

CHAPTER 13
Road Facilities Sector Plan

13. ROAD FACILITIES SECTOR PLAN

13.1. EXISTING ROAD NETWORK

13.1.1. EXISTING ROAD CONDITIONS

(1) Functional Road Classification

The existing roads are classified into four (4) categories, which are Expressways, Arterial roads, Collector roads, and Local roads. The Expressways are divided into two types of roads, such as the National and Regional Expressway and the Metropolitan Expressway. The national and regional expressway connects Lima and Callao and other provinces, as well as each district between Lima and Callao, with a high road design standard. The metropolitan expressway connects each district within the Lima and Callao Metropolitan area with a high road design standard. These expressways are maintained as the full access traffic control system.

(2) Number of Lanes on Existing Road

The number of lanes on the existing road network is shown in Figure 13.1-1. The cross sections of the Paseo de la República Expressway are the 2-lane bus exclusive lane, the 6-lane dual carriageway for high speed traffic, and the 2-lane frontage roads with side-walks on both sides. Almost all Arterial roads, including the Av. Panamericana, Av. Javier Prado, and Av. Tupac Amaru, are constructed as 4 to 6-lane dual carriageways with side walks on both sides for mixed traffic flows with car and buses.

(3) Traffic congested Road

As the results of the full reconnaissance survey, and various traffic and transport surveys, the heavier traffic congested roads are observed to consent on the trunk radial and trunk ring roads, especially the following roads. The improvement plans for these roads should be prepared to mitigate traffic congestion.

- a) Av. Panamericana Norte
- b) Av. Panamericana Sur
- c) Carretera Central
- d) Av. Aviación
- e) Av. Paseo de la República
- f) Av. Tupac Amaru
- g) Av. Independencia
- h) Av. Javier Prado

(4) Heavy Traffic Congested Areas

The most heavy traffic congestion area is observed in the Lima central area, which is covered by Av. Grau and Av. Ugarte. The heavy traffic congestion in this area is present throughout the day. The second heavy traffic congestion area is observed at the area which is covered by Av. Javier Prado. The existing trunk roads which are located within these areas should be reinforced. At present, the improvement of the Av. Grau project is under-construction by EMAPE in order to mitigate traffic congestion, especially bus traffic conditions.

Number of Lane
(Existing Major Roads 2004)

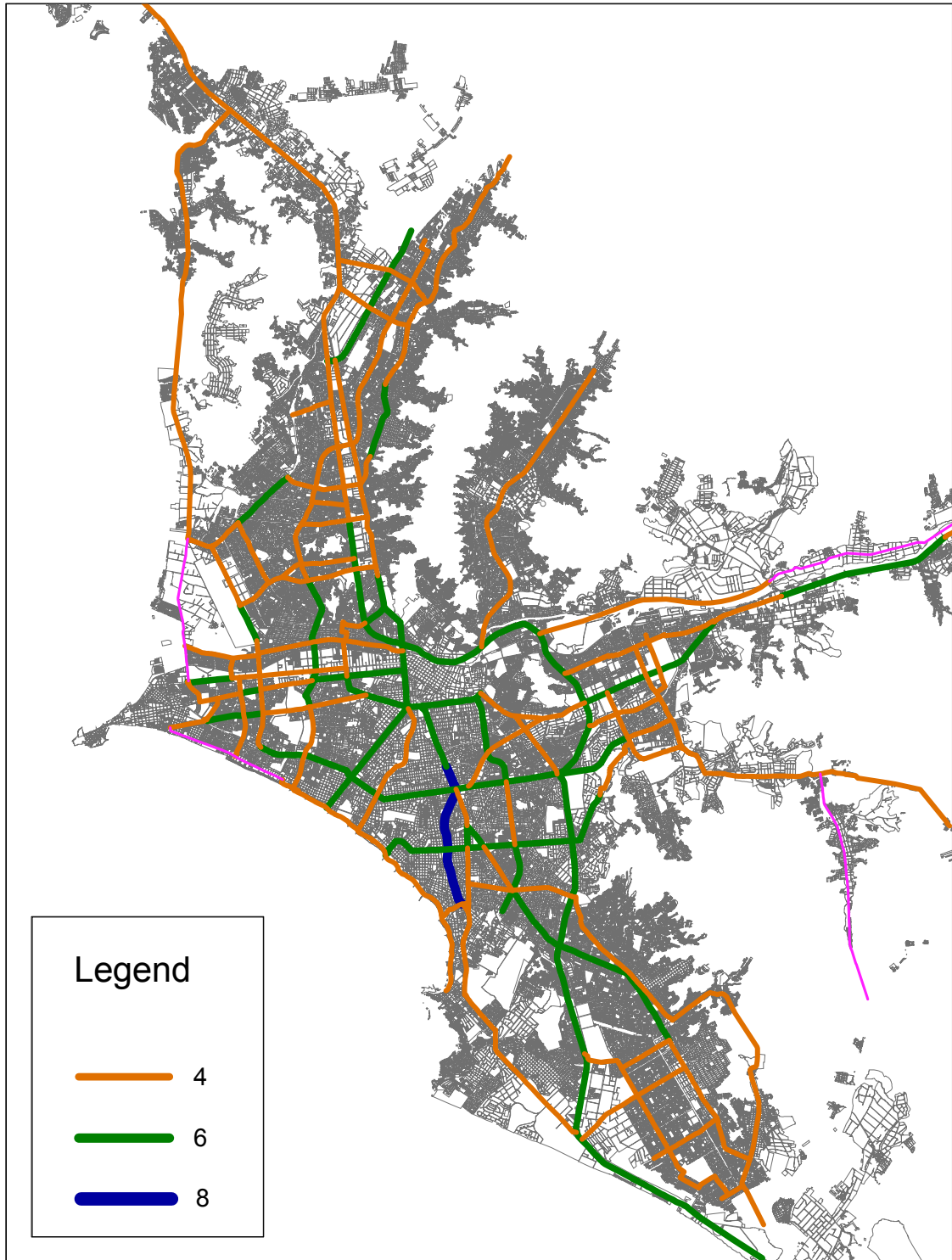


Figure 13.1-1 Existing Road Network by Number of Lanes

(5) Cargo Transport

As a result of the field Freight Survey conducted by the JICA Study Team, the following cargo transport conditions are pointed out.

- a) The largest volume of generation and attraction of cargo transport in the Study area is observed in the areas of the Port of Callao, Callao International Airport, and the Pampilla Oil Refinery in Callao.
- b) The total truck traffic volume observed in these three areas reaches 18,400 vehicles per day, and about 10,000 trailer traffic vehicles per day (about 55% of the total) of the total truck traffic volume observed.
- c) The heavy truck traffic flow from the area of Callao to other cities passes through the center of the urban area in the cities of Lima and Callao.
- d) The peak heavy traffic flows from the area of Callao to other cities also occurs between 08:00 and 09:00 hours and 18:00 and 20:00 hours. This peak hour of heavy traffic coincides with the peak hour of other traffic flows in the urban area.

Taking into account the above mentioned cargo transport conditions, the cargo transport flow network should be ensured to avoid passing through the urbanized areas, in order to mitigate traffic congestion and maintain traffic safety in the urban area. Therefore, the creation of some new diversion roads or the improvement of the existing roads for cargo transport (to the East, North, and South directions) should be required.

13.1.2. EXISTING ROAD NETWORK PATTERN

Basically, the existing trunk road network pattern based on the road hierarchy is formulated at the radial and ring roads, as shown in Figure 13.1-2. The four (4) trunk radial road directions are exited in the Study area and these radial trunk roads are connected at the center of Lima to the north area, east area, south area, and Callao. The three (3) trunk ring roads are exited, and these trunk ring roads are located at the center of Lima as the inner ring road (Av. Grau), 4 km away from the center of Lima as the first ring road (Av. Javier Prado), and 6 km away from the center of Lima as the second ring road (Av. Angamos).

On the other hand, the existing road network, based on functional roads, is not clearly developed. As mentioned previously, the National and Regional Expressway network, the Metropolitan Expressway Network, and the Arterial and Collector Road Network should be reinforced based on the functions and characteristics of each road. In addition, the Arterial and Collector road network should be developed according to the progress of new housing developments.

Considering the future traffic characteristics and conditions expected, the following existing road network should be reinforced in order to mitigate traffic congestions and to insure traffic safety.

