97859

PERU: LIMA METRO LINE 2 PROJECT (P145610)

Executive Summary of the

ENVIRONMENTAL IMPACT ASSESSMENT

Including the Resettlement Policy Framework and Compensation Plan

May 2015

BACKGROUND

The proposed Peru - Lima Metro Line 2 Project ("Project") would support the Government of Peru's (GoP) plans to build a 35-km underground urban rail line serving the Lima-Callao Metropolitan Region (LMR). The Government's overall Project will be implemented as a Public-Private Partnership (PPP) in which a private concessionaire will undertake the detailed design, construction, operation and maintenance of the rail infrastructure over a period of 35 years. The Concession Contract has been awarded and signed.

When fully completed, the project is expected to be transformational, for Lima's population, and is expected to significantly enhance the poor's economic opportunities and access to services. The Government's overall project aims to improve mobility for over 360,000 people per day and improve accessibility in 13 districts of the LMR where 2.3 million people live. The Project is expected to contribute to the twin goals of reducing poverty and boosting shared prosperity by: (i) expanding the destinations reachable within acceptable travel times and budgets thereby increasing access to jobs, health, educational and social services; (ii) improving local accessibility of the built environment around station areas and encouraging compact economic development; and (iii) mainstreaming universal accessibility and security, especially for people with physical disabilities, women, the elderly, and other vulnerable groups. The Bank is working with the Government and relevant stakeholders to further enhance the multimodal integration and accessibility features of the Project, particularly for poor and vulnerable groups. A complementary Metropolitan Transport Strategy is being developed by the Government with the technical and financial support of the Bank and other financiers to enhance the outcomes from this Project.

The Ministry of Transport (MTC) is the Concession Granting Authority Public Partner under the PPP agreement – and is in charge of the Project following its award by Proinversion, through AATE (Autoridad Autónoma del Sistema Eléctrico de Transporte Masivo de Lima y Callao) who is the Implementing Agency. The Concessionaire (Consorcio Nuevo Metro de Lima) includes Cosapi S.A., Salini Impregilo S.p.A, Iridium Concesiones de Infraestructura S.A., Vialia Sociedad Gestora de Concesiones de Infraestructura S.L, Ansaldo Breda SpA. and Ansaldo STS SpA and is organized as a Special Purpose Vehicle who is responsible for the design, finance, construction, equipment provision and operations of the Project. Finally, the Contract Regulator and Supervisor will be the Independent Transport Sector Regulation Agency (OSITRAN), which will be in charge of the regulation of the contract and supervision of works, and will be supported by external and international consultants.

The Project is classified as Environmental Category A as per Bank Operational Policy on Environmental Assessment (OP/BP 4.01). An Environmental Impact Assessment (EIA), including an Environmental and Social Management Plan (ESMP), has been developed for the Project. The MTC's Directorate General on Socio-Environmental Matters (DGASA) approved the Terms of Reference for the project Environmental Impact Assessment (EIA). The EIA was prepared by a consortium consisting of Geodata, ESAN and Serconsult. The Project EIA is based upon, and supplemented by, various detailed technical and design studies, including an evaluation of alternatives, geologic investigations, feasibility study, and project detailed design that were developed by international consultant firms contracted by the MTC. The EIA and the Project environmental license was issued by DGASA (Resolución Directoral N° 459-2013-MTC from November 16, 2013) after various public consultations.

A supplement to EIA was developed to address requirements from the IFIs (primarily based on IADB and World Bank safeguard policies), which includes additional information on

evaluation of alternatives and specific key potential environmental impacts and management measures. The supplement to the EIA was developed by the consulting firm ERM, finalized in October 2014 and published by the Bank's Infoshop on Nov. 24, 2014. AATE has presented the supplement to the EIA to DGASA for its consideration to be included as part of the Project environmental permit.

The supplement to the EIA includes:

- more comprehensive presentation of the analysis of alternatives for the Lima Metro Line 2 alignments and construction techniques, based upon previous studies and reports;
- more detailed baseline related to physical cultural resources and preparation environmental and social sensitivity maps along the alignment;
- enhanced assessment of noise and vibration potential impacts, traffic management during transport of spoil materials from tunnels to the final disposal sites, potential impacts on underground water and indirect impacts;
- more detailed assessment of potential social impacts due to construction, such as accessibility to houses and businesses and effect of traffic detours and congestion;
- inclusion of a Resettlement Plan and compensation of welfare losses on the basis of World Bank and IADB involuntary resettlement policies;
- additional environmental management recommendations for construction and supervision; and additional recommendations for future stakeholder consultations.

The concessionaire is responsible for Project construction and operation and maintenance environmental health and safety requirements as established under the Concession Agreement. The Concession Agreement has extensive environmental, health and safety (EHS) requirements including: (i) compliance with all applicable Peruvian regulatory requirements, Project EIA (and ESMP) and the Project environmental permit issued by DGASA; (ii) development and implementation of Environmental, Health and Safety (EHS) Management Systems consistent with international standards (ISO 14001, OSHAS 18000); (iii) compliance with IFI environmental requirements established for the Project, (iv) provision of EHS training to workers; (v) details of responsibilities and procedures for obtaining any required archeological or cultural resource permits and implementation measures to mitigate project impacts on such resources as required by law; (vi) presentation of EHS performance reports on a routine basis; and (vii) those to maintain insurance in relation to project EHS risks. The associated costs for implementation of these requirements are part of the overall fixed cost for the concession.

The concessionaire is responsible for preparing final detailed designs for each individual component of the project (e.g., each station, maintenance facility, conventional tunneling, tunneling boring machine tunneling, metro line ventilation points, etc.) and they must be approved by AATE and OSITRAN. Part of the final design document (EDIs in Spanish), includes environmental, health and safety measures which will be established based upon the concessionaire overall EMS and HSMS (see below, and includes the ESMP in Project EIA) and then modified, if needed to reflect specific characteristics of a given component (e.g., station).

The concessionaire's Environmental Management System and Health and Safety Management System will be consistent with international standards as required in the Concession Agreement. These systems will include various plans and are based upon: the

ESMP in the project EIA, recommended measures included in the supplement to the EIA, listed in concession agreement, being developed by Concessionaire based upon their ideas to establish an effective system (plans), and additions/modifications identified to meet Equator Principle requirements for the concessionaire private sector financing. The systems will include: staffing and responsibilities, monitoring, training, supervision, and reporting. The concessionaire is also required to undertake specific engineering studies (vibrations, ground water, soil subsidence), and the results from these studies will be used to update, as needed, ESHS systems/plans. The timing for these plans and studies is defined in the concession agreement and the associated costs for implementation are part of the overall fixed cost for the concession. Other related components in the EHS management systems are: social communication and grievance mechanism, human resources which will include relevant labor (worker) aspects; and procurement/legal which will include procedure for incorporating EHS aspects into subcontracting and purchase of goods/services.

Evaluation of project alternatives were considered as part of the EIA and the supplement to the EIA, and also in prior studies. In December 2010, with the aim of expanding mass transit provision, the GoP approved a Metro Network Plan for Greater Lima and Callao by Supreme Decree, which evaluated a range of transportation alternatives including various metro options. The 2012 Project Pre-feasibility study, supported by international consultant firms, also evaluated alternatives and recommended and the GoP approve a new 27-km subway line (known as the Metro Line 2 'Project' and including an 8-km branch of the future Metro Line 4) as the top urban transport priority. Five principal layout options were assessed based upon economical and technical viability, including demand, costs and environmental benefits, and social aspects. A multi-criteria analysis was used considering functionality, use of the territory, cost, profitability, social impacts, and environment. The Project profile and preliminary environmental assessment analyzed alternative alignments and also construction methods for the sections between stations, including open excavation (e.g., cut and fill), excavation in tunnels using mechanized excavations with Tunnel Boring Machine (TBM) and non-TBM . As part the project design finalization, measures were taken to help prevent negative environmental and social impacts, such as the optimization of the layout of the underground line (e.g., diversion to avoid affecting the archaeological site of Huaca San Marcos) and relocation of ventilation shafts and stations (e.g., relocation of the July 28 station, adjustment of ventilation well to avoid reserved zone of the archaeological site of Puruchuco).

An executive summary in English of the EIA and supplement to EIA is presented herein. Complete documents can be found at:

- Estudio de Impacto Ambiental Semi-Detallado "Proyecto Construccion de la Línea 2 y Ramal Av. Faucett Bambetta de la Red Básica del Metro de Lima y Callao" Novermber 2013

http://documents.worldbank.org/curated/en/2013/11/20391676/peru-second-lima-metro-line-project-environmental-assessment-vol-1-2-estudio-de-impacto-ambiental-semi-detallado-informe-completo

- Análisis Complementario al Estudio de Impacto Ambiental Semi-Detallado del Proyecto "Construcción de la Línea 2 y Ramal Av. Faucett-Gambetta de la Red Básica del Metro de Lima y Callao" October 2014

http://documents.worldbank.org/curated/en/2014/10/20452976/peru-second-lima-metro-line-project-environmental-assessment-vol-3-construccion-de-la-linea-2-y-ramal-av-faucett-gambetta-de-la-red-basica-del-metro-de-lima-y-callao

1 INTRODUCTION

The Construction of Line 2 and Branch Av. Faucett-Gambetta of the Basic Metro Network in Lima and Callao connects the eastern districts of Lima with the center of Lima and the district of Callao (east-west axis), complements and is integrated to Lima Metro Line 1 (San Juan de Lurigancho Villa El Salvador) and rapid bus transit system - Metropolitano (Chorrillos - Independencia). The project also includes the section of Line 4 Metro Lima connecting the area of the neighborhoods adjacent to Jorge Chavez International Airport to Metro Line 2 Av. Elmer Faucett.

The "Construction of Line 2 and Branch Av. Faucett-Gambetta of the Metro Basic Network in Lima and Callao" Project ("Project") aims to improve the viability conditions for private vehicles and public transport, reducing the travel times between the districts of Cercado de Callao, Cercado de Lima y Ate, and allowing their development as a result of the improvement of their economic activities.

Act No. 28253 of June 12, 2004, declares as public need the continued implementation of the Electric Mass Transport System of Lima and Callao, and also exempts of taxes the import of goods that are directly targeted to the implementation of the Special Project Electric System Mass Transportation in Lima and Callao.

