

## CHAPTER 3

### COTENTS OF THE PROJECT

## **Chapter 3 Contents of the Project**

### **3-1 Basic Concept of the Project**

#### (1) Overall Goal and Purpose of the Project

The objectives of this survey are to understand the background, purpose and contents of the Project and to determine an optimal design and estimate the project cost based on the analysis of the technical and economic relevance assuming the application of Japan's grant aid for the project implementation. Besides, the contents of tasks to be undertaken by the recipient country and the plan for implementation and operation/maintenance management will be proposed in order to achieve the project outputs and purpose.

Overall Goal: This project aims to contribute to the overall development of Karachi City by enhancing industrial activities in the city.

Project Purpose: Traffic congestion on N5 in Karachi City and access to the city centre from the suburbs will be improved.

#### (2) Outline of the Project

In order to achieve the said goal and purpose, the Project intends to utilize Japan's Grant Aid to widen the Quaidabad – Pakistan Steel Intersection of N5 from 4 lanes to 6 lanes for approx. 11 km, rehabilitate the pavement and construct service roads and facilities for traffic management and safety.

### **3-2 Outline Design of the Japanese Assistance**

#### **3-2-1 Design Policy**

##### (1) Basic Policy

In response to the request for the Project components from Pakistani side, the basic policy of the Project is proposed as follows;

##### 1) Target Section

Target section of the Project is approximately 100m east from the edge of Quaidabad Flyover to Pakistan Steel Intersection, the boundary of jurisdiction between NHA and KMC, as requested by the Pakistani side. The length of the target section is approximately 11km.

The target section of the Project is consistent with the policy of Pakistani side as KMC is planning to widen the existing N5 to 6 lanes from the city centre to Quaidabad Flyover.

##### 2) ROW

150 ft ROW of N5 had been secured and its property had been transferred to KMC in 1999. The Existing ROW should be utilised as the alignment of the existing road is almost fulfilled with the requirement of the planned road. Therefore, the centreline of the planned road basically traces that of the existing road so that the ROW whose edge is 75 ft from the existing centreline accommodates the planned road. However, the alignment on a part of the target section shall be reviewed to be fulfilled with the design speed and to minimise the social impact even though land acquisition will not be required.

### 3) Project Component

a) Rehabilitation and Improvement of Pavement: Existing pavement is demolished and new pavement layer is constructed on the existing ground so as not to damage the underground utilities by raising the future road elevation.

b) Widening of Carriageway: The existing 4-lane carriageway is widened to 6 lane for the whole section as the future traffic demand is expected to exceed the 4-lane traffic capacity in the near future.

c) Service Road: Service roads are installed on either side and are each approximately 6km in length, based on the discussions with KMC, where shops, buildings, factories and houses are densely located along roadside to separate the intra-regional and inter-regional traffic.

d) Traffic Management Facility: Traffic signals and pedestrian crossings are installed at major 4 intersections in the Project site.

e) Drainage Facility: Drainage facilities are installed along the whole section since there are few drainage facilities on the existing road. Existing road crossing culverts are demolished and new culverts are constructed as most of them do not connect with the drainage destination and they are inactive. Thus new drainage network to the proper destination and roadside ditches are also constructed in the Project.

f) Bus Stop: Bus stops are installed at approximately 1km interval and near the intersections on either side based on the discussions with KMC.

g) Pedestrian Bridge: Approximately 2 pedestrian bridges are considered to be installed between Cattle Colony Intersection and Port Qasim Intersection because of the long distance between intersections with the pedestrian crossings and signals.

h) Road crossing duct: Road crossing ducts are installed at approximately 1km interval for the road crossing of public utilities such as water pipes, electric cables, telecommunication cables and gas pipes in the future.

### (2) Design Standard

AASHTO is applied to the road design and the pavement design, since there is no original standard of the road design in Pakistan and AASHTO is generally used for road design in Pakistan. On the other hand, an original standard, West Pakistan Highway Code which is applied to the structure design and drainage design, while the general drainage design follows AASHTO. Table 3-2-1 shows the design standards applied in this project.

**Table 3-2-1 Design Standards**

Road design (geometric structural standard)	AASHTO 2011
Drainage design	West Pakistan Highway Code / AASHTO 2014
Pavement design	AASHTO 1993

Structural design	West Pakistan Highway Code
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### (3) Design Criteria

Main design criteria are shown in Table 3-2-2.

**Table 3-2-2 Design Conditions**

Item		Description
Design Speed		80 Km/hr
Carriageway		3.65m x 6 Lane
Shoulder		0 to 3.0m (depend on location)
Central Median		0.5 to 2.0m (depend on location)
Service Road		3.0 to 5.5m (depend on location)
Footpath		1.5 to 3.0m (depend on location)
Max Cross fall		2.0%
Gradient		Max 7% Min 0.3%
Min Curve Radius		280m
Embankment slope	Ordinary soil	1:1.5~4.0 (depend on soil type)
Excavation slope	Solid rock	1:0.5
	Decomposed rock	1:0.75
	Other than rock	1:1.0~1.5 (depend on soil type)
Pavement design life		10 years
Traffic Load		Max. Axle 12 ton (Max. gross vehicle weight 61.5 ton)
Pavement structure	Carriageway	Surface: Wearing=AC(asphaltic concrete), Binder=AC Base: Dense bitumen macadam and Crushed aggregate Sub Base: Granular material
	Service road	Surface: Interlocking block Base: Crushed aggregate or Granular material
	Bus stop	Surface: Wearing=AC, Binder=AC Base: Crushed aggregate
	Footpath /Service road reserve	Surface: Interlocking block Base: Granular material
Drainage	Design Return period	Road crossing culvert 10 years, Ditch 5years

### 3-2-2 Basic Plan

#### (1) Overall Plan

Figure 3-2-1 shows the overall layout plan based on the above design policy and its summary is as follows;

- The existing 4-lane carriageway will be widened to 6 lanes for the whole section.
- In order to separate the intra-regional and inter-regional traffic, the service roads will be constructed in areas where roadside develops. Based on the discussion with KMC, service

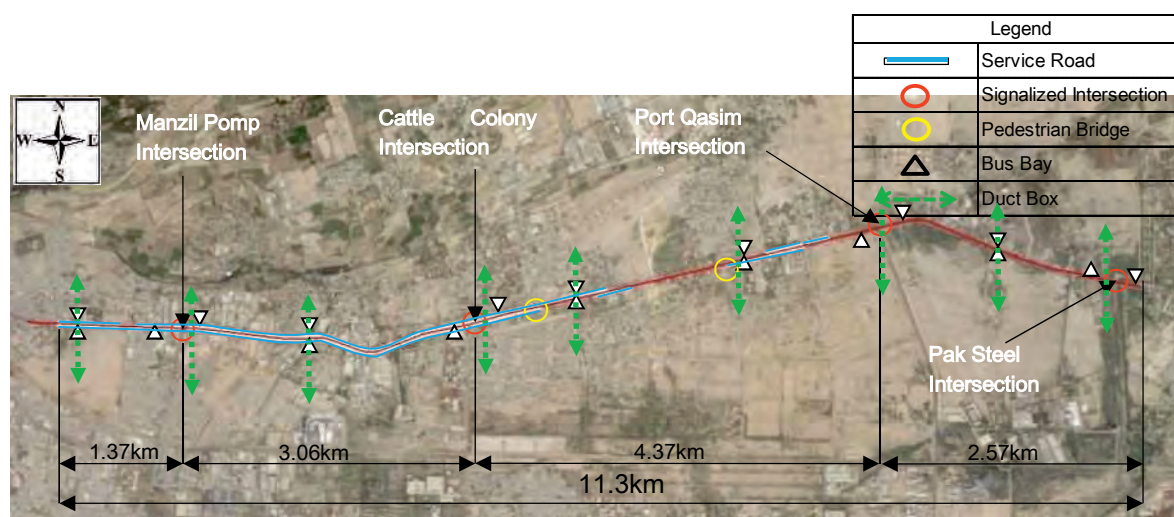
roads will be constructed on either side over approximately 57% of the section comprising mainly the built-up area between the project beginning point and Cattle Colony Intersection as shown in Table 3-2-3.

- Even though service roads will not be constructed in other non-developed areas, enough spaces will be secured so that the Pakistani side can construct service roads according to the development conditions in the future.

**Table 3-2-3 Scope of the service road**

Left Hand Side(LHS)		Right Hand Side (RHS)		Remarks
Station	Distance (km)	Station	Distance (km)	
No.0 - No.4+380	4.38	No.0 - No.4+380	4.38	From start point to Cattle Colony Intersection
No.4+380-No.5+860	1.48	No.4+380-No.5+140	0.76	
No.7+540-No.8+220	0.68	No.5+740-No.6+120	0.38	
		No.7+120-No.7+940	0.82	
Sub Total	6.54	Sub Total	6.34	Total : 12.88 (km) 57% of the entire section

- Traffic signals will be installed at the 4 main intersections on the target section. Pedestrian crossings and pedestrian signals will also be installed at the intersections.
- Between Cattle Colony Intersection and Qasim Port Intersection, many roadside stores and two universities, etc. (No.5+120, No.7+100) are located. Also, many pedestrians are observed crossing the road (50~200 people/15 minutes) at 2 locations among them. Therefore, the installation of pedestrian bridges is examined at the 2 locations.
- Bus stops will be installed around the main intersections and at intervals of 1 km on sections where the interval between intersections is long.
- Road crossing ducts are installed at approximately 1km interval for the road crossing of public utilities such as water pipes, electric cables, telecommunication cables and gas pipes in the future.



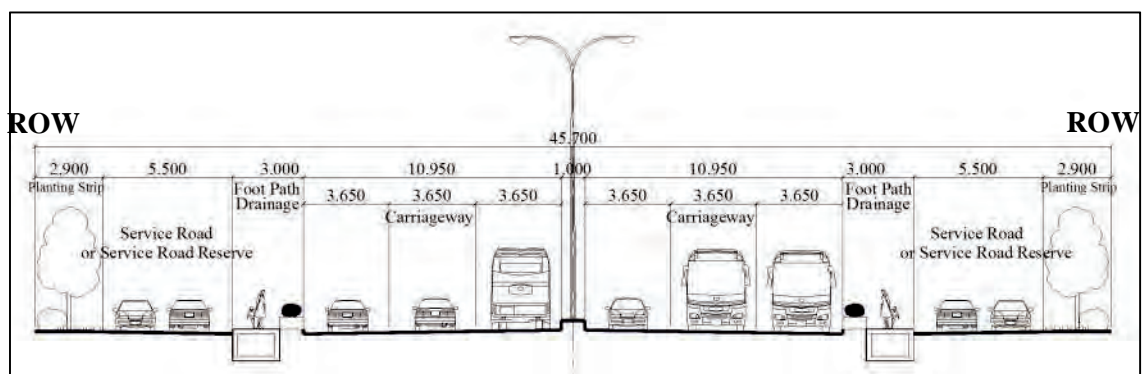
Source: Survey Team

**Figure 3-2-1 Overall Plan**

(2) Cross-section

Figure 3-2-2 shows the standard cross section of the planned road. The existing ROW of 150ft (45.7m) will be effectively utilized in determining the road cross section. The cross section is composed of six-lane carriageway whose width is 3.65m per lane and the service road having enough width for dual traffic in accordance with the AASHTO standard. Also, a green belt made of planting trees will be installed at the road edge so that ROW can be clearly identified.

Concerning the roadside ditches, it has been decided to install either box culverts or covered U-shaped ditches at the roadsides and to utilize the space above for the footpath based upon the discussions with KMC and examples of similar roads in Karachi City. Also, flower pots will be installed between the edge of the carriageway and the footpath in order to separate the carriageway from the footpath. Concerning the position of the roadside ditches, it has been decided to install them adjacent to the carriageway based on the comparison with an alternative installing them at the edge of the ROW through discussions with KMC. KMC insisted the risk of the alternative that sewerage water from private facilities might be discharged into the roadside ditches. Hence, KMC and the Survey Team propose the position of roadside ditches as shown in Figure 3-2-2.



Source: Survey Team

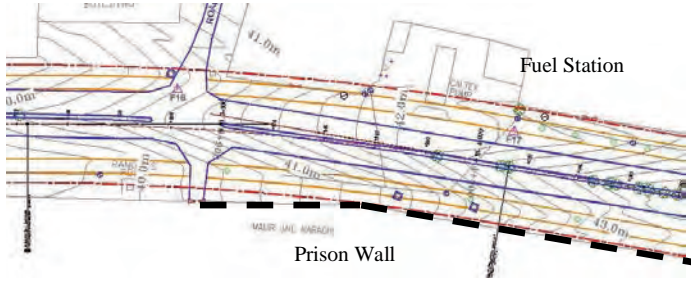
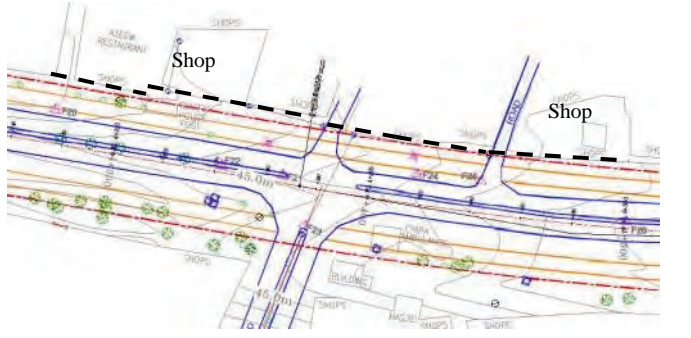
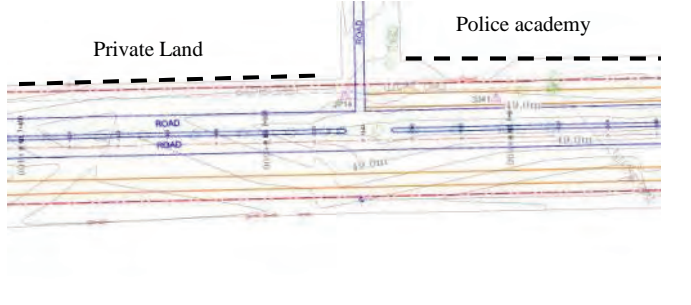
**Figure 3-2-2 Typical Cross Section**

- (3) Horizontal and vertical alignment
  - 1) Horizontal alignment

Basically, the centerline of the planned road will trace the existing one to utilize the ROW. However, the alignment is modified in some area in order to fulfill with the design speed and to minimize social impacts such as relocations. Table 3-2-4 shows the main control points of the horizontal alignment.

**Table 3-2-4 Control Points of Horizontal Alignment**

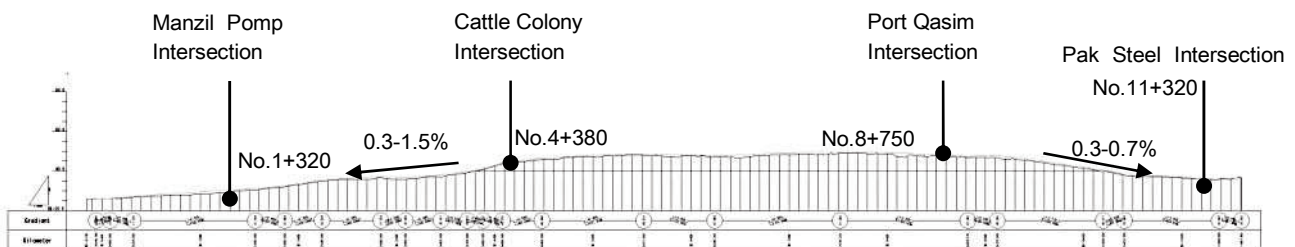
Station	Description	Image
No.0+800	To avoid a grave yard within the ROW since there is no access point around the grave yard	

<p>Around No.4</p>	<p>To modify alignment so as to avoid the prison wall on the south side.</p>	
<p>Around No.5</p>	<p>To modify the existing alignment so as to avoid the structures of shops on the north side.</p>	
<p>Around No.7+500</p>	<p>To modify alignment so as to avoid the private land on the north side.</p>	

Source: Survey Team

2) Vertical alignment

As shown in Figure 3-2-3, the vertical alignment of the existing road between Cattle Colony Intersection and Qasim Port Intersection is almost flat and it declines towards the start and end points at a gradient of no more than 1.5% with few undulations. The planned road level will be raised in order to protect the underground utilities. Also, the minimum gradient is 0.3% for the drainage.



Source: Survey Team

Figure 3-2-3 Vertical Alignment of Existing Road

### 3) Geometric standard values and adopted values in the Project

The geometric standard will be based on AASHTO. Table 4 shows the standard values and the values adopted in the Project.

**Table 3-2-5 Geometric Standard and Adopted Value in the Project**

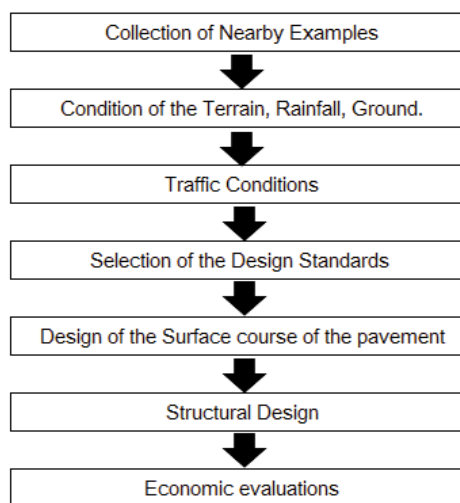
Design Element	Unit	Standards	Adoption
Design Speed	km/h	80	80
Min. Stopping Sight Distance	m	130	over 130
Min. Passing Sight Distance	m	540	over 540
Min. Horizontal Curve Radius	m	280	350
Min. Length of Curve	$\theta \geq 7$ m	140	245
Max. Gradient	%	7	Maximum 1.5
Minimum Gradient	%	0.3	0.3
Maximum Superelevation	%	4.0	Not applicable
Coefficient of Stopping Sight Distance for Crest Vertical Curve	Kmin	26	over 26
Coefficient of Stopping Sight Distance for Sag Vertical Curve	Kmin	30	over 30
Normal Cross fall	%	2.0	2.0
Shoulder Cross fall	%	2.0	2.0
Right of Way	ft(m)	150(45.7)	150(45.7)*

\* Note: except a grave yard within the ROW around the No.0+800.

### (4) Pavement Design

#### 1) Pavement design workflow

The pavement design is considered based on the workflow shown on the right. The each item in the workflow are described below.



#### 2) Collection of similar examples in Karachi

##### 2-1) Existing road

Since the road was constructed in the 1960s, it is supposed that the overlay of pavement had been done as repair works. The repair work has periodically been carried out according to growing traffic volume and the damage of pavement. The current composition of the pavement is as follows.

- Surface course: Asphalt concrete (AC) 5-15cm
- Base: Graded crush stones 15-30cm
- Subbase course: Natural granular materials

Since the reports of Equivalent Single Axle Load (ESAL) for the target road have not been maintained, it is supposed that the target road has been constructed based on similar examples and experiences. Currently, cracks can be seen on the pavement over the entire sections and alligator cracks have also been seen in places. Even though some potholes disturb the traffic flow after the rainfall, the Survey Team confirmed that no serious traffic block due to the



pavement deterioration happened at present.

### 2-2) Case of the 8,000ft road

The pavement composition of the 8,000ft road is shown below. The ESAL is not mentioned in the design report and its information was not obtained from the local consultant that was in charge of the pavement design.

The 8,000 ft road connects Karachi Port to N5 and contributes to large vehicles going to inland areas. Although it currently carries more than 60,000 vehicles per day, there is no serious cracks or ruts, etc. on it.

- Surface course: Asphalt concrete 5 cm (Straight asphalt)
- Binder course: Asphalt concrete 8 cm (Straight asphalt)
- Upper subbase: Graded crushed stones 30cm
- Subbase course: Natural granular materials 15cm (total 58cm)
- Design CBR: 10, Pavement Design Life: 10 years

### 3) Natural Conditions

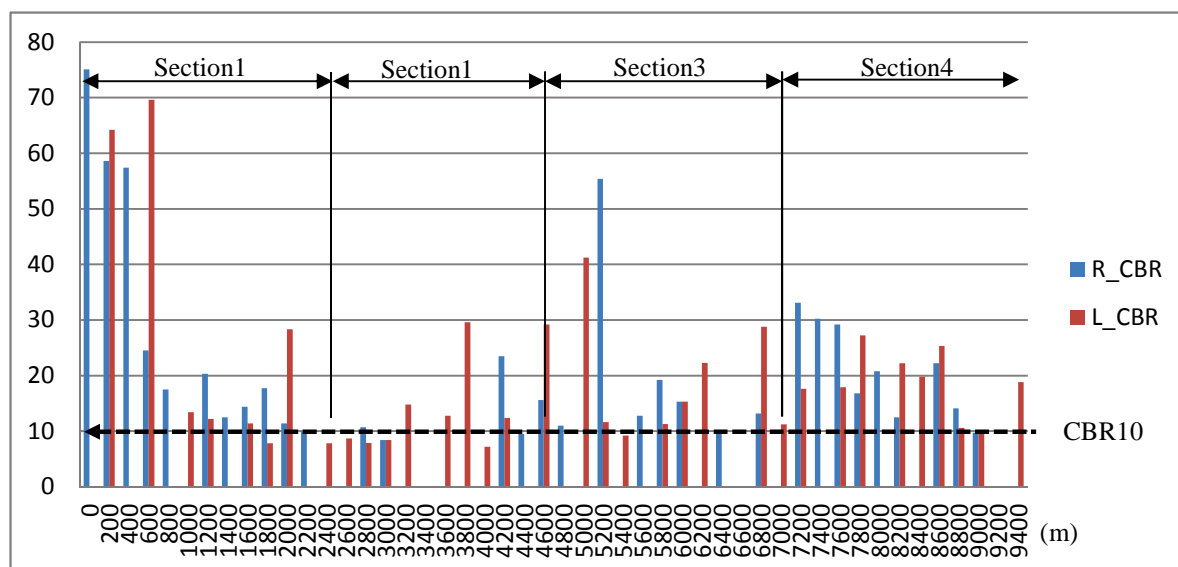
#### 3-1) In-situ Tests

The Survey Team conducted the tests shown in Table 3-2-6 in order to obtain the necessary data for the pavement design.