- a) North to South radial road network
- b) East to West radial road network
- c) Inner Ring road network
- d) First Ring road network
- e) Second Ring road network
- f) Outer Ring road network

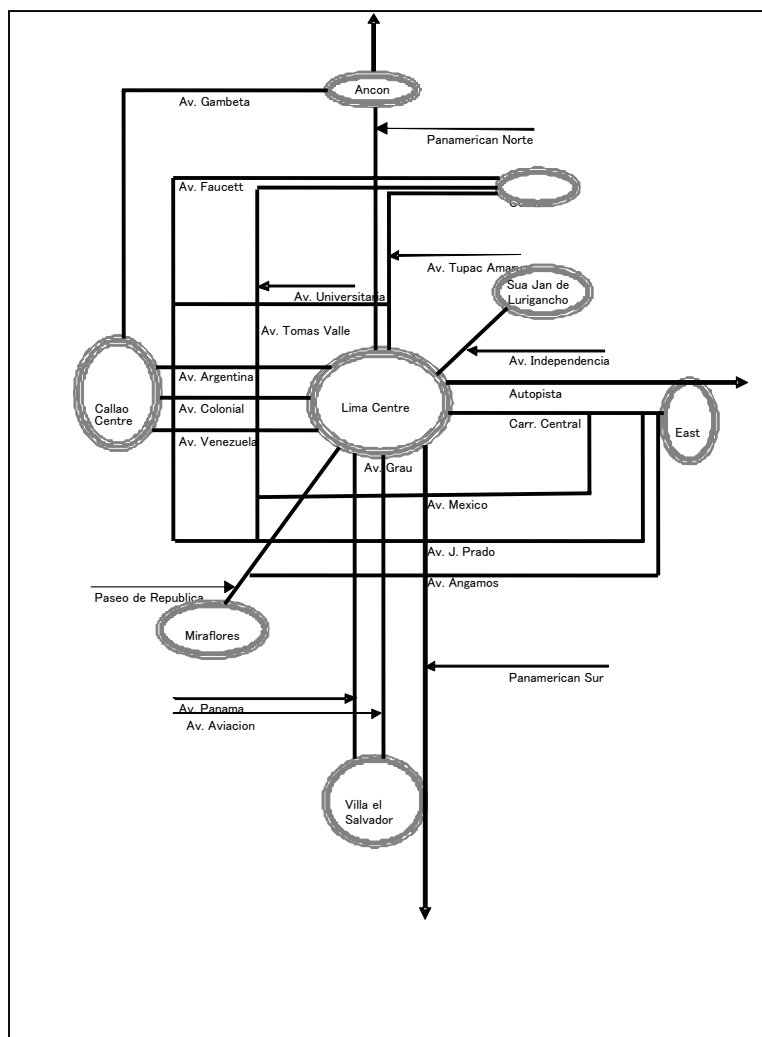


Figure 13.1-2 Conceptual Existing Road Network

13.2. FUTURE ROAD NETWORK PLAN IN 2025

13.2.1. ENVIRONMENTAL CONSIDERATION FOR FUTURE ROAD NETWORK PLAN

The road network development plan is conducted considering the maintenance of good national and social environmental conditions in the Metropolitan area of Lima and Callao based on the results of the initial environmental examination (IEE). The environmental consideration items, remarkably on the future road network plan, are the following three (3) items.

- a) To decrease air pollution
- b) To avoid additional land acquisition and re-settlement
- c) To maintain the cultural heritage

(1) To decrease Air Pollution

The condition of air pollution in the Metropolitan area of Lima and Callao is becoming worse day by day according to the increasing traffic volume and traffic congestion. The future road network plan should be conducted to ensure the smooth traffic flows due to

decreasing traffic congestion on the trunk road network. To decrease the air pollution, the following road network plans are examined.

- a) To create an effective road network
- b) To improve missing road link sections on the road network
- c) To improve the traffic congested intersections

(2) To avoid Additional Land Acquisition and Re-settlement

In spite of the land acquisition and re-settlement laws and regulations, the actual implementation of additional land acquisition and re-settlement is very difficult and it also requires a long time based on the historical experience. To ensure an adequate social environmental consideration, the following road network plans are examined.

- a) A Road Network Plan is conducted to use the right of way width of the existing roads to avoid additional land acquisition and re-settlement.
- b) The route location of the new road construction project is carried out to select comparatively vacant areas to avoid additional land acquisition and re-settlement.

(3) To Maintain Important Cultural Heritage

There are many important cultural heritages in the Metropolitan area of Lima and Callao. Basically, the future road network plan is conducted to utilize the area of the existing roads without requiring additional land acquisition, therefore, it is considered that the effectiveness of cultural heritage is scarce. However, when the route location study of the future road network is carried out, the route should be selected to avoid passing through the important cultural heritage areas.

13.2.2. TO COPE WITH THE FUTURE ROAD NETWORK PLAN

The future road network plan study is carried out based on the following four (4) considerations.

- a) Future Traffic Characteristics
- b) Future Traffic Demand
- c) Effectiveness of the Road Network
- d) Related Development Plans

(1) To Cope with Traffic Characteristics

The Metropolitan area of Lima and Callao is concentrated as the central area of the economic, cultural and political activities in Peru, and the transport and traffic network in Peru is also concentrated in this areas. Especially, the cargo transport from the Sea Port of Callao and Callao International Airport, to other cities, passes through the urbanized areas. In the future road network plan, the improvement of the cargo transport system is necessary.

(2) To Cope with Traffic Demand

In the previous section, the future traffic demand in 2025 is assigned on the future road network. As a result of this study, the heavy traffic volume (over 50,000 pcu/day) is concentrated on the radial and ring trunk roads. Especially, the heavy traffic volume is assigned on the following trunk roads.

- a) Peripheral Road of the Lima Section
- b) Peripheral Road of the Callao Section
- c) Autopista Ramiro Prialé
- d) Av. Panamericana Norte
- e) Av. Canta- Callao

- f) Av. Néstor Gambetta
- g) Av. Elmer Faucett
- h) Av., Javier Prado
- i) Av., Universitaria
- j) Av., Próceres de Independencia- Av. Grau

Considering the traffic demand assignment on the trunk roads, the improvement of the above mentioned roads should be required.

(3) To Cope with the Effectiveness of the Road Network

The existing road network is basically formed by the radial and ring roads, however, the functional road network is not completed yet. To create the functional and effective road network, a completely functional network should be created.

(4) To Cope with the Related Development Plan

The number of habitants in the Metropolitan area of Lima and Callao in 2004 and 2025 is estimated to be approximately 8 millions and 11 millions respectively. There will be an additional 3 million people during a 21 year period, and they will be basically distributed in the three areas located at the east, north, and south areas from the central area of Lima. The Arterial and Collector road network, within new development areas, should be reinforced according to the construction schedule of new developments.

13.2.3. FUTURE ROAD NETWORK PLAN OF THE STUDY IN 2025

As mentioned in the previous section 12.2.2 of this report, the future road network plan approved by the Municipalities of Lima and Callao is adopted by the Urban Transport Master Plan for the Metropolitan Area of Lima and Callao in 2025 as shown in Figure 13.2-1.

13.2.4. TRAFFIC VOLUME ASSIGNMENT ON THE FUTURE ROAD NETWORK

In section 11, the traffic volume in 2025 was forecasted, and the future traffic volume is assigned to the future road network. The future road network plan is examined based on the results of the future traffic assignment study. The results of the traffic volume in 2025 on the future road network are shown in Figure 13.2-2.

