SHEHNAZ ENTERPRISES

Final Report
June 2026

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT

T&A CRAFT RESIDENCY

PLOT NO. FL-15, CLIFTON BLOCK-2



EHS Services

Environmental & Analytical Solutions

SHEHNAZ ENTERPRISESS

Environmental Impact Assessment (EIA)

T&A Craft Residency

Plot No. FL-15, Clifton Block-2

FINAL REPORT

June 2026

Shehnaz Enterprisess



Environmental Impact Assessment (EIA)

T&A CRAFT RESIDENCY
Plot No. FL-15, Block 2,
Clifton, Karachi

Prepared for:
Shehnaz Enterprisess

Prepared by:
EHS Services

Date:
June 2026

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Executive Summary

This Environmental Impact Assessment (EIA) has been prepared for T&A Craft Residency, a proposed high-rise residential development by Shehnaz Enterprises at Plot No. FL-15, Block-2, Clifton, Karachi. The project site falls within the notified Ribbon High-Density Zone of Clifton Blocks 1–4, an area designated for vertical urban development under the applicable planning and building control framework. The project is planned as a 40-storey residential tower comprising basement levels, ground floor facilities, parking and service floors, residential floors, duplex units, rooftop utilities, solar energy provisions, and supporting mechanical, electrical, plumbing, fire protection, security, water supply, wastewater, drainage, and parking infrastructure. The development has been designed to respond to the increasing demand for secure, serviced, and well-managed residential accommodation in Clifton while ensuring integration of environmental safeguards and pregulatory compliance requirements.

Floor-wise Building Plan

Building Level / Floor Range	Designated Use / Function
Basement levels	ARS, parking, and building services
Ground floor	Recreation and service areas
Floors 1 to 5	Parking and services
Floors 6 and 7	Residential units and recreational facilities
Floors 8 to 36	Residential use
Floors 37 to 40	Duplex units
Rooftop	Solar energy systems and utility infrastructure

The Environmental Impact Assessment for this development was originally submitted to the Sindh Environmental Protection Agency in February 2018. Subsequent to the review process conducted under the SEPA Regulations 2014, a public hearing was convened on March 19, 2018, followed by an Expert Committee Meeting on December 21, 2018. Consequently, the project attained deemed approved status pursuant to the provisions of Section 17 of the Sindh Environmental Protection Act 2014. Comprehensive documentation of these prior proceedings, including public hearing notifications, committee minutes, and attendance records, is detailed in the Annexure.

The environmental assessment has been updated because the project has undergone changes in project title, partnership structure, design approvals, and regulatory applicability. The project was earlier processed under the environmental framework applicable at that time; however, following the notification of the Sindh Environmental Protection Agency (Environmental Assessment) Regulations, 2021, projects located in notified High-Density Zones

require submission of a full EIA irrespective of size. Accordingly, this revised EIA has been prepared under Section 17 of the Sindh Environmental Protection Act, 2014 and Schedule III of the 2021 Regulations for review and approval by the Sindh Environmental Protection Agency (SEPA). The EIA therefore serves as the primary environmental compliance document for guiding construction completion, operational planning, mitigation implementation, environmental monitoring, and long-term environmental management of the project.

The main objective of this EIA is to ensure that potential environmental, health, safety, and social impacts associated with the remaining construction works and future operation of the building are systematically identified, assessed, mitigated, monitored, and reported. The assessment evaluates the project in relation to applicable environmental laws, building control requirements, public safety obligations, fire and life safety provisions, occupational health and safety requirements, waste management obligations, groundwater management considerations, and Sindh Environmental Quality Standards. The study also examines the project's interaction with the surrounding urban context, including nearby residential buildings, institutional facilities, road users, public utilities, sensitive receptors, and community-level concerns.

The methodology adopted for the assessment included review of project design information, applicable approvals and regulatory documents, reconnaissance of the project setting, identification of macro- and micro-environmental conditions, review of baseline environmental data, screening of construction and operational activities, evaluation of potential impacts, stakeholder consultation, and formulation of mitigation and management measures. The impact assessment considered both direct and indirect effects, temporary and long-term effects, localized disturbances, cumulative urban pressures, and compliance risks that may arise during construction completion and building operation. This approach ensures that the EIA is not limited to regulatory documentation, but also functions as a practical management tool for the proponent, contractors, facility managers, and relevant authorities.

The baseline assessment covers the physical, ecological, and socio-economic environment of both Karachi's wider urban setting and the immediate project influence area. The project site is located in a highly developed coastal urban zone where land use is characterized by residential, institutional, recreational, and limited commercial activities. Key baseline components assessed include land use and zoning, access roads and traffic circulation, existing utility networks, topography, geology, subsurface conditions, seismicity, tsunami and storm exposure, climatic conditions, urban heat island effects, ambient air quality, noise levels, water availability, groundwater potential, water quality, sewerage and drainage systems, solid waste management practices, ecological setting, and socio-economic characteristics of the surrounding community. The immediate micro-environment includes residential buildings, a religious facility, educational and training institutions, road corridors, green

belts, and existing public utilities, all of which require protection from avoidable construction disturbance and operational nuisance.

Public consultation has been incorporated as a core component of the EIA process. Stakeholder engagement focused on understanding concerns related to construction disturbance, dust, traffic, road access, water supply, sewerage, solid waste, safety, emergency preparedness, and potential impacts on nearby residents and institutions. The feedback received has been reflected in the mitigation framework, particularly in relation to dust and noise control, traffic management, communication with nearby receptors, site safety, grievance handling, and environmental monitoring. Continued engagement during project implementation will be important to maintain transparency, address local concerns in a timely manner, and strengthen community confidence in the environmental management process.

During construction, the key potential impacts include dust emissions from material handling and site movement, exhaust emissions from construction equipment and vehicles, elevated noise and vibration from machinery and structural works, waste generation from construction activities, excavation-related risks, wastewater and stormwater management issues, traffic disturbance from material transport, occupational health and safety hazards, fire risks, spill and soil contamination risks, and temporary inconvenience to nearby receptors. Since the project is located in a dense urban area, the significance of these impacts depends largely on the quality of site management, housekeeping, contractor supervision, traffic coordination, and implementation of environmental controls. With appropriate mitigation, these impacts are expected to remain localized, temporary, and manageable.

During operation, the principal environmental and safety issues relate to domestic water demand, groundwater extraction and treatment, tanker water use where required, wastewater collection and disposal, stormwater drainage, solid waste generation from residents and building users, traffic and parking management, generator emissions and noise, energy consumption, lift and building system maintenance, fire prevention, emergency evacuation, security management, and compliance with SEQS. The project design incorporates important operational safeguards including water storage tanks, reverse osmosis treatment, greywater reuse for irrigation, stormwater drainage provisions, fire hydrants, sprinklers, hose reels, fire pumps, portable extinguishers, emergency power, CCTV surveillance, access control, parking management systems, and rooftop solar energy provisions. These systems must be regularly operated, maintained, inspected, and documented to ensure effective environmental performance and life-safety protection.

A comprehensive set of mitigation measures has been proposed to prevent, reduce, or control the identified impacts. Construction-phase mitigation includes regular water sprinkling for dust suppression, covering of loose materials, designated storage areas, controlled loading and unloading,

maintenance of vehicles and machinery, restricted idling, use of mufflers and acoustic controls, scheduling of noisy activities, barricading and safety signage, traffic marshaling, safe excavation and lifting practices, use of personal protective equipment, spill kits and secondary containment, proper construction waste segregation, reuse of suitable excavated material where feasible, disposal through authorized channels, prevention of wastewater discharge onto roads, provision of sanitation facilities for workers, fire prevention arrangements, emergency access management, and routine HSE inspections. These measures are essential to minimize disturbance to nearby residents, institutions, road users, workers, and public utilities.

Operational mitigation measures include controlled and efficient water use, regular testing of treated water quality, compliance with groundwater extraction and management requirements, maintenance of RO and pumping systems, proper wastewater collection and disposal, periodic inspection of sewerage and drainage lines, segregation and daily collection of solid waste, coordination with authorized waste handlers, maintenance of fire detection and suppression systems, regular generator maintenance and exhaust control, noise management for mechanical equipment, monitoring of parking and traffic circulation, emergency drills, security protocols, elevator and electrical safety inspections, complaint handling procedures, and preparation of periodic environmental compliance reports. These actions will reduce the likelihood of long-term nuisance, public health risks, infrastructure stress, and regulatory non-compliance.

The Environmental Management Plan (EMP) is the central implementation mechanism of this EIA. It assigns responsibilities to the project proponent, contractors, site supervision team, environmental and safety personnel, and building management. The EMP establishes procedures for mitigation implementation, monitoring, inspection, training, emergency response, recordkeeping, incident reporting, corrective action, communication, and regulatory reporting. It also includes standard operating procedures for construction and operation, environmental monitoring requirements, mitigation management matrices, compliance monitoring, effects monitoring, and training programmes. The EMP is designed to remain a living management tool and should be reviewed and updated if there are changes in project design, construction methods, operational arrangements, regulatory requirements, or environmental conditions.

The EIA concludes that the T&A Craft Residency project is environmentally acceptable and manageable, provided that the proposed mitigation measures, monitoring requirements, EMP commitments, safety controls, and regulatory obligations are fully implemented during both construction and operation. The project is located in an already urbanized and notified high-density zone, and the identified impacts are not expected to be significant, irreversible, or unmanageable if the recommended controls are applied consistently. The proponent should ensure strict compliance with SEPA approval conditions,

SBCA requirements, SEQS, fire safety provisions, occupational safety requirements, groundwater management obligations, and relevant solid waste and wastewater management procedures. Subject to effective implementation of the EMP, maintenance of environmental records, continued stakeholder communication, periodic monitoring, and timely corrective actions, the project can proceed while minimizing adverse environmental and social impacts and supporting planned high-density urban development in Clifton.

1. Introduction

1.1 Project Overview and Background

This document constitutes the formal Environmental Impact Assessment (EIA) for a high-rise residential development, comprising a basement, ground floor, and 40 storeys, submitted to the Sindh Environmental Protection Agency (SEPA) for regulatory review. The scope of the project involves the construction of a 40-storey high-rise structure.

The spatial configuration includes basement levels dedicated to ARS, parking, and services; a ground floor housing recreation and service areas; floors 1 through 5 for parking and services; floors 6 and 7 comprising residential units and recreational facilities; floors 8 through 36 designated for residential use; floors 37 to 40 featuring duplex units; and a rooftop equipped with solar energy systems and utility infrastructure. Construction activities initiated in 2021, with the structure currently progressed to the 22nd floor. The development is engineered in strict compliance with the Sindh Building Control Authority (SBCA) regulations governing the Marine Promenade coastline (Clifton Blocks 1-4), maintaining adherence to the mandated floor area ratio (FAR) of 1:9 prescribed for high-density vertical urbanization.

The Environmental Impact Assessment (EIA) for this development was originally submitted to the Sindh Environmental Protection Agency (SEPA) in February 2018. Subsequent to the review process conducted under the SEPA Regulations 2014, a public hearing was convened on March 19, 2018, followed by an Expert Committee Meeting on December 21, 2018. Consequently, the project attained "deemed approved" status pursuant to the provisions of Section 17 of the Sindh Environmental Protection Act 2014. Comprehensive documentation of these prior proceedings, including public hearing notifications, committee minutes, and attendance records, is detailed in the Annexure.

Following a change in the partnership structure due to the decease of a founding partner and the subsequent induction of new partners, the project's title was transitioned from **"Royal Marina Tower" to "T&A Craft Residency."** Concurrently, the Sindh Building Control Authority (SBCA) granted approval for an additional six floors, stipulating in the construction permit that formal SEPA authorization must be secured prior to the commencement of site works. In compliance with this requirement, Shehnaz Enterprises approached SEPA; however, the Agency mandated the submission of a revised EIA report to align with the updated 2021 regulatory framework governing environmental assessments. To facilitate this, the proponent, Shehnaz Enterprises, commissioned EHS Services to update the technical documentation in accordance with the revised architectural plans for formal regulatory review.



Figure 1.1: Architectural View of T&A Craft Residency Project

1.2 Need for Environmental Impact Assessment (EIA)

The project is situated on an FL category plot within the High-Density Zone, as detailed in the preceding introductory chapter. Specifically, the area along the coastline of Clifton Blocks 1 through 4—running parallel to the Marine Promenade and the oil pipeline reservation—is classified as a Ribbon High-Density Zone. In this zone, the Sindh Building Control Authority (SBCA) permits the development of high-rise structures with a floor area ratio of 1:9.

In accordance with the Sindh Environmental Protection Act (SEPA) 2014, conducting an Environmental Impact Assessment (EIA) is a legal mandate. Section 17(1) of the Act stipulates that no project proponent may begin construction or operations without first submitting either an Initial Environmental Examination (IEE) or an EIA and securing official approval from the Sindh Environmental Protection Agency (SEPA). For clarity, Section 17(1) states: "No proponent of a project shall commence construction or operation unless he has filed with the agency an Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) & has obtained from the Agency."

Furthermore, the Sindh Environmental Protection Agency (Environmental Assessment) Regulations of 2021, derived from Section 37 of the 2014 Act, classify projects into Schedules I, II, and III based on the severity of their potential environmental footprint. Projects listed under Schedule III are identified as having significant environmental risks and thus require a full EIA, whereas Schedule II projects require an IEE. This specific development falls under Category I (3) of Schedule III, which pertains to "Urban development and tourism" and explicitly includes **"All Projects located in High Density Zones**

notified by Government and relevant land controlling organizations, irrespective of their size."

Because the project is located within a designated **Ribbon High-Density Zone**, a comprehensive EIA is necessary. This study evaluates the various environmental consequences of high-rise construction to ensure effective mitigation. Key areas of focus include structural stability, water supply and wastewater management, sewage treatment, groundwater impact, solid waste disposal, traffic flow, parking capacity, safety protocols, proximity to sensitive receptors, and overall urban density. By addressing environmental factors alongside technical and economic feasibility throughout the project lifecycle, the micro and macro-environmental and socioeconomic integrity of the region can be preserved.

The primary objectives of this assessment are to:

- Identify all applicable legal, health, and safety regulations regarding environmental protection.
- Analyze potential environmental impacts during both the construction and operational phases.
- Propose robust mitigation strategies to be integrated into the project design to minimize adverse effects.

1.3 Methodology for Environmental Assessment

The EHS Services team was officially appointed in November 2025 to execute the Environmental Impact Assessment (EIA) for the T&A Craft Residency project, situated within the Ribbon High Density Zone of Clifton Block 2. To evaluate the effects of various project activities, the study implemented the following structured methodology:

- A multidisciplinary team of EHS Services experts, led by an Environmental Assessment Specialist, performed a reconnaissance survey to pinpoint vital environmental, ecological, and social characteristics of the site.
- Data regarding production activities within the affected zone was gathered to define the project's specific microenvironment.
- The compiled data was utilized to identify health, safety, and environmental hazards, as well as the risks associated with different project phases.
- Potential environmental impacts were screened using a checklist approach to ensure the EIA report aligns with SEPA guidelines.

The assessment relies on a comparative analysis of environmental quality before and after the project's inception. To facilitate this, a comprehensive baseline profile of the project area was established, incorporating physical, ecological, and socioeconomic data. Following the impact screening, the study details necessary mitigation measures. Furthermore, an Environmental Management Plan (EMP) is included to govern the construction and operational stages. This EMP serves as a strategic roadmap for the Project Proponent,

ensuring that workplace, social, and environmental conditions remain in strict compliance with current Health, Safety, and Environmental legislation. It outlines the specific requirements for managing occupational risks and social concerns arising from project activities.

The final report was compiled in accordance with guidelines for environmental assessment preparation and review. It encompasses the project description, analysis of the micro and macro-environments, results of public consultations, and an evaluation of impacts during pre-construction, construction, and operation.

The report is organized into the following sections:
Section 1: Introduction to Project and EIA Processes
Section 2: Project Description
Section 3: Review of Relevant National and Provincial Legislation & Guidelines
Section 4: Baseline Description of the Project Area Environment
Section 5: Public Consultation & Participation
Section 6: Screening of Potential Environmental Impacts & Mitigation Measures
Section 7: Environmental Management and Monitoring Plan (EMP)
Section 8: Conclusion and Recommendations

2. Description of Project

T&A Craft Residency is a distinguished high-rise residential development initiated by **Shehnaz Enterprises**, located at Plot No. FL-15, Block-2, Clifton, Karachi. Spanning a total plot area of 6,503.75 square yards, the project comprises a gross floor area of 1,117,889.70 square feet. Subsequent to the application of statutory exemptions, the net area is established at 526,419.29 square feet. Designated as an FL-Site, the development is strategically situated within a prescribed **High-Density Zone (Ribbon)**.

Situated within U.C#13, Kehkashan, Saddar Town, the macro-environment of Clifton Block 2 is characterized by a mature residential landscape comprising more than 30 established buildings. The district is currently undergoing a significant transformation into a high-density urban center following its official declaration as a ribbon zone. The site offers superior accessibility via a robust network of arterial roads, bounded by Shahrah-e-Ghalib to the north, Marine Promenade to the south, Khayaban-e-Saadi to the east, and Khayaban-e-Bedil to the west. Project location is shown in figure 2.1.

The immediate micro-environment is defined by the Bonvista apartments, a religious facility, and a public-school structure to the east, a landscaped green belt to the north, and the Regional Training Institute (RTI) to the west. Operational logistics are supported by 50-foot-wide roads on three perimeters and a 40-foot-wide road serving the eastern boundary.



Construction activities commenced in 2021, and the structure has currently progressed up to the 22nd floor. The building plan is engineered in strict compliance with the Sindh Building Control Authority (SBCA) regulations governing the Marine Promenade coastline of Clifton Blocks 1–4, maintaining adherence to the prescribed floor area ratio (FAR) of 1:9 for high-density vertical urbanization.

The submission drawings are presented in Figure 2.2, and the SBCA approval documentation is appended hereto. The scope of the project involves the construction of a 40-storey high-rise structure. The spatial configuration includes basement levels dedicated to ARS, parking, and services; a ground floor housing recreation and service areas; floors 1 through 5 for parking and services; floors 6 and 7 comprising residential units and recreational facilities; floors 8 through 36 designated for residential use; floors 37 to 40 featuring duplex units; and a rooftop equipped with solar energy systems and utility

infrastructure. The development is engineered to mitigate environmental and energy challenges through integrated sustainable solutions. By incorporating green building technologies, the project aims to foster a sustainable urban aesthetic while enhancing the social and ecological framework of Karachi.

🏢 **Residential Apartments**

- **Typical Floors (8th–38th):** Each tower (A & B) contains **5 apartments per floor**, totaling **10 apartments per floor**. Across 31 floors, this equals **310 apartments**.
- **Duplex Levels (39th & 40th):** Each tower contains **4 duplex apartments per floor**, adding **16 apartments**.
- **Total Apartments: 326 units** (163 in Tower A, 163 in Tower B).
- **Population Capacity:** With an average of **7 persons per apartment**, the building accommodates approximately **2,282 residents**.

🚙 **Parking Facilities**

- **Basement:** 84 cars + 151 motorcycles
- **1st Floor:** 71 cars + 65 motorcycles
- **2nd Floor:** 73 cars + 72 motorcycles
- **3rd Floor:** 76 cars + 72 motorcycles
- **4th Floor:** 76 cars + 72 motorcycles
- **5th Floor:** 76 cars + 85 motorcycles
- **Total Capacity: 456 cars + 517 motorcycles**
- **Conversion Scenario:** If motorcycle stalls are repurposed at **3 bike stalls = 1 car stall,** total car capacity rises to **628 cars**.

🛗 **Vertical Transportation**

- **Tower A:** 5 lifts (4 passenger + 1 service)
- **Tower B:** 5 lifts (4 passenger + 1 service)
- **Total: 10 lifts (8 passenger + 2 service)**
- Lifts are strategically placed to ensure smooth circulation and efficient service access.

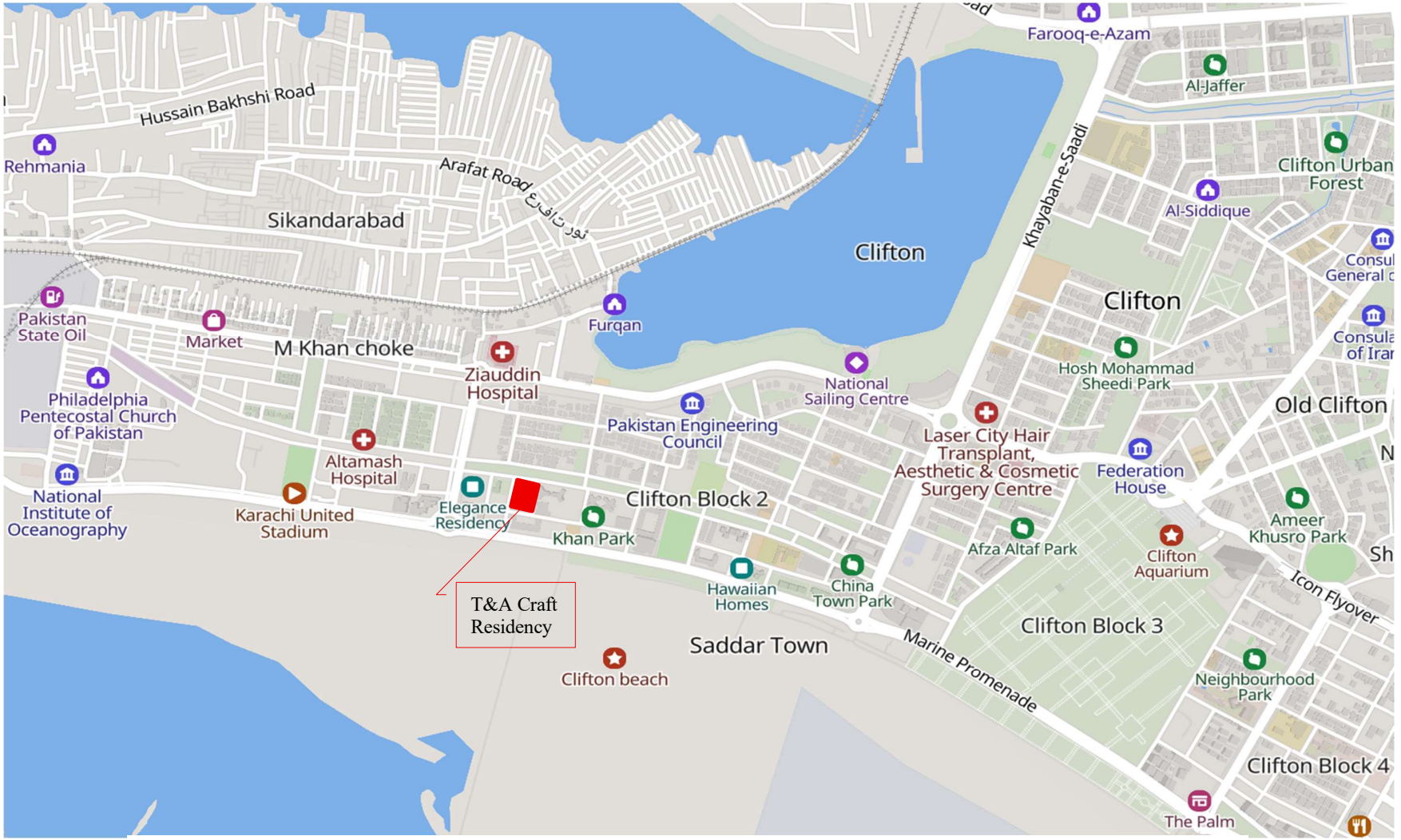


Figure 2.1: Location of project site

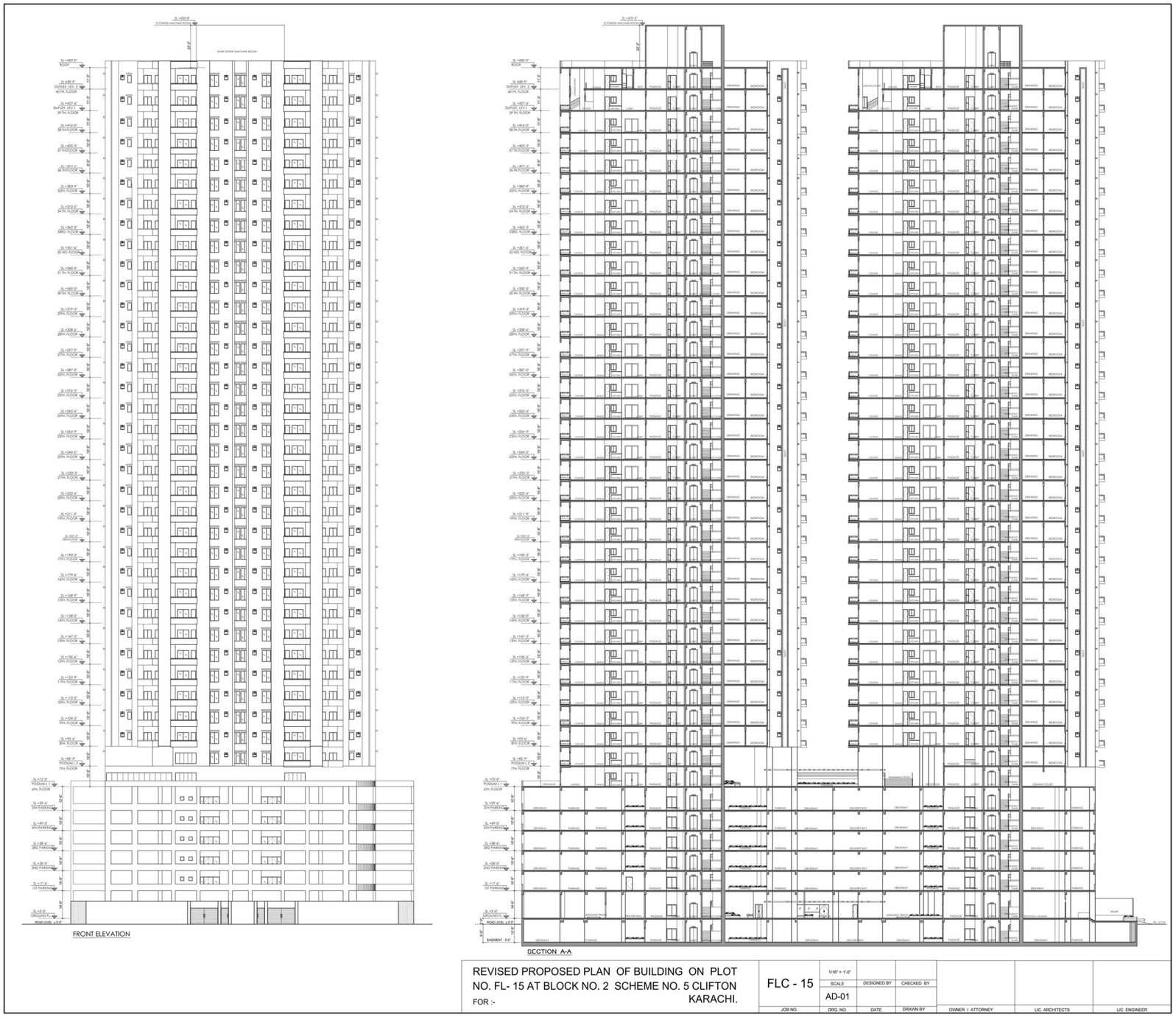


Figure 2.2: Submission Drawing

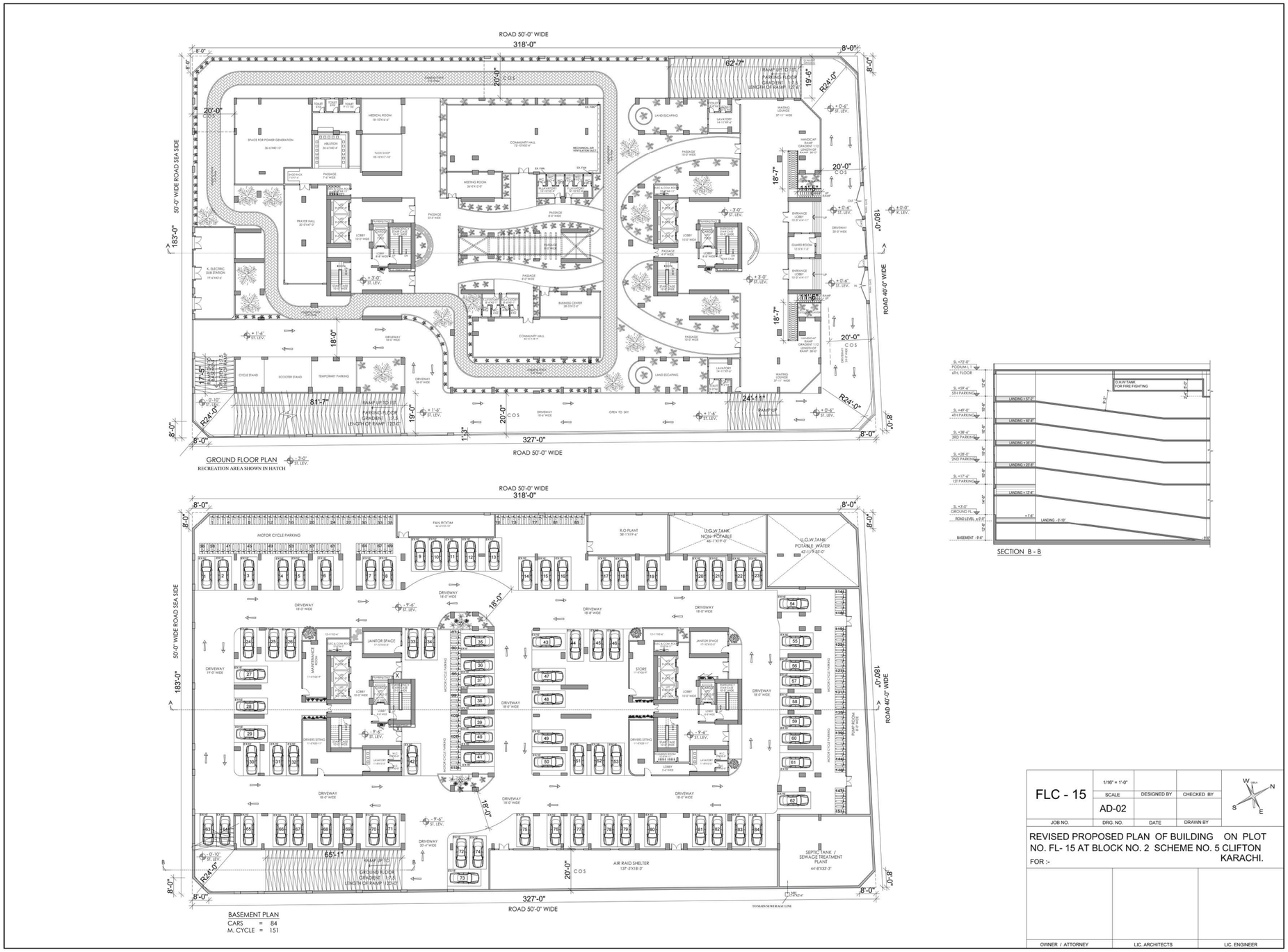
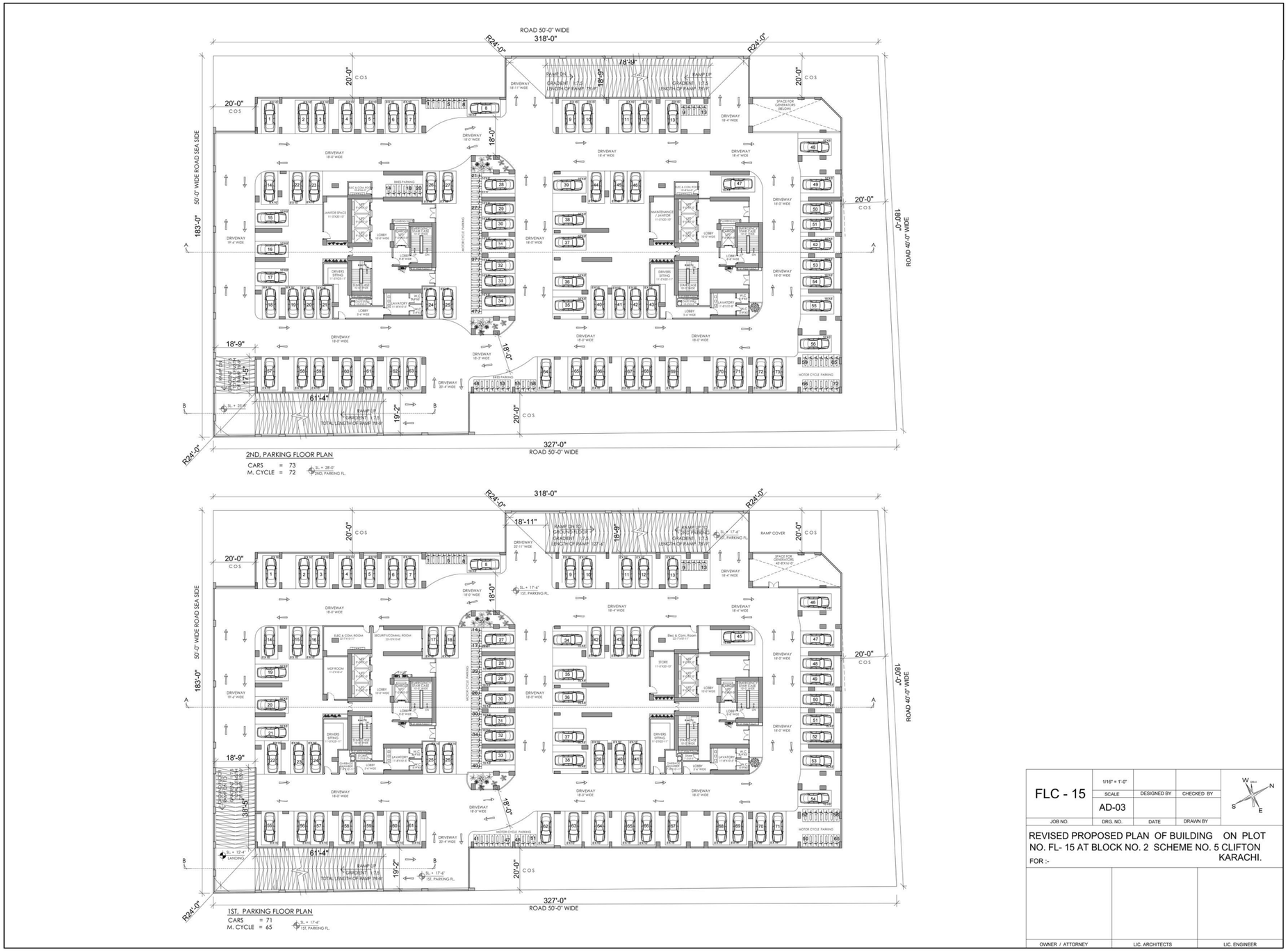


Figure 2.2: Submission Drawing



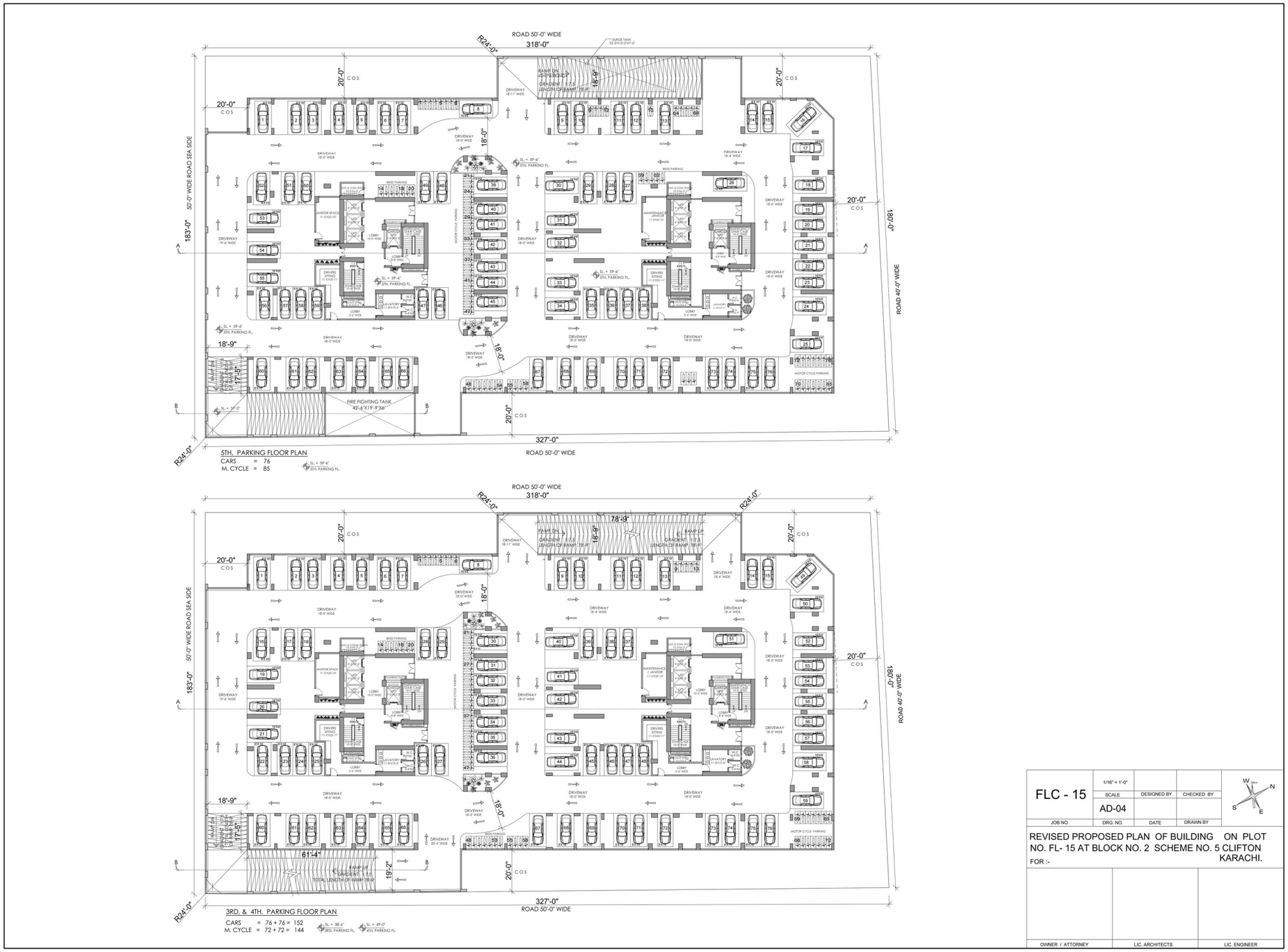
FLC - 15	1/16" = 1'-0"			W Elev. N S E
	SCALE	DESIGNED BY	CHECKED BY	
	AD-03			
JOB NO.	DRG. NO.	DATE	DRAWN BY	

REVISED PROPOSED PLAN OF BUILDING ON PLOT NO. FL- 15 AT BLOCK NO. 2 SCHEME NO. 5 CLIFTON KARACHI.

FOR :-

OWNER / ATTORNEY	LIC. ARCHITECTS	LIC. ENGINEER

Figure 2.2: Submission Drawing



FLC - 15	1/16" = 1'-0"			
	SCALE	DESIGNED BY	CHECKED BY	
	AD-04			
JOB NO.	DRG. NO.	DATE	DRAWN BY	

REVISED PROPOSED PLAN OF BUILDING ON PLOT NO. FL- 15 AT BLOCK NO. 2 SCHEME NO. 5 CLIFTON KARACHI.

FOR :-

OWNER / ATTORNEY	LIC. ARCHITECTS	LIC. ENGINEER

Figure 2.2: Submission Drawing

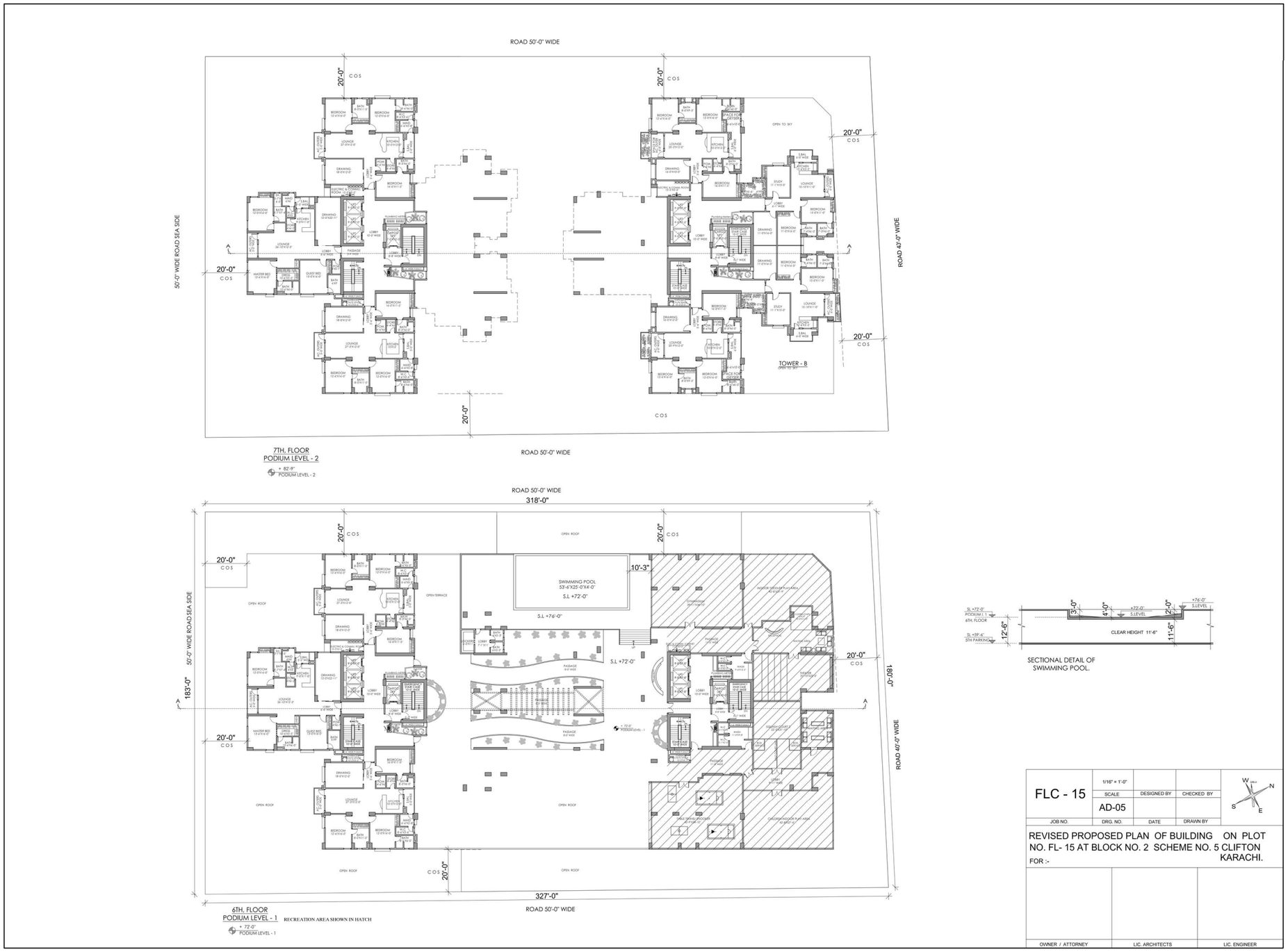
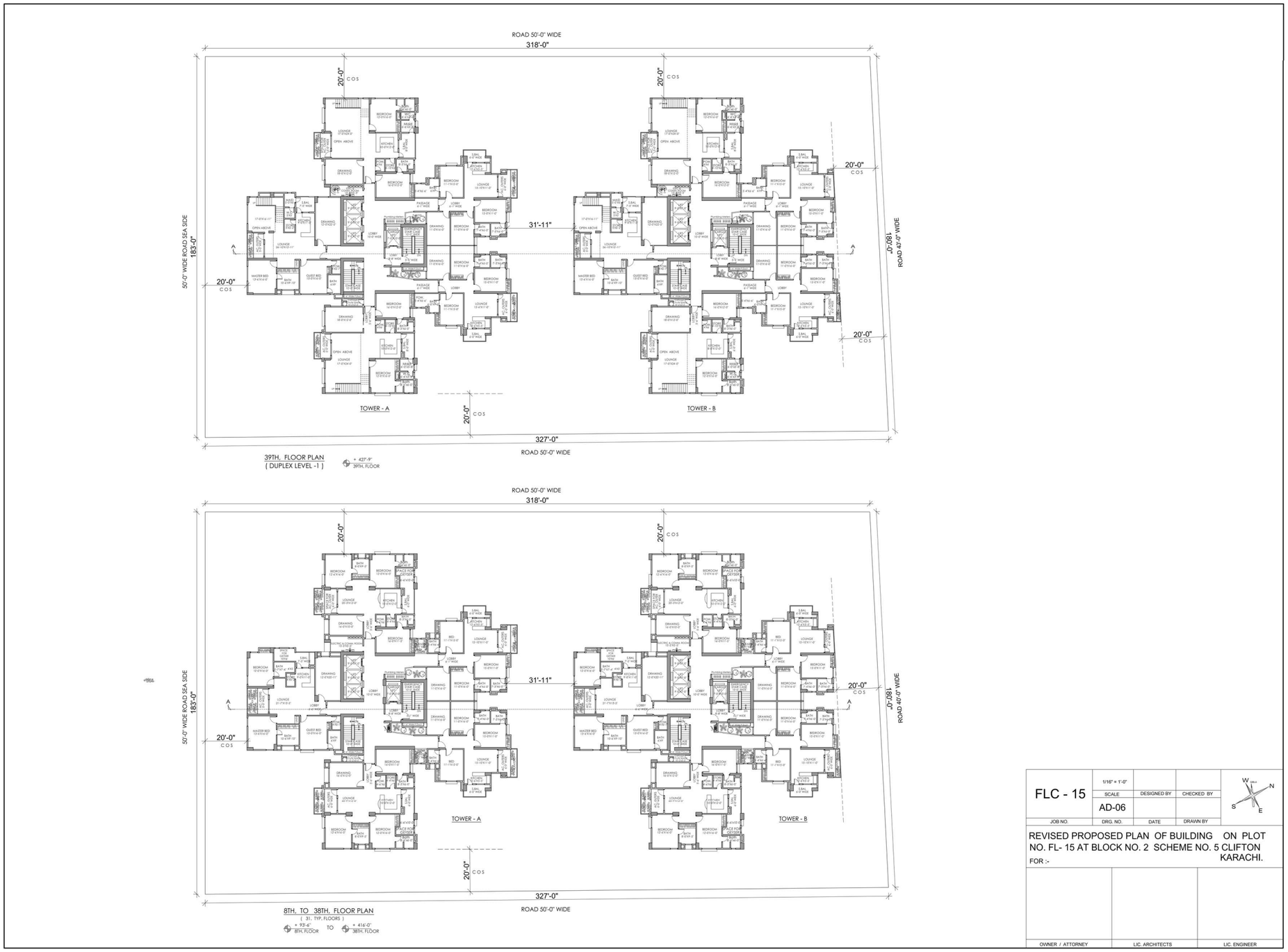


Figure 2.2: Submission Drawing



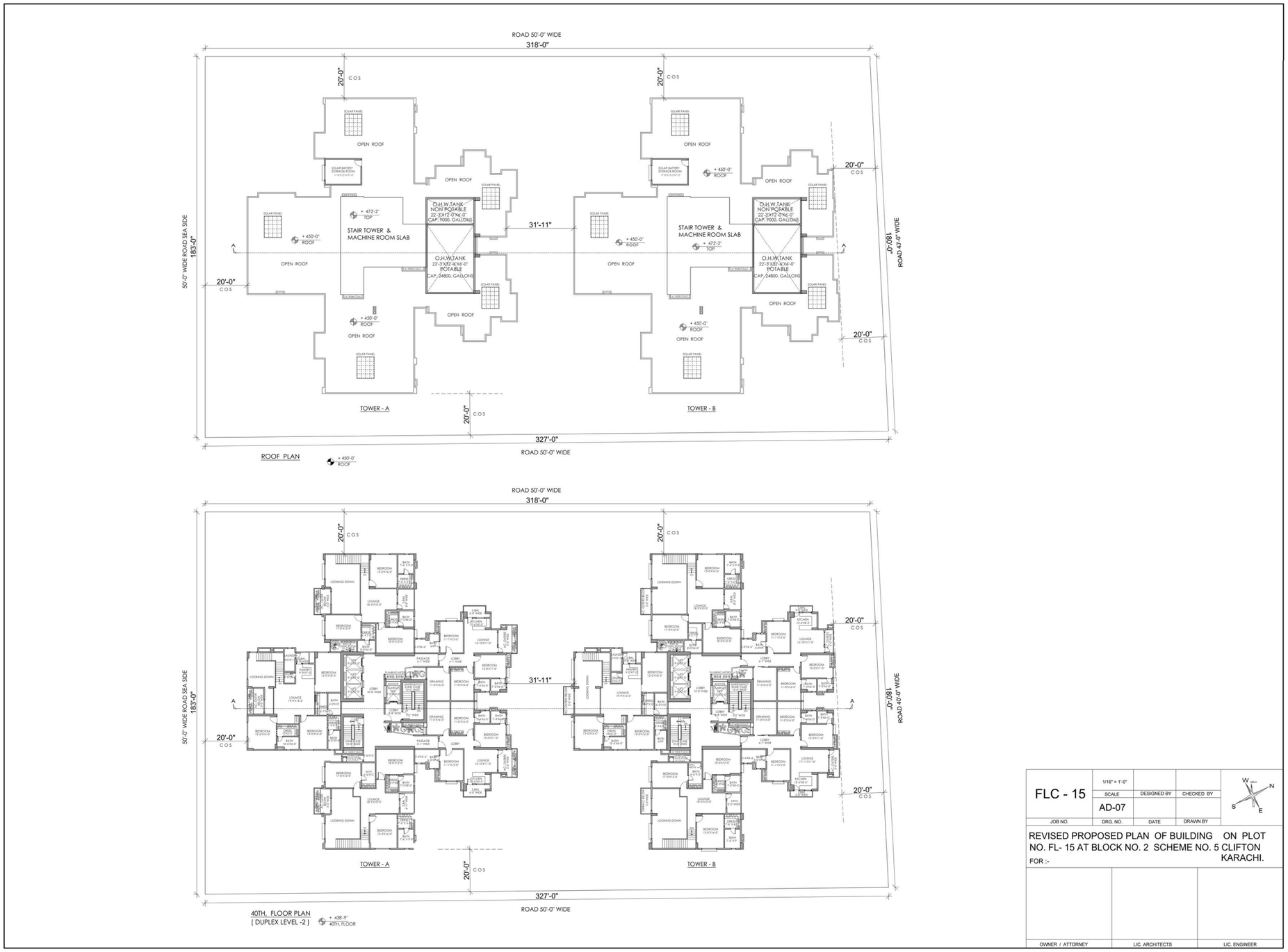
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REVISED PROPOSED PLAN OF BUILDING ON PLOT NO. FL- 15 AT BLOCK NO. 2 SCHEME NO. 5 CLIFTON KARACHI.

FOR :-

OWNER / ATTORNEY	LIC. ARCHITECTS	LIC. ENGINEER

Figure 2.2: Submission Drawing



FLC - 15	1/16" = 1'-0" SCALE			W E N S
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JOB NO.	DRG. NO.	DATE	DRAWN BY	

REVISED PROPOSED PLAN OF BUILDING ON PLOT NO. FL- 15 AT BLOCK NO. 2 SCHEME NO. 5 CLIFTON KARACHI.

FOR :-

OWNER / ATTORNEY	LIC. ARCHITECTS	LIC. ENGINEER

Figure 2.2: Submission Drawing

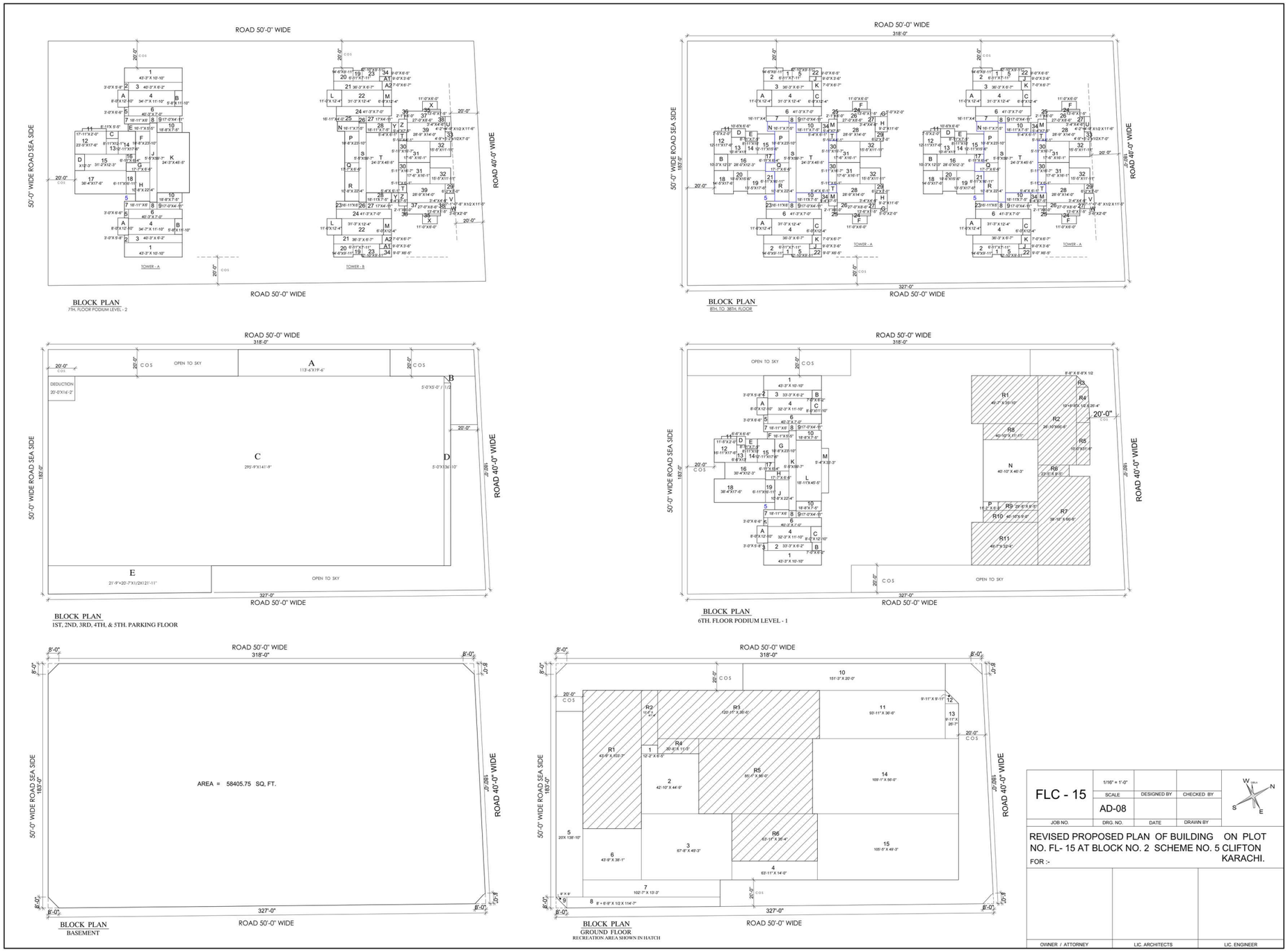


Figure 2.2: Submission Drawing

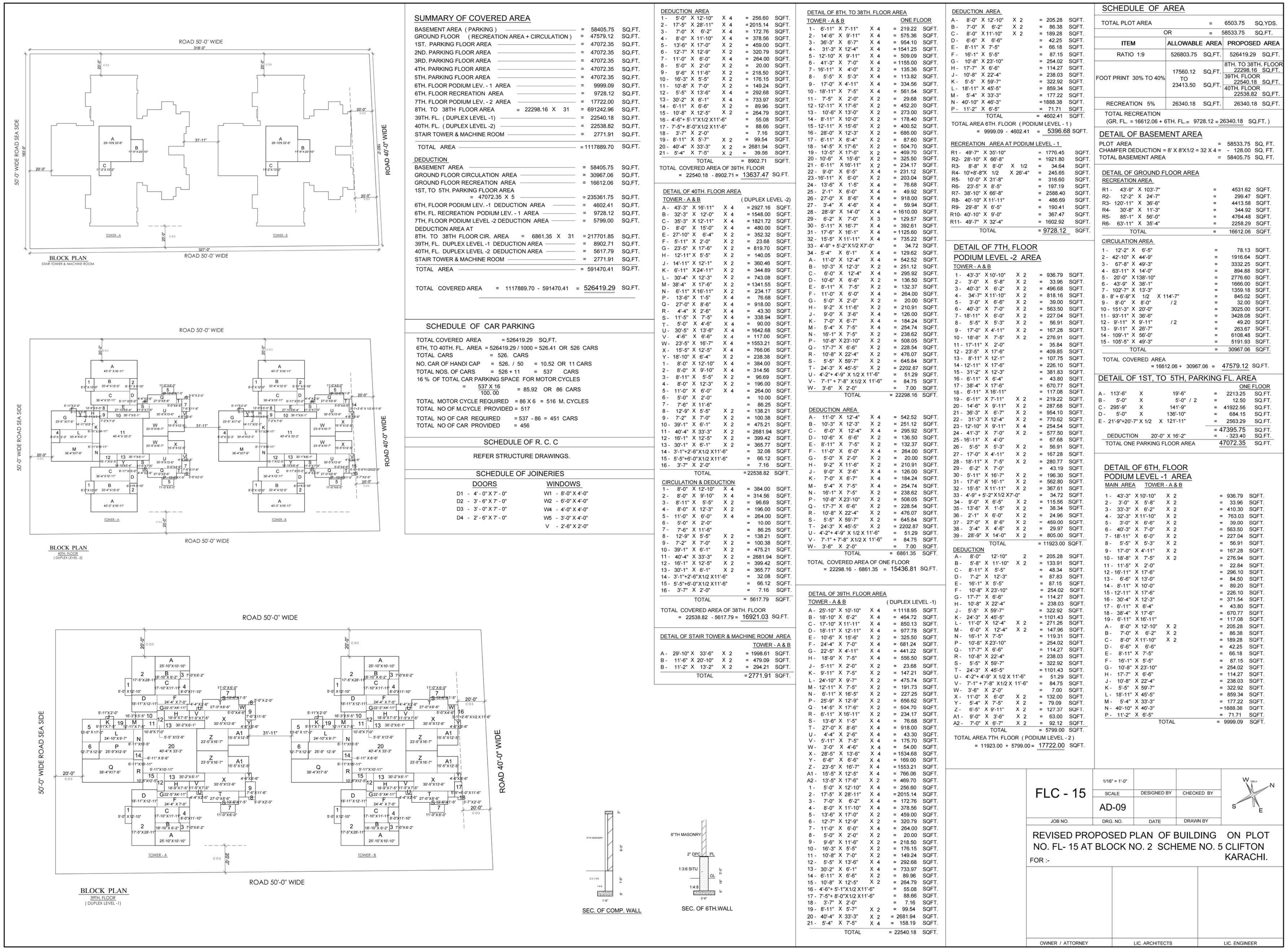


Figure 2.2: Submission Drawing

2.1 Construction & Commissioning

Pre-Construction and Design Phase: This foundational stage established the framework for the construction program, including the methodologies and technologies to be implemented. The project site underwent a comprehensive assessment regarding its geology, seismicity, and seismo-tectonics. A rigorous geotechnical investigation was executed to determine the soil's load-bearing capacity. Pre-construction activities encompassed necessary earthworks and excavations. To facilitate foundation design, a subsoil investigation was deemed essential and was subsequently awarded to 'Geotechnical Services', Karachi. The resulting report, finalized in June 2015, detailed an investigation program involving nine boreholes drilled to depths ranging from 100 to 140 feet. Standard Penetration Tests (SPTs) were conducted at various depths to evaluate the compactness and consistency of the substrata. Furthermore, a laboratory testing program was implemented, utilizing waxed core samples analyzed at the Geotechnical Services facility in Karachi.