Also, through the Emergency Decree No. 063-2009 issued on June 7, 2009, AATE returns to the Ministry of Transport and Communications, by means of a merger, becoming the Executive Unit "Autonomous Authority of the Mass Transport Electric System of Lima and Callao" within the sub-transport Sector. This analysis highlights the institutions of central, regional and local government having jurisdiction to intervene in the control and supervision of the activities to be developed for the Project.

The project aims to achieve an Efficient Transportation System in the East-West (Ate - Lima - Callao) axis; reducing travel times, promoting the growth of productive activities; raising the level of public transport service (frequency, comfort, safety, cleanliness, facilities for the disabled[1], improving the treatment of passengers, etc.). This project seeks to reduce levels of congestion by encouraging the use of the public mass transit system, allowing for reduced vehicle operating costs, reduced accidents and reduced levels of pollution; fulfilling minimum requirements in the preparation of this EIS: Annex I of the National Public Investment System at feasibility level in the development of this environmental study; and Law No. 27446 Law on the National System of Environmental Impact Assessment, Regulation DS No. 019-2009-MINAM and its amendment establishing the requirement to have this pre- environmental instrument before the implementation of works.

[1] In improving services to individuals with disabilities, the design plans of the Lime Metro Line 2 have identified measures tailored at the needs of people with disabilities, analyzing such factors as high ridership, transfer points, and service to major areas of activity. One key goal is to expand accessibility features for the disabled. All stations of Line 2 will include features that improve accessibility for customers with temporary and permanent visual, hearing, and mobility disabilities. These include: elevators or ramps; handrails on ramps and stairs; large-print and tactile signs; audio and visual information systems; accessible station booth windows; accessible vending machines; accessible service entry gates at metro stations; platform gap modifications or bridge plates to reduce or eliminate the gap between trains and platforms.

2 Purpose of the Study

The aim of the environmental study(ies) is to characterize the area of influence of the project regarding its physical, biological and social components; identify, predict, evaluate and present the potential environmental impacts that would arise as a result of the construction and operation of the project, and based on them, propose necessary actions to prevent, mitigate, control and / or compensate for negative impacts and strengthen the benefits generated by the positive impacts, thus achieving that the project is carried out in harmony with environmental conservation and respecting the Peruvian environmental legislation.

The specific objectives of the environmental assessments are:

- Set the area of direct and indirect influence of the Project.
- Describe the characteristics of the physical, biological, socioeconomic and archaeological environment of the area of influence of the project, through the development of a socio-environmental baseline.
- Identify and assess environmental and social impacts and risks and propose corresponding mitigation measures.
- Identify damages to property of third parties or utility infrastructure, which may arise as a result of the project.
- Analyze the physical, biological, social, economic and cultural dimensions related to the project.
- Propose the Environmental Management Program (EMP) containing the steps leading to mitigate, control and / or compensate the occurrence of various impacts from the implementation and operation of the project, so that current applicable environmental regulations are observed and ensuring environmental sustainability of the Project.

The scope of the Project's EIA includes the analysis of physical, biological, socio-economic and cultural components of the project area.

The development of the assessment was split in three phases: Preliminary Stage, Field Stage, and Final Office Stage. During the Preliminary Stage, existing and available secondary information on the area of direct and indirect influence of the project was collected, reviewed and analyzed. At this stage the area of influence of the project was defined following environmental, geographical and social criteria and anticipating the possible impact of activities on key physical, environmental and social components of the area. Also, it is at this stage in which the planning, logistics and coordination needed to develop the field stage were developed. In the final stage of staff, processing and analysis of information obtained in the previous step was performed, and the appropriate sections EIA content were developed.

3 LEGAL FRAMEWORK

3.1 General Aspects

The "Construction of Line 2 and Branch Av. Faucett-Gambetta of the Metro Basic Network in Lima and Callao" Project aims to improve the viability conditions for private vehicles and public transport, reducing travel times between the districts of Cercado de Callao, Cercado de Lima y Ate, allowing their development as a result of the improvement of their economic activities.

Act No. 28253 of June 12, 2004, declares as public need the continued implementation of the Electric Mass Transport System of Lima and Callao, and also exempts of taxes the import of goods that are directly targeted to the implementation of the Special Project Electric System Mass Transportation in Lima and Callao.

Also, through the Emergency Decree No. 063-2009 issued on June 7, 2009, AATE returns to the Ministry of Transport and Communications, by means of a merger, becoming the Executive Unit "Autonomous Authority of the Mass Transport Electric System of Lima and Callao" within the sub-transport Sector.

This analysis highlights the institutions of central, regional and local government having jurisdiction to intervene in the control and supervision of the activities to be developed.

3.2 General Regulations Applicable to the Project

The main regulations are listed below:

- Constitución Política del Perú
- Ley General del Ambiente - Ley Nº 28611
- D.L. 635. Código Penal – Delitos contra la Ecología
- Ley 27293, Ley que crea el Sistema Nacional de Inversión Pública
- D.L. 757. Ley Marco para el Crecimiento de la Inversión Privada
- D.S. Nº221-2006-EF, Directiva Nº002-2007-EF/68.01 y Anexos del SNIP
- Ley que establece la obligación de elaborar y reasentar Planes de Contingencias. Ley Nº 28551
- Ordenanza para la supresión y limitación de los ruidos nocivos y molestos. O.M. Nº 015- MML
- DS Nº 005-2012-TR - Reglamento de la Ley Nº 29783, Ley de Seguridad y Salud en el Trabajo.
- Ley que facilita la ejecución de Obras Públicas Viales, Ley Nº 27628
- Ley que declara de necesidad pública la continuación de la Ejecución del Sistema Eléctrico de Transporte Masivo de Lima y Callao, Ley Nº 28253
- Reglamento sobre Transparencia, Acceso a la Información Pública Ambiental y Participación y Consulta Ciudadana en Asuntos Ambientales, D S Nº 002-2009-MINAM
- D.S. 019-71-IN. Reglamento de Control de Explosivos de Uso Civil
- Ley 27972. Ley Orgánica de Municipalidades
- Ordenanza Municipal de Régimen de Intangibilidad de protección, conservación, defensa y mantenimiento de las áreas verdes de uso público de Lima Metropolitano. OM Nº 525-MML.

- Decreto de Urgencia Nº 063-2009, Aprueban fusión por absorción de la Autoridad Autónoma del Proyecto Especial Sistema Eléctrico de Transporte Masivo de Lima y Callao - AATE de la Municipalidad Metropolitana de Lima con el MTC.
- Acondicionamiento Territorial y Desarrollo Urbano - D S Nº 0027-2003-VIVIENDA
- R.M. 366-2001 EM/VME Código Nacional de Electricidad - Suministro
- D.S. 009-93-EM Reglamento de la Ley de Concesiones Eléctricas
- El Reglamento Nacional de Ferrocarriles fue aprobado mediante Decreto SupremoN°032-2005-MTC, se modificó mediante DS N° 031-2007-MTC y modifican el literal f) del artículo 106° mediante DS N° 027-2009-MTC
- RM N°404-2011-MTC/02.

3.3 Regulations concerning natural resources conservation and use

A list of regulations concerning conservation and sustainable use of natural resources:

- D.S. 029-94-EM Reglamento de Protección Ambiental en las Actividades Eléctricas
- D.L. 25844 Ley de Concesiones Eléctricas
- Reglamento de Clasificación de Tierras por su Capacidad de Uso Mayor. D S Nº 017-
  2009-AG
- Ley 26821. Ley Orgánica de Aprovechamiento de los Recursos Naturales
- D.S.011-93-MTC. Declaran que las canteras de minerales no metálicos de materiales de construcción ubicadas al lado de las carreteras en mantenimiento se encuentran afectas a estas.
- Disposiciones referidas al otorgamiento de Autorizaciones de vertimientos y de reúsos de aguas residuales tratadas. Resolución Jefatura Nº 0291-2009-ANA
- Reglamento de la administración del Centro Histórico de Lima. Ordenanza N° 6217
- D.S. 037-96-EM. Aprovechamiento de Canteras de Materiales de Construcción
- Ley 27308 Ley Forestal y de Fauna Silvestre

3.4 Environmental Evaluation Regulations applicable to the Project

The main regulations concerning environmental evaluation are listed below:

- Ley 28611 Ley General del Ambiente
- Ley de Evaluación de Impacto Ambiental para Obras y Actividades. Ley 26786.
- Ley 26834. Ley de Áreas Naturales Protegidas y su Reglamento, D S Nº 038-2001-AG.
- Uso de Canteras en Proyectos Especiales D.S.Nº 016-98-AG.
- Ley 27117 Ley General de Expropiaciones
- Ley 27314 PCM. Ley General de Residuos Sólidos, modificada mediante el D.L. N°1065, y su Reglamento, aprobado mediante D.S. 057-2004-PCM.
- R.S. 004-2000-ED. Reglamento de Investigaciones Arqueológicas
- Ley 27446. Ley del Sistema Nacional de Evaluación del Impacto Ambiental
- Reglamento de la Ley del Sistema Nacional de Evaluación de Impacto Ambiental Decreto Supremo 019-2009-MINAM
- D.S. 074-2001-PCM. Límites Máximos Permisibles y Estándares de Calidad Ambiental para Aire
- Ley 27867. Ley Orgánica de los Gobiernos Regionales
- Ley que facilita la Ejecución de Obras Públicas Viales Ley Nº 27628