**Table 3-2-6 In-situ Tests for Pavement Design**

Objective	Test	Description
To understand the characteristics of the existing road materials in ROW	CBR test	Confirmation of the bearing capacity of existing subgrade material.
	DCP test	Confirmation of the bearing capacity of existing subgrade material. (to be compared with CBR test result and calibrated)
	Sampling test	Confirmation of soil type and groundwater level of materials in ROW
To understand the characteristics of the road materials under the existing carriageway	FWD test	Confirmation of the bearing capacity of the existing pavement
	Test Pit	Confirmation of layer thickness, soil type and groundwater level of the existing pavement

(CBR test result)



Section1 : Beginning point ~Manzil Pomp intersection

Section2 : Manizil Pomp intersection ~Cattle Colony intersection

Section3 : Cattle Colony intersection~Port Qasim intersection

Section4 : Port Qasim intersection~End point

### 3-2) Condition of the geography, rainfall and ground conditions

As a result of the topographic survey, there are no sag points that could cause serious water accumulation on any part of the target road. However, the road drainage facilities have not been installed in some points, especially at sag points such as the area around Manzil Pump Intersection at 1.2km. According to the local residents, they had experienced the temporary flooding during the rainy season in some locations. So, it is supposed that installing drainage facilities could improve this drainage conditions and negative impacts on pavement because the annual rainfall in the target area is limited. Furthermore, the Survey Team has not seen any areas with high groundwater level or defective soil so far through the field survey.

Temperature is around 14 deg C in the winter season and exceeds 40 deg C in the summer season. Since the temperature is high through the daytime and the nighttime, it will be necessary to consider the pavement against the plastic flow. The temperature of the pavement surface measured in the field survey in June 2015 was 55~59 deg C.

### 4) Examination of the design condition of pavement

#### 4-1) Traffic Conditions

The traffic survey by vehicle type and by direction was conducted at five major intersections on the target road section in March 2015. Also, the axle load of vehicles passing the target road was measured from May 11th to 13th in 2015. Table 3-2-7 and 3-2-8 show the result of the traffic survey and Table 3-2-9 shows the result of the axle load survey.

**Table 3-2-7 Traffic Survey Result at Manzil Pomp intersection (Sta. 1.2km)**

Type	Taxi, Rickshaw	Sedan	Bus		Truck		Trailer				Total (Vehicle)
			Mini	Large	Light	2 Axles	3 Axles	4 Axles	5 Axles	6 Axles	
Start→End	3,209	6,148	1,654	693	1,295	774	241	140	20	27	14,201
End→Start	2,906	5,518	2,287	834	1,918	988	627	282	147	85	15,592
Total	6,115	11,666	3,941	1,527	3,213	1,762	868	422	167	112	29,793

Source: Survey Team

**Table 3-2-8 Traffic Survey Result at the Port Qasim intersection(Sta. 8.7km)**

Type	Taxi, Rickshaw	Sedan	Bus		Truck		Trailer				Total (Vehicle)
			Mini	Large	Light	2 Axles	3 Axles	4 Axles	5 Axles	6 Axles	
Start→End	1,144	4,593	1,406	791	952	690	690	479	319	317	11,371
End→Start	774	2,070	1,149	687	1,297	860	676	289	174	104	8,080
Total	1,918	6,663	2,555	1,478	2,249	1,540	1,366	768	493	421	19,451

Source: Survey Team

**Table 3-2-9 Result of the Axle Load Survey (kg)**

Sample No.	Front Axle	Rear1	Rear2	Rear3	Rear4	Rear5	Rear6	Total
Average	5,987	14,231	15,786	12,795	19,160	15,090	—	34,882

Source: Survey Team

Note : 25 Samples obtained

According to the above survey, the commercial vehicle ratio in the target road is high,

especially more than 30% of large vehicle ratio is confirmed around Qasim Port Intersection. Moreover, it is supposed that large vehicles using the road will continue to increase considering the increase of commercial vehicles coming from Karachi Port and the expansion plan of Qasim Port and surrounding factory facilities (Bin Qasim Area) and so on. Also, it was confirmed that the axle loads measured in the survey extremely exceeded the weight limit in Pakistan, 11~12 tons per axle.

#### 4-2) Design Standards

The pavement design shall comply with AASHTO standard. In addition, the design condition of the axle load refers to NHA standard.

#### 4-3) Surface course of the pavement

The Pakistani side initially proposed that the concrete pavement could be adopted on the outermost lane (third lane from the center) because of the high large vehicle ratio. However, it seems impossible to control the large vehicles to run the outermost lane only because of the vehicles going to and coming from Qasim Port Road and Pakistan Steel Road. Moreover, in case of the concrete pavement on the outermost lane only, the level difference might arise at the connection with the asphalt pavement due to lane changes by large-sized vehicles and the penetration of rainwater from such level difference might cause the damage of the pavement. Hence, the asphalt concrete pavement will be adopted on all lanes..

However, modified asphalt pavement is suggested to the surface course since the traffic volume of heavy vehicle is large. It is superior in plastic flow resistant and wear resistance.

#### 4-4) Structural Design

The pavement design life shall be 10 years as with the 8,000ft road. Also, the required Structural Number (SN) will be calculated and structural design of pavement will be carried out in accordance with the AASHTO formula. The minimum requirement of the pavement thickness of AASHTO will be checked according to the axle load.

### 5) Pavement Design

Table 3-2-10 shows the conditions used in calculating the ESAL.

**Table 3-2-10 Condition for ESAL Calculation**

Traffic growth rate for commercial vehicle	2.5% (by the traffic demand forecast)
Direction coefficient	52% (End point → Beginning point, Around the Manzil pomp intersection) 58% (Beginning point → End point, Around the Port Qasim intersection)
Lane coefficient	70% (3 lanes on each side)
Empty ratio	15% (by the OD survey)

ESAL is calculated for 10-years design life of the pavement and calculated ESAL is  $86 \times 10^6$  shown below.

	Around the Manzil pomp intersection	Around the Port Qasim intersection
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ESAL(axle)	41,244,573	86,295,283
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By the result of CBR test, the smallest CBR value of whole design section was 7%. Therefore, the design CBR of this section is adopted 10%. At the place of the CBR less than 10%, the embankment is used materials of CBR more than 30% in order to secure 10% of design CBR. In that case, the maximum embankment height is 40cm.

As a result of the examination in accordance with AASHTO the following pavement composition has been considered.

- Total pavement thickness 75cm comprising surface course 4cm (Modified asphalt concrete), binder course 7cm (Asphalt concrete, bituminous stabilized base course 9cm base course 20cm (graded crushed stones), and subbase course 35cm (granular material).

Pavement composition	Thickness		Coefficient	SN
	cm	inch		
Surface Course ( Modified asphalt concrete)	4	1.57	0.44	0.693
Binder Course ( Asphalt concrete)	7	2.76	0.44	1.213
Base Course ( Bituminous stabilized base course )	9	3.54	0.34	1.205
Base Course ( Graded crushed stones )	20	7.87	0.14	1.102
Sub base Course ( Granular material )	35	13.78	0.10	1.378
Total	75	29.53		5.591

Surface Course ( Modified asphalt concrete)	4cm
Binder Course ( Asphalt concrete)	7cm
Base Course ( Bituminous stabilized base course )	9cm
Base Course ( Graded crushed stones )	20cm
Sub base Course ( Granular material )	35cm

#### 6) Pavement for service road and footpath

As a result of discussions with KMC, the interlocking block pavement was proposed to secure the storage space for underground utilities so that new installation, repair and maintenance of them will become easy. As for the footpath, the covered drainage facilities or interlocking blocks on the box culvert drainage is proposed.

#### 【Service Road and footpath pavement composition】

Interlocking block: 6cm

Sand: 3cm

Base course (Graded crushed stones): 25cm

※Case of the footpath: 10cm (base course)

#### (5) Drainage Plan

##### 1) Current drainage conditions in the target area

As roadside ditches are not installed along any part of the target road section, the water flows into adjoining land and accumulates around the road after the rainfall. There are three box culverts crossing the road and two culverts of them near the beginning point and end point discharges the sewage water from neighboring facilities. Moreover, drainage capacity reduces due to the informally disposed wastes. The information about the current drainage conditions

acquired from the interviews to local residents is as follows.

- Around the box culvert near the beginning point: the road and residential areas becomes flood during the rainy season.
- Around the box culvert at intermediate location: Water accumulation 2~3cm in depth on the road can be seen during the rainy season. The surrounding land level is lower than the road.
- Residential area on the north side of the target road at approximately 1km from Port Qasim Intersection to the end point side: Rainwater and sewage water in this area discharge into the culvert at the end point.
- Around the culvert at the end point: No flood has been seen. No overflow of the culvert outlet to Pakistan Steel Co. side has been seen.

Figure 3-2-4 shows the current drainage system.



Source: Survey Team

**Figure 3-2-4 Current drainage system**

## 2) Basic Policy in the Drainage Plan

Based on the above conditions, the basic policy in the drainage plan is as follows.

- Roadside ditches will be constructed on both sides of the road to catch the surface rainwater quickly.
- Since the surrounding land level is lower than the existing road level, the extent of catchment area into the planned roadside ditches will basically target the area within the ROW. However, the drainage for inflows from outside of the ROW shall be considered for on the north side between No.4~No. 7 because the surrounding land level is higher than the existing road level.
- Concerning the road crossing culverts, the dimension larger than the existing one will be secured to fulfill with the discharge volume from each catchment basin. Reduction of the

catchment basin or expansion of the drainage structures will be examined at the place where sewage water inflows and the drainage capacity is inadequate.

- New drainage system will be constructed to the proper destination where the existing drainages are not connected to the end of flow.

### 3) Rainfall Intensity

#### Daily rainfall

The Survey Team has obtained the rainfall data in Karachi Airport between 1995 and 2014 from the Pakistan Meteorological Department. Table 3-2-11 shows the maximum daily rainfall data per month.

**Table 3-2-11 Maximum daily rainfall per month at Karachi Airport**

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual maximum
1995	81.3	3.0	0.2	0.0	0.0	0.0	72.8	5.4	0.0	0.0	1.0	0.0	81.3
1996	13.0	33.2	8.6	0.0	0.0	30.0	9.8	0.2	0.0	0.0	0.0	0.0	33.2
1997	8.5	0.0	18.0	3.6	5.0	9.4	12.4	9.6	24.0	6.1	0.3	4.4	24.0
1998	5.9	2.0	4.7	0.0	0.0	19.0	7.5	0.4	0.0	24.1	0.0	0.0	24.1
1999	4.5	1.2	1.8	0.0	0.0	0.0	0.2	0.0	0.0	4.0	0.0	0.0	4.5
2000	19.0	3.0	0.0	0.0	0.0	0.0	0.0	14.4	0.0	0.0	0.0	0.0	19.0
2001	0.0	0.0	0.0	0.0	0.0	10.6	52.5	14.5	0.0	0.0	0.0	0.0	52.5
2002	0.0	2.4	0.0	0.0	0.0	0.0	0.3	47.0	0.0	0.0	0.5	0.3	47.0
2003	6.4	13.1	0.0	0.0	0.0	16.3	108.4	5.2	0.0	0.0	0.2	0.0	108.4
2004	5.0	0.0	0.0	0.0	0.0	0.0	1.0	5.6	0.0	26.3	0.0	4.3	26.3
2005	6.6	6.8	0.0	0.0	0.0	0.0	1.3	0.3	31.0	0.0	0.0	17.1	31.0
2006	0.0	0.0	0.0	0.0	0.0	0.0	65.9	56.1	20.3	0.0	3.1	36.1	65.9
2007	0.0	13.0	0.0	31.0	0.0	40.6	39.8	124.2	0.0	0.0	0.0	11.0	124.2
2008	8.0	0.0	0.0	1.0	0.0	0.0	54.0	16.4	0.0	0.0	0.0	10.2	54.0
2009	2.0	0.0	0.0	0.0	0.0	2.6	142.6	54.0	68.9	0.0	0.0	1.5	142.6
2010	0.0	0.5	0.0	0.0	0.0	77.1	38.3	62.0	20.3	0.4	0.0	0.0	77.1
2011	0.0	1.0	0.0	0.0	0.0	0.0	7.2	16.0	75.0	0.0	0.0	0.0	75.0
2012	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.3	48.7	0.0	0.0	17.8	48.7
2013	0.0	8.8	0.0	2.8	23.0	0.0	2.1	102.6	4.0	1.2	0.0	0.0	102.6
2014	0.0	0.0	11.0	0.0	0.0	0.0	1.1	9.0	1.4	0.0	4.6	0.0	11.0

Source: Pakistan Meteorological Department

#### Rainfall intensity

##### a) Road crossing culvert

Concerning the road crossing culvert, the rainfall intensity for each return period is calculated by the rainfall analysis using the rainfall data shown in Table 3-2-11 and calculated by means of the Gumbel formula which is commonly used in Pakistan. Table 3-2-12 shows the daily rainfall intensity for each return period and Table 3-2-13 shows the concentration time of flow for each catchment area described in Figure 3-2-5. Daily rainfall intensity is used in the design of road crossing culverts as the concentration time exceeds 24 hours in each catchment area based on the Table 3-2-13.

**Table 3-2-12 Daily Rainfall Intensity**

Return Period(year)	2	5	10	25	50
Rainfall (mm/day)	52.0	71.2	119.0	152.9	178.0

Source: Survey Team

**Table 3-2-13 Concentration Time (Tc)**

Catchment Area NO.	Sta.NO.	Condition	Length of Streams (m)	Cat.Area (sq.km)	Elevation		Diffrence Height (m)	Slope (%)	Tc (hr)
					High Point(m)	Low Point(m)			
			1	No.0+0	New Construction	842	0.050	36	30.4
2	No.0+870	Existing Culvert (Re Construction)	1001	0.500	31.3	30.1	1.20	0.120%	53.095
3	No.1+280	Crossing Culvert (New)	1814	0.900	40.5	31.5	9.00	0.496%	48.571
4	No.6+109	Crossing Culvert (New)		0.076					
5	No.6+520	Existing Culvert (Re Construction)	3000	1.920	58.1	46.8	11.30	0.377%	79.556
6	No.11+380	Existing Culvert (Re Construction)	4510	9.370	106.6	37.9	68.70	1.523%	63.589

Source: Survey Team

b) Roadside ditch

Concerning the roadside ditch, the rainfall intensity is calculated using B.D Richard formula which is applied in urban areas of Pakistan. In addition, the rainfall duration is generally assumed to be 15 minutes for the design of roadside ditches in Pakistan. Therefore, the rainfall intensity for the Project will be calculated based on the rainfall duration of 15 minutes. As a result of calculation, the rainfall intensity adopted is 73.7mm/h as shown in Table 3-2-14.

**Table 3-2-14 Rainfall Intensity for Roadside Ditches**

Return Period	$X_n/R$	Rainfall Intensity (I) at various Durations mm/hr						
		10 min	15 min	20 min	30 min	60 min	120 min	180 min
Years	mm/day							
<b>2</b>	52.01	44.58	41.61	39.01	34.67	26.01	17.34	13.00
<b>3</b>	71.16	61.00	56.93	53.37	47.44	35.58	23.72	17.79
<b>5</b>	92.13	78.97	73.70	69.10	61.42	46.06	30.71	23.03
<b>10</b>	118.97	101.97	95.17	89.23	79.31	59.48	39.66	29.74
<b>15</b>	134.10	114.94	107.28	100.57	89.40	67.05	44.70	33.52
<b>20</b>	144.70	124.03	115.76	108.53	96.47	72.35	48.23	36.18
<b>25</b>	152.88	131.04	122.30	114.66	101.92	76.44	50.96	38.22
<b>50</b>	178.04	152.61	142.43	133.53	118.69	89.02	59.35	44.51

4) Design Return Period

The design return period is decided based on discussions with KMC as follows;

- Road crossing culverts and box culverts                      10 years
- Side ditches                                                                      5 years

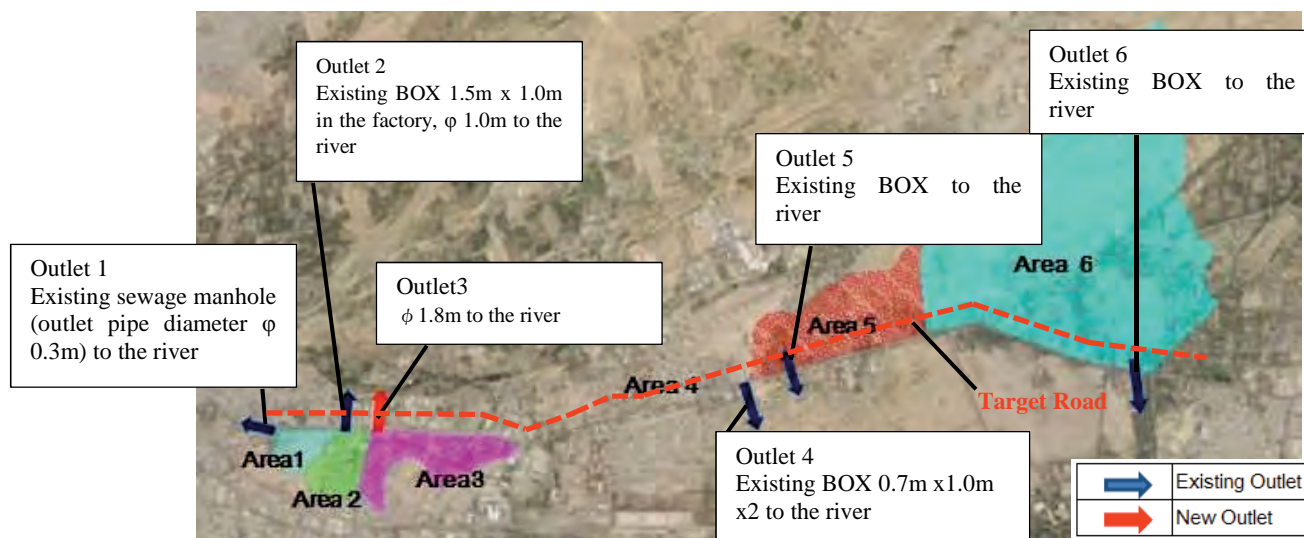
5) Road crossing culverts

5-1) Catchment area and outlet

The 6 outlets of the road drainage shown in Figure 3-2-5 are considered on the target road. Only road surface drainage is taken into consideration in the Project concerning the rainwater from Area 4 because it discharges towards north and south on opposite sides from the road due to the topography.

Since Area 2 also currently receives rainwater from Area 3 as well as sewage water, it bears

the largest runoff volume. In order to mitigate it, the installation of a new drainage system to the end of flow is proposed as indicated by the red arrows in the Figure 3-2-5.



Source: Survey Team

**Figure 3-2-5 Map of Catchment Area**

### 5-2) Runoff volume

The amount of runoff is calculated using the rational formula shown below.

$$Q = (1/3.6) \times C \times I \times A$$

Where,

Q: Maximum runoff (m<sup>3</sup>/s)

C: Runoff coefficient

I: rainfall intensity (mm/hour)

A: Catchment area (km<sup>2</sup>)

**Table 3-2-15 Runoff Coefficient**

Land use of drainage area	Runoff coefficient	
	Standard value	Adopted value
Road (asphalt)	0.90~0.95	0.90
Non-cultivated land	0.10~0.30	0.20

Then, drainage structures that can discharge the following runoff volume are designed.

**Table 3-2-16 Runoff Volume for Road Crossing Culverts**

Basin No.	Area (km <sup>2</sup> )	Runoff Volume ( m <sup>3</sup> /s )
1	0.075	0.393
2	0.500	2.618
3	0.900	4.713
4	0.076*	0.935*
5	1.920	9.075
6	9.370	48.692

Note: \*Runoff Volume of surface drainage.

### 5-3) Discharge capacity



The Manning formula below is used for the calculation of the discharge capacity. The 20% allowance for the dimension is considered for sediments and so on.

$$Q = A V$$

Q: Discharge capacity(m<sup>3</sup>/sec)

A: Cross-sectional area of structures (m<sup>2</sup>) (20% allowance considered)

V: Mean flow velocity (m/sec) =  $1/n \times R^{2/3} \times I^{1/2}$

R: Hydraulic radius(m)

I: Gradient (%)

N: Roughness coefficient of the drainage structure

**Table 3-2-17 Plan of Crossing Drainage Structures**

Catchment Area NO.	Sta.NO.	Condition	Intensity of Rainfall (mm/24h)	Discharge (m <sup>3</sup> /sec)	Plan Size of the Culvert					
					Width(m)	Hight(m)	A	i	Cell	Capacity (m <sup>3</sup> /sec)
1	No.0+0	New Construction	119.0	0.331	0.60	0.28	0.500%	1	0.47	
2	No.0+870	Existing Culvert (Re Construction)	119.0	3.306	3.0	1.5	3.6	0.500%	3	44.83
3	No.1+280	Crossing Culvert (New)	119.0	5.950	1.60	1.96	0.500%	1	6.39	
4	No.6+109	Crossing Culvert (New)	73.0	1.156	0.9	0.9	0.648	0.500%	1	1.50
5	No.6+520	Existing Culvert (Re Construction)	119.0	12.693	3.0	1.5	3.6	0.500%	2	29.89
6	No.11+380	Existing Culvert (Re Construction)	119.0	61.946	2.75	3.5	7.7	0.500%	4	158.72

Note 1: Existing dimension will be kept for the Catchment Area 2 and 6 because sewage water also constantly flows in at present in spite of the large discharge of them.

