Final Report
March 2024

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT

KARIMABAD UNDERPASS

EHS Services

Environmental & Analytical Solutions

Environmental Impact Assessment (EIA)

Karimabad Underpass

District Central, Karachi

FINAL REPORT

March 2024

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Environmental Impact Assessment (EIA)

Construction of Underpass at Karimabad Intersection

Prepared for:
Karachi Development Authority (KDA)

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Date:
March 2024

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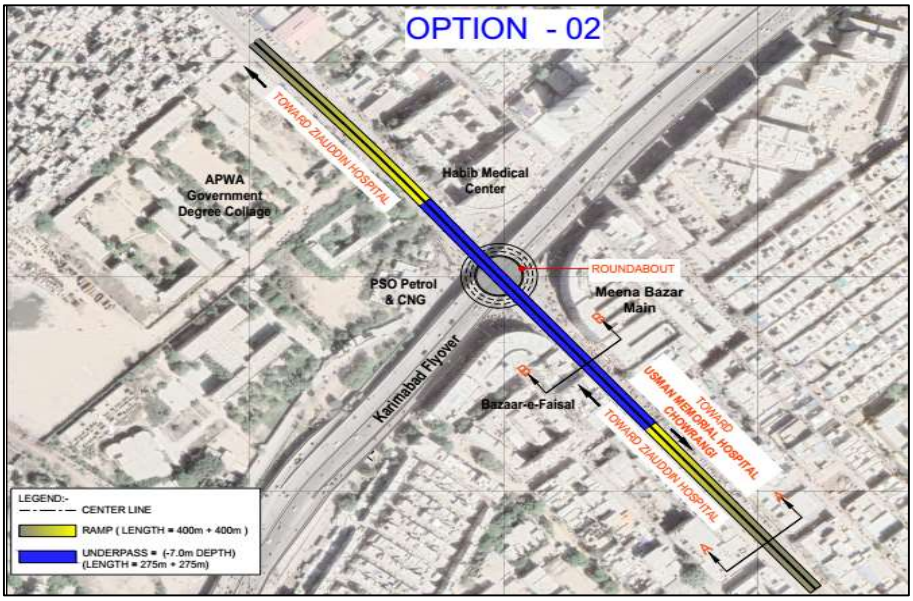
Executive Summary

Presented in this report are the findings of the *Environmental Impact Assessment (EIA)* study submitted to the Sindh Environmental Protection Agency (SEPA) for its approval to construct an underpass at Karimabad Intersection. As per Schedule III (List of projects requiring an EIA), Category E (5) Construction of Flyover, Underpass and Bridges having total length more than one km, falls in the category of projects that requires Environmental Impact Assessment (EIA) study.

This important intervention is part of the Sindh Government's plan towards Signal Free Corridor in and around project area. The project would help to reduce traffic congestion in the area. The space in front of Bazar-e-Faisal & Meena Bazar will remain intact, and Level of Service (LoS) will be increased.

The proposed underpass is being constructed with an estimated cost of Rs. 1.35 billion, its length is 1080 meters, and its width is 6.1 meters. The project will be completed within 24 months. The Option 2, (Straight Underpass from Usman Medical Hospital to Zia Uddin Hospital) is found most economical and Technically Feasible with respect to all constraints in which, regarding all the constraints, the level of service of the side roads will improve and straight traffic will be through along with keeping the existing road width remain same. It will reduce major Conflicts and have high impact on the overall Intersection Level of Service by reducing major Conflicts.



The project would help to reduce traffic congestion in the area. Some of the benefits include:

- The space in front of Bazar-e-Faisal & Meena Bazar will remain intact, and Level of Service (LoS) will be increased.
- The proposed underpass will facilitate the Traffic from Usman Medical Hospital to Zia Uddin Hospital without any traffic conflict.
- The Long Barrel will facilitate the area in from of Bazar-e-Faisal & Meena Bazar, where Traffic will be through both via Underpass and on the Barrel.
- The proposed Roundabout will allow the Traffic movements in controlled manner, as the Roundabout is considered to play a huge impact in the Traffic Calming.
- The Conflicts at Karimabad Intersection will be reduced and Black Spots which results in the accidents will be reduced.
- Upgrading and modernizing the infrastructure facilities of the fast-growing megapolis by identifying the bottlenecks and removing the constraints to smooth flow of traffic;
- Reducing traffic noise and air pollution due to idling of vehicles at the signalized intersections.

The geometric design of the road conforms to the following requirements.

Table: Geometric Design

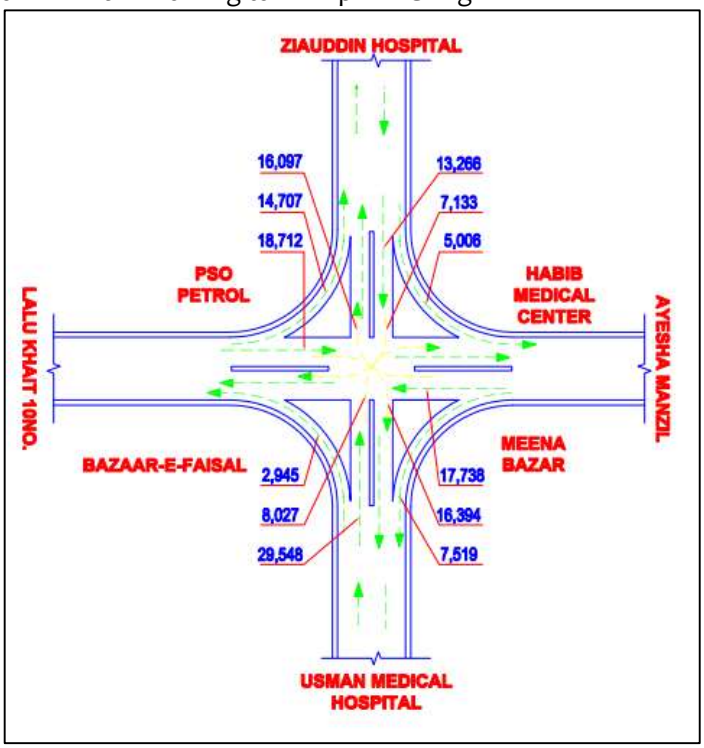
Design Elements	**Unit**	**Design Parameters**
Design Speed	Km/h	80
Minimum Stopping Sight Distance for Crest & Sag Vertical Curves	m	185
Lane Width	m	3.05
Outer Shoulder Width	m	1.0
Minimum Inner Shoulder Width	m	1.0
Minimum Radius	m	437
Maximum Super Elevation Rate	%	4.0
i). Crest Vertical Curve	-	52
ii). Sag Vertical Curve	-	185

Information available from literature relevant to baseline of the area, surroundings and Karachi was collected at the outset and reviewed subsequently. This was followed by surveys conducted by experts to investigate and describe the existing status and scenario.

An ambient air monitoring study was conducted in the microenvironment of the proposed project. The air-shed of the site of Karimabad Intersection site has, according to the assessment of ambient air quality been classified as polluted in terms of dust levels with **SPM/TSP, PM_{10} and $PM_{2.5}$ at 389 µg/m³, 157 µg/m³ and 84.1 µg/m³ respectively**.

The levels of **SO2 → 25.2 µg/m³, NO→ 18.6 µg/m³, NO2→ 41.2 µg/m³, CO→ 3.2 mg/m³ and O3 → 16.1µg/m³** were found with the permissible limits of SEQS however the levels of pollutants do not comply with WHO limits with regard to human health. It is only the moderate velocity wind in Karachi that is saving the residents from the hazards of air pollution. The noise levels ranging from 79.7dB(A) to 98.8dB(A) that in excess of SEQS. As such contribution of the traffic related emissions and noise levels on the adjoining roads of the project site will be a major nuisance and will have to be mitigated in the project design.

The Traffic Count of Karimabad Intersection was performed on Monday, December 26th, 2022, in all directions. The Traffic Count was performed for the 12 Hours, from 10:00am morning to 10:00pm Evening.



The option of flyovers/underpasses, despite being temporary relief is alternative deserving preference. Further justification for this to be the preferred alternative is provided by:

- Availability of technology for construction of flyovers/underpasses that has been well grounded in Pakistan. Thus, the Project may not need foreign assistance in any shape.
- Land acquisition will not be involved since the intervention will be constructed on the designated right of way (RoW) which is the property of KDA. However, there will be temporary disturbance to the shop owners and the commuters, including students moving on either side of the intersection during construction since heavy equipment will have to be brought in and construction material will have to be transported to the site. Appropriate traffic management so as not to disturb the business would be a solution. However, the shop owners are worried about the possible loss of business once it is disturbed. KDA will have to enter into dialogue with the concerned shop owners to arrive at an amicable solution.
- All structures, sensitive or otherwise, and the residential areas are considerably offset from the corridor of impact (CoI) of Karimabad underpass. Currently, the CoI at the said intersection is congested; construction of underpass would remove the constraints to smooth flow of vehicular traffic on Shahrahe Pakistan.
- Gaseous emission from operation of fleets of vehicular traffic on the signal free Corridor will be dispersed adequately in contrast with the current situation at the intersection where the concentration of pollutants builds up with each interruption by the signals. Thus, the siting of underpass will have a positive effect on the ambient air quality and noise level at the said intersection.
- The wastewater discharge scenario at the site would not be altered because the sewerage system would not be impacted at any stage.
- Noise emissions from the operation of vehicular traffic will continue to have the same level as at present. The level in the microenvironment i.e. at the intersection is expected to be lowered as a result of free flow of the traffic through the underpass. Although the impact of noise emission would attenuate with distance and shall be within acceptable limits of the Sindh Environmental Quality Standards, yet mitigation measures in the form of suitable landscaping with acoustic tiles would be in place at sensitive locations such as schools, hospitals, mosques and religious institutions to minimize the impact to acceptable levels.
- The estimated dispersion of emissions and discharges suggests that siting of the underpass would make them a friendly component of their macroenvironment.

- Several participants from the project area stressed the need for proponents to share project information and plans for construction activities with the area residents and commercial entities. Often the area stakeholders are consulted during the design stage, however, no prior notice or warning is given to the stakeholders regarding commencement of construction activities and the like. They also demanded that the Traffic Management Plan (TMP) be shared with them, and all approach roads must be rehabilitated in the first phase.
- The area residents and shop owners were concerned about the project schedule and shared their views that the slow progress has significantly slowed down all businesses and has negatively impacted the business and commercial activities in the shopping areas. The temporary loss of business so incurred has resulted in grievances from the concerned business operators. The stakeholders were not opposed to the Traffic Improvement Plan but they sought immediate resumption/completion of the project.
- The shop owners/business operators are particularly concerned about the slow down of business during the Monsoons and peak season of Ramadan. The apprehensions in this regard were conveyed to the study team. There is therefore need for implementation of the Traffic Management Plan that may ensure resumption of business activity. It is recommended that the KDA must maintain an active liaison with the commercial enterprises.
- The stakeholders have stressed that the removal of encroachments from, and the cleaning of, the nullahs is the first step towards easing the situation in Karachi. The most important step that needs to be taken is to remove the encroachments at the outfalls, so that water can enter the sea.
- When the site was visited by the team of EIA team, it was noticed that due safety and security measures were not being followed e.g. the site was not appropriately cordoned off to restrain people from crossing the road and entering the site; some of the construction crew members were not wearing PPEs and were not following the safety measures. This point is being raised here to remind the proponent that funds are invariably provided for PPEs and for Safety Personnel to ensure implementation of safety procedures. It amounts to temporary embezzlement of funds if the same are not appropriately utilized.

- A traffic diversion plan was prepared but not effectively implemented which resulted in inconvenience to road users during the construction stage. It was also not shared with the stakeholders in the neighborhood. This was cause for complaints from road users and also the public in the neighborhood. It was observed that the traffic diversion plan was still not being followed, for

example the information on closure of the access roads and alternate routes were not shared with the public particularly the concerned citizens.

- There is invariably a safety risk when substantial construction such as this is conducted in an urban area, and precautions will thus be needed to ensure the safety of both workers and citizens. The Contractor will be required to produce and implement a Site Health and Safety Plan. This should include such measures as:
  - Excluding the public from the site – enclosing/barricading the construction area; providing warning boards and sign boards and posting of security guards throughout the day and night;
  - Ensuring that all workers are provided with and use appropriate Personal Protective Equipment (helmet, hand gloves, boots, masks, safety hoists when working at height, etc);
  - Barricade the entire area that may come under influence in case of accidents – this may particularly critical during fixing of pre-cast girders using heavy duty cranes; this may be conducted during lean traffic periods and if required the traffic may also be stopped for that short duration;
  - Follow standard practices of safety checks as prescribed before use of equipments such as cranes, hoists, etc.
  - Employ an Environmental, Health and Safety (EHS) Expert on site;
  - Provide on -site Health and Safety Training for all site personnel;
  - Report accidents to the authorities promptly and maintain records.

- The Traffic Management Strategy (TMS) will address the local concerns of road users and residents on the issues of safety and environmental protection, whilst providing a practical input to support parking, delay control and public transport strategies.
- Environmental Management Plan (EMP) will serve as a principal execution module of the project that would not only mitigate adverse environmental impacts during the construction and the operation phase of the project but also ensures that environmental standards and good in housekeeping, is maintained. Continuous environmental monitoring is exercised to ensure that preventive measures are in place and effective to sustain environmental integrity.
- Once the construction is over, the Project will function without any major maintenance, so no major impacts are envisaged. Operation of the Project will, on adoption of the mitigation measures, have reduced significance of impact on the physical as well as socioeconomic structure of the microenvironment and macroenvironment of its corridor of impact (CoI).
- The proposed Project, when commissioned, would be integrated into the concerned microenvironment of and a friendly component of its macroenvironment. The nature of Project, its siting; adoption of adequate measures to minimize waste and control pollution during construction as

well as operation stages of the project will have residual impact of low significance on the microenvironment and macroenvironment as well as on precious ecology.

- Construction of underpass at the proposed site and operation of vehicular traffic is not expected to have unacceptable/significant impact on the aesthetics of the microenvironment and macroenvironment. The impact, if identified, will be mitigated through careful planning, suitable landscaping and adopting appropriate mitigation measures, besides providing a monitoring and contingency plan.
- Mitigation will be assured by a program of environmental monitoring conducted to ensure that all measures are provided as intended, and to determine whether the environment is protected as envisaged. This will include observations on and off site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the EPA Sindh.
- There are two essential recommendations that need to be followed to ensure that the environmental impacts of the project are successfully mitigated. The Implementing Agency (KDA) shall ensure that:

    - All mitigation, compensation and enhancement measures proposed in this EIA report are implemented in full, as described in the document;

    - The Environmental Management and Monitoring Plan is implemented in letter and spirit.

- Screening of potential impact suggests that proposed "Karimabad Underpass" will, on adoption of the suggested mitigation measures, be an environmentally acceptable proposition.
- Furthermore, the Project will achieve the prime objectives of sustainable development in facilitating safe, secure and speedy travel along the Corridor V, besides upgrading and modernizing the infrastructure facilities of the fast growing section by identifying the bottlenecks and removing the constraints to smooth flow of traffic.

1. Introduction

Name of the Project:	Construction of Underpass at Karimabad Intersection
Name of the Proponent:	Karachi Development Authority (KDA)
Salient Features:	The proposed underpass is being constructed with an estimated cost of Rs. 1.35 billion, its length is 1080 meters, and its width is 6.1 meters. The project will be completed within 24 months.

Presented in this report are the findings of the *Environmental Impact Assessment (EIA)* study submitted to the Sindh Environmental Protection Agency (SEPA) for its approval to construct an underpass at Karimabad Intersection. This important intervention is part of the Sindh Government's plan towards Signal Free Corridor in and around project area. The project would help to reduce traffic congestion in the area. The space in front of Bazar-e-Faisal & Meena Bazar will remain intact, and Level of Service (LoS) will be increased.

1.1 Project Objectives

There is a pressing need for speedy decongestion of roads in Karachi since otherwise the development process will be retarded. This provides ample justification for Construction of signal free corridors in metropolitan limits of Karachi. Moreover, technology for construction of underpasses & flyovers is now well grounded in Karachi during construction of earlier interventions particularly at *Water Pump, Ayesha Manzil, Liaquatabad Dakkhana, and Teen Hatti Segment of Corridor V*. Corridor V while operating from the busiest Central Business District (CBD) namely Saddar to destinations in the Northeast compliments the Corridor with Superhighway. The *proposed intervention at Karimabad Intersection* is part of the Sindh Government's plan towards Signal Free Corridor in and around project area. The project would help to reduce traffic congestion in the area. Some of the benefits include:

- The space in front of Bazar-e-Faisal & Meena Bazar will remain intact, and Level of Service (LoS) will be increased.
- The proposed underpass will facilitate the Traffic from Usman Medical Hospital to Zia Uddin Hospital without any traffic conflict.
- The Long Barrel will facilitate the area in from of Bazar-e-Faisal & Meena Bazar, where Traffic will be through both via Underpass and on the Barrel.
- The proposed Roundabout will allow the Traffic movements in controlled manner, as the Roundabout is considered to play a huge impact in the Traffic Calming.
- The Conflicts at Karimabad Intersection will be reduced and Black Spots which results in the accidents will be reduced.

- Upgrading and modernizing the infrastructure facilities of the fast-growing megapolis by identifying the bottlenecks and removing the constraints to smooth flow of traffic;
- Reducing traffic noise and air pollution due to idling of vehicles at the signalized intersections.

1.2 Environmental Impact Assessment Process

Decongestion of roads for smooth flow of vehicular traffic can be achieved by sustainable planning & designing with the involvement of all stakeholders. The Environmental Impact Assessment (EIA) study process provides a platform to all stakeholders to participate and provide feedback at the very early stages of the project to ensure sustainable development. The EIA study provides a review of the environmental conditions and evaluates the current status of the physical environment and ecology, along with the prevailing socioeconomic conditions. This EIA study has for that reason been designed to focus on making certain that:

- Environmental Impacts, negative as well as positive, accruing from this project are identified.
- If there is a negative impact, it is mitigated as much as possible through specified design and construction procedures.

1.2.1 Purpose of EIA

The main purpose of this EIA study is to ensure that:

- Any major adverse impact on the environment (physical and biological) during its different stages viz. pre-construction construction and operation stages are identified.
- Appropriate and adequate mitigation measures are suggested to minimize the severity of adverse impacts
- Socioeconomic aspects are identified and
- Environment Management Plan (EMP) for sustainable operation of the Project is proposed.

This EIA Report has identified the environmental aspects and screened the potential impacts to ensure that the proposed activities pertaining to construction of Karimabad underpass are environmentally, socially and economically sustainable. The study responds to Section 17 of Sindh Environmental Protection Act 2014, requires the Project Proponents to follow the procedures set out in rules/regulations framed thereunder. Section 17 requires that every new development project in Sindh has to be preceded by

an Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) depending on the nature and severity of impacts anticipated on commissioning of the project.

1.2.2 Categorization of Project

Sindh Environmental Protection Act, 2014 and SEPA (Environmental Assessment) Regulations 2021 define Schedules (I, II & III) of projects in terms of requirement of Environmental Screening, Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA). As per Schedule III (List of projects requiring an EIA), Category E (5) Construction of Flyover, Underpass and Bridges having total length more than one km, falls in the category of projects that requires Environmental Impact Assessment (EIA) study.

The severity of impact of construction activity pertaining to preparation of site, operation of haulage trucks, operation of equipment and machinery for installation of pre-stressed slabs and blocks, and diversion/dislocation of vehicular traffic during construction would be source of annoyance and considerable disruption of traffic on the already extremely busy road. The impact being not of small order would require detailed screening and assessment of impact of different aspects and the adverse impacts need to be mitigated. Moreover the cost of Project is much beyond Rs. 500 million. These aspects would require the project to be placed in Schedule III requiring an EIA to be submitted. Accordingly, an EIA Report has been prepared and is being submitted to Sindh Environmental Protection Agency (SEPA).

1.2.3 Methodology for Environmental Assessment

This EIA report takes cognizance of the construction activity that has already been initiated without following the Environmental procedures. To make amends to the situation this Report has included site assessment / audit while presenting the baseline scenario and the results from the assessment and evaluation of the environmental aspects emerging during the construction and operation phases of the Project. Following screening of potential environmental impacts, the requirement for mitigation measures to address the adverse impacts is presented. The Report includes the Environmental Management & Monitoring Program that will be implemented during the construction and operation phase. Preparation of this Report has adopted the following methodology:

1.2.3.1 Site Visits

EHSS's team visited the project site(s) and its vicinity for conducting site survey to collect primary baseline data with respect to social and environmental aspects.

1.2.3.2 Literature Review/Baseline

Available published literature and previous EIAs on the subject have been reviewed along with the legislation relevant to this project in order to compile relevant information with special reference to the physical features, ongoing social & commercial aspects, and operation of vehicular traffic at the intersections.

1.2.3.3 Project Specific Data

Information related to construction and operation activities was provided by the proponent.

1.2.3.4 Impact Identification and Assessment

The environmental aspects emerging due to different activities during the pre-construction, construction and operation phases were identified and their impact on the microenvironment and macroenvironment critically examined.

1.2.3.5 Mitigation Measures and Environmental Management Plan

Impact assessment was supplemented by incorporating the mitigation measures required to reduce the severity of impacts and to manage different activities within the framework of environmental legislation and management plan.

Environmental Management Plan (EMP) has been prepared to guide the Project Managers through the lifecycle of the project, and to enable maintenance of the environmental, social and work place conditions and for conforming to the legislations in vogue. The management plan outlines the details required to manage environmental, safety and occupational risks arising from the project activities as well as social issues.

1.2.3.6 Documentation

Finally, the report has been prepared according to the guidelines of the Sindh Environmental Protection Agency (SEPA). The report includes description of the

Project, description of microenvironment and macroenvironment and screening of potential environmental impact of activities during the pre-construction, construction and operation phases.

1.3 Structure of EIA Report

The EIA report has been structured on the standard format, prescribed by the Sindh Environmental Protection Agency. The Report has been presented in the following sections:
Section 1 – Introduction and brief description of Project and EIA Processes
Section 2 – Description of Project
Section 3 – Overview of National and Provincial Legislation & Guidelines relevant to the proposed project and to this EIA
Section 4 – Description of Environment
Section 5 – Screening of Potential Environmental Impacts and Mitigation Measures
Section 6 – Environmental Management and Monitoring Plan (EMP)
Section 7 – Conclusions and Recommendations

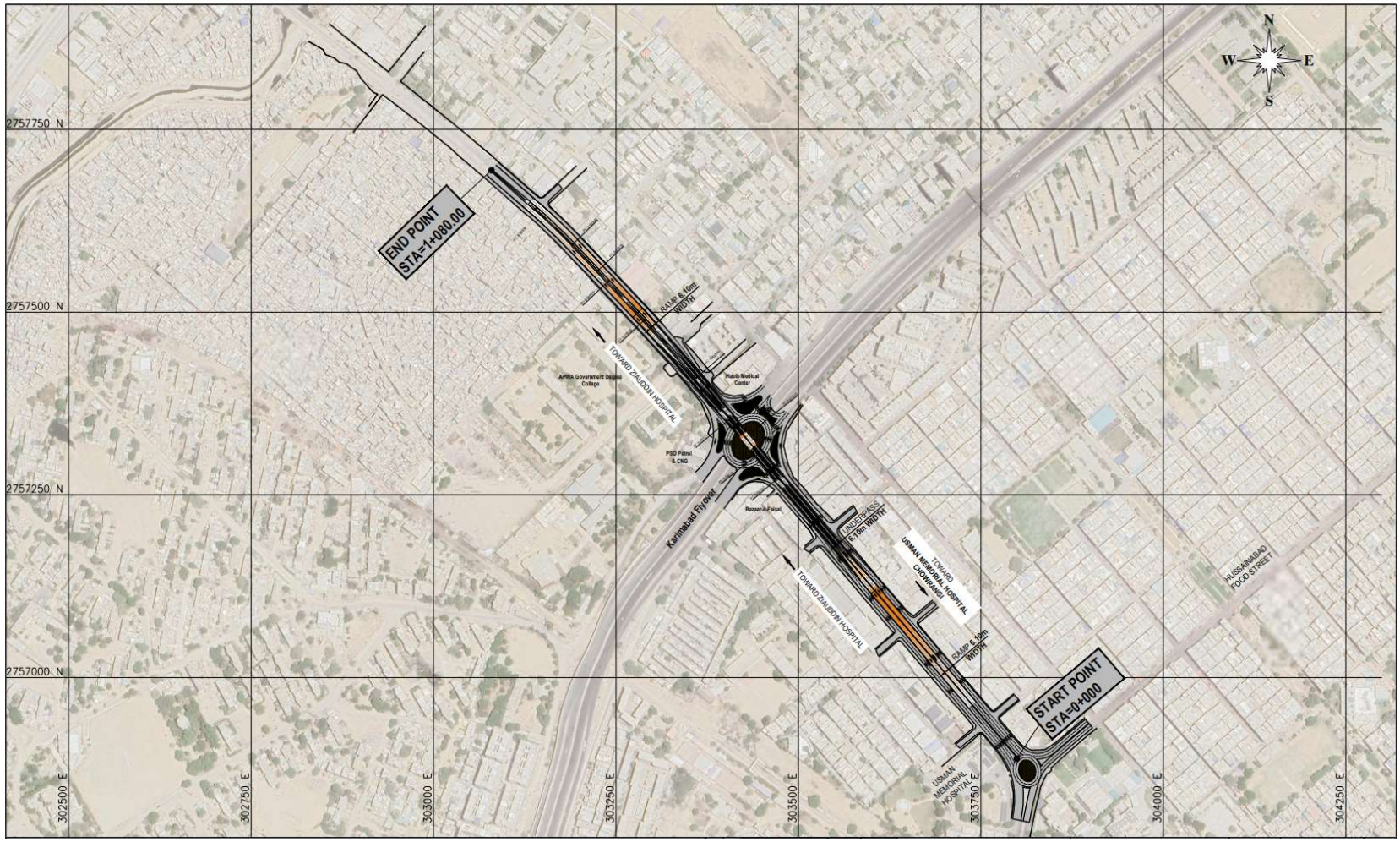


Figure 1.1: Proposed Alignment of Karimabad Underpass

2. Description of Project

During the last few years, there has been a significant growth in motorized traffic in the city, as shown by the consistent increase in the No. of motor vehicles registered and the analysis of historical traffic data for various locations in the city. The city is mainly expanding towards the North and increased commercial and business activity is now also observed in areas other than the City Centre / old CBD areas.

In the meantime, due to the construction of a record number of infra-structure development projects mainly flyover bridges, interchanges, signal free corridors / expressways, and improvement and widening of many city roads by the City District Government, the traffic flow in the city has improved and is expected to improve further in the near future on completion of the on-going / under process projects. These improvements have brought about significant changes in the traffic pattern observed previously due to the presence of traffic impediments / bottlenecks on almost all major corridors.

After completion of signal free corridor I, II and IV; there has been a great demand of general public to develop Shahrahe Pakistan as a signal free corridor where worst traffic jams have been observed during peak hours. Therefore, I view of the traffic conditions at Shahrahe Pakistan and their adverse impact on the traffic flow and quality of life of the people flyovers at Water Pump, Ayesha Manzil, Liaquatabad Dakkhana, and Teen Hatti intersections were completed to: i) provide for uninterrupted traffic movements throughout Shahrahe Pakistan; ii) reduce traffic congestion and delays; iii) decrease the travel time for each trip through the intersections; iv) provide safer and better travel conditions for vehicular and pedestrian traffic; v) reduce traffic noise and air pollution due to idling of vehicles at the signalized intersections; and vi) minimize the economic losses due to traffic congestion and delays along the corridor.

The Government of Sindh is now planning to introduce another intervention for the smooth flow of traffic and removing bottlenecks in front of Meena Bazar & Bazar-e-Faisal. This important intersection was selected due to the importance of the macro-environment accommodating businesses/bazars, important healthcare and educational institutions along the corridor.

2.1 Project Design Constraints

There is an existing Flyover, called "Karimabad Flyover" facilitating the traffic from Ayesha Manzil to Lalu Khait 10 No. as shown in Figure 2.1.

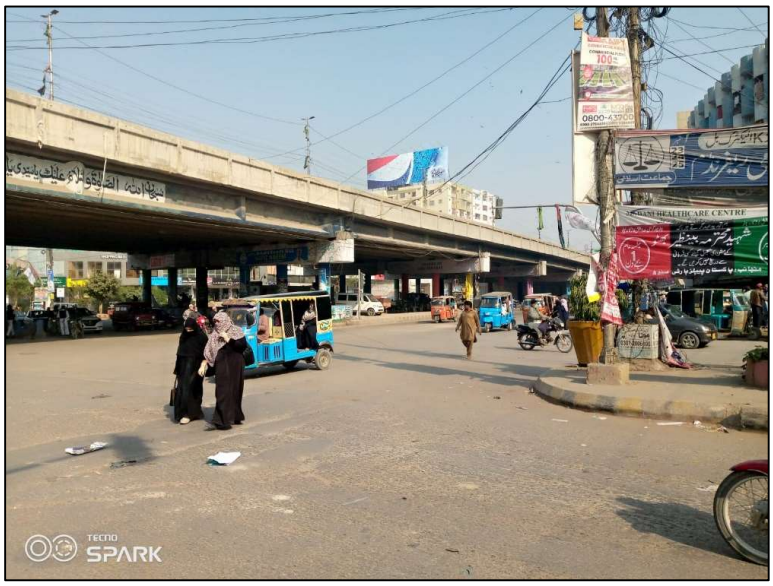


Figure 2.1 Karimabad Flyover

- The Karimabad Flyover and Ramps are among the major constraints in proposing any other Flyover at this intersection.
- The other constraint includes the Pylons in the middle of Road as shown in Figure 2.2.
- There is no space to relocate the Pylons as per International Building Codes (IBC), the Pylon must have 100" Horizontal Clearance from any residential building.

Figure 2.2: Pylon in the middle of road.

- There is another constraint that an existing covered drain is running along the length of the road in the median, having all the utilities on the top of drain, as shown in Figure 2.3.

Figure 2.3: Existing covered drain

- There is extremely uncontrolled Traffic movement below the Bridge and in front of Meena Bazar and Bazae-e-Faisal due to lack of space as shown in Figure 2.4.

Figure 2.4: Traffic Congestion

2.2 Consideration of Alternatives

Deficiencies in the public transport services together with the enormous increase in private vehicle ownerships during the period of rapid rate of GDP growth adopted for the country from 2005 has had adverse impact on the not too worthy roads for increased volume of traffic. The problem has been aggravated ever since while the road transportation problem remained unresolved. The road capacity has been far exceeded by the volume of traffic on roads. The defunct CDGK constructed flyovers/underpasses and widened several roads to make some of the main corridors signal free. The problems with regard to traffic jam, and inconvenience caused to commuters was reduced but only for a short period. The environmental health problems due to emissions from vehicles operating on fossil fuel have continued since the number of vehicles operating on the corridors and discharging the emissions has continued to remain beyond their capacity. Construction of earlier flyovers on Corridor V reduced the congestion and traffic jam and disperse the emissions but only on a temporary basis, as has been observed at the intersections which have been signalized during the past few years. The option of flyovers/underpasses, despite being temporary relief is alternative deserving preference. Further justification for this to be the preferred alternative is provided by:

- Availability of technology for construction of flyovers/underpasses that has been well grounded in Pakistan. Thus the Project may not need foreign assistance in any shape.
- Land acquisition will not be involved since the intervention will be constructed on the designated right of way (RoW) which is the property of KDA. However, there will be temporary disturbance to the shop owners and the commuters, including students moving on either side of the intersection

during construction since heavy equipment will have to be brought in and construction material will have to be transported to the site. Appropriate traffic management so as not to disturb the business would be a solution. However, the shop owners are worried about the possible loss of business once it is disturbed. KDA will have to enter into dialogue with the concerned shop owners to arrive at an amicable solution.

- All structures, sensitive or otherwise, and the residential areas are considerably offset from the corridor of impact (CoI) of Karimabad underpass. Currently, the CoI at the said intersection is congested; construction of underpass would remove the constraints to smooth flow of vehicular traffic on Shahrahe Pakistan.
- Gaseous emission from operation of fleets of vehicular traffic on the signal free Corridor will be dispersed adequately in contrast with the current situation at the intersection where the concentration of pollutants builds up with each interruption by the signals. Thus, the siting of underpass will have a positive effect on the ambient air quality and noise level at the said intersection.
- Wastewater discharge scenario at the site would not be altered because the sewerage system would not be impacted at any stage.
- Noise emissions from the operation of vehicular traffic will continue to have the same level as at present. The level in the microenvironment i.e. at the intersection is expected to be lowered as a result of free flow of the traffic through the underpass. Although the impact of noise emission would attenuate with distance and shall be within acceptable limits of the Sindh Environmental Quality Standards, yet mitigation measures in the form of suitable landscaping with acoustic tiles would be in place at sensitive locations such as schools, hospitals, mosques and religious institutions to minimize the impact to acceptable levels.
- The estimated dispersion of emissions and discharges suggests that siting of the underpass would make them a friendly component of their macroenvironment.

2.2.1 Design Options

The Traffic Count of the Karimabad Intersection has been performed as shown in Figure 2.5. The Traffic Data Analysis was performed, and different Options were proposed to resolve the Traffic Conflicts & increase the Level of Service of Roads with the existing land and other Constraints.

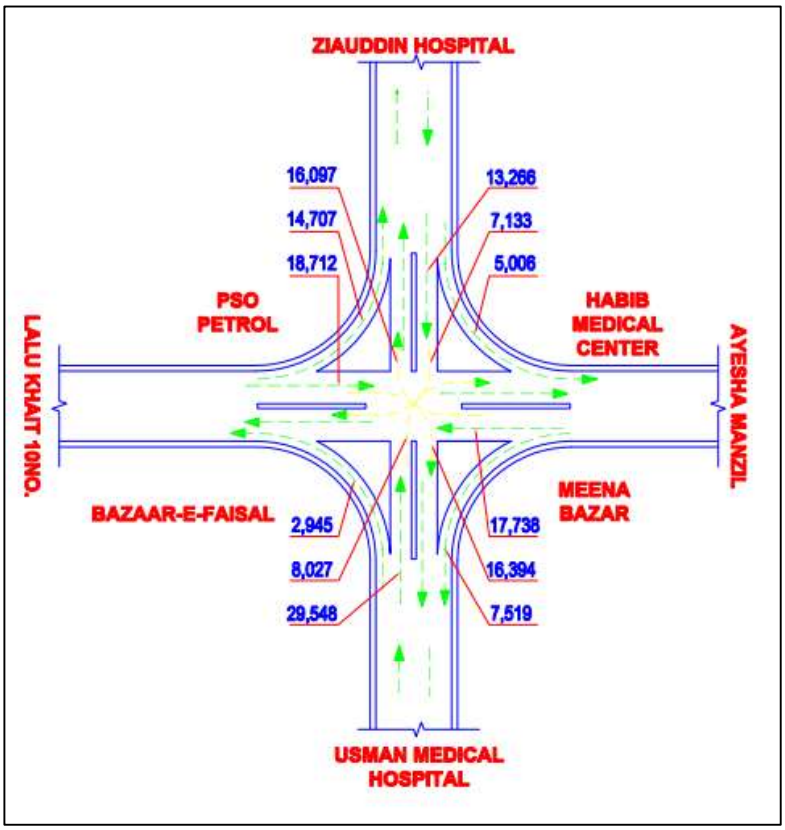


Figure 2.5: Traffic Counts at the Karimabad Intersection

2.2.1.1 Design Options 1

- Considering the Traffic Movements of Right Turns and to reduce the number of Conflicts, The Right Turns Underpass with At-Grade Roundabout was proposed as shown in Figure 2.6 & 2.7.
- Long Barrels were proposed to save the existing lanes having no space.
- The Right Turn from Zia Uddin Hospital to Lalu Khait 10 Number was proposed with long barrel due to land constraint in front of Bazar-e-Faisal.
- The Right Turn from Usman Medical Hospital to Ayesha Manzil was proposed with long barrel due to land constraint in front of Bazar-e-Faisal.
- The Roundabout was also proposed to reduce the uncontrolled traffic movements.
- The Option 1 is economical but have reduce only 2 Conflicts and have low impact on the overall Intersection Level of Service by reducing on 2 Conflicts.

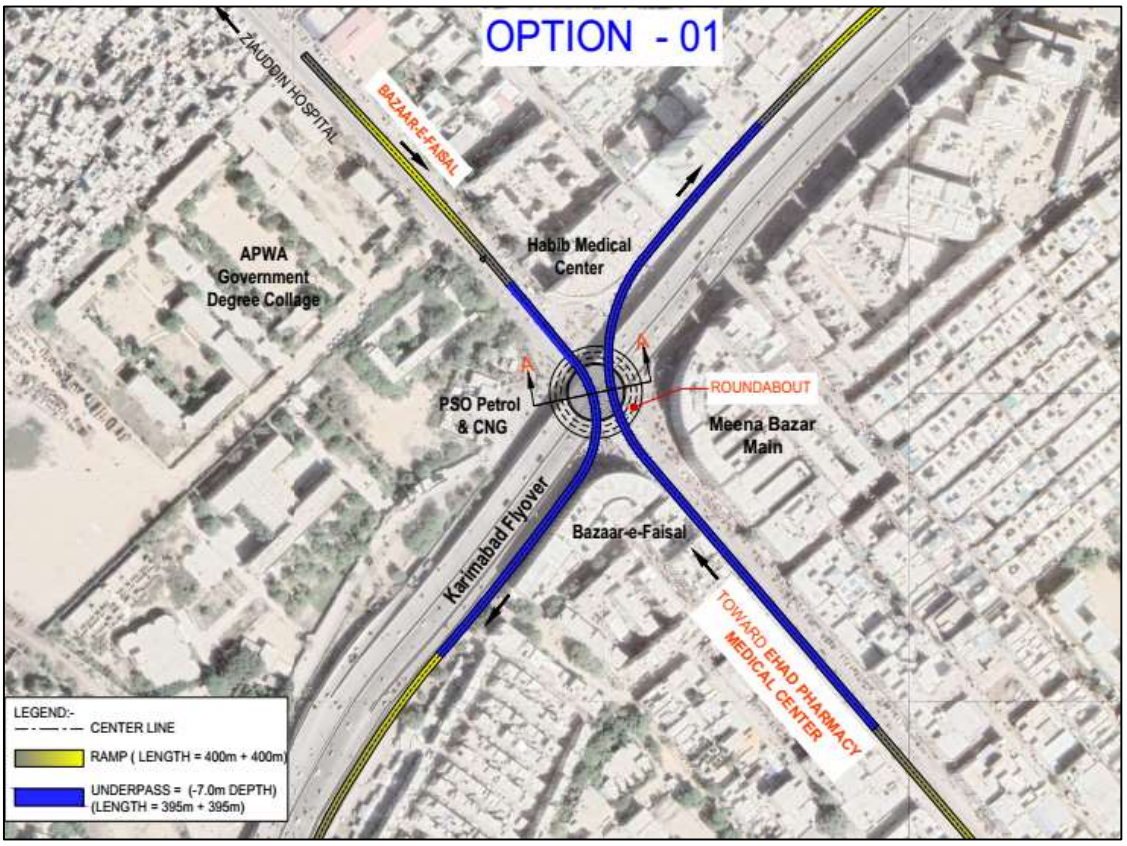


Figure 2.6: Design Option 1

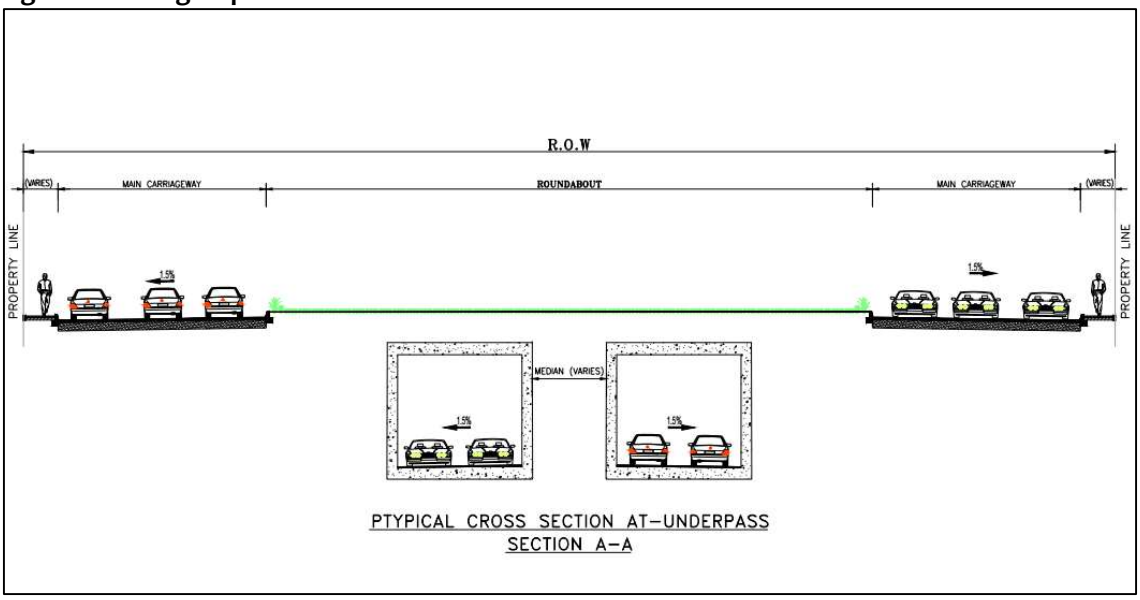


Figure 2.7 (Cross Section of Proposal 1)

2.2.1.2 Design Option 2

- Considering the relocation of drain, utilities and 220KV Pylons cost, It was proposed to construct the underpass in two different barrels, where Traffic can move from Usman Medical Hospital to Zia-Uddin Hospital with the side roads and Traffic Movement above and below the Barrel as shown in Figure 2.8.
- The Proposed long barrel will facilitate the Traffic in front of Bazar-e-Faisal and Meena Bazar will be in running condition and reduce the Major traffic conflicts as shown in Figure 2.9 & 2.10.
- The Roundabout was also proposed to reduce the uncontrolled traffic movements.
- The Option 2 is economical and reduce major Conflicts and have high impact on the overall Intersection Level of Service by reducing major Conflicts.
- The 600m Long Barrel, comprises of 2 lanes of 3.05m each is also facilitated with exhaust fans as shown in Figure 2.11.
- The Roundabout is proposed under the Karimabad Flyover to reduce the Traffic Conflicts as shown in Figure 2.12.
- The entrance of the Underpass was made before the Bazar-Faisal so that the Traffic in front of Bazar-e-Faisal and Meena Bazar will be through and facilitated as shown in Figure 2.13

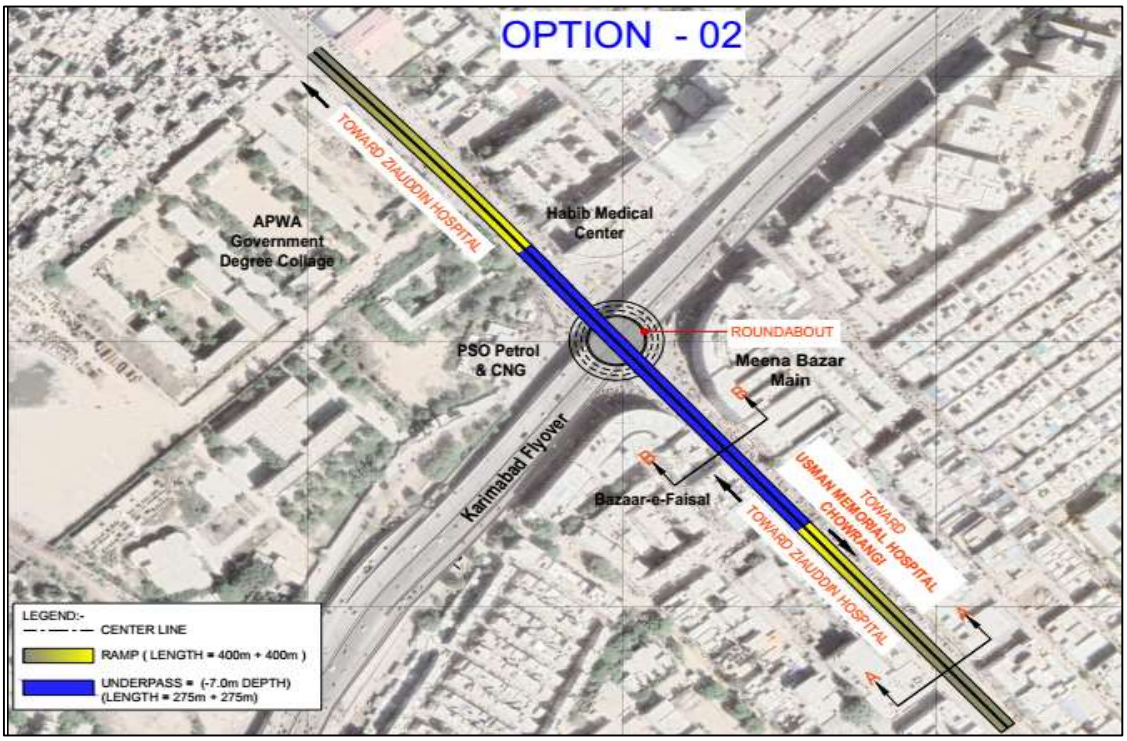


Figure 2.8: Design Option 2

Figure 2.9: Conceptual view of Design Option 2

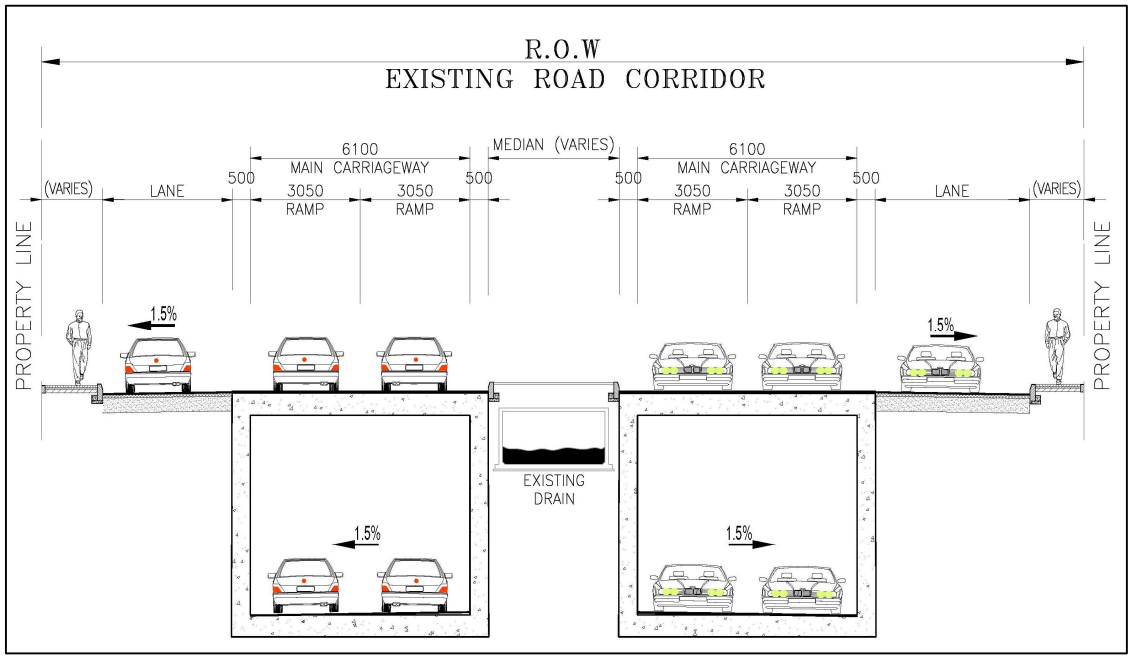


Figure 2.10: Cross Section of Option 2

Figure 2.11: Installation of Exhaust Fans

Figure 2.12: Provision of Roundabout

Figure 2.13: Entrance of the Underpass in Option 2

2.2.1.3 Design Option 3

(PHASE – 1)

- The Option – 3 is the complete solution of the Intersection, resolving all the Traffic Conflicts. It Comprises of 2 Phases. The Phase 1 of Option 3 is shown in Figure 2.14.
- In Phase – 1, Underpass was proposed from Usman Medical to Zia Uddin Hospital straight along with the Right Turn Underpass towards Ayesha Manzil.
- The Roundabout was also proposed to reduce the uncontrolled traffic movements.
- This Underpass will be underground at -7m as Level 1.

Figure 2.14: Design Option 3 (Phase-I)

(PHASE – 2)

- The Option – 3 is the complete solution of the Intersection, resolving all the Traffic Conflicts. It Comprises of 2 Phases. The Phase 2 of Option 3 is shown in Figure 2.15.

- In Phase – 2, Underpass was proposed from Zia Uddin Hospital to Usman Medical straight along with the Right Turn Underpass towards Lalu Khait 10 Number.
- The Roundabout was also proposed to reduce the uncontrolled traffic movements.
- This Underpass will be underground at -15m as Level 2.

Figure 2.15: Design Option 3 (Phase-II)

- The Complete Option – 3 is the combination of Phase 1 and Phase 2. This would be 2 different Levels Underpass with At-Grade Roundabout. This will completely resolve all Traffic Conflicts. This Option is expensive but resolve all the issues at the Intersection with all the constraints as shown in Fig 2.16.

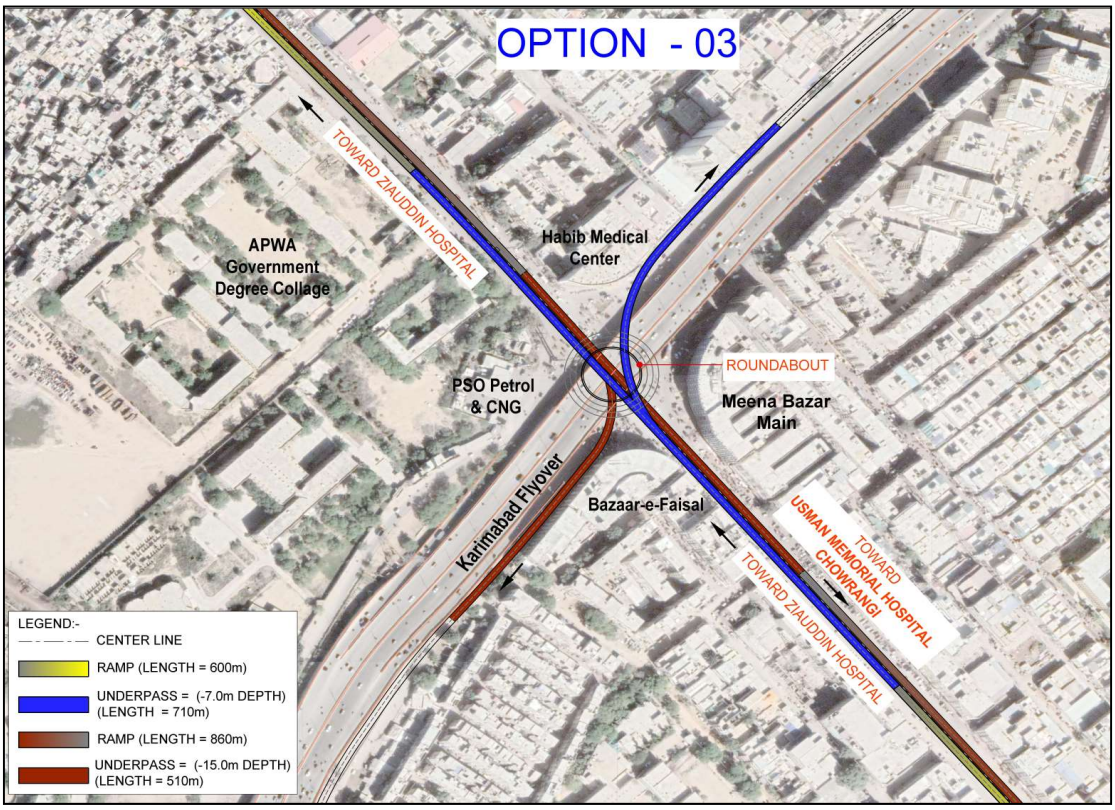


Figure 2.16: Design Option 3 (Complete)

2.2.1.4 Design Options 4

- The Option – 4 is the Straight Flyover from Usman Medical to Zia Uddin Hospital as shown in Figure 2.17. The existing Cross-Section is shown in Figure 19 and Proposed Cross-Section is shown in Figure 2.18.
- This Option was studied in detail and found many constraints such as existing Karimabad Flyover, so the Proposed Flyover will be minimum 15m high to achieve the Vertical Clearance above the existing Flyover. To achieve 15m Height, a Length of 400m is required for both Up and Down Ramps.
- The existing Drain & Utilities needs to be relocated for the Piers and already congested lanes will become more narrow and level of service of the Interchange will drop and duration of Traffic Jam will increase.
- 2 Pylons of 220KV needs to be Relocated and cost of Relocation of one 220KV Pylon is more than 600 million. However, there is no space to relocate the existing Pylons as per International Building Codes (IBC), the Pylon must have 100" Horizontal Clearance from any other building where people are living.

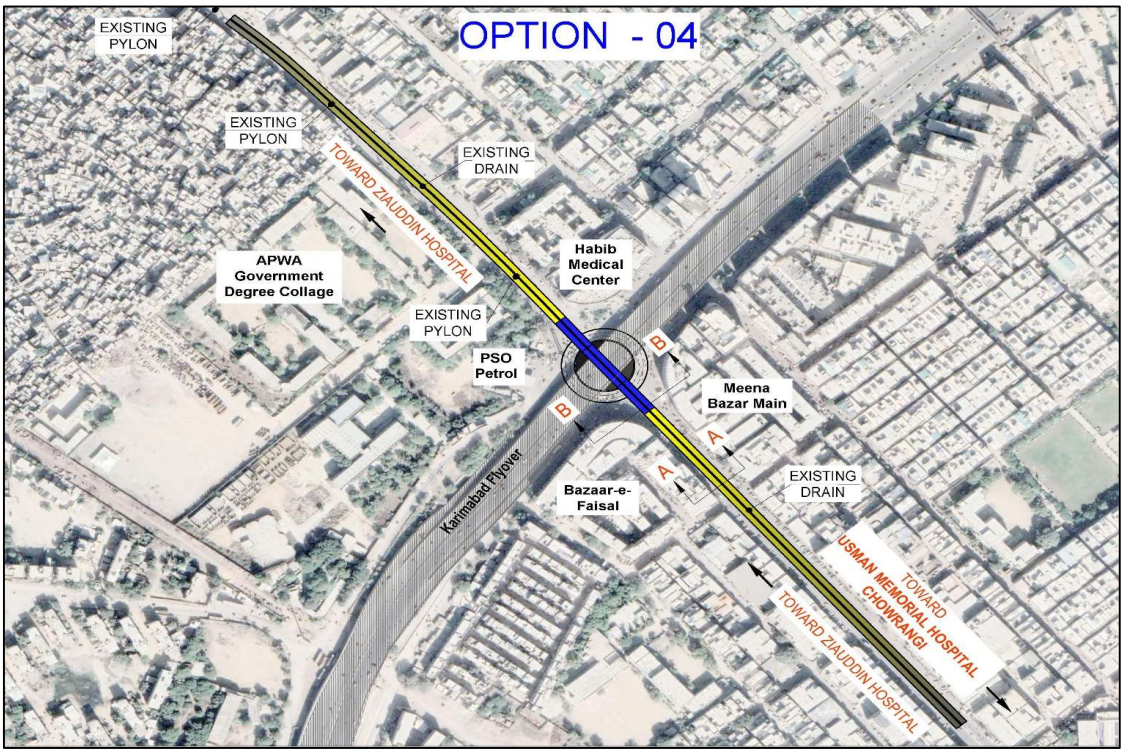


Figure 2.17: Design Option 4

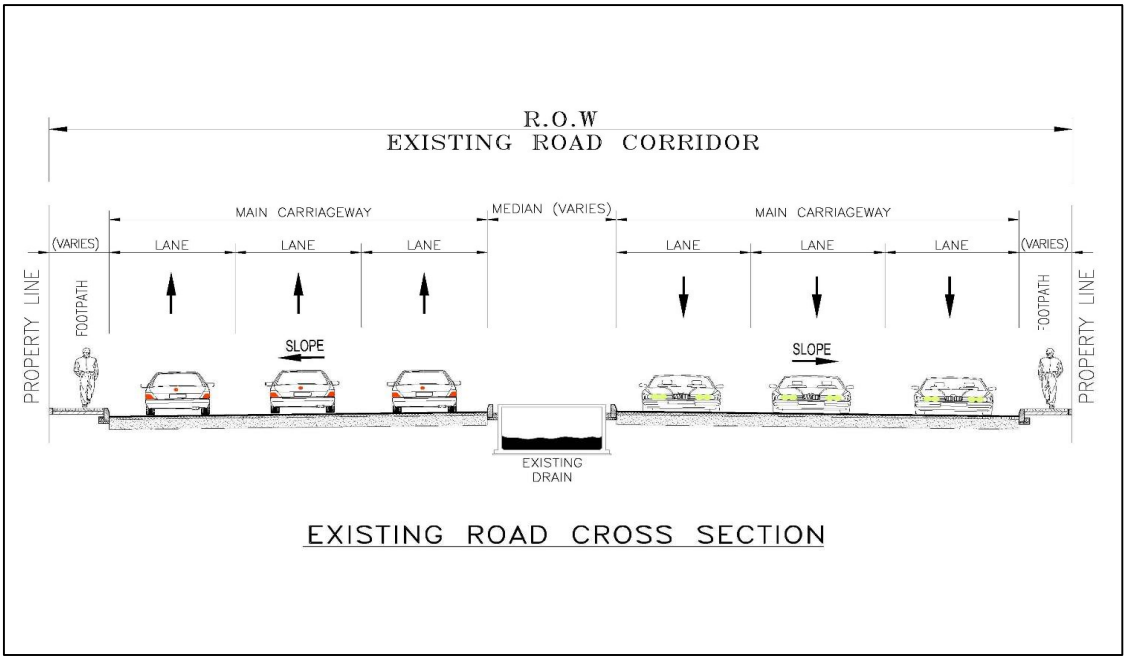


Figure 2.18: Proposed Cross-Section

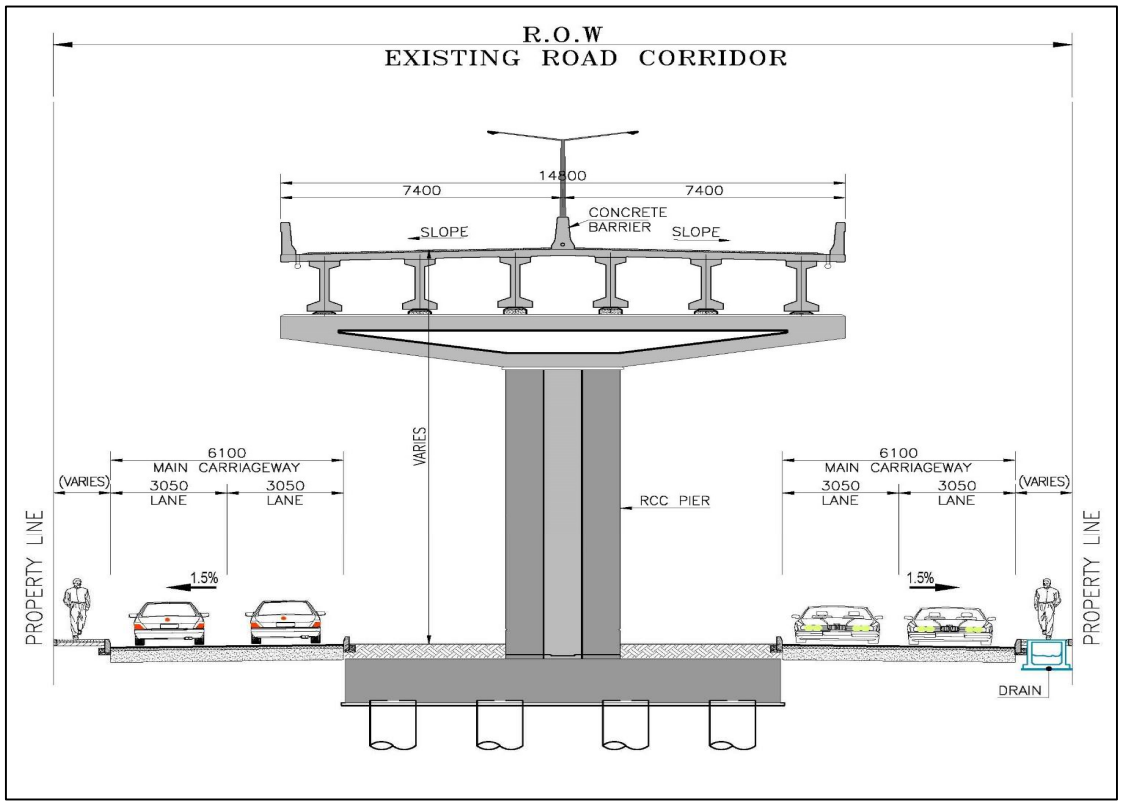


Figure 2.19: Right of Way (ROW)

2.2.1.5 Preferred Option

The Option 2, (Straight Underpass from Usman Medical Hospital to Zia Uddin Hospital) is found most economical and Technically Feasible with respect to all constraints in which, regarding all the constraints, the level of service of the side roads will improve and straight traffic will be through along with keeping the existing road width remain same. It will reduce major Conflicts and have high impact on the overall Intersection Level of Service by reducing major Conflicts.

2.3 Geometric Design

The geometric design of the road conforms to the following requirements.

Table 2.1: Geometric Design

Design Elements	Unit	Design Parameters
Design Speed	Km/h	80
Minimum Stopping Sight Distance for Crest & Sag Vertical Curves	m	185

Lane Width	m	3.05
Outer Shoulder Width	m	1.0
Minimum Inner Shoulder Width	m	1.0
Minimum Radius	m	437
Maximum Super Elevation Rate	%	4.0
i). Crest Vertical Curve	-	52
ii). Sag Vertical Curve	-	185

Reference: A Policy on Geometric Design of Highways & Streets 2011

2.3.1 Typical Geometric Cross Section Design

The design of the geometric cross section of Road & Bridge is an important element which determines the layouts of roadway structures such as right-of-way requirements, length of culverts, span of overhead bridges, extent of earthwork and maintenance activities etc., and thus the costs of construction.

Typical geometric cross section for the sections is described as follows:

New Jersey Barrier
The Width of NJB is 0.6m and the Height of 0.82m.

Traffic Lanes
The standard Lane width of 3.65m has been adopted for the project.

Cross Slopes
In normal tangent sections, carriageways have been designed for a uniform cross slope of 2 percent.

Horizontal Alignment Design
The horizontal alignment of the road consists of tangents and curves designed in accordance with the AASHTO geometric standards matching the existing topography of the land through which the road is passing.

Vertical Alignment Design
The Maximum gradient of profile geometry is about 3.0%.

Sight Distances
Stopping sight distances are available over the entire length of the road for a design speed of 80 Kph.

Traffic Signs
Traffic signs and pavement markings are very essential for the safety of traffic. By means of these, the road users are provided with all the necessary

information pertaining to the roadway geometry, traffic control and available roadside services. While travelling at the operating speed of traffic, a driver should be able to perceive, read and understand the signs sufficiently early to take safety measures. The location and type of signs and markings, suggested for the proposed road are discussed briefly as follows:

There are three types of traffic signs which can be classified as follows:

Informatory Signs
These signs guide the road users in advance and provide them information.

The following are a few examples:
- Approach to a road junction
- Entry signs at an interchange/roundabout, etc.

Warning Signs
These signs warn the driver advance about any possible danger and enable him to ensure his safety. Some of these are listed below:
- Right curves
- Left curves
- Bridge ahead, etc.

Other Signs
These signs are installed where a prohibition is imposed on the road user.
The following are a few examples of such signs:
- Speed Limit
- No parking, etc.

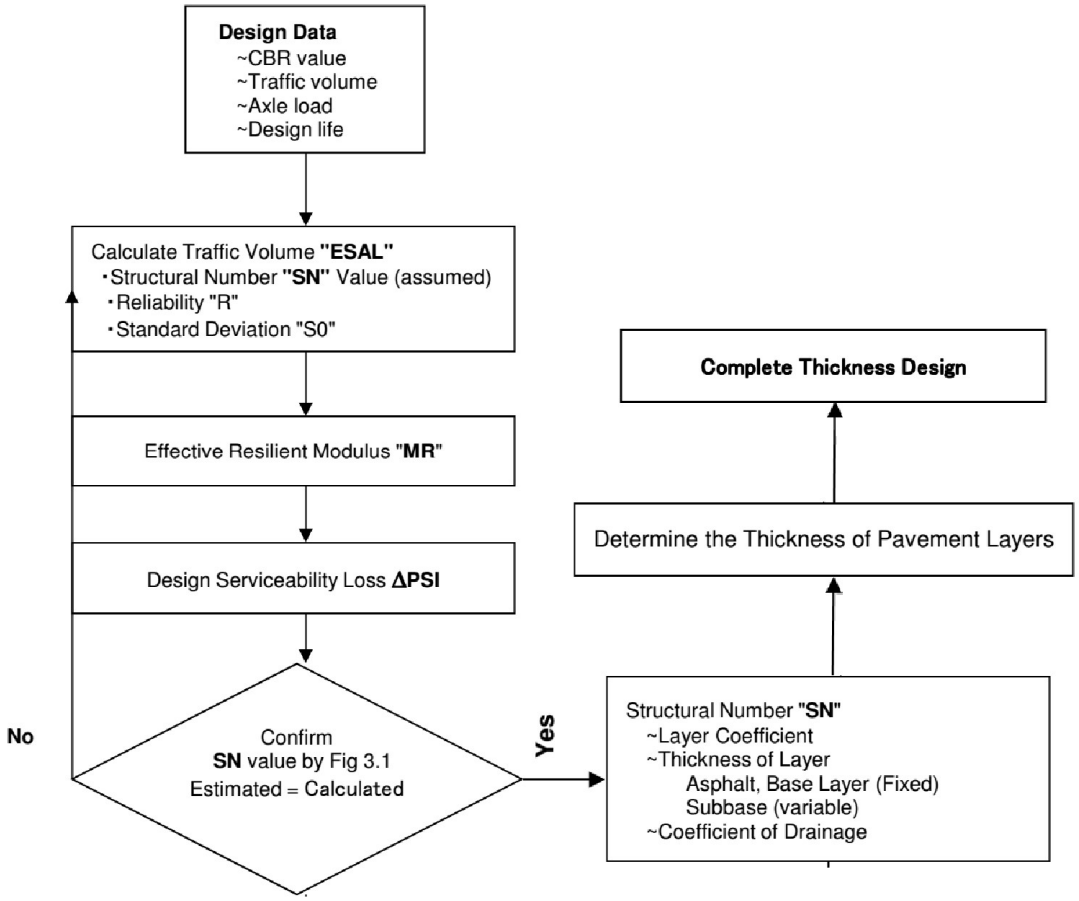
Installation of Signs
Signs have been proposed at such locations that the information supplied to the driver is well in advance to enable him to act accordingly.

Pavement Markings
Pavement markings have been provided as under:
- Both edges of pavements would be marked with continuous yellow lines of 0.20-meter width.
- The center of the pavement would be marked with broken white line with 2m solid and 7m gap. The line would be 0.15 meter wide.

Pavement marking shall be carried out with thermoplastic reflective paint.

2.4 Pavement Design

A pavement, like any other engineering structure, is supposed to resist certain loads. In this case the primary load that needs to be taken in considerations in the design is the traffic spectrum that will be passed by the proposed road along with the location (which is near the sea) and purpose Road which is connecting the proposed facilities.



Pavement Design Parameters

- Reliability
- Standard Deviation
- Cumulative Single Axle Load
- Resilient Modulus
- Serviceability Index
- Structural Number

- Reliability

A reliability level (R) depends on the functional classification of the road and whether the road is in urban or rural area. The reliability is the chance that Pavement will last for the proposed design period without failure.

The reliability factor in the AASHTO 1993, design equation takes care of chance variations in the pavement performance from that anticipated at the design stage. The reliability factor provides means to ensure a known probability that the designed pavement will withstand the actual number of ESALs that will be applied over the design period.

A reliability level of 95 percent has been used. This corresponds to a ZR value of -1.645.

- Standard Deviation

Another criterion required for the consideration of reliability is the overall standard deviation (So). The range of So values given in the Guide is 0.40 to 0.50 for flexible pavement. So has been selected as 0.45 for flexible pavement.

- Cumulative Single Axle Load

The procedures for pavement design of highways are based on cumulative 18 kip equivalent single-axle loads (ESALs) expected to ply during design life. The mixed traffic is, therefore, required to be converted to ESAL applications. This is done by multiplying the number of vehicles in each category by appropriate Damaging Factors.

- Resilient Modulus

Borrow area for embankment construction has been investigated in the vicinity of the project site. Borrow materials consists of A-1-a and A-1-b materials. Soaked CBR of the borrow material has been estimated to be 25%. Resilient modulus of subgrade has been calculated by applying following expression:

$$MR = 2555\ (CBR)^{0.64}$$

- Serviceability Index

The serviceability of pavement is defined as its ability to serve the type of traffic which uses the facility. The primary measurement of serviceability is the Present Serviceability Index (PSI), which ranges from 0 (impossible road) to 5 (perfect road). The basic design philosophy of AASHTO guide is the serviceability performance concept, which provides a means of designing a pavement based on a specific total traffic volume and a minimum level of serviceability desired at the end of the performance period. Selection of the lowest allowable PSI as terminal serviceable index (pt) is based on the lowest index that will be tolerable before rehabilitation, resurfacing, or reconstruction becomes necessary. An index of 2.5 or higher is suggested for design of major highways and 2.0 for highways with lesser traffic volumes.

Based on traffic volumes and functional classification, a terminal serviceability of 2.5 was selected. The initial serviceability (Po) expected to be achieved for the flexible pavement is 4.2, a value observed at the AASHTO road test.

Thus, the overall serviceability loss is given by:

$$\Delta PSI = Po - Pt = 4.2 - 2.5 = 1.7$$

- Structural Number

The design is based on identifying a flexible pavement structural number (SN) to withstand the projected number of axle load applications. Once the design SN for a pavement structure is determined, it is necessary to identify a set of pavement layer thicknesses which, when combined, will provide the load carrying capacity corresponding to the design SN.

The input variables for pavement design are cumulative equivalent axle loads to be encountered during the design life of the pavement, properties of sub-grade soil and pavement layer materials, the environmental characteristics of the project area, the design reliability to be ensured and the level of serviceability required.

The basic design equation used for flexible pavement in the AASHTO Guide 1993 is as follows:

$$Log_{18}\left(W_{18}\right) = Z_R \times S_0 + 9.36 \times \log_{10}\left(SN+1\right) - 0.20 + \frac{\log_{10}\left[\frac{\Delta PSI}{4.2-1.5}\right]}{0.40 + \frac{1094}{\left(SN+1\right)^{5.19}}} + 2.32 \times \log_{10}\left(M_R\right) - 8.07$$

Where,

W18 = Predicted number of 18 Kip equivalent single axle load applications

Zr = Standard Normal Deviate

So = Combined standard error of the traffic prediction and performance

Prediction.

ΔPSI = Difference between the initial design serviceability index, Po, and the Design terminal serviceability index, Pt' and

MR = Resilient Modulus (psi)

SN is equal to the structural number indicative of the total pavement thickness required.

$$SN = a1* D1 + a2* D2 * m2 + a3* D3 * m3$$

Where

ai = ith Layer Coefficient

Di = ith Layer Thickness, and

mi = ith Layer Drainage Coefficient

The SN equation does not have a single unique solution; i.e. there are many combinations of layer thicknesses that provide satisfactory solutions. When selecting appropriate values of layer thickness, it is necessary to consider their cost effectiveness along with the construction and maintenance constraints in order to avoid possibility of producing an impractical design.

Two methods are available in the AASHTO 93 guide for the computation of individual layer thicknesses of pavement structure. In the first method, the SN is balanced by selecting the thickness of individual layers based on experience. A number of design alternatives can be prepared using this method and the most cost-effective combination can be finally adopted. This method is best suited if the behavior of the local materials is well known, and the past experience of highway pavements is successful.

The second method entails the balancing of SN using layered design analysis. In this method the structural number required over the roadbed soil is computed first. In the same way, the structural number required over the subbase layer and the base layer is computed using the applicable strength values of each. By working with differences between the computed structural numbers required over each layer, the maximum allowable thickness of any layer is computed.

2.5 Project Implementation Timeline

The proposed underpass project shall take about 24 months' time for completion.

2.6 Manpower requirements by skills during execution and operation

Table 2.2 gives the details on manpower requirements during the two phases of the project.

Table 2.2: Manpower requirements by skills		
Personnel	**For Execution (Man Month)**	**For Maintenance (No.)**
Professional & Technical	10 X 24 = 240	-
Administrative Executive and Managerial	04 X 24 = 96	-
Skilled	25 X 24 = 600	08
Unskilled	60 X 24 = 1,440	20

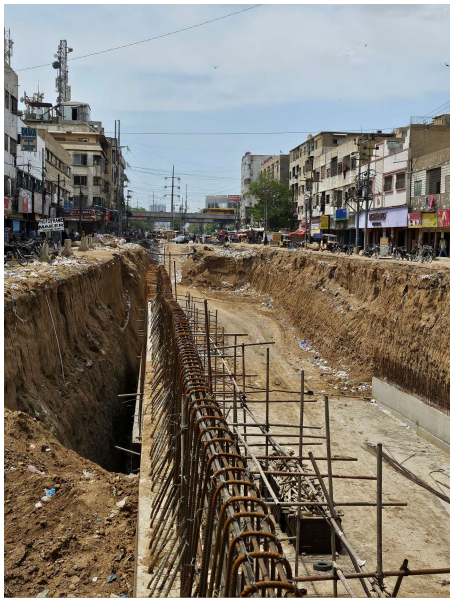
2.7 Utilities

- Electricity needs during would be fulfilled through diesel generator.
- Water needs during construction would be fulfilled through bowzers.

2.8 Amount of material required for construction.

Detailed BOQ (document) is provided in the annexures.

2.9 Current Situation



3. Statutory Requirements

Presented in this section are the Policy, Legal and Administrative Framework applicable to Project in the context of sustainable development. All legal provisions relevant to environmental protection applicable to the planning, construction and operation were identified under the scope of the EIA. The proponent has to be well aware of these requirements and comply with the provisions as applicable and necessary.

3.1 Administrative Framework

Before the 18th amendment in the Constitution of Pakistan, the environmental issues were governed under the federal regime through Pakistan Environmental Protection Act, 1997. As a result of the 18th Amendment this subject is now in the exclusive domain of the provincial government. The Ministry of Environment at the federal level was abolished. Its functions related to national environmental management were transferred to the provinces. To manage the international obligations in the context of environment, a new ministry - the Ministry of Climate Change – was created at the federal level. As of now, all four provinces have enacted their own environmental protection laws.

For Sindh province, the Sindh Environmental Protection Act, 2014 (SINDH ACT NO.VIII OF 2014) was passed by the Provincial Assembly of Sindh on 24th February, 2014 and assented to by the Governor of Sindh on 19th March, 2014 and published in official gazette on Thursday March 20, 2014. (Hereinafter the Sindh Environmental Protection Act, 2014 is referred to as the "2014 Act").

Under the 2014 Act, the Environmental Protection Council (the "EPC") has been formed consisting of Chief Minister as Chairman with Minister in charge of Environment Protection Department, Addl. Chief Secretary, Planning & Development Department, Government of Sindh and Secretaries of Environment, Finance, Public Health Engineering, Irrigation, Health, Agriculture, Local Government, Industries, Livestock & Fisheries Forest & Wildlife, Energy, Education Departments Government of Sindh and Divisional Commissioners of Sindh. Non-official members are also included (i.e. representatives of Chamber of Commerce & Industry and from medical or legal professions etc.) along with DG, EPA & two Members of Provincial Assembly also form part of EPC.

The EPC within the framework of the 2014 Act acts as a policy making body. The functions and powers of EPC include coordination & supervision of provisions of Act, approving provincial environmental & sustainable development policies & SEQS, provide guidance for protection & conservation, consider annual Sindh Environmental Report, deal with interprovincial and federal provincial issues,

provide guidance for bio safety & assist Federal Government in implementation of various provisions of UN Convention on laws on Seas (UNCLOS).

Sindh Environmental Protection Agency (the "SEPA") establishes under the provisions of the 2014 Act is headed by Director General (DG) with the aim to exercise the powers and perform the functions assigned to it under the provisions of the 2014 Act and the rules and regulations made there under. The SEPA acts as the executive body of the provisions of the 2014 Act. It has technical and legal staff and may form advisory committees. SEPA requires preparing environmental policies, taking measures for implementation of environmental policies, preparing Sindh Environment Report and preparing or revising Sindh Environmental Quality Standards. It also establishes systems and procedures for surveys, surveillance, monitoring, measurement, examination, investigation research, inspection and audit to prevent and control pollution and to estimate the costs of cleaning up pollution and rehabilitating the environment and sustainable development. SEPA would also take measures for protection of environment such as to promote research; issues licenses for dealing with hazardous substances, certify laboratories, identify need for or initiate legislation, specify safeguards etc. SEPA would also encourage public awareness and education regarding environmental issues. SEPA has powers to enter or inspect under a warrant issued by Environmental Protection Tribunal or a Court search at any time, any land or building etc. where there are reasonable grounds to believe that an offence has been or is being or likely to be committed. SEPA may also take samples, arrange for testing or confiscate any article in discharge of their duties.

The 2014 Act also provides for establishing Sindh Sustainable Fund derived from various sources such as voluntary contributions or fees generated etc. This fund is utilized for protection, conservation or improvement of environment.

Under the 2014 Act and rules and regulations made there under a complete framework for pre- and post-approval is given, which a proponent of project requires to comply with.

3.2 Statutory Framework

As stated supra after 18th Amendment in Constitution of Pakistan, 1973 subject of environmental protection is devolved to the provinces and all provinces have enacted their own provincial environmental protection acts, rules and regulations. Now all matters related to environmental protection are governed under respective provincial environmental protection laws. However, it would be apposite to give here a brief history of the development of statutory environmental framework in the Country. Prior to the 18th Amendment to the Constitution of Pakistan in 2010, the legislative powers were distributed

between the federal and provincial governments through two 'lists' attached to the Constitution as Schedules. The Federal list covered the subjects over which the federal government had exclusive legislative power, while the 'Concurrent List' contained subjects regarding which both the federal and provincial governments could enact laws. The subject of 'environmental pollution and ecology' was included in the Concurrent List and hence allowed both the national and provincial governments to enact laws on the subject. However, as a result of the 18th Amendment this subject is now in the exclusive domain of the provincial government. The Ministry of Environment at the federal level was abolished. Its functions related to national environmental management were transferred to the provinces. To manage the international obligations in the context of environment, a new ministry - the Ministry of Climate Change – was created at the federal level. The PEPA 1997 is no longer applicable to the provinces. The provinces have enacted their own environmental protection laws. These provincial laws are largely based on PEPA 1997 and, hence, provide the same level of environmental protection as the parent law. Between 1993 and 2010, the Pak-EPA promulgated several rules, regulations, standards, and guidelines to implement the provisions of the PEPA 1997. The province of Sindh has made its own rules and regulations. However, sectorial guidelines made under PEPA 1997 are still useful document to benefit from.

Sindh EPA has taken lead in finalizing and notifying the Sindh Provincial rules, regulations and standards.

- On December 16, 2014, SEPA enacted the Sindh Environmental Protection Agency (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations, 2014 (the "IEE-EIA Regulations").

- On December 19, 2014, SEPA enacted the (i) Environmental Sampling Rules 2014, (ii) Hazardous Substances Rules, 2014, (iii) Sindh Environmental Protection (Composition of Offences and Payment of Administrative Penalty) Rules 2014, (iv) Sindh Environmental Protection Tribunal Rules, 2014, (v) Sindh Hospital Waste Management Rules, 2014, (vi) Sindh Environmental Quality Standards (Certification of Environmental Laboratories) Rules 2014, (vii) Sindh Prohibition of Non-degradable Plastic Products (Manufacturing, Sale and Usage) Rules 2014, (viii) Sindh Sustainable Development Fund (Procedure and Utilization) Rules 2014, and (ix) Sindh Environmental Quality Standards (Self-Monitoring and Reporting by Industry) Rules 2014.

- On June 28, 2016, the Sindh Environmental Industrial Wastewater, Effluent, Domestic, Sewerage, Industrial Air Emission and Ambient Air, Noise for Vehicles, Air Emissions for Vehicles and Drinking Water Quality Standards, 2015 have been notified.

For purpose of this report, the 2014 Act, Sindh Environmental Protection Agency (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations, 2014 ("2014 Regulations") and other relevant rules and regulations made under the 2014 Act are applicable.

3.3 Constitutional Provision

The Constitution of Pakistan is supreme law of the Country. It is one of the few constitutions in the world, which covers environmental protection and considers it one of the fundamental rights of citizens of Pakistan. Article 9 & 14 of the Constitution bestows fundamental right to life and dignity to every citizen. The Supreme Court of Pakistan in landmark judgment in the case of Shehla Zia and others versus WAPDA (1994) referred to both these Articles and laid down the foundation of modern environmental law in Pakistan. The august Court held that the word "life" in the constitution has not been used in a limited manner. A wide meaning should be given to enable a man not only to sustain life but to enjoy it. Under the Constitution, Article 14 provides that the dignity of man and subject to law the privacy of home shall be inviolable. The fundamental right to preserve and protect the dignity of man under Article 14 is unparalleled and could be found only in few Constitutions of the world. The Constitution guarantees dignity of man and also right to "life" under Article 9 and if both are read together, question will arise whether a person can be said to have dignity of man if his right to life is below bare necessity like without proper food, clothing, shelter, education, health care, clean atmosphere and unpolluted environment.

3.4 Sindh Environmental Protection Act, 2014

The 2014 Act as stated above is the basic legislative tool empowering the provincial government to frame regulations for the protection of the environment. The Act envisages protection, improvement, conservation & rehabilitation of environment of Sindh with the help of legal action against polluters and green awakening of communities. It equally lays emphasis for the preservation of the natural resources of Sindh and to adopt ways and means for restoring the balance in its eco-system by avoiding all types of environmental hazards. The act is applicable to a broad range of issues and extends to air, water, industrial liquid effluent, marine, and noise pollution, as well as to the handling of hazardous wastes.

The following articles of the SEPA 2014 have a direct bearing on the proposed Project:

- Article 11(1): 'Subject to the provisions of this Act and the rules and regulations therein, no person shall discharge or emit or allow the discharge or emission of any effluent, waste, pollutant, noise or any other matter that

may cause or likely cause pollution or adverse environmental effects, as defined in Section 2 of this Act, in an amount, concentration or level which is in excess to that specified in Sindh Environmental Quality Standards…'

- Article 11(2): 'All persons, in industrial or commercial or other operations, shall ensure compliance with the Environmental Quality Standards for ambient air, drinking water, noise or any other Standards established under section 6(1)(g)(i); shall maintain monitoring records for such compliances; shall make available these records to the authorized person for inspection; and shall report or communicate the record to the Agency as required under any directions issued, notified or required under any rules and regulations.'

- Article 14 (1): 'Subject to the provisions of this Act and the rules and regulations, no person shall cause any act, deed or any activity', including;

  - (b) disposal of solid and hazardous wastes at unauthorized places as prescribed;

  - (c) dumping of wastes or hazardous substances into coastal waters and inland water bodies; and

  - (d) release of emissions or discharges from industrial or commercial operations as prescribed.

- Article 15 (1): 'Subject to the provisions of this Act, no person shall operate or manufacture a motor vehicle or class of vehicles from which air pollutants or noise are being emitted in an amount, concentration or level which is in excess of the Sindh Environmental Quality Standards or, where applicable, the standards established under sub-clause (i) of clause (g) of sub-section (1) of section 6'.

- Article 17(1): 'No proponent of a project shall commence construction or operation unless he has filed with the Agency an initial environmental examination or environmental impact assessment, and has obtained from the Agency approval in respect thereof'

- Article 17(2): The agency shall;

  - a) review the initial environmental examination and accord its approval, subject to such terms and conditions as it may prescribe, or require submission of an environmental impact assessment by the proponent; or

  - (b) review the environmental impact assessment and accord its approval subject to such terms and conditions as it may deem fit to impose or require

that the environmental impact assessment be re-submitted after such modifications as may be stipulated or decline approval of the environmental impact assessment as being contrary to environmental objectives.

- Article 17(3): 'Every review of an environment impact assessment shall be carried out with public participation and, subject to the provisions of this Act, after full disclosure of the particulars of the project'.

- Article 17(4): 'The Agency shall communicate its approval or otherwise within a period of two months from the date that the initial environmental examination is filed, and within a period of four months from the date that the environmental impact assessment is filed complete in all respects in accordance with the regulations, failing which the initial environmental examination or, as the case may be, the environmental impact assessment shall be deemed to have been approved, to the extent to which it does not contravene the provisions of this Act and the rules and regulations'.

- Article 20(1): 'The Agency shall from time to time require the person in charge of a project to furnish, within such period as may be specified, an environmental audit or environmental review report or environmental management plan containing a comprehensive appraisal of the environmental aspects of the project'.

- Article 20(2): The report of a project prepared under sub-section (1) shall include:

  - (a) analysis of the predicted qualitative and quantitative impact of the project as compared to the actual impact;

  - (b) evaluation of the efficacy of the preventive, mitigation and compensatory measures taken with respect to the project; and

  - (c) recommendations for further minimizing or mitigating the adverse environmental impact of the project.

- Article 20(3): 'Based on its review of the environmental audit report, the Agency may, after giving the person in charge of the project an opportunity of being heard, direct that specified mitigation and compensatory measures be adopted within a specified time period and may also, where necessary, modify the approval granted by it under section 17'.

3.5 Sindh EPA (Environmental Assessment) Regulations 2021

Sindh Environmental Protection Agency (Environmental Assessment) Regulations, 2021 ("2021 Regulations") made in exercise of powers conferred under section 37 of the Act 2014 provide the necessary guidelines on the preparation, submission, & review of Initial Environmental Examinations (IEEs) and Environmental Impact Assessments (EIAs). The regulations categorize projects in three categories provided in Schedule I, II and III of the 2021 Regulations. As per Schedule III (List of projects requiring an EIA), *Category E (5) Construction of Flyover, Underpass and Bridges having total length more than one km, falls in the category of projects that requires Environmental Impact Assessment (EIA) study*.

The submission and approval procedure for the EIA is summarized below:

- The EIA report shall be submitted, together with a review fee and form included as Schedule-V of the 2021 Regulations.
- The SEPA shall conduct a preliminary scrutiny and reply within 10 working days of the submittal of the report a) confirming completeness, or b) asking for additional information, if needed, or c) returning the report requiring additional studies, if necessary.
- The SEPA is required to make every effort to complete the EIA review process within 60 days of the issue of confirmation of completeness.
- SEPA shall call for a Public Hearing for the project to invite all the concerned persons to raise concerns on the project.
- Following the Public Hearing, SEPA shall constitute a Committee of Experts to assist the agency in review of the EIA.
- The approval granted at the end of the review process is valid for three years for start of construction.
- Once project construction has been completed, the proponent is required to submit a request to the SEPA for confirmation of compliance. An environmental management plan for the operation phase is to accompany the request.
- The SEPA is required to communicate its decision within four months of receipt of the request. The project can commence operation only after it has received approval from the SEPA.

3.6 Guidelines for Public Consultation

Public consultation is mandated under Sindh's environmental law. Regulation 11 of the 2014 Regulations provides the general requirements whereas the sectoral guidelines indicating specific assessment requirements are provided in the Guidelines for Public Consultation 1997 (the 'Guidelines'). These are summarized below:

- **Objectives of Public Involvement:** 'To inform stakeholders about the proposed project, to provide an opportunity for those otherwise unrepresented to present their views and values, providing better transparency and accountability in decision making, creating a sense of ownership with the stakeholders';

- **Stakeholders:** 'People who may be directly or indirectly affected by a proposal will clearly be the focus of public involvement. Those who are directly affected may be project beneficiaries, those likely to be adversely affected, or other stakeholders. The identification of those indirectly affected is more difficult, and to some extent it will be a subjective judgment. For this reason, it is good practice to have a very wide definition of who should be involved and to include any person or group who thinks that they have an interest. Sometimes it may be necessary to consult with a representative from a particular interest group. In such cases the choice of representative should be left to the group itself. Consultation should include not only those likely to be affected, positively or negatively, by the outcome of a proposal, but should also include those who can affect the outcome of a proposal';

- **Mechanism of consultations: '**Provide sufficient relevant information in a form that is easily understood by non-experts (without being simplistic or insulting), allow sufficient time for stakeholders to read, discuss, consider the information and its implications and to present their views, responses should be provided to issues and problems raised or comments made by stakeholders, selection of venues and timings of events should encourage maximum attendance';

- **Timing and Frequency:** Planning for the public consultation program needs to begin at a very early stage; ideally it should commence at the screening stage of the proposal and continue throughout the EIA process;

- **Consultation Tools:** Some specific consultation tools that can be used for conducting consultations include; focus group meetings, needs assessment, semi-structured interviews; village meetings and workshops;

- **Other Important Considerations:** 'The development of a public involvement program would typically involve consideration of the following issues; objectives of the proposal and the study; identification of stakeholders; identification of appropriate techniques to consult with the stakeholders; identification of approaches to ensure feedback to involved stakeholders; and mechanisms to ensure stakeholders' consideration are taken into account'.

As above, the Guidelines for Public Consultation introduce effective ways to inform the contents of the project to the general public during the planning stage and that eventually consensus building toward the implementation of project is reached.

Incorporating public involvement into the stages of environmental assessment is explained in the guidelines that public consultation meeting has to be carried out after the works on "developing options and assessing and mitigating impacts" for comments and assessment.

3.7 Sindh Environmental Quality Standards (SEQS)

On June 28, 2016, the Sindh Environmental Industrial Wastewater, Effluent, Domestic, Sewerage, Industrial Air Emission and Ambient Air, Noise for Vehicles, Air Emissions for Vehicles and Drinking Water Quality Standards, 2015 have been notified by Sindh EPA.

Table 3.1 shows Sindh environmental quality standard for ambient air.