Construction Activities: Construction operations commenced in 2021 following the essential regulatory clearances/processes, specifically from the Sindh Environmental Protection Agency (SEPA) and the Sindh Building Control Authority (SBCA). The structural design is primarily characterized by reinforced concrete, with all beams and columns utilizing this material. Internal partitions on the ground floor are constructed from solid concrete blocks, whereas upper floors utilize sheet rock with aluminum studs. The project employs standard, environmentally compatible materials—including cement, sand, steel reinforcement, and bricks—alongside modern construction techniques and practices. All operations adhere to the Standard Operating Procedures (SOPs) delineated in the Environmental Management Plan (EMP).

(1) Construction Office and Camp

The construction contractor established a self-contained camp and administrative offices within the project site. The development of this infrastructure included:

- Site levelling and compaction for the office and campsite areas.
- Installation of comprehensive drainage systems surrounding the campsite.
- Application & compaction of gravel surfacing for the office and camp areas.
- Construction of dedicated fuel storage and water tank facilities.
- Installation of perimeter fencing, access gates, and emergency exits.
- Construction of onsite septic tanks.
- Installation of membrane liners for fuel storage containment.
- Placement of security guard cabins.
- Installation of a sewerage pipeline network and manholes, connected to the primary sewer line.
- Provision of standardized signage across all activity centers.

(2) Foundations

Foundation excavations were performed in strict accordance with the recommendations provided in the geotechnical investigation. Excavated materials were transported off-site via trucks to approved disposal locations, with suitable soil diverted to road construction contractors for beneficial reuse.

(3) Building Shell and Core Construction

The construction of the exterior enclosure, or "shell," involved the assembly of the building's structural framework (beams and columns), floor decks, facade (exterior walls and cladding), and roofing. These operations necessitated the deployment of tower cranes, compressors, personnel and material hoists, front-end loaders, concrete pumps, and onsite bending jigs. Simultaneously, critical infrastructure connections were established, including systems for potable water, sewerage, storm water management, electricity, and telecommunications.

(4) Interior Construction and Finishing

This phase encompasses the construction of internal walls, installation of lighting fixtures, and the application of interior finishes such as flooring and painting. Key mechanical and electrical installations include:

- Elevator systems.
- Internal and external piping networks.
- Fire protection and life safety systems.
- Car park ventilation.
- Electrical distribution infrastructure.
- Emergency lighting and lightning protection systems.

(5) Civil Works

Civil engineering works included excavation, piling, formwork, reinforcement, and concreting. This was supplemented by masonry, plastering, painting, and specialized waterproofing using gas-flame techniques. Additional works involved the construction of lightweight partitions, suspended ceilings, and comprehensive flooring and lining.

(6) Construction Equipment and Machinery

Standard industrial machinery was utilized for all construction activities, including dozers, excavators, loaders, mobile cranes, dump trucks, backhoes, and bar-bending machines. Supporting equipment included water bowsers, material & passenger hoists, concrete placement booms, & power generators.

(7) Construction Materials and Supplies

The primary construction materials include ready-mix concrete sourced from reputable vendors, alongside paint, glass, timber, tiles, aluminum, and various

piping (PVC/GI/Concrete). These materials are transported to the site via trucks and stored in designated areas. Aggregates such as paving stones, crushed rock, gravel, and sand are procured from commercial suppliers. General supplies, including camp provisions, fuel, lubricants, and spare parts, are also managed through a regular logistics schedule.

(8) Site Restoration

Upon the conclusion of the construction phase, the entire site will be fully developed; consequently, restoration to the original site condition is not required. No external sites are utilized for the permanent works.

2.2 Plumbing System

Design Codes and Standards: The design and installation of the plumbing system shall adhere to the following regulatory codes and professional standards:

- International Plumbing Code (IPC) 2012.
- American Society of Plumbing Engineers (ASPE) Handbook – 2010.
- SBCA Bye-Laws.

Scope of Plumbing Services: The plumbing infrastructure encompasses the following services:

- Potable water supply.
- Soil and wastewater drainage.
- Septic tank and wastewater treatment plant systems.
- Stormwater drainage.
- Natural gas distribution.
- Irrigation water supply.

Firefighting System: The firefighting system is designed as a comprehensive life-safety installation comprising:

(a) Fire hydrants and landing valves.
(b) Fire hose reels housed in dedicated cabinets.
(c) Portable fire extinguishers (Dry Powder and Carbon Dioxide types) for general and electrical fire hazards.
(d) Automatic fire sprinkler systems.
(e) A dedicated fire pump station consisting of:
i. An electric motor-driven primary fire pump.
ii. A jockey pump for pressure maintenance.
iii. A diesel engine-driven standby fire pump.
(f) Integrated automatic system controls.

Plumbing and Drainage Infrastructure: The integrated plumbing and drainage system includes:

(a) Water Supply: Independent distribution lines and pumps for retail and residential sectors.
(b) Underground water storage tanks.
(c) Soil and waste drainage networks.
(d) Septic tank facilities.
(e) Reverse Osmosis (R.O.) plant for potable water production.
(f) Greywater recycling system for irrigation purposes.
(g) Natural gas supply infrastructure.

Domestic Water Requirements:

(a) The total project water demand is estimated at approximately 80,000 US Gallons per day.
(b) To mitigate local water scarcity, the following sources have been identified:
i. Water tankers.
ii. Tube wells supplemented by an R.O. plant.
(c) Raw water extracted from tube wells will be stored in a raw water tank for treatment. The treatment process aims to reduce Total Dissolved Solids (TDS) to below 500 ppm, followed by storage in a separate treated water tank.

Soil and Drainage System Design

(a) A two-pipe system has been adopted to maintain separate lines for soil and waste discharge.
(b) Loop venting is incorporated to maintain atmospheric pressure within the piping.
(c) Gully traps and manholes are designed in accordance with relevant standards.
(d) The system includes clean-out plugs and floor drains for maintenance and functionality.
(e) Kitchens are equipped with grease traps to prevent drainage line blockages.
(f) Recycled greywater is designated for irrigation use.
(g) Hot water provisions are included for all toilet facilities.
(h) Material Specifications:
i. Heavy-duty Class D piping for drainage.
ii. PPRC, PN 20 piping for cold water distribution.
iii. PPRC, PN 25 piping for hot water distribution.
iv. High-quality branded fixtures and fittings.

💧 **Water & Sewage Infrastructure**

- **Overhead Water Tanks:**
  - Two tanks of **24,800 gallons each** = 49,600 gallons
  - One additional tank of **9,000 gallons**
  - **Total overhead capacity = 58,600 gallons**
- **Firefighting Tank:**
  - Dimensions: 48'-6" × 19'-9" × 28'
  - Approximate volume ≈ **26,000 gallons**
- **Combined Storage Capacity:**
  $58{,}600 + 26{,}000 = 84{,}600$ gallons
- **Daily Water Requirement:**
  $2{,}282$ persons $\times$ 35 gal/person
  $= 79{,}870$ gallons/day
- **Sewage Generation:** ≈ $79{,}870 \times 0.85 = 67{,}890$ gallons/day
- **Recycling (40%):** $67{,}890 \times 0.40 = 27{,}156$ gallons/day recycled
- **Net Sewage Discharge:**
  $67{,}890 - 27{,}156 = 40{,}734$ gallons/day

✅ **Final sewage discharge = ~40,734 gallons/day**
✅ **Recycled water available = ~27,156 gallons/day**

Stormwater Drainage System

(a) Rainwater leaders are integrated into the building structure.
(b) Roof rainwater discharge is directed to the road level.
(c) Rainwater harvesting into greywater tanks for irrigation is incorporated into the design.

Natural Gas Distribution

(a) Independent natural gas connections shall be provided to each apartment.
(b) Individual metering for each residential unit.
(c) A dedicated SSGC meter room shall be located on the Ground Floor.
(d) Gas risers will be ventilated in compliance with SSGC regulations.
(e) Connections support both kitchen appliances and geysers.
(f) Meters are primarily located on the Ground Floor; however, installation at parking levels may be considered if unrestricted access for meter readers is guaranteed.

Summary of Codes and Standards

(a) Firefighting: NFPA 10 (Portable Extinguishers), NFPA 13 (Sprinklers), NFPA 14 (Standpipes & Hydrants), and NFPA 20 (Pumps).
(b) Plumbing & Drainage: IPC, ASPE Handbook, and Local Bye-Laws.
(c) HVAC: ASHRAE Standards.
(d) Natural Gas: Local statutory regulations.

2.3 Electrical and Allied Works

Compliance and Standards: All electrical design work shall strictly comply with the codes, standards, and design guidelines issued by:

- IEEE (Institute of Electrical & Electronics Engineers)
- UL (Underwriters Laboratories)
- BSI (British Standards Institution)
- IEC (International Electrotechnical Commission)
- NFPA (National Fire Protection Association)
- PSI (Pakistan Standards Institution)
- PEC (Pakistan Energy Codes)
- IES (Illuminating Engineering Society)

Technical Abbreviations

- MV: Medium Voltage (11kV)
- LV: Low Voltage (400V)
- BW: Busways
- TRAFO: Transformer
- MLVP: Main LV Panel
- LVP: LV Panels
- SMDB: Sub-Main Distribution Board
- RMU: Ring Main Unit
- DB: Distribution Board
- ELV/LCS: Extra Low Voltage / Low Current System
- TOB: Tap-Off Box
- FA: Fire Alarm System
- UTP: Unshielded Twisted Pair
- IDF: Internal Distribution Frame

Utility and Emergency Power Supply

Prime Power: Given the demand load of ~2,500 KW, a dedicated substation will be established in accordance with K-Electric policies.

Standby Power: To ensure operational continuity during power outages, a diesel generator-backed system is proposed. The configuration includes 2 x 1000 kVA + 1 x 250 kVA (Prime) units housed in soundproof enclosures.

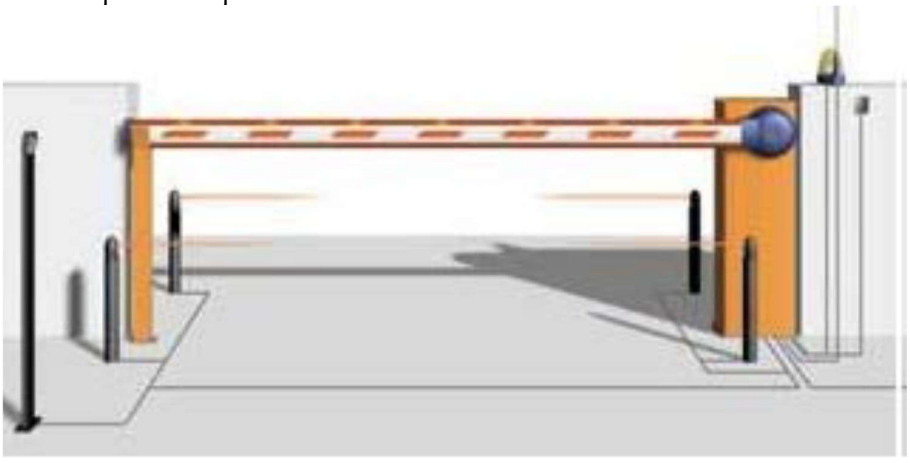
Renewable Energy: Solar energy solutions are integrated to optimize long-term cost savings and efficiency. Roof-mounted solar power distribution will be utilized to supplement the building's energy needs.

CCTV System: An integrated IP-based CCTV security and surveillance system will monitor and record activities across internal and external zones.

- **Building Entrance:** Box Camera
- **Stairs:** Dome Camera (2MP)
- **Corridors & Lobbies:** Dome Camera (2MP)
- **Parking Areas:** Box and Dome Cameras

Access Control System (3-in-1 RFID): Proximity card-based door access control will be implemented at secured locations, including electrical, IT, and control rooms, to prevent unauthorized entry. Each access event is integrated with the CCTV system for synchronized monitoring.

Parking Management: Electromechanical parking barriers equipped with long-range proximity card readers will be installed at all vehicle entrances. Authorized vehicles with front-mounted encoded cards will trigger automatic barrier operation upon detection.



Security Screening (Optional): Walk-through security gates may be installed at the main entrance to detect magnetic and non-magnetic metallic objects, including weapons, in accordance with the Client's security policy.

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).

T&A Craft Residency

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

Following the Eighteenth (18th) Amendment to the Constitution of Pakistan, 1973, the jurisdiction over environmental protection was formally devolved to the provinces. Consequently, each province has established its own distinct statutory framework, including environmental protection acts, rules, and regulations. Legislative and regulatory matters concerning the environment are now governed exclusively by these provincial mandates.

Historically, prior to the 2010 constitutional reform, legislative authority was divided via the Federal and Concurrent Lists. The subject of "environmental pollution and ecology" resided within the Concurrent List, permitting both federal and provincial governments to exercise legislative powers. However, the Eighteenth Amendment abolished this shared jurisdiction, placing environmental governance within the exclusive domain of the provinces. This transition resulted in the dissolution of the federal Ministry of Environment and the transfer of its operational functions to provincial authorities. To address international environmental obligations, the federal government subsequently established the Ministry of Climate Change.

While the Pakistan Environmental Protection Act (PEPA) of 1997 is no longer applicable to the provinces, the newly enacted provincial laws are largely modeled after it, ensuring a consistent standard of environmental protection. Although the provinces have developed their own regulatory instruments, the sectoral guidelines originally promulgated under PEPA 1997 remain relevant reference documents.

The Sindh Environmental Protection Agency (SEPA) has been proactive in codifying its provincial regulatory framework. Significant milestones include:

- *Environmental Assessment Regulations:* On December 16, 2014, SEPA enacted the IEE-EIA Regulations, which were subsequently superseded by the Sindh Environmental Protection Agency (Environmental Assessment) Regulations, 2021. These regulations mandate environmental compliance and sustainable development by requiring projects to undergo a preliminary Environmental Checklist (EC), an Initial Environmental Examination (IEE), or a comprehensive Environmental Impact Assessment (EIA) prior to commencement.

- *Procedural and Thematic Rules:* In December 2014, a comprehensive suite of rules was enacted, covering environmental sampling, hazardous substances, hospital waste management, tribunal procedures, administrative penalties, and the certification of environmental laboratories. Furthermore, regulations concerning non-degradable plastic products and the Sindh Sustainable Development Fund were established.

- *Environmental Quality Standards:* On June 28, 2016, SEPA notified the Sindh Environmental Quality Standards (2016), which regulate industrial wastewater, domestic sewerage, ambient air quality, noise levels, and drinking water standards.

For the purposes of this assessment, the Sindh Environmental Protection Act of 2014, the Sindh Environmental Protection Agency (Environmental Assessment) Regulations of 2021, and all associated provincial rules and standards serve as the primary legal benchmarks.

3.3 Constitutional Provision

Through the enactment of the Twenty-Sixth (26th) Constitutional Amendment in October 2024, Pakistan formally incorporated Article 9A into its Constitution, thereby establishing the right to a clean, healthy, and sustainable environment as a fundamental constitutional guarantee. This legislative development codifies and expands upon long-standing judicial precedents, most notably the landmark ruling in Shehla Zia v. WAPDA (PLD 1994 SC 693). In that instance, the Supreme Court of Pakistan proactively interpreted the Article 9 right to life to encompass environmental protection, laying the conceptual foundation for this recent constitutional entrenchment.

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

The Sindh Environmental Protection Agency (Environmental Assessment) Regulations, 2021, enacted under Section 37 of the 2014 Act, categorize projects into three groups reflected in Schedules I, II, and III of the 2014 Regulations. These classifications are based on the anticipated degree of environmental impact, where projects in Schedule III are deemed potentially seriously harmful and necessitate an EIA, while those in Schedule II may have lesser effects and require an IEE.

This specific development falls under Category I (3) of Schedule III, which pertains to "Urban development and tourism" and explicitly includes **"All Projects located in High Density Zones notified by Government and relevant land controlling organizations, irrespective of their size."**

3.6 Guidelines for Public Consultation

Compliance with Sindh's environmental legal framework necessitates comprehensive public consultation. Pursuant to Regulation 11 of the 2014 Regulations and the specific sectoral requirements outlined in the Guidelines

for Public Consultation 1997 (the 'Guidelines'), the regulatory framework for stakeholder engagement is structured as follows:

- **Objectives of Public Involvement:** The primary goals include informing stakeholders of proposed projects, empowering unrepresented groups to articulate their perspectives, and enhancing transparency and accountability in decision-making. Such engagement is intended to foster a sense of project ownership among stakeholders.

- **Stakeholder Identification:** Engagement efforts prioritize individuals and groups directly or indirectly impacted by a proposal. Direct stakeholders encompass project beneficiaries and those potentially facing adverse effects. Due to the subjective nature of identifying indirectly affected parties, the Guidelines advocate for a broad definition of inclusivity, encompassing any person or group claiming an interest. In instances requiring representative consultation, the choice of representative should remain with the respective interest group. Involvement must extend to both those influenced by the project and those capable of influencing its outcome.

- **Consultation Mechanisms:** Information must be disclosed in a clear, non-technical format accessible to non-experts. Stakeholders must be afforded adequate time to review, deliberate upon, and respond to the implications of the project. Furthermore, proponents are required to address issues or comments raised, while ensuring that the logistics of consultation events—such as venue and timing—facilitate maximum participation.

- **Timing and Frequency:** Public consultation planning should be initiated at the earliest opportunity, ideally commencing during the screening phase and maintained throughout the Environmental Impact Assessment (EIA) process.

- **Consultation Methodologies:** Recommended tools for effective engagement include focus group discussions, needs assessments, semi-structured interviews, village-level meetings, and workshops.

- **Strategic Considerations:** The development of a public involvement program requires the systematic definition of project objectives, rigorous stakeholder identification, the selection of appropriate communication techniques, and the establishment of robust feedback mechanisms to ensure stakeholder concerns are integrated into project planning.

The Guidelines emphasize that early and effective communication is essential for building consensus toward project implementation. Regarding the integration of public involvement into environmental assessment stages, the Guidelines mandate that formal consultation meetings be conducted following the development of project options and the assessment of mitigation measures to facilitate informed public comment.

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***	*1.5µg/m³*	
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 3.5: 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 or Thermo tolerant Coliform bacteria)	Must not be detectable in any 100 ml sample	Essential Inorganics (mg/liter)		
			3	Aluminum (Al) mg/l	≤ 0.2
			4	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	5	Arsenic (As)	≤ 0.05
			6	Barium (Ba)	0.7
			7	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.	8	Cadmium (Cd)	0.01
			9	Chloride (Cl-)	< 250
			10	Chromium (Cr)	≤ 0.05
			11	Copper (Cu)	2
			Organic (mg/L)		
			12	Phenolic compounds	<0.0002
			Toxic Inorganics (mg/liter)		
			13	Cyanide (CN)-	≤ 0.05
			14	Fluoride (F)	≤ 1.5
			15	Lead (Pb)	≤ 0.05
			16	Manganese (Mn)	≤ 0.5
Physical			17	Mercury (Hg)	≤ 0.001
4	Color	< 15 TCU	18	Nickel (Ni)	≤ 0.02
5	Taste	Non-objectionable/ Acceptable	19	Nitrate $(NO_3)^-$	≤ 50
6	Odor	Non-objectionable/	20	Nitrite $(NO_2)^-$	≤ 3

		Acceptable			
7	Turbidity	< 5 NTU	21	Selenium (Se)	≤ 0.01
8	Total Hardness as $CaCO_3$	< 500 mg/l	22	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	23	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 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

The Sindh Solid Waste Management Board (SSWMB) was established through an Act passed by the Provincial Assembly on 10th February 2014. Subsequently, the Amended Sindh Solid Waste Management Board Act-2021 was enacted by the Provincial Assembly of Sindh on 11th December 2021.

Under these acts, the "Powers and Functions of the Board" grant the Board rights over solid waste-related issues, as well as the assets, funds, and liabilities of the Councils. The Board possesses sole rights over all kinds of solid waste within the limits of all Councils. Furthermore, the Board has the authority to grant permissions to individuals, institutions, industries, factories, workshops, and furnaces for activities such as compost making and power generation from solid waste, including the segregation of recyclable materials from waste, collection, treatment, sale and purchase, recycling, or disposal of any kinds of waste.

In the performance of its functions, the Board shall not impede or prejudice the exercise of the executive authority of the Government.

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 work places 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 (200 ft) 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 Condominium Act, 2014

The purpose of Act is to regulate the services, amenities, façade, parking and common areas in public sale projects by the residents, union or society of the project through the registered maintenance companies in the Province of Sindh. Under the Act maintenance of the project for one after obtaining completion certificate shall be the responsibility of the builder against prescribed maintenance fee charged from the allottees. Section 3 of the Act provides complete mechanism how builder will maintain the building for one year, and who will maintain thereafter etc. The Act further provides for responsibilities and rights of maintenance societies, and company, provision for insurance of the building.

3.19 Civil Aviation Rules, 1994

The Civil Aviation Rules 1994 has mandated it for all the builders and developers to obtain No Objection Certificate (NOC) from Civil Aviation Authority (CAA) under rule 68, section-3 of Civil Aviation Rules, 1994 for "Height Clearance" for projects/buildings within the radius of 25km of all airports. The rule 68, section 3 (Safe Guarding at Aerodromes (68) Limitation of obstructions) reads as under: "No person shall erect any temporary or permanent structure, nor position a vehicle or other mobile object on or in the vicinity of any aerodrome to which these rules are applicable, that will be within the clearance area, or will protrude through an obstacle limitation surface, at that aerodrome".



پاکستان سول ایوی ایشن اتھارٹی

اطلاعِ عام

ہر خاص و عام، تمام متعلقہ افراد بشمول بلڈرز، ڈیولپرز اور سیلولر کمپنیاں، جو تمام ایئر پورٹس کے گرد 15 کلومیٹر کی حدود میں کوئی عمارت تعمیر کرنا یا ایستادہ نصب کرنا چاہتی ہوں، کو مطلع کیا جاتا ہے کہ اُن پر لازم ہے کہ وہ سول ایوی ایشن اتھارٹی کے قوانین 1994ء کے رول 68، سیکشن 3 کے تحت، عمارت یا ایستادہ کی بلندی کی حد کے تعین کیلئے سی اے اے سے پیشگی اجازت نامہ (NOC) ضرور حاصل کریں۔ اجازت نامہ (NOC) حاصل کرنے کیلئے درخواست درج ذیل دستاویزات کے ساتھ ڈائریکٹر جنرل، سول ایوی ایشن اتھارٹی، ہیڈ کوارٹر، جناح انٹرنیشنل ایئرپورٹ، بزنس۔1 کراچی کو بذریعہ ڈاک ارسال کی جائے۔

الف) پراجیکٹ کا نام

ب) مجوزہ سائٹ کا سروے آف پاکستان سے باضابطہ تصدیق شدہ WGS-84 جیوگرافیکل کوآرڈینیٹس (WGS-84 Geographical Coordinates)، جو کہ ڈگری، منٹ اور سیکنڈ کے 1/100 ویں حصے کے 8 ہندسوں (up to 8 digits of their 1/100 part) پر مشتمل ہوں۔

ج) سروے آف پاکستان سے تصدیق شدہ گائیڈ میپ اسکیل 1:500,000، جس میں ہر مجوزہ مقام کی نشاندہی کی گئی ہو۔

د) مجوزہ عمارت کی کل بلندی (چھت پر تمام تنصیبات کے ساتھ)/ بی بی ایس ٹاور کی سطح زمین سے بلندی۔

ہ) مجاز حکام کی جانب سے جاری شدہ یا منظور شدہ پلاٹ کا سائٹ پلان۔

نوٹ: خلاف ورزی کرنے والے کے خلاف سول ایوی ایشن آرڈیننس 1960ء اور سول ایوی ایشن رولز 1994ء کی متعلقہ شقوں کے تحت کارروائی کی جائے گی۔

ڈائریکٹر جنرل هیڈ کوارٹرز، پاکستان سول ایوی ایشن اتھارٹی، ٹرمینل۔1، جناح انٹرنیشنل ایئرپورٹ، کراچی۔

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3.20 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.

3.21 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.

3.22 Groundwater (Extraction, Consumption & Management), Regulations - 2024

In 2024, the Board of Karachi Water & Sewerage Corporation established the Groundwater (Extraction, Consumption, and Management) Regulations under the authority of section 47 of the KW&SC Act 2023. These regulations apply to the entire Karachi Division and any additional areas specified by the Government. Under these regulations, "Consideration of Applications for Grant of License" requires that applicants declare their existing sources of water supply, such as the KW&SC network, bores, tube wells, wells, tankers, or any other provisions, along with the intended quantity needed through the prescribed application form. Misleading or incorrect information shall lead to the rejection of the application. To assess existing sources and proposed extraction connections (bore, tube wells) or suppliers, KW&SC field staff or authorized agents are permitted to enter premises and record flows, including the inspection of tanks and inflow points.

3.23 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.

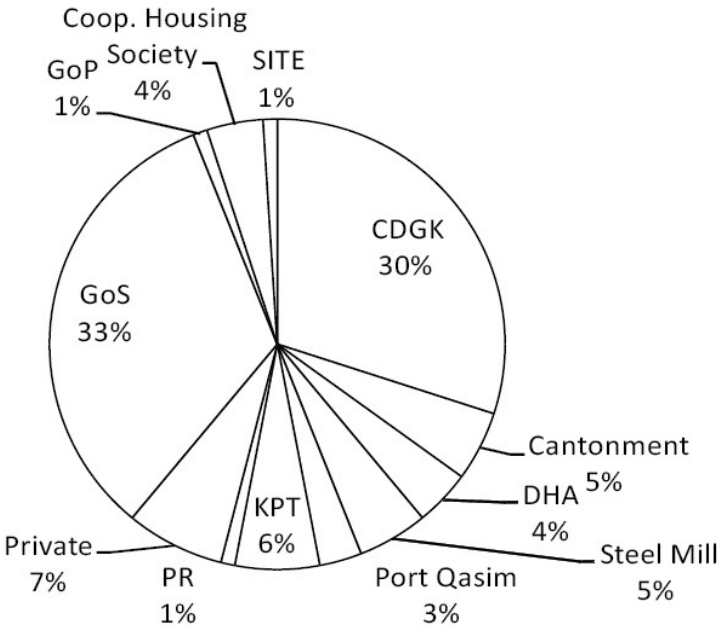


Figure 3.2: Land Holdings by Agency in Karachi
Source: KMP 2020

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

3.24 Karachi Building and Town Planning Regulations (KB&TPR), 2002

Under these regulations, not limited to but including the following should be taken into account for designing, construction, or operation and maintenance of the project in terms of industrial and public safety:

i. Sanitation and Solid Waste

a) In case pre-construction, construction, and operation and maintenance will emanate noise, pollute air, produce solid waste and sewage, the construction and operation and maintenance of the project should be complied with all requirement of NEQS;

b) In all public purpose projects, the central waste disposal system should be provided by the project proponent;

c) Where no public sewer is in existence, all sewage shall be disposed off after properly treating, through digester or septic tank and effluent shall be discharged safely into a soak pit as a temporary measure till such time as a sewer system is laid out;
d) Ventilating pipe should be provided in all stacks carrying wastewater or sewage in accordance with the plumbing code;
e) At every change of alignment, gradient or diameter of a drainage, manhole or inspection chamber should be provided. Bends and junctions in the drainage should be grouped together in manhole as far as possible;
f) The roofs of every building and the floor or balconies abutting on a street or constructed over a street should be so constructed or framed so as to permit effectual drainage of the rainwater wherefrom by means of a sufficient number of leaders of adequate sizes so arranged, jointed and tied as to ensure that the rainwater is carried away from the building without causing dampness in any part of the walls, foundations of the walls, of foundations of the building, or those of an adjacent building, provided the fall is not greater than 20ft.(6m) in case of spouts;
g) A leader should not discharge into or connect with any soil pipe of its ventilation pipe, or any waster pipe or its ventilating pipe, nor should it discharge into a sewer;
h) Rainwater from leader spouts should not discharge onto a public street at a height greater than 12 inch (0.3m) from that street, or onto a neighboring property.

ii. Fire Resistance and Precautions
a) All buildings which are ground plus three storey or above or more than 43 ft.(13m) high shall be provided a set standpipe/pipes. Buildings over 8 storey high should be equipped with not less than 4-inch (10 cm) diameter stand pipe;
b) In so far as practicable, standpipes should be located with outlets within stairway enclosures but if these are not available the standpipes shall be located in a common corridor. In any case, one should be located in the main;
c) The standpipes should be installed in every storey and it is fed by an overhead water tank reserved solely for this purpose;
d) Automatic Sprinkler System should be provided in the covered car parking area(s) in building for which upper stories are designed for other uses and when such parking Under these regulations, not limited to but including the following should be taken into account for designing, construction, or operation and maintenance of the project in terms of the industrial and public safety.

ii. High Density Zone (Ribbon) facing coastal line of Block 1, 2, 3 & 4 Clifton parallel within Marine Promenade and Oil Pipeline Reservation

25-14.1. Amalgamation of Plots

Amalgamation of Residential /flat sites and commercial plots shall be allowed provided land grant/allotment conditions of the plots are similar and on payment of fees as may from time to time be determined by CDGK.

25-14.2. Change of land

For Residential Plots: The plot Ratio of High-density zone shall be allowed provided the category is changed into flat site/ commercial by MPGO, CDGK

25-14.3. Recreational Spaces

For all public sale and commercial plots, a minimal 5% of the permissible floor area ratio/ proposed covered area shall be provided for recreation facilities/ children play area/ prayer area. This area shall not be included in the total floor area up to a maximum of 5% of total floor area.

25-14.4. Height related setbacks of buildings

Not applicable in High Density Zone

25-14.5 Commercial (Building Bulk Standards)

25-14.5.1 FAR 1:9

25-14.5.2 Arcade 12'- 0 wide

25-14.5.3 FOOTPRINT 70% ground floor (in the case floor/s above ground floor proposed for shopping mall up to 3 – floors and parking the allowable foot print shall be the same) upper floor 30% minimum to 40% maximum

25-14.5.4 COS Two time as given in table No. 25-3.1

25-14.5.5 Other Conditions shall be as per 25-3.2 (all)

25-14.6.1 The provision of density (person per acre) is not applicable in High density zone

25-14.6.2 FAR 1:9

25-14.6.3 Footprint 30% minimum to 40% maximum

25-14.6.4 COS same as per table 25-4

25-14.7 Conditions to be fulfilled

25-14.7.1 Minimum area of plot should not be less than 1000 sq. yards

25-14.7.2 Adequate alternative arrangement for self-sufficient and self-reliant electric supply through an electricity generation unit shall be made by the builder for the overall requirement of the project duly assessed and designed through the Electrical consultant registered with PEC

25-14.7.3 Project Management board shall arrange to provide the infrastructure for supply of water for the area of High density zone. However, the sponsor of the project shall be responsible to arrange the supply of water through alternative arrangement for the consumption of the project.

25-14.7.4 Recycling plant for the treatment of effluent/sewage of adequate size and dimension shall be provided by the builder at an appropriate location of the plot in accordance with the requirement for construction and maintenance as set by NEQS. Arrangement for the disposal of sewage shall be made through septic tank of adequate size and capacity. However, disposal of treated sewage shall be made through existing mains and the sludge so created shall be disposed of through transportation to the designated sites with the concurrence of KWSB. Treated water shall be used for landscaping purpose.

25-14.7.5 Betterment charges shall be charged on entire proposed area of plots. However, the rates for the plots facing sea and not facing sea, shall be subsequently decided by the project management board for the development/improvement of infrastructure. A separate account for the purpose shall be maintained.

25-14.7.6 Firefighting arrangements and fire escape as per international standard up to the satisfaction of the authority shall be provided.

25-14.7.7 No other category of plot shall be allowed to be utilized into High density zone except FL sites and commercial plots

25-14.8 Parking Facility

25-14.8.1 Parking facility as per these regulations shall be provided. If in the event the provision of adequate car parking is not provided the facility of plot ratio 1:9 shall not be allowed, and such cases shall be governed as per standard prescribed under regulations No 25-3 and 25-4 of KB&TPR-2002**.**

25-14.9 Environment

25-14.9.1 No such activity on any part of project detrimental to the esthetics and environment of the area shall be allowed**.**

3.25 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

3.26 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.

3.27 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.

4. Description of Environment

4.1 Macro and Micro-Environmental Context

Situated within U.C. #13, Kehkashan, Saddar Town, Clifton Block 2 represents a mature residential landscape featuring over 30 established developments. Following its official designation as a "ribbon zone," the district is transitioning into a high-density urban center. The site maintains exceptional connectivity via a strategic network of arterial roads: Shahrah-e-Ghalib (North), Marine Promenade (South), Khayaban-e-Saadi (East), and Khayaban-e-Bedil (West). The immediate micro-environment is bordered to the east by the Bonvista apartments, a religious institution, and a public school; to the north by a landscaped green belt; and to the west by the Regional Training Institute (RTI). Logistical access is facilitated by 50-foot-wide roads on three perimeters and a 40-foot-wide road along the eastern boundary.

To the north and northeast lie the Boat Basin recreational area and Shaheed Benazir Bhutto Park. The nearby Nehre Khayyam, formerly a natural creek, currently serves as a conduit for wastewater from the western Defence Housing Authority (DHA), discharging into the Manora Channel near the Karachi Port. The Karachi harbor is situated approximately 1.5 km west of the project site. Notably, the southern coastline along the Marine Promenade has recently undergone significant land reclamation.

The coastal belt extends 14 km from the Keamari Groyne (sea wall) to Korangi Creek, characterized by a gentle gradient of 1:50. Clifton Beach is primarily composed of dark grey silty deposits and micaceous sand, transported from the Indus River delta by littoral currents and subsequently deposited by wave and eolian action. To the east, the landscape transitions into the Ghizri hills.

Administrative oversight is divided among three entities: the Karachi Port Trust (KPT) manages the sea wall section; the City Government oversees the stretch from the sea wall to Shireen Jinnah Colony; and the DHA controls the remaining area to Korangi Creek. The western portion intersects Keamari and Bhutta Village (Keamari Town). Shireen Jinnah Colony, although adjacent to Bhutta Village, falls under the Saddar Town Administration. Much of the DHA-managed coastal land was reclaimed within the last two decades without the prior conduct of Environmental Impact Assessments (EIAs), which likely would have highlighted the resulting loss of mangrove habitats.

The surrounding union councils remain underdeveloped. Shireen Jinnah Colony, regularized in the mid-1990s, houses approximately 50,000 residents. The coastal road serving this area is in a state of disrepair and is heavily utilized by oil tankers traveling from Keamari installations. A 3-km secure zone from the Manora Channel to Shireen Jinnah Colony is reinforced with stone pitching and restricted for recreational use. The DHA administrative boundary

commences at the Bilawal House roundabout, marking the terminus of Shireen Jinnah Colony.

The environmental integrity of the coastal area is severely compromised at the DHA entry point, where multiple outfalls discharge untreated domestic sewage and industrial effluents, including oils and greases from local workshops. Such pollution has significantly diminished the recreational utility of the beaches and halted proposed water sports initiatives at Chinna Creek.

Historical data underscores the persistence of environmental contaminants; for instance, oil residues from 1971 were still detectable in Keamari soil as late as 1994, indicating a high long-term retention capacity for hydrocarbons. While precise volumetric data for current waste streams is limited, analysis suggests a hazardous mixture of municipal sewage and industrial waste.

Karachi's coastal sediments originate from the Indus River, historically one of the world's most prolific sediment-bearing waterways. These deposits have been transported offshore over millennia, with the Murray Ridge near Cape Monze serving as a natural geological barrier that prevents westward sediment migration.



Figure 4.1: Project Location Map

4.2 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 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 checklist. Other studies and reports were referred to and reviewed for the verification of information.

4.2.1 Climatic Condition

Karachi's climate features intensely hot and dry summers, transitioning to mild winters marked by sporadic yet considerable monsoon rainfall. The southwest monsoon season is active from April through October, bringing a significant shift in wind direction and substantial precipitation across much of the Indian Subcontinent. The peak heat occurs between mid-March and June, while January represents the year's coldest point, with temperatures typically descending to around 10°C. Karachi experiences an average annual rainfall of approximately 217.3 mm, with nearly 80% of this occurring during the monsoon period. For instance, in 2025, Karachi recorded a monsoon season with 304.4 mm of rain, exceeding the historical average.

Seasonal Overview:

- **Summer (mid-March to mid-June):** Characterized by high temperatures, this season also brings moderate rainfall and humidity, alongside strong winds blowing consistently from the southwest to the northeast.

- **Summer Monsoon (mid-June to mid-September):** Temperatures remain elevated during this period, which is defined by significant rainfall, high humidity, and strong south-westerly to northeasterly winds.

- **Post-Monsoon Summer (mid-September to mid-November):** This season features moderate temperatures and reduced rainfall. Winds generally blow from the southwest to the northeast, with a directional shift observed towards the end of the period.

- **Winter (mid-November to mid-March):** Cooler, dry conditions dominate, accompanied by low humidity and a noticeable decrease in wind speed. Winds transition from a northeast-to-southwest direction, eventually shifting to the northwest by late winter.

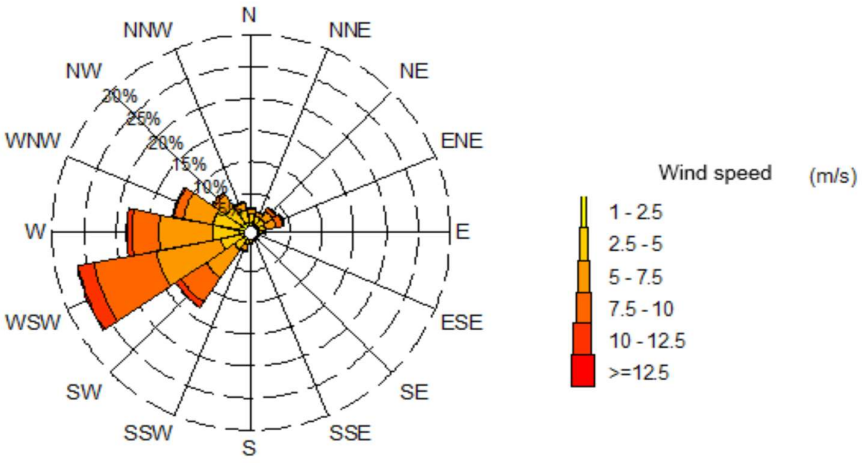


Figure 4.2: Annual Wind Rose

4.2.2 Urban Heat Island (UHI) Effect

An urban heat island (UHI) characterizes metropolitan regions where temperatures are distinctly elevated above those of surrounding natural landscapes. This phenomenon, driven by human activities, results in a noticeable thermal discrepancy, particularly accentuated at night and during periods of calm winds. The UHI effect intensifies during summer and winter seasons. Large cities, housing over a million inhabitants, may register average air temperatures 1–3°C higher than their rural counterparts, with nocturnal differences sometimes soaring to 12°C.

The ramifications of urban heat islands for local populations are extensive, encompassing elevated peak energy consumption in summer, increased costs for air conditioning, degraded air quality, and magnified greenhouse gas emissions. Furthermore, they pose significant health risks, including heat-related illnesses, and can adversely affect water quality.

Causes of the Urban Heat Island Effect:

The fundamental cause of the UHI effect lies in the unique thermal and radiative properties of urban construction materials. Concrete and asphalt, ubiquitous in city pavements and rooftops, readily absorb short-wave solar radiation throughout the day. Unlike natural surfaces, these materials retain this absorbed energy, slowly re-emitting it as long-wave radiation during the night. This altered energy balance within metropolitan areas hinders nocturnal cooling, leading to persistently elevated temperatures. For instance, this mechanism significantly

contributed to the exceptionally high minimum temperatures observed in Karachi during past heatwave events.

In Karachi, several specific factors intensify the UHI phenomenon:

- **Diminished Evapotranspiration:** A scarcity of green spaces and vegetation reduces natural cooling through evapotranspiration, leading to a loss of shade, reduced arboreal cooling, and decreased carbon dioxide sequestration.
- **Aggravated Urban Geometry:** The proliferation of tall structures amplifies the UHI by creating numerous surfaces that reflect and absorb solar radiation, thus increasing thermal mass. This "urban canyon effect" also obstructs natural air circulation, impeding convective cooling.
- **Waste Heat Emissions:** Significant heat output from vehicular traffic, air conditioning units, industrial activities, and other anthropogenic sources further exacerbates urban warming. Moreover, high concentrations of urban pollutants can modify atmospheric radiative properties, thereby intensifying the UHI.

Beyond merely elevating temperatures, UHIs can fundamentally alter local meteorological conditions, impacting wind patterns and humidity levels. Notably, in Karachi, this effect has been a substantial factor in the increase of heat-related fatalities. Projections based on future climate scenarios indicate a likely escalation in the frequency and intensity of such extreme events as global temperatures continue their upward trend.

Karachi's populace is exceptionally susceptible to extreme heat events. A devastating heatwave struck the city in June 2015, marked by relentlessly high temperatures both day and night, which had severe consequences for its inhabitants. Post-event analyses of heat-related mortalities revealed distinct vulnerability clusters, primarily linked to inadequate housing, high population density, low-income demographics, and limited educational access.

Such hot, arid conditions pose threats to agricultural yields, drive up energy consumption, and necessitate public advisories recommending minimal sun exposure during peak daylight hours. Climate scientists have issued stern warnings: the recent extreme heat episodes observed across Pakistan and India are unprecedented, with forecasts suggesting even more severe occurrences in the future, exacerbated by accelerating climate change.

In response to these challenges, Karachi's 2017 Heatwave Management Plan outlines comprehensive preparedness and response protocols for forthcoming heat seasons. Complementing these immediate measures, long-term strategies

advocate for significant advancements in urban development, building design, and energy policies to alleviate the city's thermal burden. These specific actions encompass:

- The execution of Karachi's Strategic Development Master Plan 2020 (SDMP 2020).
- The establishment of land use regulations tailored to Karachi's specific urban context.
- The careful designation of high-rise development zones, ensuring robust supporting infrastructure for transport, water supply, and the integration of green spaces.
- A thorough revision of existing building and land use regulations to foster green urbanization and encourage the emergence of multiple city centers to ease current congestion.
- Substantial investment in sustainable transportation solutions, aimed at improving the overall urban environment.

Addressing the persistent challenges presented by urban heat islands necessitates a multifaceted approach to urban planning and a robust enhancement of community resilience, particularly within megacities like Karachi.

4.2.3 Topography of the Microenvironment

The topography of the Project area is completely altered from what was swampy mud flats. The entire area from the Manora Channel to Clifton has been reclaimed by filling the low marshy lands. The flat sandy plain built along the seacoast on the recently filled silt and sand sediments has following three types of coastal sediments (Figure 4.3).



Figure 4.3: Surface Geology Map of Clifton Area, Karachi

Sand bar deposits: The sand bar deposits have medium to coarse sand, micaceous and shifting sand dunes as the main constituents.

Coastal sand dune deposits: These comprise medium size sand and shifting sand dunes.

Beach sand deposits: Medium to coarse grained, unconsolidated sand with pebbles and broken shells are the main constituents of beach sand deposits. These have been marked but keep on shifting by wind into small coastal dunes.

4.2.4 Geology & Landforms

Geologically the Clifton area is composed of the Middle and Upper Tertiary rock formations that include fresh, and slightly weathered recent and sub-recent shoreline deposits. The shoreline deposits are derived from Gaj/Manchhar formations of lower Miocene to Middle Miocene/Upper Miocene to Pliocene age. The deposits have the inter-bedded sandstone and shale together with subordinate amounts of large size gravels or conglomerate as the principal constituents.

The seabed is predominantly sand and silt while the sediment of the coast beyond Gizri/Korangi Creek is fine grained and the soil is typically of continental shelf/Indus delta origin. The gravels or conglomerates are loosely bonded with

medium to coarse brown sand and are derived from Manchhar Formations of Pleistocene age. The Gaj formation consists mostly of limestone with subordinate shales and sandstone. The limestone is hard, sandy and extremely fossiliferous. This formation overlies Nari formation which consists of harder limestone beds and shales. Manchar formation overlies Gaj formation and is spread all along the coastal areas of Karachi but is best exposed in Clifton, Ibrahim Hydri, Gizri, Korangi and Landhi areas. This formation is composed of sandstone, clay beds, cemented sand and gravel (pseudo-Conglomerate). Sandstone is thick, porous and friable and also contains bands of conglomerate. The clay/shale has different colours varying from grey, brown, chocolate and orange, but the most frequent variety is light brown and dark grey in colour. Sandy layers are also found inter-bedded with clay and gravel. The mudflats are recent deposits of the delta area while soil cover is the drift type that has been slightly withered with time and marine activity. It seems to have been transferred with the flood flows from Malir River and the Indus on the east.

4.2.5 Subsurface Geology

The subsurface geology was studied by analysis of samples of soil collected from different depths of the bore holes.

The stratigraphy and the subsurface conditions have been evaluated on the basis of boring logs supported by field and laboratory test results. It is seen that the stratigraphy is heterogeneous though not necessarily erratic. The investigation has revealed that top 15-20 feet consist of loose to medium dense silty SAND Beneath this layer, there occurs a thin layer of hard CONGLOMERATE followed by hard, silty CLAY/SHALE. This is underlain by friable to medium hard SANDSTONE with interlayers of clayey silt followed by medium hard SILTSTONE deposits that continues upto the investigated depth of 140 ft.

These lithological units can be described as follows:

- Grey, loose silty SAND
- Grey, medium dense, silty SAND
- Greyish brown, hard CONGLOMERATE, interlayer sandstone, highly fractured
- Yellowish brown, hard, silty CLAY /sandy SHALE
- Greyish brown, friable to medium hard SANDSTONE, highly fractured
- Greyish brown, medium hard SILTSTONE

In rock deposits, greater numbers of waxed core samples were subjected to unconfined compression test so as to obtain reliable design parameters for

bearing capacity calculations. Unconfined compressive strength was determined on 79 waxed core samples of SHALE / SILTY CLAY, CONGLOMERATE, SANDSTONE and CLAYSTONE/SILTSTONE.

Ground water table was encountered at a depth of about 4-5 feet below existing ground.

Cement Type: American Concrete Institute (ACI) gives the requirements for concrete exposed to Sulphate (SO_4) containing solutions. The ACI standards are given below:

Sulphate Exposure	Water Soluble Sulphate in Soil (%)	Sulphate in Water (mg/liter)	Cement Type
Negligible	0.00-0.10	0-150	OPC
Moderate	0.10-0.20	150-1500	Type II
Sever	0.20-2.00	1500-10000	Type V
Very Sever	Over 2.00	Over 10000	Type V plus pozzolan

The sulphate content in the groundwater has been identified as severe; consequently, Sulphate Resisting Cement (SRC) was utilized for all concrete elements in contact with the soil.

4.2.6 Seismicity

Seismicity: Seismotectonics of Pakistan is related to interaction of the following three lithospheric plates: Indian, Arabian, and Eurasian plate. In 1945, an inter-plate earthquake of M 8.1 struck the Makran coast of Pakistan and produced 1-3 meters of coastal uplift. Other large earthquakes hit Pakistan coast in 1765 and 1851.

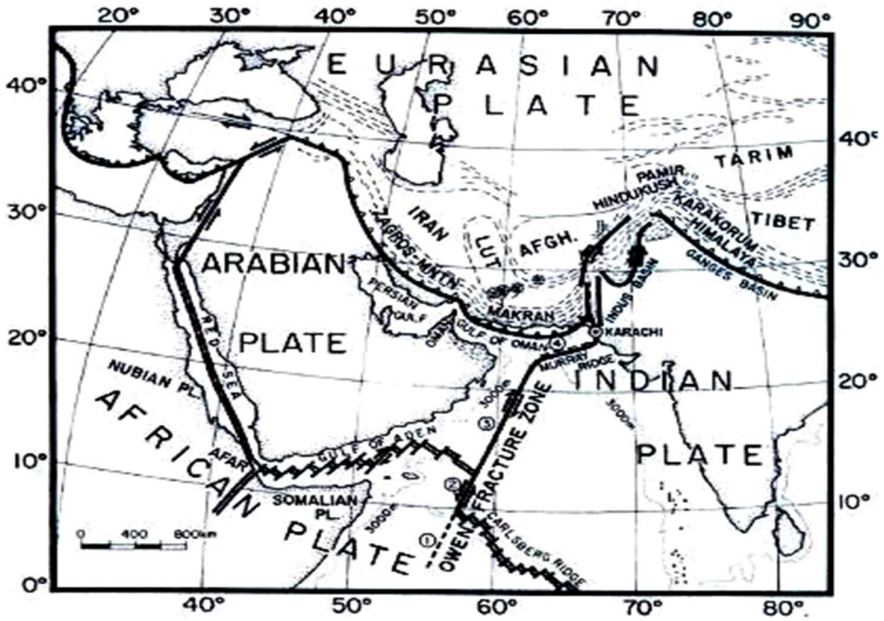


Fig. 4.7: Plate-tectonic sketch map showing location of Karachi and Makran with respect to major plate boundaries (after Jacob and Quittmeyer, 1979).

The dominant tectonic feature of the Karachi-Makran region is the extensive fold and thrust belt that extends from northwestern India to southern Pakistan. History of the region reveals that the seismically active areas around Karachi are: (a) Kirthar fold and thrust belt/Ornach-Nal-Chaman transform fault zone, (b) Makran subduction zone, and (c) Intracrationic rift zone of Indian Gujrat. All these seismically active areas lie within a range of few hundred km from Pakistan's most populous and coastal city of Karachi. The structures associated within these areas have potential of generating highly damaging earthquakes and have already played significant part in the earthquake/seismic history of the region.

Indus offshore basin is an Atlantic-type passive margin basin, which straddles the continental crust of extension of Sindh platform and Kirthar Fore Deep as well as oceanic crust of Arabian Sea. West of Indus offshore, a mid-oceanic ridge was produced as an effect of rifting of the Indian plate and eventually thinning of the lithosphere of this plate is named Murray Ridge. Northward in Pakistan offshore, the Murray Ridge extends to unite the Ornach-Nal-Chaman Fault system onshore, displaying a strike-slip boundary between the major tectonic plates of India and Eurasia (Baloch and Quirk, 2003). Makran coast and its interior is one of the very active seismic regions. Earthquakes of high intensity have occurred here. The tectonic instability of this region lies in the large number of reverse and tear faults. The greatest earthquake that occurred in this region was on 27th November 1945. A shock of 8.1 magnitude hit the

coastal areas of Makran. Its epicenter was about 60 miles from Makran coast and 160 miles north-west of Karachi. The City itself was rocked and people felt tremors strongly. The earthquake was accompanied by a tidal wave as high as 40 feet with a speed of 140 miles per hour. Many fishing villages of Sindh and Balochistan were swept away. Karachi luckily escaped because the tidal wave coincided with the ebb tide. Had it coincided with high tide, the Karachi Coast would have been under water within no time (KDA, 1970).

DHA - Clifton and its adjoining locations fall in the approach of Karachi Coastal area which is a part of Indus deltaic region. The seismic activity in the Indus deltaic region is mainly from active faults. The Indus Delta complex zone shows profound influence of various faults such as Nagar Parker fault/Luni-Sukri fault, Island Belt fault/Allah Band fault, Banni fault and Kach mainland fault. The Rann of Kutch is separated from the Thar Desert of Pakistan by the Nagar Parkar fault, which defines the boundary between two geologic provinces. The tectonic lineament shows signatures of reactivation during Pleistocene and is also well evidenced by frequent seismicity. A complex series of faults occurs between Karachi and Rann of Kutch. The main faults are generally oriented easterly and slightly concave to the north. Historically this region has suffered a number of earthquakes. The largest earthquake was in 1819. It had a magnitude of 8.0 and was felt over a wide sheathe of the Indian sub-continent. Eastern branch of the Indus River was blocked. Long tract of alluvial land uplifted as a result of earthquake. This earthquake was also associated with surface faulting and subsequent subsidence in the epicenter area. This fault produced a scarp called “The Allah Bund”. Effects of recent earthquake on January 26, 2001 have been noticed in the deltaic areas. The earthquake occurred along an approximately East-West trending thrust fault at shallow (less than 25 km) depth.

According to a map created by the Pakistan Meteorological Department, the country is divided into 4 zones based on expected ground acceleration. The areas surrounding Quetta, those along the Makran coast and parts of the NWFP, and also along the Afghan border fall in Zone 4. The rest of the NWFP lies in Zone 3, with the exception of southern parts of this province, which lie in Zone 2. The remaining parts of the Pakistani coastline also lie in Zone 3. The remaining parts of the country lie in Zone 2. According to this classification, the Project site would be placed in Zone 2B.

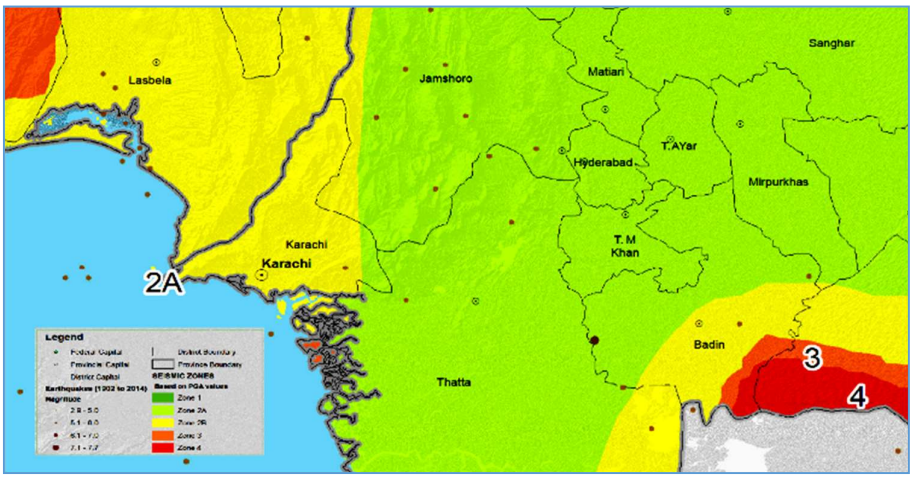


Figure 4.8: Seismic Zones between Karachi[1]

Liquefaction Features Caused by Earthquake: Liquefaction is a total loss of strength due to undrained restructuring. Disturbance, by shearing or vibration, destroys soil skeleton, with loss of grain contact and decrease of porosity, soil load is transferred to pore water, water pressure> normal stress=0, and soil acts as a liquid. Drainage reduces pore water pressure, allows grain contact and thixotropic recovery of strength (Waltham, 2002). Strong shaking produces liquefaction in the fine sands and silts during the earthquake. This causes the mineral grains to settle and expel their interstitial water to the surface. If the pore-water pressure rises to a level approaching the weight of overlying soil, the granular layer behaves as a viscous liquid rather than a solid and leads to collapse of even engineered structures. Liquefaction has been abundant in areas, where groundwater lies within 10 meters of the ground surface (Husain et al., 2004). Investigators typically have designated sites as "Liquefied" on the basis of the presence of surficial liquefaction features, such as venting of sediment to the surface (i.e., sand boils), ground cracking associated with liquefaction (e.g., lateral spreading), or surface settlements. Other evidence of liquefaction includes tilting or settling of overlying structures and floating of underground structures (Olson et al., 2002).

4.2.7 Tsunamis

Tsunamis in Indo-Pak region are relatively rare. Destructive tsunamis that may have occurred in the Arabian Sea have not been documented.

[1] Map data source(s): PMD, GSP, Pakistan Engineering Council – Prepared by Al hasan Systems Private Limited

27th/28th November 1945 (origin Makran): The 1945 earthquake of magnitude of 8.3 on Richter Scale induced a Tsunami that was the deadliest. It originated off the Makran coast in Pakistan and was centred at 97.6 kilometres SSW of Pasni, 98.5 kilometres SE of Gwadar, and 408 kilometres W of Karachi. It reached a height of 40 feet in some Makran ports and caused great damage to the entire coastal region. The fishing village of Khudi, some 30 miles west of Karachi, was wiped out completely. All the inhabitants and their huts were washed away. The towns of Pasni and Ormara were badly affected. Both were reportedly under water after the tsunami.

