# ENVIRONMENTAL IMPACT ASSESSMENT OF ESTABLISHMENT OF NOVACARE HOSPITAL PROJECT, PHASE V, DHA, ISLAMABAD


**FINAL REPORT**

**MARCH 2024**

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## Report Disclaimer

Project Procurement International has prepared an Environmental Impact Assessment of Establishment of Novacare Hospital, Islamabad in accordance with the instructions of the **M/s Novacare Hospitals Pvt. Limited, Islamabad** for its sole and specific use.

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# Executive Summary

### Title and Location of the Project

This report presents the findings of "Environmental Impact Assessment (EIA) of the Establishment of Novacare Hospital Project, Phase V, DHA, Islamabad".

The EIA study aims at the identification of the possible environmental and social impacts of the proposed project on its immediate surroundings on both a short and long-term basis, suggesting mitigation measures and identifying the responsible agencies to implement those measures.

The Novacare Hospital Project is located on DHA Expressway, Phase V, DHA, Islamabad. The coordinates of the proposed project location are **33°31'35.46"N and 73°12'11.53"E**.

### Name of Proponent

M/s Novacare Hospitals Pvt. Limited is the proponent of the project with aim to deliver quality healthcare services to the community through an efficient and effective service delivery system that is accessible, equitable, culturally acceptable, affordable, and sustainable. Novacare Hospital Project aims to improve the health and quality of life of all, through access to essential and tertiary health services.

### Name of the organization preparing the report

M/s Project Procurement International, an Environmental and Management Consultancy Firm, Islamabad has prepared the Environmental Impact Assessment Report of the Novacare Hospital Project.

### Project Outline

M/s Novacare Hospitals Pvt. Limited intends to construct a 250 Bedded Novacare Hospital in DHA Phase V, Islamabad.

The project objective is to make quality healthcare more accessible to more people by increasing in patient bed capacity in Islamabad and Rawalpindi by providing more room for family outpatient and inpatient clinics, diagnostic, therapeutic centers and specialist referral centers to overcome the shortage of health infrastructures. Novacare Hospital is being designed to comply with **LEED** (Leadership in Energy and Environmental Design) and **EDGE** (Excellence in Design for Greater Efficiencies) certification.

The Novacare Hospital Project has been proposed at a piece of land having an area of 225,000 sq.ft. Proposed hospital has a functional covered area of 450,000 sq.ft and an additional subgrade covered parking area of 150,000 sq.ft.

The hospital paring plaza will be designed for accommodating **850 vehicles**. The multi-story parking building will have dedicated floors for the hospital employees, patients, and supply chain vehicles with proper access and internal circulation plan making sure parking occupancy never leads to on-street parking. The CDA requirement for the car parking spaces is **168 car parking**.

The proposed project will comprise of 2 basements, Ground floor plus 9 floors and a mumty floor for MEP services. The facilities and departments provided at the Novacare Hospital, DHA Phase V, Islamabad include various outpatient clinics, emergency and trauma services, lab and imaging, surgical facilities, ICUs, and inpatient facilities.

The estimated cost of the project is **Rs 24 Billion** and is expected to be completed in **30 months**.

### Environmental Baseline Conditions

To assess and evaluate the impacts and related mitigation measures at the project area, existing conditions of the physical, biological, and socio-economic environment were studied as under:

**Physical Environment**

Topography: Islamabad is located at the edge of the Potohar Plateau and at the foot of the Margalla Hills in Islamabad Capital Territory. The topography of Islamabad consists of plains and mountains. The northern part of the metropolitan area comprises mountains terrain of the Margalla Hills, and Rawal Lake lies in the northeast just below the hills. The southern portion of this city is an undulating plain drained by Korang River followed by its tributaries. Towards the east is a relatively flat area with bare soil and settlements.

Surface Water: The Soan and Kurang Rivers are the main streams draining the area. Their primary tributaries are the Ling River, draining north-westward into the Soan; Gumreh Kas, draining westward into the Kurang from the area between the Kurang and Soan; and Lei Nala, draining southward into the Soan from the mountain front and urban areas. The Kurang and Soan Rivers are dammed at Rawal and Sambli Lakes, respectively, to supply water for the urban area. Extensive forest reserves in the Kurang and Soan Rivers' headwaters benefit the quality and quantity of water supply.

There is a Rainfed Nullah is passing in the vicinity (850m) of the project site. This Nullah then falls into the Ling River.

Ground Water: A chemical analysis test of the ground water in the project site was conducted. The samples of ground water were collected on 23rd October 2023.

The parameters that were analyzed include pH, Total Dissolved Solids, Chloride, Cadmium, Chromium, Copper, Lead, Manganese, Nickel, Zinc, Antimony, Aluminum, Arsenic, Boron, Barium, Mercury, Selenium, Total Coliforms, Fecal Coliforms Bacteria, E.Coli, Color, Taste, Odour, Turbidity, Total Hardness as $CaCO_3$, Cyanide, Fluoride, Nitrate, Nitrite, Residual Chlorine and Phenolic Compounds (as Phenols) whose concentrations at the project site were 7.5, 509 mg/L, 30 mg/L, ND, ND, ND, ND, ND, ND, ND, ND, ND, ND, ND, ND, ND, ND, ND, ND, ND, ND, ND, ND, ND, Acceptable, Acceptable, 1.2 NTU, 356 mg/L, ND, 0.1 mg/L, 7.0 mg/L, ND, ND, and ND respectively.

It was found that all these parameters are within the permissible limit.

Land Use: The land for project site is the non-agriculture site.

Climate: Islamabad has distinct seasons marked by the wide variation in temperature. The climate remains very salubrious from April to October, but the winters get very cold due to snowfall in surrounding areas (especially in Murree). The coldest months are December, January, and February. The hottest months are June and July. Rainfall in April and May is occasional, but the heaviest rain is in July and August.

The temperature of capital territory Islamabad ranges between -1 ºC to 46 ºC. The coldest month is January when the mean maximum temperature is 18.3 ºC, and the mean minimum is 3.8 ºC.

From February to May the temperature rises at the rate of 5.0 ºC per month. The highest temperature reached in May when the mean maximum temperature remains 39.1 ºC.

Air Quality: The ambient air and noise level monitoring was conducted on 23rd to 24th October 2023 for 24 hours at the project site of Novacare Hospital, Phase V, DHA, Islamabad.

The ambient air quality and noise monitoring was carried out by Pak - EPA Certified laboratory, Environmental Services Pakistan (ESPAK).

The average 24-hour CO, $SO_2$, $O_3$, NO, $NO_2$, $PM_{2.5}$, $PM_{10}$, and SPM were recorded at project site as 2.1 mg/$m^3$, 11.4 ug/$m^3$, 23.2 ug/$m^3$, 13.9 ug/$m^3$, 26 ug/$m^3$, 32.1 ug/$m^3$, 141 ug/$m^3$, 389 ug/$m^3$ respectively.

The ambient air quality monitoring results indicate that the parameters for ambient air quality are within the NEQS limits.

Noise and Vibration: The 24-hour monitoring period for noise level was carried out at the project site. The low noise level data was 51.1 dB, and the highest was 69.5 dB which maybe corresponds to nearby road i.e. DHA Expressway.

The hourly noise variation throughout the day reveals that noise levels were within the compliance limit of NEQS (i.e., 65 dB) most of the time but exceeded the values for some peak hours at the project site. The average noise level during the daytime was observed to be 62 dB whereas the noise level at night was 55 dB respectively.

**Ecological Environment**

**Flora**

According to the natural vegetation of Pakistan, ecologically Islamabad lies under the thorny zone of vegetation. The vegetation is a representative of Dry Subtropical Scrub Forest which is dominated by *Acacia Modesta* (Phulai), *Ziziphus mauritiana* (Ber), etc.