Table 3.1: Sindh Environmental Quality Standard for Ambient Air

Pollutant	Time-weighted average	Concentration in Ambient Air	Method of measurement
Sulfur Dioxide (SO_2)	Annual Average*	80µg/m³	Ultraviolet Fluorescence Method
	24 hours**	120µg/m³	
Oxides of Nitrogen as (NO)	Annual Average*	40µg/m³	Gas Phase Chemiluminescence
	24 hours**	40µg/m³	
Oxides of Nitrogen as (NO_2)	Annual Average*	40µg/m³	Gas Phase Chemiluminescence
	24 hours**	80µg/m³	
O_3	1 hour	130µg/m³	Non dispersive UV absorption méthode
Suspended Particulate Matter (SPM)	Annual Average*	360µg/m³	High volume Sampling, (Average flow rate not less than 1.1m³/minute)
	24 hours**	500µg/m³	
Respirable Particulate Matter (PM10)	Annual Average*	120µg/m³	B Ray absorption method
	24 hours**	150µg/m³	

Respirable Particulate Matter (PM2.5)	Annual Average*	40µg/m³	B Ray absorption method
	24 hours**	75µg/m³	
	1 hour	15µg/m³	
Lead (Pb)	Annual Average*	1µg/m³	ASS Method after sampling using EPM 2000 or equivalent Filter paper
	24 hours**	1.5µ/gm³	
Carbon Monoxide (CO)	8hours**	5mg//m³	Non Dispersive Infra Red (NDIR) method
	1hours	10mg//m³	
*Annual arithmetic means of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.			
**24 hourly / 8 hourly values should be met 98% of the in a year. 2% of the time, it may exceed but not on two consecutive days.			

Table 3.2 shows the standards for motor vehicle noise.

Table 3.2: The Motor Vehicle Ordinance (1965) and Roles (1969)

Parameter	Standards (maximum permissible limit)	Measuring method
Noise	85dB(A)	Sound-meter at 7.5meter from the source

Table 3.3 shows the Sindh Environmental Quality Standard for noise.

Table 3.3: Sindh Environmental Quality Standard for Noise

S. No.	Category of Area / Zone	Limit it in dB(A) Leq*	
		Day Time	Night Time
1	Residential area (A)	55	45
2	Commercial area (B)	65	55
3	Industrial area (C)	75	65
4	Silence Zone (D)	50	45
Note: 1	Day time hours: 6.00 a. m to 10.00 p. m		
2	Night time hours: 10.00 p. m to 6.00p. m		
3	Silence zone; Zone which are declared as such by competent authority. An area comprising not less than 100 meters around hospitals, educational institutions and courts.		
4	Mixed categories of areas may be declared as one of the four above-mentioned categories by the competent authority.		
*dB(A)Leq	Time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.		

The SEQS for effluents are shown in Table 3.4.

Table 3.4: Sindh Environmental Quality Standard for Municipal & Liquid Industrial Effluents

S. No.	Parameter	Into Inland Waters	Into Sewage Treatment	Into Sea	unit
1	Temperature or Temp. increase	<3	<3	<3	°C
2	pH value (H^+)	6-9	6-9	6-9	

3	Biological Oxygen Demand $(BOD)_5$ at 20 °C	80	250	80	mg/l
4	Chemical Oxygen Demand $(COD)_{Cr}$	150	400	400	mg/l
5	Total Suspended Solids (TSS)	200	400	200	mg/l
6	Total Dissolved Solids (TDS)	3500	3500	3500	mg/l
7	Oil and Grease	10	10	10	mg/l
8	Phenolic Compounds (as Phenol)	0.1	0.3	0.3	mg/l
9	Chloride (as Cl^-)	1000	1000	SC	mg/l
10	Fluoride (as F^-)	10	10	10	mg/l
11	Cyanide (as CN^-)total	1.0	1.0	1.0	mg/l
12	An-ionic detergents (as MBAS)	20	20	20	mg/l
13	Sulphate(SO_4^{2-})	600	1000	SC	mg/l
14	Sulphide (S^{2-})	1.0	1.0	1.0	mg/l
15	Ammonia (NH_3)	40	40	40	mg/l
16	Pesticides	0.15	0.15	0.15	mg/l
17	Cadmium	0.1	0.1	0.1	mg/l
18	Chromium (trivalent and hexavalent)	1.0	1.0	1.0	mg/l
19	Copper	1.0	1.0	1.0	mg/l
20	Lead	0.5	0.5	0.5	mg/l
21	Mercury	0.01	0.01	0.01	mg/l
22	Selenium	0.5	0.5	0.5	mg/l
23	Nickel	1.0	1.0	1.0	mg/l
24	Silver	1.0	1.0	1.0	mg/l
25	Total toxic metals	2.0	2.0	2.0	mg/l
26	Zinc	5.0	5.0	5.0	mg/l
27	Arsenic	1.0	1.0	1.0	mg/l
28	Barium	1.5	1.5	1.5	mg/l
29	Iron	8.0	8.0	8.0	mg/l
30	Manganese	1.5	1.5	1.5	mg/l
31	Boron	6.0	6.0	6.0	mg/l
32	Chlorine	1.0	1.0	1.0	mg/l

The SEQS for drinking water are shown in Table 3.5.

Table 2.5: Sindh Environmental Quality Standards for Drinking Waters (mg/l)

S.#	Properties/ Parameters	Standard Values for Pakistan	S.#	Properties / Parameters	Standard Values for Pakistan
Bacterial			**Chemical**		
1	All water intended for drinking (E.Coli	Must not be detectable in any 100 ml sample	Essential Inorganics (mg/liter)		
			13	Aluminum (Al) mg/l	≤ 0.2

	or Thermo tolerant Coliform bacteria)		14	Antimony (Sb)	≤ 0.005
2	Treated water entering the distribution system (E.Coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample	15	Arsenic (As)	≤ 0.05
			16	Barium (Ba)	0.7
			17	Boron (B)	0.3
3	Treated water in the distribution system (E.coli or thermo tolerant coliform and total coliform bacteria)	Must not be Detectable in any 100 ml sample. In case of large supplies, where sufficient samples are examined, must not be resent in 95% of the samples taken throughout any 12-month period.	18	Cadmium (Cd)	0.01
			19	Chloride (Cl-)	< 250
			20	Chromium (Cr)	≤ 0.05
			21	Copper (Cu)	2
			Organic (mg/L)		
			22	Phenolic compounds	<0.0002
			Toxic Inorganics (mg/liter)		
			23	Cyanide (CN)-	≤ 0.05
			24	Fluoride (F)	≤ 1.5
			25	Lead (Pb)	≤ 0.05
			26	Manganese (Mn)	≤ 0.5
Physical			27	Mercury (Hg)	≤ 0.001
4	Color	< 15 TCU	28	Nickel (Ni)	≤ 0.02
5	Taste	Non-objectionable/ Acceptable	29	Nitrate (NO_3)-	≤ 50
6	Odor	Non-objectionable/ Acceptable	30	Nitrite (NO_2)-	≤ 3
7	Turbidity	< 5 NTU	31	Selenium (Se)	≤ 0.01
8	Total Hardness as $CaCO_3$	< 500 mg/l	32	Residual Chlorine	0.2-0.5 At consumer end 0.5-1.5 at source
9	TDS	<1000			
10	pH	6.5-8.5			
Radioactive					
11	Alpha Emitters bq/L	0.1	33	Zinc (Zn)	5.0
12	Beta emitters	1			

3.8 Sindh Prohibition of Child Employment Act, 2017

Article 11(3) of the Constitution of Pakistan prohibits employment of children below the age of 14 years in any factory, mines or any other hazardous employment. In accordance with this Article, the Prohibition of Child Employment Act (PCEA) 2017 disallows the child labor in Sindh. The PCEA defines a child as a person who has not completed his/her fourteenth years of age, and

an adolescent means a person who has completed fourteenth year of age but has not completed eighteenth years of his age. No child shall be employed or permitted to work in any establishment including construction, but an adolescent can be employed or permitted to work under strict guidelines provided in the PCEA and rules. An adolescent shall not be employed in any hazardous work included in the schedule to the PCEA.

3.9 Land Acquisition Act, 1894

The Land Acquisition Act, 1894 (LAA) governs land acquisition against compensation for public interest projects. It is termed as draconian law because it gives complete powers to the government to acquire the land and there is no provision for landowner to refuse transferring the land. Only remedy to a landowner is to challenge quantum of compensation, that too, through a civil court where decades pass in deciding the matter. The Act gives power to the Government to acquire the land under an emergency clause under which requirement of prior public notice is exempted.

3.10 Cutting of Trees (Prohibition) Act, 1975 and the Protection of Trees and Bush Wood Act, 1949

The Cutting of Trees Act prohibits cutting or chopping of trees without prior permission of the Forest Department. Section 3 of this Act states "No person shall, without the prior written approval of the local formation commander or an officer authorized by him in this behalf, cut fell or damage or cause to cut, fell or damage any tree."

Similarly, the Protection of Trees and Bush wood Act, 1949 prohibits cutting of trees and bush wood without permission of the Forest department. The Act was enforced to prevent unlawful removal/clearing of trees and green area for any reason without the consent of the Forest Department".

3.11 Pakistan Panel Code, 1860 (PPC)

Chapter XIV of the PPC deals with the offences affecting the public health, safety, convenience, decency and morals. Person may be guilty of public nuisance if his act or omission causes common injury, danger or annoyance to the public or results in spread of infection of disease dangerous to life. The chapter also deals with environmental pollution.

3.12 Sindh Solid Waste Management Board Act, 2014

A board established under the Act for management of collection and disposal of all solid waste, to arrange for effective delivery of sanitation services, and to deal

with other relevant matters. Under the Act, the board shall have the right over the solid waste related issues, assets, funds and liabilities of the Councils and shall possess sole rights on all kinds of solid waste within the limits of all Councils.

3.13 Disaster Management Act, 2010

This Act was enacted to provide for the establishment of a National Disaster Management System for Pakistan. Sindh Disaster Management Authority enforces the Act. The Act defines 'disaster' as a catastrophe or a calamity in an affected area, arising from natural or man-made causes or by accident which results in a substantial loss of life or human suffering or damage to, and destruction of, property. Disaster management includes preparedness and response. The Act provides establishment of disaster management authorities at national, provincial and district levels. The authorities require preparing and implementing disaster management plan for their area.

3.14 The Sindh Occupational Safety and Health Act, 2017

The Sindh Occupational Safety and Health Bill 2017 has been approved by the Provincial Assembly of Sindh (Ref. Sindh Bill No. 27 of 2017) and enacted as the Sindh Occupational Safety and health Act, 2017. The Act makes provision for Occupational Safety and Health conditions at all workplaces for the protection of persons at workplaces against risk of injury arising out of the activities at work places and the promotion of safe, healthy and decent working environment adapted to the physical, physiological and psychological needs of all persons at work.

3.15 Laws on protection of Archaeological Sites & Cultural Heritage

After the Eighteenth amendment in the constitution the subject of "Ancient and historical monuments, archaeological sites and remains" the entry No.37 of the concurrent legislative list has also devolved to provincial legislations. There are two laws that are directly relevant for archaeological relics. The first is The Antiquities Act, 1975, which ensures the protection of Pakistan's cultural resources. Since separate provincial Act has not been enacted yet the Antiquities Act, 1975 shall remain enforce in Sindh under Article 270AA(6) of the Constitution of Pakistan, 1973. The second is The Sindh Cultural Heritage (Preservation) Act, 1994, which is the provincial law for the protection of cultural assets. Its objectives are similar to those of the Antiquity Act.

3.16 Antiquities Act, 1975

The act ensures the protection of cultural resources in Pakistan. It is designed to protect antiquities from destruction, theft, negligence, unlawful excavation, trade

and export. Antiquities have been defined in the Act as ancient products of human activity, historical sites, or sites of anthropological or cultural interest, national monuments etc. The Act prohibits new construction in the proximity of a protected antiquity and empowers the Government of Sindh to prohibit excavation in any area, which may contain articles of archaeological significance. The developers are obligated to ensure that no activity is undertaken within 61 m (200ft) of a protected antiquity, and to report to the GoPS's Dept. of Archaeology if any archaeological discovery made during the course of the project.

3.17 The Sindh Cultural Heritage (Preservation) Act, 1994

The Sindh Cultural Heritage (Preservation) Act, 1994 is the provincial law for the protection of cultural assets. According to KB&TPR 2002, any building declared as a Heritage Building by the GoS, under the above-mentioned preservation Act (1994) shall not be considered for approval by the KBCA, except with the prior approval of the department designated as such by the Government of Sindh. Under the Act an Advisory Committee is formulated to overlook and subsequent right of Acquisition of a protected heritage of architectural, historical, archaeological or national value, custodian/guardianship rights for preservation and declaration of protected heritage, evaluation of ownership rights, take legal action against any offender who attempts to damage, destroy, remove, deface, alter or imperil the protected heritage or to build on or near the site. It also details the purchase, maintenance and repair works of a protected heritage under the government's jurisdiction. The advisory committee may also receive voluntary donations towards the cost of maintenance of a protected heritage site. The act also establishes the right of access to certain protected heritage sites, penalties for violators, formulation of rules and provides protection to the persons working under this Act.

3.18 Sindh Drinking Water Policy, 2017

Public Health Engineering & Rural Development Department, Government of Sindh, with the approval of Chief Minister Sindh issued the drinking water policy on 3rd May 2017.

Principles: The main principles of Sindh Drinking Water Policy, adopted from the National Drinking Water policy 2009, and aligned with the Sustainable Development Goals, are as follows:

- Access to safely managed drinking water is a fundamental right of every citizen and that it is the responsibility of the Government to ensure its provision to all citizens,

- Water allocation for drinking purpose shall be given priority over other uses,

- In order to ensure equitable access, special attention shall be given to removing the existing disparities in coverage of safe drinking water and for addressing the needs of the poor and the vulnerable on priority basis.

- Recognizing that inadequate and unsafe water supply and sanitation are a major cause of diarrhea and nutritional deficiency in children, which as a consequence contribute towards child mortality. Safely managed drinking water supply and sanitation shall be integrated in health, nutrition and school health programs.

- Access shall be increased to high quality nutrition-sensitive services, including access to water, sanitation facilities, and hygiene.

- Key hygiene actions (safe drinking water, hand washing with soap, safe disposal of excreta, food hygiene) shall be integrated as essential components in all nutrition programs.

- Realizing the fact that access and availability of safe drinking water affects all aspects of life of a citizen, a multi sectoral approach, involving different departments of the government, shall be adopted to address the issues related to safe drinking water.

- Being cognizant of the fact that women are the main providers of domestic water supply and maintainers of hygienic household environment, their participations in planning, implementation, monitoring and operation & maintenance of water supply systems shall be ensured, and WASH shall be integrated in maternal and neonatal health programs.

- Responsibilities and resources shall be delegated to local authorities to enable them to discharge their assigned functions with regard to provision of safe water supply.

- A supportive policy framework shall be developed that encourages alternate options through private provision, public private partnerships, the role of NGOs and community organizations

- The execution of component-sharing model for government programs and projects shall be promoted to ensure financial sustainability and community and private sector involvement in development and O&M.

- Low-cost technologies in water and sanitation, that are easy and cost-effective to maintain shall be developed and used.

Goals and Objectives:

Overall Goal: The goal of the Sindh Drinking Water Policy is to improve the quality of life of people of Sindh by reducing morbidity and mortality caused by water-borne diseases through provision of safely managed and potable drinking water to the entire population that is located on premises, available when needed, and free from contamination, affordable and of sufficient quantity, and in a way, that is efficient, equitable and sustainable.

Objectives:

- Introduce legislative measures and regulations to create an enabling framework for safely managed drinking water supply, regulation of water usage, extraction, treatment, transportation and distribution.
- Ensure that all drinking water resources and supply systems are protected with community involvement.
- Develop district level drinking water availability plans for urban and rural areas to ensure improved planning for equitable access.
- Enhance the coverage of safely managed drinking water supply in the province to achieve the Sustainable Development Goals (SDGs) targets of universal access.
- Develop criteria for installation of new drinking water supply schemes and ensure that all new schemes are safely managed, rationalized and constructed through need-based criteria so that all areas and communities are served.
- Develop standardized service delivery models for both urban and rural drinking water supply schemes to improve efficiency, cost-effectiveness, monitoring & sustainability.
- Develop mechanisms for reuse, recycle and recharge of wastewater for other municipal and productive uses.
- Ensure that all drinking water supply systems are designed and constructed in line with the national drinking water quality standards and all municipal discharges comply with National Environment Quality Standards (NEQS).
- Install water treatment plants at existing drinking water supply schemes where required and incorporate water treatment facilities in all new drinking water supply schemes.

- Ensure development of water safety plans for all drinking water supply systems.

- Develop and sustain regular drinking water quality monitoring & surveillance, and institute mechanisms for remedial action.

- Increase public awareness about water borne and water related diseases (including polio), nutrition and hygiene, and enhance the role of communities for household water treatment/storage, water safety and conservation, and safe hygiene practices.

- Ensure that drinking water supply projects are nutrition sensitive and integrated in health, nutrition and school health programs.

- Institutionalize Water, Sanitation & Hygiene (WASH) in schools (infrastructure and 3 starts) and introduce curricular change to incorporate health, nutrition and hygiene and improve safe water and sanitation practices among school children.

- Institute adaptation measures and disaster risk reduction and mitigation strategies to minimize the impact of climate events on drinking water supply system.

3.19 Sindh Sanitation Policy, 2016

The goal of the Provincial Sanitation policy is to ensure that the entire population of Sindh has access to a safely managed sanitation service and sanitary environment that is also nutrition- sensitive and hygienic. The motto of the policy was 'Saaf Suthro Sindh' (Neat and Clean Sindh). The Policy sets targets to achieve its motto. For instance, eradication of Open Defecation from Sindh Province by 2025, while 70% villages of 13 high priority districts achieve the status of open defecation free by 2020; create and develop wastewater treatment mechanisms to cover 75% of urban areas and 40% in rural areas by 2025, and implement integrated solid waste management with 100% coverage in urban areas and 60% in rural areas of Sindh by 2025. A WASH behavior change and communication strategy has also been developed for sustainable and safe hygiene environment by 2025 to enhance the living standards of the people of Sindh.

3.20 Laws and Regulations on Urban Development

Sindh Government also has some laws and regulations for building control:

- 1) Buildings Control Ordinance, 1979

- 2) Karachi Building Control Licensing Regulations, 1982
- 3) Sindh Regulation & Control (Use of Plots & Construction of Buildings) Ordinance, 2002

Karachi Building Control Authority (KBCA) has been established under these ordinances, in order to implement and enforce the above regulations. The Government of Sindh on 14th February 2011 notified extension of the jurisdiction of KBCA to the whole of Sindh and renamed the KBCA to Sindh Building Control Authority (SBCA). The SBCA (Karachi region) is responsible to oversee that the land development process & construction activities do not violate the Karachi Building and Town Planning Regulations, 2002.

Karachi Building and Town Planning Regulations, 2002 is the fundamental regulation for 'Building & Town Planning' for the whole City District of Karachi, except for the cantonment areas and the projects of National Security declared by the Federal Government, which supersedes 'Karachi Building and Town Planning Regulations-1979'. Eight (8) public agencies are individually designated as 'Concerned Authorities for respective areas and purposes', following City District Government Karachi (CDGK), such as:

- Cantonment Boards of the Ministry of Defense
- Karachi Port Trust (KPT)
- Pakistan Railways (PR)
- Ministry of Works, Government of Pakistan (GOP)
- Sindh Industrial Trading Estates, Karachi (SITE)
- Sindh Katchi Abadis Authority
- Board of Revenue

For reference, there are many agencies holding lands in Karachi and no dominant ones. An outline of existing condition of land holdings in Karachi is illustrated as follows.

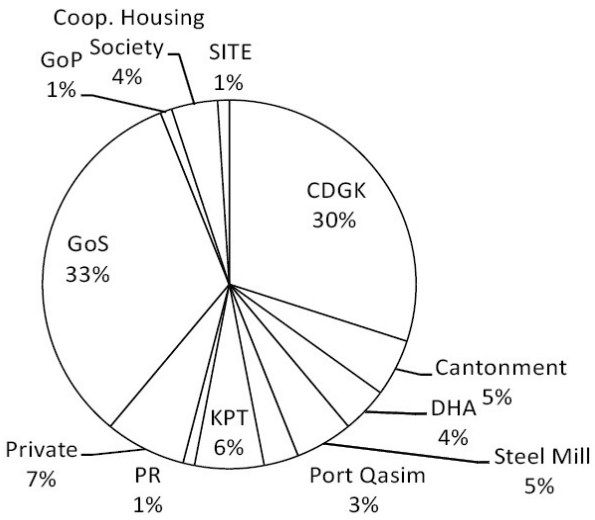


Figure 3.1: Land Holdings by Agency in Karachi
Source: KMP 2020

The above-mentioned regulations have been quite frequently amended as needs arose, since its commencement, especially among the detailed provisions.

These regulations shall apply to the whole city district of Karachi but shall not apply to the cantonment area of the projects of the national security declared by the federal government. In order to meet emergency conditions and the regulations of the persons in the sub-economic income government may declare special areas where these regulations may be relaxed for a specific period. Under these regulations following are the important information related to design and operation of this project.

3.21 Karachi Strategic Development Plan 2020

Karachi Strategic Development Plan (KSDP) 2020 was formulated in 2007 as the official development plan of the City District Government of Karachi (CDGK). This is the first ever approved development plan which has now a legal status under Section 40 of the Sindh Local Government Ordinance 2001 in contrast to the previous master plans. The contents of KSDP 2020 consist of following 7 chapters and they are summarized as follows:

(1) Introduction/Outline

1) Coverage of the Plan: Whole City District of Karachi, consisting of 18 Towns, 6 cantonments, and Federal and provincial governments land-holding agencies; approximately 3,600 sq.km, of which 1,300 sq.km is urbanized (built-up) area.

2) Critical Issues in Land Planning and Municipal Control: The land planning and municipal control is fragmented into about twenty agencies, such as 6 Cantonment Boards, Karachi Port Trust, Port Qasim Authority, Defence Housing Authority, Pakistan Steel, Pakistan Railways, Export Processing Zone, Sindh Industrial Trading Estate, Government Sindh, City District Government Karachi, Lyari Development Authority, Malir Development Authority, cooperative housing societies and private owners, with overlapping powers/functions and utter lack of coordination. The share of CDGK is only 31% of the total area.

3) Vision for Karachi: "Transforming Karachi into a world class city, an attractive economic center with a decent life for Karachiites".

4) Plan Objectives: In order to achieve the vision, the Plan consists not only of physical renewal plans but equally invoking the spirit and commitment of both leaders and citizens to realize a more prosperous, secure & sustainable future.

- Finding out Karachi's advantages/potential for future development
- Promoting a holistic vision towards sustainable growth
- Identifying and addressing key issues in social, economic, environment & urban infrastructure sectors
- Setting out strategic framework against the backdrop of current conditions
- Framing the development plans and programs
- Putting in place an effective, collaborative institutional arrangement with participation of all stakeholders

5) Status and Role: KSDP 2020 has a legal status under SLGO for guiding city's growth in a planned and coordinated manner, and is mandatory for all agencies, stakeholders to follow the plan.

6) Time Span of the Plan: The operational time span for the plan extends to the year 2020 within the scope of Pakistan's Vision 2030. The plan will be further extended to 2030 to cover the city's region that includes part of surrounding districts of Thatta, Jamshoro and Lasbella.

(2) Summary of Land Use Plan, KSDP 2020

Major points of land use plan/strategy are:

Page 1-4 "The spatial needs for commerce, industry, housing and infrastructure development to cope with future population growth (15.2 million in 2005 to 27.6 million in 2020; 4% of AAGR) will be provided through a set of policies and programs, as follows":

1) Spatial Growth Strategy (Basic)

- Densification: Saddar, Jamshed, North Nazimabad, Gulberg, SITE and Shah Faisal Towns
- Densification & Infill: Gulshan-e-Iqbal, Landhi, Korangi, New Karachi Towns, DHA & Cantonments
- Infill and Expansion: Baldia, Malir, Orangi and Gadap Towns
- Status Quo: Lyari and Liaquatabad Towns

2) Various Land development policies and Strategies

In addition to the basic strategy (spatial growth), following several individual land development policies/strategies were considered and proposed in the plan.

- Regeneration of the Inner City
- Promotion of Mixed-Use Development
- Permit and Guide Vertical Development and Densification
- Enable Densification and Vertical Development of Existing Residential Areas
- Development of New Urban Centers
- Policy for Urban Renewal
- Integration of Civil Areas of Cantonment and other Land-Owning Agencies
- Incorporation of Existing Goths into the Urban Fabric
- Development of Industrial Zones
- Decentralization of financial districts
- Additional site for international airport

- Special Purpose Zone along Northern bye-pass
- Development of Education city
- Additional spaces for graveyards and landfill sites for garbage

3.22 Building Code of Pakistan, Fire Safety Provisions 2016

The Building Code of Pakistan-Fire Safety Provisions-2016 provide rules for fire prevention, life safety in relation to fire and fire protection of building and structures as prescribed. All the federal and provincial governments, organizations, authorities, both public and private are mandated to adopt and implement Building Code of Pakistan-Fire Safety Provisions-2016, as notified. Any construction and modification of buildings in violation of Building Code of Pakistan (Fire Safety Provisions-2016) shall be considered as violation of professional engineering works as specified under clause (xxv) of section 2 of the Act.

The implementation and enforcement of this bye-law shall vest with the Authority Having Jurisdiction (AHJ) within their respective jurisdictions and circles as follow:

- (1) Building Control, Housing and Development Authorities
- (2) District Administration
- (3) Tehsil or Town Administration
- (4) Municipal Administration
- (5) Station Headquarters (Army, Air Force and Navy)
- (6) Cantonment Administration
- (7) Union Council Administration
- (8) Autonomous Bodies
- (9) Industrial Estates
- (10) Directorates of Civil Defense
- (11) Export Processing Zones

- (12) Other Federal/Provincial Authorities as and when notified

This Bye-law shall come into force upon being notified and all the concerned AHJs shall implement the same immediately in the prescribed manner.

All relevant AHJs shall ensure compliance and implementations of this Code and accordingly adopt or amend their relevant regulations, Bye-laws or rules as the need be.

This Bye-law shall apply to both new and existing buildings.

- buildings permitted for construction after the adoption of these Provisions shall comply with the provisions stated herein for new buildings forthwith.

- existing buildings constructed prior to adoption of these provisions shall comply with the provisions stated herein as soon as possible but not later than three years of notification of these provisions; and

- minimum fire protection requirements such as provision of fire alarm and detection system, fire extinguishers, emergency response plans and fire drills shall however be in place as soon as possible but not later than one year of notification of these provisions.

Any person who fails to comply with this Bye-law or fails to carry out an order made pursuant to these provisions, or violates any condition attached to a permit, approval, or certificate shall be subject to the penalties in accordance with the regulations of AHJ.

3.23 Guidelines for Sensitive and Critical Area, October 1997

The above guidelines list up a number of areas subject to protection in terms of sensitive ecosystems and archaeological importance. In Appendix II of the Guidelines, a list of eight Archaeological Sites and Monuments, of which four of them are National Monuments, in Karachi is provided. Further, there are 203 sites declared as "Protected Heritage" within Karachi District.

None of such sites, however, exist within the microenvironment of the proposed Project.

3.24 Policy for Sustainable Urban Transport

The Transport & Mass Transit Department has formulated the policy document in line with the draft National Transport policy of Pakistan. The overall vision on the Government of Sindh is to put citizens at the center stage and make its cities

livable and efficient. This global vision of livability and efficiency will be sought by setting up a transport system focused on three Objectives:

a) Promote Citizen Needs and security. The policy aims to put in place a transport system focused on citizen needs, with a special attention on the needs of women, children and people with disability. It aims to provide users with a reliable, efficient, safe and affordable service, integrated across different modes, both functionally and financially.

b) Encourage Economic Growth. As developing cities have become the engines of economic growth, they are faced with increasing congestion. The cost of congestion in Sindh's main cities ranges between 2-4% of the GDP. Sindh aims to increase the economic efficiency of its cities by improving travel conditions of people and goods by reducing congestion. To achieve this, the Government will create the right balance between "hardware" issues like building new infrastructures, and "soft" issues, such as improving coordination among multiple departments and stakeholders and strengthening regulation and implementation capacity.

c) Promote Environmental sustainability. The vision is also to create an environmentally friendly transport system. As congestion in cities has an adverse impact on the quality of the air and living conditions, systematic measures to lower the toxic emissions generated by the transport sector will be pursued to improve the well-being of the population, improve health & contribute to the climate change efforts to lower carbon footprint.

The Vision is intended to guide policy, planning, investment programming, and operation implementation for the cities of the province for a 20-year planning horizon.

4. Description of Environment

Presented in this chapter of the EIA study are the findings of environmental and social baseline conditions of the project area in terms of its macroenvironment & microenvironment. Information available from literature relevant to baseline of the area, surroundings and Karachi was collected at the outset and reviewed subsequently. This was followed by surveys conducted by experts to investigate and describe the existing status and scenario.

4.1 Description of Physical Environment

4.1 Physical Resource

Detailed description of the physical resources existing in the area is stated in the following sections. Major areas covered under physical resources are; topography, geology, soil conditions, climate, surface and ground water resources, and seismology. Most of the information is collected from the authentic secondary resources besides primary data collection for critical aspects. Respective departments were contacted by the project team members and information was collected with the help of a checklist. Other studies and reports were referred and reviewed for the verification of information.

4.1.1 Climatic Condition

The climate of the macroenvironment is characterized as hot and dry during summer, and mild during winter with heavy, sporadic, rainfall during the monsoon. The southwest monsoon prevails from April to October. The monsoon is characterized by a reversal in wind direction during the remaining months; and heavy rainfall over most of the Indian Subcontinent. The hottest months are between mid-March to June. The winters are mild with temperature dropping to 10°C in January. Karachi receives approximately 217.3 mm of rain annually. Almost 80% of the rain is concentrated in the monsoon season.

The general characteristics of the seasons based on this data is described as follows:

- ***Summer (mid-March to mid-June):*** Characterized by high temperatures, moderate rainfalls with moderate atmospheric humidity and high speed-winds that blow from southwest towards northeast.

- ***Summer Monsoon (mid-June to mid-September):*** Characterized by high temperatures, high rainfalls with high atmospheric humidity and high speed-winds that blow from southwest towards northeast.

- ***Post-Monsoon summer (mid-September to mid-November):*** Characterized by moderate temperatures, low rainfalls and low speed-winds that normally blows from southwest towards northeast with direction of wind changing in the end of post-monsoon summer from southwest to northeast.

- ***Winter (mid-November to mid-March):*** Characterized by low temperatures, dry conditions with low atmospheric humidity and significant reduction in wind speeds that blows from northeast to southwest with the direction of wind changing in the end of winter from northeast to northwest.

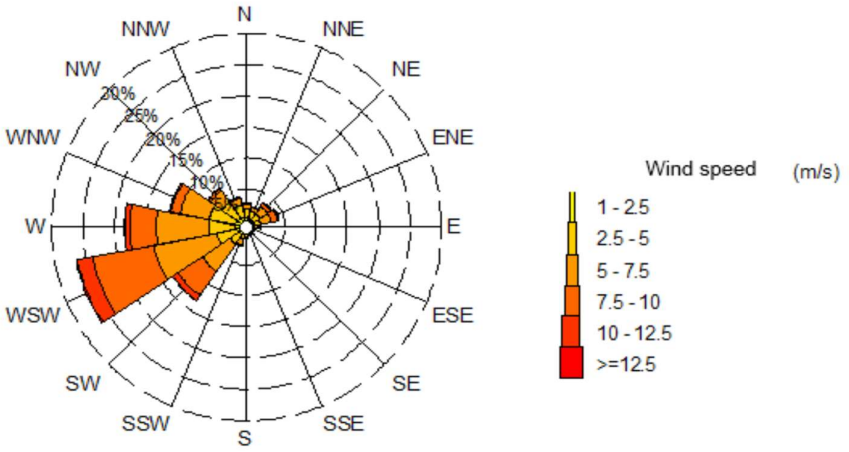


Figure 4.1: Annual Wind Rose

4.1.2 Land use

The Karachi City District is spread across an area of approximately 3,600 km^2. A large portion of this area consists of vacant land including the area dedicated to the Kirthar National Park. The KSDP-2020 (August 2007) indicated that Karachi has now an urbanized area of approximately 527 km^2 which comprises various types of land uses as shown in Table 4.1.

Table 4.1: Existing Land Use in Urbanized Area of Karachi

Land Use	Urbanized Area 2006 (acres)	% of Total Urbanized Area	KSDP 2020 Plan Area (acres)	% of Total Plan Area
Formal Residential	35,206	27.00%	69,369	12.00%
Informal Residential	10,558	8.10%	10,998	1.90%
Goth (villages = residential)	2,043	1.60%	13,126	2.30%

Commercial	2,921	2.20%	3,386	0.60%
Health	685	0.50%	729	0.10%
Educational	3,320	2.60%	3,495	0.60%
Government	3,036	2.30%	69,712	12.10%
Other Institutional	1,218	0.90%	1,450	0.30%
Industries	9,285	7.10%	26,919	4.70%
Cottage Industries	28	0.00%	28	0.00%
Transport	723	0.60%	4,296	0.70%
Warehouses	563	0.40%	2,670	0.50%
Mining	166	0.10%	167	0.00%
Vacant Land	9,541	7.30%	216,198	37.50%
Open Space	13,439	10.60%	26,655	4.60%
Agriculture	7,296	5.60%	56,256	9.80%
Water	2,392	1.80%	11,353	2.00%
Road Space	23,089	17.70%	54,036	9.40%
Other Land Uses	4,660	3.60%	5,003	0.90%
Total	130,169	100.00%	575,845	100.00%
Source: KSDP-2010(August 2007), Annexure-I, 3. Existing Land Use and Housing				

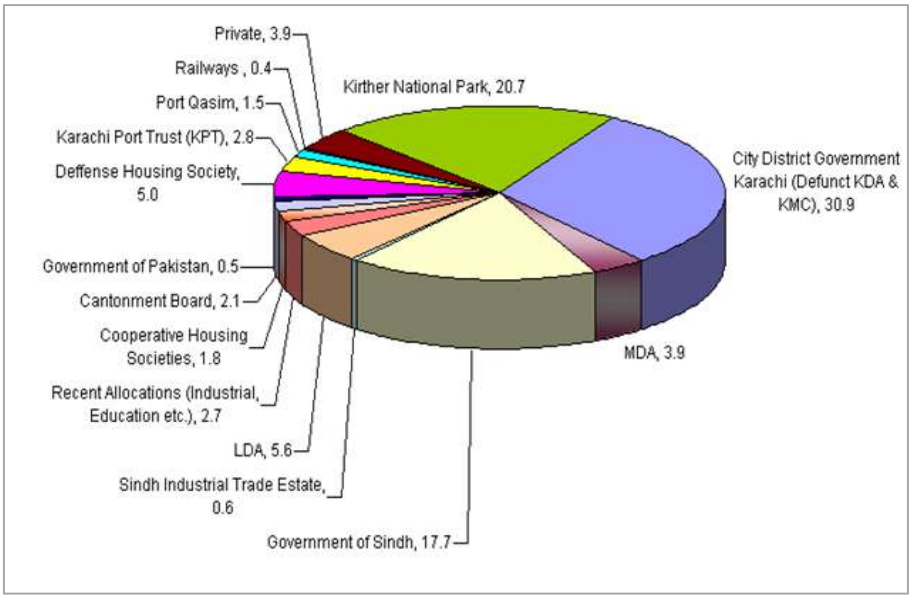


Figure 4.2: Land Control of Karachi (Source: KSDP 2020)

It should be noted that vacant land accounts for only 7% of all land and housing is the leading user of land (with about 37% of the total), while roads and open spaces are next to follow. Most of the developed areas are concentrated in the

inner ring towns of Saddar, Jamshed, Lyari, Liaquatabad, Gulshan-e-Iqbal and Gulberg. These towns contain the most diverse mix of land uses and include most of the governmental and regional-scale industrial and commercial activities. The KSDP-2020 (August 2007) stated that with mounting pressures exerted by the population growth over the last two decades, the following two basic trends in land use have recently been observed. Commercial growth has taken place along major arterials, while most residential neighborhoods have acquired one or two storey structures; significant densification has taken places through construction of upper floors and subdivisions of large plots. In many old and new areas, apartment buildings, 5-6 storeys high, have replaced the low-density bungalows and small houses.

Vertical Development of Residential Neighborhoods: Driven by a strong real estate market, residential neighborhoods are rapidly being developed across Karachi. Along main arterials, intersections and other land with high potential commercial value, offices and shops are replacing residences on the ground floor. In some cases, houses are being demolished and replaced by multi-storied buildings, with commercial uses on the ground floor and apartments above. In other cases, the G+1 height limit is being ignored and floors are being added to existing houses. This trend can be observed in towns such as New Karachi, North Nazimabad and Gulberg that are experiencing rapid commercial and cottage industrial growth. This growth results in increasing the burden on the infrastructure networks, without any associated investment to increase capacity.

The Project falls into the appropriate category that permits the designated land-use by the Development Authority. Numbers of residential and commercial projects are sited in the macroenvironment of project site.

4.1.3 Topography

Karachi is located in the south of Sindh, on the coast of the Arabian Sea. It covers an area of approximately 3,600 km^2, comprised largely of flat or rolling plains, with hills on the western and northern boundaries of the urban sprawl. The city represents quite a variety of habitats such as the seacoast, islands, sand dunes, swamps, semiarid regions, cultivated fields, dry stream beds, sandy plains, hillocks. Classified according to physiographic features, Karachi City District can be divided into three broad categories: Hilly Region (Mountain Highland) Alluvial Plain (Piedmont Plain) Coastal Areas (Valley Floor). Among the various physiographic features, low flat-topped parallel hills devoid of vegetation, interspersed with widespread plains and dry riverbeds are the main topographic characteristics of the city. The greatest height of the region is 250 ft that gradually decreases to 5 ft above mean sea level along the coastline.

Topographic survey was drawn on appropriate scales and contour intervals. Planning and Design of this sub project has been carried out considering the following objectives:

- Development of site plans of the roads and service corridor,
- Observe and plot cross-sections of reaches of the roads at strategic locations,
- To establish ground control for road alignment and vertical profile,
- Preparation of survey plans on appropriate horizontal and vertical scales,
- Establishment of permanent benchmarks and reference points at site.
- Identification of all above ground existing services and utilities, located in the right-of-way, and their marking in survey maps / layout.
- approximate outline of water bodies - including drains, nullahs, rivers/ streams/ ponds etc. along with direction of flow, angle of skew and locations,
- Collect field measurement and digital representation of ground levels at appropriate distances / grids, and
- Mark location, orientation and levels of all existing features and structures.

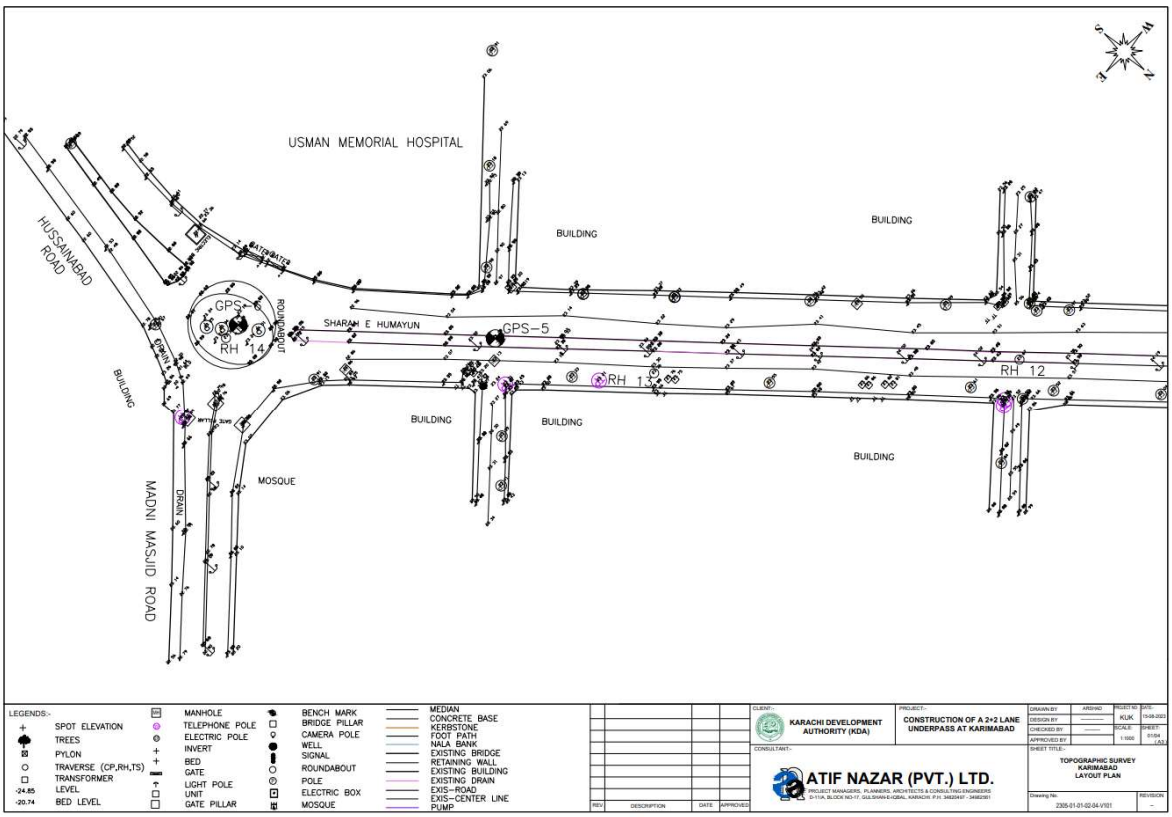
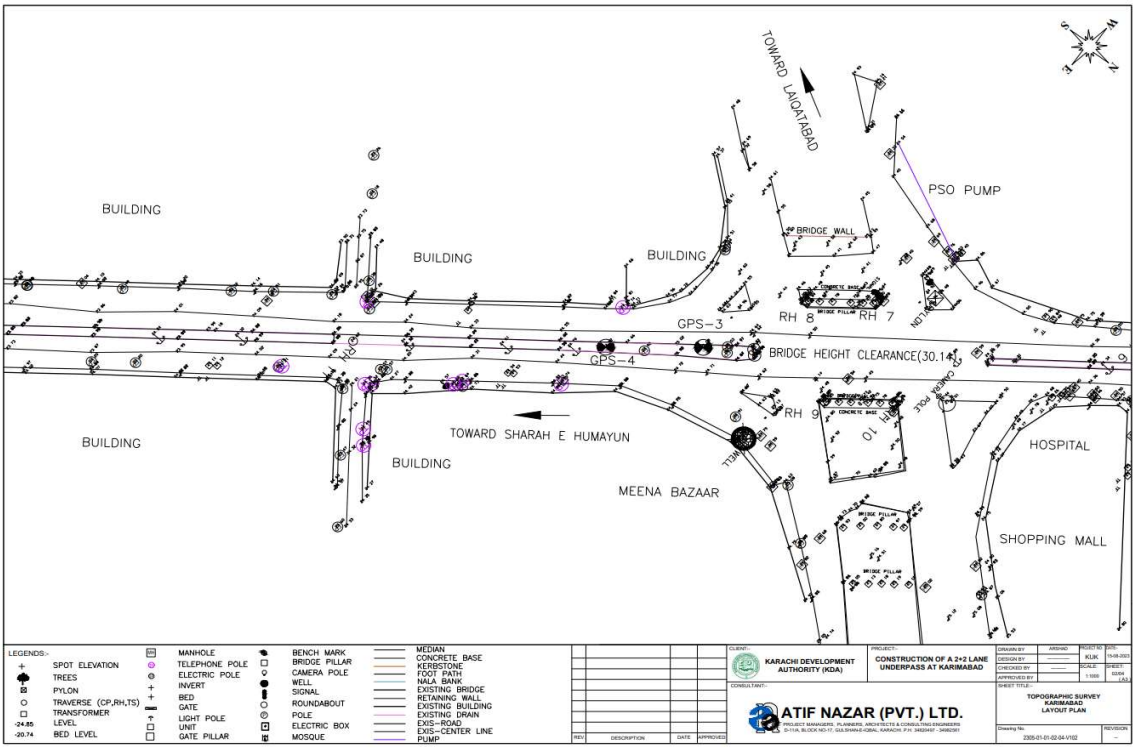


Figure 4.3 (a): Topographic map (Section 1)



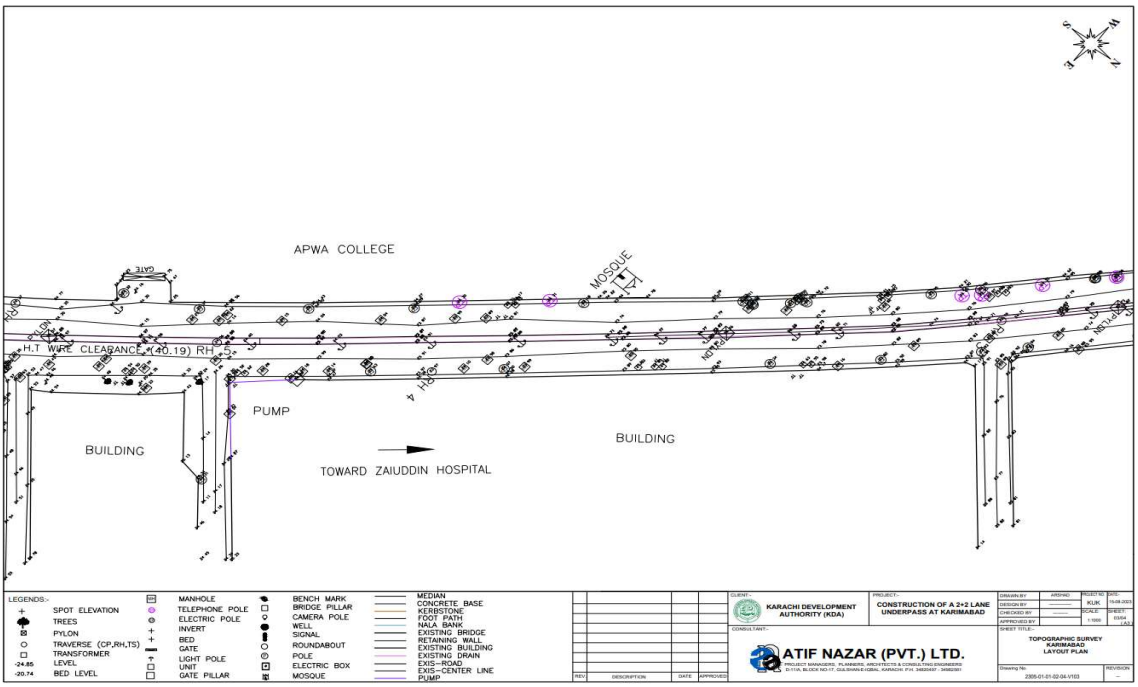


Figure 4.3 (b): Topographic map (Section 2 & 3)

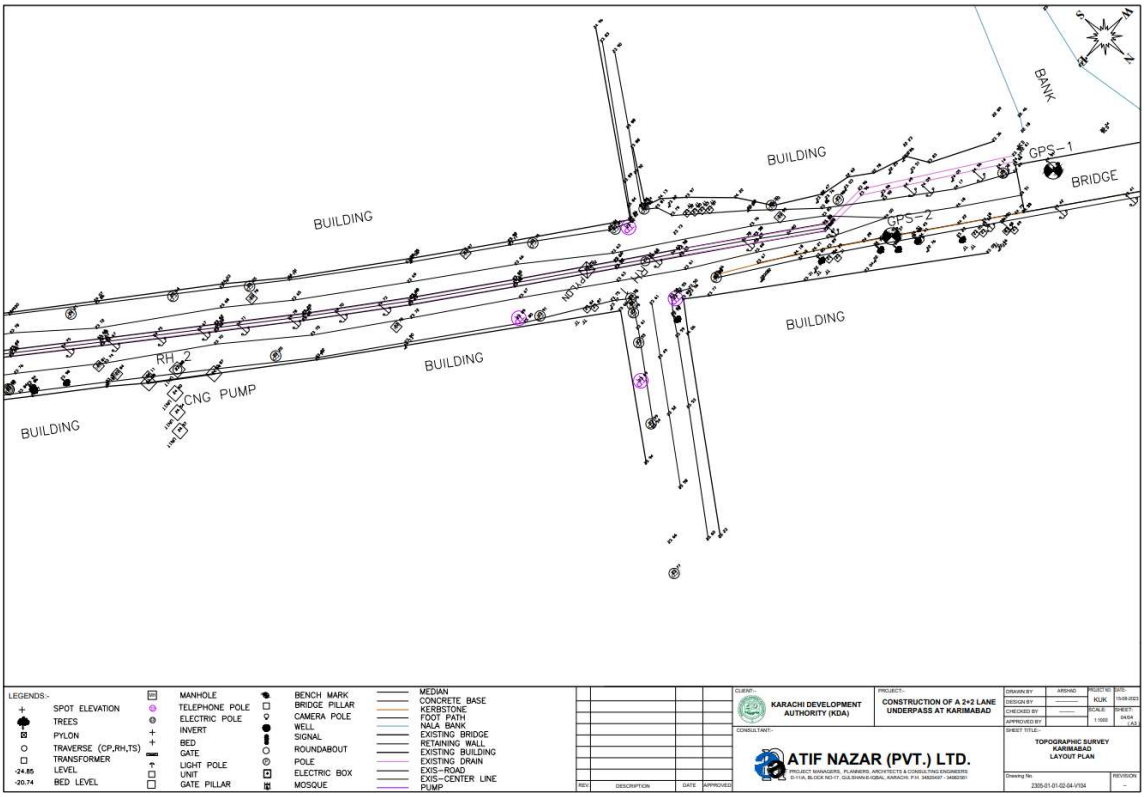


Figure 4.3 (c): Topographic map (Section 4)

4.1.4 Geology and Soils

Karachi and adjoining areas have plains, hills, rivers, valleys and coasts as diversified physical features. Rocks ranging in age from Eocene to recent, deposited under shallow marine to deltaic conditions are exposed. Karachi is a part of major synclinorium stretching from Ranpathani River in the east to Cape Monze in the west. Mehar and Mol mountains lie in the north. Within the synclinorium a number of structures such as Pipri, Gulistan-e-Jauhar, Pir Mangho and Cape Monze are exposed. The presence of concealed structures under the Malir River Valley, Gadap and Mauripur plains can fairly be deduced (GSP, 2001).

Various rock units described above have been folded to form anticlinal hills and synclinal valleys, with moderate to gentle dips. The fold axes run approximately north south. Structurally the area may be divided into two zones. First zone is to the east and northeast and it is characterized by relatively more intense folding and faulting. Rocks ranging in age from Paleocene to Oligocene are also exposed in this zone. The second zone is located in the centre and to the west and southwest and comprises the large area, which opens out towards the south and largely consists of horizontal or near horizontal strata which form gentle

structural undulations in the form of synclines and anticlines with low dips of 2 to 6 degrees (rarely up to 10 degrees). These folds have a general southward plunge direction. These structural features clearly indicate that the structure of the Gaj basin (Khadeji basin) is more suitable for the accumulation and storage of ground water by virtue of more extensive recharge zones, locations of probable groundwater aquifers at shallower depths and several shallow synclinal structures.

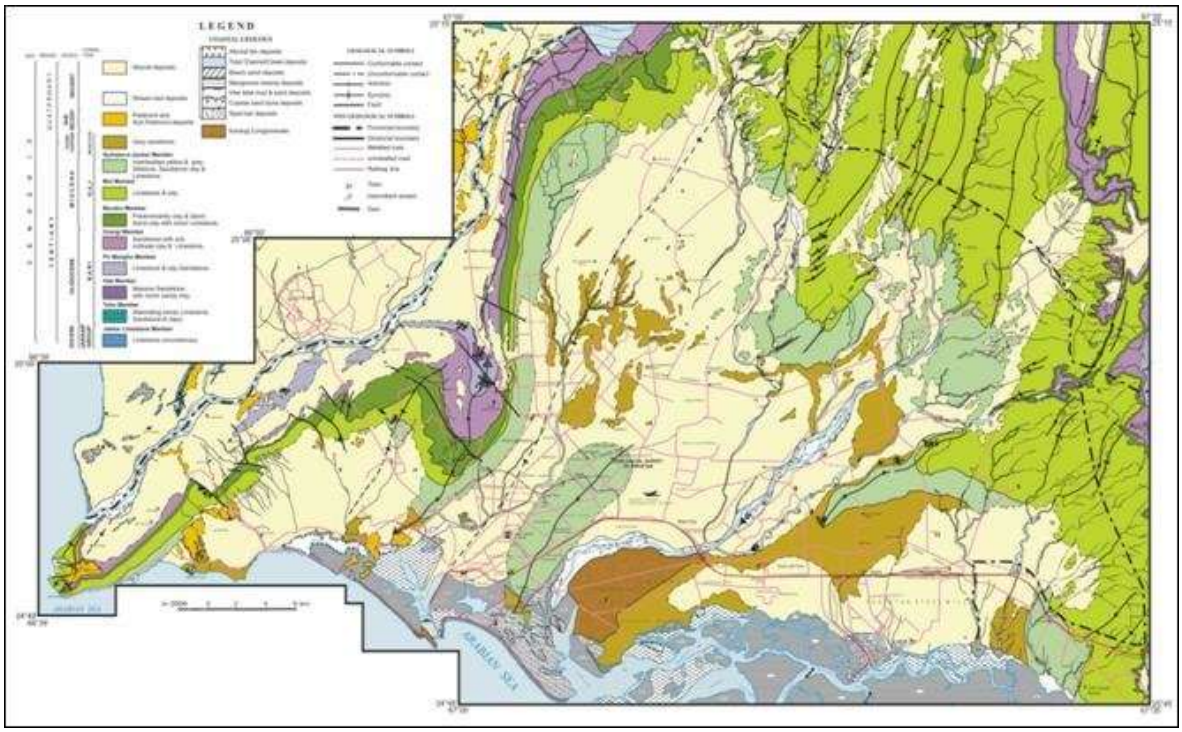


Figure 4.4: Geological Map of Karachi (Source: Geological Survey of Pakistan)

Soil investigation by analysis of borehole samples suggests that soil deposits derived from Gaj and Manchar formation of Lower Miocene to Middle/Upper Miocene to Pliocene age characterize the macroenvironment of the 15 priority intersections. Similar deposits are found along the entire coastal belt of Karachi and adjacent areas.

Borehole data generated for other corridors shows that the water table is low ranging from 0.8 m near the coastline to 6.5 m at higher elevations and 2.3 m on an average. It is assumed that the strata in the vicinity of water table are saturated with water. The different strata of the soil comprise an initial 1 to 4 m of mostly soft rocks like fine to coarse silty sand, followed by fine to coarse sandy shale to 8 m, mudstone in the following 10 to 15 m, hard clay or shale, mudstone and hard/compact rocks available further down to depth of 30m. Filling material

found in a few samples has been found to contain silty sand, broken pieces of bricks etc.

The borehole data along the Corridor indicate that the sandstone strata have fair strength while rocks encountered down to 30 meter depth in the bore holes along the Corridor show poor Rock Quality and low load bearing capacity. This would require appropriate mitigation measures in providing bored reinforced concrete piles to the depth of hard rocks. It is therefore suggested that piles of the piers/columns of the flyovers should be laid at depth of sandstone which are hard and pose minimum risk to the liquefaction threat during major (> 7 on Richter Scale) earthquake.

Liaquatabad Town

Soil Type: The alluvial covers mainly composed of poorly sorted, unconsolidated loose gravel, sand and silt.

Lithology: The area is totally uncovered with recent alluvial deposit of quarternancy age.

Geological Structure: The area is synclinal in structure. The recent alluvial deposit has unconformable contact with Gulistan-e-Juhar member of Gaj formation in NE and NW direction.

Stratigraphy of various soil layers at the site has been assessed through information / data obtained from drilling, field testing and laboratory test results. Detailed examination of the borehole logs reveals that:

BH-1	**Under Flyover Bridge**
00m-2.4m	Road filled material.
2.4m-9.0m	Yellowish, Brown Gray very dense fine to coarse SAND some Gravels.
9.0m-12.0m	Brown, Gray medium hard pieces of LIME STONE / SAND STONE with Sandy Gravels.
12.0-18.0m	Yellowish Brown medium hard SAND STONE some coarse SAND & Gravels.
18.0m-25.0m	Yellowish Brown medium hard FRIABLE SAND STONE Traces Silt & Mica.

BH-2	Front of Habib Medical
00m-2.0m	Road filled material.
2.0m-3.0m	Yellowish Brown, Gray very dense Fine to Coarse SAND Traces Gravels.
3.0m-5.0m	Yellowish Brown, Gray very dense SANDY CLAY Traces Gravels.
5.0-7.6m	Yellowish Brown, Gray very dense Fine to Coarse SAND Traces Gravels.
7.6m-10.6m	Yellowish Brown, Gray very dense Fine to Coarse SAND with Gravels.
10.6m-12.0m	Yellowish Brown medium hard CLAY some fine to Coarse Sand.
12.0m-15.0m	Brown, Gray, Black medium hard CLAY STONE Traces Sand.

BH-3	Front of UBL Bank
00m-2.0m	Road filled material.
2.0m-7.6m	Yellowish Brown, Gray very dense fine to Coarse SAND some Gravel Traces Clay.
7.6m-15.0m	Yellowish Brown medium hard to hard pieces of SAND STONE some Coarse SAND Traces Gravels.

BH-4	Near of Bank AL-Habib
00m-1.8m	Road filled material.
1.8m-4.5m	Yellowish Brown, Gray dense to very dense fine to Coarse SAND Traces Gravel.
4.5m-9.0m	Yellowish Brown medium to hard SANDY CLAY Traces Gravels.
9.0m-15.0m	Yellowish Brown, Gray medium hard pieces of SAND STONE some Coarse Sand, Gravels & Clay.

The detailed report on geotechnical investigation is provided in the annexure.

4.1.5 Seismic Conditions

The Sindh Building Control Authority has placed Karachi in Zone 2B based on the actual events, the past observance of fault movement and other geological activities. It has been inferred that Karachi is situated in a region where moderate earthquakes of magnitude 5.0 to 6.0 equivalents to intensity between VI and VII on Modified Mercallis Scale may occur. On the basis of correlation of different scales and zoning, Karachi has been established as being situated in a noticeably moderate earthquake zone.

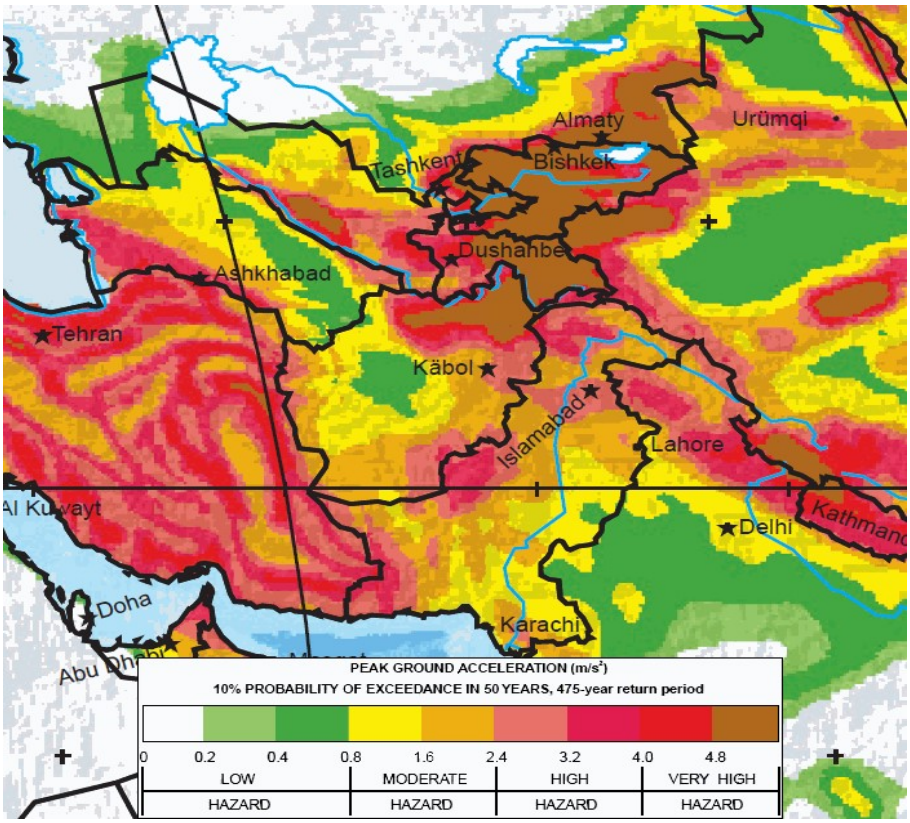


Figure 4.5: Peak Ground Acceleration (m/sec²)

S.No.	Seismic Parameters	Values
1	U.B.C Zone – 1997	2B
2	Maximum Peak Ground Acceleration	16 to 24% of 9.8 m/sec^2
3	Seismic Hazard	Moderate
4	Magnitude (Richter Scale)	6.5 to 7.0 Intensity
5	Intensity (MM Scale)	VI to VIII

At Depth (Meter)	Soil Profile Type	Seismic Coefficient
00 – 2.50	SD	$C_a = 0.28$ $C_V = 0.40$
2.50 – 25.0	SC	$C_a = 0.24$ $C_V = 0.32$

4.1.6 Ambient Air & Noise Quality

Primary source of air pollution on and along the major corridors of Karachi is transport sector, so the primary pollutants in ambient air quality in the City in general and project area in particular are directly linked with fuel consumption.

According to available estimates, country's consumption of petroleum products has shown exponential growth, of which one-half is consumed by the transport sector. The high content of Sulphur in diesel (0.5-1 %) and furnace oil (1-3.5 %) is a major contributor to air pollution. Vehicular emissions are major source of $PM_{2.5}$ and these fine particulates are responsible for respiratory problems in Karachi. The number of diesel trucks and buses have increased and a major share of the emission load from motor vehicles can be attributed to low quality diesel fuel and oil burning two-stroke engines.

Karachi has also witnessed an increase in vehicles fueled by compressed natural gas (CNG) in recent years and many formerly diesel fueled vehicles have been converted to run on CNG which has added another burden on the existing air-shed besides causing public safety issue. Buses and trucks cause significant air pollution and since the main sources of pollutants are traffic, and traffic has increased on the major corridors including the mass transit corridors (project area), it is assumed that air quality has deteriorated as a result.

The primary pollutants Oxides of Nitrogen (NOx), Sulphur dioxide (SO_2) particulate matter (PM10, PM with diameter of 10 microns or smaller and PM2.5, i.e., PM 2.5 microns or smaller) and carbon monoxide (CO). Most of the PM emissions (>80%) comes from diesel-run vehicles. Sindh Environmental Quality Standards (SEQS) for these parameters in addition to lead (Pb) and ozone (O_3) are set by the Government and have been promulgated at provincial level by the Government of Sindh as well as standards for vehicle emissions in line with Euro II. Finally, the Government has promulgated tailpipe emissions standards.

All these standards are discussed in Section 03 of this EIA. Studies undertaken between 1987 and 1994 had raised concern on the deteriorating air quality and noise levels. Studies over the past decade, had quantified the problem and identified the tremendous growth in volume of traffic as the main factor responsible for increasing congestion all over Karachi roads and aggravating the problem. A 1990 survey[1] monitored CO at 9-10 ppm along the busy urban streets; maximum NO2 concentrations were 0.3-0.5 ppm during the daytime; with an ozone maximum around noon of 40 ppb and 50 ppb, below WHO's interim quality guideline. A 2005 study[2] that shows hourly readings over 24 hours for O_3,

[1] Ghauri et.al. 1994
[2] Hashmi et.al.

SO_2, CO and NO_2 measured at five locations in Karachi. O_3 concentrations were well within the WHO guideline of 100 µg/m³ 8-hr average; NO_2 and SO_2 also were well within the WHO guideline of 200 µg/m³ (1-hr average) and 20 µg/m³ (24-hr), respectively.

The Feasibility Study and Development of a Transport Control Plan of Karachi Metropolis (May 2007) presented data for these parameters of air quality for 26 locations. At that time all critical parameters were found to exceed the NEQS. This study has highlighted the increasing level of NOx, PM & CO to critical limits as the major environmental problem created by the Transport Sector. The main findings of this study are that the pollution load that is being mainly contributed by operation of trucks and buses on diesel oil, and the rickshaws on two stroke engines is composed of NOx and PM whose concentration has increased to critical limits while that of CO is approaching these limits at almost all the intersections in the Metropolitan area. High Noise level and rise in temperature and humidity are other irritants that are annoying for the living environment in general but the corridor of impact along the middle and northeast sections of the roads in particular.

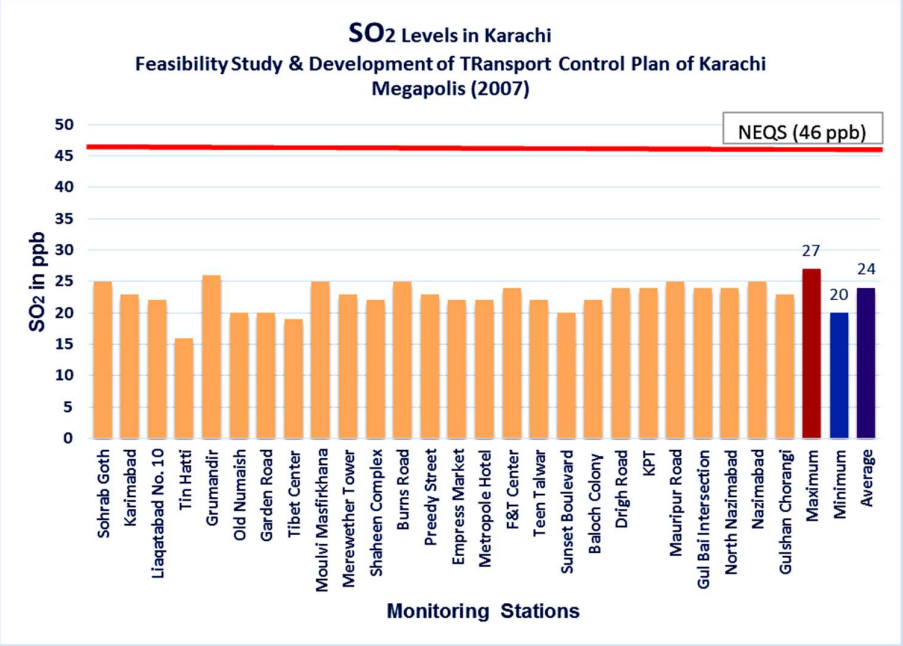


Figure 4.6: SO_2 Levels in Karachi

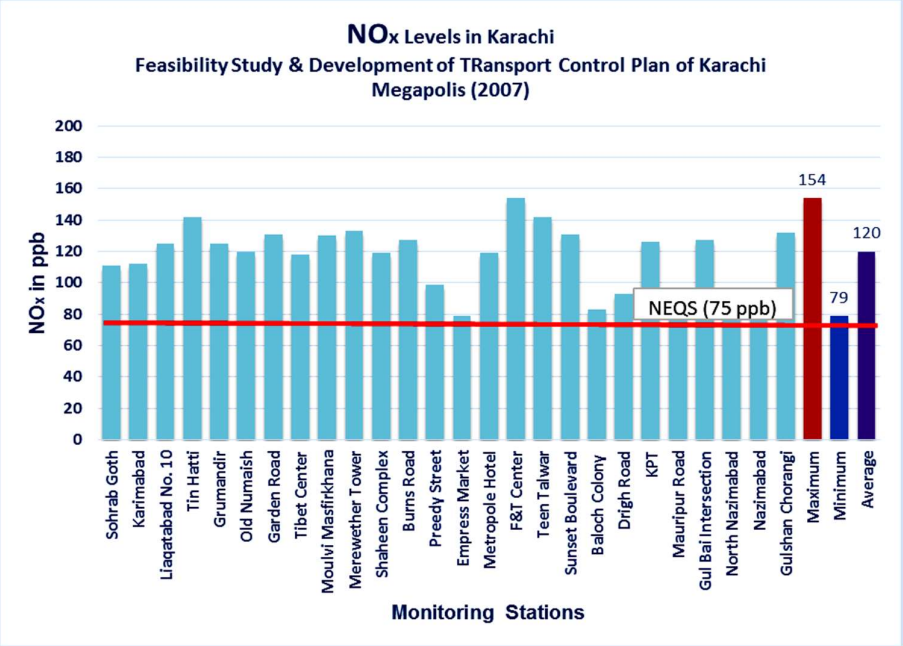


Figure 4.7: NOx Levels in Karachi

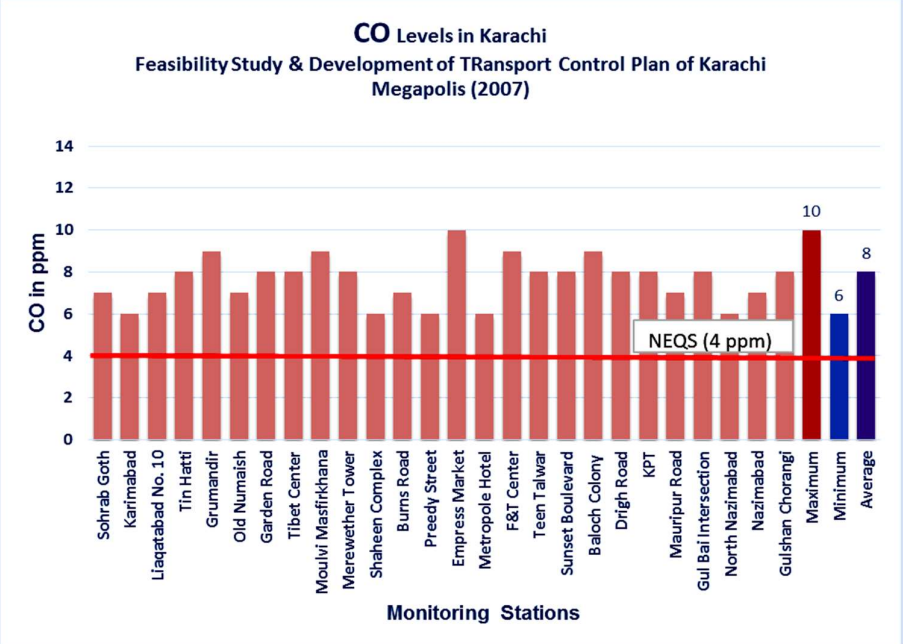


Figure 4.8: CO Levels in Karachi

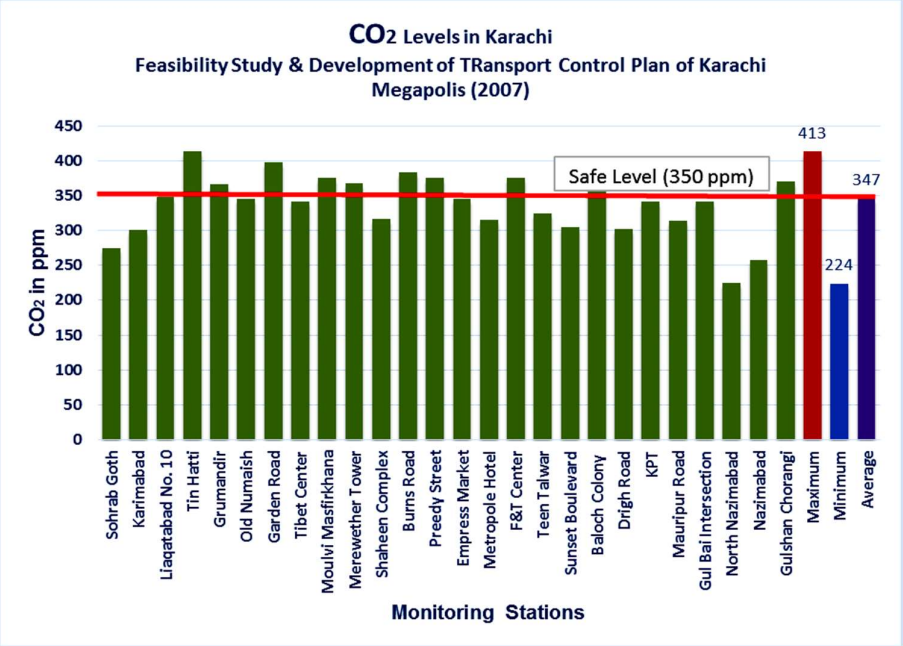


Figure 4.9: CO2 Levels in Karachi

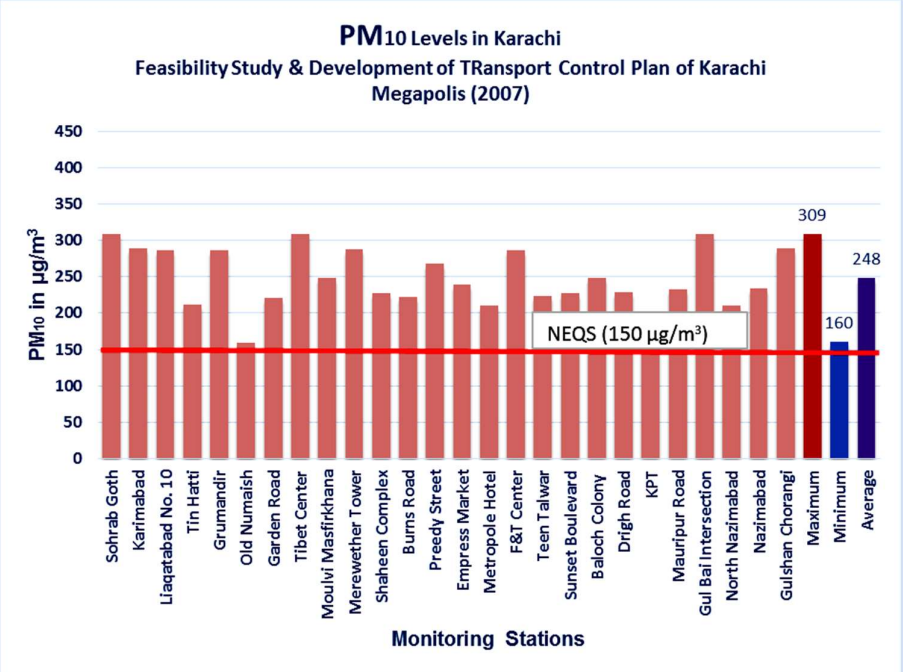


Figure 4.10: PM10 Levels in Karachi

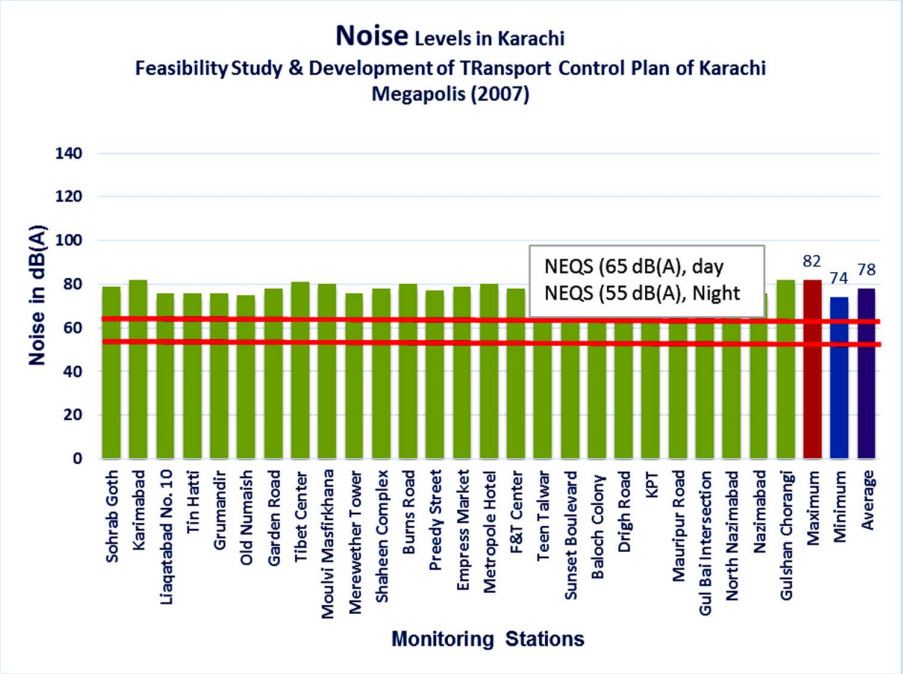


Figure 4.11: Noise Levels in Karachi

Finally, another report[3] quotes the World Bank's data with the following maximum values: PM2.5 201 µg/m³; SO2 173 µg/m³; NO2 122 µg/m³; O3 86 µg/m³; CO2 mg/m³. For reference, WHO's interim target for PM2.5 is 35 µg/m³, whereas its guideline is 10 µg/m³. WHO guideline for O_3: 100 µg/m3 8-hour mean. Both NO2 and SO2 are within WHO's guideline for short term average concentration. (200 and 400 µg/m³ respectively). Data by this same author show excessive levels of PM at major intersections, including some along the BRT corridor, as well as SO2, NO_X, O_3 and CO, all exceeding WHO limits, based on data taken by SUPARCO in 2004.

PAQI has been measuring particulate matter ($PM_{2.5}$) levels in Karachi since October 2016. The measurements show a $PM_{2.5}$ concentration of 47 micrograms per cubic meter of air (µg/m³) for October to December 2016. The World Health Organization (WHO) prescribes 10 µg/m³ as the guideline value for ambient air. Exceeding this value leads to serious public health issues.

[3] Kalwar 2014

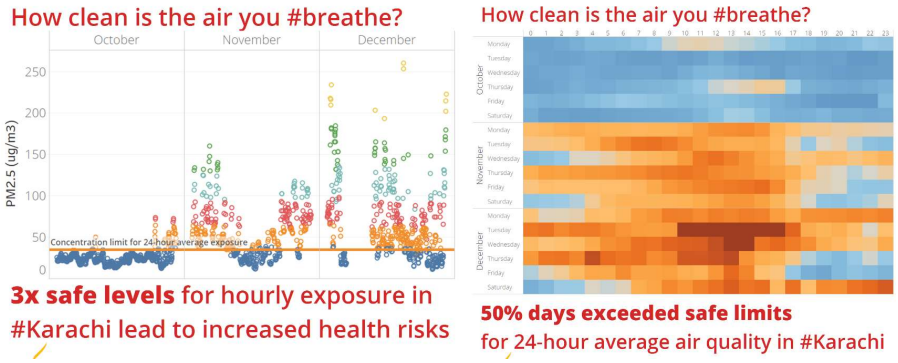
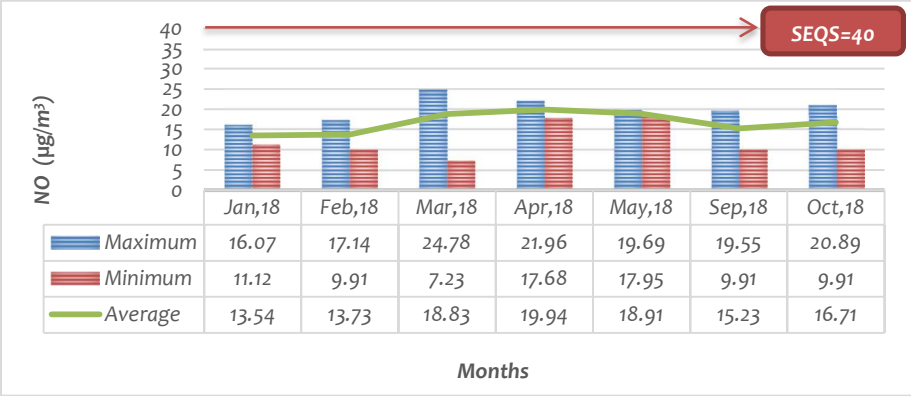


Figure 4.12: How Clean is Karachi's Air

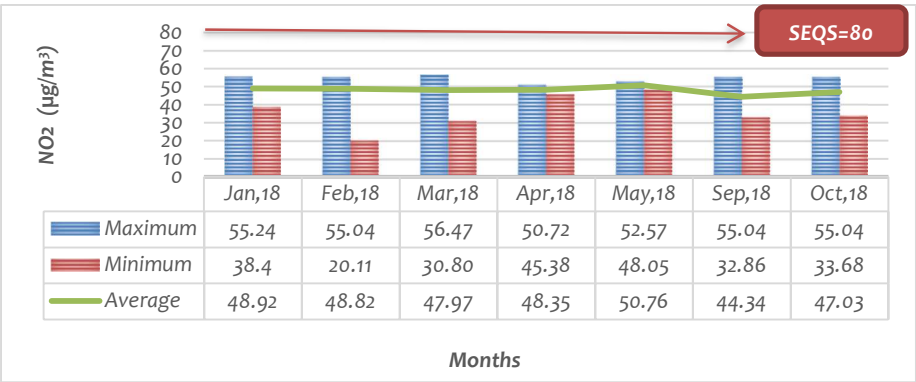
Karachi's air quality is nearly 5x above this level, and twice the value for daily exposure. That is also 3x the safe levels recommended by the National Environmental Quality Standards for Ambient Air by the Pakistan Environmental Protection Agency (Pak-EPA).

Sindh Environmental Protection Agency (SEPA) has been uploading the data of ambient air quality on their website (www.epasindh.gov.pk) received from the monitoring stations of SEPA and analyzed by SEPA Laboratory team. The results presented below clearly show the levels of dust are far exceeding the limits set by SEQS. The reasons are obvious; indiscriminate cutting down of trees and vegetation on and along major corridors of Karachi as well the vehicles plying on road with no control. According to the report of Vehicular Emission Control Programme (VECOP) by the SEPA, regular monitoring and inspection was started from January 2010 and during the first 18 months, about 11,384 vehicles of all categories have been inspected and tested for their emission levels. Out of them, about 3,503 did not comply with the NEQS for vehicles and 1,947 were challenged by the traffic police for violation of the standards.



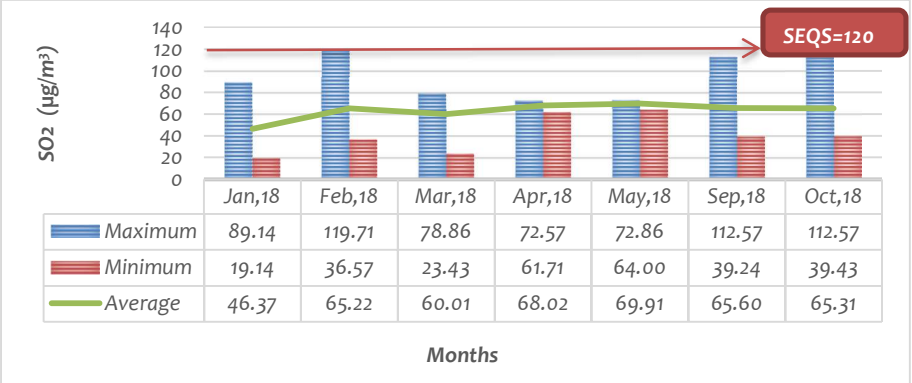
	Jan,18	Feb,18	Mar,18	Apr,18	May,18	Sep,18	Oct,18
Maximum	16.07	17.14	24.78	21.96	19.69	19.55	20.89
Minimum	11.12	9.91	7.23	17.68	17.95	9.91	9.91
Average	13.54	13.73	18.83	19.94	18.91	15.23	16.71

Source: EPA Sindh



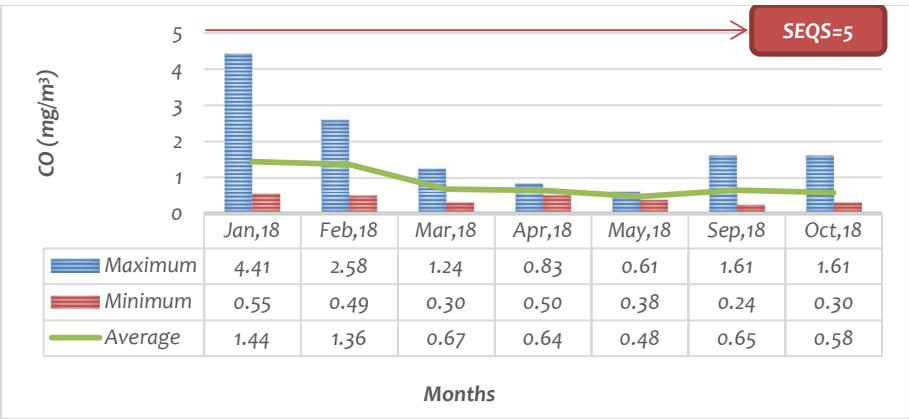
	Jan,18	Feb,18	Mar,18	Apr,18	May,18	Sep,18	Oct,18
Maximum	55.24	55.04	56.47	50.72	52.57	55.04	55.04
Minimum	38.4	20.11	30.80	45.38	48.05	32.86	33.68
Average	48.92	48.82	47.97	48.35	50.76	44.34	47.03

Source: EPA Sindh



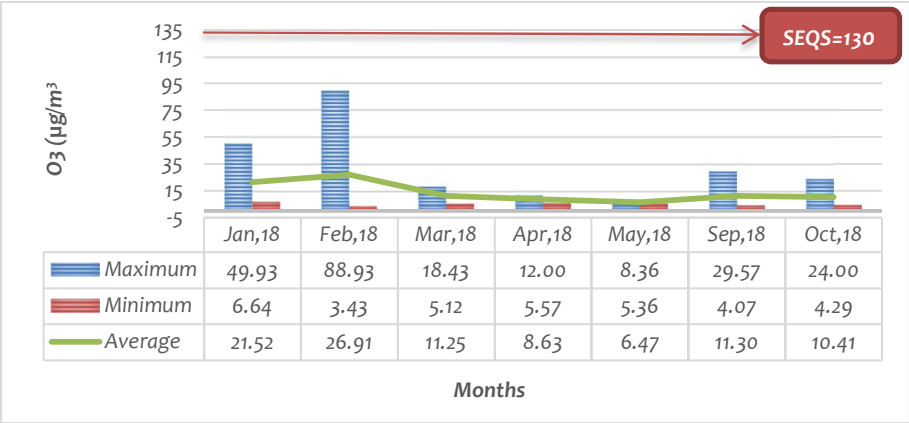
	Jan,18	Feb,18	Mar,18	Apr,18	May,18	Sep,18	Oct,18
Maximum	89.14	119.71	78.86	72.57	72.86	112.57	112.57
Minimum	19.14	36.57	23.43	61.71	64.00	39.24	39.43
Average	46.37	65.22	60.01	68.02	69.91	65.60	65.31

Source: EPA Sindh



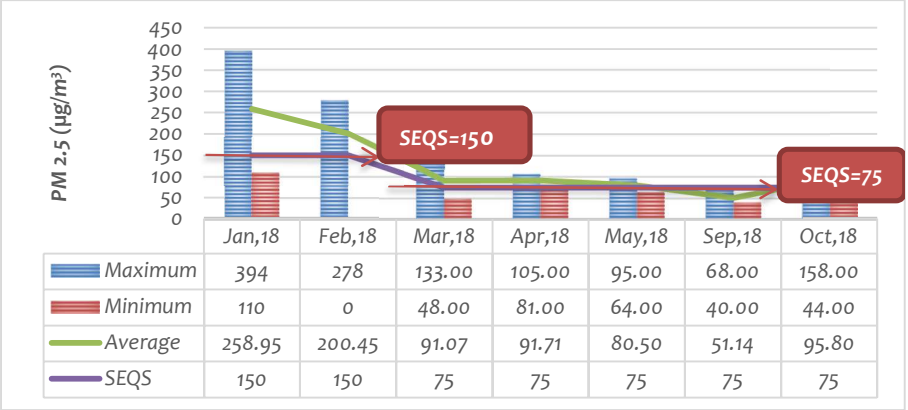
	Jan,18	Feb,18	Mar,18	Apr,18	May,18	Sep,18	Oct,18
Maximum	4.41	2.58	1.24	0.83	0.61	1.61	1.61
Minimum	0.55	0.49	0.30	0.50	0.38	0.24	0.30
Average	1.44	1.36	0.67	0.64	0.48	0.65	0.58

Source: EPA Sindh



	Jan,18	Feb,18	Mar,18	Apr,18	May,18	Sep,18	Oct,18
Maximum	49.93	88.93	18.43	12.00	8.36	29.57	24.00
Minimum	6.64	3.43	5.12	5.57	5.36	4.07	4.29
Average	21.52	26.91	11.25	8.63	6.47	11.30	10.41

Source: EPA Sindh



	Jan,18	Feb,18	Mar,18	Apr,18	May,18	Sep,18	Oct,18
Maximum	394	278	133.00	105.00	95.00	68.00	158.00
Minimum	110	0	48.00	81.00	64.00	40.00	44.00
Average	258.95	200.45	91.07	91.71	80.50	51.14	95.80
SEQS	150	150	75	75	75	75	75

Source: EPA Sindh

Figure 4.13: Ambient Air Quality of Karachi (Source: SEPA)

An ambient air monitoring study was conducted in the microenvironment of the proposed project through SEPA Certified Lab[4]. The air-shed of the site of Karimabad Intersection site has, according to the assessment of ambient air quality been classified as polluted in terms of dust levels with **SPM/TSP, PM_{10} and $PM_{2.5}$ at 389 µg/m³, 157 µg/m³ and 84.1 µg/m³ respectively.**

The levels of **SO2 → 25.2 µg/m³, NO→ 18.6 µg/m³, NO2→ 41.2 µg/m³, CO→ 3.2 mg/m³ and O3 → 16.1µg/m³** were found with the permissible limits of SEQS however the levels of pollutants do not comply with WHO limits with regard to human health. It is only the moderate velocity wind in Karachi that is saving the

[4] Ambient Air Monitoring Activity was performed on Jan 27, 2024

residents from the hazards of air pollution. The noise levels ranging from 79.7dB(A) to 98.8dB(A) that in excess of SEQS[5]. As such the contribution of the traffic related emissions and noise levels on the adjoining roads of the project site will be a major nuisance and will have to be mitigated in the project design.