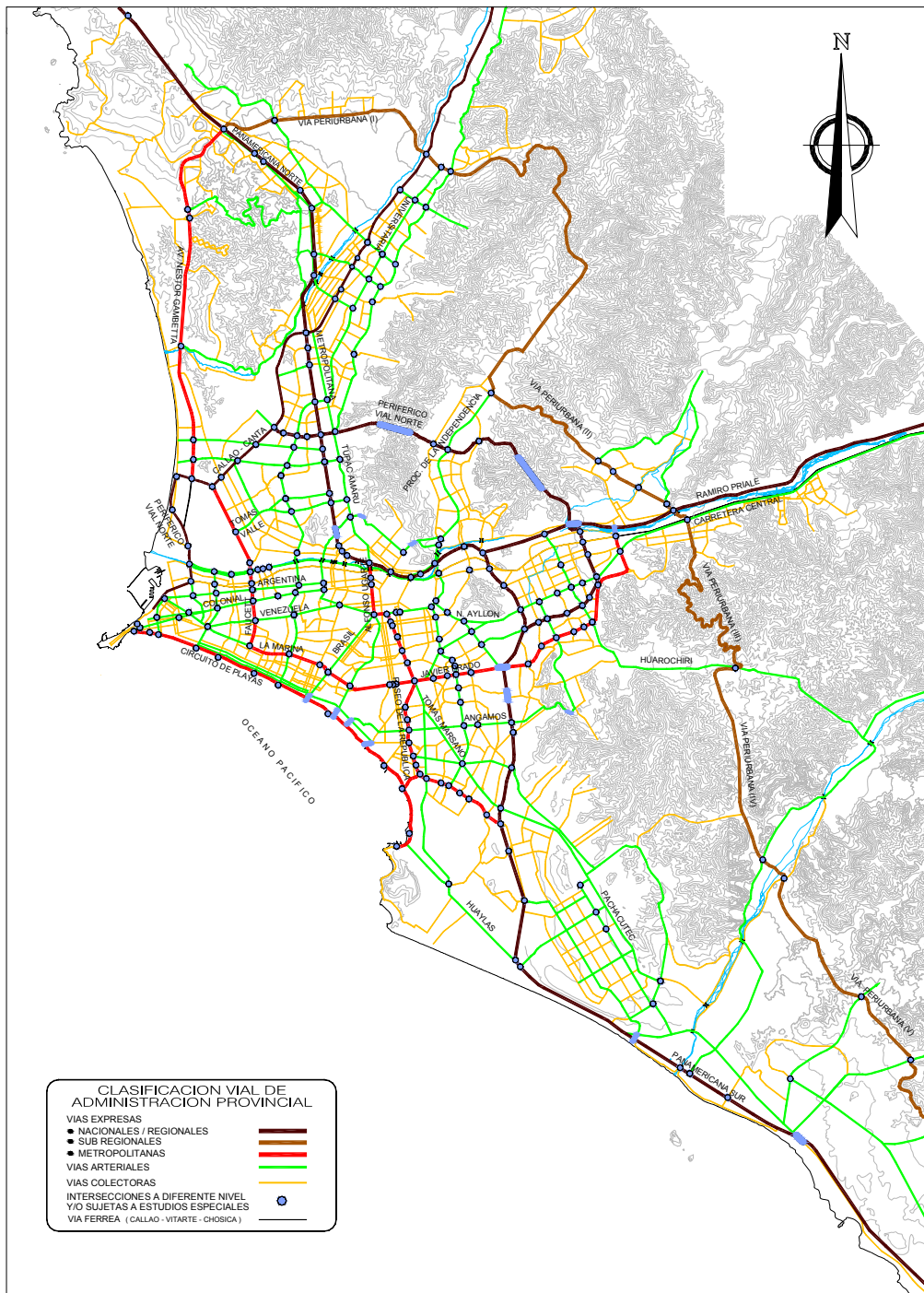


Figure 13.2-1 Future Road Network in 2025

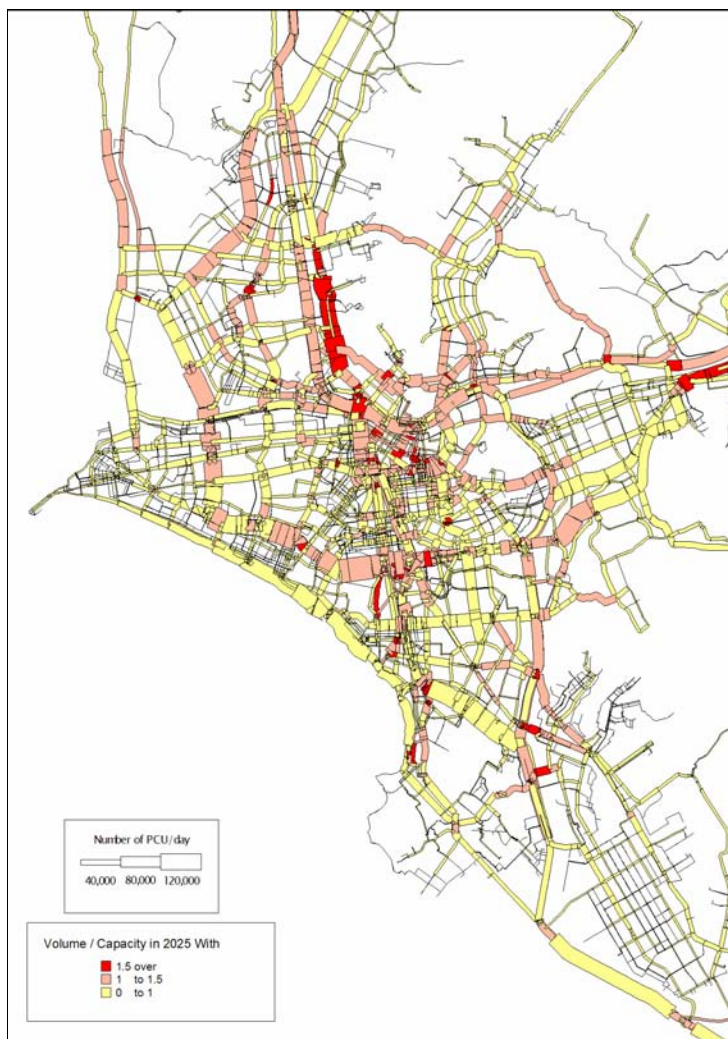


Figure 13.2-2 Traffic Volume on the Future Road Network (2025)

13.2.5. VERIFICATION OF THE FUTURE ROAD NETWORK

The future road network of the Urban Transport Master Plan in 2025 for the Metropolitan area of Lima and Callao is verified based on the following perspectives.

- From the Perspective of the Road Network
- From the Perspective of Traffic Demand
- From the Perspective of Cargo Transport
- From the Perspective of the Economic Evaluation

(1) From the Perspective of the Road Network

The future functional road network is formed by the National / Regional Expressway, the Sub-regional Expressway, the Metropolitan Expressway, Arterial Roads, and Collector Roads.

The future road network is basically formed by the trunk radial and trunk ring road network. The trunk ring road network consists of four (4) ring roads such as the inner ring road (passing through Av. Grau), the 1st ring road (passing through Av. Javier Prado), the 2nd ring road (passing through Av. Angamos), and the outer ring road (new road construction). On the other hand, the radial trunk road network consists of four (4)

directions of traffic axis, which are located at the north direction (Av. Panamericana, Av. Tupac Amaru, and Av. Gambetta), the east direction (Carretera Central and Autopista), south direction (Av. Panamericana, Av. Aviación, and Av. Paseo de la República), and west direction (Lima and Callao).

Considering the above mentioned road hierarchy and road function, the future road network approved by the Municipality is evaluated to ensure a sufficient road network pattern.

(2) From the Perspective of Traffic Demand

Based on the future traffic demand assignment on the future road network, the number of lanes required on the major trunk roads is examined as shown in Table 13.2-1. The number of lanes required is estimated to compare with the traffic volume in 2025 and capacity. With the results of the examination of the number of lanes required, the future road network will be able to ensure the future traffic demand.

The traffic volume on the major roads in 2025 will almost reach the full capacity. Therefore, a mass rapid transit system should be introduced to ensure the smooth traffic flows, and to decrease traffic congestion in 2025. However, the traffic volume on the road which connects Punta Piedra - San Juan de Lurigancho – Ate – Pachacamac - San Bartolo is very low, with approximately 10,000 to 15,000 pcu / day in both directions. This road needs to become a 2-lane road in 2025.

Table 13.2-1 Number of Lanes Required on Major Roads

Name of Road	Traffic Volume (2025) (pcu/day)	Capacity Per Lane (pcu/day/lane)	No. of Lanes Planned	No. of Lanes Required
Peripheral Road of the Lima Section	65,000-95,000	15,000	6	6
Peripheral Road of the Callao Section	58,000	15,000	6	4
Autopista Ramiro Prialé	74,000	15,000	4	6
Av. Panamericana Norte	100,000	18,000	6(10)	6
Av. Canta - Callao	98,000	18,000	6(10)	4
Urban Peripheral of Puente Piedra – Lurigancho	14,000-16,000	15,000	6	2
Urban Peripheral of Lurigancho - Ate	20,000	15,000	6	2
Urban Peripheral of Ate - Pachacamac	13,000	15,000	4	2
Urban Peripheral of Pachacamac	23,000	15,000	6	2
Urban Peripheral of Pachacamac - San Bartolo	10,000	15,000	6	2
Av. La Costa Verde of Lima	110,000	18,000	6(10)	6
Av. La Costa Verde of Callao	75,000	18,000	6(10)	6
Extension of Av. Paseo de la República in the South	150,000	18,000	6(10)	8
Av. Nestor Gambetta	79,000	18,000	6(10)	6
Av. Elmer Faucett	110,000	18,000	6(10)	8
Av. Javier Prado	150,000	18,000	6(10)	8
Extension of Av. Paseo de la República in the North	120,000	18,000	8(12)	8
Av. Universitaria	67,000	15,000	4(8)	4
Av. Próceres de Independencia - Av. Grau	53,000	15,000	4(8)	4

(): including frontage roads

(3) From the Perspective of Cargo Transport

The cargo traffic from the Port of Callao to the other cities is able to pass to the north direction (Av. Gambetta), to the east direction (new construction of north ring road with tunnel), and south direction (new construction of coastal road) to avoid passing through inside the urban area, based on the future road network. Therefore, the future road network has formed a sufficient cargo transport network.

(4) From the Perspective of the Economic Evaluation

The economic evaluation of the future road network is conducted based on the comparison between without project case and with project case. Without project case means that the future traffic demand in 2025 is assigned to the road network in 2004, and with project case means that the future traffic demand in 2025 is assigned to the future road network in 2025.

As the result of the economic analysis, the cost/ benefit (B/C) ratio is calculated at 2.5, and the traffic congestion ratio also improved. From the economic evaluation, the future road network is identified as economically feasible. The detailed analysis is described in section 12 of this report.

13.3. INTERSECTION IMPROVEMENT PLAN

13.3.1. INTERSECTIONS TO BE IMPROVED ON ARTERIAL ROADS

The functional road classification in the Study area is categorized into five (5) roads, such as National and Regional Expressway, Metropolitan Expressway, Arterial Road, Collector Road, and Local Road. The type of intersections on the National and Regional Road and the Metropolitan Expressway are already planned at Grade-Separated Intersections, based on the previously mentioned future road network plan approved by the municipalities.

As a result of the field reconnaissance survey, and discussions with Peruvian counter parts, the following 62 intersections on the existing arterial roads should be improved for mitigation of traffic congestion and to maintain smooth traffic flows. The locations of the 62 intersections are shown in Figure 13.3-1.