The most common trees in Islamabad are of Amal Tas (*Casia fistulla*), Chinar (*Platanus orientalis*), Phulai (*Acacia modesta*), Dharek (*Melia zardorachita*), Jangali ber (*Zizyphus maurantiana*), Kiker (*Acacia nilotica*), Mulberry-Shahtoot (*Morus alba*), Safaida (*Eucalyptus camaldulensis*), Shisham (*Dalbergia sissoo*), Coconut (*Cocos nucifera*), Papeta (*Manilkara zapota*), Jaman (*Syzygium cumini*),Peli Kaner (*Thevetia peruviana*), Shireen (*Albizia lebbek*), Bamboo (*Bambusa*), Semal (*Bombax ceiba*), Palm (*Arecaceae*), Mango (*Mangifera indica*), etc. In the undergrowth *Cannabis sativa* (Bhang), *Calotropis procera* (Desi Ak), *Parthenium hysterophorous* (Gandi Booti) and *Ocimum bacilicum* (Niazbo) are predominant.

The project site is barred with no tree cover.

**Fauna**

In its original form, the Dry Sub Tropical Semi-Evergreen Scrub Forest constitutes the habitat of wild fauna consisting of a host of animals and birds. As the disturbances increased to a maximum level with complete inhabitation, wildlife abundance and diversity decreased to a minimum degree.

The major wildlife of the area is jackal, fox, hare, wild boar, and grey partridges. The ecology of project area is very low because of already ongoing development activities.

**Protected Areas/National Sanctuaries**

In Pakistan, there are several areas of land devoted to the preservation of biodiversity through the dedication of national parks and wildlife sanctuaries. There are no protected areas within the immediate vicinity of the proposed site.

**Socio-Economic and Cultural Environment**

The socio-cultural and socio-economic conditions of the local community in the project area, Islamabad, is described in the report. The project area is defined as the area around the project site, which is within a one km radius of the project site. This area may get direct positive or negative impacts from the construction of the Novacare Hospital Project.

**Public Consultation**

During the public consultation, meetings were held with the Proponent's Project Management Team, Pakistan Environmental Protection Agency, CDA's Emergency and Disaster Management Directorate, private doctors, university academia and community living around the project site. Their point of concern and suggestions regarding the project was solicited.

The impact of project activities on the project site's physical, biological, and socio-economic environment was highlighted. Stakeholders concerns regarding various aspects, the existing

environment, and impacts of the project were noted, and mitigation measures are proposed in the EIA report.

Much of the public consultation process has revolved around concerns for the mitigation of construction stage and operational stage impacts like air and noise pollution. The information obtained from the community was used to identify concerns and issues that have been subsequently mentioned and addressed in the EIA report.

**Major impacts**

**Physical Environment**

Impacts: Soil-related issues include soil erosion, slope stability, and soil contamination. The land excavation and filling, construction activities and maintenance of equipment/vehicles may cause these issues. The quality of soil would be affected, as soil contamination would occur because of the disposal of untreated wastewater or direct disposal of chemical and onsite preparation of materials. Oils, chemical spills, and waste from campsites may also deteriorate the quality of the soil.

Dumping of construction wastes/excavated material in the surrounding area may limit disturbance. The solid waste may be generated due to different construction activities, and it will mainly include surplus excavated and construction material.

Construction machinery and project vehicles will release exhaust emissions containing Carbon Monoxide (CO), Oxides of Sulfur (SOx), Oxides of Nitrogen (NOx), and Particulate Matter (PM). In addition, various burning activities involved in road construction will also cause air pollution.

These emissions can deteriorate the ambient air quality in the immediate vicinity of the project site. Furthermore, construction activities such as excavation, land levelling, filling and vehicular movement on unpaved tracks may also cause fugitive dust emissions.

Noise and vibration will be generated by construction machinery and vehicles.

The quality of water may deteriorate in the area. For example, during the deep excavation, the aquifer may be hit, and water quality will be depleted. In addition, because of the preparation of construction material on-site, leachate may be produced and percolated through the soil. It may then reach the water table and contaminate the water that the local people may consume.

The activities during the construction and operational phase of the proposed project will affect the community living in the vicinity of the project site. Therefore, there is a need to implement mitigation measures during the construction and operational phase to minimize the potential negative impacts on these areas.

**Ecological Environment**

Impacts: The project site preparation and construction activities may necessitate the removal of the natural vegetation and very limited loss of plant cover and productivity.

Most of the potential impacts of the proposed project operation on the faunal resources are associated with the damage to the natural vegetation. In addition, the wildlife may be disturbed by noise, illumination, and emissions.

The covered project area is small and inhibits no wildlife, while smoke, chemicals, dust particles, and noise generated by heavy machinery during the construction period are scary factors for biota. Rodents and insects would lose their abode.

**Socio-Economic Environment**

Impacts: The project site is located close to residential area, which may pose some safety hazards to the residents during the project's construction phase.

Construction workers may be susceptible to eye and respiratory diseases due to their routine exposure to dust and exhaust emissions on site. Injuries could happen primarily by

occupational-related accidents, animal bites, etc. Activities such as land clearing, earthworks, and construction of facilities present various occupational hazards to the workers on the project site.

There are no reported sites of the archaeological or historically significant site at the project site. However, in case an artefact of such significance is found during the construction activities, the Archaeology Department, the Government of Pakistan will be informed.

**Recommendations for mitigation measures**

Soil erosion can be minimized by appropriate land clearing, levelling, and grading. Excavated slopes will not be left untreated/unattended for long durations, and appropriate slope stabilization measures will be taken as per the design.

For the domestic sewage from the contractor's camp, a septic tank with a soakage pit will be constructed having adequate capacity. Waste oils will be collected in drums and sold to the recycling contractor.

The recyclable waste from the project site (such as cardboard, drums, broken/used parts, etc.) will be sold to recycling contractors, or where appropriate, to reuse/recycle. The hazardous waste will be kept separate and handled according to the nature of the waste. While storing, hazardous waste will be marked.

Appropriate sewage treatment mechanisms such as septic tanks of adequate sizes will be incorporated in the design for the treatment of sanitation water where the municipal sewage system is not available or does not exist.

Water quality analysis will be carried out at the project site and at the campsite quarterly during the construction phase. The management of the Novacare Hospital Project will maintain the area's existing plantation cover and aesthetic beauty. Endeavours will be made to enhance the environment through a plantation of trees.

All preventive measures will be adopted to control the spill-over of chemicals and other effluents on the ground to protect soil fauna and ensure microbial activity in accordance with PEQS.

Special measures will be adopted to minimize impacts on birds, such as avoiding noise-generating activities. The measures to restore natural vegetation loss in the area will benefit the area's fauna as well.

After completion of the project, the proponent will rehabilitate the land by planting trees and ornamental flowers on disturbed and undisturbed areas.

Eye and respiratory diseases will be mitigated through routine health screening and training of contractor's employees. The physical injury will be mitigated through the provision of appropriate training and emergency response procedures. Protected fencing will be fixed around the construction site.

The provision of Personal Protective Equipment (PPE) to the workers will be ensured. Protective fencing will be fixed around the construction site.

Unauthorized access within the construction area will not be allowed. A vehicle speed of 20 km/hr at the project site will be implemented. Appropriate light diffusers and reflectors will be used, if required, to minimize the public nuisance caused by light pollution.

**Environmental Management Plan**

The Environmental Mitigation Plan (EMP) aims to minimize the potential environmental impacts due to the project. The EMP reflects the commitment of Novacare Hospital to safeguard the environment as well as the surrounding population.

The EMP provides a delivery mechanism to address the adverse environmental impacts, enhance the project's benefits, and introduce standards of best practices for all phases of the project.

**Proposed Monitoring**

The contractor will prepare a Quarterly Environmental Monitoring Report of project activities carried out during the project's construction phase. These reports will be submitted to the Pakistan Environmental Protection Agency, to review and consider. The total estimated Environmental Mitigation and Monitoring Cost is **Rs. 528.147 million**.