Figure 4.14: Ambient Air Quality Monitoring at Project site

4.1.7 Climate Change and Effects

Climate change acting hand-in-hand with urban dislocation and growth promises to exert a significant negative impact on Karachi's urban infrastructure systems and services, its built environment and ecosystem services, and therefore on its urban population and economy. As one of the region's coastal mega cities, which includes Manila, Bangkok, Jakarta, Mumbai and Shanghai, Karachi will face increased flooding and damage from unpredictable weather patterns along with other forms of extreme event including drought with attendant risks on water

[5] SEQS Limits: 55/45 dB(A) Leq Day/Night. These are the SEQS Limits for Residential Area (A) Category Zone Sindh Environmental Protection Act, 2014 No. PAS/Legis-B-06/2014

supply, heat waves with attendant effect on fuel consumption and water use, sea level rise that impacts mangrove and other ecosystems, flood water removal, and complicity with tropical cyclones. (Anwar 2012).

Another prominent study (Hasan et.al. 2017) maintains that Karachi, being a city of migrants located in the midst of an alien and unwelcoming province, suffers from a disconnect of governance that bodes ill for dealing with the effects of climate change:

"Of the estimated 3.35 million 'illegal' immigrants in Pakistan, 75 per cent (or 2.5 million) are settled in more than 100 migrant-concentrated residential areas in Karachi. Living conditions in these settlements are mostly cramped, and services such as clean drinking water, sanitation and solid waste disposal are hard to come by. Research from the region suggests that processes and structures of unplanned rapid urbanisation, environmental change and social exclusion reinforce urban vulnerability for migrants." (p. 6).

The report concludes with recommendations to enhance capacity and political support for institutional reforms, reconstitute the low-cost housing market and support private and public sector cooperation in health and housing provision, as means for reducing vulnerabilities among the Katchi Abadi population.

4.1.8 Water Resources, Water Quality and Drainage

4.1.8.1 Hydrogeology of Karachi

Hydrogeologically, the city of Karachi lies in the Hab River Basin and the Malir River Basin. The Malir River Basin is drained by the Malir River and the Lyari River. The aquifer of Karachi is, therefore, mainly recharged by seepage from Hab River, Hab Dam as well as the Malir and the Lyari Rivers. The Hab River lies on the western frontier of Sindh and for some distance the boundary between Sindh and the Baluchistan provinces. It is located about 30 km to the west of Karachi, along the Karachi- Lasbela boundary. It falls into the Arabian Sea near Cape Monze, with a total drainage course length of 336 km. During the past several years, a number of pumping wells have been installed to meet requirements for the irrigation-water supply (to raise vegetables, fruits, dairy and poultry) and drinking-water supply for Karachi. Excessive pumping of groundwater and continuous lowering of water-table is likely to result in intrusion of seawater into the Malir Basin under natural seepage conditions and under artificially induced conditions of recharge of saline seawater in the coastal aquifer(s) of Karachi.

Recharge Sources: Five possible water-sources are contributing to the groundwater recharge in Karachi. The first possible source is the rainfall. As the city of Karachi suffers from deficit of precipitation (only rainfall), the

contribution to shallow groundwater storage from rain is very little. However, rainfall in the hinterlands and other areas surrounding Karachi may significantly contribute to the groundwater flow-system. The two freshwater sources are the Hab Lake/Hab Dam and the Indus River. Water from Hab Dam and the Indus River is piped to various residential zones in Karachi for drinking and irrigation purposes. The spring water discharges into Malir River and Lyari River and the municipal/industrial waste effluents added to these rivers are also contributing to groundwater storage as a fourth recharge source. Seawater intrusion along Karachi coast is the fifth possible source.

Shallow Groundwater: Physico-chemical data of shallow groundwater (depth less than 30 meters) shows that the shallow wells, located in the vicinity of coast and in the proximity of polluted rivers, have relatively higher values of electrical conductivity, salinity and population of Coliform bacteria. The shallow groundwater is moderately saline, representing electrical conductivity values in the range of 1.1 to 1.9 mS/cm and salinity in the range of 1 ppt. The pH of shallow groundwater varies from mildly acidic (~6.3) to mildly alkaline values (~7.9). Areas with quite poor sanitary conditions have relatively low values of pH (~6.3 to 6.8). Shallow groundwater below 20 meters is slightly reducing. The dissolved oxygen is in the range of 1.5 to 7.9 mg/L. Turbidity of shallow groundwater varies between 3.6 NTU and 95 NTU. The concentration of HCO_3^- (356-514ppm, n=4), Cl^- (82-169 ppm, n=4) and SO_4^{-2} (38-117 ppm, n=4) in shallow groundwater is very reasonable. The mean chemical concentrations of Cl^-, SO_4^{-2} and HCO_3^- in shallow groundwater are as follows:

- Mean Cl^- (Shallow Groundwater): 132.8 $\pm$ 36.5 ppm (n=4)
- Mean SO_4^{-2} (Shallow Groundwater): 63.3 $\pm$ 36.7 ppm (n=4)
- Mean HCO_3^- (Shallow Groundwater): 423 $\pm$ 67.4 ppm (n=4)

The range of variation in stable isotope content of total dissolved inorganic carbon (TDIC) and oxygen in Lyari River water is as follows:

- δ 18 O (Shallow Groundwater) -6.3 to -5.8 ‰ V-SMOW (n=8)
- δ 13 C (TDIC-Shallow Groundwater): -16.5 to -5.5 ‰ PDB (n=8)

The mean stable isotope content of 18O and 13C in shallow groundwater is as follows:

- Mean δ 18 O (Shallow Groundwater): -5.9 + 0.32 ‰ V-SMOW (n=8)
- Mean δ 13 C (TDIC-Shallow Groundwater): -10.1 + 3.3 ‰PDB (n=8)

The stable-isotope results indicate that the shallow / phreatic aquifers are recharged by a mixture of fresh waters of Indus River and Hab River (draining spring water and flooded rainwater), as well as polluted Lyari and Malir rivers and their feeding drains (both under natural infiltration conditions and artificially induced infiltration conditions) and, to a much smaller extent, from direct recharge of local precipitation.

Deep Groundwater: In general, Deep groundwater is mostly saline and has high electrical conductivity (range: 1.9- 19.1 mS/cm) and salinity (range: 1.7-7.4 ppt), as compared to shallow groundwater.

Based on hydro chemical data of water samples collected from pumping wells, it is assumed that the shallow mixed deep groundwater discharged by large-scale pumping wells mainly represents the deep groundwater from confined aquifer. The mean chemical concentrations of Cl^-, SO_4^{-2} and HCO_3^- in shallow mixed deep groundwater are as follows:

- Mean Cl- (Deep Groundwater): 2169.2 + 1828.0 ppm (n=9)
- Mean SO4-2 (Deep Groundwater): 458.4 + 691.4 ppm (n=9)
- Mean HCO3- (Deep Groundwater): 353.6 + 215.4 ppm (n=9)

The range of variation in stable isotope content of total dissolved inorganic carbon (TDIC) and oxygen in shallow mixed deep groundwater is as follows:

- δ 18 O (Deep Groundwater): - 6.2 to -4.2 ‰ V-SMOW (n=10)
- δ 13 C (TDIC - Deep Groundwater): -13.2 to -0.3 ‰ PDB (n=10)

The mean stable isotope content of 18O in shallow mixed deep groundwater is as follows:

- Mean δ 18 O (Deep Groundwater): -5.3 +0.7‰ V-SMOW (n=10)
- Mean δ 13 C (TDIC- Deep Groundwater): -10.5 + 3.7‰ PDB (n=10)

The hydro chemical and stable isotope results indicate that the confined aquifer hosts a mixture of rainwater from hinterlands and surrounding regions around coastal Karachi, as well as sea trapped water / seawater, through intrusion under natural infiltration conditions or under induced recharge conditions.

Groundwater Recharge Characteristics/Sea water Intrusion: Presently, coastal Karachi is known to have five sources of recharge to its groundwater reserves.

(i) Rainfall,
(ii) Indus River water supply
(iii) Hab-River & Hab Lake water supply
(iv) Polluted Lyari and Malir rivers/ contributory channels draining mixtures of domestic industrial and agricultural wastewater, composed of pre-said three sources
(v) Seawater.

The possibilities of major contribution to groundwater recharge of shallow/phreatic aquifer directly by local rainfall seems very small, due to very poor frequency of rainfall events and rainfall intensities in the Karachi and high evaporation rates. The long-term (15 years annual record) mean monthly average precipitation for Karachi is between 0-15 mm during the months of January to June, 23 - 91 mm during the months of July to September, and 0-7 mm during the months of October to December. The remaining four sources play a significant role in recharge of the shallow aquifer-system and deep groundwater system (confined aquifer) in coastal Karachi. Unpolluted seawater of Karachi coast is characterized by a δ 18O value of ~ +1 ‰ VSMOW and a chloride content of ~23000 ppm. Both the Lyari River and Malir River waters, as well as the Indus River water and the Hab Lake water, have extremely very low aqueous contents of chloride and sulfate ions as compared to seawater. The average mean value of δ 18O in polluted river waters is ~ 5 ‰ V-SMOW and in shallow groundwater is -5.9 ‰ V-SMOW. The relatively deeper ground waters representing confined aquifer have a mean δ 18O value of -4.3 ‰ VSMOW and excessively high values of aqueous chloride and sulfate.

4.1.8.2 Water Supply

The water distribution network in Karachi covers 18 towns, 6 Cantonments and a Defense Housing Authority Area. The Project area receives its share of freshwater from the water supply system of Karachi Water and Sewerage board. The supply is, however, insufficient and is made up by supplies by tanker trucks which draw from groundwater sources.

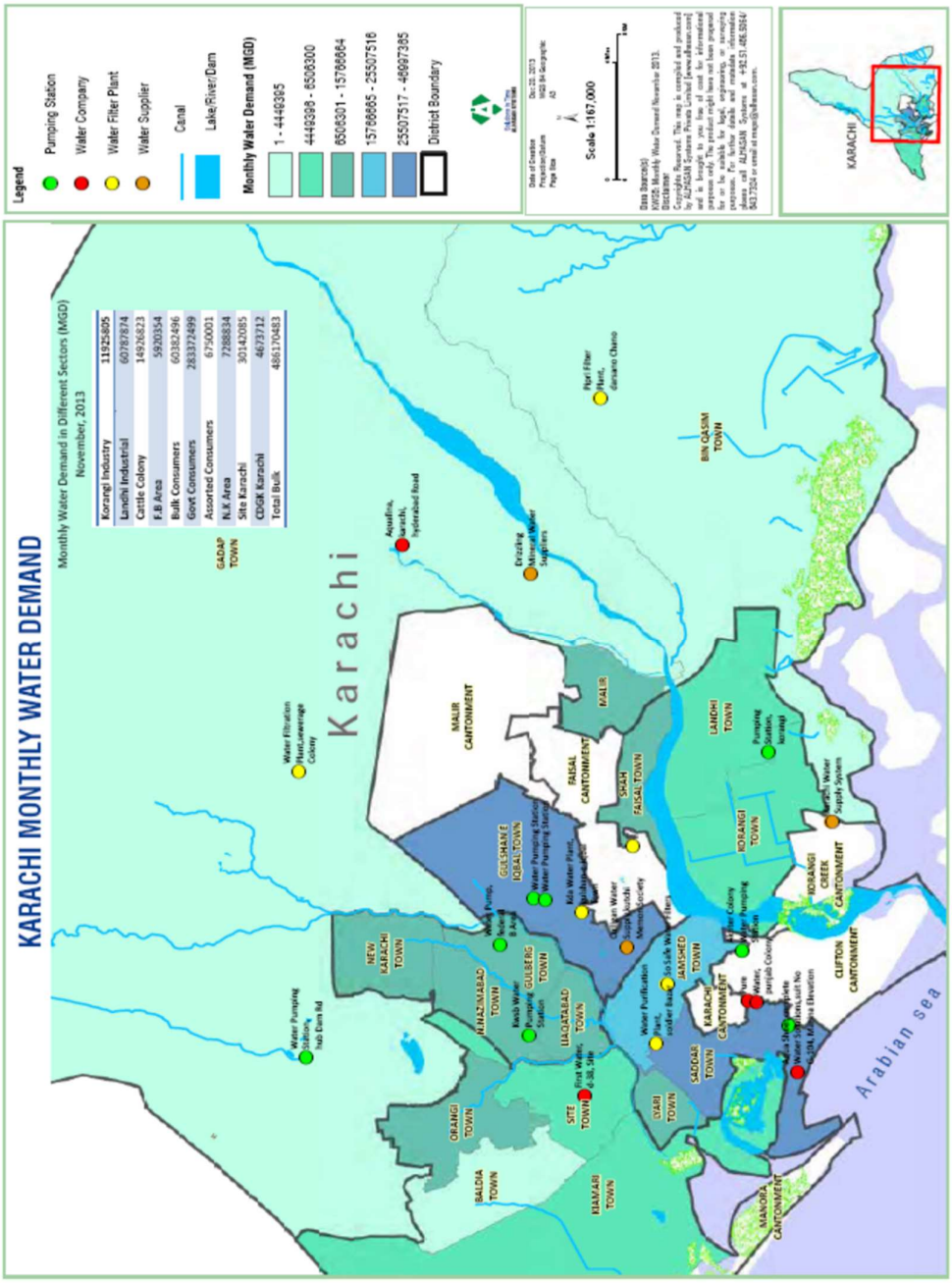


Figure 4.15: Karachi Monthly Water Demand
(Source: Pakistan Development Perspective)

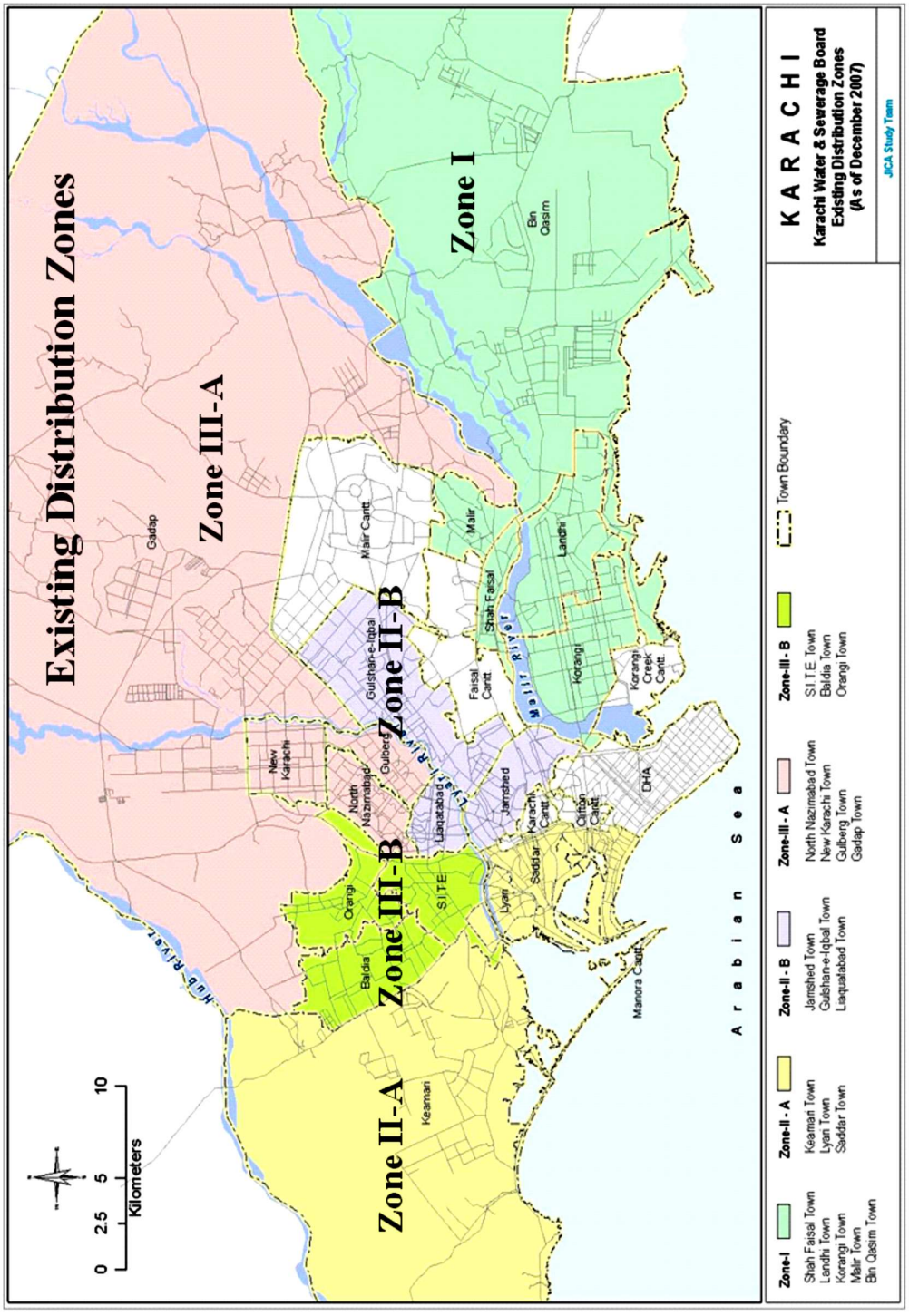


Figure 4.16: Existing Water Distribution Zones

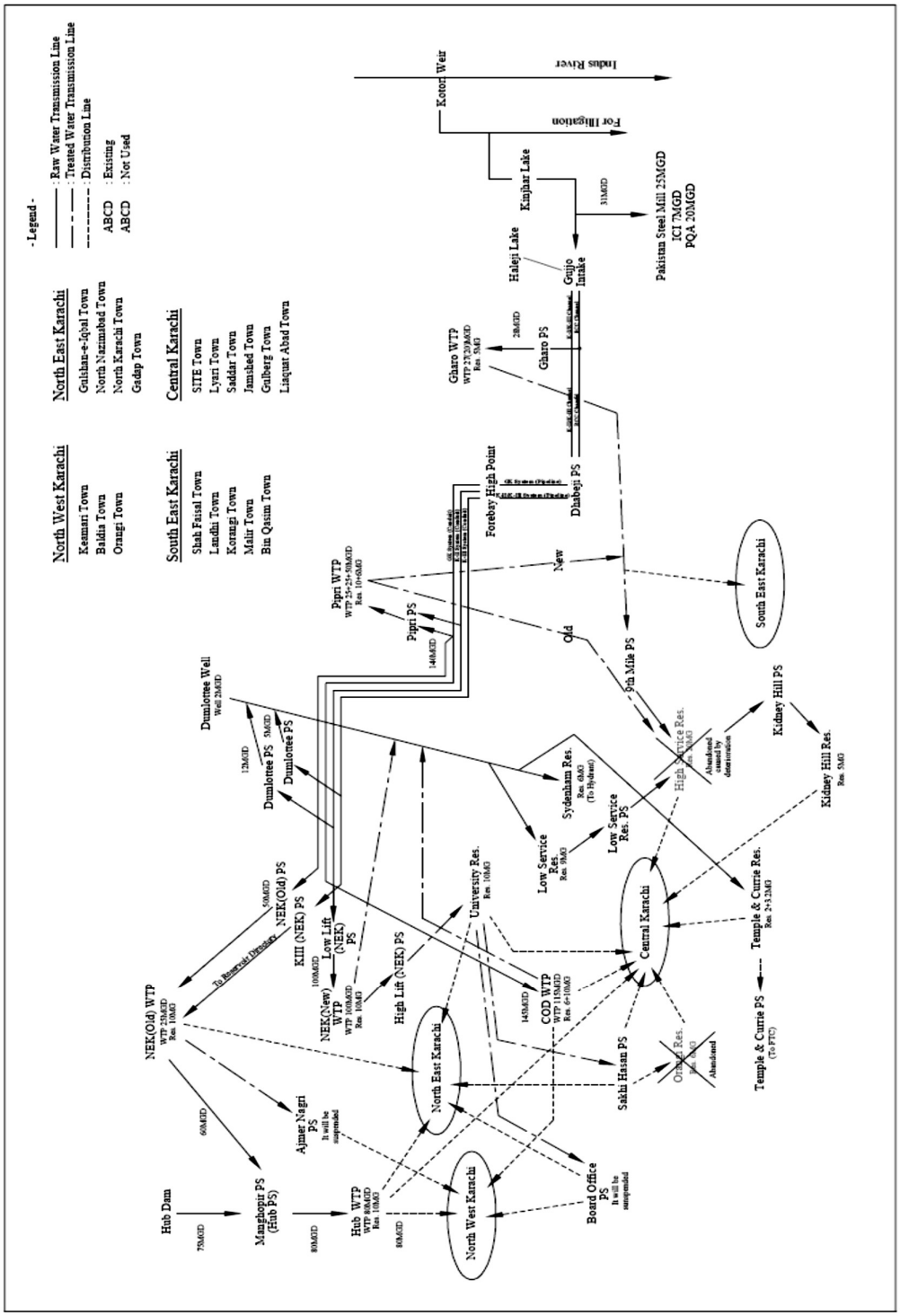


Figure 4.17: Water Transmission System

4.1.8.3 Groundwater Resources

Groundwater resources in Karachi Division are limited. The aquifers close to the coastal belt are mostly saline and unusable for domestic purposes. Five possible water-sources are contributing to the groundwater recharge in Karachi. The first possible source is rainfall. As the city of Karachi suffers from deficit of precipitation (only rainfall), the contribution to shallow groundwater storage from rain is very little. However, rainfall in the hinterlands and other areas surrounding Karachi may significantly contribute to the groundwater flow-system. The two freshwater sources are the Hab Lake/Hab Dam and the Indus River. Water from Hub Dam and the Indus River is piped to various residential zones in Karachi for drinking and irrigation purposes. The spring water discharges into Malir River and Lyari River and the municipal/industrial waste effluents added to these rivers are also contributing to groundwater storage as a fourth recharge source. Seawater intrusion along Karachi coast is the fifth possible source.

The possibilities of major contribution to groundwater recharge of shallow / phreatic aquifer directly by local rainfall seems very small, due to very poor frequency of rainfall events and rainfall intensities in the Karachi and high evaporation rates. The long-term (15 years annual record) mean monthly average precipitation for Karachi is between 0-15 mm during the months of January to June 23 – 91 mm during the months of July to September, and 0-7 mm during the months of October to December.

The remaining four sources play a significant role in recharge of the shallow aquifer-system and deep groundwater system (confined aquifer) in coastal Karachi. Both the Lyari River and Malir River waters, as well as the Indus River water and the Hub Lake water, have extremely very low aqueous contents of chloride and sulfate ions as compared to seawater. The relatively deeper ground waters representing confined aquifer have excessively high values of aqueous chloride and sulfate.

The shallow / phreatic aquifers are recharged by a mixture of fresh waters of Indus River and Hub River (draining spring water and flooded rainwater), as well as polluted Lyari and Malir rivers and their feeding drains (both under natural infiltration conditions and artificially induced infiltration conditions) and, to a much smaller extent, from direct recharge of local precipitation. The confined aquifer hosts a mixture of rainwater from hinterlands and surrounding regions around coastal Karachi, as well as sea trapped water/seawater, through intrusion under natural infiltration conditions or under induced recharge conditions.

4.1.8.4 Water Quality of Karachi

The shortage of water in Karachi city due to rapid increase in population and industrial activities, has forced people to meet their water requirements from alternative supplies such as privately-owned ground water sources which extract, process and sell groundwater at a very high commercial cost. However, the quality of groundwater is very poor in Karachi mainly due to the excessive pumping of groundwater by farmers, seepage of domestic wastewater in groundwater, huge amounts of chemical constituents in industrial wastewater and sea water encroachment, rendering it medically unfit for human consumption if consumed without prior treatment. A study conducted by PCRWR in 2015-2016 to assess of the water quality of cities of Pakistan revealed that out of 28 samples collected from surface and groundwater of Karachi, 24 were found contaminated with E.coli. This constitutes almost 86 per cent of the total water sources of Karachi rendering it unfit for consumption. The most probable source of bacterial contamination is the sewerage discharge, which is usually flowing in pipelines parallel to that of drinking and household water and poor maintenance and breakages in pipelines lead to the mixing of water supply with the sewerage water. Also, no significant improvement in the water quality was observed from the year 2002-2015. Another study analyzed the surface and groundwater samples of Karachi and found that almost 88 percent of the samples/sources had Lead values higher than the WHO recommended guidelines. According to a world bank study conducted in 18 towns of Karachi, blood lead levels greater than WHO guideline were found in 89 per cent of the samples. Increased lead levels have been related to learning disabilities in children resulting in socioeconomic problems for future generations.

The study on water supply and sewerage system in Karachi by JICA in 2008 records the final analysis on quality of drinking water collected from the macroenvironment of project area. The analysis for the samples shows contamination by metallic ions namely Lead (31.4 mg/l), Copper (11.52) and by Faecal Coliform (<3). According to the analysis of groundwater[6], the quality of groundwater in the macroenvironment of project area ranges from acceptable to poor, in terms of bacterial count. Water from the wells of shallow depth in these locations has been found to be contaminated with sewage bacteria. Such water is being used by the users for purposes other than drinking.

Chemically the groundwater quality varies from palatable to brackish. The former has been found to have TDS from 400 to 1200 ppm, and although it falls in the range of being acceptable because of dilution with leakages from the water supply mains, it does not qualify as such because of serious contamination

[6] Ecosystem Research on Water Resource Management in Sindh West, December 2010, HEC Project, Lead Author: Mirza Arshad Ali Beg

otherwise. The brackish water contains 1200 to 3000 ppm of TDS, which is the usual range of concentration of salts in the groundwater at reasonable depths in the Industrial Areas. The groundwater in Korangi Area has pH in the range of 6.8 to 7.2; Bicarbonate in 360 to 720 ppm; Chloride varying from 459 to 931 ppm; Sulphate from 235 to 560 ppm; Calcium from 69 to 128 ppm; Magnesium from 60 to 142 ppm; Sodium from 300 to 650 ppm, and Total dissolved Solids from 1682 to 2970 ppm. The high concentration of Chloride and Sodium is indicative of significant saltwater intrusion.

Toxic materials discharged by factories outside their working areas, have only slightly impacted the groundwater so far since the quantities of the concerned contaminants such as chromium is in traces, if detected at all. The groundwater quality at much lower depths has high salinity, with the TDS in excess of 2,500 ppm. Water quality was assessed7 using the parameters salinity, dissolved oxygen, suspended load, organic matter (in particulate carbon) and total oil and grease. The salinity in Karachi Harbour ranged between 25.062–36.042 ppt in the Down Stream Lyari River Mouth and outside Manora Channel to open sea respectively. The dissolved oxygen values observed at all stations ranged between 0–6.01 mg/l. Complete anoxic condition with zero oxygen value was found at Lyari River Mouth the discharge point of mostly untreated industrial and domestic wastes. The very high concentrations of suspended load have been found at Korangi creek and Gizri creek Tip which are 177.6 ppm, and 100 ppm respectively. Concentrations of the suspended load in Karachi Harbour were in the range of 28.30–61.60 mg/l however, higher values have been found in the Manora Channel and its surrounding area. The level of organic matter ranged between 2.35–11.50 mg/l, with high values detected in Korangi creek and Gizri creek, which were 11.5mg/l and 7.15 mg/l respectively. The concentration of total oil and grease in seawater was detected in the range of 0.9–49.9 mg/l. The highest concentration of total oil and grease (49.9 mg/l) in seawater had been observed in Manora Channel. Similar results were also observed for total oil and grease in sediments. The highest concentration in sediment was found in Manora Channel, and Korangi creek which were 115 mg/kg, and 81 mg/kg respectively. The lowest value 0.9 mg/l was detected in water sample collected outside Manora Channel in the open sea, which clearly showed that the pollution level decreased from Karachi Harbour towards open sea, due to tidal flushing and mixing of pollutant with seawater. Karachi the largest industrial and thickly populated city of Pakistan which is situated at the northwestern boundary the Arabian Sea is highly vulnerable to flood damages either due to flash floods during SW monsoon or impact of sea level rise and storm surges coupled with cyclones passing through Arabian Sea along Pakistan Coast.

7 Assessment Of Water Quality In The Coastal Environment Of Karachi Bordering Northern Arabian Sea

Lyari River is the major watercourse in Corridor V. Most of the watershed has become highly urbanized and contaminated by unmitigated pollutants from industries as well as towns, to the extent that very little natural flora or fauna are found along the valley. The headwater area, found on the outskirts of the city, is only represented by a series of ponds. These ponds no longer act as wildlife refuge, since urban expansion has devastated it in the same manner as at the downstream reaches.

Due to excessive loading of nutrients and chemical contaminants to the Lyari River system, the natural aquatic and terrestrial ecosystems associated with rivers of their size, do not exist. Air pollution, the dumping of industrial and residential sewage, and runoff from adjacent residential, and industrial land uses provide additional sources of contaminants to the two rivers. Extensive dumping and subsequent burning of urban solid waste material along the river banks, floodplain, and river channel also contribute to their pollution load. The problem of unmitigated pollutant loading is further compounded by the fact that the watercourses lack regular and perennial water flows, which could assist in diluting and moderating the toxicity of many contaminants.

Water quality data, outlined in the following Table, support the visual observations that Lyari River is a highly polluted watercourse. The biochemical oxygen demand (BOD5) of 400 indicates an extremely high degree of nutrient loading to the water body. It is therefore not unusual to find that, with a BOD5 of 400, there is no dissolved oxygen present. Any oxygen present or added to the river waters would be rapidly used during bacterial decomposition of organic matter. The high water temperatures further reduce the capacity of the water to hold dissolved oxygen.

There are also extremely high concentrations of total phosphorus present in the river water. Levels of this magnitude should result in extensive algal blooms within the rivers, however, the high level of suspended solids does not allow enough light penetration to permit the growth of aquatic plants.

Although the water quality data in the following Table only indicate organic pollutant loading, it can be assumed that much more hazardous wastes have made their way into the Lyari River systems.

Table 4.2: Water Quality Data for Lyari River

Parameter	Measurement or Range
Colour	Grey to black
PH	6.2 to 7.9
Electrical Conductivity (umhos/cm)	1.5 to 3.9
Temperature(°C)	29 to 34
Dissolved Oxygen (mg/L)	Virtually zero

Biochemical Oxygen Demand, BOD (mg/L)	30 to 400
Total Suspended Solids (mg/L)	60 to 416
Total Dissolved Solids	650 to 3000
Total Phosphorus (mg/L)	0.49 to 4.79
Total Ammonia (mg/L)	> 10
Nitrites (mg/L)	< 1

4.1.8.5 Drainage System

The intersections on Corridor V fall in the shallow synclines of the Lyari river and its flood plains. The effluent from North Karachi Industrial Area and sewage from North Karachi Town and Gulshane Iqbal Town are discharged into the Lyari River which flows by the Teen Hatti Intersection.

Inundation of intersections is apparently of temporary nature since the rainwater flows along the slope of the roads into the river. At all the intersections even 5 mm of rainfall leaves the area under stagnant pools of water since the surrounding area lacks appropriate storm water drainage system. This calls for remedial measures in terms of provision of a suitably designed storm water drainage system for the intersection concerned.

The intervention based on the proposed profile will be provided with suitable drainage channels to carry as much as the rainiest rainfall event of August, 2020. The channels will discharge the storm water into the designated channel in the nearest section of the roadway.

The following Table outlines storm water drainages and nallahs under each township administration. Drainages are artificial water channels for storm water drainage; on the contrary, nallahs are natural water channels. Much drainages are connected to nallahs and some drainages connected to river directly; Nallahs discharge into rivers such as Lyari River and Malir River receiving storm water. As sewage collection system in Karachi City is not enough and its maintenance is not satisfactory, storm water drainage and nallahs have to receive sewage all year long in addition to storm water in rainy season.

Table 4.3: Town-wise Storm water Drainage / Nallah Length

Town	Depth (m)	Width (m)	Length (km)
Keamari Town	1.21	0.91~3.04	7.62
SITE Town	2.13	3.65	16.08
Baldia Town	1.22	2.43	11.77
Orangi Town	1.52	2.43~3.65	34.1
Lyari Town	1.37	0.6~13.7	19.4

Saddar Town	1.37	3.05	11.14
Jamshed Town	1.5	2.43	33.8
Iqbal Town	3.64	2.4~15.2	28.0
Faisal Town	1.22~4.57	1.52~24.0	20.1
Landhi Town	1.22	2.43	35.36
Korangi Town	1.52	2.74	36.4
North Nazimabad Town	1.22	2.4	30.7
North Karachi Town	1.22	2.4	45.1
Gulberg Town	1.37	2.4	22.1
Liaquatabad Town	1.52	3.65	19.5
Malir Town	1.22	6.04	6.15
Bin Qasim Town	1.22	3.64	14.63
Gadap Town	1.22	3.65	24.43
Total			416.38
Source: Karachi Water Supply Improvement Project, KWSB			

There are no exclusive pumping facilities for storm water drainage in Karachi City. However, many pumping stations called "ejector", which were constructed for sewage discharge to natural nallahs or rivers have worked as storm water pumping facilities in rainy season.

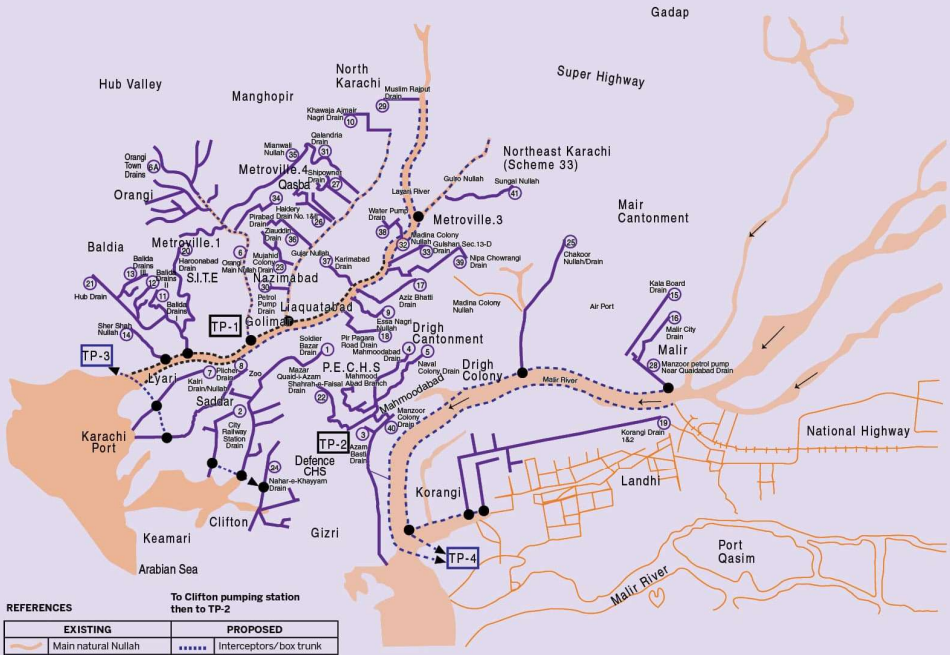
Roadside drains are cleaned by KW&SB one to two months before monsoon season comes every year. Removed and collected silt/garbage is conveyed to designated solid waste disposal sites.

However, roads are cleaned afterwards by town administration and silt / garbage is transferred to drains again. This is said to be how inundation is caused. In addition to above mentioned administrative issues, many drains and nallhas have been already encroached on by illegal houses and buildings. Strong enforcement of building code and other relevant laws is expected.

Another major issue with malfunctioned drains / nallahs is that garbage is easily and routinely dumped to these facilities, which leads to their reduced sections. Comprehensive solid waste management system has to be introduced.

Karachi map showing the documented natural *nullahs* and drains (which are the main disposals for sewage and rain water) and the intergration of these with the mains and STPs.

CONCEPTUAL PLAN FOR A REALISTIC SEWAGE DISPOSAL SYSTEM



REFERENCES

EXISTING		PROPOSED	
	Main natural Nullah		Interceptors/box trunk
	Branch Nullah	TP	Sewage treatment plant
	Drain		Intake chambers
	Drain/Nullah's Number		
	Interceptors/box trunk		
TP	Sewage treatment plant		

To Clifton pumping station then to TP-2

S.No.	Name of Drain/Nullah	Length (ft)
1.	Soldier Bazar Drain +4 Branches	40000
2.	City Railway Station Drain	10825
3.	Azam Basti Drain	866
4.	Mahmoodabad Drain & Branch	27000
5.	Naval Colony Drain	11258
6.	Orangi Nullah Main (Banaras Chowk to Lyari Nadi)	19918
6A.	Orangi Town Drain	94234
7.	Kalri Drain / Nullah	9526
8.	Pitcher Drain	14700
9.	Essa Nagri Nullah And Welfare Colony Drain	7794
10.	Khawaja Ajmair Nagri Drain And North Karachi Sec. 11-A Drain	14000
11.	Baldia Drains – I	15715
12.	Baldia Drains – II	7000
13.	Baldia Drains – III	7784
14.	Sher Shah Nullah	6603
15.	Kala Board Drain	9310
16.	Malir City Drain	9959
17.	Aziz Bhatti Drain	13856
18.	Pir Pagara Road Drain	8877
19.	Korangi Drain 1 & 2	48496
20.	Haroonabad Drain	17753
21.	Hub Drain	23815
22.	Shahrah-e-Faisal Drain	6000
23.	Mujahid Colony Drain	12500
24.	Nahar-e-Khayyam Drain	5629
25.	Chakoor Nullah/Drain	23080
26.	Haidery Drain I & II	15600
27.	Shipowner College Drain	6575
28.	Manzoor Petrol Pump to Islamia Kanta Malir (Near Qaidabad) Drain	900
29.	Muslim Rajput Colony Drain	2552
30.	Petrol Pump Drain	3350
31.	Qalandria Drain	17200
32.	Madina Colony Nullah	1299
33.	Gulshan-e-Iqbal Sec. 13-D Drain	9093
34.	Pirabad Drain	2598
35.	Mianwali Colony Nullah (Joins 6A)	11238
36.	Ziauddin Hospital Drain	16478
37.	Karimabad Drain	7000
38.	Water Pump Drain	5890
39.	NIPA Chowrangi Drain	15588
40.	Manzoor Colony Drain	11700
41.	Sungal Nullah	8660

Source: OPP-RTI

Figure 4.18: Existing Sewerage System of Karachi

Figure 4.19: Sewage flowing into gujar nalla flowing through the project area

4.1.8.6 Emerging Drainage issues and Authorities' Response

Pakistan Meteorological Department has confirmed that Karachi received the heaviest rain in a single day ever in its history when 231 mm rain fell in just 12

hours, the highest rainfall record over the last 90 years.[8] Hub Dam water level crossed 338.5 feet, the highest level in 13 years. During August 2020 only, Karachi received 484 mm (19 inches) rain. With rainwater and overflowed water from nullahs and drains flooding most of the main roads and streets in residential locations, many residential areas including urban slums and villages in peri-urban areas gravely disrupted the people's lives. The inundated roads caused massive traffic jams on 27th August 2020, 6 out of 7 districts of Karachi were declared as "Calamity hit areas" by the Relief Commissioner – Government Sindh under Sindh National Calamities (P&R) Act 1958. Karachi East and Malir being most affected. Fully 70% of areas were difficult to access due to damages to the road/ streets or the presence of stagnant water, 0.3% of houses were completely or partially damaged. 27% of bridges and walkways are partially damaged. Electricity breakdown reported in all areas for 10 – 34 hours.

The critical areas where rainwater accumulated or flooded the localities were Gujjar Nullah in Liaquatabad, Sher Shah Suri Road where pillars of Green Line infrastructure had been constructed within the drain, Kashmir Colony at the tail end of Orangi Nullah, Gulistan-i-Jauhar where encroachment had emerged and desilting could not be done, Gulshan-i-Zafar adjacent to PECHS where encroachment issues were the main causes, Zaman Town in Korangi which also had encroachment issues and Soldier Bazaar Nullah at Police Lines which was deliberately choked by putting heavy stones in the drain.

After July 17 rains, PECHS & Shahrahe Faisal were choked for a few hours at Rumi Mosque due to encroachment at Gulshan-i-Zafar. Zaman Town was flooded due to encroachments there. It was pointed out that most of the previous year problematic areas remained normal because their issues were addressed.

On July 26, it rained more than 86mm within an hour resulting in accumulation of rainwater in Gulistan-i-Jauhar where a private educational institution had encroached upon the drain whose desilting could not be done. According to the local government, the Green Line infrastructure disconnected old drainage systems in Gujjar Nullah, which caused flooding in the area.

On July 27, it rained over 74mm in one hour. The water from hill torrents inundated Orangi Town and caused Gujjar Nullah to overflow. Due to the Green Line, rainwater inundated KDA Chowrangi, Sakhi Hassan and Nagan Chowrangi. Heavy rains in Orangi Town inundated Kashmir Mohalla, a low-lying katchi abadi.

[8] Dha Karachi and cbc Disparaged very wrongly, Ikram Sehgal, Daily Times

Karachi Metropolitan Corporation had 38 drains and they all were being cleaned under a World Bank project called SWEEP.

Apart from KMC, the district municipal corporations had 514 smaller nullahs and they were responsible for the cleaning for which the Sindh government was providing them additional funds.

The Sindh government invested an amount equal to $8 million from its own sources which would be reimbursed by the WB. It had released Rs200m as a stopgap arrangement for cleaning the drains. Gujjar Nullah in district Central, Mehmoodabad Nullah in district East, Songal Nullah in district Malir/East and City Nullah, Pitcher Nullah, Kalri Nullah in district South had been cleaned. 3,966,193 tonnes of sludge had been disposed of from six districts — 822,995 tonnes from Central, 973,009 West, 368,309 South-1, 664,631 South-2, 804,279 East, 187,937 Malir and 145,033 tonnes from Korangi.

To improve the sewerage system of Karachi and reduce the pollution load on natural water bodies, KWSB is working on Greater Karachi Sewerage Plan (S-III). This project, through a well-integrated system of collection, treatment and sewage of wastewater from municipal and industrial sources, aims to improve the environmental conditions of Karachi. In this project, sewage will be transmitted to the River Lyari and Malir via a RCC before finally being disposed of in the sea. Following initiatives will be taken under this project

- Malir Trunk Sewer: 05 Contract Packages with overall length of 22.74 km
- Lyari Trunk Sewer: 08 Contract Packages with overall length of 33.32 km
- Upgradation and Capacity Enhancement of Sewage Treatment Plant from 51 to 100 MGD at Haroonabad SITE
- Upgradation and Capacity Enhancement of Sewage Treatment Plant from 54 to 180 MGD at Muaripur
- Construction of New Sewage Treatment Plant at Korangi of 180 MGD

According to the planning commission of Pakistan 862 Million Rupees have been allocated to the project for the fiscal year of 2018-2019. The rehabilitation of the TPIII for 77 MGD has been done while five different packages of sewage transmission in the length of 20.151 km have substantially been completed.

4.1.9 Solid Waste Issue

Although Karachi is spatially a large city of 3,780 sq kms (with a built-up area of approximately 500 sq kms), it has only two landfill sites, both next to each other and in District West. Consequently, solid waste has to be carried for over 40 kms from the eastern edge of the city so as to reach the landfill sites. Because of this distance, and the time and costs entailed, solid waste from most of Karachi does not reach the landfill sites and is dumped at numerous informal dumping sites

along the Korangi Creek and various other open areas and **nullahs** that join it. Proposals for additional landfill sites have been made since 1975 and, in a 2001 report, one landfill site for each district was suggested, but never implemented.

Meanwhile, a solid waste recycling industry, mostly in the informal sector, developed in Karachi over the years. This recycling industry, which is growing rapidly, acquires recyclable material from two streams. One is known as the clean stream, whereby housewives and markets sell bottles, newspapers, metal objects and cans to **kabaarris**, who then sell them to the recyclers. The other stream is known as the dirty stream, wherein young boys, mainly of Afghan origin, are organised by contractors to pick all recyclable material from **kachra kundis** or neighbourhood dumps. They carry it on bicycles to abandoned parks, empty plots or spaces under bridges, where it is sorted out into different categories and sold to the recyclers by weight.

Bones are crushed into powder and mixed with chicken feed; rags are turned into fluff by rag-pulling machines and used for upholstery; small pieces of paper are recycled into board; and plastic items are granulated and the granules are sent to the Punjab for being turned into utensils and toys. The contractors organising this activity pay the Karachi Municipal Corporation (KMC) staff to not pick up the garbage so that the picking can be made easier. The organic waste that is left behind has, over the years, been dumped in the nullahs or has been burned. Burning has been reduced considerably due to public protests.

The homes along the **nullahs** also throw their waste into them. It is estimated by various reports that no more than 30 to 40 percent of waste reaches the landfill sites. By the mid-'90s, most of the **nullahs** of the city were full of compacted solid waste, and today children play cricket and football on them. A 2001 study by the Karachi Urban Resource Center estimated that, directly or indirectly, the recycling industry employed over 40,000 families. The number today is nearer 100,000 families.

Figure 4.20: Existing conditions of the ROW

4.2 Traffic Count

The Traffic Count of Karimabad Intersection was performed on Monday, December 26th, 2022, in all directions. The Traffic Count was performed for the 12 Hours, from 10:00am morning to 10:00pm Evening. The total traffic count and traffic movement are mentioned in Figure 4.21.

The Traffic Count Survey performed are attached as Tables.

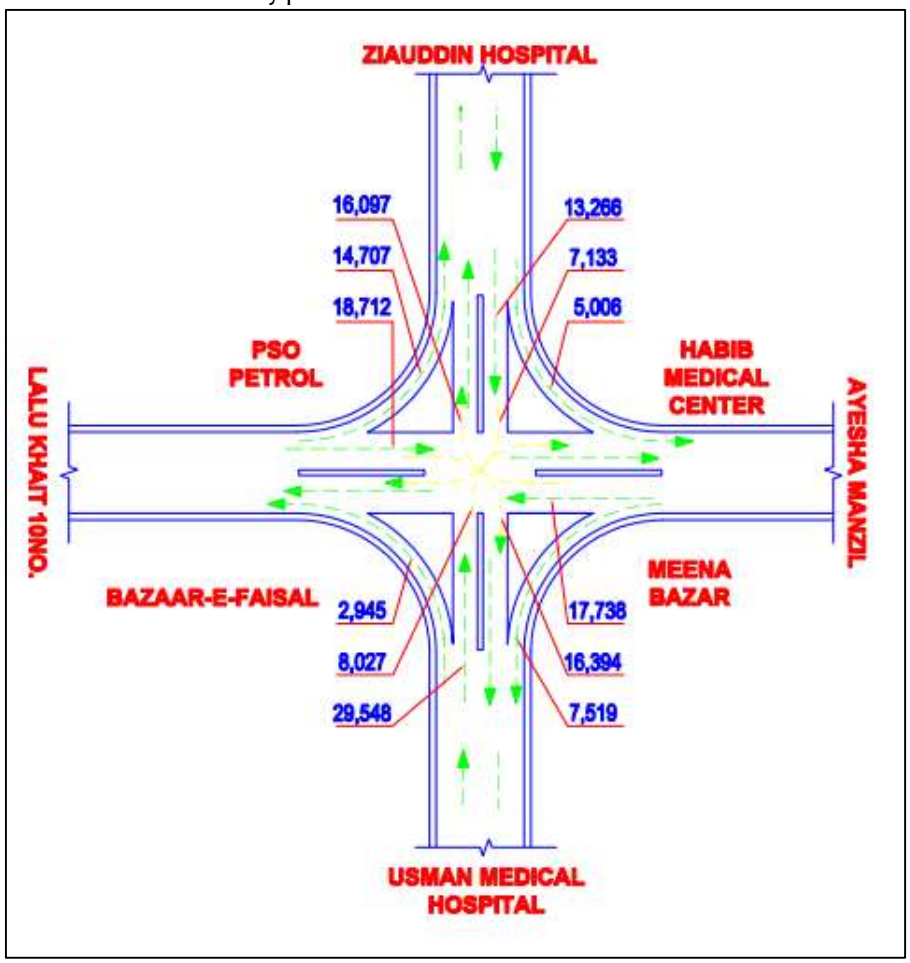


Figure 4.21: Traffic Count of Karimabad Intersection

Location	Karimabad Intersection	Vehicle Count Summary 12 Hour (From 10 AM TO 10 PM)	Date	Mon, Dec 26, 2022
Direction	Zia Uddin Hospital to Usman Medical			

Time	Animal Cart	B. Cycle	Scooter/ Motorcycle	Rickshaws	Car / Jeep Pickup	Mini Bus Wagon	Bus	Trucks 2-Axles 1.2	3-Axles 1.22	4-Axles 1.2 - 2.2	4-Axles 1.2 + 2.2	5-Axles 1.22 - 222	5-Axles 1.22 - 22	5-Axles 1.22 - 222	Total
10:00 AM - 11:00 AM	0	0	665	155	185	5	3	5	5	0	0	0	0	0	1023
11:00 AM - 12:00 PM	0	0	360	132	120	3	1	5	3	0	0	0	0	0	624
12:00 PM - 01:00 PM	0	0	320	135	150	7	5	4	4	0	0	0	0	0	625
1:00 PM - 2:00 PM	0	0	485	160	155	6	2	2	2	0	0	0	0	0	812
2:00 PM - 3:00 PM	0	0	590	185	206	9	2	4	5	0	0	0	0	0	1001
3:00 PM - 4:00 PM	0	0	564	353	418	6	5	3	6	0	0	0	0	0	1355
4:00 PM - 5:00 PM	2	0	833	636	570	8	3	6	2	0	0	0	0	0	2060
5:00 PM - 6:00 PM	0	0	504	218	183	11	6	7	5	0	0	0	0	0	934
6:00 PM - 7:00 PM	0	0	769	426	507	6	6	5	8	0	0	0	0	0	1727
7:00 PM - 8:00 PM	0	0	716	243	361	5	2	2	6	0	0	0	0	0	1335
8:00 PM - 9:00 PM	0	0	489	232	283	13	3	3	5	0	0	0	0	0	1028
9:00 PM - 10:00 PM	0	0	357	216	146	9	5	4	5	0	0	0	0	0	742
Total	2	0	6652	3091	3284	88	43	50	56	0	0	0	0	0	13266

Location	Karimabad Intersection	Vehicle Count Summary 12 Hour (From 10 AM TO 10 PM)	Date	Mon, Dec 26, 2022
Direction	Zia Uddin Hospital to Ayesha Manzil			

Time	Animal Cart	B. Cycle	Scooter/ Motorcycle	Rickshaws	Car / Jeep Pickup	Mini Bus Wagon	Bus	Trucks 2-Axles 1.2	3-Axles 1.22	4-Axles 1.2 - 2.2	4-Axles 1.2 + 2.2	5-Axles 1.22 - 222	5-Axles 1.22 - 22	5-Axles 1.22 - 222	Total
10:00 AM - 11:00 AM	0	0	123	85	97	5	2	3	2	0	0	0	0	0	317
11:00 AM - 12:00 PM	0	0	125	112	118	5	3	2	0	0	0	0	0	0	365
12:00 PM - 01:00 PM	0	0	190	145	125	3	1	3	1	0	0	0	0	0	468
1:00 PM - 2:00 PM	0	0	280	98	165	3	3	2	1	0	0	0	0	0	552
2:00 PM - 3:00 PM	0	0	163	103	124	2	5	3	2	0	0	0	0	0	402
3:00 PM - 4:00 PM	0	0	180	75	150	7	2	3	0	0	0	0	0	0	417
4:00 PM - 5:00 PM	0	1	184	85	169	7	3	3	2	0	0	0	0	0	454
5:00 PM - 6:00 PM	0	0	159	55	135	3	2	1	0	0	0	0	0	0	355
6:00 PM - 7:00 PM	0	0	219	96	164	3	2	4	1	0	0	0	0	0	489
7:00 PM - 8:00 PM	0	0	145	80	179	4	2	3	2	0	0	0	0	0	415
8:00 PM - 9:00 PM	0	0	148	88	193	3	2	4	0	0	0	0	0	0	438
9:00 PM - 10:00 PM	0	0	164	56	108	2	2	2	0	0	0	0	0	0	334
Total	0	1	2080	1078	1727	47	29	33	11	0	0	0	0	0	5006

Location	Karimabad Intersection	Vehicle Count Summary 12 Hour (From 10 AM TO 10 PM)	Date	Mon, Dec 26, 2022
Direction	Zia Uddin Hospital to Lalukhait 10 No			

Time	Animal Cart	B. Cycle	Scooter/ Motorcycle	Rickshaws	Car / Jeep Pickup	Mini Bus Wagon	Bus	Trucks 2-Axles 1.2	3-Axles 1.22	4-Axles 1.2 - 2.2	4-Axles 1.2 + 2.2	5-Axles 1.22 - 222	5-Axles 1.22 - 22	5-Axles 1.22 - 222	Total
10:00 AM - 11:00 AM	0	0	225	245	230	5	3	15	0	0	0	0	0	0	723
11:00 AM - 12:00 PM	0	0	260	277	170	5	2	12	0	0	0	0	0	0	726
12:00 PM - 01:00 PM	0	0	302	238	235	6	3	12	0	0	0	0	0	0	796
1:00 PM - 2:00 PM	0	0	298	122	257	3	5	13	0	0	0	0	0	0	698
2:00 PM - 3:00 PM	0	0	290	104	214	15	4	13	0	0	0	0	0	0	640
3:00 PM - 4:00 PM	0	0	180	130	195	18	1	14	0	0	0	0	0	0	538
4:00 PM - 5:00 PM	0	0	214	128	194	8	3	12	0	0	0	0	0	0	559
5:00 PM - 6:00 PM	0	0	226	60	155	6	5	14	0	0	0	0	0	0	466
6:00 PM - 7:00 PM	0	0	241	80	210	9	4	17	0	0	0	0	0	0	561
7:00 PM - 8:00 PM	0	0	219	70	226	7	4	10	0	0	0	0	0	0	536
8:00 PM - 9:00 PM	0	0	195	63	195	6	3	13	0	0	0	0	0	0	475
9:00 PM - 10:00 PM	0	0	223	47	123	5	4	13	0	0	0	0	0	0	415
Total	0	0	2873	1564	2404	93	41	158	0	0	0	0	0	0	7133

Location	Karimabad Intersection						Vehicle Count Summary 12 Hour (From 10 AM TO 10 PM)						Date	Mon, Dec 26, 2022	
Direction	Usman Medical to Zia Uddin Hospital														
Time	Animal Cart	B. Cycle	Scooter/ Motorcycle	Rickshaws	Car / Jeep Pickup	Mini Bus Wagon	Bus	Trucks 2-Axles 1.2	3-Axles 1.22	4-Axles 1.2 - 2.2	4-Axles 1.2 + 2.2	5-Axles 1.22 - 222	5-Axles 1.22 - 22	5-Axles 1.22 - 222	Total
10:00 AM - 11:00 AM	0	0	995	335	440	147	62	67	36	7	0	0	0	0	2089
11:00 AM - 12:00 PM	0	0	1140	493	580	103	77	88	22	5	0	0	0	0	2508
12:00 PM - 01:00 PM	0	0	1235	447	563	109	48	103	42	16	0	0	0	0	2563
1:00 PM - 2:00 PM	0	0	1026	479	536	110	64	104	27	4	0	0	0	0	2350
2:00 PM - 3:00 PM	0	0	1196	340	520	165	53	110	37	8	0	0	0	0	2429
3:00 PM - 4:00 PM	0	0	1263	530	580	170	76	145	56	6	0	0	0	0	2826
4:00 PM - 5:00 PM	0	0	905	380	555	111	38	163	45	3	0	0	0	0	2200
5:00 PM - 6:00 PM	0	0	1040	445	589	129	29	159	23	2	0	0	0	0	2416
6:00 PM - 7:00 PM	0	0	1212	624	825	225	35	198	40	0	0	0	0	0	3159
7:00 PM - 8:00 PM	0	0	883	655	769	105	52	85	23	3	0	0	0	0	2575
8:00 PM - 9:00 PM	0	0	950	423	590	124	36	56	15	0	0	0	0	0	2194
9:00 PM - 10:00 PM	0	0	880	524	445	235	41	98	11	5	0	0	0	0	2239
Total	0	0	12725	5675	6992	1733	611	1376	377	59	0	0	0	0	29548

Location	Karimabad Intersection						Vehicle Count Summary 12 Hour (From 10 AM TO 10 PM)						Date	Mon, Dec 26, 2022	
Direction	Usman Medical to Ayesha Manzil														
Time	Animal Cart	B. Cycle	Scooter/ Motorcycle	Rickshaws	Car / Jeep Pickup	Mini Bus Wagon	Bus	Trucks 2-Axles 1.2	3-Axles 1.22	4-Axles 1.2 - 2.2	4-Axles 1.2 + 2.2	5-Axles 1.22 - 222	5-Axles 1.22 - 22	5-Axles 1.22 - 222	Total
10:00 AM - 11:00 AM	0	0	242	220	170	5	2	11	12	0	0	0	0	0	662
11:00 AM - 12:00 PM	0	0	280	255	210	10	2	17	12	1	0	0	0	0	787
12:00 PM - 01:00 PM	0	0	340	165	250	2	0	16	14	0	0	0	0	0	787
1:00 PM - 2:00 PM	0	0	274	170	226	2	3	17	11	3	0	0	0	0	706
2:00 PM - 3:00 PM	0	0	264	124	205	12	2	12	15	0	0	0	0	0	634
3:00 PM - 4:00 PM	0	0	150	183	180	4	0	17	15	4	0	0	0	0	553
4:00 PM - 5:00 PM	0	0	314	100	214	7	1	18	13	0	0	0	0	0	667
5:00 PM - 6:00 PM	0	0	333	170	204	3	7	14	14	3	0	0	0	0	748
6:00 PM - 7:00 PM	0	0	324	175	185	7	1	17	14	2	0	0	0	0	725
7:00 PM - 8:00 PM	0	0	275	198	208	7	2	12	15	0	0	0	0	0	717
8:00 PM - 9:00 PM	0	0	214	90	233	2	1	12	17	2	0	0	0	0	571
9:00 PM - 10:00 PM	0	0	184	79	183	3	0	11	10	0	0	0	0	0	470
Total	0	0	3194	1929	2468	64	21	174	162	15	0	0	0	0	8027

Location	Karimabad Intersection						Vehicle Count Summary 12 Hour (From 10 AM TO 10 PM)						Date	Mon, Dec 26, 2022	
Direction	Usman Medical to Lalukhait 10 No														
Time	Animal Cart	B. Cycle	Scooter/ Motorcycle	Rickshaws	Car / Jeep Pickup	Mini Bus Wagon	Bus	Trucks 2-Axles 1.2	3-Axles 1.22	4-Axles 1.2 - 2.2	4-Axles 1.2 + 2.2	5-Axles 1.22 - 222	5-Axles 1.22 - 22	5-Axles 1.22 - 222	Total
10:00 AM - 11:00 AM	0	0	285	60	32	0	0	2	0	0	0	0	0	0	379
11:00 AM - 12:00 PM	0	0	330	45	40	0	0	3	0	0	0	0	0	0	418
12:00 PM - 01:00 PM	0	0	315	55	40	0	0	2	0	0	0	0	0	0	412
1:00 PM - 2:00 PM	0	0	235	50	26	0	0	0	0	0	0	0	0	0	311
2:00 PM - 3:00 PM	0	0	142	47	12	0	0	0	0	0	0	0	0	0	201
3:00 PM - 4:00 PM	0	0	65	30	2	0	0	0	0	0	0	0	0	0	97
4:00 PM - 5:00 PM	0	0	73	34	5	0	0	0	0	0	0	0	0	0	112
5:00 PM - 6:00 PM	0	0	55	40	10	0	0	0	0	0	0	0	0	0	105
6:00 PM - 7:00 PM	0	0	56	31	5	0	0	0	0	0	0	0	0	0	92
7:00 PM - 8:00 PM	0	0	135	100	70	0	0	0	0	0	0	0	0	0	305
8:00 PM - 9:00 PM	0	0	138	75	42	0	0	0	0	0	0	0	0	0	255
9:00 PM - 10:00 PM	0	0	123	97	38	0	0	0	0	0	0	0	0	0	258
Total	0	0	1952	664	322	0	0	7	0	0	0	0	0	0	2945

Location	Karimabad Intersection	Vehicle Count Summary 12 Hour (From 10 AM TO 10 PM)	Date	Mon, Dec 26, 2022
Direction	Ayesha Manzil to Zia Uddin Hospital			

Time	Animal Cart	B. Cycle	Scooter/ Motorcycle	Rickshaws	Car / Jeep Pickup	Mini Bus Wagon	Bus	Trucks 2-Axles 1.2	3-Axles 1.22	4-Axles 1.2 - 2.2	4-Axles 1.2 + 2.2	5-Axles 1.22 - 222	5-Axles 1.22 - 22	5-Axles 1.22 - 222	Total
10:00 AM - 11:00 AM	0	0	210	165	188	7	14	6	0	0	0	0	0	0	590
11:00 AM - 12:00 PM	0	0	198	197	198	25	22	2	0	0	0	0	0	0	642
12:00 PM - 01:00 PM	0	0	603	198	370	70	43	1	0	0	0	0	0	0	1285
1:00 PM - 2:00 PM	0	0	798	598	398	65	13	1	0	0	0	0	0	0	1873
2:00 PM - 3:00 PM	0	0	800	410	398	83	0	0	0	0	0	0	0	0	1691
3:00 PM - 4:00 PM	0	0	1000	422	411	55	2	2	0	0	0	0	0	0	1892
4:00 PM - 5:00 PM	0	0	460	460	260	68	2	0	0	0	0	0	0	0	1250
5:00 PM - 6:00 PM	0	0	800	400	425	55	18	0	0	0	0	0	0	0	1698
6:00 PM - 7:00 PM	0	0	400	612	469	24	4	1	0	0	0	0	0	0	1510
7:00 PM - 8:00 PM	0	0	283	280	254	48	13	0	0	0	0	0	0	0	878
8:00 PM - 9:00 PM	0	0	605	418	446	40	1	2	0	0	0	0	0	0	1512
9:00 PM - 10:00 PM	0	0	435	456	355	30	0	0	0	0	0	0	0	0	1276
Total	0	0	6592	4616	4172	570	132	15	0	0	0	0	0	0	16097

Location	Karimabad Intersection	Vehicle Count Summary 12 Hour (From 10 AM TO 10 PM)	Date	Mon, Dec 26, 2022
Direction	Ayesha Manzil to Usman Medical			

Time	Animal Cart	B. Cycle	Scooter/ Motorcycle	Rickshaws	Car / Jeep Pickup	Mini Bus Wagon	Bus	Trucks 2-Axles 1.2	3-Axles 1.22	4-Axles 1.2 - 2.2	4-Axles 1.2 + 2.2	5-Axles 1.22 - 222	5-Axles 1.22 - 22	5-Axles 1.22 - 222	Total
10:00 AM - 11:00 AM	0	0	425	106	200	18	0	4	2	1	0	0	0	0	756
11:00 AM - 12:00 PM	0	0	298	170	170	10	0	8	3	0	0	0	0	0	659
12:00 PM - 01:00 PM	1	0	280	110	130	9	0	8	2	0	0	0	0	0	540
1:00 PM - 2:00 PM	0	0	290	145	150	10	0	8	2	0	0	0	0	0	605
2:00 PM - 3:00 PM	0	0	265	182	176	30	0	0	1	0	0	0	0	0	654
3:00 PM - 4:00 PM	0	0	242	152	101	8	0	0	1	0	0	0	0	0	504
4:00 PM - 5:00 PM	0	0	360	112	121	16	2	0	0	0	0	0	0	0	611
5:00 PM - 6:00 PM	0	0	333	252	219	24	0	4	2	0	0	0	0	0	834
6:00 PM - 7:00 PM	0	0	301	227	150	31	0	6	5	0	0	0	0	0	720
7:00 PM - 8:00 PM	0	0	322	102	144	16	1	3	0	0	0	0	0	0	588
8:00 PM - 9:00 PM	0	0	277	143	116	9	2	2	0	0	0	0	0	0	549
9:00 PM - 10:00 PM	0	0	236	141	107	12	1	2	0	0	0	0	0	0	499
Total	1	0	3629	1842	1784	193	6	45	18	1	0	0	0	0	7519

Location	Karimabad Intersection	Vehicle Count Summary 12 Hour (From 10 AM TO 10 PM)	Date	Mon, Dec 26, 2022
Direction	Ayesha Manzil to Lalukhait 10 No			

Time	Animal Cart	B. Cycle	Scooter/ Motorcycle	Rickshaws	Car / Jeep Pickup	Mini Bus Wagon	Bus	Trucks 2-Axles 1.2	3-Axles 1.22	4-Axles 1.2 - 2.2	4-Axles 1.2 + 2.2	5-Axles 1.22 - 222	5-Axles 1.22 - 22	5-Axles 1.22 - 222	Total
10:00 AM - 11:00 AM	0	0	530	326	96	83	81	12	15	0	0	0	0	0	1143
11:00 AM - 12:00 PM	0	0	600	200	81	75	79	31	10	0	0	0	0	0	1076
12:00 PM - 01:00 PM	0	0	930	222	100	85	135	10	5	0	0	0	0	0	1487
1:00 PM - 2:00 PM	0	0	505	439	130	65	18	10	5	0	0	0	0	0	1172
2:00 PM - 3:00 PM	0	0	425	456	210	222	245	20	10	0	0	0	0	0	1588
3:00 PM - 4:00 PM	0	0	810	1400	195	214	263	45	0	0	0	0	0	0	2927
4:00 PM - 5:00 PM	0	0	395	685	125	115	110	33	0	0	0	0	0	0	1463
5:00 PM - 6:00 PM	0	0	658	856	189	160	151	40	0	0	0	0	0	0	2054
6:00 PM - 7:00 PM	0	0	444	552	160	65	25	35	0	0	0	0	0	0	1281
7:00 PM - 8:00 PM	0	0	526	445	140	20	20	20	4	0	0	0	0	0	1175
8:00 PM - 9:00 PM	0	0	685	560	135	25	60	20	7	0	0	0	0	0	1492
9:00 PM - 10:00 PM	0	0	195	470	160	30	10	15	0	0	0	0	0	0	880
Total	0	0	6703	6611	1721	1159	1197	291	56	0	0	0	0	0	17738

Location	Karimabad Intersection						Vehicle Count Summary 12 Hour (From 10 AM TO 10 PM)						Date	Mon, Dec 26, 2022	
Direction	Lalukhait 10 No to Usman Medical														
Time	Animal Cart	B. Cycle	Scooter/ Motorcycle	Rickshaws	Car / Jeep Pickup	Mini Bus Wagon	Bus	Trucks 2-Axles 1.2	3-Axles 1.22	4-Axles 1.2 - 2.2	4-Axles 1.2 + 2.2	5-Axles 1.22 - 222	5-Axles 1.22 - 22	5-Axles 1.22 - 222	Total
10:00 AM - 11:00 AM	1	0	150	24	19	66	2	0	0	0	0	0	0	0	262
11:00 AM - 12:00 PM	0	0	200	100	100	45	2	0	0	0	0	0	0	0	447
12:00 PM - 01:00 PM	0	1	400	200	592	74	0	0	0	0	0	0	0	0	1267
1:00 PM - 2:00 PM	0	0	1931	200	630	82	0	1	0	0	0	0	0	0	2844
2:00 PM - 3:00 PM	0	0	1930	390	540	132	0	0	0	0	0	0	0	0	2992
3:00 PM - 4:00 PM	0	0	1400	200	200	19	7	1	2	1	0	0	0	0	1830
4:00 PM - 5:00 PM	0	0	740	200	200	55	2	14	0	0	0	0	0	0	1211
5:00 PM - 6:00 PM	0	0	1600	600	400	60	7	0	0	0	0	0	0	0	2667
6:00 PM - 7:00 PM	0	0	930	460	200	25	0	0	0	0	0	0	0	0	1615
7:00 PM - 8:00 PM	0	0	185	100	90	34	0	3	0	0	0	0	0	0	412
8:00 PM - 9:00 PM	1	0	190	65	50	22	0	0	0	0	0	0	0	0	328
9:00 PM - 10:00 PM	0	0	200	100	200	10	4	5	0	0	0	0	0	0	519
Total	2	1	9856	2639	3221	624	24	24	2	1	0	0	0	0	16394

Location	Karimabad Intersection						Vehicle Count Summary 12 Hour (From 10 AM TO 10 PM)						Date	Mon, Dec 26, 2022	
Direction	Lalukhait 10 No to Zia Uddin Hospital														
Time	Animal Cart	B. Cycle	Scooter/ Motorcycle	Rickshaws	Car / Jeep Pickup	Mini Bus Wagon	Bus	Trucks 2-Axles 1.2	3-Axles 1.22	4-Axles 1.2 - 2.2	4-Axles 1.2 + 2.2	5-Axles 1.22 - 222	5-Axles 1.22 - 22	5-Axles 1.22 - 222	Total
10:00 AM - 11:00 AM	0	0	810	579	321	372	12	92	0	0	0	0	0	0	2186
11:00 AM - 12:00 PM	0	0	880	544	293	370	16	75	0	0	0	0	0	0	2178
12:00 PM - 01:00 PM	0	0	520	335	200	195	5	43	0	0	0	0	0	0	1298
1:00 PM - 2:00 PM	0	0	400	200	130	150	9	30	0	0	0	0	0	0	919
2:00 PM - 3:00 PM	0	0	425	170	140	210	32	2	0	0	0	0	0	0	979
3:00 PM - 4:00 PM	0	0	356	180	140	161	22	6	0	0	0	0	0	0	865
4:00 PM - 5:00 PM	0	0	345	245	130	250	41	8	0	0	0	0	0	0	1019
5:00 PM - 6:00 PM	0	0	444	236	270	180	12	5	0	0	0	0	0	0	1147
6:00 PM - 7:00 PM	0	0	425	222	235	150	19	20	1	0	0	0	0	0	1072
7:00 PM - 8:00 PM	0	0	469	240	264	169	22	40	3	0	0	0	0	0	1207
8:00 PM - 9:00 PM	0	0	258	210	245	198	14	17	2	0	0	0	0	0	944
9:00 PM - 10:00 PM	0	0	255	266	222	110	8	32	0	0	0	0	0	0	893
Total	0	0	5587	3427	2590	2515	212	370	6	0	0	0	0	0	14707

Location	Karimabad Intersection						Vehicle Count Summary 12 Hour (From 10 AM TO 10 PM)						Date	Mon, Dec 26, 2022	
Direction	Lalukhait 10 No to Ayesha Manzil														
Time	Animal Cart	B. Cycle	Scooter/ Motorcycle	Rickshaws	Car / Jeep Pickup	Mini Bus Wagon	Bus	Trucks 2-Axles 1.2	3-Axles 1.22	4-Axles 1.2 - 2.2	4-Axles 1.2 + 2.2	5-Axles 1.22 - 222	5-Axles 1.22 - 22	5-Axles 1.22 - 222	Total
10:00 AM - 11:00 AM	0	0	322	280	268	138	140	2	0	0	0	0	0	0	1150
11:00 AM - 12:00 PM	0	0	435	400	240	107	160	20	0	0	0	0	0	0	1362
12:00 PM - 01:00 PM	0	0	780	810	320	110	108	15	0	0	0	0	0	0	2143
1:00 PM - 2:00 PM	0	0	876	880	560	180	170	0	0	0	0	0	0	0	2666
2:00 PM - 3:00 PM	0	0	660	698	309	115	115	0	0	0	0	0	0	0	1897
3:00 PM - 4:00 PM	0	0	580	580	380	65	85	3	0	0	0	0	0	0	1693
4:00 PM - 5:00 PM	0	0	690	645	411	20	11	5	0	0	0	0	0	0	1782
5:00 PM - 6:00 PM	0	0	550	550	340	60	85	6	1	1	1	1	0	1	1596
6:00 PM - 7:00 PM	0	0	340	350	254	30	40	1	1	1	0	0	1	1	1019
7:00 PM - 8:00 PM	0	0	420	440	226	50	45	2	2	2	0	0	1	1	1189
8:00 PM - 9:00 PM	0	0	466	410	245	45	50	2	1	1	1	1	0	0	1222
9:00 PM - 10:00 PM	0	0	435	220	280	32	21	5	0	0	0	0	0	0	993
Total	0	0	6554	6263	3833	952	1030	61	5	5	2	2	2	3	18712

4.3 Ecology

The ecology of microenvironment and macroenvironment of the project area has completely changed as a result of continuous emergence of urban conglomerates. Ecological risk of high order has been induced by land clearance and removal of natural vegetation from the plains during the urban sprawl to make room for industrialization and urbanization. This has degraded the physical environment as quantified in the above section & the biological environment in the sense that the entire macroenvironment has lost its biodiversity. During the survey, less number of flora species was recorded in the project area such as **Conocarpus, Acacia Nilotica (Sindhi Babur), Capparis Decidua (Kirar), Ficrus Religiosa (Pepul), Azadirachta Indica (Neem), Prosopis Juliflora (Devi) and Saveda Fruticosa (Lani)**. Horticulturist and tree activists have declared Conocarpus as harmful as the eucalyptus trees planted in the past. Eucalyptus was planted in huge numbers across the city only to be cut down for its negative impact on the environment. The same mistake was repeated with Conocarpus. In response to the growing concern against planting Conocarpus, various NGOs and CBOs have put tremendous efforts in recent years towards plantation of neem trees on and along the major corridors and its arterials.

The impoverished as well as degraded environment resulting from non-availability of surface as well as groundwater and discharge of untreated wastewater into Lyari and Malir River has irreversibly reduced the biodiversity of the indigenous as well as introduced vegetation and hence it offers very little chance for the survival / growth of fauna in the macroenvironment of project area. There are even otherwise no habitats of large and small animals, birds or reptiles within the surveyed area.

4.4 Socioeconomic Environment

4.4.1 Population Distribution

The City is comprised of six urban districts with unevenly distributed population where the potential subprojects of the proposed KWSSIP will be identified, planned, constructed and operated. Population distribution across its 6 districts (Census, 2017), shown in the graph below, indicates much lower populations in Malir and Karachi South as compared to other districts. On the other hand, Karachi West and Central have the highest residential population densities — some parts of the districts comprise of congested residential apartments which are extremely difficult to access.

Looking at the age composition from the 1998 Census, out of the total population 37.6% is under 15 years of age and 58% of the population between 15 to 50 years of age.

These numbers point to the fact that Karachi is a young city, which implies substantial future needs relating to municipal services, water supply & sanitation, housing, education, health, employment, and transportation etc. that the city has to address.

Karachi Division has six districts, of these; East, West and Malir (which also contain rural areas) report substantially higher annual growth rates. It is evident from high sex ratios in these districts, that there has been substantial in-migration to these districts. On the other hand, Central and South districts of Karachi report lowest annual growth rates, which could be due to, either substantial decline in fertility rate in these district or out-migration.

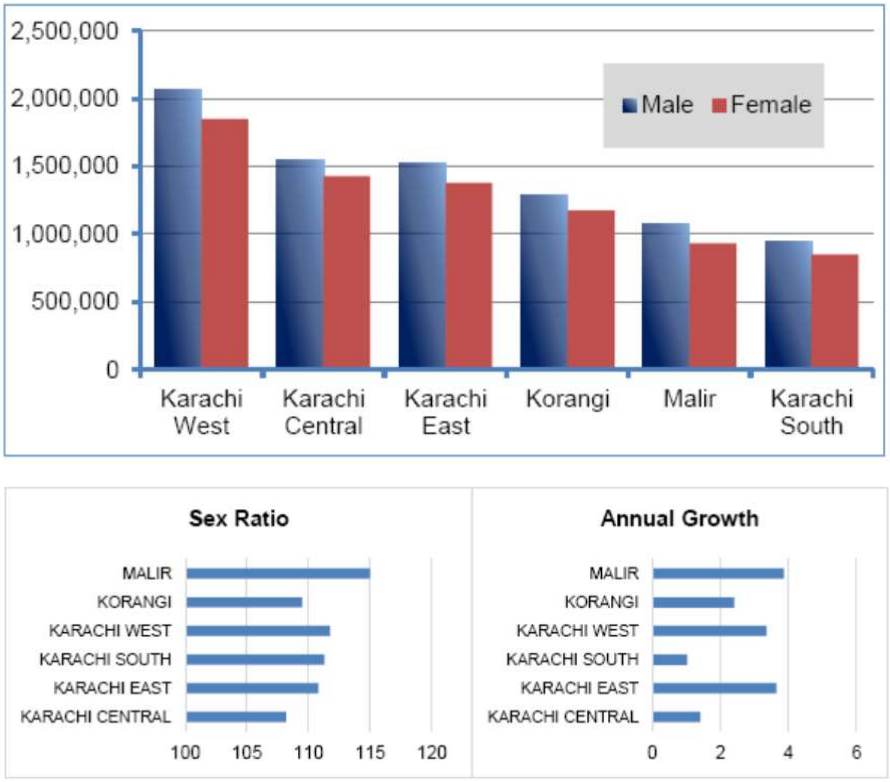


Figure 4.22: Population Distribution

4.4.2 Education and Literacy

According to UNDP, Pakistan has low gender development index (GDI) of 0.742 (2016) and low gender inequality index (GII)[9] of 0.546. However, over the years, Karachi has witnessed an increase in literacy; the narrowing of the male-female literacy gap; an increase in the age at which people get married (especially women); an increase in divorce rates; a reduction in the number of married people; and a trend towards the formation of nuclear families as opposed to extended ones.

In 2017, Karachi's literacy rate was 87 percent and nationally, Karachi ranked 59th in terms of school infrastructure and availability of facilities.[10] Karachi stands 43rd in national and first in district education. In 2016, Karachi's Education Score was 72.18, Enrollment Score was 73.70, Learning Score was 67.90, Retention Score was 58.00 and Gender Score 89.13 as presented in the following Graph.[11] The Figure 4 provides details of literacy and education ranking.

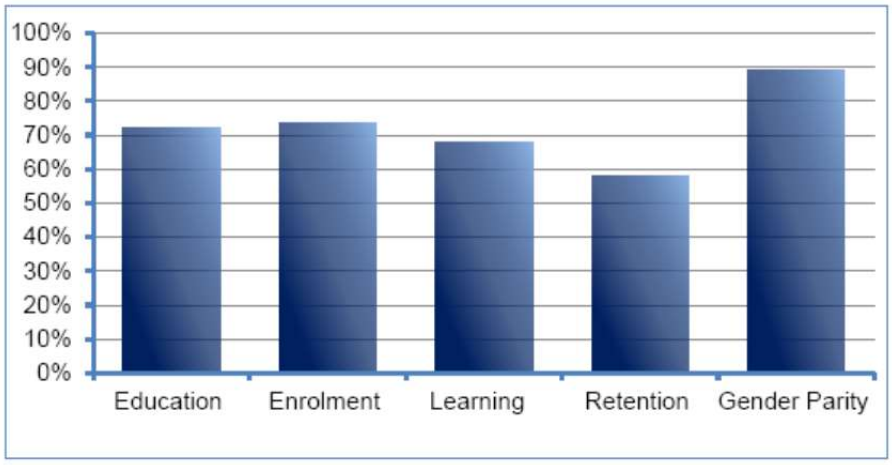


Figure 4.23: Literacy and Education Ranking

Education is one of the most important factors that distinguish the poor from the non-poor. It is a vital prerequisite for combating poverty, empowering women, protecting children from hazardous and exploitative labor, protecting the environment and influencing population growth. However, literacy rate in Katchi Abadis exhibits a dismal picture. Overall literacy rate in Katchi Abadis is 71

[9] GII reflects gender-based inequalities in three dimensions – reproductive health, empowerment, and economic activity. Empowerment is measured by the share of parliamentary seats held by women and attainment in secondary and higher education by each gender

[10] Federal Bureau of Statistics through PSLM survey, 2017

[11] SDPI, Pakistan District Education Ranking, 2016

per cent with a significant gender gap with 76 per cent for males and 66 per cent for females. The adult literacy rate in Katchi Abadis is low at 45 per cent, and ranges from 30 to 48 per cent in different areas with a primary enrollment rate at 54 per cent.

4.4.3 Karachi Human Development Index (HDI)

Pakistan has experienced a marginal increase in the value of HDI from 0.560 last year to 0.562 in 2017. Within the country, Karachi falls in high HDI[12] and is fourth in the national HDI ranking[13] in terms of human life – education, health, and standard of living. The graph below shows incremental improvement from 2005 to 2013. However, 2015 shows a downward trend mainly due to political confrontation between two major parties resulting in change in development priorities. Figure 4.23 provides HDI trends from year 2005 to 2015.

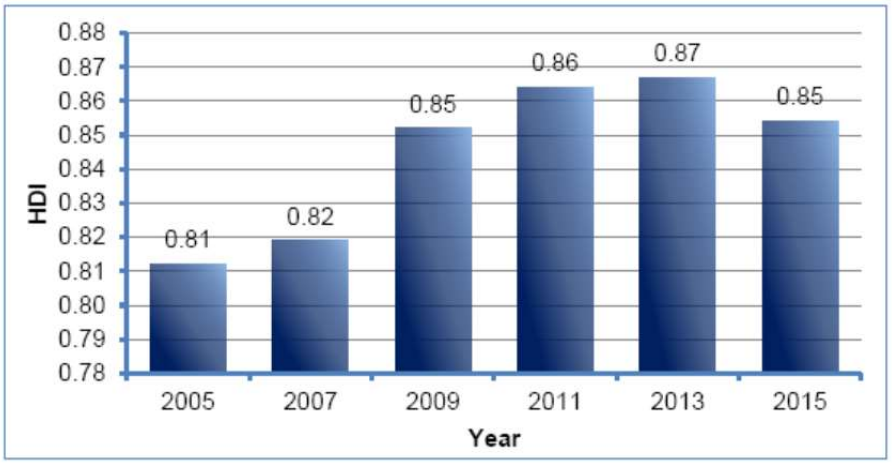


Figure 4.24: Karachi Human Development Index (HDI)

4.4.4 Health

Information on the health characteristics of a population is crucial to a proper understanding and interpretation of the health status of people, their potential

[12] Pakistan Human Development Index Report 2017, UNDP, available at http://www.pk.undp.org/content/dam/pakistan/docs/HDR/HDI%20Report_2017.pdf

[13] HDI classifications are based on HDI fixed cut-off points. The cut-off points and HDI classification are as follows: less than and equal to 0.299 for very low human development; 0.300-0.499 for low human development;
0.500-0.599 for low medium human development; 0.600-0.699 for medium human development; 0.700-0.799 for
high medium human development; and 0.800 or greater for high human development

health problems, and the resources required for providing services. However, current statistics were not available.

4.4.5 Infant and Maternal Mortality

The presence of private sector health facilities has helped in improving health related incidences of poverty. The current infant mortality rate under 5 years [per 1000 live births] has improved to 59 and the maternal mortality to 180. These positive changes reflect increasing levels of awareness, education and the availability of decentralized governance of Sindh Katchi Abadis. An increasing number of young people in Karachi are benefiting from preventive health facilities and the adoption of family planning presence of private sector health facilities helped improve health related incidences of poverty. The current infant mortality rate under 5 years [per 1000 live births] has improved to 59 and the maternal mortality to 180. These positive changes reflect increasing levels of awareness, education and availability of decentralized governance of Sindh Katchi Abadis. The preventive health facilities and adoption of family planning practices by an increasing number of young peoples in Karachi practices.[14]

4.4.6 Disability in Urban Sindh

During the year 2017-18, 3,232 men and 5,680 women at the age of 15 or above were reported to have disabilities – almost twice the number in rural Sindh. [15]The disability statistics are based on the framework of WHO's International Classification to take into account six core functional domains namely, seeing, hearing, communication, cognition, walking, and selfcare[16].

4.4.7 HIV

Karachi is among the top cities in the world which have recorded an 'alarming' increase in HIV prevalence, according to a senior official of the Joint United Nations Program on HIV/AIDS (UNAIDS). In 2017, the Sindh Aids Control Program (SACP) reported 11,464 HIV patients who were undergoing treatment in Karachi out of which 11,225 were HIV positive patients while the remaining 239 were full-blown AIDS cases.[17]

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[14] Sindh District –Based Multiple Indicators Cluster Survey (MISC) 2003-4, Planning & Development Department, Government of Sindh, Karachi, Nov. 2004
[15] The Pakistan Demographic and Household Survey, 2017-18
[16] Person who have difficulty in functioning according to domain, by the highest degree of difficulty in at least one domain, and percentage with a lot of difficulty or cannot do at all in more than one domain, according to background characteristics, Pakistan DHS 2017-18
[17] Dawn, April 27th, 2017

4.4.8 Occupational Safety and Health Situation in Urban Sindh

The overall incidence of occupational injuries/diseases in the province indicates that approximately 5 percent of all employed work force (10 years & above) had suffered from an occupational injury/disease during 2014-15. The gender segregation shows that the incidence of occupational injury/ disease was higher among male workers compared to their female counterparts (5.24 percent vs. 3.02 percent respectively).[18]

4.4.9 Housing

The poverty dimension in Karachi is further exacerbated due to the lack of housing facilities leading to the constant fear of eviction from illegal settlements and extortion by middlemen, police and various officials for the provision of various services and permission to live in the illegal settlements. Housing is one of the most pressing issues in Karachi. Given the continuous increase in the population of Karachi and the backlog in housing demand that exists, the housing needs of the city are estimated at approximately 80,000 units per year.[19]

There exists, however, a huge demand and supply gap in this sector. The shortfall in the supply of housing facilities is most severely experienced by the poor segments of the society due to severe lack of low-income housing provided by the public sector. Since partition, and due to a number of migrations into Karachi, this need for housing demand by poor and lowincome inhabitants has been met by the sprawl of Katchi Abadis.

Housing needs in such settlements are met largely by informal developers with no government support whereby majority of the basic services like water, sanitation, education and health are developed with the investment of the inhabitants and the involvement of the informal sector and NGOs. Reasons behind shortage of water and sanitation services are: a) unregulated ongoing vertical development and construction of high rise buildings; b: the unchecked change land use from domestic to commercial as allowed by SBCA. Recently the Supreme Court of Pakistan has put a restraint on any conversion of land-use from domestic to commercial in Karachi and has barred the SBCA from issuing any such NOCs. Housing needs of approximately 50% of Karachi's population requiring low-income housing are met via densification of existing Katchi Abadis

[18] PBS, Pakistan Labour Force Survey 2014-15

[19] One sector requiring major planning and investment by the public sector and offering economic opportunities to the private sector. The city government should seriously think about regularizing/legalizing the involvement of a large number of informal developers prolific in the city's low income and poor settlements.

and slums, vertical growth of existing settlements and horizontal growth on vacant land and encroachment on natural drains.

Comparison of housing data from 1980 and 1998 reveals that the total stock of one room houses fell from 44.94% to 30.09% and the total stock of three-room houses increased from 13.96% to 21.12%; the number of houses with electric connections increased from 65.78% to 93.79%; the number of houses with piped water connections increased from 44.45% to 74.38%; and the percentage of houses with reinforced concrete roofs increased form 42.5% to 56.04%.[20]

These large sections of the city's population living in unplanned settlements have minimal or no access to basic services. Karachi's high intensity construction and densely built areas add to the immense pressure on the city's water, sanitation, sewerage and solid waste management services.

The current housing demand in Karachi is estimated at 80,000 new units per year. "The formal sector supplies 32,000 housing units and another 32,000 are built in katchi abadis. Meanwhile, 75.5pc of the city's residents are classified as poor, and as such they constitute the majority of the unmet demand. The result has been the continuous demand for katchi abadis.[21]

4.4.10 Economy

Karachi is the financial capital of Pakistan and contributes towards a substantial percentage of the national GDP and revenue. Karachi's economy has grown steadily in the past 18 years and per capita income has remained the highest in the country. Depending on the methodology used, Karachi's contribution to gross domestic product (GDP) is estimated to range from 11 to 20 percent. According to various estimates, Karachi generates approximately 65% of the total national revenue (federal and provincial taxes, customs and surcharges). At the Sindh provincial level, the city's share of the provincial tax receipts is as high as 70%.

Karachi is home to Pakistan's premier port which handles almost 95% of all foreign trade - in 2001 alone the Karachi Port handled more than 29 million tons of cargo. The city produces 30% of manufactured goods and about 42% percent of value-added products in large scale manufacturing. The per capita income of the city is also estimated to be four to five times higher than the national

[20] Arif Hasan and Masooma Mohib, 2001
[21] Arsam Saleem, 'Evictions, dispossessions and urban sprawl in Karachi, Karachi Urban Lab, 2018

average. Nevertheless, the city has a large population around 50% of which lives in Katchi Abadis and slums.

The economy of the city includes diverse sectors like cement plants, corn mills, ship building, steel, textiles, chemicals, pharmaceuticals, automobiles, refined oil, shoes, machines and food production, wholesale and retail. Recent additions to the economic activity are in sectors such as telecommunication, electronic media, software outsourcing, call centers, medical services, and accounting.

Growth in the real estate and construction sector has fluctuated in response to speculative activities, fueled in part by cash inflows from outside the city and the country. However, the competitiveness of Karachi's traditional sectors of manufacturing and trade is declining, especially relative to other cities. The decline in the formal manufacturing sector has been accompanied by increased access to cheap imported goods, especially from China.[22]

Furthermore, being the financial hub of the country, Karachi hosts the head offices of the majority of Pakistan's public and private banks. Karachi is also home to Pakistan's largest stock exchange, the Karachi Stock Exchange (KSC) 100 Index, which has been contributing significantly to GDP growth, and handles nearly all of the transactions in government securities and in the shares of most of the important industrial and financial institutions.

4.4.11 Employment

Underemployment and unemployment constitute a fundamental set of economic challenges that Karachi faces. Despite that, Karachi has emerged as a major trading, commercial, banking, insurance, retail, financial and economic hub of Pakistan; a growth that has attracted a vast number of migrants over the years. The City is the heart of manufacturing employment in the country23. Karachi has a high concentration of industrial activity and is home to the Sindh Industrial & Trading Estate (SITE), Korangi Industrial & Trade Estate, North Karachi Industrial & Trade Estate, etc. According to one study conducted in 1997, Karachi's large-scale industrial sector employed 71.6% of the total employed labor force in Sindh, and out of the total number of large-scale units in Sindh, 72.7% were located in Karachi producing 74.8% of the total large-scale output of the province.[24] According to the 1998 census, employment has fallen from

[22] Sayeed, Asad, Khurram Husain, and Syed Salim Raza. 2016. Informality in Karachi's Land, Manufacturing, and Transport Sectors: Implications for Stability, Washington, DC: US, Institute of Peace Press
[23] Transforming Karachi into a Liveable and Competitive Megacity, World Bank
[24] Khuhro, Hamida & Mooraj, Anwer (1997) Karachi, Mega City of Our Times, OUP, Karachi

33.43% in 1981 to 27.58%, with the worst affected being the population above 60 years of age.