- D.S. 085-2003-PCM. Reglamento de Estándares Nacionales de Calidad Ambiental para Ruido
- Ley 28245. Ley Marco del Sistema Nacional de Gestión Ambiental, y su Reglamento D.S 008-2005-PCM del 28 de enero de 2005
- Ley 28221. Ley que Regula el Derecho por Extracción de Materiales de los Álveos Cauces de los Ríos por las Municipalidades
- Ley 28256-PCM Ley que Regula el Transporte Terrestre de Materiales y Residuos Peligrosos
- Ley 28296. Ley General del Patrimonio Cultural de la Nación
- D.S. Nº 034-2004-AG. Categorización de Especies Amenazadas de Fauna Silvestre
- R.D. 007-2004-MTC. Aprueban Directrices para la Elaboración y Aplicación de Planes de Compensación y Reasentamiento Involuntario para Proyectos de Infraestructura de Transporte y R.D.067-2005-MTC/16 Marco Conceptual de Compensación y Reasentamiento Involuntario (MCCRI)
- R.D. 006-2004-MTC. Aprueban Reglamento de Consulta y Participación Ciudadana en el Proceso de Evaluación Ambiental y Social en el Subsector Transportes
- D.S.010-2005-PCM Estándares de Calidad Ambiental (ECAS) para radiaciones No ionizantes.
- D.S. 043-2006-AG Categorización de Especies Amenazadas de Flora Silvestre
- R.M. 037-2006 MEM/DM Código Nacional de Electricidad - Utilización
- R.V.M.1079-2007-MTC/02
- D.L. 1013 y 1039. Aprueba la creación, organización y funciones del Ministerio del Ambiente
- D.S. 006-2008-MINAM. Reglamento de Organización y Funciones del Servicio Nacional de Áreas Protegidas por el Estado – SERNANP
- D.S.021-2008-MTC Reglamento Nacional de Transporte Terrestre de Materiales y Residuos Peligrosos
- D.L. 1090. Ley Forestal y de Fauna Silvestre
- D.S.074-2001-PCM Reglamento de Estándares Nacionales de Calidad Ambiental del Aire, modificado mediante el D.S. Nº 069-2003-PCM y el D.S. 003-2008-MINAM. Aprueban Estándares de Calidad para Aire
- Decreto Supremo 017-2009-AG, Aprueban Reglamento de Clasificación de Tierras por su capacidad de Uso Mayor
- D.S. 002-2009-MINAM Reglamento sobre Transparencia, Acceso a la Información Pública Ambiental y Participación y Consulta Ciudadana en Asuntos Ambientales.
- R.D.031-2009-MTC/16 Lineamientos para elaborar un Plan de Contingencia para el Transporte Terrestre de Materiales y/o Residuos Peligrosos en el Sub Sector Transportes
- RD 025-2009-MTC/14 Directiva de Seguridad e Higiene Industrial y Gestión Ambiental de la Dirección de Caminos y Ferrocarriles
- D.S. 002-2008-MINAM Aprueban los Estándares Nacionales de Calidad Ambiental para Agua.
- R.M. 175-2008 MEM/DM, Modificación del Código Nacional de Electricidad – Utilización
- Reglamento Nacional del Sistema Eléctrico de Transporte de Pasajeros en vías férreas que formen parte del Sistema Ferroviario Nacional. Decreto Supremo N° 039-2010-MTC
- R.M. 052-2012-MINAM Aprueban directiva para la Concordancia entre el Sistema Nacional de Evaluación de Impacto Ambiental (SEIA) y el Sistema Nacional de Inversión Pública (SNIP)

3.5 Regulations Applicable to the Electro Mechanic Component

The main regulations concerning the electromechanical component are listed below:

- Ley 29783 Ley de Seguridad y Salud en el Trabajo .
- Ley de Concesiones Eléctricas, Decreto Legislativo Nº 25844
- Modificación del Código Nacional de Electricidad-Utilización Resolución Ministerial N°175-2008-MEM/DM
- Reglamento de Seguridad y Salud en el Trabajo de las Actividades Eléctricas Resolución Ministerial N° 161-2007-MEM/DM
- Código Nacional de Electricidad- Utilización, Resolución Ministerial N° 037-2006- MEM/DM
- Estándares de Calidad Ambiental (ECA) para Radiaciones No Ionizantes, Decreto Supremo N° 010-2005-PCM
- Ley Orgánica del Sector de Energía y Minas D.L. Nº 25962 Incluye Modificación según Ley Nº 27523
- Código Nacional de Electricidad-Suministro, Resolución Ministerial N° 366- 2001 EM/VME
- D.S. Nº 009-93 Reglamento de Ley de Concesiones Eléctricas
- Reglamento de Protección Ambiental en las Actividades Eléctricas D.S N° 29-94-EM

3.6 Regulations Concerning the Health Sector Applicable to the project

The main regulations concerning the Health Sector are listed below:

- Ley General de Salud Ley Nº 26842
- Ley General de Residuos Sólidos Ley Nº 27314
- D.S.057-04-PCM. Reglamento de la Ley General de Residuos Sólidos
- Reglamento de Estándares Nacionales de Calidad Ambiental del Aire, DS Nº 074-2001- PCM
- Estándares de Calidad Ambiental para Aire. DS Nº 003-2008- MINAM
- Reglamento de los Niveles de Estados de Alerta Nacionales para Contaminantes del Aire. DS Nº 009-2003-SA
- Establecen valor anual de concentración de plomo. DS Nº 069-2003-PCM
- Ley de Declaratoria de Emergencia Ambiental Ley Nº 28804
- Ley de Transporte Terrestre de Materiales y Residuos Peligrosos Ley Nº 28256
- Aprueban Estándares de Calidad Ambiental (ECAS) para radiaciones no ionizantes Decreto Supremo Nº 010-2005 PCM
- Reglamento de Estándares Nacionales de Calidad Ambiental para el Ruido Decreto supremo Nº 085-2003-PCM
- Reglamento de la Ley de Declaratoria de Emergencia Ambiental Decreto Supremo Nº 024-2008-PCM
- Aprueban los Estándares Nacionales de Calidad Ambiental para Agua DS Nº 002-2008- MINAM

3.7 Regulations Concerning the Transport Sector Applicable to the Project

The main regulations concerning the Transport Sector are highlighted below:

- LMP de emisiones contaminantes para vehículos automotores que circulen en la red vial Decreto Supremo Nº 047-2001-MTC
- Registro de Entidades autorizadas para la elaboración de la EIA en el Subsector transportes Resolución Ministerial Nº 116- 2003-MTC/02
- Reglamento de Consulta y Participación Ciudadana en el Proceso de Evaluación Ambiental y Social en el Subsector Transportes Resolución Directoral Nº 006-2004-MTC-16
- Guía Metodológica de los Procesos de Cultura y Participación Ciudadana en la Evaluación Ambiental y Social-Subsector Transportes Resolución Directoral Nº 030 2006- MTC/16

3.8 Regulations from Regional and Local Governments Applicable to the Project

The main regulations concerning Regional and Local Governments are highlighted below:

- Reglamento de Acondicionamiento Territorial y Desarrollo Urbano. DS Nº 0027-2003 VIVIENDA
- Reglamento de la Ordenanza Municipal (Lima Metropolitana) O.M Nº 525– MML Decreto de Alcaldía Nº 073
- Aprueban fusión por absorción de la Autoridad Autónoma del Proyecto Especial Sistema Eléctrico de Transporte Masivo de Lima y Callao – AATE de la Municipalidad Metropolitana de Lima con el MTC. Derecho de Urgencia Nº 063 2009
- Reglamento Nacional del Sistema Eléctrico de Transporte de Pasajeros en vías férreas que formen parte del Sistema Ferroviario. DS N° 039-2010-MTC.
- Sistema Regional de la Gestión Ambiental en el ámbito del Gobierno Regional de Lima Ordenanza Regional N° 04- 2008-CR-RL
- Ordenanza N° 1338-MML, Reglamenta la prestación del servicio público de transporte regular de pasajeros en Lima Metropolitana
- Sistema Metropolitano de Gestión Ambiental Ordenanza N° 1016

3.9 International Financial Institution Requirements

The main environmental and social policies of International Financial Institutions are listed below:

- World Bank
  - Environmental Assessment (OP/BP 4.01)
  - Natural Habitats (OP/BP 4.04)
  - Pest Management (OP/BP 4.09)
  - Physical Cultural Resources (OP/BP 4.11)
  - Involuntary Resettlement (OP/BP 4.12)
- Inter-American Development Bank
  - Environment and Safeguards Compliance (OP-703)
  - Involuntary Resettlement (OP-710)
- Equator Principles

The proposed Project has been considered an Environmental Category A per World Bank and IDB policies.

4 DESCRIPTION AND ANALYSIS OF THE PROJECT

4.1 Geographic Location

The project area cuts across 7 districts of the province of Lima and in 3 districts of the province of Callao, department of Lima. See Table 4.1 below and Figures 1, 2, and 3 in the Annex.

Table 4.1 Project's Alignment Location

LÍNEA	PROVINCIA	DISTRITOS	TRAZO
Línea 2 (Eje Este-Oeste)	Lima - Callao	Ate Santa Anita San Luis El Agustino La Victoria Breña Cercado de Lima Bellavista Cercado del Callao	Av. Víctor Raúl Haya de la Torre (Carretera Central), Av. Nicolás Ayllón, Av. 28 de Julio, A. Paseo de la República, A. Paseo Colón, Av. Arica, Av. Venezuela, Av. Germán Amézaga, Av. Oscar R. Benavides y Av. Guardia Chalaca.
Ramal Av. Faucett-Gambeta de la Línea 4	Callao	Bellavista Carmen de la Legua Reynoso Cercado del Callao	Av. Elmer Faucett, entre la Av. Néstor Gambetta y la Av. Oscar R. Benavides.

Fuente: Consorcio Geodata-ESAN-Serconsult

4.2 Technical Specifications of the Project

4.2.1 Geometric Layout

The Construction of Line 2 and Branch Av. Faucett-Gambetta of the Basic Metro Network in Lima and Callao connects the eastern districts of Lima with the center of Lima and the district of Callao (east-west axis), complements and is integrated to Lima Metro Line 1 (San Juan de Lurigancho Villa El Salvador) and rapid bus transit system - Metropolitano (Chorrillos - Independencia); the project also includes the section of Line 4 Metro Lima connecting the area of the neighborhoods adjacent to Jorge Chavez International Airport to Metro Line 2 Av. Elmer Faucett. Construction is expected to take 6 years. See Table 4.2:

Table 4.2 Basic design information of Line 2 and Av. Faucett – Gambetta Branch of Line 4

Denomination	Line 2	Av. Faucett – Gambeta Branch of Line 4
Line extension	27.06 Km	7.66 Km
Stations	27 (2 terminals, 3 for connections)	8 (2 terminals, 1 for connections)
Third Way	3	0
Yards	1	1
Ventilation Shafts	26	7
Emergency Shafts	1	0

Source: Consortium Geodata-ESAN-Serconsult

The Project also has two branches of access and exit to Yards of about 1 km each.