Note 2: Existing dimension will be kept for the Catchment Area 5 because the culvert there is effective to prevent in the neighbouring land in north and south from the road from flooding.

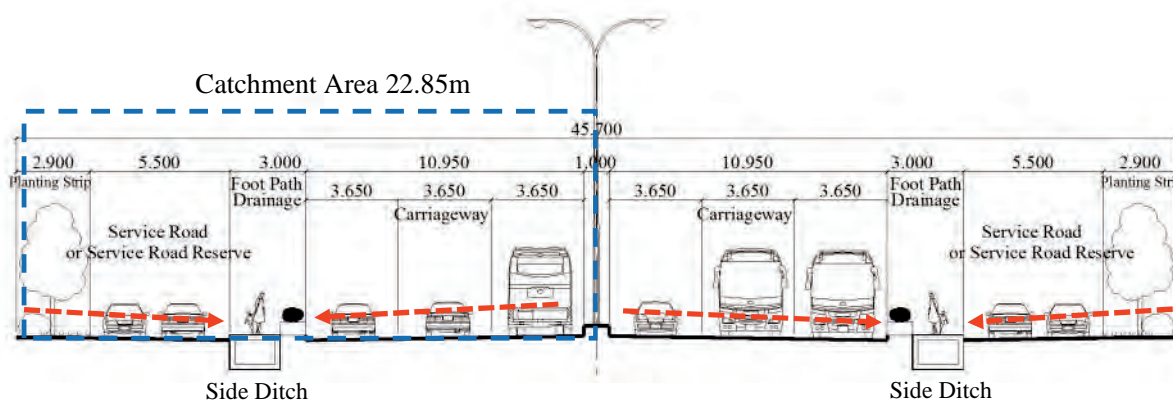
Note 3: New pipe culvert will be installed for Catchment Area 1, 3 and 4

## 6) Roadside ditches

### 6-1) Catchment area of roadside ditches

The BOX culvert will be adopted for the ditches that are commonly seen in Karachi City.

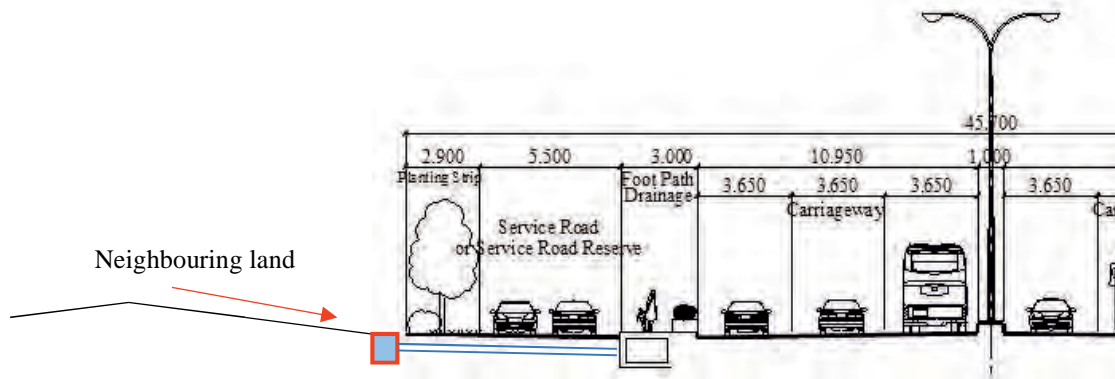
The catchment area for the ditches will be 22.85 m, half of the 45.7m ROW.



Source: Survey Team

**Figure 3-2-6 Catchment Area of Roadside Ditches**

Additional ditches will also be installed along the edge of the ROW at the section where the rainwater flowing to the road from the neighbouring lands as shown in Figure 3-2-7.



**Figure 3-2-7 Ditch to collect the water from neighbouring land**

6-2) Calculation of discharge volume for roadside ditches

The same formula with crossing culverts are used to calculate the runoff volume and discharge capacity as follows;

- Runoff volume: Rational formula
- Discharge capacity: Manning formula (20 % allowance considered as with crossing drainage structures).

As a result, the minimum width (W) and height (H) of the ditches, 0.5m (W) x 0.5m (H) becomes larger towards the discharge directions, in which the maximum dimension becomes 1.3m (W) x 1.0m (H) as shown in Table 3-2-18. However, the dimension may need to be changed due to the interference with underground utilities and earth covering with the access roads.

**Table 3-2-18 Dimension of roadside ditch**

Station						Length	Box Size	
0	+	0	-	0	+		B	H
0	+	460	-	0	+	460	0.5	0.5
0	+	870	-	1	+	280	410	0.5
1	+	280	-	1	+	620	340	1.3
1	+	620	-	2	+	20	400	1.2
2	+	20	-	2	+	520	500	1.1
2	+	520	-	3	+	320	800	1.0
3	+	320	-	3	+	920	600	0.9
3	+	920	-	4	+	420	500	0.8
4	+	420	-	4	+	820	400	0.7
4	+	820	-	5	+	170	350	0.6
5	+	170	-	5	+	620	450	0.5
5	+	620	-	5	+	860	240	0.5
5	+	860	-	6	+	109	249	0.6
6	+	109	-	6	+	320	211	0.8
6	+	320	-	6	+	720	400	0.7
6	+	720	-	7	+	70	350	0.6
7	+	70	-	7	+	520	450	0.5
7	+	520	-	7	+	970	450	0.5
7	+	970	-	8	+	320	350	0.6
8	+	320	-	8	+	720	400	0.7
8	+	720	-	9	+	220	500	0.8
9	+	220	-	9	+	820	600	0.9
9	+	820	-	10	+	620	800	1.0
10	+	620	-	11	+	120	500	1.1
11	+	120	-	11	+	380	260	1.2
11	+	380	-	11	+	600	220	0.5
Total Length						11,600		

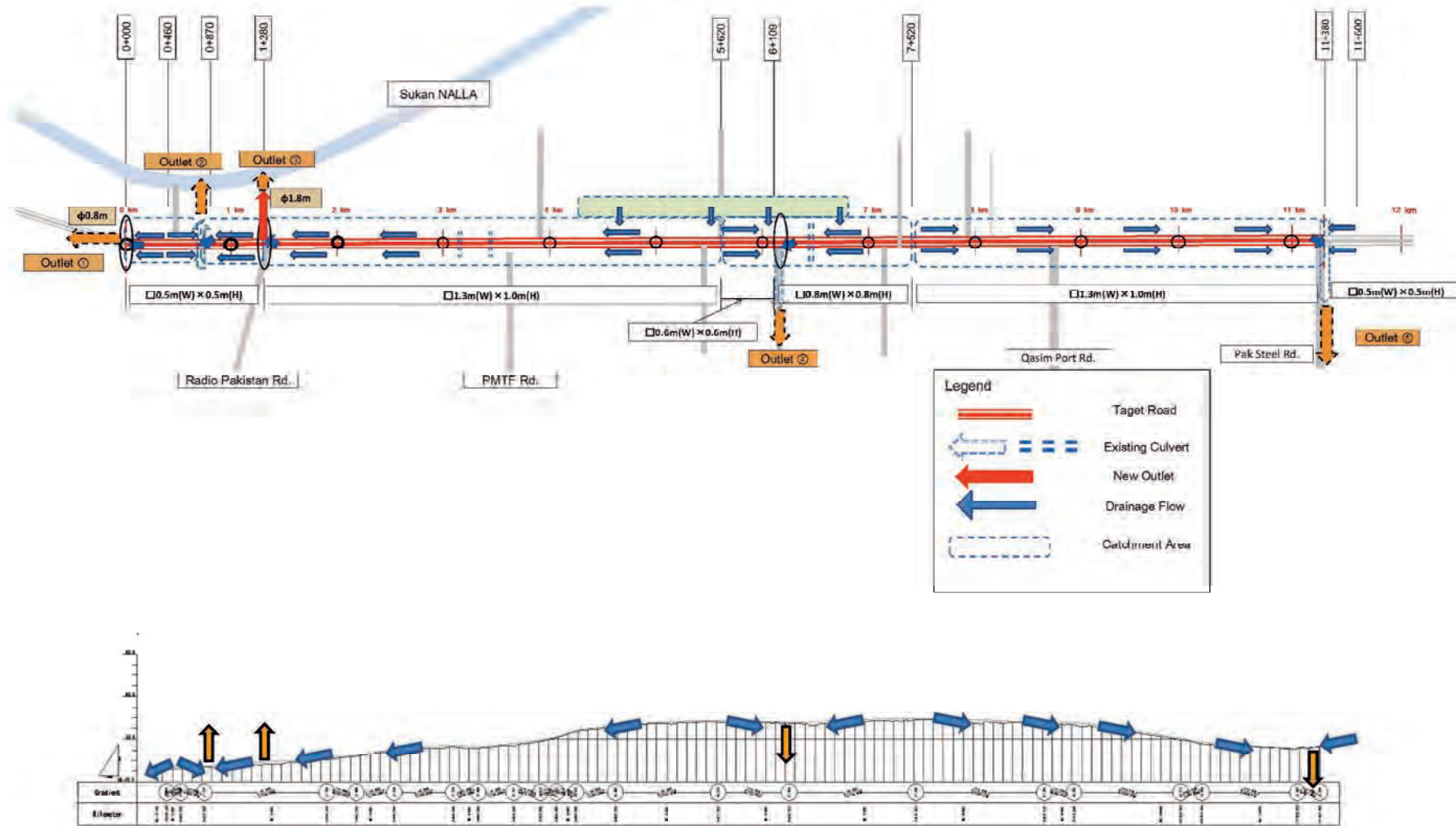


Figure 3-2-8 Proposed Drainage Network in the Target Area

(6) Intersection Planning

Traffic signals will be installed at 4 main intersections in the target road as a result of the analysis of the intersection capacity based on the result of traffic survey in the intersections and traffic demand forecast.

The Channelization of left-turn lane and the installation of right-turn lane are examined to maximize the traffic capacity of the intersections.

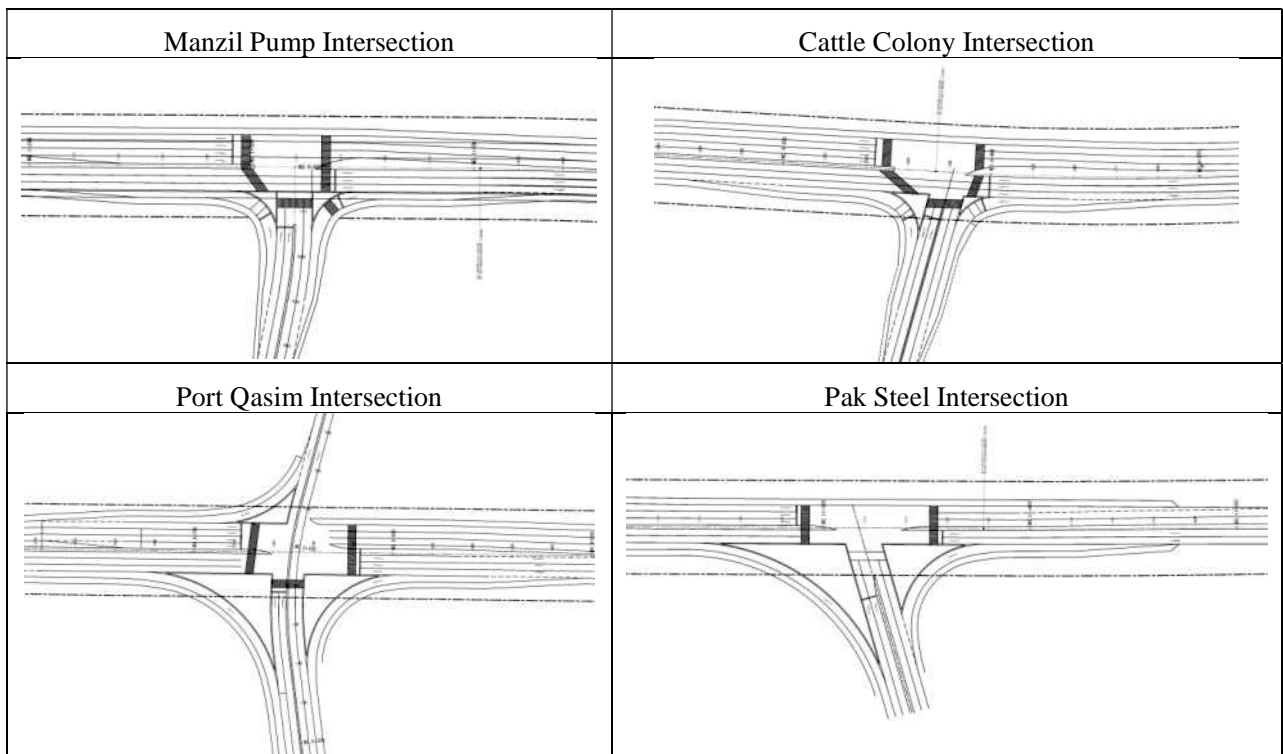
Since the Volume-Capacity ratios (V/C) of each intersection are under 0.9 until 9 years after the operation at Manzil Pump Intersection and until 10 years after the operation at other intersections as shown in Table 3-2-19, the signal control at all intersections is supposed to be effective. KMC is planning to construct a flyover at Manzil Pump Intersection.

**Table 3-2-19 V/C Ratio of Intersection**

Intersection		Manzil Pump Intersection	Cattle Colony Intersection	Port Qasim Intersection	Pak Steel Intersection
V/C Ratio	Present (2015)	0.420	0.328	0.257	0.495
	Operation (2020)	0.599	0.488	0.411	0.590
	5 years later(2024)	0.740	0.650	0.529	0.712
	10 years later(2029)	0.957	0.865	0.730	0.897

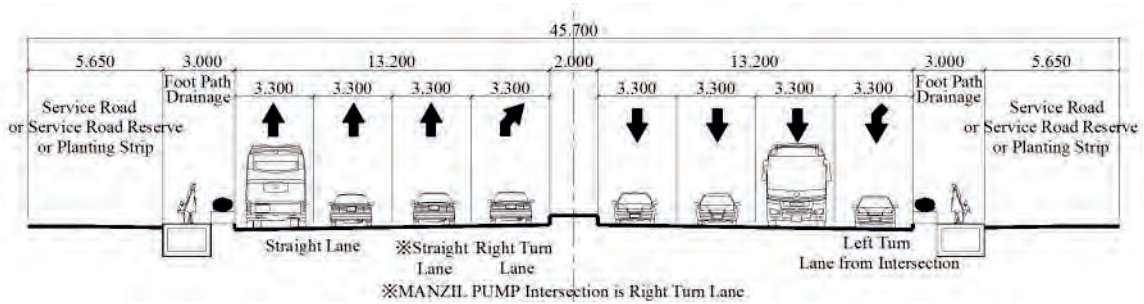
Source: Survey Team

Pedestrian crossings and pedestrian signals will also be installed. In addition, the wider median strip than non-intersectional section will be secured in the intersections so that the pedestrian can stay there during the crossing because the crossing distance will be longer than present. Figure 3-2-9, 3-2-10 and 3-2-11 show the general plan and standard cross section of the intersections.



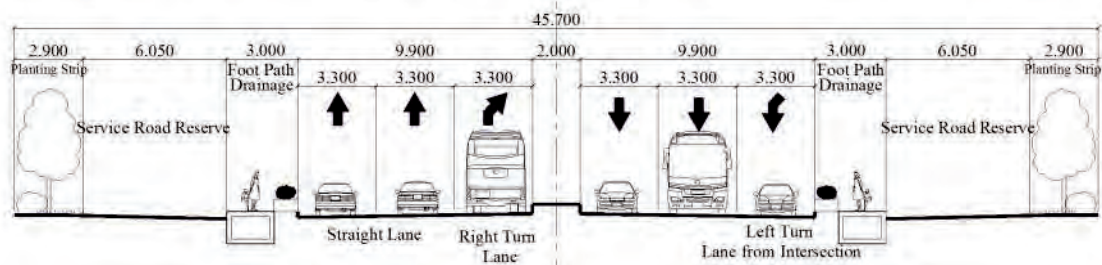
Source: Survey Team

**Figure 3-2-9 General Plan of Intersections**



Source: Survey Team

**Figure 3-2-10 Standard Cross Section of Manzil Pump, Cattle Colony, Port Qasim Intersection**



Source: Survey Team

**Figure 3-2-11 Standard Cross Section of Pak Steel Intersection**

(7) Road Ancillaries

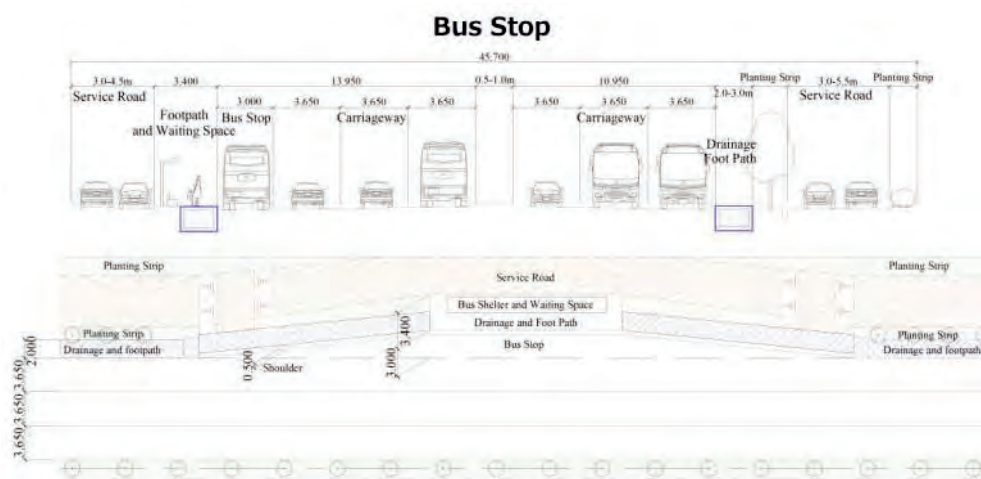
- 1) Bus stop

The bus stops will be installed near the intersection and at approximately 1km interval where the distance between intersections distance is long. Table 3-2-20 shows the location of bus stops and Figure 3-2-12 shows the image of the bus stop.

**Table 3-2-20 Location of Bus Stops**

No.	LHS	RHS	Remarks
1	No.0	No.0	
2	No.1+480	No.1+200	Around the Manzil Pomp Intersection
3	No.2+800	No.2+800	
4	No.4+500	No.4+200	Around the Cattle Colony Intersection
5	No.5+100	No.5+100	
6	No.7+140	No.7+140	
7	No.8+800	No.8+540	Around The Port Qasim Intersection
8	No.10+100	No.10+100	
9	No.11+400	No.11+180	Around the Pak Steel Intersection
Total		18 nos	

Source: Survey Team



Source: Survey Team

**Figure 3-2-12 Image of Bus Stops**

## 2) Pedestrian bridge

The pedestrian bridges are examined at 2 locations. There are three types of the pedestrian bridge, 1) Slope, 2) Slope with srair, 3) Stair in Karachi City.

In the Project, the stair type with one direction service will be adopted as few wheel chair users are found and they can use the pedestrian crossing at the intersections.



**Photo Pedestrian Bridge on the Sharee faisal road**

3) Street light

The Street light will be installed on the median strip for the entire target road for the contribution to the security around the area. Interval the streets light is 40m.



**Photo (Left) Example on Access road to the N5, (Right) New construction in the Karachi City**

4) Access road

The access road connecting with the target road will be improved within the ROW.

However, the improvement will be done with maximum gradient of 5 % beyond the ROW in the locations where the rainwater is flowing from the access road and where the coordination of the elevation is required between the target road and access road.

The following pavement composition is assumed for the access road.

Surface Course : 5cm (AC)

Base : 25cm (Crushed stone)

5) Road crossing duct

Road crossing ducts will be installed at approximately 1km interval for the future extension and maintenance of utilities such as water pipes, electric cables, telecommunication cables and gas pipes based on the discussion with KMC.

The dimension of ducts will be 2.0m (W) x 1.0m (H) to make them shallow and to avoid the interference with the roadside ditches.

6) Planting Strip

Planting strip will be installed on the edge of ROW on either side by the Project. There is the Horticulture department in KMC which is in charge of planting and maintenance of street

trees in Karachi. According to the Horticulture department, the famous and suitable tree type for the Project is Lignum vitae or Delonix regia of the middle tree and they will be newly planted and existing trees in the median will be demolished.

### **3-2-3 Outline Design Drawing**

Outline design drawing is attached in Appendix.