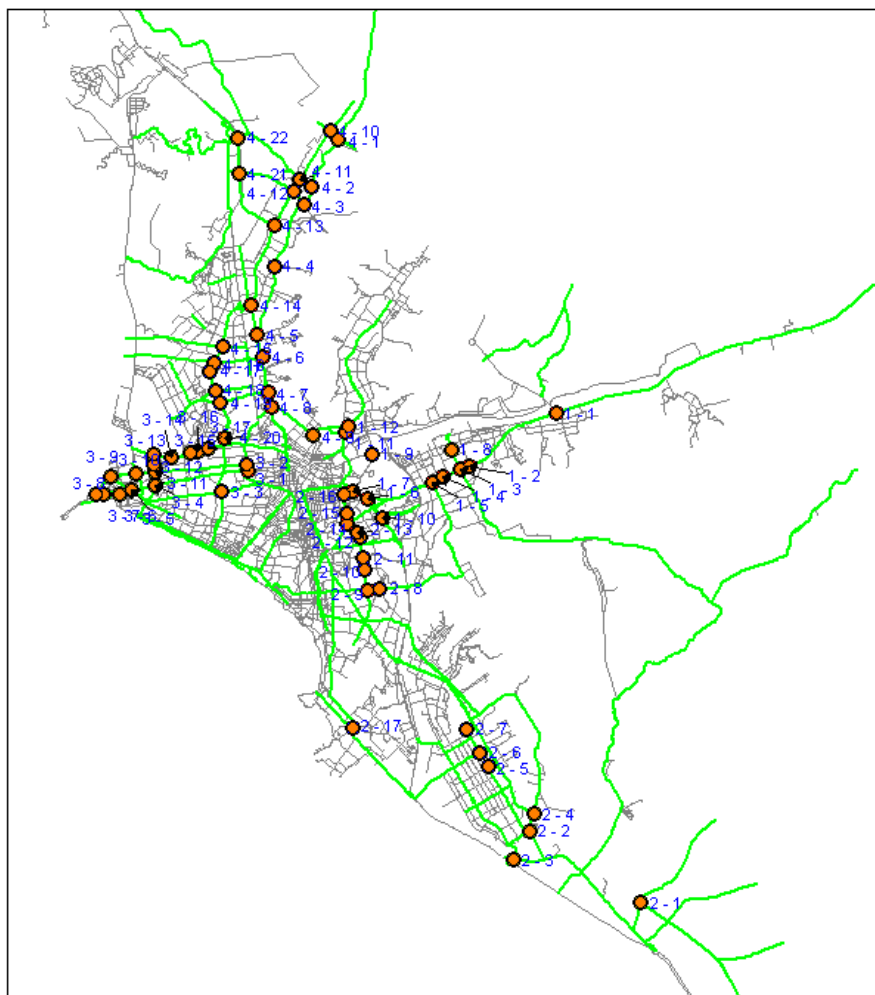


Figure 13.3-1 Locations of the Intersection to be Improved on Arterial Roads

13.3.2. PRIORITY OF IMPLEMENTATION OF THE INTERSECTION IMPROVEMENT PLANS

It is very difficult to implement among 62 intersections at the same period considering the total project costs. Therefore, in this section, the 62 intersections are divided into three (3) construction stages, considering the importance of the intersections to be improved. The study to identify the implementation priority among the 62 intersections is examined based on the following four (4) categories.

- a) From the perspective of road hierarchy
- b) From the perspective of the number of public transport passengers
- c) From the perspective of traffic volume
- d) From the perspective of environmental aspects

(1) From the Perspective of Road Hierarchy

For identifying the priority of intersections by road hierarchy, the following 1 to 5 scoring points are adopted by road hierarchy. For the intersections closed by the different road hierarchy, the following scoring points from 5 to 1 can be obtained.

- a) Intersection between major arterial road and major arterial road = 5 points
- b) Intersection between major arterial road and arterial road = 4 points

- c) Intersection between major arterial road and collector road = 3 points
- d) Intersection between arterial road and arterial road = 2 points
- e) Intersection between arterial road and collector road = 1 point

(2) From the Perspective of the Number of Public Transport Passengers

For identifying the priority of intersections by road hierarchy, the following 1 to 5 scoring points are adopted by number of passengers. For the intersections closed by the different number of passenger on roads, the following scoring points from 5 to 1 can be obtained.

- a) Intersection used by over 20,000 passengers = 5 points
- b) Intersection used by 20,000 to 15,000 passengers = 4 points
- c) Intersection used by 15,000 to 10,000 passengers = 3 points
- d) Intersection used by 10,000 to 5,000 passengers = 2 points
- e) Intersection used by less than 5,000 passengers = 1 point

(3) From the Perspective of Traffic Volume

For identifying the priority of intersections by road hierarchy, the following 1 to 5 scoring points are adopted by traffic volume. For the intersections closed by the different traffic volumes on roads, the following scoring points from 5 to 1 can be obtained.

- a) Intersection used by over 40,000 (pcu/day) = 5 points
- b) Intersection used by 40,000 to 20,000 (pcu/day) = 4 points
- c) Intersection used by 20,000 to 10,000 (pcu/day) = 3 points
- d) Intersection used by 10,000 to 5,000 (pcu/day) = 2 points
- e) Intersection used by less than 5,000 (pcu/day) = 1 point

(4) From the Perspective of Environmental Aspects

For identifying the priority of intersections by road hierarchy, the following 1 to 5 scoring points are adopted by environmental aspects. For the intersection closed by the different environmental conditions on roads, the following scoring points from 5 to 1 can be obtained.

- a) Additional land acquisition needed = -2 points
- b) Re-settlement needed = -1 point

(5) Results of Categorized Intersections

According to the results of the scoring points analysis, amongst the 62 intersections selected by the reconnaissance survey, the intersections which obtain over 9 scoring points are classified as a first priority improvement intersection (Package-1), a total of 9 to 6 scoring points is obtained by intersections classified as a second priority improvement intersection (Package-2), and less than 6 scoring points can be obtained by intersections classified as a third priority improvement intersection (Package-3) as shown in Table 13.3-1 .

From table 13.3-1, a total of 13 intersections are classified as first priority (Package-1), a total of 26 intersections are classified as second priority (Package-2), and a total of 23 intersections are classified as third priority (Package-3) respectively.

Table 13.3-1 Scoring Points of Each Intersection

Location	Intersection by road	Scoring Points					Priority		
		H	P	T	E	Total	1	2	3
1 - 1	Carretera Central / Av. Las Torres	3	3	4		10	1		
1 - 2	Carretera Central / Av. La Cultura	3	2	4		9	1		
1 - 3	Carretera Central / Av. Huarochiri	4	4	4		12	1		
1 - 4	Carretera Central / Ca. Los Rosales	3	4	4		11	1		
1 - 5	Carretera Central / Av. La Molina	4	4	4		12	1		
1 - 6	Av. Circunvalación / Av. Nicolás Ayllón	4	3	4		11	1		
1 - 7	Av. Nicolás Ayllón / Av. José de la Riva Agüero	4	3	4		11	1		
1 - 8	Av. Huarochiri / Av. Metropolitana	1	0	2		3			1
1 - 9	Av. José de la Riva Agüero / Jr. Ancash	3	0	4		7		1	
1 - 10	Av. Circunvalación / Av. Separadora Industrial	2	3	4		9		1	
1 - 11	Av. Próceres de la Independencia / Ca. Perú	5	4	4	-1	12	1		
1 - 12	Av. Próceres de la Independencia / Av. Lima	5	4	4	-1	12	1		
2 - 1	Proy. (Via Portillo Grande / Prolog. Pachacutec)	2	0	1		3			1
2 - 2	Av. Lima / Av. Maria Reiche	4	0	1		5			1
2 - 3	Antigua Pan. Sur / Proy. (Prolog. Pastor Sevilla)	3	0	2		5			1
2 - 4	Av. Pachacutec / Av. Lima	4	0	1		5			1
2 - 5	Av. Separadora Industrial / Av. Velasco Alvarado	3	2	2		7		1	
2 - 6	Av. Separadora Industrial / Av. El Sol	4	2	2		8		1	
2 - 7	Av. Separadora Industrial / Av. Mateo Pumacahua	4	2	2		8		1	
2 - 8	Av. Angamos / Av. Caminos del Inca	3	2	3		8		1	
2 - 9	Av. Angamos / Av. Aviación	5	2	3		10	1		
2 - 10	Av. Aviación / Av. San Borja Sur	3	2	3		8		1	
2 - 11	Av. Aviación / Av. San Borja Norte	3	2	3		8		1	
2 - 12	Av. Aviación / Av. Canadá	3	2	4		9		1	
2 - 13	Av. Aviación / Av. Del Aire	3	2	4		9		1	
2 - 14	Av. Aviación / Av. Nicolás Arriola (Ovalo Arriola)	5	2	4		11	1		
2 - 15	Av. Aviación / Av. México	3	2	4		9		1	
2 - 16	Av. Aviación / Av. 28 de Julio	3	2	4		9		1	
2 - 17	Av. Huaylas / Av. Guardia Civil	4	0	3		7		1	
3 - 1	Av. Oscar R. Benavides / Av. Nicolás Dueñas	4	3	4		11	1		
3 - 2	Av. Argentina / Av. Nicolás Dueñas	4	3	4	-2	9		1	
3 - 3	Av. Universitaria / Av. Venezuela	4	3	4	-2	9		1	
3 - 4	Av. Oscar R. Benavides / Av. Santa Rosa	2	1	2		5			1
3 - 5	Av. Guardia Chalaca / Av. Miguel Grau	2	1	2		5			1
3 - 6	Av. Miguel Grau / Jr. Vigil	1	1	2		4			1
3 - 7	Av. Saenz Peña / Av. 2 de Mayo	2	1	2		5			1
3 - 8	Av. Saenz Peña / Jr. Paz Soldan	1	0	2		3			1
3 - 9	Plaza Garibaldi (Av. Argentina / Av. 2 de Mayo)	2	0	2		4			1
3 - 10	Plaza Tupac Amaru (Av. Argentina / Av. Alfredo Palacios)	2	0	2		4			1
3 - 11	Av. Argentina / Av. Santa Rosa	2	0	2		4			1
3 - 12	Av. Santa Rosa / Ca. Huascar	1	0	1		2			1
3 - 13	Av. Morales Duares / Ca. Santa Rosa	2	0	1		3			1
3 - 14	Av. Morales Duarez / Ca. Madre de Dios	1	1	1		3			1
3 - 15	Av. Morales Duarez / Jr. Libertad	1	1	1		3			1
3 - 16	Av. Morales Duarez / Ca. José Gálvez	1	1	1		3			1
3 - 17	Av. Morales Duarez / Ca. José Olaya	1	1	1		3			1
4 - 1	Av. Tupac Amaru / Ca. Manuel Prado	2	1	2		5			1
4 - 2	Av. Tupac Amaru / Av. Chimpu Oclo	2	1	3		6		1	
4 - 3	Av. Tupac Amaru / Av. San Felipe	2	2	3		7		1	
4 - 4	Av. Tupac Amaru / Av. Belaunde	2	3	3		8		1	
4 - 5	Av. Tupac Amaru / Av. Metropolitana	4	5	3		12	1		
4 - 6	Av. Tupac Amaru / Av. Carlos Izaguirre	4	5	4		13	1		
4 - 7	Av. Tupac Amaru / Av. Tomas Valle	4	5	4		13	1		
4 - 8	Av. Tupac Amaru / Av. Juan V. Nicolini	5	5	4	-1	13	1		
4 - 9	Av. C. Samuel Alcázar / Ca. Antón Sánchez	3	0	1	-1	3			1
4 - 10	Av. Universitaria / Ca. Manuel Prado	4	0	2		6		1	
4 - 11	Av. Universitaria / Av. Chimpu Oclo	4	0	2		6		1	
4 - 12	Av. Universitaria / Av. San Felipe	4	2	3		9		1	
4 - 13	Av. Universitaria / Ca Sangarara	4	2	4		10	1		
4 - 14	Av. Universitaria / Av. Gerardo Unger	5	3	3		11	1		
4 - 15	Av. Universitaria / Av. Los Alisos	4	2	3		9		1	
4 - 16	Av. Universitaria / Av. Carlos Izaguirre	4	2	3		9		1	