4.3 Project Components

The main civil works of Line 2 and Av. Faucett-Gambetta Branch of Metro Line 4 are:

- Tunnel
- Passenger Stations
- Ventilation and emergency shafts
- Yards
- Electromechanical Installations
- Rolling Stock
- Railway superstructure
- Railway Systems

4.3.1 Tunnel

The technological solution chosen for tunneling was mechanized excavation using a Tunnel Boring Machine (TBM).

TBM Section

Most of the length of the tunnel is made with TBM with a circular diameter of about 10 m (minimum diameter 9.20 m) section. The rail will be at a height of approx. 3m of the lower bound of the circular excavation section.

Traditional Cavern Section

For example in maneuver areas:

- Port of Callao on line 2
- Municipality of Ate on line 2

Cut & Cover Section

In specific sections Cut & Cover (C&C) will be used to perform special works as stations, TBM entry and exit shafts, third ways, maneuver areas. The C&C sections are:

- The Gambetta maneuver area on line 4
- Part of the connection to the Santa Anita yard on line 2
- Part of the connection to the Bocanegra yard on line 4
- All 3 third ways on line 2

TRENCH CUTTING

The only Trench Cutting (trinchera) sections are the final parts of the accesses to the surface yards.

4.3.2 Passenger stations

Four types of stations were considered:

- Typological Stations 1: small C&C stations.
- Typological Stations 2: large C&C stations.
- Typological Stations 3 and 4: stations in caverns.
- Viaduct Station.

4.3.3 Ventilation and emergency shafts

The ventilation shafts and emergency exits are an integral part of the metro system. They are

located halfway between two stations, according to the distances under NFPA130 requirements (National Fire Protection Association) and are activated in emergency situations, allowing the management of any fumes and ensuring passengers a safe escape route. These shafts may have two different configurations:

- Ventilation and emergency shaft - comprising the ventilation equipment and emergency way for individuals and stretchers.
- Emergency shaft - only comprised by the escape routes.

Line 2, in total, provides:

- 25 ventilation and emergency shafts
- 1 emergency shaft

Av. Faucett-Gambetta Branch (future line 4) :

- 7 ventilation and emergency shafts

4.3.4 Yards

The project includes two yards:

1. "Santa Anita" Yard, located near the "Mercado Santa Anita" Station on Line 2

2. "Bocanegra" Yard, located near the "Bocanegra" Station in Av. Faucett- Gambetta Branch.

4.3.5 Description of the rolling stock proposed

A train with capacity for 1200 passengers (6 passengers / m2) able to absorb the expected traffic with a maximum speed of 80 km / h and a bend radius of 90 m will be used. A train of this kind can have a length of about 110m, consisting of 6 cars (4 motorized), capable of reaching a commercial speed of 36 km / h. Trains will feature an Integrated Automation System with automated integrated transport.

The basis of this system is the automated train control (ATC - Automatic Train Control), featuring the following main functions:

- Automatic driving and train control, ATO
- Automatic protection of trains and passengers, ATP
- Automatic monitoring of trains, ATS.

4.4 Ancillary Facilities

4.1 Deposits of surplus soil material

This project is expected to remove substantial amounts of excess material mainly from the excavation of the tunnel, stations and ventilation shafts.

In this regard 2 areas (Costa Verde and Cieneguilla deposits) for excess materials produced by the project were identified. The two areas have sufficient capacity to handle the volumes of excess material to be eliminated (i.e., approximately 4,529,640 and 7,818,417 cubic meters respectively of capacity available).

4.1 Yards

During the operation phase of Metro Line 2 and the branch of Metro Line 4 to Lima airport, 2 machine yards will be used, one for each line. For the section corresponding to Line 4 the

property located on Av. Elmer Faucett in front of Bocanegra station will be used and named "Bocanegra" Yard. For Line 2 the property located at Av. Víctor Raúl Haya de la Torre (Central Highway) between the Station Cultura and Mercado Santa Anita Station will be used and named "Mercado Santa Anita" Yard.

4.5 Description of Planning Phase

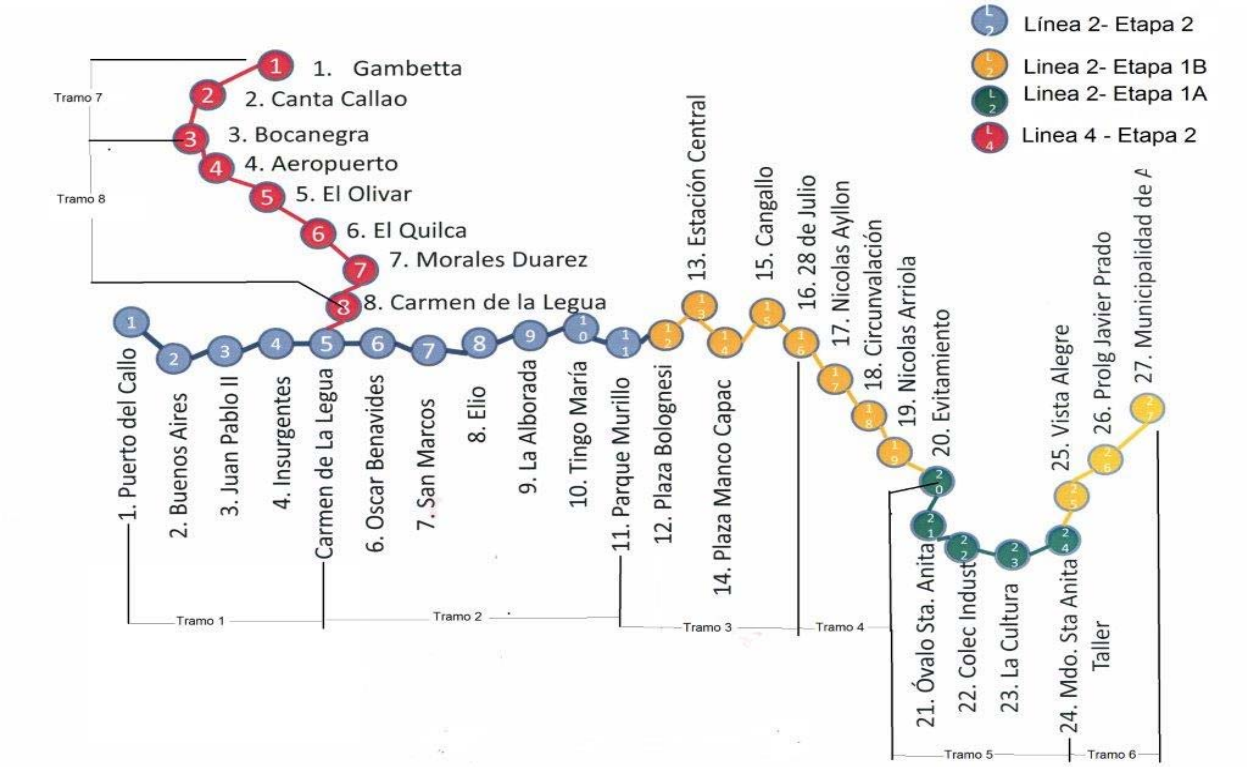
The following planning activities are expected to take place from the time of the award of the Project:

- Detailed engineering studies:
- Signature of the minutes of start of works
- Preliminary work
    - Surveys
    - Interference
    - Monitoring
    - Expropriation for Stations
    - Expropriation for major workshops and yards
    - Injections for consolidation and protection of existing structures
    - Purchase, Installation and Dismantling of the tunneling machines

4.6 Description of Construction Phases

The civil works, which started in the first semester of 2015, are not expected to be concluded before 2020 and will be developed in three different construction stages as illustrated in Figure 1 below:

Figure 1: Construction Phases



Phase 1A consists of the construction of 4.9 km of tunnel and five stations: Evitamiento, Óvalo Santa Anita, Colectora Industrial, La Cultura, and Mercado Santa Anita (this last station will have a connection to a train yard). Phase 1A is expected to be operational in year 2016/2017 as it requires at least two years from the start of construction to completion. This segment includes a rail yard and test tracks at Santa Anita station. Land acquisition for this segment is complete and has been developed without major issues except for the land required for one ventilation shaft partially occupied by 12 informal businesses – the GoP eventually decided for their expropriation as a last resource as these occupants did not accept the GoP's offer of compensation. MTC's resolution n. 124 from 2015 dated as of February 27 2015 approves the Resettlement Action Plan for Phase 1A (PACRI 1A).

Phase 1B consists of three different tunnel sections that together add approximately 11km of line. It will include eleven stations: Plaza Bolognesi, Estación Central (integration with future Line 3 and Metropolitano BRT), Plaza Manco Capac, Cangallo, 28 de Julio (integration with Line 1), Nicolas Ayllon, Circunvalación, Nicolas Arriola, Vista Alegre, Prolongación Javier Prado, Municipalidad de Ate. Phase 1B is expected to be completed within 3 to 4 years of the start of construction (year 2018 in the estimated schedule).

Phase 2A and 2B consists of the remaining sections of Line 2 (approximately 9.9km of tunnel) and a branch of Line 4 branch of approximately 7.7km. These sections will include a total of nineteen stations: Puerto del Callao, Buenos Aires, Juan Pablo II, Insurgentes, Carmen de la Legua, Oscar Benavides, San Marcos, Elio, La Alborada, Tingo María, Parque Murillo (these eleven in Line 2), and Gambetta, Canta Callao, Bocanegra, Aeropuerto, El Olivar, El Quilca, Moralez Duarez, Carmen de la Legua (these eight in the Line 4 branch). Phase 2 is expected to be completed in about 5 years from the start of construction (year 2020 in the estimated schedule).

5 ENVIRONMENTAL AND SOCIAL BASELINES

The Direct Influence Area is the physical space to be occupied permanently or temporarily during construction and operation phases of the Project. It also includes adjacent physical spaces where an environmental component is impacted in an evident way by the Project activities; likewise, the areas with temporary interventions during construction phase. The Indirect Influence Area of the Project is defined as the physical space in which could be affected indirectly such as areas immediately adjoining the direct influence area or activities that are indirect consequence of the execution of the project works.