Table 4.4: Labour Force Participation 1981-98

Employment	1981		1998	
Male	1,235,104	95.06	1,920,895	94.33
Female	64,126	64.94	115,406	5.67
Total	**1,299,230**	**33.43**	**2,036,301**	**27.58**
Pop. 10 and above	3,886,152		7,384,156	

Source: Arif Hasan and Masooma Mohib, 2001

The pattern and nature of employment can be judged from one sample study that was conducted in 2005 and consisted of 5,000 households in 18 towns of Karachi Division which shows that out of the total population, 81% is employed, out of which 50% are self-employed, 31% are employed by the private sector, 3% by the semi-private sector and 16% by the public sector. Out of the self-employed, 32% are shopkeepers and 12% are laborers. However, out of the total population, a large proportion of the city population, i.e., 75% is employed by the informal sector comprising of small scale or cottage industry, trade and provision of services including water, waste disposal, health, education and housing.[25]

The growth in the service sector has attracted many people to new jobs in the city; however, the existing infrastructure has been unable to cope with the growth. As a result, the poorer populations, though an integral part of the growing service sector, have been pushed out into relocation colonies far from the city center to make way for new development in line with the economic growth of the city. The distance of these relocation colonies from the city often results in a total disconnection from livelihoods and limited access to basic services — further deepening the cycle of poverty.

4.4.12 Informal Sector

The informal labor market is characterized by lack of regulation, lack of security in conditions of employment and ease of entry. It includes small, unregulated enterprises, often family-managed or self-employed enterprises that use traditional technology and labor-intensive methods.

While there is no comprehensive data available on the informal economy, according to some estimates, 75 per cent of those employed in the city of

[25] ECIL, 2005

Karachi work in the informal sector. At present the informal sector activities are primarily based in and out of katchi abadis and are diverse in scope and nature — comprising of small scale or cottage industry, trade, and provision of services like water, waste disposal, health, education and housing. These activities thus provide a large number of families in Karachi with employment and a means of livelihood. Unfortunately, the fact that such economic activity is in the informal domain means that job security, sufficient wages or adequate health and safety safeguards are rare.

4.4.13 Social Infrastructure and Services

Karachi's economy and population continues to expand rapidly, but investment in urban infrastructure and services has not kept pace with this growth. Inadequate and unreliable infrastructure and services increase business and household costs, harm the urban and natural environment, and compromise the city's regional and global competitiveness.

4.4.14 Water Supply

As one of Pakistan's fastest growing metropolises, Karachi is challenged by increasing demand for water and sanitation services. Katchi Abadis in particular, face major challenges in service delivery. Unlike other major urban centers in Pakistan which are either located along freshwater bodies or depend on groundwater sources, Karachi receives its supply of water from distant sources.

The two main sources of the city's water supply are primarily River Indus (through Keenjhar/Kalri) and Hub Dam, which are miles away. Although the city's main pipelines carry water for many miles, almost all of the Katchi Abadis and many of the formal settlements face an acute water shortage.[26]

This demand is inadequately met by a water supply of 360 to 530 MGD46[27] which is filtered at various water filtration plants including COD, Pipri, NEK, Hub and Gharo through an extensive generation, filtration, pumping/boosting and piping system. Against a demand of about 1080 MGD which is estimated for a population of about 20 million people, the KW&SB has the capacity of supplying approximately 640 MGD, out of which 20-40% is lost during transmission due to pilferage and leakages in the aging and dilapidated service delivery system. According to one study, if 40% of the leakages in the transmission routes could

[26] KW&SB

[27] Different estimates in different studies, which could be due to the time gap between them and methodology used

be plugged, water supply could be increased by approximately 81 MGD. The shortage is due to many reasons, such as insufficient supply from the two main sources (Indus & Hub Rivers), low levels of ground water, and inadequate and aging water transmission and storage facilities. [28]

An inefficient delivery system has forced people to make alternate arrangements through unregulated extraction, illegal online motors to boost pressure, etc., — with severe negative effects on water availability and water quality. Those most affected by this shortage are the poor who have no option other than buying water from high-priced private sources that operate in the city. In addition to the shortage of water in Karachi, substandard quality is another problem: drinking water seldom meets acceptable standards of filtration and treatment. A number of poor localities/squatter settlements have pooled money to build their own water supply systems by laying piped water networks that tap into government's main transmission lines or storage tanks. It has been observed that in settlements having larger dependence on community sources of water like boreholes, women play a crucial role in collection of water.[29]

Incidence of diverting water pipelines for personal usage are rampant leading to massive wastage and decrease in the already low water pressure supply at the tail end of the distribution chain. Water requirements peak during certain times forcing many households to obtain supplementary water supplies at high costs. Tankers and pushcarts provide complimentary services in unauthorized colonies and slums.

The many challenges in delivering proper water services include: improving the quality of raw water, providing household connections to the poor, efficient provisioning of services, checking illegal tapping and transmission leakages, setting up distribution networks in highdensity informal settlements with metering, strengthening weak grievance redress and voice systems, proper pricing of water for cost recovery, etc. Lack of data and poor organization makes efficient provision of services nearly impossible.

The KW&SB is Karachi's prime provider of drinking water and wastewater removal services and provides an intermittent supply of water to Karachi's population. There is lo coverage in terms of piped-water supply connections, and even lower coverage of piped sewerage connections. Poor water and sewerage lead to environmental and health hazards which, in turn, lead to public and

[28] ibid
[29] FGDs

political dissatisfaction. Because of this dissatisfaction, the KW&SB is unable to raise its tariffs, and unable to collect much of what it bills. This leads to a lack of funds for maintenance and improvements and, in a vicious cycle, back to poor service delivery.

KW&SB is also constrained in meeting the city's water and wastewater needs. Supplementary services are provided by other water distributors, but these services are also unsatisfactory. The system provides inadequate coverage and service, endangers public health, and is financially unsustainable.

The KW&SB divides Karachi into 6 water Circles and 20 towns based upon population and the outlet and inlet points of the existing water pipeline network in the city. Each water Circle is headed by a Superintending Engineer. The KW&SB provides intermittent water to some part of the city. To supplement the water supply, KW&SB supplies water tankers on request only in formal settlement.

Table 4.5 shows that there is a large variation in reliance on piped water between districts. Piped water supply is poorest in District West with less than half the population relying on it for drinking, whereas approximately 80 percent of the population in District Central were using piped water as a main water source for drinking. There are also marked differences in sources of water for drinking and other purposes within and amongst households.

Table 4.5: Water sources in Karachi, by districts (per cent)

District	Purpose	Piped	Public Tap/ Filtration Plant	Boreholes/ Tube well/ Hand pump	Tanker/ bottled	Other
Karachi	Drinking	66.2	3.7	3.8	23.2	3.0
	Other	71.0	0.3	18.0	9.1	1.7
East	Drinking	70.8	2.5	7.0	18.4	1.3
	Other	73.2	0.0	24.1	2.7	0.0
Central	Drinking	79.9	2.3	4.8	11.2	1.7
	Other	85.9	0.0	9.0	2.6	2.6
West	Drinking	46.9	2.2	2.4	40.7	7.8
	Other	63.6	0.0	13.6	18.2	4.5
South	Drinking	67.2	9.7	1.6	20.1	1.4
	Other	73.9	0.9	3.6	19.8	1.8
Malir	Drinking	64.8	2.5	2.8	26.7	3.2
	Other	30.8	0.0	61.5	5.1	2.6

Source: Multi Indicator Cluster Survey 2015-16 dataset

On average, approximately two-thirds of Karachi's population relies on piped water for drinking and 71 per cent for other purposes. About one-fourth of the population in Karachi purchases water through tankers or water bottles, or other sources.

In the two districts – East and Central, the reliance on piped water is slightly higher than the average. In District East, the reliance of other (privately installed) investments such as boreholes, tube wells or hand pumps is also slightly higher.

In the case of water supply, among the minimum critical sustainability criteria included is the provision of an average of 5 liters of water per capita per day for drinking and cooking. The Strategic National Master Plan for Water and Sanitation also makes it mandatory in addition to potable water. However, international guidelines widely followed, use a broader definition of daily human requirements for water, including basic consumption, hand washing and food preparation needs, suggesting a volume of about 20 liters per capita per day.[30]

4.4.15 Sewerage System

Karachi generates approximately 350-392 MGD of sewage. However the three operational waste water treatment plants have a combined capacity to treat only 151 MGD and out of these three, only one is currently functional. The situation is further aggravated due to the aging sewer network and operational losses at the treatment plants. Consequently, only 40 to 80 MGD of sewage is actually treated50. A large amount of the sewage flows directly into open drains and storm water drains given the lack of an adequate disposal system. Through Malir and Lyari rivers — which have been transformed into huge open sewers — this sewage ultimately ends up in the Arabian Sea, causing extensive environmental damage.

The major polluters are industrial units (which dump untreated toxic waste into the rivers and the sea) and squatter settlements (both formal and informal including slums) which lack piped sewage collection as a result of which their waste flows through open drains into the rivers. It also important to note that the government treatment plants do not provide treatment of chemical waste, which is which makes it a serious issue for long term environmental impact.

There are no estimates of the number of settlements in the city linked to underground sewerage system. The KAs located close to the planned areas are

[30] (e.g., World Health Organization, 2003; IFC, 2007; DFID, 1998).
World Health Organization (WHO). 2003. Domestic Water Quantity, Service, Level and Health

using the Sewerage System laid for those areas. The sewerage network in Karachi is old, poorly maintained and not properly networked to treatment systems. This has resulted in system blockages, raw system overflows and environmental damage.

The collection, treatment and disposal of both domestic and industrial wastewater within the city are primarily the responsibility of KW&SB that operate an extensive sewer network and three sewage treatment plants (STPs). However, low treatment capacity and poor interconnectivity between elements of the sewerage system means that much of the wastewater generated in the city is discharged untreated into the storm water drainage system, from where it flows to Karachi Harbor and the Arabian Sea untreated.

Household sanitation within the inner city is reasonably good with a relatively high incidence of sanitary toilets within households and sewerage network connections. The 1998 population census revealed that 92.8 percent of households within the city had separate latrines, 4.1 percent had shared latrines, while only 2.1 percent had no toilet facility. There is a good record of collaboration between the government and the NGO sector regarding provision of sewerage in Karachi.

Over time, water and sanitation services are provided but growing population pressures, commercialization land use, and unorganized development due to housing shortages has led to unregulated urban growth and the development of unauthorized katchi abadis stresses service delivery in water and sanitation sector.

Apart from inadequate investment water and sewerage deficiencies, the overall shortage is due to the following factors: poor collection of revenue from users; deficient maintenance because of under-trained staff and lack of required funds; lack of appropriate policies; and limited capacity of the management. Charges for water are low relative to both the costs and to the rates charged by private vendors. In most districts, there are no charges for sewerage and drainage services. Further the existing sewers have outlived their designlife and suffer from insufficient hydraulic capabilities, heavy silt deposition and severe choking due to dumping of solid waste.

4.4.16 The Drainage System

There are two types of drainage in Karachi — storm water drainage and surface drainage. Karachi's drainage situation is complex; it has several natural and man-made drainage systems, two drainage basins, large natural drains, storm water drains along roads and combined 'sewer and storm' water drains.

According to the Orangi Pilot Project, Karachi has 41 major drains. These drains are about 167 KM in length and discharge into two non-perennial rivers, i.e., the Malir and the Lyari, which run through the city districts.[31] Gujjar Nala is among the main streams of Karachi beside the Orangi stream which is a tributary of the Lyari River. The Gujjar Nala is an ephemeral stream which flows through the megacity of Karachi from north-east (North Karachi Sector 11J) to the center and merges with Lyari River in Liaqatabad Area before draining into the Arabian Sea. Most of the Gujjar Nala passes through the Karachi Central District while the remaining passes through Karachi West District. The Nala carries waste generated from industrial and domestic activities — these activities can generate up to 472 MGD of waste water in Karachi. Minor drainage networks (about 1,000KM in length) are the responsibility of the town councils. However, conflicts arise from the fact that much of the storm water drainage network also functions as part of the wastewater disposal system as a result of which maintenance is largely neglected.

Katchi Abadi Authority reveals that there are 5,639 slums in Karachi and a majority of them are built alongside drains. Karachi faces the threat of flooding mainly due to unrestrained housing and encroachment on natural waterways coupled with dumping of solid waste into storm water drains. As the settlements keep swelling, the drains are constricted, blocking the natural water paths. According to KMC, Gujjar Nala used to be 200 feet wide and now its width has been reduced to 15 feet.[32] These compounding factors have increased the frequency and intensity of flooding in certain neighborhoods. Karachi has witnessed urban flooding in 2006, 2011, 2012, 2013 and 2017. The city lacks a full assessment of the drainage system's conditions and performance required to develop an adequate city flood management plan.

Urban flooding is most likely to become an even more serious issue – directly affecting tens of thousands and possibly affecting millions indirectly. Different parts of the city are inundated during heavy downpours such as North Karachi, North Nazimabad, Drigh Road, NIPA, Orangi, Malir, Northern Bypass, and colonies located on either side of one of the city's longest drains, the Gujjar Nala. Many underpasses were inaccessible as they were completely submerged. These drains would normally bring rainwater from across the city to either Lyari River or Malir River, which would then drain into the Arabian Sea.

[31] These drains include Gujjar Nala, Orangi Nala, CBM Nala, Chakra Goth Nala, Nasir Colony 2100 Road Nala, Chakore Nala, Soldier Bazaar Nala, PECHS Nala, Mahmood Abad Nala and other drains scattered across the city.

[32] KMC

The key issue in the drainage sector is the maintenance of adequate storm water drainage infrastructure by: (i) avoiding encroachments by unplanned low-income settlements along drainage channels; (ii) improving the hydraulic performance of the drainage networks; (iii) ensuring that drainage lines are kept clear, clean and well-maintained (iv) separating wastewater systems from storm water systems so that responsibility for storm drain maintenance can be returned to those originally responsible; and (v) urgently developing a Storm-Water Drainage Master Plan, developing programs to establish and maintain drainage rights of way, and introducing a system of routine drainage maintenance.

4.4.17 Solid Waste

Solid waste management has become a daunting task for KMC and DMC authorities which seem to lack the capacity to deal with the escalating waste production. Statistics indicate that on a daily basis, approximately 12,000 tons of solid waste is generated in Karachi alone, out of which forty percent can be found on the city streets. Improper management of solid waste is causing the spread of infectious diseases and environmental pollution.

Solid Waste Management within the City is the combined responsibility of Sindh Solid Waste Management Board (SSWMB) and DMCs. In addition, the Cantonment Boards, Karachi Port Trust and Pakistan Steel Mills carry out their own waste collection and waste transportation. The key agencies responsible for collection are the town councils who either use their own equipment or contract private sector operators for managing and operating the primary collection system. KMC is responsible for the maintenance and operation of the land fill sites at Jam Chakro and Gond Pass located each at 35 km from the city center.

Public opinion and perception of solid waste management system is characterized by irregularity and inefficiency of the collection system as well as poor monitoring of the private waste service providers by the local authorities. Most of the households recognized solid waste management as a major problem. It was also revealed that residents currently pay for waste management services to private waste pickers. Strategies to address solid waste problem will need to consider an adequate supply of containers, intensive public education and introduction of user fees for waste management services.

4.4.18 Power Supply

Supply of water depends on the availability and quality of electricity in the towns, although almost all of the households were reported to have an electric

connection in their household. However, electric supply was found to be very erratic in informal settlements. Due to irregular electric connections, operation of water pumps is interrupted and a steady supply of water is stalled. It has been observed that many settlements get water only once in a week. This has serious implications on enhancing coverage by generating a demand for piped water supplies because it invariably requires pumping.

Karachi Electric Supply Corporation (KESC) has a generating capacity which is 9 percent of the total power generated nationally (1,756 MW).It generates, transmits and distributes electricity to domestic, institutional and industrial users. Current peak demand outstrips supply by an estimated 518 MW or 24% of generation capacity.[33] This results in frequent load-shedding during periods of peak demand in summer with serious consequences for the economy. In recent years, frequent electricity load shedding has also led to civil unrest in some areas of the city.

In addition to the shortfall in supply, there are serious problems with the distribution network. Many of the feeders are overloaded which adds to transmission losses and outages. A significant number of feeders are very long which further increases transmission losses. While there are 1.4 million paying domestic consumers and 400,000 commercial, institutional and industrial consumers within the service area, it is estimated that more than 350,000 consumers are illegally connected to the system and do not pay for the power that they consume. The combined transmission, distribution and administrative losses are over 37 percent of supply.

4.4.19 Public Transport

There are various estimates regarding the number and types of public transport available in Karachi but broadly speaking, over 90% of the Karachi's public transportation is comprised of privately owned buses and mini-buses. [34]Out of these, various studies estimate that there are approximately 13,500 to 20,209 minibuses and coaches in Karachi. In addition, according to different estimates, there are 13,613 (2002) to 44,480 (2007) taxis and 23,337 rickshaws in the city[35]. This substantial involvement of the private sector in fulfilling the transport requirements of the city can be largely attributed to the limited capacity of the government to provide an efficient and affordable public transport system. It is

[33] KESC, Website, Dec. 2018
[34] largely owned and run by Pukhtuns
[35] Other modes of transportation consist of Suzuki pick-ups, horse-drawn victories and carts, and boats (operating between the port and certain settlements located across the bay). The Karachi circular railway also operates within the city however servicing a negligible fraction of the population.

important to note that the government owned Karachi Transport Corporation (KTC), shut down its services comprising of 800 buses in 1997 due to lack of funds and unsustainable losses.

Available public transport system in Karachi is also highly gender insensitive (as other sectors in Pakistan due to the overall socio-cultural context). A study by URC reports that women respondents complain about non-availability of female seats, having to sit on hot engine cover in buses, harassment, and unnecessary touching by male drivers and conductors.

The urgent need for a public transport system specifically for just one sub-set of the population can be gauged form the fact that morning peak hour traffic is largely generated by travel to educational facilities. A research study conducted by JICA in 2005 reports 15.43 million trips to educational facilities per day. Out of a total of 24.227 million trips made on a typical weekday, 60% are for schooling purposes. This number sheds light on the immediate need to address the transportation needs of the education sector. In order to substantially reduce traffic congestion, there is a need for providing student specific transportation on various routes, providing reserved seats for students, and involving private educational institutions to provide transport facilities for students.

4.4.20 Roads

The Karachi Metropolitan Corporation (KMC) is responsible for the maintenance and upkeep of all major roads within the city, and District Municipal Corporations (DMC) are responsible for the secondary/tertiary roads (176 KM in length) along with associated drainage and street lighting. Maintenance budgets come from federal, provincial and district sources and new construction and maintenance works are contracted out - although contractors frequently hire back the plant owned by the Works and Services department in order to undertake the works.

4.4.21 Fire Services

Under the Sindh Local Government Ordinance (SLGA) of 2013, the KMC is responsible for the maintenance of a fire brigade for the prevention and extinction of fires. However, the Karachi Fire Brigade does not possess adequate staff, fire stations and equipment to cover a city of over 13 million people which creates a serious shortfall in fire service coverage. There is a serious need for trained fire-fighting staff as well as hydrants – of which there are only nine in the city.

5. Stakeholders Engagement, Screening of Potential Impacts and Proposed Mitigation Measures

This section presents the screening process that identifies the environmental aspects and makes assessment of impact of different activities on the physical, biological and social environment.

At the outset it needs to be stated that the preconstruction stage was not preceded by the procedures of environmental assessment. Under such circumstances it is usual to conduct an environmental audit. However, it was difficult to verify if the procedures were followed. This screening process is therefore limited to measures that should have been adopted. It was stated by some stakeholders, for example, that the construction machinery just moved for introducing the diversionary track, without taking the stakeholders into confidence. Similar is the case with the measures that need to be taken preparatory to construction and during construction.

When the site was visited by the team of Environmental Experts, it was noticed that due safety and security measures were not being followed e.g. the site was not cordoned off to restrain people from crossing the road and entering the site; the construction crew was not wearing any PPE as safety measures. This point is being raised here to remind the proponent that funds are invariably provided for PPEs and for Safety Personnel to ensure implementation of safety procedures. It amounts to temporary embezzlement of funds if the same are not appropriately utilized.

Mitigation measures have been proposed to reduce, minimize or compensate for the identified potential negative impacts and their adoption has been recommended.

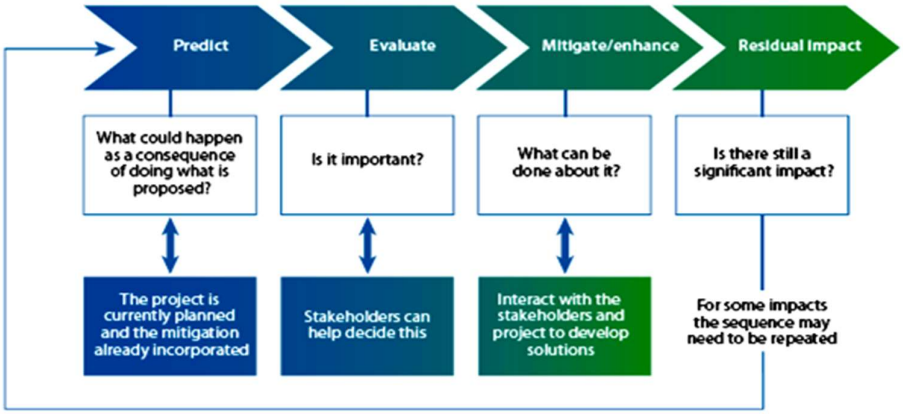


Figure 5.1: Impact Assessment Approach

5.1 Screening of Potential Environmental Aspects raised by Stakeholders.

The EIA process is considered incomplete without active public participation. Accordingly, the Sindh Environmental Protection Act 2014 as well as the rules & regulations framed thereunder demand robust public participation in the formulation and implementation of all development projects. Public consultation & participation process is the means to communicate the pros and cons of the project to those directly & indirectly affected by the project and to ensure that the EIA process is open, transparent and robust, characterized by defendable analysis to attain sustainability in the design, implementation, operation & management of development proposals. The stakeholders are provided the opportunity to directly express their concerns before the feasibility of the project is ascertained.

5.1.1 Concerns & Observations

- The general opinion of the stakeholders was that the public concerns raised in the public hearing of the EIAs are limited to the four walls of the meeting place. The SEPA is ill-responsive to the points raised during the public hearing and the meeting of the experts committee has become a mere formality since whatever the SEPA officials gather at the public hearing are not communicated to it.
- SEPA is helpless in not doing anything to redress the grievances of the stakeholders. Similar is the case with other utility agencies, they have been burdened with responsibility but have no resources to implement them.
- The infrastructure facilities are lacking in each sector: the roads are not vehicle worthy but are congested to the extent that the traffic volume is several folds in exceedance with its capacity. The institutional stakeholders showed sympathy with the authorities which has been burdened with heavy responsibility and has no authority to implement its instances on its own.
- The institutional stakeholders believed post construction/completion monitoring is attended to in a routine manner. Neither SEPA nor other agencies / authorities have capacity to monitor the implementation of the mandated monitoring plan. The result is that the proponents and their contractors are scot-free to go unmonitored. Both SEPA and other concerned authorities should have a separate cell for monitoring the activities of the monitoring teams and their reporting.
- Deficiencies in the public transport services together with the enormous increase in private vehicle ownerships during the period of rapid rate of GDP growth adopted for the country from 2005 has had adverse impact on the not too worthy roads for increased volume of traffic. The problem

has been aggravated ever since while the road transportation problem remained unresolved. The road capacity has been far exceeded by the volume of traffic on roads.

- The defunct CDGK constructed flyovers and widened several roads to make some of the main corridors signal free. The problems with regard to traffic jam, and inconvenience caused to commuters was reduced but only for a short period.
- The environmental health problems due to emissions from vehicles operating on fossil fuel have continued since the number of vehicles operating on the corridors and discharging the emissions has continued to remain beyond their capacity. Construction of flyovers / underpasses on Corridor V would reduce the congestion and traffic jam, and disperse the emissions but only on a temporary basis, as has been observed at the intersections which have been signalized during the past few years.

Meeting at Office of the Citizens for Environment (CFE)

Meeting with Director CAC (Climate Action Centre)

Meeting with Director Sindh EPA

Meeting with OHSE Expert

Meeting with Sociologist

Meeting with neighboring business operators and residents

- According to the principles of sustainability, socially equitable and economically viable development would be in balance with the ecosystem in situations where the three components of sustainability viz. economic, social and environment are interdependent. It will be contrary to the principles of sustainability as it would be chaotic and

misbalanced when any of the components: economic, social and environment, tends to be viewed as separate, unrelated parts of the ecosystem. Once misbalanced it creates community problems including those related to transport management; it is then that they are viewed as isolated issues. This is where the transport problem of Karachi lies. Transport management has remained unresolved and this status is being resolved by ad-hoc planning and miscued development as against sustainable development.

- Development activities focusing mainly on economic development have brought limited amount of social or community development and have had no regard for environmental sustainability. Likewise the focus on social development has brought only peripheral sustainability of the economy and environment. The extent of development has in each case, including the transport system, been distanced from being sustainable. Accordingly the systems have not been managed by good governance practices.
- BRT/LRT/MRT is certainly a solution for the complex traffic in Karachi. It is, however, plagued with the problem of being highly capital intensive and requires transfer of technology as well as capital from one of the 'donors' who have own agenda to follow so as to cash their technology and return on investment. This is where the decision makers in Pakistan fall in the cobweb of Social Pollution. It may be one of those exquisite plans that may have been prepared by the French, the Americans, or the Japanese but none of them has had the blessing of the provincial legislature. Under the circumstances flyovers and underpasses are built right on the same track where a mass transit system may come up. According to stakeholders it is the eschewed policy in which different institutions concerned do not sit down to prepare and agree on a Strategic Plan and thus public money is wasted in implementing temporary solutions and not providing adequate mass transit service to the commuters.
- The Bus Rapid Transit (BRT) has been accepted as a mass transit system the world over in cities that were faced with over capacity roads, as in Karachi, that were not vehicle worthy and needed a rapid transport system of some kind. It may be reminded that the over capacity of roads was a consequence of rapid urbanization and an equally rapid increase in the volume of vehicular traffic. Cities with population exceeding 3.0 million had planned and implemented in time one or the other mass transit system. Urban planners in such cities first introduced a Bus System followed by a Railway System and finally a Bus Rapid Transit (BRT) system.
- Several participants from the project area stressed the need for proponents to share project information and plans for construction activities with the area residents and commercial entities. Often the area stakeholders are consulted during the design stage, however, no prior

notice or warning is given to the stakeholders regarding commencement of construction activities and the like. They also demanded that the Traffic Management Plan (TMP) be shared with them, and all approach roads must be rehabilitated in the first phase.

- The area residents and shop owners were concerned about the project schedule and shared their views that the slow progress has significantly slowed down all businesses and has negatively impacted the business and commercial activities in the shopping areas. The temporary loss of business so incurred has resulted in grievances from the concerned business operators. The stakeholders were not opposed to the Traffic Improvement Plan but they sought immediate resumption/completion of the project.
- The shop owners/business operators are particularly concerned about the slow down of business during the Monsoons and peak season of Ramadan. The apprehensions in this regard were conveyed to the study team. There is therefore need for implementation of the Traffic Management Plan that may ensure resumption of business activity. It is recommended that the KDA must maintain an active liaison with the commercial enterprises.
- The stakeholders have stressed that the removal of encroachments from, and the cleaning of, the nullahs is the first step towards easing the situation in Karachi. The most important step that needs to be taken is to remove the encroachments at the outfalls, so that water can enter the sea.
- The awareness on traffic laws is also severely lacking amongst the general public. Regardless of plans for mass-transit and other traffic management measures, without awareness of basic road laws and motivation to follow these, traffic congestion will continue, and accidents will rise. Recent measures by the Traffic police of increasing fines and penalties are steps in the right direction but, positive incentives for drivers to follow the rules can also make a huge difference. Steps should be taken for area-wise education of traffic rules and benefits of following basic principles of road safety.
- Construction debris has of recent become a major constituent of the solid waste disposal system in Karachi. This is because the debris is left to the ill-equipped solid waste collection system to cater; the result is accumulation of piles of construction debris.
- During construction, it is expected that construction workers are likely to have accidental injuries and hazards as a result of accidental occurrences, handling hazardous waste, lack or neglect of the use of protective wear etc.
- As effective Grievance Redress Mechanism (GRM), monthly consultative meetings will be held during construction phase to ensure that that any emerging concerns are addressed promptly and with the finality required.

5.2 Screening of Potential Environmental Impacts in Siting of Karimabad Underpass & Its Design

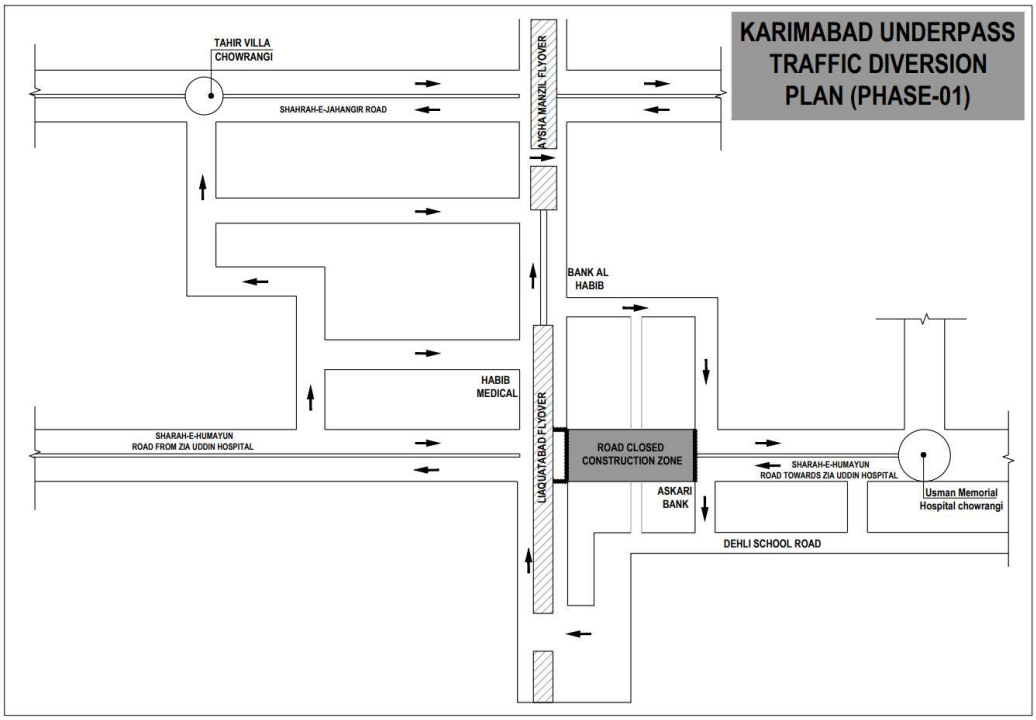
- The living area of the resident population and sensitive structures are offset considerably by secondary lanes alongside the site / ROW housing the underpass and allied facilities. Siting the underpass and its allied facilities will therefore have no significant impact on the demographic pattern, and on the social and cultural values of the settled population. Consequently, no resettlement of its population or of business would be involved.
- The construction activity at the site will be a constraint to the movenment of the people of the area from their residence to / through the site. The commercial ventures and shops are also offset from the CoI of Project. In their case also the business may slow down due to constraints of accessibility. Mitigation measures in the form of alternate routes and pedestrian walkways will have to be ensured. KDA had taken due cognizance of the situation and notified the diversion plan.
- The siting of proposed underpass would not require land acquisition at any site. The Proponent has had a dialogue with all stakeholders to ensure provision of measures by appropriate designing, suitable landscaping and providing proper signage wherever required.
- Similar steps will have to be taken for relocation of utiliies including water supply, sanitation, electricity, telecommunication and gas pipelines. KDA has taken all the relevant departments/agencies on board.
- Vegetation will not be impacted by construction of the underpass; this aspect was confirmed during the visit to the sites / ROW. However, the Proponent is committed to suitably landscape the site with vegetation and thus compensate the losses, if any.
- The proposed site have no protected areas such as wildlife sanctuaries, game reserves or national park or archaeological sites.
- Operation of vehicular traffic on the Corridor has remained unresolved for a long time. The road users need a transportation system that is safe, convenient, comfortable and cost effective, while still being environmentally and aesthetically acceptable. The same would be provided when the underpass will provide a signal free corridor, while the underpass system becomes a component of the ecosystem of Corridor V that will link the CBD of Karachi with Hyderabad through the M-9.
- The addition of proposed Karimabad underpass would, as such make Shahrahe Pakistan Corridor V Expressway a long-awaited facility with no significant impact on the precious ecology. Care will be taken to replace the lost vegetation, restore the site after the construction and beautify the entire area through appropriate plantation of trees and shrubs wherever needed for street scaping.
- The project would have an insignificant share of the water resources of Karachi and would have no significant impact on other beneficial water uses.

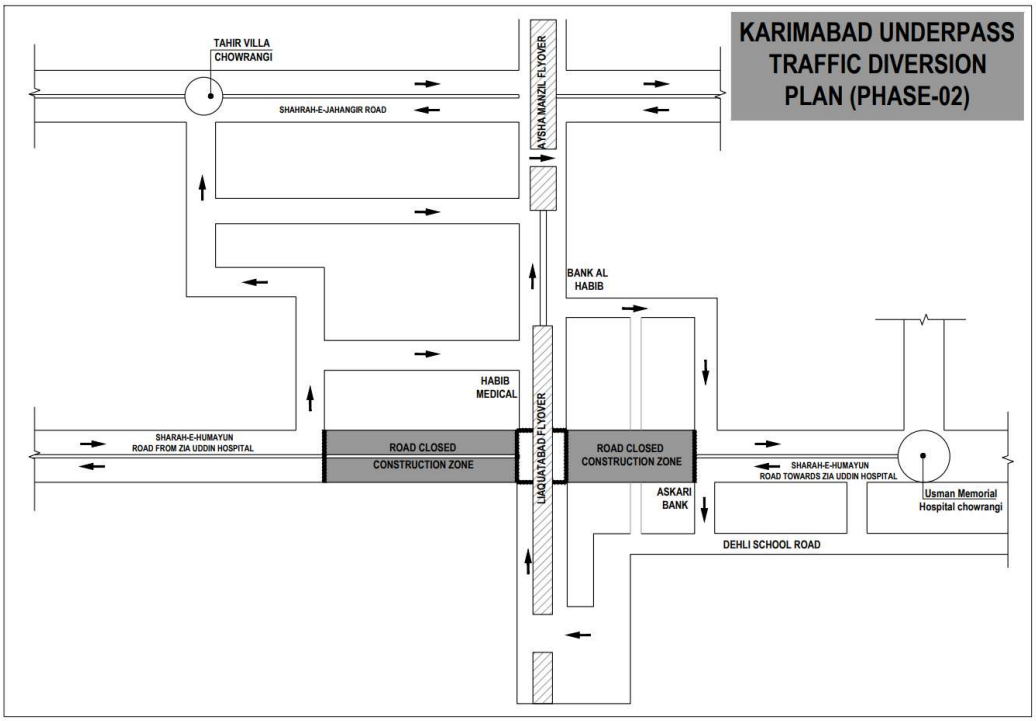
- The airshed of the corridor of impact of the underpass will not be degraded due to
  - Optimized operation of the vehicular traffic resulting from reduced congestion and signal free movement
  - Dispersion of Air pollutants along the corridor.
- The air quality of the airshed of the macroenvironment as well as that of the RoW of the Corridor itself will as such have no significant impact from the location of the underpass at/along Karimabad intersection.

5.3 Screening of Potential Environmental Impacts at Construction Stage

- The screening of potential environmental impacts has been carried out for the construction stage and the impact of construction has been evaluated, besides the residual impacts after construction have been identified.
- The construction activity which was started in Nov 2023 without the EIA approval has significantly slowed down all businesses and has negatively impacted the business and commercial activities in the shopping areas. The temporary loss of business so incurred has resulted in grievances from the concerned business operators. The stakeholders were not opposed to the intervention / improvement plan, but they sought immediate completion of the project.
- The shop owners/business operators were particularly concerned about the slow down of business during the Monsoons and peak season of Ramadan. The apprehensions in this regard were conveyed to the monitoring team. There is therefore need for implementation of the Traffic Management Plan that may ensure resumption of business activity. It is recommended that the KDA must maintain an active liaison with the commercial enterprises.
- Safety issues seem to receive low priority at the construction site as was observed by the EIA team. Health, Safety and Environment are major components of the Environmental Management Plan (EMP) of which monitoring of the environmental performance is an integral part. The proponent has to ensure strict adherence to the measures and guidelines stated in the EMP and the contractor must be made to follow the Standard Operating Procedures for construction activities.
- When the site was visited by the team of EIA team, it was noticed that due safety and security measures were not being followed e.g. the site was not appropriately cordoned off to restrain people from crossing the road and entering the site; some of the construction crew members were not wearing PPEs and were not following the safety measures. This point is being raised here to remind the proponent that funds are invariably provided for PPEs and for Safety Personnel to ensure implementation of safety procedures. It amounts to temporary embezzlement of funds if the same are not appropriately utilized.

- A traffic diversion plan was prepared but not effectively implemented which resulted in inconvenience to road users during the construction stage. It was also not shared with the stakeholders in the neighborhood. This was cause for complaints from road users and also the public in the neighborhood. It was observed that the traffic diversion plan was still not being followed, for example the information on closure of the access roads and alternate routes were not shared with the public particularly the concerned citizens. Following measures are therefore required to be implemented:
  - Maintain the service roads in good condition to allow smooth traffic movement; provide necessary personnel to guide and control the traffic;
  - Provide alternative traffic arrangement/detours so that traffic can be distributed and move on different roads; and, ensure that public/residents association is informed about such traffic diversions
  - Provide information to the public through media – daily news papers and local cable television (TV) services about the need and schedule of work, and alternative routes
  - To maintain transparency of the project, public information/caution boards must be provided at the work site – information shall inter-alia include: project name, cost and schedule; executing agency and contractor details; nature and schedule of work; traffic diversion details, if any; entry restriction information; competent official's name and contact information for public complaints.





- It was observed by the monitoring team that the excavated material from the area designated for underpass was being dumped into uncovered loaders and transported to disposal sites. No safety measures were followed by the crew handling the excavated material. The team interviewed the public in the immediate environment and found them complaining about the nuisance of dust emission.
- It is recommended that the measures adopted after identifying the environmental issue should be strictly followed and supervised and the Project Manager should remain in contact with the population living in the immediate neighborhood.
- In order to maintain liaison with the public the KDA is advised to frame a grievance register and designate the HSE Officer to register all the complaints on the issues of construction and its impact on their living conditions.
- Drainage of the site needs to be modified with suitable drains to suit the changed topography to avoid flooding and accumulation of water. These are included in the project design.
- Background noise levels are likely to be high during nighttime (10 pm to 6 am). Therefore the performance criteria shall be as follows. During nighttime (10 pm to 6 am) the impact of noise measured at the residential (sensitive receptor) shall not exceed 3dBA over the background noise level. The

contractor shall also maintain and service all equipment to minimize noise levels.

- To minimize impacts the contractors will be mandated by the KDA to:
  - Ensure SEQS compliance to the effect that all equipments and machinery to be used during construction are equipped with the necessary air pollution and noise dampening devices to meet statutory requirements;
  - Perform regular maintenance and service all equipment to minimize noise levels;
  - Locate and operate equipment to minimize nuisances; and
  - Install acoustic insulation or use portable noise barriers or install hoarding where practicable to limit noise at sensitive receivers.
  - Appropriate PPE such as earmuffs shall be provided for the workforce and their usage enforced with sound policies and by setting examples.
  - An effective staff awareness campaign on the implications of non-compliance with PPE policy shall be enforced. All workers will be required to make proper use of the protection equipment provided by management and also to observe all rules and regulations pertinent to the use of equipment designed to minimize noise exposure.
  - Records of noise-exposure measurement of workers shall be maintained.
  - Individual workers' exposure to excessive noise shall therefore be controlled by shift arrangement.
  - Acoustic enclosures and silencers shall be used for high-capacity diesel generators.
- There will be considerable agitation among the business community if the Project is not completed within the stipulated time since the temporary disturbance may turn into permanent loss of business. KDA is also required to contain the impact of activities and conserve the footprint of all resources.
- The fugitive dust emissions will be a cause for annoyance but the same must be controlled through appropriate measures including water sprinkling and spreading heavy dust on eroded surfaces to reduce the impact to level of minor significance. The site of excavation will be restored by appropriate landscaping and signage.
- Diesel and other petroleum products used for the operation of construction machinery and equipment would cause air pollution besides causing soil pollution through spills. The impact from such activity despite being of minor significance were not attended to and visit to the site showed that control by good housekeeping practices was missing.
- Water required for numerous construction activities would not be of such order as to result in its reduced availability for other activities on the Corridor or for the living environment. Conservation practices would nevertheless be adopted during the entire course of construction.

- Some shops and other premises along the road may lose business income because the presence of the construction site will deter customers, and at some locations access will be impeded by road closures, and by the presence of heavy vehicles and machinery, etc. These impacts must be avoided by confining the construction area to the actual area in the middle of the road and allowing the traffic to move on the service roads on either side. The construction area must be confined and barricaded.
- There are no historical or cultural heritage sites in the microenvironment of proposed site. Therefore there are no likely impacts.
- There is no risk of other impacts on such community assets.
- Although residential and commercial structures along the road and in the vicinity will not be directly impacted, action should be taken to minimize disturbance as far as possible. This will require:
    - Consultation with the local community to inform them of the nature, duration and likely effects of the construction work, and the mitigation measures in place.
    - Proper planning of work programme so that any particularly noisy or otherwise invasive activities can be scheduled to avoid sensitive times;
    - Avoiding noise-generating activities at night;
    - Implementing the measures to reduce dust;
    - Utilizing modern vehicles and machinery with the requisite adaptations to limit noise and exhaust emissions and ensuring that these are maintained to manufacturers' specifications at all times.
- There is invariably a safety risk when substantial construction such as this is conducted in an urban area, and precautions will thus be needed to ensure the safety of both workers and citizens. The Contractor will be required to produce and implement a Site Health and Safety Plan. This should include such measures as:
    - Excluding the public from the site – enclosing/barricading the construction area; providing warning boards and sign boards and posting of security guards throughout the day and night;
    - Ensuring that all workers are provided with and use appropriate Personal Protective Equipment (helmet, hand gloves, boots, masks, safety hoists when working at height, etc);
    - Barricade the entire area that may come under influence in case of accidents – this may particularly critical during fixing of pre-cast girders using heavy duty cranes; this may be conducted during lean traffic periods and if required the traffic may also be stopped for that short duration;
    - Follow standard practices of safety checks as prescribed before use of equipments such as cranes, hoists, etc.
    - Employ an Environmental, Health and Safety (EHS) Expert on site;
    - Provide on -site Health and Safety Training for all site personnel;
    - Report accidents to the authorities promptly and maintain records.

- There could be some short-term socio-economic benefits from the construction work if local people gain employment in the workforce. To ensure that these benefits are directed to local people, the Contractor should be required to employ as much of his labor force as possible from the local communities in the vicinity of construction sites. Drawing of majority of workforce from local communities will avoid problems that can occur if workers are imported, including social conflicts and issues of health and sanitation due to labor camps. If temporary labor camps are to be provided; Contractor should ensure that they are maintained well with proper water supply and sanitation facilities. Wastewater from construction camps will pass through septic tanks before disposal.

5.4 Screening of Potential Environmental Impacts at Operation Stage

- Operation of vehicular traffic will be under optimized conditions as a result of reduced congestion and free movement. According to assessment of impacts, operation of vehicular traffic will be responsible for small volumes of gases, which will be dispersed over the project area. The quality of the airshed of the system including the interchanges, would not be degraded since the level of priority pollutants viz. SO_2 and NOx emissions would, according to estimates, be adequately dispersed to small order of concentration and would remain well within acceptable limits. As such operations at the Project sites will have no significant impact on the air quality of the airshed of the macroenvironment as well as that of the RoW of the Corridor itself.
- The project site will discharge only low volume of wastewater. The wastewater would be discharged into the sewerage system of the neighborhood. As such the wastewater from the operation of vehicular traffic at the project site would not have significant impact on the micro or macroenvironment of the area. Likewise the quality of surface water and groundwater would not be impacted by the operations since the wastewater would be suitably disposed of in existing sewerage network.
- Noise emission level will be substantially reduced due to dispersion in the microenvironment. Furthermore, the noise level would be contained within the microenvironment of the Project area by adopting adequate mitigation measures to bring it the acceptable limits of the World Bank Guidelines and Sindh Environmental Quality Standards, for living areas.
- Operation in the project area would start as soon as the interventions are in place, operations tested for performance as stipulated in the commitment for sustainable development and the suggested mitigation as well environmental enhancement measures are in place.
- Implementation of proposed Traffic Improvement Plan will induce land use and value changes of such order that will be of permanent nature but of such magnitude e.g. speculation, whose impact can be anticipated and contained within the CoI. The macroenvironment of the Project would have minor

impact on the aesthetics of the area but there would be positive impact due to operation of the system.

- The roads and bridges/underpasses generally operate without the need for major maintenance or repair, therefore there are no long-term impacts envisaged. During its design life, the Project should require no major repair or refurbishment, beyond routine maintenance like small scale ad-hoc repairs of surface damage caused by traffic use or accidents; repairs and replacement of damaged safety barriers and signs, etc.
- As there are no significant ecological resources in or around the project area, the operation and the routine repair & maintenance works will have no impacts on the precious ecology. There would be some ecological gain from the planting of trees to mask the visual impact of the structures.
- The implementation of Project will improve the infrastructure of the area by providing a more efficient and effective transportation route, and this should have positive impacts on the overall economy by reducing time spent idle in stationary traffic by delivery vehicles, employees and customers.
- There are unlikely to have any negative impacts on economic resources. The citizens of the project area in particular and Karachiites in general will benefit from a more effective transportation route as they will spend less time in stationary traffic exposed to noise, pollution and the associated physical and psychological stresses. Social and cultural resources may also benefit in a small way as it will be easier for people to reach their destinations. People may also benefit from an improvement in the economy of the city, although it would require much larger improvements in transportation and other infrastructure for this to be recordable.
- The Traffic Management Strategy (TMS) will address the local concerns of road users and residents on the issues of safety and environmental protection, whilst providing a practical input to support parking, delay control and public transport strategies.
- The high level of daily complaints by the general public demonstrates the importance of the issue of traffic management to the local population. Predominant concerns are:
    - Speeding;
    - Parking nuisance;
    - Lack of pedestrian facilities;
    - Accident risk;
    - Inadequate direction, warning and regulatory signs; and,
    - Inappropriate levels or type of traffic.
- Measures to address these concerns are largely "Management strategy", which includes:
    - The understanding of the congestion phenomenon
    - Promotion of sustainable travel,
    - Minor and major highway works,
    - Large Goods Vehicle Regulation,
    - Traffic Regulation Orders, and

- Design of quality signing schemes & road markings

5.5 Checklist of Actions Affecting Environment & Significance of Their Impact

Actions Affecting Environment Resources & Values	Damage To Environment	Recommended Mitigation Measures	Significance of Impact			
A. Environmental Problems due to Inadequate Design			**None**	**Small**	**Medium**	**Major**
1. Unrealistic assumptions on available O & M skills	1. Unnecessary damages because O&M requirements too high	1. Realistic O & M assumptions		**X**		
2. Pollution Control Equipment Selection	2. Assumed pollution removals not realized	2. Appropriate equipment selection		**X**		
3. Environmental pollution control operations	3. Possible loss in overall regional welfare	3. Careful planning/designing/monitoring and use of appropriate standards		**X**		
3a. Surface water (Fresh/esturine)	3a. Impairment of downstream beneficial water uses	3a. Careful planning & monitoring		**X**		
3b. Groundwater	3b Impairment of beneficial water uses	3b. Careful planning & monitoring		**X**		
3c. Air	3c. Impairment of air quality	3c. Careful planning & monitoring		**X**		
3d. Noise	3d. Environmental Degradation & Health hazard	3d. Careful planning & monitoring		**X**		
3e. Vibration	3e. Environmental degradation	3e. Careful planning & monitoring		**X**		
3f. Seismicity	3f. Seismic hazard	3f. Careful planning/Disaster Management Plan		**X**		
4. Impacts on adjacent land economic users including recreation/tourism	4. Impairment of land uses	4. Careful planning/O&M		**X**		
5. Occupational health & Safety hazards	5. Hazards to workers health & safety	5. Careful planning to offset problem		**X**		
6. Hazards due to Spills/fires/explosions	6. Hazards to workers health & safety	6. Contingency Plan & Disaster Management Plan		**X**		

Actions Affecting Environment Resources & Values	Damage To Environment	Recommended Mitigation Measures	Significance of Impact			
7. Area sanitation	7.Sanitation/disease hazards	7. Careful planning/design		**X**		
8. Hauling routes & entry/exit at Interchanges	8. Traffic congestion and nuisances along routes/Interchanges	8. Careful planning		**X**		
B. Environmental Problems During Construction Stage	C. Poor Construction Practices cause Environmental Degradation Problems, Hazards to workers health & safety	C. Careful Construction Planning and Implementation	**None**	**Small**	**Medium**	**Major**
1. Problems due to uncontrolled construction practices	1. Problems of Environmental Degradation, Hazards to workers health & safety	1. Careful Planning and Implementation		**X**		
a) run off erosion	(a) Problems of Environmental Degradation	a) Careful Planning and Implementation		**X**		
b) worker accidents	b) Problems of Environmental Degradation, Hazards to workers health & safety	b) Careful Planning and Implementation		**X**		
c) sanitation disease hazards	c) Environmental Health Risks	c) Careful Planning and Implementation of EMP		**X**		
d) insect vector disease hazards	(d) Environmental Health Risks	d) Careful Planning and Implementation of EMP		**X**		
e) hazardous material handling	(e) Problems of Environmental Management	e) Careful Planning and Implementation of EMP		**X**		
f) dust / odors / fume	(f) Problems of Environmental Degradation, Hazards to workers health & safety	f) Careful Planning and Implementation		**X**		
g) explosion/fire hazards/hazardous materials spills	(g) Problems of Environmental Degradation, Hazards to workers health & safety	g) Contingency Plan & Disaster Management Plan		**X**		

Actions Affecting Environment Resources & Values	Damage To Environment	Recommended Mitigation Measures	Significance of Impact			
h) noise/vibration hazards	(h) Problems of Environmental Degradation	h) Careful Planning and Implementation of EMP		**X**		
j) traffic congestion	(j) Problems of Environmental Management	j) Careful Planning and Implementation of EMP			**X**	
k) water pollution hazards	(k) Problems of Environmental Degradation	k) Careful Planning and Implementation of EMP		**X**		
l) blockage of wildlife passageways	(l) Problems of Environmental Degradation	l) Careful Planning and Implementation	**X**			
2. Uncovered cut & fill areas	2. Soil erosion & consequent damage to properties & environment	2. Careful Planning and Implementation of EMP			**X**	
2. Inadequate construction monitoring	2. Encourages poor construction practices	2. Adequate monitoring during construction		**X**		
C. Environmental Hazards Relating to Operations (assuming proper design assumptions on O&M)	D. Unnecessary Environmental Damages	D. Adequate O&M and Implementation of EMP	**None**	**Small**	**Medium**	**Major**
1. Inadequate O & M	1. Variety of environmental degradation similar to items B.1 to 8	1. Adequate O&M and Implementation of EMP		**X**		
2. Inadequate operations phase/environmental monitoring	2. Opportunity loss for feedback connections to project design and O&M	2. Adequate monitoring and Implementation of EMP		**X**		
3. Occupational Health & Safety Programmes including accidents	3. Hazards to workers health & safety	3. Careful O&M including readiness for emergency and Implementation of EMP		**X**		
4. Nuisance from handling & Transportation of fuels on access roads	4. oil drips, spills, dust & noise hazards	4. Careful O&M including safe driving and Implementation of EMP		**X**		
5. Surface run	5. leakage of fuel on ground & oil drips	5. Adequate O&M/monitoring and Implementation of EMP		**X**		

Actions Affecting Environment Resources & Values	Damage To Environment	Recommended Mitigation Measures	Significance of Impact			
D. Critical Environmental Review Criteria	E. Unnecessary Environmental Damages from Poor Planning	E. Careful Siting/ Design/O&M Monitoring and Implementation of EMP	**None**	**Small**	**Medium**	**Major**
1. Loss of irreplaceable resources	1. Long-term national environmental and economic losses	1. Planning will be consistent with high-level government policies		**X**		
2. Accelerated use of resources for short term gain	2. Long-term national environmental and economic losses	2. Planning will be consistent with polices		**X**		
3. Endangering of species	3. Long-term environmental losses	3. Planning to be consistent with polices	**X**			
4. Promoting undesirable rural-to-urban migration	4. Intensification of urban socioeconomic problems	4. Planning to be consistent with polices	**X**			
5. Increase in affluence/poor income gap	5. Intensification of national socioeconomic imbalances	5. Planning to be consistent with polices		**X**		
E. Potential Environmental Problems During Operation	F. Problems Normally Handled at Operation Stage	F. Carefully Implemented Environmental Management Plan, EMP	**None**	**Small**	**Medium**	**Major**
1. Removal or damage to vegetative growth	1. Problem at preparation of site & during operation	1. Careful implementation of EMP		**X**		
2. Land Use Changes	2. Problem at preparation of site & during operation	2. Careful implementation of EMP		**X**		
3. Micro level changes in the human settlements	3. Problem at siting & Operation stage	3. Careful implementation of EMP		**X**		
4. Industrial & Transportation Activities	4. Problem at Operation Stage	4. Careful implementation of EMP including Traffic Management		**X**		
5. Emergence of Slums & Wayside Commercial Activity	5. Problem at Construction & Operation Stage	5. Careful implementation of EMP		**X**		
F. Impacts from power Transmission facilities	G. Unnecessary Environmental Damages	G. Careful planning & Adequate O&M	**None**	**Small**	**Medium**	**Major**

Actions Affecting Environment Resources & Values	Damage To Environment	Recommended Mitigation Measures	Significance of Impact			
1 Environmental health hazard due to electromagnetic radiation	1. Unnecessary exposure of workers to environmental hazards.	Careful planning, training of workers		**X**		
2. Depreciation of environmental aesthetics	2. Loss of values	2. Careful planning & implementation		**X**		
3. Encroachment on ecosystem	2. Loss of precious ecology	2. Careful planning		**X**		
Overall Rating: The overall significance of impact of activity pertaining to construction of Karimabad Underpass will be of small order.			**03**	**42X**	**02**	

6. Environmental Management Plan (EMP)

6.1 Introduction

This Environmental Management Plan (EMP) will serve as a principal execution module of the project that would not only mitigate adverse environmental impacts during the construction and the operation phase of the project but also ensures that environmental standards and good in housekeeping, is maintained. Continuous environmental monitoring is exercised to ensure that preventive measures are in place and effective to sustain environmental integrity. Some of the key objectives of EMP are to:

- To outline functions and responsibilities of responsible persons.
- To state and implement standards and guidelines which are required under environmental legislations particular in context to the project.
- Facilitates the implementation of the mitigation measures by providing the technical details of each project impact and proposing implementation schedule of the proposed mitigation measures.
- Define a monitoring mechanism and identify monitoring parameters to ensure that all proposed mitigation measures are completely and effectively implemented.
- Identify training requirements at various levels and provide a plan for the implementation of training sessions.
- Identify the resources required to implement the EMP and outline corresponding financing arrangements; and
- Providing a cost estimate for all proposed EMP actions.

6.2 Functions and Responsibilities

Formal responsibilities are necessary to be designated in order to ensure that key procedures are executed and desired functions are carried out effectively. Specific responsibilities of the Project Manager, Site Manager, Environmental Officer, Contractor and Independent Monitoring Consultant (IMC) are detailed below.

The Project Manager shall:

- Ensure that the contractor is aware of all specifications, legal constraints, standards and procedures pertaining to the project specifically with regards to environment.
- Ensure that all stipulations within the EMP are communicated and adhered to by contractor(s).
- Monitor the implementation of the EMP throughout the project by means of site inspections and meetings. This will be documented as part of the minutes of the site meeting documents.
- Be fully conversant with the Environmental Assessment of the project, the conditions of the approval of EIA and all relevant environmental legislations.

The Site Manager shall:

- Be fully conversant with the Environmental Assessment and conditions of its approval.
- Be fully conversant with the Environmental Management Plan.
- Be fully conversant with all relevant environmental legislation, policies and procedures, and ensure compliance with these.
- Have overall responsibility for the implementation of EMP.
- Conduct audits to ensure compliance to the EMP.
- Liaise with the Project Manger or his delegate, the Environmental Officer and relevant discipline Engineers on matters concerning the environment.
- Prevent actions that will harm or may cause harm to the environment, and take steps to prevent pollution on the site.
- Confirm activities to the demarcated construction site.

The Environmental Control Officer (ECO) shall:

- Be fully conversant with the Environmental Assessment and conditions of its approval.
- Be fully conversant with the Environmental Management Plan.

- Be fully conversant with all relevant environmental legislation, policies and procedures, and ensure compliance with these.
- Convey the contents of this document to the contractor site staff and discuss the contents in detail with the Project Manager and Contractor.
- Undertake regular and comprehensive inspection of the site and surrounding areas in order to monitor compliance with the EMP.
- Take appropriate action if the specifications contained in the EMP are not followed.
- Monitor and verify that environmental impacts are kept to a minimum, as far as possible.
- Review and approve construction methods, with input from the Site Manager, where necessary.
- Ensure that activities on site comply with all relevant environmental legislation.
- Order the removal of person(s) and/or equipment in contravention of the specifications of the EMP.
- Compile progress reports on regular basis, with input from the Site Manager, for submission to the Project Manager, including a final post construction audit.
- Liaise with the Site Manager regarding the monitoring of the site.
- Report any non-compliance or remedial measures that need to be applied.
- All environmental problems arising on the construction area will be reported to the Site Manager by the Environmental Manager. Reports on such problems will be submitted to the Project Manager by the Site Manager.

Contractors and Service Providers:

- Environmental management is part of on-site quality management. Under the environmental management plan, the contractor:
- Shall propose measures to minimize environmental impacts during construction process, and submit them to the Environmental Officer.

- In case of having impacts on the environment, the contractor will inform them to the Environmental Officer in time to get instructions and then take next step.
- Comply with the environmental management specifications;
- Submitting an obligatory Methods Statement for approval by the Environmental Officer before any work is undertaken;
- Adhering to any instructions issued by the Engineer/Project Manager on the advice of the Environmental Officer;
- Submitting a report at each site meeting which will document all incidents that have occurred during the period before the site meeting.
- Displaying the list of transgressions issued by the Environmental Officer in the site office.
- Maintaining a public complaints register.
- Arrange that all his employees and those of his subcontractors receive training before the commencement of construction.

Independent Monitoring Consultant: Independent Monitoring Consultant appointed will be headed by Project Manager. He along with his team will supervise the Project Contractors to ensure quality of work and fulfillment of contractual obligations. The Independent Monitoring Consultant (IMC) shall:

- Ensure that all environmental and social parameters/provisions comply with the applicable standards;
- Ensure that day-to-day construction activities are carried out in an environmentally sound and sustainable manner.
- Organize periodic environmental training programmmes and workshops for the Contactor's staff and Site staff in consultation with the administration; and
- Develop "good practice" construction guidelines to assist the Contractors and Administrative staff in implementing the EMP.

Independent Safety Manager will:

- Also be appointed for the project. The Safety Manager will identify safety deficiencies at various stages in the development of the project, so that they can be eliminated at the most opportune time to reduce costs and minimize disruption to design and construction progress. It will be the Safety Manager's responsibility to critically examine all aspects of the project which may have adverse safety implications, considering carefully the needs of all road users.

- Shall specifically describe the safety deficiencies, potential or real, which have been identified along with the relevant references to accepted standards, practices and highway safety principles.

The Sindh Environmental Protection Agency (EPA) is mandated to oversee and regulate environmental compliance. EPA may check at any point whether activities comply with national environmental legislation and monitor enforcement of recommendations for environmental mitigation measures as prescribed in the EIA.

6.3 Environmental Management Plan

The proposed subproject and its components, the baseline environmental profile of the project area, the anticipated environmental impacts and appropriate mitigation measures to avoid / reduce / mitigate / compensate for the identified impacts have been discussed in detailed in earlier sections.

This Environmental Management Plan is developed for implementation listing the impacts, appropriate mitigation measures, delegating the responsibility of implementation to concerned agencies. This is shown in the following Table 6-1.

6.4 Environmental Monitoring Plan

A program of monitoring will be conducted to ensure that all the parties take the specified action to provide the required mitigation, to assess whether the action has adequately protected the environment, and to determine whether any additional measures may be necessary. Regular monitoring of implementation of mitigations measures by Construction Contractor will be conducted by the Implementing Agency. Periodic monitoring and overseeing of implementation of mitigation measures will be conducted by the IMC. Monitoring during operation stage will be conducted by the Operating Agency.

Most of the mitigation measures are fairly standard methods of minimizing disturbance from building in urban areas (public inconvenience and traffic

disruptions). Monitoring of such measures normally involves making observations in the course of site visits, although some require more formal checking of records and other aspects.

Table 6-2 shows the proposed Environmental Monitoring Plan for this Project, which specifies the various monitoring activities to be conducted during different phases of the project. The plan describes: (i) mitigation measures, (ii) location, (iii) measurement method, (iv) frequency of monitoring and (v) responsibility (for both mitigation and monitoring).

6.5 Grievance Redress Mechanism

Timely and effective redress of stakeholder grievances contribute to bringing sustainability in the operations of a project. In particular, it will help advocate the process of forming and strengthening relationships between project management and the stakeholder community groups and bridge any gaps to create a common understanding, providing the project management the 'social license' to operate in the area.

The grievance redress mechanism proposed for the Project will help achieve the objectives of sustainability and cooperation by dealing with the environmental and social issues of the Project.The proposed grievance redress mechanism will be designed to cater for the issues of the people that can be affected by the Project.

6.5.1 Framework for Grievance Redress Mechanism

The Owners will develop a stakeholder grievance redress mechanism.

6.5.2 Environmental Regulations

The Federal Agency, under Regulation 6 of the IEE-EIA Regulations 2000, has issued a set of guidelines of general applicability and sectoral guidelines indicating specific assessment requirements. Under the regulations and guidelines, no specific requirements are laid out for developing a grievance redress mechanism for projects.

However, under its Guidelines for Public Consultation, 1997, the proponents are required to consult stakeholders during the implementation phase of the project. In this regards, it is stated that the representatives of local community partake in the monitoring process to promote a stable relationship between the project management and the community.

6.5.3 Outline of Mechanism for Grievance Redress

The Owners will have an effective mechanism to ensure timely and effective handling of grievances related to the Project. It may include:

- A Public Complaints Unit (PCU), which will be responsible to receive, log, and resolve complaints; and,
- A Grievance Redress Committee (GRC), responsible to oversee the functioning of the PCU as well as the final non-judicial authority on resolving grievances that cannot be resolved by PCU;
- Grievance Focal Points (GFPs), which will be educated people from the community that can be approached by the community members for their grievances against the Project.

Table 6-1: Environmental Management Plan

Impact	Significance	Duration	Mitigation	Responsibility
Preconstruction				
Involuntary resettlement	L	P	➢ Implement compensatory measures ➢ Suggested measures must be implemented before the signing of contract for civil works including: o Compensation equivalent to the amount of business income lost as a result of the construction process; o Compensation at replacement cost for lost income-generating assets (shop premises, etc); o Additional financial assistance to enable them to re-establish their business at an alternative location.	KDA
Construction				
Tree Cutting			➢ Obtain necessary approvals from concerned authority for tree cutting ➢ Plant and maintain five trees for each tree felled as a compensatory measure	CC

Table 6-1: Environmental Management Plan

Impact	Significance	Duration	Mitigation	Responsibility
Excavation will produce large quantity of waste soil, which needs proper disposal.	L	P	➢ Utilize surplus soil for beneficial purposes such as in construction activities elsewhere and filling up low-lying areas	CC
Dust nuisance due to construction	M	T	➢ Cover or damp down by water spray on the excavated mounds of soil to control dust generation ➢ Damp down soil while moving from excavation area to earthen ramp portion ➢ Damp down the surface of the developing ramps and any soil stockpiled on site by spraying with water when necessary during dry weather; ➢ Use tarpaulins to cover soil/materials when transported by truck ➢ Bring the material (aggregate) as and when required; ➢ Use tarpaulins to cover loose material/soil that is transported to and from the site by truck ➢ Damp down soil sufficiently while using for leveling the ground ➢ Control dust generation while unloading the material (particularly aggregate) at the site by sprinkling water and unloading an a barricaded area ➢ Sprinkle water in truck after downloading material; or cover it with tarpaulin to avoid dust raging from the truck while it is moving	CC
Impacts on drainage			➢ Do not divert/dispose silt laden water into drains directly ➢ Provide temporary ponds in the site for temporary storage; dispose of clarified water into nearest drains ➢ Ensure that disposal into drains do not lead to water accumulation in the nearby areas	CC

Table 6-1: Environmental Management Plan

Impact	Significance	Duration	Mitigation	Responsibility
			➢ Divert existing drains in the working section (ROW) temporarily; construct a temporary drain if required ➢ Complete construction of new drain as soon as possible and restore the flow	
Generation of noise and vibrations from excavation	L	T	➢ Consultation with the local community to inform them of the nature, duration and likely effects of the construction work, and the mitigation measures in place ➢ Do not conduct noise generating activities in the night ➢ Employ manual methods, where required ➢ Proper planning of work programme so that any particularly noisy activities can be scheduled to avoid sensitive times; ➢ Utilize modern vehicles and machinery with the requisite adaptations to limit noise and exhaust emissions, and ensuring that these are maintained to manufacturers' specifications at all times.	CC
Impacts due to improper mining for construction materials	L	P	➢ Ensure that construction materials (sand, aggregate and gravel) are obtained from quarries licensed by district government	CC
Shops and other business may lose income if costumer's access is impeded	L	T	➢ Inform the public in general and business establishments in particular about the work in advance ➢ Maintain service roads and pedestrian walks in good condition ➢ Control dust generation	CC
Excavation could damage existing infrastructure / utilities	L	P	➢ Confirm location of underground infrastructure/utilities before start of work ➢ Provide prior public information about the likely disruption of services ➢ Ensure that alternate arrangements are provided during the relocation	CC

Table 6-1: Environmental Management Plan

Impact	Significance	Duration	Mitigation	Responsibility
Hindrance to traffic due to construction work	M	T	➢ Maintain the service roads in good condition to allow smooth traffic movement; provide necessary personnel to guide and control the traffic ➢ Provide alternative traffic arrangement/detours so that traffic can be distributed and move on different roads and ensure that public is informed about such traffic diversions ➢ Barricade the site properly; avoid accidental entry of traffic (pedestrian / vehicular) into site. ➢ Provide information to the public through media–daily newspapers and local cable television (TV) services, about the need and schedule of work, and alternative routes ➢ At the work site, public information/caution boards shall be provided - information shall inter-alia include: project name, cost and schedule; executing agency and contractor details; nature and schedule of work; traffic diversion details, if any; entry restriction information; competent official's name and contact information for public complaints.	CC
Increase in traffic due to trucks carrying construction material and heavy equipment	L	T	➢ Plan routes to avoid narrow streets, congested roads, and places of religious importance ➢ Plan work to avoid peak traffic hours	CC
Workers and public at risk from accidents on site	M	T	➢ Follow standard and safe construction practices ➢ Exclude the public from the site – enclose/barricade the construction area, provide warning boards/sign boards and post security guards throughout the day and night ➢ Ensure that all workers are provided with and use appropriate Personal Protective	CC

Table 6-1: Environmental Management Plan

Impact	Significance	Duration	Mitigation	Responsibility
			Equipment (helmet, hand gloves, boots, masks, safety hoists when working at height, etc); ➢ Barricade the entire area that may come under influence in case of accidents – this may particularly be critical during fixing of pre-cast girders using heavy duty cranes; this may be conducted during lean traffic periods and if required traffic may also be stopped ➢ Follow standard practices of safety checks as prescribed before use of equipments such as cranes, hoists, etc. ➢ Employ an Environmental, Health and Safety (EHS) Expert on site; ➢ Provide on-site Health and Safety Training for all site personnel; ➢ Report accidents to the authorities promptly, and maintain records	
Economic benefits for people employed in workforce	L	T	➢ Ensure that most of the unskilled workforce is from local communities	CC

Table 6-2: Environmental Monitoring Plan

Mitigation Measures	Responsible for Mitigation	Monitoring Method and Parameters	Monitoring Frequency	Responsible for Monitoring
Preconstruction				
➢ Implement compensatory measures	KDA	Records review; interview with APs	As needed	IMC
➢ Obtain necessary approvals for tree cutting ➢ Plant and maintain five tree	CC	Records review; onsite-observation	As needed	IMC

for each tree felled				
➢ Confirm location of underground infrastructure ➢ Inform public about the likely disruption of services ➢ Ensure alternate arrangements during the relocation	CC	Observations on-site; CC records; Consult respective agencies; informal public interviews	Weekly	IMC
Construction				
➢ Utilize surplus soil for beneficial purposes	CC	Observations onsite/off-site; CC records	Weekly	IMC
➢ Damp down soil to arrest dust ➢ Use tarpaulins to cover soil in transport				
➢ Do not divert/dispose silt laden water into drains ➢ Provide temporary ponds in the site ➢ Ensure that no water accumulated due to disposal ➢ Divert existing drains in the work area (ROW) ➢ Construct temporary drains if required ➢ Complete construction of new drain early				

➢ Inform local community about the work ➢ Identify old and sensitive buildings and safe practices ➢ Do not conduct noise generating activities in the night ➢ Employ manual methods, where required ➢ Avoid noisy or invasive activities in sensitive times;				
➢ Utilize modern machinery and in good condition				
➢ Obtained construction material from licensed quarries				
➢ Inform public and business about the work in advance ➢ Maintain service roads / pedestrian walks in good condition				
➢ Provide necessary personnel to guide & control traffic ➢ Provide bypasses / traffic detours & inform public ➢ Barricade the site properly; avoid accidental entry	CC	Observations on-site; CC records; informal public interviews	Weekly	IMC

➢ Provide information to the public through media ➢ Provide public information / caution boards at site				
➢ Avoid congested / sensitive roads for material transport ➢ Avoid peak traffic hours				
➢ Follow standard and safe construction practices ➢ Exclude the public from the site and post security guards ➢ Provide Personal Protective Equipment to workers ➢ Barricade the entire area that may come under influence in case of accidents ➢ Follow standard safety checks as prescribed for equipment ➢ Employ EHS Expert on site ➢ Provide on-site Health and Safety Training for personnel ➢ Report accidents and maintain records				

➢ Engage unskilled workforce from local communities				

Table 6-3: Environmental Monitoring Parameters

Monitoring Item	Construction Stage	Operation Stage
Noise & Vibration Monitoring		
Monitoring Parameter	Leq (dBA)	Leq (dBA)
Monitoring Frequency	Measuring 2 Times Per Month, 16 hours/day, 3 times/hour	Measuring 1 time per quarter during the first 12 months
Comparative Standard	NEQS, International	NEQS, International
Air Quality Monitoring		
Monitoring Parameter	CO, CO_2, SO_2, NOx, Dust	CO, CO_2, SO_2, NOx, Dust
Monitoring Frequency	Measuring 2 Times Per Month, 16 hours/ day, 3 times / hour	Measuring 1 time per quarter during the first 12 months
Comparative Standard	NEQS	NEQS
Solid Water Removal		
Monitoring Parameter	Solid Waste/Construction Debris	Solid Waste/Construction Debris/Garbage
Monitoring Frequency	This has to be removed before the operation phase begins. The garbage dumping will not be allowed at the roads.	
Comparative Standard	------	-------
Removal of Encroachments		
Monitoring Parameter	Encroachments	Encroachments
Monitoring Frequency	Nobody shall be allowed to encroach on any further land/area. Strict action would be taken against the violator.	
Comparative Standard	------	-------

7. Conclusion

The environmental assessment process described in this document has evaluated the environmental impacts of the proposed "Karimabad Underpass" project. The *proposed intervention at Karimabad Intersection* is part of the Sindh Government's plan towards Signal Free Corridor in and around project area. The project would help to reduce traffic congestion in the area. Some of the benefits include:

- The space in front of Bazar-e-Faisal & Meena Bazar will remain intact, and Level of Service (LoS) will be increased.
- The proposed underpass will facilitate the Traffic from Usman Medical Hospital to Zia Uddin Hospital without any traffic conflict.
- The Long Barrel will facilitate the area in from of Bazar-e-Faisal & Meena Bazar, where Traffic will be through both via Underpass and on the Barrel.
- The proposed Roundabout will allow the Traffic movements in controlled manner, as the Roundabout is considered to play a huge impact in the Traffic Calming.
- The Conflicts at Karimabad Intersection will be reduced and Black Spots which results in the accidents will be reduced.

The project responds to the emerging need of traffic management resulting from continuity of development activities sought by Karachi Development Authority (KDA) in the project area. There has been continuous increase in the volume of vehicular traffic while the project area is constrained by capacity of the roads. The activities in the Project area are likely to entail a tremendous increase in Trip attraction/generation rates for which a master plan must be in hand to forecast the traffic movement and its handling.

Once the construction is over, the Project will function without any major maintenance, so no major impacts are envisaged. Operation of the Project will, on adoption of the mitigation measures, have reduced significance of impact on the physical as well as socioeconomic structure of the microenvironment and macroenvironment of its corridor of impact (CoI).

The proposed Project, when commissioned, would be integrated into the concerned microenvironment of and a friendly component of its macroenvironment. The nature of Project, its siting; adoption of adequate measures to minimize waste and control pollution during construction as well as operation stages of the project will have residual impact of low significance on the microenvironment and macroenvironment as well as on precious ecology.

Construction of underpass at the proposed site and operation of vehicular traffic is not expected to have unacceptable/significant impact on the aesthetics of the

microenvironment and macroenvironment. The impact, if identified, will be mitigated through careful planning, suitable landscaping and adopting appropriate mitigation measures, besides providing a monitoring and contingency plan.

Mitigation will be assured by a program of environmental monitoring conducted to ensure that all measures are provided as intended, and to determine whether the environment is protected as envisaged. This will include observations on and off site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the EPA Sindh.

There are two essential recommendations that need to be followed to ensure that the environmental impacts of the project are successfully mitigated. The Implementing Agency (KDA) shall ensure that:

- All mitigation, compensation and enhancement measures proposed in this EIA report are implemented in full, as described in the document;

- The Environmental Management and Monitoring Plan is implemented in letter and spirit.

Screening of potential impact suggests that proposed "Karimabad Underpass" will, on adoption of the suggested mitigation measures, be an environmentally acceptable proposition.

Furthermore the Project will achieve the prime objectives of sustainable development in facilitating safe, secure and speedy travel along the Corridor V, besides upgrading and modernizing the infrastructure facilities of the fast growing section by identifying the bottlenecks and removing the constraints to smooth flow of traffic.

Annexures

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI

SUMMARY OF COST

SR. No.	ITEMS OF WORKS	COST (Rs.)
1	CIVIL WORKS	953,156,001
2	ELECTRIFICATION	144,784,878
A	**SUB-TOTAL**	**1,097,940,879**
B	**CONSULTANCY**	
i	3.25% FOR DESIGN ON B	35,683,079
	SUB-TOTAL	**35,683,079**
C	**PROVISION FOR ESCALATION**	
	6.5% IN 2ND YEAR	71,366,157
D	**CONTINGENCY**	
	ADD 2% CONTINGENCY ON B	21,958,817.59
E	**GRAND TOTAL (A+B+C+D)**	**1,226,948,933**
F	**Utilities Relocation / Protection etc.**	**120,000,000**
	TOTAL COST OF PROJECT	**1,346,948,933**

SUB-ENGINEER
ENGINEERING DEPARTMENT
KDA

ASSISTANT EXECUTIVE ENGINEER
ENGINEERING DEPARTMENT
KDA

EXECUTIVE ENGINEER
ENGINEERING DEPARTMENT
KDA

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI

ABSTRACT OF COST (CIVIL WORKS)

S. No	ITEMS	QUANTITIES	UNITS	RATES	AMOUNT
A	**SCHEDULE ITEMS**				
1	**Road Works**				
1	Clearing and grubbing the site by cutting, uprooting and removing all rubbish and shrubs including disposal to (outside limits) designated places. V-III, Part-6, Item no. 1 page 01	369,175.60	% SFT	97.07	358,358.75
2	Dismantling of existing asphalt concrete road including base,sub-base and disposal of dismantling material to designated placed. Sch/Highways/F Item:11,Pg:15	1,067,370.40	% CFT	773.86	8,259,952.58
3	Earth Excavation ash,sand soft soil or silt clearnce undresses lead upto 50ft. (Sch/Vol-I/Pg-01,Itm-02)	1,067,370.40	% CFT	3,327.50	35,516,750.06
4	Cartage of 100 CFT / 5 tons of all material likes one aggregate, spawl, coal, lime, surkhi etc. B.G. Rait fastenings points & crossing Bridges Girders, Pipes, Sheets Raits, M.S. Bars etc. or 1000 Nos brinks, 10' x 5' x 3' or 1000 manuds of fuel wood by trucks or any other means owned by the contractors (Lead upto 10 Miles etc). CSR-2012. (Sch/Vol-III/Part IV/	5,409,222.68	% CFT	1,065.00	57,608,221.54
5	Compaction of Natural Ground upto a depth of 20cm (8" inch) below the natural ground level compacted upto 90% density modified AASHTO. V-III, Part-6, Item no. 2 page 1	325,167.20	% SFT	177.56	577,366.88
6	Preparing sub grade in cluding earth excavation or filling to an average depth of 9" dressing to camber and consolidation with power Roller V-III, Part-6, Item no. 9 page 02	369,175.60	% SFT	526.28	1,942,897.35
7	P/L Granular sub-base course material over prepared sub grade in conformity with liner grader thickness and typer cross section as shown in drawing for new pavements at grade wideining exisiting pavement using well graded granular crushed stone with sand and silt having a smooth gradation curve with in the limit for grading C or D as per AASHTO T-180 method D using approved minerals means of i/c watering with all land and lift complete as per specification as directed by the Engineer Incharge. (Vol-III, (Highways), Chap-2, Pg-4, Sr.11-d)	144,559.14	% CFT	3,341.71	4,830,747.24
8	Providing and laying Aggregate base course in proper grade and chamber having CBR 80% as per AASHTO standard specifications i/c spreading and compacting by approved mechanical means (Motor grader, Vibratory roller and smooth wheel roller etc) watering to maintain the moisture content the compaction of each layer shall 100 percent to the max dry density (rate i/e all cost of material T&P and carriage upto 3 chains) V-III, Part-6, Item no. 13(B) page 05	144,559.14	% CFT	5,542.24	8,011,814.48

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI

ABSTRACT OF COST (CIVIL WORKS)

S. No	ITEMS	QUANTITIES	UNITS	RATES	AMOUNT
9	**2" (50mm) Thick Asphalt Concrete Wearing Course** **Plant Mix** Laying to proper line and grade plant mixed Asphalt concrete paver finished (Hydraulic / Electronic control) Prepared to specified formula according to job mix formula approved by engineer incharge including rolling and finishing to properline, grade level and camber etc (Machinery with POLs cost of material carriage). V-III, Part-6, Item no. 24(B) page 10	369,175.60	% SFT	15,051.82	55,567,646.80
10	**3'' (75mm) Asphaltic Base Course** **Plant Mix** Providing and laying plant mixed Asphalt Concrete Binder course compacted thickness 3 inches (75mm thick) as per approved job mix formula using crush aggregate from approved sources. Using asphalt of grade 60/70 during laying temperature not less than 140C compacted by steel wheel & PTR roller. the procedure of laying binder course material and methodology shall fully comply with AASHTO and as directed by Engineer Incharge. Minimun bitumen content should be 3.5% binder course shall be spreading using paver machine. Rolling & Finishing to design proper grade line level and camber etc. (Machinery with POLs cost of material carriage) V-III, Part-6, Item no. 23(a) page 09	220,257.20	% SFT	10,769.91	23,721,502.21
	Road Furniture				
11	Pavement marking in Reflective Thermoplastic Paint for lines of 6" width V-III, Part6, Item no. 39(13) page 15	18,373.60	RFT	41.24	757,727.26
12	CatEyes/Road Studs Supplying and fixing of reflectorize Road Stud Double Face, Flush surface type. V-III, Part-6,Item no. 39 (12) page 15	520.00	NO.	596.23	310,039.60
13	Providing & Fixig each Informatory Sign Rectangular shape 4xx3" comprizing 2 Nos: 3" Dia G.I pipe Post i/c Painting, writing as directed each. V-III, Part-6, Item no. 39 (18 -c-II) page 17	25.00	NO.	16,956.00	423,900.00
14	**Kerbstone** Providing & fixing Precast Edge Block 3750 PSI industrial Made Size 6 inches thick x 12 inches long x 12 inches high including the cost of Cartage, excavation, form Work for haunching, 1450 PSI lean concrete, 2250 PSI concrete for haunching, 1:4 cement sand mortor .V-III, Part-6, Item no. 14 page 16	3,970.01	RFT	297.01	1,179,132.67

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI

ABSTRACT OF COST (CIVIL WORKS)

S. No	ITEMS	QUANTITIES	UNITS	RATES	AMOUNT
15	Providing & fixing cement paving blocks flooring having size of 197 x 97 x 60 (mm) of city / quddra / cobble shape with pigmented, having strength b/w 5000 psi to 8500 psi I/c filling the joints with hill sand and laying in specified manner/ pattern and design etc: complete. Chp no. 08, Item no. 72, Pg 49	24,317.60	SFT	223.97	5,446,412.87
16	Providing and laying fairfaced 15 reinforced cement concrete new jersey barrier having 3000 PSI compressive cylindrical strength Concrete (Ready mixed concrete) (area 3.50 Siy as per drawing including the cost of excavation, formwork, lean concrete compressive 1450 PSI cylindrical strength etc. complete in all respect. (excluding the cost steel reinforcement). V-III, Part-6, Item no. 15 page 16	1,968.60	RFT	1,224.61	2,410,767.25
	Dismantling works				
17	Dismantling of Cement concrete 1:2:4 work V-III, Part-3, Chp 2, Item no. 19©, page 10	111,258.00	% CFT	3,327.00	3,701,553.66
	Structures				
18	Compacted Earth-Fill Supplying and filling sand under floor and plugging in walls. Chp no. 05, Item no. 29, Pg 26	23,375.22	% CFT	1,141.25	266,769.70
19	Bitumen coating to plastered or cement concrete surface. (S/I No.9, Ch/11, P/71)	208,206.00	% SFT	778.09	1,620,030.07
20	Cement concrete plain including placing compacting, finishing and curing, comlete (including screening and washing at stone aggregate without shuttering. Lean Concrete (1:4:8). V-III, Part-3, Chp no. 04, Item no. 5 (i), Pg 16	69,066.36	% CFT	11,288.75	7,796,728.71
21	Providing and laying reinforced cement concrete having 4000 PSI cylindrical strength (ready mixed concrete) including all kinds of formwork, hoisting, placing, placing compacting, finishing, curing complete in all respect as shown on the drawing. V-III, Part-3, Chp no. 18, Item no. 102, Pg 112	531,005.90	% CFT	28,814.66	153,007,545.82
22	Fabrication of mild steel reinforcement for cement concrete including cutting, bending, laying in position, making joints and fastenings including cost of binding wire (also includes removal of rust from bars.) Using Tor Bars (Vol-III, Part-II, Ch-2, Pg-17, Sr. 8 a)	1,422.34	TONS	100,034.00	142,282,083.75
23	Structural Excavation in Common Material NHA 2022 CENTRAL106a	3,163,223.88	CFT	11.07	35,027,486.18

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI

ABSTRACT OF COST (CIVIL WORKS)

S. No	ITEMS	QUANTITIES	UNITS	RATES	AMOUNT
24	Common Backfill NHA 2022 CENTRAL107e	2,213,629.80	CFT	8.91	19,726,500.01
25	Neoprene Rubber joint filter 12mm thick with bitumastic joint seal. NHA 2022 CENTRAL 406b	6,907.92	SFT	502.37	3,470,324.58
B	**NON SCHEDULE ITEMS**				
26	P/S Tack coat with medium curing asphalt of penetration grade 60/70 prime coats shall be used @ of 11 hires % Sft (1.2 with adequate quantity of kerosene oil, using uniformly pressure spray distributor / boiler with automatic temperature controller. Prior to application of the prime coat all used material shall be removed from the base course and the same shall be cleaned y means of approved mechanical sweepers blowers, hard brooms and disposal the same within three chain after the application, traffic shall be kept of from surface till the laying of bituminous course Material and methodology shall fully comply the tests and specification AASHTO and as directed by the Engineer Incharge.	220,257.20	SFT	15.00	3,303,858.00
27	P/S prime coat with medium curing asphalt of penetration grade 60/70 prime coats shall be used @ of 11 hires % Sft (1.2 with adequate quantity of kerosene oil, using uniformly pressure spray distributor / boiler with automatic temperature controller. Prior to application of the prime coat all used material shall be removed from the base course and the same shall be cleaned y means of approved mechanical sweepers blowers, hard brooms and disposal the same within three chain after the application, traffic shall be kept of from surface till the laying of bituminous course Material and methodology shall fully comply the tests and specification AASHTO and as directed by the Engineer Incharge.	369,175.60	SFT	15.00	5,537,634.00
				A = Total Schedule Amount Rs.	**573,822,260.02**
				B = Total Non Schedule Amount Rs.	**8,841,492.00**
				DIFFERENCE COST OF MATERIAL	**370,492,249.47**
				GRAND TOTAL AMOUNT	**953,156,001.49**

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI

S. No.	Description	Unit	No	L	B	H	TOTAL
	Road Works						
1	Clearing and grubbing the site by cutting, uprooting and removing all rubbish and shrubs including disposal to (outside limits) designated places. V-III, Part-6, Item no. 1 page 01						
		SqM	2	750.00	6.10		9,150.00
		SqM	2	450.00	7.10		6,390.00
		SqM	2	750.00	6.10		9,150.00
		SqM	2	300.00	13.20		7,920.00
		SqM	1	1700.00	1.00		1,700.00
		SqM					**34,310.00**
		Sqft					**369,175.60**
2	Dismantling of existing asphalt concrete road including base,sub-base and disposal of dismantling material to designated placed. Sch/Highways/F Item:11,Pg:15						
		CUM	2	750.00	7.10	0.152	10,650.00
		CUM	2	750.00	6.10	0.152	9,150.00
		CUM	2	300.00	13.20	0.152	7,920.00
		CUM	1	500.00	5.00	0.152	2,500.00
	TOTAL	**CUM**					**30,220.00**
	TOTAL	**Cft**					**1,067,370.40**
3	Earth Excavation ash,sand soft soil or silt clearnce undresses lead upto 50ft. (Sch/Vol-I/Pg-01,Itm-02)						
		CUM	2	750.00	7.10	0.152	10,650.00
		CUM	2	750.00	6.10	0.152	9,150.00
		CUM	2	300.00	13.20	0.152	7,920.00
		CUM	1	500.00	5.00	0.152	2,500.00
	TOTAL	**CUM**					**30,220.00**
	TOTAL	**Cft**					**1,067,370.40**
4	Cartage of 100 CFT / 5 tons of all material likes one aggregate, spawl, coal, lime, surkhi etc. B.G. Rait fastenings points & crossing Bridges Girders, Pipes, Sheets Raits, M.S. Bars etc. or 1000 Nos brinks, 10' x 5' x 3' or 1000 manuds of fuel wood by trucks or any other means owned by the contractors (Lead upto 10 Miles etc). CSR-2012. (Sch/Vol-III/Part IV/						
	Quantity Same as Item # 01	CUM					30,220.00
	Quantity Same as Item # 02	CUM					30,220.00
	Quantity Same as Item # 15	CUM					3,150.00
	Quantity Same as Item # 20	CUM					89,559.00
	TOTAL	**CFT**					**5,409,222.68**

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI

S. No.	Description	Unit	No	L	B	H	TOTAL
5	Compaction of Natural Ground upto a depth of 20cm (8" inch) below the natural ground level compacted upto 90% density modified AASHTO. V-III, Part-6, Item no. 2 page 1						
		SqM	2	750.00	7.10		10,650.00
		SqM	2	750.00	6.10		9,150.00
		SqM	2	300.00	13.20		7,920.00
		SqM	1	500.00	5.00		2,500.00
	TOTAL	**SqM**					**30,220.00**
	TOTAL	**Sqft**					**325,167.20**
6	Preparing sub grade in cluding earth excavation or filling to an average depth of 9" dressing to camber and consolidation with power Roller V-III, Part-6, Item no. 9 page 02	SqM	2	750.00	6.10		9,150.00
		SqM	2	450.00	7.10		6,390.00
		SqM	2	750.00	6.10		9,150.00
		SqM	2	300.00	13.20		7,920.00
		SqM	1	1700.00	1.00		1,700.00
		SqM					**34,310.00**
		Sqft					**369,175.60**
7	P/L Granular sub-base course material over prepared sub grade in conformity with liner grader thickness and typer cross section as shown in drawing for new pavements at grade wideining exisiting pavement using well graded granular crushed stone with sand and silt having a smooth gradation curve with in the limit for grading C or D as per AASHTO T-180 method D using approved minerals means of i/c watering with all land and lift complete as per specification as directed by the Engineer Incharge. (Vol-III, (Highways), Chap-2, Pg-4, Sr.11-d)	SqM	2	750.00	6.10		9,150.00
		SqM	2	450.00	7.10		6,390.00
		SqM	2	750.00	6.10		9,150.00
		SqM	2	300.00	13.20		7,920.00
		SqM	1	1700.00	1.00		1,700.00
		SqM					**34,310.00**
		Sqft					**369,175.60**