**Conclusion and Recommendations**

Based on the overall impact assessment, more specifically, the nature and magnitude of the residual environmental impacts identified during the present EIA, it is concluded that the establishment of Novacare Hospital Project, Phase V, DHA, Islamabad is likely to cause environmental impacts during its constructional and operational phase. However, these impacts can be mitigated, providing that the proposed project activities are carried out, as mentioned in the report, and the mitigation measures included in this report are completely and effectively implemented.

The project will positively contribute to providing quality healthcare facilities in Islamabad and Rawalpindi.

There are no remaining issues that warrant further investigation. This EIA is considered adequate for the environmental and social justification of the project.

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# List of Abbreviations

| | |
|---|---|
| **AI:** | Artificial Intelligence |
| **COVID-19:** | Corona Virus Infectious Disease 2019 |
| **EIA:** | Environmental Impact Assessment |
| **EMP:** | Environmental Management Plan |
| **EPA:** | Environmental Protection Agency |
| **HCWM:** | Health Care Waste Management |
| **GPD:** | Gallons per Day |
| **HSE:** | Health, Safety and Environment |
| **PPI:** | Project Procurement International |
| **NEQS:** | National Environment Quality Standards |
| **NOC:** | No Objection Certificate |
| **PEPA:** | Pakistan Environmental Protection Act 1997 |
| **PEPC:** | Pakistan Environmental Protection Council |
| **PPE:** | Personal Protective Equipment |
| **ToR:** | Terms of Reference |
| **HWM:** | Hospital Waste Management |
| **BMW:** | Bio-Medical Waste |

# List of Units

| | |
|---|---|
| **%:** | Percent (age) |
| **$^{o}$C:** | Degree centigrade |
| **cm:** | Centimeter |
| dB (A): | Decibel |
| **$ft^2$:** | Square foot |
| **$ft^3$:** | Cubic foot |
| **Km:** | Kilo meter |
| **Km/h:** | Kilometer/hour |
| m: | Meter |
| **$m^2$:** | Square meter |
| **$m^3$:** | Cubic meter |
| **MT:** | Metric Ton |
| **Rft:** | Running Feet |

# 1 Introduction

## 1.1 Project Background and Overview

Basic health facilities are as inevitable for human beings as bread and butter, and every government across the world ensures a healthcare system compatible with its population growth and the needs of the people. The provision of better health facilities is also imperative to create a strong and productive nation as it paves way for a strong economy and invincible defence for any country. Therefore, this area of dispensation occupies a central point in the policies of every political party and the government[1].

However, this compatibility had visibly been affected in Pakistan during recent decades as health facilities could not be expanded at the pace compatible with population growth. In Islamabad, a few major hospitals in the government sector were now falling short of capacity to treat the capital city dwellers. Moreover, these hospitals also bear the burden of the populace of Azad Kashmir, Gilgit Baltistan, and adjoining areas of Punjab and Khyber Pakhtunkhwa provinces[1].

The 2017 census reveals that 2,006,572 people reside in a 906 square kilometre area of Islamabad Capital Territory (ICT) with an overall population growth rate of 4.91 percent during the inter-censual period (1998-2017). Population in rural areas was counted at 991,747 with an inter-censual rate of 6.95 and in urban areas 1,014,825 with a growth rate of 3.48 1. The population of Islamabad particularly in rural areas is also expected to continue increasing at a faster pace and 19 health facilities including three RHCs, 15 BHUs and one dispensary under the control of ICT would be quite insufficient to meet the healthcare needs of people[1]. On top of it, Islamabad receives additional patient load from Afghanistan which has already overloaded the city's premier private hospitals.

The proposed hospital has partnered with Imperial College Healthcare (a leading UK Teaching Hospital Group) to provide state-of the-art healthcare services in Pakistan.[2]

## 1.2 Brief description of nature, size and location of the project

Nature: The project involves the establishment of Novacare Hospital in Phase V, DHA, Islamabad, aiming to become a premier tertiary care facility. Our vision is to provide comprehensive healthcare services with a focus on specialized treatment within the hospital premises.

The hospital will feature state-of-the-art infrastructure and cutting-edge medical technology, ensuring the highest standards of patient care. Novacare Hospitals Pvt. Limtied understand the importance of specialized medical attention, and thus, Novacare Hospital will have dedicated departments for various tertiary care specialties.

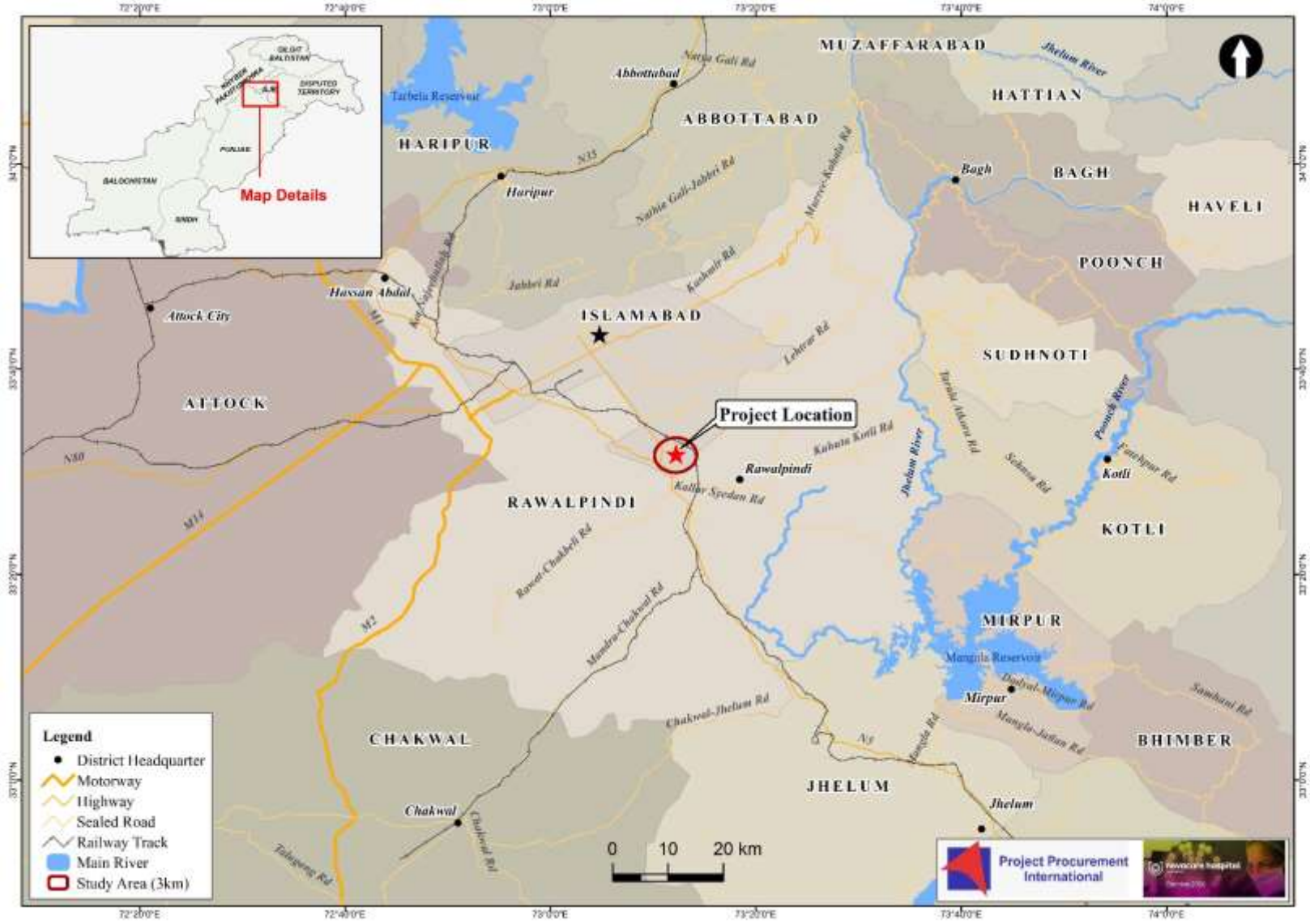
Size: The Novacare Hospital Project has been proposed at a piece of land having an area of 225,000 sq.ft. The approximate covered area of the hospital project is 450,000 sq.ft.