5.1 Physical Baseline

5.1.1 Climatology and Meteorology

The focus area of this project is the city of Lima, which is characterized by high relative humidity, aridity and cloud cover almost all year. The cloud mass is due to atmospheric inversion phenomenon, caused by the current of Humboldt, which keeps the sea temperature low and reduces ambient temperature preventing air circulation especially in the winter time.

5.1.2 Air Quality

Sampling of different parameters was undertaken to establish the current air quality conditions. Eighteen air quality sampling stations have been established in which the parameters concentration of Particulate Matter PM10, PM2.5 Particulate Matter, Lead (Pb), nitrogen dioxide (NO2), sulfur dioxide (measured SO2), hydrogen sulfide (H2S) and carbon monoxide (CO).

The results indicate that none of the parameters exceeds air quality standards. However, it should be considered that surveys were conducted during the summer, suggesting a greater dispersion of pollutants compared to the wintertime due to the phenomenon of thermic inversion in Lima.

5.1.2.1 Measurement of Environmental Noise Levels

In the area where the project will be developed, the main sources of noise are the engines and excessive use of horns by vehicles traveling along the main avenues of the project area. For this report, measurements were conducted in each of the 35 stations planned for Line 2 and Line 4 branch. Sound level measurements were performed at daytime, according to the provisions of Regulation of National Environmental Quality Standards Noise (DS 085-2003 PCM). Results indicate that noise levels are above 70 dB in most measurement points, which exceed environmental quality standards for residential and commercial area, predominant in most of the area of direct influence. Therefore, the evaluated area presents altered noise levels as a result of human activities that currently take place in the study area.

5.1.3 Vibrations

The measurements of vibration acceleration (VAL) made in 2006, in the sections of Av. Arica-Av. Venezuela, and Av. Nicolas Ayllon-Carretera Central were considered as background information. The results indicated that most VAL day values were lower than 70 dB, whereas most VAL night values were below 60 dB. Since there is no standard quality Peruvian vibration level regulation, these results were compared to the Japanese regulation allowing vibration of 65 and 70dB during the day (6:00 to 20:00) for residential and commercial / industrial areas, respectively. In the case of sampling at the fieldwork, the measurement of vibrations conducted within time interval at all 35 points set along the project site. The results can be classified as not inconvenient and only perceived by people.

5.1.4 Magnetic Field

For this report 35 measuring stations were established. According to the results of electromagnetic field none of the values exceeded population exposure limit of 83 mT.

5.1.5 Geology

The alignment of Line 2 and Line 4 branch is located in the coastal plain, which is characterized by an essentially flat terrain with some hills and surrounding hills, which are remnants of processes occurred in the early Quaternary. The bed of the Rimac River crosses the area, leaving in its margins clusters that make up its various steps of alluvial terraces, which reach a few meters in height above the river's bed.

Additionally, the alignment of line 2 and line 4 branch is almost entirely housed in the morphological unit "Terrazas Medias", which form the Pleistocene alluvial deposits of the extensive alluvial fan of the Rimac River, framed by sedimentary rocks from the upper Jurassic to lower Cretaceous and intrusive rocks of the Coastal Batholith.

5.1.6 Geomorphology

The study area and adjacent areas present a terrain peculiar to coastal environments of the central region of Peru where the morphodynamic processes have superimposed older geotectonic processes.

5.1.6.1 Stability Geomorphology

The assessment area is remarkably stable because the coastal plains and the hilly and mountainous areas have no significant erosive action. Only the beds of the Rimac River and surrounding banks have sharp levels of geomorphological instability.

Seismic activity is a permanent physical risk, significant in the entire country coast..

No erosive phenomena are observed in the area of direct influence of Line 2 and Line 4 branch, which therefore is considered a stable zone under the geomorphologic perspective.

5.1.7 Physiography

The entire Area of Influence of the Project is within urban areas.

5.1.8 Water Component

The project is located at the bottom of the Rimac river basin, the dry part of it. The Rimac valley runs closely confined between ranges of hills until the Huachipa bridge; downstream of Vitarte the river opens in alluvial fan that ends on the coast.

5.1.8.1 Water supply and basic sanitation

SEDAPAL is in charge of the Water and Sewer Service along the projected alignment of Metro Line 2 Line 4 Branch. However according to field survey, there are discharges along the Rimac River, specifically in the crossing of bridge Gambetta and Rimac river. A series of direct discharges of non-treated water to the channel were identified and this situation must be controlled in the future.

5.1.8.2 Surface Water

Within the project area, which includes part of the Constitutional Province of Callao and Lima province, water resources of the Rimac River will not be affected as a result of the underground design of Line 2 and branch line 4 of Lima Metro.

5.1.8.3 Groundwater

The work of hydrogeological research conducted throughout the project by opening pits and diamond drilling, indicate that the water table has been found in the lowlands of initial portions of lines 2 and 4. In the first 2 km of Line 2 the water table has been found in depths of between 1.50 m and 9.5 m, ; in line 4, the water table is below 30 msmn, I having been recognized digging a pit to 4.2 m deep.

In all other areas of the project, the water table was not found nor measured. In the districts of Lima, Rímac, La Victoria, Lynce and San Isidro, the depth of the water table is on average between 70 and 100 meters deep. In the 2012 Basic Engineering Studies for the East-West Line Electric System Mass transport of Lima and Callao, data from SEDAPAL indicates that during the decade of the 80s the depth of water was under 50 m, while in the 90s the depth was 100 m; in the 50 m depth Diamond drilling at P-2 and P-1 performed in these studies the water table was not reached (points located at Av. Grau blocks 2 and 15 respectively).

The groundwater in the Constitutional Province of Callao basically comes from the Chillón and Rimac rivers. The areas of Puerto Nuevo, the Naval Base and the district of La Punta have a high water table about 5 feet deep. The most representative outcrops are seen in the area Taboadita, near the site of Sarita Colonia. In the district of La Punta up to the vicinity of the airport, the depth is between 0 and 15 m.

5.1.9 Quality of surface water

As to the water quality in the area of influence, three sampling points were defined and have been assessed for physicochemical, inorganic and bacteriological parameters.

Results obtained show traces of metals such as aluminum, arsenic, iron, manganese and lead indicating the presence of contaminants entities related to industrial activity in the area of the Rimac River between Av. Faucett and Av. Gambetta. Moreover, the high content of fecal and total coliforms indicate high pollution by dumping and improper disposal of solid waste and domestic liquid directly into the Rimac River in connection to urban density and basic sanitation conditions. The waters of the Rimac river although classified as Category 3 would not meet the quality standards to be used for watering plants and animals drink unless they are subjected to a pretreatment.

5.1.10 Seismicity

The study area is located in a region of high seismic activity, where the occurrence of strong quakes over the life of the Project can be expected. The seismic activity in the area is related to the subduction of the Nazca plate that sinks beneath the South American plate with a net displacement in the order of ten centimeters per year, causing intense friction in the contact zone with the consequent release of energy by earthquakes, which are generally much more violent when they are shallower in origin.

5.1.12 Land

Cartographic units determined in this study consist of three soil units and 01 miscellaneous unit. Miscellaneous land consists of a set of land with properties, both material and location, so pronounced that soils cannot be grouped into any classification, so its agricultural value is very limited or none.

5.1.14 Current Land Use

The Project area is comprised within the urban jurisdiction of Lima, specifically in the districts of Ate, Santa Anita, El Agustino, San Luis, La Victoria, cercado de Lima, Brena province of Lima,

and Carmen de la Legua, Bellavista and Callao province of Callao, department of Lima. Therefore, the main activities are related to densely populated urban areas where they are located.

5.1.15 Landscape Resources

The description of the landscape resources comprises the route of Line 2 and Line 4 branch of Lima Metro from the 200 miles Callao's oval to the City of Ate, which runs along main roads and the center of the city, showing an urban environment, where natural landscape incidences are minimal or absent.

In short, growth and urban development in the city of Lima has transformed and changed spaces and native landscape environments, even when only some of the hills were kept as part of the natural environment. The growth and urban constructions are the predominant axis dominating the visual environment of citizens throughout the alignment of the future Line 2 and Line 4 branch Metro Lima. The impact of this construction will promote a change from a natural landscape towards a landscape of a modern city of Lima

5.2 Biological

This item includes the analysis of data from terrestrial flora and fauna represented by the group of birds, mammals, arthropods, reptiles and aquatic life (Surco river canal and Rimac river) obtained during field evaluations, supplemented by information from previous studies in the project area.

Flora located in the central and lateral berm in 26 sections located along Line 2 and 7 sections located on line 4 were evaluated. Flora (shrubs and trees) in sections limited by stations of the project was counted. Likewise, 101 points located in parks were evaluated. The flora that has been recorded in the project area involving the direct area of influence (central and lateral berm) and indirect (parks) at points of quantitative sampling and qualitative assessments (grasses and ground covers), is composed of 227 plant species distributed in 71 families.

A total of 51 species of birds were observed during testing, occasional observations of indirect routes and trails in both lines of the project. Additionally, direct (snap traps) or indirectly (surveys), 3 mammal species were recorded. No species of reptiles and amphibians were recorded in the quantitative sampling in the area of influence of the project.

In the areas of direct and indirect influence of the project there is no Natural Protected Area by the State.

5.3 Socioeconomic

Construction works of a total of 35 km (27 km East - West Line, and 8 km of the section Av.Elmer Faucett - Av. Néstor Gambetta), goes thought consolidated urban areas of Lima and Callao. For study purposes 09 districts of Metropolitan Lima and 03 districts of the Constitutional Province of Callao were involved. The ones that concentrate a high flow of pedestrians, vehicular public transport service, vehicular private transport and heavy cargo transport in high traffic areas.

According to the 2007 census, the population dynamics of the area of influence of the project is increasing, as in the case of Lima Cercado with a total population of 299.493 inhabitants (central sector). The eastern district of Ate has an accentuated population growth with a total of 478.278 inhabitants, and in the western sector, Cercado del Callao has 415.888 inhabitants. This pattern is due to factors of urban expansion, growth dynamics of economic activities and their relation to the market, access to services and immigration, among others.

The 98 population centers identified in the area of influence are consolidated formal urban spaces, with housing developments, neighborhood associations and housing cooperatives. This population centers will be temporarily impacted during project implementation (vehicular congestion on alternative routes , environmental pollution by solid waste, smog and noise pollution, deterioration of alternate routes, possible parks contamination by dust emissions, possible cracking of houses by the movement of heavy machinery, etc.), and even so families in those sectors show a favorable disposition to the project, as long as environmental measures and contingency plans are properly handled.