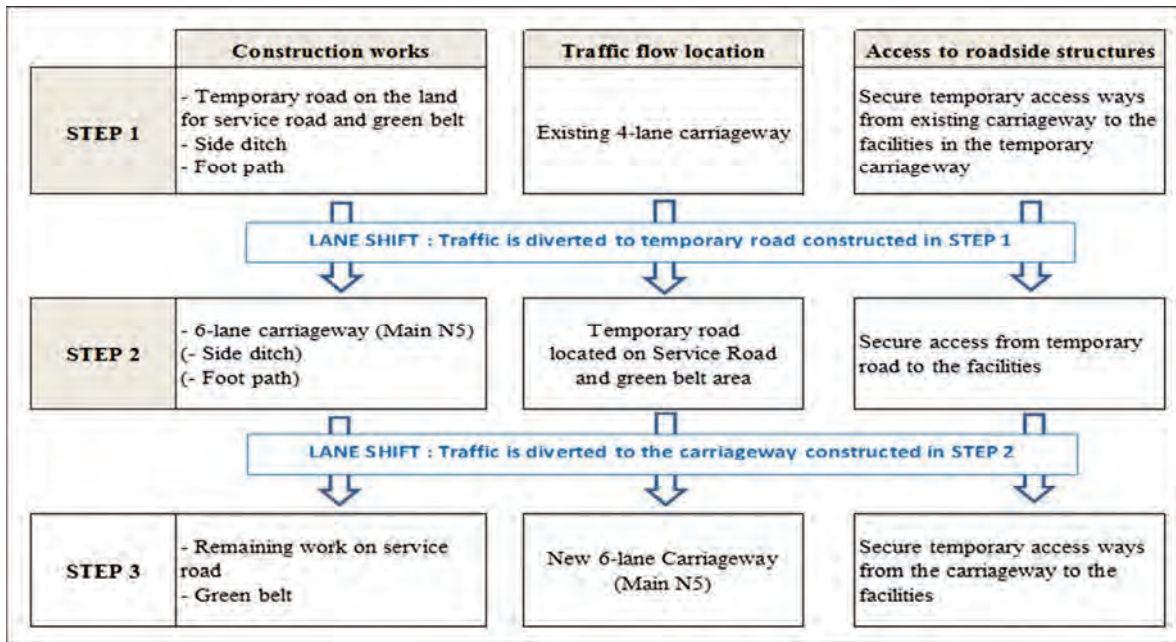
### **3-2-4 Implementation Plan**

#### **3-2-4-1 Implementation Policy**

Based on that the Project will be implemented under the framework of the Government of Japan's Grant Aid, the basic implementation policy in the Project is described below.

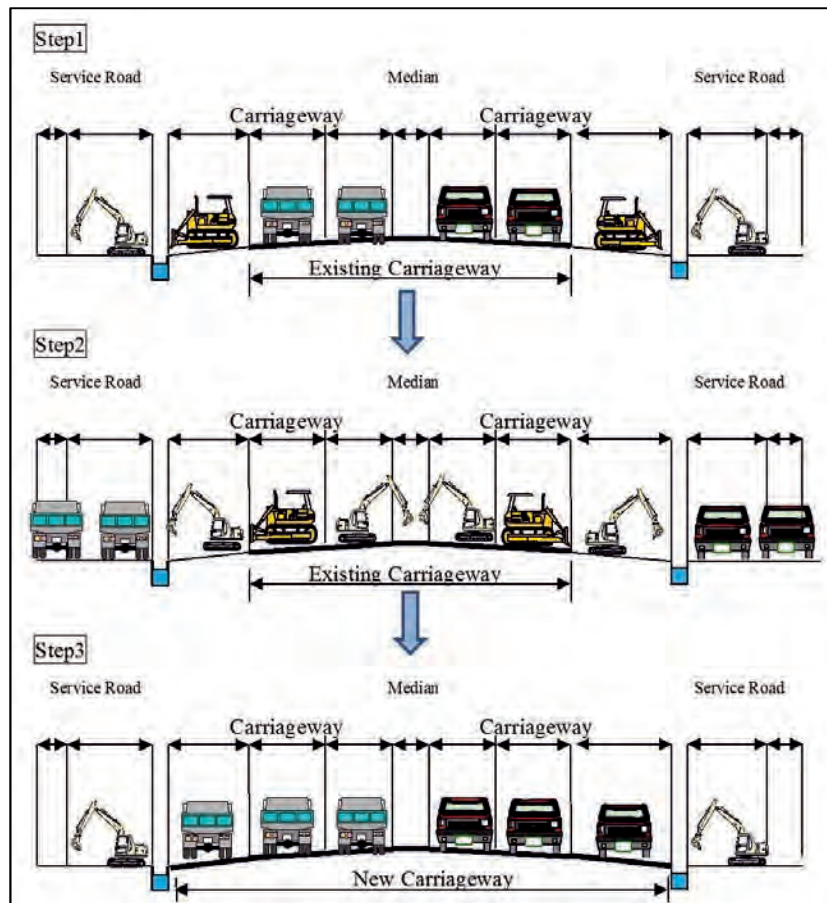
- 1) The construction methods and schedule will be planned in reflection of the natural conditions such as the local climate, topography, local characteristics and current traffic conditions in the Project area and be considered not to damage the underground utilities.
- 2) In consideration of the maintenance capacity on the Pakistani side, general construction methods will be planned so that no special construction machinery or technology are required after the operation of the road.
- 3) In the construction plan, the natural and social environment and traffic safety should be considered well.
- 4) In order to contribute to the local economy, the locally procurable equipment and materials will be utilised as much as possible.
- 5) For the construction at the location where the underground utilities might be affected, the construction methods should be considered well by using the light machine, for instance.
- 6) New road crossing culvert should be constructed and the existing one be demolished while detouring the drainage using the temporary drainage pipe.
- 7) Temporary 2-lane carriageway will be installed within ROW and the traffic be detoured to prevent the traffic congestion during the construction. The construction steps are expected as shown in Figure 3-2-13 and Figure 3-2-14 taking the lane shift into considerations. KMC will also introduce another alternative road to drivers by the sign board.
- 8) Access to the facilities and shops along the road will be secured from the temporary carriageway.





Source: Survey Team

Figure 3-2-13 Steps of construction works and traffic diversion



Source: Survey Team

Figure 3-2-14 Image of construction steps

### **3-2-4-2 Items to be Cared in the Detailed Design Phase**

#### 1) Underground Utilities

The Survey Team confirmed in the underground utility survey that some kinds of underground utilities such as electric lines, gas pipes and telecommunication lines are located in the shallow level within ROW. Since the shallow underground utilities might conflict with the ditches constructed in the Project, the location of ditches should be designed so as to avoid the underground utilities and to minimise the utility relocation borne by Pakistani side. The additional underground utility survey shall be conducted in the detailed design phase to supplement the underground utility survey in the preparatory survey which the trial excavation is conducted at 1km interval.

#### 2) Environmental and Social Considerations

The detailed impacts to the PAPs shall be confirmed again by identifying the edge of ROW based on the road alignment in the preparatory survey. The impact and ROW condition shall be updated and the necessary negotiation and agreement shall be made between KMC and related stakeholders. The Survey Team shall monitor the assistance measures provided by KMC and KMC publicly notify the clearance of ROW to their owners so that the clearance shall finish before the bidding of construction works.

#### 3) Monitoring for items to be borne by Pakistani side

The Survey Team shall monitor the following items to be borne by Pakistani side continuously in the detailed design phase to implement the Project smoothly.

- To secure the land for camp yard and material stock yard
- Procedure and amount of the tax exemption
- PC-1 procedure

### **3-2-4-3 Items to be Cared in the Construction Phase**

#### 1) Compliance with Labor Standards

The Contractor shall comply with appropriate labor conditions and employment customs based on the existing construction law in Pakistan, and it shall strive to prevent disputes with workers and secure safety during the works period.

#### 2) Social and Environmental Considerations during the Construction

- i) Wastes generated in the works shall be transported to the disposal site designated by KMC and landfilled.
- ii) Measures shall be taken to mitigate dust, noise and vibration, and monthly monitoring will be conducted to continually grasp and improve conditions.
- iii) Waste water from the construction site shall be treated and discharged properly in accordance with the corresponding standard in Pakistan.

#### 3) Security and Safety Matter

- i) Traffic will be controlled with the safety facilities such as barricades, traffic cones, revolving lights and the safety personnel. Detours may be considered based on the traffic condition and the consultation with KMC.
- ii) Signs for prohibiting entry to the construction sites and informing local residents will be necessary in order to secure safety and prevent troubles.
- iii) Security guards will be positioned for the security to prevent the theft of construction materials and equipment and troubles.
- iv) Japanese personnel shall be accompanied by the security guards in the car.
- v) Protection wall and surveillance station will be installed and security guards be positioned for the security.

#### 4) Communication on Sites

- i) As mobile phones are available around the Project site, workers will carry mobile phones.
- ii) Traffic controllers shall carry mobile transceivers and a system for traffic safety control shall be established in order to secure the safety of the traffic and local residents.

#### 5) Respect for Local Customs

Construction schedule shall be planned in consideration of local customs.

#### 6) Customs Clearance

Duration required for importing, disembarkation and customs clearance should be considered in the construction plan.

#### 7) Securing of Site Land

Even though the land acquisition for the Project is not required so far, it is necessary to make agreements and take support measures for the PAPs in the ROW before the commencement of the Project.

On the other hand, KMC is expecting to secure the camp yard in the public land near the roadside, but it is necessary to monitor that KMC secures it before the announcement of P/Q.

#### 8) Schedule Coordination

Since the Pakistani side is planning to repair the damaged joints and pipes of waterworks under the existing road before the Project, its work schedule and procedure shall be confirmed.

### **3-2-4-4 Scope of Works**

The works to be undertaken by the Japanese and Pakistani side during the Project are demarcated as follows;

#### (1) Scope of Works on the Japan Side

- Road construction and rehabilitation composed of earth works, roadbed works, binder course and surface course works, drainage structures, road auxiliary facilities, etc.
- Installation of temporary construction facilities such as base camp, plant yard, office, warehouse, etc.

- Procurement of the labor, construction materials and equipment for the construction
- Safety management and measures concerning execution of the construction works
- Detailed design, preparation of tender and contract documents, assistance for bidding, and construction supervision

(2) Scope of Work on Pakistani Side

- Securing and clearing of ROW and land necessary for the base camp, etc.
- Securing of disposal sites for the wastes and surplus soil arising from the construction
- Relocation of obstacles, allocation of local supervisors and bearing of costs arising in land clearance according to necessities
- Support and prompt implementation for the custom clearance and tax exemption based on the list of imported equipment and materials prior to commencement of the construction
- Provision of assistance for Japanese nationals entering and staying in Pakistan for the Project
- Designation of counterparts and securing of counterpart personnel and budget
- Operation and maintenance of the target road in the construction and operational phase

**3-2-4-5 Consultant Supervision**

After the exchange of notes (E/N) between the Government of Japan and Government of Pakistan, the Government of Japan and the Government of Pakistan will conclude the Grant Agreement (G/A). Following the E/N and G/A, the Consultant will conclude the Consultant Agreement with KMC, which is the implementing agency of the Government of Pakistan, based on the recommendation letter issued by JICA under the scope and procedure of Japan's Grant Aid. After the conclusion of the agreement, the Consultant will do the detailed design, assistance of the tender and consultant supervision.

The main contents of work included in the consultant agreement are as follows.

(1) Detailed Design and Preparation Stage of Tender Documents

The Consultant will do the detailed design of each facility in accordance with the Preparatory Survey report and create drawings and tender documents to obtain the approval of the Pakistan side.

(2) Tender Stage

The Consultant will support the Pakistani side for the notification of tender, P/Q , distribution of tender documents, tender implementation and tender assessment, and will advise in the contract negotiations. The Consultant will also witness the conclusion of the contract between the Government of Pakistan and the successful bidder.

Table 3-2-21 shows the personnel and their roles from the detailed design to tender.

**Table 3-2-21 Personnel and Roles in Detailed Design and Tender**

Assignment	Roles
------------	-------

Project Manager	Overall management of detailed design and tender
Road Design I (Road)	Detailed design for the road structure and pavement
Road Design II (Drainage / Ancillary facilities)	Detailed design for the drainage structure and ancillary facilities
Road Design III (Natural conditions and obstacle survey)	Supervision of natural conditions and obstacle survey
Environmental and Social Consideration I (Socio economic status survey)	Supervision of socio economic status survey
Environmental and Social Consideration II (Social consideration / monitoring)	Support for implementation of the resettlement action plan and monitoring
Procurement Plan / Cost Estimation	Review of construction plan, procurement plan and project cost
Preparation of Tender Documents	Preparation of tender documents, assistance for P/Q and tender

### (3) Construction Supervision

After concluding the contract with the Contractor, the Consultant will issue the written instruction to the Contractor to commence the works and assign the Resident Engineer to the site for the construction supervision. In the supervision, the Consultant will report the work progress to the Pakistani side and make recommendations to the Contractor for the improvement of the works progress, quality control, safety and payments, etc. The Consultant will also report periodically to the Embassy of Japan and JICA office in Pakistan. The Consultant will conduct a defect liability inspection one year after the completion of the works. Also, the Project Manager who experiences the Japan's Grant Aid Project well will be dispatched at important phases of the work for the coordination and supervision of the works. The various civil engineers will also be dispatched for each work items to conduct the spot supervise so that the work fulfill with the technical specifications.

Table 3-2-22 shows the personnel and roles concerning the construction supervision.

**Table 3-2-22 Personnel and Roles in the Construction Supervision Stage**

Assignment	Role
Project Manager	Coordination and technical management to ensure smooth execution of works
Resident Engineer	Routine management work concerning process, quality and safety, etc.
Civil Engineer (Drainage structure works)	Supervision of drainage structure works
Civil Engineer (Ancillary facilities works)	Supervision of ancillary facilities works
Civil Engineer (Pavement works)	Supervision of pavement works
Civil Engineer (Electricity works)	Supervision of distribution works concerning lighting and traffic signals
Civil Engineer (Completion inspection)	Final inspections before handover of the completed facilities

In addition to the above Japanese personnel, the local engineers, inspector, office boy and driver will be assigned to assist the Resident Engineer.

#### 3-2-4-6 Quality Control Plan

The consultant will instruct the Contractor to perform the tests indicated in Table 3-2-23 and reflect the results in quality control.

**Table 3-2-23 List of Quality Control Items**

Item		Method	Test Frequency		
Roadbed materials (crushed stone)	Mixing materials	Liquid limit, Plastic index	Each mix		
		Grain size distribution			
		Aggregate strength test			
		Aggregate density test			
		Maximum dry density (compaction test)			
Laying		Density test (compaction rate)	Once/day		
Prime coat, Tuck coat	Materials	Bitumen	Quality certificate	Each material	
			Temperature and quantity at the time of keeping/spreading	Each delivery	
Asphalt	Materials	Bitumen	Quality certificate, Ingredient analysis list	Each material	
		Aggregate	Grain size distribution	Each mix/ once a month	
			Water absorption rate		Each material
			Aggregate strength test		
	Mix test		Stability	Each mix	
			Flow value		
			Void ratio		
			Design asphalt value		
	Laying		Set temperature during mixing	As appropriate	
			Temperature during leveling	Each delivery	
		Sampling Marshal test	Approx. once a day		
Concrete	Materials	Cement	Quality certificate, chemical and physical test results	Each material	
		Water	Ingredient test results	Each material	
		Admixture	Quality certificate, componential analysis sheet	Each material	
		Fine aggregate	Dry specific gravity	Each material	
			Grain size distribution, coarse particle ratio		
			Clay lump and soft mote ratio		
		Coarse aggregate	Dry specific gravity	Each material	
	Grain size distribution				
	During mixing test		Compression strength test	Each mix	
	During placement	Slump (concrete)		Each placement	
		Air contents		Each placement	
		Temperature		Each placement	
	Strength		Compression strength test (7 days, 28 days)	Each designated interval	
Reinforcing bars	Materials	Quality certificate, tensile strength test results	Each lot		

### 3-2-4-7 Procurement Plan

#### (1) Procurement Concept

##### 1) Labor

In order to contribute employment opportunities, technology transfer and promotion of the local economy, local engineers and labours will be fully utilised. However, in case of jobs that cannot be handled with the technical level of Pakistan, skilled workers will be dispatched from Japan or third countries.

##### 2) Construction Materials

In the construction work in Karachi City, road construction materials such as soil and crushed stone and sand are transported from quarries and borrow pits located at the suburb area, approximately 55- 110 km from the target road as shown in Figure 3-2-15. Therefore, the same places are assumed for the Project. The procurement utilising local mining suppliers or local contractor are supposed because several months is required for the Contractor to acquire the mining rights in the case that the Contractor directly procures and produces the materials from quarries.



Source: Google Map

Material	Quarry name	Transport distance
Soil	Jokhya more	55km
Soil	Hub	60km
Crushed stone	Noori abad	100km
Sand	Jakhra more	110km

Figure 3-2-15 Location and Distance of Expected Borrow pits and Quarries

Procurement concepts of other construction materials are as follows.

- 1) To procure local materials as much as possible for the economic efficiency and the ease

of procurement.

- 2) If the imported goods are habitually used in the country's market, consider to use these materials.
- 3) To consider the procurement from Japan or a third country in consideration of the ease of procurement, price, quality and delivery if the local procurement is difficult.

Considering the above points, the procurement plan of main materials is shown in Table 3-2-24.

**Table 3-2-24 Procurement Sources of Main Materials**

Material	Procurement Source			Remarks
	Pakistan	Japan	Third Country	
< General materials >	●			
Embankment material	●			
Roadbed material	●			
Ordinary cement	●			
High-early-strength cement	●			
Fine aggregate	●			
Coarse aggregate	●			
Reinforcing bars	●			
Steel sheet pile	●			
General steel	●			
Admixture	●			
Water reducing agent	●			
Asphalt	●			
Asphalt emulsion	●			Imported
PVC pipes	●			
Gabion mat	●			
Large sandbags	●			
Wood	●			
Fuel	●			Imported
Street light	●			Imported, Post to procurement domestically
Traffic signal	●			Imported, Post to procurement domestically
Guard rail	●			
Road Sign	●			
Bus stop shed	●			
Superstructure of pedestrian bridge	●			
Cat's-eye	●			
Road marking	●			

### 3) Construction Machinery

Road construction machines excluding special machines can be rented from local construction companies in Pakistan.

Table 3-2-25 shows the construction machines to be procured in consideration of the expected works schedule and local procurement conditions.



**Table 3-2-25 Main Construction Machinery Procurement Sources**

Machine	Procurement Source			Remarks
	Pakistan	Japan	Third Country	
Bulldozer	●			Can be leased locally
Back hoe	●			Ditto
Wheel loader	●			Ditto
Dump truck	●			Ditto
Semi-trailer	●			Ditto
Truck crane	●			Ditto
Rough terrain crane	●			Ditto
Crawler crane (lifting capacity up to 80t)	●			Ditto
Motor grader	●			Ditto
Road roller	●			Ditto
Tire roller	●			Ditto
Fork lift	●			Ditto
Vibrating roller	●			Ditto
Asphalt finisher	●			Ditto
Asphalt distributor	●			Ditto
Asphalt sprayer	●			Ditto
Stabilizer	●			Ditto
Milling asphalt road surface machine	●			Ditto
Vibratory hammer	●			Ditto
Concrete cutter	●			Ditto
Hydraulic breaker	●			Ditto
Tamper	●			Ditto
Vibrating compacter	●			Ditto
Vehicle for road surface cleaner	●			Ditto
Line marker	●			Ditto
Submersible pump	●			Ditto
Generator	●			Ditto
Concrete mixer	●			Ditto
Concrete pumping truck	●			Ditto
Agitator Truck	●			Ditto
Concrete mixing plant	●			Ditto, (30m <sup>3</sup> /hr.)
Asphalt mixing plant	●			Ditto, (40ton/hr.)

## (2) Important Points in Procurement

The important points to be considered for the procurement in the Project are summarized as follows.

- 1) Compile a procurement plan that is reasonable within the works schedule.
- 2) In order to contribute to promotion of the local economy, procure local products as much as possible.
- 3) Concerning construction materials and equipment that cannot be procured locally, consider procurement from Japan or third countries while paying attention to the quality, ease of procurement, availability of quantities, and economy.
- 4) The products procured from Japan or third countries are embarked at Karachi Port. The construction machines for the domestic use will be transported by trailer, while general freight (materials) will be transported by truck.



- (7) Environmental monitoring based on EMoP and countermeasures according to the necessity
- (8) Appropriate and effective operation and maintenance of facilities constructed in the Project

### 3-4 Operation and Maintenance Plan

Road maintenance in Karachi City is executed by E & M Zones of KMC at its own personnel and machineries, which are owned by E & M Zones. KMC does not have the medium or long-term maintenance plan and implement the maintenance work according to the necessity, especially due to the pass of important person or serious road deterioration after the monsoon. However, routine and periodic maintenance will be required after the Project to keep the road in good states. Routine maintenance such as the small-scale patching of the pavement and cleaning of structures will be required every year, especially after rainy season. Periodic maintenance such as overlaying and repair of roadbed and structures will be required every 5 years.

Furthermore, the preventive maintenance by the routine inspection and designed procedure would be effective for the long life of the target road and for saving the maintenance costs from the long-term view points.

Therefore, the Survey Team suggests that KMC should establish the internal regulation for securing the budget, personnel and machineries, and for preparation of the road maintenance manual as well as strengthen the road maintenance capacity between the construction and operation phase of the Project.

### 3-5 Project Cost Estimation

#### 3-5-1 Initial Cost Estimation

##### (1) Cost to be borne by Pakistani side

As shown in Table 3-5-1, the costs for the environmental monitoring, relocation of obstacles, etc. to be borne by the Pakistani side are estimated to be 71.8 million Rs. which is equivalent to 76 million yen at the exchange rate (1 Rs.= 1.062 yen). This cost covers only 1.1% of the annual budget of Technical Department in 2015 (approximately 6,475 million Rs.). Therefore, it deems to be affordable for the Pakistani side.

**Table 3-5-1 Costs to be Borne by the Pakistani Side**

Cost Item		Contents	Amount (thousand Rs.)
1	Environmental and social consideration	Environmental monitoring during the construction and operational phase	5,000
2	Relocation of obstacles	Relocation of existing power poles and electric line, etc.	31,000
3	Preparation of temporary yard	Preparation of camp yard before the start of works	800
4	Commission for B/A and A/P	Bearing of commission for B/A and A/P	35,000
Total			71,800

##### (2) Estimation Conditions

- 1) Point of estimation: July 2015
- 2) USD exchange rate: 1USD=122.43 yen (mean value for the past 3 months counting from April 2015)
- 3) Implementation period: 43.0 months
- 4) Other: The Project will be implemented under the Grant Aid scheme of the Government of Japan.

### 3-5-2 Operation and Maintenance Cost

The maintenance items and costs are estimated as shown in Table 3-2-26. The annual average maintenance cost will be approximately 2.9 million Rs. (equivalent to 3.1 million yen) during the Project life. Since this is equivalent to 2.8% of the annual maintenance budget of KMC in fiscal 2014/2015, this cost could be affordable by the Pakistani side.