Table 13.3-1 Scoring Points of Each Intersection (Continued)

Location	Intersection by road	Scoring Points					Priority		
		H	P	T	E	Total	1	2	3
4 - 17	Av. Universitaria / Av. Antunez de Mayolo	3	2	3	-	8		1	
4 - 18	Av. Universitaria / Av. Angélica Gamarra	4	2	3	-	9		1	
4 - 19	Av. Universitaria / Av. Tomas Valle	4	2	3	-	9		1	
4 - 20	Av. Universitaria / Av. Perú	3	3	4	-	10	1		
4 - 21	Aprox. Ca. 1 Ca. S/N	2	0	1	-	3			1
4 - 22	Aprox. (Pan. Norte / Av. Saenz Peña)	2	0	1	-	3			1
Total							19	26	23

H: Intersection Hierarchy (Connection road)
P: Public (Peak Hour Passengers)
T: Traffic Volumes (Peak Hour PCU)
E: Environment

13.4. IDENTIFICATION OF ROAD NETWORK PLAN

13.4.1. FORMULATION OF ROAD NETWORK PLAN

In the previous section, the future road network plan of the Study area in 2025 was examined based on the future road network plan approved by the Municipalities of Lima and Callao in 1990 and the problems and issues of the future road network plan approved by the municipalities are identified to meet the future traffic demand. The future road network plan approved by the municipalities is formulated at the following three (3) road categories.

- a) National and Regional Expressway Network Development Plan
- b) Metropolitan Expressway Network Development Plan
- c) Arterial and Collector Road Network Development Plan

(1) National and Regional Expressway Network Development Plan

According to the future road network plan approved by the municipalities, the National and Regional Expressway network is formulated by the following five (5) routes.

1) *Av. Panamericana Expressway*

This road is located at parallel with the coastal area of Peru, from north to south via the Metropolitan Area of Lima and Callao, and it connects with the countries of Ecuador and Chile as one of the international roads. Considering the importance of this road, the improvement plan of the existing roads on the heavy traffic road section is identified in order to mitigate the traffic congestion of Av. Panamericana and other roads located nearby.

2) *Av. Canta - Callao*

Av. Canta - Callao directly connects the provinces of Callao and Canta via the districts of Comas and San Martín de Porras. The conditions of the current Av. Canta - Callao includes a 4-lane dual carriageway, however, some parts of the road segments have not been completed yet. Considering the importance of this road, the improvement plan of the existing road is identified in order to contribute to the growth of economic activities between the two (2) provinces.

3) *Outer Ring Road*

The existing trunk road network in the Study area is basically formed by four (4) trunk radial roads, such as from the central area of Lima to the east, south, west, and north

directions. The traffic from the north to the south areas must pass through inside the urban area since there are no by-passing roads. Considering the importance of a by-passing road, the construction plan of the outer ring road is identified for mitigation of traffic congestion in the urban area, and to decrease the travel time of the by-passed traffic. The Outer Ring Road is connected to the areas of Punta Piedra, San Juan de Lurigancho, Ate, Pachacamac, and San Bartolo passing through the mountain or hilly terrains.

4) First Ring Road

The functional road network in the Study area is formulated by four (4) ring roads, such as the Inner Ring Road (a part of the existing Av. Grau), the First Ring Road (a part of the existing Av. Javier Prado), the Second Ring Road (a part of the existing Av. Angamos), and the Outer Ring Road mentioned above. The existing First Ring Road was completed at the south half section (existing Javier Prado), however, the north half section of the First Ring Road has not been completed yet. Considering the importance of the development of the functional road network, the construction plan of the north half section of the First Ring Road is identified.

5) Extension of Autopista Ramiro Prialé

This road is located at passing in parallel with the existing Carretera Central, which is connected to / from Lima and other provinces. The Carretera Central presents heavy traffic congestion all day long, and it is very difficult to widen the existing Carretera Central. The construction plan for the extension of Autopista Ramiro Prialé is identified for the mitigation of traffic congestion in the Carretera Central and other roads.

(2) Metropolitan Expressway Network Development Plan

According to the future road network plan approved by the municipalities, the Metropolitan Expressway network is formulated by the following four (4) routes.

1) Av. Paseo de la República

This road, which has 6-lanes with frontage roads on both sides, is classified as the most important of the trunk radial road network within the urbanized area to connect north and south areas of Metropolitan Lima and Callao. However, the south end of Av. Paseo de la República did not connect to other trunk roads. Considering the formulation of the functional road network, the extension plan of this road is identified for the completion of the effective functional road network in the Study area.

2) Av. Javier Prado

This road, which has 6-lanes with frontage roads on both sides, is classified as the most important of the trunk ring road network within the urbanized area to connect various trunk radial roads in the Metropolitan area of Lima and Callao. Heavy traffic (70,000 to 80,000 pcu/day) is observed on this road, and heavy traffic congestion is present all day long, especially on the at-grade intersections. On the other hand, it is very difficult to carry out the expansion of the existing road. Considering the importance of the road, the improvement plan of the intersection is identified to increase the traffic capacity of the road.

3) Av. Costa Verde

There is no connection road and no radial road from Callao to the provinces which are located in the south direction of the Metropolitan area of Lima and Callao. Considering the importance of the functional road network, the construction plan of Av. Costa Verde is identified for the completion of the trunk radial road network in the Metropolitan area of Lima and Callao.

4) *Av. Nestor Gambetta*

This road connects the central area of Callao and the area of Ancon via the districts of Puente Piedra and Ventanilla with the trunk radial road network. The population in 2004 and 2025 is estimated at 175,000 and 374,000, and the population in 2004 and 2025 in Puente Piedra is also estimated at 210,000 and 411,000 respectively. The population in these areas in 2025 is estimated at about 800,000 persons. To ensure the smooth traffic flows in the areas of Puente Piedra and Ventanilla, and to mitigate traffic congestion in the Av. Panamericana north, the improvement plan of Av. Nestor Gambetta is identified.

(3) Arterial and Collector Road Network Development Plan

1) *Urbanized Area*

In the urbanized area, it is very difficult to promote the new road construction plans for arterial and collector roads since there is no room to construct new roads. However, there are many bottleneck sections and missing roads linked to decrease the traffic capacity on the arterial and collector roads. Considering these problems, various improvement and rehabilitation plans of the existing roads are identified.

2) *New Housing Development Area*

In the sub-urban area of Lima and Callao, according to the increasing population in the future, a new housing estate will be developed. To ensure the smooth traffic in new housing estate, the construction of new road plans, and improvement plans of the existing roads, are identified for the Urban Master Plan in 2025.

(4) Summary of the Road Network Development Plan

As a result of the future road network development plan, the following road construction plans and road improvement plans are identified by road category as shown Table 13.4-1. The location sites of the road network plans are illustrated in Figure 13.4-1 to Figure 13.4-4.

Table 13.4-1 List of Road Development Projects

Project No.	Name of Road Development Plan Name	Size of Plan	Project Cost (1,000 US\$)
1. National and Regional Expressway Development Plans			
RP-01	Construction of Peripheral Road of Lima Section	31.0 km	331,425
RP-02	Construction of Peripheral Road of Callao Section	12.4 km	175,500
RP-03	Construction of Autopista Ramiro Prialé	19.0 km	121,500
RP-04	Improvement of Av. Panamericana Norte	16.0 km	122,520
RP-05	Improvement of Av. Canta – Callao	10.0 km	19,200
RP-06	Construction of Urban Peripheral of Puente Piedra - Lurigancho	37.7 km	68,290
RP-07	Construction of Urban Peripheral of Lurigancho - Ate	13.0 km	24,960
RP-08	Construction of Urban Peripheral of Ate - Pachacamac	15.0 km	33,830
RP-09	Construction of Urban Peripheral of Pachacamac	10.4 km	17,080
RP-10	Construction of Urban Peripheral of Pachacamac - San Bartolo	35.0 km	44,550
	Sub Total		958,855
2. Metropolitan Expressway Development Plans			
RP-11	Construction of Av. La Costa Verde of Lima	11.5 km	70,875
RP-12	Construction of Av. La Costa Verde of Callao	8.0 km	151,200
RP-13	Construction of Extension of Av. Paseo de la República in the South	5.0 km	62,100
RP-14	Improvement of Av. Nestor Gambetta	19.0 km	83,730
RP-15	Improvement of Av. Elmer Faucett	5.6 km	59,400
RP-16	Improvement of Av. Javier Prado	22.3 km	294,300
RP-17	Construction of Extension of Av. Paseo de la República in the North	3.8 km	206,550
	Sub Total		928,155
3. Arterial and Collector Road Development Plans			
RP-18	Improvement of Av. Universitaria	2.7 km	9,320
RP-19	Construction of Av. Próceres de Independencia - Av. Grau	3.3 km	22,950
RP-20	Construction of Rio Banba Bridge over Rio Rímac	1 unit	9,860
RP-21	Construction of Delgado de la Flor Bridge over Rio Rímac	1 unit	2,020
RP-22	Construction of Santa Rosa Tunnel	200 m	16,200
RP-23	Construction of Rímac Tunnel	300 m	24,300
RP-24	Construction of San Francisco Tunnel	270 m	24,300
RP-25	Intersection Improvement Plan Package-1	19 No.	76,950
RP-26	Intersection Improvement Plan Package-2	26 No.	54,050
RP-27	Intersection Improvement Plan Package-3	23 No.	31,050
RP-28	Widening of existing roads in Built Up Area	161.0 km	34,615
RP-29	Widening of existing roads in Vicinity Area	69.0 km	13,800
RP-30	Construction of Roads of New Housing Area	202.8 km	70,980
RP-31	Rehabilitation of Expressway	100.0 km	54,700
RP-32	Rehabilitation of Arterial Roads	567.0 km	22,963
RP-33	Rehabilitation of Collector Roads	691.0 km	18,657
	Sub Total		486,715
Total			2,373,725