Location: Novacare Hospital Project is located on DHA Expressway, Phase V, DHA, Islamabad. The coordinates of the proposed project location are **33°31'35.46"N and 73°12'11.53"E**.

The key map of the project location is shown in **Figure 1.1.**

[1] https://www.thenews.com.pk/print/971302-need-for-more-hospitals-in-islamabad-stressed
[2] https://www.brecorder.com/news/40293041

**Figure 1.1: Key Location Map of Novacare Hospital Project, Phase V, DHA, Islamabad**



## 1.3 Identification of project and proponent

M/s Novacare Hospitals Pvt. Limited, is the proponent of the project and will be responsible for its construction, operation, and maintenance.

## 1.4 Details of consultant

M/s Project Procurement International, an Environmental and Management Consultancy Firm, Islamabad has prepared the Environmental Impact Assessment Report of the Novacare Hospital Project.

The list of names, qualifications and roles of team members carrying out the EIA has been attached in **Annexure-1**.

### 1.4.1 Contact Persons

The authorized representative of the proponent and Environmental Consultant are the following:

| Proponent's Representative | Environmental Consultant |
|---|---|
| **Mr. Ghalib Hafiz,**<br>Director,<br>M/s Novacare Hospitals Private Limited<br>House 7, Street No. 589, Sector G -13/2<br>Islamabad.<br>Email: ghalibhaf@gmail.com<br>Cell no: +971564188715 | **Engr. Ali Abdullah**<br>Environmental Engineer<br>26, Second Floor, Silver City Plaza<br>G 11 Markaz<br>Islamabad 44000<br>Tel: +051 2363624<br>Cell: 03009110245<br>Email: projectpi@gmail.com |

## 1.5 Environmental Impact Assessment

According to the Pakistan Environmental Protection Agency (Review of IEE/EIA), Regulations 2000:

*"No proponent of a project shall commence construction or operation unless he has filed with the Federal Agency an Initial Environmental Examination or where the project is likely to cause an adverse environmental effect, an Environmental Impact Assessment, and has obtained from the Federal Agency approval in respect thereof".*

## 1.6 Purpose of Report

The Environmental Impact Assessment (EIA) is the assessment of the environmental consequences (positive and negative) of a plan, policy, program, or actual projects prior to the decision to move forward with the proposed action.

The EIA is the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of a development project prior to major decisions being taken and commitments made. Furthermore, the report will enable the proponent to obtain environmental approval for the establishment of the Novacare Hospital Project from the Pakistan Environmental Protection Agency.

## 1.7 Screening

The project is to establish the Novacare Hospital having 250 beds capacity.

EIA is mandatory according to section 12 of the Pakistan Environmental Protection Act, 1997 for all the development interventions. According to Pakistan EPA (Review of IEE/EIA Regulations, 2000), the proposed project falls under Category J (Other Projects) of Schedule II, which states that *"Any other project for which filing of an EIA is required by the Federal Agency under sub-regulation (2) of Regulation 5 and any other project likely to cause an adverse environmental effect" require the EIA study."*

Pakistan EPA through **Letter No. 3(1)/2023-EIA-NVACH-DD(EIA/Mont)** dated **01st October 2023** conveyed to M/s Novacare Hospitals Pvt. Limited to submit Environmental Impact Assessment Report of the project according to the Section 12 of the Pakistan Environmental Protection Act, 1997. The proposed project falls under Schedule II. The letter from Pak EPA is attached as **Annexure - 2**.

## 1.8 Scoping

A scoping exercise was undertaken to identify the potential issues that are to be considered in the environmental impact assessment. The scoping exercise includes the following indispensable tasks.

Spatial and Temporal Boundaries of Environmental Assessment: The project site is in DHA Phase V, Islamabad. The project site is located in an urban area. The project site occupies a total plot area of 225,000 sq.ft. The establishment of Novacare Hospital will be completed in 30 months, and the impacts of the construction phase will be short term. Similarly, the magnitude of impacts will moderate in nature due to the limited covered area of the project.

The spatial and temporal boundary during the operational phase of the project will be long term as the project is to establish Novacare Hospital Islamabad.

Important issues and concerns raised during consultation: Stakeholder consultation was undertaken to document the concerns of the local community and other stakeholders and to identify issues that may require additional assessment in order to address these concerns.

Stakeholder consultation was conducted during the survey with the following objectives:

- To inform the Stakeholders, Communities and Project Affected Persons about the project.
- To gather feedback from the primary and secondary stakeholders of the project
- To identify relevant potential issues, including the socio-economic impact of the project and corresponding mitigation measures.

During the stakeholder consultation process for the project, the following key aspects were highlighted by stakeholders:

- Traffic Management Plan and car parking arrangements for the Hospital
- Wastewater Treatment Plant
- Infextious Waste Management
- Concerns of the residents (Project Affected Persons, if any)

Significant impacts and factors to be determined: The magnitude of the impact will be localized as Major Issue.

## 1.9 Scope of EIA

The project requires the Environmental Impact Assessment to identify the environmental impacts of construction and operational phases of the proposed project of Novacare Hospital Project, Phase V, DHA, Islamabad.

The scope of EIA of Novacare Hospital Project, DHA, Islamabad is as follows:

- The identification and assessment of all major and minor impacts during pre-construction, construction, and operational phases.
- Identification of all significant impacts that may require detailed assessment.
- Propose mitigation measures to minimize, eliminate or compensate the potential adverse impacts that may arise during pre-construction, construction and operational phases of the project;

- Public consultation with all the stakeholders of the proposed project;
- Preparation of Environmental Management Plan.
- Conclusions and recommendations; and
- Preparation of an Environmental Report for submission to Pakistan Environmental Protection Agency.

The Terms of Reference for the EIA report has been attached in **Annexure-3**.

## 1.10 Approach and Methodology

### 1.10.1 Approach for EIA

The approach for conducting EIA of Novacare Hospital Project is to follow the requirements of Pakistan Environmental Protection Agency (Review of IEE/EIA) Regulations, 2000.

### 1.10.2 Kick-off Meeting with the Proponent

The kick-off meeting was held between the PPI team and proponent of Novacare Hospital Project, DHA, Islamabad.

During this meeting, the list of activities for the study relevant to the environmental impact assessment of the project was discussed.

### 1.10.3 Collection of Secondary Data

All available published and unpublished information pertaining to the background environment was obtained and reviewed. In addition, all data sources were carefully reviewed to collect the following information:

- Physical Environment: topography, geology, soils, surface and groundwater resources and climate;
- Biological Environment: habitat types, flora and fauna (particularly rare or endangered species), critical habitats, and vegetation communities within the area;
- Socio-Economic Environment: settlements, socio-economic conditions, infrastructure and land use; and
- Heritage Aspects: sites of cultural, archaeological or historical significance.

The list of secondary data consulted during the EIA study is provided in **Annexure-4**. The glossary of terms used in the EIA report has been provided in **Annexure-5.**

### 1.10.4 Collection of Primary Data and Field Visit

The project site and adjoining areas of Novacare Hospital Project, DHA, Islamabad were visited to obtain detailed knowledge of the area's environmental conditions. During the field visits, the existing environmental conditions were studied.

The Rapid Social Appraisal method was applied to discover the facts, empirically verifiable observations, or verify the old facts on the project area's prevailing socio-economic and cultural conditions. Communities that were in the surrounding 1 km radius were investigated during the field survey.