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI

S. No.	Description	Unit	No	L	B	H	TOTAL
8	Providing and laying Aggregate base course in proper grade and chamber having CBR 80% as per AASHTO standard specifications i/c spreading and compacting by approved mechanical means (Motor grader, Vibratory roller and smooth wheel roller etc) watering to maintain the moisture content the compaction of each layer shall 100 percent to the max dry density (rate i/e all cost of material T&P and carriage upto 3 chains) V-III, Part-6, Item no. 13(B) page 05	CuM	2	750.00	6.10	0.20	1,830.00
		CuM	2	300.00	13.20	0.20	1,584.00
		CuM	2	1700.00	1.00	0.20	680.00
		CuM					**4,094.00**
		CFT					**144,559.14**
9	3'' (75mm) Asphaltic Base Course Plant Mix Providing and laying plant mixed Asphalt Concrete Binder course compacted thickness 3 inches (75mm thick) as per approved job mix formula using crush aggregate from approved sources. Using asphalt of grade 60/70 during laying temperature not less than 140C compacted by steel wheel & PTR roller. the procedure of laying binder course material and methodology shall fully comply with AASHTO and as directed by Engineer Incharge. Minimun bitumen content should be 3.5% binder course shall be spreading using paver machine. Rolling & Finishing to design proper grade line level and camber etc. (Machinery with POLs cost of material carriage) V-III, Part-6, Item no. 23(a) page 09	SqM	2	750.00	6.10		9,150.00
		SqM	2	300.00	13.20		7,920.00
		SqM	2	1700.00	1.00		3,400.00
		SqM					**20,470.00**
		Sqft					**220,257.20**
10	2" (50mm) Thick Asphalt Concrete Wearing Course Plant Mix Laying to proper line and grade plant mixed Asphalt concrete paver finished (Hydraulic / Electronic control) Prepared to specified formula according to job mix formula approved by engineer incharge including rolling and finishing to properline, grade level and camber etc (Machinery with POLs cost of material carriage). V-III, Part-6, Item no. 24(B) page 10						

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI

S. No.	Description	Unit	No	L	B	H	TOTAL
		SqM	2	750.00	6.10		9,150.00
		SqM	2	450.00	7.10		6,390.00
		SqM	2	750.00	6.10		9,150.00
		SqM	2	300.00	13.20		7,920.00
		SqM	1	1700.00	1.00		1,700.00
		SqM					**34,310.00**
		Sqft					**369,175.60**
11	Pavement marking in Reflective Thermoplastic Paint for lines of 6" width V-III, Part6, Item no. 39(13) page 15	RM	4	350			1,400.00
		RM	4	1050			4,200.00
		RM					**5,600.00**
		RFT					**18,373.60**
12	CatEyes/Road Studs Supplying and fixing of reflectorize Road Stud Double Face, Flush surface type. V-III, Part-6,Item no. 39 (12) page 15	No	4	130			**520.00**
13	Providing & Fixig each Informatory Sign Rectangular shape 4xx3" comprizing 2 Nos: 3" Dia G.I pipe Post i/c Painting, writing as directed each. V-III, Part-6, Item no. 39 (18 -c-II) page 17	No	1	25			**25.00**
14	Kerbstone Providing & fixing Precast Edge Block 3750 PSI industrial Made Size 6 inches thick x 12 inches long x 12 inches high including the cost of Cartage, excavation, form Work for haunching, 1450 PSI lean concrete, 2250 PSI concrete for haunching, 1:4 cement sand mortor .V-III, Part-6, Item no. 14 page 16	RM	2	525			1,050.00
		RM	1	160			160.00
		RM					**1,210.00**
		RFT					**3,970.01**
15	Providing & fixing cement paving blocks flooring having size of 197 x 97 x 60 (mm) of city / quddra / cobble shape with pigmented, having strength b/w 5000 psi to 8500 psi I/c filling the joints with hill sand and laying in specified manner/ pattern and design etc: complete. Chp no. 08, Item no. 72, Pg 49	SqM	2	1050.00	1.00		2,100.00
		SqM	1	160.00	1.00		160.00
		SqM					**2,260.00**
		Sqft					**24,317.60**

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI

S. No.	Description	Unit	No	L	B	H	TOTAL
16	Providing and laying fairfaced 15 reinforced cement concrete new jersey barrier having 3000 PSI compressive cylindrical strength Concrete (Ready mixed concrete) (area 3.50 Siy as per drawing including the cost of excavation, formwork, lean concrete compressive 1450 PSI cylindrical strength etc. complete in all respect. (excluding the cost steel reinforcement). V-III, Part-6, Item no. 15 page 16						
	New jersey barrier	RM	4	150			600.00
		RFT					**1,968.60**
17	Dismantling of Cement concrete 1:2:4 work V-III, Part-3, Chp 2, Item no. 19©, page 10	CuM	2	1050	1.5	1	3,150.00
		CFT					**111,258.00**
18	Compacted Earth-Fill Supplying and filling sand under floor and plugging in walls. Chp no. 05, Item no. 29, Pg 26	CuM	2	1050.00	1.50	0.20	630.00
		CuM	1	160.00	1.00	0.20	32.00
		CuM					**662.00**
		CFT					**23,375.22**
19	Bitumen coating to plastered or cement concrete surface. (S/I No.9, Ch/11, P/71)						
	Water proofing						
	Top slab	**SQM**	1	900	7.1		6,390.00
	Bottom slab	**SQM**	1	900	7.1		6,390.00
	WALL	**SQM**	1	900	7.3		6,570.00
		SQM					19,350.00
		SFT					**208,206.00**
20	Cement concrete plain including placing compacting, finishing and curing, comlete (including screening and washing at stone aggregate without shuttering. Lean Concrete (1:4:8). V-III, Part-3, Chp no. 04, Item no. 5 (i), Pg 16						
	Lean Concrete (1:4:8)	CuM	2	1050.00	1.50	0.30	945.00
		CuM	1	6.20	600.00	0.10	372.00
		CuM	1	7.10	900.00	0.10	639.00
		CuM					**1,956.00**
		CFT					**69,066.36**

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI

S. No.	Description	Unit	No	L	B	H	TOTAL
21	Providing and laying reinforced cement concrete having 4000 PSI cylindrical strength (ready mixed concrete) including all kinds of formwork, hoisting, placing, placing compacting, finishing, curing complete in all respect as shown on the drawing. V-III, Part-3, Chp no. 18, Item no. 102, Pg 112						
	4000 PSI Concrete						
	Top slab	CuM	1	7.10	900.00	0.50	3,195.00
	Bottom slab	CuM	1	7.10	900.00	0.50	3,195.00
	Wall	CuM	2	6.30	900.00	0.50	5,670.00
	Bottom slab	CuM	1	6.20	600.00	0.60	2,232.00
	Wall	CuM	2	1.00	600.00	0.31	373.20
	Barrier	CuM	2	1.00	600.00	0.31	373.20
		CuM					**15,038.40**
		CFT					**531,005.90**
19	Fabrication of mild steel reinforcement for cement concrete including cutting, bending, laying in position, making joints and fastenings including cost of binding wire (also includes removal of rust from bars.) Using Tor Bars (Vol-III, Part-II, Ch-2, Pg-17, Sr. 8 a)						
		Cwt	531,005.90	x 6	÷ 112		28,446.74
		Kg	28,446.74	x 50			1,422,337.24
		Ton	1,422,337.24	÷ 1000			1,422.34
	TOTAL	**Ton**					**1,422.34**
22	Structural Excavation in Common Material NHA 2022 CENTRAL106a	CuM	1	900.00	8.10	7.90	57,591.00
		CuM	1	600.00	7.20	7.40	31,968.00
		CuM					**89,559.00**
		CFT					**3,163,223.88**
23	Common Backfill NHA 2022 CENTRAL107e						
	Backfill	CuM	1	900.00	8.10	7.90	57,591.00
		CuM	1	600.00	7.20	7.40	31,968.00
		CuM					**89,559.00**
		CFT					**3,162,328.29**
	70% of excavation	**CFT**					**2,213,629.80**
24	Neoprene Rubber joint filter 12mm thick with bitumastic joint seal. NHA 2022 CENTRAL 406b						
	Movement joint						
	Element	SQM	**30**	**7.10**	**1.00**		**213.00**
	Top slab	SQM	**30**	**7.10**	**1.50**		**319.50**
	Bottom slab	SQM	**30**	**7.30**	**0.50**		**109.50**
	Wall	SQM					**642.00**

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI

S. No.	Description	Unit	No	L	B	H	TOTAL
		Sft					**6,907.92**
25	P/S Tack coat with medium curing asphalt of penetration grade 60/70 prime coats shall be used @ of 11 hires % Sft (1.2 with adequate quantity of kerosene oil, using uniformly pressure spray distributor / boiler with automatic temperature controller. Prior to application of the prime coat all used material shall be removed from the base course and the same shall be cleaned y means of approved mechanical sweepers blowers, hard brooms and disposal the same within three chain after the application, traffic shall be kept of from surface till the laying of bituminous course Material and methodology shall fully comply the tests and specification AASHTO and as directed by the Engineer Incharge.						
		SqM	2	750.00	6.10		9,150.00
		SqM	2	300.00	13.20		7,920.00
		SqM	2	1700.00	1.00		3,400.00
		SqM					**20,470.00**
		Sqft					**220,257.20**
26	P/S prime coat with medium curing asphalt of penetration grade 60/70 prime coats shall be used @ of 11 hires % Sft (1.2 with adequate quantity of kerosene oil, using uniformly pressure spray distributor / boiler with automatic temperature controller. Prior to application of the prime coat all used material shall be removed from the base course and the same shall be cleaned y means of approved mechanical sweepers blowers, hard brooms and disposal the same within three chain after the application, traffic shall be kept of from surface till the laying of bituminous course Material and methodology shall fully comply the tests and specification AASHTO and as directed by the Engineer Incharge.						
		SqM	2	750.00	6.10		9,150.00
		SqM	2	450.00	7.10		6,390.00
		SqM	2	750.00	6.10		9,150.00
		SqM	2	300.00	13.20		7,920.00
		SqM	1	1700.00	1.00		1,700.00
		SqM					**34,310.00**
		Sqft					**369,175.60**

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI					
(ELECTRICAL WORKS)					
S.NO	**DESCRIPTION**	**QTY**	**UNIT**	**RATE**	**AMOUNT**
1	**METER**				
	Supply, installation, testing and commissioning of 3-Phase Electric Meter as per K.E standards. Contractor shall be responsible for all documentation work for Meter Installation at Pole mounted Transformer.	3	Job	193,500	580,500.00
2	**STREET LIGHT CONTROL PANEL (SLCP)**				
	Supply, installation, testing and commissioning of Pole mount Street Light Control Panel (SLCP), FRP type IP-54, As per client/consultant Req. & IEC Standards. Following components to be install in a box, including Photo sensor, Magnetic contactor, Surge Protection, Neutral Bus bar with all installation accessories as directed by the Engineers.				
a	SLCP-A	1	No	338,625	338,625.00
b	SLCP-B	2	No	193,500	387,000.00
3	**WIRING**				
	Supply, Installation, Testing & Commissioning of following items including all material, tools, labor & accessories required for completion of works, Complete in all aspects. Note: Contractor is advised to confirm the cable running lengths and termination as per site conditions before commencement of work.				
a	Circuit wiring from SLCP-A to Flood Light / Tunnel Light with 3 x 6 Sq.mm in 25mm dia, complete in all aspects. From Ramp-1 to Ramp-2	3000	Rft	2,016	6,046,890.00
b	Circuit wiring from SLCP-A to Flood Light / Tunnel Light with 3 x 6 Sq.mm in 25mm dia, complete in all aspects. From Ramp-2 to Ramp-1	3000	Rft	2,016	6,046,890.00
c	Circuit wiring from SLCP-A to Air Jet System	6000	Rft	4,838	29,025,000.00

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI					
(ELECTRICAL WORKS)					
d	Circuit wiring from SLCP-B1 to double lit light pole with 3 x 6 Sq.mm in 25mm dia, complete in all aspects. Location: Ramp-1	1000	Rft	1,854	1,854,380.00
e	Circuit wiring from SLCP-B2 to double lit light pole with 3 x 6 Sq.mm in 25mm dia, complete in all aspects. Location: Ramp-1	1000	Rft	1,854	1,854,380.00
4	**LED STREET LIGHT FIXTURE**				
	Supply, Installation, Testing and Commissioning of SMD LED Street Light Fixtures, complete in all respects, as per specification, drawings and engineer approval, Light fixture must easily install on existing double arm, Lighting fixture samples with existing arm must be submitted to consultant for approval.				
i	**120W SMD-LED Street Light Fixtures** Rated wattage = **90W** ± 9% (85W to 100W) Lumens: 120 to 150 lm per watt, IP66/IP67 or equivalent compliance required IK08/IK09 or equivalent compliance required IEC60598 or equivalent compliance required Color temperature: 4000K (As approved by Consultant & Client) Rated voltage: 220VAC Surge protection required (min. 10kVA) Housing material: Aluminum Required working temperature: -5°C to 50°C Product Life ≥ 50,000 hrs @ LM79 & LM80 Product Warranty ≥ 5 years	48	No	59,663	2,863,800.00

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI					
(ELECTRICAL WORKS)					
ii	**80W SMD-LED Flood Light Fixtures** Rated wattage = **90W** ± 9% (85W to 100W) Lumens: 120 to 150 lm per watt, IP66/IP67 or equivalent compliance required IK08/IK09 or equivalent compliance required IEC60598 or equivalent compliance required Color temperature: 4000K (As approved by Consultant & Client) Rated voltage: 220VAC Surge protection required (min. 10kVA) Housing material: Aluminum Required working temperature: -5°C to 50°C Product Life ≥ 50,000 hrs @ LM79 & LM80 Product Warranty ≥ 5 years	300	No	45,150	13,545,000.00
5	**ARIAL BUNDLE CABLE (ABC)**				
I	Supply, Installation, termination, Testing and commissioning of following Aerial bundled Cables (ABC) 4 x 16 sq.mm pvc Aluminum 600/1000V as per K.E , client and consultant req. along with IEC Standards & Specifications.	200	Rft	1,532	306,376.00
II	Supply, Installation, Testing & Commissioning of ABC Cable Termination (IBC Point - P+N+E) & Support accessories including necessary items as per K.E Standards & Specification.	9	No	1,532	13,786.92
6	**EARTHING**				
	Earthing is required (Supply and fixing) to give earth resistance value less than or equal to 1 Ω and it should not deteriorate with time. Earthing must comply as per K.E Standards & specification.	24	Job	249,938	5,998,500.00
7	**POLE**				

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI					
(ELECTRICAL WORKS)					
	Supply, installation, Testing and commissioning of Street Light Tubular **8meter high Pole**, as approved, Pole should be MS powder, coated paint with approved color including following arms. As per following specification, drawings and Engineer approval. **Pole & Base:** • microns: 80/100 - Powder Coated • Wall thickness: 4mm, 3mm and 3mm. • Diameters: 140mm, 114mm and 88mm. • Self Inspection door with special key • NV65/EN40 standard for wind speed of 165-185 km/h. • IK08/IK09 or equivalent compliance required • IEC60598 or equivalent compliance required • IP66/IP67 or equivalent compliance required • Stiffeners: 04 nos. • Base plate: 375 X 375 X 20mm thick • Product Warranty: 5 years **Note**: New Pole shall be resemblance with existing pole along with arm. The above detail is minimum requirement as approve				
i	Double Arm + 10m high pole	24	No	249,938	5,998,500.00
ii	Foundation as per Sindh Schadule for 8m hi	24	No	249,938	5,998,500.00
8	**VENTILATION SYSTEM**				
i	Supply, Installation, Testing and commissioning of Air Jet Tunnel System along with all accessories. Complete in all aspects.	36	Job	1,370,625	49,342,500.00
9.00	providing, installation, testing and commisoning of following outdoor type IP65 rated pad mounted lighting control panel (LCP) on concrete pad. This job include with all civil works as per drawing anspecification , complete in all respects				-

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI					
(ELECTRICAL WORKS)					
	(a)LCP -1 Incoming 1 No. 63 A TP MCCB (Ics 15KA) Timer contractor with photo sensor outgoing 10 Nos. 16A, TP MCCB	No.	250,000.00	1.00	250,000.00
10.00	Providing installation,Testing and commissioning of following distribution board for underpass (DB-UP's) on wall mounted. As per drawing and specifications, complete in all repects (a)DB-UP-1 & DB-UP-2 Incoming 1 No.40A TP MCCB (ics 15 KA) Outgoing 10 Nos. 10A, TP MCCB	No	250,000.00	2.00	500,000.00
11.00	providing, installation, testing and commisioning of sub main- distribution board (SMDB) for pumps on wall mounted as per drawing and specification, complete in all respects: DB-UP-1 & DB-UP-2 INCOMING 1 No.150 A,TP MCCB (Ics 25KA) Outgoing 3No.80A, TP MCCB 3NO. 20A,TP MCCB 2No.10A,TP MCCB	Job	250,000.00	1.00	250,000.00

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI					
(ELECTRICAL WORKS)					
12.00	Providing, installing, testing & commissioning of following Pad mounted type Feeder Pillar (F.P) made with 14/16 SWG sheet metal, Weather proof, dust protected, vermin proof housing, confirming to protection class (IP-65), epoxy powder coated 9 paint with approved color, having all the necessary accessories and protections, etc. as per specifications and SLD complete in all r&spect. with providing shop drawings, manual and warranty documents to owners representative /Consultant a) Feeder Pilfer (FP) INCOMING 1 No.300A, TP MCCB (ICS 25 kA) OUTGOING 1 No.150A,TP MCCB 1 No.63A,TP MCCB 4 No.40A,TP MCCB 3 No.20A,TP MCCB	No	300,000.00	1.00	300,000.00
13.00	Providing and construction of RCC foundation (PAD) for respective feeder pillars (FP). Cosntruction of class C concrete use water resistance chemical , water proofing material applied on structure surfaces are concealed below FGL/FFL, pad size as per base of FP as per K-Electric specifictaion and is directed by the consultant, complete in all respect	M	12,000.00	1.00	12,000.00
14.00	supply installation testing and commissioning of 150A, automatic transfer switch (ATS) with manual bypass switch as per specification and drawing, complete in all respects	Job	25,000.00	1.00	25,000.00

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI					
(ELECTRICAL WORKS)					
15.00	providing,installing, testing and commisioning of following sizes 600/1000 volts grade copper conductor armoured cables from nearest power supply upto transformer,transformer to FP, FP TO ATS panel, ATS panel to generator,ATS panel to MCP,FP TO LCP,FP TO DB-UP,FP TO LED screens,LCP to Lighting pole,lighting ole to lighting pole, directly buried in already excavated trench of size as it mayrequire. complete in all respects as per specification drawing				-
	a) 4c-120 sq.mm Cu.PVC/SWA/PVC +1C-70SQ.MM PVC AS ECC	M	12,000.00	40.00	480,000.00
	b) 4c-95 sq.mm Cu.PVC/SWA/PVC +1C-35SQ.MM PVC AS ECC	M	800.00	55.00	44,000.00
	c) 4c-70 sq.mm Cu.PVC/SWA/PVC +1C-35 SQ.MM PVC AS ECC	M	900.00	30.00	27,000.00
	d) 4c-25 sq.mm Cu.PVC/SWA/PVC +1C-16 SQ.MM PVC AS ECC	M	800.00	35.00	28,000.00
	e) 4c-16 sq.mm Cu.PVC/SWA/PVC +1C-16 SQ.MM PVC AS ECC	M	600.00	2,500.00	1,500,000.00
	b) 4c-10 sq.mm Cu.PVC/SWA/PVC +1C-10 SQ.MM PVC AS ECC	M	500.00	600.00	300,000.00
16.00	excavation of trenches in hard ? Soft soil back filling after laying of cable , cost including providing fresh sand 6" under the cable , laying and protection bricks on sand , warning tape and backfilling compaction etc. as per drawing and specification, complete in all respect	Cu.m	350.00	1,875.00	656,250.00
17.00	providing, installing ,testing and commisioning of following sizes of 600/1000 volts grade copper conductor unarmoured cables from SMDB-P to isolators in cable trunking run in pump room . Complete in all respects asper specification and drawing.				

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI					
(ELECTRICAL WORKS)					
	a) 4c-35 sq.mm Cu.PVC/PVC +1c-25 sq.mm PVC as ECC in 50mm dia rigid PVC Conduit	M	800.00	20.00	16,000.00
18.00	Supply installation testing and commissioning of circuit wiring from DB -UP to 1st .light point (underpass)with 4c-4 sq.mm 600/1000V PVC/PVC +1c-4Sq.mm PVC as ECC single core PVC insulated copper wire in 50mm dia PVC conduit with all conduit accessories. complete in all respects as per specification and drawings	No	12,000.00	8.00	96,000.00
19.00	supply, insatllation, testing and commisioning of wiring from light poit to light point (underpass) with 4c-4 sq.mm 600/1000 PVC/PVC +1c-4 sq.mm as ECC single core PVC insulated copper wires in 50 mm dia PVC conduit with all conduit accessories. complete in all respects as per specification and drawings	No	9,000.00	56.00	504,000.00
20.00	providing and laying of following sizes of uPVC class "D" pipes for road crossing. Buried in ground as per drawing.including excavatio for laying of pipe and backfilling per specification and drawings in all respects				-
	a)150 mm dia U pvc	Job	4,300.00	100.00	430,000.00
21.00	providing,installing, testing and commisioning of 3 core 2.5 sq.mm PVC/PVC,450/750 volts grade cable for each light from cable terminal box to luminaries complete in all respects	M	120.00	600.00	72,000.00
22.00	providing, installing ,testing and commisioning of terminal box IP 65 including 1 No. 4A, circuit breaker with terminal, complete in all respects	Nos.	1,500.00	42.00	63,000.00

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI					
(ELECTRICAL WORKS)					
23.00	providing, installing ,testing and commisioning of terminal box IP 65 including 2 No. 4A, circuit breaker with terminal, complete in all respects	Nos.	2,000.00	25.00	50,000.00
24.00	providing, installing ,testing and commisioning of terminal box IP 65 including 3 No. 4A, circuit breaker with terminal, complete in all respects	Nos.	2,500.00	2.00	5,000.00
25.00	providing, installing ,testing and commisioning of terminal box IP 65 including 4 No. 4A, circuit breaker with terminal, complete in all respects	Nos.	3,000.00	4.00	12,000.00
26.00	providing, installing, testing and commisioning of 3c-120 sq.mm AI.XLPE/SWA/PVC MV cable from nearest scoured of K-electric power supply for incoming cable to 1No. 150 Kva transformers as required as per site and including cost of excavation for laying cable ,brick, watning tape and backfilling with new aned fresh sand (6" under and 6" above cable)complete in all respects	Job	150,000.00	1.00	150,000.00
27.00	supply, installation, testing & commisioning of 80 KVA (prime power rated) 3 phase-4 wire -400V diesel generator set with weatherproof canopy and electronic governer, ATS , an advanced LCD display control panel (programmable) as specification . Including transportation upto site and safety store. exhaust piping, ducting, critical silencer, with elbow, base fuel tank(8 hrs. min) etc. also inclusive of power cable and termination	No.	4,500,000.00	1.00	4,500,000.00

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI					
(ELECTRICAL WORKS)					
28.00	prepare RCC base as foundation/ pad for above 1 No. generator (as per recommendation of manufacturing & specification)with the approval of engineer, complete in all respect.	Job	35,000.00	1.00	35,000.00
29.00	supply and handing over to client representative of standard spare parts as recommended by manufacturer for operation of 1000 hours for D.G set(itemized list of spares to be provided as per specification)	Lot.	500,000.00	1.00	500,000.00
30.00	supply, installation, testing & commisioning of following isolator switch pumps etc in 16 SWG sheet metal steel enclosure with neutral and earth terminal strips, including all accessories as shown on drawing, complete in all repects				
	a)50A, TPN weatherproof type	Nos.	50,000.00	3.00	150,000.00
31.00	supply, installation ,testing of earthing pit	Nos.	70,000.00	14.00	980,000.00
32.00	supply, installation, testing and commisioning of earthing pit with 3 meter long 20 mm dia earth copper rod for transformer, generator, feeder piller ,LCP,DB-UP,betweeen pole to pole , in PVC conduit complete in all respects as per specifications				
	a) 1c-70sq.mm as ECC	M	1,200.00	90.00	108,000.00
	b)1c-16sq.mm as ECC	M	800.00	2,100.00	1,680,000.00
	c) 1c-10sq.mm as ECC	M	700.00	550.00	385,000.00
33.00	Dismantaling and removing of existing street light poles, light poles, light fixture and other accessories from site and handover yo handover authority	Job	1.00	25,000.00	25,000.00

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI					
(ELECTRICAL WORKS)					
34.00	supply, insatllation, testing and commisioning of following 10/15/16 Amps, one /two/three/four gang type switches & dimmer switches, sockets including 16 SWG sheet steel powder coated back boxes with earth terminal, recessed in wall, complete in all respects				
	i)one gang switch 10A	NO.	6,000.00	1.00	6,000.00
	ii)two gang switches 10A	NO.	6,000.00	1.00	6,000.00
	iii)10A, switch sockets until waterproof type	NO.	6,000.00	1.00	6,000.00
	iv) 15A, switch socket outlet waterproof type	NO.	8,000.00	1.00	8,000.00
35.00	supply, installation,testing, and commisioning of following light fixtures complete with starters, electronic ballast (mention otherwise), lamps drivers, mounting accessories etc. complete in all respects . Lighting fixture sample must be submitted to consultant for approval, (for complete detail reference of light fixtures, please refer to light fixture schedules)				-
	i)ceiling/wall mounted flourescent light fixture (IP-65) with 2 x 36WT8	no.	60,000.00	2.00	120,000.00
	ii)external wall ligh fixture (IP-54) with 1 x18 W CFL	NO.	45,000.00	1.00	45,000.00
36.00	supply, installation, testingand commisoining of following items including all connecting accessories as per drawing and specifications , complete in all respects				-
	i)18" dia wall bracket fan	no.	6,000.00	1.00	6,000.00
	ii) 9" dia exhaust pipe	no.	9,000.00	1.00	9,000.00

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI					
(ELECTRICAL WORKS)					
37.00	supply, installation, testing & commisioning of circuit wiring from SMDB-pump to switchboard including wiring between switch on same circuit with 2 x2.5 sq. mm. +1 x2.5 sq.mm as ECC single core copper conductor PVC insulated wires in 20mm dia PVC conduit surface /recessed in wall, column, etc including with all conduit accessories as per drawing and specification, complete in all respects	NO.	1.00	25,000.00	25,000.00
38.00	supply , installation, testing & commisioning of point wiring from SMDB-pump to switchboard including wire between switch on same circuit with 2 x 2.5 sq.mm +1 x 2.5 sq.mm as ECC single core copper conductor PVC insulated wires in 20mm dia PVC conduit surface/ recessed in wall, column, etc including all conduit accessories as per drawing and specification, complete in all respect	no.	60,000.00	2.00	120,000.00
39.00	supply, installation, testing & commisioning of point wiring from light point with 3 x 1.5 sq.mm single core copper conductor PVC insulated wires inn 20mm dia or appropriate dia PVC conduit, complete in all respects	no.	25,000.00	1.00	25,000.00
40.00	supply, installation, testing and commisioning of wiring for 10A ,socket outlet with 2x2.5 sq.mm +1 x 2.5 sq.mm single core copper conducter PVC insulated wires in 20 mm dia conduit surface/ recessed wal, column ,ceiling etc, including with all conduit accessories , as per drawing and specification, complete in all respects				-
	i) SMDB to socket outlet	no.	25,000.00	1.00	25,000.00

CONSTRUCTION OF UNDERPASS AT KARIMABAD KARACHI					
(ELECTRICAL WORKS)					
41.00	supply, installation, testing and commisioning of circuit wiring of 15A, socket with 2 x 4 sq. mm at ECC sigle core copper conductor PVC insulated wires in 20 mm dia PVC conduit surface/ recessed in wall, column, ceiling etc with all conduit accessories as per drawing and specification. complete in all respect	No.	50,000.00	1.00	50,000.00
				TOTAL AMOUNT (PKR)	**144,784,877.92**
				TOTAL AMOUNT MILLION (PKR)	**144.785**

K-304
20/09/2023

Sherjan Mosakhail & Sons

Engineers & Contractors

SMS/23/23

Dated: 23/08/2023

Chief Engineer
Engineering Department
Karachi Development Authority (KDA)
Block 14 Gulshan-e-Iqbal, Karachi,
Civic Centre
Karachi

Project: **CONSTRUCTION OF 2+2 UNDERPASS AT KARIMABAD DISTRICT CENTRAL**

Subject: **SUBMISSION OF SOIL INVESTIGATION REPORT**

In compliance of C.O.C agreement, Please find enclosed herewith the soil investigation report for your record please.

For & on behalf of

19/9/23

Consultant mr. Atif Alam.

M/S Sherjan Mosakhail & Sons

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REPORT
ON
SUB SOIL INVESTIGATION
FOR
CONSTRUCTION OF
KARIMABAD UNDERPASS
AT KARACHI.

AUGUST-2023

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Annexure:

'A' Boreholes Log.
'B' Discussion of Lab Result.
'C' Site Plan
'D' Photographs

ETS/SSI/081

24/Aug/2023

1.0 INTRODUCTION

This report presents a review of subsoil investigations carried out for **CONSTRUCTION OF KARIMABAD UNDERPASS, KARACHI.**

Client of this project is **Karachi Development Authority** and the **contractor** of this project is **M/s Sherjan Moosakhail & Sons**. The **contractor** entrusted soil investigation work to **M/s. Earth Testing Services.** Scope of work included drilling of boreholes, carrying out field tests, and collection of soil samples, laboratory testing and preparation of report including recommendations for foundation design.

Field investigations were carried out by **M/s. EARTH TESTING SERVICES** in **August 2023** and laboratory testing was performed at the Earth Testing Services, Karachi. (Approved by **Pakistan Engineering Council & S.B.C.A**).

This report includes detailed account of sub surface investigations, field and laboratory testing. Lithology of soil strata is described in section 3.0 and results of laboratory tests are discussed in the following section. In section 5.0, recommendations regarding foundation type and design parameters are presented.

Salient features of the report have been summarized in the concluding section.

2.0 DETAILS OF INVESTIGATIONS

2.1 METHODOLOGY

In order to obtain adequate subsurface information an investigation program was chalked out. This subsurface exploration program included drilling of boreholes, obtaining soil samples, and carrying out field testing, transportation of these samples to testing laboratory and performing laboratory tests on representative samples.

Detailed account of all the above-mentioned activities is described in the following sections.

2.2 DRILLING OF BOREHOLES

Total of **four** boreholes were drilled at site. Depth of the boreholes were **1 X 25 & 3 X 15 meter** below natural ground level.

The drilling work at site was accomplished by rotary/wash method. In this method the borehole is advanced by constant rotation of the bit, which cuts the material loose.

The returning drilling fluid brings up the soil cuttings, which are preserved as disturbed samples and used for visual identification of the soil.

2.3 FIELD TESTING

Standard penetration tests were attempted out at regular intervals of depth to assess the in-situ compactness of various soil layers.

It may be noted that standard penetration test is by far the most popular and economical method of obtaining subsurface information. Significant numbers of foundation design procedures make use of **SPT** results. Testing method essentially consists of driving a split spoon sampler of specified dimensions a distance of **46** cms into the soil at the bottom of the borehole. A **63.5** Kg hammer falling free from a height of **76** cm is used to drive the sampler. Number of blows required to drive the last **30.5** cm is recorded as **'N'** value. The standard penetration tests were carried in accordance with the specification of **ASTM D-1586.**

Standard penetration tests were attempted at **01-meter** Interval up to the investigated depth in the borehole. The 'N 'value found **REFUSAL** upto **25-meter** depth.

2.4 SAMPLING

Collection of representative samples forms an essential part of investigation program. Disturbed soil samples were obtained either from the bailer as the borehole was advanced or from the split spoon sampler after performing standard penetration test **(SPT).** Disturbed samples were used to classify the soil type and depth of occurrence of different layers. A number of **SPT** samples were preserved for the purpose of laboratory testing.

3.0 SUBSURFACE CONDITIONS

3.1 STRATIGRAPHY

Stratigraphy of various soil layers at the site has been assessed through information/data obtained from drilling, field testing and laboratory test results.

Detailed examination of the borehole logs (appended to this report as annexure 'A') reveals that:

BH-1 Under Flyover Bridge

00m-2.4m	Road filled material.
2.4m-9.0m	Yellowish, Brown Gray very dense fine to coarse SAND some Gravels.
9.0m-12.0m	Brown, Gray medium hard pieces of LIME STONE / SAND STONE with Sandy Gravels.
12.0-18.0m	Yellowish Brown medium hard SAND STONE some coarse SAND & Gravels.
18.0m-25.0m	Yellowish Brown medium hard FRIABLE SAND STONE Traces Silt & Mica.

BH-2 Front of Habib Medical

00m-2.0m	Road filled material.
2.0m-3.0m	Yellowish Brown, Gray very dense Fine to Coarse SAND Traces Gravels.
3.0m-5.0m	Yellowish Brown, Gray very dense SANDY CLAY Traces Gravels.
5.0-7.6m	Yellowish Brown, Gray very dense Fine to Coarse SAND Traces Gravels.
7.6m-10.6m	Yellowish Brown, Gray very dense Fine to Coarse SAND with Gravels.

10.6m-12.0m Yellowish Brown medium hard CLAY some fine to Coarse Sand.

12.0m-15.0m Brown, Gray, Black medium hard CLAY STONE Traces Sand.

BH-3 Front of UBL Bank

00m-2.0m Road filled material.

2.0m-7.6m Yellowish Brown, Gray very dense fine to Coarse SAND some Gravel Traces Clay.

7.6m-15.0m Yellowish Brown medium hard to hard pieces of SAND STONE some Coarse SAND Traces Gravels.

BH-4 Near of Bank AL-Habib

00m-1.8m Road filled material.

1.8m-4.5m Yellowish Brown, Gray dense to very dense fine to Coarse SAND Traces Gravel.

4.5m-9.0m Yellowish Brown medium to hard SANDY CLAY Traces Gravels.

9.0m-15.0m Yellowish Brown, Gray medium hard pieces of SAND STONE some Coarse Sand, Gravels & Clay.

3.2 IN SITU COMPACTNESS

The competence of any soil stratum to sustain the imposed loads is directly dependent on its in place compactness or consistency. The 'N' values obtained from **SPT** give a fair idea of in situ compactness or consistency of soil layers.

3.3 GROUNDWATER TABLE

Perched/Ground water was recorded after completion of bore. This water level could be change during monsoon weather.

BORE HOLE	DEPTH
01	17 m
02	Nil
03	Nil
04	Nil

4.0 LABORATORY TESTING RESULTS

In addition to field testing, a number of laboratories tests were also conducted on selected soil samples. Results of these tests are helpful in classification of soil, determining engineering properties such as strength & compressibility and assessing chemical characteristics of subsoil. Annexure 'B' contains laboratory test results.

Brief description of the entire laboratory test and testing standards is given in the following sections.

4.1 GRAIN SIZE ANALYSIS

A soil consists of an assemblage of discrete particles of various sizes and shapes. The object of grain size analysis is to group these particles into separate range of sizes and to determine the relative proportions by dry weight of each size range.

On the basis of results of grain size analysis, soil is classified according to the Unified Soil Classification System.

Grain size analysis is conducted in two stages. Particles size distribution of coarse grained soils is performed by sieve analysis while hydrometer test is conducted to establish distribution of fine grained soils.

Grain size analysis was carried out as per **ASTM D-422.**

4.2 ATTERBERG LIMITS

Atterberg Limits Tests include determination of the liquid limit, the plastic limit and the shrinkage limit. These limits are used to determine plasticity characteristics of fine grained soil.

Liquid Limit (LL) is the moisture content at which a soil passes from the liquid to the plastic state as the moisture is removed.

Plastic Limit (PL) is the moisture content at which the soil passes from the plastic to the semisolid state, as the moisture is removed.

Plasticity Index (PI) is the difference of moisture content at liquid and plastic limits (PI = LL - PL). A plot of PI Vs LL provides the basis for classification of cohesive soils. It also provides insight into several soil characteristics such as compressibility and strength.

Atterberg Limits for **12** soil samples were determined Values of Liquid Limits and Plasticity Index found (see lab result).

4.3 DIRECT SHEAR TEST

Direct shear test or box test, as it is commonly known is one of the simplest tests for measuring the shear strength of soil.

In this test, one portion of soil is made to slide along another by increasing the horizontal shear force. This test provides the angle of internal friction (∅) and the cohesion (c), which are important parameters for calculation of bearing capacity of soil. Share test could not be possible on hard rock.

05 samples were tested for which value of cohesion (c) were found to be in the range of **0.00 to 0.33** kg/cm^2, while value of angle of internal friction (∅) ranged between **19 to 40** degrees.

4.4 DENSITY AND MOISTURE CONTENT TEST

Density of soil is defined as mass per unit volume. Density of a soil may be expressed as either bulk density or dry density. Bulk density is defined as total weight (including that of soil particles, water and air contained in the voids) per unit volume. Density is obtained using weight of over dried soil (at **105°** C for **24** hours) per unit volume. Density is usually expressed in gm/cc.

Natural Moisture Content is the weight of moisture expressed as percentage of weight of solid in a particular soil and is determined as per **ASTM D-2216.**

A total of **07** samples were tested and their results are in the following range:

BULK DENSITY	=	2.11 to 2.17 gm/cc.
DRY DENSITY	=	1.88 to 1.98 gm/cc.
N. M. C.	=	07.7 to 13.7 %.

4.5 UNCONFINED TEST

A **08** nos. of Unconfined test carried out as per ASTM method and the strength ranging from **4.73** to **47.25** TSF.

4.6 CHEMICAL TEST

Sulphate in groundwater or soil can attack concrete placed in the ground or on surface. A reaction takes place between the Sulphate and the aluminate compounds present in the cement, causing crystallization of complex compounds. The expansion, which accompanies crystallization, induces stresses in the concrete, which results in mechanical disintegration.

Measurement of Sulphate content enables the ground condition to be assessed with respect to potential Sulphate attack. Appropriate precautionary measures, such as the use of Sulphate Resisting Cement can be adopted on the basis of test result. Sulphate content for **three** soil sample were determined, and were found to be in range of **0.079 % to 0.085 %.**

4.7 SEISMIC PARAMETERS

S.No.	Seismic Parameters	Values
1	U.B.C Zone – 1997	2B
2	Maximum Peak Ground Acceleration	16 to 24% of 9.8 m/sec^2
3	Seismic Hazard	Moderate
4	Magnitude (Richter Scale)	6.5 to 7.0 Intensity
5	Intensity (MM Scale)	VI to VIII

4.8 SOIL PROFILE

At Depth (Meter)	Soil Profile Type	Seismic Coefficient
00 – 2.50	SD	$C_a = 0.28$ $C_V = 0.40$
2.50 – 25.0	SC	$C_a = 0.24$ $C_V = 0.32$

NOTE:

Our Recommendation is based on the information gathered from bore holes and is limited to the immediate vicinity of bore holes. If during excavation of foundation any changes of soil strata should be reported to laboratory for review the bearing capacity.

5.0 GEO TECHNICAL RECOMMENDATION CONSTRUCTION OF KARIMABAD UNDERPASS, KARACHI.

5.1 FOUNDATION DEPTH

The Foundation of an engineering structure is considered adequate if the following conditions are considered.

a) It must be adequately safe against Rapture or Shear Failure.

b) It must not under go excessive different settlement.

It must be placed at suitable depth were no change to Erosion. Scouring action.

5.2 BEARING CAPACITY

The sub-soil has been carried out by means of exploratory borings. From the study of bore logs, field test (**SPT**), Laboratory test results and visual inspection of strata, it is observed that from the existing ground surface to **2.50 m** depth, the sub-soil is **road filled material** and from **2.50 to 18.00 m** the soil is a **very dense fine to coarse Sand and gravels** layer existing at site, therefore a **Mat foundation** will be best choice for above site.

TYPE OF FOUNDATION	DEPTH FROM ROAD LEVEL	SAFE ALLOWABLE BEARING CAPACITY
1) Mat Foundation	5.00 meter	2.40 TSF
2) Mat Foundation	6.00 meter	2.48 TSF
3) Mat Foundation	7.00 meter	2.50 TSF

NOTE:

A) Perched water was encountered at **17m** depth, only in borehole no. **01** and the remaining **03** boreholes have no water encountered upto investigation depth.

B) It is recommended to measure all safety precautions while excavating as the nearby vicinity is populated further a **secant pile wall can be optional** to protect near vicinity.

C) Sulphate Content in soil is within limit therefore used of (**OPC**) Cement recommended upto Plinth level.

ENGR. AMMAD AHMED
BS (Civil) PE (Geotech)
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SBCA License No. GTL-13

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7.0 CONCLUSIONS

Salient features of this report are summarized hereunder.

Geotechnical Investigations carried out for **CONSTRUCTION OF KARIMABAD UNDERPASS, KARACHI.**
Were carried out by **M/s Earth Testing Services** in **August 2023.**

- **Four** bore holes **1 X 25 & 3 X 15 meter** deep were drilled.
- Standard penetration tests were performed every **01-meter** interval.
- SPT/Disturbed samples were collected and selected samples were tested at the **M/s. Earth Testing Services, Karachi.**
- Perched water was encountered at **17m** depth, only in borehole no. **01** and the remaining **03** boreholes have no water encountered upto investigation depth.
- Recommendations for foundation design have been described in section 5.0.
- Use of **Ordinary Portland Cement (OPC)** is recommended for all concrete work up to Plinth level.

EARTH TESTING SERVICES

SOIL INVESTIGATION & MATERIALS TESTING LABS

Bore Hole No. 01

Date: 10/08/2023 to 11/08/2023

Client: Karachi Development Authority

Project: Construction of Karimabad Underpass at Karachi.

Location: Under Flyover Bridge

Ground Water Table 17 m

Type of Boring Rotary

Depth (METER)	Sample No.	STRATUM DESCRIPTION	Dia of Casing / Hole	SPT BLOWS			SPT N. Count	Percent Recovery	R.Q.D.	REMARKS
0	2.4	Road filled material	4" Dia	---	---	---	---			DS-01
				---	---	---	---			DS-02
2.4	6.6	Yellowish, Brown Gray very dense fine to coarse SAND some Gravels		21 ---	26 ---	34 ---	60/Ref			SPT-1 DS-03
				29	38	---	Ref			DS-04 SPT-02
				58	---	---	58/3"			DS-05 SPT-03
				62	---	---	62/4"			DS-06 SPT-04
				81	---	---	81/6"			DS-07 SPT-05
				---	---	---	Ref			DS-08 SPT-06
9.0	3.0	Brown, Gray medium hard pieces of LIME STONE / SAND STONE with Sandy Gravels		---	---	---	Ref			DS-09 SPT-07
				---	---	---	---			DS-10
				---	---	---	---			DS-11
12.0				---	---	---	---			DS-12

Log by: ***Muhammad Aqeel***

EARTH TESTING SERVICES

SOIL INVESTIGATION & MATERIALS TESTING LABS

Bore Hole No. 01

Date: 12/08/2023 to 13/08/2023

Client: Karachi Development Authority

Project: Construction of Karimabad Underpass at Karachi.

Location: Under Flyover Bridge

Ground Water Table 17 m

Type of Boring Rotary

Depth (METER)	Sample No.	STRATUM DESCRIPTION	Dia of Casing / Hole	SPT BLOWS			SPT N. Count	Percent Recovery	R.Q.D.	REMARKS
12.0				---	---	---	---	12%	8%	CORE-1
				---	---	---	---	18%	15%	CORE-2
	6.0	Yellowish Brown medium hard SAND STONE some coarse SAND & Gravels		---	---	---	---	15%	20%	CORE-3
				---	---	---	---	18%	20%	CORE-4
				---	---	---	---			DS-13
18.0			4" Dia	---	---	---	---			DS-14
				---	---	---	---			DS-15
				---	---	---	---	35%	40%	CORE-5
	6.0	Yellowish Brown medium hard FRIABLE SAND STONE Traces Silt & Mica		---	---	---	---	40%	60%	CORE-6
				---	---	---	---	45%	65%	CORE-7
				---	---	---	---	35%	40%	CORE-8
24.0				---	---	---	---			DS-16

Log by: ***Muhammad Aqeel***

EARTH TESTING SERVICES

SOIL INVESTIGATION & MATERIALS TESTING LABS

Bore Hole No. 01

Date: 13/08/2023

Client: Karachi Development Authority

Project: Construction of Karimabad Underpass at Karachi.

Location: Under Flyover Bridge

Ground Water Table 17 m

Type of Boring Rotary

Depth (METER)	Sample No.	STRATUM DESCRIPTION	Dia of Casing/ Hole	SPT BLOWS			SPT N. Count	Percent Recovery	R.Q.D.	REMARKS
24.0		Yellowish Brown medium hard								
	1.0	FRIABLE SAND STONE Traces Silt								
25.0		& Mica	4" Dia	---	---	---	---	58%	60%	CORE-9
		END OF BOREHOLE								

Log by: ***Muhammad Aqeel***

EARTH TESTING SERVICES

SOIL INVESTIGATION & MATERIALS TESTING LABS

Bore Hole No. 02

Date: 14/08/2023 to 15/08/2023

Client: Karachi Development Authority

Project: Construction of Karimabad Underpass at Karachi.

Location: Front of Habib Medical.

Ground Water Table NIL

Type of Boring Rotary

Depth (METER)	Sample No.	STRATUM DESCRIPTION	Dia of Casing/ Hole	SPT BLOWS				Percent Recovery	R.Q.D.	REMARKS
							SPT N. Count			
0.0	2.0	Road filled material	4" Dia	---	---	---	---			DS-01
2.0	1.0	Yellowish Brown, Gray very dense Fine to Coarse SAND Traces Gravels		---	---	---	---			DS-02
3.0	2.0	Yellowish Brown, Gray very dense SANDY CLAY Traces Gravels		34	41	---	Ref			SPT-1
5.0	2.6	Yellowish Brown, Gray very dense Fine to Coarse SAND Traces Gravels		41	56	---	Ref			SPT-02
7.6	3.0	Yellowish Brown, Gray very dense Fine to Coarse SAND with Gravels		54	---	---	54/3"			SPT-03
10.6	1.4	Yellowish Brown medium hard CLAY some fine to Coarse Sand		61	---	---	61/4"			SPT-04
12.0				80	---	---	80/5"			SPT-05
				---	---	---	---			DS-03
				---	---	---	---			DS-04
				62	---	---	Ref			SPT-06
				19	23	34	57			DS-05 SPT-07
				21	24	30	54			SPT-08

Log by: ***Muhammad Aqeel***

EARTH TESTING SERVICES

SOIL INVESTIGATION & MATERIALS TESTING LABS

Bore Hole No. 02

Date: 14/08/2023 to 15/08/2023

Client: Karachi Development Authority

Project: Construction of Karimabad Underpass at Karachi.

Location: Front of Habib Medical.

Ground Water Table NIL

Type of Boring Rotary

Depth (METER)	Sample No.	STRATUM DESCRIPTION	Dia of Casing/ Hole	SPT BLOWS			SPT N. Count	Percent Recovery	R.Q.D.	REMARKS
12.0		Brown, Gray, Black medium hard CLAY STONE Traces Sand	4" Dia	---	---	---	---	10%	14%	CORE-1
	3.0			---	---	---	---	15%	20%	CORE-2
15.0				---	---	---	---	25%	30%	CORE-3
		END OF BORE HOLE								

Log by: *Muhammad Aqeel*

EARTH TESTING SERVICES

SOIL INVESTIGATION & MATERIALS TESTING LABS

Bore Hole No. 03

Date: 16/08/2023 to 17/08/2023

Client: Karachi Development Authority

Project: Construction of Karimabad Underpass at Karachi.

Location: Front of UBL Bank.

Ground Water Table NIL

Type of Boring Rotary

Depth (METER)	Sample No.	STRATUM DESCRIPTION	Dia of Casing / Hole	SPT BLOWS			SPT N. Count	Percent Recovery	R.Q.D.	REMARKS
0.0				---	---	---	---			DS-01
	2.0	Road filled material		---	---	---	---			DS-02
2.0				32	41	---	Ref			SPT-1
				52	---	---	Ref			SPT-02
	5.6	Yellowish Brown, Gray very dense fine to Coarse SAND some Gravel Traces Clay		62	---	---	62/4"			SPT-03
				71	---	---	71/5"			SPT-04
				---	---	---	Ref			SPT-05
7.6				---	---	---	---			DS-03
				---	---	---	---			DS-04
	4.4	Yellowish Brown medium hard to hard pieces of SAND STONE some Coarse SAND Traces Gravels	4" Dia	---	---	---	---			DS-05
				---	---	---	---			DS-06
12.0				---	---	---	---			DS-07

Log by: ***Muhammad Ageel***

EARTH TESTING SERVICES

SOIL INVESTIGATION & MATERIALS TESTING LABS

Bore Hole No. 03

Date: 16/08/2023 to 17/08/2023

Client: Karachi Development Authority

Project: Construction of Karimabad Underpass at Karachi.

Location: Front of UBL Bank.

Ground Water Table NIL

Type of Boring Rotary

Depth (METER)	Sample No.	STRATUM DESCRIPTION	Dia of Casing/ Hole	SPT BLOWS			SPT N. Count	Percent Recovery	R.Q.D.	REMARKS
12.0			4" Dia	---	---	---	---	15%	19%	CORE-1
	3.0	Yellowish Brown medium hard to hard pieces of SAND STONE some Coarse SAND Traces Gravels		---	---	---	---	10%	25%	CORE-2
15.0				---	---	---	---	20%	35%	CORE-3
		END OF BORE HOLE								

Log by: *Muhammad Aqeel*

EARTH TESTING SERVICES

SOIL INVESTIGATION & MATERIALS TESTING LABS

Bore Hole No. 04

Date: 18/08/2023 to 19/08/2023

Client: Karachi Development Authority

Project: Construction of Karimabad Underpass at Karachi.

Location: Near Bank AL-Habib.

Ground Water Table NIL

Type of Boring Rotary

Depth (METER)	Sample No.	STRATUM DESCRIPTION	Dia of Casing/ Hole	SPT BLOWS				Percent Recovery	R.Q.D.	REMARKS
							SPT N. Count			
0.0	1.8	Road filled material	4" Dia	---	---	---	---			DS-01
1.8				---	---	---	---			DS-02
	2.7	Yellowish Brown, Gray dense to very dense fine to Coarse SAND Traces Gravel		23	28	31	58			SPT-01
				32	41	---	Ref			SPT-02
4.5				54	---	---	54/3"			SPT-03
	4.5	Yellowish Brown medium to hard SANDY CLAY Traces Gravels		61	---	---	61/4"			SPT-04
				53	---	---	53/5"			SPT-05
				---	---	---	---			DS-03
9.0				---	---	---	---			DS-04
	3.0	Yellowish Brown, Gray medium hard pieces of SAND STONE some Coarse Sand, Gravels & Clay		---	---	---	---			DS-05
				---	---	---	---			DS-06
12.0				---	---	---	---			DS-07

Log by: ***Muhammad Aqeel***

EARTH TESTING SERVICES

SOIL INVESTIGATION & MATERIALS TESTING LABS

Bore Hole No. 04

Date: 18/08/2023 to 19/08/2023

Client: Karachi Development Authority

Project: Construction of Karimabad Underpass at Karachi.

Location: Near Bank AL-Habib.

Ground Water Table NIL

Type of Boring Rotary

Depth (METER)	Sample No.	STRATUM DESCRIPTION	Dia of Casing/ Hole	SPT BLOWS			SPT N. Count	Percent Recovery	R.Q.D.	REMARKS
12.0			4" Dia	---	---	---	---	15%	16%	CORE-1
	3.0	Yellowish Brown, Gray medium hard pieces of SAND STONE some Coarse SAND & Gravels		---	---	---	---	18%	25%	CORE-2
15.0				---	---	---	---	20%	30%	CORE-3
		END OF BORE HOLE								

Log by: ***Muhammad Aqeel***

EARTH TESTING SERVICES

SOIL INVESTIGATION & MATERIALS TESTING LAB

Bungalow No. R-163, Gulshan-e-Mahmood Society, Block 10-A,
Behind Alladin Park, Gulshan-e-Iqbal, Karachi.
Tel: 021-34661387 Email: ets.laboratory@gmail.com

CLIENT: Karachi Development Authority.

PROJECT: Construction of Karimabad Underpass at Karachi.

DATE: 24/Aug/2023

LAB TEST RESULT

BH #	DEPTH (METER)	SAMPLE	ATTERBERG LIMIT LL	PL	PI%	NMC %	BULK DENSITY (gr/cc)	DRY DENSITY (gr/cc)	REMOULDED D/SHEAR (c/kg/cm²)	ø Angle	SULPHATE %
1	3.00	SPT	NON PLASTIC			7.7	2.13	1.98	0.01	36	0.079
1	4.50	SPT	NON PLASTIC			---	---	---	---	---	---
1	6.00	SPT	NON PLASTIC			10.3	2.16	1.96	---	---	---
2	3.00	SPT	33.7	25.3	8.4	8.5	2.11	1.94	---	---	---
2	6.00	SPT	NON PLASTIC			---	---	---	0.00	38	---
2	7.50	SPT	NON PLASTIC			13.7	2.14	1.88	0.00	40	0.085

Earth Testing Services ETS

For EARTH TESTING SERVICES

EARTH TESTING SERVICES
SOIL INVESTIGATION & MATERIALS TESTING LAB
Bungalow No. R-163, Gulshan-e-Mahmood Society, Block 10-A,
Behind Alladin Park, Gulshan-e-Iqbal, Karachi.
Tel: 021-34661387 Email: ets.laboratory@gmail.com

CLIENT: Karachi Development Authority.
PROJECT: Construction of Karimabad Underpass at Karachi.

DATE: 24/Aug/2023

LAB TEST RESULT

BH #	DEPTH (METER)	SAMPLE	ATTERBERG LIMIT LL	PL	PI%	NMC %	BULK DENSITY (gr/cc)	DRY DENSITY (gr/cc)	REMOULDED D/SHEAR (c/kg/cm²)	ø Angle	SULPHATE %
3	3.00	SPT	NON PLASTIC			9.9	2.12	1.93	0.08	35	---
3	4.50	SPT	NON PLASTIC			---	---	---	---	---	---
3	6.00	SPT	NON PLASTIC			12.0	2.17	1.94	---	---	---
4	3.00	SPT	NON PLASTIC			---	---	---	---	---	---
4	6.00	SPT	34.1	24.0	10.2	10.9	2.15	1.94	0.33	19	---
4	7.50	SPT	32.9	25.0	8.0	---	---	---	---	---	0.083

Earth Testing Services ETS

For EARTH TESTING SERVICES

EARTH TESTING SERVICES
SOIL INVESTIGATION & MATERIALS TESTING LAB
Bungalow No. R-163, Gulshan-e-Mahmood Society, Block 10-A,
Behind Alladin Park, Gulshan-e-Iqbal, Karachi.
Tel: 021-34661387 Email: ets.laboratory@gmail.com

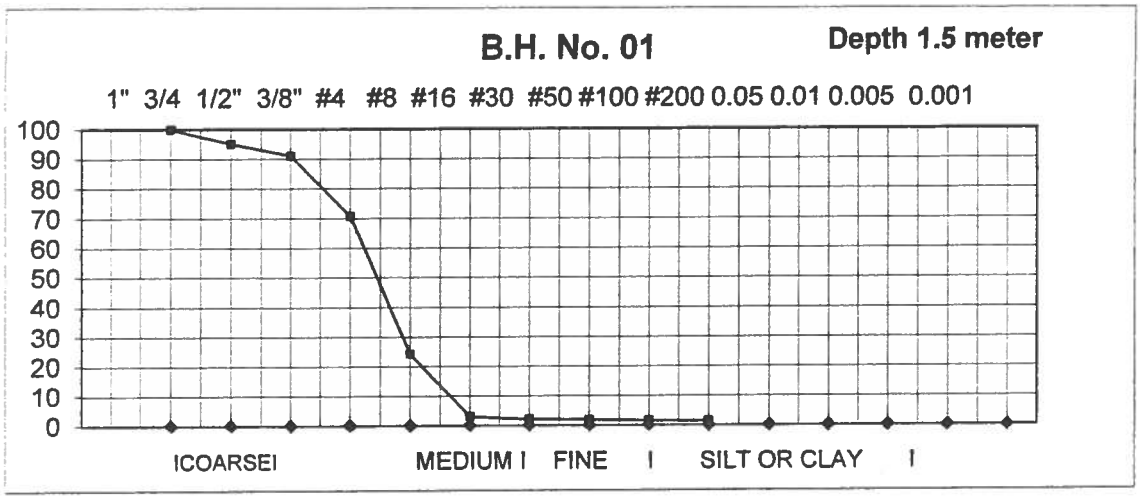
CLIENT: Karachi Development Authority.
PROJECT: Construction of Karimabad Underpass at Karachi.

DATE: 21/Aug/2023

Un-Confined Test Result

BH #	DEPTH (METER)	SAMPLE	UN-CONFINED VALUE (TSF)
1	12.60	CORE	23.65
1	15.00	CORE	41.00
1	20.00	CORE	47.25
2	13.00	CORE	38.10
3	10.00	CORE	28.90
3	15.00	RUN	4.73
4	4.50	RUN	4.92
4	12.00	CORE	32.80

For *EARTH TESTING SERVICES*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1" 3/4 1/2" 3/8" #4 #8 #16 #30 #50 #100 #200 0.05 0.01 0.005 0.001
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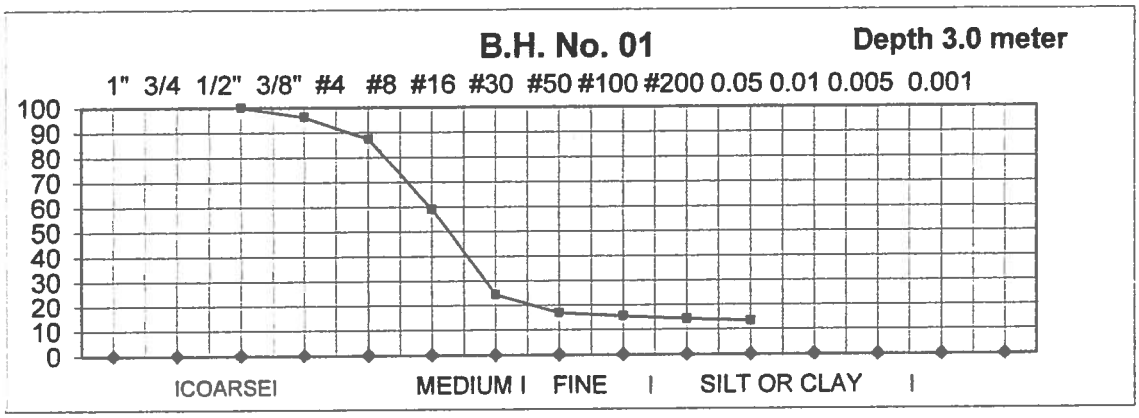
MEDIUM I FINE I SILT OR CLAY I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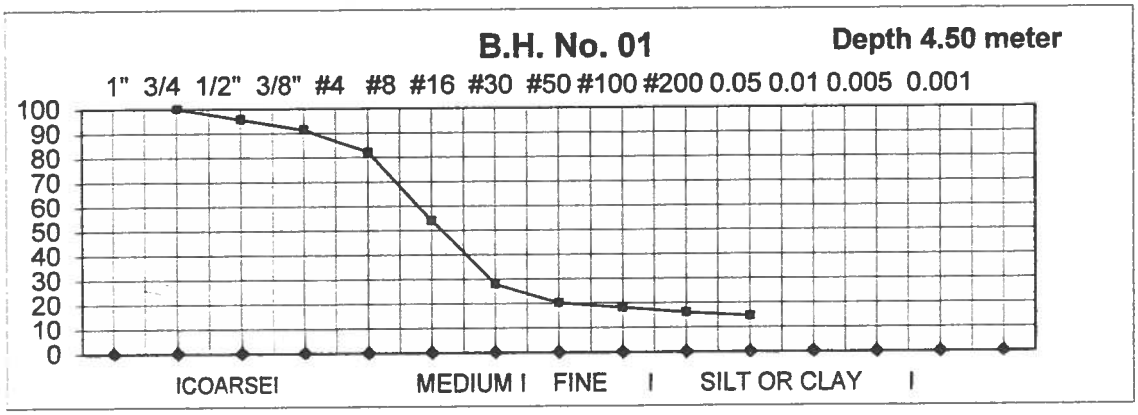
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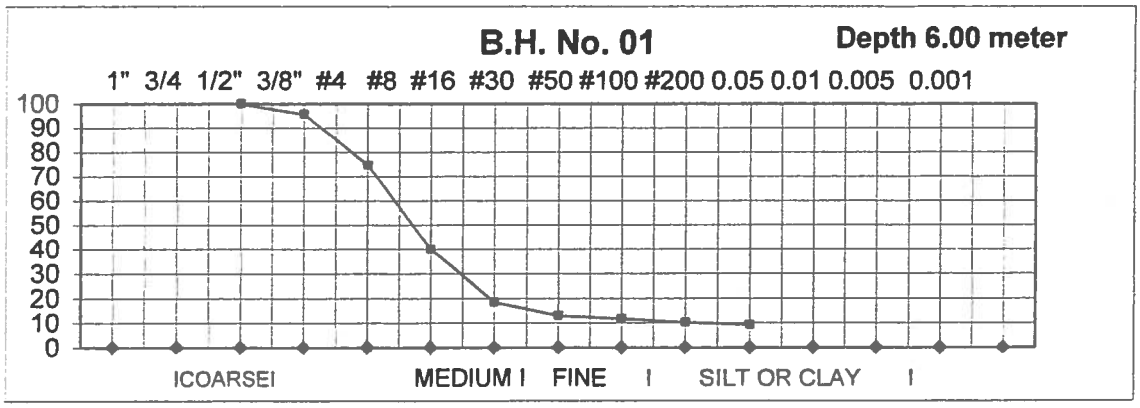
B.H. No. 01
Depth 6.00 meter
1" 3/4 1/2" 3/8" #4 #8 #16 #30 #50 #100 #200 0.05 0.01 0.005 0.001
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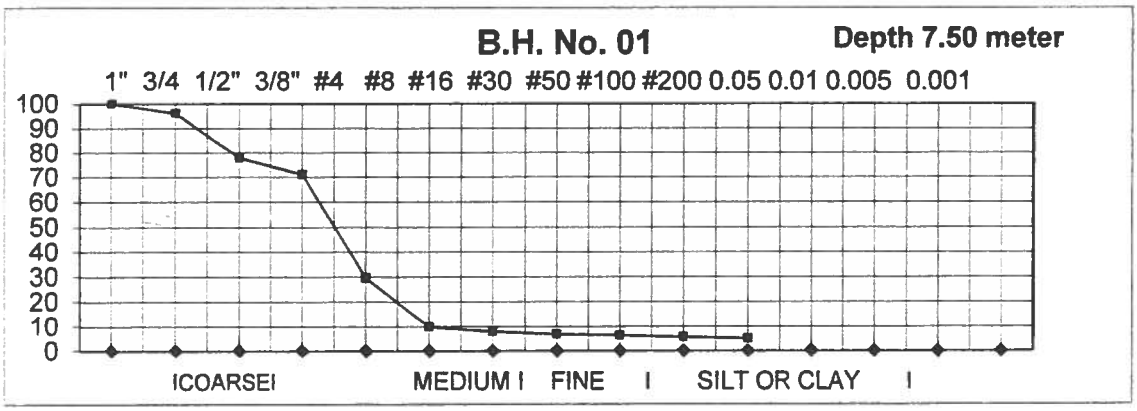
B.H. No. 01
Depth 7.50 meter
1" 3/4 1/2" 3/8" #4 #8 #16 #30 #50 #100 #200 0.05 0.01 0.005 0.001
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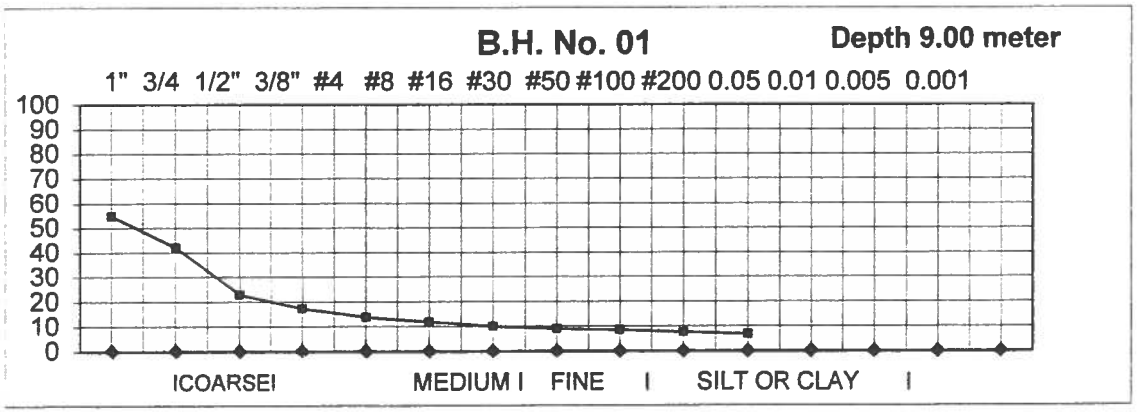
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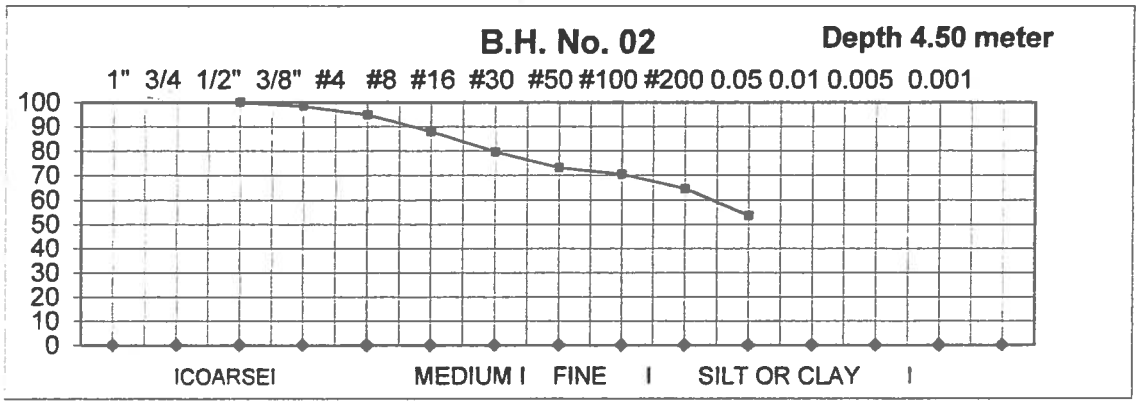
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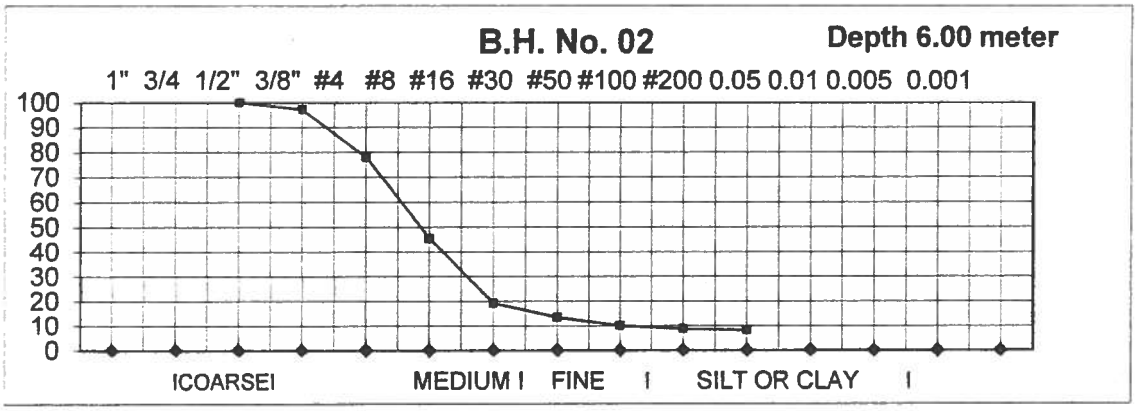
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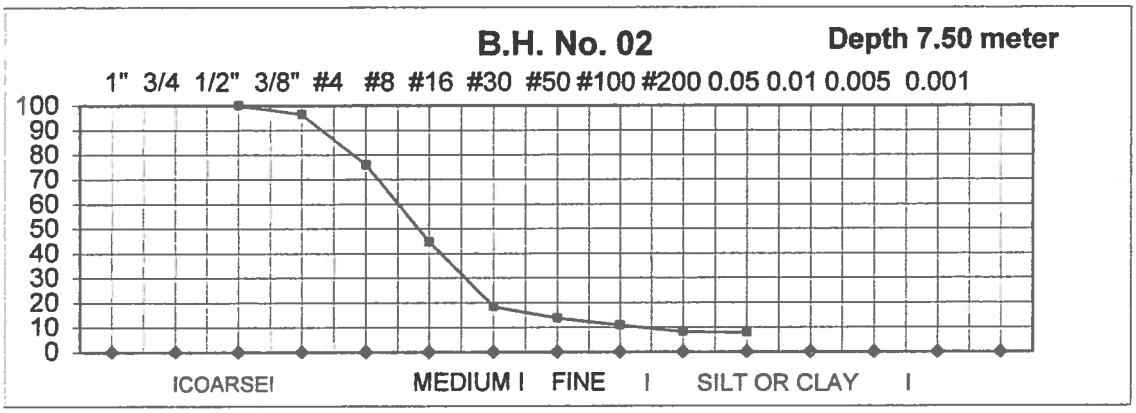
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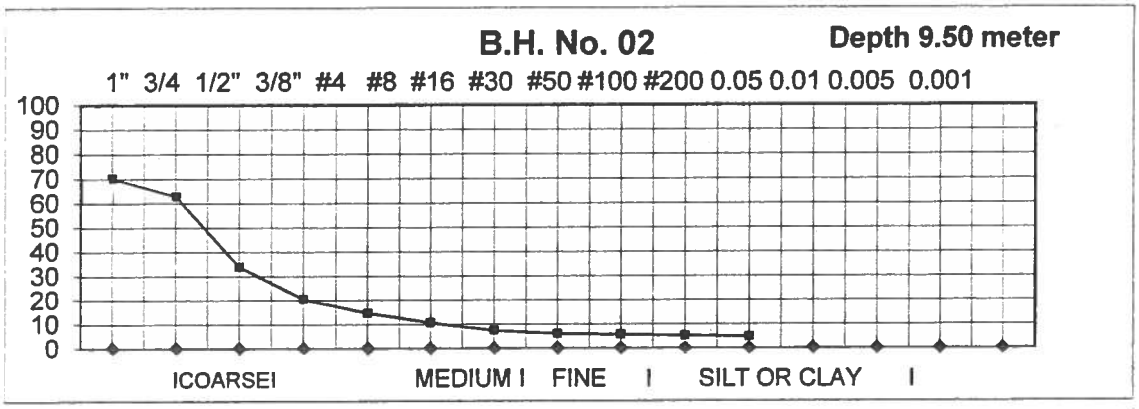
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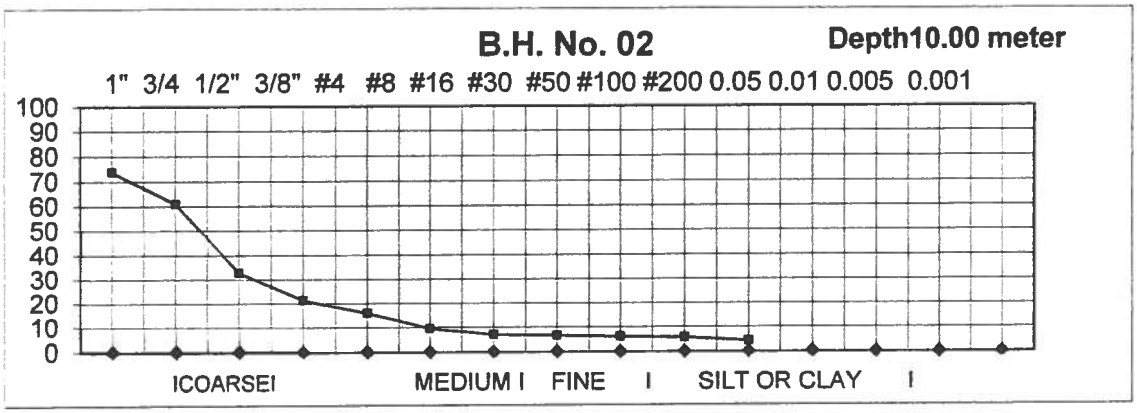
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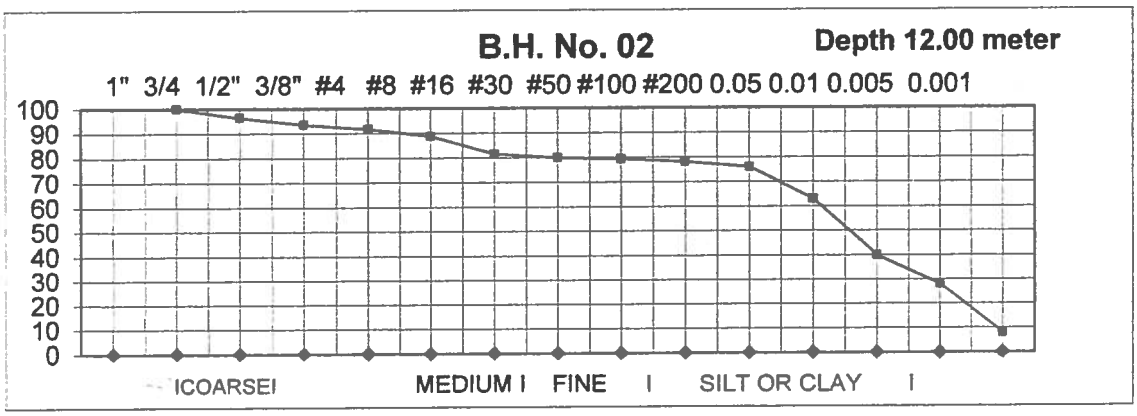
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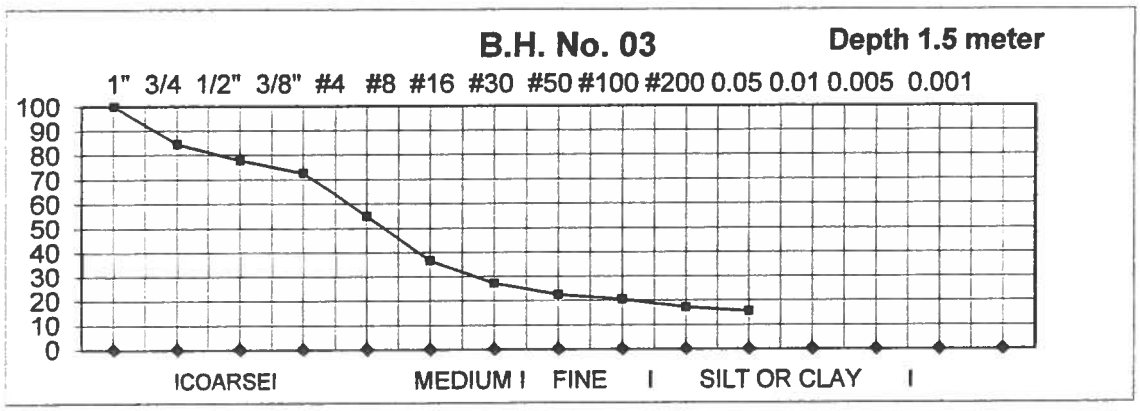
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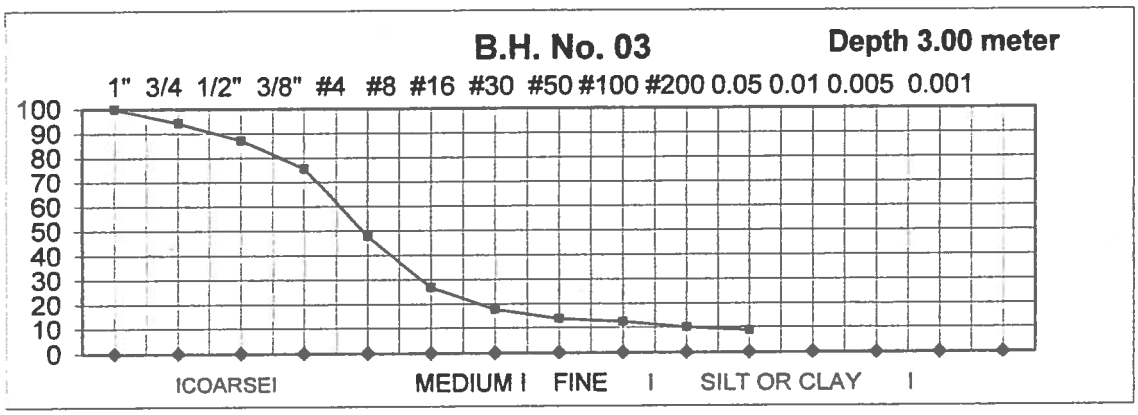
B.H. No. 03
Depth 3.00 meter
1" 3/4 1/2" 3/8" #4 #8 #16 #30 #50 #100 #200 0.05 0.01 0.005 0.001
100
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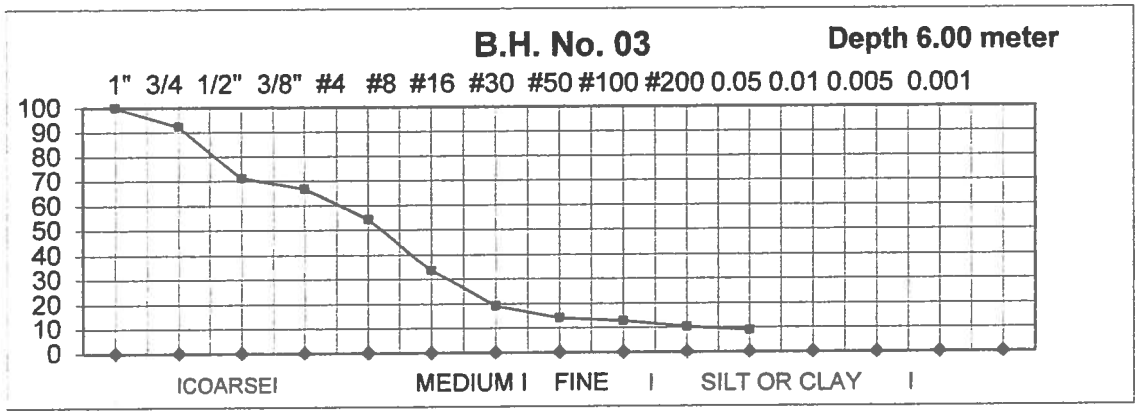
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Depth 6.00 meter
1" 3/4 1/2" 3/8" #4 #8 #16 #30 #50 #100 #200 0.05 0.01 0.005 0.001
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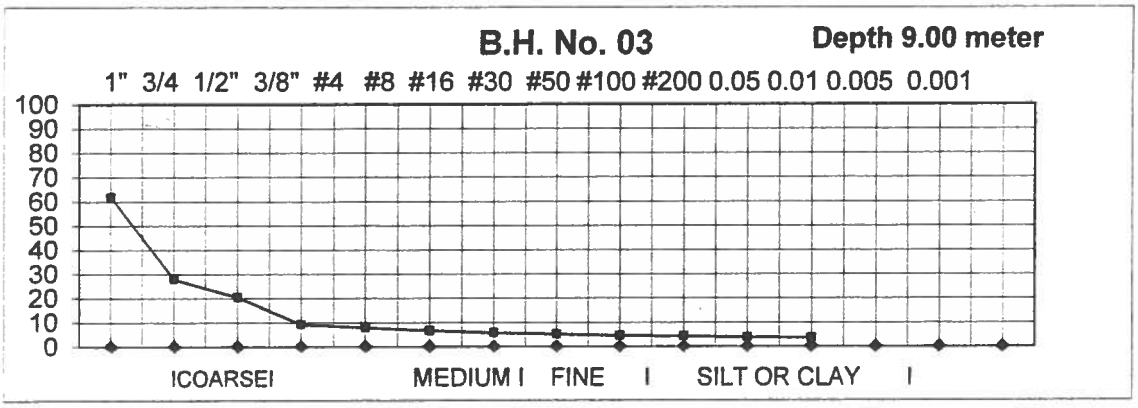
B.H. No. 03
Depth 9.00 meter
1" 3/4 1/2" 3/8" #4 #8 #16 #30 #50 #100 #200 0.05 0.01 0.005 0.001
100
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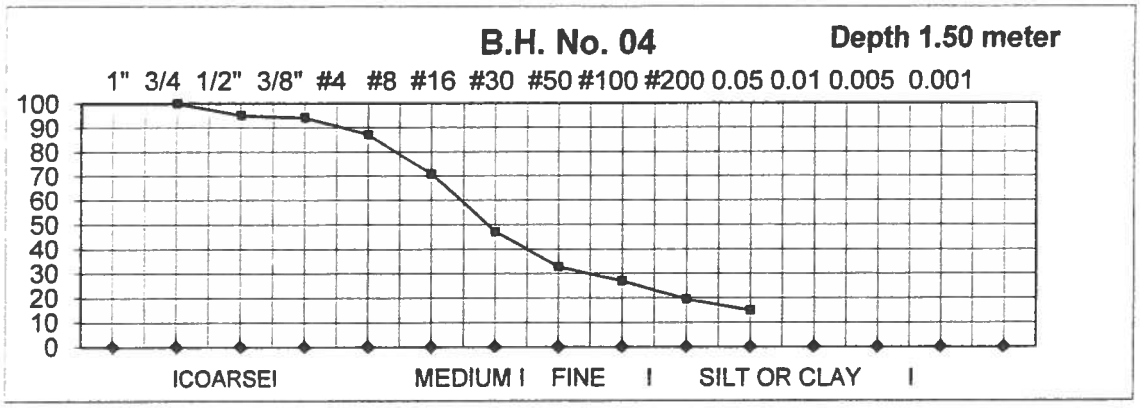
B.H. No. 04
Depth 1.50 meter
1" 3/4 1/2" 3/8" #4 #8 #16 #30 #50 #100 #200 0.05 0.01 0.005 0.001
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80
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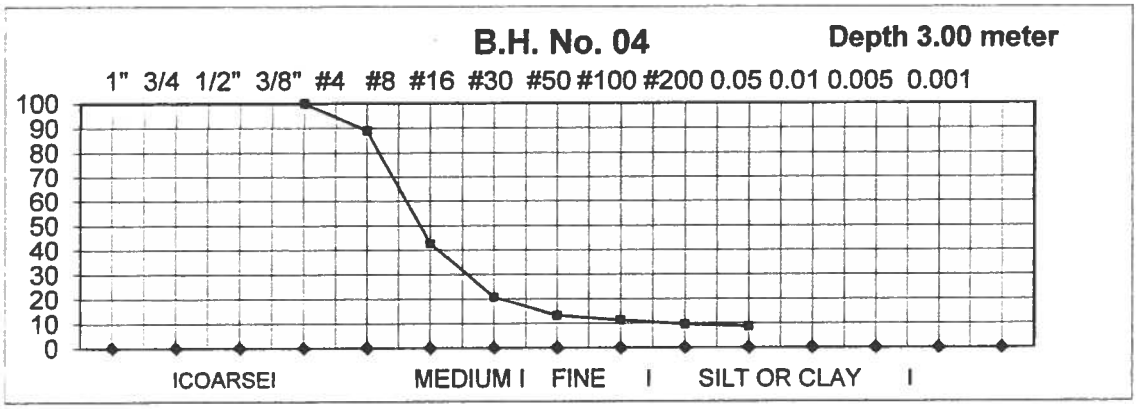
SILT OR CLAY I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Depth 3.00 meter
1" 3/4 1/2" 3/8" #4 #8 #16 #30 #50 #100 #200 0.05 0.01 0.005 0.001
100
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80
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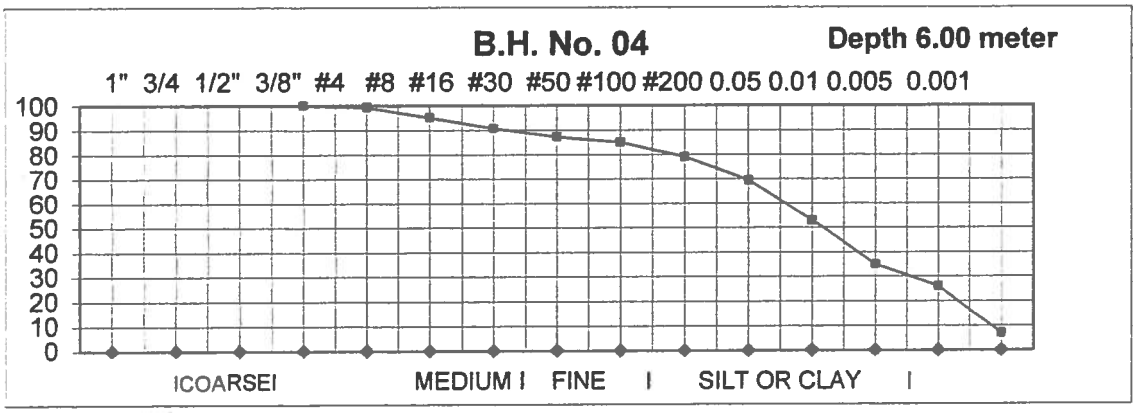
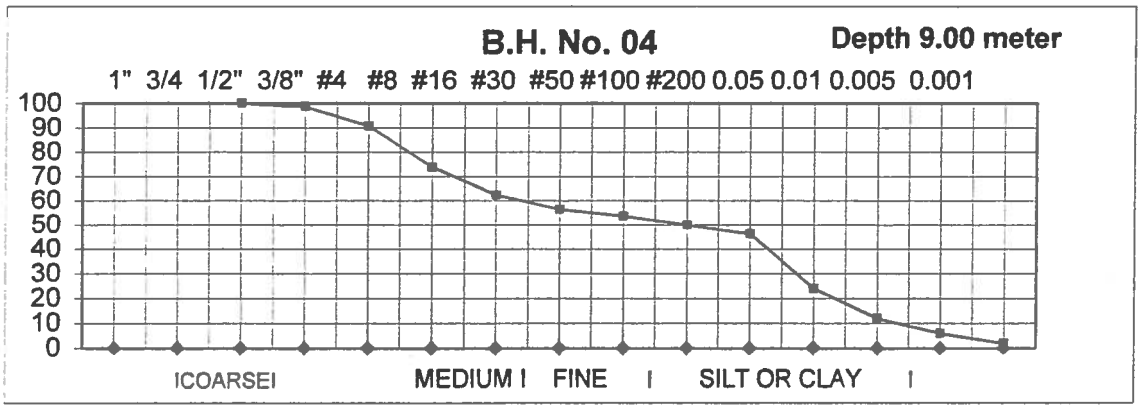
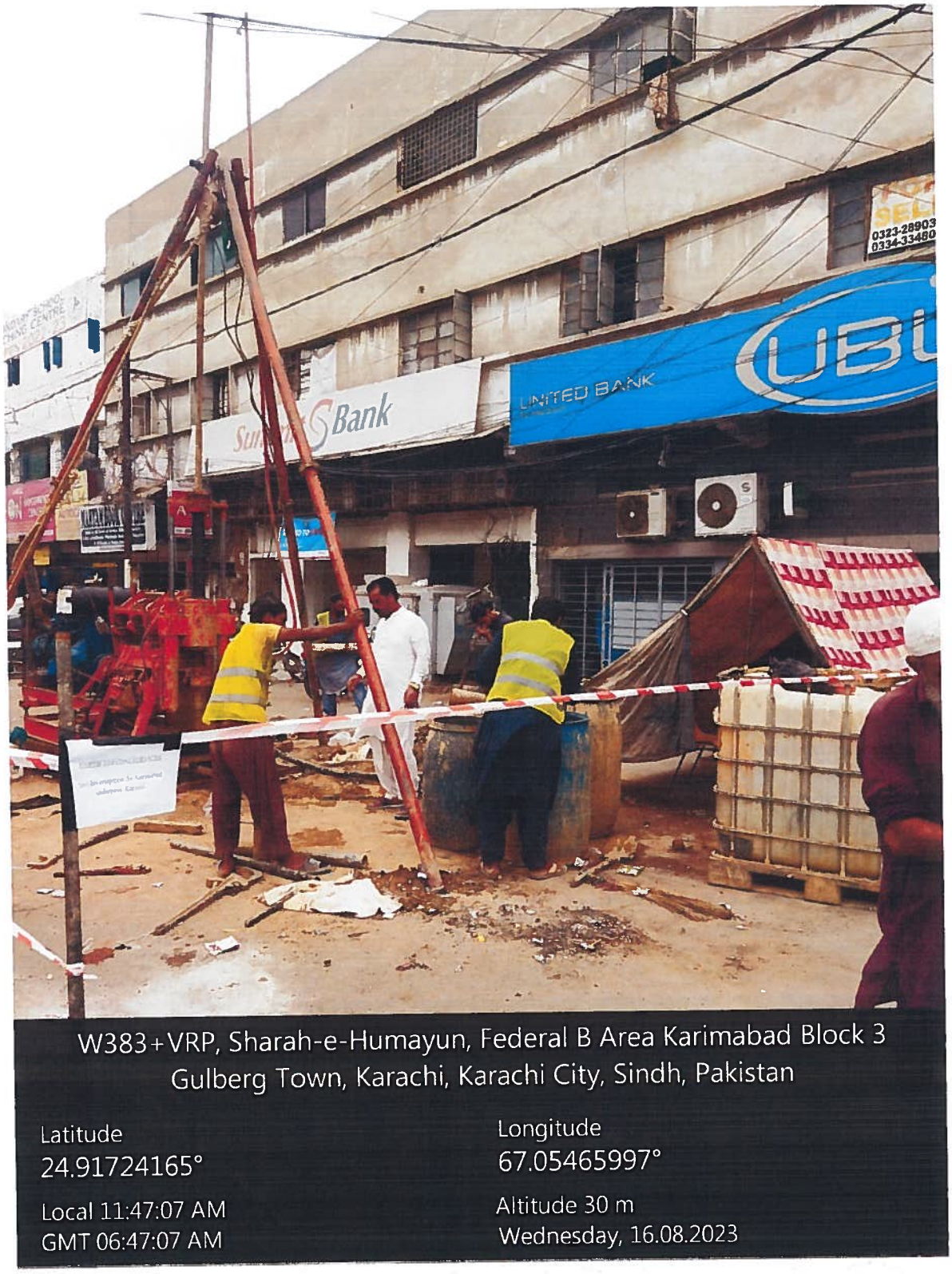
MEDIUM I FINE I
SILT OR CLAY I


B.H. No. 04
Depth 6.00 meter
1" 3/4 1/2" 3/8" #4 #8 #16 #30 #50 #100 #200 0.05 0.01 0.005 0.001
100
90
80
70
60
50
40
30
20
10
0
ICOARSEI
MEDIUM I FINE I
SILT OR CLAY I


B.H. No. 04
Depth 9.00 meter
1" 3/4 1/2" 3/8" #4 #8 #16 #30 #50 #100 #200 0.05 0.01 0.005 0.001
100
90
80
70
60
50
40
30
20
10
0
ICOARSEI
MEDIUM I FINE I SILT OR CLAY I



W383+VRP, Sharah-e-Humayun, Federal B Area Karimabad Block 3
Gulberg Town, Karachi, Karachi City, Sindh, Pakistan

Latitude
24.91724165°

Longitude
67.05465997°

Local 11:47:07 AM
GMT 06:47:07 AM

Altitude 30 m
Wednesday, 16.08.2023

DRILLING WORKS IN PROGRESS ON CONSTRUCTION OF KARIMABAD UNDERPASS AT KARACHI.