**Table 3-5-2 Maintenance Items and Costs**

(1 Rs. = 1.062 yen)

Type	Cycle	Maintenance contents	Specifications	Unit	Unit cost (Rs.)	Work quantity	Frequency	Cost(Rs.)
Routine	Every year	Patching	1 % of road area	m <sup>2</sup>	140	2,900	10	4,060,000
		Clearing structure	5 % of the length of drainage structures	m	20	1,200	10	240,000
		Subtotal-I					10-years aggregate=	4,300,000
Periodic	Every 5 years	Roadbed repair	2 % of road area	m <sup>2</sup>	380	5,800	2	4,408,000
		Overlay	2 % of road area	m <sup>2</sup>	1,200	5,800	2	13,920,000
		Repair of structure	1 % of the length of drainage structures	m	8,000	240	2	3,840,000
		Subtotal-II						22,168,000
			Total routine and periodic maintenance III (=I+II)					26,468,000
Operation and maintenance cost			10 % of III	Set	-	-		2,646,800
Total								29,114,800
Cost per year								2,911,480

## CHAPTER 4

# PROJECT EVALUATION

## **Chapter 4 Project Evaluation**

### **4-1 Preconditions for the Project Implementation**

The preconditions necessary for the Project implementation will be as follows;

- (1) Relocation of existing facilities and public utilities which will be obstacles for the Project such as power poles and electric lines, etc. within ROW.
- (2) Securing and levelling of construction yard and camp yard
- (3) Extraction approval for the borrow pit and quar
- (4) Securing of the access to electricity necessary for street lights and traffic signals installed in the Project

Above (1) - (4) have to be completed before the commencement of construction.

### **4-2 Items to be borne by the Pakistani Side Necessary for Achievement of the Overall Project Plan**

Following inputs by the Pakistani side will be necessary in order to realize and maintain the Project effects.

- (1) Securing budget and engineer for maintenance of the road  
Although facilities to be constructed in the Project are planned to minimise the maintenance costs, routine and periodic maintenance and repair work according to the necessity will be necessary to maintain the function of the facilities properly.
- (2) Periodic Monitoring around the Project site  
Continual monitoring on the environmental and social aspects will be necessary so as not to cause negative impacts on the Project site due to the implementation of the Project.

### **4-3 External Conditions**

External conditions to realise and maintain the Project effects enough are as follows:

- (1) Security in Karachi City and Pakistan will not be worse.
- (2) Overloading and broken-down vehicles should be policed for the long life of the facilities.
- (3) On-road parking should be regulated to secure the traffic capacity.

### **4-4 Project Evaluation**

#### **4-4-1 Relevance**

The relevance is shown as follows;

- (1) Target Beneficiaries  
Target beneficiaries of securing smooth and stable traffic between the centre of Karachi City and the suburbs including the industrial area around Qasim Port number about 20 million people. As the target beneficiaries are so many, the relevance of the Project is high.
- (2) Coordination with the long-term development plan

In the KSDP that is a long-term development plan in Karachi City, strengthening of the existing road network and enhancement of traffic capacity have been proposed to promote the competitive industry.

Furthermore, the enhancement of traffic capacity of N5 where is supposed to be one of most congested roads in Karachi City has been proposed in KTIP implemented by JICA.

Accordingly, the relevance of the Project is high.

(3) Coordination with the assistance policy of Japan

As one of the assistance policy of Japan to Pakistan, “The improvement of economic infrastructure” is mentioned. Also, the development of fundamental infrastructures for the urban transport sector, especially for supporting the activities of Japanese company in the industrial area is proposed.

Accordingly, the relevance of the Project is high.

#### 4-4-2 Effectiveness

(1) Quantitative Effect

The Project is to improve the traffic condition of the target road and to improve the access between the city centre and suburbs.

Therefore, it is suggested that the effectiveness of the Project is 1) Enhancement of traffic capacity, 2) Improvement of average travel speed at the peak hours.

Table 4-4-1 shows the indicators of quantitative effect, baselines, and target values in 3 years later after the completion of the Project.

**Table 4-4-1 Indicators of Quantitative Effect**

Indicator	Baseline (2015)	Target Value (2022) 【3 years after completion】
Traffic Capacity (pcu/hour)	5,120 / 4 lanes	7,680 / 6 lanes
Average Travel Speed at Peak Hours* (km/h)	35	60

\*peak hours : 8 :00 ~9 :00 a.m., 17 :00~18 :00 p.m.

(2) Qualitative Effect

- 1) Transportation costs related to N5 will be reduced due to the shortening of travel time.
- 2) Access improvement between the city centre and industrial area around Qasim Port will contribute to the social and economic activation in Pakistan.
- 3) Safe and smooth traffic will be ensured by separating the high-speed and slow-speed vehicles.
- 4) Security around the Project site will be improved along with the development of road space.
- 5) Roadside development will be promoted due to the improvement of road condition
- 6) Number of traffic accidents will be reduced
- 7) Road maintenance costs will be reduced.
- 8) Water accumulation on and around the target road will be improved due to the development of drainage facilities

### (3) Benefit around the Project Site

Land use at the roadside varies in each section of the target road. In Section 1 and Section 2, the roadside is well developed and many buildings and shops are located. Karachi Export Processing Zone (KEPZ) is located at the south of Section 2. In addition, these sections have the heaviest traffic in the target road. Traffic is jammed in the morning and evening peak hour and crimes such as robbers using guns happen targeting the slow vehicles.

In Section 3, many large vehicles are running between the city centre and Qasim Port, and the service facilities are located along the road. Also, the logistics infrastructures related to the Project are being developed. For example, ZOTPT, the parking facility for commercial vehicles is being constructed and the improvement of Qasim Port Road is being planned.

In Section 4, many tank lorries running between Qasim Port and the suburbs are using the road, and the on-road parking by the large vehicles is frequently observed in front of gas stations. Furthermore, Japanese companies have begun to establish their factories in Bin Qasim Industrial Area.

Based on the above-mentioned land use and traffic conditions, the benefits to the roadside in each section along with the Project are summarised as the Table 4-4-2.

**Table 4-4-2 Benefits to the Roadside in each Section along with the Project**

Section	Benefits to roadside
Section 1, Section 2 (Quaidabad~Cattle Colony Intersection)	<ul style="list-style-type: none"> <li>- Transportation time and commuting time will be reduced due to the improvement of traffic jam and the economic activities will be activated.</li> <li>- Risk for on-road crime will be improved due to the improvement of the average travel speed.</li> <li>- Logistics related to KEPZ and Qasim Port will be activated due to the traffic distribution with Mehran Highway</li> </ul>
Section 3 (Cattle Colony Intersection~ Port Qasim Intersection)	<ul style="list-style-type: none"> <li>- Transportation time between the city centre and Qasim Port will be reduced.</li> <li>- On-road parking and the congestion in Qasim Port due to the cargo-waiting vehicles will be improved in coordination with ZOTPT.</li> </ul>
Section 4 (Port Qasim Intersection~ Pak Steel Intersection)	<ul style="list-style-type: none"> <li>- Transportation time between the suburbs and Qasim Port will be reduced.</li> <li>- Economic activities by Japanese companies will be activated in Bin Qasim Area.</li> </ul>



## APPENDICES

- Appendix 1 Member List of the Survey Team
- Appendix 2 Survey Schedule
- Appendix 3 List of Parties Concerned in the Recipient Country
- Appendix 4 Minutes of Discussions (M/D)
- Appendix 5 Other Relevant Data (Technical Note)
- Appendix 6 References
  - 6-1. Monitoring Form
  - 6-2. Environmental Checklist
  - 6-3. Environmental Permit
  - 6-4. Outline Design Drawings

## Appendix 1 Member List of the Survey Team

### (1) 1st Field Survey

Assignment	Name	Agency/Company
Leader	Nobuyuki TSUNEOKA	Senior Advisor, JICA
Planning Coordinator	Yasunori TONEGAWA	Planning and Coordination Division Team 1, Transportation and ICT Group, Infrastructure and Peacebuilding Department
Chief Consultant/Traffic Planning1/Pavement Design1	Hideaki MORITA	Ingérosec Corporation
Deputy Chief Consultant /Traffic Survey & Demand Forecast/Traffic Planning 2	Makoto MATSUURA	Ingérosec Corporation
Road Design/Pavement Design 2	Ikumasa KAWASAKI	Eight-Japan Engineering Consultants Inc.
Natural Condition Survey (Topography /Geology)	Yoshiyuki AKAGAWA	Ingérosec Corporation
Natural Condition Survey (Hydraulic/Hydrology/Drainage Planning)	Tatsuo TOMIDOKORO	Eight-Japan Engineering Consultants Inc.
Environmental Consideration	Chiaki YAMADA	Ingérosec Corporation
Social Consideration/Resettlement Planning	Kakiko IDE	Ingérosec Corporation
Construction Planning/Cost Estimation	Fujio OGAWA	Ingérosec Corporation

### (2) 2nd Field Survey

Assignment	Name	Agency/Company
Leader	Nobuyuki TSUNEOKA	Senior Advisor, JICA
Planning Coordinator	Yasunori TONEGAWA	Planning and Coordination Division Team 1, Transportation and ICT Group, Infrastructure and Peacebuilding Department
Chief Consultant/Traffic Planning1/Pavement Design1	Hideaki MORITA	Ingérosec Corporation
Deputy Chief Consultant /Traffic Survey & Demand Forecast/Traffic Planning 2	Makoto MATSUURA	Ingérosec Corporation
Road Design/Pavement Design 2	Ikumasa KAWASAKI	Eight-Japan Engineering Consultants Inc.

Natural Condition Survey (Topography /Geology)	Yoshiyuki AKAGAWA	Ingérosec Corporation
Natural Condition Survey (Hydraulic/Hydrology/Drai nage Planning)	Tatsuo TOMIDOKORO	Eight-Japan Engineering Consultants Inc.
Environmental Consideration	Chiaki YAMADA	Ingérosec Corporation
Social Consideration/ Resettlement Planning	Kakiko IDE	Ingérosec Corporation
Construction Planning/ Cost Estimation	Fujio OGAWA	Ingérosec Corporation

(3) 3rd Field Survey

Assignment	Name	Agency/Company
Chief Consultant/Traffic Planning1/Pavement Design1	Hideaki MORITA	Ingérosec Corporation
Environmental Consideration	Chiaki YAMADA	Ingérosec Corporation
Social Consideration/ Resettlement Planning	Kakiko IDE	Ingérosec Corporation

(4) Outline Explanation of the Preparatory Survey

Assignment	Name	Agency/Company
Leader	Nobuyuki TSUNEOKA	Senior Advisor, JICA
Planning Coordinator	Takahiro KUGE	Planning and Coordination Division Team 1, Transportation and ICT Group, Infrastructure and Peacebuilding Department
Chief Consultant/Traffic Planning1/Pavement Design1	Hideaki MORITA	Ingérosec Corporation

## Appendix 2 Survey Schedule

### (1) 1st Field Survey

No.	Date	Team Leader	Planning Coordinator	Chief Consultant/Traffic Planning/Pavement Design	Deputy Chief Consultant/Traffic Demand Forecast/Traffic Planning	Road Design/Pavement Design	Natural Condition Survey (Topography and Geology)	Natural Condition Survey (Hydrology/ Drainage Planning)	Environmental Consideration	Social Consideration/ Resettlement Planning	Construction Planning/ Cost Estimation
		Nobuyuki TSUNEOKA	Yasunori TONEGAWA	Hideaki MORITA	Makoto MATSUURA	Ikumasa KAWASAKI	Yoshiyuki AKAGAWA	Tatsuo TOMIDOKORO	Chiaki YAMADA	Kakiko IDE	Fujio OGAWA
1	7 Sa	Tokyo-Karachi	Tokyo-Karachi	Tokyo-Karachi	Tokyo-Karachi	Tokyo-Karachi	Tokyo-Karachi	Tokyo-Karachi		Tokyo-Karachi	Tokyo-Karachi
2	8 Su	Field Survey	Field Survey	Field Survey	Field Survey	Field Survey	Field Survey	Field Survey		Field Survey	Field Survey
3	9 Mo	Explanation of Inception Report	Explanation of Inception Report	Explanation of Inception Report	Explanation of Inception Report	Explanation of Inception Report	Explanation of Inception Report	Explanation of Inception Report		Explanation of Inception Report	Explanation of Inception Report
4	10 Tu	M/D Discussion	M/D Discussion	M/D Discussion	Field Survey	Field Survey	Field Survey	Field Survey		Field Survey	Field Survey
5	11 We										
6	12 Th	M/D Signing	M/D Signing	M/D Signing							
7	13 Fr	Report to EOJ, JICA, Pakistan Government	Report to EOJ, JICA, Pakistan Government	Report to EOJ, JICA, Pakistan Government							
8	14 Sa	Islamabad-Tokyo	Islamabad-Tokyo	Internal Meeting	Internal Meeting	Internal Meeting	Internal Meeting	Internal Meeting		Internal Meeting	Internal Meeting
9	15 Su			Data Arrangement	Data Arrangement	Data Arrangement	Data Arrangement	Data Arrangement		Data Arrangement	Data Arrangement
10	16 Mo			Field Survey	Field Survey	Field Survey	Field Survey	Field Survey		Field Survey	Field Survey
11	17 Tu								Tokyo-Karachi		
12	18 We										
13	19 Th								Field Survey		
14	20 Fr										
15	21 Sa			Internal Meeting	Internal Meeting	Internal Meeting	Internal Meeting	Internal Meeting	Internal Meeting	Internal Meeting	Internal Meeting
16	22 Su			Data Arrangement	Data Arrangement	Data Arrangement	Data Arrangement	Data Arrangement	Data Arrangement	Data Arrangement	Data Arrangement
17	23 Mo			Field Survey	Field Survey	Field Survey	Field Survey	Field Survey		Field Survey	Field Survey
18	24 Tu										
19	25 We										
20	26 Th										
21	27 Fr					Karachi-Tokyo	Karachi-Tokyo				Another mission
22	28 Sa			Another mission	Internal Meeting	Internal Meeting			Internal Meeting	Internal Meeting	
23	1 Su				Data Arrangement	Data Arrangement			Data Arrangement	Data Arrangement	
24	2 Mo				Field Survey	Field Survey			Field Survey	Field Survey	
25	3 Tu										
26	4 We										
27	5 Th										
28	6 Fr										
29	7 Sa				Karachi-	Karachi-			Karachi-	Karachi-	
30	8 Su				-Tokyo	-Tokyo			-Tokyo	-Tokyo	

(2) 2nd Field Survey

No.	Date	Team Leader	Planning Coordinator	Chief Consultant/Traffic Planning/Pavement Design	Deputy Chief Consultant/Traffic Demand Forecast/Traffic Planning	Road Design/Pavement Design	Natural Condition Survey (Topography and Geology)	Natural Condition Survey (Hydrology/ Drainage Planning)	Environmental Consideration	Social Consideration/ Resettlement Planning	Construction Planning/ Cost Estimation						
		Nobuyuki TSUNEOKA	Yasunori TONEGAWA	Hideaki MORITA	Makoto MATSUURA	Ikumasa KAWASAKI	Yoshiyuki AKAGAWA	Tatsuo TOMIDOKORO	Chiaki YAMADA	Kakiko IDE	Fujio OGAWA						
1	9	Sa		Tokyo-Karachi							Tokyo-Karachi						
2	10	Su		↓ Another mission	Tokyo-Karachi		Tokyo-Karachi		Tokyo-Karachi	Tokyo-Karachi	↓ Another mission						
3	11	Mo			Explanation of Interim Report		Explanation of Interim Report		Explanation of Interim Report	Explanation of Interim Report							
4	12	Tu			Field Survey		Field Survey		Field Survey	Field Survey							
5	13	We															
6	14	Th															
7	15	Fr															
8	16	Sa			Internal Meeting		Internal Meeting		Internal Meeting	Internal Meeting							
9	17	Su			Data Arrangement		Data Arrangement		Data Arrangement	Data Arrangement							
10	18	Mo			Field Survey		Field Survey		Field Survey	Field Survey							
11	19	Tu															
12	20	We															
13	21	Th															
14	22	Fr															
15	23	Sa	Tokyo-Karachi	Tokyo-Karachi	Data Arrangement	Data Arrangement	Data Arrangement	Data Arrangement	Data Arrangement	Data Arrangement	Data Arrangement						
16	24	Su	Internal Meeting	Internal Meeting	Internal Meeting		Internal Meeting		Internal Meeting	Internal Meeting	Internal Meeting						
17	25	Mo	M/D Discussion	M/D Discussion	M/D Discussion	Field Survey	Tokyo-Karachi	Field Survey	Tokyo-Karachi	Field Survey	Field Survey						
18	26	Tu	M/D Discussion	M/D Discussion	M/D Discussion												
19	27	We	M/D Discussion	M/D Discussion	M/D Discussion												
20	28	Th	M/D Discussion	M/D Discussion	M/D Discussion												
21	29	Fr	Meeting with Concerned Parties	Report to EOI, JICA, Pakistan Government	Report to EOI, JICA, Pakistan Government	Meeting with Concerned Parties											
22	30	Sa	Karachi-Tokyo	Islamabad-Tokyo	Internal Meeting	Internal Meeting	Internal Meeting		Internal Meeting	Internal Meeting	Internal Meeting						
23	31	Sa			Data Arrangement	Data Arrangement	Data Arrangement		Data Arrangement	Data Arrangement	Data Arrangement						
24	1	Mo		Field Survey	Field Survey	Field Survey		Field Survey	Field Survey	Field Survey	Field Survey						
25	2	Tu															
26	3	We															
27	4	Th															
28	5	Fr															
29	6	Sa		Internal Meeting	Internal Meeting	Internal Meeting		Internal Meeting	Internal Meeting	Internal Meeting							
30	7	Sa		Data Arrangement	Data Arrangement	Data Arrangement		Data Arrangement	Data Arrangement	Data Arrangement							
31	8	Mo		Field Survey	Karachi-Tokyo	Field Survey		Field Survey	Field Survey	Field Survey	Field Survey						
32	9	Tu															
33	10	We															
34	11	Th															
35	12	Fr			Karachi-Tokyo												
36	13	Sa				Internal Meeting		Internal Meeting	Internal Meeting	Internal Meeting							
37	14	Sa				Data Arrangement		Data Arrangement	Data Arrangement	Data Arrangement							
38	15	Mo		Field Survey	Field Survey	Field Survey		Field Survey	Field Survey	Field Survey	Field Survey						
39	16	Tu															
40	17	We															
41	18	Th															
42	19	Fr															
43	20	Sa				Internal Meeting		Internal Meeting	Internal Meeting	Internal Meeting							
44	21	Sa				Data Arrangement		Data Arrangement	Karachi-Tokyo	Data Arrangement							
45	22	Mo		Field Survey	Field Survey	Field Survey		Field Survey	Field Survey	Field Survey	Field Survey						
46	23	Tu															
47	24	We															
48	25	Th															
49	26	Fr															
50	27	Sa				Internal Meeting		Internal Meeting	Internal Meeting	Internal Meeting							
51	28	Sa				Data Arrangement		Data Arrangement	Data Arrangement	Data Arrangement							
52	29	Mo		Field Survey	Field Survey	Field Survey		Field Survey	Field Survey	Field Survey	Field Survey						
53	30	Tu															
54	1	We															
55	2	Th															
56	3	Fr															
57	4	Sa				Internal Meeting	Tokyo-Karachi	Internal Meeting									
58	5	Sa				Data Arrangement	Data Arrangement	Data Arrangement									
59	6	Mo		Field Survey	Field Survey	Field Survey		Field Survey	Field Survey	Field Survey	Field Survey						
60	7	Tu															
61	8	We												Karachi-Tokyo			
62	9	Th															
63	10	Fr															
64	11	Sa				Data Arrangement											
61	12	Su				Data Arrangement											
62	13	Mo		Field Survey	Field Survey	Field Survey		Field Survey	Field Survey	Field Survey	Field Survey						
63	14	Tu															
64	15	We															
65	16	Th															
66	17	Fr												Karachi-Tokyo			

(3) 3rd Field Survey

No.	Date		Chief Consultant/Traffic Planning/Pavement Design	Environmental Consideration	Social Consideration/Resettlement Planning
			Hideaki MORITA	Chiaki YAMADA	Kakiko IDE
1	2	We			Tokyo-Karachi
2	3	Th			Field Survey
3	4	Fr			
4	5	Sa			Data Arrangement
5	6	Su			
6	9	7	Mo		Field Survey
7		8	Tu		
8		9	We		
9		10	Th		
10		11	Fr		
11		12	Sa		
12	13	Su			-Tokyo
1	10	5	Mo		Tokyo-Karachi
2		6	Tu		Field Survey
3		7	We		
4		8	Th		
5		9	Fr		
6		10	Sa		
7		11	Su		
8		12	Mo		Field Survey
9		13	Tu		
10		14	We		
11		15	Th		
12		16	Fr		
1	11	8	Mo	Tokyo-Karachi	
2		9	Tu	Field Survey	
3		10	We		
4		11	Th		
5		12	Fr		
6		13	Sa		Data Arrangement
7		14	Su		
8		15	Mo	Meeting with Concerned Parties	
9		16	Tu		
10		17	We	Karachi-Tokyo	

