolition of the existing bridge are described below:

#### 2.1.1 Preliminary activities

Initially, two areas will be adapted for the operation of the camp (an area of approximately 572.33 m2 to be used as a parking area for machinery, a materials storage area and two containers will be installed for the storage of spare parts) and storage areas (approximately 1621.1 m2 that will include the installation of 7 containers: 3 of the containers will be used as offices, 2 will be used as dressing rooms, 1 will be used as a warehouse for supplies and 1 container for mechanics. A restroom area and a hand-washing area will be set up on the green area of the traffic circle, ensuring that there is no economic or social impact from the use of this space. (See Figure 3)







Sorurce: Metro Line 1 SAS,2022

For the development of the activities to be carried out on Primero de Mayo Ave. and 68th Ave., the implementation of a PMT will be divided into several phases, with different levels of impact, considering the way in which the construction of the bridges and the demolition of the existing bridge are foreseen.

Prior to the development of the works, a fence will be erected to isolate the intervention area, thus preventing unauthorized personnel from entering the area where the activities will be carried out, and to prevent accidents or damage to civilians or third parties who may be near the intervention area. It is estimated that approximately 1,230 linear meters of metal fencing will be installed, taking into account the construction process of the bridges and the demolition of the existing bridge.

Prior to the execution of the work, sidewalks and/or pavements will be demolished and existing urban furniture will be dismantled, either manually or by using machinery and/or mechanical equipment, according to the thickness of the surface. It is estimated the demolition of approximately 10826.3 m2 of hard surfaces, represented in the hard areas where the foundation will be built and the area of the existing connectors.

#### 2.1.2 Constructive activities

#### 2.1.2.1 Removal of vegetation cover and silvicultural management

The vegetation cover will be removed, and the corresponding silvicultural management will be carried out according to the characteristics and needs of each of the trees. Considering that the foundations and piles will be built mostly within the internal area of the existing traffic circle, the topsoil will be removed in



such a way that the vegetation cover can be removed and stored and/or taken to an authorized supplier so that it can be reused or given the corresponding management. It is estimated that approximately 623.23 m3 will be removed. This material will be transported by dump trucks.

#### 2.1.2.2 Manual and/or mechanical excavation

Initially, drilling will be done for the piles, continuing with the excavation for the foundation blocks.eep depending on the support, it can be mechanical or manual, in the same way excavation will be done for the subsequent construction of urban planning and implementation of landscaping, having different depths of excavation for the different points that will be intervened, depending on the works to be carried out. Likewise, for the development of the demolition of the foundations of the existing bridge, excavation works will be carried out around these elements. A total excavation volume of 18286.24 m3 is estimated.

#### 2.1.2.3 Leveling and compactation

Considering that leveling and compaction will be carried out to improve the bearing capacity of the soil where the heavy machinery will be supported, and if the natural soil and weather conditions do not permit the normal use of the machinery, this activity must be carried out beforehand. The material used for leveling will be, as far as possible, RCD from the activities that meet the necessary bearing capacity. There is no estimated volume of material, or a specific intervention zone where this activity will be carried out.

#### 2.1.2.4 Construction of foundations and retaining structures

The foundations of the north and south bridges will consist of deep piles, located at different depths and of different sizes, in accordance with the structural designs. As is shown in Figure 4:



Figure 4 Piles location

Font: Consorcio Ambiental Metro Bogotá L1., 2022

For the north bridge, supports 3 and 4 will each have 4 piles of 2 m in diameter, with a length of 53 m and 55 m respectively, supports 2 and 5 will have 4 piles each, with a length of 36 m and a diameter of 1.5 m, and finally, supports 1 and 6 will have 2 support piles each, with a length of 36 m and 1.5 m in diameter.

For the south bridge, the length of the piles varies slightly with respect to the north bridge. Supports 3 and 4 will each have 4 piles, 60 m and 56 m long, respectively, and with a diameter of 2 m. Supports 2

and 5 will have 4 piles each, 36 m long and 1.5 m in diameter. Finally, for supports 1 and 6, 2 piles of 1.5 m diameter and 33 m and 36 m in length, respectively, will be constructed. For these supports, the piles will serve directly as support for the abutments that will be built.

The construction of the piles will be done by drilling using a machine that will remove the material to the required depth, then a liner will be installed, or polymeric mud will be used. It is estimated that approximately 3000 kg of polymer, 550 kg of flocculant and 700 L of caustic soda will be used for the construction of the bridges, which must be handled and arranged in a special way.

To direct the loads produced by the superstructure of the bridge to the foundation piles, the construction of buried foundation blocks will be carried out on each group of piles. Taking into account that the diameter and number of piles varies according to the support, the dimensions of the foundation blocks will be different. For the north bridge and for the south bridge, the dimensions of the foundation blocks are similar for the supports with the same identification. For supports 3 and 4, a foundation block of 8.6m x 8.6m and a thickness of 2.5m will be built for each one, which will be buried 1.2m. For supports 2 and 5, foundation blocks of 6.6m x 6.6m and a thickness of 2m will be built, which will be buried 0.5m. As mentioned above, for supports 1 and 6 no foundation footings will be built, on the contrary, the abutment will be directly supported on the piles at a height of approximately 0.7m above ground level.

For the construction of the foundation piles, a shoring system called sheet piling will be installed prior to the excavation and it will be buried around the area where the piles will be installed, avoiding collapses and having a better maneuvering space; the elements for the installation of this type of shoring system will be made of steel. Subsequently, the excavation of the area where the foundation block will be built will be carried out, continuing with the removal of the previously built piles, then the poor concrete will be cast on the molten ground, continuing with the reinforcement and installation of steel, the installation of the formwork, the pouring and vibrating of the concrete, and then the removal and curing of the foundation blocks.

The retaining walls are independent of the bridge structure and will be built in reinforced concrete as a support structure for the bridge approach slab on the sides of each bridge. Three walls will be built for each of the approach slabs. The side walls will have a length of 73.5m for the two approaches of the north bridge and for the eastern approach of the south bridge, while the western approach of the south bridge will have a length of 63m. The rear wall varies for each of the approaches, the walls will be 0.40m thick. To prevent the wall from overturning, the wall footing will be offset, i.e., it will not be centered, but will be located towards the interior zone of the approach and will have a width of between 3m to 5.10m; the thickness of all the footings is 50 cm.

For the construction, the excavation will be made with the width required for the wall footing and the depth required for its stability, the base concrete will be poured, continuing with the installation of the reinforcing steel and the formwork, the footing will be cast, making sure that the steel is left tied from the base to be able to install it to the rest of the wall, then, the missing reinforcing steel and the formwork will be installed, finishing with the casting of the wall according to the specifications of the designs.



#### 2.1.2.5 Construction of piles, capital beams, abutments, piers, and voussoirs

For supports 2, 3, 4 and 5, rectangular piers will be constructed, which will be directly positioned on the previously constructed foundation blocks. For supports 3 and 4, hollow rectangular piers will be built. For the north bridge, these piers will be 6 m long, 3 m wide and approximately 6.8 m high, while for the south bridge the height of the piers will be 6.5 m. For supports 2 and 5, solid rectangular piers will be built, considering that the dimensions of these piers are smaller than those of the central supports. The dimensions of the solid piles are 6 m long, 1.5 m wide and approximately 5.6 m high.

For the construction of the piles, the assembly of the formwork must be carried out together with scaffolding or self-climbing systems that allow increasing the height of the element, as well as the reinforcement and installation of steel according to the designs; as the formwork is installed, when the desired height is reached, the concrete will be poured with the use of a concrete pump, then the vibration and leveling of the element, after finishing and completing the setting process, the formwork will be stripped and the curing process will continue with the application of water.