DRILLING WORKS IN PROGRESS ON CONSTRUCTION OF KARIMABAD UNDERPASS AT KARACHI.

KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:

CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

ROAD WORKS

DRAFT CONSTRUCTION DRAWINGS
(NOVEMBER ,2023)

CONSULTANT:

ATIF NAZAR (PVT.) LTD.

PROJECT MANAGERS, PLANNERS, ARCHITECTS &
CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI.
P.H. 34820497 - 34982561

GENERAL NOTES

1. GRID COORDINATES & ELEVATIONS ARE BASED ON UNIVERSAL TRANSVERSE MERCATOR (UTM WGS84).
2. EACH DRAWING SHALL BE READ IN CONJUNCTION WITH OTHER DRAWINGS.
3. NOTES GIVEN ON DRAWINGS ADJACENT TO A SECTION OR DETAIL PERTAIN TO THAT PARTICULAR DETAIL ONLY.
4. TENDER DRAWINGS ARE INDICATIVE ONLY. CONSTRUCTION DRAWINGS SHALL BE ISSUED IN DUE COURSE OF TIME, AS THE CONSTRUCTION PROCEEDS.
5. THE BIDDERS SHOULD CAREFULLY EXAMINE THE BOQ ITEMS AND RATES SHOULD BE QUOTED ACCORDINGLY.
6. LOCATION OF UNDERGROUND CABLES/UTILITIES SHOWN ON PLAN ARE APPROXIMATE. EXACT LOCATION SHALL BE DETERMINED BY THE CONTRACTOR AT NO EXTRA COST TO THE EMPLOYER.
7. THE CONTRACTOR SHALL ENDEAVOR MAXIMUM TO MAINTAIN UNINTERRUPTED FLOW OF TRAFFIC ON BOTH SIDES OF EXISTING ROAD AND ITS ADJOINING CROSS ROADS.
8. ANY DAMAGE CAUSED TO THE UTILITIES DURING EXCAVATION/EXECUTION OF WORK SHALL BE REPAIRED BY THE CONTRACTOR AT NO EXTRA COST TO THE EMPLOYER.
9. PROFILE DRAWINGS SHALL BE FINALIZED AFTER TAKING JOINT X-SECTIONS WITH CONSULTANT BEFORE STARTING CONSTRUCTION ACTIVITIES.
10. CONTRACTOR SHALL PREPARE AND SUBMIT, FOR ENGINEER'S APPROVAL, SHOP DRAWINGS FOR STRUCTURES, PAVEMENT MARKINGS (LOCATION, TYPE AND SIZE), ROAD SIGNS ETC. BEFORE EXECUTION OF RELATED WORKS WITHOUT ANY EXTRA COST TO THE EMPLOYER.
11. SERVICE DUCTS SHALL BE PROVIDED AT JUNCTION LOCATIONS OR AT AN INTERVAL AS DIRECTED BY THE ENGINEER.
12. STRUCTURES SHOWN ON PLAN ARE SYMBOLIC. FOR DETAIL OF STRUCTURES SEE RELEVANT DRAWINGS.
13. THE LENGTHS, SIZES, SLOPE, INVERT LEVELS AND OTHERS DETAILS AS SHOWN IN DRAWINGS ARE TENTATIVE. THE CONTRACTOR SHALL PREPARE SHOP DRAWINGS OF EACH STRUCTURE LOCATIONS WITH THE REQUIRED SKEW ANGLE AS PER SITE REQUIREMENTS AND SHALL SUBMIT THE SAME TO THE ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION EXECUTION.
14. THE CONTRACTOR SHALL BE RESPONSIBLE TO CATER FOR ALL TEMPORARY TRAFFIC DIVERSION DURING CONSTRUCTION TO THE SATISFACTION OF THE ENGINEER INCLUDING DETOUR ROAD AND ITS MAINTENANCE, SPRINKLING OF WATER, GRADING AND COMPACTION WHEN AND WHERE REQUIRED WITHOUT ANY EXTRA COST TO EMPLOYER.
15. ROADWAY EXCAVATION MATERIAL SHALL BE UTILIZED IN MOST EFFECTIVE MANNER IN THE EMBANKMENT EVEN WITH BLENDING/ MIXING THE SUPERIOR MATERIALS (IF REQUIRED WITHOUT AT ANY EXTRA COST).ROADWAY EXCAVATION SHALL NOT BE DISPOSED OFF OUTSIDE RIGHT OF WAY WITHOUT WRITTEN APPROVAL OF THE EMPLOYER.
16. 600MM SIGN BOARD SHALL BE USED ALONG CARRIAGEWAY.
17. THE EXISTING UTILITIES SHALL BE SHIFTED AND REPAIRED WITHIN THE CONSTRUCTION LIMITS DURING EXECUTION OF THE WORK. THE CONTRACTOR SHALL ASSIST AND COORDINATE WITH THE RESPECTIVE AGENCIES FOR THIS PURPOSE.
18. RETAINING/DRAINAGE STRUCTURES FOUNDATION SHALL BE PLACED ON FIRM/HARD STRATA AS DIRECTED BY THE ENGINEER.

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:- KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:- CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-

ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO: KUK	DATE:- 15-08-2023
DESIGN BY	SAMEED		
CHECKED BY	WAZI IQBAL	SCALE: N.T.S	SHEET: 01/01 (A3)
APPROVED BY	ATIF		

SHEET TITLE:- GENERAL NOTES

Drawing No. 2305-01-01-02-04-R002 | REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\02_GN\2305-01-01-02-04-R002.dwg
User and Plot Date:- Arshad Ahmed - Tue, 07 Nov 2023 - 4:54pm

LIST OF DRAWINGS

LIST OF DRAWINGS

ROAD WORKS

DWG. No.	TITLE	NO. OF SHEETS
2305-01-01-02-04-R001	LIST OF DRAWINGS	SHEET 1 OF 1
2305-01-01-02-04-R002	GENERAL NOTES	SHEET 1 OF 1
2305-01-01-02-04-R003	KEY MAP	SHEET 1 OF 1
2305-01-01-02-04-R004	LOCATION PLAN	SHEET 1 OF 1

TOPOGRAPHIC SURVEY

2305-01-01-02-04-V100	TOPOGRAPHIC SURVEY LAYOUT PLAN (OVER ALL)	SHEET 1 OF 1
2305-01-01-02-04-V100A	SHEET INDEX	SHEET 1 OF 1
2305-01-01-02-04-V101	LAYOUT PLAN	SHEET 1 OF 04
2305-01-01-02-04-V102	LAYOUT PLAN	SHEET 2 OF 04
2305-01-01-02-04-V103	LAYOUT PLAN	SHEET 3 OF 04
2305-01-01-02-04-V104	LAYOUT PLAN	SHEET 4 OF 04

ROAD LAYOUT PLAN

2305-01-01-02-04-R250	ROAD LAYOUT PLAN	SHEET 1 OF 1
2305-01-01-02-04-R250A	ROAD LAYOUT SHEET INDEX	SHEET 1 OF 1
2305-01-01-02-04-R251	ROAD LAYOUT	SHEET 1 OF 4
2305-01-01-02-04-R252	ROAD LAYOUT	SHEET 2 OF 4
2305-01-01-02-04-R252	ROAD LAYOUT	SHEET 3 OF 4
2305-01-01-02-04-R252	ROAD LAYOUT	SHEET 4 OF 4

ALIGNMENT DATA

2305-01-01-02-04-R005	ALIGNMENT DATA	SHEET 1 OF 1

SETTING - OUT DATA

2305-01-01-02-04-R400	SETTING-OUT CO-ORDINATES	SHEET 1 OF 1
2305-01-01-02-04-R401	SETTING-OUT CO-ORDINATES LAYOUT PLAN	SHEET 1 OF 4
2305-01-01-02-04-R402	SETTING-OUT CO-ORDINATES LAYOUT PLAN	SHEET 2 OF 4
2305-01-01-02-04-R403	SETTING-OUT CO-ORDINATES LAYOUT PLAN	SHEET 3 OF 4
2305-01-01-02-04-R404	SETTING-OUT CO-ORDINATES LAYOUT PLAN	SHEET 4 OF 4

TYPICAL ROAD CROSS SECTIONS

2305-01-01-02-04-R200	TYPICAL CROSS SECTION	SHEET 1 OF 10
2305-01-01-02-04-R201	TYPICAL CROSS SECTION	SHEET 2 OF 10
2305-01-01-02-04-R202	TYPICAL CROSS SECTION	SHEET 3 OF 10
2305-01-01-02-04-R203	TYPICAL CROSS SECTION	SHEET 4 OF 10
2305-01-01-02-04-R204	TYPICAL CROSS SECTION	SHEET 5 OF 10
2305-01-01-02-04-R205	TYPICAL CROSS SECTION	SHEET 6 OF 10
2305-01-01-02-04-R206	TYPICAL CROSS SECTION	SHEET 7 OF 10
2305-01-01-02-04-R207	TYPICAL CROSS SECTION	SHEET 8 OF 10
2305-01-01-02-04-R208	TYPICAL CROSS SECTION	SHEET 9 OF 10
2305-01-01-02-04-R209	TYPICAL CROSS SECTION	SHEET 10 OF 10

PLAN AND PROFILE

2305-01-01-02-04-R301	PLAN & PROFILE	SHEET 1 OF 2
2305-01-01-02-04-R302	PLAN & PROFILE	SHEET 2 OF 2

GENERAL DRAWINGS

2305-01-01-02-04-R900	GEOMETRIC DESIGN PARAMETERS	SHEET 1 OF 1
2305-01-01-02-04-R901	ROAD TRAFFIC SIGNS DETAIL	SHEET 1 OF 10
2305-01-01-02-04-R902	ROAD TRAFFIC SIGNS DETAIL	SHEET 2 OF 10
2305-01-01-02-04-R903	ROAD TRAFFIC SIGNS DETAIL	SHEET 3 OF 10
2305-01-01-02-04-R904	ROAD TRAFFIC SIGNS DETAIL	SHEET 4 OF 10
2305-01-01-02-04-R905	ROAD TRAFFIC SIGNS DETAIL	SHEET 5 OF 10
2305-01-01-02-04-R906	ROAD TRAFFIC SIGNS DETAIL	SHEET 6 OF 10
2305-01-01-02-04-R907	SIGN POST AND FOUNDATION DETAIL	SHEET 7 OF 10
2305-01-01-02-04-R908	SIGN POST AND FOUNDATION DETAIL	SHEET 8 OF 10
2305-01-01-02-04-R909	PAVEMENT MARKING DETAIL	SHEET 9 OF 10
2305-01-01-02-04-R910	PAVEMENT MARKING DETAIL	SHEET 10 OF 10
2305-01-01-02-04-R911	STANDARD DETAILS OF CURB BLOCKS, PRECAST CURB & GUTTER AND FOOTPATH	SHEET 1 OF 1

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO: KUK	DATE:- 15-08-2023
DESIGN BY	SAMEED		
CHECKED BY	WAZI IQBAL	SCALE: N.T.S	SHEET: 01/01 (A3)
APPROVED BY	ATIF		

SHEET TITLE:-
LIST OF DRAWINGS

Drawing No. 2305-01-01-02-04-R001
REVISION C0

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User and Plot Date: Arshad Ahmed - Wed, 08 Nov 2023 - 11:30am

LOCATION PLAN

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-

KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-

CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

DRAWN BY	ARSHAD	PROJECT NO. KUK	DATE:- 15-08-2023
DESIGN BY	-----		
CHECKED BY	WAZI IQBAL	SCALE: N.T.S	SHEET: 01/01 (A3)
APPROVED BY	ATIF		

CONSULTANT:-

ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

SHEET TITLE:-

KEY MAP

Drawing No.	REVISION
2305-01-01-02-04-R003	C0

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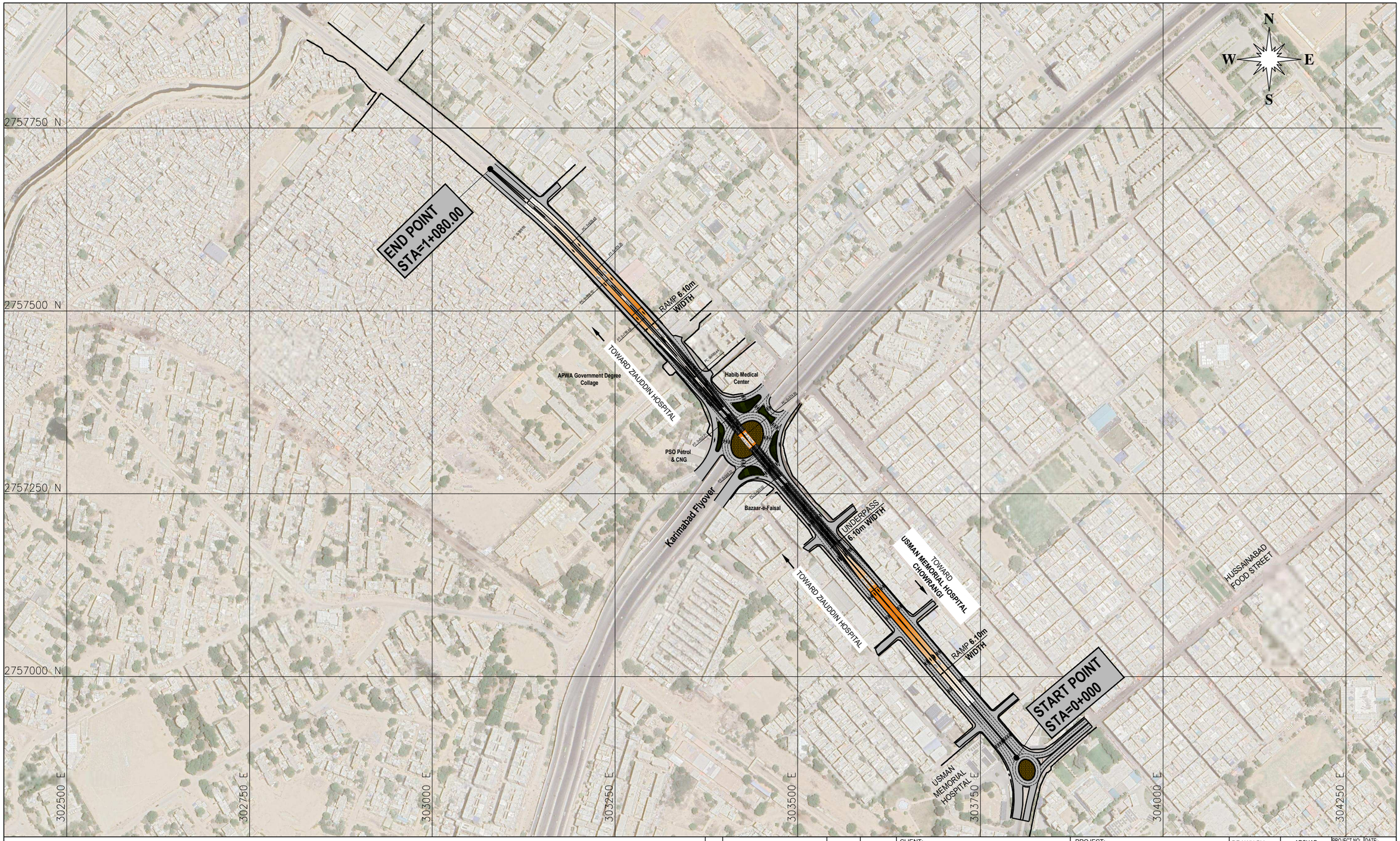

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-

KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-

CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

DRAWN BY	ARSHAD	PROJECT NO: KUK	DATE:- 15-08-2023
DESIGN BY	MAHRUKH		
CHECKED BY	WAZI	SCALE: 1:5000	SHEET: 01/01 (A3)
APPROVED BY	ATIF		

CONSULTANT:-

ATIF NAZAR (PVT.) LTD.

PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

SHEET TITLE:-

KARIMABAD
LOCATION PLAN

Drawing No. 2305-01-01-02-04-R003

REVISION --

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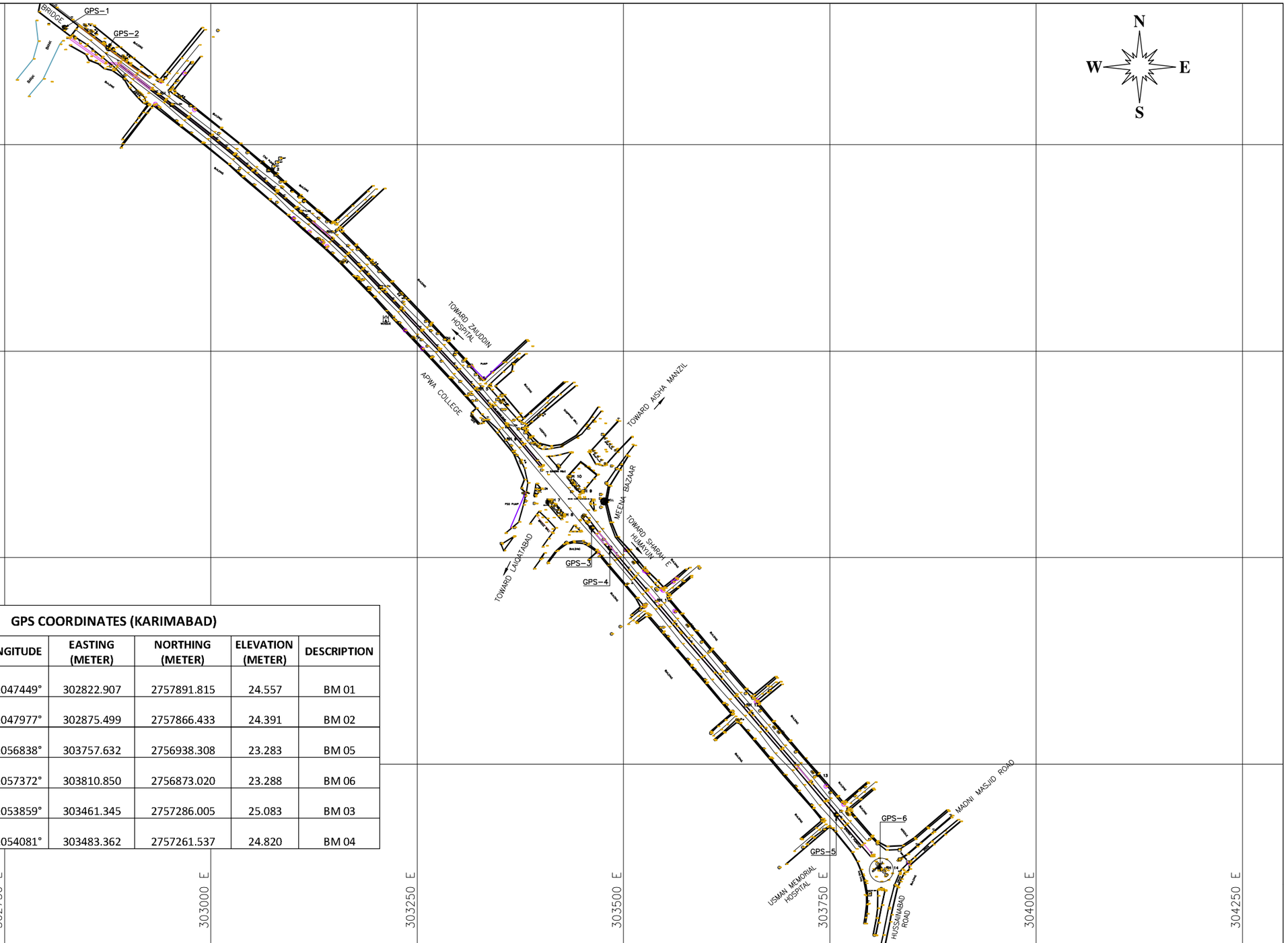
User and Plot Date: Arshad Ahmed - Tue, 07 Nov 2023 - 3:51pm

SURVEY DATA PLAN



GPS COORDINATES (KARIMABAD)

S.NO	LATITUDE	LONGITUDE	EASTING (METER)	NORTHING (METER)	ELEVATION (METER)	DESCRIPTION
1	24.923480°	67.047449°	302822.907	2757891.815	24.557	BM 01
2	24.923261°	67.047977°	302875.499	2757866.433	24.391	BM 02
3	24.914999°	67.056838°	303757.632	2756938.308	23.283	BM 05
4	24.914419°	67.057372°	303810.850	2756873.020	23.288	BM 06
5	24.918102°	67.053859°	303461.345	2757286.005	25.083	BM 03
6	24.917879°	67.054081°	303483.362	2757261.537	24.820	BM 04

LEGENDS:-

- SPOT ELEVATION
- TREES
- PYLON
- TRAVERSE (CP,RH,TS)
- TRANSFORMER
- 24.85 LEVEL
- 20.74 BED LEVEL
- MANHOLE
- TELEPHONE POLE
- ELECTRIC POLE
- INVERT
- BED
- GATE
- LIGHT POLE
- UNIT
- GATE PILLAR
- BENCH MARK
- BRIDGE PILLAR
- CAMERA POLE
- WELL
- SIGNAL
- ROUNDABOUT
- POLE
- ELECTRIC BOX
- MOSQUE
- MEDIAN
- CONCRETE BASE
- KERBSTONE
- FOOT PATH
- NALA BANK
- EXISTING BRIDGE
- RETAINING WALL
- EXISTING BUILDING
- EXISTING DRAIN
- EXIS-ROAD
- EXIS-CENTER LINE
- PUMP

REV.	DESCRIPTION	DATE	APPROVED

CLIENT:- KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:- CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-

ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO.	DATE:-
DESIGN BY	----------	KUK	15-08-2023
CHECKED BY	-------	SCALE:	SHEET:
APPROVED BY		1:5000	01/01 (A3)

SHEET TITLE:-
TOPOGRAPHIC SURVEY
KARIMABAD
OVER ALL LAYOUT PLAN

Drawing No. 2305-01-01-02-04-V100

REVISION --

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\04_Survey Data\2305-01-01-02-04-V100.dwg
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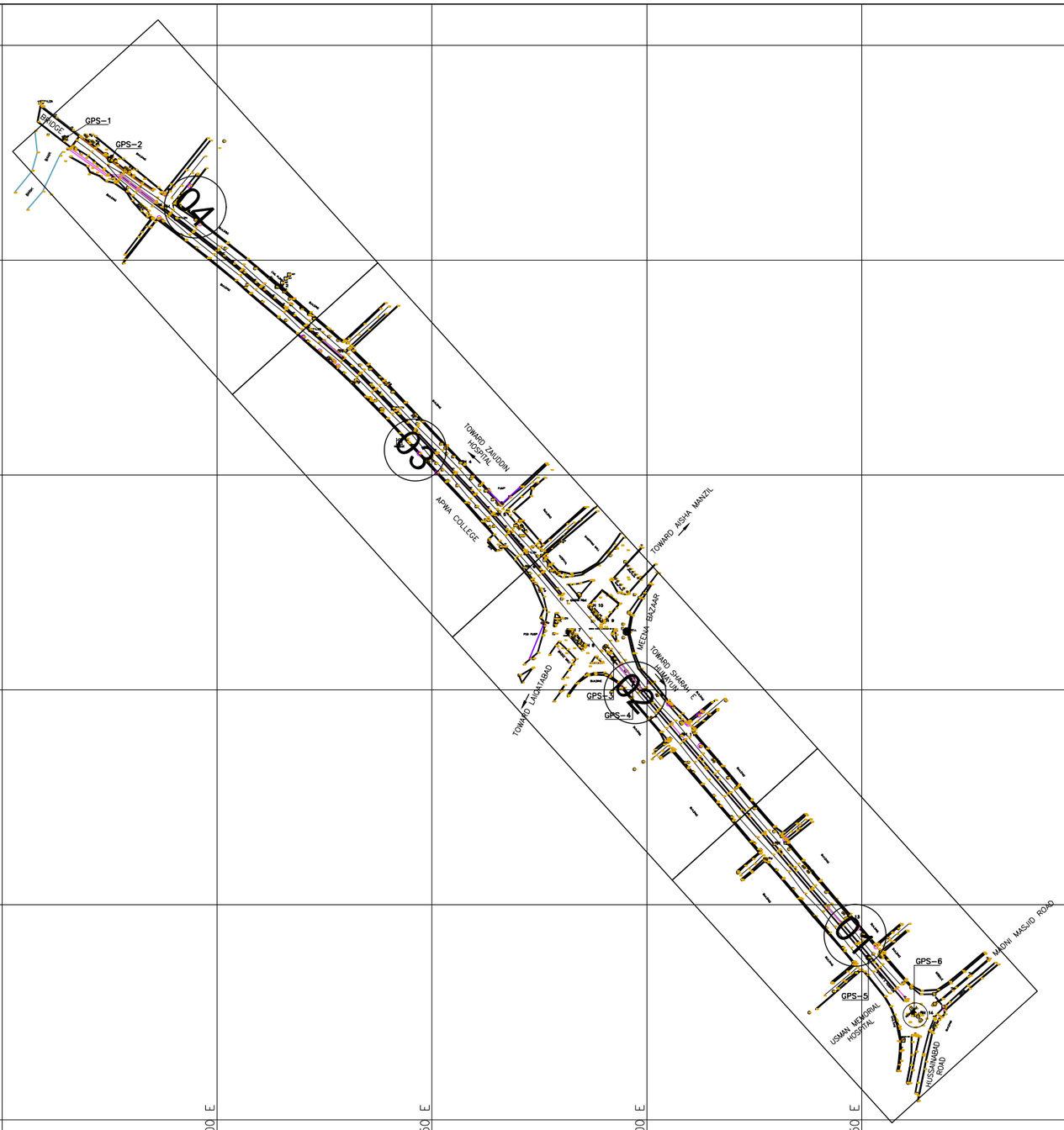

LEGENDS:-

+	SPOT ELEVATION	MH	MANHOLE		BENCH MARK
	TREES	TP	TELEPHONE POLE		BRIDGE PILLAR
⊠	PYLON	EP	ELECTRIC POLE		CAMERA POLE
○	TRAVERSE (CP,RH,TS)	+	INVERT		WELL
□	TRANSFORMER	+	BED		SIGNAL
·24.85	LEVEL		GATE		ROUNDABOUT
·20.74	BED LEVEL		LIGHT POLE		POLE
			UNIT		ELECTRIC BOX
			GATE PILLAR		MOSQUE

MEDIAN			
CONCRETE BASE			
KERBSTONE			
FOOT PATH			
NALA BANK			
EXISTING BRIDGE			
RETAINING WALL			
EXISTING BUILDING			
EXISTING DRAIN			
EXIS-ROAD			
EXIS-CENTER LINE			
PUMP			

REV.	DESCRIPTION	DATE	APPROVED

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO:	DATE:-
DESIGN BY	----------	KUK	15-08-2023
CHECKED BY	----------	SCALE:	SHEET:
APPROVED BY		1:6000	01/01 (A3)

SHEET TITLE:-
TOPOGRAPHIC SURVEY
KARIMBAD
SHEET INDEX

Drawing No. 2305-01-01-02-04-V100A
REVISION --

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\04_Survey Data\2305-01-01-02-04-V100A.dwg
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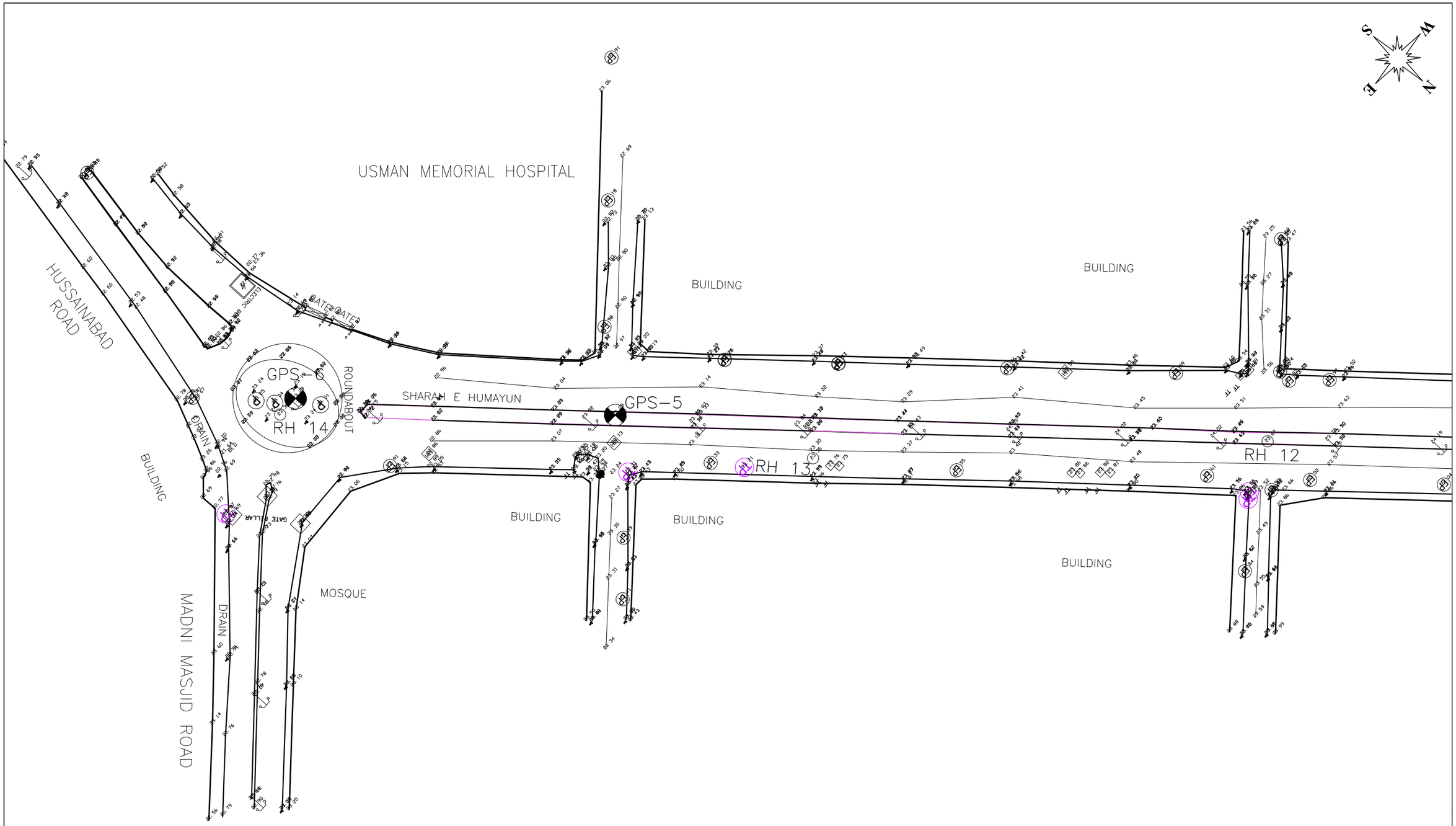

LEGENDS:-

+	SPOT ELEVATION	MH	MANHOLE		BENCH MARK
	TREES	TP	TELEPHONE POLE		BRIDGE PILLAR
⊠	PYLON	EP	ELECTRIC POLE		CAMERA POLE
○	TRAVERSE (CP,RH,TS)	+	INVERT		WELL
□	TRANSFORMER	+	BED		SIGNAL
·24.85	LEVEL		GATE		ROUNDABOUT
·20.74	BED LEVEL		LIGHT POLE	P	POLE
			UNIT		ELECTRIC BOX
			GATE PILLAR		MOSQUE

MEDIAN	CONCRETE BASE	KERBSTONE	FOOT PATH
NALA BANK	EXISTING BRIDGE	RETAINING WALL	EXISTING BUILDING
EXISTING DRAIN	EXIS-ROAD	EXIS-CENTER LINE	PUMP

REV.	DESCRIPTION	DATE	APPROVED

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-
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PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO:	DATE:-
DESIGN BY	----------	KUK	15-08-2023
CHECKED BY	----------	SCALE:	SHEET:
APPROVED BY		1:1000	01/04 (A3)

SHEET TITLE:-
TOPOGRAPHIC SURVEY
KARIMABAD
LAYOUT PLAN

Drawing No. 2305-01-01-02-04-V101
REVISION --

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\04_Survey Data\2305-01-01-02-04-V101 TO 104.dwg
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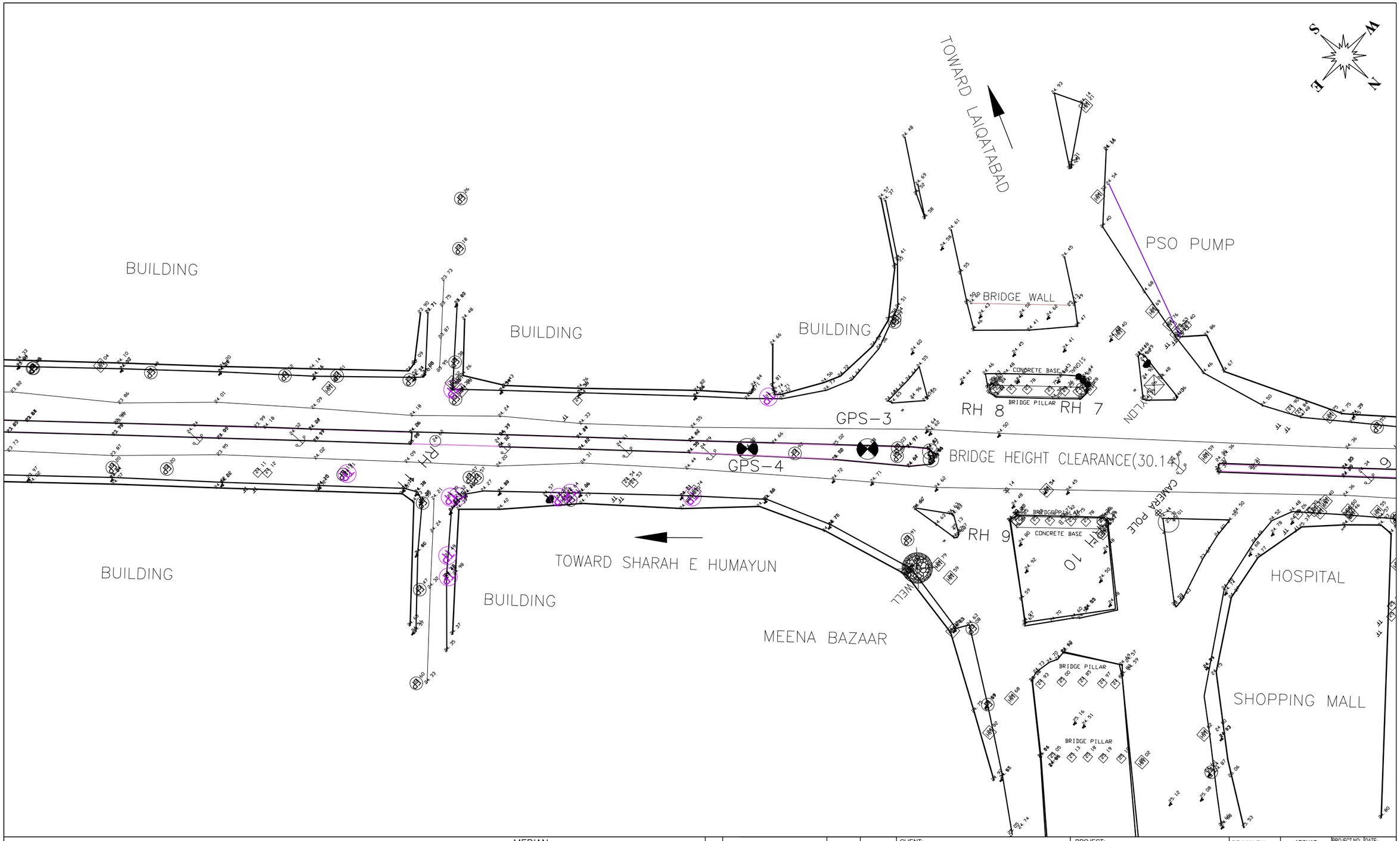

LEGENDS:-

+	SPOT ELEVATION	MH	MANHOLE		BENCH MARK
	TREES	TP	TELEPHONE POLE		BRIDGE PILLAR
	PYLON	EP	ELECTRIC POLE		CAMERA POLE
	TRAVERSE (CP,RH,TS)	+	INVERT		WELL
	TRANSFORMER	+	BED		SIGNAL
·24.85	LEVEL		GATE		ROUNDABOUT
·20.74	BED LEVEL		LIGHT POLE	P	POLE
			UNIT		ELECTRIC BOX
			GATE PILLAR		MOSQUE

MEDIAN
CONCRETE BASE
KERBSTONE
FOOT PATH
NALA BANK
EXISTING BRIDGE
RETAINING WALL
EXISTING BUILDING
EXISTING DRAIN
EXIS-ROAD
EXIS-CENTER LINE
PUMP

REV.	DESCRIPTION	DATE	APPROVED

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

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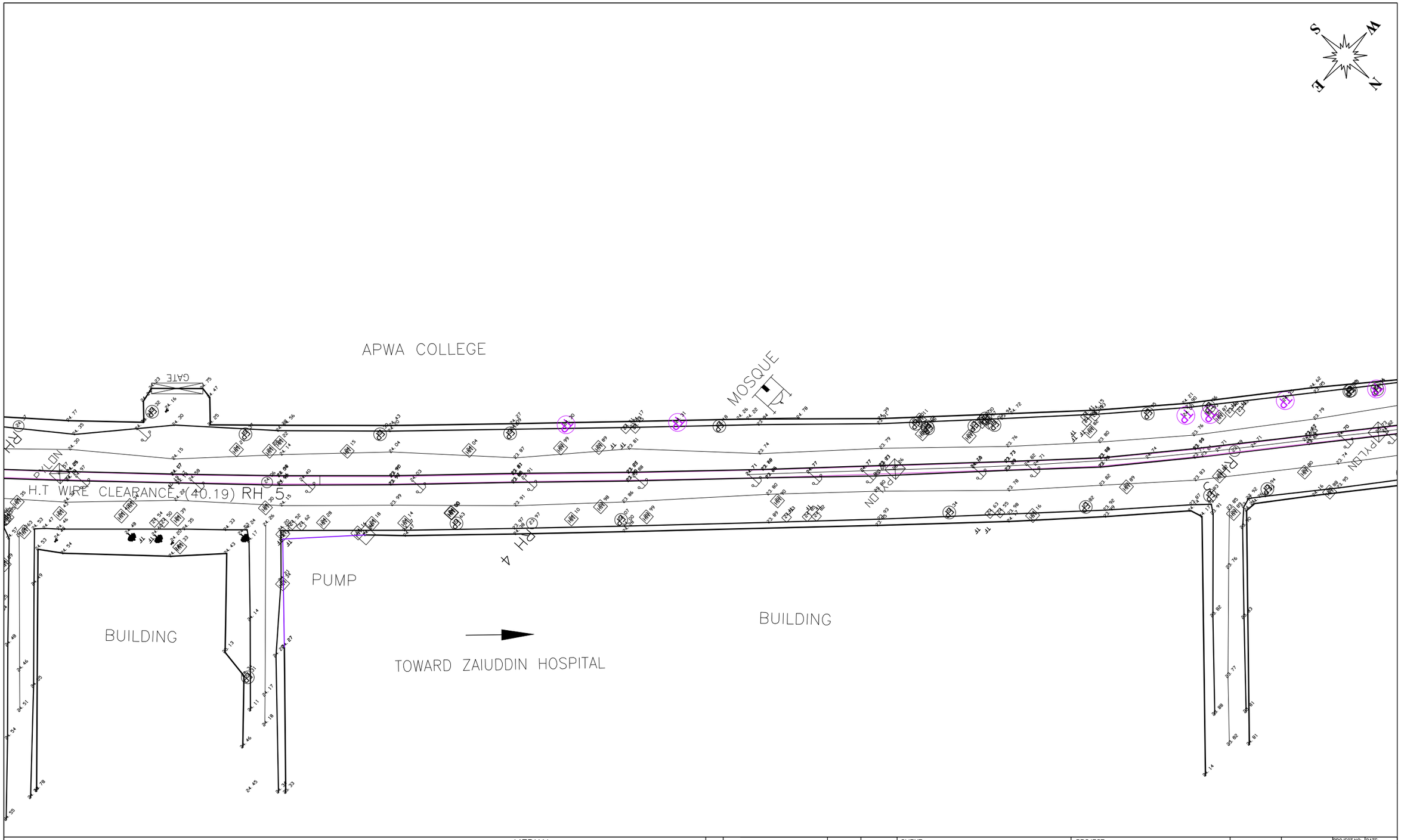
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO:	DATE:-
DESIGN BY	----------	KUK	15-08-2023
CHECKED BY	----------	SCALE:	SHEET:
APPROVED BY		1:1000	02/04 (A3)

SHEET TITLE:-
TOPOGRAPHIC SURVEY
KARIMABAD
LAYOUT PLAN

Drawing No. 2305-01-01-02-04-V102
REVISION --

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\04_Survey Data\2305-01-01-02-04-V101 TO 104.dwg
User and Plot Date:- Arshad Ahmed - Tue, 07 Nov 2023 - 3:54pm



LEGENDS:-

+	SPOT ELEVATION	MH	MANHOLE		BENCH MARK
	TREES	TP	TELEPHONE POLE		BRIDGE PILLAR
⊠	PYLON	EP	ELECTRIC POLE		CAMERA POLE
○	TRAVERSE (CP,RH,TS)	+	INVERT		WELL
□	TRANSFORMER	+	BED		SIGNAL
24.85	LEVEL		GATE		ROUNDABOUT
20.74	BED LEVEL		LIGHT POLE	P	POLE
			UNIT		ELECTRIC BOX
			GATE PILLAR		MOSQUE

MEDIAN			
CONCRETE BASE			
KERBSTONE			
FOOT PATH			
NALA BANK			
EXISTING BRIDGE			
RETAINING WALL			
EXISTING BUILDING			
EXISTING DRAIN			
EXIS-ROAD			
EXIS-CENTER LINE			
PUMP			

REV.	DESCRIPTION	DATE	APPROVED

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

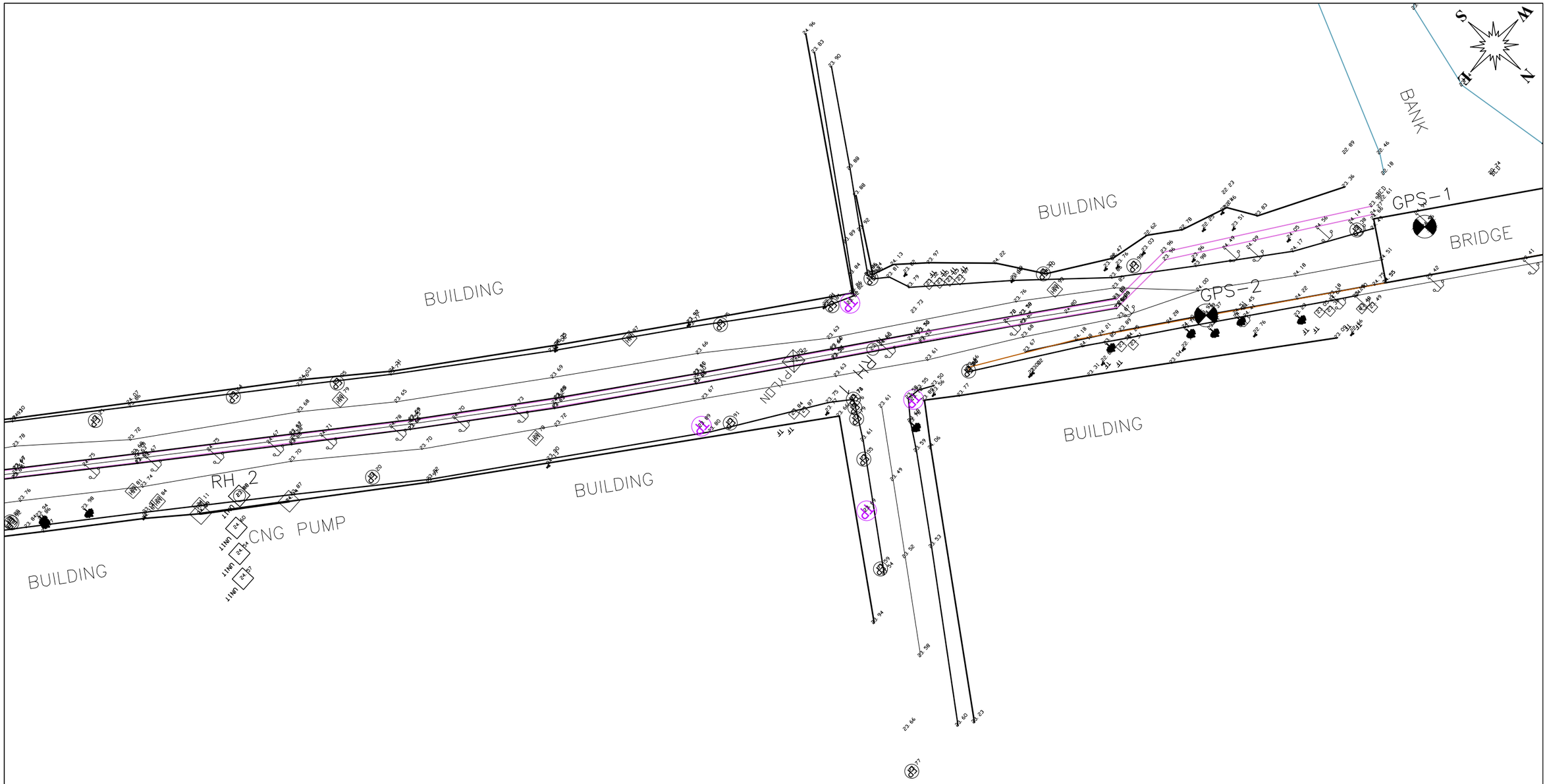
CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO:	DATE:-
DESIGN BY	----------	KUK	15-08-2023
CHECKED BY	----------	SCALE:	SHEET:
APPROVED BY		1:1000	03/04 (A3)

SHEET TITLE:-
TOPOGRAPHIC SURVEY
KARIMABAD
LAYOUT PLAN

Drawing No. 2305-01-01-02-04-V103
REVISION --

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\04_Survey Data\2305-01-01-02-04-V101 TO 104.dwg
User and Plot Date: Arshad Ahmed - Tue, 07 Nov 2023 - 3:54pm



LEGENDS:-

+	SPOT ELEVATION	MH	MANHOLE		BENCH MARK
	TREES	TP	TELEPHONE POLE		BRIDGE PILLAR
⊠	PYLON	EP	ELECTRIC POLE		CAMERA POLE
○	TRAVERSE (CP,RH,TS)	+	INVERT		WELL
□	TRANSFORMER	+	BED		SIGNAL
·24.85	LEVEL		GATE		ROUNDABOUT
·20.74	BED LEVEL		LIGHT POLE	Ⓟ	POLE
		□	UNIT		ELECTRIC BOX
		□	GATE PILLAR		MOSQUE

	MEDIAN		
	CONCRETE BASE		
	KERBSTONE		
	FOOT PATH		
	NALA BANK		
	EXISTING BRIDGE		
	RETAINING WALL		
	EXISTING BUILDING		
	EXISTING DRAIN		
	EXIS-ROAD		
	EXIS-CENTER LINE		
	PUMP		

REV.	DESCRIPTION	DATE	APPROVED

CLIENT:-

KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-

CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-

ATIF NAZAR (PVT.) LTD.

PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO: KUK	DATE:- 15-08-2023
DESIGN BY	----------		
CHECKED BY	----------	SCALE: 1:1000	SHEET: 04/04 (A3)
APPROVED BY			

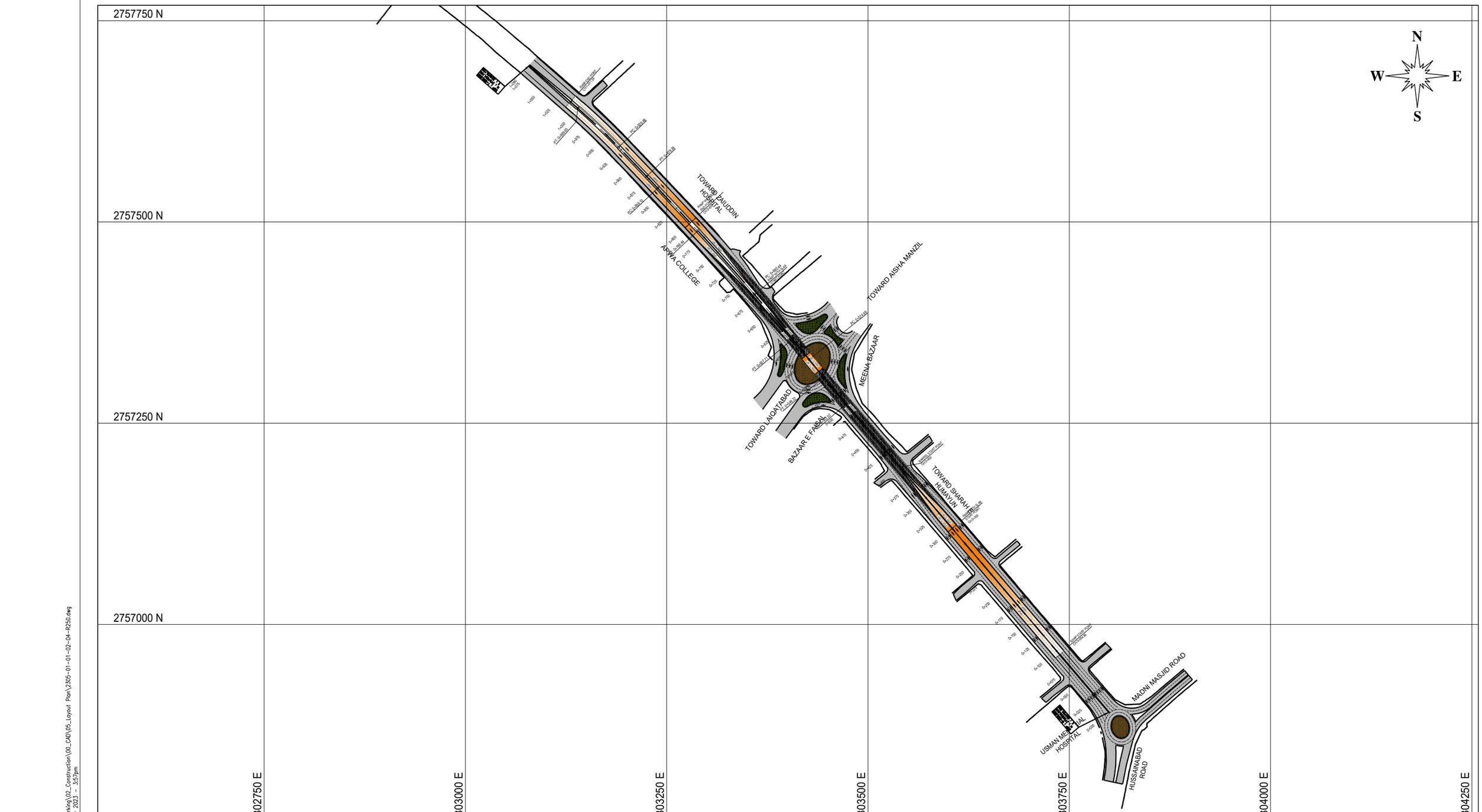
SHEET TITLE:-

TOPOGRAPHIC SURVEY KARIMABAD LAYOUT PLAN

Drawing No.	REVISION
2305-01-01-02-04-V104	--

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\04_Survey Data\2305-01-01-02-04-V101 TO 104.dwg
User and Plot Date:- Arshad Ahmed - Tue, 07 Nov 2023 - 3:54pm

ROAD LAYOUT PLAN



NOTES:–

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE STATED.
2. FOR CROSS SECTION LOCATIONS, REFER PLAN&PROFILE DRAWINGS.
3. FOR UTILITY DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.
4. FOR STRUCTURAL DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.

LEGEND

- PROPOSED CENTER LINE
- PROPOSED KERB
- PROPOSED LANE MARKING
- PROPOSED EDGE LINE
- EXISTING BUILDING
- L.O.W. (LIMIT OF WORK)
- RAMP
- BARREL
- MARKING ARROWS
- FOOTPATH
- GREEN AREA

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-

KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-

CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-

ATIF NAZAR (PVT.) LTD.

PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	A.A	PROJECT NO:	DATE-
DESIGN BY	SAMEED	KUK	15-08-2023
CHECKED BY	WAZI IQBAL	SCALE:	SHEET:
APPROVED BY	ATIF	1:5000	01/01 (A3)

SHEET TITLE:-

OVER ALL LAYOUT PLAN
KARIMABAD UNDERPASS

Drawing No.	REVISION
2305-01-01-02-04-R250	T0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\05_Layout Plan\2305-01-01-02-04-R250.dwg
User and Plot Date: Arshad Ahmed – Tue, 07 Nov 2023 – 3:57pm

2758000 N

2757750 N

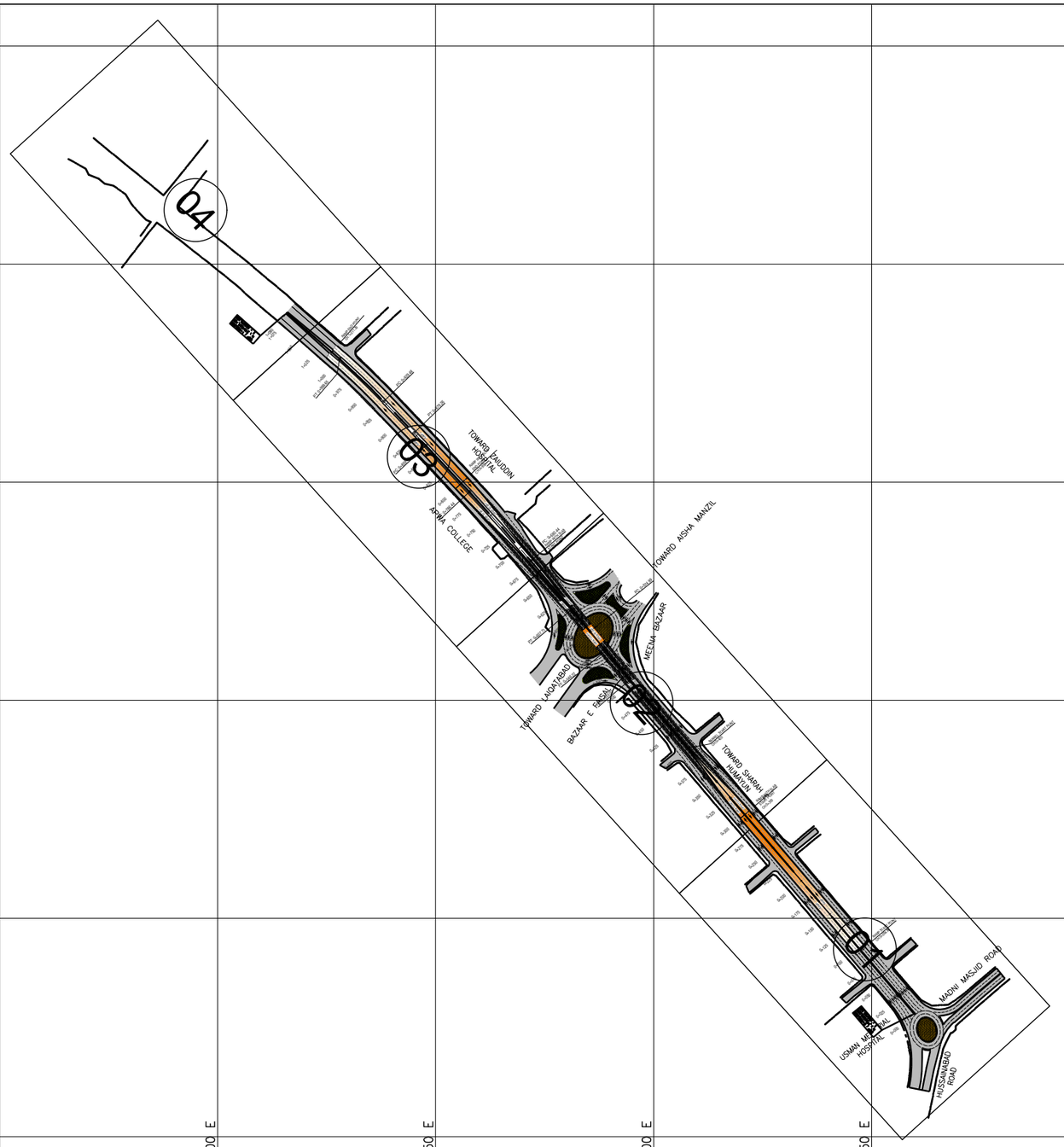
2757500 N

2757250 N

2757000 N

2756750 N

302250 E | 302500 E | 302750 E | 303000 E | 303250 E | 303500 E | 303750 E | 304000 E | 304250 E



N

W E

S

NOTES:–

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE STATED.
2. FOR CROSS SECTION LOCATIONS, REFER LAYOUT PLAN DRAWINGS.
3. FOR UTILITY DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.
4. FOR STRUCTURAL DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.

LEGEND

- PROPOSED CENTER LINE
- PROPOSED KERB
- PROPOSED LANE MARKING
- PROPOSED EDGE LINE
- EXISTING BUILDING
- L.O.W. (LIMIT OF WORK)
- RAMP
- BARREL
- MARKING ARROWS
- FOOTPATH
- GREEN AREA

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-

KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-

CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

DRAWN BY	A.A	PROJECT NO: KUK	DATE- 15-08-2023
DESIGN BY	SAMEED		
CHECKED BY	WAZI IQBAL	SCALE: 1:4500	SHEET: 01/01 (A3)
APPROVED BY	ATIF		

CONSULTANT:-

ATIF NAZAR (PVT.) LTD.

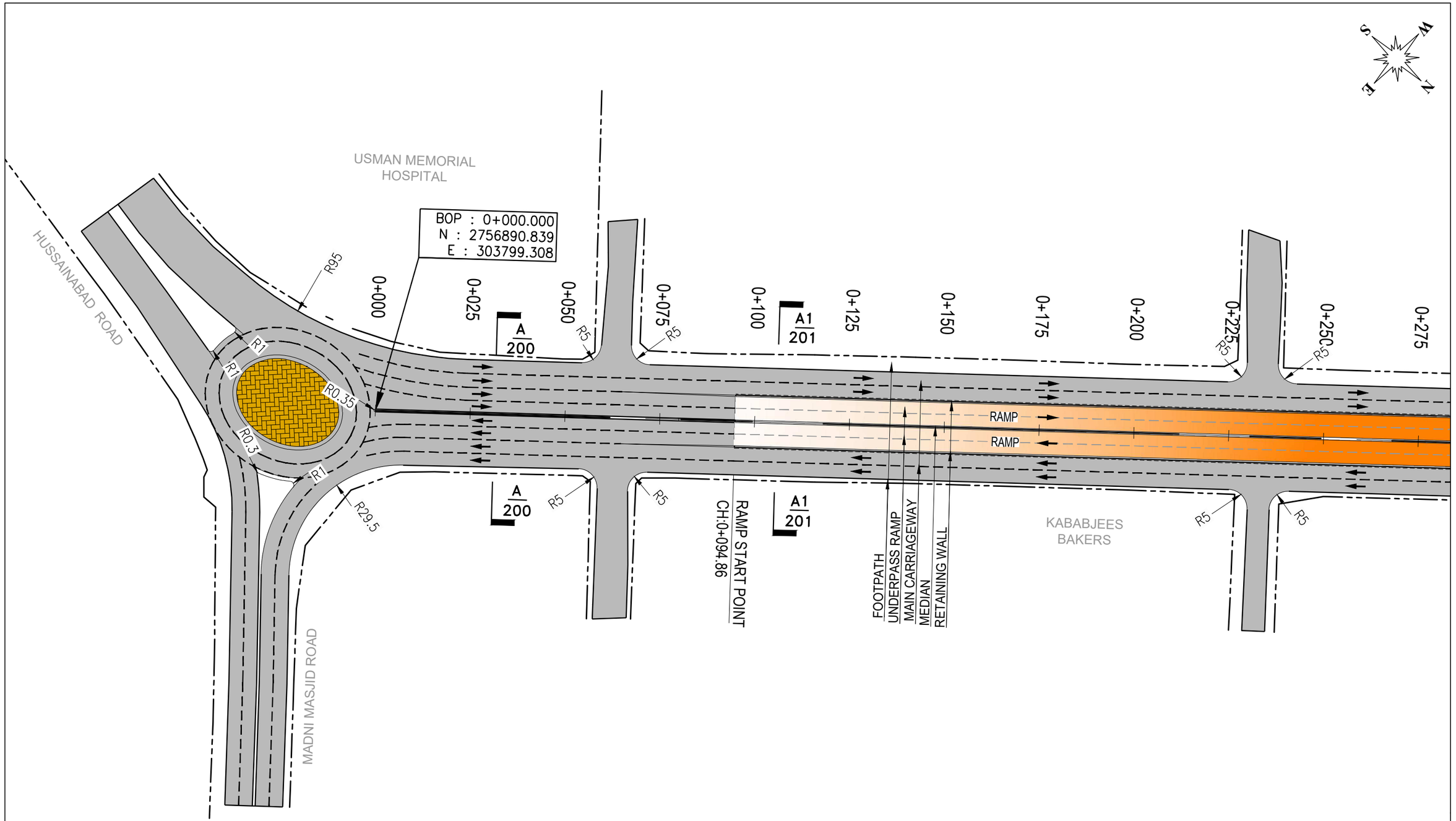
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

SHEET TITLE:-

SHEET INDEX PLAN
KARIMBAD UNDERPASS

Drawing No.	REVISION
2305-01-01-02-04-R250A	T0

Drawing file path & name: D:\Projects\03_Karimabad Working\02_Construction\00_CAD\05_Layout Plan\2305-01-01-02-04-R250A.dwg
User and Plot Date: Arshad Ahmed - Tue, 07 Nov 2023 - 3:56pm



NOTES:–

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE STATED.
2. FOR CROSS SECTION LOCATIONS, REFER LAYOUT PLAN DRAWINGS.
3. FOR UTILITY DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.
4. FOR STRUCTURAL DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.

LEGEND

- PROPOSED CENTER LINE
- PROPOSED KERB
- PROPOSED LANE MARKING
- PROPOSED EDGE LINE
- EXISTING BUILDING
- L.O.W. (LIMIT OF WORK)
- RAMP
- BARREL
- MARKING ARROWS
- FOOTPATH
- GREEN AREA

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

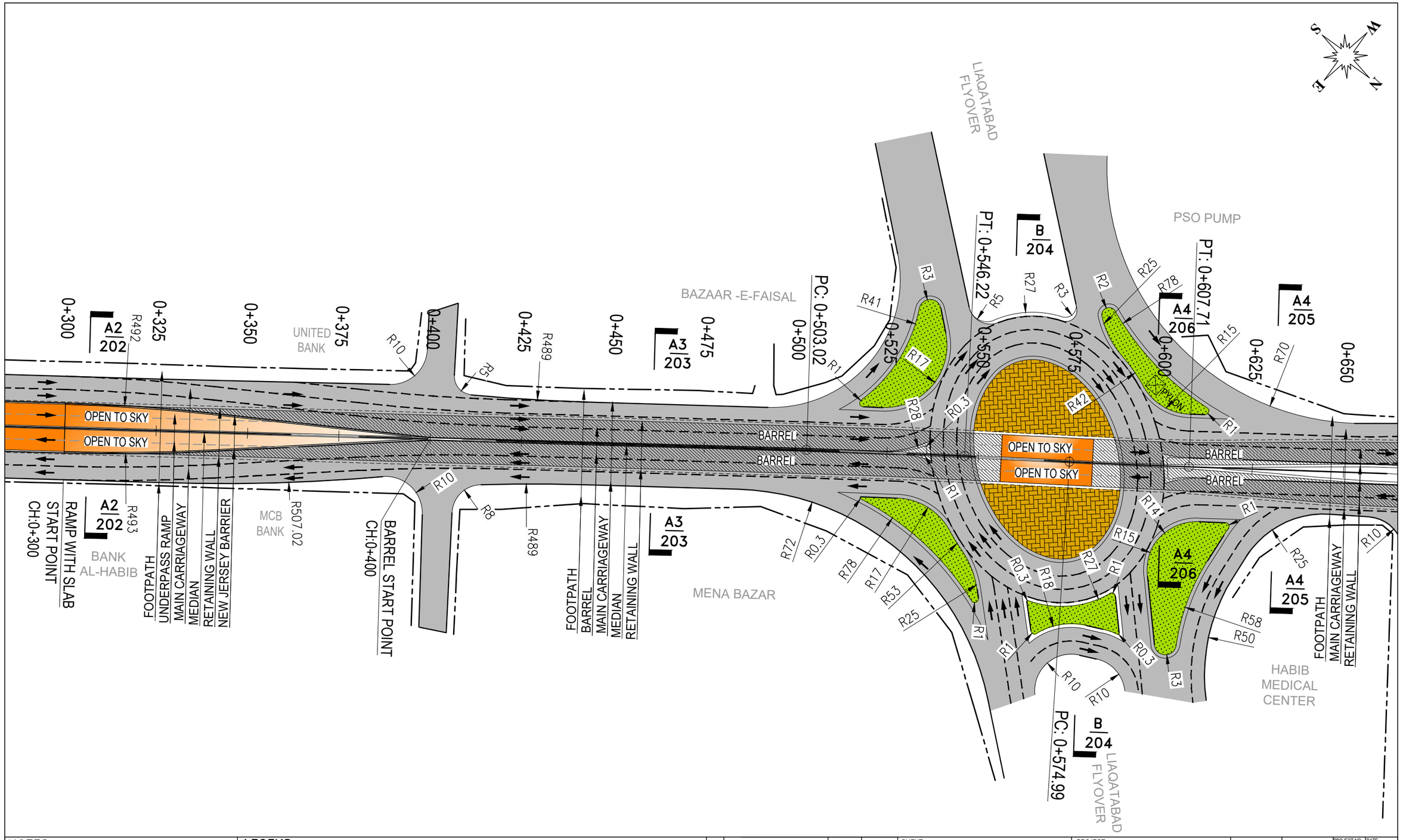
CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO:	DATE:-
DESIGN BY	SAMEED	KUK	15-08-2023
CHECKED BY	WAZI IQBAL	SCALE:	SHEET:
APPROVED BY	ATIF	1:1000	01/04 (A3)

SHEET TITLE:-
KARIMABAD UNDERPASS LAYOUT PLAN (SHEET 01/04)

Drawing No. 2305-01-01-02-04-R251
REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\05_Layout Plan\2305-01-01-02-04-R251 TO 254.dwg
User and Plot Date: Arshad Ahmed – Tue, 07 Nov 2023 – 5:20pm



NOTES:–

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE STATED.
2. FOR CROSS SECTION LOCATIONS, REFER LAYOUT PLAN DRAWINGS.
3. FOR UTILITY DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.
4. FOR STRUCTURAL DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.

LEGEND

- PROPOSED CENTER LINE
- PROPOSED KERB
- PROPOSED LANE MARKING
- PROPOSED EDGE LINE
- EXISTING BUILDING
- L.O.W. (LIMIT OF WORK)
- RAMP
- BARREL
- MARKING ARROWS
- FOOTPATH
- GREEN AREA

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

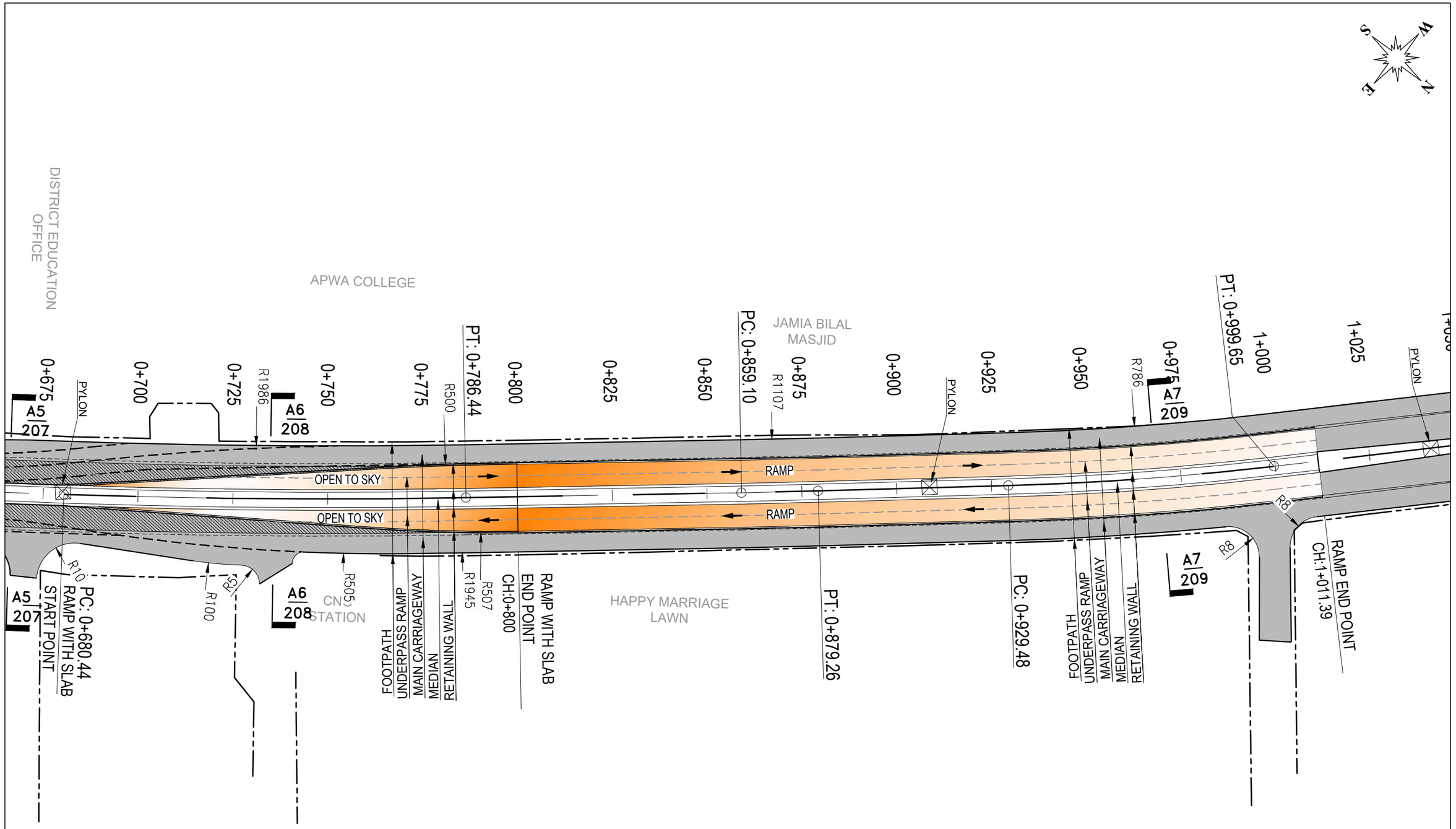
CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO:	DATE:-
DESIGN BY	SAMEED	KUK	15-08-2023
CHECKED BY	WAZI IQBAL	SCALE:	SHEET:
APPROVED BY	ATIF	1:1000	02/04 (A3)

SHEET TITLE:-
KARIMABAD UNDERPASS
LAYOUT PLAN
(SHEET 02/04)

Drawing No. 2305-01-01-02-04-R252
REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\05_Layout Plan\2305-01-01-02-04-R251 TO 254.dwg
User and Plot Date: Arshad Ahmed - Tue, 07 Nov 2023 - 5:21pm



NOTES:–

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE STATED.
2. FOR CROSS SECTION LOCATIONS, REFER LAYOUT PLAN DRAWINGS.
3. FOR UTILITY DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.
4. FOR STRUCTURAL DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.

LEGEND

- PROPOSED CENTER LINE
- PROPOSED KERB
- PROPOSED LANE MARKING
- PROPOSED EDGE LINE
- EXISTING BUILDING
- L.O.W. (LIMIT OF WORK)
- RAMP
- BARREL
- MARKING ARROWS
- FOOTPATH
- GREEN AREA

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO:	DATE:-
DESIGN BY	SAMEED	KUK	15-08-2023
CHECKED BY	WAZI IQBAL	SCALE:	SHEET:
APPROVED BY	ATIF	1:1000	03/04 (A3)

SHEET TITLE:-
KARIMABAD UNDERPASS LAYOUT PLAN (SHEET 03/04)

Drawing No. 2305-01-01-02-04-R253
REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\05_Layout Plan\2305-01-01-02-04-R251 TO 254.dwg
User and Plot Date: Arshad Ahmed - Tue, 07 Nov 2023 - 5:21pm

NOTES:–

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE STATED.
2. FOR CROSS SECTION LOCATIONS, REFER LAYOUT PLAN DRAWINGS.
3. FOR UTILITY DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.
4. FOR STRUCTURAL DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.

LEGEND

- PROPOSED CENTER LINE
- PROPOSED KERB
- PROPOSED LANE MARKING
- PROPOSED EDGE LINE
- EXISTING BUILDING
- L.O.W. (LIMIT OF WORK)
- RAMP
- BARREL
- MARKING ARROWS
- FOOTPATH
- GREEN AREA

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-

KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-

CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-

ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO:	DATE:-
DESIGN BY	SAMEED	KUK	15-08-2023
CHECKED BY	WAZI IQBAL	SCALE:	SHEET:
APPROVED BY	ATIF	1:1000	04/04 (A3)

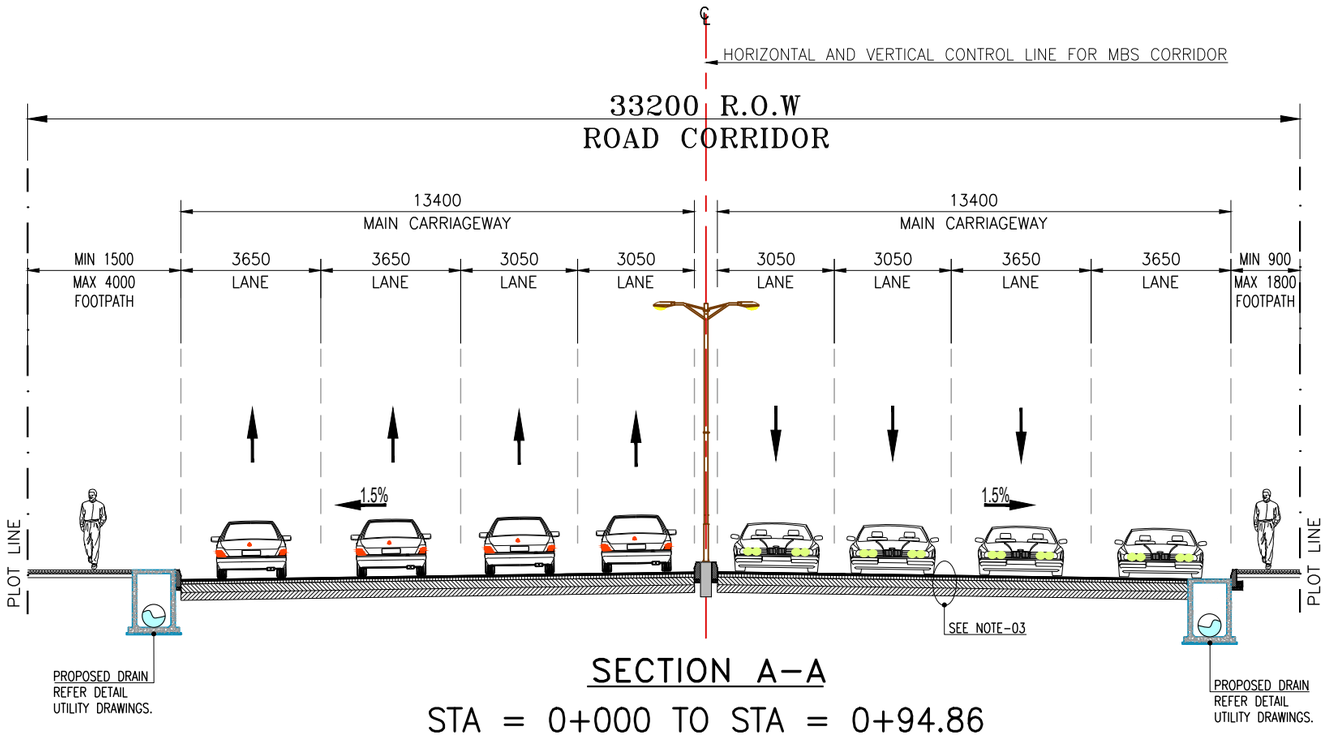
SHEET TITLE:-

KARIMABAD UNDERPASS LAYOUT PLAN (SHEET 04/04)

Drawing No.	REVISION
2305-01-01-02-04-R254	C0

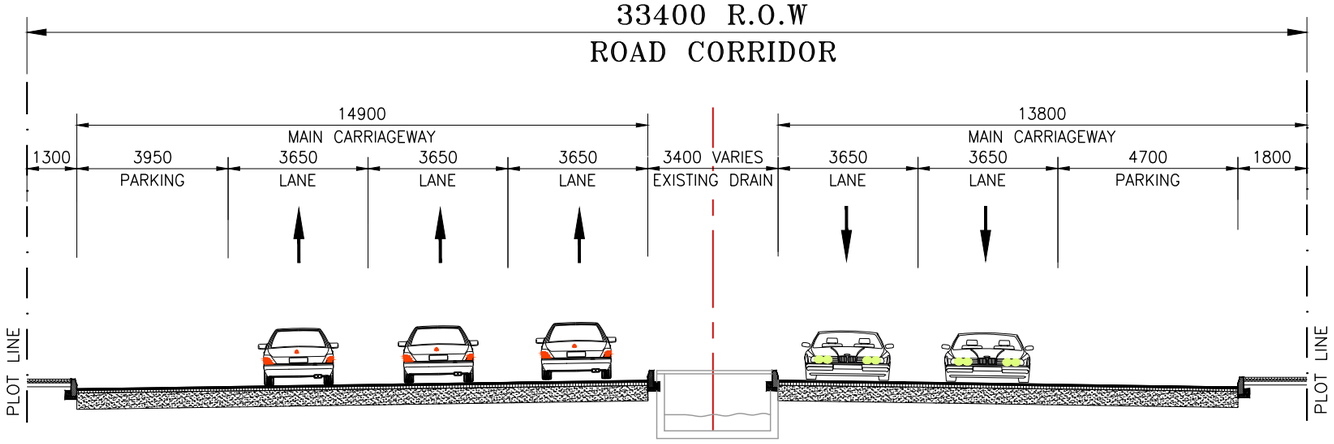
Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\05_Layout Plan\2305-01-01-02-04-R251 TO 254.dwg
User and Plot Date: Arshad Ahmed – Tue, 07 Nov 2023 – 5:21pm

CROSS SECTIONS



SECTION A–A

STA = 0+000 TO STA = 0+94.86



EXISTING ROAD CROSS SECTION

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGES IN METERS UNLESS INDICATED OTHERWISE.
2. FOR CROSS SECTION LOCATIONS, REFER PLAN&PROFILE DRAWINGS.