In the project's area of influence, a total of 599 educational public institutions, and 3,080 privately run educational institutions have been identified. Representing a student population of 645.977 students, which means the commute of schoolchildren when the inlet at 07:30 am the outlet at 01:00 pm.

The twelve (12) districts within the area of influence of the project have 71 health facilities. 06 of these are health clinics, 46 are health centers and 07 of them are hospitals. Districts of Callao and Ate are the ones with highest number of health facilities,

According to the census of 2007 the population economically active at the department of Lima is 3,744,947 people, of which 96.4% (3,611,300) are employed and 3.6% (133 647) are unemployed. In terms of the province of Lima 96.4% (3,274,973) are employed and in the province of Callao 95.6% (350,505) are employed. Regarding the districts of the project's area of influence, 96.3% (973,569) are employed and 3.7% (36,965) are unemployed. On the other hand according to the census of 2007, the number of economically active employed population at Ate district is 203.663 people and at Santa Anita district is 82,914 people (east side). In Lima district (central sector) 127,692 people are employed and in the Callao District (western sector) 168.708 people. These indicators show vehicular commute and across-districts journeys to reach the workplace.

Throughout the project surroundings, there are approximately more than a thousand commercial and business services. For the study purposes 230 businesses, including small, medium and large, have been identified. The total business number is higher, but the identified ones are the most representative. From these businesses, 36 are in the area of influence of Ramal 4 (along Av. Faucett, from Oval Gambetta to Av. Oscar R. Benavides) and 194 businesses are located on both sides of the path of Metro line 2 (from Piazza Garibaldi in Callao to the City of Ate).

The owners of commercial businesses are favorable to the project. They recommend taking security measures against traffic congestion, signaling, establishing alternate temporary routes for the suppliers as well as establishing a proper dust control, solid waste management plan and noise pollution control. They are also aware of the potential negative impacts on clients during the construction phase.

According to field inspection of the route of the construction site of this east- west (27 km) line and the section Av. Elmer Faucett. - Av. Néstor Gambetta (8 km), a variety of public, private and freight transport is currently operating in the area. The routes are varied and interconnected between them, so that the transportation is fluid from Ate until Cercado de Lima, linking the districts of Ate, Santa Anita, El Agustino, La Victoria, Jesús María and Cercado de Lima. There are also different transport companies and routes connecting Cercado de Lima with Breña, San Miguel, Cercado del Callao, Bellavista and Carmen de la

Legua - Reynoso. “Las Coaster” buses have capacity to carry 30 passengers per unit, while the "Combis" buses have capacity for 12 passengers, there is informality and traffic congestion in high traffic areas.

5.4 Archaeological

The cultural assessment was carried out based on field inspection and existing secondary information from various public and private organizations in Lima. The assessment aims at identifying the existing Archaeological and Historical Cultural Heritage in the area for the construction of Line 2 and Ramal 4 Av. Faucett-Gambetta of Lima and Callao Metro.

From the cultural assessment it appears that the project works are in the vicinity of some archaeological and historical sites, producing a minimal impact.

Interferences with greatest impact on Archaeological and Historical Monuments are located in the section between the Central station and Plaza Murillo, and Eliot and Alborada Station.

The project is close to several Archaeological and Historical sites, the closest ones to the railway line are:

- The Huaca Concha or Huaca San Marcos; approximately 207 m from the track and near the San Marcos station. Likewise, there is an area planned to be used as project worksite at a distance of 165m to the west of Huaca San Marcos.
- Huaca Miguel Grau approximately 397 m from the track and between San Marcos and Elio stations, it is outside the area of direct impact, verifiable for Environmental Management Plan.
- Huaca Corpus I: approximately 270 m from the track and near Elio station, it is outside the area of direct impact, verifiable for Environmental Management Plan.
- Huaca Corpus II: approximately 375 m from the track and near Elio station, it is outside the area of direct impact, verifiable for Environmental Management Plan.
- Huaca Palomino; approximately 42 m from the track and near La Alborada. Likewise, in the surrounding area, a ventilation shaft construction is planned, thus a certificate of absence of archaeological remains should be requested and afterwards, during the Archaeological Monitoring Plan, restricted excavations prior to works executed
- Complejo Arqueológico Puruchuco; approximately 132 m from the track and between Mercado Santa Anita and Vista Alegre stations. For the stations works a certificate of absence of archaeological remains should be requested and afterwards restricted excavations prior to works execute.

Among the historical monuments declared Cultural Heritage there are:

- Plaza Bolognesi (1905), adjacent to the track, near to Plaza Bolognesi station. This sector has houses in poor state of preservation, thus the risks of production of movements and vibrations that could further deteriorate this constructions should be evaluated..
- Conjunto de Casas Neocolonial en la Av. Guzmán Blanco (1930); adjacent to the track, between Plaza Bolognesi and Estadio Nacional stations.
- *Museo Virtual de Lima* (1872); adjacent to station Estadio Nacional.
- *Casonas de Paseo Colón* (1898), 55 m. to Plaza Bolognesi station.
- *Centro de Estudios Históricos – Militares* (1900); 495 m. to Central station.
- Parque de la Exposición y Museo de Arte de Lima (1872); adjacent to Central station.
- *Plaza Grau* (1946); approximately 414 m from the track and near to Central station.

- *Politécnico José Pardo* (1876); approximately 154 m from the track and near to Plaza Manco Cápac station.
- *Facultad San Fernando (*1903); approximately 474 m from the track and near to Cangallo station.
- Hospital 2 de Mayo (1875); approximately 481 m from the track and near to 28 de Julio station.

6 IDENTIFICATION AND EVALUATION OF SOCIO-ENVIRONMENTAL IMPACTS

This section describes the identification and evaluation of potential environmental impacts arising during construction and operation phases of the project "Construcción de la Línea 2 y Ramal Av. Faucett - Gambetta de la Red Básica del Metro de Lima y Callao ", within its area of influence.

This section summarizes the environmental management measures to be used during project implementation, which are consolidated into an Environmental and Social Management Plan. This document is a tool to avoid or minimize negative environmental impacts, and to strengthen positive ones, for the conservation and environmental protection.

Therefore, the identification and assessment of environmental impacts has considered the surrounding environment, the opinion of the people and baseline information gathered, in order to acknowledge the relationship between the environment and the Project. The methodological criteria for this environmental analysis were selected considering the interaction of the Project with its surrounding environment, as well as the effects of one over the other. When these effects become significant for humans or their environment they are considered environmental impacts.

Environmental and social conditions in the project area have been altered for decades, because of the urban features of Metropolitan Lima, the Metropolitan area that concentrates most of Peruvian population. Therefore, the project implementation represents new pressures and impacts on environmental, socioeconomic and cultural aspects within its area of influence. However, most of the impacts generated by the Project will be temporary (during the construction phase) and considered as moderate to low impacts.

6.1 Methodology

An environmental impact is the effect of human activities on the structure and functioning of natural or processed ecosystems, i.e. it is the alteration produced by the project in the environment.

In assessing environmental impacts only the stages of construction and operation will be taken into account. The closing stage is considered as a phase in which the conditions of the area are restored as far as possible, so is not necessary to carry out an assessment of environmental impact.

It is also important to establish that the analyses of all the impacts of the activities of the construction phase are measured considering the baseline conditions of each environmental component. Whereas the analysis of the impacts of the activities of the operation phase can be measured by considering the baseline conditions (such as air, noise and vibration, surface water, groundwater, local employment or social conditions) or can be measured considering the conditions given at the end of the construction phase (such as relief, soils, flora and vegetation, terrestrial wildlife and landscape

The identification and assessment of environmental impacts, will establish the measures and actions that should be considered in the Environmental and Social Management Plan, so as to avoid and/or mitigate the negative environmental implications identified, ensuring the conservation of the project surroundings.

The evaluation of impacts includes the following sequential stages:

1) **Identification of the main activities that can generate** impacts on the construction and operation phases.

2) Identification of environmental conditions that may be impacted:

Environmental conditions are the set of abiotic and biotic components of the environment (air, soil, water, flora, fauna, etc.) and social environment (economic, social, cultural), susceptible of (positive or negative) changes, due to an action or a set of them. The development of the environmental baseline, obtained through office and fieldwork, provides the knowledge of local environmental conditions. This allows the development of a checklist, based on environmental factors at local and regional level, of which of the environmental conditions may be impacted by the project actions in its different phases.

3) Identification of the main potential Environmental Impacts:

This is done by filling the Convergence Matrix of Environmental Factors and the Quantitative Assessment using a Leopold Matrix that enables the identification and assessment of significant environmental impacts as a result of the interaction between environmental conditions that can potentially be impacted with project activities.

4) Description of the potential environmental impacts identified:

It is done based on knowledge of the main activities that generate impacts, identification and impact assessment including its intensity and magnitude, recoverability, place of occurrence, current environmental situation and description of the potential environmental impact.

6.2 Environmental Impacts Identification, Assessment and description

Socio-environmental impacts have been identified based on the knowledge of the activities of the Project and the environmental conditions. Some of the project activities have (more or less important and intense) impacts on components of the physical, biotic, socioeconomic and cultural resources. The environmental conditions analysis is based on data originally available and consolidated with data obtained during the field phase. A list of the identified potential environmental impacts on the physical, biological, socioeconomic and cultural resources in the area of influence of the project in the construction and operation phase, are seen in Table 8.1 and Table 8.2, respectively.