At Karachi, the tsunami arrived from the direction of Clifton and Gizri. It ran along the oil installations at Keamari and flooded a few compounds. The waves were 2.0-meter-high when they reached Karachi. There was a delay of more than one hour between the main shock and arrival of the damaging tsunami at Karachi. The sea is 3.36 meter (11ft) below the road level and several meters below the average ground level at Project site in Clifton. A tsunami wave of much higher magnitude than 9 meter may be a matter of concern to the area but such events are less likely to occur in the north of the Arabian Sea.

4.2.8 Storms

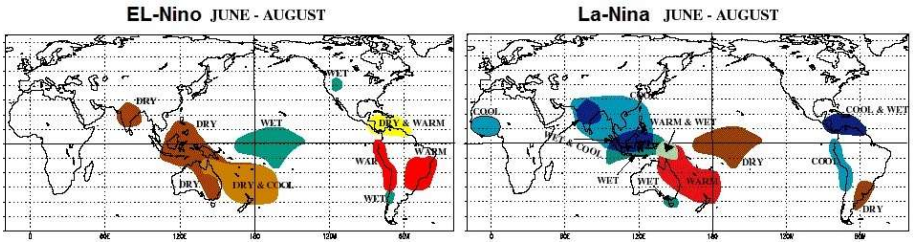
Movement of cyclone storms in the Arabian Sea is generally in the west-north-westerly direction. The one that moved into the coastal area on May 12, 1999 changed direction and hit the coastal area of Badin while Karachi was in the peripheral area and only rain showers of moderate intensity were recorded. This coast is otherwise classified outside the zone of cyclone activity for the Arabian Sea. Thunderstorm frequency is also low and is reported to occur at an average rate of 10 thunderstorms/year.

The extended period of sunshine over Pakistan during the summer of 2007 raised the heat content of the Arabian Sea that is adjacent to the heat zone of Pakistan. This had upset the heat balance and hence the water balance of the region. Northern Areas of Pakistan was lashed by windstorm in late May. This was followed by the Tropical Cyclone Gonu in the first week of June, and then by Tropical Cyclone 03A from the south of Mumbai, and thereafter in the third week of June by Tropical Cyclone 04B nicknamed Yemyin, and then a series of depressions traveling almost directly to the heat zone in Pakistan. This time again Karachi remained in the periphery of the cyclone activity zone but it did receive 61 mm rainfall during the cyclone movements about 100 km offshore.

4.2.9 Impact of Climate Change - Karachi

A UK-based climate change expert has warned that there will be an exceptional change in the temperatures in Pakistan as a whole in the coming

years, but that the province of Sindh will be less affected as compared to the other provinces of the country. Karachi may however face the threat of rising sea levels by the year 2100, at about 8 feet below sea level. The UK-based climate change expert said that climate change could influence monsoon dynamics and cause summer precipitation levels to drop, as well delays in the start of the monsoon season. While another report said that the impact of climate change in Karachi will deepen by 2030. Due to global warming the coastline of Karachi is likely to be flooded due to rising sea levels. Many seminars and public gathering are held in the city to make the government and public fully aware of global warming, speakers at the seminar have urged the government to prepare long and short-term plans to reduce the impact of global warming on natural resources. Karachi also faces the threat from super cyclones which are said to increase their intensity and momentum in years to come.



4.2.10 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.

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.

Air pollutants that cause negative health and environmental impacts include PM, ozone (O3), carbon monoxide (CO), nitrogen oxides (NOx), sulfur oxides (SOx), and volatile organic compounds (VOCs), as described below.

- PM is the term for airborne particles; it includes dust, dirt, soot, smoke, and liquid droplets. It is the air pollutant most damaging to health. Some particles are directly emitted into the air. Particles can also be created by atmospheric conversion of sulfur dioxide (SO2) and NOx into sulfates and nitrates. Monitoring stations that measure PM10 are located only in Islamabad, Quetta, Peshawar, Lahore, and Karachi. PM10 can be inhaled into the lungs and results in respiratory illness associated with premature mortality. Despite strong scientific evidence that particulate matter of less than 2.5 microns (PM2.5) is the most dangerous subset of PM10, no systematic monitoring information on PM2.5 is available in Pakistan.

- SO2 is a by-product of burning fossil fuels such as crude oil, furnace oil, diesel, and coal. SO2 can be transformed in the atmosphere into sulfates that appear as fine particles.

- NOx derives from vehicle exhaust, combustion installations such as power plants, and industrial and agricultural activity. NOx reacts with other air pollutants to form O3 & fine particulates (nitrates) in the lower atmosphere.

- O3 VOCs react with NOx and other chemicals in the atmosphere to create harmful secondary pollutants, including O3, and cause health problems ranging from eye irritation to decreased lung capacity.

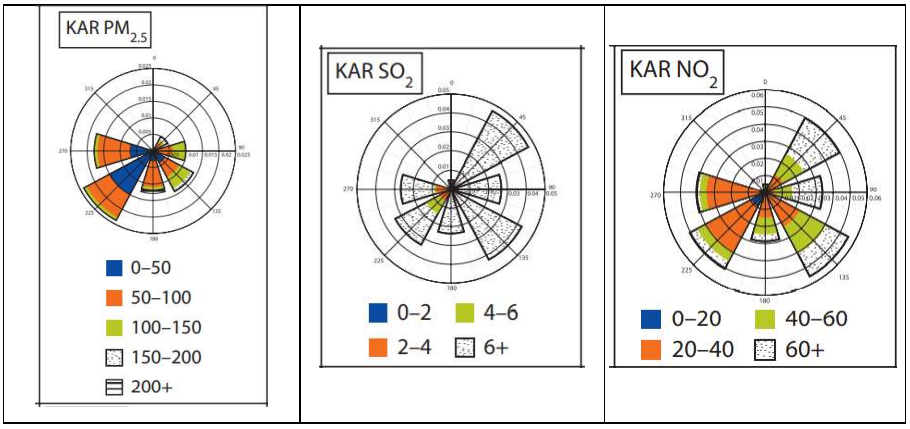
- CO is a product of incomplete fuels combustion. At low exposure levels, CO causes mild effects that include headaches, dizziness, disorientation, nausea, and fatigue. However, high exposure levels of CO might be lethal.

- VOCs encompass various contaminants, including organic compounds and solvents. Petroleum reservoirs, storage systems for gasoline and other volatile compounds, industrial processes and fuel combustion, use of paints and cleaners, and agricultural activities emit these compounds. VOCs are the main precursor of O3.

Air quality data published by Ghauri, Lodhi, and Mansha (2007) show that urban concentrations of PM10 in Pakistan frequently exceed 200 micrograms per cubic meter (µg/m³). Such concentrations are substantially larger than the World Health Organization (WHO) interim target of 70 µg/m³. In contrast, data compiled by Colbeck, Zaheer, & Zulfiqar (2010) demonstrate that concentrations of O3 in Pakistan's large cities have been well within the WHO air quality guidelines. Colbeck, Zaheer, and Zulfiqar (2010) also indicate that it is very likely that CO levels in urban centers exceed the WHO guidelines during the day, particularly Quetta (with a 48-hour mean of 8.1 mg/m³), Karachi (5.8 mg/m³), Rawalpindi, Lahore (4.6 mg/m³), and Islamabad and Peshawar (3.5 mg/m³). However, the damages caused by CO are not as significant as those of PM2.5.

Finally, another report[2] 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, as well as SO2, NO_X, O_3 and CO, all exceeding WHO limits, based on data taken by SUPARCO in 2004.

An analysis of temporal trends of air quality pollutants for Islamabad, Karachi, Peshawar, and Lahore shows higher CO, NO2, SO2, and PM2.5 concentrations during winter periods; O3 shows the opposite trend. Since sunlight and heat drive the O3 formation, warm sunny days usually have more O3 than cool or cloudy days. All pollutants present similar wind roses.[3]



[2] Kalwar 2014

[3] Cleaning Pakistan's Air • http://dx.doi.org/10.1596/978-1-4648-0235-5

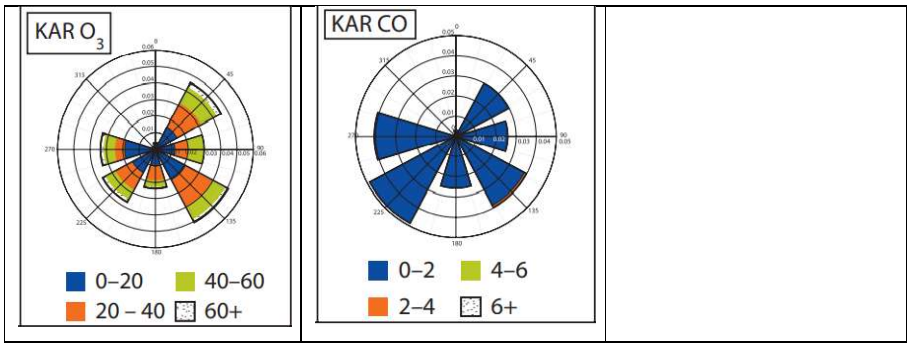


Figure 4.9: wind roses for major pollutants

During winter periods, SO2 and PM2.5 tend to present higher concentrations; O3 shows the opposite trend. Thermal inversions that happen across much of Pakistan from December to March lower the mixing height and result in high pollutant concentrations, especially under stable atmospheric conditions. Suspended PM contributes to the formation of ground fog that prevails over much of the Indo-Gangetic Plains during the winter months. In addition, sunny and stable weather conditions lead to high concentration of pollutants in the atmosphere (Sami, Waseem, and Akbar 2006). Due to high temperatures in summer (40–50°C), fine dust rises up with the hot air and forms "dust clouds" and haze over many cities of southern Punjab and upper Sindh. Dust storms generated from deserts (Thal, Cholistan, and Thar), particularly during the summer, adversely affect visibility in the cities of Punjab and Sindh.

The following Table shows the ambient AQI values that has been calculated with the recorded pollutant concentration data of the selected sampling locations, showing the degree/intensity of ambient air pollution category at monitoring locations during a certain monitoring period (e.g., 1, 8 or 24h) due to its surrounding meteorology and human activities & its relation to health hazards.

Table 4.1: Air quality index (AQI) and air quality category at selected locations in Karachi city[4]

4 A Study of Ambient Air Quality Status in Karachi, By Applying Air Quality Index (AQI) - Durdana Rais Hashmi*, Akhtar Shareef and Razia Begum, Centre for Environmental Studies, PCSIR Laboratories Complex, Karachi-75280, Pakistan

Locations	Code #	Values	Category	Values	Category	Values	Category	Values	Category
		PM_{10}		SO_2		CO		NO_2	
Jail Road	R-1	119.0	Unhealthy	56.0	Moderate	43.0	Good	102.0	Unhealthy
Gulberg chowrangi	R-2	98.0	Moderate	54.0	Moderate	40.0	Good	78.0	Moderate
Gulshan-e-Iqbal	R-3	78.0	Moderate	43.0	Good	25.0	Good	66.0	Moderate
PECHS Society	R-4	88.0	Moderate	36.0	Good	17.0	Good	58.0	Moderate
Model Colony	R-5	82.0	Moderate	41.0	Good	34.0	Good	51.0	Moderate
Paramount ground, Landhi	I-1W	126.0	Unhealthy	59.0	Moderate	51.0	Moderate	81.0	Moderate
Abbott Laboratoy, Landhi	I-2W	130.0	Unhealthy	72.0	Moderate	39.0	Good	101.0	Unhealthy
Lucky Textile, Landhi	I-3W	148.0	Unhealthy	69.0	Moderate	41.0	Good	102.0	Unhealthy
Naurus G. belt, SITE	I-4E	169.0	Poor	101.0	Unhealthy	53.0	Moderate	103.0	Unhealthy
Siemens G. belt, SITE	I-5E	172.0	Poor	76.0	Moderate	57.0	Moderate	109.0	Unhealthy
Manghopir, SITE	I-6E	167.0	Poor	65.0	Moderate	43.0	Good	90.0	Moderate
Singer chowrangi, KIA	I-7W	100.0	Moderate	59.0	Moderate	39.0	Good	81.0	Moderate
Chamra chowrangi, KIA	I-8W	98.0	Moderate	62.0	Moderate	41.0	Good	86.0	Moderate
Korangi #2, KIA	I-9W	91.0	Moderate	49.0	Good	34.0	Good	79.0	Moderate
Port Qasim	I-10	64.0	Moderate	41.0	Good	26.0	Good	56.0	Moderate
Hasan Square	C-1	162.0	Poor	79.0	Moderate	49.0	Good	100.0	Moderate
Liaquatabad	C-2	168.0	Poor	82.0	Moderate	59.0	Moderate	105.0	Unhealthy
Garden	C-3	183.0	Poor	96.0	Moderate	64.0	Moderate	108.0	Unhealthy
Gulistan-e-Johar	C-4	147.0	Unhealthy	60.0	Moderate	47.0	Good	88.0	Moderate
NIPA	C-5	98.2	Moderate	69.0	Moderate	42.0	Good	81.0	Moderate

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.

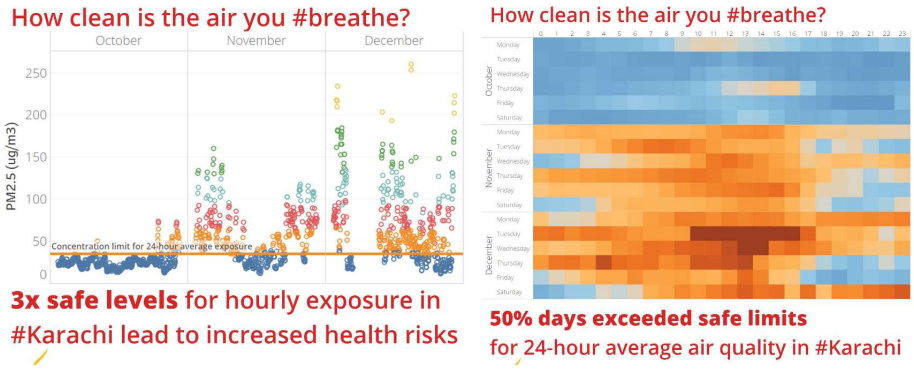


Figure 4.10: How Clean is Karachi's Air

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).

In contrast, an ambient air quality assessment conducted by EHS Services in November 2025 classified the macroenvironment's air-shed as **unpolluted, with Suspended Particulate Matter (SPM/TSP), PM_{10}, and $PM_{2.5}$ recorded at 253**

µg/m³, 90.1 µg/m³, and 29.1 µg/m³, respectively. Concentrations of **SO2 (3.4 µg/m³), NO (4.3 µg/m³), NO2 (9.1 µg/m³), CO (0.4 mg/m³), and O3 (13.8 µg/m³)** were found to be within the permissible limits of the SEQS. This substantial reduction in pollution levels is primarily due to the closure of the KPT Coal Yard—identified in 2018 as a major pollution source—following orders from the Honorable Supreme Court of Pakistan. Consequently, pollutant levels in the Clifton Block 2 area of Karachi have stabilized within permissible limits, further facilitated by the prevailing windy conditions in the region.

4.2.11 Water Resources, Water Quality and Drainage

4.2.11.1 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 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 + 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.

4.2.11.2 Greater Karachi Bulk Water Supply System

To supply the city of Karachi with 280 MGD of water supply, the Greater Karachi Bulk Water Supply Scheme was designed in 1953. The scheme was modeled and divided into four equal phases on the basis of population projection till the year 2000. Each scheme, with the design rate of 70 MGD, comprised of open canals,

covered conduits, a tunnel, siphons, pumping stations and mains to supply water from the Keenjhar Lake. The details are discussed below and shown in Figure 4.14.

1st Phase

- Proposed raw-water pumping at Dhabeji to bring 70 MGD of water from Keenjhar Lake and water treatment plant of 70 MGD at COD Hills, Karachi.
- Development of complete water conveyance system comprising of a 280 MGD lined canal, a conduit of equal capacity up to Pipri and of 140 MGD capacity up to Karachi.
- Work on 10 MG reservoir at COD Hills along with the distribution net-work.
- It started in 1954 and completed in 1961 at a total cost of PKR 185 million.

2nd Phase

- It included construction of a 70 MGD pump house at Dhabeji, laying of 84" dia pre-stressed pipe siphons, a 25 MGD pump house at pipri and two water treatment plants of 25 and 45 MGD along with 10 MG reservoirs at Pipri and COD Hills respectively.
- Work for this phase was awarded in 1969 and completed in early 1971 at a total cost of PKR 200 million.

3rd Phase

- It included the construction of a 70 MGD pumping station at Dhabeji, two pumping stations along with water treatment plants of 25 MGD capacity each at North East Karachi and Pipri, 84"dia pipe siphons, three balancing reservoirs and the distribution mains.
- - A reservation for supply of 22 MGD of un-filtered water to Karachi Steel has also been made under this phase.
- - Work for this phase started in 1975 and completed in 1978 with the total cost of PKR 750 million.

4th Phase

- Due to financial constraints, 4th Phase works were divided into two parts.
- Under this phase improvement of lined canal, modifications of the present Dhabeji Pumping Stations, laying of 84" dia pipe syphons, construction of a 25 MGD pump house and clarification units at Pipri were commissioned.
- Also, improvement of the secondary distribution network and installation of domestic meters in K.D.A. Scheme No.1 & 5 were taken up with the assistance of World Bank and all the works were completed in June, 1987 at a total cost of PKR 360 million.
- After this phase, the city's water supply increased by 50 MGD.

Hub Water Supply System

- The Hub dam was constructed by WAPDA on Hub River to from 1963-1981
- At Stage-I, 90 MGD pump house, two steel pressure mains one 20 MG reservoir, trunk mains and primary treatment of lake water by screening and chlorination were completed in August, 1982 at a total cost of PKR 260 million.

- Stage-II included the improvement of secondary distribution network and construction of a 90 MGD water treatment plant.

5th Phase (Greater Karachi Bulk Water Supply Scheme)

- Karachi's water supply system has expanded considerably in this phase. As discussed in initial four phases, Karachi was getting 280 MGD of water.
- Then 100 MGD water were added to the system through K-II supply project which were completed in 1998 with the assistance of World Bank.
- Through a bulk water supply project, the city got another 40 MGD of water in 2000.
- K-III 100 MGD Water Supply Project, further added into the existing supply which were completed in 2006 with the assistance of GoP.
- Now, the K-IV water project has been planned to fill the gap between the city's demand and supply of water.
- Approved on July 10, 2014 with the proposed design capacity of supplying an additional 650 MGD of water to Karachi. K-VI will be completed in three phases at a cost of PKR 25.6 billion rupees.

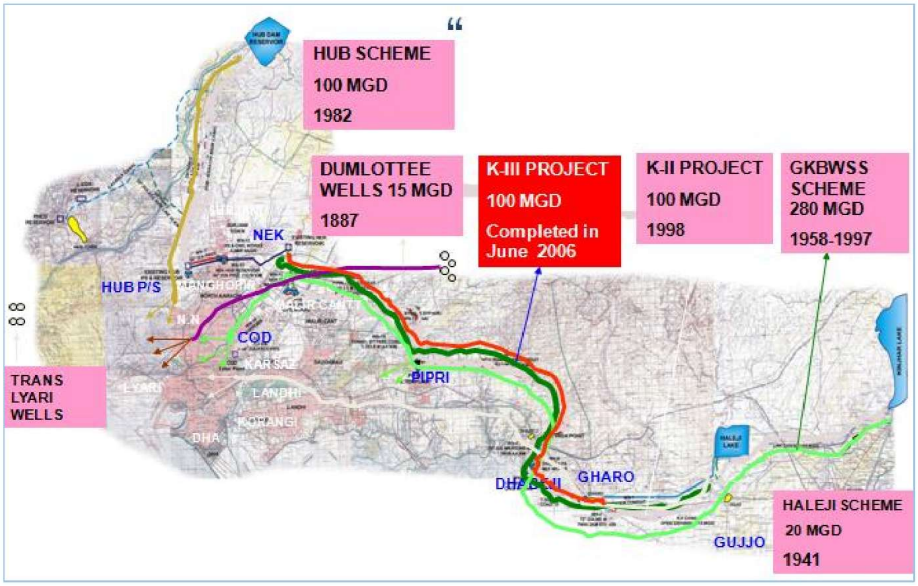


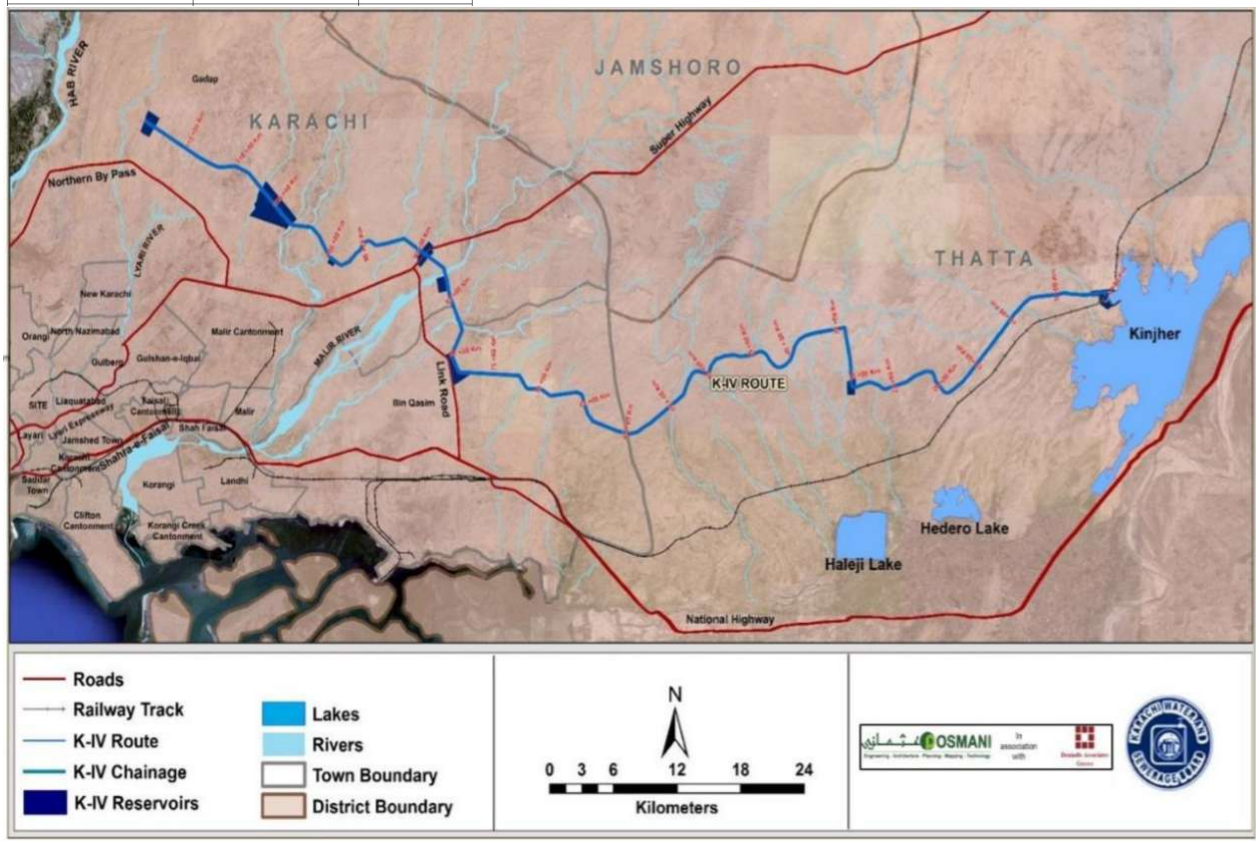
Figure 4.14: Water Supply System of Karachi (Glimpse from Past to Present)
Source: KW&SB (2019)

4.2.11.3 Proposed Bulk Water Supply Scheme

K-IV, is a municipal infrastructure project being jointly developed by the Provincial and Federal Governments in Karachi, Pakistan, to augment the city's daily water supply. This project is divided into three phases and each phase will increase water supply capacity. Details of K-IV are shown in Figure 4.15.

K-IV Project; Part of Greater Karachi Water Supply Scheme, Indus Water from Keenjhar Lake to Karachi City		
Phase	**Capacity**	**Proposed Completion Year**
K-IV Phase-1	260 MGD	Year 2018
K-IV Phase-2	260 MGD	Year 2022
K-IV Phase-3	130 MGD	Year 2025

Figure 4.15: K-IV Bulk Water Supply Schemes Karachi



4.2.11.4 Present Water Supply and Sewerage System

The water supply and sewerage system in the macroenvironment is managed by Karachi Water Supply & Sewerage Board (KW&SB). Present water supply system of Karachi City has a supply capacity of 560 mgd. Actually, as of the end of year 2006, the KW&SB supply bulk water of about 630 mgd beyond the capacity as shown in following Table. Out of 630 mgd, water of 209 mgd is supplied without filtration, which is equivalent to one third of actual supply amount of 630 mgd.

Water is collected and treated by the conventional water treatment plants and distributed by a system which is at least 40-45 years old with some new distribution facilities in the city. The outdated system along with improper operation and maintenance causes the issue of revenue loss. In addition, there is no metering for retail customers and only 25 percent of commercial and

industrial customers have a metered supply. The water supply is irregular due to power failure at KW&SB pumping stations which further increases the problems in water distribution system. Moreover, almost 40 per cent of the population lives in slums with limited water supply & poor sanitary infrastructure.

Figure 4.16 presents the detailed water distribution in Karachi.

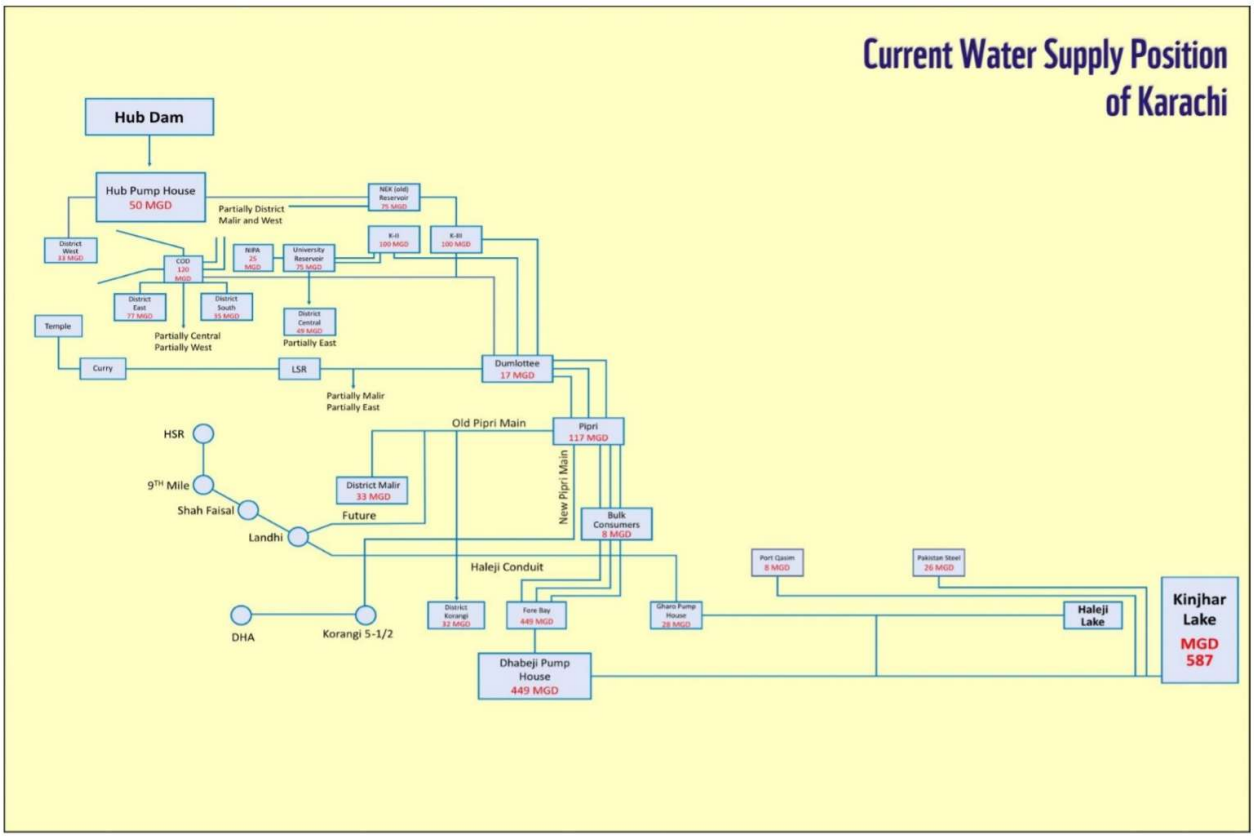


Figure 4.16: Current Water Distribution System in Karachi from Hub Reservoir and Keenjhar Lake

Table 4.1: Present Water Supply Capacity			
Supplied from		***Rated Capacity***	***Actual Supply***
Gharo Filtration Plant		20 mgd	30 mgd
Pipri Filtration Plant	with Filtration	100 mgd	102 mgd
	without Filtration	-	32 mgd
Dumlottee Conduit (without Filtration)	from Wells	20 mgd	0 mgd
	from GK/K-III Systems	-	17 mgd
NEK Old Filtration Plant		25 mgd	5 mgd
NEK New Filtration Plant		100 mgd	100 mgd
COD Filtration Plant	with Filtration	115 mgd	104 mgd

Table 4.1: Present Water Supply Capacity			
	without Filtration	-	48 mgd
Hub Filtration Plant		80 mgd	80 mgd
Supply without Filtration (from K-III System)		100 mgd	95 mgd
Supply without Filtration (from GK System)		-	17 mgd
Total		560 mgd	630 mgd

4.2.11.5 Water Supply Network

Karachi water and sewerage corporation (KWSC) is the organization responsible for water transmission and distribution across the city. Indus river system authority (IRSA) provides water to Sindh, therefore, this river indirectly becomes part of water supply system for the city. River Indus feeds water to the Lake Keenjhar. From Keenjhar, water through conduits goes to Haleji, Gharo, Port Qasim, Steel Mills and then to Dhabeji pumping station. From Dhabeji Pumping station, water is pumped to different pumping stations to supply water among all six districts of the city by using electrical pumping motors. Water from Hub Dam is supplied to Hub Pump House through Hub Canal and then supplied to NEK, Old Reservoir and different areas of the city. Karachi's water supply infrastructure comprises of 25 bulk water reservoirs, 150 pumping stations, 8 water-filtration plants, 75 kilometers of canals, over 11,000 kilometers of pipeline, 20 sewage-pumping stations, 3 sewage treatment plants, and over 250,000 manholes. Almost 1.13 million domestic connections and 9,317 bulk customers in Karachi are provided water supply and sewerage services (Figure 4.17). In informal settlements and industries, the most of the water demand is met through non-piped systems, including private water tankers. Almost 24 hydrants have been licensed to the private parties by KWSC. Out of these 24 hydrants, only 10 are operational while the rest were closed as per a recent Supreme Court Order. unregulated hydrants are rampantly spread across the city. KWSC introduced amendments to discourage the illegal use of hydrants. Since 2009, it has dismantled over 948 illegal hydrants in an effort to confront the illegal use of water. Now six regulated and meter hydrants supply water to the city. Despite that, the issue of unregulated hydrants needs attention. There are two distribution channels for Karachi, mainly Northern and Southern Channels.

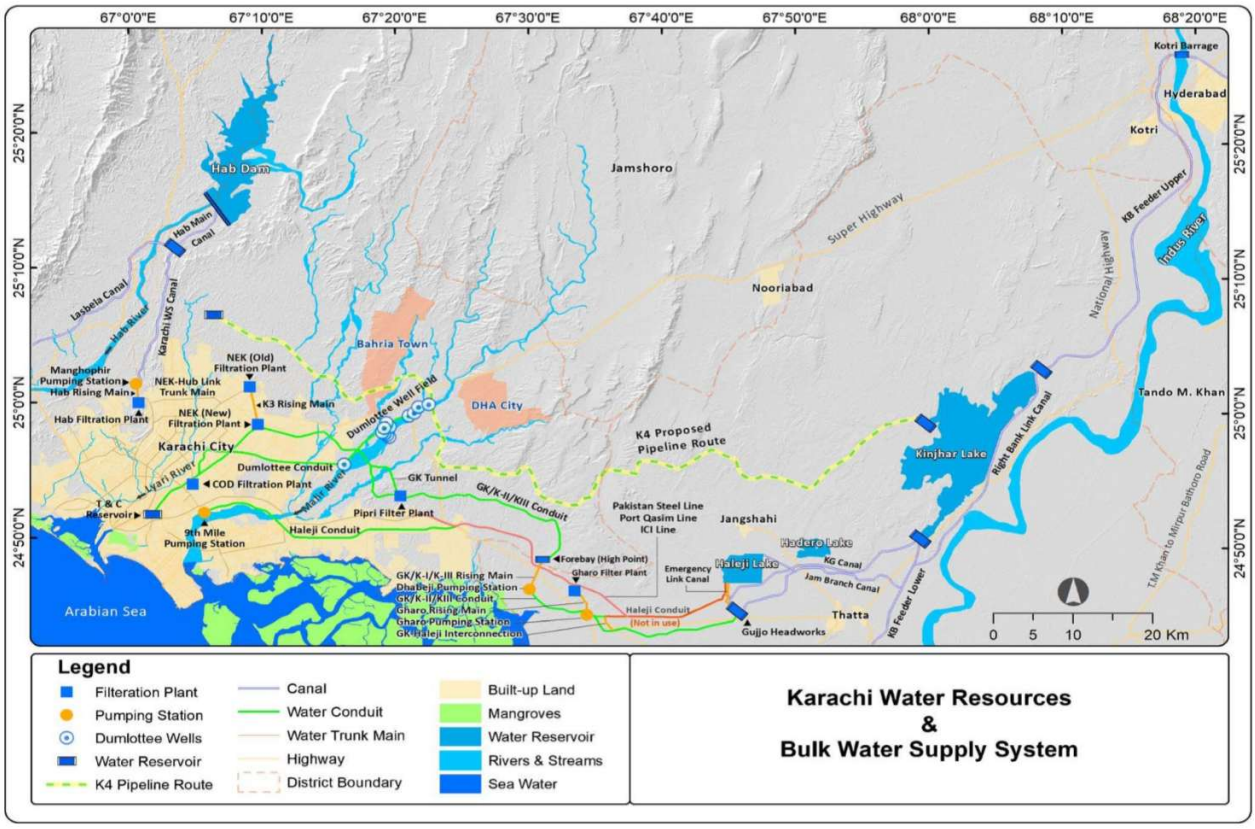


Figure 4.17: Karachi Water Resources and Bulk Water Supply System

4.2.11.6 Water demand and supply with past trends and future trends

Karachi predominantly depends on the River Indus for its water supply, particularly due to the reduced inflow from the Hub Dam. Currently, the city receives about 580 million gallons per day (MGD) from the River Indus, while its actual requirement ranges between 820 and 1,200 MGD per World Health Organization (WHO) standards, indicating that Karachi is only meeting approximately 50% of its water needs.

The K-IV water supply project, which consists of three phases, is critical to addressing this issue. Phase I aims to add an additional 260 MGD to the existing supply network but remains incomplete, exacerbating the water demand and supply gap. Phases II and III are planned to contribute another 260 MGD and 130 MGD, respectively; however, delays are anticipated for these phases as well. Even upon completion of the K-IV project, it is expected that the city will continue to face water shortages, and the situation is projected to worsen without additional measures being implemented to rectify the current challenges.

4.2.11.7 Surface water and Groundwater Quality Assessment

The water scarcity in Karachi is largely attributed to the rapid population growth and industrial activities, compelling residents to rely on alternative water sources such as privately-owned groundwater systems. These sources extract, process, and sell groundwater at significantly high costs. Unfortunately, the quality of this groundwater is poor, primarily due to over-extraction by farmers, infiltration of domestic wastewater, contamination from industrial chemicals, and seawater intrusion, which make it unsafe for human consumption without adequate treatment.

A study conducted by the Pakistan Council of Research in Water Resources (PCRWR) during 2015-2016 revealed alarming water quality issues in Karachi. Out of 28 water samples taken from various sources, 24 were contaminated with E. coli, indicating that approximately 86% of Karachi's water is unfit for consumption. The most likely cause of this bacterial contamination is the discharge of sewage, which often runs parallel to drinking water pipelines, leading to contamination due to poor maintenance and pipe breakages. Notably, no significant improvement in water quality was observed from 2002 to 2015.

Additionally, another analysis of surface and groundwater samples found that nearly 88% of the sources exceeded the World Health Organization's recommended lead levels. A World Bank study across 18 towns in Karachi revealed that 89% of blood samples showed lead levels higher than WHO guidelines. Elevated lead exposure has been linked to learning disabilities in children, posing substantial socioeconomic challenges for future generations.

4.2.11.8 Ground Water Potential in the Macroenvironment

An electrical resistivity survey was performed to evaluate the subsurface geological conditions and assess the area's groundwater potential. 2 Vertical Electrical Soundings (VES) were carried out in the microenvironment of the Plot FL-15, Block 02, Clifton for the purpose of Aquifer Delineation. The total water requirement of the project is 79,125 Gallons Per Day. The Interpreted results based on the data gathered from the field have led us to derive the following conclusions:

- All the electrical resistivity values show presence of adequate quantities of water in the microenvironment. However, the recommended location for test well must be marked in region of probe 1 to obtain sustainable yield.
- The perch water level lies between 14-30 Ft.
- Test bore hole of 700-800 ft. is recommended. The safe yield that can be drawn from 700-800 ft deep well will be 90USGPM/129,600USGPD.

4.2.11.9 Sewerage system of Karachi

To enhance the sewerage system of Karachi and mitigate pollution in natural water bodies, the Karachi Water and Sewerage Corp (KWSC) is implementing the Greater Karachi Sewerage Plan (S-III). This initiative seeks to improve the environmental conditions of the city through a comprehensive system for the collection, treatment, and disposal of wastewater from municipal and industrial sources. Sewage will be transported via a reinforced concrete pipe to the River Lyari and Malir, eventually being discharged into the sea.

Key Components of the Project:

- **Malir Trunk Sewer**: 5 contract packages totaling 22.74 km in length.
- **Lyari Trunk Sewer**: 8 contract packages spanning 33.32 km.
- **Upgrading and Capacity Enhancement of Sewage Treatment Plant** from 51 to 100 MGD at Haroonabad SITE.
- **Upgrading and Capacity Enhancement of Sewage Treatment Plant** from 54 to 180 MGD at Muaripur.
- **Construction of a New Sewage Treatment Plant** in Korangi with a capacity of 180 MGD.

The treatment of sewage, a previously neglected issue, received renewed attention from the water commission, culminating in the restoration of Sewage Treatment Plant-III (77 MGD) in June 2018. Although the completion of Treatment Plant-I (100 MGD) was anticipated in 2019, it remains unfinished, despite prior commitments made to the Judicial Commission. Additionally, Sewage Treatment Plant-IV (180 MGD), expected to be operational by December 2020, has yet to be completed. In June 2025, the Chief Minister of Sindh instructed KWSC to ensure the full operational status of the TP-I component of the S-III project by the end of August and to expedite the work on TP-IV for completion within a year.

Recent updates highlight that the Haroonabad TP1, located in the SITE Industrial Area, is currently operational and undergoing testing as of December 2025. Described as a "game-changer," this plant aims to recycle sewage for industrial use, targeting a supply of approximately 1 million gallons per day (MGD) to the SITE area by the end of December 2025. This initiative is expected to reduce industrial production costs while conserving clean public water. Furthermore, secondary treatment for 20 MGD has been successfully completed, with plans to eventually treat up to 100 MGD of sewage. TP1 primarily caters to major districts, including SITE, North Nazimabad, North Karachi, Gulberg, and Liaquatabad.

Another treatment facility was established in DHA Phase VIII to manage sewage from both DHA Phase VIII and Clifton Cantt. This facility became operational in 2014 with a capacity of 2.4 MGD, currently processing 1.2 MGD of sewage from DHA Phase VIII.

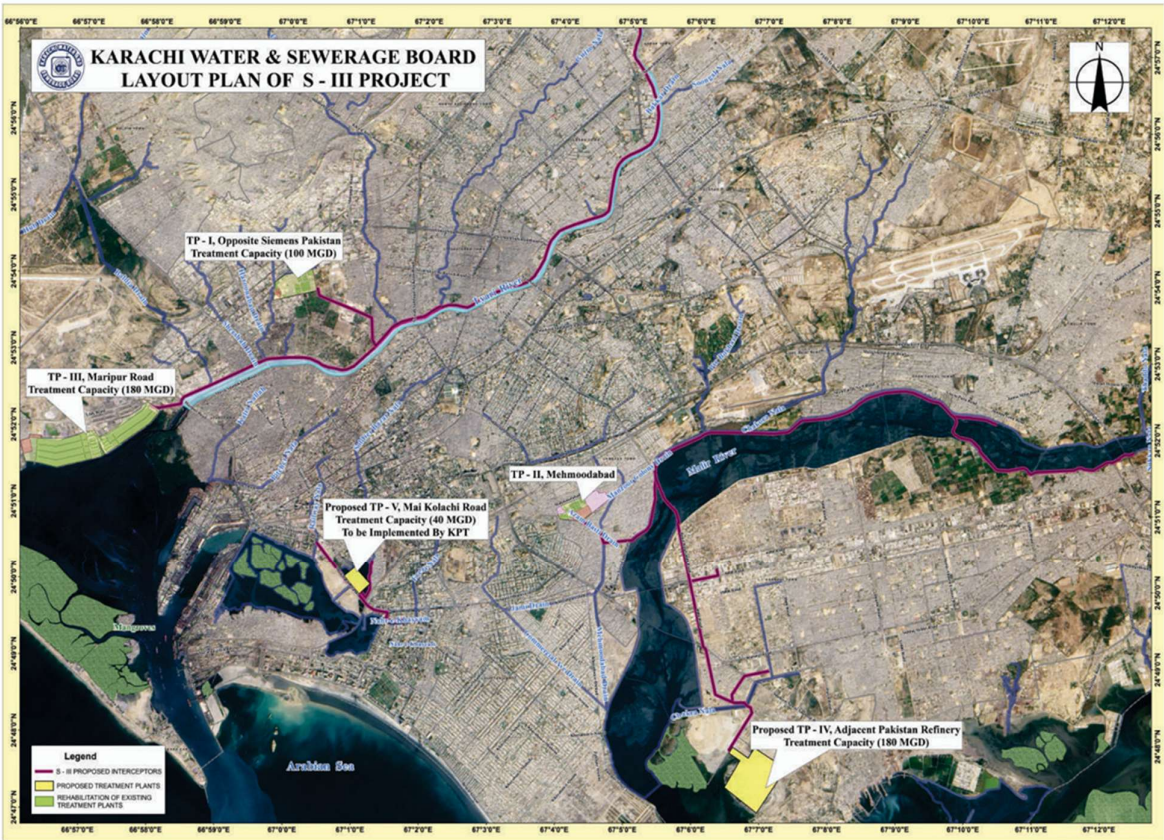


Figure 4.18: Layout Plan of S-III

4.2.11.10 Collection and Disposal Mechanism

Sewage is collected through a network of pipes and open channels and is discharged into water bodies via rivers and nullahs. In Karachi, untreated wastewater, which includes domestic sewage and industrial effluents, is released into the Lyari and Malir rivers, eventually reaching the coastal areas. Of the 475 million gallons per day (MGD) of wastewater generated, approximately 420 MGD remains untreated, with part of it flowing into the sea through a 232 km long Main nullah and a 1000 km network of local drains. These nullahs primarily feed into the two key rivers, Malir and Lyari.

Currently, there exists a significant disparity between the volume of wastewater produced and the capacity of treatment facilities. The amount of wastewater

generated in Karachi surpasses the treatment plants' capabilities, with an estimated 417-425 MGD being discharged into the sea untreated.

4.2.11.11 Drinking Water Quality in the Macroenvironment

To evaluate the potability of water within the project's macroenvironment, a representative sample was collected from the vicinity and subjected to microbiological analysis. The analytical results, summarized in Table 4.3, indicate that the water quality fails to meet the required safety standards for human consumption due to significant microbial contamination.

Table 4.3: Water Quality Analysis of the Project Area

S #	Parameter	Results	Recommended Value for Drinking Water
1	Total Colony Count	560 cfu/ml	Less than 500 cfu/ml
2	Total Coliforms	Too Numerous to Count (TNTC)	0/100 mls
3	Fecal E. Coli	Nil	0/100 mls
4	Fecal Enterococci	Isolated	0/100 mls

The analysis reveals elevated Total Colony Counts exceeding permissible limits and the detection of Fecal Enterococci. While E. Coli was not detected in this specific sample, the presence of other fecal indicators suggests a high risk of fecal contamination, rendering the water source unsafe for drinking purposes.

Recommendations: Based on the laboratory findings, it is strongly recommended that the existing water source should not be used for drinking without prior treatment. A comprehensive water treatment system, including effective disinfection methods such as chlorination, UV sterilization, or advanced filtration, must be implemented.





Figure 4.23: Water Sample from Project Neighborhood

4.3 Description of Ecological Environment

The macroenvironment of Clifton Block 2, housing the T&A Craft Residency, reflects a landscape fundamentally altered by intense urban expansion and land reclamation. Historically, the pursuit of high-value real estate led to the systematic reclamation of coastal land, which significantly degraded the original marine biodiversity. This process resulted in the substantial loss of indigenous mangrove forests and the displacement of benthic communities that once thrived in the intertidal zones. Currently, the natural woody vegetation has been largely replaced by hardy, invasive species such as *Prosopis juliflora*, *Calatropis procera*, *Conocarpus erectus*, and *Eucalyptus*, which dominate the saline-stressed terrain.

Despite these historical losses, the emergence of the Clifton Urban Forest represents a transformative milestone for the local ecology. This man-made sanctuary has revitalized the macroenvironment of Clifton Beach by serving as a critical carbon sink and a biological corridor. By utilizing the Miyawaki method and other dense planting techniques, the forest has restored soil health and successfully reintroduced various avian and insect species to the coastal belt. The forest provides a vital buffer against coastal erosion and the urban heat island effect, significantly enhancing the ecological value of Clifton Beach and offering a scalable model for urban rewilding.

To further these conservation efforts and demonstrate corporate environmental responsibility, Shehnaz Enterprises should adopt a nearby public park or green space. By transforming such areas through the systematic planting of native tree species such as *Azadirachta indica* (Neem); Shehnaz Enterprises can actively restore local biodiversity. This initiative would replace invasive monocultures with a resilient, multi-layered ecosystem, contributing to the broader ecological restoration of Clifton and fostering a sustainable urban habitat for the community.

4.4 Socio-economic Profile of Project Area

Karachi District

Overview: Karachi District, formerly known as Karachi South District, is a vital administrative unit of the Karachi Division in Sindh, Pakistan. Established in 1972, it serves as the administrative heart of the city, housing the headquarters of the divisional government. According to the 2023 Pakistani census, the district has a population of 2,329,764, all of whom reside in urban areas. In 2023, the

Government of Sindh officially renamed it from "Karachi South" to "Karachi District" to reflect its status as the central hub for divisional administration.

Administration and Governance: Under the Sindh Local Government Act of 2021, the previous system of District Municipal Corporations (DMCs) was restructured into 26 towns. Karachi District is currently divided into two primary Town Municipal Committees:

- *Saddar Town*
- *Lyari Town*

Historical Evolution: The district has undergone several administrative changes over the decades:

- *2000: The district was briefly abolished and reorganized into Jamshed Town and Saddar Town.*
- *2011: The Sindh Government restored the Karachi South District.*
- *2013: Following the creation of Korangi District, Jamshed Town was moved to Karachi East. The district was then redefined to include Saddar, Clifton, and the Defence area, establishing it as the most affluent region of the city.*
- *2022–2023: The district was formally divided into its current two-town structure and officially renamed Karachi District.*

Economic and Political Significance: Karachi District is the economic backbone of Pakistan. It hosts the head offices of major corporations, financial institutions, and banks. It is also the seat of provincial power, containing the Sindh Assembly, High Court, and the official residences and offices of the Governor, Chief Minister, Chief Secretary, and Commissioner. Additionally, it serves as the diplomatic center, housing numerous foreign embassies and consulates.

Demographics: The 2023 census recorded 425,093 households in the district. The population exhibits a sex ratio of 114 males per 100 females. The literacy rate is high at 78.57% (80.76% for males and 76.05% for females), while approximately 20.91% of the population is under the age of 10.

Linguistic Diversity: The district is a melting pot of languages, with the 2023 census reporting the following primary first languages:

→ Urdu: 34.7% (808,465 speakers)
→ Sindhi: 15.6% (363,930 speakers)

→ Balochi: 11.6% (269,872 speakers)
→ Pashto: 9.42% (219,474 speakers)
→ Punjabi: 8.17% (190,438 speakers)
→ Hindko: 3.71% (86,498 speakers)
→ Saraiki: 2.64% (61,543 speakers)
→ Others: 14.2% (Including Gujarati, Brahui, Kashmiri, and others)

Religion: Islam is the majority religion, followed by 93.85% of the population. The district also has significant minority communities, including Hindus (4.24%, including Scheduled Castes) and Christians (1.65%).

Geographic and Administrative Context

UC13 Kehkashan is a prominent area / UC located within the Saddar Town (Clifton Zone) of Karachi's South District. It is widely considered one of the most affluent and well-planned urban residential and commercial hubs in Pakistan. The area encompasses several high-profile blocks and is bordered by the Arabian Sea to the south and the Korangi Road/Defense Housing Authority (DHA) to the east.

Surroundings of the project: Bone Vista Apartments, Jama Masjid Hazrat Usman Ghani, Reginal Training Institute, Pakistan Technician Club, Fortune Apartment, Khadija Tower, Guest House, Residential Bungalows and under construction building projects.

Demographic Profile

- **Population Density:** Low to moderate compared to Karachi's inner-city areas. The planning favors large residential plots and high-end apartments rather than dense informal settlements.

- **Estimated Population:** While precise figures for UC13 alone are not readily available, estimates based on electoral rolls and housing units suggest a population of approximately 50,000 to 70,000 residents. This figure includes both permanent residents and a transient population of expatriates and high-net-worth individuals.

- **Age Distribution:** The area generally has a lower proportion of young children and a higher proportion of working-age adults and seniors compared to the national average, reflecting its status as an affluent residential area with a focus on professional and established families.

- **Ethnic Composition:** Highly cosmopolitan. While predominantly Urdu-speaking, it has a significant representation of Sindhis, Punjabis, Parsis, and

a large expatriate community, including diplomats and foreign corporate staff.

- **Literacy and Education:** The literacy rate is nearly 100%. The population consists of highly educated professionals, including doctors, lawyers, business tycoons, and high-ranking government officials.

Economic Indicators

- **Income Level:** Primarily High-Income Group (HIG). It represents the elite economic stratum of Pakistan.

- **Real Estate Market:** One of the most expensive real estate markets in the country. Property values and rentals in Kehkashan are significantly higher than the city average. The area features a mix of luxury bungalows and premium high-rise residential towers (e.g., Bakht Tower, Marine Promenade developments).

- **Employment Sectors:** Residents are largely concentrated in the corporate sector, multinational corporations, banking, and large-scale entrepreneurship.

Commercial Landscape and Infrastructure

- **Retail and Lifestyle:** The UC serves as a commercial powerhouse. It houses high-end shopping malls (e.g., Dolmen Mall Clifton, The Forum, Ocean Mall) and luxury retail outlets. The area is the epicenter of Karachi's fine-dining scene, centered around Boat Basin and the E-Street corridor.

- **Diplomatic Enclave:** A significant portion of UC13 and its immediate surroundings host foreign consulates (including the British Deputy High Commission, Chinese Consulate, and Italian Consulate), making it a high-security zone.

- **Financial Hubs:** Numerous corporate headquarters and regional offices of international banks are situated along the main thoroughfares like Khayaban-e-Iqbal and Schon Circle.

- **Important landmarks:** National Institute of Oceanography, Clifton Medical Center, South City Hospital, National Aids Center, Bagh-e-Ibne Qasim, Beach View Park, Clifton Horse Training Ground, Russian Consulate, Chinese Consulate, Dolmen City Mall, Bahri Icon Tower, and Bilawal House.

5. Infrastructure and Public Services

- **Microenvironment of the area:**The microenvironment of the area comprises of a steadily growing part of the city where many modern residential and residential-cum-commercial projects are being developed to cater to the demand for luxury apartments and offices in the larger Clifton area. With the onset of CPEC projects, the demand for apartments both for purchase and rentals is bound to increase rapidly both by the local populace as well as foreigners. The microenvironment of the project area falls in Saddar Town.

- **Saddar Town's role:**Saddar Town has an important role in Karachi because the majority of important financial, commercial institutions and government offices are located in the area. It is distinct from other towns because of its historical buildings, which include the official residences of the governor and chief minister, the Sindh Assembly, City Court, Sessions Court, and High Court, the Supreme Court's Registry and the Quaid-e-Azam's Residence. The city's main markets and head offices of various banks are located in this Town, besides several diplomatic missions.

- **Utilities:**While better served than most of Karachi, the area still faces city-wide challenges regarding water shortages, though residents often supplement supply through private tankers. Power infrastructure is managed by K-Electric with a higher-than-average ratio of underground cabling.

- **Healthcare:**Home to top-tier medical facilities such as South City Hospital and Ziauddin Hospital, providing international-standard healthcare services.

- **Health Facilities:**In comparison the South District under which Kehkashan falls is well off and the health conditions are better. Common health issues prevalent among the residents of Kehkashan area include hypertension, heart attack and diabetes because of lifestyle. Health facilities are quite adequate and of high standard within this town. There are a lot of private clinics and hospitals in Saddar town and its nearby areas, while the main hospitals which are at accessible distance from the project site are as follows:

    - Dr. Ziauddin University Hospital
    - South City Hospital
    - Clifton Medical Center
    - National Research Institute OF Fertility Care
    - Aga Khan University Hospital - Clifton Medical Services
    - College of Speech Language & Hearing Sciences

- Clifton Kidney & General Hospital
- Altamash Institute of Dental Medicine

- **Education:** Houses prestigious educational institutions including Karachi Grammar School (KGS), Convent of Jesus and Mary, and various international baccalaureate schools.

- **Education Centers:** Educational facilities in the surrounding area of the Project are excellent. Availability and access to all levels of education is well provided because of efficient and effective management system to facilitate and promote higher education. Literacy rate among females is comparable with males. Training in technical skills is equally adequate. Some of the prominent educational institutes in the surrounding areas include:

  - Reginal Training Institute
  - Ziauddin Medical University
  - Indus Valley School of Art and Architecture
  - National Institute of Oceanography
  - Pakistan Institute of Tourism & Hotel Management
  - SZABIST-Karachi campus

- **Emergency Services:** The area is served by several fire stations in the broader Clifton/Saddar zone, including Saddar Fire Station, Clifton Fire Station, Gizri Fire Station, and DHA Fire Station, ensuring rapid response times.

- **Cemeteries/Graveyards:** While UC13 itself does not host large public graveyards due to its high-value land use, residents typically utilize cemeteries in nearby areas such as the Defence View Graveyard, DHA Phase VIII Graveyard, Gora Qabaristan (Maseehi Qabraistan), and Mewashah Graveyard, or other community-specific burial grounds.

- **Sewage Treatment Plants (STPs):** Karachi's overall sewage infrastructure is undergoing upgrades. While specific STPs directly within UC13 are limited, the area's wastewater is directed to larger municipal treatment facilities, though challenges with capacity and maintenance persist city-wide.

Social Amenities and Environment

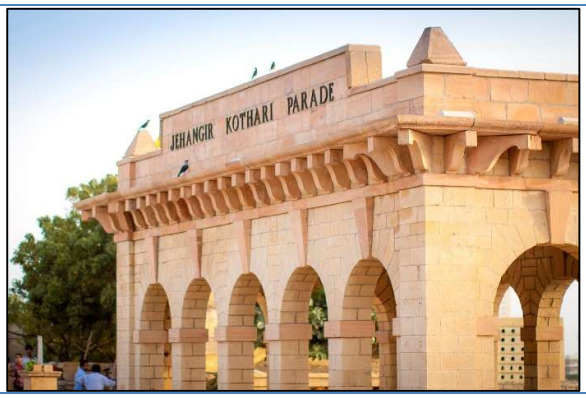
- **Recreation:** The UC features significant green spaces and public landmarks, including Bagh Ibne Qasim (Karachi's largest urban park), the Jehangir Kothari Parade, and proximity to the Clifton Beach.

- **Recreational Facilities:** There are many recreational facilities for the area residents which are also open to the general public. There are many parks, Grounds and greenbelts in the area including:

  - Bagh ibn-e-Qasim
  - Benazir Bhutto park
  - Beach park
  - Umer Sharif park
  - Bagh-e-Behbud
  - Usman Family park
  - Zamzama Park

- **Urban Forestry Initiatives:** The Clifton Urban Forest, a significant environmental project, is located within or adjacent to UC13. This initiative aims to combat pollution and enhance biodiversity through Miyawaki-style afforestation, contributing to the area's green cover and environmental resilience.

- **Cultural and Historical Sites:** There are few culturally historical sites located in the surrounding area of the project site. Some popular structures are as follows.

Jehangir Kothari Parade – About 2.2 kilometers distance	

Lady Lloyd Pier – About 2.2 kilometers distance	
Katrak Bandstand – About 2.2 kilometers distance	
Abdullah Shah Ghazi (R.A) Shrine – About 2.8 kilometers distance	

Mohatta Palace – About 03 kilometers distance	
Mules Mansion – About 4.2 kilometers distance	

5. Public Consultation

This section provides a comprehensive record of the detailed stakeholder consultations conducted in **2017** as a pivotal component of the **Environmental Impact Assessment (EIA)** study for the T&A Craft Residency (formerly Royal Marina Towers) project. These consultations were subsequently followed by a formal **Public Hearing** organized by the **Sindh Environmental Protection Agency (SEPA)**, in strict compliance with the **Sindh Environmental Protection Act 2014** and **SEPA (Environmental Assessment) Regulations 2021**.