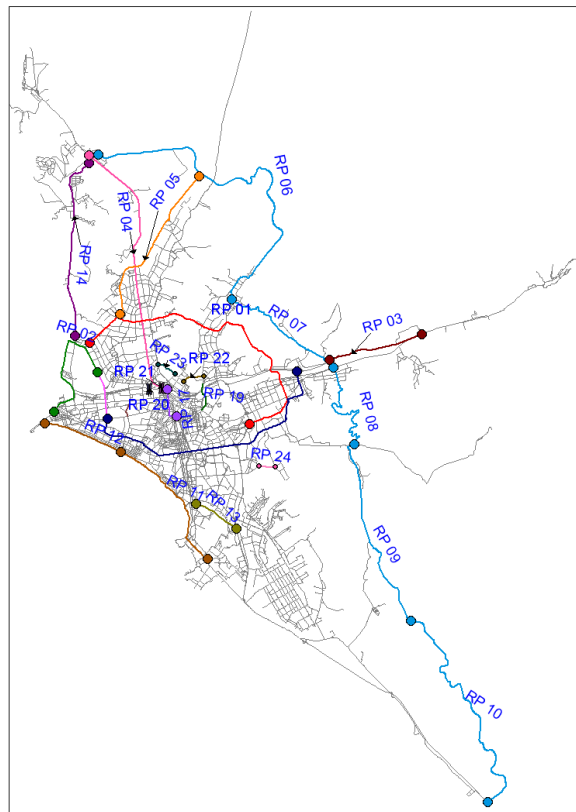


Figure 13.4-1 Location of Road Construction and Improvement Plans

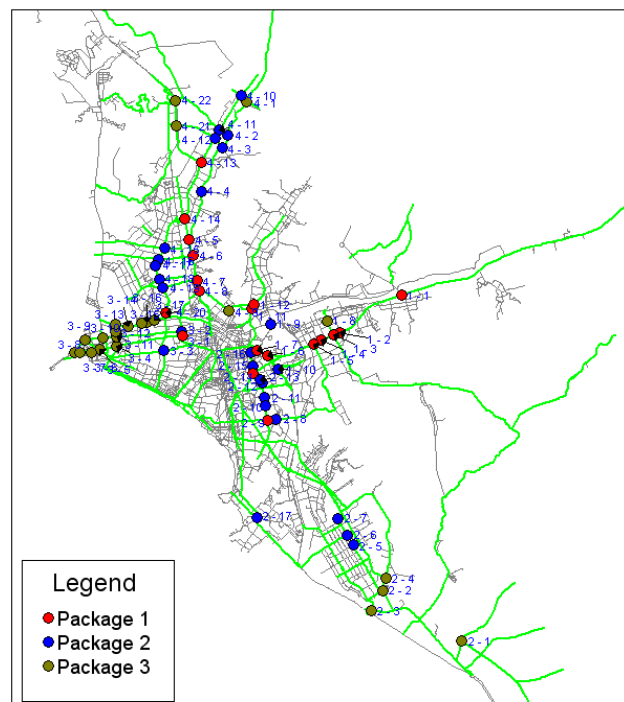


Figure 13.4-2 Location of Intersection Improvement Plans

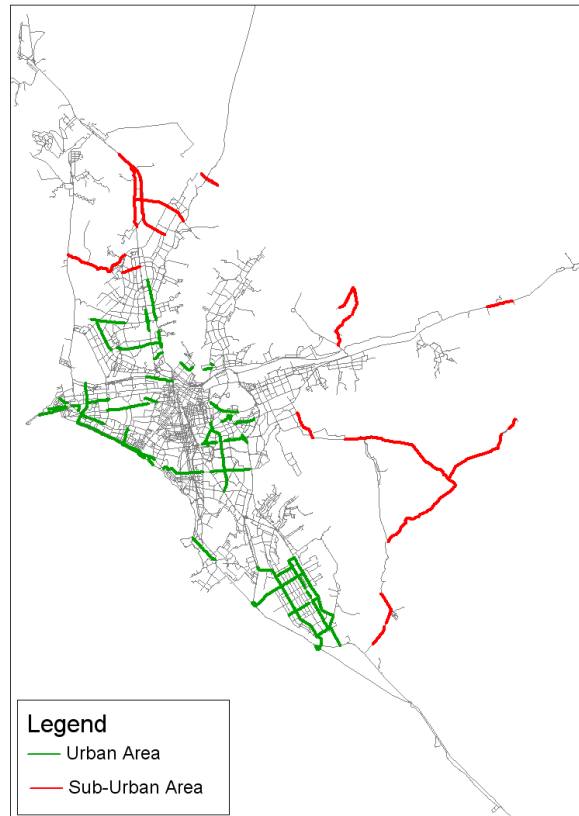


Figure 13.4-3 Location of Road Widening Plans



Figure 13.4-4 Location of Construction Roads in New Housing Area

13.4.2. OUTLINE OF PLANS

The outlines of road network plans identified are presented in the following tables.

(1) National and Regional Expressway Network Development Plan

Items	Contents of the Plan
Name of Plan	RP-01, Construction of Peripheral Road of Lima Section
Location	<ol style="list-style-type: none"> 1) The location of this road is shown in Figure 13.4-1 2) This road is connected between Callao central area to north part of Lima central area 3) The following districts are connected, at San Martín de Porras- Los Olivos- Independencia- San Juan de Lurigancho- Lurigancho Chosica- Ate Vitare- La Molina. 4) Road Segments are divided at 5 sections <ol style="list-style-type: none"> a) Section 1 = Faust to Naranjal b) Section 2 =Canta to Panamericana Norte via Callao c) Section 3 =Panamericana Norte to San Juan de Lurigancho d) Section 4 =San Juan de Lurigancho to Santa Anita e) Section 5 = Santa Anita to Vía de Evitamiento
Objectives	<ol style="list-style-type: none"> 1) The road is classified as regional expressway 2) The road is diversion road for the cargo transport from Callao to east provincials. 3) The road is formed as the one part of 2nd ring road network
Outline of Plan	<ol style="list-style-type: none"> 1) Design Speed=80km/h 2) Road Length=31.0km 3) Numbers of Lane= 6 Lane with Sidewalks 4) Right of Way width=48 m 5) There are two tunnels 6) 13 interchanges are constructed 7) About 2,300 houses (12,000 persons) may be re-settled (RP-01 and RP-02) 8) Some segments of the road are classified as new construction roads and other segments are classified as improvement of the existing roads.
Cost	<ol style="list-style-type: none"> 1) Construction Cost= US\$ 245,500,000 2) Project Cost= US\$ 331,425,000

Items	Contents of the Plan
Name of Plan	RP-02, Construction of Peripheral Road of Callao Section
Location	1) The location of road is shown in Figure 13.4-1 2) The road is connected at Callao port
Objectives	1) The road is classified as regional expressway 2) The road is diversion road for the cargo transport from Callao to east provincials. 3) The road is formed as the one part of 2nd ring road network
Outline of Plan	1) Design Speed=80km/h 2) Road Length=12.4 km 3) Numbers of Lane= 6 Lane with Sidewalks 4) Right of Way width=48 m 5) 4 interchanges are constructed 6) About 2,300 houses (12,000 persons) may be re-settled (RP-01 and RP-02) 7) Some segments of the road are classified as new construction roads and other segments are classified as improvement of the existing roads.
Cost	1) Construction Cost=US\$ 130,000,000 2) Project Cost= US\$ 175,500,000

Items	Contents of the Plan
Name of Plan	RP-03, Construction of Autopista Ramiro Prialé
Location	1) The location of this road is shown in Figure 13.4-1 2) This road is connected at San Juan de Lurigancho, Chaclacayo, and Ate Vitarte
Objectives	1) This road is extension of the existing Autopista Ramiro Prialé 2) The function of this road is classified as diversion route of Carretera Central
Outline of Plan	1) Road Length=19.0 km 2) The road is constructed as a new road 3) 3 interchanges are planned 4) 4-lane dual carriageway without sidewalks
Cost	1) Construction Cost=US\$ 90,000,000 2) Project Cost= US\$ 121,500,000

Items	Contents of the Plan
Name of Plan	RP-04, Improvement of Panamericana Norte
Location	1) The location of this road is shown in Figure 13.4-1 2) This road is connected at Puente Piedra, Comas, Los Olivos, and Independencia
Objectives	1) To mitigate the traffic congestion on the existing Panamericana Norte
Outline of Plan	1) Road Length=16.0 km 2) Numbers of lanes= 6-lane dual carriage way 3) 8 interchanges are planned 4) 14 intersections are planned
Cost	1) Construction Cost=US\$ 90,755,000 2) Project Cost= US\$ 122,520,000