MAIN CARRIAGEWAY (NEW CONSTRUCTION)

3. NEW CONSTRUCTION DETAILS FOR MAIN CARRIAGEWAY:
   ASPHALTIC WEARING COURSE 50mm
   APPLY TACK COAT
   ASPHALT CONCRETE BASE COURSE (ACBC) 75mm
   APPLY PRIME COAT
   AGGREGATE BASE COURSE (ABC) 150mm
   GRANULAR SUB BASE (GSB) 150mm
   IMPROVED SUB-GRADE 150mm (25% CBR)

FOOTPATH

4. CONSTRUCTION DETAILS FOR FOOTPATH:
   INTERLOCKING TILES/PAVERS 60mm THICK
   SAND CUSHION 50mm THICK
   LEAN CONCRETE 100mm THICK
5. FOR UTILITY DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.
6. FOR STRUCTURAL DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:- KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:- CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-

ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO: KUK	DATE:- 15-08-2023
DESIGN BY	SAMEER		
CHECKED BY	WAZI IQBAL	SCALE: 1:160	SHEET: 01/09 (A3)
APPROVED BY	ATIF		

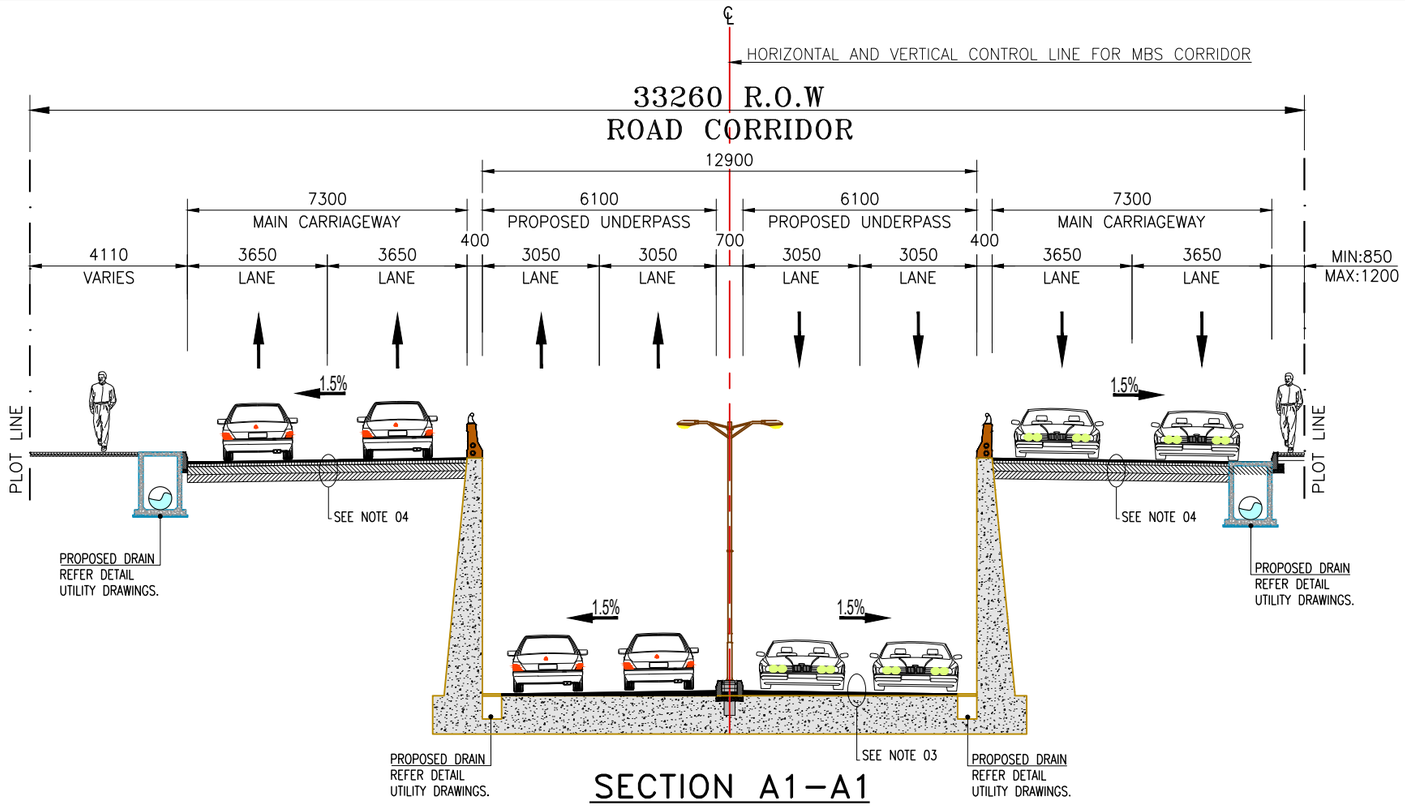
SHEET TITLE:-

SECTION A-A
(STA = 0+000 TO STA = 0+156)

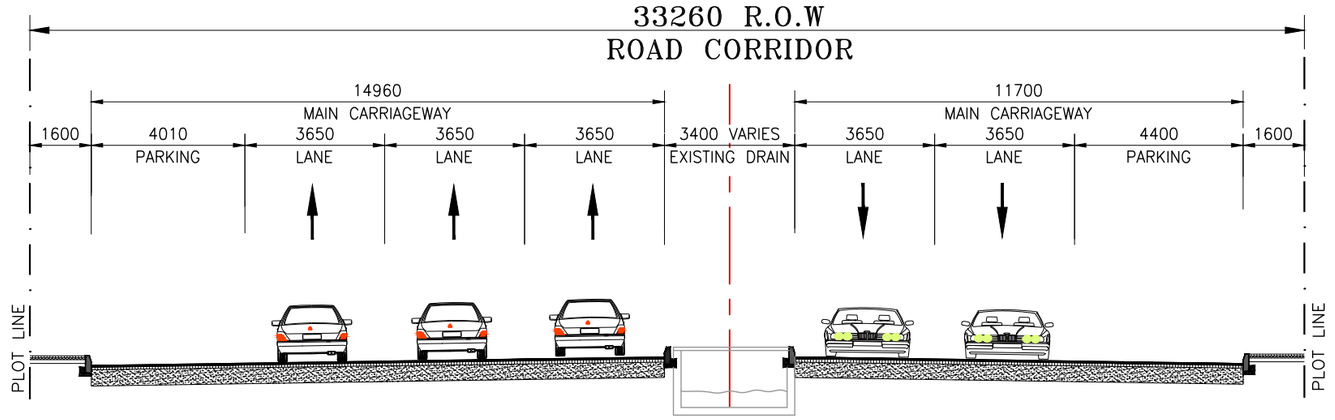
Drawing No. 2305-01-01-02-04-R200

REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad Working\02_Construction\00_CAD\06_Typical Cross Section\2305-01-01-02-04-R200 TO 209.dwg
User and Plot Date: Arshad Ahmed - Wed, 08 Nov 2023 - 11:51am



SECTION A1–A1
PROPOSED UNDERPASS RAMP
STA = 0+94.86 TO STA = 0+300



EXISTING ROAD CROSS SECTION

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGES IN METERS UNLESS INDICATED OTHERWISE.
2. FOR CROSS SECTION LOCATIONS, REFER PLAN&PROFILE DRAWINGS.
3. NEW CONSTRUCTION DETAILS FOR UNDERPASS:
   ASPHALTIC WEARING COURSE 50mm

MAIN CARRIAGEWAY (NEW CONSTRUCTION)

4. NEW CONSTRUCTION DETAILS FOR MAIN CARRIAGEWAY:
   ASPHALTIC WEARING COURSE 50mm
   APPLY TACK COAT
   ASPHALT CONCRETE BASE COURSE (ACBC) 75mm
   APPLY PRIME COAT
   AGGREGATE BASE COURSE (ABC) 150mm
   GRANULAR SUB BASE (GSB) 150mm
   IMPROVED SUB-GRADE 150mm (25% CBR)

FOOTPATH

5. CONSTRUCTION DETAILS FOR FOOTPATH:
   INTERLOCKING TILES/PAVERS 60mm THICK
   SAND CUSHION 50mm THICK
   LEAN CONCRETE 100mm THICK
6. FOR UTILITY DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.
7. FOR STRUCTURAL DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

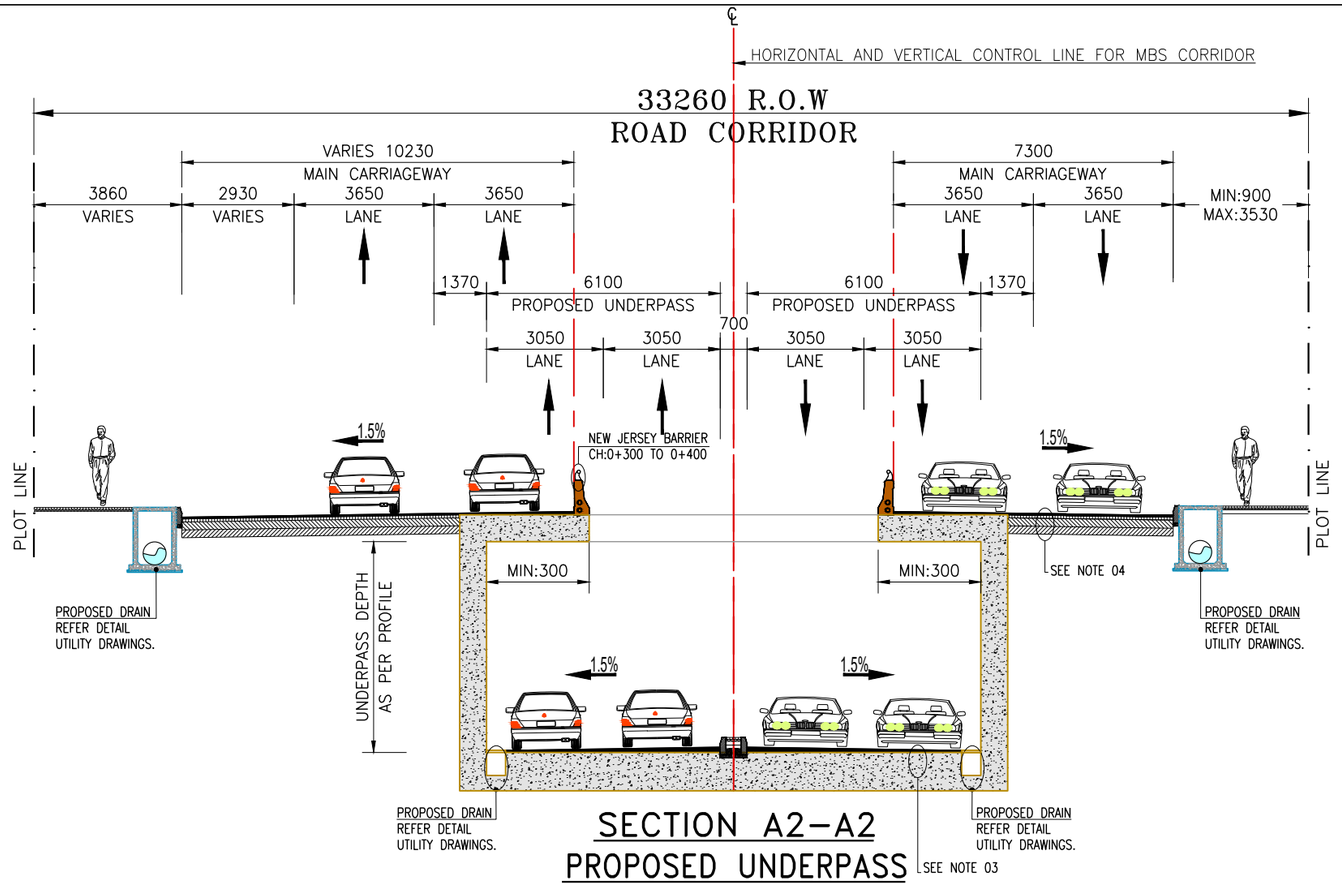
CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

		PROJECT NO:	DATE:-
DRAWN BY	ARSHAD	KUK	15-08-2023
DESIGN BY	SAMEER		
CHECKED BY	WAZI IQBAL	SCALE: 1:160	SHEET: 02/09 (A3)
APPROVED BY	ATIF		

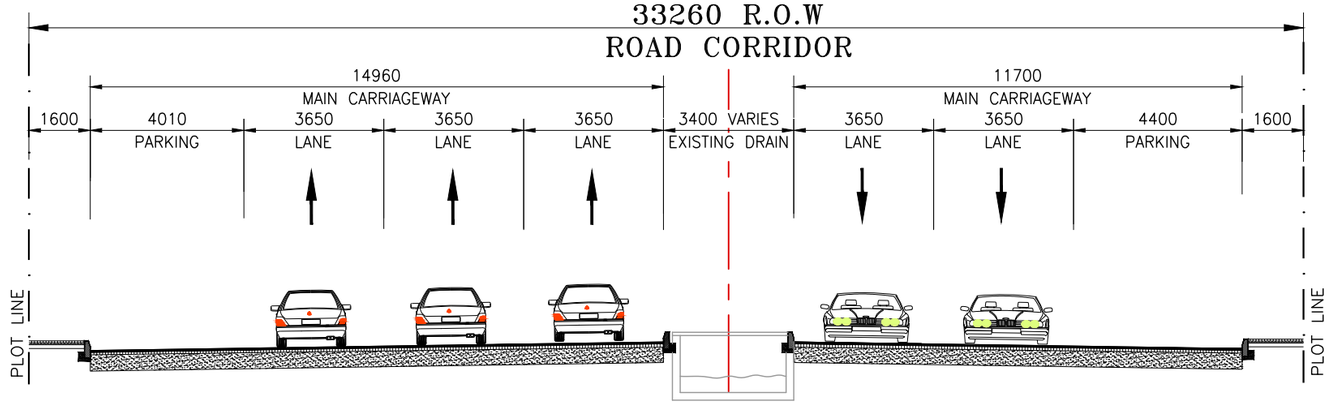
SHEET TITLE:-
SECTION A1-A1
UNDERPASS RAMP
STA = 0+94.86 TO STA = 0+300

Drawing No. 2305-01-01-02-04-R201
REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad Working\02_Construction\00_CAD\06_Typical Cross Section\2305-01-01-02-04-R200 TO 209.dwg
User and Plot Date: Arshad Ahmed - Wed, 08 Nov 2023 - 11:51am



SECTION A2-A2
PROPOSED UNDERPASS
STA = 0+300 TO STA = 0+400



EXISTING ROAD CROSS SECTION

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGES IN METERS UNLESS INDICATED OTHERWISE.
2. FOR CROSS SECTION LOCATIONS, REFER PLAN&PROFILE DRAWINGS.
3. NEW CONSTRUCTION DETAILS FOR UNDERPASS:
   ASPHALTIC WEARING COURSE 50mm

MAIN CARRIAGEWAY (NEW CONSTRUCTION)

4. NEW CONSTRUCTION DETAILS FOR MAIN CARRIAGEWAY:
   ASPHALTIC WEARING COURSE 50mm
   APPLY TACK COAT
   ASPHALT CONCRETE BASE COURSE (ACBC) 75mm
   APPLY PRIME COAT
   AGGREGATE BASE COURSE (ABC) 150mm
   GRANULAR SUB BASE (GSB) 150mm
   IMPROVED SUB-GRADE 150mm (25% CBR)

FOOTPATH

5. CONSTRUCTION DETAILS FOR FOOTPATH:
   INTERLOCKING TILES/PAVERS 60mm THICK
   SAND CUSHION 50mm THICK
   LEAN CONCRETE 100mm THICK
6. FOR UTILITY DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.
7. FOR STRUCTURAL DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

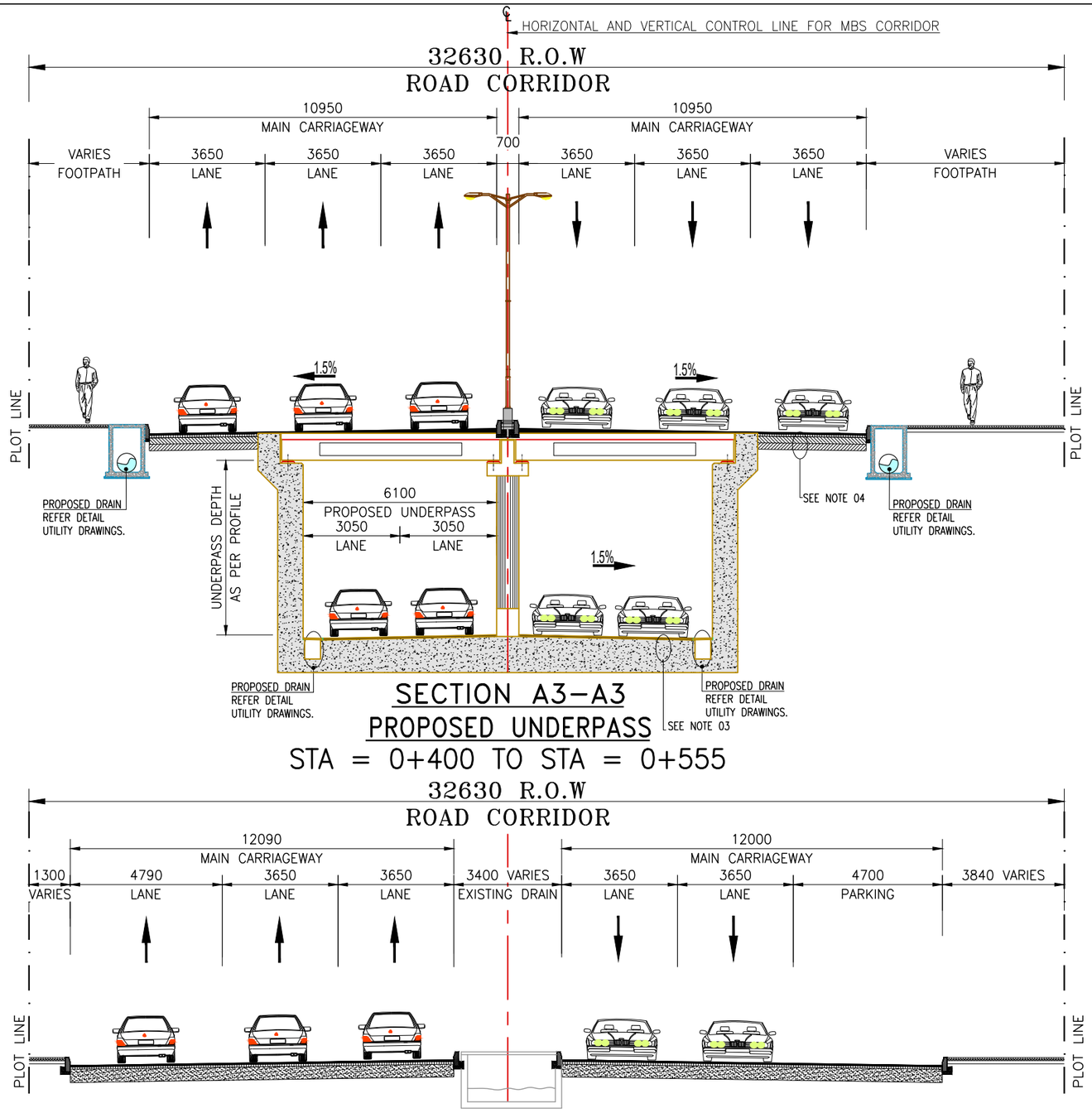
CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO: KUK	DATE:- 15-08-2023
DESIGN BY	SAMEER		
CHECKED BY	WAZI IQBAL	SCALE: 1:160	SHEET: 03/09 (A3)
APPROVED BY	ATIF		

SHEET TITLE:-
SECTION A2-A2
UNDERPASS
STA = 0+300 TO STA = 0+400

Drawing No. 2305-01-01-02-04-R202
REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\06_Typical Cross Section\2305-01-01-02-04-R200 TO 209.dwg
User and Plot Date: Arshad Ahmed - Wed, 08 Nov 2023 - 11:51am



SECTION A3–A3
PROPOSED UNDERPASS
STA = 0+400 TO STA = 0+555

EXISTING ROAD CROSS SECTION

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGES IN METERS UNLESS INDICATED OTHERWISE.
2. FOR CROSS SECTION LOCATIONS, REFER PLAN&PROFILE DRAWINGS.
3. NEW CONSTRUCTION DETAILS FOR UNDERPASS:
   ASPHALTIC WEARING COURSE 50mm

MAIN CARRIAGEWAY (NEW CONSTRUCTION)

4. NEW CONSTRUCTION DETAILS FOR MAIN CARRIAGEWAY:
   ASPHALTIC WEARING COURSE 50mm
   APPLY TACK COAT
   ASPHALT CONCRETE BASE COURSE (ACBC) 75mm
   APPLY PRIME COAT
   AGGREGATE BASE COURSE (ABC) 150mm
   GRANULAR SUB BASE (GSB) 150mm
   IMPROVED SUB-GRADE 150mm (25% CBR)

FOOTPATH

5. CONSTRUCTION DETAILS FOR FOOTPATH:
   INTERLOCKING TILES/PAVERS 60mm THICK
   SAND CUSHION 50mm THICK
   LEAN CONCRETE 100mm THICK
6. FOR UTILITY DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.
7. FOR STRUCTURAL DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

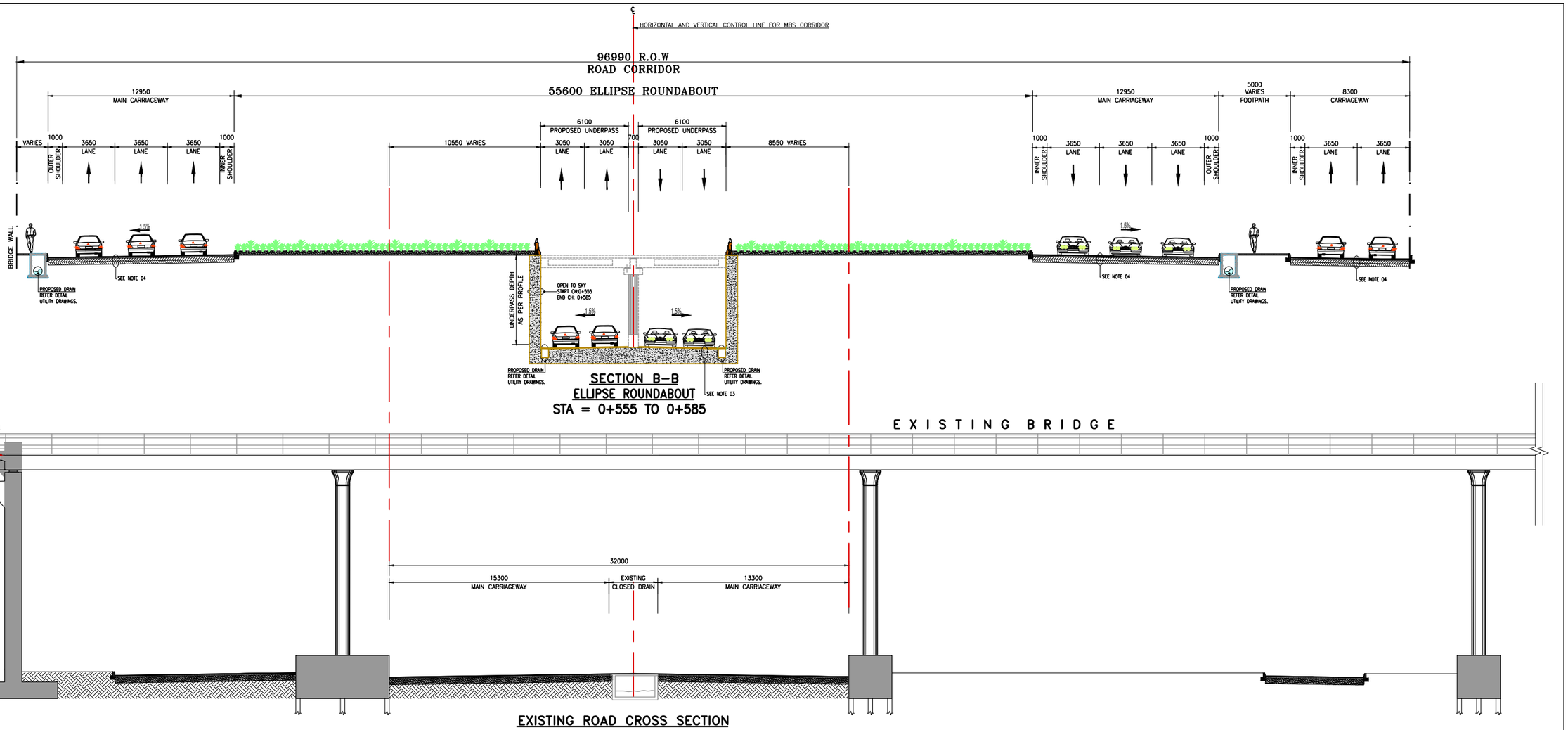
CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO: KUK	DATE:- 15-08-2023
DESIGN BY	SAMEER		
CHECKED BY	WAZI IQBAL	SCALE: 1:160	SHEET: 04/09 (A3)
APPROVED BY	ATIF		

SHEET TITLE:-
SECTION A3-A3
UNDERPASS
STA = 0+400 TO STA = 0+555

Drawing No. 2305-01-01-02-04-R203
REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\06_Typical Cross Section\2305-01-01-02-04-R200 TO 209.dwg
User and Plot Date: Arshad Ahmed - Wed, 08 Nov 2023 - 11:51am



EXISTING ROAD CROSS SECTION

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGES IN METERS UNLESS INDICATED OTHERWISE.
2. FOR CROSS SECTION LOCATIONS, REFER PLAN&PROFILE DRAWINGS.
3. NEW CONSTRUCTION DETAILS FOR UNDERPASS:
   ASPHALTIC WEARING COURSE 50mm

MAIN CARRIAGEWAY (NEW CONSTRUCTION)

4. NEW CONSTRUCTION DETAILS FOR MAIN CARRIAGEWAY:
   ASPHALTIC WEARING COURSE 50mm
   APPLY TACK COAT
   ASPHALT CONCRETE BASE COURSE (ACBC) 75mm
   APPLY PRIME COAT
   AGGREGATE BASE COURSE (ABC) 150mm
   GRANULAR SUB BASE (GSB) 150mm
   IMPROVED SUB-GRADE 150mm (25% CBR)

FOOTPATH

5. CONSTRUCTION DETAILS FOR FOOTPATH:
   INTERLOCKING TILES/PAVERS 60mm THICK
   SAND CUSHION 50mm THICK
   LEAN CONCRETE 100mm THICK
6. FOR UTILITY DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.
7. FOR STRUCTURAL DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

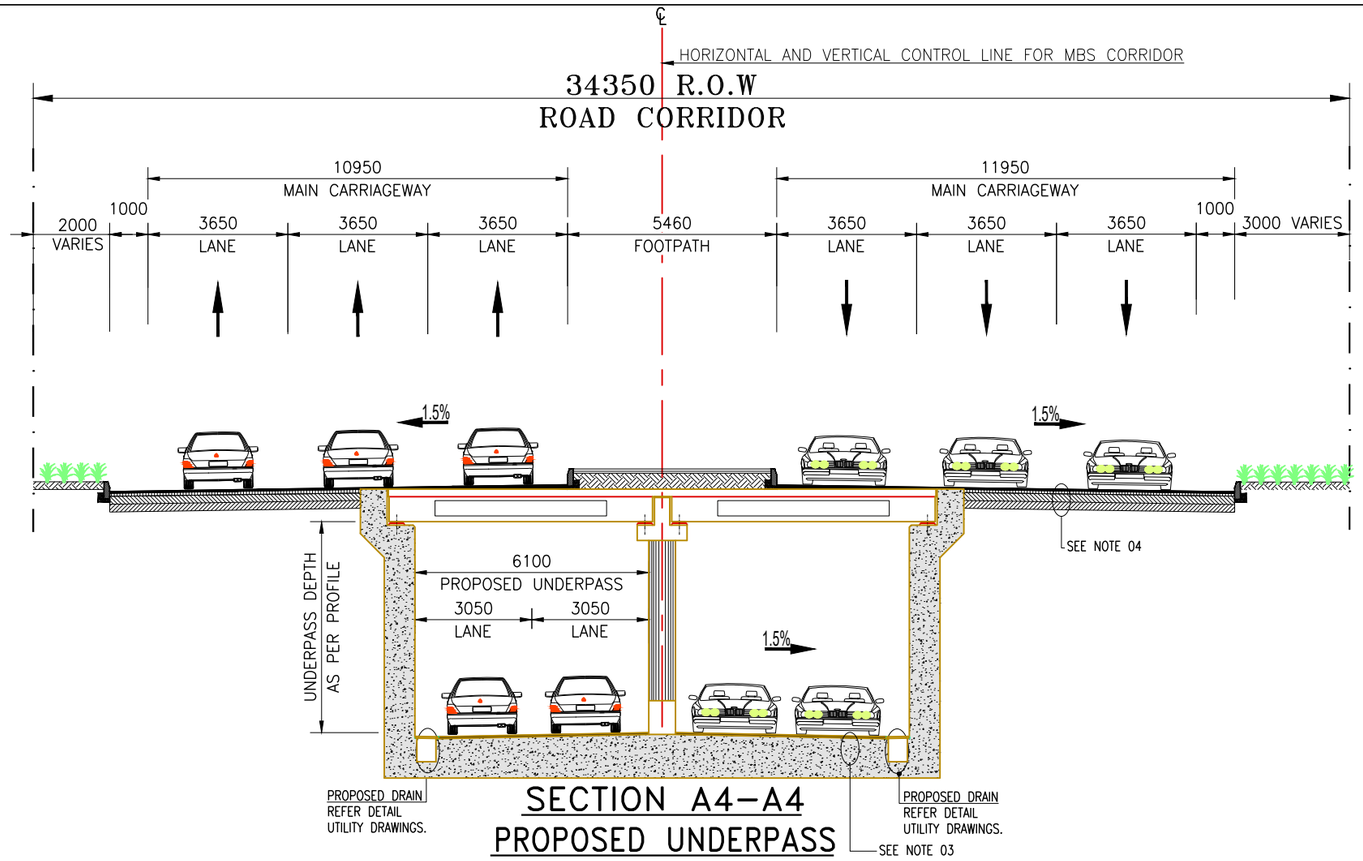
CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS. PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO. KUK	DATE:- 15-08-2023
DESIGN BY	SAMEER		
CHECKED BY	WAZI IQBAL	SCALE: 1:300	SHEET: 05/09 (A3)
APPROVED BY	ATIF		

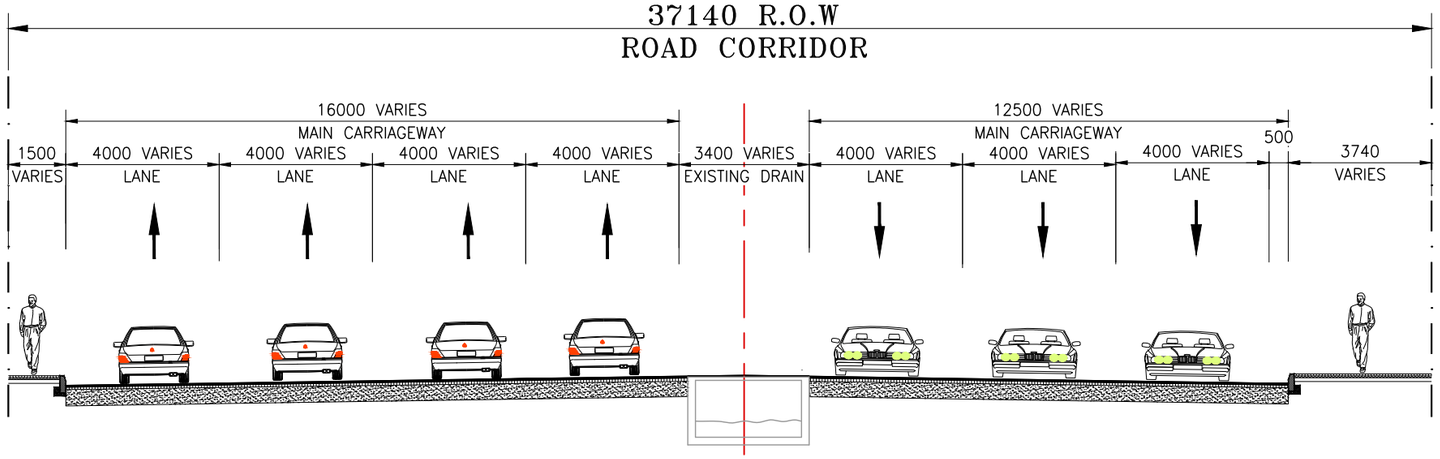
SHEET TITLE:-
SECTION B-B
ELLIPSE ROUNDABOUT
STA = 0+555 TO STA = 0+585

Drawing No. 2305-01-01-02-04-R204
REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad Working\02_Construction\00_CAD\06_Typical Cross Section\2305-01-01-02-04-R200 TO 209.dwg
User and Plot Date: Arshad Ahmed - Wed, 08 Nov 2023 - 11:51am



SECTION A4–A4
PROPOSED UNDERPASS
STA = 0+585 TO STA = 0+616



EXISTING ROAD CROSS SECTION

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGES IN METERS UNLESS INDICATED OTHERWISE.
2. FOR CROSS SECTION LOCATIONS, REFER PLAN&PROFILE DRAWINGS.
3. NEW CONSTRUCTION DETAILS FOR UNDERPASS:
   ASPHALTIC WEARING COURSE 50mm

MAIN CARRIAGEWAY (NEW CONSTRUCTION)

4. NEW CONSTRUCTION DETAILS FOR MAIN CARRIAGEWAY:
   ASPHALTIC WEARING COURSE 50mm
   APPLY TACK COAT
   ASPHALT CONCRETE BASE COURSE (ACBC) 75mm
   APPLY PRIME COAT
   AGGREGATE BASE COURSE (ABC) 150mm
   GRANULAR SUB BASE (GSB) 150mm
   IMPROVED SUB-GRADE 150mm (25% CBR)

FOOTPATH

5. CONSTRUCTION DETAILS FOR FOOTPATH:
   INTERLOCKING TILES/PAVERS 60mm THICK
   SAND CUSHION 50mm THICK
   LEAN CONCRETE 100mm THICK
6. FOR UTILITY DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.
7. FOR STRUCTURAL DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

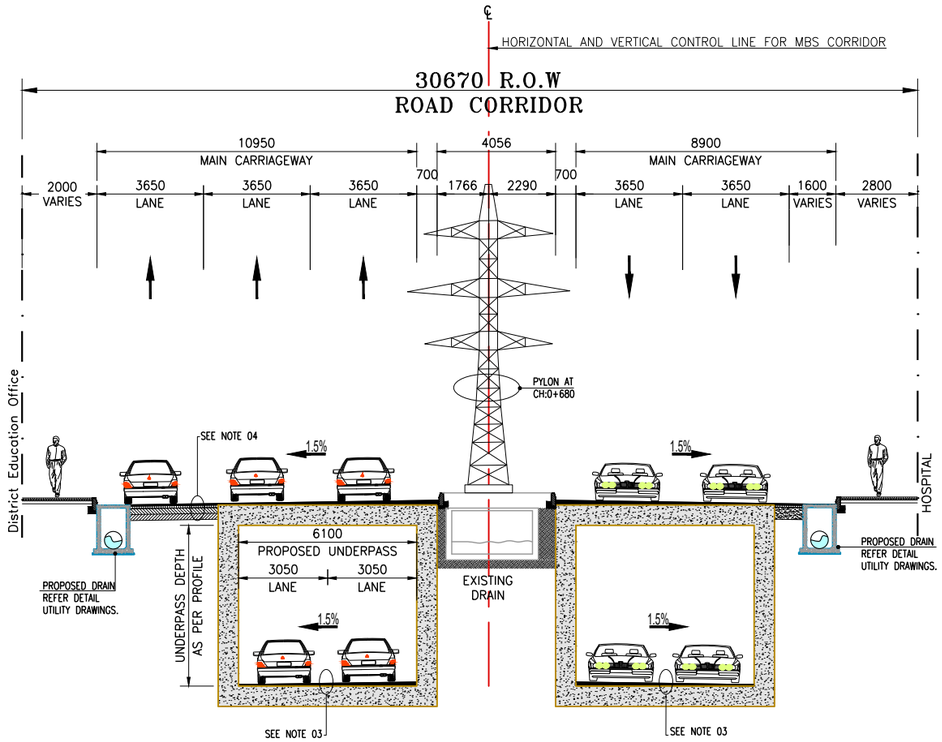
CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO. KUK	DATE:- 15-08-2023
DESIGN BY	SAMEER		
CHECKED BY	WAZI IQBAL	SCALE: N.T.S	SHEET: 06/09 (A3)
APPROVED BY	ATIF		

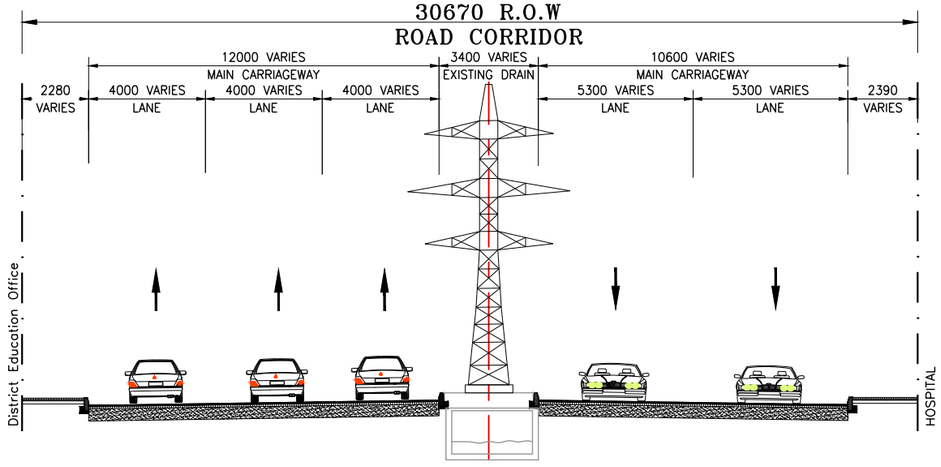
SHEET TITLE:-
SECTION A4-A4
UNDERPASS
STA = 0+585 TO STA = 0+616

Drawing No. 2305-01-01-02-04-R205
REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\06_Typical Cross Section\2305-01-01-02-04-R200 TO 209.dwg
User and Plot Date: Arshad Ahmed – Wed, 08 Nov 2023 – 11:51am



SECTION A5–A5
PROPOSED UNDERPASS
STA = 0+616 TO STA = 0+680



EXISTING ROAD CROSS SECTION

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGES IN METERS UNLESS INDICATED OTHERWISE.
2. FOR CROSS SECTION LOCATIONS, REFER PLAN&PROFILE DRAWINGS.
3. NEW CONSTRUCTION DETAILS FOR UNDERPASS:
   ASPHALTIC WEARING COURSE 50mm

MAIN CARRIAGEWAY (NEW CONSTRUCTION)

4. NEW CONSTRUCTION DETAILS FOR MAIN CARRIAGEWAY:
   ASPHALTIC WEARING COURSE 50mm
   APPLY TACK COAT
   ASPHALT CONCRETE BASE COURSE (ACBC) 75mm
   APPLY PRIME COAT
   AGGREGATE BASE COURSE (ABC) 150mm
   GRANULAR SUB BASE (GSB) 150mm
   IMPROVED SUB-GRADE 150mm (25% CBR)

FOOTPATH

5. CONSTRUCTION DETAILS FOR FOOTPATH:
   INTERLOCKING TILES/PAVERS 60mm THICK
   SAND CUSHION 50mm THICK
   LEAN CONCRETE 100mm THICK
6. FOR UTILITY DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.
7. FOR STRUCTURAL DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

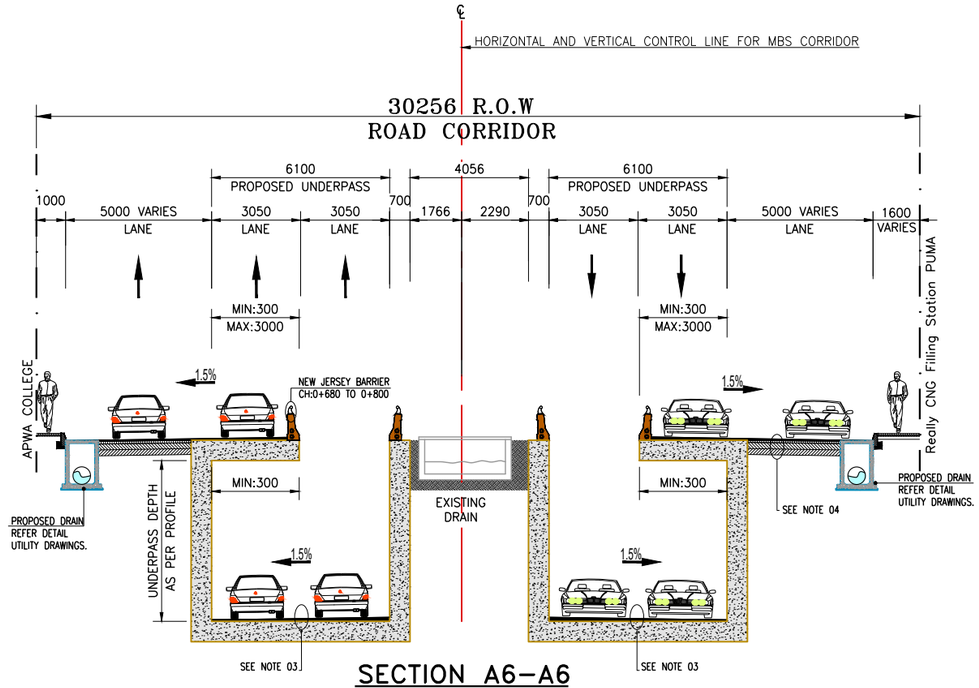
DRAWN BY	ARSHAD	PROJECT NO: KUK	DATE:- 15-08-2023
DESIGN BY	SAMEER		
CHECKED BY	WAZI IQBAL	SCALE: N.T.S	SHEET: 07/09 (A3)
APPROVED BY	ATIF		

CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

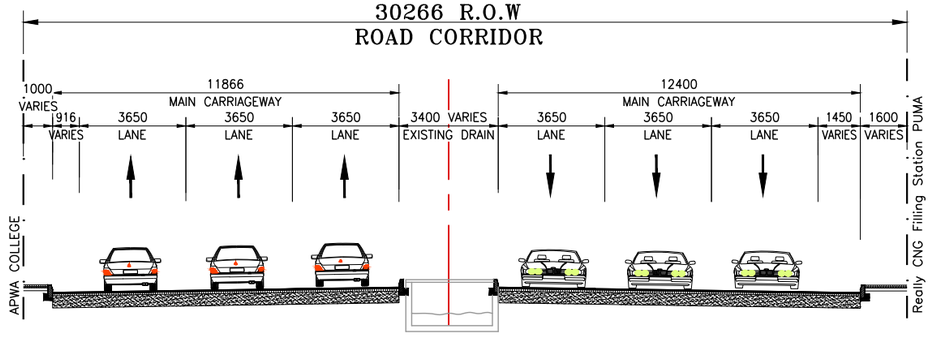
SHEET TITLE:-
SECTION A5-A5
UNDERPASS
STA = 0+616 TO STA = 0+680

Drawing No. 2305-01-01-02-04-R207
REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\06_Typical Cross Section\2305-01-01-02-04-R200 TO 209.dwg
User and Plot Date: Arshad Ahmed – Wed, 08 Nov 2023 – 11:51am



SECTION A6–A6
PROPOSED UNDERPASS
STA = 0+680 TO STA = 0+800



EXISTING ROAD CROSS SECTION

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGES IN METERS UNLESS INDICATED OTHERWISE.
2. FOR CROSS SECTION LOCATIONS, REFER PLAN&PROFILE DRAWINGS.
3. NEW CONSTRUCTION DETAILS FOR UNDERPASS:
   ASPHALTIC WEARING COURSE 50mm

MAIN CARRIAGEWAY (NEW CONSTRUCTION)

4. NEW CONSTRUCTION DETAILS FOR MAIN CARRIAGEWAY:
   ASPHALTIC WEARING COURSE 50mm
   APPLY TACK COAT
   ASPHALT CONCRETE BASE COURSE (ACBC) 75mm
   APPLY PRIME COAT
   AGGREGATE BASE COURSE (ABC) 150mm
   GRANULAR SUB BASE (GSB) 150mm
   IMPROVED SUB-GRADE 150mm (25% CBR)

FOOTPATH

5. CONSTRUCTION DETAILS FOR FOOTPATH:
   INTERLOCKING TILES/PAVERS 60mm THICK
   SAND CUSHION 50mm THICK
   LEAN CONCRETE 100mm THICK
6. FOR UTILITY DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.
7. FOR STRUCTURAL DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:- KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:- CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-

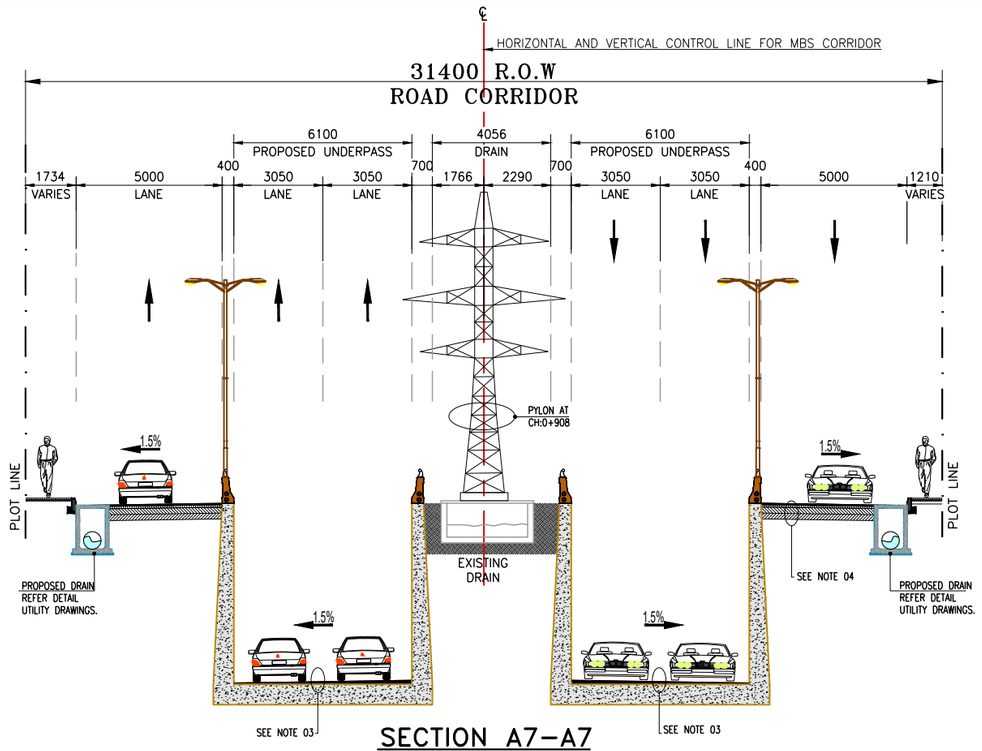
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

		PROJECT NO.	DATE:-
DRAWN BY	ARSHAD	KUK	15-08-2023
DESIGN BY	SAMEER		
CHECKED BY	WAZI IQBAL	SCALE: N.T.S	SHEET: 08/09 (A3)
APPROVED BY	ATIF		

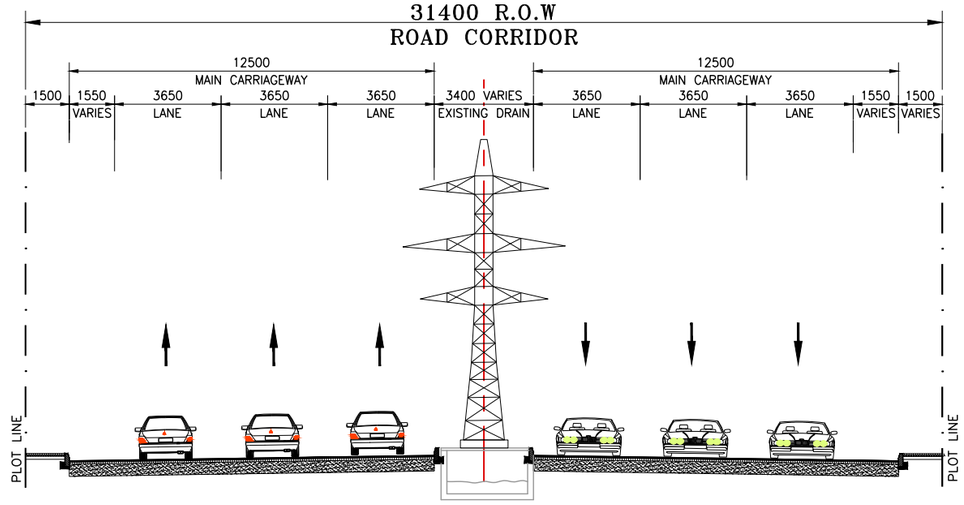
SHEET TITLE:-
SECTION A6-A6
UNDERPASS
STA = 0+680 TO STA = 0+800

Drawing No. 2305-01-01-02-04-R208
REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad Working\02_Construction\00_CAD\06_Typical Cross Section\2305-01-01-02-04-R200 TO 209.dwg
User and Plot Date: Arshad Ahmed – Wed, 08 Nov 2023 – 11:51am



SECTION A7–A7
PROPOSED UNDERPASS RAMP
STA = 0+800 TO STA = 1+011.39



EXISTING ROAD CROSS SECTION

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS AND CHAINAGES IN METERS UNLESS INDICATED OTHERWISE.
2. FOR CROSS SECTION LOCATIONS, REFER PLAN&PROFILE DRAWINGS.
3. NEW CONSTRUCTION DETAILS FOR UNDERPASS:
   ASPHALTIC WEARING COURSE 50mm

MAIN CARRIAGEWAY (NEW CONSTRUCTION)

4. NEW CONSTRUCTION DETAILS FOR MAIN CARRIAGEWAY:
   ASPHALTIC WEARING COURSE 50mm
   APPLY TACK COAT
   ASPHALT CONCRETE BASE COURSE (ACBC) 75mm
   APPLY PRIME COAT
   AGGREGATE BASE COURSE (ABC) 150mm
   GRANULAR SUB BASE (GSB) 150mm
   IMPROVED SUB-GRADE 150mm (25% CBR)

FOOTPATH

5. CONSTRUCTION DETAILS FOR FOOTPATH:
   INTERLOCKING TILES/PAVERS 60mm THICK
   SAND CUSHION 50mm THICK
   LEAN CONCRETE 100mm THICK
6. FOR UTILITY DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.
7. FOR STRUCTURAL DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO. KUK	DATE:- 15-08-2023
DESIGN BY	SAMEER		
CHECKED BY	WAZI IQBAL	SCALE: N.T.S	SHEET: 09/09 (A3)
APPROVED BY	ATIF		

SHEET TITLE:-
SECTION A7-A7
UNDERPASS RAMP
STA = 0+800 TO STA = 1+011.39

Drawing No. 2305-01-01-02-04-R209
REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\06_Typical Cross Section\2305-01-01-02-04-R200 TO 209.dwg
User and Plot Date: Arshad Ahmed – Wed, 08 Nov 2023 – 11:51am

ROAD LAYOUT
WITH STAKE - OUT DATA

KARIMABAD UNDERPASS
(SETTING OUT DATA)

S.N	PI - POINT	P.I. Coordinates EASTING	P.I. Coordinates NORTHING	G.DIST	GRID BEAR	DEFLECTION ANGLE	L/R	RADIUS	LENGTH OF TANGENT (LT)	LENGTH OF CURVE (LC)	E (m)	STATION @ PI	CH @ PC	CH @ PT
BOP	A - POINT	303799.308	2756890.839											
1	PI - 1	303458.850	2757289.980	524.619	319° 32' 12"	1° 14' 26"	R	2000.0	21.651	43.300	0.117	0 + 524.619	0 + 502.968	0 + 546.268
2	PI - 2	303416.650	2757341.680	66.736	320° 46' 37"	0° 56' 20"	L	2000.0	16.386	32.771	0.067	0 + 591.354	0 + 574.968	0 + 607.739
3	PI - 3	303325.000	2757450.280	142.104	319° 50' 18"	3° 2' 28"	L	2000.0	53.092	106.159	0.705	0 + 733.457	0 + 680.366	0 + 786.524
4	PI - 4	303232.070	2757549.230	135.746	316° 47' 49"	0° 34' 11"	L	2000.0	9.942	19.884	0.025	0 + 869.179	0 + 859.237	0 + 879.121
5	PI - 5	303166.070	2757618.120	95.404	316° 13' 39"	5° 1' 50"	L	800.0	35.143	70.241	0.772	0 + 964.582	0 + 929.439	0 + 999.680
EOP	PI - 6	303079.190	2757694.169	115.462	311° 11' 48"							1 + 80.000	1 + 80.000	1 + 80.000

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

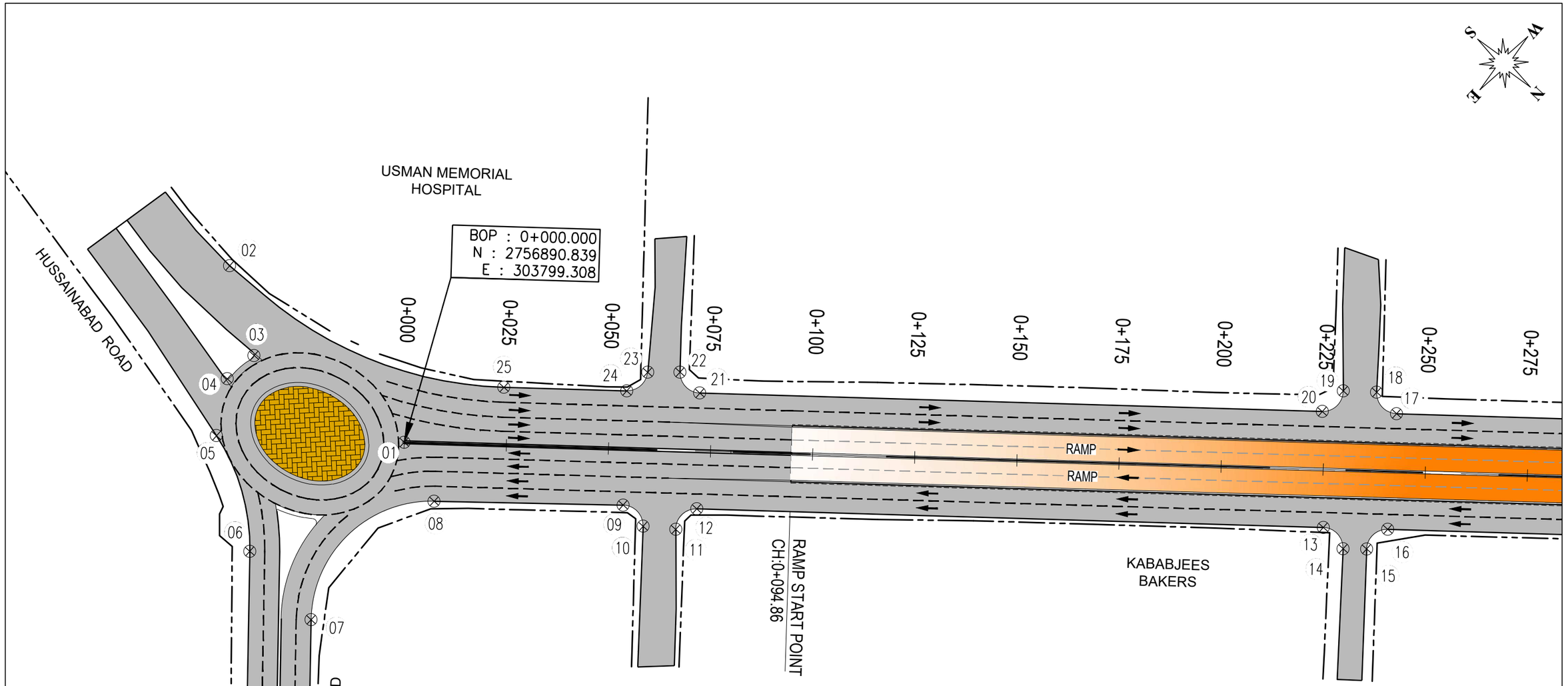
CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO: KUK	DATE:- 15-08-2023
DESIGN BY	SAMEED		
CHECKED BY	WAZI IQBAL	SCALE: N.T.S	SHEET: 01/01 (A3)
APPROVED BY	ATIF		

SHEET TITLE:-
SETTING OUT DATA

Drawing No. 2305-01-01-02-04-R400
REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\07_Stake Out Data\2305-01-01-02-04-R400.dwg
User and Plot Date: Arshad Ahmed - Wed, 08 Nov 2023 - 10:22am



SETTING-OUT CO-ORDINATES

POINT REF.	COORDINATES	
	EASTING	NORTHING
1	303799.308	2756890.838
2	303795.944	2756830.192
3	303808.219	2756849.358
4	303816.844	2756848.323
5	303828.942	2756855.684
6	303844.423	2756880.707
7	303846.757	2756903.063
8	303805.081	2756905.927
9	303774.723	2756940.858
10	303775.288	2756947.972

SETTING-OUT CO-ORDINATES

POINT REF.	COORDINATES	
	EASTING	NORTHING
11	303770.484	2756954.402
12	303763.307	2756954.849
13	303663.762	2757071.554
14	303664.381	2757078.653
15	303660.556	2757082.959
16	303653.536	2757083.542
17	303631.132	2757066.184
18	303630.487	2757059.064
19	303635.740	2757052.783
20	303642.932	2757052.351

SETTING-OUT CO-ORDINATES

POINT REF.	COORDINATES	
	EASTING	NORTHING
21	303741.829	2756936.405
22	303741.281	2756929.366
23	303746.605	2756923.535
24	303753.435	2756922.799
25	303772.952	2756899.918

NOTES:–

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE STATED.
2. FOR CROSS SECTION REFER RELEVANT LAYOUT PLAN DRAWINGS.
3. FOR UTILITY DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.
4. FOR STRUCTURAL DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.

LEGEND

- PROPOSED CENTER LINE
- PROPOSED KERB
- PROPOSED LANE MARKING
- PROPOSED EDGE LINE
- EXISTING BUILDING
- L.O.W. (LIMIT OF WORK)
- RAMP
- BARREL
- MARKING ARROWS
- FOOTPATH
- GREEN AREA

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO:	DATE:-
DESIGN BY	SAMEED	KUK	15-08-2023
CHECKED BY	WAZI IQBAL	SCALE:	SHEET:
APPROVED BY	ATIF	1:1000	01/04 (A3)

SHEET TITLE:-
SETTING - OUT CO-ORDINATES
KARIMABAD UNDERPASS
LAYOUT PLAN (SHEET 01/04)

Drawing No.	REVISION
2305-01-01-02-04-R401	C0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\07_Stake Out Data\2305-01-01-02-04-R401 TO 404.dwg
User and Plot Date: Arshad Ahmed - Tue, 07 Nov 2023 - 4:16pm

SETTING-OUT CO-ORDINATES

POINT REF.	COORDINATES	
	EASTING	NORTHING
26	303598.719	2757147.809
27	303561.855	2757187.084
28	303556.074	2757192.560
29	303556.468	2757207.434
30	303550.630	2757213.133
31	303539.790	2757213.787
32	303577.228	2757129.381
33	303536.086	2757177.074
34	303522.098	2757178.212
35	303522.485	2757188.497
36	303523.338	2757195.367
37	303503.458	2757220.274
38	303471.129	2757258.010
39	303443.399	2757270.275
40	303416.469	2757256.064
41	303493.476	2757266.802
42	303490.133	2757356.022
43	303480.621	2757364.780
44	303473.137	2757361.413
45	303464.421	2757366.510

SETTING-OUT CO-ORDINATES

POINT REF.	COORDINATES	
	EASTING	NORTHING
46	303462.035	2757370.752
47	303460.813	2757376.766
48	303463.333	2757382.361
49	303468.412	2757352.274
50	303467.926	2757353.870
51	303461.721	2757357.110
52	303457.187	2757362.442
53	303454.801	2757366.684
54	303452.913	2757370.687
55	303445.850	2757363.023
56	303446.285	2757361.401
57	303452.100	2757358.714
58	303457.604	2757354.185
59	303462.994	2757345.951
60	303473.194	2757334.734
61	303471.461	2757335.644
62	303469.767	2757333.596
63	303466.556	2757328.611
64	303464.609	2757323.011
65	303464.009	2757320.610

SETTING-OUT CO-ORDINATES

POINT REF.	COORDINATES	
	EASTING	NORTHING
66	303462.985	2757317.373
67	303462.289	2757308.727
68	303465.948	2757300.863
69	303472.730	2757293.114
70	303470.257	2757314.117
71	303452.780	2757275.481
72	303453.744	2757277.104
73	303450.343	2757281.164
74	303436.723	2757287.254
75	303423.546	2757280.258
76	303419.533	2757274.767
77	303423.502	2757270.426
78	303437.667	2757275.699
79	303414.142	2757280.372
80	303409.239	2757289.395
81	303399.050	2757300.932
82	303393.902	2757301.407
83	303358.136	2757280.615
84	303383.236	2757328.306
85	303367.010	2757379.698

SETTING-OUT CO-ORDINATES

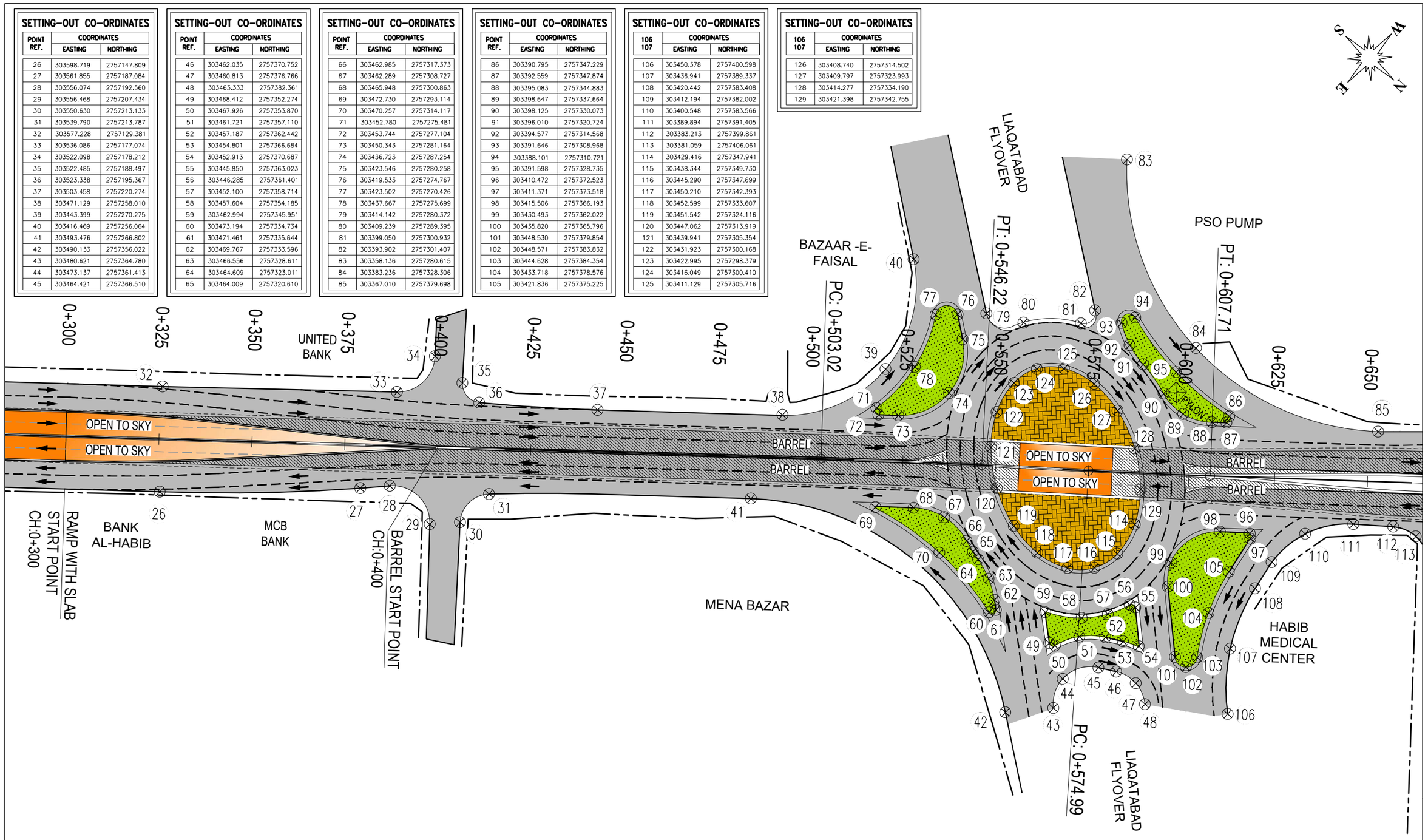
POINT REF.	COORDINATES	
	EASTING	NORTHING
86	303390.795	2757347.229
87	303392.559	2757347.874
88	303395.083	2757344.883
89	303398.647	2757337.664
90	303398.125	2757330.073
91	303396.010	2757320.724
92	303394.577	2757314.568
93	303391.646	2757308.968
94	303388.101	2757310.721
95	303391.598	2757328.735
96	303410.472	2757372.523
97	303411.371	2757373.518
98	303415.506	2757366.193
99	303430.493	2757362.022
100	303435.820	2757365.796
101	303448.530	2757379.854
102	303448.571	2757383.832
103	303444.628	2757384.354
104	303433.718	2757378.576
105	303421.836	2757375.225

SETTING-OUT CO-ORDINATES

106 107	COORDINATES	
	EASTING	NORTHING
106	303450.378	2757400.598
107	303436.941	2757389.337
108	303420.442	2757383.408
109	303412.194	2757382.002
110	303400.548	2757383.566
111	303389.894	2757391.405
112	303383.213	2757399.861
113	303381.059	2757406.061
114	303429.416	2757347.941
115	303438.344	2757349.730
116	303445.290	2757347.699
117	303450.210	2757342.393
118	303452.599	2757333.607
119	303451.542	2757324.116
120	303447.062	2757313.919
121	303439.941	2757305.354
122	303431.923	2757300.168
123	303422.995	2757298.379
124	303416.049	2757300.410
125	303411.129	2757305.716

SETTING-OUT CO-ORDINATES

106 107	COORDINATES	
	EASTING	NORTHING
126	303408.740	2757314.502
127	303409.797	2757323.993
128	303414.277	2757334.190
129	303421.398	2757342.755



NOTES:–

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE STATED.
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3. FOR UTILITY DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.
4. FOR STRUCTURAL DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.
5.

LEGEND

- PROPOSED CENTER LINE
- PROPOSED KERB
- PROPOSED LANE MARKING
- PROPOSED EDGE LINE
- EXISTING BUILDING
- L.O.W. (LIMIT OF WORK)
- RAMP
- BARREL
- MARKING ARROWS
- FOOTPATH
- GREEN AREA

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO:	DATE:-
DESIGN BY	SAMEED	KUK	15-08-2023
CHECKED BY	WAZI IQBAL	SCALE:	SHEET:
APPROVED BY	ATIF	1:1000	02/04 (A3)

SHEET TITLE:-
SETTING - OUT CO-ORDINATES KARIMABAD UNDERPASS LAYOUT PLAN (SHEET 02/04)

Drawing No.	REVISION
2305-01-01-02-04-R402	C0

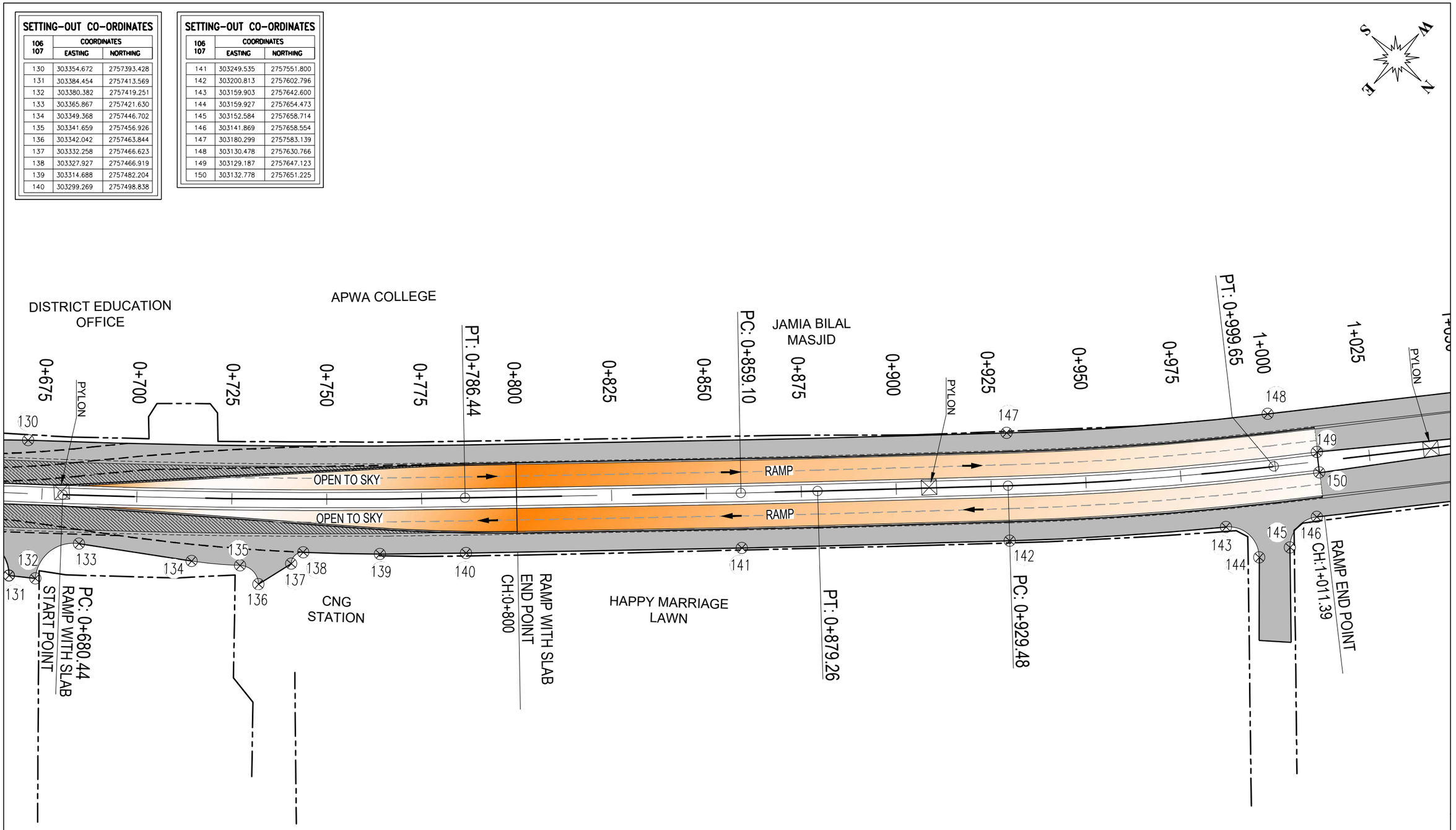
Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\07_Stake Out Data\2305-01-01-02-04-R401 TO 404.dwg
User and Plot Date:- Arshad Ahmed – Tue, 07 Nov 2023 – 4:16pm

SETTING-OUT CO-ORDINATES

106 / 107	COORDINATES	
	EASTING	NORTHING
130	303354.672	2757393.428
131	303384.454	2757413.569
132	303380.382	2757419.251
133	303365.867	2757421.630
134	303349.368	2757446.702
135	303341.659	2757456.926
136	303342.042	2757463.844
137	303332.258	2757466.623
138	303327.927	2757466.919
139	303314.688	2757482.204
140	303299.269	2757498.838

SETTING-OUT CO-ORDINATES

106 / 107	COORDINATES	
	EASTING	NORTHING
141	303249.535	2757551.800
142	303200.813	2757602.796
143	303159.903	2757642.600
144	303159.927	2757654.473
145	303152.584	2757658.714
146	303141.869	2757658.554
147	303180.299	2757583.139
148	303130.478	2757630.766
149	303129.187	2757647.123
150	303132.778	2757651.225



NOTES:–

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3. FOR UTILITY DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.
4. FOR STRUCTURAL DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.
5.

LEGEND

- PROPOSED CENTER LINE
- PROPOSED KERB
- PROPOSED LANE MARKING
- PROPOSED EDGE LINE
- EXISTING BUILDING
- L.O.W. (LIMIT OF WORK)
- RAMP
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- FOOTPATH
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REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

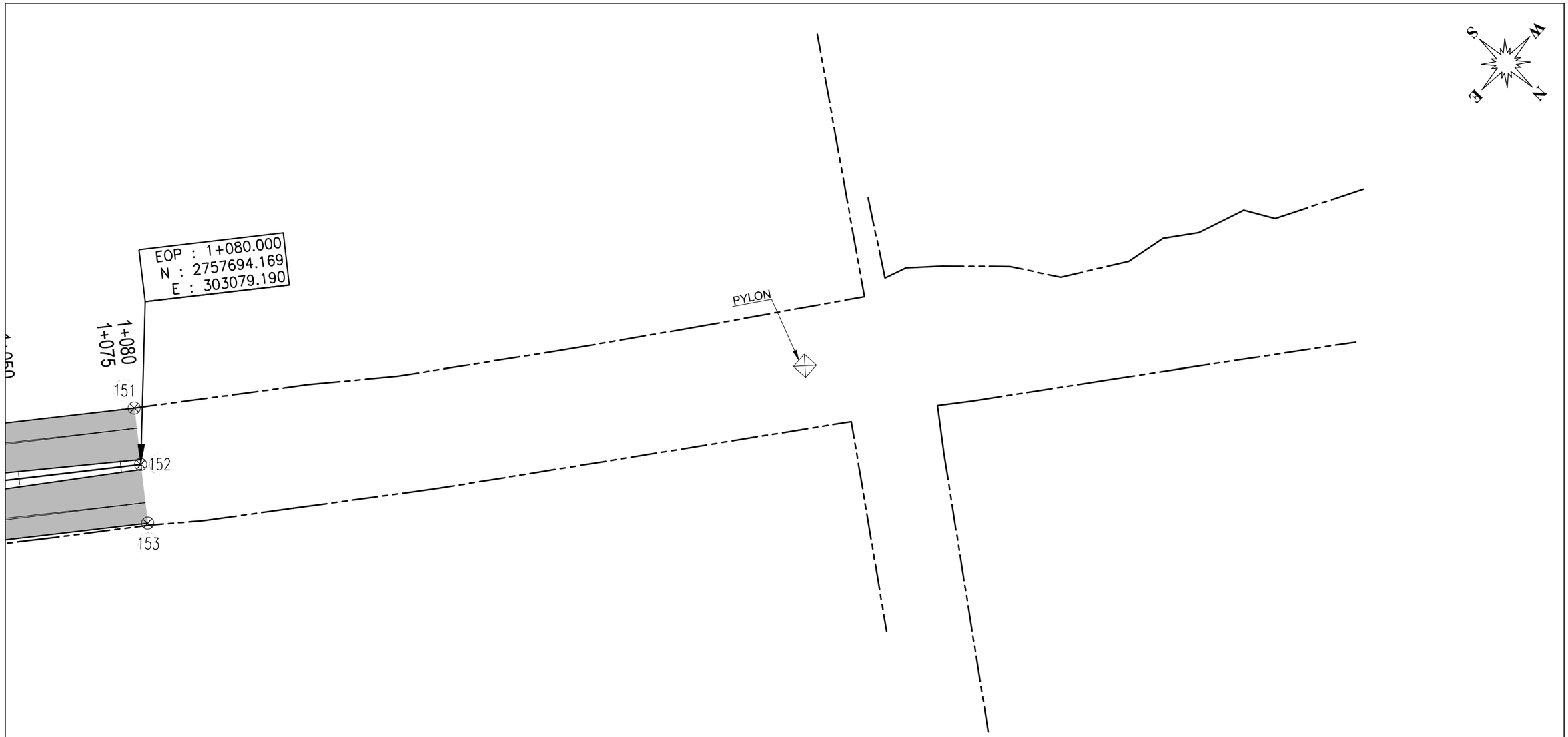
CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO:	DATE:-
DESIGN BY	SAMEED	KUK	15-08-2023
CHECKED BY	WAZI IQBAL	SCALE:	SHEET:
APPROVED BY	ATIF	1:1000	03/04 (A3)

SHEET TITLE:-
SETTING - OUT CO-ORDINATES KARIMABAD UNDERPASS LAYOUT PLAN (SHEET 03/04)

Drawing No.	REVISION
2305-01-01-02-04-R403	C0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\07_Stake Out Data\2305-01-02-04-R401 TO 404.dwg
User and Plot Date: Arshad Ahmed – Tue, 07 Nov 2023 – 4:16pm



SETTING-OUT CO-ORDINATES

106 / 107	COORDINATES	
	EASTING	NORTHING
141	303070.085	2757683.678
142	303079.233	2757694.128
143	303088.774	2757705.028

NOTES:–

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE STATED.
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3. FOR UTILITY DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.
4. FOR STRUCTURAL DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.
5.

LEGEND

- PROPOSED CENTER LINE
- PROPOSED KERB
- PROPOSED LANE MARKING
- PROPOSED EDGE LINE
- EXISTING BUILDING
- L.O.W. (LIMIT OF WORK)
- RAMP
- BARREL
- MARKING ARROWS
- FOOTPATH
- GREEN AREA

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO: KUK	DATE:- 15-08-2023
DESIGN BY	SAMEED		
CHECKED BY	WAZI IQBAL	SCALE: 1:1000	SHEET: 04/04 (A3)
APPROVED BY	ATIF		

SHEET TITLE:-
SETTING - OUT CO-ORDINATES
KARIMABAD UNDERPASS
LAYOUT PLAN (SHEET 04/04)

Drawing No. 2305-01-01-02-04-R404
REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\07_Stake Out Data\2305-01-01-02-04-R401 TO 404.dwg
User and Plot Date: Arshad Ahmed - Tue, 07 Nov 2023 - 4:17pm

ALIGNMENT DATA

UNDER PASS CENTER LINE ALIGNMENT DATA

POINT REF.	COORDINATES		
	STATION	NORTHING	EASTING
1	0+000.000	2756890.839	303799.308
2	0+010.000	2756898.447	303792.819
3	0+020.000	2756906.055	303786.329
4	0+030.000	2756913.664	303779.839
5	0+040.000	2756921.272	303773.350
6	0+050.000	2756928.880	303766.860
7	0+060.000	2756936.488	303760.371
8	0+070.000	2756944.097	303753.881
9	0+080.000	2756951.705	303747.391
10	0+090.000	2756959.313	303740.902
11	0+100.000	2756966.921	303734.412
12	0+110.000	2756974.530	303727.923
13	0+120.000	2756982.138	303721.433
14	0+130.000	2756989.746	303714.944
15	0+140.000	2756997.354	303708.454
16	0+150.000	2757004.963	303701.964
17	0+160.000	2757012.571	303695.475
18	0+170.000	2757020.179	303688.985
19	0+180.000	2757027.787	303682.496
20	0+190.000	2757035.395	303676.006
21	0+200.000	2757043.004	303669.516
22	0+210.000	2757050.612	303663.027
23	0+220.000	2757058.220	303656.537
24	0+230.000	2757065.828	303650.048
25	0+240.000	2757073.437	303643.558
26	0+250.000	2757081.045	303637.069
27	0+260.000	2757088.653	303630.579
28	0+270.000	2757096.261	303624.089
29	0+280.000	2757103.870	303617.600
30	0+290.000	2757111.478	303611.110
31	0+300.000	2757119.086	303604.621
32	0+310.000	2757126.694	303598.131
33	0+320.000	2757134.303	303591.641
34	0+330.000	2757141.911	303585.152
35	0+340.000	2757149.519	303578.662
36	0+350.000	2757157.127	303572.173
37	0+360.000	2757164.736	303565.683
38	0+370.000	2757172.344	303559.194
39	0+380.000	2757179.952	303552.704
40	0+390.000	2757187.560	303546.214
41	0+400.000	2757195.169	303539.725
42	0+410.000	2757202.777	303533.235
43	0+420.000	2757210.385	303526.746
44	0+430.000	2757217.993	303520.256
45	0+440.000	2757225.601	303513.766
46	0+450.000	2757233.210	303507.277
47	0+460.000	2757240.818	303500.787
48	0+470.000	2757248.426	303494.298
49	0+480.000	2757256.034	303487.808
50	0+490.000	2757263.643	303481.319

UNDER PASS CENTER LINE ALIGNMENT DATA

POINT REF.	COORDINATES		
	STATION	NORTHING	EASTING
51	0+500.000	2757271.251	303474.829
52	0+510.000	2757278.867	303468.349
53	0+520.000	2757286.514	303461.905
54	0+530.000	2757294.193	303455.499
55	0+540.000	2757301.904	303449.132
56	0+550.000	2757309.645	303442.801
57	0+560.000	2757317.391	303436.477
58	0+570.000	2757325.138	303430.153
59	0+580.000	2757332.881	303423.825
60	0+590.000	2757340.596	303417.462
61	0+600.000	2757348.279	303411.062
62	0+610.000	2757355.930	303404.623
63	0+620.000	2757363.572	303398.174
64	0+630.000	2757371.215	303391.724
65	0+640.000	2757378.857	303385.275
66	0+650.000	2757386.499	303378.825
67	0+660.000	2757394.141	303372.375
68	0+670.000	2757401.783	303365.926
69	0+680.000	2757409.425	303359.476
70	0+690.000	2757417.053	303353.009
71	0+700.000	2757424.648	303346.504
72	0+710.000	2757432.210	303339.961
73	0+720.000	2757439.740	303333.380
74	0+730.000	2757447.236	303326.762
75	0+740.000	2757454.700	303320.106
76	0+750.000	2757462.130	303313.414
77	0+760.000	2757469.526	303306.684
78	0+770.000	2757476.889	303299.917
79	0+780.000	2757484.218	303293.113
80	0+790.000	2757491.514	303286.275
81	0+800.000	2757498.804	303279.430
82	0+810.000	2757506.094	303272.585
83	0+820.000	2757513.384	303265.739
84	0+830.000	2757520.673	303258.894
85	0+840.000	2757527.963	303252.048
86	0+850.000	2757535.253	303245.203
87	0+860.000	2757542.542	303238.357
88	0+870.000	2757549.812	303231.490
89	0+880.000	2757557.047	303224.587
90	0+890.000	2757564.267	303217.669
91	0+900.000	2757571.488	303210.750
92	0+910.000	2757578.708	303203.832
93	0+920.000	2757585.929	303196.913
94	0+930.000	2757593.149	303189.994
95	0+940.000	2757600.321	303183.026
96	0+950.000	2757607.406	303175.969
97	0+960.000	2757614.402	303168.824
98	0+970.000	2757621.308	303161.592
99	0+980.000	2757628.123	303154.274
100	0+990.000	2757634.846	303146.871

UNDER PASS CENTER LINE ALIGNMENT DATA

POINT REF.	COORDINATES		
	STATION	NORTHING	EASTING
101	1+000.000	2757641.477	303139.385
102	1+010.000	2757648.063	303131.861
103	1+020.000	2757654.650	303124.336
104	1+030.000	2757661.236	303116.812
105	1+040.000	2757667.823	303109.287
106	1+050.000	2757674.409	303101.763
107	1+060.000	2757680.996	303094.238
108	1+070.000	2757687.582	303086.714
109	1+080.000	2757694.169	303079.190

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

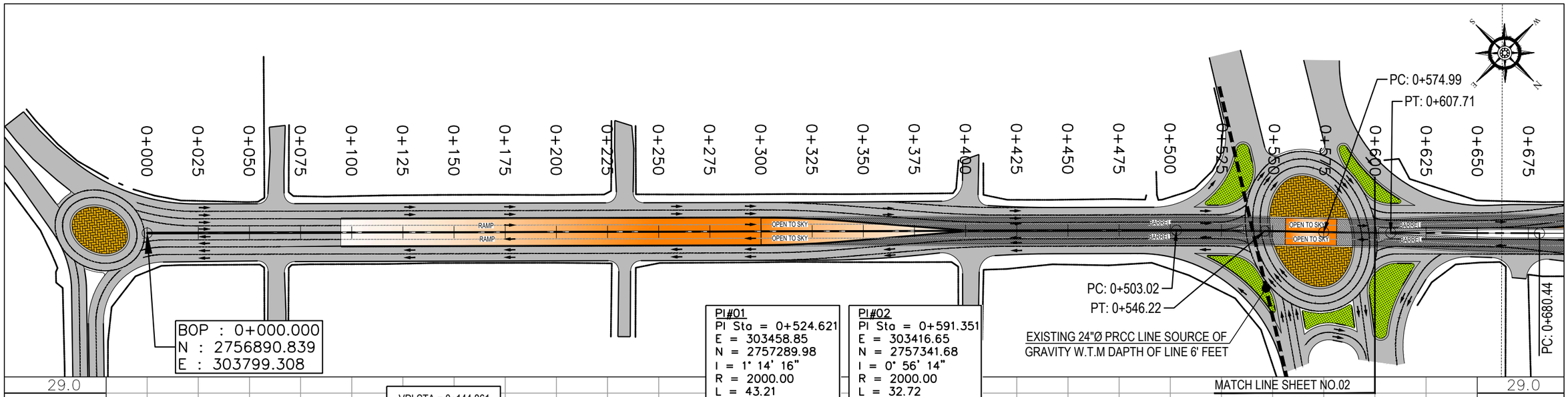
DRAWN BY	ARSHAD	PROJECT NO: KUK	DATE:- 15-08-2023
DESIGN BY	SAMEED		
CHECKED BY	WAZI	SCALE: N.T.S	SHEET: 01/01 (A3)
APPROVED BY	ATIF		

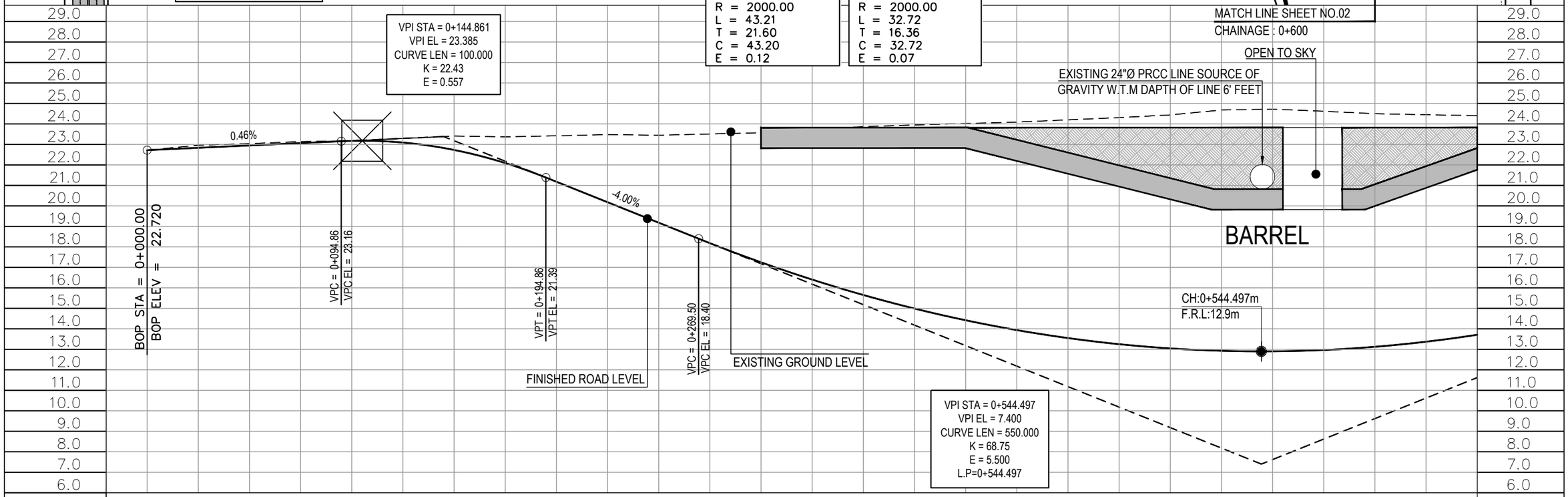
SHEET TITLE:-
ALIGNMENT DATA

Drawing No. 2305-01-01-02-04-R005
REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\11_Alignment Data\2305-01-01-02-04-R005.dwg
User and Plot Date: Arshad Ahmed - Tue, 07 Nov 2023 - 4:30pm

PLAN AND PROFILE





FRL	22.720	22.835	22.950	23.064	23.173	23.092	22.731	22.092	21.180	20.180	19.180	18.182	17.247	16.404	15.651	14.989	14.418	13.938	13.549	13.251	13.044	12.928	12.902	12.968	13.124	13.371
EGL	22.720	22.960	23.040	23.140	23.180	23.290	23.410	23.370	23.420	23.480	23.450	23.510	23.570	23.730	23.870	23.950	24.020	24.090	24.200	24.310	24.440	24.680	24.720	24.620	24.500	24.450
STATION	0+000	0+025	0+050	0+075	0+100	0+125	0+150	0+175	0+200	0+225	0+250	0+275	0+300	0+325	0+350	0+375	0+400	0+425	0+450	0+475	0+500	0+525	0+550	0+575	0+600	0+625

NOTES

1. ALL DIMENSIONS, CHAINAGES AND LEVELS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. FOR ROAD LAYOUT DETAILS, REFER DRAWING NOS. 2305-01-01-02-03-R251 TO 254
3. FOR TYPICAL CROSS SECTION REFER DRAWING NO: 2305-01-01-02-03-R200 TO 209
4. FOR DETAILS STORM WATER DRAIN REFER RELEVANT DRAWINGS.
5. FOR STRUCTURAL DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.

LEGEND

- PROPOSED CENTRE LINE
- PROPOSED KERB
- PROPOSED EDGE LINE
- PROPOSED LANE MARKING
- L.O.W. (LIMIT OF WORK)
- RAMP
- BARREL
- MARKING ARROWS
- FOOTPATH
- GREEN AREA

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:- KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:- CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-

ATIF NAZAR (PVT.) LTD.

PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

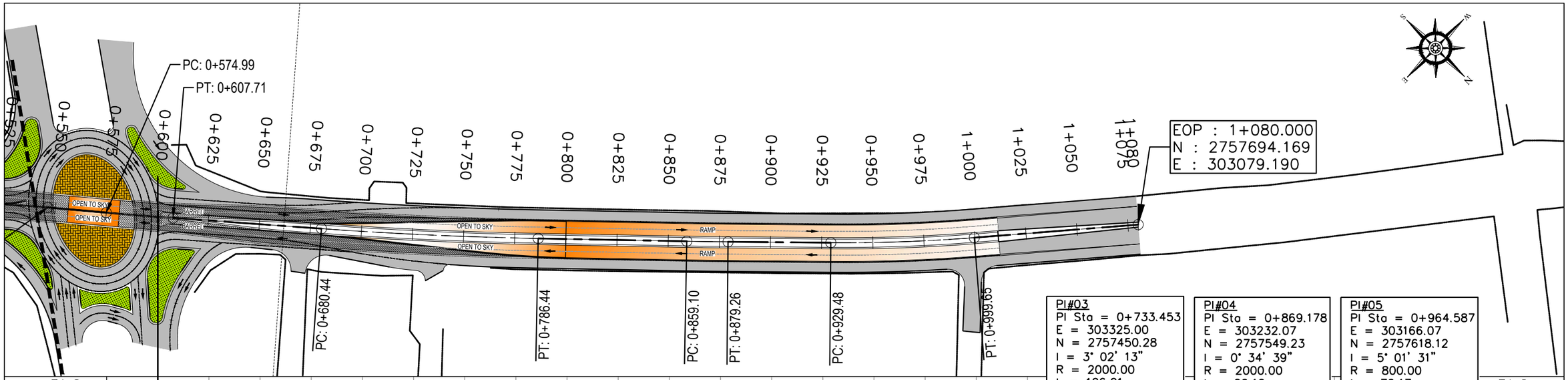
DRAWN BY	ARSHAD	PROJECT NO: KUK	DATE:- 15-08-2023
DESIGN BY	SAMEED		
CHECKED BY	WAZI IQBAL	SCALE: HOR:1=2000 VER:1=200	SHEET: 01/02 (A3)
APPROVED BY	ATIF		

SHEET TITLE:-

PLAN & PROFILE KARIMABAD UNDERPASS (CH:0+300 TO 0+600)

Drawing No. 2305-01-01-02-04-R300 | REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad Working\02_Construction\00_CAD\08_Plan&Profile\2305-01-01-02-04-R300 TO 301.dwg
User and Plot Date:- Arshad Ahmed - Tue, 07 Nov 2023 - 4:23pm



FRL	13.124	13.371	13.709	14.139	14.659	15.269	15.971	16.764	17.648	18.620	19.620	20.620	21.620	22.580	23.300	23.750	23.932	23.885	23.810	23.735						
EGL	24.500	24.450	24.405	24.360	24.300	24.150	24.140	23.990	24.040	23.870	23.810	23.740	23.800	23.790	23.760	23.805	23.747	23.789	23.774	23.729						
STATION	0+600	0+625	0+650	0+675	0+700	0+725	0+750	0+775	0+800	0+825	0+850	0+875	0+900	0+925	0+950	0+975	1+000	1+025	1+050	1+075	1+100	1+125	1+150	1+175	1+200	1+225

NOTES

1. ALL DIMENSIONS, CHAINAGES AND LEVELS ARE IN METERS UNLESS OTHERWISE INDICATED.
2. FOR ROAD LAYOUT DETAILS, REFER DRAWING NOS. 2305-01-01-02-04-R251 TO 254
3. FOR TYPICAL CROSS SECTION REFER DRAWING NO: 2305-01-01-02-04-R200 TO 209
4. FOR DETAILS STORM WATER DRAIN REFER RELEVANT DRAWINGS.
5. FOR STRUCTURAL DETAILS OF UNDERPASS, REFER RELEVANT DRAWINGS.

LEGEND

- PROPOSED CENTRE LINE
- PROPOSED KERB
- PROPOSED EDGE LINE
- PROPOSED LANE MARKING
- L.O.W. (LIMIT OF WORK)
- RAMP
- BARREL
- MARKING ARROWS
- FOOTPATH
- GREEN AREA

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:- KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:- CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-

ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO: KUK	DATE:- 15-08-2023
DESIGN BY	SAMEED		
CHECKED BY	WAZI IQBAL	SCALE: HOR:1=2000 VER:1=200	SHEET: 02/02 (A3)
APPROVED BY	ATIF		

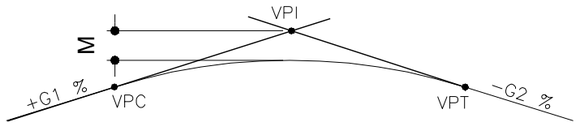
SHEET TITLE:- PLAN & PROFILE KARIMABAD UNDERPASS (CH:0+600 TO 1+080)

Drawing No. 2305-01-01-02-04-R301 REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\08_Plan&Profile\2305-01-01-02-04-R300 TO 301.dwg
User and Plot Date: Arshad Ahmed - Tue, 07 Nov 2023 - 4:24pm

STANDARD DRAWINGS

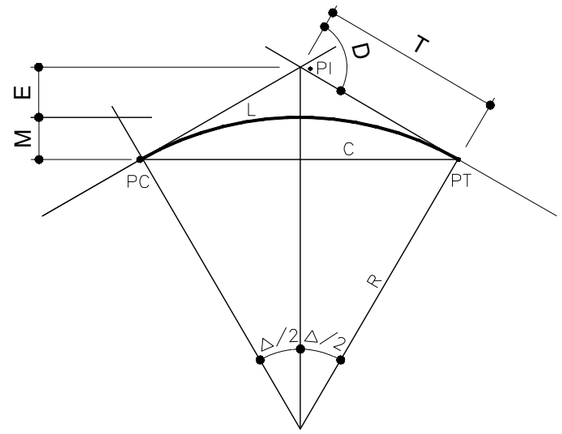
DETAIL OF VERTICAL CURVE



VPC : VERTICAL POINT OF CURVATURE
VPI : VERTICAL POINT OF INTERSECTION
VPT : VERTICAL POINT OF TANGENCY
L : LENGTH OF VERTICAL CURVE
M : VERTICAL OFFSET

+G : UPWARD VERTICAL GRADE
−G : DOWNWARD VERTICAL GRADE
K : RATE OF GRADE CHANGE = $\frac{G2-G1}{L}$
A : TOTAL CHANGE IN VERTICAL GRADE BETWEEN TANGENTS = G2−G1

DETAIL OF HORIZONTAL CURVE



CIRCULAR CURVE PARAMETERS

PI : POINT OF INTERSECTION
PC : POINT OF CURVATURE
PT : POINT OF TANGENCY
Δ : DEFLECTION ANGLE
Da : DEGREE OF CURVE (ARC DEFINITION)
Dc : DEGREE OF CURVE (CHORD DEFINITION)

T : TANGENT LENGTH
R : RADIUS
L : LENGTH OF CURVE
C : CHORD LENGTH
E : EXTERNAL
M : MIDDLE ORDINATE

S.NO	DESIGN PARAMETERS	UNITS	VALUES
1	DESIGN SPEED	Km/h	60
2	LANE WIDTH	m	3.05
3	NUMBER. OF LANES	No.	2
4	TOTAL PAVEMENT WIDTH	m	6.1
5	PAVEMENT CROSS SLOPE	%	1.5
6	RIGHT OF WAY (ROW)	m	33.26
7	MINIMUM RADIUS OF HORIZONTAL CURVE	m	135
8	MINIMUM STOPPING SIGHT DISTANCE (SSD)	m	85
09	MINIMUM PASSING SIGHT DISTANCE (PSD)	m	180
10	K VALUE FOR CREST CURVE (SSD)	m%	11
11	K VALUE FOR CREST CURVE (PSD)	m%	38
12	MINIMUM VERTICAL CLEARENCE	m	5.5

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

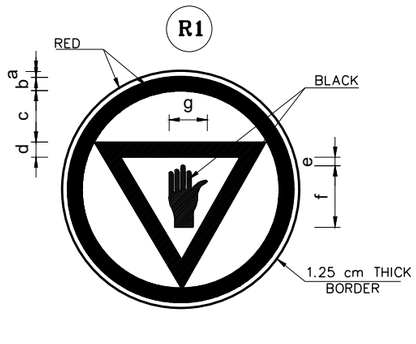
CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO: KUK	DATE:- 15-08-2023
DESIGN BY	SAMEED		
CHECKED BY	WAZI IQBAL	SCALE: N.T.S	SHEET: 01/01 (A3)
APPROVED BY	ATIF		

SHEET TITLE:-
GEOMETRIC DESIGN PARAMETERS

Drawing No. 2305-01-01-02-04-R900
REVISION C0

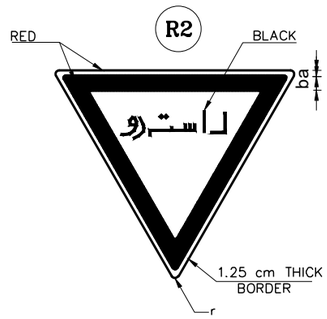
Drawing file path & name D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\10_General Drawings\2305-01-01-02-04-R900.dwg
User and Plot Date : Arshad Ahmed - Wed, 08 Nov 2023 - 11:38am



STOP

DIMENSION(cm)

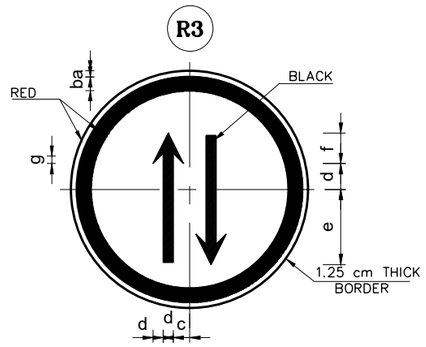
PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	10.7	13.3	16.0	18.7
d	3.7	4.6	5.5	6.4
e	2.3	2.9	3.5	4.1
f	20.0	25.0	30.0	35.0
g	12.3	15.4	18.5	21.6



GIVEWAY

DIMENSION(cm)

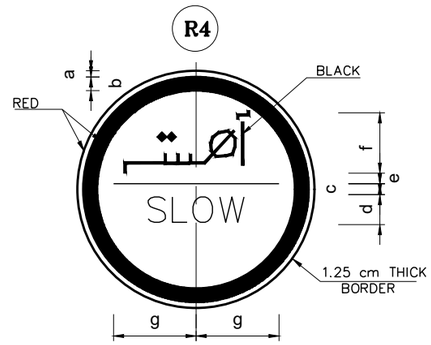
PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
r	2.3	2.9	3.5	4.1



PRIORITY ROAD

DIMENSION(cm)

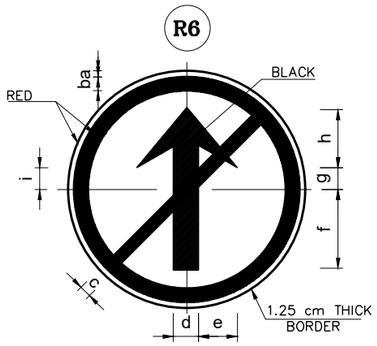
PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	7.0	8.7	10.5	12.2
d	4.7	5.8	7.0	8.2
e	17.3	21.7	26.0	30.3
f	12.7	15.8	19.0	22.2
g	1.3	1.7	2.0	2.3



SLOW

DIMENSION(cm)

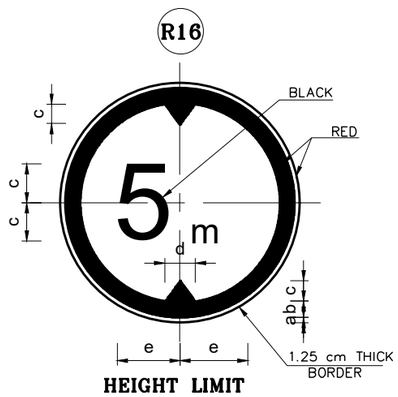
PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	2.7	3.3	4.0	4.7
d	9.7	12.1	14.5	16.9
e	1.3	1.7	2.0	2.3
f	16.0	20.4	24.5	28.6
g	18.0	22.5	27.6	31.5



NO ENTRY

DIMENSION(cm)

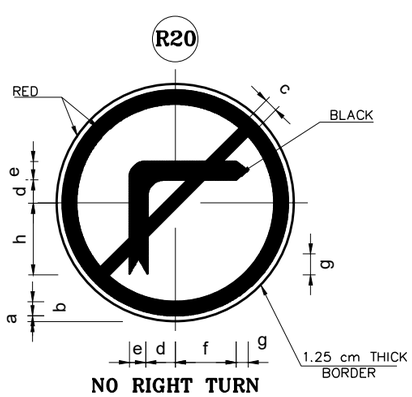
PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	3.7	4.6	5.5	6.4
d	5.3	6.7	8.0	9.3
e	6.0	7.5	9.0	10.5
f	20.3	25.4	30.5	35.6
g	4.7	5.8	7.0	8.2
h	15.7	19.6	23.5	27.4
i	3.0	3.7	4.5	5.2



HEIGHT LIMIT

DIMENSION(cm)

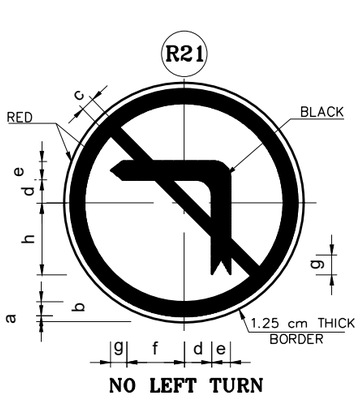
PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	11.0	13.7	16.5	19.2
d	17.3	21.7	26.0	30.3
e	13.3	16.7	20.0	23.3



NO RIGHT TURN

DIMENSION(cm)

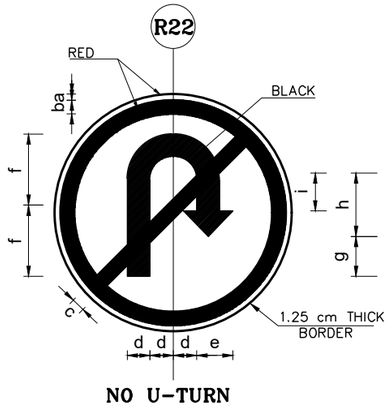
PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	3.7	4.6	5.5	6.4
d	4.0	5.0	6.0	7.0
e	6.7	8.3	10.0	11.6
f	16.7	20.8	25.0	29.2
g	3.3	4.2	5.0	5.8
h	20.0	25.0	30.0	35.0



NO LEFT TURN

DIMENSION(cm)

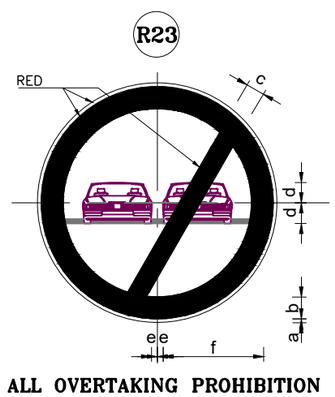
PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	3.7	4.6	5.5	6.4
d	4.0	5.0	6.0	7.0
e	6.7	8.3	10.0	11.6
f	16.7	20.8	25.0	29.2
g	3.3	4.2	5.0	5.8
h	20.0	25.0	30.0	35.0



NO U-TURN

DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	3.7	4.6	5.5	6.4
d	5.3	6.7	8.0	9.3
e	6.0	7.5	9.0	10.5
f	18.7	23.3	28.0	32.7
g	7.0	8.7	10.5	12.2
h	15.7	19.6	23.5	27.4
i	3.0	3.7	4.5	5.2



ALL OVERTAKING PROHIBITION

DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.3
b	4.3	5.4	6.5	8.7
c	3.7	4.6	5.5	7.3
d	8.0	10.0	12.0	16.0
e	2.0	2.5	3.0	4.0
f	19.7	24.6	29.5	39.3

NOTES:–

1. ALL DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
2. FOR INTERNAL ROADS, SIGN BOARDS OF 60CM SHALL BE FOLLOWED.
3. THE TRAFFIC SIGNS DETAILS SHOWN IN THE DRAWINGS ARE BASED ON "NTRC'S MANUAL OF SIGNS, SIGNALS AND ROAD MARKINGS, JULY 1989 ". FOR COLOR SCHEME SAME MANUAL SHOULD BE USED.
4. TRAFFIC SIGNS WITH DESIGNATION R51 TO R52 AND W43 TO W47 ARE NOT IN NTRC MANUAL.
5. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR APPROVAL OF THE ENGINEER.
6. ALL TRAFFIC SIGNS SHALL BE MANUFACTURED AS PER SPECIFICATIONS. REFER TRAFFIC SIGNS AND MOUNTING DETAILS FOR FURTHER INFORMATION ABOUT TRAFFIC SIGNS MATERIAL.
7. THE MATERIAL OF SIGN PANELS AND REFLECTIVE SHEETING SHALL BE APPROVED BY THE ENGINEER PRIOR TO MANUFACTURING OF TRAFFIC SIGNS.