The ambient air quality and noise monitoring at the project site were carried out. The survey team ensured that the mammals, birds and other species were observed without causing any potential disturbance. The sampling locations were randomly selected, ensuring that sufficient locations are represented from each habitat type, and the maximum number of species is recorded.

### 1.10.5 Consideration of Alternatives

The EIA report gives the details of alternatives considered during the planning and design phases of the project**.**

### 1.10.6 Public Consultation

Public consultations were held with the community living in the vicinity of Novacare Hospital Project, DHA, Islamabad. Different aspects of the proposed project were highlighted to the community regarding their impacts on the project area's physical, biological, and socio-economic environment and their concerns and suggestions were solicited.

Meetings were held with the Proponent, and community living around the project site. Their point of concern and suggestions regarding the project was solicited.

The information obtained from the community was used to identify concerns and issues that have been subsequently mentioned and addressed in the EIA report. The list of the people met during the public consultation is provided in **Annexure-6**.

### 1.10.7 Review of Legislative Requirements

The information on environmental policies, national and international laws, guidelines relevant to the project was reviewed, and a synopsis of all relevant laws has been narrated in the report.

### 1.10.8 Identification and Evaluation of Impacts

The identification of impacts is a key activity in the environmental assessment process, which is based on the professional judgment of our experienced team supported by national and international guidelines.

The potential impacts were identified with methodical consideration of likely or possible significant impacts on the environment for the Novacare Hospital Project. The aim of this task was to assess the associated risks with these impacts.

Each impact identified has been evaluated against its significance in terms of severity and likelihood of its occurrence. The impact evaluation process prioritized each potential impact and screened out insignificant or inconsequential impacts.

The significance of the impacts has been assessed in terms of the effects on the natural ecosystem, level of public concern and conformity with legislative or statutory requirements. The assessment of the severity was to consider the nature, magnitude, extent and location, timing and duration and reversibility of the potential impact. The evaluation of the significant impacts has formed the basis for the development of the Environmental Management Plan.

### 1.10.9 Identification of Mitigation Measures

The objective of the identification of mitigation measures is to identify practices, technologies or activities that would prevent or minimize all significant environmental impacts and propose physical and procedural controls to ensure that mitigation is effective.

Based on the impact evaluation performed, changes or improved practices have been suggested, where practical, in the planned activities, to prevent and control unacceptable adverse impacts resulting from normal or extreme events. Monitoring requirements and institutional arrangements for monitoring have been defined and suggested.

### 1.10.10 Development of Environmental Management Plan (EMP)

An Environmental Management Plan has been developed for effective implementation of the recommended mitigation measures of negative impacts during the pre-construction, construction, and operation phase. The Environmental Monitoring Plan has been developed to monitor the achievement of the Environmental Management Plan during the pre-construction, construction, and operational phases of the project.

The EMP also lays down procedures to be followed during the operation of the project and identifies the roles and responsibilities of all concerned personnel, including reporting in the operational phase.

## 1.11 Organization of the EIA Report

This report has been structured in the following manner:

**Chapter 1** (Introduction) provides an overall introduction to the project and impact assessment methodology.

**Chapter 2** (Legal Framework) describes the regulatory framework of Pakistan on the environment and its implications for the project.

**Chapter 3** (Project Description) provides the description of the proposed project, its layout plan and associated activities, raw material details and utility requirements.

**Chapter 4** (Project Alternatives) details the potential alternatives that were considered during the design phase.

**Chapter 5** (Existing Environment) provides a description of the micro-environment and macro-environment of the proposed project site. This chapter describes the physical, ecological and socio-economic resources land of the project area and surroundings.

**Chapter 6** (Public/Stakeholder Consultation) describes details of discussions held with primary and secondary stakeholders.

**Chapter 7** (Impact Assessment and Mitigation Measures) details the proposed project's potential environmental and social impacts on the different features of the micro and macro-environment using the matrix method.

**Chapter 8** (Environmental Management Plan) explains the mitigation measures proposed for the project to minimize the impacts to acceptable limits. It also describes the implementation of mitigation measures on the ground and monitoring of environmental parameters against likely environmental impacts.

**Chapter 9** (Conclusion) summarizes the report and presents its conclusions.

The last Chapter is followed **Annexure** that provides supporting information.

**Table 1.1: Summary of Methodologies and Activities to Conduct EIA**

**Project screening**
- Determine the Legal requirements of EIA is necessary

**Scoping**
- Decide the potential main issues to be addressed

**Baseline Data Collecion**
- Collecting relevant data on the state of environment

**Impact Prediction**
- Forecasting the likely changes in the environment as a result of the development

**Impact Assessment**
- Evaluation of the significance of the identified impacts

**Mitigation**
- Measures taken to reduce or remedy adverse impacts, or enhance positive impacts

**Environmental Management and Monitoring Plan**
- Environmental Management and Monitoring Plan (EMMP) develops for effective implementation of the recommended mitigation measures and to monitor the environmental parameters against likely environmental impacts

**EIA Report Submission to EPA for approval**
- EPA reviews all the nitty gritties of the report to make sure the compliance with environmental guidlines.

**Correcpondance with EIA for Final Approval**
- EPA reviews the Draft report submitted and communicate comments to address discrepencies, if any.

**Public Hearing**
- For the purpose of dessimination of information of the Project with stakeholders, a public hearing is held with its 30 days prior advertisement in local/national news papers.

**Project Approval/Rejection by EPA**
- EPA issues Environmental Approval for the Project development after client/consultant addresses the comments from EPA on Draft report and Public Hearing.

# 2 Legislative Institutional Framework

## 2.1 Introduction

Pakistan is a signatory of multilateral international treaties, has a comprehensive set of environmental legislation covering multiple environmental issues facing Pakistan like pollution of freshwater bodies and coastal water, air pollution, deforestation, loss of biodiversity, lack of proper waste management and climate changes. The basic policy and legislative framework, along with detailed rules, regulations, and guidelines required for implementing the policies and enforcement of legislation for the protection of the environment and overall biodiversity, are in place.

The compliance status of the Novacare Hospital Project was reviewed with reference to the legislation and existing legal framework on the environment at Pakistan and the International level as described henceforth.

## 2.2 Laws and Regulations

Pakistan has several laws and regulations regarding the conservation and protection of the environment. However, the enactment of comprehensive legislation on the environment, in the form of an act of parliament, is a relatively new phenomenon. Most of the existing laws on environmental issues were enforced over an extended period and are context specific. The laws relevant to the developmental projects are briefly reviewed below.

### 2.2.1 Pakistan Environmental Protection Act, 1997

The Pakistan Environmental Protection Act, 1997 (the Act) is the basic legislative tool empowering the government to frame regulations for the protection of the environment. The Act is applicable to a broad range of issues and extends to air, water, soil, marine and noise pollution, as well as the handling of hazardous waste. The discharge or emission of any effluent, waste, air pollutant or noise in an amount, concentration or level in excess of the National Environmental Quality Standards (NEQS) specified by the Pakistan Environmental Protection Agency (Pak EPA) has been prohibited under the Act, and penalties have been prescribed for those contravening the provisions of the Act. The powers of the federal and provincial Environmental Protection Agencies (EPAs), established under the Pakistan Environmental Protection Ordinance 1983, have also been considerably enhanced under this legislation, and they have been given the power to conduct inquiries into possible breaches of environmental law either of their own accord or upon the registration of a complaint.

The requirement for environmental assessment is laid out in Section12 (1) of the Act. Under this section, no project involving construction activities or any change in the physical environment can be undertaken unless an Initial Environmental Examination (IEE) or an Environmental Impact Assessment (EIA) is conducted, and approval is received from the Federal or relevant Provincial EPA. Section 12(6) of the Act states that this provision is applicable only to such categories of projects as Pakistan Environmental Protection Agency (Review of IEE and EIA Regulations), 2000.