At the end of the construction of the piles, the construction of the support elements is carried out, depending on each support a different element will be built. For supports 3 and 4, the construction of the initial segments will be carried out, which will be part of the bridge superstructure, these segments will have a free height of 4.5m.

For supports 2 and 5, a capital beam will be built on which the superstructure composed of segments will be supported. This will be rectangular in shape and will have a length of 6m, a width of 3m and a height of, on this capital beam neoprene supports will be installed that will allow the superstructure to be supported on the element.

Finally, for supports 1 and 6, an abutment will be built which will be supported on the foundation piles that will be built with a height of 0.7m above ground level, the abutment will be the support for the ends of the super structure, likewise, neoprene supports will be installed so that the bridge super structure can be supported on the abutment, the element will be like the one shown in the following figure.

The construction of these elements can begin when the piles have 7 days of setting, as they are at a considerable height above ground level, for their construction it will be necessary as a first step to assemble the scaffolding and falsework elements, Afterwards, the reinforcing steel and the formwork will be assembled and installed according to the shape and needs of each element. Subsequently, the elements will be cast by means of a concrete pump, taking into account the height of the elements, ending with the formwork removal after the concrete has set and the curing of the concrete.

The segments that make up the superstructure of the bridge will be built using the successive cantilever method, i.e., the construction will be carried out by means of a carriage that will allow the construction of these elements without a support structure resting on the ground. The construction of the elements will start at supports 3 and 4 towards the center of the bridge, and then continue towards the ends. The height of the hollow box of the elements will vary between 2 and 5 m, the location of the segment will be determined by the free height; the top plate or deck will have a width of 13 m and the width of the box will be 6 m.



For the areas where two elements are joined, the construction of a connecting or closing segment will be carried out by means of formwork elements or if it is desired to speed up the construction process in other areas of the bridge. For the construction of these elements, the same principles should be maintained as for the successive cantilever segments, i.e. the height of the free box should vary according to the design requirements.

It is important to assemble the scaffolding and the formwork that will be used to support the superstructure for its construction, then the steel and the formwork will be assembled with the required measurements and the element will be cast using the concrete pump, and when the concrete sets, the element will be stripped.

#### 2.1.2.6 Construction of the approach slabs

This pavement will be confined by the retaining walls and supported on polystyrene blocks on which the granular material structure will be installed and compacted to comply with the technical specifications required for the correct operation of the slabs.

#### 2.1.2.7 Installation of the wearing course

The asphalt pavement wearing course should be laid on the beam that forms the superstructure of the bridge, which will have a thickness of 5 cm and should be laid along the entire length and width of the superstructure and should tie in with the approach slab wearing course. The pavement used for the wearing course should have 30% recycled rubber granules in its composition, to use recycled materials, guaranteeing the conditions of the asphalt used.

For the construction of the wearing course, a general cleaning of the surface is made, a primer is applied on the entire superstructure plate, then the asphalt is poured with the characteristics specified in the designs, it will be spread and compacted with the help of the specified machinery, ensuring that it meets all the requirements.

#### 2.1.2.8 Execution of minor civil Works

To complete the construction of the bridge so that it can be put into operation, the execution of minor safety, aesthetic and structural works is required, as Installation of protective barriers, Road signaling, Installation of street lighting and Resurfacing of the structure.

#### 2.1.2.9 Formation of base, subbase, finished sidewalks and pavements.

Existing hard areas that are affected or that must be demolished to build these structures will have to be reshaped or reconstructed so that they can once again be at the service of the community; therefore, when the bridges are finished, roads and sidewalks will be intervened so that they can be put into operation.

After locating the area to be intervened, the granular material will be spread and compacted according to the needs of each particular area and the designs. For the finishing of the sidewalks, two construction methodologies are proposed, the first is the shaping of the concrete sidewalks and the second is the installation of paving stones and tiles.

# 2.1.2.10 Adequacy of public space, street furniture and implementation of landscaping design.

Upon completion of the bridge construction, the public space and urban furniture must be adapted to reestablish the area of direct influence that was previously intervened. Likewise, the established landscape design will be implemented, which will correspond to the new needs of the area. The landscaping design proposes the planting of one hundred and eighteen (118) tree individuals of five (5) species and thirty-six (36) permanent tree individuals, having as a final positive balance of green areas a total of 59.41 m2.

#### 2.1.2.11 Removal of signage, dismantling and cleaning up

Finally, at the end of the construction and demolition activities, it must be ensured that the intervened area is in the same or better conditions than before the intervention, due to this, for the closure activities, cleaning, collection of materials, removal of camps and any other intervention that must be carried out to maintain the initial conditions of the area are planned.

#### 2.1.2.12 Demolition and clearing of the existing bridge

Demolition of the existing bridge will begin once construction of the north bridge has been completed; the bridge will be demolished using the system of sectioned clearing of the existing spans for subsequent demolition at ground level. To start the activity, a demolition protocol must be drawn up, which will determine the sequence of clearing to be used, the scaffolding, shoring and machinery to be used.

Upon completion of the respective scaffolding and shoring assembly, the main beam will be cut using heavy equipment with the dimensions established in the demolition protocol, so that it can be lifted and taken to the ground using a crane, for subsequent demolition at floor level. The area to be used for the demolition activities of these elements will be primarily the southeast area of the traffic circle, where there is a free space and the activity can be carried out, applying the necessary management measures to control possible impacts.

At the end of the demolition of the main beam, a horizontal cut will be made by sections of the different piles, continuing with the hoisting of each section, and taking it to ground level so that the section can be demolished. The same process will be carried out for each of the piles.

After the demolition and dismantling stage of the piles, the base and foundations of the structure will be demolished, starting with an excavation process around each foundation to carry out the corresponding demolition. Finishing with a filling with specific material for each of the excavations made and then proceed to reconstitute the areas by filling with material according to the specifications given, calculating that the material used for filling will be RCD material and it is estimated that the volume will be very similar to the volume removed, i.e., 561.6 m3.

#### 2.2 AREAS OF INFLUENCE

In this sense, the areas of influence were defined for the different components and environments, taking as a reference point the most critical scenarios of manifestation of the identified environmental impacts, in addition to criteria and variables that mitigate the spatial transcendence of these and that function as



barrier or limiting elements, such as changes in land cover, roads, among others. However, the Figure 5 represents the overlapping of the areas of influence defined for each of the media, where the impacts caused by the activities of the PMAS may materialize. Then in the Table 1, the total hectares that define the IIA for each medium are presented.



Figure 5 Indirect Areas of Influence for each medium

Source: Metro Bogotá L1 Environmental Consortium, 2022

Table 1 – Areas of Indirect Influence for each Medium

Medio	Area of Indirect Influence (Ha)	Area of direct Influence (Ha)
Abiotic	157,40	11,97
Biotic	127,97	5,10
Socioeconomic	1847,28	35,11

Source: Bogotá Metro Environmental Consortium L 1, 2022

#### 2.3 CHARACTERIZATION

2.3.1 Abiotic Environment

The components for the characterization are described below:

2.3.1.1 Geospheric Component

#### 2.3.1.1.1 geology

In the area of direct influence, (ANNEX L1T1-CON-AMB-PN-0016\_A01 / 1\_2Planos), are the sediments that make up the units called the Sabana Formation (Qsa2), as well as the deposits of the Chía Formation (Qch1) and deposits of anthropic origin of lesser size and relevance.



#### 2.3.1.1.2 geomorphology

In the area of direct influence are the geoforms corresponding to fill fields and planes, flood plains, fluvial decantation basins, alluvial fans, lacustrine plains and deltas, torrential flows and a channel (anthropic geoform).

#### 2.3.1.1.3 Scenery

The visual quality of the landscape is low, this taking into account that the development area of the project is an area that is heavily intervened, and features of anthropic type predominate, which has caused a reduction and transformation of the natural spaces that in the long run term generated a change in the perception of the landscape. It is noteworthy that low values were found due to the lack of presence of green areas and the low record of tree individuals found, additionally, even though in the area there is the presence of historical and architectural resources that are of great importance, it is not very common to find them throughout the project.