Items	Contents of the Plan
Name of Plan	RP-05, Improvement of Av. Canta- Callao
Location	1) The location of this route is shown in Figure 13.4-1 2) This road is connected at Carabayllo, Comas, Los Olivos, and San Martin de Pores
Objectives	1) To ensure the smooth traffic flows from Comas and Callao
Outline of Plan	1) Road Length=10.0 km 2) Numbers of Carriage way =6 lane dual carriageway 3) 6 interchanges are planned 4) 8 intersections are planned
Cost	1) Construction Cost=US\$ 14,222,,000 2) Project Cost= US\$ 19,200,000

Items	Contents of the Plan
Name of Plan	RP-06, Construction of Urban Peripheral of Punta Piedra- Lurigancho
Location	1) The route is shown in Figure 13.4-1 2) The road segments are divided at 5 sections 3) This road section is connected at Puente Piedra- Carabayllo-Lurigancho
Objectives	1) This road is classified as outer ring road of Lima and Callao cities. 2) The function of this road is to divert the traffic flows passing through in the urbanized area. 3) The road is to contribute the decreasing traffic accidents and to increase the traffic congestion in the urbanized area.
Outline of Plan	1) Design speed = 60 to 80 km/h 2) Numbers of Lane= 4-lane dual carriageway with frontage roads 3) Road Length=37.7 km 4) New Road construction Length=25.2 km, Improvement road length =12.5 km of total road length. 5) 2 interchanges are planned 6) 2 intersections are planned
Cost	1) Construction Cost=US\$ 50,587,000 2) Project Cost= US\$ 68,290,000

Items	Contents of the Plan
Name of Plan	RP-07, Construction of Urban Peripheral of Lurigancho-Ate
Location	<ol style="list-style-type: none"> 1) The route is shown in Figure 13.4-1 2) The road segments are divided at 5 sections 3) This road section is connected at Lurigancho-Ate
Objectives	<ol style="list-style-type: none"> 1) This road is classified as outer ring road of Lima and Callao cities. 2) The function of this road is to divert the traffic flows passing through in the urbanized area. 3) The road is to contribute the decreasing traffic accidents and to increase the traffic congestion in the urbanized area.
Outline of Plan	<ol style="list-style-type: none"> 1) Design speed = 60 to 80 km/h 2) Numbers of Lane= 4-lane dual carriageway with frontage roads 3) Road Length=13.0 km 4) New Road construction Length=6.5 km, Improvement road length =6.5 km of total road length. 5) 2 intersections are planned
Cost	<ol style="list-style-type: none"> 1) Construction Cost=US\$ 18,489,000 2) Project Cost= US\$ 24,960,000

Items	Contents of the Plan
Name of Plan	RP-08, Construction of Urban Peripheral of Ate- Pachacamac
Location	<ol style="list-style-type: none"> 1) The route is shown in Figure 13.4-1 2) The road segments are divided at 5 sections 3) This road section is connected at Ate-Pachacamac
Objectives	<ol style="list-style-type: none"> 1) This road is classified as outer ring road of Lima and Callao cities. 2) The function of this road is to divert the traffic flows passing through in the urbanized area. 3) The road is to contribute the decreasing traffic accidents and to increase the traffic congestion in the urbanized area.
Outline of Plan	<ol style="list-style-type: none"> 1) Design speed = 60 to 80 km/h 2) Numbers of Lane= 4-lane dual carriageway with frontage roads 3) Road Length=15.0 km 4) New Road construction Length=11.1 km, Improvement road length =3.9 km of total road length. 5) 3 intersections are planned 6) 2 interchanges are planned
Cost	<ol style="list-style-type: none"> 1) Construction Cost=US\$ 20,062,000 2) Project Cost= US\$ 33,830,000

Items	Contents of the Plan
Name of Plan	RP-09, Construction of Urban Peripheral of Pachacamac
Location	<ol style="list-style-type: none"> 1) The route is shown in Figure 13.4-1 2) The road segments are divided at 5 sections 3) This road section is connected at Pachacamac
Objectives	<ol style="list-style-type: none"> 1) This road is classified as outer ring road of Lima and Callao cities. 2) The function of this road is to divert the traffic flows passing through in the urbanized area. 3) The road is to contribute the decreasing traffic accidents and to increase the traffic congestion in the urbanized area.
Outline of Plan	<ol style="list-style-type: none"> 1) Design speed = 60 to 80 km/h 2) Numbers of Lane= 4-lane dual carriageway with frontage roads 3) Road Length=10.4 km 4) New Road construction Length=9.5 km, Improvement road length =0.9 km of total road length. 5) 23intersections are planned
Cost	<ol style="list-style-type: none"> 1) Construction Cost=US\$ 12,652,000 2) Project Cost= US\$ 17,080,000

Items	Contents of the Plan
Name of Plan	RP-10, Construction of Urban Peripheral of Pachacamac-San Bartolo
Location	<ol style="list-style-type: none"> 1) The route is shown in Figure 13.4-1 2) The road segments are divided at 5 sections 3) This road section is connected at Pachacamac- San Bartilo
Objectives	<ol style="list-style-type: none"> 1) This road is classified as outer ring road of Lima and Callao cities. 2) The function of this road is to divert the traffic flows passing through in the urbanized area. 3) The road is to contribute the decreasing traffic accidents and to increase the traffic congestion in the urbanized area.
Outline of Plan	<ol style="list-style-type: none"> 1) Design speed = 60 to 80 km/h 2) Numbers of Lane= 4-lane dual carriageway with frontage roads 3) Road Length=35.0 km with new road construction 4) 3 intersections are planned
Cost	<ol style="list-style-type: none"> 1) Construction Cost=US\$ 33,000,000 2) Project Cost= US\$ 44,550,000

(2) Metropolitan Expressway Development plan

Items	Contents of the Plan
Name of Plan	RP-11, Construction of Av. La Costa Verde of Lima
Location	1) The route location is shown in Figure 13.4-1 2) The route is located along the coast of Miraflores
Objectives	1) The road is functioned for diversion of cargo traffic from Callao Port to south provincials. 2) The road is contribute to mitigate the traffic congestion of Av. Javier Prado 3) The road is formed as one part of trunk ring road network in urbanized area.
Outline of Plan	1) Road Length=11.5 km 2) Numbers of lane=6-Lane dual carriageway with sidewalks 3) Road is constructed to utilize on the existing seashore area 4) Concrete wall is constructed at the sea side for protection of sea water waves.
Cost	1) Construction Cost=US\$ 52,500,000 2) Project Cost= US\$ 70,875,000

Items	Contents of the Plan
Name of Plan	RP-12, Construction of Av. La Costa Verde of Callao
Location	1) The route location is shown in Figure 13.4-1 2) The route is located along the coast of Miraflores
Objectives	1) The road is functioned for diversion of cargo traffic from Callao Port to south provincials. 2) The road is contribute to mitigate the traffic congestion of Av. Javier Prado 3) The road is formed as one part of trunk ring road network in urbanized area.
Outline of Plan	1) Road Length=8.0 km 2) Numbers of lane=6-Lane dual carriageway with sidewalks 3) Road is constructed to utilize on the existing seashore area 4) Concrete wall is constructed at the sea side for protection of sea water waves.
Cost	1) Construction Cost=US\$ 112,000,000 2) Project Cost= US\$ 151,200,000

Items	Contents of the Plan
Name of Plan	RP-13, Construction of Extension of Av. Paseo de la República South
Location	<ol style="list-style-type: none"> 1) The route location is shown in Figure 13.4-1 2) The route is located at the extension of the existing Av. Paseo de la República 3) This road is connected at Barranc0, Santiago de Surco, and San Juan de Miraflores
Objectives	<ol style="list-style-type: none"> 1) The road is connected to the Costa Verde planned and be formed as the radial trunk road network in the coastal area of Miraflores 2) The road is to contribute to mitigation of traffic congestion on the Av. Panamericana South. 3) This road is functioned as the one of trunk ring road in urbanized area of Lima and Callao.
Outline of Plan	<ol style="list-style-type: none"> 1) Road Length= 5.0 km 2) Numbers of Lane=6-lane dual carriageway with frontage roads 3) 2 interchanges are planned 4) 6 grade separated intersections are planned 5) 5 pedestrian bridges are planned 6) Re-settlements problems are occurred.
Cost	<ol style="list-style-type: none"> 1) Construction Cost=US\$ 46,000,000 2) Project Cost= US\$ 62,100,000

Items	Contents of the Plan
Name of Plan	RP-14, Improvement of Av. Nestor Gambeta
Location	<ol style="list-style-type: none"> 1) The route location is shown in Figure 13.4-1 2) The route is located in Ventanilla and Callao areas
Objectives	<ol style="list-style-type: none"> 1) This road is to contribute the mitigation of traffic congestion on the Av. Panamericana north, and also in the areas of Ventanilla and Callao. 2) The road is utilized for diversion route of cargo traffic from Callao to north provincials.
Outline of Plan	<ol style="list-style-type: none"> 1) Road length = 19.0 km 2) Numbers of lane=6-lane dual carriageway with frontage roads 3) 6 intersections are planned 4) 2 interchanges are planned
Cost	<ol style="list-style-type: none"> 1) Construction Cost=US\$ 45,030,000 2) Project Cost= US\$ 83,730,000

Items	Contents of the Plan
Name of Plan	RP-15, Improvement of Av. Elmer Faucett
Location	<ol style="list-style-type: none"> 1) The route location is shown in Figure 13.4-1 2) The route is located in front of Callao airport
Objectives	<ol style="list-style-type: none"> 1) To mitigate the traffic congestion on the existing Av. Faucett
Outline of Plan	<ol style="list-style-type: none"> 1) Road Length = 5.6 km 2) Numbers of Lane=6-Lane dual carriageway with frontage roads 3) 5 interchanges are planned 4) 10 pedestrian bridges are planned
Cost	<ol style="list-style-type: none"> 1) Construction Cost=US\$ 44,000,000 2) Project Cost= US\$ 59,400,000