Table 6.1 Summary of environmental impacts identified for construction phase

Medium	Potential environmental impacts	Type	Magnitude
Physical	Alteration of air quality	Adverse	Mild
	Modification of environmental noise levels	Adverse	Moderate
	Increase in vibration levels	Adverse	Mild
	Impact on quality and soil stability	Adverse	Mild
Biological	Affectation of urban green areas	Adverse	Moderate
	Affectation of the urban wildlife habitat	Adverse	Mild
	Temporary displacement of urban wildlife	Adverse	Mild
Social	Impact on Population for Public, Private and Housing Infrastructure Intervention	Adverse	Moderate
	Risk of affecting cultural and archaeological heritage	Adverse	Moderate
	Alteration of the landscape quality	Adverse	Moderate
	utility interference	Adverse	Moderate
	Obstructing Roads Access (residents, pedestrians and merchants)	Adverse	Moderate
	Risk of Occupational Accidents and hazards to physical	Adverse	Mild

	health and integrity of workers		
	Dynamism of commercial and local business temporarily	Positive	Mild
	Generation of jobs for local people temporarily	Positive	Moderate
	Social distress with public and private entities, merchants and local population in general, regarding the implementation of the Project	Adverse	Moderate
	Risk health and safety of the local population	Adverse	Mild
	Increased national and international industrial dynamism as part of enabling the project.	Positive	Moderate

Table 6.2 Summary of environmental impacts identified for operation phase

Medium	Potential environmental impacts	Type	Magnitude
Physical	Alteration of Air Quality	Positive	High
	Noise reduction due to decreased traffic.	Positive	Moderate
	Increase in vibration levels	Adverse	Moderate
Social	Beneficial social conditions (improvement of district integration)	Positive	Mild
	Alteration of the landscape quality and land use	Positive	Moderate
	Risk of Occupational accidents	Adverse	Mild
	Improvement of the quality of life of the local population (decrease of stress on passengers and drivers from the current state of vehicular traffic)	Positive	Moderate
	Stimulation of the National and Local Economy (Revaluation of Property, increased productivity of urban labor market)	Positive	Moderate
	Contribution to the organization and efficiency of public transport (reduction of hours of travel, offering better transport service)	Positive	High
	Possible impact on reducing local crime due to the presence of public safety at stations.	Positive	Mild
	Generation of jobs for the local population	Positive	Mild
	Social Discomfort from the effect of vibrations on housing and public and private infrastructure vibration	Adverse	Mild

The project may have long-term positive environmental benefits, in particular related to greenhouse gas emissions (GHGs), air quality and other improvements in the health and quality of life of the residents of Lima. The Project was estimated to reduce GHG emission from vehicles powered by fossil fuels by 30,000 to 50,000 tons per year of CO2-equivalent under the conservative base demand scenario assumptions.[2] The level of emission reductions and

[2] The externalities that can be quantified and monetized are estimated by calculating physical changes in each of these impacts (e.g. changes in the volume of GHG emissions) multiplied by estimated unit costs from available sources. The emissions estimates are based on a methodology consistent with the World Bank's GHG Transport Accounting Tool. A value of US$35 to US$80 per metric ton of CO2-equivalent was used during the evaluation period based on the 2014 World Bank Guidance note on the "Social Value of Carbon for Project Appraisal."

climate change mitigation will be primarily a function of the migration of trips from road-based modes consuming fossil fuels to the more efficient electric Metro and its feeder system.

In terms of potential negative environmental impacts and risks, in addition to typical infrastructure construction impacts that are localized and of short duration (e.g., generation of noise, dust, waste management, etc.), there are some project specific potential impacts and risks.

Important potential negative impacts during construction are:

- effects on soil stability or subsidence during tunnel excavation or vibrations that may cause damage to the structure of buildings,
- traffic congestion, noise and dust around metro station locations,
- transport and disposal of soil/excavated material from the tunnel and station excavations potential sites for disposal of soil from tunnel and station construction (approximately 10.3 million m3), possibility of archaeological chance finds and damage, and associated impacts on cultural physical resources,
- worker health and safety risks in tunneling and excavation works, and
- decreased accessibility to businesses and homes in the immediate vicinity of metro stations.

Important potential operational phase negative impacts or risks include:

- vibration impacts on buildings,
- waste management of metro rail car maintenance facilities, and
- risk of fire, explosion or other emergencies.

The project design does not impact directly or significantly on physical cultural resources.

Potential cumulative negative impacts were considered in the EIA and supplement to EIA, and no significant cumulative negative impacts are anticipated since there are no other established projects within the Project area of influence that would result in significant cumulative impacts and given the characteristics of the metro line project (e.g., within a metropolitan urban area already developed, intended users are people already residing in established urban areas).

The identification and subsequent valuation of environmental liabilities is aimed at determining those situations that affect the surroundings of the project in the preliminary stages of construction, so that subsequent measures to reduce or eliminate negative environmental health impacts on the population, quality of life, the surrounding ecosystem and / or property are established. In the Area of Direct Influence of the Project "Construction of Line 2 and Branch Av. Faucett- Gambette of Basic Metro Network in Lima and Callao" a total of 13 environmental liabilities have been identified close to the area where the Project's structure will be installed. These environmental liabilities correspond to waste from construction materials and solid waste that affect the landscape of the area.

7 STAKEHOLDER/CITIZEN CONSULTATION AND PARTICIPATION

The overall objective of stakeholder/citizen consultations and participation is to promote the active involvement of citizens, especially people that could potentially be impacted by the project, in the approval procedures of the environmental study. The purpose of this participatory process is to systematize the opinion of citizens represented by all involved sectors, so as to provide input to the preparation of EIS.

7.1 Specific Objectives

The objectives were to:

- Inform the people and stakeholders about the Project and the scope of the Environmental Impact Study.
- Identify the institutions and organizations interacting with the population in the area of influence of the project.
- Understand the perception of people about the social and environmental impacts. Know their proposed mitigation or maximization solutions, from the point of view of the population and its representatives.
- Understand the perception of the population about the Project through their concerns, expectations and opinions in order to develop strategies and improve the design of the actions in the Environmental Management Plan.

Below are the dates, venues and type of mechanism for citizen participation. Four General Public Consultations, three Specific Public Consultations and one General Public Hearing on proposed locations were made in total:

Table 7.1 General Data - Mechanisms of Citizen Participation

Nº	DATE AND TIME	LOCATIONS	AUDIENCE
		GENERAL PUBLIC CONSULTATIONS	
01	Saturday 24 August 2013 15:00 p.m.	Auditorio de la Facultad de Ciencias Matemáticas de la UNMSM. Av. Venezuela cdra. 34, Lima Cercado	Lima (SAN MIGUEL y Lima Cercado).
02	Sunday 25 August 2013. 09:00 a.m.	AMORAP (Local de aduaneros). Calle 10 B Nº 212 alt. cdra. 31 Oscar R. Benavides.	Callao (Callao Cercado, Bellavista Carmen de la legua-Reynoso y San Miguel)
03	Tuesday 27 August 2013. 18:00 p.m.	Auditorio "Angélica Gallegos" de universidad UTP. Av. Petit Thouars 116, Lima Cercado.	Breña, San Luis, La Victoria, Jesús María
04	Wednesday 28 August 2013. 18:00 p.m.	Auditorio Hno. Lázaro Simón Canovas, Hogar clínica San Juan de Dios. Av. Nicolás Arriola 3250, San Luis	East (Ate, Santa Anita, El Agustino)
		SPECIFIC PUBLIC CONSULTATIONS	
01	Friday 06 September 2013. 18:00 p.m.	Auditorio Hno. Lázaro Simón Canovas, Hogar clínica San Juan de Dios. Av. Nicolás Arriola 3250, San Luis	East (Ate, Santa Anita, El Agustino)
02	Saturday 07 September 2013. 15:00 p.m.	Auditorio "Angélica Gallegos" de universidad UTP. Av. Petit Thouars 116, Lima Cercado.	Lima
03	Sunday 08 September 2013. 09:00 a.m.	Auditorio del Ilustre Colegio de Abogados del Callao. Av. Oscar R Benavides 4368, Callao.	Callao
		GENERAL PUBLIC HEARING	
01	Saturday 14 September 2013. 04:00 p.m.	Auditorio "Angélica Gallegos" de universidad UTP	General

7.2 General Methodology applied for all the participatory process

Citizen participation strategy was based on the application of the participatory approach characterized by its flexibility in the organization, duration, location and frequency; taking in consideration local population agendas.

For this purpose the use of a methodology for identifying stakeholders in fieldwork as a first step in implementing the public participation process was proposed. Also, the use of formal and non-formal instruments of citizen participation was applied, containing consultation mechanisms as general and specific public consultation as well as public hearings, was developed.

7.3 Citizen Participation Results

Four General Public Consultations, three Specific Public Consultations and one General Public Hearing were conducted, developed in the three geographic areas covered by the study: West (Callao), Centro (Downtown Lima) and East (San Luis) all related to the infrastructure project.

As a result of this citizen participation mechanisms, important opinions and perceptions about the impacts were obtained, noting that the majority agrees with the project still making a series of observations on different impacts. These and other recommendations were noted and evaluated by the environmental team and relevant suggestions were incorporated into the final report.

Overall, in these consultations, the following results were obtained:

a) Most of the attendees to the public consultation already had notions about the project, therefore, public consultations served to handle more accurate information.
b) It was found that stakeholders are in favor of the project, since the Metro Line 2 and Line 4 Ramal entail a benefit. However, attendees requested that the environment is not affected and especially their collective or individual properties are neither affected. Consultations served to clarify that the environmental impact will be minimal and temporary, and to explain the measures provided both on site
c) The objectives of the Public Consultation were achieved, which were to inform and consult with the people about the intention of implement the project with the least possible impact on the environment. Authorities and people were informed about the project specifications, the outcomes of the EIS and the study of damages and the compensation programs. Finally, perceptions, opinions, attitudes of the population about the project and its impacts were gathered through these consultations.

Thus was fulfilled the public participation process objective, which was to promote the active participation of project stakeholders in the evaluation phase of the EIS.

There were no difficulties in carrying out the public consultations, from its announcement to its execution. The consortium made their respective coordination to support with equipment and logistics (meeting room).

Details of the stakeholder/citizen participation are presented in the EIA, including: the objectives, place and date of the public consultations; general methodology applied for all the citizen participation process; main institutions and organizations that attended public consultations; strategic allies for the whole process of public participation; questions and interventions of the attendees and responses given by specialists in each consultation; lessons learned from this citizen participation process; conclusions and recommendations; records of attendance and minutes of the meetings; and photographs and videos.

During Project construction and operation additional stakeholder engagement will be performed during as established in the project ESMP and concessionaire stakeholder engagement plans.