#### 2.3.1.1.4 Soils

The regulated use of land in the area of indirect influence of the abiotic environment of the project is presented, as can be seen, the highest percentage of the area corresponding to 640.09 Ha (88.5%) is classified as urban land: followed by urban land. of protection that is equivalent to 83.35 Ha (11.5%).

#### 2.3.1.2 Hydrospheric Component

#### 2.3.1.2.1 Hydrology

Mapping at a scale of 1:25,000 was used and, with the support of satellite images, the lentic and lotic bodies were identified. From what is observed, it is concluded that, in the PMAS AII (specifically the biotic AII) one (1) body of water was identified, as is the case of the Fucha River, which is located 692 meters from the AID.

#### 2.3.1.2.2 Hydrogeology

#### 2.3.1.2.2.1 Groundwater Points Inventory

A total of 9 groundwater points were identified in indirect influence area: 3 points correspond to the SDA inventory, one of which is definitively sealed.

Based on the updated geology and for updating the conceptual and numerical hydrogeological model, the hydrogeological units in the influence area re classified.

#### 2.3.1.3 Atmospheric Component

#### 2.3.1.3.1 Meteorology

Information from 34 weather stations was reviewed and analyzed. After a verification, complementation, analysis of consistency, homogeneity and purification of the information, the climatic characterization was defined by the information of 23 stations, which allowed establishing the following meteorological conditions of the area of influence:



#### 2.3.1.3.2 Identification of emission sources

Within the area of influence, according to the information issued by the District Secretariat of the Environment, there are 95 commercial establishments in which the 148 fixed emission sources are distributed in the area surrounding the project, which operate with boilers, industrial stove, oven, toaster, dryer, drying tower, thermosetting branch, kettle, pelletizer, cabin, others. In ANNEX L1T1-CON-AMB-PN-0016\_A07/7\_3Atmosférico the inventory of these.

As for mobile sources, vehicular capacity was carried out for a period of twenty-four (24) continuous hours, on a business day and a holiday, on the roads in the area of influence of the project (ANNEX L1T1-CON-AMB-PN-0016\_A07/7\_3Atmosférico).

#### 2.3.1.3.3 Air quality

To determine the current condition of air quality in the area of influence of the PMAS, the monitoring carried out within the update of the ESIA of the PLMB, in the year 2021. Based on this information, the air quality baseline was constructed for this study, extracting the results of four (4) monitoring points, which allowed establishing that:

Once the verification and analysis of the monitoring reports of the Air Quality Network in Bogotá for the years 2019 and 2020 carried out by the District Secretary of the Environment is carried out, it is evident that the pollutants that exceed the maximum permissible limits established by Resolution 2254 of 2017 are PM10. PM2.5 and SO2, especially for the report for the month of March 2020 for the stations (Puente Aranda and Carvajal/Sevillana).

Finally, in the monitoring carried out by the Metro Bogotá L1 Environmental Consortium, it shows that the pollutants that exceed the maximum permitted levels are PM10 and CO, the latter with an air quality index that is harmful to sensitive groups.

#### 2.3.1.3.4 Environmental noise

According to the results obtained in the environmental noise monitoring (day and night), the points that are in influence area correspond to a sector C (roads) according to the classification established in table 2 of article 17 of Resolution 0627/2006.

#### 2.3.2 Biotic Environment

#### 2.3.2.1 Strategic, sensitive ecosystems and/or protected areas

A validation of cartographic and bibliographic information was carried out for the area of direct biotic influence, where it was determined that there are NO overlaps with strategic, sensitive ecosystems and/or protected areas such as: National System of protected areas SINAP, complementary areas for conservation, SINAP Priorities and Sensitive Ecosystems such as the Urban Wetlands Complex of the Capital District of Bogotá.



#### 2.3.2.2 Main Ecological Structure – EPP

The Main Ecological Structure – EEP is defined by the current territorial arrangement planning (POT) by its acronym in Spanish as one of the three overlapping and interdependent structures around which the ordering strategy for Capital District is defined in development of its first basic principle: the protection and guardianship of the environment and natural resources and their assessment as a basic substratum of land use planning.

In accordance with District Decree 190 of 2004, the EEP has four components, namely:

#### 2.3.2.3 Terrestrial ecosystems

#### 2.3.2.3.1 Holdrige Living Zone

According to Holdrige, in the area of influence of the sector of Avenida Carrera 68 with Avenida Primero de Mayo, it is located in a plant formation, which corresponds to low montane dry forest (bs-MB), presenting rainfall between 500 and 1000 mm., biotemperature between 12 and 18 °C and heights between 2,000 and 3,000 meters above sea level, occupying 127.97 ha of the area of indirect influence and 8.25 ha of the area of direct influence, which respectively represent the 100% in full).

#### 2.3.2.3.2 Climatic Zones and Subzones Vegetal Cover Manual of Bogotá DC, proposed by the Bogotá Botanical Garden (2020)

In the influence area the Z 3.3 subzone predominates, which is characterized by having a rainfall of 497.92 mm, tree density is Very Low and building density is Low.

#### 2.3.2.3.3 Biomes and Ecosystems

The crossing was made with the layer of Ecosystems 2017 (IAvH, 2017), for the area of influence, which showed that it has three (3) biomes, where the indirect area is made up of these three biomes, while the direct area only with one. land covers

#### 2.3.2.4 Land covers

Six types of coverage were identified. The largest coverage is the Urban Areas of the Capital City with 79.32 ha (61.98%), followed by Green and urban areas of urban parks with 21.28 ha (16.63%) and in third place other urban green areas with 11.00 ha (8.60%).

#### 2.3.2.5 Vegetation Area of Indirect Influence

As a result of the 100% forest inventory, the existence in the field of 246 forest individuals located in the Area of Direct Intervention was identified, however, it should be noted that only 138 of these individuals were requested in the request for treatments included in Resolution SDA No 3464 of 2022, The remaining 108 individuals were not considered for silvicultural treatments because the impact of these individuals will correspond to the works to be carried out for the designs of the viaduct that to date have not been fully defined, and some of these individuals require special procedures such as individuals located in the Parque Milenta Tejar San Eusebio and those located on private properties.



# 2.3.2.6 Floristic characterization of the individuals associated with the specific intervention area

246 tree individuals were identified in the influence area, but only 138 individuals will be affected, this information is detailed in chapter 7.4. Demand, numeral 7.4.6 Forestry harvesting (Request for silvicultural permit and/or authorization) and 7.4.7 Silvicultural treatment, additionally in annex L1T1-CON-AMB-PN-0016\_A09 / 9\_3 Silvicultural treatment the information corresponding to the silvicultural permit request for each of the individuals is presented.

#### 2.3.2.7 Restricted species

According to the Appendices of the list generated by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 2018), the categories established by the International Union for Conservation of Nature (IUCN, 2018), the red books of plants in Colombia, Resolution 1912 of September 15, 2017 of the Ministry of Environment and Sustainable Development and lists issued by the District Secretary of Environment, two (2) distributed individuals of the oak species (*Quercus humboldtii*) are recorded, which are categorized as closed by Resolution 096 of 2006 of the MAVDT for the area of direct influence of avenue 68 with avenue Primero de Mayo.

#### 2.3.2.8 Inventory of green areas

Within the framework of Joint Resolution No. 001 of 2019, of the District Environment Secretariat and the District Planning Secretariat (2019), for the intersection of Carrera 68 Avenue, the following green areas were determined before the project by localities. In Annex L1T1-CON-AMB-PN-0016\_A08 / 8.1\_B, the shape of the inventory of the green areas of Av. 68 is presented.