### 2.2.2 Pakistan Environmental Protection Agency (Review of IEE and EIA Regulations), 2000

Pakistan Environmental Protection Agency (Review of IEE and EIA Regulations), 2000 (the Regulations) prepared by the Pakistan Environmental Protection Agency under the powers conferred upon it by the Act, provide the necessary details on preparation, submission, and review of the IEE and the EIA. Categorization of projects for IEE and EIA is one of the main components of the Regulations.

Projects have been classified on the basis of the expected degree of adverse environmental impacts. Project types listed in Schedule-I are designated as potentially less damaging to the

environment and those listed in Schedule-II as having potentially serious adverse effects. Schedule-I projects require an IEE to be conducted, provided they are not located in environmentally sensitive areas. For the Schedule-II projects, conducting an EIA is necessary. Salient features of the regulation relevant to the proposed project are listed below:

- Categories of projects requiring IEE and EIA are issued through two schedules attached to the regulations.
- A fee, depending on the cost of the project, has been imposed for the review of IEE and EIA.
- The submittal is to be accompanied by an application in prescribed format included as schedule IV of the Regulations.
- The EPA is bound to conduct preliminary scrutiny and reply within 10 days of submittal of the report, a) confirming completeness, b) asking for additional information, or c) requiring additional studies.
- The EPA is required to make every effort to complete the review process for IEE within 45 days and of the EIA within 90 days of the issue of the confirmation of completeness.
- EPAs accord their approval subject to the following conditions:
- Before commencing construction of the project, the proponent is required to submit an undertaking accepting the conditions.
- Before commencing the operation of the project, the proponent is required to obtain from EPA a written confirmation of compliance with approval conditions and requirements of the IEE/ EIA.
- An EMP is required to be submitted with the request for obtaining confirmation of compliance.
- The EPAs are required to issue a confirmation of compliance within 15 days of receipt of the request and complete documentation.
- The IEE/ EIA approval will be valid for three years from the date of the accord.
- A monitoring report is required to be submitted to the EPA after completion of construction, followed by annual monitoring reports during operations.

The construction of the Novacare Hospital Project falls in schedule-II of the regulations. Hence, this type of project needs an EIA to be conducted.

### 2.2.3 Hospital waste management rules, 2005

Ministry of Environment, Government of Pakistan, had prepared the hospital waste management rules on August 03, 2005.

According to these rules, every hospital shall be responsible for the proper management of the waste generated by it until its final disposal in accordance with the provision of the act and the rules 16 to 22.

The rules provide information on the roles and responsibilities of the waste management team, waste management plan, waste segregation, waste collection, waste transportation, waste storage, waste disposal, accident and spillages, waste minimization and reuse, inspection and hospital waste management advisory committee.

### 2.2.4 National Environmental Quality Standards (NEQS), 2000

The NEQS, promulgated under the PEPA 1997, specify the following standards:

- Maximum allowable concentration of pollutants (16 parameters) in gaseous emissions from industrial sources,
- For power plants operating on oil and coal:

- Maximum allowable emission of sulphur dioxide,
- Maximum allowable increment in the concentration of sulphur dioxide in the ambient air,
- Maximum allowable concentration of nitrogen oxides in ambient air, and
- Maximum allowable emission of nitrogen oxide for steam generators as a function of heat input.

- Maximum allowable concentration of pollutants (32 parameters) in municipal and liquid industrial effluents discharged to inland waters, sewage treatment and sea (three separate sets of numbers).

The NEQS for liquid effluents discharged to inland waters, gaseous emission from industrial sources and emissions from motor vehicles are provided on the following website. http://www.environment.gov.pk/info.html

The National Environmental Quality Standards (NEQS), 2000, specify the following standards:

- Maximum allowable concentration of pollutants (32 parameters) in municipal and liquid industrial effluents discharged into inland waters, sewage treatment facilities, and the sea (three separate sets of numbers)
- Maximum allowable concentration of pollutants (16 parameters) in gaseous emissions from industrial sources
- Maximum allowable concentration of pollutants (02 parameters) in gaseous emissions from vehicle exhaust and noise emission from vehicles.
- Maximum allowable noise levels from vehicles.

These standards also apply to the gaseous emissions and liquid effluents generated by the generator, process waste etc. The standards for vehicles will apply during the construction as well as the operation phase of the project. Standards for air quality have not been prescribed as yet.

### 2.2.5 NEQS for Liquid Effluent

The National Environmental Quality Standards (NEQS) for the discharge of effluent from industry are presented in **Table 2.1**.

**Table 2.1: NEQS for Liquid Effluent Discharge**

| Parameters | Into Inland Waters | Into Sewage Treatment | Into Sea |
|---|---|---|---|
| Tempereture | =<3°C | =<3°C | =<3°C |
| pH Value | 6-9 | 6-9 | 6-9 |
| Biological Oxygen Demand $(BOD)_5$ | 80 | 250 | 80 |
| Chemical Oxygen Demand (COC) | 150 | 400 | 400 |
| Total Suspended Solids (TSS) | 200 | 400 | 200 |
| Total Dissolved Solids (TDS) | 3500 | 3500 | 3500 |
| Grease & Oil | 10 | 10 | 10 |
| Phenolic Compounds (as phenol) | 0.1 | 0.3 | 0.3 |
| Chlorides (as Cl') | 1000 | 1000 | SC |

| Parameters | Into Inland Waters | Into Sewage Treatment | Into Sea |
|---|---|---|---|
| Fluoride (as F') | 10 | 10 | 10 |
| Cyanide (CN') total | 1.0 | 1.0 | 1.0 |
| An-ionic Detergents (as MBAs) | 2.0 | 20 | 20 |
| Sulphate (SO'') | 600 | 1000 | SC |
| Sulphide (S') | 1.0 | 1.0 | 1.0 |
| Ammonia ($NH^3$) | 40 | 40 | 40 |
| Pesticides | 0.15 | 0.15 | 0.15 |
| Cadmium | 0.1 | 0.1 | 0.1 |
| Chromium (trivalent & hexavalent) | 1.0 | 1.0 | 1.0 |
| Copper | 1.0 | 1.0 | 1.0 |
| Lead | 0.5 | 0.5 | 0.5 |
| Mercury | 0.01 | 0.01 | 0.01 |
| Selenium | 0.5 | 0.5 | 0.5 |
| Nickel | 1.0 | 1.0 | 1.0 |
| Silver | 1.0 | 1.0 | 1.0 |
| Total Toxic Metals | 2.0 | 2.0 | 2.0 |
| Zinc | 5.0 | 5.0 | 5.0 |
| Arsenic | 1.0 | 1.0 | 1.0 |
| Barium | 1.5 | 1.5 | 1.5 |
| Iron | 8.0 | 8.0 | 8.0 |
| Manganese | 1.5 | 1.5 | 1.5 |
| Boron | 6.0 | 6.0 | 6.0 |
| Chlorine | 1.0 | 1.0 | 1.0 |

***Source:*** *NEQS, Pakistan Environmental Protection Agency*

### 2.2.6 NEQS for Drinking Water, 2010

The National Environmental Quality Standards (NEQS) for drinking water quality, 2010, are presented in **Table 2.2**.