(4) Outline Explanation of the Preparatory Survey

No.	Date		Team Leader	Planning Coordinator	Chief Consultant/Traffic Planning/Pavement Design
			Nobuyuki TSUNEOKA	Takahiro KUGE	Hideaki MORITA
1	3	Sa	Tokyo-Karachi	Tokyo-Karachi	Tokyo-Karachi
2	4	Su	Internal Meeting	Internal Meeting	Internal Meeting
3	5	Mo	M/D Discussion	M/D Discussion	M/D Discussion
4	6	Tu			
5	7	We	M/D Signing	M/D Signing	M/D Signing
6	12	8	Report to EOJ, JICA, Pakistan Government	Report to EOJ, JICA, Pakistan Government	Report to EOJ, JICA, Pakistan Government
7		9			
8	10	Sa	Documentation	Documentation	↓ Another mission
9	11	Su			
10	12	Mo	Meeting with Concerned Parties	Meeting with Concerned Parties	
11	13	Tu			
12	14	We	Islamabad-Tokyo	Islamabad-Tokyo	

### Appendix 3 List of Parties Concerned in the Recipient Country

<b>Karachi Metropolitan Corporation, KMC</b>	
Niaz Ahmed Soomro	Director General (Technical Services)
Khalid Masroor	Superintending Engineer
Junaid Ahmed Siddiqi	Deputy Project Manager
Iftikhar Ali Kaimkhani	Director General, Karachi Mass Transit Cell
Fazal Karim Khatri	Director Planning & Coordination, Karachi Mass Transit Cell
Syed Anwar Ul Haq Tariq	Deputy District Officer, Works & Service Department
<b>Economic Affairs Division, Ministry of Economic Affairs and Statistics, EAD</b>	
Yasmeen Sadiq	Section Officer
Syed Mujtaba Hussain	Joint Secretary (ADB/Japan)
<b>Planning and Development Department, Government of Sindh</b>	
Muhammad Waseem	Additional Chief Secretary
Mahtab Ul Haq	Secretary (Technical)
Muhammad Asghar Memon	Chief Foreign Aid
Abul Nabi Thaheem	Senior Chief (T&C)
Riaz Ali Gohoti	Planning Officer (Foreign Aid)
<b>Local Government &amp; Rural Development Department, Government of Sindh</b>	
Abdul Kabir Kazi	Secretary
<b>Finance Department, Government of Sindh</b>	
Qassim Dada	Assistant Director, Public Private Partnership Unit
<b>Environmental Protection Agency, Government of Sindh, SEPA</b>	
Naeem Ahmed Mughal	Director General
Waqar Hussain Phulpoto	Director
<b>District Municipal Corporation Malir</b>	
Taruq Hussain Mughal	Administrator
<b>Port Qasim Authority, PQA</b>	
Aleem Shaikh	Director (Civil Maintenance)
Ramesh Lal Lund	Manager (Planning)
<b>Karachi Water &amp; Sewerage Board, KWSB</b>	
Muhammad Shakeel Qureshi	Project Director
A. Ghani Shaikh	GIS Manager
<b>Pakistan Telecommunication Company Limited, PTCL</b>	
Rana Muhammad Akram	Regional General Manager
<b>Sui Southern Gas Company Limited, SSGC</b>	
Nadeem Qayyum	Acting General Manager
<b>K-Electric</b>	
Latif	Manager
<b>Embassy of Japan</b>	
Tepei Nakagawa	First Secretary
<b>Consulate General of Japan in Karachi</b>	
Akira Ouchi	Consul General
Yasuharu Shinto	Deputy Consul General
Mitsuhiro Kobayashi	Consul
<b>JICA Pakistan Office</b>	
Ken Kato	Senior Representative
Michino Yamaguchi	Senior Representative
Maki Suzuki	Representative
Tomoko Fujikawa	Representative
Mahmood A. Jilani	National Staff
Naila Almas	National Staff



## Appendix 4. Minutes of Discussions(M/D)

### (1) 1st Field Survey

**THE MINUTES OF DISCUSSION  
ON  
THE MISSION FOR THE PREPARATORY SURVEY  
ON  
THE PROJECT FOR CONSTRUCTION AND REHABILITATION  
OF NATIONAL HIGHWAY N-5 IN KARACHI CITY  
IN  
THE ISLAMIC REPUBLIC OF PAKISTAN**

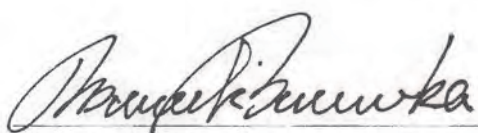
In response to a request from the Government of the Islamic Republic of Pakistan (hereinafter referred to as "Pakistan"), Japan International Cooperation Agency (hereinafter referred to as "JICA") in consultation with the Government of Japan decided to conduct a Preparatory Survey (hereinafter referred to as "the Survey") and sent a Preparatory Survey Team (hereinafter referred to as "the Team"), headed by Dr. Nobuyuki Tsuneoka, Senior Advisor of JICA, to Pakistan from February 7 to March 7, 2015 to discuss things on the Project for Construction and Rehabilitation of National Highway N-5 in Karachi City (hereinafter referred to as "the Project").

JICA and Karachi Metropolitan Corporation (hereinafter referred to as "KMC"), Government of Sindh (hereinafter referred to as "GOS"), first of all, agreed on the implementation of the Survey of the Project.

The Team held discussions with officials concerned of the Government of Pakistan and conducted a field survey in the Project area. In the course of discussions and field survey, both sides confirmed the main items described in the attached sheets.

The Team will continue further studies and prepare a Preparatory Survey Report.

Karachi, February , 2015



Nobuyuki Tsuneoka  
Leader  
Preparatory Survey Team  
Japan International Cooperation Agency

**YASMEEN SADIQ**  
Section Officer  
Economic Affairs Division  
Government of Pakistan  
Karachi

Syed Mujtaba Hussain  
Joint Secretary (ADB/Japan)  
Economic Affairs Division  
Ministry of Economic Affairs and Statistics



Saqib Soomro  
Administrator  
Karachi Metropolitan Corporation



Muhammad Waseem  
Additional Chief Secretary  
Planning and Development Department  
Government of Sindh



Abdul Kabir Kazi  
Secretary  
Local Government & Rural Development Department  
Government of Sindh

## ATTACHMENT

### 1. Title of the Project

Both Japanese and Pakistani sides (hereinafter referred to as “Both sides”) confirmed that the title of the Project shall be “the Project for Construction and Rehabilitation of National Highway N-5 in Karachi City”.

### 2. Objective of the Project

Both sides confirmed that the objective of the Project is to widen and repair the existing National Highway N-5 between Quaidabad Flyover and Pakistan Steel Junction and install adjoining facilities in order to improve traffic condition among Karachi city center and suburbs.

### 3. Objective of the Survey

Both sides confirmed the objective of the Survey as follows:

- 3.1 To understand the background and objective of the Project and examine its impacts and appropriateness.
- 3.2 To identify the components, conduct outline design and estimate the Project cost, based on the data and information collected from and the results of meetings with the Pakistani side.
- 3.3 To study the issues of environmental and social considerations through the Survey.
- 3.4 It should be noted that implementation of the Survey does not imply any decision or commitment by JICA to extend its grant for the Project at this stage.

### 4. Items requested by the Government of Pakistan

Both sides confirmed the components of the Project will be selected from the following items with a consideration of effectiveness and appropriateness as well as available budget of the Project:

#### 4.1 Project Site

The target road to be constructed is a part of National Highway N-5 in Karachi city. The target road begins and ends at the edges of Quaidabad Flyover and Pakistan Steel Junction in length of approximately 11 km, corrected from 14 km as requested in the application.

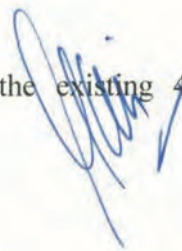
The site is also shown in Annex-1.

#### 4.2 Civil Works

- (1) Rehabilitation and improvement of the existing 4-lane dual carriageway (approx. 11 km)



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- (2) Construction of additional 2 lanes to the carriageway making a 6-lane dual carriageway (approx. 11 km)
- (3) Construction of maximum 2-lane service roads on either side
- (4) Installation of traffic control devices

#### 4.3 Technical Matters

4.3.1 Layout plan of the road will be discussed and confirmed at a technical note of each mission and therefore decided at the mission of explaining the draft final report.

4.3.2 Following road facilities may be included within the Project

- One lane of rigid pavement for the heavy traffic on either side
- Pedestrian bridges

#### 5. Responsible and Implementing Agency

Both sides confirmed the responsible and implementing organizations as follows:

5-1 The responsible and implementing organization is Karachi Metropolitan Corporation (KMC).

5-2 The organization chart of KMC is shown in Annex-2.

5-3 Upon completion, KMC will be responsible for maintenance and management for the road and facilities constructed by the Project.

#### 6. Japan's Grant Aid Scheme

6.1 The Pakistani side understands the Japan's Grant Aid scheme explained by the Team, as described in Annex-3 and Annex-4.

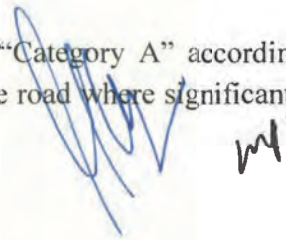
6.2 The Team explained the necessary measures to be taken by the Pakistani side, as described in Annex-5, to facilitate the smooth implementation of the Project.

#### 7. Environmental and Social Considerations

Both sides agreed on the procedure of Environmental and Social Considerations necessary for commencement of the Project. The Pakistani side is responsible for implementing the activities while JICA monitors and supports for smooth preparation.

7.1 The Team explained the outline of the JICA Guidelines for Environmental and Social Considerations (April, 2010) (hereinafter referred to as "the JICA Guidelines") to the Pakistani side. The Pakistani side understood the concept of the JICA Guidelines and confirmed to conduct the necessary procedure.

7.2 The Team explained the Project is categorized as "Category A" according to the JICA Guidelines, since the Project is widening of the road where significant adverse impact on the environment may be expected.




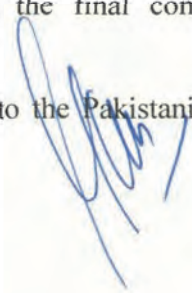


- 7.3 The Pakistani side understands the Project needs to follow the JICA Guidelines. Therefore environmental and social surveys at the Environmental Impact Assessment (EIA) level shall be done through the Survey by the Pakistani side in cooperation with the Team.
- 7.4 The Pakistani side shall prepare EIA report and obtain the Environmental Permit for the Project from the Sindh Environmental Protection Agency in accordance with the corresponding Pakistani environmental laws and regulations.
- 7.5 The Team explained that the approved EIA report with the Environmental Compliance Certificate is required to be disclosed on JICA's website 120 days prior to Grant Agreement. The Pakistani side took note of it.
- 7.6 Regarding the Project Affected Persons (PAPs) and businesses within the Project sites, the Pakistani side agreed to secure the appropriate budget to be allocated for their resettlement, compensation and assistances, and secure the land before the implementation of the Project. In this regard, an Abbreviated Resettlement Action Plan (Abbreviated RAP) will be prepared and approved by the responsible authorities before the implementation of the Project, and KMC will take necessary measures to PAPs, including affected businesses, according to the Abbreviated RAP in close communication with JICA.
- 7.7 Regarding the resettlement issues, Both sides confirmed those described in Annex-6.

## 8. Schedule of the Survey

The Preparatory Survey will be carried out under following schedule. The schedule may be subject to change during the preparation and the course of the survey.

- 8.1 Below are major schedules of the Survey. The Team will visit Pakistan four (4) times in total before finalizing the Preparatory Survey Report.
- The First Survey as "Project Scoping" (February, 2015): The Team will continue further studies in Pakistan until March 7, 2015.
  - The Second Survey as "Outline Design" (May to July, 2015): The Team will implement technical surveys necessary for road design.
  - The Third Survey as "Mid-Review" (September, 2015): The Team will come to discuss further planning of the Project and monitor the progress of social and environmental issues.
  - The Fourth (the last) Survey as "Explanation on the Draft Final Report" (December, 2015): JICA will prepare the Draft Final Report and send The Team to explain details of the Project including the final components and cost estimation to the Pakistani side.

- 8.2 JICA will finalize the Final Report and send it to the Pakistani side around May, 2016.



8.3 As commencing of each survey, the Team will prepare reports and explain on it to the Pakistani side for smooth implementation of the Survey and mutual understanding.

#### 9. Approval of PC-1

KMC agreed that PC-1 will be prepared by KMC based on the information to be provided by the Team to KMC soon after Draft Final Report is explained and shared by the Team in December 2015. Pakistani stakeholders including Planning and Development Department (P&D), GOS, Local Government & Rural Development Department, GOS and KMC, showed their understanding on PC-1 to be approved by PDWP/CDWP by March 2016, as is required before the approval by Japanese Cabinet. KMC informed that KMC will follow the approval process of PDWP/CDWP for ensuring timely approval of PC-1 before the approval of Japanese Cabinet.

#### 10. Other Relevant Issues

10.1 The Pakistani side understood the principle of the Japan's Official Development Assistance (ODA) Charter, which stresses that ODA must not be utilized for military purposes or promoting international conflicts.

10.2 The Pakistani side confirmed that the following undertakings should be taken by the Pakistani side at its own expense if implementation of the Project is accepted by the Government of Japan.

(1) To secure sites for material storing yard, temporary construction yard and waste disposal for the Project.

(2) To relocate existing utilities within the Project site to designated area.

(3) To arrange issuance of license, permission and other necessary procedures for the Project

10.3 The Pakistani side shall secure enough budget and personnel necessary for the operation and maintenance of the facilities implemented by the Project, including the periodical maintenance work after the completion of the Project.

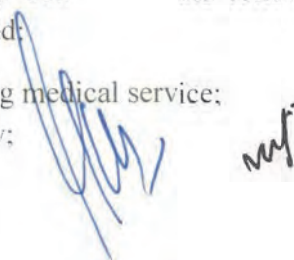
10.4 KMC shall act as a counterpart agency to the Team and also as a coordinating body with other organizations concerned for the smooth implementation of the Survey.

10.5 The Government of Pakistan and GOS shall take all possible and necessary security arrangement to ensure the safety of the concerned Japanese people during the Survey as well as implementation of the Project at the Project sites and movement to the Project sites from their accommodations, if Japanese side requests.

10.6 KMC shall, at its own expense, provide the Team with the following items in cooperation with other organizations concerned:

(1) information as well as support in obtaining medical service;

(2) data and information related to the Survey;



- (3) counterpart personnel;
- (4) credentials or identification cards;
- (5) entry permits necessary for the Team members to conduct field surveys;
- (6) permission for the implementation of traffic survey;
- (7) necessary arrangement for exemption of the taxes, duties, and any charges on equipment, machinery and other materials brought into Pakistan for the implementation of the Survey; and

10.7 KMC shall answer to the Questionnaire submitted by the Team in English with relevant documents by 20 February 2015.

#### 10.8 Misconduct

If JICA receives information concerning suspected corrupt or fraudulent practices, KMC shall take necessary measures in accordance with the Procurement Guidelines in the competition for, or in execution of, the contract funded by the Grant:

- (1) to provide JICA with such information as JICA may reasonably request, including information related to any concerned official of the government and/or public organizations of Pakistan;
- (2) not to treat unfairly or unfavorably the physical persons and juridical persons, that provide the information.

Annex-1: Project Site

Annex-2: Organization Chart of KMC

Annex-3: Japan's Grant Aid Scheme

Annex-4: Flowchart of Japan's Grant Aid Procedure

Annex-5: Major Undertakings to be Taken by Each Government

Annex-6: Resettlement Issues

**Annex-1: Project Site**

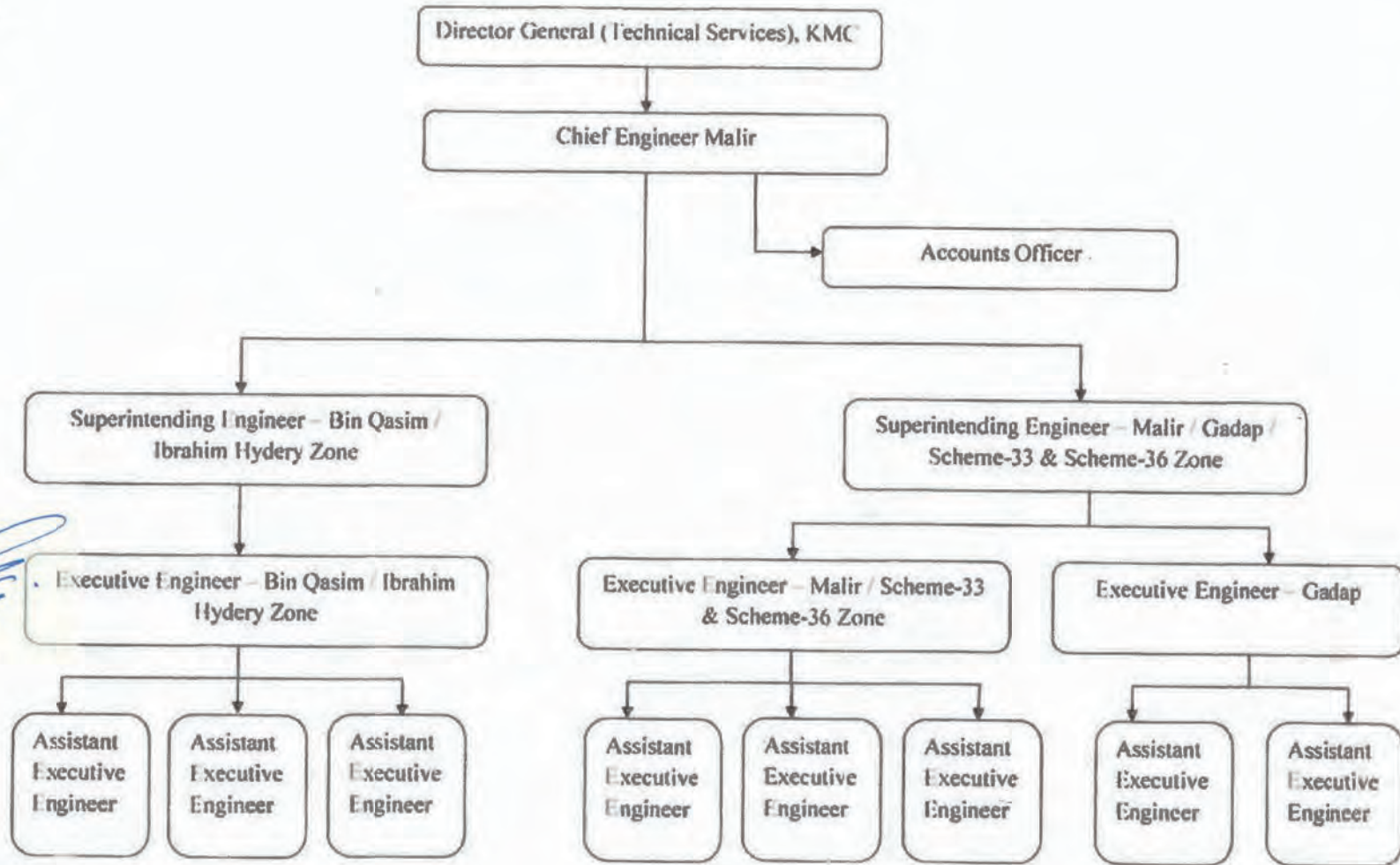


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Annex-2: Organization Chart of KMC



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### **Annex-3: Japan's Grant Aid Scheme**

#### JAPAN'S GRANT AID

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on this law and the decision of the GOJ, JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

#### **1. Grant Aid Procedures**

The Japanese Grant Aid is supplied through following procedures:

- Preparatory Survey
  - The Survey conducted by JICA
- Appraisal & Approval
  - Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Authority for Determining Implementation
  - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
  - Agreement concluded between JICA and a recipient country
- Implementation
  - Implementation of the Project on the basis of the G/A

#### **2. Preparatory Survey**

##### **(1) Contents of the Survey**

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.

- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Outline Design of the Project is confirmed based on the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

#### (2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

#### (3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

### 3. Japan's Grant Aid Scheme

#### (1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be signed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

#### (2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

#### (3) Eligible source country


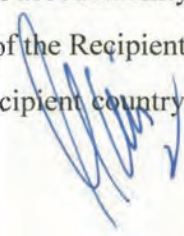
Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

#### (4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

#### (5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake



such necessary measures as Annex-5.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant Aid, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

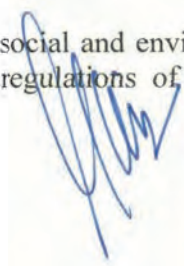
- a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.
- b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

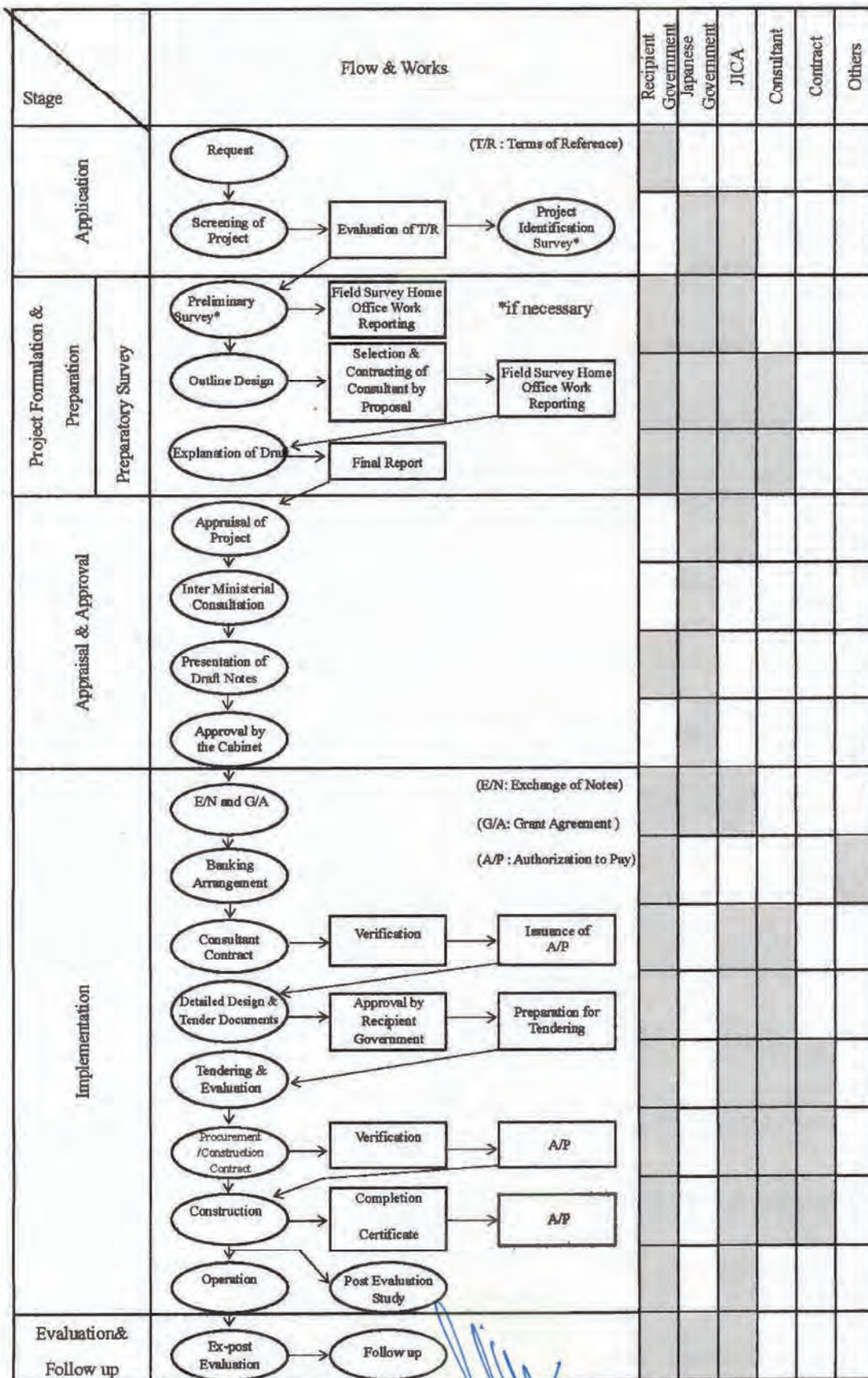
The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(10) Social and Environmental Considerations

A recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA socio-environmental guidelines.