While the project was recognized for its potential to increase real estate value, the overwhelming consensus from the 2017 consultation was that such developments must be strictly regulated. The findings underscored that the proponent must not only provide internal solutions for water and waste but also contribute to the broader sustainability of the district's dilapidated infrastructure.

5.1 Regulatory Context and Objectives

The Sindh Environmental Protection Act 2014 mandates that proponents engage primary and secondary stakeholders to ensure the EIA scope extends beyond the immediate microenvironment to encompass the macro-environmental impacts. Following the enactment of the guidelines for public consultation under PEPA 1997, all projects must demonstrate conformity with sustainability principles. Furthermore, the findings of the Water Commission's enquiry report have underscored the criticality of public rights regarding resource availability—specifically water supply and wastewater disposal—linking these directly to sustainable development.

Given the project's location within Saddar Town, District South, the consultation aimed to integrate the project's design into a rapidly transforming social setup, ensuring it adapts to the evolving lifestyle demands of Karachi's major corridors.

5.2 Identification of Stakeholders

The 2017 consultation identified and engaged the following major groups:

- **Local Neighbourhood:** Residents (e.g., Bone Vista Apartments) and institutions (Regional Training Institute, local Mosque) most vulnerable to proximity impacts.
- **Government & Utility Agencies:** SEPA, K-Electric, SSGC, KW&SB, Civil Aviation Authority, and Traffic Police.

- **NGOs and Interest Groups:** Shehri-CBE, Karachi Residents Association, Citizens for Environment (CFE), NFEH, IUCN, and WWF Pakistan.

- **Proponents & Experts:** Ensuring cost-effective yet environmentally responsive project delivery.

5.3 Consultation Methodology

The process was executed in two distinct stages during 2017:

1. **Scoping Stage (April 13, 2017):** A Background Information Document (BID) was shared with key stakeholders to solicit feedback on design, construction, and operational phases.

2. **Neighbourhood Survey Stage:** A field team conducted a reconnaissance survey followed by a social survey. A "Project Brief" was distributed, and the team engaged in face-to-face meetings with residents, commercial interests, and public service providers to record concerns and establish communication channels.





5.4 Key Findings and Stakeholder Feedback

A. Strategic Urban Planning and Densification Concerns

Institutional stakeholders and NGOs expressed significant concern regarding the "densification" policy of Karachi.

- **Ad-hoc Development:** The process was criticized as an ad-hoc solution to urban sprawl, implemented without a Masterplan or a Strategic Environmental Assessment (SEA).

- **Infrastructure Overload:** Stakeholders argued that densification is unresponsive to the city's limited resources, spreading infrastructure like roads, water, and sewage too thin.

- **Regulatory Compliance:** Experts, including Dr. Raza Gardezi, emphasized that proponents must strictly adhere to Section 17 of the Act, which prohibits construction prior to SEPA clearance.

B. Utility Services and Resource Management

- **Water Scarcity:** Mr. Nooruddin Ahmed noted that per capita water availability has dropped to ~15 gallons/day. Concerns were raised that reliance on groundwater and Reverse Osmosis (RO) leads to seawater intrusion and high capital costs.

- **Accountability of Charges:** Stakeholders noted that while SBCA and KMC collect development charges, these funds are often not reinvested into the localized infrastructure needed to support high-rise developments.

C. Traffic and Public Safety

- **Traffic Congestion:** The Traffic Police and local experts highlighted that roads like Dr. Zia Uddin and Shahrah-e-Ghalib are already beyond capacity. They recommended that high-rise approvals should be restricted to residential use to avoid "trip-attracting" commercial activities.

- **Fire Safety:** Following recent incidents in Clifton/DHA, stakeholders demanded that the project feature independent firefighting systems for each floor and use inert construction materials, as the city's fire department is ill-equipped for high-rise emergencies.

D. Environmental and Social Impacts

- **Ecological Balance:** Concerns were raised regarding the conversion of "amenity plots" into commercial ventures, leading to a "concrete jungle" and the degradation of natural channels like Nehre Khayyam.

- **Urban Heat Island:** WWF Pakistan noted that high-rise density restricts air circulation and sunlight, contributing to the warming of the microenvironment.

- **Privacy and Nuisance:** The Regional Training Center emphasized the need to protect the privacy of hostel areas, while neighbors raised concerns regarding construction dust and noise.

5.5 Institutional Recommendations

The "Citizens for Environment" (CFE) and other experts proposed:

- **Cumulative Impact Assessment:** SEPA should require assessments of the entire corridor rather than isolated plots.
- **Utility Strips:** Reserving a 10-15 foot strip at the front of projects for new utility lines to avoid burdening existing infrastructure.
- **Monitoring:** The establishment of an independent committee to oversee SEPA and SBCA functions to ensure transparency and adherence to Environmental Management Plans (EMPs).

5.6 Summary of Stakeholder Consultation – November 2025

In November 2025, EHS Services conducted a series of stakeholder consultation meetings to gather expert input and regulatory guidance regarding the Environmental Impact Assessment (EIA) of the proposed T&A Craft Residency. The consultations focused on urban integration, environmental compliance, and public safety within the high-density coastal zone of Karachi.

Sindh Environmental Protection Agency (SEPA)

- **Focus:** Regulatory Compliance and Coastal Ecology.
- **Suggestions:** SEPA officials emphasized strict adherence to the Sindh Environmental Protection Act 2014. They recommended the implementation of an advanced on-site Sewage Treatment Plant (STP) to prevent any direct discharge of untreated wastewater into the marine environment. Furthermore, they mandated a comprehensive monitoring plan for air quality and noise levels during the construction phase to minimize the impact on the existing residential community in Clifton Block 2.

Rescue 1122 (Sindh Emergency Service)

- **Focus:** Emergency Access and Disaster Response.
- **Suggestions:** Representatives from Rescue 1122 stressed the importance of wide access routes for emergency vehicles within the high-density ribbon zone. They suggested the inclusion of a dedicated emergency command

center within the building and ensured that the architectural design allows for rapid evacuation and aerial rescue operations, given the high-rise nature of the development.

Fire Protection Industry of Pakistan (FPIP)

- **Focus:** Fire Safety Infrastructure and Systems.
- **Suggestions:** The FPIP CEO recommended going beyond the minimum requirements of the Building Code of Pakistan. Their specific suggestions included the installation of redundant high-pressure fire pumps, automated sprinkler systems in all residential units, and the use of fire-rated materials for all structural elements. They also proposed regular fire drills and the appointment of certified fire safety wardens for the residency once occupied.

Independent Environmental Experts

- **Focus:** Sustainable Urban Development and Micro-climate.
- **Suggestions:** The experts raised concerns regarding the "canyon effect" and wind patterns along the marine promenade. They suggested incorporating green building techniques, such as vertical gardens and energy-efficient glazing, to reduce the heat island effect. Additionally, they recommended a robust solid waste management plan that prioritizes waste segregation at the source and collaboration with authorized recyclers to reduce the burden on municipal landfills.



6. Screening of Potential Environmental Impacts and Mitigation Measures

This section presents the screening process that identifies environmental aspects and assesses the impact of various activities on the physical, biological, and social environment for the T&A Craft Residency (formerly Royal Marina Tower). The project, which commenced construction in 2021 following approval from the Sindh Building Control Authority (SBCA) and attaining "deemed approved" status from the Sindh Environmental Protection Agency (SEPA), is being updated to reflect design modifications and administrative changes.

While the original plan envisioned a 34-storey structure, the proponent obtained approval in 2023 for an additional 6 floors, bringing the total height to 40 storeys. As of the current reporting period, structural work has progressed to the 22nd floor. In response to SEPA's directives, this revised EIA report incorporates the updated project name, the increased floor count, and current ownership status.

The screening process utilizes literature reviews, primary and secondary baseline data, and expert judgment to assess potential impacts within the context of the Ribbon High-Density Zone. The assessment specifically addresses the marine microenvironment and the criticality of the sub-soil structure, which must support the extensive load of the 40-storey vertical expansion.

Project Configuration and Scope

The T&A Craft Residency involves the construction and commissioning of a 40-storey high-rise residential building. The spatial configuration is optimized as follows:

- **Basement Levels:** Dedicated to the Air Raid Shelter (ARS), parking, and essential services.
- **Ground Floor:** Housing recreation areas and service facilities.
- **Floors 1–5:** Allocated for parking and utility services.
- **Floors 6–7:** Comprising residential units integrated with recreational facilities.
- **Floors 8–36:** Designated for standard residential use.

- **Floors 37–40:** Featuring premium duplex units (added per the 2023 approval).

- **Rooftop:** Equipped with solar energy systems and utility infrastructure to enhance sustainability.

The environmental aspects are categorized into the physical, biological, and socio-economic environments. Subsequent chapters provide detailed classifications of the micro-site and macro-environment based on data regarding climate, air quality, noise, hydrology, geology, seismicity, & the built environment.

6.1 Screening of Potential Environmental Impacts in Siting of Project

- **Authorized Land Use:** The project site is designated as an FL category plot in the master plan. The construction of a 40-storey residential tower in the Clifton Block 2 high-density zone is fully authorized and aligns with the densification strategy for Karachi.
- **Site Preference and Ownership:** The plot is owned by the proponent, ensuring no change in land use. Given the structural progress (currently at the 22nd floor) and compliance with the densification plan, this site remains the preferred alternative.
- **Accessibility:** The site offers superior accessibility via an arterial road network, bounded by Shahrah-e-Ghalib (North), Marine Promenade (South), Khayaban-e-Saadi (East), and Khayaban-e-Bedil (West). Bounded by the Bonvista apartments and a public school to the east, a green belt to the north, and the Regional Training Institute to the west, the site is served by 50-foot and 40-foot wide roads. The 40-storey design includes adequate parking & optimized entry/exit points to minimize impact on local traffic flow.
- **Regulatory Compliance:** To formalize the transition from the initial 34-storey design to the current 40-storey configuration, the proponent, Shehnaz Enterprises, has coordinated with the relevant governing bodies. The Sindh Building Control Authority (SBCA) has officially approved the revised building plan, following the issuance of No Objection Certificates (NOCs) from the Civil Aviation Authority (CAA) and the Pakistan Air Force (PAF) for a maximum height clearance of 490 feet above ground level (AGL).
- **Geotechnical and Structural Integrity Considerations:** Given the transition from a 34-storey to a 40-storey configuration, the geological screening focuses on the load-bearing capacity of the sub-soil strata. The site is situated within a coastal sedimentary zone characterized by varying layers of sandy silt and clay. Detailed geotechnical investigations conducted have confirmed that the foundation system is engineered to penetrate deeper

stable strata to mitigate the risks of differential settlement and liquefaction. The structural design accounts for the increased vertical load and the seismic parameters of Karachi, which falls within Zone 2B (Moderate Damage) of the Building Code of Pakistan. This ensures that the vertical expansion does not compromise the structural safety of the existing 22-floor framework or the stability of adjacent properties.

- **Self-Sustenance:** T&A Craft Residency is designed as a self-sustained unit with back-up arrangements for water supply & energy, sewage treatment and disposal, and parking, ensuring it does not hinder the existing infrastructure of Clifton Block 2. Upon completion, the 40-storey tower will require approximately 80,000 gallons of water per day, ~2.5 MW of electricity, and 13,000 units of natural gas per month. The proponent is securing updated connections from utility agencies to accommodate the 6-floor expansion. Resource Consumption and Sustainability Integration. The expansion to 40 storeys demands an upward revision of resource requirements, particularly water, electricity, and construction materials. The screening indicates a projected increase in peak water demand, which will be met through a combination of municipal supply and an on-site Reverse Osmosis (RO) plant to reduce pressure on the public grid. To offset the increased carbon footprint of the additional six floors, the project integrates green building principles including water conservation and recycling. The rooftop solar energy systems are designed to provide a minimum of 15-20% of the common area lighting load
- **Social and Built Environment Compatibility:** The project does not involve population displacement or loss of local business. Impacts are localized to the built environment, featuring state-of-the-art security, firefighting, and traffic circulation systems. In terms of the socio-economic screening, the T&A Craft Residency is evaluated against the existing densification of Clifton Block 2. The increase in residential density is balanced by the inclusion of recreational spaces on the Ground and 6th-7th floors, which aim to provide internal amenities that reduce the outward social pressure on public parks. Potential negative impacts during the remaining construction phase, such as noise from machinery and dust dispersion, are screened as temporary and localized. The project's placement within the Ribbon High-Density Zone ensures that the 40-storey silhouette is consistent with the emerging skyline, avoiding "visual intrusion" while contributing to the modernization of the district's urban fabric.
- **Ecological Sensitivity:** The site contains no sensitive wildlife sanctuaries, protected areas, or archaeological heritage sites. No significant flora or fauna will be disturbed within this designated high-density urban zone. The project's proximity to the Clifton coastline necessitates a stringent screening of marine-related impacts. While the site is separated from the immediate shoreline by the Marine Promenade, the high-water table and potential for saline intrusion are critical factors. The screening process identifies that dewatering activities during the early basement

construction phases were managed through dewatering plan, and ongoing structural work maintains a moisture-resistant barrier to prevent chemical weathering of the foundation. The biological assessment indicates no direct encroachment on mangrove ecosystems or coastal nesting grounds, as the project is situated within a fully developed urbanized block.

6.2 Assessment of Impacts at the Construction and Operation stages

6.2.1 Demolition of Structure(s)

The T&A Craft Residency site consisted of vacant land devoid of any permanent structures, both within the project boundary and the immediate vicinity. Consequently, construction activities commenced directly with land development and excavation. As no demolition works were required, there were no reported issues regarding dust emissions, noise, or vibrations typically associated with such activities. This is further substantiated by the project site office's grievance management and redressal records, which contain no complaints related to demolition-induced disturbances.

6.2.2 Building Stability

The T&A Craft Residency (formerly Royal Marina Tower) was originally designed and approved as an RCC framed structure comprising a basement, ground, and 34 upper floors. Following the commencement of construction in 2021, the project scope was expanded to 40 floors, with the structure having currently reached the 22nd floor. Comprehensive measures regarding building stability were proactively integrated into the design and execution phases to accommodate this vertical extension and ensure structural integrity.

Detailed geological assessments confirmed that the site's lithology consists of loose to medium-dense silty sand, followed by layers of hard conglomerate, silty clay/shale, friable sandstone, and medium-hard siltstone extending to a depth of 140 feet. The groundwater table was identified at 4-5 feet below ground level. Given these subsoil conditions and the increased load requirements, a piled-raft foundation system was implemented. This system was finalized through finite element modeling to optimize the interaction between the piles and the raft, ensuring the stability of the 40-story structure.

During the piling operations initiated in 2021, stringent quality control protocols were followed. Detailed boring logs were maintained for every pile to verify the bearing stratum. Boreholes were meticulously cleaned of all loose soil and debris prior to concreting to prevent any reduction in pile capacity. Concrete was cast using tremie pipes, maintaining a consistent submergence of 3-4 meters to

prevent soil necking, while a slump of 150-175mm and plasticizers were utilized to ensure workability and structural density.

Seismic and liquefaction risks were fully addressed at the onset of the project. Analysis based on a peak ground acceleration of 0.20g (per PBC 2007) and an earthquake magnitude of M=6.6 determined that the factor of safety against liquefaction remained above 1.0 from depths of 3.0 to 30 meters. Consequently, the subsurface deposits were deemed non-susceptible to liquefaction.

Mitigation Measures Taken

- **Seismic Design:** Seismic considerations were strictly enforced by adopting the Uniform Building Code (UBC)-2B standards for moderate-to-severe seismic intensity, addressing all recent seismic risk regulations.
- **Foundation Integrity:** It was ensured that no foundations were placed on fill material. Proper drainage systems were installed to prevent water infiltration into the foundation soil, and subsurface disturbances during drilling were minimized.
- **Quality Assurance:** All pile tips were cleaned of loose material, and concreting only proceeded after the bearing stratum was verified. This rigorous examination served as a safeguard against variations in subsoil quality.
- **Chemical Resistance:** Due to high sulphate content in the subsoil, Sulphate Resistant Cement (SRC) was utilized for all underground structural components.
- **Site Constraints:** Construction limits were strictly maintained with appropriate setbacks from the boundary walls of the immediate neighborhood to ensure the safety of adjacent structures.

6.2.3 Excavation

The provision of foundation required excavation below ground level. Once removed, the void space was likely to impact the integrity of the soil in the surrounding area. To maintain the stability of excavation and to protect foundations of adjacent structures, retention measures such as bracing or shoring were utilized to retain the soil during the construction of the basement. It was essential to keep the excavation dry, and excavation was performed during the dry season. Due to the presence of the ground water table at 4-5 feet, it was imperative that the system had adequate waterproofing to ensure moisture did not ingress into the retention system and basement. Compliance with these requirements was confirmed.

The ground water table at the time of investigation occurred at about 4-5 feet depth below existing ground level. Hence, the construction of the basement entailed dewatering. This was accomplished by a well point system or by sinking a number of wells with submersible turbine pumps. The wells featured properly designed filters and strainer pipes. Moreover, it was ensured that adequate drains were available to discharge the pumped water. Compliance with dewatering protocols was confirmed.

The exposed soil after excavation for foundations was vulnerable to erosion and runoff by rains. Such a situation was of a temporary nature and short duration, lasting only during the landscaping and concreting phase of construction at the site. Standard operating procedures were adopted to minimize the impact.
The following mitigation measures were implemented in view of the sensitivity of the living area in the neighborhood, and confirmation of compliance was maintained throughout the process:

Mitigation Measure

- An engineering study of the sub-soil structure and an impact analysis were carried out to determine soil stability, load-bearing capacity, and geological and hydrogeological hazards.
- Fencing and obscuring of the construction site were undertaken to reduce the perception impact.
- During the construction of the basement, excavation cuts were monitored and, where found necessary, shoring/bracing was employed. It was ensured that the excavation was done in the dry season.
- A Dewatering Management Plan (DMP) was prepared and monitored by a professional hydrogeologist to: i) verify the availability of an adequate drainage system required to discharge pumped water, and ii) study effects on the hydrogeology of the surrounding area and other groundwater users.
- The excavation procedure and dewatering activities were monitored by the IMC and recorded on a daily basis to ensure the safe disposal of debris through regular channels of waste contractors and the discharge of pumped water into drains in line with the recommendations of the hydrogeological study.
- The wells utilized properly designed filters and strainer pipes.
- The neighborhood was notified with adequate signage at the very start of the project. The site was appropriately covered all around to contain fugitive dust emissions within the microenvironment. The impact of the activity was continuously monitored by the IMC to protect residents in the immediate neighborhood from dust fall hazards.
- Open soil was adequately covered during excavation and construction activities until the foundation was adequately concreted.

- The intensification of fugitive dust emissions caused by soil erosion was mitigated by appropriate measures to reduce the level of impact to minor significance. Control of air emissions during construction was effected, and contractors were mandated to adopt sound operating procedures, including the following:
    - Exposed surfaces were regularly wetted to effectively keep airborne dust levels to a minimum.
    - Stockpiles of fine material were wetted or covered with tarpaulin, especially during windy weather conditions.
    - Site workers were mandated to wear dust masks, especially during dry and windy weather conditions.

6.2.4 Construction Waste

Typical solid waste generated during construction, including wasted concrete, steel and wooden scaffolding, cement bags, excavated soil, and wood remains, is being strictly managed. Measures have been implemented since the inception of the "T&A Craft Residency" project and continue to be enforced as the building has reached 22 floors, with construction progressing toward the upper floor. Since the commencement of construction in 2021, it has been recognized that the quantum of earth fill material is enormous due to deep excavation. To prevent adverse impacts on the surroundings, the following measures are being taken & will continue throughout subsequent construction:

Mitigation Measures

- The site is properly cordoned off with curtains placed all around.
- Unusable wastes are being transported to approved dumpsites.

6.2.5 Air Quality

To safeguard the surrounding ambient air quality, mitigation strategies have been operational since the project's start in 2021 and will remain active throughout the upcoming construction phases. These protocols focus on managing dust generated by building activities and controlling gaseous discharge from machinery and transport.

Dust Emission Mitigation Measures: The current practices being enforced and upheld include:

- Regular water sprinkling and oversight are carried out as standard operations to guarantee effective dust control.
- To lower emissions from aggregate stock and soil mounds, the IMC monitors constant dampening of these materials.

- Furthermore, the ongoing utilization of commercial ready-mix concrete helps limit fugitive dust. Sensitive building supplies are moved exclusively in vehicles that are tightly covered.
- Additionally, it is compulsory for site personnel to use provided dust masks to reduce their inhalation risks.

Vehicle & Equipment Exhaust Mitigation Measures: To mitigate emissions including PM, NOx, SO2, and COx, the following measures are currently being taken and will continue during the remaining construction and subsequent operation phases:

- The implementation of induction fans is intended as a high-efficiency substitute for traditional ducted systems. Based on CFD Analysis, these fans ensure superior air circulation, require less upkeep, and offer enhanced safety.
- All vehicles, generators, and construction equipment are properly tuned and maintained in good working condition to minimize pollutant emissions.
- Stack heights for generators are designed to vent vertically, minimizing ground-level exposure.
- Noise and air emissions are contained within the microenvironment through building design features; mechanical areas are equipped with noise abatement devices, and generators are maintained to control emissions to acceptable levels.
- Finally, the plan includes the use of carbon monoxide sensors to automatically regulate mechanical ventilation systems within parking zones.

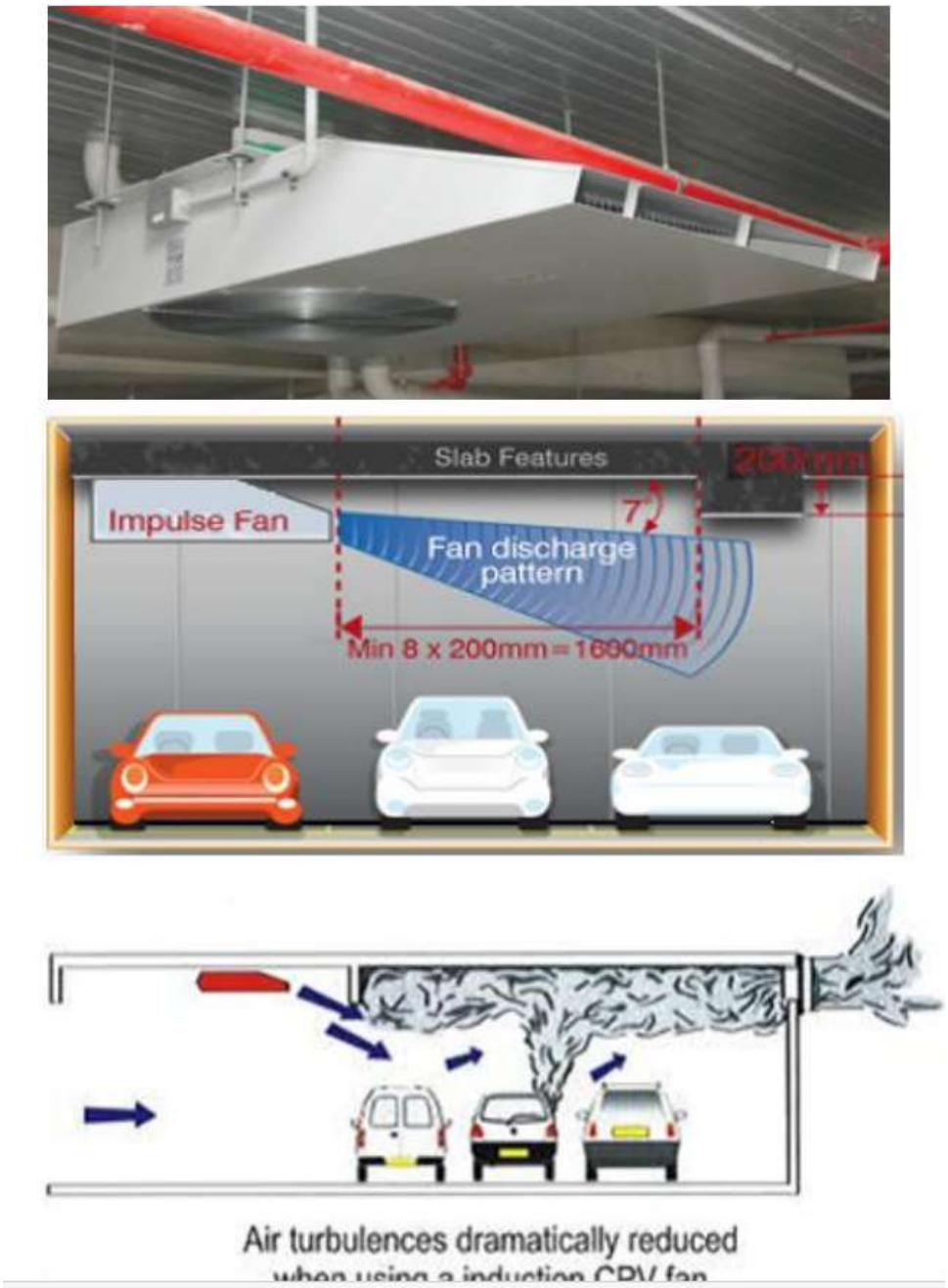


Figure 6.2: Basement ventilation system

6.2.6 Construction Noise

The operation of heavy construction machinery poses a risk of exposing local residents and commuters to fluctuating and intermittent noise levels, depending on the distance from the source. High-intensity peak noise during daytime hours can induce physiological stress and significantly degrade the quality of the living environment for the surrounding community.

The human ear typically perceives a 3 dB shift in sound as a noticeable change, while a 10 dB increase is perceived as a doubling of the noise level. Construction activities and the eventual completion of the 40-story T&A Craft Residency are expected to elevate ambient noise levels. Without proper containment, such as strategic fencing and site covering, these activities will cause substantial disturbance to nearby sensitive receptors.

A 24-hour baseline noise assessment indicated that current levels are minimal, primarily due to the presently low traffic volume on adjacent roads. However, this baseline will shift significantly once the project is operational and the area becomes a major hub for traffic generation. The Sindh Environmental Quality Standards (SEQS) mandate noise limits of 55 dB(A) for residential and 65 dB(A) for commercial areas during the day, and 45 dB(A) and 55 dB(A) respectively at night. Given the projected increase in future traffic density, strictly adhering to these SEQS limits may prove challenging.

To mitigate noise impacts during both the construction and operational phases, the following measures are recommended:

Mitigation Measures

- Regulate the use of high-decibel equipment to align with environmental standards, targeting a maximum of 65 dB(A) during the day and 55 dB(A) at night.
- Implement source-level noise reduction through the regular maintenance, repair, and optimal design of all construction machinery.
- Attenuate noise by installing acoustic tiling within the building structures and equipping backup generators with high-quality silencers and mufflers. Deploy additional noise-abatement technologies where feasible.
- Collaborate with the traffic police department to establish a comprehensive traffic management plan aimed at restricting the operation of excessively noisy vehicles within the project vicinity.

6.2.7 Water Sourcing

Construction of T&A Craft Residency commenced in 2021 and has currently reached the 22nd floor, with work continuing to upper floors. During these

ongoing construction stages, water is obtained from tanker trucks, primarily sourced from the KWSC water supply system. The utilization of commercial-scale ready-mix concrete has significantly mitigated water availability challenges during the structural phases. Drinking water for the workforce is provided through reputable bottled water suppliers.

The projected water requirement during the operation phase is approximately 80,000 gallons per day. To meet this demand, the Proponent is implementing arrangements for the purification of water from underground aquifers. In response to concerns raised by Shehri-CBE and other stakeholders, an Electrical Resistivity Survey has been undertaken to assess groundwater potential and facilitate its use via Reverse Osmosis (RO) treatment.

To ensure efficient water management as the project progresses from its current 22nd floor to completion and subsequent operation, the following mitigation measures will be enforced:

- Wastewater recycling and groundwater regeneration via RO treatment are being prioritized to ensure a reliable supply independent of the municipal system.
- Rigorous records of water consumption are maintained throughout the construction and operational phases.
- Water conservation practices are strictly adopted to prevent wastage.
- Infrastructure is regularly inspected and repaired to eliminate leaks.
- Water-efficient sanitary fittings, including low-flush toilets and aerators, are installed throughout the building.

6.2.8 Soil Contamination

The proponent is committed to maintaining soil integrity by preventing contamination from oil spills, chemical leaks, and the adverse effects of water impounding. This commitment was verified during an environmental audit conducted by the EHSS team. To ensure continued compliance, the contractor is required to strictly adhere to Standard Operating Procedures (SOPs) for the handling, storage, transfer, use, and disposal of all potential contaminants. The following mitigation measures will remain in effect throughout the construction phase to minimize the risk of soil degradation:

Mitigation Measures:

- Fuel, lubricants, and chemicals must be stored in designated, secure areas equipped with impervious lining. Construction sites will utilize hard covers or tarpaulin lining to provide a barrier against soil pollution.
- Vehicle and equipment maintenance, including washing, shall be restricted to authorized, designated locations only.
- Routine inspections will be performed on all construction machinery and vehicles to promptly identify and repair any leaks.

- Emergency spill kits, including shovels, plastic bags, and absorbent materials, will be stationed near fuel and oil storage zones to facilitate the immediate removal of any spills or contaminated soil.
- Any contaminated soil must be excavated and disposed of through professional treatment, such as incineration, conducted by a SEPA-certified contractor.
- All activities involving the storage, transfer, handling, and disposal of hazardous chemicals during the operational stage will strictly comply with the Hazardous Substances Rules 2014.

6.2.9 Wastewater Generation & Disposal

Construction Phase: The management of domestic effluent during the construction period is strictly controlled to ensure wastewater is directed through established channels, preventing any contamination of the soil or groundwater within and around the project site. The estimated peak wastewater discharge is 500 liters per day, which is managed via an on-site septic tank system.

Mitigation Measures

The following measures shall be implemented during the construction phase:

- All generated wastewater must pass through a septic tank before being discharged into the nearest drainage network.

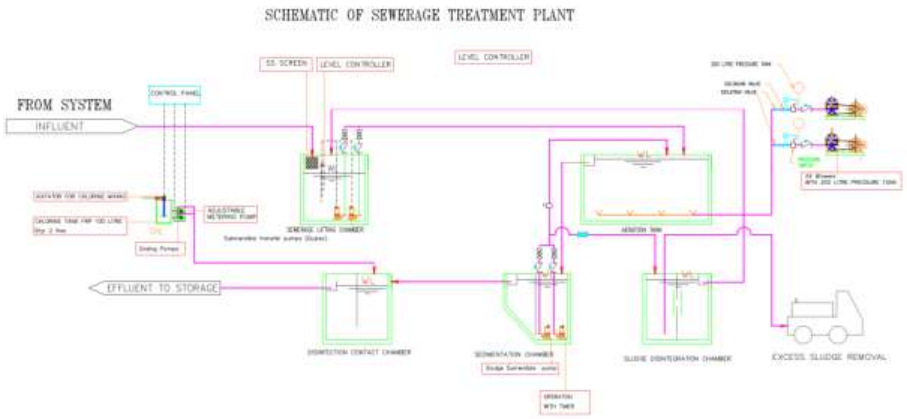
- Sewage must be kept separate and not mixed with any other forms of waste.

Operation Phase: Once operational, the T&A Craft Residency is projected to generate approximately 40,000 gallons of wastewater daily, primarily consisting of sewage. Additionally, minor volumes of hazardous wastewater, such as oily water, may be produced during routine building maintenance.

Wastewater sources include restrooms, laundries, and kitchens. This effluent is expected to meet Sindh Environmental Quality Standards (SEQS) provided it remains free of hazardous materials like paints. Kitchen effluents will be routed through grease traps to isolate oily waste, which will then be disposed of by an EPA-approved contractor.

The environmental impact of sewage disposal is minimized through a sustainable treatment framework that includes over 40% water recycling and the safe management of sludge. Treated wastewater will be utilized for the

irrigation of green belts, lawns, and nurseries, significantly reducing the project's overall water footprint.



Mitigation Measures

The following measures will be enforced for effective wastewater management during the operational stage:

- All wastewater will undergo treatment to ensure full compliance with SEQS.
- Strict waste segregation protocols will be implemented to prevent solid waste from entering the wastewater stream.
- Comprehensive water conservation strategies will be adopted to minimize water wastage across the facility.

6.2.10 Solid Waste Generation and Management

Construction Phase: Active construction of the project has been progressing steadily since 2021, currently reaching the 22nd floor. As witnessed and verified by the EHS Services team, all environmental mitigation measures are being effectively implemented on-site. These stringent protocols will continue to be strictly followed during the subsequent construction stages as the structure advances from the 22nd floor to the 40th floor.

The construction phase involves the generation of various waste streams, including packaging waste, scrap, excess materials, debris, domestic waste from construction camps, empty containers, and used oils or chemicals. Inappropriate disposal of these wastes could significantly impact worker health, cause soil pollution, and deteriorate water quality. However, waste

generated is inherently less reactive, and its minor impacts are being successfully controlled through the Environmental Management Plan (EMP).

Mitigation Measures:

A comprehensive waste management plan is in place for the construction stage, featuring the following key elements:

- Separate bins are provided for plastic, paper, metal, glass, wood, and cotton to ensure segregation.
- Recyclable materials are separated at the source and sold to SEPA-certified contractors.
- Non-hazardous, non-recyclable waste is disposed of at municipal-approved landfill sites.
- No waste is dumped outside the site boundary.
- Hazardous waste is strictly segregated, stored in designated restricted areas with proper marking, and disposed of via approved contractors.
- Surplus materials and chemical containers are returned to suppliers, while inert waste is used as on-site fill or sold as scrap.
- A Waste Tracking Register is maintained to log all waste generation, disposal, and recycling activities.
- Personnel receive continuous training on waste identification, segregation, and management.

Operation Phase: Once completed, T&A Craft Residency will generate solid waste from apartments, primarily consisting of food waste, paper, packaging, and plastics. Based on Karachi's per capita estimates for high-end areas like DHA and Clifton, the project is anticipated to generate approximately 600-700 kg of solid waste per day. While solid waste management is a challenge in Karachi, the project aligns with the holistic strategies launched by the Sindh Solid Waste Management Board (SSWMB).

Mitigation Measures

The following measures will be implemented to minimize the impact of operational solid waste:

- Grease interceptors will be installed at all kitchen drains to trap oils and grease.
- Solid waste will be collected via garbage chutes at a dedicated site.
- Organic and recyclable wastes will be segregated at the source before collection and transport.
- A dedicated waste management contractor will handle the collection and final disposal.

- The established solid waste management plan will be fully operationalized, ensuring organized collection, storage, and transportation facilities.

6.2.11 Traffic Management

Current Baseline and Community Concerns: During the public consultation process, local residents expressed significant concern regarding the escalating traffic burden in the vicinity. This surge in congestion is largely attributed to the rapid commercialization of major corridors, such as the Marine Promenade. Observations indicate that the existing commercialization policy requires urgent review, as it has inadvertently encouraged unauthorized activities both within and adjacent to the project area. These developments have led to the encroachment of road networks, the overstretching of sewage infrastructure, increasing water scarcity, and heightened concerns regarding public security.

Impact Assessment

Construction Phase: It is anticipated that there will be a minor, temporary increase in traffic volume due to the movement of construction machinery and material transport. However, this impact is localized and short-term.

Operational Phase: Since the proposed project is strictly residential, trip generation will be limited to residents and their occasional visitors. Unlike commercial developments, this project will not attract heavy commercial traffic. Consequently, significant long-term congestion or adverse cumulative impacts on the existing traffic flow are not envisaged. Despite this, rigorous vehicular traffic management remains essential to prevent localized bottlenecks and ensure the convenience of commuters on surrounding arterial roads. The project includes **456 car stalls and 517 motorcycle stalls** (convertible to 628 cars if bike stalls are repurposed). The Shehnaz Enterprises is mandated to implement a comprehensive traffic management plan that accounts for both current volumes and projected future expansions in the area.

SCHEDULE OF CAR PARKING

TOTAL COVERED AREA = 526419.29 SQ,FT.
6TH, TO 40TH. FL. AREA = 526419.29 / 1000 = 526.41 OR 526 CARS
TOTAL CARS = 526. CARS
NO. CAR OF HANDI CAP = 526. / 50 = 10.52 OR 11 CARS
TOTAL NOS. OF CARS = 526 + 11 = 537 CARS
16 % OF TOTAL CAR PARKING SPACE FOR MOTOR CYCLES

$$= \frac{537 \times 16}{100.00} = 85.92 \text{ OR } 86 \text{ CARS}$$

TOTAL MOTOR CYCLE REQUIRED = 86 X 6 = 516 M. CYCLES
TOTAL NO OF M.CYCLE PROVIDED = 517
TOTAL NO OF CAR REQUIRED = 537 - 86 = 451 CARS
TOTAL NO OF CAR PROVIDED = 456

Parking and Regulatory Compliance: In strict accordance with the prevailing Regulations for High-Density Zones (Ribbon), the project design incorporates sufficient internal car parking facilities for both residents and visitors. Dedicated building space has been strategically allocated to satisfy all parking requirements internally, ensuring no spillover onto public streets. The integration of a formal traffic management plan will further facilitate smooth vehicular movement, particularly during peak hours.

Mitigation Measures

To minimize disruption and ensure organized traffic flow, the following mitigation measures shall be strictly enforced:

- **Scheduling of Heavy Vehicles:** The movement of heavy machinery and construction logistics will be restricted to late-night hours to avoid peak-hour interference.
- **Noise Control:** All project-related vehicles are prohibited from using pressure horns or any high-decibel acoustic signaling devices.
- **Speed Regulation:** Strict speed limits will be enforced for all construction-related vehicles to ensure pedestrian and commuter safety.
- **Traffic Flow Optimization:** A structured traffic management plan will be implemented to prevent the formation of long queues and ensure the continuous flow of vehicles.
- **Designated Parking:** During the operational phase, all vehicles must be parked within the project's designated internal parking zones.

- **Roadside Parking Prohibition:** The parking of any project-related or resident vehicles along the roadside is strictly prohibited at all times to maintain unobstructed road width.

6.2.12 Fire Hazards and Life Safety

Fire incidents in high-rise buildings have garnered significant attention in the fire safety over the years. The proponent has to take lessons from the ongoing fire episodes in buildings and take suitable measures with regard to provision of life safety systems. The design of life safety systems is a multidisciplinary solution with the architect detailing the fire stairs, evacuation routes, areas of refuge as well as the fire rating of the shafts and internal fire separation within the building. The structural engineers will specify the fire-retardant materials that will protect the structure. MEP Consultants have designed the active systems in the building to provide a comprehensive fire detection and management system in line with the overall fire and life safety strategy.

Mitigation Measures

The following mitigation measures have been adopted:

- **STANDPIPE AND HOSE SYSTEM**
- The fire standpipe and hose systems are provided for class III as per NFPA-14.
- A 2.5" Landing Valves is installed on each floor in the fire exit for fireman usage.
- A 1" dia 100 ft. in length fire hose reel in cabinet is installed on each floor near to fire exit staircase. Each fire hose reel is provided to cover maximum distance of 120 ft.
- Fire reserve for one hour firefighting is provided in the underground tank. This reserved water will not be used for the building requirement as the suction level of building water transfer pump is higher than the fire reserve.
- An automatic UL listed and FM approved fire pumps set as per NFPA -20 is installed to supply the water automatically in case of opening of any fire sprinkler, fire hose or landing valve.
- The fire pump set installed in basement 2 consist of 3 pumps:

  1) Electric drive jockey pump to keep pressure in system.

  2) Main pump electric driven for fire suppression

3) Standby pump diesel engine driven

- **AUTOMATIC SPRINKLER SYSTEM**
- The entire building is protected against fire with automatic fire sprinkler as per recommendation of NFPA-13.
- 0.1 GPM/sqft over 1500 sqft for apartment. (Light Hazard)
- 0.15 GPM/sqft over 1500 sqft for basements, parking areas and services (Ordinary Hazard group 1)
- The water to sprinklers is provided through the combine standpipe systems and fire pump set. Hydraulic calculations are performed to calculate the zone pressure and pipe sizing.
- **PORTABLE EXTINGUISHER SYSTEM**
- Portable fire extinguishers are provided along fire escape routes and in M&E plant rooms.
- The type and number of extinguishers are subjected to the requirement of NFPA 10.

6.2.13 HSE Management

The Environmental Management Plan (EMP) fundamentally integrates Health, Safety, and Environment (HSE) protocols, with environmental performance monitoring serving as a critical component. It is the proponent's responsibility to ensure rigorous compliance with EMP guidelines, while the contractor must strictly implement Standard Operating Procedures (SOPs) for all construction-related activities.

A common deficiency in construction management is the failure to provide workers with adequate protection against site hazards. Accidents are predominantly concentrated at unsecured locations involving unprotected personnel. Comprehensive HSE management mandates proactive mitigation of all risks, regardless of perceived significance. Key social and safety concerns during construction typically stem from: i) inadequate communication with stakeholders regarding project timelines; ii) failure to properly secure site perimeters against unauthorized entry; iii) non-compliance with mandatory Personal Protective Equipment (PPE) requirements by the workforce; iv) a lack of specialized hazard awareness training for the crew; and v) insufficient supervisory oversight regarding the enforcement of HSE protocols.

Safety risks are significantly amplified in dense urban environments, necessitating stringent adherence to HSE procedures. To safeguard both the workforce and the public, all incidents resulting from procedural lapses must be meticulously monitored and documented. Consequently, the contractor is required to maintain comprehensive records detailing the execution of the Health, Safety, and Environmental Management Plan alongside established SOPs.

The project serves as a catalyst for local employment across both construction and operational phases. The construction stage currently employs over 100 individuals. Post-completion, sustained employment opportunities will emerge, encompassing facility management staff under Shehnaz Enterprises, private domestic staff for apartment owners, security teams, and transportation personnel.

6.2.14 Cultural Resources

Assessment of the project's microenvironment indicates an absence of protected cultural, historical, or archaeological sites; therefore, no adverse impacts on such resources are anticipated. Despite this, the project team will maintain active coordination with relevant stakeholders throughout the planning and construction phases to ensure continued oversight.

7. Environmental Management Plan (EMP)

7.1 Introduction

The Environmental Impact Assessment (EIA) for the proposed development activities of T&A Craft Residency Project has identified potential impacts that are likely to arise during the construction and operation phases. The EIA has examined in detail both negative and positive impacts of each stage of the operation. Where adverse impacts have been identified, the EIA has recommended mitigation measures; include management and monitoring practices, physical controls, or compensation in monetary terms. The mitigation measures proposed are based on a good understanding of the sensitivity and behavior of environmental receptors, past experience, case studies, legislative controls, guidelines, & expert advice.

For any residual impacts (impacts remaining after applying the recommended mitigation measures) or for impacts in which there has been a level of uncertainly in prediction, monitoring measures have been recommended. Advice on monitoring measures required was sought from experts involved in the EIA and case studies of similar development activates at international level.

For the effective implementation and management of the mitigation measures and monitoring requirements an Environmental Managements Plan (EMP) has been prepared and presented in this section. The EMP satisfies the requirements of the Pakistan Initial Environmental Examination and Environmental Impacts Assessment Review Procedures, 2014.

7.2 Objectives

The EMP provides a delivery mechanism to address adverse impacts, to enhance project benefits and to introduce standards of good practice to be adopted for all project works. The primary objectives of the EMP are to:

- Outline mitigation measures recommended in the EIA and define the responsibility and timing for the implementation of these measures;
- Develop a monitoring mechanism and identify parameters that can confirm the implementation of the mitigation of these measures;
- Define roles and responsibilities of the project proponent for the implementation of EMP and identify areas where these roles and responsibilities can be shared with other stakeholders and
- Define the requirements necessary for documenting compliance with the EMP and communicating it to all concerned regulatory agencies.

For each impact, or activity, which could give rise to an impact, the following information is presented:

- Mitigation measure that will be implemented;
- The person(s) responsible for ensuring full implementation of the mitigation measure;
- The parameters that will be monitored to ensure effective implementation of the mitigation measure;
- The timing for the implementation of the action, to ensure that the objectives of the mitigation are fully met.

7.3 Structure of the EMP

The EMP consists of the following section.

- Legislation and guidelines.
- Organizational structure and roles and responsibilities;
- Mitigation management's matrix
- Environmental monitoring programme
- Change management plan
- Training Programme

7.4 Legislation and Guidelines

The EIA has discussed in detail all the legislation and guidelines (chapter 3) which has relevance to the project. Shehnaz Enterprises shall ensure that the construction and operation of project is conducted in conformance to relevant legislations and guidelines and guidance is sought as and when required. Shehnaz Enterprises shall also ensure that the key project management staff is aware of these legislations and guidelines. SEQS for municipal and industrial effluents, selected gaseous pollutants from industrial sources and motor vehicle exhaust and noise are provided in Chapter 2.

7.5 Organizational Structure and Roles and Responsibilities

7.5.1 Organizational Structure

The proposed project includes the following main organization:

- Shehnaz Enterprises as the project proponent and owners of the EMP.
- The construction contractor as well as contractor required during the operational phase (e.g. waste contractor) as the executors of the EMP.

These organizations will have the following roles and responsibilities during the project activities.

7.5.2 Roles and Responsibilities

7.5.2.1 General

Project Proponent: As project proponents, Shehnaz Enterprises will be responsible for ensuring the implementation of the EMP. A person holding a senior position will be responsible for the overall environmental performances during the proposed project. The person will be responsible for ensuring the implementation of the EMP by Shehnaz Enterprises and all project contractors. The proponent's Site Representative (SR) will be responsible of implementation of the EMP and liaison with project contractor and stakeholders at site regarding environmental issues during the construction phase. Further the person holding a senior position in Shehnaz Enterprises will also be responsible for monitoring EMP's compliance and provided technical support in environmental issues.

Project Contractors: For the proposed project, Shehnaz Enterprises will appoint construction contractor for different field operations. Various contractor will also be hired during the operation phase of the building (e.g. waste contractors) The contractors will be responsible for implementation of, or adherence to, all provisions of the EIA and the EMP and with any environmental and other codes of conduct required by Shehnaz Enterprises. Overall responsibility of the contractor's environmental performances will rest with the person holding the highest management position within the contractor's organization reporting to their management. The contractor's site managers will be responsible for the effective implementation of the EIA and the EMP. The contractor's HSE officers will have functional responsibilities to ensure implementation of or adherence to the EMP.

7.5.3 Planning and Design of the Operations

Details of project Activities: Details of the project activities are provided in section 2 of the EIA report. Following approval of the EIA, any changes to the proposed activities will be handled through the change Management Plan provided in this EMP.

Approvals: Obtaining Approval from SEPA will not relieve the proponent of other legal obligation and hence Shehnaz Enterprises and project contractors will obtain all other relevant clearance and necessary approvals required by the Government of Sindh and Relevant departments prior to commencing the respective operations.

Contractual Provision: Adherence to the requirements of the EIA and EMP in terms of environmental mitigation will be required from all project contractors and thus EMP will form part of their contractor with Shehnaz Enterprises.

7.5.4 Implementation of the Operation

Co-ordination with Stakeholders: Shehnaz Enterprises will ensure that co-ordination with the regulators and other stakeholders on environmental & social matters is maintained throughout construction & operation phase of the project.

Monitoring: Shehnaz Enterprises and the contractors will ensure that monitoring of the project activities is carried out throughout the project. The Shehnaz Enterprises' site representative will monitor all project activities during the construction and operation phase. He will keep a record of all non-conformances observed and report these along with actions to Shehnaz Enterprises management in Karachi for further action. The site representative will also report any impacts anticipated along with his recommendation for further action.

Emergency Procedures: Shehnaz Enterprises and the contractors will prepare contingency plans to deal with any emergency situation that may arise during the construction and operation e.g. major oil spills, medical evacuation & communicate these to the regulatory agencies if required by these agencies.

Approvals: The project contractor will be responsible for obtaining all relevant approvals such as approvals for waste contractors, water source & others as specified in Mitigation Management Matrix.

Trainings: The project contractors will be responsible for the selection and training of their staff capable of completing the project activities properly and efficiently. The contractors will be responsible for providing training to their staff members according to the training programme. The training programme is discussed briefly in section 7.7.3.

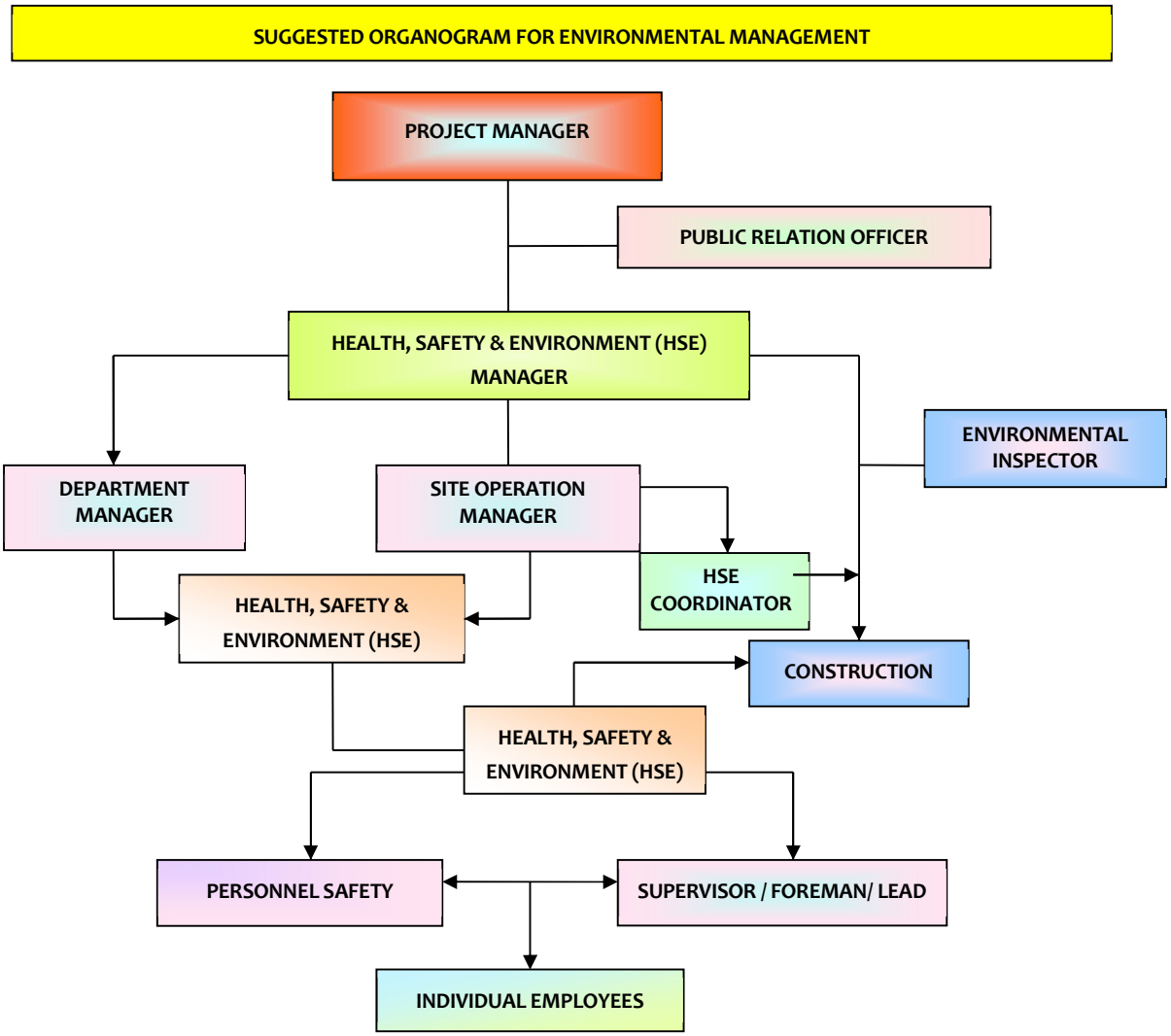
7.5.5 Communication and Documentation

Shehnaz Enterprises and the contractor will ensure that the communication and documentation requirements specified in the EMP are fulfilled during the construction and operation phase.

Change Management: The EIA for the proposed operation recognizes that changes in the operation or the EMP may be required during the project activities and therefore provides a Change Management Plan to manage such

changes. Overall responsibility for the preparation of change management statements will be with Proponent's site representative.

Restoration: Shehnaz Enterprises along with the construction contractor will be responsible for the final restoration of work areas.



7.5.6 Maintenance of the EMP

EMP needs to be revised on timely basis to keep up-to-date as per the requirements comes up regularly. Therefore, outlining the responsibilities and

activities associated with the maintenance of the EMP is essential. The responsibilities of the Construction Contractor should be detailed and procedures for requesting EMP revisions should also be outlined. EMP revision procedures must include requirements for notification of the appropriate government and municipal agencies so that their role is also played in the overall management process.

7.5.7 Environmental Health and Safety Management System

Environmental, Health and Safety Management System is essential for the care of EHS issues which should outline mitigation measures and best management practices. This management system recommends carrying out a complete assessment, evaluating, monitoring, identifying and control all potential hazards and risks arise during the construction and operation phases of the proposed project. It needs to ensure that the Health and Safety Plan (HSP) along with the Health and Safety Rules is established and enforced. The Plan should outline roles, responsibilities and expected outcomes with respect to the environmental health and safety management of the construction & operation phase of the Project. These measures should be implemented to ensure that no significant adverse environmental, health and safety impacts are created by activities associated with the construction of the project.

Protection of the public and workforce health and safety during both construction and operations is the prime responsibility of proponent. Utilizing expert personnel and the Environment, Health and Safety Management System (EHSMS), the potential health and safety hazards and risks will be identified and assessed, then the subject of substantial planning, organization, procedures for various facility are developed.

7.5.8 Health and Safety during Construction Phase

Worker Health & Safety Management Plan will also be outlined to implement mitigation measures and best management practices. The plan should be implemented to ensure that no significant adverse worker's health and safety issues arise from activities associated with the construction of the project.

Potential hazards for workers in construction include:

- Falls (from heights);
- Trench collapse;
- Scaffold collapse;
- Electric shock and arc flash/arc blast;
- Failure to use proper personal protective equipment; and
- Repetitive motion injuries.

7.5.9 Health and Safety during Operation Phase

T&A Craft Residency is a high-rise development, occupational health & safety issues need to be addressed managed effectively to ensure safety of its occupants in particular and the neighborhood in general.

7.5.10 Emergency Response Plan

Emergency may be defined as a sudden event causing or has the potential to cause serious human injury and/or environmental degradation of large magnitude. The best "cure" for an emergency is, of course, "prevention". The probable emergency situation can be:

- Serious fire or explosion
- Major gas leakage.
- Major Spillage
- Natural calamity such as heavy rain, flooding, dust storm or earthquake, cyclone, etc.
- Bomb threat or any sabotage/terrorist activity
- Any other incident involving all or large part of the premises and its workers.

Emergency Response Management is provided by a small team of senior managers (the "Control Committee") who in turn will direct all response activities through the Emergency Response Unit.

7.5.10.1 Objectives

The main objective of this plan is to establish the general guidelines for the actions to be taken in the event of fires, explosion, emergencies, accidents, disasters and sabotage, aimed at minimizing their effects and consequences, in order to protect:

- The lives of own or third-party personnel present in the building's facilities.
- The lives of the occupants of the Project
- The lives of the nearby residents & communities coming into the direct influence of the building's area.
- The lives of the ecological systems located in the surroundings of the Project.

7.5.10.2 Emergency Response Manuals

Based on the Risk Assessment the proponent should prepare written emergency preparedness and response plans/procedures for the building to

cover emergency situations that could occur. It may be required that Emergency Response Manuals will be developed for various situations arising.

Emergency Contact Numbers			
S. #	**Description**	**Image**	**Contact #**
01	Fire Brigade		16,
02	Ambulance		2022, 1015
03	Civil Hospital		
04	Police Station		15,
05	K Electric		
06	SSGC		1199
07	Air Port		114
08	Railway		117

7.5.11 Environmental Compliance Reporting, Documentation and Trainings

The management will be responsible for the regular audit and review of the environmental management and monitoring plan. This will include both on-site auditing and review of performance reports. Additional onsite inspections and investigations will be undertaken in the event of significant environmental incidents. These will be undertaken in conjunction with the IMC.

The management will participate in the audits & inspections and investigations. The management will also be responsible for regular review of the environmental performance of the site and site personnel, and for the reporting on the implementation of commitments made in the EMP.

In particular, there will be:

- Periodic audit reports.
- A review and improvement of the EMP.

Management recognizes that periodic external compliance audits and inspections will be made through a third-party consultant (IMC) to monitor, assess and validate the level of performance and compliance pursuant to the commitments made in the accepted Environmental Management Plan. The monitoring reports shall also be submitted to Sindh Environmental Protection Agency (SEPA) on regular intervals.

Training: It an important step for the implementation of the EMP. All the employees will require to be trained to work appropriately on EMP. EHS Manager will organize trainings in consultation with HSE Officer. It will make sure that employees understand the Environment, Health and Safety issues. Trainings should be arranged on regular basis with notification that it should be attended all respective employees.

HSE Officer will determine the training requirements during both phases. Induction will be the basis of all training courses for contractor & subcontractor during construction phase.

Trainings identified in EMP are given below:

- Site induction course
- Training for emergency response and preparedness
- Training for familiarization with site environmental controls

Specific environmental training for relevant employees e.g. daily checks to maintain controls, waste minimization, etc.

7.5.12 Mitigation Management Matrix

The Mitigation Management Matrix will be used as a management & monitoring tool for implementation of the mitigation measures required by the EIA. Mitigation management matrix for construction and operation is provided in the table 7.1. The matrix lists down the following:

- The mitigation measure recommended in the EIA.

- The person/organization directly responsible for adhering to or executing the required mitigation measures.
- The parameters which will be monitored to ensure compliance with the mitigation measures;
- The timing at which the mitigation or monitoring has to be carried out.