**Table 2.2: NEQS for drinking water quality**

| Parameter | Standard values | WHO Guidelines |
|---|---|---|
| **Biological** | | |
| All water intended for drinking (E. Coli or Thermo-tolerant Coliform bacteria) | Must not be detectable in any 100 ml sample. | Must not be detectable in any 100 ml sample. |
| 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. | Must not be detectable in any 100 ml sample. |
| 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.<br>In the case of large supplies, where sufficient samples are examined, it must not be present in 95% of the samples taken throughout any 12-month period. | Must not be detectable in any 100 ml sample.<br>In the case of large supplies, where sufficient samples are examined, it must not be present in 95% of the samples taken throughout any 12-month period. |
| **Physical** | | |
| Color | ≤ 15 TCU | ≤ 15 TCU |
| Taste | Non-acceptable | Non-acceptable |
| Odour | Non-acceptable | Non-acceptable |
| Turbidity | < 5 NTU | < 5 NTU |
| Total hardness | < 500 mg/L | --- |
| TDS | <1000 | <1000 |
| pH | 6.5- 8.5 | 6.5- 8.5 |
| **Chemical** | | |
| Essential Organic | mg/Litre | mg/Litre |
| Alminium | ≤ 0.2 | 0.2 |
| Antimony | ≤ 0.005 | 0.02 |
| Arsenic | ≤ 0.05 | 0.01 |
| Barium | 0.7 | 0.7 |
| Boron | 0.3 | 0.3 |
| Cadmium | 0.01 | 0.003 |
| Chloride | ≤ 250 | 250 |
| Chromium | ≤ 0.05 | 0.05 |
| Copper | 2 | 2 |
| Toxic Inorganic | | mg/Litre |
| Cyanide | ≤ 0.05 | 0.07 |
| Flouride | ≤ 1.5 | 1.5 |
| Lead | ≤ 0.05 | 0.01 |

| Parameter | Standard values | WHO Guidelines |
|---|---|---|
| Mangnese | ≤ 0.5 | 0.5 |
| Mercury | ≤ 0.001 | 0.001 |
| Nickel | ≤ 0.02 | 0.02 |
| Nitrate | ≤ 50 | 50 |
| Nitrite | ≤ 3 | 3 |
| Zinc | 5 | 3 |
| Pesticides mg/L | | PSQCA No.4639-2004.page No 4 Table No. 3serial No. 20-58 |
| Phenolic Compounds | | <0.002 |
| Polynuclear aromatic hydrocarbons | | 0.01 |
| **Radioactive** | | |
| Alpha emitters bq/L | 0.1 | 0.1 |
| Beta emitters | 1 | 1 |

***Source:*** *NEQS Pakistan Environmental Protection Agency*

### 2.2.7 NEQS for Ambient Air and Noise

The National Environmental Quality Standards (NEQS) for Ambient Air and Noise, 2010, are presented in **Tables 2.3** and **2.4.**

**Table 2.3: NEQS for Ambient Air**

| Pollutants | Time Weighted Average | Concentration in Ambient Air (ug/m$^3$) |
|---|---|---|
| Sulfur Dioxide ($SO_2$) | Annual Average*<br>24 hrs** | 80<br>120 |
| Oxides of Nitrogen gas (NO) | Annual Average*<br>24 hrs** | 40<br>40 |
| Oxides of Nitrogen gas ($NO_2$) | Annual Average*<br>24 hrs** | 40<br>80 |
| Ozone ($O_3$) | 1 hour | 130 |
| Suspended Particulate Matter (SPM) | Annual Average*<br>24 hrs** | 360<br>500 |
| Respirable Particulate Matter ($PM_{10}$) | Annual Average*<br>24 hrs** | 120<br>150 |
| Respirable Particulate Matter ($PM_{2.5}$) | Annual Average*<br>24 hrs**<br>1 hr | 15<br>35<br>15 |
| Lead (Pb) | Annual Average*<br>24 hrs** | 1<br>1.5 |
| Carbon monoxide (CO) | 8 hrs<br>1 hr | 5 mg/m$^3$<br>10 mg/m$^3$ |

** Annual Arithmetic mean of minimum 1040 measurements in a year taken twice a week 24 hourly at a uniform interval

* 24 hourly /8 hourly values should be met 98 % of the year, 2 % of the time, it may exceed.

**Source:** NEQS, National Environmental Protection Agency

**Table 2.4: NEQS for Noise**

| Area | **Daytime** | **Nighttime** |
|---|---|---|
| Residential area | 55 | 45 |
| Commercial area | 65 | 55 |
| Industrial area | 75 | 65 |
| Silence area | 50 | 45 |

**Source:** NEQS, National Environmental Protection Agency

## 2.3 Environmental Protection Agency's Environmental Guidelines

The Pak EPA has prepared a set of guidelines for conducting environmental assessments. The package of regulations, of which the guidelines form a part, includes the PEPA 1997 and the NEQS. The guidelines themselves are listed below:

- Guidelines for the Preparation and Review of Environmental Reports,
- Guidelines for public consultation,
- Guidelines for Sensitive and Critical Areas, Sectorial Guidelines.

It is stated in the Pakistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2000 that the IEE or EIA must be prepared, to the extent practicable, in accordance with the Pakistan Environmental Protection Agency guidelines. The government of Pakistan has also framed guidelines for the preparation of EIA of Projects in various developmental sectors.

## 2.4 The Implication of Legislations to the project

The implication of the above-mentioned legislation to the pre-construction, construction, and operational phase of Novacare Hospital Project would be as follows:

- M/s Novacare Hospitals Pvt. Limited, being the proponent of the project, will ensure that construction and operational phases of the project be carried out in accordance with the EIA report and Environmental Management Plan is effectively implemented.
- The project will be subjected to four basic provisions relating to pollution control under the Pakistan Environmental Protection Act, 1997, as contained in sections 11, 13, 14 and 15 as follows:
    - Section 11 prohibits discharge or emission of any effluent or waste or air pollutant or noise in excess of the NEQS or the established ambient standards for air, water or land.
    - Section 13 prohibits hazardous wastes.
    - Section 14 prohibits the handling of hazardous substances except under a license or in accordance with the provision of any local law or international agreement.
    - Section 15 prohibits the operation of motor vehicles for each air pollutant or noise is being emitted in excess of the NEQS of the established ambient standard.

# 3 Description of the Project

## 3.1 Introduction

This chapter provides a description of the project, its salient features, location, components and various phases.

## 3.2 Type and Category of the Project

The proposed project is the Establishment of Novacare Hospital Project, Phase V, DHA, Islamabad which falls under Category J (Other Projects) of Schedule II, which states that "Any other project for which filing of an EIA is required by the Federal Agency under sub-regulation (2) of Regulation 5 and any other project likely to cause an adverse environmental effect" require the EIA study.

## 3.3 Objectives of Project

The objectives of the project are as follows:

- To improve access of Islamabad and Rawalpindi to quality health care through provision of high-quality services.
- To provide infrastructure for speedy provision of general healthcare facilities
- To achieve optimum respective SDG health indicators and to ensure service delivery by trained, skilled and well-equipped staff with provision of consultant / expert opinion from different disciplines.

## 3.4 Location and Site Layout of the project

Novacare Hospital Project is located on DHA Expressway, Phase V, DHA, Islamabad. The coordinates of the proposed project location are **33°31'35.46"N and 73°12'11.53"E**.