### Annex-4: Flowchart of Japan's Grant Aid Procedure



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**Annex-5: Major Undertakings to be Taken by Each Government**

NO	Items	To be covered by the Grant	To be covered by Recipient side
1	To secure land		●
2	To clear the site when needed		●
3	To construct roads		
	1) Within the site	●	
	2) Outside the site		●
4	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities		
	1) Electricity		
	a. The distributing line to the site		●
	b. The drop wiring and internal wiring within the site	●	
	c. The main circuit breaker and transformer	●	
	2) Drainage		
	a. The city drainage main (for storm, sewer and others) to the site		●
	b. The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the site	●	
	3) Equipment	●	
5	To bear the following commissions to a bank of Japan for the banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
6	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		
	1) Marine(Air) transportation of the products from Japan to the recipient country	●	
	2) Tax exemption and customs clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	(●)	(●)
7	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●

NO	Items	To be covered by the Grant	To be covered by Recipient side
8	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract		●
9	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		●
10	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for construction of the facilities as well as for the transportation and installation of the equipment		●

(B/A: Banking Arrangement, A/P: Authorization to Pay)

## Annex-6 : Resettlement Issues

### 1. JICA Guidelines for Environmental and Social Considerations (April, 2010)

The JICA Mission for the Project for Construction and Rehabilitation of National Highway N-5 in Karachi City (hereinafter referred as "the Project") explained that the JICA Guidelines for Environmental and Social Considerations (the JICA Guidelines) (April, 2010) is mandatory for all JICA assisted projects to recognize and address environmental and social impacts. In terms of involuntary resettlement, the JICA Guidelines covers eligibility of compensation/assistance for all the Project Affected Persons (PAPs) irrespective of their land titles. As an effective stopgap measures, Abbreviated Resettlement Action Plan (Abbreviated RAP) is required under a certain conditions by the JICA Guidelines referring to World Bank's Operational Policy (OP) 4.12 and its "Annex A". The JICA Guidelines is the guiding rule to identify impacts and to plan measures for mitigating various losses likely to occur due to resettlement impacts. In particularly, JICA is required to confirm that projects do not deviate significantly from the World Bank's Safeguard Policies OP/ BP 4.12 (involuntary resettlement) as well as other relevant documents such as World Bank's Involuntary Resettlement Sourcebook.

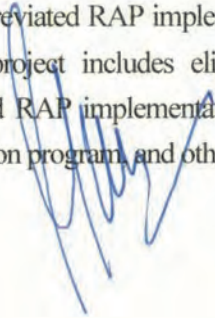
### 2. Resettlement Principles and Assistance for the Project

Land Acquisition Act 1894 (hereinafter referred to as "LAA 1894"), stipulates to consider Government Guidelines, decisions, and circulations issued time to time with regard to valuation of assets and compensation determination. Accordingly, the resettlement principles adopted for the Project also recognizes both, Pakistan's country system represented by the LAA 1894, and the JICA Guidelines. In order to solve the gaps between the Pakistan's Country system and the JICA Guidelines, the most fundamental resettlement policy which will be adopted in the Project shall stand on the base of Compensation/Assistance to all PAPs regardless of their land title. Based on the above policy features, the JICA Mission and Pakistani side agreed that the following major items/principles of resettlement issues of the Project:

- Land replacement or cash compensation at full replacement costs<sup>1</sup> based on current market price to the PAPs subject to be fixed by the Land Acquisition Collector, by the direction of the Land Commissioner.
- Cash compensation for all affected structures (residential/residential-cum commercial and other structures) affected by the project at full replacement cost subject to be determined by the Land Acquisition Collector.

<sup>1</sup> "full replacement cost" is the method of valuation of assets that helps determine the amount sufficient to replace lost assets and cover transaction costs. In applying this method of valuation, depreciation of structures and assets should not be taken into account. For losses that cannot easily be valued or compensated for in monetary terms (e.g., access to public services, customers, and suppliers; or to fishing, grazing, or forest areas), attempts are made to establish access to equivalent and culturally acceptable resources and earning opportunities. (Ref) World Bank OP 4.12

- Assistance will be provided to the owners of structures and non-titleholders, who may incur loss of ability to maintain livelihood during relocation and resettlement;
- Rehabilitation assistance i.e.; compensation for lost business and workdays (including employees) due to relocation and disruption of business enterprise;
- Compensation and Assistance for resettlement impacts will be made in accordance with this policy before taking possession of the acquired lands and properties;
- Stakeholder Meeting complying with the JICA Guidelines must be ensured and implemented with enough considerations and participation of socially vulnerable groups including women.
- KMC must disclose necessary documents and information complying with the JICA Guidelines to secure transparency for PAPs and other relevant stakeholders.
- All cost required for compensation and Abbreviated RAP implementation will be borne by KMC. The estimated resettlement cost for the project includes eligible compensation, resettlement assistance, and support cost for Abbreviated RAP implementation, such as external monitoring, resettlement site preparation, income restoration program, and other activities.





**THE MINUTES OF DISCUSSION**  
**ON**  
**THE MISSION FOR THE PREPARATORY SURVEY**  
**ON**  
**THE PROJECT FOR CONSTRUCTION AND REHABILITATION**  
**OF NATIONAL HIGHWAY N-5 IN KARACHI CITY**  
**IN**  
**THE ISLAMIC REPUBLIC OF PAKISTAN**  
**(The 2nd Field Survey)**

On the basis of the preparatory survey in the Islamic Republic of Pakistan (hereinafter referred to as "Pakistan") in February, 2015 and following technical examination in Japan, Japan International Cooperation Agency (hereinafter referred to as "JICA") prepared an Interim Report (hereinafter referred to as "the Report") on the Project for Construction and Rehabilitation of National Highway N-5 in Karachi City (hereinafter referred to as "the Project").

The Preparatory Survey Team (hereinafter referred to as "the Team"), headed by Dr. Nobuyuki Tsuneoka, Senior Advisor of JICA, explained to and consulted with Karachi Metropolitan Corporation (hereinafter referred to as "KMC"), Government of Sindh (hereinafter referred to as "GOS"), and the concerned officials of the Government of Pakistan based on the Report and conducted a field survey in the Project area.

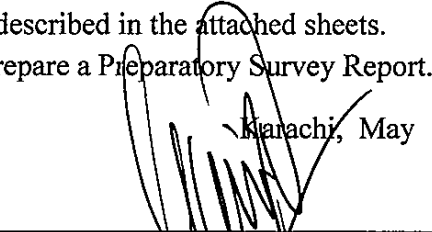
As a result of discussions and the field survey, both sides reconfirmed the contents of the Minutes of Discussions on the Preparatory Survey for the Project signed on February 20, 2015, and additionally confirmed the main items described in the attached sheets.

The Team will continue further studies and prepare a Preparatory Survey Report.


Karachi, May , 2015



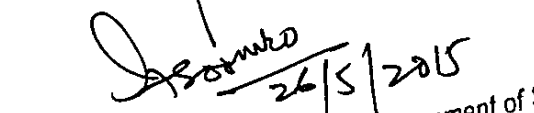
Nobuyuki Tsuneoka  
Leader  
Preparatory Survey Team  
Japan International Cooperation Agency



Saqib Soomro  
Administrator  
Karachi Metropolitan Corporation

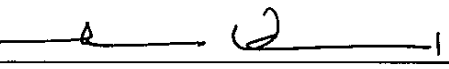


Shahid Ahmeed Wakil  
Deputy Secretary (Japan)  
Economic Affairs Division  
Ministry of Economic Affairs and Statistics



Imram Atta Soomro  
Secretary  
Local Government & Rural Development Department  
Government of Sindh

Secretary to Government of Sindh  
Local Government Department



Muhammad Waseem  
Additional Chief Secretary  
Planning and Development Department  
Government of Sindh

## ATTACHMENT

### 1. Field Survey

First Field Survey was conducted from February 7 to March 7, 2015 and Minutes of Discussion of First Field Survey (hereinafter referred to as "M/D-1") was signed on February 20, 2015.

Both sides confirmed Minutes of Discussions of Second Field Survey (hereinafter referred to as "M/D-2") is based on the M/D-1, therefore descriptions in the M/D-2 focuses on necessary points to be added to and/or amended from the M/D-1.

### 2. Contents of the Interim Report

The Pakistani side agreed and accepted in principle the contents of the report explained by the Team.

### 3. Conditions for the Outline Design of the Project

Both sides confirmed the basic conditions for the outline design of the road are follows;

#### 3-1. Project Section

The target road to be constructed is a part of National Highway N-5 in Karachi city.

- Start Point: Approximately 100 m from the edge of Quidabad Flyover

- End Point: Port Qasim Intersection

Based on the result of traffic survey and pavement condition, the End Point would be changed from Pakistan Steel Junction to Port Qasim intersection in length of approximately 9 km.

The site is shown in Annex-1.

The Team confirmed that the section (between Port Qasim Intersection and Pakistan Steel Junction) excluded from the Project will be widened by KMC at an appropriate time.

#### 3-2. Route of the Project Road

Outline design works will be conducted based on the Option "Widening and rehabilitation of the target road".

The route of the Project Road is also shown in Annex-1.

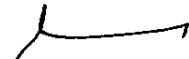
#### 3-3. Cross section

The width of ROW is 150 feet (45.7 m), and the cross section will be examined within the ROW.

### 4. Project Components Requested by the Pakistani Side



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Both sides confirmed the components of the Project in the following table. However, the Pakistani side understood that the final components of the Project would be selected by the Japanese side with a consideration of appropriateness, effectiveness, technical and financial viability, and sustainability.

Component	Remark
(1) Rehabilitation and improvement of the existing road (4-lane)	- Necessity of the rehabilitation and improvement will be verified based on condition of pavement composition, result of traffic demand forecast and axle load survey.
(2) Widening of the road from 4-lane to 6-lane	- Necessity of the widening will be verified based on the result of traffic demand forecast.
(3) Construction of service roads	- Necessary sections will be identified based on the result of this field survey.
(4) Installation of traffic control devices	- Necessary points will be identified based on the results of traffic survey.
(5) Construction of surface drainage facilities	- Necessary sections will be identified based on the drainage plan considered through this survey.
(6) Installation of bus bays	- Location and specification will be considered based on the results of this field survey.
(7) Installation of pedestrian bridges	- In case strong positive impacts are identified at specified locations, it might be included.
(8) Installation of crossing utility ducts	- Necessity of the ducts will be verified based on the result of this field survey.

#### 5. Major Undertakings to be taken by the Pakistani Side

5-1 The Pakistani side will take the necessary measures, as described in Annex-2, to facilitate the smooth implementation of the Project, as a condition for the Japan Grant Aid to be implemented.

5-2 The Pakistani side agreed that the following undertakings should be taken by the Pakistani side at the Pakistan's expenses under the Project if implementation of the Project is approved by the Government of Japan;

- (1) to provide tax exemption for construction materials and equipment for the Project;
  - 1) The Pakistani side agreed that customs duties, internal taxes and other fiscal levies which may be imposed in Pakistan are exempted under mutual agreement of Exchange of Note (E/N).
  - 2) If any expenses stated above are caused by some reasons such as the delay of execution of tax exemption, the Pakitani side shall pay for it.
- (2) to secure the lots of land necessary for the implementation of the Project including land for site office, plant yards, material storing yard, motor pool, temporary construction yard and waste disposal site;
- (3) to relocate existing utilities within the Project site if necessary;
- (4) to relocate existing buildings and facilities if necessary;
- (5) to arrange issuance of license, permission and other necessary procedures for the Project;

- (6) to obtain the royalties/permission for taking raw materials such as stone/rock/filling materials from the quarry/river-bed/borrow pit; and
- (7) to provide security arrangement to ensure the safety of the concerned Japanese people at the Project sites and movement to the Project sites from their accommodations.

## 6. Environmental and Social Considerations

6.1 Pakistani side agreed to continuously conduct environmental and social considerations study in accordance with the JICA Guidelines for Environmental and Social Considerations (April, 2010) (hereinafter referred to as "the JICA Guidelines").

6.2 Both sides confirmed that both sides will cooperate with each other continuously to solve the gaps on policies for compensation and entitlement provisions between the Pakistan's Country system and the JICA Guidelines.

6.3 The Team explained that the Project will be categorized as "Category B" in accordance with the JICA Guidelines since the Project section which has changed as shown in the Article 3 above will not be considered as a sector having significant adverse impacts on the environmental and society under the JICA Guidelines. The Team also explained that the approved EIA report will not be required to be disclosed on JICA's website for 120 days prior to Grant Agreement only after re-categorization of the Project to "Category B". Pakistani side understood these JICA's explanations.

6.4 Both sides confirmed the tentative schedule of environmental certificate procedures (e.g. approval of EIA, etc.) necessary for commencement of the Project shown in Annex-3.

The Pakistani side shall conduct necessary procedures for environmental certificate procedures according to the schedule and report its progress to JICA Pakistan Office. The report to JICA Pakistan Office shall be submitted monthly with actual progress bar chart in Annex-3.

## 7. Operation and Maintenance

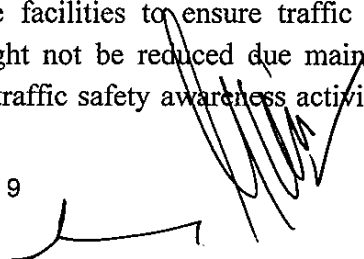
7.1 The Pakistani side will take every necessary action to maintain the drainage facilities and avoid clogging which could cause overflowing and damages to the road.

7.2 The Team explained and the Pakistani side agreed that taking necessary actions to let the road users respect traffic regulations are fundamental regarding the following three issues to maintain the facilities and to ensure road safety.

- (1) Although the project includes some facilities to ensure traffic safety such as guardrail, frequency of accidents might not be reduced due mainly to increased traffic volume. Therefore continuous traffic safety awareness activities by relevant



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organizations are required.

- (2) Overloading trucks which would exceed designed live load would cause earlier rehabilitation and shorter lifespan.
- (3) Proper asset management will impact greatly to maintenance cost and lifespan.

## 8. Safety Measures

8.1 To avoid accidents on site during the implementation of the Project, the Pakistani side agreed to cause the consultant and the contractor to enforce safety measures such as setting safety assurance to the site, providing information for security control to public, and deploying adequate security personnel, based on "The Guidance for the Management of Safety for Construction Works in Japanese ODA Projects" which has been published on JICA's URL below.

[http://www.jica.go.jp/activities/schemes/oda\\_safety/ku57pq00001nz4eu-att/guidance\\_en.pdf](http://www.jica.go.jp/activities/schemes/oda_safety/ku57pq00001nz4eu-att/guidance_en.pdf)

8.2 The Team recommended to the Pakistani side to explain to the residents about the Project (necessity and significance, construction period, sites, impact etc.), so that consensus support can be obtained from them for the smooth operation of the Project.

## 9. Schedule of the Survey

9.1. The Team will stay and continue the survey till July 31, 2015.

9.2. The Team for "Mid-Review" will be sent in September, 2015 to discuss further planning of the Project and monitor the progress of social and environmental issues.

9.3. JICA will prepare a draft final report and the Team for "Explanation of Draft Final Report" will be sent in December, 2015 to explain details of the Project including the final components and cost estimation to the Pakistani side.

9.4. JICA will finalize the Final Report and send it to the Pakistani side around May 2016.

## 10. Approval of PC-1

Pakistani stakeholders including Planning and Development Department (P&D), GOS, Local Government & Rural Development Department, GOS and KMC, showed their understanding on PC-1 to be approved by PDWP/CDWP/ECNEC or at least Anticipatory Approval of ECNEC by March 2016, as is required before the approval by Japanese Cabinet.

Annex-1: Project Site

Annex-2: Major Undertakings to be taken by Each Government

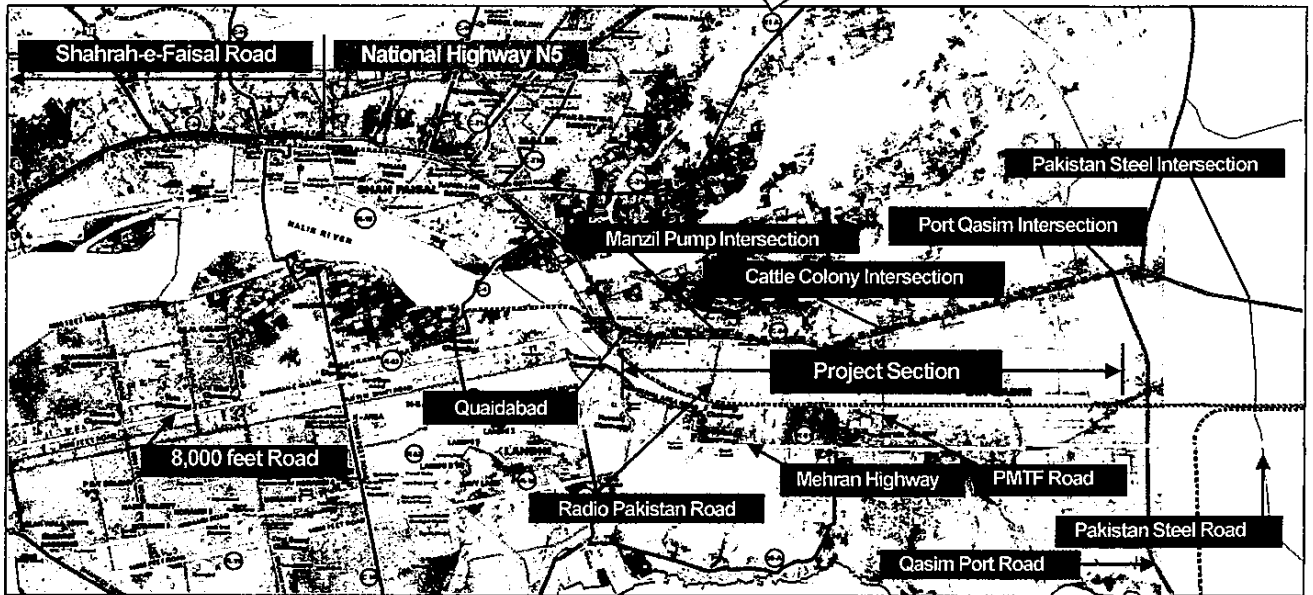
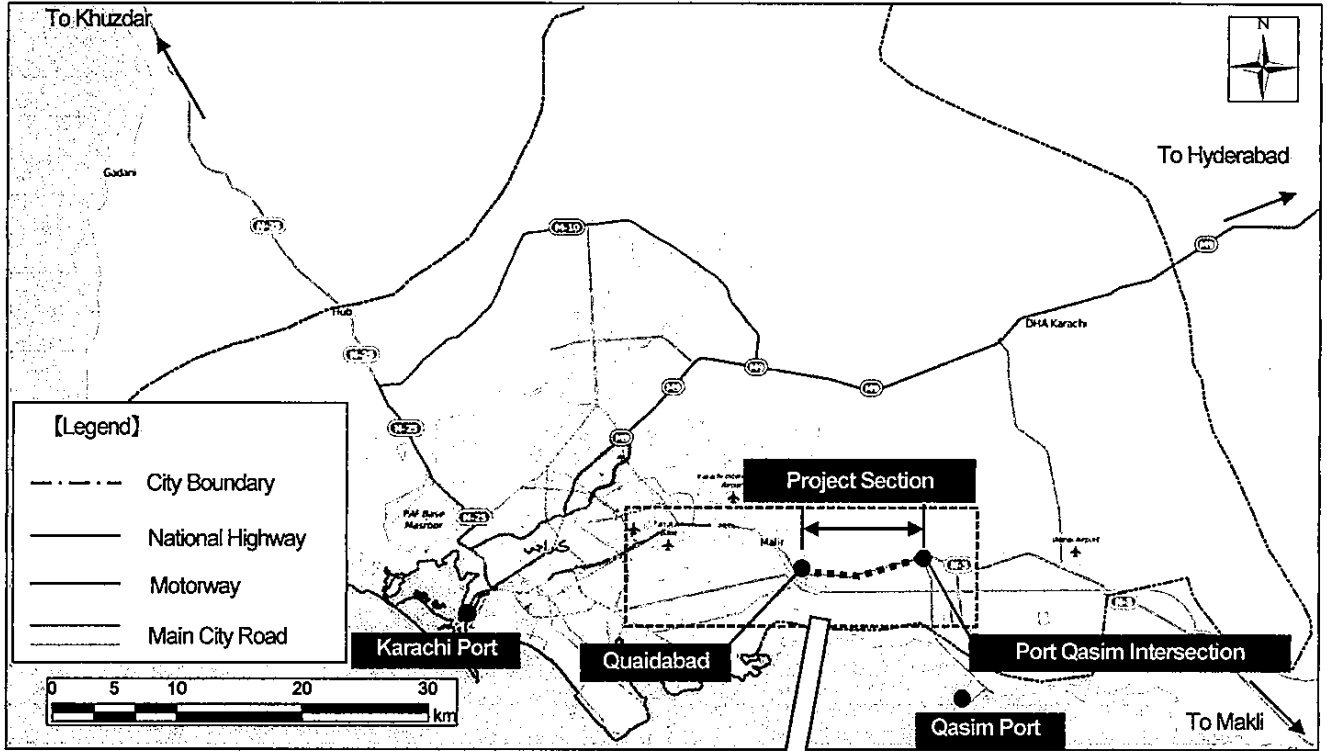
Annex-3: Tentative Schedule for EIA Procedures of the Project