It is highlighted that although responsibilities for executing and monitoring mitigation measures have been delegated to different persons, Shehnaz Enterprises will hold the primary and overall responsibility for ensuring full implementation of the EMP.

7.5.13 Environmental Monitoring Programme

The objective of environmental monitoring during the construction & operation phase will be as follows:

- To check compliance of the contractors with the EMP by monitoring activities of the project on a daily basis. This will be called compliance monitoring.
- To monitor impacts of the operation in which there has been a level of uncertainty in prediction such as impacts of noise, water abstraction etc. and to recommend mitigation measures if the impacts are assessed to be in excess of or different from those assessed in the EIA. The aim will be attained through effects monitoring.
- To achieve these objectives, the following monitoring programme will be implemented.

7.5.14 Compliance Monitoring

Compliance monitoring will be carried out to ensure compliance with the requirements of the EIA and to document and report all non-compliances. The mitigation management matrix provided in the EMP will be used as a management and monitoring tool. The contractor's HSE Officer will be responsible for monitoring the compliance of their organization with the relevant EMP requirements. Proponent's site representative will monitor the contractor's compliance and will also ensure that during construction each activity system and plan is in place for effective compliance monitoring. The site representative will make regular checks on the contractor's works; keep records of all non-compliances observed during the execution of the project activities; & the details of all remedial actions taken to mitigate the project impacts.

7.5.15 Effects Monitoring

The effects monitoring requirements have been detailed in Table 7.2. An independent monitoring consultant (IMC) will be responsible to carry out the required effects monitoring during the construction and operation phase.

7.5.16 Environmental Reporting

7.5.16.1 Final Monitoring Report (Construction Phase)

After completion of construction phase, a final monitoring report will be prepared by site representative. The report will include the following:

- Introduction.
- Details of the Project Activities.
- Natural Resource used during the Project.
- List of Non-compliances recorded.
- Effects of the Project on Communities and Physical Resources.
- Photographic Records
- Approvals provided during the project
- Change managements statements
- Trainings
- Conclusions

7.5.16.2 Annual Environmental Monitoring Reports (Operation Phase)

The project proponent shall prepare annual environmental monitoring reports describing the conduct of the operation phase for project along with details of the effects monitoring conducted annually during the operation phase of the project. The report shall be submitted to the SEPA.

7.5.17 Change Management Plan

The EIA for the proposed project recognizes that changes in the operation or the EMP may be required during the construction and operation and therefore provides a Change Management Plan to manage such changes. The management of changes is discussed under two separate headings, Additions to the EMP and Changes to the Operation and the EMP.

7.5.17.1 Changes to the EMP

The EIA and the EMP have been developed based on the best possible information available at the time of the EIA study. However, it is possible that during the conduct of the proposed operation additional mitigation measures

based on the findings of environmental monitoring during the operation may have to be included in the EMP. In such cases following actions will be taken:

- A meeting will be held between Shehnaz Enterprises and the concerned project contractors. During the meeting, the proposed addition to the EMP will be discussed and agreed upon by all parties.
- Based on the discussion during the meeting, a change report will be produced collectively, which will include the additional EMP clause and the reasons for the addition.
- The report will be signed by all parties and will be filled at the site office: A copy of the report will be sent to Shehnaz Enterprises and contractor head offices.
- All relevant project personnel will be informed of the addition.

7.5.17.2 Changes to the Operation

The change management system recognizes three orders of changes:

First Order: A first order change is one that leads to a significant departure from the project described or the impacts assessed in the EIA and consequently require a reassessment of the environmental impacts associated with the change. Example of first order change includes change in location of proposed project. Action required in this case will be that the environmental impacts of the proposed change will be reassessed by Shehnaz Enterprises and sent to the SEPA for approval.

Second Order: A second order change is one that does not result in the change in project description or impacts that are significantly different from those detailed in the EIA. Example of second order changes includes extension in the site area. Action required for such changes will be that Shehnaz Enterprises will reassess the impact of the activity on the environment & specify additional mitigation measures if required and report the changes to SEPA.

Third Order: A third order change is one that does not result in impacts above those already assessed in the EIA, rather these may be made site to minimize the impact of an activity such as:

- Increase in project workforce;
- Change in layout plan.

The only action required for such changes will be to record the change in the Change Record Register.

7.5.18 Training Programme

Environmental training will form part of the environmental management system. The training will be directed towards all personnel for general environmental awareness.

7.5.18.1 Objectives

The key objective of training programme is to ensure that the requirements of the EMP are clearly understood and followed throughout the project. The trainings to the staff will help in communicating environmental related restrictions specified in the EIA and EMP.

7.5.18.2 Roles and Responsibilities

The contractors will be primarily responsible for providing environmental training to all project personnel on potential environmental issues of the project. The contractors will be responsible to arrange trainings and ensure the presence of targeted staff.

7.5.18.3 Training Programme

The environmental awareness, EIA and EMP training will be carried out during the project activities.

Training log: A training log will be maintained by tine contractors. The training log will include:

- Topic
- Date, time and location
- Trainer
- Participants

Training Needs Assessment: In addition to the training specified in the training log special/additional trainings will be provided during the project activity. The criteria to assess the need of training will be based on the following:

- When a specified percentage of staff is newly inducted in the project
- When any non-compliance is repeatedly reported refresher training will be provided regarding that issue.
- When any incident/accident of minor or major nature occurs. Arrival of new contractor/sub-contractor.
- Start of any new process/activity.

Training Material: The contractors will develop & prepare training material regarding environmental awareness, sensitivity of the area, EIA, EMP and restrictions to be followed during the project. Separate training material will be prepared for each targeted staff.

Table 7.1: Environmental Management Plan (EMP)

S.#	Impact and Mitigation Measures	Responsibilities	Monitoring	Timing
1	**Land Use and Soils**			
1.1	The construction activities will be planned to minimize disturbance to soil	Shehnaz Enterprises, CC	Monitoring compliance	During construction phase
1.2	To the extent possible, equipment and materials would be staged in areas that have already been disturbed	Shehnaz Enterprises, CC	Monitoring compliance	During construction phase
1.3	Movement of construction equipment will be restricted to work areas only to avoid unnecessary disturbance to soil	CC	Monitoring compliance	During construction phase
1.4	Routes of water tankers, dumper trucks and other project vehicles will be monitored for any signs of soil disturbance & road damage	CC	Monitoring compliance	During construction phase
1.5	Area showing signs of unstabilised soil conditions will be compacted and watered	Shehnaz Enterprises, CC	Monitoring compliance	During construction phase
1.6	The assessment of settlement within affected zone due to dewatering will be conducted prior to dewatering	CC	Monitoring compliance	During construction phase
1.7	The affected zone of settlement, if identified will be monitored regularly during dewatering activity	Shehnaz Enterprises, CC	Monitoring compliance	During construction phase
1.8	Proper drainage will be provided to construction camp, construction site, especially near excavations and around proposed facility	CC	Monitoring compliance	During construction phase

1.9	Vehicle speed will be regulated and monitored to avoid excessive dust emissions	CC	Monitoring compliance	During construction phase
1.10	Total land uptake by the project and associated facilities will be kept to the minimum	Shehnaz Enterprises, CC	Monitoring compliance	During construction phase
1.11	Periodic trainings will be provided to drivers on mitigation measures related to off-road travel and speed limits	Shehnaz Enterprises, CC	Check training records	During construction phase
1.12	The Project will have a storm water collection system so that the storm water effluent has minimal sediment load	Shehnaz Enterprises, CC	Monitoring compliance	During design and construction phase
2	**Air Quality**			
2.1	**Dust Emissions**			
2.1.1	Water will be sprinkled daily or when there is an obvious dust problem on all exposed surfaces to suppress emission of dust. Frequency of Sprinklings will be kept such that the dust remains under control, particularly when wind is blowing towards the receptors	CC	Monitoring compliance	During construction phase
2.1.2	Dust emissions from soil piles and aggregate storage stockpiles will be reduced by appropriate measures. These may include: → Keeping the material moist by sprinkling of water at appropriate frequency → Erecting windshield walls on three sides of the piles such that the wall project 0.5m above the pile, or → Covering the pile, for example with	CC	Monitoring compliance	During construction phase

	tarpaulin or thick plastic sheets, to prevent emissions. → Locating stock piles out of the wind direction			
2.1.3	All roads within the proposed Project will be paved as early as possible after the commencement of construction work. Until the roads are paved, they will be sprinkled regularly to prevent dust emission. Other temporary tracks within the site boundary will be compacted and sprinkled with water during the construction works.	Shehnaz Enterprises, CC	Monitoring compliance	During construction phase
2.1.4	Project traffic will maintain a maximum speed limit of 20km/hr on all unpaved roads within the proposed site area.	Shehnaz Enterprises, CC	Check speed of vehicles	During construction phase
2.1.5	Construction materials that are susceptible to dust formation will be transported only in securely covered trucks to prevent dust emission during transportation.	CC	Monitoring compliance	During construction phase
2.1.6	The exposure of construction workers to dust will be minimized by provision of dust masks.	CC	Check for dust masks	During construction phase
2.2	**Vehicle Equipment and Exhaust.**			
2.2.1	All vehicles, generators and other equipments used during the construction will be properly tuned and maintained in good working condition in order to minimize emission of pollutants.	Shehnaz Enterprises, CC	Maintenance records of vehicles and equipments	During construction phase
2.2.2	The stack height of the generators during operation phase will be	CC	Monitor compliance	During construction phase

	vented through vertical stacks to minimize exposure at ground level			
2.3	**Generator Emissions**			
2.3.1	The option of using natural gas as fuel in the back-up generators should be explored.	Shehnaz Enterprises, Generator Vendor	Monitor compliance	During design phase
2.3.2	The generator will be properly tuned and maintained in good working condition in order to minimize exhaust emissions	Shehnaz Enterprises	Check maintenance records	During operation phase
2.3.3	The diesel generator should be used for a very short duration with the power switched back to the main power supply as quickly as possible.	Shehnaz Enterprises	Monitoring compliance	During operation phase
2.3.4	NOx emission reduction techniques should be employed on a regular basis	Shehnaz Enterprises	Monitor NOx emissions	During operation phase
3	**Construction Noise**			
3.1	Reduce equipment noise at source by proper design, maintenance and repair of construction machinery and equipment	Shehnaz Enterprises, CC	Check maintenance records	During construction phase
3.2	Minimize noise from vehicles and power generators by use of proper silencers and mufflers.	Shehnaz Enterprises, CC	Monitor compliance	During construction phase
3.3	Use noise-abating devices wherever needed and practicable.	Shehnaz Enterprises, CC	Monitor compliance	During construction phase
4	**Water Sourcing**			
4.1	A complete record of water consumption during construction and operation phase will be maintained	Shehnaz Enterprises, CC	Check water consumption records	During construction and operation phase
4.2	If a new water well is to be installed, it will be designed to abstract water preferably from	Shehnaz Enterprises, CC	Monitor compliance	During construction phase

	deep aquifer not being used by local communities			
4.3	Water conservation program will be initiated to prevent wastage of water.	Shehnaz Enterprises, CC	Monitor compliance	During construction and operation phase
4.4	The water supply lines will be checked and repaired for leaks in order to reduce wastage of water.	Shehnaz Enterprises, Maintenance Contractor	Check maintenance records	During operation phase
4.5	Recycle grey water for use for toilet flushing	Shehnaz Enterprises	Monitor compliance	During operation phase
4.6	Ensure that water efficient sanitary fittings are used throughout the development e.g. low flush toilets, water efficient shower heads, and aerators on faucets	Shehnaz Enterprises, CC	Monitor compliance	During construction and operation phase
5	**Soil Contamination**			
5.1	Fuels, lubricants, and chemical will be stored in covered bounded areas, underlain with impervious lining	Shehnaz Enterprises, CC	Monitor compliance	During construction phase
5.2	Maintenance of vehicles and equipment will only be carried out designated areas. The area will be provided with hard surface or tarpaulin will be spread on the ground to prevent contamination of soil	Shehnaz Enterprises, CC	Monitor compliance	During construction phase
5.3	Vehicles will only be washed at designated areas.	CC	Vehicle Inspection record	During construction phase
5.4	Regular inspections will be carried out to detect leakage in construction vehicles and equipment	Shehnaz Enterprises, CC	Check inspection / maintenance records	During construction phase
5.5	Appropriate arrangements, including shovels, plastic bags and absorbent materials, will	CC	Monitor compliance	During construction phase

	be available near fuel and oil storage areas			
5.6	Contaminated soil will be removed and properly disposed after treatment such as incineration etc.	Shehnaz Enterprises, CC	Monitor compliance	During construction phase
6	**Traffic**			
6.1	Heavy traffic during construction phase will come to the project site during late night hours.	Shehnaz Enterprises, CC	Traffic record	During construction phase
6.2	Project vehicles shall not be fitted with pressure horns	CC	Monitor compliance	During construction phase
6.3	During construction, regulate speed of vehicles	Shehnaz Enterprises, CC	Monitor compliance	During construction phase
6.4	Designated parking areas will be provided for different type of project vehicles within and around the project site	Shehnaz Enterprises, CC	Monitor compliance	During construction phase
6.5	Manage vehicle movement to avoid traffic jam and long queues	Shehnaz Enterprises, CC	Monitor compliance	During construction and operation phase
6.6	Prepare, implement and monitor the traffic management plan	Shehnaz Enterprises	Monitor compliance	During construction and operation phase
6.7	Vehicles to use designated parking areas during operational phase.	Shehnaz Enterprises	Monitor compliance	During operation phase
6.8	Parking of vehicles alongside the road should be prohibited at all time.	Shehnaz Enterprises	Monitor compliance	During construction and operation phase
7	**Wastewater Generation**			
7.1	**Wastewater Generation During Construction**			
7.1.1	Wastewater generated at the campsites will be stored temporarily in septic systems comprising of septic tanks from where it will	Shehnaz Enterprises, CC	Monitor compliance	During construction phase

	be routed to a nearest drain/sewerage system.			
7.1.2	At the time of restoration, septic tanks will be dismantled in place and backfilled with at least 1m of soil cover above the surrounding natural surface level	CC	Monitor compliance	After the completion of construction phase
7.2	**Wastewater Generation During Operation**			
7.2.1	The grey water will be recycled to be re-used again in toilets and kitchens etc.	Shehnaz Enterprises	Monitor compliance	During operation phase
7.2.2	Black water will be temporary stored in septic tanks and will be discharged into a nearby out fall sewer via trunk sewer	Shehnaz Enterprises, CC	Monitor compliance	During design, construction & operation phase
7.2.3	Waste segregation measures would be employed to minimize entry of solid waste into the wastewater stream	Shehnaz Enterprises	Monitor compliance	During operation phase
7.2.4	Water conservation strategies will be employed to avoid wastage of water	Shehnaz Enterprises	Monitor compliance	During operation phase
8	**Solid Waste Generation and Management**			
8.1	**Solid Waste Generation and Management During Construction**			
8.1.1	Separate bins will be placed for different types of wastes- plastics, paper, metal, glass, wood, and cotton.	Shehnaz Enterprises, CC	Monitor compliance	During construction phase
8.1.2	Recyclable material will be separated at source. The recyclable waste will be sold to waste contractors for recycling	Shehnaz Enterprises, CC	Monitor compliance	During construction phase
8.1.3	Non-hazardous non-recyclable wastes such as construction camp kitchen wastes will be disposed off in landfill site through municipal administration or	Shehnaz Enterprises, CC	Monitor compliance	During construction phase

	approved waste contractor.			
8.1.4	No waste will be dumped at any location outside the proposed site boundary.	Shehnaz Enterprises, CC	Monitor compliance	During construction phase
8.1.5	All hazardous waste will be separated from other wastes. Hazardous wastes will be stored in designated areas with restricted access and proper marking. Hazardous wastes will be disposed of through approved waste contractors.	Shehnaz Enterprises, CC	Check hazardous waste disposal records	During construction phase
8.1.6	Surplus construction materials including partially filled chemical and paint containers will be returned to suppliers. Inert construction wastes will be disposed of onsite as fill material or sold as scrap to contractors.	Shehnaz Enterprises, CC	Check waste records	During construction phase
8.1.7	Records of all waste generated during the construction period will be maintained. Quantities of waste disposed, recycled, or reused will be logged on a Waste Tracking Register	Shehnaz Enterprises, CC	Check waste record register	During construction phase
8.1.8	Training will be provided to personnel for identification, segregation, and management of waste	Shehnaz Enterprises, CC	Check training records	During construction phase
8.2	**Solid Waste Generation and Management During Operation**			
8.2.1	Waste generation will be minimized by adopting waste management strategy of reduce, reuse and recycle	Shehnaz Enterprises	Monitor compliance	During operation phase
8.2.2	A waste management plan will be prepared, implemented and monitored for the safe	Shehnaz Enterprises	Monitor compliance	During operation phase

	collection, storage and treatment/disposal of the building waste			
8.2.3	Records of all waste generated will be maintained. Quantities of waste disposed, recycled, or reused will be logged on a Waste Tracking Register	Shehnaz Enterprises	Check waste tracking register	During operation phase
8.2.4	Training will be provided to personnel for identification, segregation, and management of waste	Shehnaz Enterprises	Check training records	During operation phase
8.2.5	All inert and non-hazardous construction wastes will be disposed to the existing tipping sites within or outside of the city limits	Shehnaz Enterprises, Waste Contractor	Monitor compliance	During operation phase
8.2.6	Hazardous wastes will be disposed through waste management contractors who will identify suitable disposal options for these wastes such as recycling, metal recovery, incineration or bioremediation etc.	Shehnaz Enterprises, Waste Contractor	Monitor compliance	During operation phase
8.2.7	Various waste containers for waste collection should be placed at appropriate locations in the building	Shehnaz Enterprises	Monitor compliance	During operation phase
8.2.8	Waste storage areas should be located within the facility and sized to the quantities of waste generated, with the following design considerations: Hard, impermeable floor with drainage, and designed for cleaning/disinfection with available water supply, Secured by locks with restricted access designed for access and regular cleaning by authorized	Shehnaz Enterprises, CC	Monitor compliance	During operation phase

	cleaning staff and vehicles Protected from sun, and inaccessible to animals/Rodents Equipped with appropriate lighting and ventilation Segregated from food supplies and preparation areas Equipped with supplies of protected clothing, and spare bags/containers			
9	**Seismicity**			
9.1	No specific mitigation measures other than to construct the facility in accordance with UBC Zone 2B	Shehnaz Enterprises, Structure Design Consultant, CC	Monitor compliance	During project design phase
10	**Sustainability**			
10.1	Best practice of energy efficiency will be incorporated in the building design	Shehnaz Enterprises, CC	Monitor compliance	During project design phase
10.2	Buildings to be constructed with high levels of thermal insulation	Shehnaz Enterprises, CC	Monitor compliance	During project design phase
10.3	Ensure that HVAC system, refrigeration equipment and fire suppression equipment do not contain HCFC's or Halons	Shehnaz Enterprises, CC	Monitor compliance	During project design phase
11	**Socio-Economic Impacts**			
11.1	Deliveries should be programmed to arrive and routed to minimize disturbance to sensitive receptors	Shehnaz Enterprises, CC	Monitor compliance	During construction phase
11.2	Designated parking areas will be provided for different type of project vehicles within and around project site	Shehnaz Enterprises, CC	Monitor compliance	During construction & operation phase
11.3	Areas earmarked for amenity infrastructure will not be used for other purposes after construction	Shehnaz Enterprises	Monitor compliance	During construction & operation phase

11.4	Employment preference will be given to residents of the project area	Shehnaz Enterprises, CC	Monitor compliance	During construction & operation phase
11.5	Local contractors will be given preference for hiring equipment and machinery during operation	Shehnaz Enterprises, CC	Monitor compliance	During construction & operation phase
11.6	Ensure maximum quantity of water to be treated and reused in order to lessen its burden on the existing sewerage system.	Shehnaz Enterprises	Monitor compliance	During design, construction & operation phase
11.7	Locals, surrounding business and city government are kept on the same page during all stages of the development of the project.	Shehnaz Enterprises	Monitor compliance	During construction phase
11.8	A complaint register will be maintained on site during construction to record complaints of the nearby residents.	Shehnaz Enterprises	Provision of complaint register	During construction phase

Table 7.2: Environmental Monitoring Plan

Ambient Air Quality Sampling Plan

Phase	**Parameters**	**Locations**	**Frequency**	**Duration**	**Standards**
Construction	SOx, NOx, CO, O_3, Smoke, PM_{10}	At the interface of project site and receptors	Twice Monthly	Continuous for 8 hours* in a full working day	NAAQS (USEPA)
Operation	SOx, NOx, CO, O_3, Smoke, PM_{10}	At the interface of project site and receptors	Quarterly	Continuous for 8 hours* in a full working day	SEQS (Pak EPA)

Drinking Water Quality Sampling Plan

Stages	**Parameters**	**Locations**	**Frequency**	**Duration**	**Standards**
Construction	Heavy metals, TDS, TSS, pH, Total Coliform, Faecal Coliform	Ground water source and other sources	Monthly	Grab sampling	WHO drinking water quality guidelines

Operation	Heavy metals, TDS, TSS, pH, Total Coliform, Faecal Coliform	Drinking water sources	Quarterly	Grab sampling	WHO drinking water quality guidelines
Wastewater Quality Sampling Plan					
Stages	**Parameters**	**Locations**	**Frequency**	**Duration**	**Standards**
Construction	BOD, COD, DO, TSS, TDS, pH, NO_3, SO_4, Oil & Grease)	Camp site discharge points into drains	Twice Monthly	Grab sampling	SEQS (Pak EPA)
Operation	BOD, COD, DO, TSS, TDS, pH, NO_3, SO_4, Oil & Grease)	Effluent from wastewater treatment plant	Twice Monthly	Composite sampling / Grab sampling	SEQS (Pak EPA)
Noise Level Sampling Plan					
Stages	**Parameters**	**Locations**	**Frequency**	**Duration**	**Standards**
Construction	Decibels [dB(A)Scale]	At the interface of project site & receptors	Twice Monthly	Continuous for 8 hours in a full working day	WHO Noise Guidelines
		7 m from the equipment at construction site			
Operation		At the interface of project site & facing road	Quarterly		SEQS for Noise (Pak EPA)
		7 m from the equipment at construction site			
Solid Waste					
Stages	**Parameters**	**Locations**	**Frequency**	**Duration**	**Standards**
Construction	Waste generation rate, waste composition; recyclables and non-recyclables, hazardous waste	At main solid waste collection point from where the waste is transported from site	Monthly	24-hour sample collected during week days	EPA
Operation	Waste generation	At waste transfer	Quarterly	24-hour sample	EPA

	rate, waste composition; recyclables and non-recyclables, hazardous waste	facility of the project site prior to off-site disposal		collected during week days and holidays	

Table 7.3: Sample Forms for Ambient Air Quality Monitoring Record

Items		*Measured Value (Mean)*	*Measured Value (Max.)*	*SEQS*	*Remarks (Measurement Point, Frequency, Method, etc.)*	*Comments**
SO_2	Annual Average			80 µg/m³		
	24 hours			120 µg/m³		
NO_2	Annual Average			40 µg/m³		
	24 hours			80 µg/m³		
NO	Annual Average			40 µg/m³		
	24 hours			40 µg/m³		
CO	8 hours			5.0 mg/m³		
	1 hour			10 mg/m³		
Lead Pb	Annual Average			1.0 µg/m³		
	24 hours			1.5 µg/m³		
O_3	1 hour			130 µg/m³		
Suspended	Annual Average			360 µg/m³		
SPM	Annual Average			360 µg/m³		
	24 hours			500 µg/m³		
Respirable particulate matter *PM_{10}*	Annual Average			120 µg/m³		
	24 hours			150 µg/m³		
Respirable particulate matter *$PM_{2.5}$*	Annual Average			40 µg/m³		
	24 hours			75 µg/m³		

* (H=High, L=Low)

Table 7.4: Stack Emissions

CO, SO_x, NO_x, Smoke							
Location	*S.#*	*Parameters*	*Date*	*Time (Hrs: Min)*	*Result (mg/Nm³)*	*SEQS (mg/Nm³)*	*Comments**
	1	CO				800	
	2	SO_x				1700	

	3	NO_x				600	
	4	Smoke				40% or 2 Ringlemann Scale or equivalent smoke number	
	5	PM_{10}				500	

* (H=High, L=Low)

Table 7.5: Sample Forms for Wastewater Quality Monitoring Record

Item	*Unit*	*Measured Value (Mean)*	*Measured Value (Max.)*	*SEQS*	*Remarks (Measurement Point, Frequency, Method, etc)*
pH	pH			6-10	
TSS (Total Suspended Solids)	mg/L			150	
TDS (Total Dissolved Solids)	mg/L			3500	
BOD5	mg/L			80	
COD	mg/L			150	
Oil and Grease	mg/L			10	
Phenols	mg/L			0.1	
Chloride	mg/L			1000	
Cyanide	mg/L			2	
Sulphate	mg/L			600	
Sulphide	mg/L			1.0	
Ammonia	mg/L			40	
Fluoride	mg/L			10	
Pesticides	mg/L			0.15	
Cadmium	mg/L			0.1	
Chromium	mg/L			1.0	
Copper	mg/L			1.0	
Lead	mg/L			0.5	
Mercury	mg/L			0.01	
Selenium	mg/L			0.5	
Nickel	mg/L			1.0	
Total Toxic metals	mg/L			2.0	
Zinc	mg/L			5.0	
Arsenic	mg/L			1.0	
Barium	mg/L			1.5	
Iron	mg/L			8.0	
Silver	mg/L			1.0	
Manganese	mg/L			1.5	
Boron	mg/L			6.0	
Chlorine	mg/L			1.0	

An-ionic detergents	mg/L			20	
Temperature	°C			40°≤ 3°	

Table 7.6: Sample Form for Noise Quality Monitoring Record

Location	*S. #*	*Date*	*Time (Hrs: Min)*	*Analysis Result [dB(A)Scale*	*SEQS [dB(A)Scale]**	*Comments***
	1				55 (Day) / 45 (Night)	
	2				55 (Day) / 45 (Night)	
	3				55 (Day) / 45 (Night)	
	4				55 (Day) / 45 (Night)	
	5				55 (Day) / 45 (Night)	
	6				55 (Day) / 45 (Night)	
	7				55 (Day) / 45 (Night)	
	8				55 (Day) / 45 (Night)	

** (H=High, L=Low)

Table 7.7: Sample Form for Drinking Water Quality Monitoring Record

Location	*Date*	*Parameters*	*Sindh Environmental Quality Standards (mg/l)*	*Analysis Result (mg/l)*	*Comments**
		Color	< 15 TCU		
		Taste	Non-objectionable/ Acceptable		
		Odor	Non-objectionable /Acceptable		
		Turbidity	< 5 NTU		
		Total Hardness as $CaCO_3$	< 500 mg/l		
		TDS	<1000		
		pH	6.5-8.5		
		Aluminum (Al) mg/l	≤ 0.2		
		Antimony (Sb)	≤ 0.005		
		Arsenic (As)	≤ 0.05		
		Barium (Ba)	0.7		
		Boron (B)	0.3		
		Cadmium (Cd)	0.01		
		Chloride (Cl^-)	< 250		
		Chromium (Cr)	≤ 0.05		
		Copper (Cu)	2		
		Phenolic compounds	<0.0002		
		Cyanide (CN^-)	≤ 0.05		
		Fluoride (F)	≤ 1.5		
		Lead (Pb)	≤ 0.05		
		Manganese (Mn)	≤ 0.5		

		Mercury (Hg)	≤ 0.001		
		Nickel (Ni)	≤ 0.02		
		Nitrate $(NO_3)^-$	≤ 50		
		Nitrite $(NO_2)^-$	≤ 3		
		Selenium (Se)	≤ 0.01		
		Residual Chlorine	0.2-0.5 At consumer end 0.5-1.5 at source		
		Zinc (Zn)	5.0		
		All water intended for drinking (E.Coli or Thermo tolerant Coliform bacteria)	0.0 cfu/ 100 ml		
		Treated water entering the distribution system (Ecoli or thermo tolerant coliform and total coliform bacteria)	0.0 cfu/ 100 ml		
		Treated water in the distribution system (E.coli or thermo tolerant coliform and total coliform bacteria)	0.0 cfu/ 100 ml		

(cfu=Coliform Unit), * (H=High, L=Low)

Table 7.8: Sample Form for Solid Waste Monitoring Record

(Domestic/residential/commercial solid wastes)

Location: _____, Date: _____, Source: _____ (domestic/commercial)

Total Quantity (kg)	*Components*	*Weight (as % by weight discarded)*		*Recyclables (as discarded)*	*Non-recyclables*	*Organic waste*
	Food/kitchen waste					
	Plastics					
	Metals					
	Paper					
	Textile/Rugs					
	Cardboard					
	Glass					
	Rubber					
	Other					
Total						

Generation Rate:

For domestic or residential units $\frac{\text{Total waste generated}}{\text{No of persons in units}}$ = _____ kg/capita/day

For commercial units $\frac{\text{Total waste generated}}{\text{Total floor area of unit}}$ = _____ kg per unit area

Summary:

- Total Waste Generated (as collected) = _____ kg
- Recyclable waste quantity = _____ kg
- Non-Recyclable waste quantity = _____ kg
- Organic waste quantity = _____ kg
- %age of Recyclables = _____ %
- %age of Non-recyclables = _____ %
- %age of Organic waste = _____ %
- Total waste sent for recycling = _____ kg
- Total waste sent for landfill = _____ kg

Comments:

_____

Table 7.9: Sample Form for Solid Waste Monitoring Record (Hazardous solid wastes)

Location: _____, Date: _____, Source: _____ (domestic/commercial)

Total Quantity (kg)	*Hazardous waste Components*	*Weight (as discarded)*	*% by weight (as discarded)*	*Characteristics (corrosive, toxic, explosive, etc.)*	*Non-recyclables (requiring disposal)*	*Recyclables*
Total						

Generation Rate:

Whichever of the following applies:

For domestic or residential units $\frac{\text{Total waste generated}}{\text{No of persons in units}}$ = _____ kg/capita/day

For commercial units area

$$\frac{\text{Total waste generated}}{\text{No of persons in units}} = \_\_\_\_\_ \text{ kg per unit}$$
$$\text{Total floor area of unit}$$

Summary:

- Total Waste Generated (as collected) = _____ kg
- Recyclable waste quantity = _____ kg
- Non-Recyclable waste quantity = _____ kg
- %age of Recyclables = _____ %
- %age of Non-recyclables = _____ %
- Total waste sent for recycling = _____ kg
- Total waste sent for disposal = _____ kg

Comments:

_____

7.6 Standard Operating Procedures (During Construction phase)

7.6.1 Wastewater/ Storm water management

(1) Purpose of Wastewater/storm water Management

The purpose of the adopted procedure is to provide guidelines and simplify the process of categorizing, quantifying, managing, and disposing of wastewater wherever and whenever arising during the project's construction phase. Wastewater management is a critical component of operating policies. Wastewater management includes the proper disposal / recycling and reuse of the wastewater generated during construction and operation phase.

(2) Scope

Wastewater as part of construction operation will be managed as per this procedure. An integrated wastewater management system for T&A Craft Residency project is essential to reduce wastewater.

Substitute techniques must be investigated, including source reduction, recycling and reuse wherever possible with a view towards maximizing the benefits and minimizing the cost of each method of wastewater management.

(3) Procedure

Main concern to manage the wastewater is listed below:

- Eliminate wastewater production wherever possible.
- Minimize wastewater production.

- Recycle or Reuse
- Wastewater disposal in an environmentally safe manner through adequately designed facility
- Proper drainage of Storm water

a) **Wastewater Minimization:** Generation of wastewater will be minimized through the following steps taken by working personnel at the facility:

- Through efficient use of raw water (minimizing the wastewater).
- Reuse of wastewater after treatment.

b) **Storage and Handling:** Wastewater shall be stored/retained in specifically designed facility or storage tanks till proper treatment at sewage treatment plant is sought and subsequently disposed of.

c) **Segregation:** Wastewater used in construction will be segregated from wastewater originating from latrines used by construction staff.

d) **Recycling:** Reuse of wastewater is a best way to reduce the quantity of the wastewater that requires subsequent treatment and disposal. Construction wastewater may be reused in construction activity because it is generally Non-hazardous.

e) **Treatment:** Wastewater originates from latrines used by construction staff requires treatment through retention in septic tanks and through primary and secondary treatment processes.

f) **Disposal:** Proper disposal should be done following the treatment through discharge into water bodies or sewerage system where available.

(4) Wastewater Management Options

- All storm water run-off from construction sites will be inspected for the sediment load and may be directed to sedimentation basins to remove suspended solids (e.g., silt);
- Sewage may be collected and temporarily stored in tank(s) until it is transported to a designated wastewater treatment facility;
- Standard mobile sewage tankers may be engaged to collect and transport sewage from portable latrines and temporary storage tanks;
- Direct discharge will only be considered as a contingency option.

7.6.2 Solid Waste Management Plan

(1) Purpose

The purpose of this procedure is to provide guidelines and simplify the process of categorizing, managing and disposing of solid wastes. Waste management includes the proper handling, collection, storage, manifesting, transportation, and disposal/recycling of the solid waste generated. The procedure is designed to assist in the management's wide effort to provide protection to the environment and to comply with environmental laws and regulations regarding proper waste management.

(2) Scope

The waste management plan has been developed to ensure that the Management of solid waste generated as a result of the construction is consistent, efficient, and in conformance with the laws and regulations.

With respect to monitoring, the waste management sets out the following objective:

- To monitor and inspect waste management-related facilities and activities directly resulting from executing the scope of the contract in order to ensure compliance with the WMP. Guidelines for proper handling, categorization, recording, minimization, recycling and disposal of all types of waste associated with company operations and projects are part of this procedure.

(3) Definitions

a) **Waste:** Any material, for which no further use is intended, is considered a waste. It can be solid, semi-solid or liquid. Additionally, abandoned materials and materials intended to be recycled are considered wastes. It is very important to understand this concept, because even though something is going to be recycled, it must be managed as a waste until it is actually recycled.

b) **Hazardous Waste:** Waste is categorized as a hazardous waste if it has one or more of the following properties:

- Ignitability (flash point less than 60°C);
- Corrosivity (pH less than or equal to 2.0, or greater than or equal to 12.5);
- Reactivity (inherently unstable under ordinary conditions or when exposed to water);
- Irritability (when in contact with body causes inflammation)

- Toxicity (may cause risk of injury to health of organisms or the environment.)

c) **Non-hazardous Waste:** The wastes are categorized as non-hazardous wastes, if they do not possess any of the hazardous characteristics as defined above. However, non-hazardous waste may still present hazards to employees who handle them. All recommended safety and handling practices must be followed.

(4) Procedure

Priorities to manage the waste are listed below:

- Eliminate waste production whenever and wherever possible. Use the material only for its intended purpose on site
- Minimize waste production
- Reuse
- Dispose of waste through properly designed waste disposal facility.

a) **Waste Minimization:** To minimize waste, the following steps shall be taken by all personnel working on sites (during construction phase):

- Only the needed amount of materials shall be ordered. Before purchasing hazardous material, all alternatives for non-hazardous material should be explored.
- Prior consideration shall be given to the sizes of containers available when ordering products that could potentially generate waste. The intent is to avoid unused products and/or their containers from becoming wastes that require special handling.

b) **Waste Categorization:** All wastes generated at facilities shall be categorized in two major categories (i.e. Hazardous wastes and Non-hazardous wastes) as per the definitions in section above. Each category has different types of requirement for handling, storage and disposal.

c) **Labelling**

- Name of the waste (e.g., waste oil, solvents, paints).
- Waste category (e.g., toxic, ignitable).
- Facility name and address (disposal site, etc.).
- Date of waste accumulation: (date when waste was placed in drum).
- Wastes are segregated and located in designated areas to optimize control; storage areas.

d) **Segregation:** The scheme of segregation is as follow:

- All hazardous waste if found shall be segregated from other types of hazardous wastes as well as non-hazardous wastes at the point of generation of waste.
- Food waste shall be collected in separate containers.
- All containers must be clearly labeled. The label must clearly mention the name or type of waste. Also, if the waste is hazardous, it should be clearly labeled on the container along with its hazardous characteristics (e.g. flammable, toxic, radioactive, etc.). This is important to workers and to emergency response teams, who need to know what they are dealing with. Missing or unreadable labels must be replaced.

e) Storage and Handling

- Waste shall be temporarily stored at waste storage facility that will be sent for recycling or off-site disposal shall be temporarily stored at designated site(s) within the building premises.
- The oily sludge, contaminated soil shall be stored in containers
- All other wastes awaiting disposal shall be kept in closed containers/boxes separately. Care must be taken to prevent wastes giving rise to secondary environmental problems, such as odors or soil and groundwater contamination through rainwater leaching.
- All stored wastes must be clearly labeled with type of waste and warning signs.
- Daily estimates of hazardous and non-hazardous waste and volumes generated on site.
- Waste segregation, waste storage containers, general housekeeping and the provision of adequate resources will be monitored.
- All workers handling wastes shall use proper PPE.

f) Reuse

Construction waste can be reused in other construction projects & excavated material can be reused in backfilling.

g) Disposal

Disposal becomes the only available alternatives, if reuse and recycling options are exhausted. A material should be classified as a waste for disposal only if no other useful purpose can be identified and if the material cannot be beneficially reused or recycled. The choice of a suitable disposal option for any waste depends on both environmental and economic considerations. The final disposal can only be off-site disposal facilities due to limited space available.

It requires properly designed and well-operated commercial waste disposal facilities such as sanitary landfill. All such facilities should be explored and evaluated for possible future use.

(5) Recording & Reporting

The management has to record the information about source, composition, quantity, and final disposal of the waste. This information is needed for regulatory compliance, risk assessment and setting reduction targets and objectives as well as corporate statistics. The routine track of waste shall be recorded.

7.6.3 Air and Noise Emissions

(1) Purpose

The purpose of this guideline is:

- To monitor contents of polluting substances in the atmospheric air;
- To control observance of approved limiting permissible emissions at man-made sources;
- To monitor natural sources and a number of man-made sources of emission at work sites at the construction phase;
- To identify sources of noise emissions and control noise pollution;
- To monitor noise emissions.

(2) Scope

Scope of work includes:

- Evaluation of present ambient air quality and noise level at existing area.
- Evaluation of impact of traffic movement at the proposed site and noise level.
- Evaluation of impacts on roads and in the adjacent area due to construction.
- Evaluation of impacts of air emissions and noise from various stationary sources.
- Recommendations for mitigation techniques to redress the expected impacts both for design phase.

(3) Definitions

Air pollution may be referred to as contamination of pollutants dispersed in air affecting ambient air quality that may be deleterious to life and property.

In common use the word noise means unwanted sound or noise pollution. Excessive noise permanently damages hearing, but a continuous low-level sound can be dangerous too.

(4) Procedure

Air emissions (continuous or non-continuous) from facilities such as power generators are comprising of principal gases (greenhouse gases) which typically include carbon monoxide (CO), carbon dioxide (CO_2), water vapors and other gases such as nitrogen oxides (NOx), and, in case of sour gases, sulphur dioxide (SO_2). Air quality impacts should be estimated by the use of baseline air quality assessments and atmospheric dispersion models to establish potential ground level ambient air concentrations during facility design and operations planning. These studies should ensure that no adverse impacts to human health and the environment result. All reasonable attempts should be made to maximize energy efficiency and design facilities to minimize energy use. The overall objective should be to reduce air emissions and evaluate cost-effective options for reducing emissions that are technically feasible.

Also, vehicular emissions and noise due to traffic movement in and around the complex facility may of concern to be mitigated and monitored. Atmospheric conditions that may affect noise levels include humidity, wind direction, and wind speed. Vegetation, such as trees, and walls can reduce noise levels. Installation of acoustic insulating barriers can be implemented, where necessary.

(5) Noise and Air Emissions Management Options

Noise and air emissions monitoring includes;

- Monitoring of air and noise emissions.
- Pollution control technology assessment,
- Emission inventory development,
- Development of parametric monitoring, periodic monitoring, and compliance assurance monitoring.

(6) Air and Noise Quality Monitoring

Refer attached Environmental Monitoring Plan for details of air and noise quality monitoring at the T&A Craft Residency project site during construction phase.

a) **Performance Indicator:** Monitoring results of ambient air shall show the concentration of pollutant in ambient air.
b) **Record and Comments:** Record would be kept with the laboratory report attached.

7.7 Standard Operating Procedures (During Operational Phase)

7.7.1 Wastewater Management

(1) Purpose of Wastewater Management

The purpose of this procedure is to provide guidelines and simplify the process of categorizing, managing, and disposing of wastewater wherever and whenever arising during the project's operational phase. Wastewater management includes the proper disposal/recycling & reuse of the wastewater generated during operation phase.

(2) Scope

Wastewater generation as part of operational activity will be managed as per this procedure. An effective wastewater management system for T&A Craft Residency building is essential to reduce wastewater. Substitute techniques must be investigated, including source reduction, recycling and reuse wherever possible with a view towards maximizing the benefits and minimizing the cost of each method of wastewater management.

(3) Definitions

a) **Wastewater:** All water arising after use/consumption from the Project which can encompass a wide range of potential contaminants and concentrations.

b) **Hazardous Wastewater:**

- All wastewater comes in the category of hazardous wastewater. If it has one or more of the following properties:
- Oily water
- Toxicity (wastewater containing laboratory testing chemicals, antibiotics etc.)
- Concentration of contaminants too high above safe acceptable limits

c) **Non-hazardous Wastewater:** All wastewaters are categorized as non-hazardous wastes, if they do not possess any of the hazardous contaminant mainly comprising of consumed water arising from washing area and sanitary wastewater.

(4) Procedure

Main concern to manage the wastewater is listed below:

- Eliminate wastewater production wherever possible.
- Minimize wastewater production.
- Recycle or Reuse

- Wastewater disposal in an environmentally safe manner through adequately designed facility

a) **Wastewater Minimization:** Generation of wastewater will be minimized through the following steps taken by working personnel at the facility:

- Through efficient use of raw water (minimizing the wastewater).

b) **Storage and Handling:** Wastewater shall be stored/retained in specifically designed facility or storage tanks till appropriate treatment is sought and subsequently disposed of.

c) **Segregation:** Hazardous wastewater shall be segregated from Non-hazardous wastewater.

d) **Recycling:** Recycling of Non-hazardous wastewater is a best way to reduce the quantity of the total wastewater that requires subsequent treatment and disposal. Non-hazardous wastewater may be used in the cooling plants and for horticulture purposes.

e) **Treatment**

- Treatment of wastewater through retention in septic tanks and through primary and/or secondary treatment processes.
- Some of the wastewater may be reused as mentioned in recycling of wastewater. The treated water should comply with Sindh Environmental Quality Standards (SEQS).

f) **Disposal**

Proper disposal should be done following the treatment through discharge into water bodies or sewerage system where available.

(5) Drinking Water Quality and Wastewater Monitoring Plan

Refer attached Environmental Monitoring Plan for details of drinking water quality and wastewater monitoring plan.

a) Performance Indicator

Monitoring results of water quality shall show the extent of contamination in the drinking water and shall regulate and maintain the quality of potable water for establishing its suitability for human consumption as per WHO guidelines for drinking water quality.

Monitoring results of wastewater quality shall show the concentration of pollutants in the sewage water and potential for contamination of ground water if not disposed of properly.

b) Record and Comments

Record of analysis reports shall be maintained.

7.7.2 Solid Waste Management Plan

(1) Purpose

The purpose of this procedure is to provide guidelines and simplify the process of categorizing, managing, and disposing of solid wastes. Waste management is a critical component of management's operating policies. Waste management includes the proper handling, collection, storage, manifesting, transportation, and disposal / recycling of the solid waste generated.

(2) Scope

The waste management plan has been developed to ensure that the Management of solid waste generated as a result of operation is consistent, efficient, and in conformance with the laws and regulations.

(3) Definitions

a) Waste: Any material, for which no further use is intended, is considered a waste. It can be solid, semi-solid or liquid. Additionally, abandoned materials and materials intended to be recycled are considered wastes. It is very important to understand this concept, because even though something is going to be recycled, it must be managed as a waste until it is actually recycled.

b) Hazardous Waste: Waste is categorized as a hazardous waste if it has one or more of the following properties:

- Ignitability (flash point less than 60°C);
- Corrosivity (pH less than or equal to 2.0, or greater than or equal to 12.5);
- Reactivity (inherently unstable under ordinary conditions or when exposed to water);
- Irritability (when in contact with body causes inflammation)
- Toxicity (may cause risk of injury to health of organisms or the environment.)

c) Non-hazardous Waste: The wastes are categorized as non-hazardous wastes, if they do not possess any of the hazardous characteristics as defined above. However, non-hazardous waste may still present hazards to employees who handle them. All recommended safety & handling practices must be followed.

(4) Procedure

Priorities to manage the waste are listed below:

- Eliminate waste production whenever and wherever possible.
- Minimize waste production
- Reuse
- Dispose of waste through properly designed waste disposal facility.

a) **Waste Minimization:** To minimize waste, the following steps shall be taken by all personnel working on sites:

- Only the needed amount of materials shall be ordered. Before purchasing hazardous material, all alternatives for non-hazardous material should be explored.
- Prior consideration shall be given to the sizes of containers available when ordering products that could potentially generate waste. The intent is to avoid unused products and/or their containers from becoming wastes that require special handling.

b) **Waste Categorization:** All wastes generated at facilities shall be categorized in two major categories (i.e. Hazardous wastes and Non-hazardous wastes) as per the definitions in section above. Each category has different types of requirement for handling, storage and disposal.

c) **Labelling**

- Name of the waste (e.g., chemical waste, solvents, paints, biomedical etc.).
- Waste category (e.g., toxic, ignitable).
- Facility name and address (disposal site, etc.).
- Date of waste accumulation: (date when waste was placed in drum).
- Wastes are segregated and located in designated areas to optimize control; storage areas.

d) **Segregation:** As there are no hazardous wastes envisaged in the project therefore segregation among the waste will be done as per their matter.

The scheme of segregation is as follow:

- All hazardous waste if found shall be segregated from other types of hazardous wastes as well as non-hazardous wastes at the point of generation of waste.
- Laboratory chemical waste is also to be segregated into chlorinated and non-chlorinated solvents.
- Non- hazardous waste consists of containers, shipping cartons, bags, reject, broken bottles, rejected cartons, labels, strips, corrugated boxes, paper etc.

e) Storage and Handling

- All waste from floor and equipment is to be collected using vacuum cleaners.
- All containers must be properly and clearly labeled. The label must clearly mention the name or type of waste. Also, if the waste is hazardous, it should be clearly labeled on the container along with its hazardous characteristics (e.g. flammable, toxic, radioactive, etc.). This is important to workers and to emergency response teams, who need to know what they are dealing with. Missing or unreadable labels must be replaced.
- Non-hazardous waste shall be temporarily stored at waste storage facility that will be sent for recycling or off-site disposal shall be temporarily stored at waste storage facilities available at different sites such as junkyard, scrap yard, pits, etc.
- All other wastes awaiting disposal shall be kept in closed containers/boxes separately. Care must be taken to prevent wastes giving rise to secondary environmental problems, such as odors or soil and groundwater contamination through rainwater leaching.
- Daily estimates of hazardous and non-hazardous waste and volumes generated on site.
- Waste segregation, waste storage containers, general housekeeping and the provision of adequate resources will be monitored.
- All workers handling wastes shall use proper PPE.

f) Recycling: Non-hazardous waste can be recycled and reuse to minimize the quantity of waste requiring disposal. Some of the wastes (like one side printed paper) can be reused within the facilities while others can only be recycled at off-site recycling centres.

g) Disposal: Disposal becomes the only available alternatives, if reuse and recycling options are exhausted. Onsite burning or dumping of waste is strictly prohibited.

A material should be classified as a waste for disposal only if no other useful purpose can be identified and if the material cannot be beneficially reused or recycled. The choice of a suitable disposal option for any waste depends on both environmental and economic considerations. The final disposal can only be off-site disposal facilities due to limited space available.

The waste shall be disposed of through a contractor.

(5) Recording & Reporting

The management has to record the information about source, composition, quantity, and final disposal of the waste. This information is needed for

regulatory compliance, risk assessment and setting reduction targets and objectives as well as corporate statistics.

The routine track of waste shall be recorded. It is the responsibility of the proponent to assign a suitable person to sign off the record of waste tracking before the waste is dispatched outside.

7.7.3 Air and Noise Emissions

(1) Purpose

The purpose of this guideline is:

- To monitor contents of polluting substances in the atmospheric air;
- To control observance of approved limiting permissible emissions at man-made sources;
- To monitor natural sources and a number of man-made sources of emission at work sites during operational phase;
- To identify sources of noise emissions and control noise pollution;
- To monitor noise emissions.
- The air emissions from backup generators should comply with the SEQS for air emissions and reported as per SEPA reporting requirements.

(2) Scope

Scope of work include

- Evaluation of present ambient air quality and noise level at existing area.
- Evaluation of impact of traffic movement at the proposed site and noise level.
- Evaluation of impacts on roads and in the adjacent area during operational phase.
- Evaluation of impacts of air emissions and noise from various stationary sources.
- Recommendations for mitigation techniques to redress the expected impacts both for design phase and operational phase.

(3) Definitions

Air pollution may be referred to as contamination of pollutants dispersed in air affecting ambient air quality that may be deleterious to life and property.

In common use the word noise means unwanted sound or noise pollution. Excessive noise permanently damages hearing, but a continuous low-level sound can be dangerous too.

(4) Procedure

Air emissions (continuous or non-continuous) from facilities such as power generators, etc. are comprising of principal gases (greenhouse gases) which typically include carbon monoxide (CO), carbon dioxide (CO_2), water vapors and other gases such as nitrogen oxides (NOx), and, in case of sour gases, sulphur dioxide (SO_2). Air quality impacts should be estimated by the use of baseline air quality assessments and atmospheric dispersion models to establish potential ground level ambient air concentrations during facility design and operations planning. These studies should ensure that no adverse impacts to human health and the environment result. All reasonable attempts should be made to maximize energy efficiency and design facilities to minimize energy use. The overall objective should be to reduce air emissions and evaluate cost-effective options for reducing emissions that are technically feasible. Also, vehicular emissions and noise due to traffic movement in and around the plant is to be mitigated and monitored.

Atmospheric conditions that may affect noise levels include humidity, wind direction, and wind speed. Vegetation, such as trees, and walls can reduce noise levels. Installation of acoustic insulating barriers can be implemented, where necessary.

(5) Noise and Air Emissions Management Options

Noise and air emissions monitoring includes;

- Air dispersion modeling and monitoring of air and noise emissions.
- Indoor air quality management
- Pollution control technology assessment,
- Emission inventory development,
- Development of parametric monitoring, periodic monitoring, & compliance assurance monitoring.

(6) Air and Noise Quality Monitoring

Refer attached Environmental Monitoring Plan for details of air and noise quality monitoring at the T&A Craft Residency project site during operation phase.

a) **Performance Indicator:** Monitoring results of ambient air shall show the concentration of pollutant in ambient air.

b) **Records & Comments:** Records of monitoring reports shall be maintained

8. Conclusion

Based on the findings of the environmental impact assessment it is concluded that the environmental impacts of the construction and operation of T&A Craft Residency project are manageable and can be mitigated by implementing the Environmental Management and Monitoring Plan which forms an integral part of EIA document. Mitigation measures have been proposed to reduce, minimize or compensate for the identified potential negative impacts and their adoption has been recommended. The proposed project is a self-contained building having its own back-up power generation, water supply supplemented by R.O treatment system and sewage treatment, recycling and disposal system in addition to provision of more than required parking space. This being a positive impact would be an indicator of achievement of the objectives of the Project.

The design of life safety systems is a multidisciplinary solution with the architect detailing the fire stairs, evacuation routes, areas of refuge as well as the fire rating of the shafts and internal fire separation within the building. The structural engineers will specify the fire-retardant materials that will protect the structure. MEP Consultants have designed the active systems in the building to provide a comprehensive fire detection and management system in line with the overall fire and life safety strategy. General specification/details have been worked out in respect of type of structures, concrete, and all other materials required for the Construction of T&A Craft Residency Project.

Safety risk assumes substantial proportion in densified areas of urban centers. Under the circumstances there is need for strict compliance with the HSE procedures and accidents incident on non-observation of HSE procedures must be keenly monitored and recorded to ensure the safety of both workers and citizens. For this purpose, the contractor will be required to maintain a record of procedures on Health, Safety and Environment.

Realizing that the city has overgrown its sustainability limits, it is imperative that the Builders and Developers take cognizance of the cumulative effect of the current pace of rapid development. Consequently, each project is required to keep the sustainability principles in view and go an extra mile beyond the present approach which is confined to bare survival. Their projects have so far been profit oriented, now they will have to share the profit with net zero energy and net zero discharge approach in the project design.

The study recommends that the Environmental Impact Assessment (EIA) report should be approved with the provision that the suggested mitigation measures will be adopted and the Environmental Management & Monitoring Plan will be followed in letter and spirit.

Annexures

- *Approvals/NOCs*
- *Soil Investigation Report of the Project Site*
- *Electrical Resistivity Survey Report*
- *Title Docs*
- *Record of Previous Proceedings*

SINDH BUILDING CONTROL AUTHORITY
ONE WINDOW CELL

No. Clifton/PC-7/96/OWC/Arch. & Planning/Construction Permit/2021/20 Dated: 08/11/ 2021

M/S. Shehnaz Enterprises Through
Mrs. Shehnaz W/O Abdul Sattar
(42201-1214953-6) (Owner/Attorney)
Office address: FL-15, Block-2, KDA Scheme-5, Clifton, Karachi.

Area of plot: 6503.75 Sq yds
Gross covered area:987751.28 Sq.fts
Net area after exemptions: 516362.515q.fts
Category: Flat-Site

Professional Team:-
1. **Lic. Arch: Muhammad Nasir (AL-01-680)**
2. **Lic. Engr. Muhammad Ishaque (SE-06-35)**
3. **Lic. Site Engr: Anas Usaid Hashmi (Civil/32436)**
4. **Membership of ABAD: (FM-199)**
5. **Builder License of SBCA (BL-1963)**

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Above professionals will be fully responsible for safe & sound construction in accordance with approved plan and standard specifications and ensuring all safety measures during construction for the safety of workers, neighbors and pedestrians at site as defined in KB & TPR-2002 (As amended).

SUBJECT: CONSTRUCTION PERMIT ON PLOT NO. FL-15, BLOCK-2, KDA SCHEME-5, CLIFTON, KARACHI.

No. of Stories: Basement (ARS + Parking + Services) + Ground Floor (Recreation Area + Services) + 1st to 5th Floors (Parking + Services) + 6th to 7th Floor (Flats + Recreation Area + Services) + 8th to 32nd Floors (Flats + Services) + 33rd to 34th (Duplex) + Roof (Solar Panel + Battery Room + Services) only.

- Architectural Concept Plan (Not valid for construction) vide No.Clifton/PC-7/96/OWC/Arch.&Planning/ 2021/42 Dated: 26-08-2021.
- Structure NOC No. SBCA/DD(STR)/2021/22, Dated: 05-11-2021
- CAA NOC No. No. HQCAA/11/17/003/ARAS/KHI-25/1382, dated: 28.10.2016 (490 feet from AGL)
- PAF NOC No. AHQ/1532/2/ATS (PC-162/16), dated: 08.02.2017 (490 feet from AGL).
- Verification of title documents and status of land issued vide No. SBCA/title Verification Cell/AD/TP&R/2021/51, dated: 14-04-2021, by the Assistant Director, One Window Cell, SBCA. Reply has been received vide letter No.KDA/DLM/AD/BP/2021/583/1, Dated:28-06-2021, by the Assistant Director (B.P) KDA.

1. The building plan for the above mentioned plot attached herewith is hereby approved and you are Permitted to carry out construction on the said plot accordingly.
2. Provided that it does not entitle you to build on land not lawfully conveyed to you and land or road of City District Government, Karachi or any other local Authority.
3. Provided that right of easement is a matter between the concerned parties with which this Authority has not concern.
4. Provided that it holds good only if the work is started within ONE YEAR from the date where after it shall be deemed to have lapsed.
5. A full time site engineer registered with PEC shall be deputed by the owner / builder during the execution of work.
6. Provided that rain water spouts from balconies, shops, windows doors of the building shall not Project or over hanged on public streets or the land belonging to the CDGK or local Authority.
7. Provided that the construction shall be carried out under the supervision of Lic. Engineering and Lic. Architect started above.
8. The Lic. Architect, Lic. Engineer/Owner shall be jointly and severally responsible for all the structural design and standard specification to be provided for the execution of the work.
9. Provided that plinth cornice shall not project more than 2" on any public street for ornamental purpose.

AND

10. Provided that premises shall not be used for the purpose other than the use approved by the Authority and according to the terms and condition of allotment / lease.
11. Subject to the condition that if any violation is found during / after construction, the same shall be demolished.
12. Provided that the quality control and stability of the structure slab be the responsibility of the owner /attorney and Lic. Architect / Lic. Engineer.
13. No building materials or any kind of machine shall be stores/placed for execution on road of Govt. land footpaths during construction.
14. Subject to condition that all the constructional activities supervision etc shall jointly be the responsibility of professionals & owner.