#### 2.3.2.9 Epiphytic Plants

As a result of the characterization of vascular and non-vascular wild flora species, a total of 123 trees were evaluated, distributed within four (4) vegetation covers that correspond to Capital City (Pa), Other urban green areas (Ozvu), Separadores roads (Sv) and commercial areas (Zc). With a record of one species of vascular plants and 7 species of non-vascular plants.

#### 2.3.2.10 Fauna

During the characterization of wildlife in the study area, two phases were used in the methodological process (See Annex L1T1-CON-AMB-PN-0016\_A03); firstly, a collection of secondary information was made through a bibliographical review and secondly, primary information was obtained through field sampling; Next, the results of the characterization in the field are presented. Next, the general results of the characterization carried out are presented:

#### Birds

According to the sampling and interviews carried out for the area of influence, the wild bird community in the area is made up of 23 species (Annex L1T1-CON-AMB-PN-0016\_A08 / 8.3 FAUNA), belonging to 13 families and six (6) orders. The most diverse order is Passeriformes, with 17 species in eight (8) families, which represent 73.91% of all registered birds; These data agree with those reported for



Colombia, where this constitutes the taxon with the greatest diversity of species. The remaining orders make up 43% of the registered birds, these have a richness less than or equal to four species

Amphibians and Reptiles

For the community of amphibians and reptiles in the influence area, a species of reptile of the order Squamata is reported; Savannah snake (Atractus crassicaudatus), present in park grasslands when there is higher solar radiation, recorded by informal interviews (Annex L1T1-CON-AMB-PN-0016\_A08 / 8\_3 FAUNA). Despite carrying out a suitable sampling effort for this group, using the Random Visual Encounter (VES) method and bioacoustic records, NO herpetic species was recorded directly.

Mammals

From the acoustic recordings made, one (1) species of insectivorous bat was detected: Myotis nigricans of the Vespertilionidae family. Additionally, through informal interviews, two (2) species of invasive rodents were recorded. The details of this report can be found in the item Report of invasive and/or introduced species found. It is pertinent to clarify that these species are not included in the analyzes of the registered mastofauna because they are not considered part of the natural community of mammals)

#### 2.4 DEMAND, USE, EXPLOITATION AND/OR AFFECTATION OF NATURAL RESOURCES

For the project, there is an estimated total consumption of drinking water of 165.6 m3, for each of the work fronts. Water for human consumption in compliance with the instructions for hydration will be supplied through the purchase of natural water and proof of purchase will be carried out through purchase invoices (See instructions for hydration in Annex 8 of the SST Plan).

The provision of water for the development of construction activities will be carried out through the hiring of water tankers from authorized suppliers The use of water for the different activities is as follows: Compaction of granular material for the conformation of the structure for approaches, pavements, and platforms (544.69 m3); Pile curing (16,51m3), Construction of piles (663.12 m3), Demolition of bridge (105 m3) and demolition of pavements and sidewalks (55,44 m3).

Regarding the unitssanitation and wastewater resulting from cleaning and disinfection of these will be managed through specific providers for whom their wastewater will be treated by a third party who are also authorized by the AAC. The approximate volume of domestic wastewater generated in the different activities will be 12480 Kg/Project.

To carry out the project, the following quantities of materials have been estimated: Concrete (11,347.4 m3); Steel (2973546.6 m3); Asphalt (2,260.32 m3) and fill with granular material (18,156.37 m3). The previous calculations of quantity of materials were made using information provided by the area in charge of the bridge designs, for different materials values are not recorded in the tables because they will not be used in the section.

The total waste and the composition for each type of waste is: Organic 103 Kg/month; Common 1067 Kg/month; Paper 753 Kg/month; Cardboard 324 Kg/month; Plastic 533 Kg/month and Glass 55

Kg/month. The disposal of unusable conventional waste will be done in accordance with the guidelines defined by the companies providing the service, considering the collection routes and schedules.

The generation of hazardous waste during the development of the construction of the bridges of Avenida Primero de Mayo with Avenida 68, is associated with the operation of the camps, heavy machinery, and the handling of materials that generate RESPEL. For the project, an estimated volume of used oil is 1368 Kg and hazardous waste is 14040 Kg.

During the development of the activities, together with the technical area, activities and verifications will be established to ensure compliance with the established reuse percentage (30%) in accordance with the standard. The reuse of the CDW is projected in the backfill for the demolition areas of the existing bridge base primarily.

Emissions were calculated considering the following source: EPA (https://www.epa.gov/sites/default/files/2020-10/documents/c03s03.pdf page 6). (See management program for sources of atmospheric emissions: air, Greenhouse Gas Management Program)

The estimate of emissions gases from the generation of electricity is given from 5 power plants of 75 KW, which represents a consumption for the project of 464400 gal. (See GHG emissions program and atmospheric emissions program). Regarding PM10 and PM2.5 pollutants, they are considered because Particulate Matter is generated during combustion.

The silvicultural intervention for the activities at 68th Avenue and First of May will respond to what is authorized in Resolution 03464 of 2022, which establishes the blocking and removal of twenty-six (26) individuals, the conservation of fifteen (15) and the cut down of seventy-four (74) trees and the comprehensive treatment of twenty-one (21) tree individuals.

It is worth noting that the treatments recommended in Resolution 03464 of 2022 by the authority do not include species that are not subject to permit such as *Yucca elephantipes* and *Buxus sempervirens*, however, these species are part of the 138 individuals presented in the application, which is why the following table shows 76 cut downs and not 74 as determined by Resolution 0346 of 2022, this also applies to conservation treatments and comprehensive treatment.

The Fauna Management Plan was approved by the SDA through File 2022EE168423 OF July 7, 2022, where the following is established: "the Subdirectorate of Forestry.

# 2.5 IDENTIFICATION AND ASSESSMENT OF ENVIRONMENTAL IMPACTS AND RISKS

The result of the interactions of the identification of impacts in the scenario without and with the project is presented in Annex L1T1-CON-AMB-PN-0016\_A11.

For the scenario without project, a total of 16 impacts were identified, which were evaluated with the 11 activities identified and a total of 127 interactions were obtained, of these, four (4) were positive and 123 were negative.



In Table 2 – Hierarchy of impacts scenario without project the hierarchy of impacts is presented according to the results obtained from the evaluation exercise in the current scenario, where the impacts are organized from the most significant to the least significant. In the hierarchy of impacts, a similar distribution is observed in negative impacts (moderate and irrelevant), obtaining the highest value in the impact of affectation on closed plant species, followed by alteration in sound pressure levels. In relation to the positive impacts, both irrelevant and moderate ratings were obtained in impacts such as the alteration in the visual perception of the landscape, affectation of habitats, alteration in the quality of the soil and modification of the vegetal covers and/or green areas.

Impact	Worth	Importance
Affectation of closed plant species	-45	Moderate
Alteration to sound pressure levels	-41	Moderate
Alteration in the visual perception of the landscape	-39	Moderate
Increase in the amount of waste to be disposed of	-37	Moderate
Alteration to air quality	-35	Moderate
Modification of plant coverage and/or green areas	-35	Moderate
Change in the composition and structure of wildlife	-28	Moderate
Habitat damage	-28	Moderate
Contribution to global warming	-25	Irrelevant
Alteration to soil quality	-25	Irrelevant
Alteration in the transport capacity of water in the	-25	Irrelevant
Alteration of geomorphological conditions	-25	Irrelevant
Generation and/or activation of erosive processes and soil stability	-25	Irrelevant
Alteration to the quality of the underground water resource	-24	Irrelevant
Generation of offensive odors	-24	Irrelevant
Damage to the Main Ecological Structure	-23	Irrelevant
Alteration in the visual perception of the landscape	22	Irrelevant
Habitat damage	22	Irrelevant
Alteration to soil quality	31	Moderate
Modification of plant coverage and/or green areas	35	Moderate

#### Table 2 - Hierarchy of impacts scenario without project

Source: Metro Bogotá L1 Environmental Consortium, 2022

# 2.6 ENVIRONMENTAL MANAGEMENT PROGRAMS, MONITORING AND PLANNING

Based on the characterization, the activities to be developed, the estimated demand for resources and the evaluation of impacts, the management programs are consolidated. See the following table with programs and indicators.