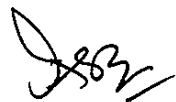

5 / 9



**Annex-1: Project Site**



*Handwritten signatures and initials:*

**Annex-2: Major Undertakings to be taken by Each Government**

NO	Items	To be covered by the Grant	To be covered by Recipient side
1	To secure land		●
2	To clear the site when needed		●
3	To construct roads		
	1) Within the site	●	
	2) Outside the site		●
4	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities		
	1) Electricity		
	a. The distributing line to the site		●
	b. The drop wiring and internal wiring within the site	●	
	c. The main circuit breaker and transformer	●	
	2) Drainage		
	a. The city drainage main (for storm, sewer and others) to the site		●
	b. The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the site	●	
3) Equipment	●		
5	To bear the following commissions to a bank of Japan for the banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
6	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		
	1) Marine(Air) transportation of the products from Japan to the recipient country	●	
	2) Tax exemption and customs clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	(●)	(●)
7	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●

NO	Items	To be covered by the Grant	To be covered by Recipient side
8	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract		●
9	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		●
10	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for construction of the facilities as well as for the transportation and installation of the equipment		●

(B/A: Banking Arrangement, A/P: Authorization to Pay)



Tentative Schedule for EIA Procedures of the Project for Construction and Rehabilitation of National Highway N-5 in Karachi City

NO	Required Procedures	Responsibility	Year Month	2015											
				5	6	7	8	9	10	11	12				
1	Issuance of Public Notice (15 days before Scoping Meeting)	KMC	Plan	▲											
			Actual												
2	Preparation of documents for Scoping Meeting	KMC	Plan												
			Actual												
3	Scoping Meeting	KMC	Plan		▲										
			Actual												
4	EIA Survey	KMC	Plan												
			Actual												
5	Preparation of draft EIA Report	KMC	Plan				▲								
			Actual												
6	Public Hearing	KMC	Plan												
			Actual						▲						
7	Expert Committee	KMC	Plan												
			Actual								▲				
8	Review of EIA report	KMC	Plan												
			Actual												
8	Submission of final EIA report to SEPA	KMC	Plan												
			Actual								▲				
9	Review of final EIA report	SEPA	Plan												
			Actual												
10	Approval of EIA report	SEPA	Plan												
			Actual											▲	

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A-32

Handwritten signatures and initials are present at the bottom of the page, including a large signature on the left, a signature with '9/2' below it, and another signature with 'J83' below it. There is also a simple line drawing of an arrow pointing to the right.

(3) Outline Explanation of the Preparatory Survey

**Minutes of Discussions  
on The Preparatory Survey for  
The Project for Construction and Rehabilitation  
of National Highway N-5 in Karachi City  
IN  
The Islamic Republic of Pakistan  
(Explanation on Draft Preparatory Survey Report)**

With reference to the minutes of discussions signed between Karachi Metropolitan Corporation (hereinafter referred to as "KMC"), Government of Sindh (hereinafter referred to as "GOS"), and the concerned officials of the Government of Pakistan and the Japan International Cooperation Agency (hereinafter referred to as "JICA") in February ,2015 and May ,2015 , and in response to the request from the Government of the Islamic Republic of Pakistan (hereinafter referred to as "Pakistan") dated August 13 ,2013 , JICA dispatched the Preparatory Survey Team (hereinafter referred to as "the Team") for the explanation of Draft Preparatory Survey Report (hereinafter referred to as "the Draft Report") for the Project for Construction and Rehabilitation of National Highway N-5 in Karachi City (hereinafter referred to as "the Project"), headed by Dr. Nobuyuki Tsuneoka, Senior Advisor of JICA, from December 3 to 9, 2016.

As a result of the discussions, both sides agreed on the main items described in the attached sheets.

Karachi, December , 2016



**Nobuyuki Tsuneoka**

Leader

Preparatory Survey Team

Japan International Cooperation Agency

**Niaz Ahmed Soomro**

Director General (Technical Services)

Karachi Metropolitan Corporation

---

**Rana Muhammad Yousaf Khan**

Deputy Secretary(Japan)

Economic Affairs Division

---

**Muhammad Ramzan Awan**

Secretary

Local Government & Rural Development

Department

Government of Sindh

---

**Mahtab UI Haq**

Secretary(Technical)

Planning and Development Department

Government of Sindh



## ATTACHMENT

### 1. Contents of the Draft Report

After the explanation of the contents of the Draft Report by the Team, the Pakistani side agreed to its contents.

The Pakistani side agreed that the draft report has been prepared on the assumption of implementing the Project under the Japan's Grant Aid scheme.

### 2. The project section of the target road

#### 2-1. The previously confirmed target road

The Team explained the target road as follows, on The 2nd Field Survey.

The target road to be constructed was a part of National Highway N-5 in Karachi city.

- Start Point: Approximately 100 m from the edge of Quidabad Flyover

- End Point: Port Qasim Intersection

Based on the result of traffic survey and pavement condition, the End Point would be changed from Pakistan Steel Junction to Port Qasim intersection in length of approximately 9 km.

#### 2-2. The surveyed section of the target road

The Outline Design has been conducted as follows, in according with discussion with Japanese relevant organization.

The surveyed section of the target road is a part of National Highway N-5 in Karachi city.

- Start Point: Approximately 100 m from the edge of Quidabad Flyover

- End Point: Pakistan Steel Junction

The site is shown in Annex-1.

### 3. Cost estimate

The Team explained that the Project cost is attached in the Annex-2, which is estimated based on the assumption of undertakings by both side.

The Team explained that large gap has occurred between the requested costs by the Pakistani side and the estimated costs by JICA.

The factors of cost increase are as follows;

- The requested costs do not contain those of Detailed Design, Procurement Supervision and the contingency.

- The requested costs contain indirect cost, but its details and amounts are uncertain and smaller, compared with JICA estimate.
- The estimated costs reflect the results of Outline Design. The main factor of cost increase is pavement price where the estimated pavement costs reflect the future traffic volume and relevant geotechnical data.

#### 4. Confidentiality of the cost estimate and technical specifications

Both sides confirmed that the cost estimate and technical specifications in the Draft Report should never be duplicated or disclosed to any third parties until all the contracts under the Project are concluded.

#### 5. Schedule of the Study

JICA will finalize the Preparatory Survey Report based on the confirmed items. The Pakistani side shall send the comments to the Draft Report by January 17, 2017. The report will be sent to the Pakistani side around February, 2017.

#### 6. Contents of the Final Report

In case contents of the report might be used for any purpose other than assistance by the Government of Japan (including JICA's activities) before signing of Grant Agreement for the Project, the Pakistani side shall inform the Japanese side (JICA Pakistan Office) in advance.

#### 7. Environmental and Social Considerations

7.1 The Team explained the Project had been changed to be categorized as "Category A" according to the JICA Guidelines, since the Project is widening of the trunk road of around 11km long where significant adverse impact on the environment may be expected.

7.2 The Team explained the necessary measure as "Category A" has been implemented and concluded for Japanese side.

7.3 The Pakistani explained to have obtained the Environmental Permit for the Project from the Sindh Environmental Protection Agency in accordance with the corresponding Pakistani side environmental laws and regulations.



8. Information from the Pakistani side

(1) The Pakistani side explained that the construction of flyover will be commenced at Manzil Pump intersection around January, 2017.

(2) The Pakistani side requested that future direction of the project will be informed in a written letter. The team took note of it.

END

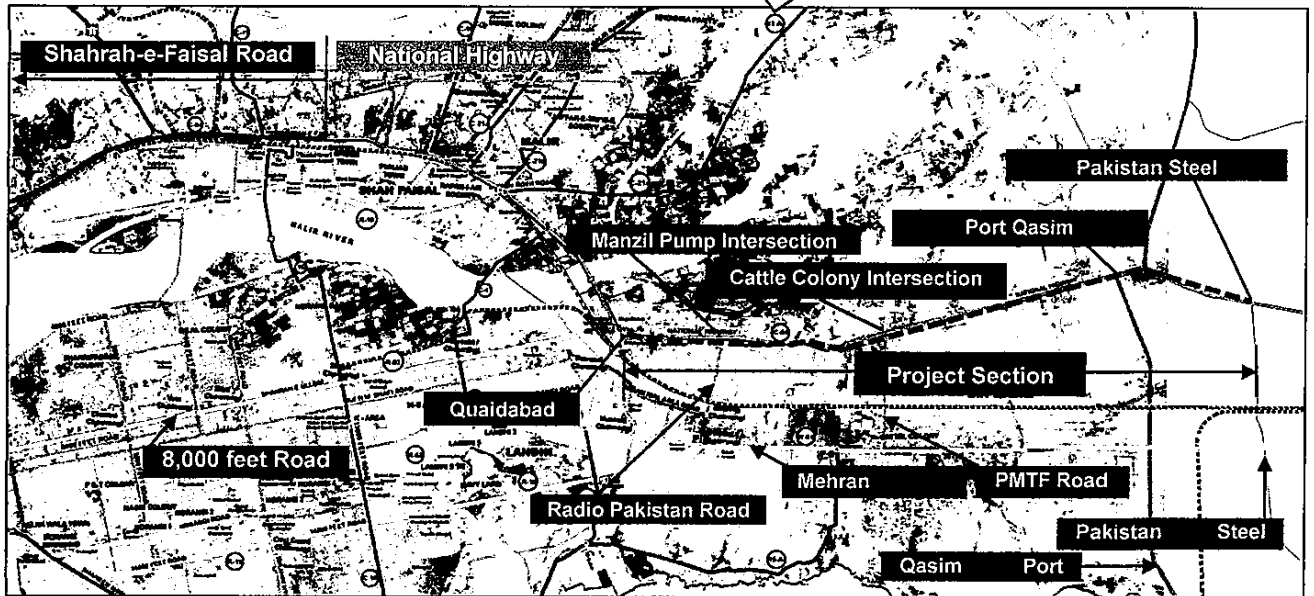
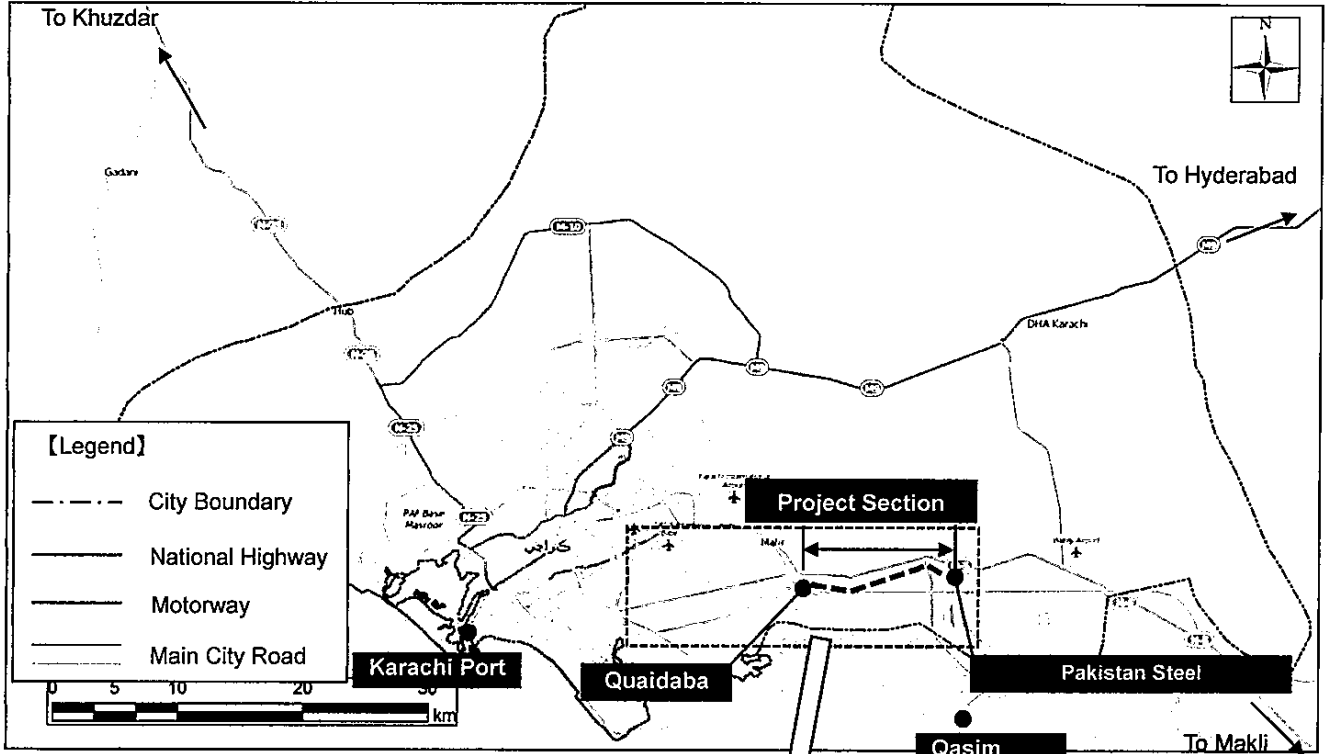
Annex 1 Project Site

Annex 2 Project Cost Estimation



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**Annex-1: Project Site**



## Annex-2: Project Cost Estimation

CONFIDENTIAL

### (1) Cost Borne by the Government of Japan

This part is concealed for the confidentiality.
-------------------------------------------------

### (2) Cost Borne by the Government of Pakistan

Items	Deadline	In charge	Estimated Cost*
Environmental and social consideration	Before P/Q Notice	KMC	5,000
Relocation of obstacles	-ditto-	-ditto-	31,000
Preparation of temporary yard	-ditto-	-ditto-	800
Commission for B/A and A/P	-ditto-	-ditto-	35,000

\*Unit: Thousand Pakistan Rupee

### (3) Conditions of Cost Estimation

- Estimated timing: July 2015
- Exchange rates: USD1.00 = 122.43 JPY  
Rs 1.00 = 1.062 JPY





Appendix 5. Other Relevant Data (Technical Note)



**INGÉROSEC Corporation**

Shinjuku i-LAND Tower 43F, 6-5-1, Nishi-Shinjuku, Shinjuku-ku, Tokyo  
163-1343 JAPAN, TEL: +81-3-5324-0211 FAX: +81-3-5324-0215  
Homepage : <http://www.ingerosec.com> E-mail: [ingerosec@ingerosec.com](mailto:ingerosec@ingerosec.com)



**Eight-Japan Engineering Consultants Inc**

Our Ref : KHIN5/OD/IGS/KMC/01/Mar/2015

Date: 10/June/2015

To: Director General (Technical Service)  
Karachi Metropolitan Corporation (KMC)  
Civic Centre , Karachi, The Islamic Republic of Pakistan

Dear Sir,

**RE: THE PROJECT FOR CONSTRUCTION AND REHABILITATION OF NATIONAL  
HIGHWAY N-5 IN KARACHI CITY, JAPAN GRANT AID PROJECT**

**SUB: Technical note of design value to be used for Preparatory Survey of the Project**

We are very pleased to submit a Technical Note for the key design value to be used for the captioned project. The values on the Technical Note is in accordance with the result of discussion carried out at the conference room of KMC on 8th June, 2015 by the Survey Team dispatched by Japan International Cooperation Agency (JICA) and KMC technical representatives..

Yours faithfully,

A handwritten signature in blue ink, appearing to read 'Hideaki MORITA', written over a horizontal line.

Hideaki MORITA  
The Chief Consultant of JICA Survey Team  
INGEROSEC CORPORATION

Attachment: Memorandum of Technical Note

## Memorandum

10/June/2015

**Subject : Technical note of Design Value to be used for Preparatory Survey on The Project for Construction and Rehabilitation of National Highway N-5 in Karachi City, JICA Grant Aid Project**

The JICA Preparatory Survey Team will propose the following principal standard for the design of the captioned project.

**Table Proposed Road Design Parameter**

Item		Description
Target Road Section		Approx. 9.0km, between Quaidabad Flyover (Start, approx. 100m from Flyover edge) and Port Qasim Intersection
Design Standard		Geometry: AASHTO 2011 Drainage: West Pakistan Highway Code / AASHTO 2014 Pavement: AASHTO 1993 Structure: West Pakistan Highway Code
Design Speed		80 Km/hr
Carriageway		3.65m x 6 Lane
Shoulder		0 to 3.0m (depend on location)
Central Median		0.5 to 2.0m (depend on location)
Service Road		3.0 to 5.5m (depend on location)
Footpath		1.5~3.0m (depend on location)
Cross fall		2.0%
Gradient		7% (Max.), 0.3% (Min.)
Min Curve Length		280m (Horizontal). 70m (Vertical)
Slope (Fill)	Ordinary soil	1:1.5~4.0 (depend on soil type)
Slope(Cut)	Rock	1:0.5 (Solid rock), 1:0.75 (Decomposed rock)
	Other than rock	1:1.0~1.5 (depend on soil type)
Pavement design life		10 years
Traffic Load		Max. Axle 12 ton (Max. gross vehicle weight 61.5 ton)
Pavement structure	Carriageway/Junction/Bus stop	Surface: Wearing=AC(asphaltic concrete), Binder=AC Base: Crushed aggregate, Sub Base: Granular material
	Service road	Surface: AC or Interlocking block Base: Crushed aggregate, Sub Base: Granular material
	Footpath/Parking space	Surface: Interlocking block or AC or DBST Base: Sand, Sub Base: Granular material
Drainage	Design Return period	Road crossing culvert (BOX, Pipe) 10years, Ditch 5 years
	Transversal	Concrete culvert (Box, Pipe)
	Road side ditch	Concrete U type, concrete block type, concrete surface type
	Access/Entrance ditch	Ditto

Note: AC=Asphaltic concrete, DBST=Double bituminous surface treatment (Reference information: 8000ft road project AC=5+8cm, Base=30cm, Subbase=15cm)

**Note:**

**(1) Right of Way (RoW)**

- 1) National Highway N5: Width 150ft (150x0.3048=45.72m)

Note: Start to End point (Approx. 9.0km), The proposed road alignment will be studied within the public-private property line.

- 2) Port Qasim Road

General section: Width 100m (50m both side from the existing road center)

Around intersection: Width 560m (280m both side from the existing road center)

**(2) Major Intersections**

- 1) Manzil pump Intersection: At grade, signal control type

- 2) Cattle colony Intersection: At grade, signal control type

- 3) Port Qasim Intersection: At grade, signal control type

Note: Pedestrian crossing and signal will be studied for major intersections

**(3) Drainage**

- 1) Existing crossing culvert will be replaced and reconstructed

- 2) Installation of new drainage system to proper drainage destinations will be considered

**(4) Ancillaries**

- 1) Street light: Installation will be studied for whole target section (connection to the existing power line will be excluded)

- 2) Traffic signal: Installation will be considered for major intersections (refer above)

- 3) Fence along median: Installation will be considered to control random pedestrian crossing for 100m along median at major intersections

- 4) Bus stop: Installation of either side will be considered near the major intersections

- 5) Crossing utility duct: Installation will be considered for required location (Assumed Max. interval 1km)

**(5) Protection and Relocation of existing public utilities**

**i) Main underground utilities (waterworks, sewage, gas, electric and telecom, etc.)**

Within proposed carriageway :	Minimum relocation of existing underground utilities considered (protection by road raising approx. 60cm from the existing road elevation).
Outside proposed carriageway:	Plan and construction method of service road, footpath and ditch will be considered to avoid underground utilities damage (eg: by light weight construction equipment, pavement type selection).
Around crossing culvert/utility duct:	Underground utilities affected by the newly installed culvert and duct should be relocated
Electric/Telephone poles and manholes on the ground:	On the ground obstacles within RoW should be relocated (eg: Electric/Telephone poles/lines)

**(6) Private properties**

Removal of existing private properties (kiosk, plants, etc.) within the RoW required

**(7) Environmental permission**

Environmental permission need to be obtained before Dec./2015.

Note: Relocation should be completed before PQ call (assumed next year end).



Hideaki MORITA  
The Chief Consultant of JICA Survey Team  
INGEROSEC CORPORATION



Niaz Ahmed SOOMRO  
Director General (TS)  
KARACHI METROPOLITAN CORORATION