OFFICIAL COPY OF CONSTRUCTION PERMIT FOR SITE

Contd.....2

15. Fire-fighting and safety arrangements shall be provided as per existing regulations and also in accordance with international standard.
16. This approval is granted with the condition that owner / builder shall mandatory design / provide the provision for utilization of at-least 5% for solar energy.
17. This approval is granted with the condition that owner / builder shall design / provide the provision of Broadband wiring which is MANDATORY as per Clause 25-1.9.3 of KB&TPR-2002.
18. Owner shall obtain the plinth verification through licensed professionals on prescribed form (ZP-4) upon completion of foundation as per KB&TPR from concerned Town.
19. The owner and professionals shall submit to the authority floor certificate (form ZP-5) at the time of casting of slab of each floor as per KB&TPR in concerned Town.
20. In case of any complaint / dispute or any court matter, the **SBCA** shall not be a party and shall not be responsible.
21. If at any later stage, it is found that the approval of Proposed plan was obtained with mis-representation of facts, the same will be withdraw / cancelled.
22. Owner / Attorney is bound to get the completion / occupancy plan approved from this Authority before occupation as per KB&TPR.
23. Air Raid Shelter (ARS) shall not be misused under any circumstances.
24. Parking as provided on **Basement, 1st Floor, 2nd Floor, 3rd Floor, 4th Floor & 5th Floor** shall not be misused under any circumstances.
25. Recreation area as provided at **Ground Floor, 6th Floor & 7th Floor** shall not be misused under any circumstances.
26. All the construction work to be carried out strictly as per Administrative Instruction and as per KB & TPR-2002 (Amended to date) with maintaining the shear wall / columns etc. as per structure drawings.
27. Owner & License professionals will take all the precautionary measures as per KB & TPR-2002 (Amended to date) and also follow the specifications / notes mentioned by Dy. Director Structure Section, SBCA in the approval letter / structural drawings during excavation and further construction to avoid any mishap to the adjoining / surrounding buildings.
28. In case of any complaint / evidence regarding Sale / Booking of Units without Sale NOC, approval of building plan should be withdrawn and builder license shall be cancelled by the Authority.
29. As per Notification No. SBCA/Secy. to DG/2016/503 Dated: 18-05-2016, owner / builder shall obtain NOC from Environment & Building Services Section, SBCA as and when made functional.
30. NOC for Sale & Advertisement shall be obtained from Design Section, SBCA as per Notification No. SBCA/PS CE/2020/06, dated 23.07.2020.
31. To achieve quality concrete of required strength for safe, sound and stable structure, the owner / builder shall use ready mix concrete from batching plant which is mandatory under clause 11-1 of KB&TPR-2002 and amended up to date.
32. This approval is granted by One Window Cell/Architectural & Planning Section only planning point of view, all other aspects like ownership/court case/complaint/dispute implementation of construction activities according to KB & TPR shall be the responsibility of concerned District.
33. At any stage, any ambiguity / error found in the approval of building plan, the same shall be conveyed accordingly by the District concerned.
34. The owner/builder shall conduct Environmental Impact Assessment (EIA) Study from **SEPA** through consultants and accordingly report shall be submitted to SBCA well before commencement of construction.
35. Before commencement of construction, the owner / builder shall obtain the requisite approval / NOC from the SEPA.
36. SBCA reserve the right to obtain all fees / charges / taxes / dues remaining to owner / builder subsequently.

Encl:

- Approved Proposed Building Plans.

Deputy Director 05/11/21
One window Cell / Arch.& Planning
Head Quarters, SBCA

Copy for information to:-

1. Director, (District South), SBCA.
2. Director, Design, SBCA.
3. Director, Vigilance Section, SBCA.
4. Director, I.T, SBCA.
5. Chairman, ABAD, Karachi.
6. Secretary to DG, SBCA.

05/11/21

SINDH BUILDING CONTROL AUTHORITY
ONE WINDOW CELL

No. Clifton/PC-7/96/OWC/Arch. & Planning/Construction Permit/2023/119 Dated: 05/06/2023

M/S. Shehnaz Enterprises (BL-1963)
Mrs. Shehnaz,(42201-1214953-6)
(Owner/Attorney)
Office address: FL-15, Block-2, KDA Scheme-5, Clifton, Karachi.

Area of plot: 6503.75 Sq.yds
Gross covered area:1117889.70 Sq.fts
Net area after exemptions:526419.29 Sq.fts
Category: FL-Site

Professional Team:-
1. **Lic. Arch: Muhammad Nasir (AL-01-680)**
2. **Lic. Engr. Muhammad Ishaque (SE-06-35)**
3. **Lic. Site Engr: Anas Usaid Hashmi (Civil/32436)**
4. **Membership of ABAD: (FM-199)**

Above professionals will be fully responsible for safe & sound construction in accordance with approved plan and standard specifications and ensuring all safety measures during construction for the safety of workers, neighbors and pedestrians at site as defined in KB & TPR-2002 (As amended).

SUBJECT: REVISED CONSTRUCTION PERMIT ON PLOT NO. FL-15, BLOCK-2, KDA SCHEME-5, CLIFTON, KARACHI.

Reference:- REV-20230529-21, dated: 01-06-2023

No. of Stories: Basement (ARS + Parking + Services) + Ground Floor (Recreation Area + Services) + 1st to 5th Floors (Parking + Services) + 6th to 7th Floor (Flats + Recreation Area + Services) + 8th to 36th Floors (Flats + Services) + 37th to 40th (Duplex) + Roof (Solar Panel + Battery Room + Services) only.

- Previous Construction Permit vide letter No.Clifton/PC-7/96/OWC/Arch.&Planning/Construction Permit/2023/56, dated: 21-03-2023.
- CAA NOC No. No. HQCAA/1117/003/ARAS/KHI-25/1382, dated: 28.10.2016 (490 feet from AGL)
- PAF NOC No. AHQ/1532/2/ATS (PC-162/16), dated: 08.02.2017 (490 feet from AGL).

1. The building plan for the above mentioned plot attached herewith is hereby approved and you are Permitted to carry out construction on the said plot accordingly.
2. Provided that it does not entitle you to build on land not lawfully conveyed to you and land or road of City District Government, Karachi or any other local Authority.
3. Provided that right of easement is a matter between the concerned parties with which this Authority has not concern.
4. Provided that it holds good only if the work is started within **ONE YEAR** from the date where after it shall be deemed to have lapsed.
5. A full time site engineer registered with PEC shall be deputed by the owner / builder during the execution of work.
6. Provided that rain water spouts from balconies, shops, windows doors of the building shall not Project or over hanged on public streets or the land belonging to the CDGK or local Authority.
7. Provided that the construction shall be carried out under the supervision of Lic. Engineering and Lic. Architect started above.
8. The Lic. Architect, Lic. Engineer/Owner shall be jointly and severally responsible for all the structural design and standard specification to be provided for the execution of the work.
9. Provided that plinth cornice shall not project more than 2" on any public street for ornamental purpose.

AND

10. Provided that premises shall not be used for the purpose other than the use approved by the Authority and according to the terms and condition of allotment / lease.
11. Subject to the condition that if any violation is found during / after construction, the same shall be demolished.
12. Provided that the quality control and stability of the structure slab be the responsibility of the owner /attorney and Lic. Architect / Lic. Engineer.
13. No building materials or any kind of machine shall be stores/placed for execution on road of Govt. land / footpaths during construction.
14. Subject to condition that all the constructional activities supervision etc shall jointly be the responsibility of professionals & owner.
15. Fire-fighting and safety arrangements shall be provided as per existing regulations and also in accordance with international standard.

...ns approval is granted with the condition that owner / builder shall mandatory design / provide the provision for utilization of at-least 5% for solar energy.

17. This approval is granted with the condition that owner / builder shall design / provide the provision of Broadband wiring which is MANDATORY as per Clause 25-1.9.3 of KB&TPR-2002.
18. Owner shall obtain the plinth verification through licensed professionals on prescribed form (ZP-4) upon completion of foundation as per KB&TPR from concerned Town.
19. The owner and professionals shall submit to the authority floor certificate (form ZP-5) at the time of casting of slab of each floor as per KB&TPR in concerned Town.
20. In case of any complaint / dispute or any court matter, the **SBCA** shall not be a party and shall not be responsible.
21. If at any later stage, it is found that the approval of Proposed plan was obtained with mis-representation of facts, the same will be withdraw / cancelled.
22. Owner / Attorney is bound to get the completion / occupancy plan approved from this Authority before occupation as per KB&TPR.
23. Air Raid Shelter (ARS) shall not be misused under any circumstances.
24. Parking as provided on **Basement, 1st Floor, 2nd Floor, 3rd Floor, 4th Floor & 5th Floor** shall not be misused under any circumstances.
25. Recreation area as provided at **Ground Floor, 6th Floor & 7th Floor** shall not be misused under any circumstances.
26. All the construction work to be carried out strictly as per Administrative Instruction and as per KB & TPR-2002 (Amended to date) with maintaining the shear wall / columns etc. as per structure drawings.
27. Owner & License professionals will take all the precautionary measures as per KB & TPR-2002 (Amended to date) and also follow the specifications / notes mentioned by Dy. Director Structure Section, SBCA in the approval letter / structural drawings during excavation and further construction to avoid any mishap to the adjoining / surrounding buildings.
28. In case of any complaint / evidence regarding Sale / Booking of Units without Sale NOC, approval of building plan should be withdrawn and builder license shall be cancelled by the Authority.
29. Revised NOC for Sale & Advertisement shall be obtained from Design Section, SBCA as per Notification No. SBCA/PS CE/2020/06, dated 23.07.2020.
30. To achieve quality concrete of required strength for sale, sound and stable structure, the owner / builder shall use ready mix concrete from batching plant which is mandatory under clause 11-11of KB&TPR-2002 and amended up to date.
31. This approval is granted by One Window Cell/Architectural & Planning Section only planning point of view, all other aspects like ownership/court case/complaint/dispute implementation of construction activities according to KB & TPR shall be the responsibility of concerned District.
32. At any stage, any ambiguity / error found in the approval of building plan, the same shall be conveyed accordingly by the District concerned.
33. This approval is granted as per stability certificate submitted by the Lic.Engineer with remarks that the structure designated for B+G+40th Floor/Story.
34. The owner/builder shall conduct Environmental Impact Assessment (EIA) Study from **SEPA** through consultants and accordingly report shall be submitted to SBCA well before commencement of construction.
35. Before commencement of construction, the owner / builder shall obtain the requisite approval / NOC from the SEPA.
36. SBCA reserve the right to obtain all fees / charges / taxes / dues remaining to owner / builder subsequently. (if applicable)

Encl:

- Approved Proposed Building Plans.

05/06/23

Assistant Director
One window Cell / Architectural & Planning
Head Quarters, SBCA

05/06/23

Copy for information to:-

1. Director, (District South), SBCA.
2. Director, Design, SBCA.
3. Director, Vigilance Section, SBCA.
4. Director, I.T, SBCA.
5. Chairman, ABAD, Karachi.
6. Secretary to DG, SBCA.

MST. SHAHNAZ

REPORT
ON
GEOTECHNICAL INVESTIGATION
FOR
HIGHRISE BUILDING
ON PLOT NO. FL-15, BLOCK-II
SCHEME-5, CLIFTON, KARACHI

JUNE, 2015

GEOTECHNICAL SERVICES

Civil & Geotechnical Engineers
Testing Laboratory

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Off Shaheed-e-Millat Road, Karachi.
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REPORT
ON
GEOTECHNICAL INVESTIGATION
FOR A HIGH RISE BUILDING ON
PLOT NO. FL-15, BLOCK-II, SCHEME-5
CLIFTON, KARACHI

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APPENDIX

REPORT
ON
GEOTECHNICAL INVESTIGATION
FOR A HIGH RISE BUILDING ON
PLOT NO. FL-15, BLOCK-II, SCHEME-5
CLIFTON, KARACHI

1. INTRODUCTION:

Mst. Shahnaz plans to construct high-rise building complex on Plot No. FL-15, Block-II, Scheme-5, Clifton, Karachi. The project would comprise of single basement plus ground plus 38 storeys.

In order to obtain geotechnical information for the design of foundations, it was considered essential to carry out subsoil investigation at the project site. `***Geotechnical Services'***, Karachi, were assigned the job of subsoil investigation. The report was prepared in June, 2015.

The investigation program consisted of drilling ten boreholes varying in depth from 100 ft to 140 ft.

In order to ascertain the degree of compactness / consistency of substrata, standard penetration tests (SPTs) were performed at various depth horizons.

Laboratory testing program was developed and waxed core samples were tested in the laboratory of Geotechnical Services, Karachi.

This report presents a review of geotechnical investigation carried out at the project site. It gives an account of field and laboratory activities. The field and laboratory test results have been used for the interpretation of soil/rock design parameters.

The report presents recommendations regarding the foundation type, foundation depth, allowable bearing pressure and retention system. In addition, the report gives seismic coefficients in accordance with UBC 1997. Recommendation is also given about the type of cement to be used in foundation and substructure.

The report incorporates borehole location plan, borehole logs and field/laboratory test results.

Saif Ahmed Saeed
B.E.(Civil),M.Engg.ATT.Bangkok
PEC Regn:Civ/2917 Consult/682

2. DESCRIPTION OF INVESTIGATION:

2.1 Field investigation:

The program of investigation consisted of drilling ten boreholes. Rotary core drilling was employed to advance the borehole.

Following is the break-up of borehole depths:

Borehole No.	Investigated Depth (feet)
BH-1	140
BH-2	140
BH-3	100
BH-4	100
BH-5	100
BH-6	100
BH-7	100
BH-8	100
BH-9	140
BH-10	140

The locations of these boreholes are shown on borehole location plan appended to this report.

Standard penetration tests (SPTs) were performed at various depth horizons where found feasible. These tests were performed in accordance with ASTM Designation D-1586. This test gives indication of degree of compactness/consistency of granular/cohesive substrata. The 'N'-values are shown on borelogs appended to this report

Core drilling was carried out using H-size double tube core barrel in conjunction with tungsten carbide bit. After each run of the core barrel, percent core recovery and rock quality designation (RQD) were determined. The cores were stored in wooden core boxes. Wooden markers indicating depth and run numbers were inserted between each core run. The core boxes were, then, transported to the laboratory for testing. Some of the cores were sealed with molten wax and treated as undisturbed samples.

Saif Ahmed Saeed
B.E.(Civil),M.Engg.ATT.Bangkok
PEC Regn:Civ/2917 Consult/682

2.2 Laboratory Testing:

In order to arrive at a rational evaluation of the geotechnical properties of the substrata encountered at the site, a comprehensive program of laboratory testing was undertaken. The tests were performed to determine classification, strength, compressibility and chemical characteristics. The testing was generally performed in accordance with ASTM standard.

Following physical and chemical tests were performed on representative soil/rock and water samples:

- Grain size analysis
- Atterberg limits
- Moisture content
- Unconfined compression
- Bulk density
- Total salts
- Sulphate content
- Chloride content
- pH value

The results of laboratory tests are appended to this report.

Saif Ahmed Saeed
B.E.(Civil),M.Engg.ATT.Bangkok
PEC Regn:Civ/2917 Consult/682

3. SUBSURFACE CHARACTERISTICS:

The stratigraphy and the subsurface conditions have been evaluated on the basis of boring logs supported by field and laboratory test results. It is seen that the stratigraphy is heterogeneous though not necessarily erratic. The investigation has revealed that top 15-20 feet consist of loose to medium dense silty SAND Beneath this layer, there occurs a thin layer of hard CONGLOMERATE followed by hard, silty CLAY/SHALE. This is underlain by friable to medium hard SANDSTONE with interlayers of clayey silt followed by medium hard SILTSTONE deposits that continues upto the investigated depth of 140 ft.

These lithological units can be described as follows:

- Grey, loose silty SAND
- Grey, medium dense, silty SAND
- Greyish brown, hard CONGLOMERATE, interlayer sandstone, highly fractured
- Yellowish brown, hard, silty CLAY/sandy SHALE
- Greyish brown, friable to medium hard SANDSTONE, highly fractured
- Greyish brown, medium hard SILTSTONE

The exact sequence of occurrence of these deposits is shown on borelogs appended to this report.

Saif Ahmed Saeed
B.E.(Civil),M.Engg.ATT.Bangkok
PEC Regn:Civ/2917 Consult/682

In rock deposits, greater numbers of waxed core samples were subjected to unconfined compression test so as to obtain reliable design parameters for bearing capacity calculations. Unconfined compressive strength was determined on 79 waxed core samples of SHALE/SILTY CLAY, CONGLOMERATE, SANDSTONE and CLAYSTONE/SILTSTONE.

Table 3.1 gives maximum, minimum and average unconfined compressive strengths of hard CONGLOMERATE, friable to medium hard SANDSTONE, hard SILTY CLAY/SHALE & CLAYSTONE/SILTSTONE core samples for each borehole:

TABLE 3.1

UNCONFINED COMPRESSIVE STRENGTH

Boring No.	UNCONFINED COMPRESSIVE STRENGTH (kg/cm^2)		
	Maximum	Minimum	Average
BH-1	100.28	1.81	19.05
BH-2	86.54	1.86	22.12
BH-3	1.91	1.32	1.62
BH-4	13.11	1.75	7.27
BH-5	120.31	0.80	28.14
BH-6	218.89	2.20	55.35
BH-7	213.25	1.66	37.72
BH-8	14.02	0.88	6.17
BH-9	28.10	1.38	11.61
BH-10	96.72	1.25	23.47

Ground water table was encountered at a depth of about 4-5 feet below existing ground level.

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4. FOUNDATION RECOMMENDATIONS:

4.1 General:

The foundation of a structure is considered satisfactory provided following requirements are fulfilled:

a) The foundation must be safe against the possibility of shear failure.

b) It must be placed at sufficient depth below ground surface so as to be safe from erosion, scouring action of water and seasonal variations.

4.2 Foundation Type:

The choice about the foundation type is made on the basis of geotechnical properties of the substrata, type of structure and the anticipated loading conditions.

According to the information provided by the consultants, the proposed building will have single basement whose base will be at about 10-12 feet below the existing ground level.

Taking into account these considerations, it is recommended to support the structure on pile foundation.

4.3 Pile Foundation:

Accordance to the information furnished by the Consultants, the highrise building will have single basement. As discussed earlier in section-3, top 15-20 feet comprise of loose to medium dense silty SAND. Hence, the pile capacities have been computed with sacrificial length of 20.0 feet depth below the existing ground level.

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4.3.1 Allowable Pile Capacity:

It is recommended that pile tip be rested in `SILTSTONE / CLAYSTONE'. The pile capacities have been computed using static equations.

Following Table 4.1 presents allowable pile capacities for 30, 36 & 40 inches diameter piles with effective lengths of 60.0 ft, 80 ft & 100.0 feet respectively.

TABLE 4.1

ALLOWABLE CAPACITY OF PILE

Pile Dia (inches)	Total Length (ft)	Effective* Length (ft)	Bearing Stratum	Allowable Pile Capacity (compression) (Tons)
30	80	60	SANDSTONE	167
30	100	80	SANDSTONE	281
30	120	100	SILTSTONE/SANDSTONE	406
36	80	60	SANDSTONE	214
36	100	80	SANDSTONE	358
36	120	100	SILTSTONE/SANDSTONE	509
40	80	60	SANDSTONE	247
40	100	80	SANDSTONE	413
40	120	100	SILTSTONE/SANDSTONE	581

* Due to the construction of basement, the soffit of pile cap will be at about 10-12.0 feet depth below the existing ground level (EGL).

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4.3.2 Pile Load Test:

The pile capacities given in Table 4.1 must be verified by conducting a number of pile load tests. The load test must be performed in accordance with ASTM D-1143 for compression

In the case of index piles, the load test must be carried upto a minimum of two times the working load. On the other hand, for works pile, the applied load must equal 1.5 times the working load.

4.3.3 General Notes on Pile Foundation:

i. The pile capacities given in Section 4.3.1 are valid for vertical axial load in compression only.

ii. During piling operation, it is imperative that proper boring log is maintained for each pile. Before the commencement of concreting, the bearing stratum must be clearly identified.

iii. **Before commencing concreting, the bottom of borehole should be cleaned of loosened soil, mud or any other debris. In case the borehole is not clean, the pile capacity can be significantly reduced.**

iv. Concreting should be done using a tremie pipe. During concreting it should be ensured that 3-4m length of the bottom of tremie pipe is always submerged in concrete. This precaution is necessary to prevent 'necking' of soil.

v. The concrete should have a slump of about 150-175mm so that it may freely pass through the tremie pipe. Plasticizer must be used to improve workability of concrete.

4.4 Dewatering:

Ground water table at the time of investigation occurred at about 4-5 feet depth below existing ground level. Hence, the construction of basement would entail dewatering. This can be accomplished by well point system or by sinking a number of wells with submersible / turbine pumps. It is important to note that the wells must have properly designed filter and strainer pipes. Moreover, it must be ensured that adequate drains are available to discharge the pumped water.

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4.5 Stability of Excavation & Retaining System:

As already discussed, construction of basement would entail excavation of 10-12 feet below the EGL. During excavation, care must be taken to protect the foundations of adjacent structures.

To maintain the stability of excavation and to protect foundations of adjacent structures, retention measures such as bracing or shoring can be used to retain the soil during the construction of basement.

It is essential to keep the excavation dry and excavation should be performed during dry season. Due to the presence of ground water table at 4-5 feet, it is imperative that system should have adequate water proofing to make sure moisture doesn't ingress into the retention system and basement.

4.6 Seismicity of the Site:

According to the Uniform Building Code (1997), Karachi and its adjoining areas fall in Seismic Zone-2B.

Following are the seismic parameters for Karachi Region:

Seismic Parameters	Value
UBC Zone	2B
Max Peak Ground Acceleration	0.15 – 0.25g
Magnitude (Richter Scale)	6.0 – 7.0
Intensity (MM Scale)	VII – VIII

It is evident from investigation that the soil profile type falls in `S_C' category as per UBC (1997) which is termed as 'very dense soil and soft rock'.

The seismic coefficients "Ca" & "Cv" are as follows:

Seismic zone	Zone factor 'z'	Soil profile Type	Seismic Coefficient 'Ca'	Seismic Coefficient 'Cv'
2B	0.20	'S_C'	0.24	0.32

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4.7 Cement Type:

American Concrete Institute (ACI) gives the requirements for concrete exposed to sulphate (SO_4) containing solutions. The ACI standards are given below:

Sulphate Exposure	Water Soluble Sulphate in Soil (%)	Sulphate in Water (mg/litre)	Cement Type
Negligible	0.00-0.10	0-150	OPC
Moderate	0.10-0.20	150-1500	Type II
Severe	0.20-2.00	1500-10000	Type V
Very Severe	Over 2.00	Over 10000	Type V plus pozzolan

Sulphate content in ground water has been found to be severe. Therefore it is recommended that **Sulphate Resistant Cement** shall be used in concrete in contact with soil.

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For GEOTECHNICAL SERVICES

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CERTIFICATE

This is to certify that I, Saif Ahmed Saeed, am submitting the soil investigation report for high-rise building on Plot No. FL-15, Block-II, Scheme-5, Clifton, Karachi, which has been carried out under my guidance and supervision. The recommended bearing capacity is given on page 7 and summarized below:

Pile Dia (inches)	Total Length (ft)	Effective* Length (ft)	Bearing Stratum	Allowable Pile Capacity (compression) (Tons)
30	80	60	SANDSTONE	167
30	100	80	SANDSTONE	281
30	120	100	SILTSTONE/SANDSTONE	406
36	80	60	SANDSTONE	214
36	100	80	SANDSTONE	358
36	120	100	SILTSTONE/SANDSTONE	509
40	80	60	SANDSTONE	247
40	100	80	SANDSTONE	413
40	120	100	SILTSTONE/SANDSTONE	581

* Due to the construction of basement, the soffit of pile cap will be at about 10-12.0 feet depth below the existing ground level (EGL).

I certify that following conditions have been observed while performing the entire soil investigation:

1. I was present at site from 12.05.15 to 05.06.15 when field work of the subsoil investigation was in progress on above site.

2. The representative of subsoil testing laboratory Mr. Irshad Ahmad was present at site to obtain the soil samples for laboratory testing purposes.

3. Books and references considered while giving the final recommendations are listed in the appendix of the report.

4. The borelog results are in conformity with and correlated to laboratory results.

Saif Ahmed Saeed

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GEOTECHNICAL ENGINEER
PEC REGN No. CIV/2917

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LIST OF REFERENCES

1. FOUNDATION ANALYSIS & DESIGN

   BY J.E. BOWLES

2. FOUNDATION DESIGN & CONSTRUCTION

   BY M.J. TOMLINSON

3. SOIL MECHANICS & FOUNDATIONS

   BY PUNMIA

4. SOIL MECHANICS

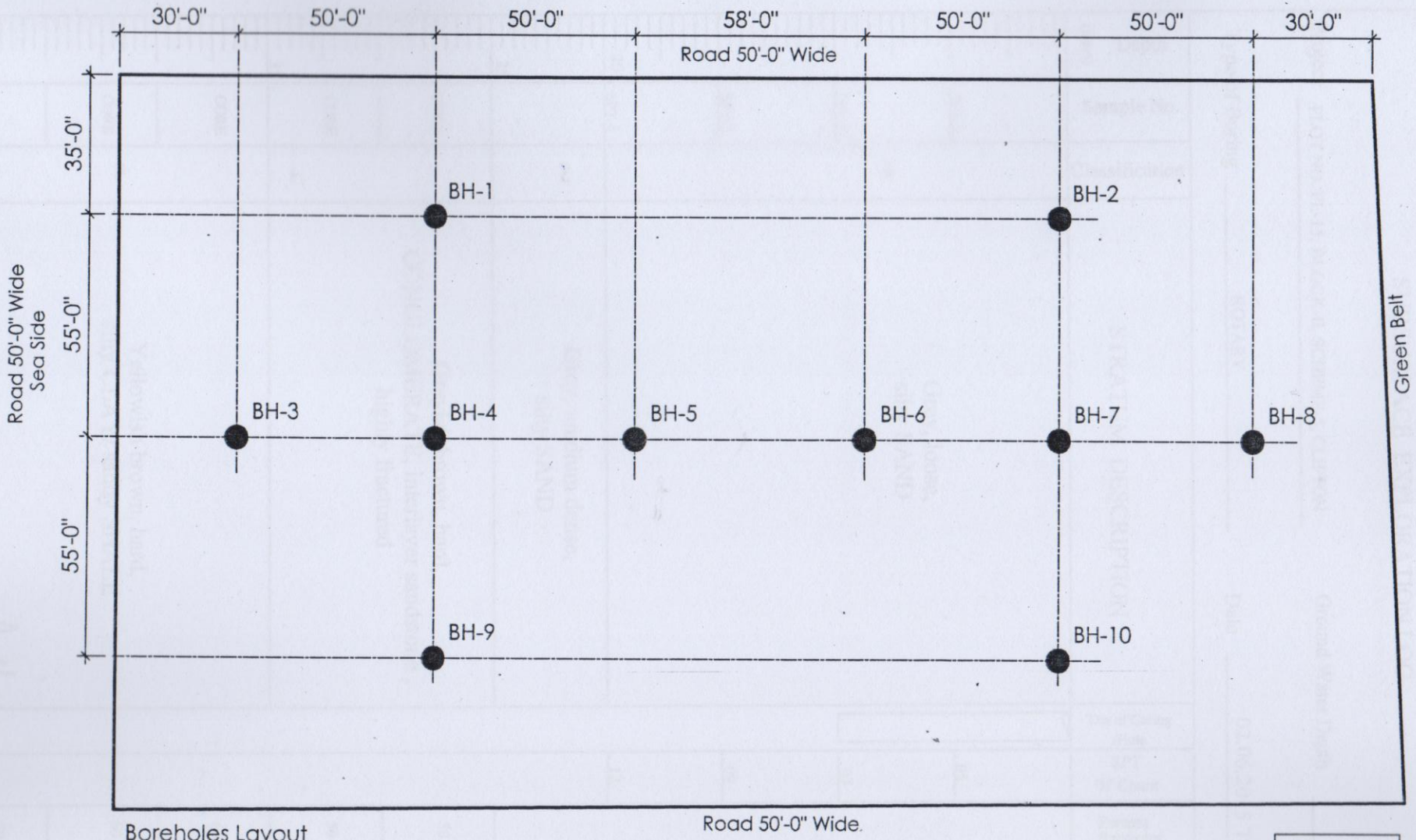
   BY LAMB & WHITMAN

5. FOUNDATION ENGINEERING

   BY PECK, HANSON & THORNBURN

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APPENDIX



Boreholes Layout

Building

Basement+
Ground+38 Storeys

Suggests 10 Boreholes.

4 - 140 Feet.
6 - 100 Feet.

FL -15

Date: 27-04-2015

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Bore Hole No BH-1

Sheet 1 of 3

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-II, SCHEME-5, CLIFTON

Ground Water Depth 4.33 feet

Type of Boring ROTARY

Date 02.06.2015 To 05.06.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing /Hole	SPT 'N' Count	Percent Recovery	R.Q.D.	Unconfined Compression (kg/sq cm)	REMARKS (Feet)
	SPT-1	SM	Grey, loose, silty SAND		05				05
	SPT-2				07				10
	SPT-3				09				15
20	SPT-4				12				20
25		SM	Grey, medium dense, silty SAND						25
	CORE		Greyish brown, hard, CONGLOMERATE, interlayer sandstone , highly fractured			50	Nil	100.28	Core 25.00-30.00 30
35	CORE					50	Nil		35
	CORE	CL	Yellowish brown, hard, silty CLAY/ sandy SHALE			60	Nil		40
	CORE					60	Nil		45
50	CORE					70	30	1.81	Waxed Core 48.00-49.00 50

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Bore Hole No BH-1

Sheet 2 of 3

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-II, SCHEME-5, CLIFTON

Ground Water Depth 4.33 feet

Type of Boring ROTARY

Date 02.06.2015 To 05.06.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing /Hole	SPT 'N' Count	Percent Recovery	R.Q.D.	Unconfined Compression (kg/sq.cm)	REMARKS (Feet)
	CORE		Yellowish brown, hard, silty CLAY/clayey SILT, interlayers of siltstone and sand stone			80	15		55
	CORE					80	10	10.11	Waxed Core 58.00-58.50
	CORE					60	Nil		60
	CORE					50	Nil		65
70									70
	CORE	CL	Greyish brown, medium hard, CLAYSTONE, fractured			70	10	8.11	Waxed Core 74.00-74.50
75									75
	CORE		Greyish brown, medium hard, SANDSTONE, interlayer clayey silt, highly fractured			60	15	3.99	Waxed Core 78.00-78.50
	CORE					70	30	12.56	80
85									Waxed Core 83.00-83.66
	CORE					40	Nil		85
	CORE		Greyish brown, medium hard, CLAYSTONE, interlayer sand, fractured			60	10	5.32	90
	CORE					60	Nil		Waxed Core 92.00-92.50
100									95
									100

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Bore Hole No BH-1

Sheet 3 of 3

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-II, SCHEME-5, CLIFTON

Ground Water Depth 4.33 feet

Type of Boring ROTARY

Date 02.06.2015 To 05.06.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing /Hole	SPT 'N' Count	Percent Recovery	R.Q.D.	Unconfined Compression (kg/sq.cm)	REMARKS (Feet)
115	CORE	CL	Greyish brown, medium hard, CLAYSTONE, interlayer sand, fractured			60	Nil		105
	CORE					50	Nil		110
	CORE					70	Nil		115
	CORE		Greyish brown, medium hard, SANDSTONE , interlayer clayey silt, highly fractured			50	Nil		120
	CORE					50	Nil		125
	CORE					60	Nil		130
135	CORE					70	10	10.24	Waxed Core 133.0-133.50
140	CORE	ML	Greyish brown, medium hard, SILTSTONE			40	10		135
	CORE		BOTTOM OF BOREHOLE						140
	CORE								145
									150

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Bore Hole No BH-2

Sheet 1 of 3

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-II, SCHEME-5, CLIFTON

Ground Water Depth 4.50 feet

Type of Boring ROTARY

Date 12.05.2015 To 15.05.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing /Hole	SPT 'N' Count	Percent Recovery	R.Q.D.	Unconfined Compression (kg/sq.cm)	REMARKS (Feet)
15	SPT-1	SM	Grey, loose, silty SAND		08				05
	SPT-2				09				10
	SPT-3				15				15
22	SPT-4	SM	Grey,medium dense, silty SAND		11				20
	CORE		Greyish brown, hard, CONGLOMERATE, highly fractured			40	Nil		25
30	CORE					50	Nil		30
35	CORE	ML	Yellowish brown, hard, clayey SILT, interlayer gravel			50	Nil		35
	CORE		Yellowish brown, hard, sandy SHALE			70	20	5.64	Waxed Core 38.00-38.50 40
	CORE	CL				80	10	1.86	Waxed Core 42.00-42.33 45
50	CORE					60	Nil		50

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Bore Hole No BH-2

Sheet 2 of 3

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-II, SCHEME-5, CLIFTON

Ground Water Depth 4.50 feet

Type of Boring ROTARY

Date 12.05.2015 To 15.05.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing /Hole	SPT 'N' Count	Percent Recovery	R.Q.D.	Unconfined Compression (kg/sq.cm)	REMARKS (Feet)
	CORE					40	Nil		
	CORE					40	10	32.65	55 Waxed Core 56.00-56.33
	CORE					50	Nil		60
	CORE					60	15	30.89	65 Waxed Core 66.00-66.50
	CORE		Greyish brown, medium hard, SANDSTONE with cemented sand, highly fractured			70	Nil		70
	CORE					60	Nil		75
	CORE					50	20	15.67	80 Waxed Core 83.00-83.66
	CORE					60	10		85
	CORE					40	Nil		90
	CORE					60	10	15.34	95 Waxed Core 97.00-97.42
100									100

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Bore Hole No BH-2

Sheet 3 of 3

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-II, SCHEME-5, CLIFTON

Ground Water Depth 4.50 feet

Type of Boring ROTARY

Date 12.05.2015 To 15.05.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing /Hole	SPT 'N' Count	Percent Recovery	R.Q.D.	Unconfined Compression (kg/sq.cm)	REMARKS (Feet)
105	CORE	CL-ML	Grey,hard clayey SILT/silty CLAY interlayer sand			70	10		105
	CORE					70	Nil		110
	CORE		Greyish brown, medium hard, SANDSTONE , interlayer clayey silt, highly fractured			60	10	86.54	Waxed Core 112.00-112.33
120	CORE					70	30		115
	CORE	ML				80	10		120
	CORE		Greyish brown, medium hard, SILTSTONE			30	Nil	3.51	Waxed Core 124.00-124.66
	CORE					60	20	6.95	125
140	CORE					40	10		Waxed Core 130.00-130.66
	CORE		BOTTOM OF BOREHOLE						130
	CORE								135
									140
									145
									150

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Bore Hole No BH-3

Sheet 1 of 2

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-II, SCHEME-5, CLIFTON

Ground Water Depth 4.66 feet

Type of Boring ROTARY

Date 18.05.2015 To 20.05.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing /Hole	SPT 'N' Count	Percent. Recovery	R.Q.D.	Unconfined Compression (kg/sq.cm)	REMARKS (Feet)
	SPT-1		Grey, loose, silty SAND		06				05
	SPT-2				08				10
15	SPT-3				11				15
	SPT-4		Grey, medium dense, silty SAND		13				20
25	SPT-5				19				25
	CORE	CL	Brown, very stiff, silty CLAY/ SHALE, interlayer sand			90	20	1.91	30 Waxed Core 34.00-34.50
	CORE					60	Nil		35
42	CORE					70	20		40
								1.32	Waxed Core 44.00-44.66
	CORE	CL	Greyish brown, friable SANDSTONE			60	Nil		45
50	SPT-6				51/3"				50

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GEOTECHNICAL SERVICES

Bore Hole No BH-3

Sheet 2 of 2

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-II, SCHEME-5, CLIFTON

Ground Water Depth 4.66 feet

Type of Boring ROTARY

Date 18.05.2015 To 20.05.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing /Hole	SPT 'N' Count	Percent Recovery	R.Q.D.	Unconfined Compression (kg/sq.cm)	REMARKS (Feet)
	CORE					50	Nil		
	SPT-7				51/2"				55
	CORE					40	Nil		
	SPT-8				51/3"				60
	CORE					60	Nil		
	SPT-9				51/2"				65
	CORE					60	Nil		
	CORE		Greyish brown,friable to medium hard, SANDSTONE			50	Nil		70
	SPT-10				51/2"				75
	CORE					40	Nil		
	CORE					40	Nil		80
	SPT-11				51/2"				85
	CORE					60	Nil		
	SPT-12				51/2"				90
	CORE					60	Nil		
	SPT-13				51/2"				95
	CORE					50	Nil		
100									100

BOTTOM OF BOREHOLE

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Bore Hole No BH-4

Sheet 1 of 2

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-II, SCHEME-5, CLIFTON

Ground Water Depth 4.57 feet

Type of Boring ROTARY

Date 24.05.2015 To 26.05.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing /Hole	SPT 'N' Count	Percent Recovery	R.Q.D.	Unconfined Compression (kg/sq.cm)	REMARKS (Feet)
10	SPT-1	SM	Grey, loose, silty SAND		06				05
	SPT-2				11				10
	SPT-3	SM	Grey, medium dense, silty SAND		12				15
	SPT-4				17				20
25									25
30	CORE		Brown, CONGLOMERATE, highly fractured			40	Nil		30
	CORE					40	20	2.76	Waxed Core 32.00-32.66
	SPT-6				51/3"				35
	CORE	CL	Brown, hard silty CLAY, interlayer sand			60	Nil		
	SPT-7				51/3"				40
	CORE					50	Nil		
	SPT-8				51/3"				45
50	CORE					60	Nil		50

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GEOTECHNICAL SERVICES

Bore Hole No BH-4

Sheet 2 of 2

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-II, SCHEME-5, CLIFTON

Ground Water Depth 4.57 feet

Type of Boring ROTARY

Date 24.05.2015 To 26.05.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing /Hole	SPT 'N' Count	Percent Recovery	R.Q.D.	Unconfined Compression (kg/sq cm)	REMARKS (Feet)
	CORE		Greyish brown,friable to medium hard, *SANDSTONE,highly fractured*			60	10	13.11	Waxed Core 53.00-53.50
	CORE				51/2"	40	Nil		55
	CORE				51/3"	40	Nil		60
	CORE				51/2"	40	Nil		65
	CORE					50	Nil		70
	CORE					60	Nil		75
80	CORE		Greyish brown,friable to medium hard, SANDSTONE,highly fractured			50	Nil		80
	CORE					60	10	6.15	85 Waxed Core 89.00-89.33
90	CORE	CL	Brown, hard, silty CLAY/ SHALE, interlayer sand			80	40	1.75	90 Waxed Core 93.00-94.00
	CORE					50	20	12.58	95 Waxed Core 96.00-96.66
100									100

BOTTOM OF BOREHOLE

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Bore Hole No BH-5

Sheet 1 of 2

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-II, SCHEME-5, CLIFTON

Ground Water Depth 4.33 feet

Type of Boring ROTARY

Date 30.05.2015 To 01.06.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing /Hole	SPT 'N' Count	Percent Recovery	R.Q.D.	Unconfined Compression (kg/sq.cm)	REMARKS (Feet)
10	SPT-1	SM	Grey, loose, silty SAND		05				05
	SPT-2				10				10
	SPT-3	SM	Grey, loose to medium dense, silty SAND		09				15
	SPT-4				14				20
25									25
30	CORE		Brown, medium hard SANDSTONE, highly fractured			40	10		30
35	CORE		Brown, CONGLOMERATE, highly fractured			50	15	120.31	Core 30.00-35.00 35
	CORE	CL	Brown, hard silty CLAY/clayey SILT,interlayer sand			60	10	0.80	Waxed Core 38.00-38.42 40
	CORE					70	20	9.11	Waxed Core 43.00-43.50
50	CORE		Greyish brown, soft, CLAYSTONE, interlayer sand			40	15	3.88	45 Waxed Core 45.00-45.66 50

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GEOTECHNICAL SERVICES

Bore Hole No BH-5

Sheet 2 of 2

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-II, SCHEME-5, CLIFTON

Ground Water Depth 4.33 feet

Type of Boring ROTARY

Date 30.05.2015 To 01.06.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing /Hole	SPT 'N' Count	Percent Recovery	R.Q.D.	Unconfined Compression (kg/sq.cm)	REMARKS (Feet)
	CORE		Greyish brown, medium hard, SANDSTONE, interlayer clayey silt, highly fractured			70	Nil		55
	CORE					80	30	16.44	Waxed Core 58.00-58.66
	CORE					60	20		60
65	SPT-5				51/2"			17.52	Waxed Core 64.00-64.66
	CORE	CL	Brown, hard, silty CLAY,interlayer sand			40	Nil	1.26	65
70	SPT-6				51/2"				Waxed Core 68.00-68.66
	CORE		Greyish brown,friable to medium hard, SANDSTONE, highly fractured			60	Nil		70
75	SPT-7				51/2"				75
	CORE	CL	Brown, hard, silty CLAY,interlayer sand			50	15	13.63	Waxed Core 78.00-78.50
80	SPT-8				51/2"				80
	CORE		Greyish brown,friable to medium hard, SANDSTONE,highly fractured			40	10	10.17	Waxed Core 82.00-82.33
	SPT-9				53/2"				85
	CORE					50	Nil		
	SPT-10				51/2"				90
	CORE					60	Nil		
	SPT-11				51/2"				95
	CORE					60	Nil		
100									100

BOTTOM OF BOREHOLE

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GEOTECHNICAL SERVICES

Bore Hole No BH-6

Sheet 1 of 2

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-II, SCHEME-5, CLIFTON

Ground Water Depth 4.33 feet

Type of Boring ROTARY

Date 24.05.2015 To 30.05.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing /Hole	SPT 'N' Count	Percent Recovery	R.Q.D.	Unconfined Compression (kg/sq.cm)	REMARKS (Feet)
	SPT-1	SM	Grey, loose, silty SAND		05				05
10	SPT-2				09				10
	SPT-3	SM	Grey, loose to medium dense, silty SAND		12				15
	SPT-4				14				20
25									25
	CORE		Brown, CONGLOMERATE, highly fractured			40	Nil		30
	CORE					60	30	218.89	Core 30.00-35.00
35									35
	CORE	MH	Brown, medium hard, sandy SHALE, highly plastic			50	Nil	2.20	40
	CORE					50	10		Waxed Core 40.00-40.50
	CORE					50	10		45
50									50

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GEOTECHNICAL SERVICES

Bore Hole No BH-6

Sheet 2 of 2

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-II, SCHEME-5, CLIFTON

Ground Water Depth 4.33 feet

Type of Boring ROTARY

Date 24.05.2015 To 30.05.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing /Hole	SPT 'N' Count	Percent Recovery	R.Q.D.	Unconfined Compression (kg/sq cm)	REMARKS (Feet)
	CORE					60	15	97.32	Waxed Core 52.00-52.50
	CORE					70	10		55
	CORE					80	Nil	12.96	Waxed Core 58.00-58.50
	SPT-5				51/2"				60
	CORE					50	Nil		
	SPT-6		Greyish brown, medium hard, SANDSTONE, interlayer claystone/siltstone, highly fractured		51/2"				65
	CORE					50	Nil		
	SPT-7				51/2"				70
	CORE					60	Nil		
	CORE					50	20	14.11	75
	CORE					50	10	22.81	Waxed Core 82.00-82.50
	SPT-8				51/2"				80
	CORE					60	Nil		Waxed Core 87.00-87.33
95								19.18	85
	CORE	ML	Greyish brown, medium hard, clayey SILT, interlayer sandstone			90	20		Waxed Core 95.00-95.66
100									90
			BOTTOM OF BOREHOLE						95
									100

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GEOTECHNICAL SERVICES

Bore Hole No BH-7

Sheet 1 of 2

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-II, SCHEME-5, CLIFTON

Ground Water Depth 4.50 feet

Type of Boring ROTARY

Date 19.05.2015 To 22.05.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing /Hole	SPT 'N' Count	Percent Recovery	R.Q.D.	Unconfined Compression (kg/sq.cm)	REMARKS (Feet)
	SPT-1	SM	Grey, loose, silty SAND		06				05
10	SPT-2				11				10
	SPT-3	SM	Grey, medium dense, silty SAND		14				15
20									20
25	CORE		Brown, hard, CONGLOMERATE, highly fractured			40	Nil		25
30	CORE		Brown, GRAVEL/BOULDERS			40	Nil		30
32.5	CORE		Brown, hard, CONGLOMERATE, highly fractured			70	20	3.20	Waxed Core 34.00-34.50
	CORE					60	20		35
	CORE	ML	Greyish brown, hard, sandy SHALE			50	10	1.66	40 Waxed Core 42.00-42.33
	CORE					60	40		45
50									50

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Bore Hole No BH-7

Sheet 2 of 2

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-II, SCHEME-5, CLIFTON

Ground Water Depth 4.50 feet

Type of Boring ROTARY

Date 19.05.2015 To 22.05.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing /Hole	SPT 'N' Count	Percent Recovery	R.Q.D.	Unconfined Compression (kg/sq.cm)	REMARKS (Feet)
55	CORE		Brown, friable, SANDSTONE, highly fractured			60	30	2.73	Waxed Core 53.00-53.50
60	CORE	ML	Greyish brown, hard, sandy SHALE			80	40		
	CORE		Brown, friable, SANDSTONE, fractured			70	30	3.72	Waxed Core 63.00-63.66
70	CORE					60	30	1.78	Waxed Core 68.00-68.66
	CORE		Greyish brown, medium hard to hard, SANDSTONE, fractured			50	10	213.25	Waxed Core 74.00-74.50
	CORE					50	Nil		
	CORE					70	Nil		
	CORE					60	Nil		
	CORE					70	Nil		
100	CORE					70	Nil		

BOTTOM OF BOREHOLE

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GEOTECHNICAL SERVICES

Bore Hole No BH-8

Sheet 1 of 2

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-II, SCHEME-5, CLIFTON

Ground Water Depth 4.33 feet

Type of Boring ROTARY

Date 18.05.2015 To 20.05.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing /Hole	SPT 'N' Count	Percent Recovery	R.Q.D.	Unconfined Compression (kg/sq cm)	REMARKS (Feet)
	SPT-1	SM	Grey, loose, silty SAND		04				05
10	SPT-2				10				10
	SPT-3	SM	Grey, medium dense, silty SAND		14				15
	SPT-4				16				20
21.5									
	CORE		Brown, hard, CONGLOMERATE, highly fractured			30	10		25
	CORE					40	10		30
35.0									
	CORE					60	20	3.96	35 Waxed Core 39.00-39.50
	CORE	ML-MH	Greyish brown, hard, sandy SHALE, highly plastic			60	20		40
	CORE					70	40	3.64	45 Waxed Core 49.00-49.50
50									50

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GEOTECHNICAL SERVICES

Bore Hole No BH-8

Sheet 2 of 2

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-II, SCHEME-5, CLIFTON

Ground Water Depth 4.33 feet

Type of Boring ROTARY

Date 18.05.2015 To 20.05.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing /Hole	SPT 'N' Count	Percent Recovery	R.Q.D.	Unconfined Compression (kg/sq.cm)	REMARKS (Feet)
	CORE	MH	Greyish brown, hard, sandy SHALE, highly plastic			70	20		55
	CORE					70	30		60
65	CORE					90	30	0.88	65 Waxed Core 65.00-65.66
70	CORE		Brown, friable, SANDSTONE, fractured			60	20		70
	CORE	ML	Greyish brown, hard, sandy SHALE,			70	Nil		
77.5	CORE					60	10	4.55	75 Waxed Core 76.00-76.33
	CORE		Greyish brown, medium hard, SANDSTONE, fractured			60	10		80
	CORE					90	20	11.70	85 Waxed Core 84.00-84.50
	CORE					80	40		90
	CORE					60	Nil	14.02	95 Waxed Core 94.00-94.50
100									100

BOTTOM OF BOREHOLE

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Bore Hole No BH-9

Sheet 1 of 3

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-II, SCHEME-5, CLIFTON

Ground Water Depth 4.50 feet

Type of Boring ROTARY

Date 16.05.2015 To 18.05.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing /Hole	SPT 'N' Count	Percent Recovery	R.Q.D.	Unconfined Compression (kg/sq.cm)	REMARKS (Feet)
	SPT-1	SM	Grey, loose, silty SAND		06				05
	SPT-2				08				10
15	SPT-3				10				15
	SPT-4	SM	Grey, medium dense, silty SAND		12				20
	CORE								
	SPT-5				14				25
26	CORE		Brown, friable, SANDSTONE, fractured			80	10	4.88	Waxed Core 28.00-28.50
	CORE					40	Nil		30
	CORE					60	Nil		35
	CORE					50	15	6.71	40
45								6.68	Waxed Core 42.00-42.50
	CORE		Brown, friable SANDSTONE, inerlayers of silty clay			60	10		45 Waxed Core 45.00-45.33
50									50

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Bore Hole No BH-9

Sheet 2 of 3

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-II, SCHEME-5, CLIFTON

Ground Water Depth 4.50 feet

Type of Boring ROTARY

Date 16.05.2015 To 18.05.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing /Hole	SPT 'N' Count	Percent Recovery	R.Q.D.	Unconfined Compression (kg/sq.cm)	REMARKS (Feet)
	CORE		Brown, friable to medium hard SANDSTONE, interlayer clayey silt			60	20	8.89	Waxed Core 54.33-55.00
	CORE					50	20	1.38	Waxed Core 58.00-58.66
60	CORE	CL-ML	Greyish brown, medium hard, SILTSTONE/CLAYSTONE, interlayer sandstone/cemented sand			60	20	10.82	Waxed Core 61.33-62.00
	CORE					50	10		
70	CORE		Brown, friable to medium hard SANDSTONE, interlayer clayey silt			80	10	6.33	Waxed Core 71.00-71.33
77.5	CORE					60	20		
	CORE	CL-ML	Greyish brown, medium hard, SILTSTONE/CLAYSTONE, interlayer cemented sand			60	30	15.56	Waxed Core 84.00-84.50
	CORE					70	10		
95.0	CORE					60	20	28.10	Waxed Core 94.00-94.50
	CORE	SM	Brown, friable to medium hard SANDSTONE			60	10	9.13	Waxed Core 96.00-96.33
100									

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Bore Hole No BH-9

Sheet 3 of 3

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-II, SCHEME-5, CLIFTON

Ground Water Depth 4.50 feet

Type of Boring ROTARY

Date 16.05.2015 To 18.05.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing /Hole	SPT 'N' Count	Percent Recovery	R.Q.D.	Unconfined Compression (kg/sq.cm)	REMARKS (Feet)
105	CORE					70	Nil		105
	CORE		Greyish brown, medium hard, SANDSTONE , highly fractured			60	10	19.76	Waxed Core 108.00-108.50
	CORE					60	Nil		110
	CORE					80	30	12.63	115 Waxed Core 118.00-118.60
120	CORE					60	10		120
	CORE	ML	Greyish brown, medium hard, SILTSTONE,fractured, interlayer sandstone			70	10	12.13	Waxed Core 124.00-124.33 125
	CORE					60	40	6.28	Waxed Core 128.00-128.33 130
	CORE							24.92	Waxed Core 132.00-132.60
140	CORE					70	Nil		135
	CORE		BOTTOM OF BOREHOLE						140
	CORE								145
									150

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GEOTECHNICAL SERVICES

Bore Hole No BH-10

Sheet 1 of 3

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-H, SCHEME-5, CLIFTON

Ground Water Depth 4.66 feet

Type of Boring ROTARY

Date 13.05.2015 To 15.05.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing /Hole	SPT 'N' Count	Percent Recovery	R.Q.D.	Unconfined Compression (kg/sq cm)	REMARKS (Feet)
	SPT-1	SM	Grey, loose, silty SAND		05				05
	SPT-2				07				10
15	SPT-3				10				15
	SPT-4	SM	Grey, medium dense, silty SAND		14				20
25	CORE		Brown, coarse GRAVEL, with conglomerate			30	Nil		25
30	CORE		Brown,hard CONGLOMERATE			50	Nil		30
	CORE	ML	Brown,hard, clayey SILT/SHALE, highly plastic			70	10	2.79	Waxed Core 33.00-33.66 35
37.5	CORE					90	20		40
	CORE		Brown, friable to hard SANDSTONE, fractured			80	30	96.72	Waxed Core 43.00-43.66 45
50	CORE					40	10		50

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Bore Hole No BH-10

Sheet 2 of 3

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-H, SCHEME-5, CLIFTON

Ground Water Depth 4.66 feet

Type of Boring ROTARY

Date 13.05.2015 To 15.05.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing Hole	SPT 'N' Count	Percent Recovery	R.Q.D.	Unconfined Compression (kg/sq.cm)	REMARKS (Feet)
	CORE		Brown, friable SANDSTONE, interlayer clayey silt			40	10		55
	CORE					40	Nil		
	CORE					50	20	1.25	60 Waxed Core 61.00-61.66
	CORE					40	Nil		65
	CORE		Brown, friable to medium hard SANDSTONE, interlayer clayey silt			50	Nil		70
	CORE					65	10	26.10	75 Waxed Core 77.00-77.33
	CORE					50	Nil		80
	CORE					60	Nil	15.56	Waxed Core 84.00-84.50
	CORE					40	10		85
95.0	CORE					60	30	1.55	90 Waxed Core 93.00-93.42
100									95
									100

Signature

Name

PEC Registration

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Bore Hole No BH-15

Sheet 3 of 3

SUBSURFACE EXPLORATION LOG

Project PLOT NO. FL-15, BLOCK-H, SCHEME-5, CLIFTON

Ground Water Depth 4.66 feet

Type of Boring ROTARY

Date 13.05.2015 To 15.05.15.