						_
Table 2	Concolidated	Abiatic and Riatic	Environment	Monitoring a	and Tracking	Drograme
able 5 –	Consolidated	ADIULIC ALLU DIULIC				FIUUIAIIIS

Management program	Indicators
Environmental and social compliance program	<ul> <li>Environmental Reports</li> <li>Environmental requirements met</li> <li>Environmental Permits</li> </ul>



Management program	Indicators		
Inter-institutional coordination program	<ul> <li>Diagnosis of organizations identified in the AID</li> <li>Inter-institutional meetings</li> <li>% of inspections carried out</li> <li>Compliance with Strategies formulated in the inter- institutional roundtable.</li> </ul>		
Demolition and excavation leftover materials management and disposal program.	<ul> <li>Certification of volume disposed of in authorized sites.</li> <li>Programmed trainings</li> <li>PQR's addressed and closed</li> <li>Use of demolition and excavation material.</li> <li>Proper disposal of material with asbestos waste.</li> <li>Vehicles registered before the SDA</li> </ul>		
Materials management program	<ul> <li>Suppliers of materials that comply with legal requirements and certify the supply of construction materials.</li> <li>PQR's attended and closed.</li> <li>Scheduled trainings</li> <li>Use of asphalt mixtures improved with recycled rubber rain.</li> <li>Compliance with quarterly visits to suppliers.</li> <li>Conventional waste suitable for recycling</li> </ul>		
Conventional solid waste management program.	<ul> <li>Programmed trainings</li> <li>Implementation of ecological points with normative color code.</li> </ul>		
Integral hazardous waste management plan	<ul> <li>Programmed trainings</li> <li>Adequate and certified RESPEL disposal.</li> </ul>		
Liquid fuel spill or leak management program.	<ul> <li>Events with presence of hazardous waste attended.</li> <li>Programmed trainings</li> <li>Adequate and certified RESPEL disposal.</li> </ul>		
Used oil management program	<ul> <li>Programmed trainings</li> <li>Proper and certified disposal of used oils.</li> </ul>		
Programa de manejo de vertimientos	<ul> <li>Disposal of liquid waste generated in the maintenance of portable sanitary units.</li> <li>Protection of existing drains in the intervention area.</li> <li>Programmed trainings</li> </ul>		
Environmental liabilities management program: contaminated soils.	<ul> <li>Environmental liabilities verification inspections.</li> <li>Areas remediated</li> <li>Scheduled trainings</li> </ul>		
Atmospheric emissions source management program: air	<ul> <li>Maintenance of vehicles and construction machinery.</li> <li>Techno-mechanical revision certificate.</li> <li>Entry of vehicles and machinery</li> <li>Covering cargo vehicles on construction site.</li> <li>Wetting of areas</li> </ul>		
Greenhouse gas emissions management program.	<ul> <li>Estimates of greenhouse gas generation</li> <li>Scheduled training</li> <li>Efficiency of GHG abatement</li> <li>Replacement of ordinary lamps with energy-efficient lamps.</li> <li>Compliance with preventive maintenance program for equipment and vehicles.</li> </ul>		
Noise management program	<ul> <li>Techno-mechanical revision certificate</li> <li>PQR's attended and closed</li> <li>Noise sanctioning processes.</li> </ul>		
Vibration and structural noise management program	<ul> <li>Controls to reduce the effects of vibration.</li> <li>PQR's handled and closed</li> </ul>		
Sump management program	<ul> <li>Protection of existing sinkholes in the intervention area.</li> <li>Scheduled trainings</li> </ul>		



Management program	Indicators			
	<ul> <li>Adequate disposal of 100% of wastewater.</li> </ul>			
Temporary Facilities Management Program	<ul> <li>Installation of portable sanitary units in relation to the number of workers.</li> <li>Order, cleanliness and cleanliness of the work site.</li> <li>Scheduled training</li> </ul>			
Efficient water use management	<ul> <li>Monthly water consumption m3</li> <li>Attend 100% of damages to water distribution systems.</li> <li>Programmed trainings</li> <li>Scheduled inspections</li> </ul>			
Geomorphological conditions management program and erosion control program	<ul> <li>Excavation shoring</li> <li>Scheduled training</li> <li>Scheduled current condition inspections</li> </ul>			
Groundwater management program	<ul> <li>Groundwater quality</li> <li>Scheduled monitoring regulatory compliance</li> <li>Scheduled trainings</li> </ul>			
Urban fauna management program	<ul> <li>Efficiency of the chasing away.</li> <li>Accompanying days</li> <li>Nest census</li> <li>In situ/ex situ management of active nests</li> <li>Disabling of nests</li> <li>Rescue of individuals of fauna.</li> <li>Trainingb</li> </ul>			
Biotic environment compensation Landscaping affectation management program	<ul> <li>Compensatory planting</li> <li>Effectiveness of the planting</li> </ul>			
Vegetation cover removal and vegetation cover management and clearing program.	<ul> <li>Reuse of material</li> <li>Intervention areas</li> <li>Grassland recovery</li> </ul>			
Silvicultural management program	<ul> <li>Felling</li> <li>Volume harvested</li> <li>Disposal of plant material</li> <li>Training</li> </ul>			
Biotic environment management program for the visual quality of the landscape	<ul> <li>Compliance with obligations</li> </ul>			
Program for management of vascular and non-vascular epiphytes	<ul> <li>Rescue of individuals</li> <li>Transfer and delivery</li> </ul>			
Management program for areas of the Main Ecological Structure	<ul> <li>Delimitation of EEP areas</li> <li>EEP training</li> <li>Preservation of individuals of permanence</li> </ul>			

Source: Metro Bogotá L1 Environmental Consortium, 2022

#### 2.7 WORKPLACE HEALTH AND SAFETY MANAGEMENT SYSTEM

The company METRO LINEA 1, in compliance with the provisions of Law 1562 of 2012, Decree 1072 of 2015 and Resolution 0312 of 2019 and other applicable regulations in force regarding safety and health at work; Metro Line 1 - ML1, has structured the WORKPLACE SAFETY AND HEALTH MANAGEMENT SYSTEM, whose main objective is to control the hazards and risks present in the project, promote continuous improvement and prevent hazardous conditions that may affect the well-being of workers and productivity, with the commitment and responsibility of the top management of the company METRO LINEA 1, extending the application and compliance to contractors, subcontractors, suppliers, visitors and third parties. (L1T1-CON-AMB-PN-0013\_A14).



In each of the phases (PLAN, DO, VERIFY AND ACT) defined in the Occupational Health and Safety Management System, the components established in the regulations are specified, which are identified within the Matrix of legal requirements SIG- PI-FR-03, in accordance with the identification of risks established in the IPER SIG-PI-FR-04 Matrix, establishes the different plans, policies, procedures and standards necessary to carry out adequate SST management, guaranteeing compliance with the objectives, indicators and goals established by the organization in matters of Safety and Health at Work.

#### 2.7.1 Annual work plan in Safety and Health at Work

The annual plan establishes goals, responsibilities, resources, and a schedule of activities, in accordance with the minimum standards of the mandatory system of quality assurance of the General System of Occupational Risks; It is aligned with the Occupational Health and Safety policy, hazard and risk identification matrix with the respective measurement of compliance, coverage and effectiveness indicators. The report will be made monthly with the necessary supports for compliance with the plan, verifying compliance with the indicators and goals, generating action plans and improvement in case of deviations or gaps in compliance with it.