Items	Contents of the Plan
Name of Plan	RP-16, Improvement of Av. Javier Prado
Location	1) The route location is shown in Figure 13.4-1 2) The site is north part of the existing Av. Javier Prado
Objectives	1) To mitigate the traffic congestion on the Av. Javier Prado 2) To reinforce the trunk ring road network in urbanized area
Outline of Plan	1) Road Length=22.3 km 2) Numbers of Lane=6-Lane dual carriageway with frontage roads 3) 29 grade separated intersections are planned 4) 20 pedestrian bridges are planned
Cost	1) Construction Cost=US\$ 218,000,000 2) Project Cost= US\$ 294,300,000

Items	Contents of the Plan
Name of Plan	RP-17, Construction of Extension of Av, Paseo de la República North
Location	1) The route location is shown in Figure 13.4-1 2) The road is located on the existing Av. Paseo de la República (Av. Ugarte)
Objectives	1) To mitigate traffic congestion on the Paseo de la República 2) To reinforce the trunk radial roads in urbanized area
Outline of Plan	1) Road Length=3.8 km 2) Numbers of lane=6-Lane dual carriageway with frontage roads 3) Type of Road Structure= Concrete Wall 4) The road is formed as one part of COSAC project 5) COSAC project is under construction
Cost	1) Construction Cost=US\$ 153,000,000 2) Project Cost= US\$ 206,550,000

(3) Arterial and Collector Roads Network Development Plan

Items	Contents of the Plan
Name of Plan	RP-18, Improvement of Av. Universitaria
Location	1) The route location is shown in Figure 13.4-1 2) This route is located on the existing Av. Universitaria
Objectives	1) To mitigate the traffic conditions on Av. Universitaria 2) To contribute traffic congestions in Los Oivos and Comas
Outline of Plan	1) Road Length=2.7 km 2) The road is widened to 4-lane to 6-lane 3) 2 grade separated intersections are planned
Cost	1) Construction Cost=US\$ 6,900,000 2) Project Cost= US\$ 9,320,000

Items	Contents of the Plan
Name of Plan	RP-19, Construction of Av. Próceres of Av. Independencia – Av. Grau
Location	1) The route location is shown in Figure 13.4-1 2) The route connects San Juan de Lurigancho to Lima center
Objectives	1) This road is formed as a part of inner ring road network 2) The road is to contribute the mitigation of traffic conditions at Lurigancho area
Outline of Plan	1) Road Length=3.3 km 2) railway over bridge is planned 3) 1 Rio Rimac over bridge is planned 4) 1 interchange is planned
Cost	1) Construction Cost=US\$ 17,000,000 2) Project Cost= US\$ 22,950,000

Items	Contents of the Plan
Name of Plan	RP-20, Construction of Riobamba Bridge over Rio Rimac
Location	1) The bridge is located at Riobamba over Rio Rimac
Objectives	1) The bridge is connect Rimac and San Martin Districts
Outline of Plan	1) New bridge is constructed 2) 4-lane bridge is planned
Cost	1) Construction Cost=US\$ 7,300,000 2) Project Cost= US\$ 9,860,000

Items	Contents of the Plan
Name of Plan	RP-21 Construction of Delgado de la Flor Bridge over Rio Rimac
Location	1) The bridge is located at Degado de la Flor over Rio Rimac
Objectives	1) The bridge is connect Rimac and San Martin Districts
Outline of Plan	1) 2-lane bridge is planned 2) New bridge is constructed
Cost	1) Construction Cost=US\$ 1,500,000 2) Project Cost= US\$ 2,020,000

Items	Contents of the Plan
Name of Plan	RP-22, Construction of Santa Rosa Tunnel
Location	1) The tunnel is located at Santa Rosa
Objectives	1) The tunnel is connected as arterial road network
Outline of Plan	1) Tunnel Length=200m
Cost	1) Construction Cost=US\$ 12,000,000 2) Project Cost= US\$ 16,200,000

Items	Contents of the Plan
Name of Plan	RP-23, Construction of Rimac Bridge
Location	1) The tunnel is located at Rimac District
Objectives	1) The tunnel is formed as one of segment of inner ring road network
Outline of Plan	1) Tunnel length=300m
Cost	1) Construction Cost=US\$ 18,000,000 2) Project Cost= US\$ 24,300,000

Items	Contents of the Plan
Name of Plan	RP-24, Construction of San Francisco Tunnel
Location	1) The tunnel is located at Santiago de Surco of la Molina District
Objectives	1) The tunnel is formed as one of segment of arterial road network
Outline of Plan	1) Tunnel Length=270 m
Cost	1) Construction Cost=US\$ 18,000,000 2) Project Cost= US\$ 24,300,000

Items	Contents of the Plan
Name of Plan	RP-25, Intersection Improvement Plan- Package-1
Location	1) Intersection improved site is shown in Figure 13.4-2
Objectives	1) To contribute decreasing traffic accidents and to keep smooth traffic flows 2) To increase traffic capacity 3) To mitigate traffic congestion
Outline of Plan	1) At grade intersections are improved 2) Grade separated intersections are constructed 3) Total 19 intersections are improved
Cost	1) Construction Cost=US\$ 57,000,000 2) Project Cost= US\$ 76,950,000

Items	Contents of the Plan
Name of Plan	RP-26, Intersection Improvement Plan- Package-2
Location	1) Intersection improved site is shown in Figure 13.4-2
Objectives	1) To contribute decreasing traffic accidents and to keep smooth traffic flows 2) To increase traffic capacity 3) To mitigate traffic congestion
Outline of Plan	1) At grade intersections are improved 2) Grade separated intersections are constructed 3) Total 21 intersections are improved
Cost	1) Construction Cost=US\$ 18,000,000 2) Project Cost= US\$ 54,050,000

Items	Contents of the Plan
Name of Plan	RP-27, Intersection Improvement Plan- Package-3
Location	1) Intersection improved site is shown in Figure 13.4-2
Objectives	1) To contribute decreasing traffic accidents and to keep smooth traffic flows 2) To increase traffic capacity 3) To mitigate traffic congestion
Outline of Plan	1) At grade intersections are improved 2) Grade separated intersections are constructed 3) Total 21 intersections are improved
Cost	1) Construction Cost=US\$ 23,000,000 2) Project Cost= US\$ 31,050,000

Items	Contents of the Plan
Name of Plan	RP-28, Widening of Existing Road in Built Up Area
Location	1) The roads widen are located within built up area
Objectives	1) To increase traffic capacity 2) To mitigate traffic congestion
Outline of Plan	1) Road Length=161 km
Cost	1) Construction Cost=US\$ 25,640,000 2) Project Cost= US\$ 34,615,000

Items	Contents of the Plan
Name of Plan	RP-29, Widening of Existing Road in Vicinity Area
Location	1) The roads widen are located in vicinity area
Objectives	1) To increase traffic capacity 2) To mitigate traffic congestion
Outline of Plan	1) Road Length=69km
Cost	1) Construction Cost=US\$ 10,222,000 2) Project Cost= US\$ 13,800,000

Items	Contents of the Plan
Name of Plan	RP-30, Construction of Roads in New Housing Areas
Location	1) The routes are shown in Figure 13.4-4
Objectives	1) The roads will be constructed accordance with progress of housing development 2) To ensure transport network in new housing area
Outline of Plan	1) Road Length=202.8 km 2) New road construction and improvement of existing road are planned
Cost	1) Construction Cost=US\$ 52,578,000 2) Project Cost= US\$ 70,980,000

Items	Contents of the Plan
Name of Plan	RP-31, Rehabilitation of Expressway
Location	1) Roads of Expressway
Objectives	1) To ensure smooth traffic flows 2) To increase traffic capacity 3) To mitigate traffic congestion
Outline of Plan	1) Improvement of traffic lane marker 2) Rehabilitation of pavement 3) Rehabilitation of traffic signal and information 4) Road Length=100km
Cost	1) Construction Cost=US\$ 40,518,000 2) Project Cost= US\$ 54,700,000

Items	Contents of the Plan
Name of Plan	RP-32, Rehabilitation of Arterial Road
Location	1) Roads of Arterial
Objectives	1) To ensure smooth traffic flows 2) To increase traffic capacity 3) To mitigate traffic congestion
Outline of Plan	1) Improvement of traffic lane marker 2) Rehabilitation of pavement 3) Rehabilitation of traffic signal and information 4) Road Length=567km
Cost	1) Construction Cost=US\$ 17,009,000 2) Project Cost= US\$ 22,963,000

Items	Contents of the Plan
Name of Plan	RP-33, Rehabilitation of Collector Road
Location	1) Roads of Collector
Objectives	1) To ensure smooth traffic flows 2) To increase traffic capacity 3) To mitigate traffic congestion
Outline of Plan	1) Improvement of traffic lane marker 2) Rehabilitation of pavement 3) Rehabilitation of traffic signal and information 4) Road length=691km
Cost	1) Construction Cost=US\$ 13,820,000 2) Project Cost= US\$ 18,657,000

13.4.3. PROJECT COST ESTIMATE FOR ROAD FACILITIES DEVELOPMENT PLANS

Basically, the construction cost of each project formulated in this study is estimated based on the results of the formerly construction cost estimated by Peruvian side. The construction cost including direct and in-direct construction cost, land acquisition cost, and compensation.

The project cost of each plan is including the construction cost, engineering cost for road design and construction supervision, administration of project implementation, and contingencies cost.

The project cost is calculated the following conditions.

- a) Construction cost(A)
- b) Engineering cost=(A)*10%
- c) Administration cost=(A)*10%
- d) Contingencies cost=(A)*15%

The results of the project cost estimated by US\$ for road network plans are summarized in Table 13.4-1 previous mentioned.