Depth (Feet)	Sample No.	Classification	STRATUM DESCRIPTION	Dia of Casing /Hole	SPT 'N' Count	Percent Recovery	R.Q.D.	Unconfined Compression (kg/sq cm)	REMARKS (Feet)
	CORE		Greyish brown, medium hard, SANDSTONE , highly fractured			60	15		105
	CORE					70	10		110
115	CORE					50	20	15.56	Waxed Core 114.00-114.50
	CORE		Greyish brown, medium hard, SILTSTONE,fractured, interlayer sandstone			60	Nil	12.63	115 Waxed Core 118.00-118.66
	CORE		Greyish brown, medium hard, SANDSTONE , interlayer siltstone			70	20		120 Waxed Core 124.00-124.33
	CORE					90	40	16.79	125 Waxed Core 128.00-128.75
135	CORE					70	Nil		130
140	CORE		Greyish brown, medium hard clayey SILT/SILTSTONE, organic			80	20	49.51	135 Waxed Core 138.00-138.33
	CORE		BOTTOM OF BOREHOLE						140
	CORE								145
									150

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PROJECT: PLOT AT BLOCK-II, CLIFTON, KARACHI

DATE : 18.06.2015.
L.R. No.: 279/15

GRAIN SIZE ANALYSIS (PER CENT FINER BY WEIGHT) **HYDROMETER**
SIEVE SIZES IN mm **(DIA IN mm)**

S No.	BORING NO.	SAMPLE	DEPTH (ft)	75.0	37.5	19.0	9.50	4.75	2.36	1.18	0.600	0.300	0.150	0.075	.05	.01	.002	.001
1.	BH-1	SPT-3	15.00	-	-	-	-	100	99	98	97	96	73	40	32	18	08	02
2.	BH-1	Waxed Core	48.00-49.00	-	-	-	100	90	84	80	77	76	74	73	64	48	30	14
3.	BH-2	SPT-2	10.00	-	-	-	100	99	98	97	96	90	56	36	-	-	-	-
4.	BH-2	Waxed Core	38.00-38.50	-	-	-	-	100	99	97	96	95	94	93	80	61	36	16
5.	BH-3	Waxed Core	34.00-34.50	-	-	-	100	99	98	97	96	95	94	93	80	58	32	14
6.	BH-4	SPT-2	10.00	-	-	-	-	-	-	100	99	96	55	33	-	-	-	-
7.	BH-4	Waxed Core	32.00-32.66	-	-	-	-	-	-	-	100	99	98	97	84	60	33	15
8.	BH-5	Waxed Core	38.00-38.42	-	-	-	-	-	100	99	98	97	96	95	82	58	31	13
9.	BH-6	Waxed Core	40.00-40.50	-	-	-	100	97	96	95	93	91	85	81	75	60	42	20
10.	BH-7	SPT-3	15.00	-	-	-	100	99	98	97	96	88	52	33	-	-	-	-
11.	BH-7	Core	25.00-30.00	100	21	01	-	-	-	-	-	-	-	-	-	-	-	-
12.	BH-7	Waxed Core	34.00-34.50	-	-	-	-	-	-	-	-	-	100	99	90	72	44	20
13.	BH-8	SPT-2	10.00	-	-	-	-	100	97	94	92	81	47	28	-	-	-	-
14.	BH-9	SPT-1	5.00	-	-	-	-	100	99	98	97	96	66	45	34	18	08	02
15.	BH-10	SPT-3	15.00	-	-	-	-	-	-	-	100	99	72	49	38	20	10	03
16.	BH-10	Waxed Core	33.00-33.50	-	-	-	-	100	99	98	97	96	95	94	85	68	45	21

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PROJECT: PLOT AT BLOCK-II, CLIFTON, KARACHI

DATE : 18.06.2015.
L.R. No.: 279/15
SHEET 1 OF 2

ATTERBERG LIMITS / MOISTURE CONTENT

S. NO.	BORING NO.	SAMPLE	DEPTH (ft)	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)
1.	BH-1	Waxed Core	48.00-49.00	33	10	22.09
2.	BH-1	Waxed Core	58.00-58.50	27	07	12.79
3.	BH-1	Waxed Core	74.00-74.50	32	09	14.58
4.	BH-1	Waxed Core	83.00-83.66	31	09	13.23
5.	BH-1	Waxed Core	92.00-92.50	32	09	16.76
6.	BH-2	Waxed Core	38.00-38.50	37	12	17.96
7.	BH-2	Waxed Core	42.00-42.33	33	11	16.95
8.	BH-2	Waxed Core	100.0-100-33	25	07	18.49
9.	BH-2	Waxed Core	124.0-124.66	39	12	18.36
10.	BH-3	Waxed Core	138.0-130.66	32	08	13.39
11.	BH-3	Waxed Core	34.00-34.50	32	09	21.76
12.	BH-3	Waxed Core	44.00-44.66	31	09	18.48
13.	BH-4	Waxed Core	32.00-32.66	33	10	20.44
14.	BH-4	Waxed Core	89.00-89.33	28	07	16.07
15.	BH-4	Waxed Core	93.00-94.00	44	14	16.04
16.	BH-4	Waxed Core	96.00-96.66	29	08	14.19
17.	BH-5	Waxed Core	38.00-38.42	30	08	19.61
18.	BH-5	Waxed Core	43.00-43.50	35	10	14.98
19.	BH-5	Waxed Core	45.00-45.66	31	08	16.90
20.	BH-5	Waxed Core	68.00-68.66	29	08	22.38
21.	BH-5	Waxed Core	78.00-78.50	30	08	13.28

.....cont'd

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PROJECT: PLOT AT BLOCK-II, CLIFTON, KARACHI

DATE : 18.06.2015.
L.R. No.: 279/15
SHEET 2 OF 2

ATTERBERG LIMITS / MOISTURE CONTENT

S. NO.	BORING NO.	SAMPLE	DEPTH (ft)	LIQUID LIMIT	PLASTICITY INDEX	MOISTURE CONTENT (%)
22.	BH-6	Waxed Core	40.0-40.50	50	18	26.54
23.	BH-6	Waxed Core	58.00-58.50	24	04	8.98
24.	BH-6	Waxed Core	95.00-95.66	39	12	12.16
25.	BH-7	Waxed Core	34.00-34.50	49	18	24.47
26.	BH-7	Waxed Core	42.00-42.33	47	17	25.00
27.	BH-7	Waxed Core	53.00-53.50	50	19	24.82
28.	BH-7	Waxed Core	63.00-63.66	NON-PLASTIC	NON-PLASTIC	21.99
29.	BH-7	Waxed Core	68.00-68.66	43	14	24.98
30.	BH-8	Waxed Core	39.00-39.50	48	19	20.72
31.	BH-8	Waxed Core	49.00-49.50	54	23	22.34
32.	BH-8	Waxed Core	58.00-58.50	54	23	21.14
33.	BH-9	Core	45.00-50.00	36	11	8.84
34.	BH-9	Waxed Core	58.00-58.66	31	10	13.85
35.	BH-9	Waxed Core	61.33-62.00	41	14	16.27
36.	BH-9	Waxed Core	84.00-84.50	30	08	13.04
37.	BH-9	Waxed Core	94.00-94.50	33	10	9.75
38.	BH-9	Waxed Core	124.0-124.33	41	12	13.35
39.	BH-9	Waxed Core	132.0-132.66	34	10	10.32
40.	BH-10	Waxed Core	33.00-33.50	52	22	23.16
41.	BH-10	Waxed Core	138.0-138.33	42	13	3.91

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PROJECT: PLOT AT BLOCK-II, CLIFTON, KARACHI

DATE : 18.06.2015.
L.R. No.: 279/15
SHEET 1 OF 5

UNCONFINED COMPRESSION / BULK DENSITY

S. NO.	BORING NO.	SAMPLE	DEPTH (ft)	UNCONFINED COMPRESSION		BULK DENSITY (gm/cc)
				qu (kg/cm^2)	STRAIN (%)	
1.	BH-1	Core	25.00-30.00	100.28	2.23	2.295
2.	BH-1	Waxed Core	48.00-49.00	1.81	15.46	2.129
3.	BH-1	Waxed Core	58.00-58.50	10.11	3.25	2.015
4.	BH-1	Waxed Core	74.00-74.50	8.11	2.93	2.112
5.	BH-1	Waxed Core	78.00-78.50	3.99	4.35	2.082
6.	BH-1	Waxed Core	83.00-83.66	12.56	4.37	2.192
7.	BH-1	Waxed Core	92.00-92.50	5.32	5.11	2.115
8.	BH-2	Waxed Core	133.00-133.50	10.24	3.23	2.185
9.	BH-2	Waxed Core	38.00-38.50	5.64	6.25	2.224
10.	BH-2	Waxed Core	42.00-42.33	1.86	12.12	2.101
11	BH-2	Waxed Core	56.00-56.33	32.65	2.17	2.183
12.	BH-2	Waxed Core	66.00-66.50	30.89	2.16	2.125
13.	BH-2	Waxed Core	83.00-83.66	15.67	3.15	2.232
14.	BH-2	Waxed Core	97.00-97.42	15.34	2.70	2.141
15.	BH-2	Waxed Core	112.00-112.33	86.54	3.02	2.289
18.	BH-2	Waxed Core	124.00-124.66	3.51	7.84	1.908
17.	BH-2	Waxed Core	130.00-130.66	6.95	4.88	2.041

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S. NO.	BORING NO.	SAMPLE	DEPTH (ft)	UNCONFINED COMPRESSION		BULK DENSITY (gm/cc)
				qu (kg/cm^2)	STRAIN (%)	
19.	BH-3	Waxed Core	34.00-34.50	1.91	12.87	2.134
20.	BH-3	Waxed Core	44.00-44.66	1.32	7.92	2.107
21.	BH-4	Waxed Core	32.00-32.66	2.76	15.22	2.159
22.	BH-4	Waxed Core	53.00-53.50	13.11	5.45	2.238
23.	BH-4	Waxed Core	89.00-89.33	6.15	4.36	2.174
24.	BH-4	Waxed Core	93.00-94.00	1.75	6.46	2.036
25.	BH-4	Waxed Core	96.00-96.66	12.58	3.10	2.231
26.	BH-5	Core	25.00-30.00	98.44	2.32	2.249
27.	BH-5	Core	30.00-35.00	120.31	2.51	2.233
28.	BH-5	Waxed Core	38.00-38.42	0.80	12.47	2.105
29.	BH-5	Waxed Core	43.00-43.50	9.11	3.61	2.156
30.	BH-5	Waxed Core	45.00-45.66	3.88	6.56	2.149
31.	BH-5	Waxed Core	58.00-58.66	16.44	4.24	2.228
32.	BH-5	Waxed Core	64.00-64.66	17.52	5.39	2.135
33.	BH-5	Waxed Core	68.00-68.66	1.26	11.66	2.098
34.	BH-5	Waxed Core	78.00-78.50	13.63	3.63	2.146
35.	BH-5	Waxed Core	82.00-82.33	10.17	2.99	2.128

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S. NO.	BORING NO.	SAMPLE	DEPTH (ft)	UNCONFINED COMPRESSION		BULK DENSITY (gm/cc)
				qu (kg/cm^2)	STRAIN (%)	
36.	BH-6	Core	30.00-35.00	218.89	2.45	2.384
37.	BH-6	Waxed Core	40.00-40.50	2.20	12.05	1.956
38.	BH-6	Waxed Core	52.00-52.50	97.32	2.09	2.253
39.	BH-6	Waxed Core	58.00-58.50	12.96	5.84	2.150
40.	BH-6	Waxed Core	82.00-82.50	14.11	2.49	2.166
41.	BH-6	Waxed Core	87.00-87.33	22.81	1.74	2.162
42.	BH-6	Waxed Core	95.00-95.66	19.18	2.43	2.213
43.	BH-7	Waxed Core	34.00-34.50	3.20	9.56	1.902
44.	BH-7	Waxed Core	42.00-42.33	1.66	14.18	2.009
45.	BH-7	Waxed Core	53.00-53.50	2.73	8.06	2.065
46.	BH-7	Waxed Core	63.00-63.66	3.72	10.34	2.117
47.	BH-7	Waxed Core	68.00-68.66	1.78	15.63	1.974
48.	BH-7	Waxed Core	74.00-74.50	213.25	2.27	2.294
49.	BH-8	Waxed Core	39.00-39.50	3.96	7.90	2.176
50.	BH-8	Waxed Core	49.00-49.50	3.64	7.91	2.031
51.	BH-8	Waxed Core	58.00-58.50	4.50	10.38	2.111
52.	BH-8	Waxed Core	65.00-65.66	0.88	4.26	1.940
53.	BH-8	Waxed Core	76.00-76.33	4.55	1.78	2.123
54.	BH-8	Waxed Core	84.00-84.50	11.70	2.25	2.101
55.	BH-8	Waxed Core	94.00-94.50	14.02	3.01	2.178

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S. NO.	BORING NO.	SAMPLE	DEPTH (ft)	UNCONFINED COMPRESSION		BULK DENSITY (gm/cc)
				qu (kg/cm^2)	STRAIN (%)	
56.	BH-9	Waxed Core	28.00-28.50	4.88	5.58	2.086
57.	BH-9	Waxed Core	42.00-42.50	6.71	6.46	2.225
58.	BH-9	Waxed Core	45.00-45.33	6.68	4.32	2.086
59.	BH-9	Waxed Core	54.33-55.0	8.89	3.41	2.112
60.	BH-9	Waxed Core	58.00-58.66	1.38	10.82	2.127
61.	BH-9	Waxed Core	61.33-62.00	10.82	3.76	2.195
62.	BH-9	Waxed Core	71.00-71.33	6.33	3.14	2.091
63.	BH-9	Waxed Core	84.00-84.50	15.56	2.56	2.310
64.	BH-9	Waxed Core	94.00-94.50	28.10	3.11	2.225
65.	BH-9	Waxed Core	96.00-96.33	9.13	2.05	2.026
66.	BH-9	Waxed Core	108.00-108.50	19.76	1.77	2.121
67.	BH-9	Waxed Core	118.00-118.66	12.63	2.55	1.990
68.	BH-9	Waxed Core	124.00-124.33	12.13	3.62	2.145
69.	BH-9	Waxed Core	128.00-128.33	6.28	6.73	2.314
70.	BH-9	Waxed Core	132.00-132.66	24.92	4.26	2.299

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UNCONFINED COMPRESSION / BULK DENSITY

S. NO.	BORING NO.	SAMPLE	DEPTH (ft)	UNCONFINED COMPRESSION		BULK DENSITY (gm/cc)
				qu (kg/cm^2)	STRAIN (%)	
71.	BH-10	Waxed Core	33.00-33.66	2.79	10.15	2.060
72.	BH-10	Waxed Core	43.00-43.66	96.72	2.11	2.314
73.	BH-10	Waxed Core	61.00-61.66	1.25	2.95	2.081
74.	BH-10	Waxed Core	77.00-77.33	26.10	2.22	2.318
75.	BH-10	Waxed Core	93.00-93.42	1.55	4.03	2.092
76.	BH-10	Waxed Core	114.00-114.50	15.56	4.93	2.235
77.	BH-10	Waxed Core	124.00-124.66	0.99	14.84	1.931
78.	BH-10	Waxed Core	128.00-128.75	16.79	4.26	2.294
79.	BH-10	Waxed Core	138.00-138.33	49.51	2.24	2.329

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SULPHATE TEST ON SOIL

S. NO.	BORING NO.	SAMPLE	DEPTH (ft)	SULPHATE CONTENT (%)
1.	BH-2	SPT-1	5.00	0.088
2.	BH-4	SPT-2	10.00	0.078
3.	BH-9	SPT-1	5.00	0.098

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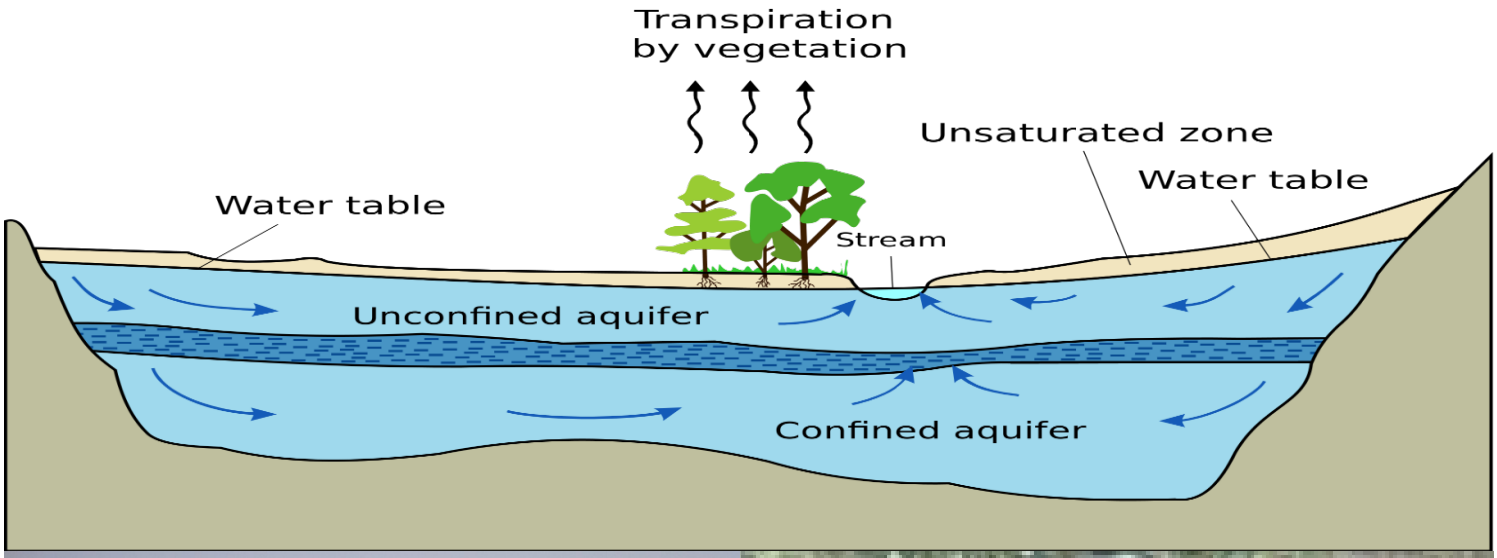
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PROJECT: PLOT AT BLOCK-II, CLIFTON, KARACHI

DATE : 18.06.2015.
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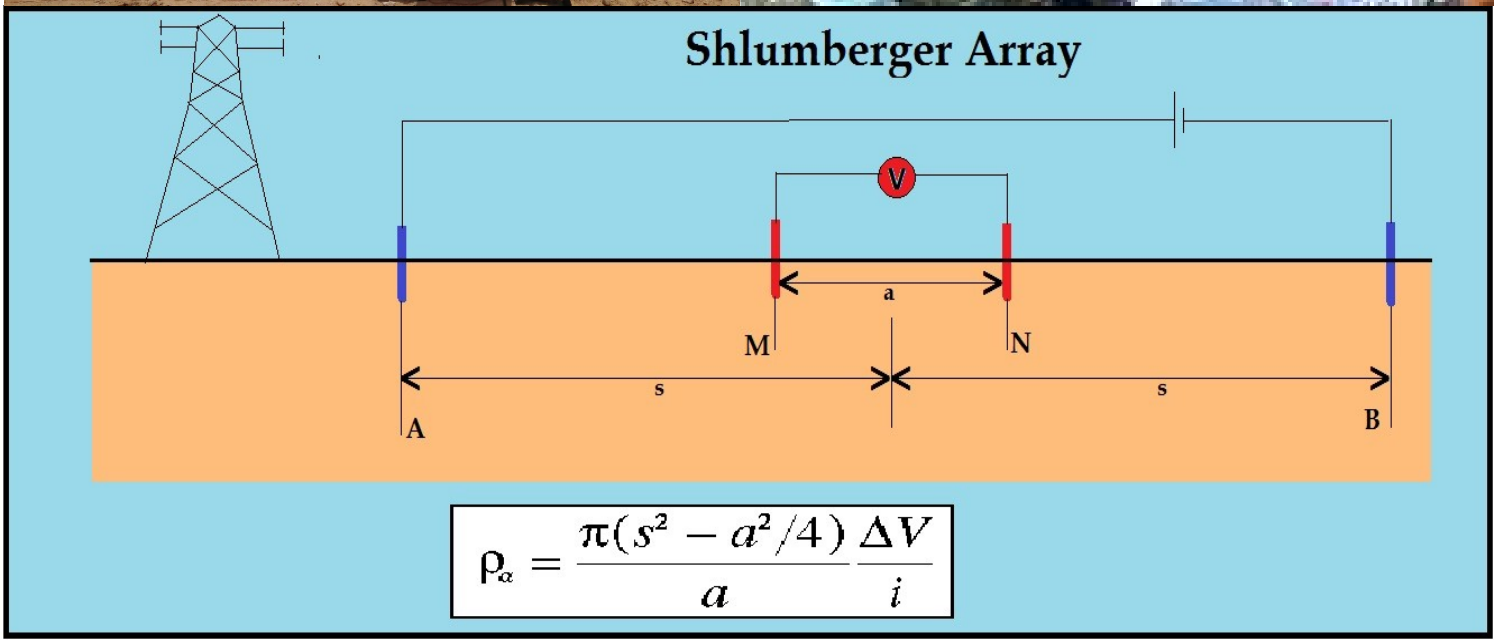
CHEMICAL TESTS ON WATER

S. NO.	BORING NO.	TOTAL DISSOLVED SALTS (mg/lit)	SULPHATE CONTENT (mg/lit)	CHLORIDE CONTENT (mg/lit)	pH VALUE
1.	BH-1	14400	211	5500	7.7
2.	BH-2	17500	329	7000	7.8
3.	BH-4	18000	306	7000	7.7
4.	BH-6	35000	345	13800	7.8









ELECTRICAL RESISTIVITY SURVEY/ INVESTIGATION

GROUND WATER POTENTIAL AQUIFER ZONES

T&A Craft Residency (formerly Royal Marina Tower)

Plot FL-15, Block 02, Clifton, Karachi

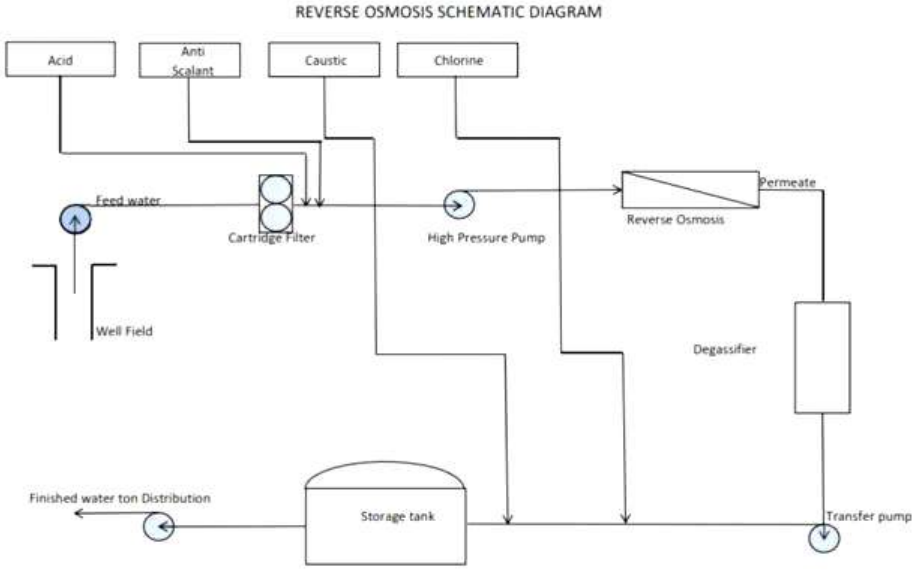
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EXECUTIVE SUMMARY

2 Vertical Electrical Soundings (VES) were carried out in the microenvironment of the Plot FL-15, Block 02, Clifton for the purpose of Aquifer Delineation. The total water requirement of the project is ~80,000 Gallons Per Day. The Interpreted results based on the data gathered from the field have led us to derive the following conclusions: -

- All the electrical resistivity values show presence of adequate quantities of water in the microenvironment. However, the recommended location for test well must be marked in region of probe 1 to obtain sustainable yield.
- The perch water level lies between 14-30 Ft.
- Test bore hole of 700-800 ft. is recommended. The safe yield that can be drawn from 700-800 ft deep well will be 90USGPM/129,600USGPD.
- The estimated TDS levels in the subjected area based on the available resistivity data is quite high (25,000 – 30,000 ppm) implying high salinity of subsurface. The actual values of TDS will be determined after the testing of water sample which will be collected from test bore hole. The trial hole must be geological and geophysical logged for proper assessment of aquifer zones.
- The Quantity and Quality of the aquifer zone are assumptions based on the data gathered in the field. Exact values will be known after the accumulation of samples from bore hole 24-72 hours continuous pump test will have to be performed for validation of the above findings.
- RO technology has proceeded to the extent of becoming viable on large scale with the advancement in technology that the cost of treatment per gallon is only a small fraction of a rupee. The advancement in the technology has not only reduced the treatment cost but also reduced the burden of wastage with the introduction double pass RO treatment systems. The high-density zone regulations on being self-sufficient, and independent of the supply from KWSB will reasonable be fulfilled by extracting potable from saline aquifers using RO Technology which in our consideration is the most viable, socially, economically and environmentally acceptable proposition.



INTRODUCTION

This report presents the findings of the Electrical Resistivity (ER) survey which aimed at determining the groundwater potential aquifer zones in the microenvironment of Plot FL-15, Block 02, Clifton, Karachi using "Vertical Electrical Soundings (VES) with Schlumberger configuration".

The project is planned as a 40-storey residential tower comprising basement levels, ground floor facilities, parking and service floors, residential floors, duplex units, rooftop utilities. The total water requirement of the project is ~80,000 Gallons Per Day.

Floor-wise Building Plan

Building Level / Floor Range	Designated Use / Function
Basement levels	ARS, parking, and building services
Ground floor	Recreation and service areas
Floors 1 to 5	Parking and services
Floors 6 and 7	Residential units and recreational facilities
Floors 8 to 36	Residential use
Floors 37 to 40	Duplex units
Rooftop	Solar energy systems and utility infrastructure

The locations for Vertical Electrical Soundings (VES) were identified by senior hydrogeologist (Geo-Professionals) in association with the representatives of the proponent. As per the standard operating procedures, 02 Vertical Electrical Soundings (VES) were conducted at site to study the subsurface lithology. The results of the investigations obtained by using electrical resistivity software have been presented in tabulated form, indicating the interpreted thickness and resistivity of the subsurface layers.



Figure 1: Satellite Image of Study Area

PURPOSE AND SCOPE OF ER SURVEY

Main purpose of this investigation is to determine the subsurface resistivity distribution by making measurements on the ground surface to delineate the aquifers. For this purpose, it is necessary to have diagnostic regarding the sub-surface lithological conditions and behavior of groundwater such as lithological nature of different subsurface formations, thickness and lateral extent of sub soil formations.

The present investigation is intended to help quantify the water potential at the project site. Through this report, Royal Builders (hereinafter designated as project proponent) aim to establish the aquifer condition and to estimate its potential for the project: T&A Craft Residency.

PRINCIPLES OF METHOD APPLIED

The earth is energized with the help of controlled power pack specially designed to provide voltage according to field requirement. The commutated D.C is passed through the outer stainless-steel electrodes and the resulting potential difference is recorded by the inner electrodes. The ratio of potential drop(ΔV) to the energized current(I) multiplied by schlumberger geometrical constant 'K' give the apparent resistivity, which is cumulative effect of the resistivities of different subsurface lithological units from the surface to the depth which the current penetrates. Apparent resistivity (ρa) is thus

$$\rho_a = K^* (\Delta V)/I$$

Where,

ρ_a = Apparent resistivity in ohm-cm
ΔV= Potential difference millivolts
I = Current in milliamps
K= Geoelectric constant

Schlumberger configuration was used in the field to record resistivity measurement. Geometric factor 'K' for schlumberger array is calculated as:

$$K = \pi \frac{[(AB/2)^2 - (MN/2)^2]}{MN}$$

Where, AB= Distance between outer current electrodes.
MN = Distance between inner potential electrodes.

The depth for which resistivity measured, was controlled by varying the spacing between the electrodes. For depth scanning, the central point was fixed and the spacing of electrodes was gradually increased with a fixed distance interval horizontally. Thus, the depth of scanning was increased and apparent resistivity was obtained as function of depth.

INSTRUMENT USED

The ABEM resistivity equipment was used for field measurements. The source of power to introduce current into the ground consisted of dry batteries. The copper coated steel electrodes and geo-reels with insulated copper were used during survey.

The ABEM Terrameter is a microprocessor controlled direct current instrument which uses a single averaging system to obtain accurate readings without the need for high potentially dangerous power outputs. The output current is selected by a switch from one of a number of possible values. If the resistance between the current electrodes is too high from that current level to be maintained, a warning is given so that the next lower current setting can be tried. Alternatively, an attempt can be made to reduce the resistance of the current circuit by, for example, driving the electrodes deeper into the ground. For example, measurements of potential difference are made with the current direction being reversed after the first and third measurement and results are averaged. This gives good



cancellation of any other potentials which may be present (self-potential) within the ground or potentials due to electrochemical at the electrodes, provided these are constant or varying linearly with time. The result is displayed as the ratio of potential difference to current in ohms. Up to 64 cycles may be used. After each cycle is completed average of the number of cycles used is usually in the range 4 to 16. The averaging of number of cycles reduces error due to random electrical noise. Stainless steel rods were used as electrodes. Electrodes spacing were measured by numbered marking on the current cables to reduce risk of gross error which can easily arise when survey tapes are used.



Figure 2: 16GL-N Electric Resistivity Equipment

FIELD PROCEDURE

Electrical resistivity method is the most common geophysical techniques used for groundwater investigation which is also known as "Direct Current method". The purpose of the method is the determination of the subsurface resistivity contribution, by conducting measurements at the surface of the earth. To achieve this, electric current is inserted into the ground via two electrodes and the potential difference, which is caused by the inserted current, is measured in two other electrodes. The measured potential difference gives an image for the difficulty of the current flow through the subsurface. This is an indication of the electrical resistance of the subsurface.

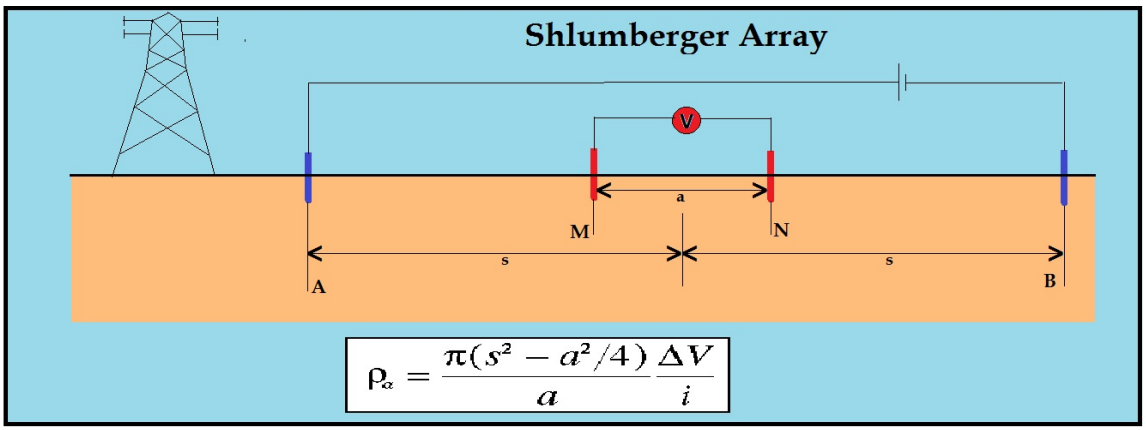


Figure 3: Schlumberger Array

The observations were made by adopting the Schlumberger electrode configuration using Vertical Electrical Sounding technique. (Fig: 2). The current electrode spacing was increased in steps from 2 m to 200m.

Observations were taken using the controlled current which was sent to earth between current electrodes, A & B, and Potential thus developed was measured between potential electrodes, M & N (Fig:3). The apparent resistivity values were calculated for each step and plotted on 2x3 cycle bi-logarithmic graph.

COMPUTER BASED EVALUATION OF FIELD CURVES

Apparent earth resistivity values are complex function of a number of parameters, i.e.,

- specific resistance/conductance,
- compactness,
- inhomogeneity,
- moisture.

Therefore, the field resistivity curves of the area give composite resistivity of the subsurface layers of different resistivities through which the current penetrated. In order to determine the thicknesses and the true resistivity values of the individual sub-surface layers, the field resistivity curves were modeled using specific software program.

MODELING OF FIELD RESISTIVITY CURVES

The resistivity field curves have been analyzed qualitatively by the empirical method in order to determine the possible number of subsurface lithological/geoelectrical layers, their tentative depth and the ranges of their approximate resistivity values (Wetzel & Mooney, 1956). This data was formatted for ASCII data file to be used in the modeling program. The data which was affected by presence of manmade structures was inserted after interpolation of data from nearby soundings.

COORDINATES

	Latitude	Longitude
Probe 01	24˚48'48.27"	67˚0'28.90"
Probe 02	24˚48'47.65"	67˚0'29.83"

FIELD DATA ACQUISITION

The resistivity values are collected by using Vertical Electrical Sounding applying Schlumberger array two probes at site. The values are tabulated as follows: -

Electrical Resistivity Field Data, Probe 1

Site: Plot FL-15, Block 02, Clifton, Karachi. Depth of Investigation: 50m

Project: ER Survey for aquifer delineation Date: 23/05/2017

Supervised By: Tariq Zaman Conducted By: Asad

Electrode spacing AB/2 (m)	Electrode spacing MN/2 (m)	Resistance ohms	Constant K	Apparent Resistivity Ohms-m
2	0.5	6.8	24.74	168.232
4	0.5	3.4	100.14	340.476
6	0.5	2.5	225.8	564.5
8	0.5	15.9	401.73	6387.507
8	2	18	98.96	1781.28
10	2	8.5	155.51	1321.835
12	2	1.5	224.62	336.93
16	2	8.8	400.55	3524.84

20	2	4.5	626.75	2820.375
25	2	1.5	980.18	1470.27
25	5	2.5	388.77	971.925
30	5	2	561.56	1123.12
40	5	1.9	1001	1901.9
50	5	1.8	1567	2820.6

Table-1: Electrical Resistivity Field Data, Probe 1

Electrical Resistivity Field Data, Probe 2

Site: Plot FL-15, Block 02, Clifton, Karachi. Depth of Investigation: 100m

Project: ER Survey for aquifer delineation Date: 23/05/2017

Supervised By: Tariq Zaman Conducted By: Asad

Electrode spacing AB/2 (m)	Electrode spacing MN/2 (m)	Resistance ohms	Constant K	Apparent Resistivity Ohms-m
2	0.5	2.8	24.74	69.272
4	0.5	0.276	100.14	27.63864
6	0.5	10	225.8	2258
8	0.5	11.6	401.73	4660.068
8	2	6.3	98.96	623.448
10	2	1.9	155.51	295.469
12	2	1.6	224.62	359.392
16	2	6.4	400.55	2563.52
20	2	1.6	626.75	1002.8
25	2	6.2	980.18	6077.116
25	5	1.6	388.77	622.032
30	5	36	561.56	20216.16
40	5	1.6	1001	1601.6
50	5	1.6	1567	2507.2
50	10	0.773	777.54	601.03842
60	10	1.2	1123	1347.6
80	10	1.3	2003	2603.9
100	10	1.9	3134	5954.6

Table-2: Electrical Resistivity Field Data, Probe 2

FIELD DATA INTERPRETATION AND MODELING

The number of subsurface lithological layers, their true resistivity values and thickness have been computed through modeling process for field resistivity curve of the area and presented in Tables as follows. The layer numbers are designated in ascending order from surface to the depth of investigation. The trend of the resistivity field curve plotted for each site indicates 9-10 geo electric layers. The subsurface layers consisting of clay and sand sequence are dominated by finer material. Results of investigation for each site are presented as follows.

Probe 1

Layer No.	Thickness of layer (m)	Depth (m)	Resistivity (ohms-m)	Lithologies
1	2	2	168	Clay + Sand
2	2.28	4.28	369	Sand
3	1.69	5.97	278	Silt + Sand
4	3.15	9.12	612	Sand
5	5.78	14.9	428	Silt + Sand
6	9.64	24.5	826	Sand
7	15.2	39.7	519	Clay + Sand
8	15.7	55.4	975	Sand
9			682	Clay + Sand

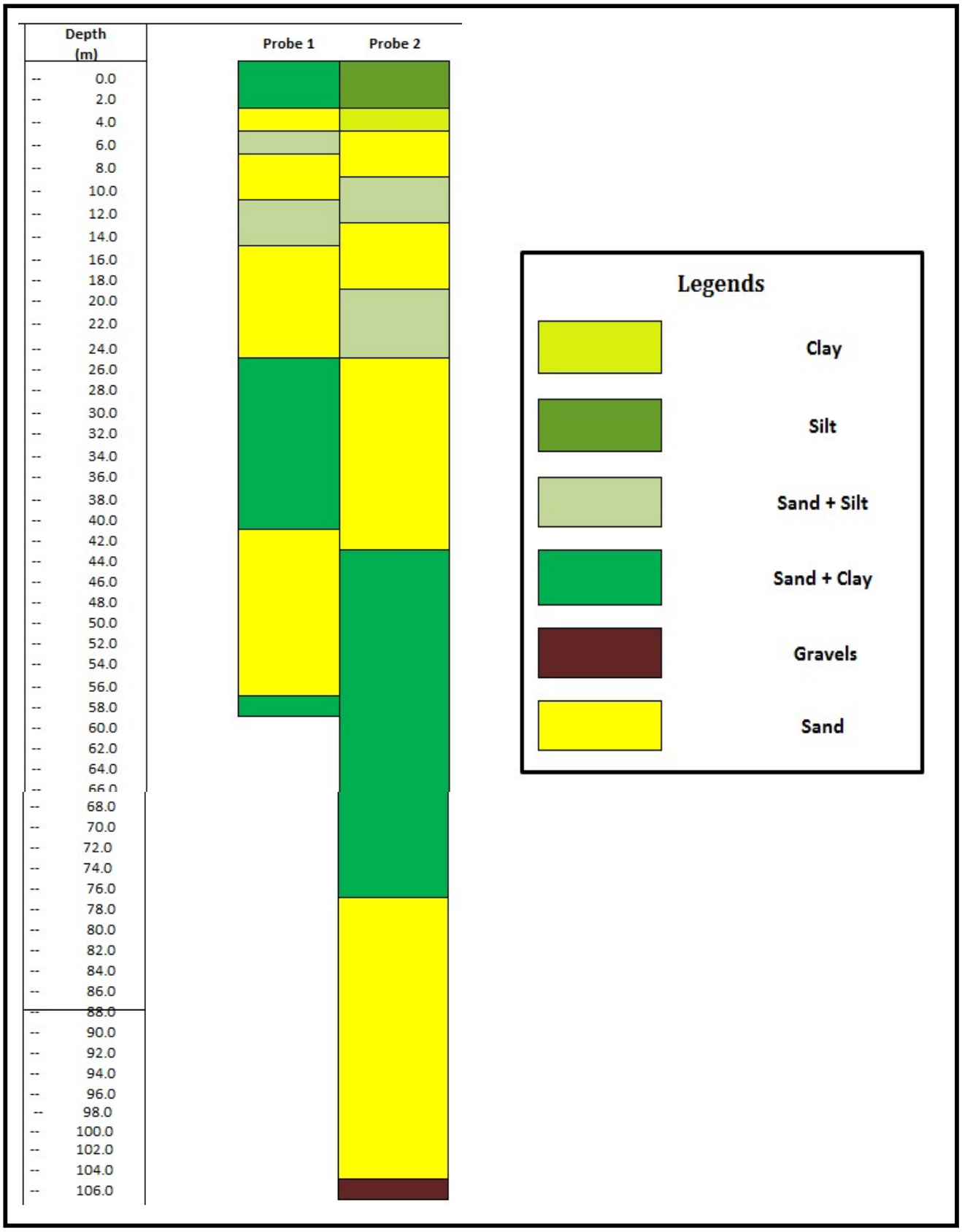
Table-3: Interpreted Geo Electric Layers, Probe 1

Probe 2

Layer No.	Thickness of layer (m)	Depth (m)	Resistivity (ohms-m)	Lithologies
1	2	2	124	Silt
2	2.27	4.27	13.1	Clay
3	3.65	7.92	380	Sand
4	4.51	12.4	215	Silt + Sand
5	4.92	17.3	627	Sand
6	6.08	23.4	442	Silt + Sand
7	18.6	42	890	Sand
8	33.3	75.3	627	Clay + Sand
9	29.8	105	648	Sand
10			1734	Gravel

Table-4: Interpreted Geo Electric Layers, Probe 2

SOIL PROFILE



FIELD & MODELED CURVES

FIELD CURVES

Field data curves are mentioned below according to the field data acquisition these curves are the true representatives of the field data without any attenuation and processing.

On x- axis: depth (m)
On y-axis: apparent resistivity (ohms-m)

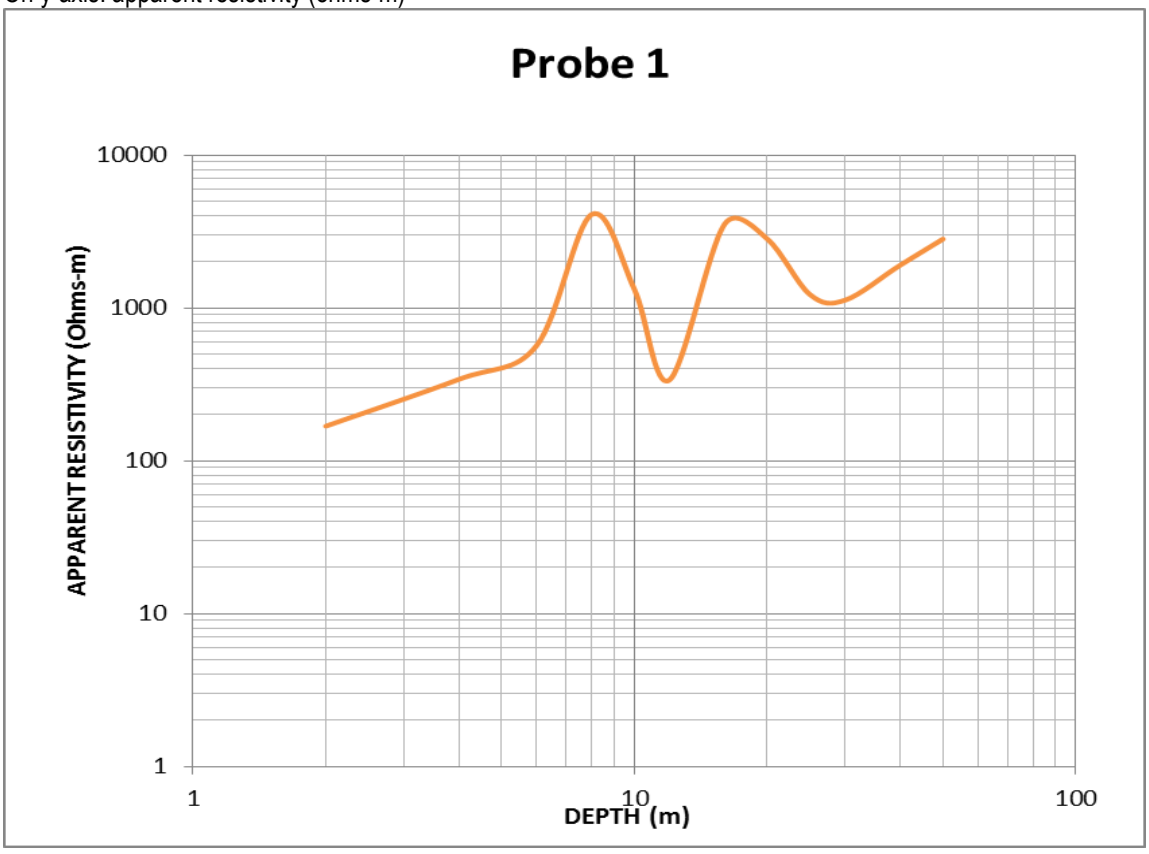


Figure 4: Field Data Curve of Probe 1

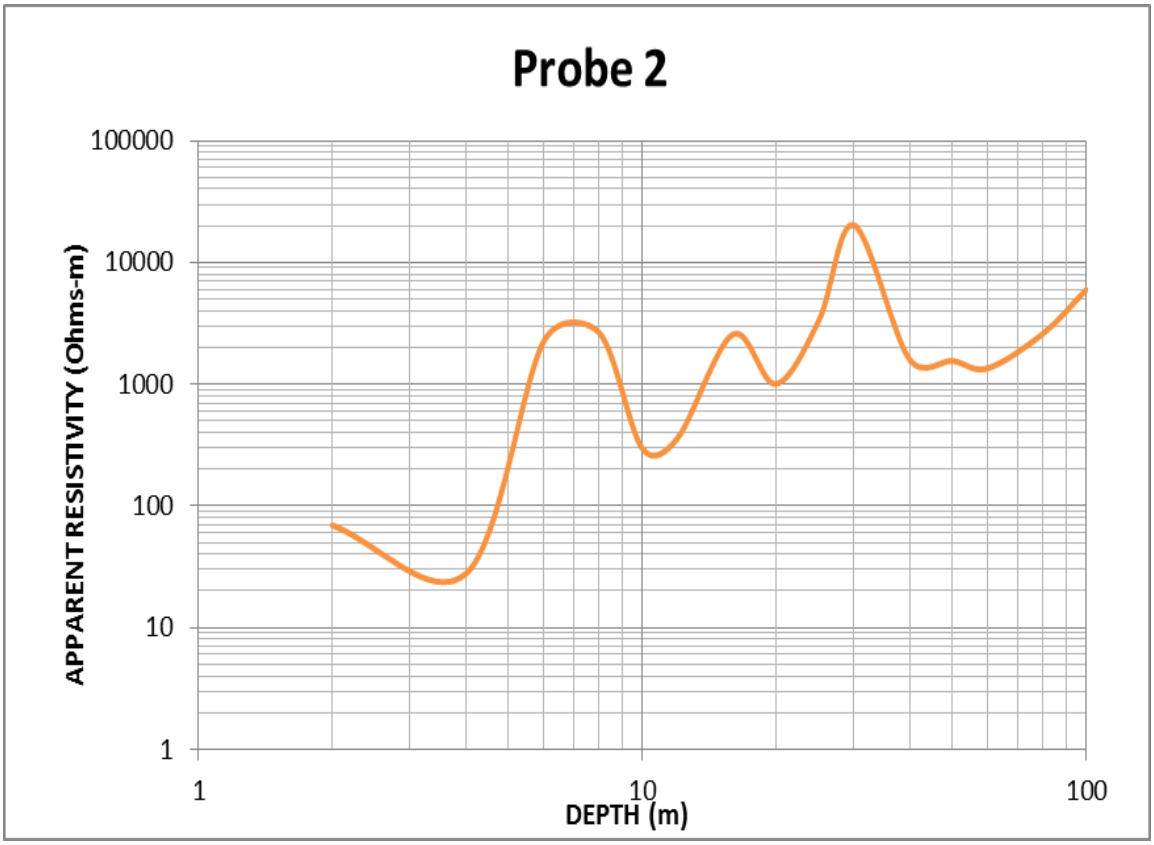


Figure 5: Field Data Curve of Probe 2

CONCLUSION AND RECOMMENDATIONS

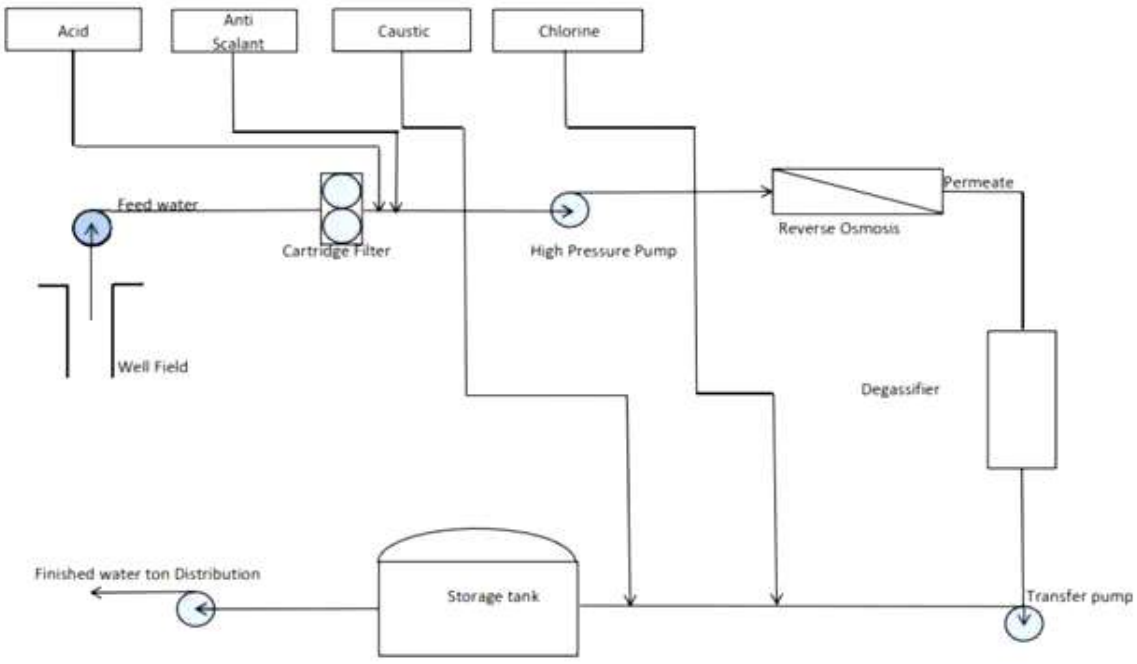
After interpretation and attenuation of field data we conclude the following results:

- All the electrical resistivity values show presence of adequate quantities of water in the microenvironment. However, the recommended location for test well must be marked in region of probe 1 to obtain sustainable yield.
- The perch water level lies between 14-30 Ft.
- Based on reconnaissance & electrical resistivity findings and available geological information it is inferred that the project will have to rely on the potential of the aquifer at 700-800 ft. depth with due care being taken for the increasing salinity with passage of time since sea water intrusion will be incident continuously with extraction as the project goes into operation. This will spell into raising the cost of treatment which will have to be covered under the project but will be transferred to the occupants of the project after residents have acquired possession of the property.
- Test bore hole of 700-800 ft. is recommended. The safe yield that can be drawn from 700-800 ft deep well will be 90USGPM/129,600USGPD.
- The estimated TDS levels in the subjected area based on the available resistivity data is quite high (25,000 – 30,000 ppm) implying high salinity of subsurface. The actual values of TDS will be determined after the testing of water sample which will be collected from test bore hole. The trial hole must be geological and geophysical logged for proper assessment of aquifer zones.
- The Quantity and Quality of the aquifer zone are assumptions based on the data gathered in the field. Exact values will be known after the accumulation of samples from bore hole. 24-72 hours continuous pump test will have to be performed for validation of the above findings.
- RO technology has proceeded to the extent of becoming viable on large scale with the advancement in technology that the cost of treatment per gallon is only a small fraction of a rupee. The advancement in the technology has not only reduced the treatment cost but also reduced the burden of wastage with the introduction double pass RO treatment systems. The high-density zone regulations on being self-sufficient, and independent of the supply from KWSB will reasonable be fulfilled by extracting potable from saline

aquifers using RO Technology which in our consideration is the most viable, socially, economically and environmentally acceptable proposition.

- A Reverse osmosis treatment plant shall be used to desalinate water to convert it to potable water. It uses a semi-permeable membrane under pressure to separate relatively pure water from a less pure solution. When two aqueous solutions of different concentrations are separated by a semi-permeable membrane, water passes through the membrane in the direction of the more concentrated solution as a result of osmotic pressure. In reverse osmosis an applied pressure is used to overcome the naturally occurring osmotic pressure. The RO Plant shall be selected on the basis of TDS level of the location.

REVERSE OSMOSIS SCHEMATIC DIAGRAM



REFERENCES

- Ahmed. A., Shuja, T.A., Kazmi, A.H., 1985,
  "Final interpretation on groundwater resources of Thano Bula, Kalu Khuhar, Upper Malir and Gadap Basins; Dadu, Thatta and Karachi District, Sindh, Pakistan: GSP Mem.Vol. XV-Part-1"
- Meidav, T. (1960,
  "An electrical resistivity survey for groundwater". *Geophysics* 25, 1077- 1093.
- Zaigham, N. A., 1985,
  "Earth Resistivity measurements to explore groundwater potential in Kalu Khuhar and Upper Malir Basin, Dadu-Karachi-Thatta Districts, Sindh, Pakistan, GSP Mem.Vol. XV-Part-3"
- Zohdy, A.A.R, Eaton, G.P
  Application of Surface Geophysics to Ground Water Investigation

Form 0.2

320014

GOVERNMENT OF PAKISTAN

THE TRADE MARKS REGISTRY, KARACHI

Trade Marks Ordinance 2001

CERTIFICATE of Registration of Trade Mark. Section 33(4)

Trade Mark No. 678060 **Dated:** 04/10/2022

Certified that the Trade Mark, of which a representation is annexed hereto has been registered in the name of SHEHNAZ, Trading as, SHEHNAZ ENTERPRISES (whose legal address is PLOT # FL 15, CLIFTON BLOCK 2, SCHEME 5, KARACHI, PAKISTAN)

in class 37 **under no.** 678060

as of the date 04/10/2022

in respect of CONSTRUCTION SERVICES; INSTALLATION AND REPAIR SERVICES; MINING EXTRACTION, OIL AND GAS DRILLING BEING SERVICES INCLUDED IN CLASS 37.

Sealed at my direction, this 23 JUL 2024

DISCLAIMER: REGISTRATION OF THE TRADE MARK SHALL GIVE NO RIGHT TO THE EXCLUSIVE USE OF LETTER "T & A" SEPARATELY APART FROM THE MARK AS A WHOLE



Note: Original representation of Mark may please be seen on right or as Annexed

(MUHAMMAD RAFIQ)
Registrar of Trade Marks

Registration is for 10 years from the date first above-mentioned and may then be renewed for a period of 10 years, and also at the expiration of each period of 10 years thereafter. (See Section 35 of the Trade Marks Ordinance 2001 and rules 45-39 (2) (b) of the Trade Marks Rules, 2004)

ORIGINAL

Sindh Building Control Authority

Civic Centre, Annexe University Road,
Gulshan-e-Iqbal, Karachi-5(Pakistan)
Phones: Tel: 021-9923029
Fax: 021-99230326
www.sbca.gos.pk

RENEWAL OF BUILDER LICENSE
(NO.BL-1963)

Under the policy for renewal of licenses approved by the authority
Under Section 4 of the SBCO 1979 as amended up-to-date,

The Builders License granted to
"M/S. SHEHNAZ ENTERPRISES"
to act as a licensed;

"BUILDER"

is hereby renewed upto 31st December 2026
on the terms & conditions of the original license.

05/1/2024

ENGR. MUJAHID ABBAS
Director
Licensing & Record, S.B.C.A.

05/01/24

11/1/24

No. SBCA/Dir.(Lic.& Rec.)/2023/ 12 *Dated:* 5/01 */2023.*

PAKISTAN

ISLAMIC REPUBLIC OF PAKISTAN

National Identity Card

Name
Shehnaz

شہناز

Husband Name
Abdul Sattar Mundia

عبدالستار موندیا

Gender	Country of Stay
F	Pakistan

Identity Number	Date of Birth
42201-1214953-6	01.01.1951

Date of Issue	Date of Expiry
09.09.2021	Lifetime



شہناز

Holder's Signature

CamScanner

42201-1214953-6

موجودہ پتہ: کاسموپولیٹن کالونی نزد مزار قائد، مکان

نمبر E-1، کراچی شرقی

مستقل پتہ: کاسموپولیٹن کالونی نزد مزار قائد، مکان

نمبر E-1، کراچی شرقی

103321002241

Registrar General of Pakistan

گمشدہ کارڈ ملنے پر قریبی لیٹر بکس میں ڈال دیں

AGREEMENT OF SALE

THIS AGREEMENT OF SALE is made at Karachi on this day 13th day of September 1995.

B E T W E E N

MARCHANT CONSTRUCTION COMPANY (PVT) LTD.. a private Company registered under the Companies Ordinance having its registered.

Cont.P/2

office at 406 Mehboob Chamber Abdullah Harron Road, Karachi through its Managing Director MR.Abdul Hamid A.Marchant S/o Abdul Aziz Marchant duly authorized by Resolution dated:16th April,1995 passed by the Board of Directors of the Company hereinafter re-ferred to as the "VENDOR" (which expression shall,wherever the context so requires or admits mean and include the said Company, its successors in interest and assigns) of the ONE PART;

A N D

M/s.Shenaz Enterprises, a sole proprietory concern through its proprietor Mst.Shenaz wife of Abdul sattar muslim adult, R/o Karachi hereinafter referred to as the "Vendee" (which expression shall mean and include her heirs legal representative executers administrator and assigns) of the Other Part;

WHEREAS the vendor is seized and possessed of and otherwise well and sufficiently entitled to ALL THAT piece and parcel of open plot of land bearing Flat Site No.FL-15 admeasuring 6503.75 sq.yds. or thereabout situated at Block-2, KDA Scheme No.5, Kehkashen, Clifton, Karachi more fully described in the Schedule hereinafter written (hereinafter re-ferreed to as the "said Property") having been ac-quired by the Vendor directly from the KDA under

Cont.P/3

MOHAMMAD UMAR CHOHAN ★ O.A.th COMMISSIONER ★ KARACHI ★ NOTARY PUBLIC

Allotment order NO.K.D.A/LAND/GUL/CC/3782 dated 20-06-75 issuedby the Land Manager, Land & Estate Department KDA quoting the referance of G.B.Resolution no.23, dated 22-01-1974.

AND WHEREAS the Vendor has agreed to sell and the Vendee has agreed to purchase the aforesaid property for a lumpsum consideration) of Rs.1,62,50,000/- (Rupees One Crore Sixty Two Lacs Fifty Thousand Only).

AND WHEREAS the Vendee has agreed to purchase the aforesaid Property for the total consideration mentioned above with good marketable title, free from all claims, disputes, litigation, encumbrances, charges, truts, attachments, wakfs, gifts, inheritances, notices and proceedings of recovery, requisition or acquistion, burdens and liens of whatsoever nature with complete vacant physical possession.

NOW THEREFORE THIS AGREEMENT WITNESSETH AS UNDER

1. That in consideration of the sum of Rs.1,62,50,000/-(Rupees One Crore Sixty Two Lacs Fifty Thousand Only) being the full consideration payable in the manner stated hereinafter, the Vendor hereby agrees to sell and the Vendee agrees to purchase the aforsaid Property more fully described in the schedule hereunder written.

2. That the Vendee has paid to the Vendor a sum of

Cont.P/4

UMAR CHOHAN COMMISSIONER KARACHI PUBLIC

Rs.50,00,000/- (Rupees Fifty Lacs Only) as advance/part payment vide pay order No.23/1090 DP No.304475 dated.24th April 1995, drawn by Allied Bank Of Pakistan Ltd. Saleh Muhammad Street Branch, Karachi.

3. That the remaining blance of Rs.1,12,50,000/- (Rupees One Crore Twelve Lacs Fifty Thousand Only) shall be paid by the Vendee not later than the 20th day of August, 1995 at the time of recording of the statement before the DLM,KDA for transfer of a clear valid and unencumbered marketable title of the said Property in favour of the vendee in the record of the KDA.

4. That this Agreement is irrevocable to all intents and purposes and shall be specifically performed by both the parties hereto.

5. Time for payment is the essence of the Contract; if the vendee is unable to offer the payment of balance amount on the date specified hereinabove for completion of sale then an amount equivalent to 5% of the total agreed price being the eartnest money shall be forfeited by the Vendor and balance refunded to the Vendee.

6 That the Vendor shall at the time of execution of this Agreement produce for the inspection of the Vendee and her Solicitor all the original documents and title deeds of the said Property such as Allot-

Cont.P/5

ment and possession orders, acknowledgment of possession transfer order site plan paid challans etc. and shall provide their Photo-Copies to enable the Solicitor of the Vendee to prepare the pre-lease joint transfer application towards completion of sale in favour of the Vendee.

7. It is agreed that all taxes and government dues pertaining to the said property such as ground rent property tax becoming due upto the date of possession shall be the liability and responsibility of the vendor and shall be paid by the Vendor.

8. That it is agreed by the Vendor that the Vendor shall help to obtain requisite NOC and sign and execute all necessary papers/forms and give statements before the KDA for approval of the transfer/mutation of the said Property in favour of the Vendee against the receipt of balance consideration amount mentioned under clause 3 of these presents.

9. That the Vendor hereby covenants with the Vendee that the Vendor has observed and complied with all the rules, regulations, terms and conditions of the KDA pertaining to allottment of the said Property to the Vendor.

10. That the Vendor assures the Vendee that all dues of the KDA including full occupancy value ground rent, non utilization fee secuirty deposit at 2% of

Cont.P/6

-pancy value shall be paid by the vendee upto the date of delivery of possession of the said Property to the Vendee.

11. That the Vendor assures the Vendee that neither the said Property nor any portion thereof is affected by any notice or scheme of acquisition or requisition of the government.

12. That the Vendor convenants with the Vendee that the said Property is its separate, exclusive individual and absolute Property free from all claims, disputes, gifts, attachments, trusts, wakfs, liens, charges and encumberances of whatsoever nature and that it has good marketable title full power and absolute lawful authority to sell the same to the Vendee.

13. That the Vendor further covenants with the Vendee that previous to this transaction it has not sold or entered into any agreement to sell of the said Property with any person or persons nor the Vendor has done or caused to be done any act. deed or thing which is likely to affect or impair the right, title, interest or estate of the Vendor in the said Property.

14. That the Vendor agrees to indemnify the Vendee and keep the Vendee indemnified against all losses and detriments suffered by or occasioned to the Vendee on account of any defect in the title of

Cont.P/7

KARACHI ★ NOTARY PUBLIC ★ MAH CHOHAN COMMISSIONER

the said Property or any misrepresentation made under these presents.

15. That at the time of submission of joint Transfer Application the Vendor shall alongwith possession handover all the original documents of the said Property to the Vendee.

16. That all expenses and charges payable to the KDA on account of transfer/mutation of the said Property in the name of the Vendee and the legal charges pertaining to this transaction and advocate's fee shall be paid by the Vendee.

17. Any dispute or difference of opinion with respect to the interpretation of the terms and conditions herein contained shall be referred to a panel of two arbitrators one each to be appointed by either party. The arbitration proceedings shall be conducted by such panel in accordance with the Aribitration act 1940 and its statuotory modification made from time to time.