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:- KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:- CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-

ATIF NAZAR (PVT.) LTD.

PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO: KUK	DATE:- 15-08-2023
DESIGN BY	SAMEED		
CHECKED BY	WAZI	SCALE: N.T.S	SHEET: 01/10 (A3)
APPROVED BY	ATIF		

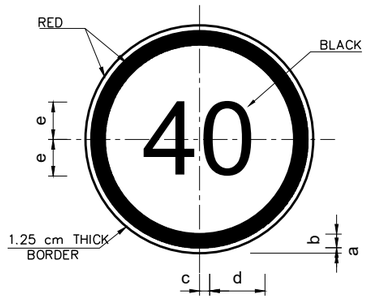
SHEET TITLE:- ROAD TRAFFIC SIGNS DETAIL

Drawing No. 2305-01-01-02-04-R901

REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\10_General Drawings\2305-01-01-02-04-R901.dwg
User and Plot Date: Arshad Ahmed - Tue, 07 Nov 2023 - 4:27pm

R25

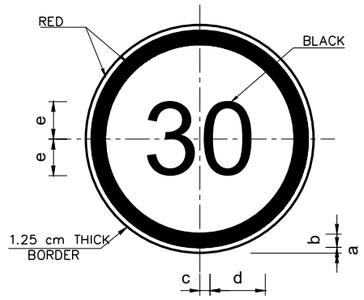


SPEED LIMIT

DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	2.0	2.5	3.0	3.5
d	15.3	19.2	23.0	26.8
e	13.3	16.7	20.0	23.3

R25A

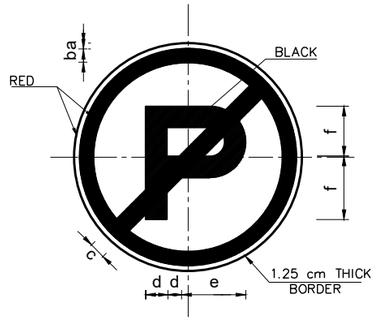


SPEED LIMIT

DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	2.0	2.5	3.0	3.5
d	15.3	19.2	23.0	26.8
e	13.3	16.7	20.0	23.3

R29

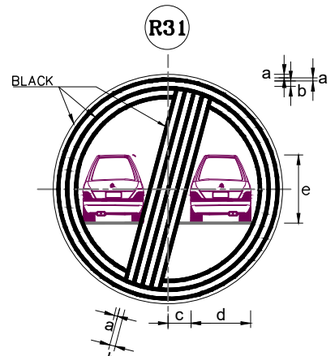


PARKING PROHIBITION

DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	3.7	4.6	5.5	6.4
d	5.3	6.7	8.0	9.3
e	10.6	13.3	16.0	18.7
f	18.0	22.5	27.0	31.5

R31

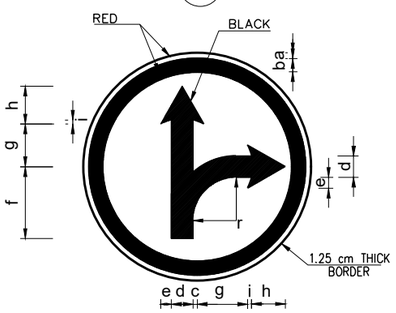


END OF OVERTAKING RESTRICTION

DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	1.1	1.4	1.7	2.0
c	6.7	8.3	10.0	11.7
d	16.7	20.8	25.0	29.2
e	14.0	17.5	21.0	24.5

R39

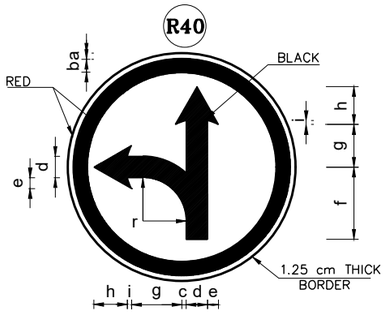


PROCEED STRAIGHT OR RIGHT ONLY

DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	2.7	3.3	4.0	4.7
c	3.3	4.2	5.0	5.8
d	5.3	6.7	8.0	9.3
e	6.0	7.5	9.0	10.5
f	22.7	28.3	34.0	39.7
g	7.0	8.7	10.5	12.2
h	15.7	19.6	23.5	27.4
i	3.0	3.7	4.5	5.2
r	5.3	6.7	8.0	9.3

R40

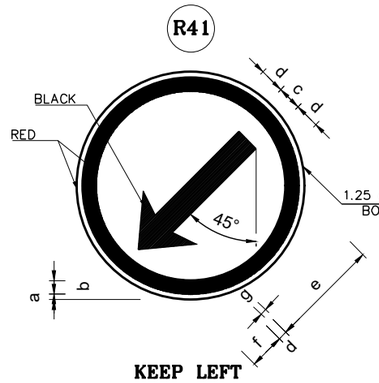


PROCEED STRAIGHT OR LEFT ONLY

DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	2.7	3.3	4.0	4.7
c	3.3	4.2	5.0	5.8
d	5.3	6.7	8.0	9.3
e	6.0	7.5	9.0	10.5
f	22.7	28.3	34.0	39.7
g	7.0	8.7	10.5	12.2
h	15.7	19.6	23.5	27.4
i	3.0	3.7	4.5	5.2
r	5.3	6.7	8.0	9.3

R41

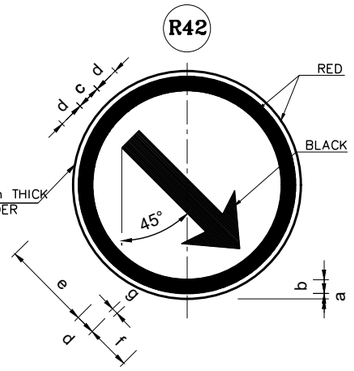


KEEP LEFT

DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	2.7	3.3	4.0	4.7
c	5.3	6.7	8.0	9.3
d	6.0	7.5	9.0	10.5
e	21.3	26.7	32.0	37.3
f	15.3	19.2	23.0	26.8
g	3.0	3.7	4.5	5.2

R42

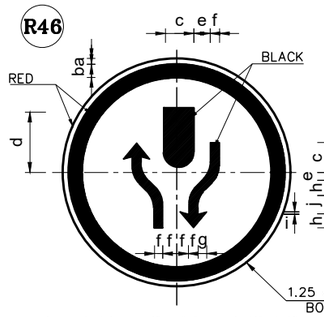


KEEP RIGHT

DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	2.7	3.3	4.0	4.7
c	5.3	6.7	8.0	9.3
d	6.0	7.5	9.0	10.5
e	21.3	26.7	32.0	37.3
f	15.3	19.2	23.0	26.8
g	3.0	3.7	4.5	5.2

R46

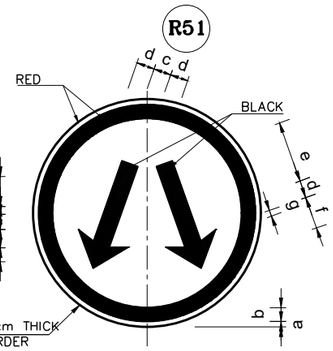


DIVIDED HIGHWAY BEGINS

DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	2.7	3.3	4.0	4.7
c	9.3	11.7	14.0	16.3
d	20.7	25.8	31.0	36.2
e	5.3	6.7	8.0	9.3
f	4.7	5.8	7.0	8.2
g	4.0	5.0	6.0	7.0
h	8.7	10.8	13.0	15.2
i	1.0	1.2	1.5	1.7
j	3.5	4.2	5.0	5.8

R51



PASS EITHER SIDE

DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	2.7	3.3	4.0	4.7
c	5.3	6.7	8.0	9.3
d	6.0	7.5	9.0	10.5
e	21.3	26.7	32.0	37.3
f	15.3	19.2	23.0	26.8
g	3.0	3.7	4.5	5.2

NOTES:–

1. ALL DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
2. FOR INTERNAL ROADS, SIGN BOARDS OF 60CM SHALL BE FOLLOWED.
3. THE TRAFFIC SIGNS DETAILS SHOWN IN THE DRAWINGS ARE BASED ON "NTRC'S MANUAL OF SIGNS, SIGNALS AND ROAD MARKINGS, JULY 1989 ". FOR COLOR SCHEME SAME MANUAL SHOULD BE USED.
4. TRAFFIC SIGNS WITH DESIGNATION R51 TO R52 AND W43 TO W47 ARE NOT IN NTRC MANUAL.
5. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR APPROVAL OF THE ENGINEER.
6. ALL TRAFFIC SIGNS SHALL BE MANUFACTURED AS PER SPECIFICATIONS. REFER TRAFFIC SIGNS AND MOUNTING DETAILS FOR FURTHER INFORMATION ABOUT TRAFFIC SIGNS MATERIAL.
7. THE MATERIAL OF SIGN PANELS AND REFLECTIVE SHEETING SHALL BE APPROVED BY THE ENGINEER PRIOR TO MANUFACTURING OF TRAFFIC SIGNS.

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

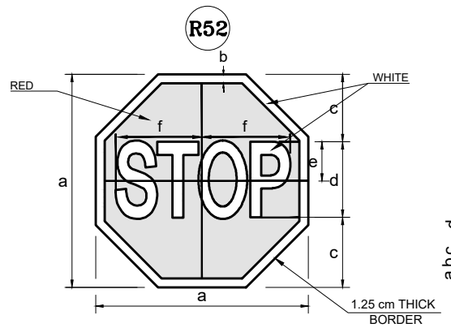
CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO:	DATE:-
DESIGN BY	SAMEED	KUK	15-08-2023
CHECKED BY	WAZI	SCALE:	SHEET:
APPROVED BY	ATIF	N.T.S	02/10 (A3)

SHEET TITLE:-
ROAD TRAFFIC SIGNS DETAIL

Drawing No. 2305-01-01-02-04-R902
REVISION C0

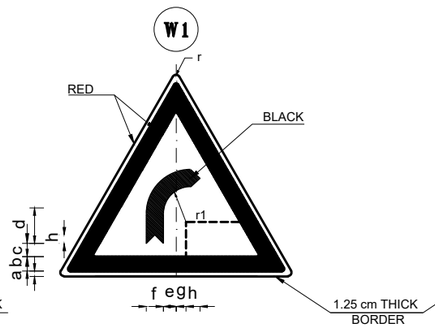
Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\10_General Drawings\2305-01-01-02-04-R902.dwg
User and Plot Date:- Arshad Ahmed - Tue, 07 Nov 2023 - 4:27pm



STOP

DIMENSION(cm)

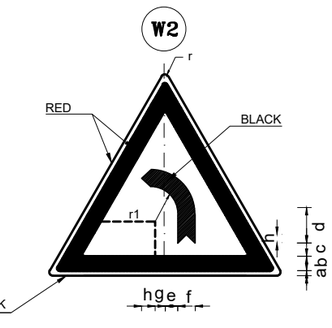
PARTS	SIGN SIZE			
	60cm	75cm	90cm	120cm
a	60.0	75.0	90.0	120.0
b	1.6	1.9	2.2	3.1
c	20.0	25.0	30.0	40.0
d	20.0	25.0	30.0	40.0
e	10.0	12.5	15.0	20.0
f	25.0	31.3	37.5	50.0



CURVE TOWARDS RIGHT

DIMENSION(cm)

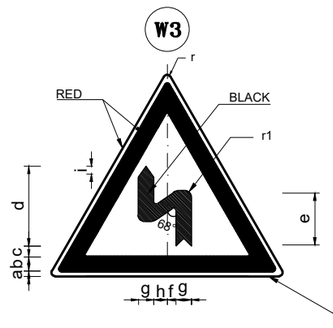
PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	2.7	3.3	4.0	4.7
d	7.6	9.6	11.5	13.4
e	5.7	7.1	8.5	9.9
f	4.7	5.8	7.0	8.2
g	4.0	5.0	6.0	7.0
h	2.3	2.9	3.5	4.1
r	2.3	2.9	3.5	4.1
r1	8.3	10.4	12.5	14.6



CURVE TOWARDS LEFT

DIMENSION(cm)

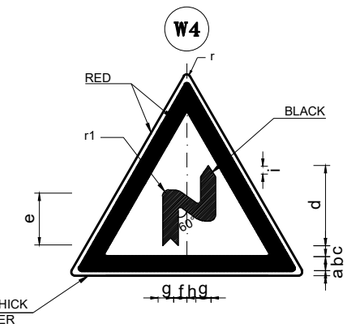
PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	2.7	3.3	4.0	4.7
d	7.6	9.6	11.5	13.4
e	5.7	7.1	8.5	9.9
f	4.7	5.8	7.0	8.2
g	4.0	5.0	6.0	7.0
h	2.3	2.9	3.5	4.1
r	2.3	2.9	3.5	4.1
r1	8.3	10.4	12.5	14.6



LEFT REVERSE CURVE

DIMENSION(cm)

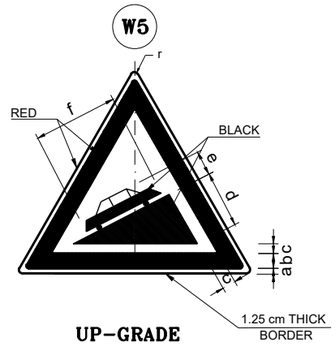
PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	2.0	2.5	3.0	3.5
d	22.0	27.5	33.0	38.5
e	9.3	11.7	14.0	16.3
f	5.3	6.7	8.0	9.3
g	4.5	5.8	7.0	8.2
h	1.3	1.7	2.0	2.3
i	2.3	2.9	3.5	4.1
r	2.3	2.9	3.5	4.1
r1	3.0	3.7	4.5	5.2



RIGHT REVERSE CURVE

DIMENSION(cm)

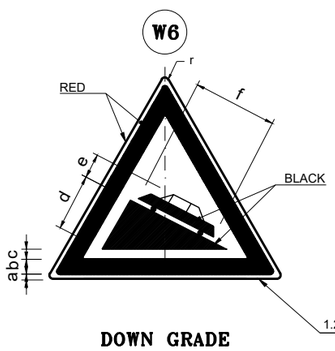
PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	2.0	2.5	3.0	3.5
d	22.0	27.5	33.0	38.5
e	9.3	11.7	14.0	16.3
f	5.3	6.7	8.0	9.3
g	4.7	5.8	7.0	8.2
h	1.3	1.7	2.0	2.3
i	2.3	2.9	3.5	4.1
r	2.3	2.9	3.5	4.1
r1	3.0	3.7	4.5	5.2



UP–GRADE

DIMENSION(cm)

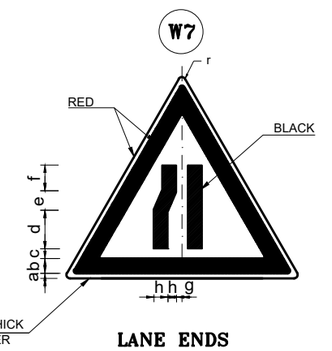
PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.3	6.5	7.6
c	2.3	2.9	3.5	4.1
d	15.7	19.6	23.5	27.4
e	7.7	9.6	11.5	13.4
f	22.0	27.5	33.0	38.5
r	2.3	2.9	3.5	4.1



DOWN GRADE

DIMENSION(cm)

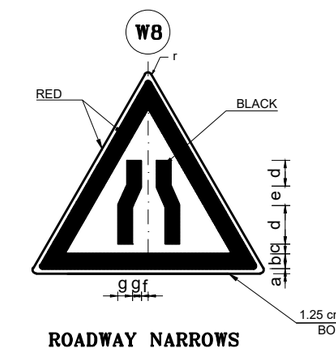
PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.3	6.5	7.6
c	2.3	2.9	3.5	4.1
d	15.7	19.6	23.5	27.4
e	7.7	9.6	11.5	13.4
f	22.0	27.5	33.0	38.5
r	2.3	2.9	3.5	4.1



LANE ENDS

DIMENSION(cm)

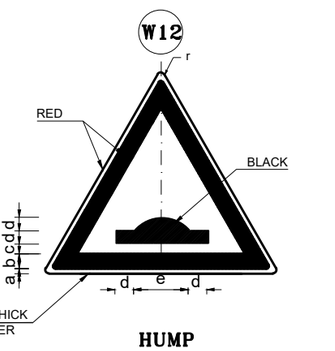
PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	2.0	2.5	3.0	3.5
d	9.3	11.7	14.0	16.3
e	4.8	6.0	7.2	8.4
f	7.5	9.4	11.3	13.2
g	2.3	2.9	3.5	4.1
h	3.3	4.2	5.0	5.8
r	2.3	2.9	3.5	4.1



ROADWAY NARROWS

DIMENSION(cm)

PARTS	SIGN SIZE			
	90cm	105cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	2.3	2.9	3.5	4.1
d	6.7	8.3	10.0	11.7
e	9.3	11.7	14.0	16.3
f	1.7	2.1	2.5	2.9
g	3.3	4.2	5.0	5.8
r	2.3	2.9	3.5	4.1



HUMP

DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	2.7	3.3	4.0	4.7
d	4.7	5.8	7.0	8.2
e	21.3	26.7	32.0	37.3
r	2.3	2.9	3.5	4.1

NOTES:–

1. ALL DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
2. FOR INTERNAL ROADS, SIGN BOARDS OF 60CM SHALL BE FOLLOWED.
3. THE TRAFFIC SIGNS DETAILS SHOWN IN THE DRAWINGS ARE BASED ON "NTRC'S MANUAL OF SIGNS, SIGNALS AND ROAD MARKINGS, JULY 1989 ". FOR COLOR SCHEME SAME MANUAL SHOULD BE USED.
4. TRAFFIC SIGNS WITH DESIGNATION R51 TO R52 AND W43 TO W47 ARE NOT IN NTRC MANUAL.
5. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR APPROVAL OF THE ENGINEER.
6. ALL TRAFFIC SIGNS SHALL BE MANUFACTURED AS PER SPECIFICATIONS. REFER TRAFFIC SIGNS AND MOUNTING DETAILS FOR FURTHER INFORMATION ABOUT TRAFFIC SIGNS MATERIAL.
7. THE MATERIAL OF SIGN PANELS AND REFLECTIVE SHEETING SHALL BE APPROVED BY THE ENGINEER PRIOR TO MANUFACTURING OF TRAFFIC SIGNS.

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-

KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-

CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-

ATIF NAZAR (PVT.) LTD.

PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO: KUK	DATE:- 15-08-2023
DESIGN BY	SAMEED		
CHECKED BY	WAZI	SCALE: N.T.S	SHEET: 03/10 (A3)
APPROVED BY	ATIF		

SHEET TITLE:-

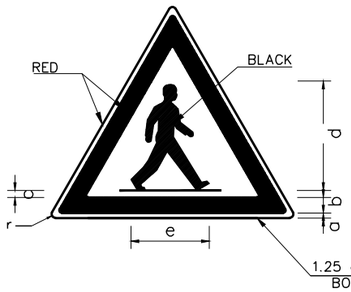
ROAD TRAFFIC SIGNS DETAIL

Drawing No. 2305-01-01-02-04-R9023

REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\10_General Drawings\2305-01-01-02-04-R903.dwg
User and Plot Date: Arshad Ahmed – Tue, 07 Nov 2023 – 4:27pm

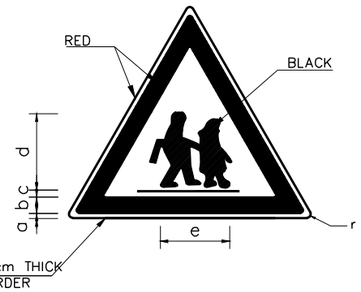
W17



PEDESTRIAN CROSSING
DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	1.7	2.1	2.5	2.9
d	28.7	35.8	43.0	50.2
e	15.3	19.2	23.0	26.8
r	2.3	2.9	3.5	4.1

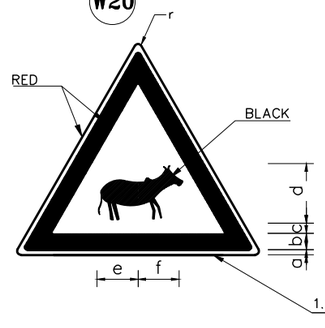
W18



CHILDREN CROSSING
DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	3.0	3.8	4.5	5.3
d	19.0	23.8	28.5	33.3
e	25.0	31.3	37.5	43.8
r	2.3	2.9	3.5	4.1

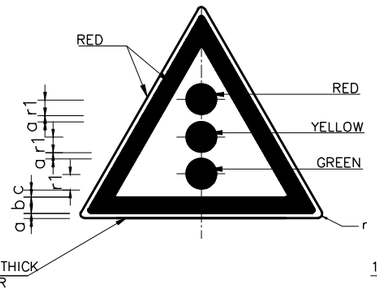
W20



CATTLE CROSSING
DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	1.3	1.7	2.0	2.3
d	14.7	18.3	22.0	25.7
e	12.3	15.4	18.5	21.6
f	11.7	14.6	17.5	20.4
r	2.3	2.9	3.5	4.1

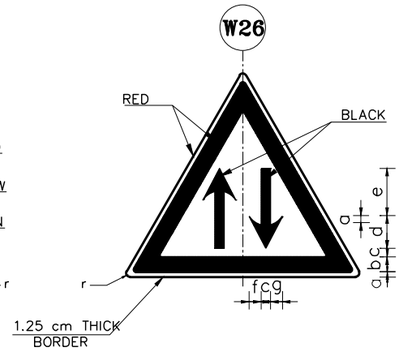
W23



SIGNAL AHEAD
DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	1.7	2.1	2.5	2.9
r1	4.3	5.4	6.5	7.6
r	2.3	2.9	3.5	4.1

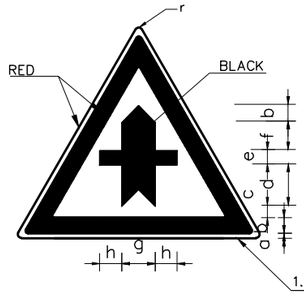
W26



TWO-WAY TRAFFIC
DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	2.7	3.3	4.0	4.7
d	6.0	7.5	9.0	10.5
e	12.7	15.8	19.0	22.2
f	3.3	4.2	5.0	5.8
g	2.3	2.9	3.5	4.1
r	2.3	2.9	3.5	4.1

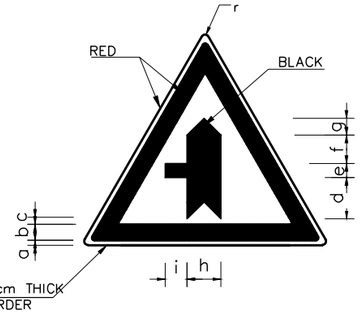
W27



MINOR ROAD CROSSING AT RIGHT ANGLE
DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	2.7	3.3	4.0	4.7
d	10.0	12.5	15.0	17.5
e	4.0	5.0	6.0	7.0
f	7.3	9.2	11.0	12.8
g	9.0	11.2	13.5	15.7
h	5.7	7.1	8.5	9.9
r	2.3	2.9	3.5	4.1

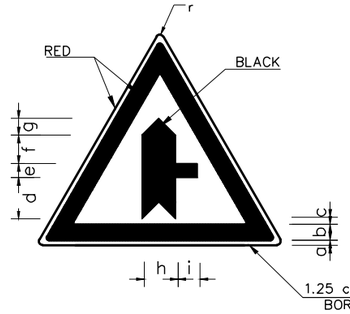
W29



MINOR ROAD ON LEFT SIDE ONLY
DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	2.0	2.5	3.0	3.5
d	9.0	11.3	13.5	15.8
e	3.7	4.6	5.5	6.4
f	10.0	12.5	15.0	17.5
g	4.7	5.8	7.0	8.2
h	9.3	11.7	14.0	16.3
i	7.0	8.8	10.5	12.3
r	2.3	2.9	3.5	4.1

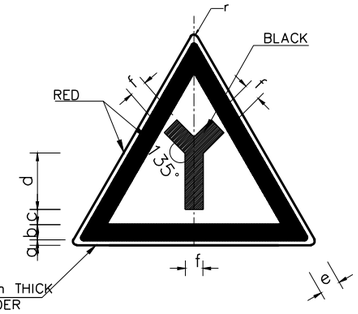
W30



MINOR ROAD ON RIGHT SIDE ONLY
DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	2.0	2.5	3.0	3.5
d	9.0	11.3	13.5	15.8
e	3.7	4.6	5.5	6.4
f	10.0	12.5	15.0	17.5
g	4.7	5.8	7.0	8.2
h	9.3	11.7	14.0	16.3
i	7.0	8.8	10.5	12.3
r	2.3	2.9	3.5	4.1

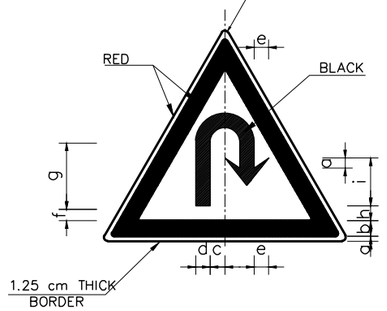
W31



JUNCTION
DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	2.0	2.5	3.0	3.5
d	11.3	14.2	17.0	19.8
e	8.7	10.8	13.0	15.2
f	4.7	5.8	7.0	8.2
r	2.3	4.1	3.5	4.1

W34



U-TURN
DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	3.7	4.6	5.5	6.4
d	4.7	5.8	7.0	8.2
e	3.3	4.2	5.0	5.8
f	1.7	2.1	2.5	2.9
g	15.3	19.2	23.0	26.8
h	5.0	6.3	7.5	8.8
i	8.0	10.0	12.0	14.0
r	2.3	2.9	3.5	4.1

NOTES:-

1. ALL DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
2. FOR INTERNAL ROADS, SIGN BOARDS OF 60CM SHALL BE FOLLOWED.
3. THE TRAFFIC SIGNS DETAILS SHOWN IN THE DRAWINGS ARE BASED ON "NTRC'S MANUAL OF SIGNS, SIGNALS AND ROAD MARKINGS, JULY 1989 ". FOR COLOR SCHEME SAME MANUAL SHOULD BE USED.
4. TRAFFIC SIGNS WITH DESIGNATION R51 TO R52 AND W43 TO W47 ARE NOT IN NTRC MANUAL.
5. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR APPROVAL OF THE ENGINEER.
6. ALL TRAFFIC SIGNS SHALL BE MANUFACTURED AS PER SPECIFICATIONS. REFER TRAFFIC SIGNS AND MOUNTING DETAILS FOR FURTHER INFORMATION ABOUT TRAFFIC SIGNS MATERIAL.
7. THE MATERIAL OF SIGN PANELS AND REFLECTIVE SHEETING SHALL BE APPROVED BY THE ENGINEER PRIOR TO MANUFACTURING OF TRAFFIC SIGNS.

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

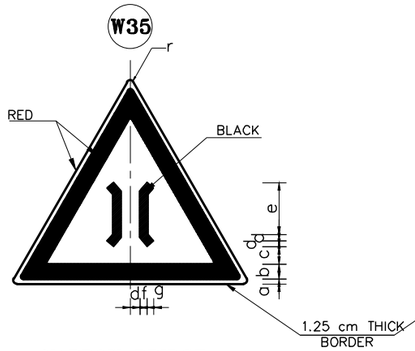
CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO:	DATE:-
DESIGN BY	SAMEED	KUK	15-08-2023
CHECKED BY	WAZI	SCALE:	SHEET:
APPROVED BY	ATIF	N.T.S	04/10 (A3)

SHEET TITLE:-
ROAD TRAFFIC SIGNS DETAIL

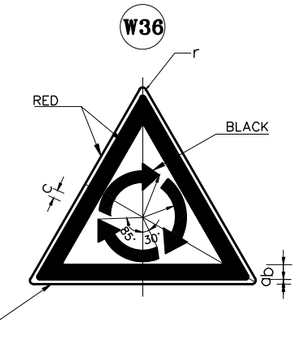
Drawing No. 2305-01-01-02-04-R904
REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\10_General Drawings\2305-01-01-02-04-R904.dwg
User and Plot Date: Arshad Ahmed - Tue, 07 Nov 2023 - 4:27pm



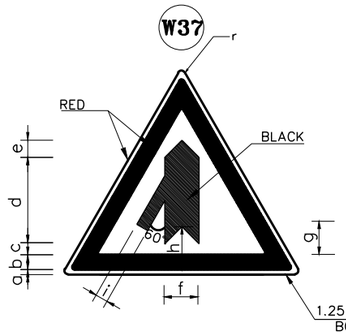
NARROW BRIDGE
DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	4.0	5.0	6.0	7.0
d	1.2	2.1	2.5	2.9
e	10.0	12.5	15.0	17.5
f	2.7	3.3	4.0	4.7
g	2.0	2.5	3.0	3.5
r	2.3	2.9	3.5	4.1



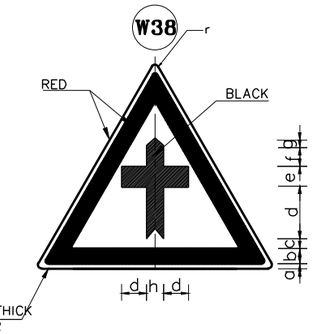
ROUNDABOUT
DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	2.0	2.5	3.0	3.5
d	6.0	7.5	9.0	10.5
r1	8.0	10.0	12.0	14.0
r2	10.7	13.3	16.0	18.7
r	2.3	2.9	3.5	4.1



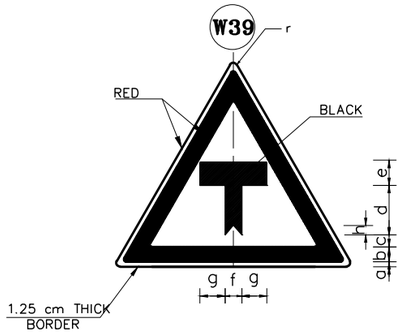
MERGE
DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	2.3	2.9	3.5	4.1
d	22.0	27.5	33.0	38.5
e	4.7	5.8	7.0	8.2
f	9.3	11.7	14.0	16.3
g	10.0	12.5	15.0	17.5
h	2.0	2.5	3.0	3.5
i	3.7	4.6	5.5	6.4
r	2.3	2.9	3.5	4.1



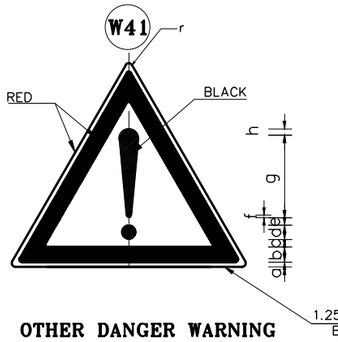
MAJOR INTERSECTION AHEAD
DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	2.0	2.5	3.0	3.5
d	8.7	10.8	13.0	15.2
e	4.7	5.8	7.0	8.2
f	6.7	8.3	10.0	11.7
g	1.7	2.1	2.5	2.9
h	3.3	4.2	5.0	5.8
r	2.3	2.9	3.5	4.1



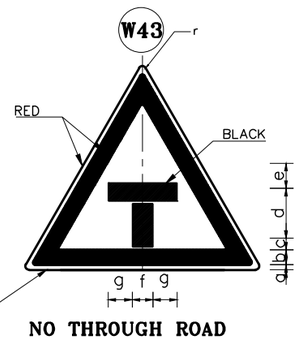
MAJOR ROAD AHEAD
DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	2.0	2.5	3.0	3.5
d	10.3	12.9	15.5	18.1
e	4.7	5.8	7.0	8.2
f	3.3	4.2	5.0	5.8
g	7.3	9.2	11.0	12.8
h	1.7	2.1	2.5	2.9
r	2.3	2.9	3.5	4.1



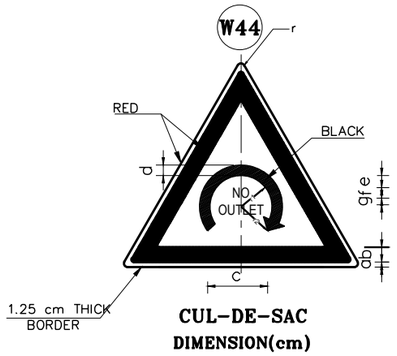
OTHER DANGER WARNING
DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	1.7	2.1	2.5	2.9
d	6.7	8.3	10.0	11.7
e	1.3	1.7	2.0	2.3
f	1.1	1.4	1.7	2.0
g	16.7	20.8	25.0	29.2
h	3.3	4.2	5.0	5.8
r	2.3	2.9	3.5	4.1



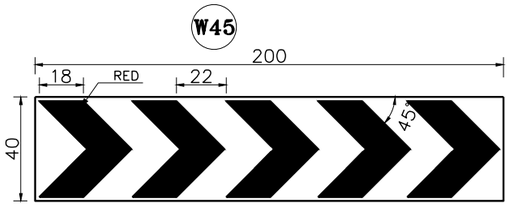
NO THROUGH ROAD
DIMENSION(cm)

PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	2.0	2.5	3.0	3.5
d	10.3	12.9	15.5	18.1
e	4.7	5.8	7.0	8.2
f	4.7	5.8	7.0	8.2
g	7.3	9.2	11.0	12.8
r	2.3	2.9	3.5	4.1

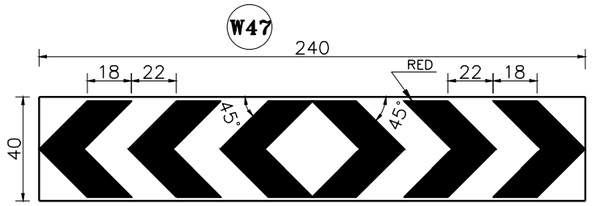


CUL-DE-SAC
DIMENSION(cm)

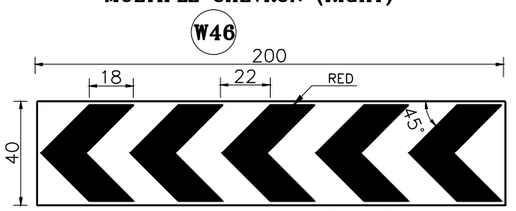
PARTS	SIGN SIZE			
	60cm	75cm	90cm	105cm
a	0.7	0.8	1.0	1.2
b	4.3	5.4	6.5	7.6
c	20.9	26.2	31.4	36.7
d	3.6	4.5	5.4	6.3
e	4.2	5.2	6.3	7.3
f	3.7	4.6	5.5	6.4
g	2.4	2.9	3.5	4.1
r1	10.8	13.5	16.2	18.9
r2	12.6	15.7	18.9	22.0
r	2.3	2.9	3.5	4.1



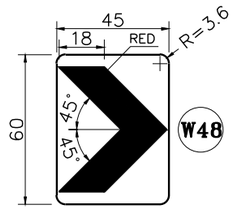
MULTIPLE CHEVRON (RIGHT)

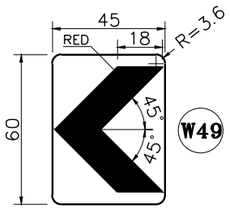


MULTIPLE CHEVRON (BOTH WAYS)



MULTIPLE CHEVRON (LEFT)





NOTES:–

1. ALL DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
2. FOR INTERNAL ROADS, SIGN BOARDS OF 60CM SHALL BE FOLLOWED.
3. THE TRAFFIC SIGNS DETAILS SHOWN IN THE DRAWINGS ARE BASED ON "NTRC'S MANUAL OF SIGNS, SIGNALS AND ROAD MARKINGS, JULY 1989 ". FOR COLOR SCHEME SAME MANUAL SHOULD BE USED.
4. TRAFFIC SIGNS WITH DESIGNATION R51 TO R52 AND W43 TO W47 ARE NOT IN NTRC MANUAL.
5. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR APPROVAL OF THE ENGINEER.
6. ALL TRAFFIC SIGNS SHALL BE MANUFACTURED AS PER SPECIFICATIONS. REFER TRAFFIC SIGNS AND MOUNTING DETAILS FOR FURTHER INFORMATION ABOUT TRAFFIC SIGNS MATERIAL.
7. THE MATERIAL OF SIGN PANELS AND REFLECTIVE SHEETING SHALL BE APPROVED BY THE ENGINEER PRIOR TO MANUFACTURING OF TRAFFIC SIGNS.

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

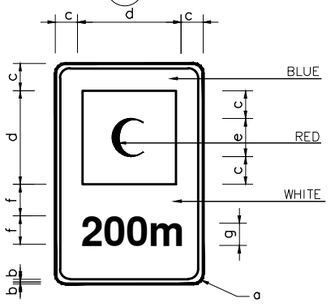
DRAWN BY	ARSHAD
DESIGN BY	SAMEED
CHECKED BY	WAZI
APPROVED BY	ATIF
PROJECT NO:	KUK
DATE:-	15-08-2023
SCALE:	N.T.S
SHEET:	05/10 (A3)

SHEET TITLE:-
ROAD TRAFFIC SIGNS DETAIL

Drawing No. 2305-01-01-02-04-R905
REVISION C0

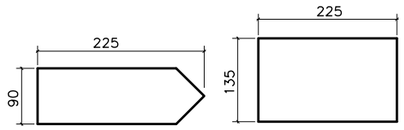
Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\10_General Drawings\2305-01-01-02-04-R905.dwg
User and Plot Date: Arshad Ahmed - Tue, 07 Nov 2023 - 4:26pm

I9



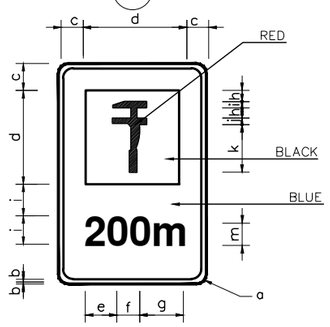
FIRST AID STATION
DIMENSION (cm)

PARTS	SIGN SIZE 60x90	SIGN SIZE 90x135	SIGN SIZE 120x180
a	3.0	4.5	6.0
b	1.2	1.8	2.4
c	10.0	15.0	20.0
d	40.0	60.0	80.0
e	20.0	30.0	40.0
f	13.0	19.5	26.0
g	7.0	10.0	14.0



ALTERNATIVE PANELS FOR SIGNS

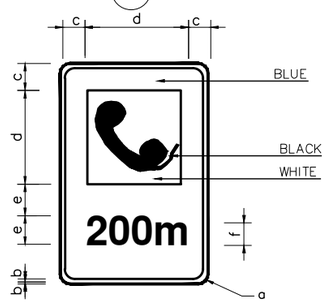
I10



AUTO REPAIR SHOP
DIMENSION (cm)

PARTS	SIGN SIZE 60x90	SIGN SIZE 90x135	SIGN SIZE 120x180
a	3.0	4.5	6.0
b	1.2	1.8	2.4
c	10.0	15.0	20.0
d	40.0	60.0	80.0
e	15.0	22.5	30.0
f	7.5	11.3	15.0
g	17.5	26.3	35.0
h	2.5	3.8	5.0
i	5.5	8.3	11.0
j	3.5	5.3	7.0
k	22.0	33.0	44.0
l	13.0	19.5	26.0
m	7.0	10.0	14.0

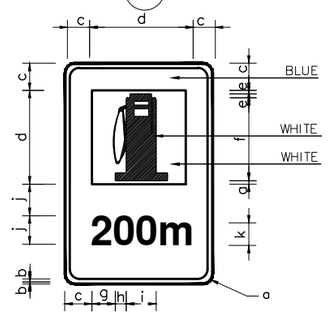
I11



PHONE SERVICE
DIMENSION (cm)

PARTS	SIGN SIZE 60x90	SIGN SIZE 90x135	SIGN SIZE 120x180
a	3.0	4.5	6.0
b	1.2	1.8	2.4
c	10.0	15.0	20.0
d	40.0	60.0	80.0
e	13.0	19.5	26.0
f	7.0	10.5	14.0

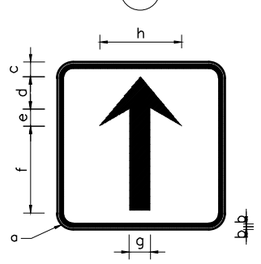
I12



PETROL PUMP
DIMENSION (cm)

PARTS	SIGN SIZE 60x90	SIGN SIZE 90x135	SIGN SIZE 120x180
a	3.0	4.0	6.0
b	1.2	1.8	2.4
c	10.0	15.0	20.0
d	40.0	60.0	80.0
e	2.0	3.0	4.0
f	30.0	45.0	60.0
g	4.0	6.0	8.0
h	6.0	9.0	12.0
i	8.5	12.3	17.0
j	13.0	19.5	26.0
k	7.0	10.5	14.0

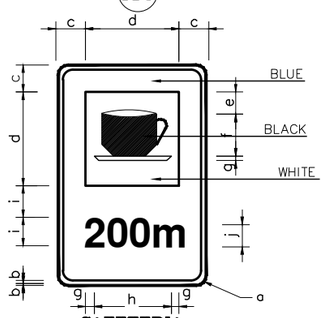
I23



ONE-WAY AHEAD
DIMENSION (cm)

PARTS	SIGN SIZE 60x60	SIGN SIZE 90x90	SIGN SIZE 120x120
a	3.0	4.5	6.0
b	1.2	1.8	2.4
c	6.0	9.0	12.0
d	21.0	31.5	42.0
e	2.0	3.0	4.0
f	26.0	39.0	52.0
g	7.5	11.3	15.0
g	27.0	40.5	54.0

I15



CAFETERIA
DIMENSION (cm)

PARTS	SIGN SIZE 60x90	SIGN SIZE 90x135	SIGN SIZE 120x180
a	3.0	4.5	6.0
b	1.2	1.8	2.4
c	10.0	15.0	20.0
d	40.0	60.0	80.0
e	8.0	12.0	16.0
f	17.0	25.5	34.0
g	4.0	6.0	8.0
h	32.0	48.0	64.0
i	13.0	19.5	26.0
j	7.0	10.5	14.0

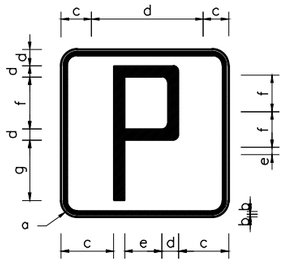
CATEGORIES OF TRAFFIC SIGNS

CATEGORY	SHAPE OR MODEL	TYPE
1		WARNING / DANGER
2		REGULATORY / PROHIBITORY
3a	1sqm	INFORMATORY
3b	2sqm	
3c		

SIZE AND LOCATION OF TRAFFIC SIGNS

ROAD TYPE	SIZE OF TRAFFIC SIGNS	LOCATION OF WARNING SIGNS	
		MINIMUM	MAXIMUM
PRINCIPAL ARTERIALS	90	50m	100m
SECONDARY ARTERIALS	90	50m	100m
COLLECTOR ROADS	75	40m	80m
LOCAL STREETS	60	25m	50m

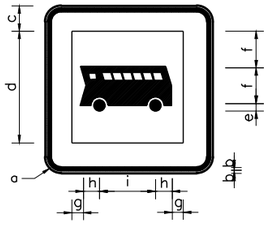
I26



PARKING
DIMENSION (cm)

PARTS	SIGN SIZE 60x60	SIGN SIZE 90x90	SIGN SIZE 120x120
a	3.0	4.5	6.0
b	1.2	1.8	2.4
c	15.0	22.5	30.0
d	6.5	9.8	13.0
e	17.0	25.5	34.0
f	14.5	21.8	29.0
g	20.0	30.0	40.0

I25



BUS STOP
DIMENSION (cm)

PARTS	SIGN SIZE 60x60	SIGN SIZE 90x90	SIGN SIZE 120x120
a	3.0	4.5	6.0
b	1.2	1.8	2.4
c	10.0	15.0	20.0
d	40.0	60.0	80.0
e	4.0	6.0	8.0
f	13.0	19.5	26.0
g	2.0	3.0	4.0
h	6.0	9.0	12.0
i	24.0	36.0	48.0

NOTES:–

1. ALL DIMENSIONS ARE IN CENTIMETERS UNLESS OTHERWISE INDICATED.
2. FOR INTERNAL ROADS, SIGN BOARDS OF 60CM SHALL BE FOLLOWED.
3. THE TRAFFIC SIGNS DETAILS SHOWN IN THE DRAWINGS ARE BASED ON "NTRC'S MANUAL OF SIGNS, SIGNALS AND ROAD MARKINGS, JULY 1989 ". FOR COLOR SCHEME SAME MANUAL SHOULD BE USED.
4. TRAFFIC SIGNS WITH DESIGNATION R51 TO R52 AND W43 TO W47 ARE NOT IN NTRC MANUAL.
5. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR APPROVAL OF THE ENGINEER.
6. ALL TRAFFIC SIGNS SHALL BE MANUFACTURED AS PER SPECIFICATIONS. REFER TRAFFIC SIGNS AND MOUNTING DETAILS FOR FURTHER INFORMATION ABOUT TRAFFIC SIGNS MATERIAL.
7. THE MATERIAL OF SIGN PANELS AND REFLECTIVE SHEETING SHALL BE APPROVED BY THE ENGINEER PRIOR TO MANUFACTURING OF TRAFFIC SIGNS.

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:- KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:- CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-

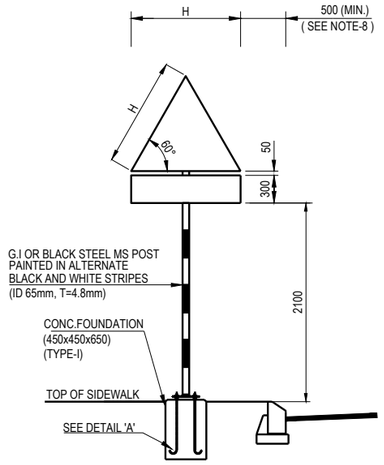
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

		PROJECT NO:	DATE-
DRAWN BY	ARSHAD	KUK	15-08-2023
DESIGN BY	SAMEED		
CHECKED BY	WAZI	SCALE: N.T.S	SHEET: 06/10 (A3)
APPROVED BY	ATIF		

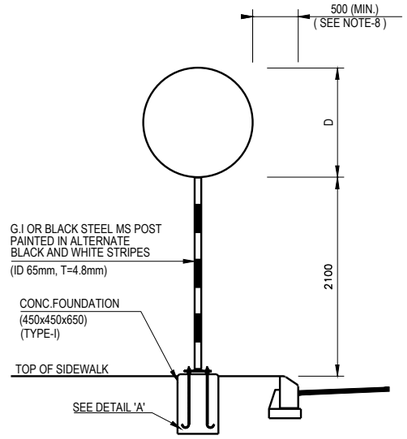
SHEET TITLE:- ROAD TRAFFIC SIGNS DETAIL

Drawing No. 2305-01-01-02-04-R906 | REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\10_General Drawings\2305-01-01-02-04-R906.dwg
User and Plot Date: Arshad Ahmed - Tue, 07 Nov 2023 - 4:26pm

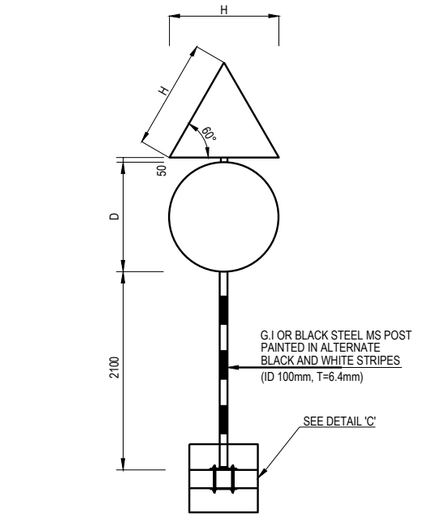


CATEGORY 1

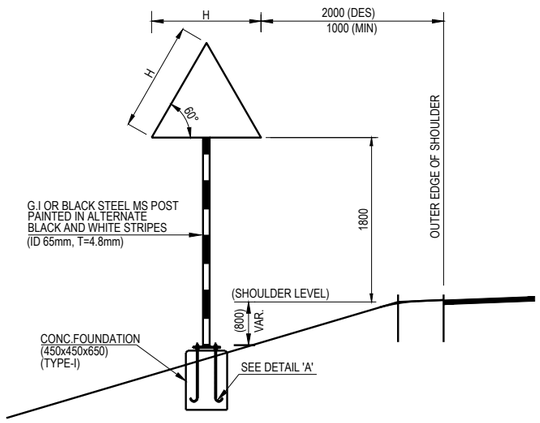


CATEGORY 2

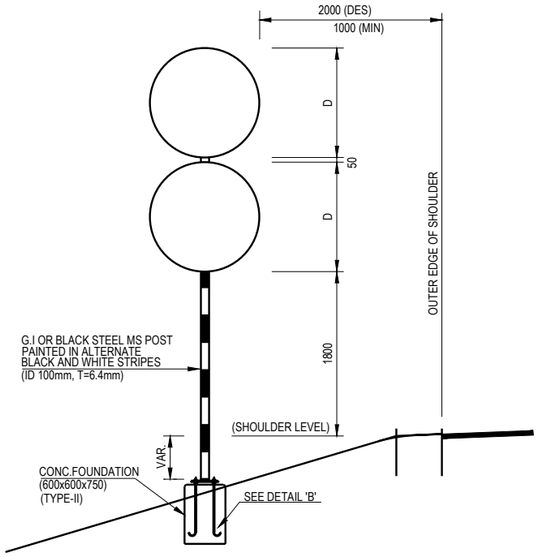
MOUNTED ALONG SIDEWALK OR ISLAND



CATEGORY 1 AND 2 (MOUNTED ON STRUCTURE)

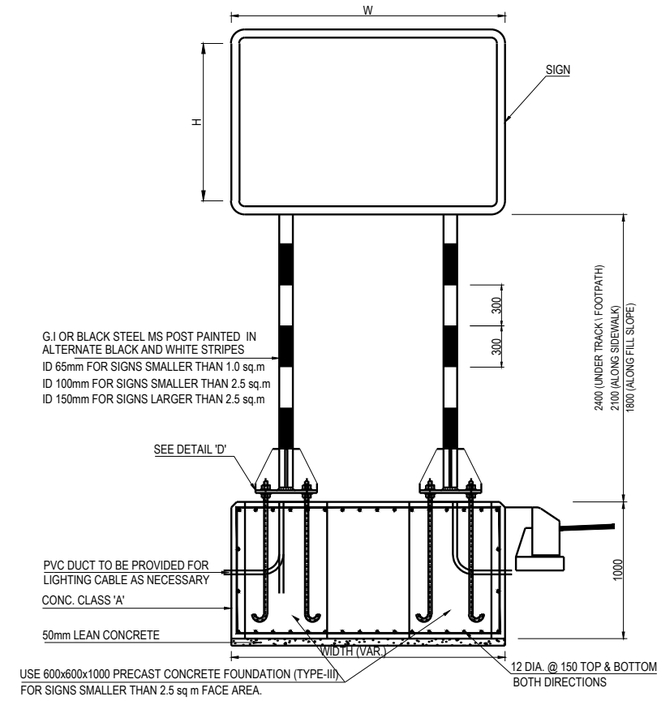


CATEGORY 1



CATEGORY 2

MOUNTED ALONG FILL SLOPE



CATEGORY 3
POST FOR LARGE SIGNS (> 1.5 Sq m FACE AREA)
(TYPE III & IV)
(SEE NOTES-5 & 6)

TYPICAL PLACING DETAILS OF ROAD SIGNS

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE INDICATED.
2. SIGN PANELS SHALL BE MADE OF ALUMINIUM ALLOY OR POLYVINYL PLATES OF 3MM THICKNESS AS DIRECTED & APPROVED BY THE ENGINEER.
3. HIGH INTENSITY GRADE REFLECTIVE SHEETING TO BE USED FOR TRAFFIC SIGNS SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS.
4. TWO SIGN PLATES MAXIMUM MAY BE PLACED ON ONE POST ASSEMBLY.
5. USE DIA. 65mm G.I OR BLACK STEEL MS POST WITH 450x450x650 (TYPE-I), DIA 100mm G.I OR BLACK STEEL MS POST WITH 600x600x750 FOUNDATION (TYPE-II) FOR PROHIBITIVE, MANDATORY, WARNING AND SMALL INFORMATORY SIGNS. FOR LARGE SIGNS, USE 100mm DIA. G.I OR BLACK STEEL MS POST WITH 600x600x1000mm CONCRETE POST FOUNDATION (TYPE-III). FOR SIGNS WITH FACE AREA LARGER THAN 2.5 Sq.M. USE 150mm DIA. G.I OR BLACK STEEL MS POST WITH INSITU REINFORCED CONCRETE FOUNDATION (TYPE-IV), FOR INFORMATORY SIGNS WITH FACE AREA SMALLER THAN 1.0 SQ.M, USE 65mm DIA G.I OR BLACK STEEL MS POST.
6. WIDTH OF CAST IN SITU CONCRETE FOUNDATION FOR LARGE SIGNS (TYPE-IV) SHALL BE SAME AS THAT OF SIGN FACE, WHERE AS ITS BREADTH AND DEPTH SHALL BE 1000mm.
7. BLACK STEEL MS PIPE SHALL BE PAINTED WITH PRIMER (ANTI CORROSIVE) AND TWO COATS OF GRAY COLOUR.
8. A SIGN POST SHALL NOT BE MOUNTED IN THE MIDDLE OF SIDEWALK.
9. THE CONTRACTOR SHALL SUBMIT THE SHOP DRAWING OF TRAFFIC SIGNS WITH MOUNTING AND FASTENING DETAILS FOR THE ENGINEER'S APPROVAL.

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:- KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:- CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-

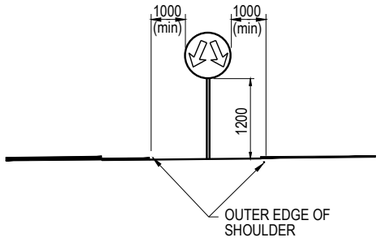
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO: KUK	DATE:- 15-08-2023
DESIGN BY	SAMEED		
CHECKED BY	WAZI	SCALE: N.T.S	SHEET: 07/10 (A3)
APPROVED BY	ATIF		

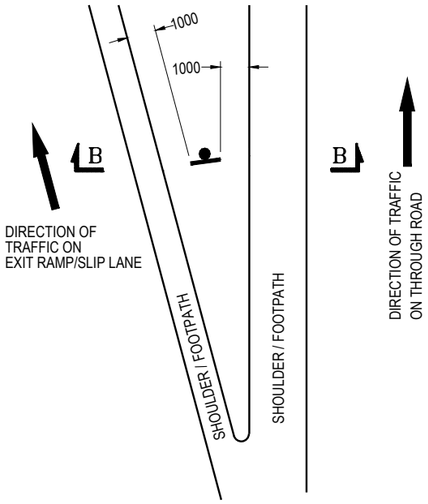
SHEET TITLE:- SIGN POST AND FOUNDATION DETAIL

Drawing No. 2305-01-01-02-04-R907 | REVISION C0

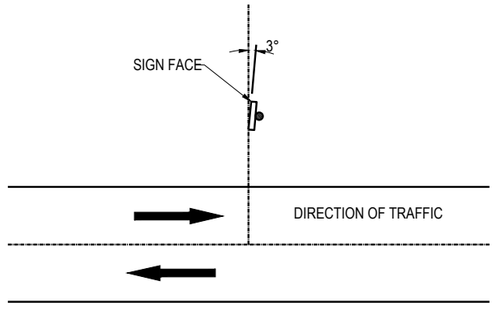
Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\10_General Drawings\2305-01-01-02-04-R907.dwg
User and Plot Date: Arshad Ahmed - Tue, 07 Nov 2023 - 4:26pm



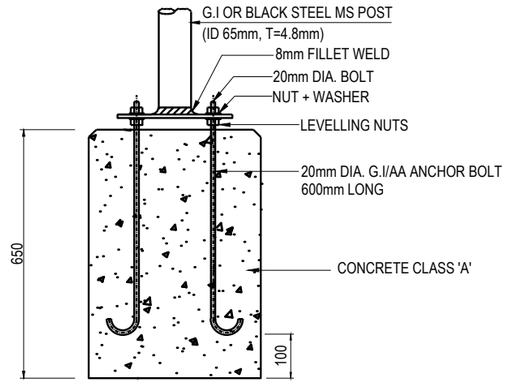
SECTION B–B



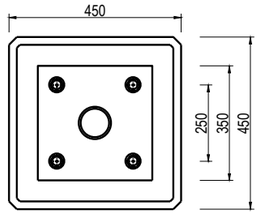
PLACING OF SIGN AT NOSE



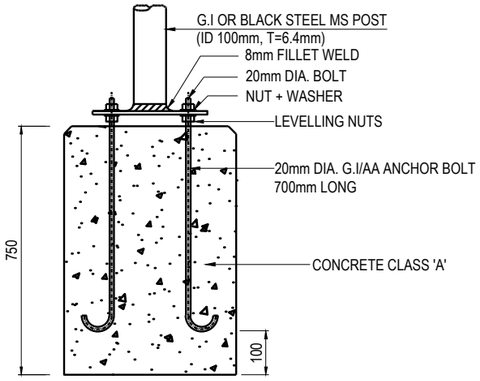
ORIENTATION OF SIGN IN PLAN
RELATED TO DIRECTION OF TRAFFIC



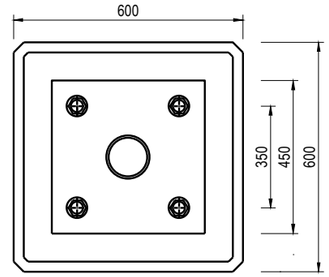
DETAIL 'A'
PRECAST FOUNDATION DETAIL
(TYPE–I)



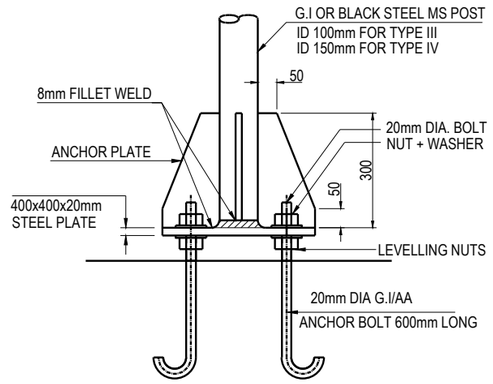
PLAN FOR DETAIL A



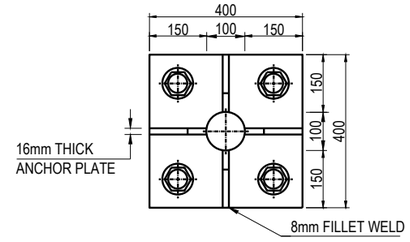
DETAIL 'B'
PRECAST FOUNDATION DETAIL
(TYPE–II)



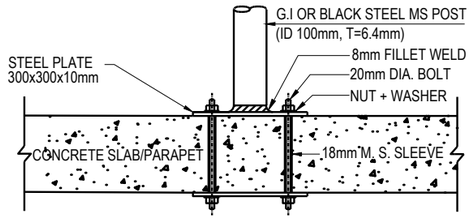
PLAN FOR DETAIL B



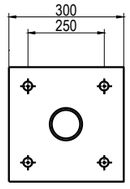
DETAIL 'D'
(TYPE III & IV)



PLAN FOR DETAIL D



DETAIL 'C'



PLAN FOR DETAIL C

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE INDICATED.
2. SIGN PANELS SHALL BE MADE OF ALUMINIUM ALLOY OR POLYVINYL PLATES OF 3MM THICKNESS AS DIRECTED & APPROVED BY THE ENGINEER.
3. HIGH INTENSITY GRADE REFLECTIVE SHEETING TO BE USED FOR TRAFFIC SIGNS SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS.
4. TWO SIGN PLATES MAXIMUM MAY BE PLACED ON ONE POST ASSEMBLY.
5. USE DIA. 65mm G.I OR BLACK STEEL MS POST WITH 450x450x650 (TYPE–I), DIA 100mm G.I OR BLACK STEEL MS POST WITH 600x600x750 FOUNDATION (TYPE–II) FOR PROHIBITIVE, MANDATORY, WARNING AND SMALL INFORMATORY SIGNS. FOR LARGE SIGNS, USE 100mm DIA. G.I OR BLACK STEEL MS POST WITH 600x600x1000mm CONCRETE POST FOUNDATION (TYPE–III). FOR SIGNS WITH FACE AREA LARGER THAN 2.5 Sq.M. USE 150mm DIA. G.I OR BLACK STEEL MS POST WITH INSITU REINFORCED CONCRETE FOUNDATION (TYPE–IV), FOR INFORMATORY SIGNS WITH FACE AREA SMALLER THAN 1.0 SQ.M, USE 65mm DIA G.I OR BLACK STEEL MS POST.
6. WIDTH OF CAST IN SITU CONCRETE FOUNDATION FOR LARGE SIGNS (TYPE–IV) SHALL BE SAME AS THAT OF SIGN FACE, WHERE AS ITS BREADTH AND DEPTH SHALL BE 1000mm.
7. BLACK STEEL MS PIPE SHALL BE PAINTED WITH PRIMER (ANTI CORROSIVE) AND TWO COATS OF GRAY COLOUR.
8. A SIGN POST SHALL NOT BE MOUNTED IN THE MIDDLE OF SIDEWALK.
9. THE CONTRACTOR SHALL SUBMIT THE SHOP DRAWING OF TRAFFIC SIGNS WITH MOUNTING AND FASTENING DETAILS FOR THE ENGINEER'S APPROVAL.

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-
ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

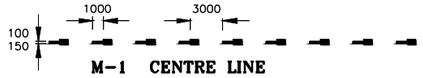
DRAWN BY	ARSHAD	PROJECT NO:	DATE:-
DESIGN BY	SAMEED	KUK	15-08-2023
CHECKED BY	WAZI	SCALE:	SHEET:
APPROVED BY	ATIF	N.T.S	08/10 (A3)

SHEET TITLE:-
SIGN POST AND FOUNDATION DETAIL

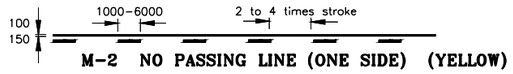
Drawing No. 2305-01-01-02-04-R908
REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\10_General Drawings\2305-01-01-02-04-R908.dwg
User and Plot Date: Arshad Ahmed - Tue, 07 Nov 2023 - 4:26pm

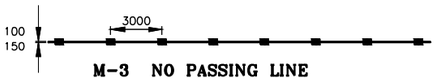
PAVEMENT MARKING LINES



M-1 CENTRE LINE

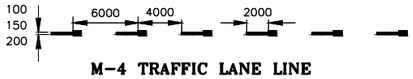


M-2 NO PASSING LINE (ONE SIDE) (YELLOW)

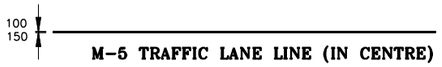


M-3 NO PASSING LINE

M-3A NO PASSING LINE (YELLOW)



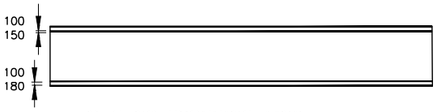
M-4 TRAFFIC LANE LINE



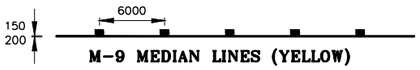
M-5 TRAFFIC LANE LINE (IN CENTRE)

M-6 EDGE MARKING (YELLOW)

M-7 NO PARKING LINE (YELLOW)

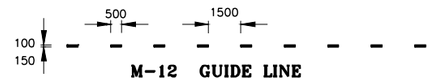


M-8 NO STOPPING LINE

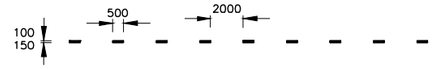


M-9 MEDIAN LINES (YELLOW)

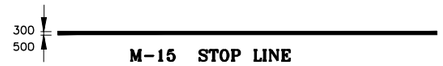
M-11 OBSTRUCTION MARKING



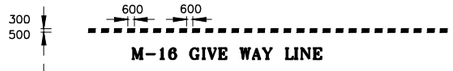
M-12 GUIDE LINE



M-14 EXLUSIVE TURN LANE

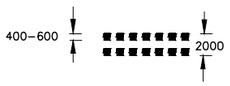


M-15 STOP LINE



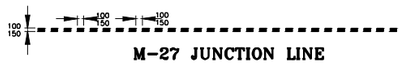
M-16 GIVE WAY LINE

M-20 PAVEMENT REDUCTION MARKING



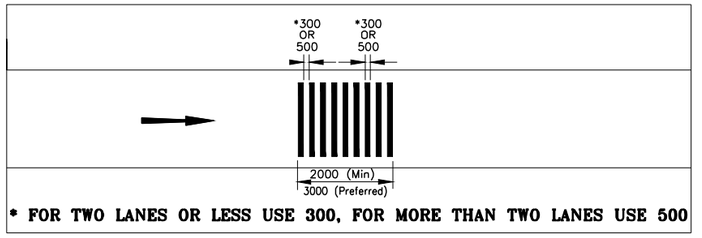
M-21 CYCLISTS CROSSING

M-26 WORD MARKING



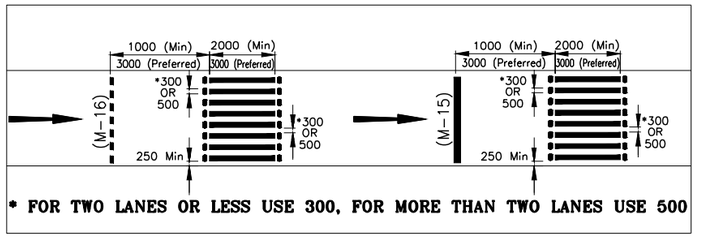
M-27 JUNCTION LINE

M-28 CHANNELIZING LINE



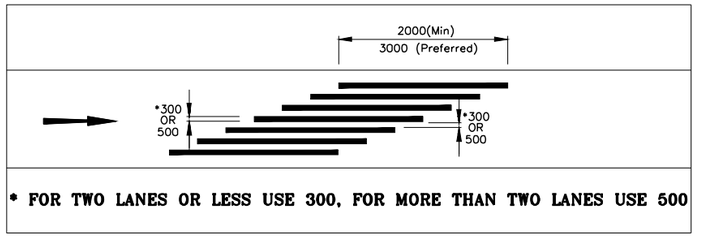
* FOR TWO LANES OR LESS USE 300, FOR MORE THAN TWO LANES USE 500

M-17 CROSS WALK WITH TRANSVERSE LINES



* FOR TWO LANES OR LESS USE 300, FOR MORE THAN TWO LANES USE 500

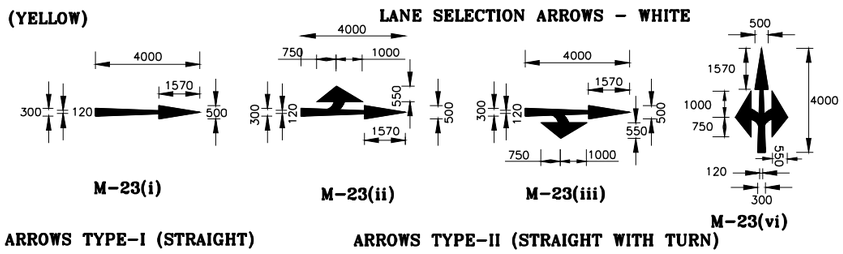
M-18 CROSS WALK WITH LONGITUDINAL LINES



* FOR TWO LANES OR LESS USE 300, FOR MORE THAN TWO LANES USE 500

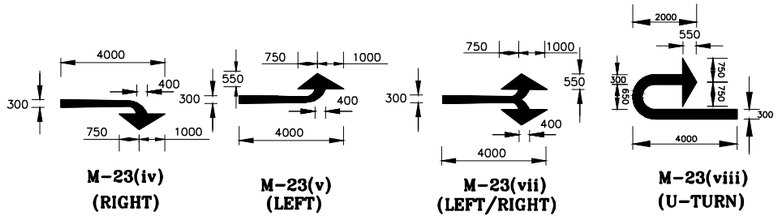
M-19 CROSS WALK WITH DIAGONAL LINES

LANE SELECTION ARROWS - WHITE



M-23(i) M-23(ii) M-23(iii) M-23(vi)

ARROWS TYPE-I (STRAIGHT) ARROWS TYPE-II (STRAIGHT WITH TURN)



M-23(iv) (RIGHT) M-23(v) (LEFT) M-23(vii) (LEFT/RIGHT) M-23(viii) (U-TURN)

ARROWS TYPE-III (TURN ONLY)

M-22-BOX JUNCTION MARKING

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. SPEED HUMPS/RUMBLE STRIPS WILL BE PROVIDED NEAR AMENITIES SUCH AS MOSQUES, PLAYGROUNDS, SCHOOLS, HOSPITALS, ETC. FOR TRAFFIC CALMING AS PER DECISION OF THE ENGINEER.
3. THE ROAD MARKING DETAILS SHOWN IN THE DRAWING ARE BASED ON "NTRC'S MANUAL OF SIGNS, SIGNALS AND ROAD MARKINGS, JULY 1989". FOR COLOR SCHEME SAME MANUAL SHOULD BE USED.
4. ROAD MARKINGS WITH DESIGNATION BEYOND M-26 ARE NOT IN NTRC MANUAL.
5. REFLECTIVE THERMOPLASTIC PAINT MATERIAL SHALL BE USED FOR PAVEMENT MARKING AS PER SPECIFICATIONS.
6. THE PAINT SHALL BE APPLIED IN CONFORMANCE TO THE SIZE, SHAPE AND LOCATION OF THE MARKINGS AS SHOWN IN THE DRAWINGS OR DIRECTED BY THE ENGINEER.
7. THE PAINT SHALL BE PRODUCED IN A PLANT OWNED AND OPERATED BY THE MANUFACTURER FOLLOWING A PROCESS WHICH HAS BEEN USED BY THE MANUFACTURER FOR AT LEAST FIVE (5) YEARS TO PRODUCE PAINT.
8. THE THERMOPLASTIC PAINTS SHALL ONLY BE APPLIED TO SURFACES, WHICH ARE CLEAN AND DRY.
9. CARRIAGEWAY CENTER LINES, LANE LINES AND EDGE LINES SHALL BE LAID AT A REGULAR ALIGNMENT BY SELF PROPELLED MACHINE. OTHER MARKINGS MAY BE LAID BY HAND, HAND PROPELLED MACHINE OR SELF PROPELLED MACHINE AS APPROVED BY THE ENGINEER.
10. THE SURFACE PRODUCED AFTER APPLICATION OF PAINT SHALL BE UNIFORM IN TEXTURE AND THICKNESS AND APPRECIABLY FREE FROM BLISTERS AND STREAKS.
11. THE MATERIAL SHALL BE LAID TO THE THICKNESSES OF 1.5MM FOR WHITE LINES AND 0.8MM FOR YELLOW EDGE LINES. THESE THICKNESSES ARE EXCLUSIVE OF SURFACE APPLIED BALLOTINI.
12. THE CONTRACTOR SHALL NOT PROCEED WITH THE WORK UNTIL THE EQUIPMENT, METHOD OF APPLICATION AND RATE OF APPLICATION CONFORMING THE REQUIRED THICKNESS (AS ESTABLISHED BY A TEST SECTION) HAVE BEEN APPROVED BY THE ENGINEER.
13. REFLECTORIZED RAISED PROFILE TYPE STUDS OR CAT-EYES OF METAL OR ACRYLIC PLASTIC SHELL HAVING BASE DIMENSION OF 10CM X 10CM OR VARIABLE AND THICKNESS NOT EXCEEDING 2 CM SHALL BE USED AS PER DECISION OF THE ENGINEER.
14. THE REFLECTOR SHALL WITHSTAND A VERTICAL LOAD OF 1000 KG WHEN TESTED AS PER SPECIFICATIONS.
15. A WRITTEN APPROVAL IS REQUIRED FROM THE ENGINEER REGARDING RELECTORIZED PAVEMENT STUDS SPECIALLY WITH RESPECT TO MATERIAL AND SIZE PRIOR TO EXECUTION OF WORKS.

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:- KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:- CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

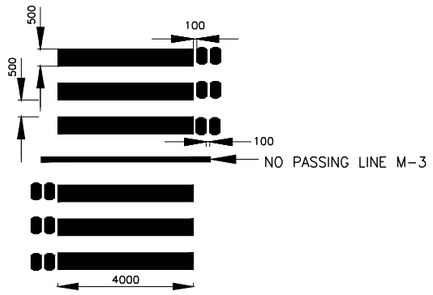
CONSULTANT:- ATIF NAZAR (PVT.) LTD.
PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO: KUK	DATE:- 15-08-2023
DESIGN BY	SAMEED		
CHECKED BY	WAZI	SCALE: N.T.S	SHEET: 09/10 (A3)
APPROVED BY	ATIF		

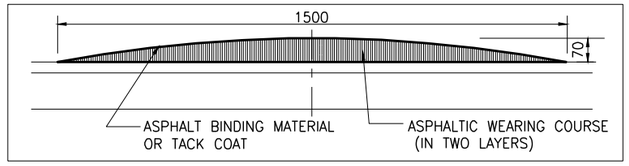
SHEET TITLE:- PAVEMENT MARKING DETAIL

Drawing No. 2305-01-01-02-04-R909 REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\10_General Drawings\2305-01-01-02-04-R909.dwg
User and Plot Date: Arshad Ahmed - Tue, 07 Nov 2023 - 4:29pm



M-29-SPEED HUMP MARKING



TYPICAL ROAD SPEED HUMP DETAIL

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS.
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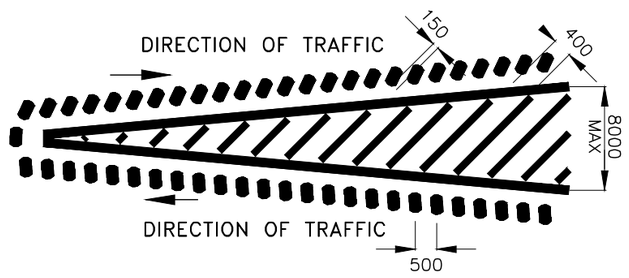
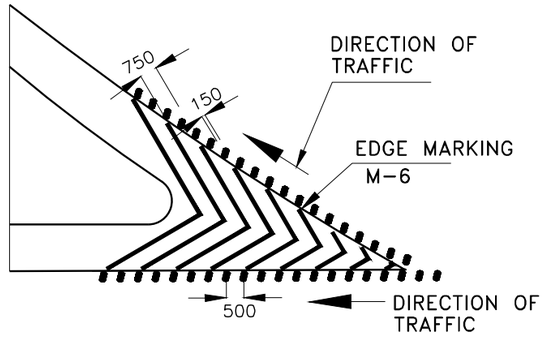
14. THE REFLECTOR SHALL WITHSTAND A VERTICAL LOAD OF 1000 KG WHEN TESTED AS PER SPECIFICATIONS.
15. A WRITTEN APPROVAL IS REQUIRED FROM THE ENGINEER REGARDING RELECTORIZED PAVEMENT STUDS SPECIALLY WITH RESPECT TO MATERIAL AND SIZE PRIOR TO EXECUTION OF WORKS.



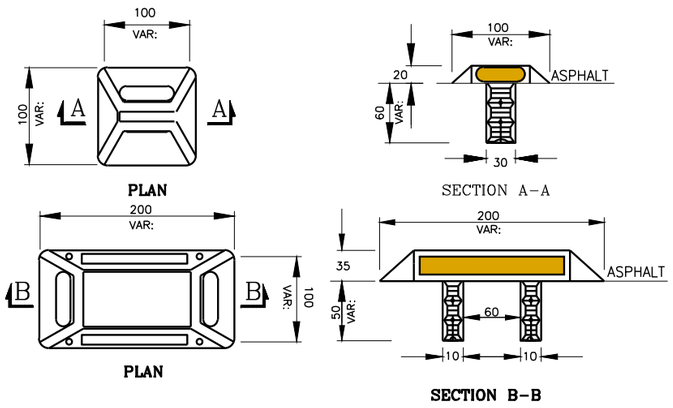
M-31 CHEVRON MARKING WITH STUDS



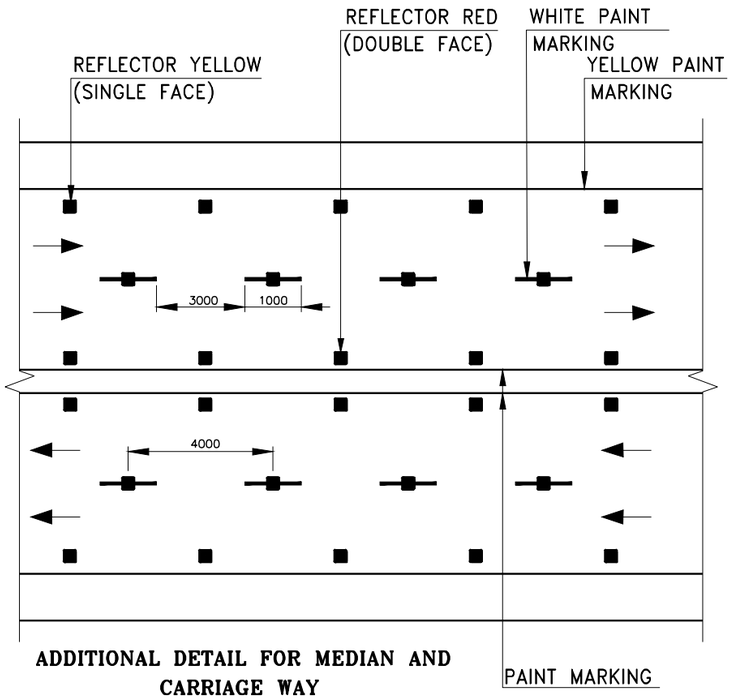
M-30 CHEVRON MARKING WITH STUDS

USAGE AND LOCATION OF PAVEMENT STUDS

COLOUR OF REFLECTIVE STUDS	USAGE	LOCATION
White	For lane line and centre line marking.	At the start of every sroke
Yellow	For edge marking, no passing line & median line.	6000 c/c
Green	For edge line continuation,at a junction/U-turn. Also at cross road to the main road where crossing of the edge line is allowed.	
Red	At hazards like beginning of narrow bridges, rigid structures close to the road, low or narrow underpasses, tunnels etc.	



REFLECTORISED PAVEMENT STUD (RAISED PROFILE TYPE)



ADDITIONAL DETAIL FOR MEDIAN AND CARRIAGE WAY

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:- KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:- CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

DRAWN BY	ARSHAD	PROJECT NO. KUK	DATE:- 15-08-2023
DESIGN BY	SAMEED		
CHECKED BY	WAZI	SCALE: N.T.S	SHEET: 10/10 (A3)
APPROVED BY	ATIF		

CONSULTANT:-

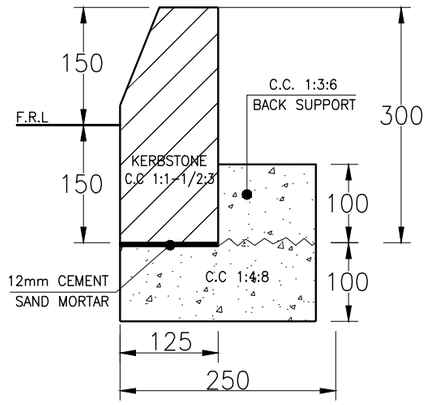
ATIF NAZAR (PVT.) LTD.

PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

SHEET TITLE:- PAVEMENT MARKING DETAIL

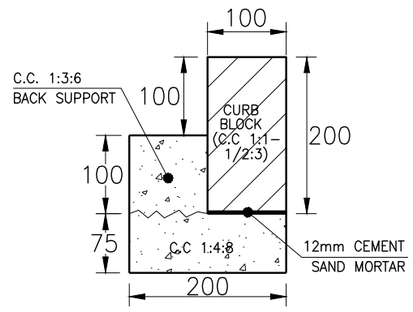
Drawing No. 2305-01-01-02-04-R910 | REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\10_General Drawings\2305-01-01-02-04-R910.dwg
User and Plot Date: Arshad Ahmed - Tue, 07 Nov 2023 - 4:29pm



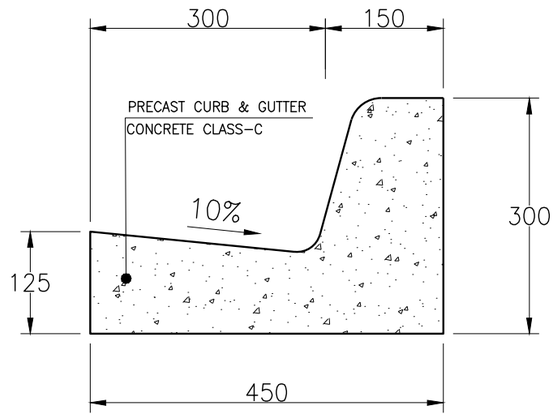
DETAIL A

HALF BATTER CURB BLOCK (300x300x125)
(UPSTAND CURB BLOCK)



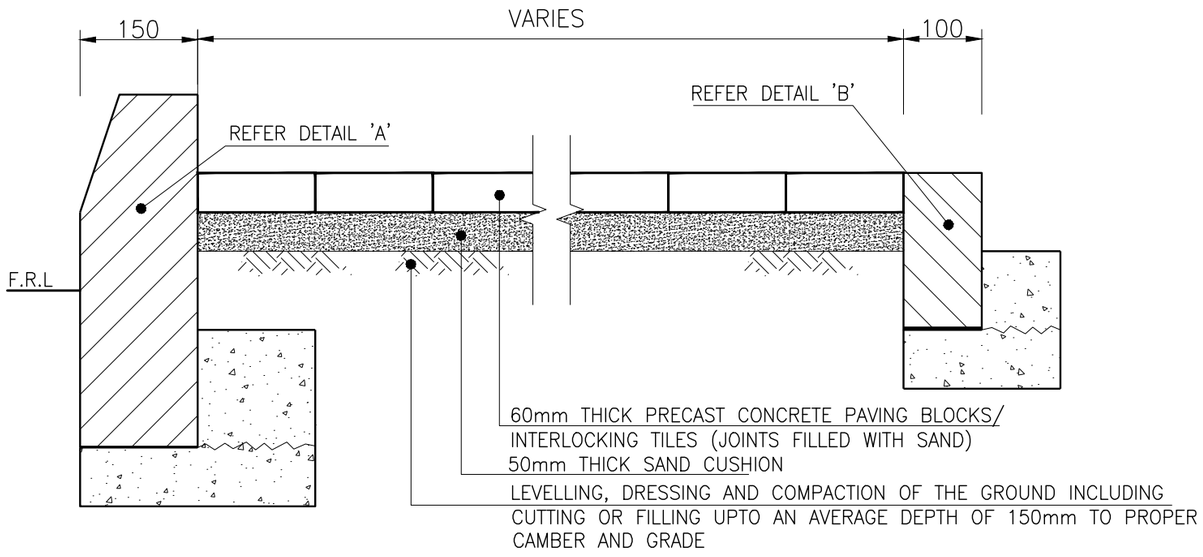
DETAIL B

HEEL CURB BLOCK 200x300x100



DETAIL C

PRECAST CURB & GUTTER



DETAIL D

FOOTPATH

NOTES

1. ALL DIMENSIONS ARE IN METER/MILLIMETERS UNLESS OTHERWISE INDICATED.

REV.	DESCRIPTION	DATE	APPROVED
DR	DRAFT CONSTRUCTION ISSUE	07-11-2023	ATIF
T0	TENDER ISSUE	15-08-2023	ATIF

CLIENT:-
KARACHI DEVELOPMENT AUTHORITY (KDA)

PROJECT:-
CONSTRUCTION OF A 2+2 LANE UNDERPASS AT KARIMABAD

CONSULTANT:-
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PROJECT MANAGERS, PLANNERS, ARCHITECTS & CONSULTING ENGINEERS
D-11/A, BLOCK NO-17, GULSHAN-E-IQBAL, KARACHI. P.H. 34820497 - 34982561

DRAWN BY	ARSHAD	PROJECT NO: KUK	DATE:- 15-08-2023
DESIGN BY	SAMEED		
CHECKED BY	WAZI	SCALE: N.T.S	SHEET: 01/01 (A3)
APPROVED BY	ATIF		

SHEET TITLE:-
STANDARD DETAILS
DETAILS OF CURB BLOCKS, PRECAST CURB & GUTTER AND FOOTPATH

Drawing No. 2305-01-01-02-04-R911
REVISION C0

Drawing file path & name: D:\Projects\03_Karimabad\Working\02_Construction\00_CAD\10_General Drawings\2305-01-01-02-04-R911.dwg
User and Plot Date: Arshad Ahmed - Tue, 07 Nov 2023 - 4:28pm