#### 2.7.2 SST Plan Construction of bridges on Avenida Primero de Mayo with AV. 68

The SST plan identifies the requirements for the execution of the activities in Safety and Health at Work for the Construction of the bridges of Avenida 1 de Mayo with Av 68 and describes the structure that will be implemented to comply with legal requirements, contractual agreements, and the Multilateral Banking safeguards described above. (See Annex L1T1-CON-AMB-PN-0016\_A15\_ 16\_1SST Plan).

To establish corrective and control actions or measures to review losses that could affect workers, interested parties, equipment and/or the operational continuity of processes, SIG-PI-FR-04 Matrix is established. identification of hazards, risk assessment and determination of controls, because of the application of techniques for collecting information on occupational risk factors, the intensity of exposure to which the different groups of workers are subjected, as well as the controls existing at the time of evaluation. The matrix will be reviewed and updated every six months or when new activities, changes in working conditions or a serious accident occur.

The following table summarizes the risk assessment of the risk to people:

Hazard category	Hazard description	Risk assessment
BIOLOGICAL	<ul><li>Covid 19 Virus</li><li>Bites and Stings</li></ul>	Acceptable
	<ul> <li>Vibration (Whole Body, Segmental)</li> </ul>	To be improved
PHYSICAL	<ul> <li>Illumination (Visible Light for Excess or Deficiency)</li> <li>Noise (Impact, Intermittent, Continuous)</li> </ul>	Acceptable
CHEMICAL	<ul> <li>Liquids</li> <li>Particulate Matter</li> <li>Gases and vapors</li> </ul>	Acceptable

#### Table 4 – People Risk Assessment Summary



Hazard category	Hazard description	Risk assessment
	Manual handling of loads	To be improved
BIOMECHANIC AL	<ul> <li>Prolonged/Maintained postures</li> <li>Efforts</li> <li>Repetitive movements</li> </ul>	Acceptable
	<ul> <li>Public - robberies, muggings, assaults, assaults, attacks, riots</li> <li>Mechanical - Particle projection</li> <li>Locative - falling objects</li> </ul>	To be improved
CONDITIONS	<ul> <li>locative (falls from the same level)</li> <li>Traffic accidents (run over on the contrary)</li> <li>Mechanical - Contact with elements or parts of machines, tools or equipment</li> <li>Electrical - Contact with low voltage</li> </ul>	Acceptable
NATURAL PHENOMENA TECHNOLOGIC AL	<ul><li>Storms, gales</li><li>Fires and/or Explosions</li></ul>	Acceptable
HIGH RISK TASKS	<ul> <li>Working at positive or negative heights (fall from heights)</li> <li>Work with lifting of loads (collapse or fall of materials or equipment)</li> <li>Mechanical (Moving parts or entrapment)</li> <li>Work in excavations (Entrapment).</li> <li>Work in confined spaces (Hazardous Atmosphere).</li> <li>Hot work</li> </ul>	Not acceptable /or acceptable with specific control

Source: Metro Bogotá L1 Environmental Consortium, 2022

#### 2.8 DISASTER RISK MANAGEMENT PLAN

The Disaster Risk Management Plan is based on the written structuring of preventive actions, administrative, functional and operational preparation before, during and after an emergency or contingency, which allows the project to adapt to the conditions in which the activities will be carried out and to define within the training plan the organizational knowledge and attitudes necessary to act correctly in the prevention and control of emergencies.

The plan includes a specific risk analysis that considers possible effects of natural, socio-natural, technological, and unintentional human origin on the exposed infrastructure and those derived from possible effects in the area of influence.

The following table summarizes the hazards and vulnerabilities identified, as well as the measures to be implemented for their control (L1T1-CON-AMB-PN-0016\_A16 Disaster Risk Management Plan).

Type of threat	Description of the event	Measures to be implemented	
1. Natural (Implicit in all the	Earthquakes	<ul> <li>Formation, Training and Training of Emergency Brigade, Drills.</li> <li>There is a meeting point located in: Parque La llanura, Parque el Tejar, Parque la Floralia.</li> <li>Standardization of SOP for evacuation and for earthquakes.</li> </ul>	
phases)	Mass movement	<ul> <li>Conformation, training and training of emergency brigade, drills.</li> <li>Closing and signaling of construction site.</li> <li>Standardization of SOP for mass movements.</li> </ul>	

Table 5 – Consolidated Threats and Vulnerabilities of the Project



Type of threat	Description of the event	Measures to be implemented	
	Rain and thunderstorms	<ul> <li>Formation, training and training of emergency brigade.</li> <li>Location of grounding.</li> <li>Suspension of construction activities.</li> <li>Construction of temporary drainage systems.</li> <li>Standardization of SOP for electrical storms.</li> </ul>	
2. Anthropic (Implicit in all phases)	Terrorist acts	<ul> <li>Public Risk Protocol; Talks, training, socialization.</li> <li>Constant communication with oversight entities.</li> <li>Coordination with district entities.</li> <li>Standardization of SOP for terrorist attacks.</li> </ul>	
	Thefts and robberies	<ul> <li>Public Risk Protocol.</li> <li>Lectures, training.</li> <li>Private surveillance controls.</li> <li>Standardization of SOP for thefts and robberies.</li> </ul>	
	Protests	<ul> <li>Public Risk Protocol.</li> <li>Coordination with district authorities.</li> <li>Standardization of SOP for protests.</li> </ul>	
	POT	Consider the provisions made by SDP and apply them according to the provisions.	
	Potential interference with other work in progress initiatives	<ul> <li>Coordination with other works in progress.</li> <li>Operational accidents and work incidents.</li> </ul>	
3. Technical/Engineering (Constructionn Phase)	Operational Workplace Accidents	<ul> <li>Implementation of the SGSST.</li> <li>Safe Work Analysis.</li> <li>Standard Operating Procedures</li> <li>TAR work permits.</li> <li>Standardization of SOP for work accidents.</li> </ul>	
	Operational Fires	<ul> <li>Installation of fire extinguishing equipment, drills, emergency brigade, talks and training.</li> <li>Standard Operating Procedures.</li> <li>Standardization of SOP in case of fire and in case of explosion.</li> </ul>	
	Equipment and/or machinery failures	<ul> <li>Procedures for handling of equipment and machinery * Standardization of SOP for fire and explosion.</li> <li>Standardization of SOP in case of machinery overturning.</li> </ul>	
	Structural failures (Structural collapse)	<ul> <li>Compliance with construction procedures and civil construction regulations in force.</li> <li>Adequacy and installation of temporary infrastructures to avoid building failures.</li> <li>Standardization of SOP in case of structural collapse.</li> </ul>	
	Chemical spills	<ul> <li>Safe handling of chemical substances.</li> <li>Safe storage of chemical substances.</li> <li>Training in interpretation of safety data sheets.</li> <li>Labeling of chemical substances according to GHS.</li> <li>Standardization of SOP in case of chemical spills.</li> </ul>	
	Food poisoning	<ul> <li>Training and socialization lectures.</li> <li>Compliance with the law in terms of food handling and preparation.</li> <li>Good food preservation.</li> <li>Maintain cold chain for perishable products.</li> </ul>	
	Road Accidents (Vehicle Overturn))	<ul> <li>Implementation of PESV and PMT.</li> <li>Adequacy of access roads to the construction site at Av. 1 de Mayo and AV. 68.</li> <li>Standardization of SOP for Road Accidents.</li> <li>Standardization of machinery overturning SOP.</li> </ul>	
	Inconsistencies in the information provided by the basic and/or detailed engineering.	<ul> <li>Compliance with construction procedures and civil construction regulations in force.</li> <li>adequacy and installation of temporary infrastructures to avoid building failures.</li> </ul>	