SCHEDULE OF THE PROPERTY ABOVE REFERRED TO

ALL THAT piece and parcel of open land being Flat Site No. FL-15, admeasuring 6503.75 sq.yds, or thereabout situated at Block-2, KDA SchemeNo-5, Kehkashan, Clifton, Karachi (within P.S. Clifton) abutted and bounded an follows :-

ON THE NORTH BY:	40'-0" WIDE ROAD
ON THE SOUTH BY:	50'-0" WIDE ROAD
ON THE EAST BY:	50'-0" WIDE ROAD
ON THE WEST BY:	50'-0" WIDE ROAD.

Cont.P/8

IN WITNESS WHEREOF the parties have signed and subscribed their respective hands on the day, month and year first mentioned hereinabove.

WITNESSES:

1. Abdul Majid Pasal, Advocate, Karachi

2. (Mehtab Khan Mahsud)

VENDOR:

Marchant
Construction Co (Pvt)Ltd.
Through its Managing
Director Abdul Hamid A.
Marchant S/o Abdul Aziz
Marchant NIC No
571-51-284211

VENDEE:

M/S.SHENAZ ENTERPRISES THROUGH
PROPRIETOR

MST.SHENAZ W/O ABDUL SATTAR

NIC No.511-51-033382

ATTESTED

MOHAMMAD UMAR CHOHAN
NOTARY PUBLIC
& OATH COMMISSIONER,
KARACHI, 95

KARACHI DEVELOPMENT AUTHORITY.
DIRECTORATE OF LAND MANAGEMENT.
(CONSTRUCTION COMPANIES CELL).

NO:KDA/LAND/GUL/CC/87 67 Dated: 04 JAN 1987

M/S. Merchant Construction Co., (Pvt.) Ltd;
406, Mahboob Chambers,
Abdullah Haroon Road,
KARACHI-3.

SUBJECT: ISSUE OF POSSESSION ORDER AND SITE PLAN OF FL-15, BLOCK NO. 2, KDA'S SCHEME NO.5, KEHKASHAN, KARACHI.

In continuation of this Authority's Allotment Order No.KDA/Land/Gul/CC/3782, dated 20/6/1975, you are, hereby advised to take over physical possession of Flat Site No.FL-15, Block No.2, KDA Scheme No.5 Kehkashan, Karachi from Executive Engineer, Scheme No.5 (Clifton) within 15 days time positively.

ASSISTANT DIRECTOR (CC)

Encl: Site Plan.

Copy to:-

1) The D.P. & U.D. K.D.A.
2) The C.O.B. K.D.A.
3) The A.O.(Rev)-K.D.A.
4) The E.E.Scheme No.5 (Clifton) KDA with the request to hand over physical possession of the above flat site to M/s.Merchant Construction Co. (Pvt.) Ltd.

Naseer

ASSISTANT DIRECTOR (CC)

KARACHI DEVELOPMENT AUTHORITY

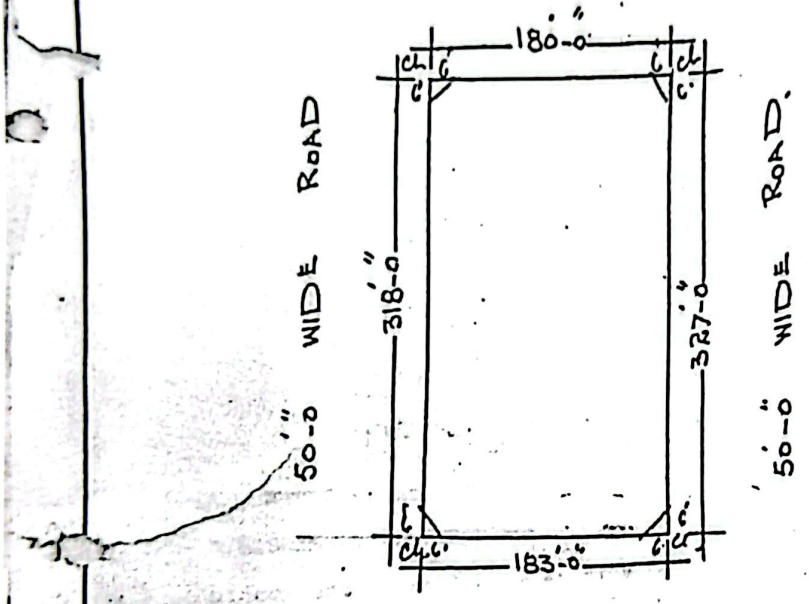
ENGINEERING WING

Sch:-5

SITE PLAN FOR PLOT NO. F.L/15 BLOCK NO. 2 ~~SEC. NO.~~

TYPE F.L FOR ~~RESIDENTIAL~~ COM./INDUSTRIAL 6503.75 SQ. YDS.





CHECKED

29.8.85

25-8-85

AREA IN SQ. YDS. 6503.75 RATE..... per SQ. YD.

SCALE 100 = 1"

Total Value Rs.....

DEMARCATED BY.....

DRAWN BY.....

CHECKED BY.....

ASSTT. ENGINEER-I

EXECUTIVE ENGINEER/S
.....SHIFT ON..... Division
K.D.A

POSSESSION LETTER

I, Abdul Hamid A.Merchant S/o Abdul Aziz Merchant director, Merchant Construction Company (Pvt) Ltd.,do hereby confirm having handed over vacant and peaceful physical possession of ALL THAT piece and parcel of flat site bearing No.FL-15, Block 2, admeasuring 6503.75 sq.yds. situated at K.D.A. Scheme No.5, Kehkashan, Clifton, Karachi, to the Vendee M/S. SHEHNAZ ENTERPRISES acting through sole proprietor Mst.Shehnaz W/o Abdul Sattar, on this 13th day of August 1995.

for MERCHANT CONSTRUCTION CO. (PVT) LTD.

ABDUL HAMID A.MERCHANT S/O
ABDUL AZIZ MERCHANT
N.I.C.NO.571-51-284211
VENDOR

ACKNOWLEDGMENT OF POSSESSION

I, Mst.Shehnaz W/o Abdul Sattar, sole proprietor of M/S.SHEHNAZ ENTERPRISES, the Vendee of ALL THAT piece and parcel of flat site admeasuring 6503.75 sq.yds. situated at K.D.A. Scheme No.5, Kehkashan, Clifton, Karachi, do hereby acknowledge having received the vacant and peaceful physical possession of the aforesaid property from the Vendor Merchant Construction Co.(Pvt) Ltd., acting through its director MR.ABDUL HAMID A.MERCHANT S/O ABDUL AZIZ MERCHANT on this 13th day of August 1995.

for SHEHNAZ ENTERPRISES
(Attorney)

MST.SHEHNAZ W/O ABDUL SATTAR
VENDEE
N.I.C.NO.511-51-033382

CamScanner

KARACHI DEVELOPMENT AUTHORITY
DIRECTORATE OF LAND MANAGEMENT

CHALLAN (PROVISIONAL) PRINT DATE : 15/08/95

A/C # 0300021501 TITLE OF A/C ST-606

II 0000003723

REGISTRATION NO : 502
ISSUE DATE :15/08/95
VALID UPTO :30/08/95

HBL
CIVIC CENTRE BRANCH
KARACHI

Please receive the undermentioned amount due from Mr./Ms. M/S MERCHANT CONST. CO.
S/o/D/o/W/o THRO.M.D. A.HAMEED MERCHANT against plot # FL 15 Block/Sector # 2
Scheme # 005 Namely CLIFTON Nature REGIDENTIAL measuring 6503.72 Sq Yds
on account of its Booking:

PARTICULARS	AMOUNT	PARTICULARS	AMOUNT
D.V. ( ) INST.		TEMP. LAND RENT	
E.A. UPTO		C.T.C. CHARGES.	
TRANSFER/MUTATION FEE	3,90,240.00	EXTRA LAND CHARGES	
SURCHARGE ON		SUB LEASE CHARGES	
N.O.C. UPTO		CONDONATION FEE	
LEASE FEE		RE-DEMARCATION FEE	
REVALIDATION FEE		PERMISSION TO MORTGAGE	
CORNER CHARGES		ALTERNATE/EXCHANGE FEE	
RESTORATION FEE		MISCELLANEOUS CHARGES	
CHANGE OF TRADE FEE		SALE OF FORMS	
TOTAL P.O.# 436510 ABL DATE 06/08/95			3,90,240.00

THREE LAKH NINETY THOUSAND TWO HUNDRED FORTY ONLY

Prepared By Assistant 16/8/95

Checked By Supdt.

Signature & Stamp
Bank's Receiving Officer

KARACHI DEVELOPMENT AUTHORITY

ENGINEERING DEPTT.

Registration No. KDA/Land/644/Co/87
8/87 Dt. 4.1.1987

(ACKNOWLEDGEMENT OF POSSESSION ORDER)

Sub: Possession of Occupancy Rights for plot No. FL-15
Block.
~~Sector~~ No 2 Scheme No/~~Township~~ 5 Clifton

I hereby acknowledge that Mr./M/s M/S Marsland Construction Co. Ltd (Pvt)
having paid to the KARACHI DEVELOPMENT AUTHORITY
a sum of Rs ..... (Rupees .....)
being the 50% of occupancy value at the rate of Rs ..... per sq. yd.
and an annual rent in advance @ Rs ..... per sq. yd, as per form
of his/her application for the above plot of land measuring 650.3.25 Sqyds
sq. yds. by the same a little more or less, I have this the 10th day
of Jan. 1987 on behalf of the said application entered upon and
taken possession of all that piece and parcel of land bearing plot No FL-15
Block 2
~~Sector~~ No ..... in the above Scheme.

On behalf of the said Allottee I accept the plot allotted to the applicant/me in the conditions it is today and I/said allottee undertake/s not to hold the Karachi Development Authority responsible for any deficiency or lack of facilities whatsoever on the said plot.

Dated this the 10th day of Jan. 1987

Witness

For & on behalf .....
Executive
.....

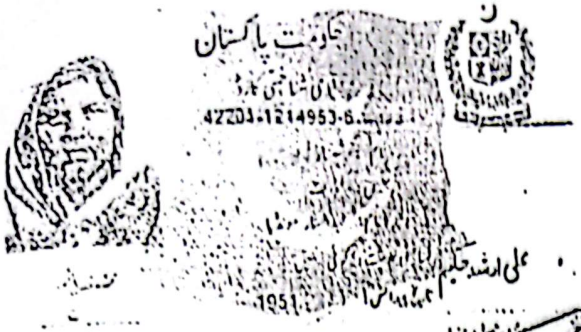
Certified that the possession of plot No FL-15 Block 2 Sector No .....
Scheme No/~~Township~~ 5 Clifton was handed over by me on 15/1/87
to Mr./Mr. Abdul Sattar Marsland
representing the allottee.

The actual area of the plot is 650.3.25 sq.yds.

10/1/87
EXECUTIVE ENGINEER
M.A. Division
K.D.A. Karachi.
10/1/87

Dated 15/1/87

Copy to Asstt. Director (C.C.)
for info





National Tax / GST No. /	

Company Representative Profile

Name of Company Representative /	
Father's / Husband's Name /	
CNIC Number and Validity /	
Designation /	
Address of Correspondence /	
Contact Number /	Office / — Mobile /
Email Address /	

Type of Service Required

- [X] New Connection / نیا کنکشن
- [X] Load Extension / لوڈ میں اضافہ
- [ ] Temporary Connection / عارضی کنکشن
- [X] Meter Voltage / وولٹ
- [X] Meter Phase / بجلی
- [X] Change of Meter Position / میٹر کی جگہ کی تبدیلی
- [X] Tatkaal Meter / فوری میٹر

Location Where Service Required

Address / PLOT NO. FL-15, BLOCK-2, SCHEME-5, CLIFTON, KARACHI

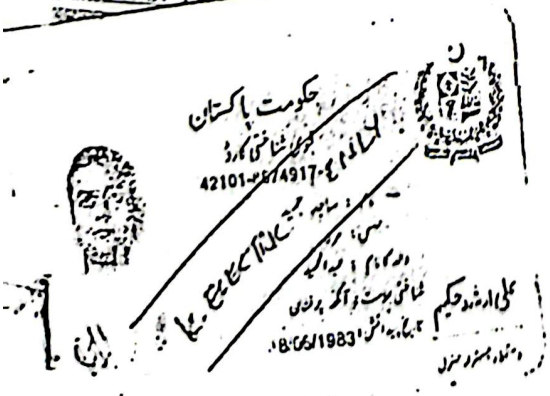
Existing Energy Meter Number / موجودہ بجلی میٹر نمبر	X
Existing Gas Meter Number / موجودہ گیس میٹر نمبر	X
Nearest Energy Meter Number / قریب ترین بجلی میٹر نمبر	X

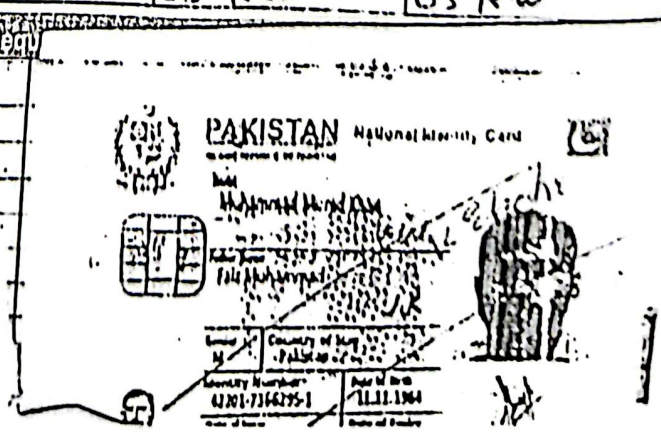
Type of Connection

- [X] Single Phase / سنگل فیز
- [ ] Three Phase / تھری فیز
- [X] CT/PT / سی ٹی / پی ٹی
- [X] Underground / زیر زمین
- [ ] Overhead / اوور ہیڈ

Details of Premises

Type of Unit / یونٹ کی قسم	Area of the Premises / عمارت / جگہ کا رقبہ	Number of Connections / Meters / کنکشن / میٹر کی تعداد	Load Required (KW) / مطلوبہ لوڈ (کلوواٹ)	Total Load Required / کل مطلوبہ لوڈ
GROUND + 3		NO.	05 KW	05 KW





No:S/EPA/ 2018|2|1|EIA|133|894|2025

ENVIRONMENTAL PROTECTION AGENCY,
GOVERNMENT OF SINDH,
Plot No. ST-2/1, Sector 23, Korangi Industrial Area, Karachi
Ph: 021- 35065621, 35115575
Fax No: 021- 35065940
epasindh@cyber.net.pk

Karachi, the 24th July, 2025

To,

Ms.Shehnaz,
M/s Shehnaz Enterprises, Proprietor
Fl-15, Block-02, Cliftion, Karachi.

SUBJECT: ENVIRONMENTAL IMPACT ASSESSMENT (EIA) OF HIGH-RISE RESIDENTIAL CUM COMMERCIAL DEVELOPMENT IN BLOCK-2, SCHEME# 5, KEHKASHAN, CLIFTION, KARACHI.

I am directed to refer Environmental Impact Assessment (EIA) report of your project **ROYAL MARINEA TOWERS** submitted in 1ST February, 2018 and to inform you that:

i. The EIA submitted was in accordance with Review of EIA/IEE Regulations 2014 whereas the regulatory framework governing environmental assessments has been revised in 2021 and now Sindh Environmental Protection Agency (Environmental Assessment) Regulations, 2021 are required to file EIA to Sindh EPA for approval.
ii. The Validity period of Approval accorded by the Agency shall be for a period of three years from the date of issue, for commencement of construction. If construction is commenced during the initial three years of validity period, the validity of the approval shall stand extended for a further period of three year. The proponent applies to the Agency for extension in the validity periods if the conditions of the approval do not require significant change. The proponent to submit a fresh IEE or EIA, if there is changes in location, design, construction and operation of the project.
iii. It comes to the knowledge of this Agency that scope of the project has been changed and few more floors are included in the project.

In view of above, it is directed to submit reply of above within seven (07) days positively. Further, you are also directed to appear before Director General, Sindh EPA on ***31st July, ,2025 at 03:00p.m.*** in the committee room of Sindh EPA located at Plot No. ST-2/1, Sector 23, Korangi Industrial Area, Karachi. Please note that proponent (in person) and senior level management must also be present for responding relevant queries.

Shoaib Qureshi
Assistant Director (Technical)

Cc....
1. P.A. to Director General, Sindh EPA.
2. Office copy

ROYAL MARINA
TOWERS

Date: 15th Dec, 2017

DIRECTOR GENERAL
Environmental Protection Agency
Government of Sindh

SUBJECT: **SUBMISSION OF ENVIRONMENTAL IMPACT ASSESSMENT OF HIGH-RISE RESIDENTIAL CUM COMMERCIAL DEVELOPMENT IN BLOCK # 2, SCHEME # 5, KEHKASHAN, CLIFTON, KARACHI.**

Dear Sir,

We, **M/s. Shenaz Enterprises** are pleased to submit the Environmental Impact Assessment of our up-coming High-rise residential-cum-commercial development: **Royal Marina** on Plot No. FL - 15, Block # 2, Scheme # 5, Kehkashan, Clifton Karachi.

Building will comprise of **Basement** for parking and air raid shelter, **Ground floor** for community hall, prayer area and other related activities, **1st to 5th floor** for parking and other services, **6th and 7th floors** as Podium Levels, **8th to 34th floors** for flats, circulation and services and 35th floor as roof top. Building has a provision for potable and non-potable overhead water tank, air raid shelter, sewage treatment plant, electrical room, potable Underground water tank, R.O plant, raw water storage tank and parking, gas meter room, electric meter room, security room, and dedicated space for generators.

The project addresses the issues of energy & environment and provides the most effective solutions. The green systems integrated in the building design will create positive and sustainable urban image to the environment and improve social and ecological resources of Karachi. The project design conforms to the standards of environmental pollution control specified by Sindh EPA and international codes of practice.

The EIA study has been prepared through **EMC Pakistan Pvt. Ltd** to respond to the mandatory requirements of Section 17 of Sindh Environmental Protection Act 2014, which demands an Environmental Impact Assessment (EIA) to be carried out before commencement of Project activity. The potential environmental and social impacts have been identified on the basis of baseline environmental study, project design, concerns raised by stakeholders, technical guidelines, and professional opinion of the project team.

You are requested to process our application at your earliest.

for Shenaz Enterprises

SHEHNAZ ENTERPRISES
FL-15 Block-2,
Clifton, Karachi.

Copy to: EMC Pakistan Pvt. Ltd

SHEHNAZ ENTERPRISE
FL-15, BLOCK-2, CLIFTON KARACHI.

Reference No: EPA/2018/2/1/EIA/133

ENVIRONMENTAL PROTECTION AGENCY
GOVERNMENT OF SINDH
Plot # ST – 2/1, Sector 23, Korangi
Industrial Area, Karachi – 74900
Ph: 021 – 35065950, 35065621, 35065946
epasindh@cyber.net.pk
Fax No: 021 - 35065940

SINDH ENVIRONMENTAL PROTECTION AGENCY
PUBLIC NOTICE

Sindh Environmental Protection Agency hereby notifies that M/s Shehnaz Enterprise has submitted Environmental Impact Assessment (EIA) report for **Royal Marina Towers** is proposed to construct a G+34 storeys high rise residential tower in the High-Density Zone (HDZ). The area along the coastline at Clifton Block 1, 2, 3 & 4 parallel to and within Marine Promenade and oil pipeline reservation falls in the Ribbon High-Density Zone where SBCA has allowed construction of high risers at 1:9 ratio. The proposed project located at Fl.-15, Block No.02, Scheme-5, Kehkashan, Clifton, Karachi. The area of the project is 6,503.75sq.yds.

The EIA reports identify potential environmental and social impacts, and provides mitigation measures to minimize the impacts. The general public, stakeholders, experts can pursue / consult the EIA report in the Office of the Director General, Sindh Environmental Protection Agency located at: Plot No. ST-2/1, Sector-23, Korangi Industrial Area, Karachi. The report can be downloaded from the website: www.epasindh.gov

A Public Hearing will be conducted by the EPA Sindh at 12:00 noon on the 19th March, 2018 at Beach Luxury Hotel, Karachi in which the proponent will make a presentation about the project. The general public, concerned citizens, civil society organizations and all other stakeholders are requested to attend this public hearing. All others who are interested to offer their comments in writing may communicate the same to Director General, EPA, Sindh on the above-mentioned address or through email at epasindh@gmail.com, within 15 days of the publication of the notice.

Waqar Hussain Phulpoto
Additional Director General

Reference No: EPA/2018/2/1/EIA/133

ENVIRONMENTAL PROTECTION AGENCY
GOVERNMENT OF SINDH
Plot # ST – 2/1, Sector 23, Korangi
Industrial Area, Karachi – 74900
Ph: 021 – 35065950, 35065621, 35065946
epasindh@cyber.net.pk
Fax No: 021 - 35065940

Dated: 27th February, 2018

Partner,
M/s Shehnaz Enterprise
Karachi.

SUBJECT: PUBLIC HEARING OF THE EIA REPORT.

Please find enclosed herewith the Public Notice to be published mainly in at least two National News Papers for wide coverage of information and participation of stakeholders and general public in the public hearing of Environmental Impact Assessment (EIA) to be held on 19th March, 2018. The public notice must appear on 4th March, 2018 in order to fulfill the regulatory requirement of 15 days for inviting the comments of stakeholders and general public under the provision of EIA/IEE Regulations, 2014.

It may please be noted that the above said notices should cover an appropriate space with a minimum of 20 x 3 Colum of the newspapers and an appropriate slogan regarding environmental protection should also be displayed at the bottom of advertisement/notice.

M.Imran Sabir
Deputy Director (Tech - II)

Reference No: EPA/2018/2/1/EIA/133

ENVIRONMENTAL PROTECTION AGENCY
GOVERNMENT OF SINDH
Plot # ST – 2/1, Sector 23, Korangi
Industrial Area, Karachi – 74900
Ph: 021 35065950, 35065621, 35065946
epasindh@cyber.net.pk
Fax No: 021 - 35065940

Date: 27-02-2018

The Director Information(Advertisement).
Information Department,
Government of Sindh,
Karachi.

SUBJECT: **PUBLIC HEARING NOTICE FOR EIA REPORT OF ENVIRONMENTAL IMPACT ASSESSMENT (EIA) OF ROYAL MARINA TOWER, BUILDING PROJECT TO BE PUBLISHED IN WELL CIRCULATED NEWSPAPER.**

Enclosed please find the Public Hearings Notification for Environmental Impact Assessment(EIA) reports of subject matter proposed by M/s Shehnaz Enterprises.

The public notice has to be advertised before 4th March, 2018 for inviting the comments of stakeholders and general public under the provision of Environmental Impact Assessment(EIA)/Initial Environmental Examination(IEE) Regulations, 2014.

It is requested to provide the "Information Department No." so that Public Notice may be got advertised by the project proponent: **M/s Shahnaz Enterprises** (All expenses will be paid by proponent).

Muhammad Imran Sabir
Deputy Director(Tech-II)

C.C to: Additional Director General, Sindh EPA, Karachi.
P.A to the Director General, Sindh EPA, Karachi.

Reference No: EPA/2018/2/1/EIA/133
ENVIRONMENTAL PROTECTION AGENCY
GOVERNMENT OF SINDH
Plot # ST - 2/1, Sector 23, Korangi
Industrial Area, Karachi – 74900
Ph: 021 - 35065950. 35065621, 35065946
epasindh@cyber.net.pk
Fax No: 021 – 35065940

SINDH ENVIRONMENTAL PROTECTION AGENCY

PUBLIC NOTICE

Sindh Environmental Protection Agency hereby notifies that Ms Shehnaz Enterprise has submitted Environmental Impact Assessment (E1A) report for Royal Marina Towers is proposed to construct a G+34 storeys high rise residential tower in the High-Density Zone (HDZ). The area along the coastline at Clifton Block 1, 2, 3 & 4 parallel to and within Marine Promenade and oil pipeline reservation falls in the Ribbon High-Density Zone where SBCA has allowed construction of high risers at 1:9 ratio. The proposed project located at FL-15. Block No.02, Scheme-5, Kehkashan, Clifton. Karachi. The area of the project is 6.503.75 sq.yds.

The E1A reports identify potential environmental and social impacts, and provides mitigation measures to minimize the impacts. The general public, stakeholders, experts can pursue consult the EIA report in the Office of the Director General, Sindh Environmental Protection Agency located at: Plot No. ST-2T. Sector-23. Korangi Industrial Area, Karachi. The report can be downloaded from the website: www.epasindh.gov.

A Public Hearing will be conducted by the EPA Sindh at 12:00 noon on the 19th March, 2018 at Beach Luxury Hotel, Karachi in which the proponent will make a presentation about the project. The general public, concerned citizens, civil society organizations and all other stakeholders are requested to attend this public hearing. All others who are interested to offer their comments in writing may communicate the same to Director General. EPA, Sindh on the above-mentioned address or through email at epasindh@gmail.com. within 15 days of the publication of the notice.

Waqar Hussain Phulphoto
Additional Director General

The Nation

Reference No: EPA/2018/2/1/EIA/133

ENVIRONMENTAL PROTECTION AGENCY
GOVERNMENT OF SINDH
Plot # ST 2/1, Sector 23, Korangi
Industrial Area, Karachi 74900
Ph: 021 35065950, 35065621, 35065946
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SINDH ENVIRONMENTAL PROTECTION AGENCY

PUBLIC NOTICE

Sindh Environmental Protection Agency hereby notifies that **M/s. Shehnaz Enterprise has submitted Environmental Impact Assessment (EIA) report for Royal Marina Towers is proposed to construct a G+34 storeys high rise residential tower in the High-Density Zone (HDZ).** The area along the coastline at Clifton Block 1, 2, 3 & 4 parallel to and within Marine Promenade and oil pipeline reservation falls in the Ribbon High-Density Zone where SBCA has allowed construction of high risers at 1:9 ratio. The proposed project located at FL-15, Block No. 2, Scheme-5, Kehkashan, Clifton Karachi. The area of the project is 6.503.75 sq.yds.

The EIA reports identify potential environmental and social impacts, and provides mitigation measures to minimize the impacts. The general public, stakeholders, experts can pursue/consult the EIA report in the Office of the Director General, Sindh Environmental Protection Agency located at: Plot No. ST-2/1, Sector-23, Korangi Industrial Area, Karachi. The report can be downloaded from the website: www.epasindh.gov

A Public Hearing will be conducted by the EPA Sindh at **12:00 noon**, on the **19th March 2018 at Beach Luxury Hotel, Karachi** in which the proponent will make a presentation about the project. The general public, concerned citizens, civil society organizations and all other stakeholders are requested to attend this public hearing. All others who are interested to offer their comments in writing may communicate the same to Director General, EPA, Sindh on the above-mentioned address or through email at epasindh@gmail.com, within 15 days of the publication of the notice.

Waqar Hussain Phulpoto
Additional Director General

روزنامہ دنیا کراچی، بتاریخ 13 مارچ 2018ء



حوالہ نمبر: EPA/2018/2/I/EIA/133

اینوائرمینٹل پروٹیکشن ایجنسی

حکومت سندھ

پلاٹ نمبر۔ ST - 2/1، سیکٹر 23، کورنگی انڈسٹریل ایریا، کراچی۔74900

فون نمبر: 021-35065950, 35065621, 35065946

epasindh@cyber.net.pk

فیکس نمبر: 021-35065950

سندھ اینوائرمینٹل پروٹیکشن ایجنسی

اطلاع عام

سندھ اینوائرمینٹل پروٹیکشن ایجنسی بذریعہ ہذا مطلع کرتی ہے کہ میسرز شہباز انٹرپرائز نے رائل مرینہ ٹاورز کے لیے ماحولیاتی اثرات کی جائزہ رپورٹ اینوائرمینٹل امپیکٹ اسسمنٹ رپورٹ (EIA) جمع کرائی ہے جس میں ہائی۔ ڈینسٹی زون (HDZ) میں گراؤنڈ مع 34 منزلہ بلند وبالا رہائشی عمارت کی تعمیر کی تجویز کے بارے میں اطلاع دی گئی ہے۔ یہ علاقہ کفٹن بلاک 4 & 3 ,2 ,1 میں متوازی طور پر ساحلی پٹی کے ساتھ اور زمین ہائی۔ ڈینسٹی زون میں آنے والے میرین پروسیڈ اور آئل پائپ لائن ریزرویشن کے اندر واقع ہے جہاں سندھ بلڈنگ کنٹرول اتھارٹی (SBCA) نے 1:9 کے تناسب پر ہائی رائزرز (بلند وبالا) کی تعمیر کی اجازت دے رکھی ہے۔ مجوزہ پروجیکٹ FL-15، بلاک نمبر۔02، اسکیم۔5، کہکشاں، کلفٹن، کراچی میں واقع ہے۔ پروجیکٹ کا رقبہ 6,503.75 مربع گز ہے۔

ای آئی اے کی رپورٹ میں کئی اہم ماحولیاتی اور سماجی اثرات کی نشاندہی کی گئی ہے اور ان اثرات کو کم کرنے کے لیے ضروری اقدامات تجویز کیے گئے ہیں۔ عوام الناس، اسٹیک ہولڈرز، ماہرین ای آئی اے رپورٹ کے بارے جانچ/مشاورت کے سلسلے میں دفتر ڈائریکٹر جنرل، سندھ اینوائرمینٹل پروٹیکشن ایجنسی، واقع پلاٹ نمبر ST - 2/1، سیکٹر 23، کورنگی انڈسٹریل ایریا، کراچی سے رابطہ کر سکتے ہیں۔ اس رپورٹ کو ایپ سائٹ www.epasindh.gov سے ڈاؤن لوڈ بھی کیا جا سکتا ہے۔

ای پی اے کی جانب سے اس سلسلے میں ایک عوامی ساعت 19 مارچ 2018 کو دوپہر 12.00 بجے بوقت لنچ کلڈری ہوٹل، کراچی میں منعقد کی جارہی ہے جس میں تجویز کنندہ پروجیکٹ کے بارے میں پریزنٹیشن دیں گے۔ عوام الناس، متعلقہ شہریوں، سول سوسائٹی کی تنظیموں اور دیگر تمام اسٹیک ہولڈرز سے درخواست ہے کہ وہ اس عوامی ساعت میں شرکت کریں۔ تمام دیگر ایسے افراد جو اپنے تاثرات تحریری طور پر دینے کے خواہشمند ہوں، وہ اس سلسلے میں ڈائریکٹر جنرل، ای پی اے، سندھ سے مذکورہ بالا پتے پر یا بذریعہ ای میل epasindh@gmail.com پر اس نوٹس کی اشاعت کی تاریخ سے 15 دنوں کے اندر رابطہ کر سکتے ہیں۔

دستخط

وقار حسین پھلپوٹو

ایڈیشنل ڈائریکٹر جنرل

THE ADDRESS [illegible] ON CONSTRUCTION OF ROYAL MARINA TOWER BY SHEHNAZ ENTERPRISE
(19 MARCH, 2018 – BEACH LUXURY HOTEL)

S.NO.	NAME	DESIGNATION	ORGANIZATION	CONTACT NO.	SIGNATURE	EMAIL ADDRESS
1	Gulzar Ahmed	CC Member IEP	Ex. CE KWSB	0301-8239472		~~0301-8239472~~
2	[illegible]	[illegible]	KMC Executive	0332142172		
3	Sidra Mehak	Teacher	S.M Public School	0341-2512225	Sidra	
4	NAGAR ALAM	Consultant	Geo Professionals	03002702598		Geo.[illegible]
5	[illegible]	Manager	N.A Contract	021-34891105		
6	[illegible]	Manager	N.A Constructions	0324-2345885		
7	M. Ubaid	Operator	Poess	03222383929	M Ubaid	
8	Haseeb Qureshi	Real Estate	Agent	03310333887		
9	[illegible]	[illegible]	-	0307-2885652	10:20.	
10	Nazeer Shehzad	Self Employed	Marble Factory	0342688[illegible]	Siddiq 10:21	

(19 MARCH, 2018 – BEACH LUXURY HOTEL)

S.NO.	NAME	DESIGNATION	ORGANIZATION	CONTACT NO.	SIGNATURE	EMAIL ADDRESS
11	Amna Shaikh	Marketinghead	Royal Group	03138227704	Shaikh	al.arzrealestate@g...
12	Dawar Baig	Social Media	Royal Group	03347000990	Dawar	dawar-baig@outlook.com
13	Taj Muhamd	Marketing	Royal Grup	0301-3395996		
14	Tabish Ichan	Marketing	Royal Group	0345-2485273		
15	Engr. Muneer Ahmed	Site Engineer	MAS construction	03353483165		Solangimuneer92@gmail.com
16	Engr: Rahul Parshant	Site Engineer	N. A Group of Construction	03173569969		rparshant@gmail.com
17	Faisal Hasan	Manager.	Royal Group	0321-9263347		
18	SHAHZAD LANGHA	MARKETING	ROYAL GROUP	0321-2894546		
19	GHULAM FAREED	Marketing	Royal Group	0346-3563779		
20	Marroom Khan	Social Expert	EMC Pak	0321-8259324		Nil

(1 ... AR ..., 20.. - BLACH LUXURY HOTEL)

S.NO.	NAME	DESIGNATION	ORGANIZATION	CONTACT NO.	SIGNATURE	EMAIL ADDRESS
21	Abdul Bari Qureshi	Transportation Engineer	Expert Engineers (P) Ltd	0331-2736884		abdulbari@expert.com.pk
22	Hira Raza	"	"	-		hira.raza@hotmail..
23	Ali Hamid	CEO	STEM Engineering	0333-212-8496		
24	Asif Vayani	Office Manager	AKA-Studio Abdul Razzak Associates	0345-3050447		aavijani@gmail..
25	Nasir	Architect	A.R.A	0333-2194836		ara-architects@..
26	Nauman Sh	Env. Specialist	Independent	0332-2618417		nouman.shaikh@outlook
27	Khalid	ARA.				
28	Sajid Khan	Prop	Real Estate	0331 2283992		
29	[illegible]		Retired Engineer	0333 225 9690		
30	M N Rahman	Lawyer	—	03008261096		

THE ADDRESS BY N.A CONSTRUCTION & ROAD MAINTENANCE WORKS BY SHEHRAZ ENTERPRISE

(19 MARCH, 2018 – BEACH LUXURY HOTEL)

S.NO.	NAME	DESIGNATION	ORGANIZATION	CONTACT NO.	SIGNATURE	EMAIL ADDRESS
31	Abdul Malik	Addl. Director	SEPA			
32	Amir Sheikh	Environmental Inspector	SEPA			
33	Tasneem Bhatti	Sociologist	Indigenta Con.	0300-2362302		
34	A Lone Gardezi	Member	CTE			
35	[illegible] Sabir	Dep. Director	SEPA	0340=3019757		
36	Mehboob Ejaz Hussain	Manager Environment	EMC	0300-0320332		
37	Rehmat T. Rahman	Coordinator	EMC	34311466		
38	Shaheer Rizvi	IT Manager	EMC	34311466		
39						
40						

CONSTRUCTION & RIYAT MARINA TOWER [illegible] NATIONAL ENTERPRISE

(19 MARCH, 2018 – BEACH LUXURY HOTEL)

S.NO.	NAME	DESIGNATION	ORGANIZATION	CONTACT NO.	SIGNATURE	EMAIL ADDRESS
11	[illegible]	Student	Mehran Uni	0343-5052724		—
12	Hassan Ali	Student	K U	03362728244		
13	M. Ab. Rashid	Executive Member	SHEHRI	0336320 3330		muabrashid 786@gmail.com
14	[illegible]		TOURISM DEPTT DADU	0300-3271573		
15	M N. Qadri	President	NFEH	03002068048		
16	Muddasir Ashraf	G S	NFEH	03033818327		
17						
18						
19						
20						

THE ADDRESS BY N A CONSTRUCTION & ROYAL GARDEN TOWER DE SHEHNAZ ENTERPRISE

(19 MARCH, 2018 – BEACH LUXURY HOTEL)

S.NO.	NAME	DESIGNATION	ORGANIZATION	CONTACT NO.	SIGNATURE	EMAIL ADDRESS
1	SYED ALI GHAYAS	C.E.O	Y.G.ENGG. Co.	0332-2128478		syedalighayas@gmail.com
2	Syed Nehal Ahmad	Business Manager	Y.G.EnggCo	0300-8311529		nehal.ahmedsyed@gmail.com
3	Mohammad Shafiq	Str. Engineer	A.L.A	0300-9209023		mishaq52@cyber.net.pk
4	Muhammad Usman	CEO	IMPACT.	0333-3629276		usman.impact@gmail.com
5	Farzana Naseem	AD(Tech)	Sindh EPA	0345 2625642		farzanaseem84@hotmail.com
6	S. Nadeem Arif	Director EMC	EMC Pakistan	0300-8230542		nadeem@emc.com.pk
7	M. Umair Kha	Stud ent	IQRA University	0343-3556626		Sazhr100@yahoo.com
8	Sajid Ali	Student	KU	0348349[illegible]		
9	Waqas	Student	KU	0313-8968737		
10	[illegible]	Structure Engg-	A.A. Associate	03012261337		

Reference No: SEPA/2018/02/01/EIA/133
ENVIRONMENTAL PROTECTION AGENCY
GOVERNMENT OF SINDH
Plot # ST – 2/1, Sector 23, Korangi
Industrial Area, Karachi – 74900
Ph: 021 – 35065950, 35065621, 35065946
epasindh@gmail.com
Fax No: 021 - 35065940

Dated: 18th December 2018

NOTIFICATION

SUBJECT: **FORMULATION OF COMMITTEE EXPERTS FOR EVALUATION OF ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT OF ROYAL MARINA TOWER.**

Sindh EPA under Rule 12(2) of the Sindh Environmental Protection Agency (Review of EIA/IEE) Regulations, 2014 has constituted a Committee of Experts to assist and guide EPA Sindh in reviewing the EIA report for the subjected project.

The Committee shall comprise of the following members:

1. Engr. Muhammad Muzammil Mirza, Senior Civil Engineer & Industrialist
2. Engr. Ijaz Hussain Khilji, Senior Traffic Management Expert
3. Engr. Ashkar Dawar, Director Environment, SBCA
4. Engr. Prof. Moinuddin Ali Khan, Expert on Steel Structures
5. Dr. Shahid Amjad, Senior Environmentalist, Head of Energy & Env, IoBM
6. Dr. Kaneez Fatima Mamdani, Sociologist, University of Karachi
7. Dr. Nuzhat Khan, Senior Environmentalist, NIO
8. Dr. Syed Ali Ghalib, Senior Ecologist, Ex-Director ZSD
9. Dr. A.R Tabrez, Senior Geologist, Advisor at COMSATS
10. Mr. Tahir Qureshi, Director Ecosystem, IUCN Karachi
11. Mr. Waqar Alam, Senior Hydrogeologist and Expert on Tube Wells and RO Plants.
12. Mr. Farigh Nadeem, Convener, Environmental Protection and Safety Measurement Sub-Committee, ABAD.

The Committee shall perform the following function(s) under Rule 12 (3) and 12 (4) of the Sindh Environmental Protection Agency (Review of EIA/IEE) Regulations, 2014:

"Assist and Guide EPA Sindh in reviewing the EIA report based on quantitative and qualitative assessment of the documents and data furnished by the proponent, comments from the public and Government agencies received under Rule 10 of the Regulations."

The experts provided by the committee members shall be on voluntary basis for which SEPA shall be indebted.

Naeem Ahmed Mughal
Additional Director General

Reference No: SEPA/2018/02/01/EIA/133
ENVIRONMENTAL PROTECTION AGENCY
GOVERNMENT OF SINDH
Plot # ST – 2/1, Sector 23, Korangi
Industrial Area, Karachi – 74900
Ph: 021 – 35065950, 35065621, 35065946
epasindh@gmail.com
Fax No: 021 - 35065940

Dated: 18th December 2018

1. Engr. Muhammad Muzammil Mirza, Senior Civil Engineer & Industrialist	2. Engr. Ashkar Dawar, Director Environment, SBCA
3. Engr. Ijaz Hussain Khilji, Senior Traffic Management Expert	Engr. Prof. Moinuddin Ali Khan, Expert on Steel Structures
4. Dr. Shahid Amjad, Senior Environmentalist, Head of Energy & Env, IoBM	5. Dr. Kaneez Fatima Mamdani, Sociologist, University of Karachi
6. Dr. Nuzhat Khan, Senior Environmentalist, NIO	7. Dr. Syed Ali Ghalib, Senior Ecologist, Ex-Director ZSD
8. Dr. A.R Tabrez, Senior Geologist, Advisor at COMSATS	9. Mr. Tahir Qureshi, Director Ecosystem, IUCN Karachi
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In continuation of this office Notification No: SEPA/2018/02/01/EIA/133 dated 18th December 2018 regarding the meeting of Committee of Experts for above subject mentioned Environmental Impact Assessment (EIA) report. It is informed that the meeting has been scheduled on **21-12-2018 at 3:30 p.m.** at Marriott Hotel, Karachi.

It is requested to make it convenient to attend the meeting as per given schedule.

M. Imran Sabir
Deputy Director (Tech-II)

CC to: Senior Management of M/s. Shenaz Enterprises must attend the meeting along with Consultant Team

MEETING OF COMMITTEE OF EXPERTS FOR REVIEW OF
ENVIRONMENTAL IMPACT ASSESSMENT (EIAs) OF THE ADDRESS, CREEK APARTMENTS, SOCIETY TOWERS
& ROYAL MARINA TOWER (21 DECEMBER, 2018) – MARRIOTT HOTEL, KARACHI

S.NO.	NAME	DESIGNATION	ORGANIZATION	CONTACT NO.	EMAIL	SIGNATURE
1	Dr. Nuzhat Ch	Ex Chief. Engr.	NIO	0333-2249787	nuzhatk@gmail.com	
2	Engr. Muzammil MIRZA.	C.E.O, URBAN Consults Environmentalist	URBAN Consults	0300-8294188	muzammil.mirza@gmail.com	
3	Engr. IFFI KHALJI	Advisor EA-Consulting	EA Consulting Co.	0300-8288151	iiaz-k2014@Yahoo.com	
4	Dr. S.A. Ghaffar	Consultant	Independent	0333-3618826	drghaffar614@gmail.com	
5	Dr. A.R. TABBER	Geologist	Advisor COMSATS	0300-2447763	ali_tabrez786@yahoo.com	
6	WAQAR ALAM	Hydrogeologist	Geo Professionals	0300 2702599	Geopro94@hotmail.com	
7	Engr. Muhammad Moin Uddin Ahmed Kh	H & D / Proj. Scientist/Environmentalist	IRM	0333-214 9553	Moinahmedkh@yahoo.com	
8	Mirza Hasham Baig	Architect	Tanveer Ahmed Associates	03341979364	mirzahashambaig@gmail.com	
9	Sana Sono	Architect	Tanveer Ahmed Associates.	03363407411	Sanajanali40@gmail.com	
10	M. USMAN MOOSA	Sr. Consultant	IMPACT.	0333-3162926	Umoosa@yahoo.com	

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& ROYAL MARINA TOWER (21 DECEMBER, 2018) – MARRIOTT HOTEL, KARACHI

S.NO.	NAME	DESIGNATION	ORGANIZATION	CONTACT NO.	EMAIL	SIGNATURE
11	Asghar H. Siddiq	CEO/I	Elexen Associats	0333-2125108	asghar@elexen.com	
12	SHAHZAD SALIM	Director	Society Tower	0321-2407777	sgodil@gmail.com	
13	Shamshul Hadi Memon	Former Secretary ENT: G.O.'s	—	030-8273626	shams.memon@icloud.com	
14	M. Imran Shi	D. Dir	SEPA	021-5065150		
15	FARAAZ BILWANI	Pet PARTNER.	ROYAL GROUP (ROYALMARINA/CREEKART)	0300-8243833	faraazbilwani@gmail.com	
16	M. Nasir	Architect	A.R.A	0333-219436	ara-architects@gmail	
17	M. ISHAQUE	Engineer	A.R.A	0300-9207023	mishaq52@hotmail.com	
18	Syed Dhamid	Engineer	Society Tower	0345-8311717	engr.syedahmed@yahoo.com	
19	Ahsan Khan	Engineer	Society tower	0322 3259843	ahsan khan 2812 @gmail.com	
20	Nadeem Ahmed	Dy Director	SBCA	03222605025	—	

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& ROYAL MARINA TOWER (21 DECEMBER, 2018) – MARRIOTT HOTEL, KARACHI

S.NO.	NAME	DESIGNATION	ORGANIZATION	CONTACT NO.	EMAIL	SIGNATURE
21	Javed Ahmed	Asstt. Director	SBCA	0334-3537412	–	
22	TANVEER AHMAD	ARCHITECT	TANVEER AHMAD ASSOCIATES	0333-2234142	Tanveer.tower@yahoo.com	
23	Syed M. Hi Aamir	Mechanical Consultant	BEM Engineers	0333-212-8490	BEM.engineers@gmail.com	
24	Naveed Nariman Hasan			0331-8295862		
25	Dr. Shahid Amjad	HOD EEM.	IoBM.	0300 2714260	Sajjadone@gmail.com	
26	Khurram Iqbal	A.K.A.		03009286535		
27						
28						
29						
30						

	Minutes of Meeting
Projects	The Address, Creek Apartments, Society Towers, Royal Marina Tower
Subject	Experts' Committee Meeting
Date	21st December 2018

Q/A Session

Mr. Naeem Mughal, DG SEPA	♦ What is the status of this plot? ♦ Why initially IEE was conducted and now EIA?
Mr. Saquib Ejaz Hussain, EMC Pakistan Pvt. Ltd.	♦ First, it was planned as 14-storied building but now exceeded up to 18 storeys. ♦ The land use will be apartments only with one small shop for residents' facilitation.
Dr. Nuzhat Khan, National Institute of Oceanography (NIO)	♦ Will there be any garden/green area planned for the project to offset the carbon emissions from energy usage such as elevators etc.? ♦ Another area of concern is the Wind patterns trends of the area and air dispersion within the open areas between the buildings around the project. ♦ In the surroundings, there may also be encroachment issues that need to be duly looked into as well.
Participant	♦ There is significant traffic congestion already in the project area. The parking spaces provided and the traffic congestion due to project residents. ♦ The number of per person trips is on the lower side and is not compatible with the parking spaces/number of cars.
Mr. Saquib Ejaz Hussain, EMC Pakistan Pvt. Ltd.	♦ Rooftop solar system will be installed in this project. ♦ Concept of compulsory open space will be followed for this project. ♦ Dispersion of air is much better in this area as compared to other areas.
Mr. Syed Nadeem Arif, MD EMC Pakistan Pvt. Ltd.	♦ As of now, a lot of development of roads and bridges in this particular area is completed and in and out traffic problems have been resolved to considerable extent due to construction of Gizri Flyover and Punjab Chowrangi overhead bridge.
Participant	♦ There is concern regarding the quality of material to be used and the building design. ♦ Re-bars being used in construction are not up to the required quality and depends upon thermo mechanical technology. ♦ Fatigue Testing is not done generally. ♦ Will the structure be able to survive for 99 years? ♦ Normally 5 people live in one apartment and there will be 42 apartments in total. ♦ In case of an earthquake or any other natural disaster, how will the building withstand the impact? ♦ So the responsibility on the SEPA regarding approval of project is of prime importance. ♦ It is recommended that experts of the previously established buildings in the area must also be taken in the loop for structural and safety aspects.
Participant	♦ Has anyone conducted detailed geological survey of the project?
Mr. Syed Nadeem Arif, MD EMC Pakistan Pvt. Ltd.	♦ Geotechnical study was required and a PEC registered firm – STS has conducted relevant study. ♦ They have given report for Piling, laying of foundations etc. ♦ Geological mapping has also been done and Geological Survey of Pakistan is consulted for technical assistance.

Mr. Saquib Ejaz Hussain, EMC Pakistan Pvt. Ltd.	♦ Structural Department of SBCA is responsible entity for assuring safety aspects. ♦ The area is in seismic zone 2B.
Mr. Naeem Mughal	♦ How are you building flats in a commercial building? ♦ There is concern regarding increase of population intensity due to residential flats.
Participant	♦ Sir flats are usually built in commercial buildings
Participant	♦ There is concern regarding increase in noise levels and consequent occurrence of mental health problems.
Mr. Saquib Ejaz Hussain, EMC Pakistan Pvt. Ltd.	♦ We have done a detailed noise study of the area. ♦ 75 dBA is the SEQS limit for commercial area, and the noise levels in the project area comply with this limit.
Mr. Naeem Mughal	♦ There is also an issue on the usage of subsoil water and the relevant rules that are needed to be complied with.
Mr. Saquib Ejaz Hussain, EMC Pakistan Pvt. Ltd.	♦ Water table Regulatory Authority is to be established and relevant Rules are needed to be issued
Mr. Syed Nadeem Arif, MD EMC Pakistan Pvt. Ltd.	♦ Indiscriminate usage of groundwater must be controlled and there should be some kind of policy and regulations
Dr. Waqar	♦ At 700 to 1000 feet depth deep aquifer starts and non-professional people are tapping the water at any depth at which water is obtained ♦ A hydrogeologist consultant is required in such case as to set pump-setting depth, pump yields etc.
Mr. Saquib Ejaz Hussain, EMC Pakistan Pvt. Ltd.	♦ Water board is unfortunately a mismanaged organization ♦ Water mapping is not available for Karachi.
Mr. Naeem Mughal	♦ There is a great responsibility on SEPA for reviewing and taking decision on project approvals so SEPA intends to critically review each individual project and seek suggestions from experts that how further intensive review may be facilitated.
Participant	♦ In this respect, DHA is a resourceful organization.
Participant	♦ SBCA oversees high-rise projects and have structural Engineers and Architects
Mr. Naeem Mughal	♦ Building bylaws are different from SEPA legislation. ♦ SEPA needs volunteers' experts who could assist on critical aspects before approval may be granted ♦ Concerned agencies must develop FL sites since there has been no change in overall infrastructure. ♦ A core committee meeting may be called upon to assure provisions for 1:9 high-density developments.

KARACHI DEVELOPMENT AUTHORITY

DIRECTORATE OF LAND MANAGEMENT

(Cell—Branch/Section)

TRANSFER/MUTATION ORDER

(ON THE BASIS OF SALE AGREEMENT)

Transferee/Mutatee (S) Copy

No. KDA/LAE/GUL/CC/93/589

Name & Address of transferee/mutatee

Date 16/08/1995

M/s. Sharaz Enterprises,
Office G-4, Block-8,
Clifton, Karachi,
through its Proprietor,
Mst. Shanaz
W/o. Abdul Sattar,

Scheme/ Township	B.C.L.I.F.T.C.N.	
Category	Plot No.	Block/Sector No.
FI.	15	02
Area in sq. yd.		Rate per sq. yd.
6503.75		

National Identity Card No. of Transferee 511-51-033582

Application Form No. 1/4822

Dear Sir/Madam,

The competent authority has been pleased to transfer/mutate the occupancy/lease hold rights of the above noted plot in your name by way of Gift/Joint Declaration/Registered Sale Deed/inheritance on the same terms and conditions on which the plot was originally allotted to Mr/Miss/Mrs/

M/s. Merchant Construction Co.

No relaxation in the construction period shall be allowed on account of this transfer/mutation, and it shall expire on 31.12.1995 In case of failure to complete construction on the above date, the allotment/transfer/mutation order shall be cancelled on 1.1.1996 without any further notice.

The following documents have been surrendered in original by the transferee/mutatee/allottee and they have been kept on record:—

1. ////////
2.
3. ////////
4.

ASSISTANT DIRECTOR (CC)
Assistant Director (CC)-I
Director of Land Management
K.D.A. Civic Centre, Karachi.

Architect
MUHAMMAD NASIR
B Arch A.I.A.P.
PCAP REG NO. A-2050
ARCHITECT LICE NO. AL-01-060

Copy forwarded for information/necessary action to:—

1. Allottee/last transferee/Mutatee

M/s. Merchant Construction Co.,(PVT) Ltd., through its Managing Director Mr. Abdul Hamid A Merchant, Office 406 Bombino Chambers, Karachi.
NIC No. 517-03-304211

2. Allottee / Last Transfere/Mutatee Copy
3. Executive Engineer, 05 KDA
4. Office Copy.

LANDS & ESTATES DEPARTMENT
(GULSHAN-E-IQBAL)

No.KDA/LAND/GUL/CO/ 3782 Dated: 20

A L L O T M E N T O R D E R.

To,

M/S MERCHANT CONSTRUCTION CO,
ROOM NO.94, 7th FLOOR, FARID CHAMBERS,
VICTORIA ROAD, KARACHI.

SUBJECT:- ALLOTMENT OF RESIDENTIAL ~~PLOTS AND~~ MULTI-STOREYED FLAT SITE IN SCHEME:-5, (KANKASHAN) FOR CONSTRUCTION AND SALE OF FLATS / ~~HOUSES~~.

REF:- G.B.RESOLUTION NO:-23 Dt: 22-1-1974

Dear Sirs,

With reference to your application on the subject mentioned above, it has been decided by the Governing Body KDA to ~~allot~~ and allot following residential ~~plots~~/Multi-Storeyed flat sites to your concern:-

SCHEME NO:-5 (KANKASHAN)

FLAT SITES NO:FL-14 AND FL-15 BLOCK NO:-2.

The terms & conditions of your allotment will be as under. The word Authority wherever occuring denothing the KD. and the word " Company" denoting your concern:-

1. The Company shall, within sixty days of the allotment of plots/sites pay to the Authority the balance of the price of the plots sites without any further notice. In case of default, the ten percent shall be forfeited to Govt and all liabilities incurred, and losses if any sustained by the Authority or the Govt by the re-sale of the plots/sites shall be recovered from the Company as arrears of land revenue.

2. The Company shall cause residential houses/flats to be constructed upon the ~~plots~~/sites in accordance with the plans and specifications laid down by the Authority.

3. Building plans for ~~plots~~/sites shall be submitted by the Company for approval to the Authority within thrity days of the possession orfer. In case of allotment of both plots and flat sites the building plans for both shall be submitted together.

4. The period of construction for each category of plots or sites will be determined by the Authority at the time of approval of building plans and the schedule of progress fixed by the Authority shall be binding on the Company.

5. The Authority will have to right to inspect from time to time, the quality of construction so as to ensure its being technically sound according to the prescribed specifications and standards and as per approved plans and to issue such instructions from time to time as may be deemed necessary and the Company shall be bound to carry

Contd.....P / 2

Architect
MUHAMMAD NASIR
B Arch A.I.A.P.
P.C.A.P REG NO A-2056
ARCHITECT LICE NO AL-01-023

HEADQUARTERS
PAKISTAN CIVIL AVIATION AUTHORITY
JINNAH INTERNATIONAL AIRPORT
INSPECTORATE BUILDING
KARACHI-75200, PAKISTAN
Tel: (92-21) 99242741
Fax: (92-21) 99242676
e-mail: dgarr@caapakistan.com.pk

Ref (HQCAA/1117/003/ARAS/KHI-25)/1382

Date: 23rd November, 2016

Dear Sir,

REVISED NOC FOR HEIGHT CLEARANCE

Kindly refer to your letter number H/ROYAL/001/18/2016 dated nil regarding the revised NOC for height clearance.

2. Pakistan Civil Aviation Authority has no objection to the construction of ***490 feet (Four hundred ninety feet)*** Above Ground Level ***(AGL)*** or ***520 feet*** Above Mean Sea Level (***AMSL***) high rise building **"ROYAL MARINA TOWER"** including over head water tank, antenna, Neon sign board etc. on roof top *at* (244849.48877N 670030.10083E, 244849.84433N 670027.97766E, 244846.46655N 670027.36644E & 244846.16655N 670029.54433E) on Plot No. FL-15, Block-2, Scheme-5, Clifton, Karachi, with the following terms and conditions:-

a) Height of the building should not be more than ***490 feet (Four hundred ninety feet) Above Ground Level (AGL) or 520 feet Above Mean Sea Level (AMSL)*** including over head water tank, antenna, Neon sign board etc. on roof top.
b) Obstruction light must be provided on top of the building in accordance with the specification contained in Para 6.2 of chapter 6 of Aerodrome Standard Manual of Pakistan (ASMP) (copy enclosed).
c) The refuse shall not be kept open but always be stored in covered containers to ensure that birds are not attracted.
d) Civil Aviation Authority shall not accept liability for any loss(s)/damage(s) /inconvenience suffered due to noise or other aviation related activities or any other claim by other Organizations/person(s).
e) Civil Aviation Authority reserves the right to cancel the said NOC if the terms & conditions are not compiled with **and in addition, if the work is not commenced within one year from the date of issue, the NOC will be treated as canceled.**
f) This NOC is only valid for height clearance and does not cover the NOCs required by other organization/agencies etc.
g) **NOC from Director Air Traffic Services, Air Headquarters PAF, Islamabad must also be obtained before the start of work.**
h) Completion of work is also required to be notified to HQCAA for the issuance of notices to the Aviators.

3. This NOC is only related to the clearance / permissible height at proposed location and does not absolve the holder for fulfilling requirement of other concerned departments. Moreover, any omission due to submission of incorrect data or marginal error **shall not entitle** the holder for any claim whatsoever in future. **In addition at any stage if, any dispute of land on the said survey numbers arises with CAA, this NOC shall be canceled immediately.**

4. Height clearance NOC issued vide letter No.HQCAA/1117/003/ARAS/KHI-25/110 dated 27th January 2016 is hereby canceled.

Encl. As stated in Para 2(b)

(ENGR. MUHAMMAD AZHAR SALEEM)
Director
Airspace & Aerodrome Regulations

To,
Ms. Shehnaz (Owner),
Royal Residency, Flat No. 104/105,
Plot No. 15, CL-7, Civil Lines, Karachi.

Copy to:-
- DG SBCA, Civic Centre, Karachi
- Director ATS, Air Headquarters, Islamabad.
- Airport Manager JIAP, Karachi.
- A/ Addl. Director Procedure Design, HQCAA.
- Incharge AIS HQCAA