8 COMPENSATION PLAN AND INVOLUNTARY RESETTLEMENT

Land acquisition will cause economic and physical displacement. The 35-km mostly underground alignment will only require land acquisition in the areas needed to build stations and ventilation shafts. According to estimates based on preliminary designs, Line 2 will affect 338 lots and Line 4 Branch will affect 38 lots, for a total of 376 lots. Of these, 279 are privately owned and 98 belong to public entities.

A plan was prepared to establish in detail the properties that will be affected by the project, evaluating the types of properties and the extent of damage or loss to them and proposing appropriate solutions. It includes the identification and description of the affected properties generated by the execution of the Project and takes into account measures to mitigate and/or reduce such socioeconomic and environmental impact, through fair compensations to owners according to national legislation. A specific resettlement action plan will be developed as designs are finalized for each phase. Land acquisition for segment 1A is complete and has been developed without major issues except for the land required for one ventilation shaft partially occupied by 12 informal businesses – the GoP eventually decided for their expropriation as a last resource as these occupants did not accept the GoP's offer of compensation. MTC's resolution n. 124 from 2015 dated as of February 27 2015 approves the Resettlement Action Plan for Phase 1A (PACRI 1A).

The resettlement action plans' general objectives are:

- Establish programs and projects to ensure the physical replacement of the property losses that will be suffered by the affected population.
- Process the release of areas according to affected population´s social conditions.
- Establish actions to mitigate and compensate the socioeconomic impacts that the population affected by the project will suffer, and
- Ensure that the programs and projects of the plan contribute to improve the quality of life of the affected population.

The plans' specific objectives are:

- Determine the legal actions for acquiring areas and register them.
- Establish actions for compensation and restoration of quality life of families affected by the project, through the implementation of programs aimed to improve living conditions.
- Ensure active participation of the affected population, at all stages of the process.
- Timely release of areas for project execution.

A methodology based on fieldwork and direct contact with owners or possessors was developed, according to the characteristics of each case. This methodology was developed in three phases: Office Preliminary Phase (Inventory and Registration), Field Phase (affected database) and Office Final Phase.

The Ministry of Transportation and Communications, specific the AATE unit, is responsible for compensation and resettlement.

9 SOCIO-ENVIRONMENTAL MANAGEMENT PLAN

The generation of environmental, negative and positive impacts in the Area of Influence of Construction Project of Line 2 and Branch Av. Faucett-Gambetta of the Basic Metro Network in Lima and Callao, as a consequence of the implementation of its activities requires implementation of an Environmental and Social Management Plan (ESMP) which measures to prevent, correct and / or mitigate adverse impacts are established, as well as to enhance positive impacts, according to the methodologies for the identification and evaluation in the chapter on environmental impacts.

The ESMP is a key instrument of environmental management that must be satisfied during development of the project describes the environmental management measures to be observed by the Contractor or Concessionaire under the supervision of the Ministry of Transport in its capacity as owner of the Project, so that the project activities are conducted in a safe, reliable, responsible way, preserving the environment and complying with environmental regulations.

The implementation of each of the defined environmental measures, part of the ESMP, will be the responsibility of the Contractor (concessionaire) during the construction and operation phase, with the exception of the following AATE responsibilities for coordinating environmental management of works to clear infrastructure interferences along the alignment and traffic management during construction and if encountered during construction resolving existing environmental liabilities. The concessionaire is responsible for Project construction and operation and maintenance environmental health and safety requirements as established under the concession contact.

AATE will undertake coordination with authorities and agencies on matters relating to crossings, use of infrastructure and service networks for construction, as well as for coordination with authorities responsible for compliance with environmental norms. OSITRAN is responsible for supervision of environmental health and safety aspects under the concession contract, and is hiring an international consultant firm to support project supervision including environmental health and safety aspects. DGASA was responsible for review and approval of the Project EIA (issuance of environmental permit) and for subsequent supervision of the project environmental permit. The Ministry of Culture is responsible for approving activities involving archeological resources and associated permitting if required.

The EIA ESMP considers the prevention, correction and / or mitigation of the environment that could be affected by the activities taking place during the construction phase and operation of the Project. It proposes measures to avoid unnecessary damage resulting from the application of inadequate systems or procedures during said stage. The importance of this program rests in that the proposed measures will be implemented during the course of construction activities and operation of the concession, allowing proper management of environmental aspects and, therefore, minimizes the damage of environmental components.

The Programs and Subprograms that are established in the ESMP to take place throughout all Project's phases are listed below[3]:

- Preventive, Corrective and Mitigation Measures Program

    - Solid and Liquid Waste Management Subprogram
    - Air Quality Mitigation Subprogram
    - Noise Mitigation Subprogram
    - Vibration Mitigation Subprogram
    - Change in Land Use Mitigation Subprogram

[3] Note: The EIA ESMP is being enhanced by the concessionaire as part of their development of an Environmental Health and Safety Management System and specific quality control plans and other requirements established in the concession contract

- Protection of green areas and urban fauna Subprogram
- Control de Pests and Rodents Subprogram
- Water and soil protection Subprogram
- Road signaling and signal maintenance Subprogram

- Environmental Monitoring Program

  - Air Quality
  - Noise
  - Vibraciones
  - Electromagnetic Radiation
  - Water Quality
  - Flora and Fauna
  - Archeological and Cultural Heritage Management

- Social Program

  - Subprogram for Community Relations
  - Subprogram for Citizen Participation

- Program for Environmental Training and Education

- Program for Prevention of Loss and Contingencies

  - Subprogram for Prevention and Control of Occupational Hazards
  - Subprogram for Prevention of Contingencies and Emergency Response

- Closure and Abandonment Plan

Regarding the Social Program, in December 2014, the Lima Metro Consortium carried out a social study for project´s Stage 1 A, information with which the Consortium proposes the development of a Comprehensive Social Management System (Sistema de Gestión Social Integral, SGSI by it´s initials in Spanish).

The system comprises six programs regarding the following areas: (i) grievance mechanisms, (ii) local employment, (iii) communications, (iv) social impacts monitoring and managing, (v) institutional and environmental alignment, and (vi) environmental and road safety education. Components include:

- The grievance mechanism program, aims timely and definitive resolution of complaints, it includes a permanent information office, complaints tracking software, and a reporting system.
- The local employment program, aims to maximize the jobs opportunities to Ate and Santa Anita population.
- The communications program, aims to design and implement a plan for ongoing communications with users and stakeholders (distinguishing between large and small businesses, private and public institutions, health services, vulnerable groups (disabled, mothers, children, elderly), municipal authorities and transport workers).
- The social impacts monitoring and managing program, aims to prevent, identify and mitigate social conflicts, using social risk assessment and an electronic data registration.

- The institutional and environmental alignment program, aims interagency coordination.
- The environmental and road safety education program, aims to strengthen the relation between stakeholders, the population of Santa Anita and Ate and workers of the Lima Metro Project through thematic workshops.

ANNEX: Maps of the Project and the Area of Influence

Figure 1: Lima's Metro Network Plan

Figure 2: Districts in the Area of Influence for Proposed Metro Line 2 and Branch Line 4

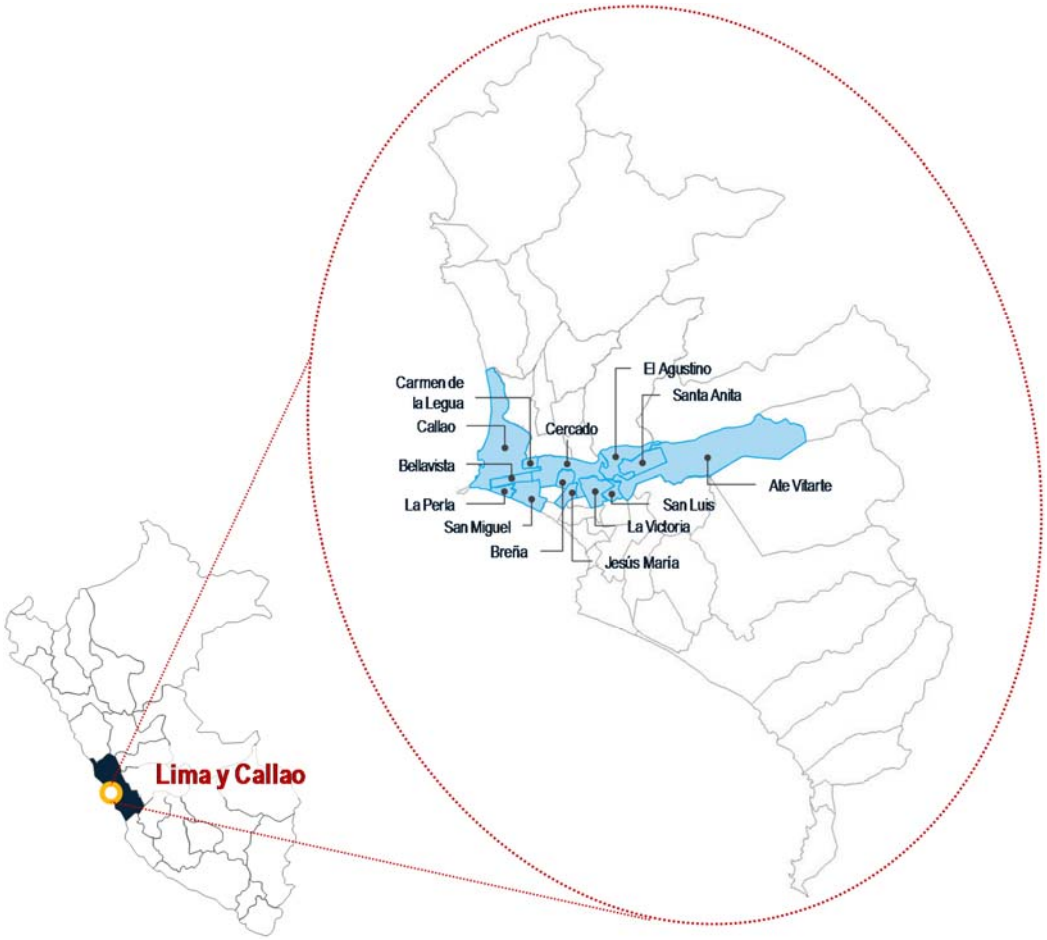


Figure 3: Selected Alignment for Metro Line 2 (and Line 4 Branch), Integration Points and Feeder Network with COSAC (Metropolitano BRT) and Metro Line 1 (Tren Electrico)