Type of threat	Description of the event	Measures to be implemented	
	Geological and geotechnical conditions requiring additional measures	<ul> <li>Compliance with construction procedures and civil construction regulations</li> </ul>	
	Structural Collapse (Demolition of the Structure)	<ul> <li>Safe lifting of loads.</li> <li>Construction site closing and signaling.</li> <li>Adequacy of access roads.</li> <li>Work permit</li> <li>Standardization of SOP in case of structural collapse.</li> </ul>	
	Structural Collapse (Deep Excavation)	<ul> <li>Safe procedure for excavation works.</li> <li>Secure procedure for excavation works.</li> <li>Work closing and signaling.</li> <li>Adequacy of access roads.</li> <li>Work permit.</li> <li>Standardization of SOP in case of structural collapse.</li> </ul>	
	High Risk Tasks (Heights, Excavations, Hot, Confined)	<ul> <li>Implementation of collective protection measures.</li> <li>Implementation of personal protection measures.</li> <li>Procedures for work at heights</li> <li>Closing and signposting of work site.</li> <li>Implementation of SGSST.</li> <li>Safe Work Analysis.</li> <li>Standard Operating Procedures</li> <li>TAR work permits.</li> <li>Standardization of SOP</li> </ul>	
3. Technical/Engineering (Operation Phase)	Operational Fires	<ul> <li>Installation of fire extinguishing equipment, drills, emergency brigade, talks and training.</li> <li>Standardization of SOP in case of fire.</li> </ul>	
	Chemical spills	<ul> <li>Procedures for Handling Chemical Products, MSDS, Compatibility Matrix, Talks, Training, Inspections.</li> <li>Standardization of SOPs in case of chemical spills.</li> </ul>	
	Failure in transport and displacement systems	<ul> <li>Compliance with construction procedures and Strategic Road Safety Plan.</li> <li>Standardization of SOP in the event of a road accident.</li> </ul>	
	Failure in sewage systems	<ul> <li>Compliance with construction procedures and civil construction regulations in force.</li> <li>Standardization of SOP in case of heavy rains.</li> </ul>	
	Failure in electrical supply	<ul> <li>Implementation of safe construction procedures for each of the activities to be carried out.</li> <li>Electrical network deviations.</li> <li>Standardization of SOP.</li> </ul>	
	High risk tasks - Heights (finishing)	<ul> <li>Implementation of collective protection measures.</li> <li>Implementation of personal protection measures.</li> <li>Procedures for work at heights</li> <li>Work site locking and signaling.</li> </ul>	
	Operational accidents at work	<ul> <li>Implementation of SGSST.</li> <li>Safe Work Analysis.</li> <li>Standard Operating Procedures.</li> </ul>	
	Differential ground settlements	<ul> <li>Compliance with construction procedures and current civil construction regulations.</li> <li>Closing and signaling of work.</li> </ul>	
	Simultaneous work with other entities and/or contractors	<ul> <li>Coordination of simultaneous activities through the ATS.</li> <li>Coordination meetings of simultaneous activities between contractors.</li> </ul>	

Source: Metro Bogotá L1 Environmental Consortium, 2022



### 3 DEVELOPMENT OF THE SOCIOECONOMIC ENVIRONMENT

With respect to the description and characterization of the areas of direct and indirect influence, information from primary and secondary sources was reviewed. The secondary sources consulted were: entities of the Capital District such as the District Planning Secretariat-SDP, statistical reports of the Secretariat of Social Integration-SDIS, the Secretariat of Economic Development and its Economic Development observatory (bulletins and studies) and the Secretariat of Health and its observatory (SALUDATA), the District Institute of Community Participation IDPAC, District Institute of Cultural Heritage IDPC, Process of Review of the Territorial Management Plan of Bogota D. C., Diagnosis Document 2020, Diagnosis by Localities No. 8 Kennedy and No.16 Puente Aranda. Likewise, national level entities such as the National Administrative Department of Statistics DANE, which through an agreement with the SDP [1] have generated relevant information through the Multipurpose Survey of Bogota 2017 and 2021 (documents and bulletins of this Survey) and population projections for Bogota.

The primary sources counted on information collected and processed from: semi-structured interviews, conversations, and direct observation in the neighborhoods of: El Tejar, Floralia, Milenta, Villa Adriana, Alquería la Fragua Primer Sector and La Llanura. For this purpose, several exploration and social research techniques were implemented, which are described in the methodology and whose purpose was to recognize the social, political, economic and cultural dynamics of the AID, which was defined from the blocks adjacent to the corridor of the works.

#### 3.1 CHARACTERIZATION

#### 3.1.1 Demographic Dimension

The demographic dimension of the area of indirect influence was developed from the secondary information reported by the official entities for the UPZs: DANE Projection (inter-administrative agreements for population projections), EMP-2017, Diagnostics by Locality, Population Viewer Bogotá DC of the SDP, SaluData - Observatory of the District Secretary of Health, Documents, and bulletins SISBEN Survey (2017 and 2019).

For the AID, the items that are part of this dimension are consigned in Technical Appendix 15 Annex 1 as follows: a) total population by zone and b) distribution of the population by each sector established for the socioeconomic analysis.

#### 3.1.2 Spatial Dimension

In this dimension, the aspects associated with the provision and coverage of public services in the localities and UPZs that are part of the project's area of influence are characterized and analyzed. Likewise, social services related to education, health, recreation, sports, housing, transportation and media will be addressed, emphasizing coverage and associated infrastructure.

#### 3.1.3 Cultural Dimension

In the IIA regarding Cultural Heritage, the locality of Kennedy stands out for having cultural and traditional activities of local and neighborhood character, likewise, the cultural equipment is more robust than that of Puente Aranda, because while Kennedy registers 37, Puente Aranda registers 6.As for the BIC, Kennedy registers 5 movable assets with administrative act, while Puente Aranda registers 16.

In the AID, one Asset of Cultural Interest was identified corresponding to the infrastructure of the Southern Railroad, which crosses the sectors of Milenta and EI Tejar in the locality of Puente Aranda. Regarding identity activities, it was found that in the Floralia neighborhood there is a farmer's market that is held every 15 days with the support of the District Secretariat of Economic Development. As well as the "burning of the devil" in the EI Tejar neighborhood.

#### 3.1.4 Political-Organizational Dimension

In the IIA, the political-organizational dimension, as indicated in Annex 1 Technical Appendix 15, the information registered begins with public entities, as well as private organizations. The instances and mechanisms of citizen participation are also related, and finally the structural projects of social intervention developed in the IIA are presented. In the AID, the information provided by primary sources is taken up through qualitative research techniques, developing the themes regarding: Zonal Committee, public institutions located in the afferent blocks, private organizations, instances and mechanisms of participation and structural projects of social intervention, it is clear that the information reported corresponds to the neighborhoods of EI Tejar and Milenta (town of Puente Aranda), Villas Adriana, La Llanura, Alquería la Fragua 1 Sector and Floralia (town of Kennedy).

#### 3.1.5 Economic Dimension

#### Productive and Technological Processes

The Bogotá Chamber of Commerce in the 2019 report, reported the existence of 63,093 companies for the entire area of indirect influence of the project. 66.1% of them are in the town of Kennedy and 33.8% in the town of Puente Aranda (Cámara de Comercio de Bogotá - CCB, 2020).

Regarding the size of the companies, the Chamber of Commerce registered that for 2019, 94.96% of the total companies were constituted as micro-enterprises. 4.6% are small and medium-sized companies, finally, only 0.43% correspond to large companies.

The analysis carried out for the productive and technological processes identified the nature of the companies and their potential in terms of employability and associativity; In this exercise, derived from the information of the Secretariat of Economic Development, it was found that there are a total of 773 companies in the AID registered with commercial registration before the Chamber of Commerce of Bogotá, of which the largest participation is registered in the category of micro companies (95.9%) with a total of 741, followed by the category of small companies (3.8%) represented by 29 companies; and finally, a total of 3 were recognized in the category of medium-sized companies (0.4%).



#### Characterization of the Current Labor Market

Regarding labor market figures, this section presents information from the Multipurpose Survey-2017, which records information before the pandemic. However, the document contains information from the city of Bogotá that allows us to understand the effects on employability at the local level. Initially, in order to understand the indicators of the labor market, the most important concepts indicated in the Ministry of Health are described below. (Secretaria Distrital de Planeación , 2017)<sup>2</sup>

The Working Age Population - WAP is made up of people aged 12 and over in the urban area and 10 years and over in the rural area.

For its part, in the town of Kennedy there is an unemployment rate of 7.8%. Of 1,019,894 people of working age, 620,053 were economically active and 48,232 unemployed. In relation to the town of Puente Aranda, an unemployment rate of 8.1% is observed with 197,201 people of working age, 122,354 economically active people and 9,873 unemployed.

With the information reported by the Secretariat of Economic Development, throughout the AID the sum of companies generates 1,612 jobs, with micro-enterprises having the highest participation with 50.9% corresponding to 820 jobs, otherwise it happens with medium-sized companies. companies that are the ones with the fewest number of jobs

#### Economic activities related to tourism and/or recreation, which take place in the AID

According to the District Institute of Tourism, as of September 2021, the All registers "290 commercial establishments dedicated to providing tourist services. 73% is in the town of Kennedy, being the most important town in this sense. The other 27% is in the town of Puente Aranda".

These data are given after a strong reduction in registrations of PST's - Providers of Tourist Services and it is pointed out in the comparative study of the IDT: "during the pandemia where all localities suffered losses, even some have not been able to overcome. In the case of the AII localities, Kennedy reports a significant increase in registrations of PTS establishments since July 2020. Although up to the date of the study they have not reached the levels registered in 2019, they show a recovery in economic activity" (Instituto Distrital de Turismo, 2021)

#### 3.2 IDENTIFICATION, ANALYSIS AND EVALUATION OF SOCIAL IMPACTS

The process for the identification, analysis and evaluation of impacts began by defining the characteristics of the socioeconomic environment, according to the territorial context of the areas of influence of the project.

From the identification and analysis of social impacts it can be established that:

Link

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at:http://www.sdp.gov.co/sites/default/files/encuesta\_multiproposito\_2017\_\_principales\_resultados\_bogota\_region .pdf



- A total of 9 impacts were identified, of which; 3 were rated as moderate, 5 severe and one (1) irrelevant.
- Two risks were identified: illnesses generated by environmental impacts (particulate matter and noise emissions) and the generation of accident risk factors for workers, passersby, and inhabitants due to the circulation of vehicles and machinery.
- Due to the development of construction activities, the AID community perceives as one of the greatest impacts the increase in situations of insecurity.
- The development of works on arterial and local roads directly affects pedestrian and vehicular mobility, increasing travel times on these roads.
- Most of commercial establishments are in the DIA, which will be affected by the impacts generated by the project's activities.
- The 3 impacts whose rating is moderate: alteration of daily life, customs and lifestyles, changes in the perception of citizen security and Generation and/or enhancement of social conflicts; are manageable with the assertive implementation of management measures in accordance with the particularities presented in the area of influence of the project.
- Only one impact related to employment generation expectations is positive in nature. The remaining 8 are negative in nature.
- None of the impacts were rated critical which is due to the fact that the sum of the criteria is not greater than 75 and below. Likewise, none were rated as irrelevant because for the most part all is rated above 25.

#### 3.3 SOCIAL MANAGEMENT PLAN PROGRAMS

The objective of the Social Management Plan for the project "Construction of the Bridges of Avenida Primero de Mayo with Avenida 68" is to design control, prevention, mitigation, compensation and correction measures for the impacts and risks generated in each activity of the project. Project. In mention.

Once the impact assessment of the socioeconomic environment was carried out, the Social Management Plan was drawn up, which includes, as illustrated in this document, the guidelines established in the Environment and Safeguards Compliance Policy (OP - 703) of the "Gender Equality in Development (OP-761)" policy and the Access to Information Policy (OP-102) of the Inter-American Development Bank-IDB. Likewise, it proposes to mainstream the safeguard policies related to the "Physical and cultural resources (OP 4.11)" of the World Bank, the policies of "Cultural Heritage" and "Rights and interests of vulnerable groups" and "Labor Standards" of the European Bank of Investments-EIB.

Based on the evaluation of the impacts identified for the execution of the activities of the 68th Avenue bridge construction project, the Social Management Programs and the estimated budget for each one is listed below. The details of the budget can be found in Annex L1T1-CON-AMB-PN-0016-A17 / 17\_10 Programs Budget;<sup>3</sup>In turn, the formats that will be considered when executing each of the programs are

<sup>&</sup>lt;sup>3</sup>Inquiry link:17\_10 Budget\_Programs.xlsx



presented in Annex L1T1-CON-AMB-PN-0016-A17 / 17\_12 Program Formats<sup>4</sup>; Likewise, a schedule was prepared to carry out each of the activities of the programs. See Annex L1T1-CON-AMB-PN-0016-A17 / 17\_11 Schedule.<sup>5</sup>

No.	Social Management Program	Budget	
1	Public information and communication program. Code: PM_SE_01	52.779.553	
2	Metro Listen, Metro Solve Program. Code: PM_SE_02	8.576.600	
3	Citizen Participation Program. Code: PM_SE_03	The costs of	
4	Citizen empowerment program for the construction of urban life of the first metro line. Code: PM_SE_04	these programs	
5	Inter-institutional articulation program for the construction of urban life of the First Metro Line of Bogotá. Code: PM_SE_05	the item "transversal to all activities".	
6	Sustainable Mobility Culture Program. Code: PM_SE_06		
7	Infrastructure Protection Program for Third Party Assets "Metro Buen Vecino" (Metro Good Neighbor). Code: PM_SE_07	35.793.318	
8	Social and Labor Inclusion Program. Code: PM_SE_08		
9	Management Program for the Economic Sustainability of Formal Commerce. Code: PM_SE_09	The costs of	
10	Program for the construction of the urban fabric of the First Line of Metro de Bogotá. Code: PM_SE_10	these programs are included in the item "transversal to all activities".	
11	Management Program for the Protection of Cultural Heritage. Code: PM_SE_11		
12	Traffic Management Program. Code: PM_SE_12		
13	Labor Influence Management Program. Code:PM_SE_13		
	Transversal to all activities.	16.067.067	
	Costo de servicios profesionales	947.200.000	
	Total (With Taxes and Contigencies)	1.091.927.680	

#### Table 6 – Social management programs and budgets

Source: Metro Bogotá L1 Environmental Consortium, 2021

#### CONCLUSION

It is possible to conclude that, based on the activities defined during the construction of the bridges and demolition of the existing bridge at Avenida Primero de Mayo and Avenida 68, the area of influence was identified, as well as the impacts caused by the planned activities. Based on the impact assessment and the definition of the demand for resources, the necessary management measures were defined. In this way, the general objective of this instrument is met, which is to define the guidelines for environmental, social and occupational health and safety management to prevent, mitigate, correct and/or compensate

<sup>&</sup>lt;sup>4</sup>Inquiry link:17\_12 Program Formats

<sup>&</sup>lt;sup>5</sup>Inquiry link:17\_11 Schedule.xlsx



for negative socio-environmental impacts and manage social and occupational health and safety risks, in compliance with contractual requirements (Technical Appendix No. 15), applicable national and local regulations and the environmental, social and occupational health and safety safeguards of the Multilateral Entities.