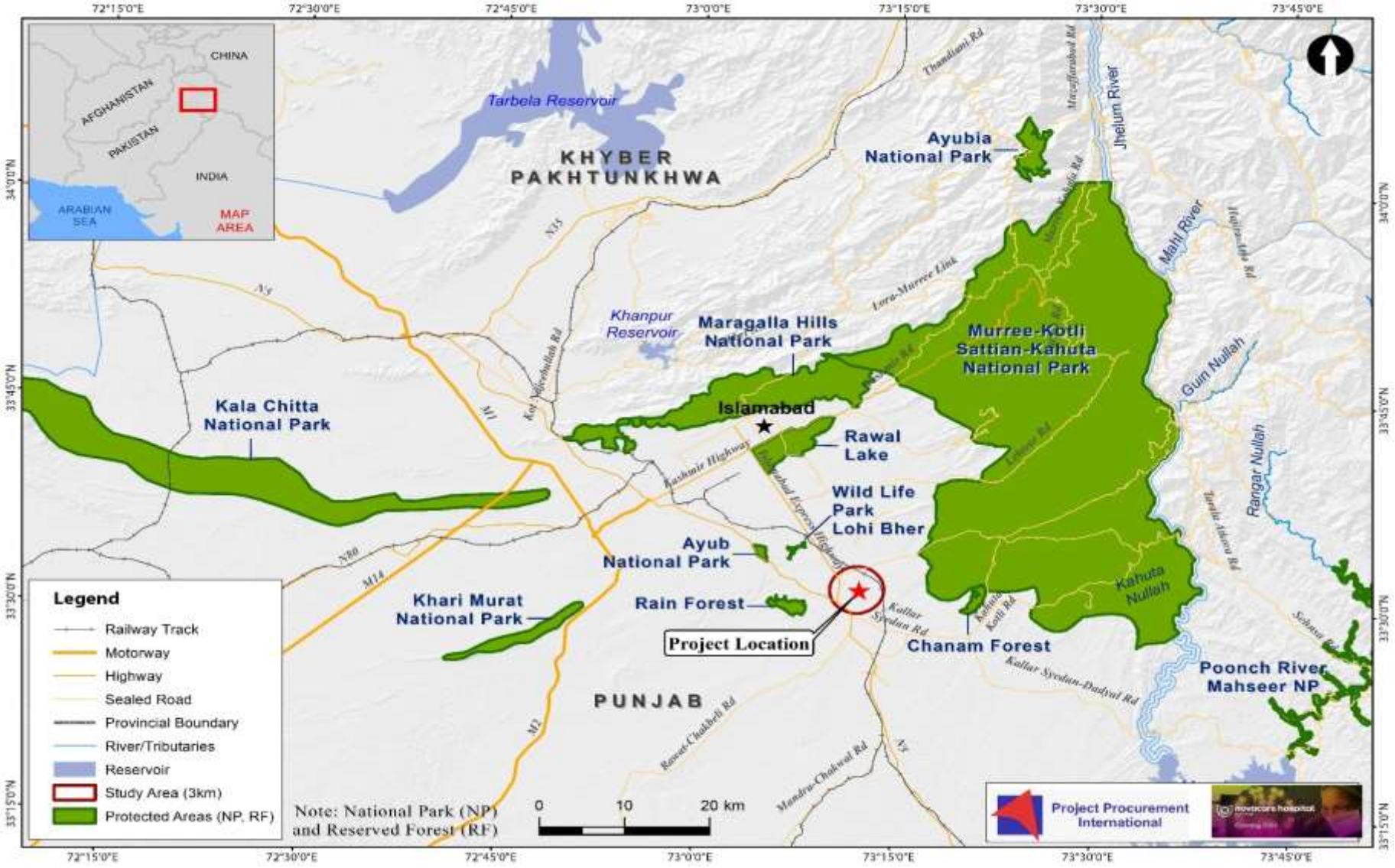
The surrounding areas near the project site are as follows and are shown in **Figure 3.1**.

- **East:** DHA Commercial Area
- **West:** Commercial Area
- **North:** DHA Future Masterplan Area + Residential Area
- **South:** DHA Expressway + Commercial Area

## 3.5 Road access

The proposed Hospital, Islamabad is accessible through DHA Expressway which is further connected to Islamabad Expressway. The accessibility of the project is shown in **Figure 3.1.**

**Figure 3.1: Project Location Map of Novacare Hospital**



## 3.6 Description of the Project

M/s Novacare Hospitals Pvt. Limited intends to construct a 250 Bedded Novacare Hospital in DHA Phase V, Islamabad.

The Novacare Hospital Project has been proposed at a piece of land having an area of 225,000 sq.ft. Proposed hospital has a functional covered area of 450,000 sq.ft and an additional subgrade covered parking area of 150,000 sq.ft.

The proposed project will comprise of 2 basements, Ground floor plus 9 floors and a mumty floor for MEP services.

The facilities and departments provided at the Novacare Hospital, DHA Phase V, Islamabad include various outpatient clinics, emergency and trauma Services, lab and imaging, surgical facilities, ICUs, and inpatient facilities.

The project is aimed at providing high standard health care facilities to the patients in Islamabad, Rawalpindi and adjoining areas.

The hospital paring plaza will be designed for accommodating **850 vehicles**. The multi-story parking building will have dedicated floors for the hospital employees, patients, and supply chain vehicles with proper access and internal circulation plan making sure parking occupancy never leads to on-street parking. The CDA requirement for the car parking spaces is 168 car parking.

The Floor Plans of the proposed Novacare Hospital Project, Islamabad, are shown in **Figure 3.2** to **Figure 3.8.**

## 3.7 Environmental Friendly Features of the Project

### 3.7.1 LEED Certification

LEED criteria will be pursued for certification and of extra-credit which is achievable for gold certification in the following sectors

- Integrative planning and design process
- Transportation and Land use
- Water Efficiency
- Energy and Greenhouse Gas emissions
- Material and resources

### 3.7.2 Solarization of Novacare Hospital

M/s Novacare Hospital Pvt. Limited plans to install approximately 400 KW of solar panels on the roof of the main building and car parking shades in the Hospital. This action will reduce GHG emissions by **338.73 tons of $CO_2e$** due to the use renewable energy as compared to the traditional energy mix of Pakistan.

| Proposed Capacity (MWh) | Avg. Gen. Hrs/day | Avg. Sunny Days | Energy units Generation (MWh/year) | Emissions per MWh (Kg $CO_2$) | Emissions per MWh (Kg $CO_2$)/p.a | Emissions per MWh (Tons $CO_2$)/p.a |
|---|---|---|---|---|---|---|
| 0.4 | 6 | 349 | 837.60 | 404.4 | 338,725.44 | **338.73** |

### 3.7.3 HVAC System

A smart HVAC (heating, ventilation, and air conditioning) system will be adopted for the hospital. Softwares that optimizes HVAC system will be used such as EcoEdge AI (that can reduce HVAC electricity load by 30.55%).

HVAC with ERR of 11.8 is selected in comparison with standard requirement of 9.0 which will increase the cost of HVAC Chiller procurement by PKR 65 million but will reduce the electricity consumption.

It has been observed that the cooling and heating load decreases significantly by using Low-E glass; 22% cooling load and 13% heating load decrease when using Low-E glass in a double-glazed window instead of conventional glass in the double-glazed window. Therefore, the Low-E glass will be used.

### 3.7.4 Reverse Osmosis Plant

An RO plant will be installed for supply of clean drinking water to the patients and staff in the hospital. The RO Plant will also be used to treat the rainwater collected in the hospital.

### 3.7.5 Rainwater Storage Tank

M/s Novacare Hospital Limited will store rainwater that is collected and after treatment use it for domestic and horticulture purpose.

### 3.7.6 Water Efficient Plumbing Fixtures

The hospital will install plumbing fixtures that reduce the water consumption by 40 % in comparison to the baseline established by International Plumbing Code.

### 3.7.7 Green Building Envelope

M/s Novacare Hospital Limited will install all external glass with a Heat Transmission Coefficient (U) value of 1.6W/$m^2$K against the requirement of 3.5W/$m^2$K which adds PKR 55 million to our budget but reduces the building energy requirements significantly.

### 3.7.8 Fire Suppression

The Fire Suppression System in Novacare Hospital has been designed in accordance with NFPA-58 Fire Safety standards. FM 200 fire protection system will be installed at the building.

The Fire Suppression Systems for the Project are as follows:

- Standpipe and Hose System
- Automatic Sprinkler System
- Portable Extinguishers

## 3.8 Electrical Load of Novacare Hospital Project

The total estimated electrical load of the Novacare Hospital will be 4 MW. The main source of electricity will be Islamabad Electric Supply Corporation (IESCO).

**Figure 3.2: Layout Plan of Novacare Hospital Project**

**Figure 3.3: First Floor Plan of Novacare Hospital Project**

**Figure 3.4: Second Floor Plan of Novacare Hospital Project**

**Figure 3.5: Third Floor Plan of Novacare Hospital Project**

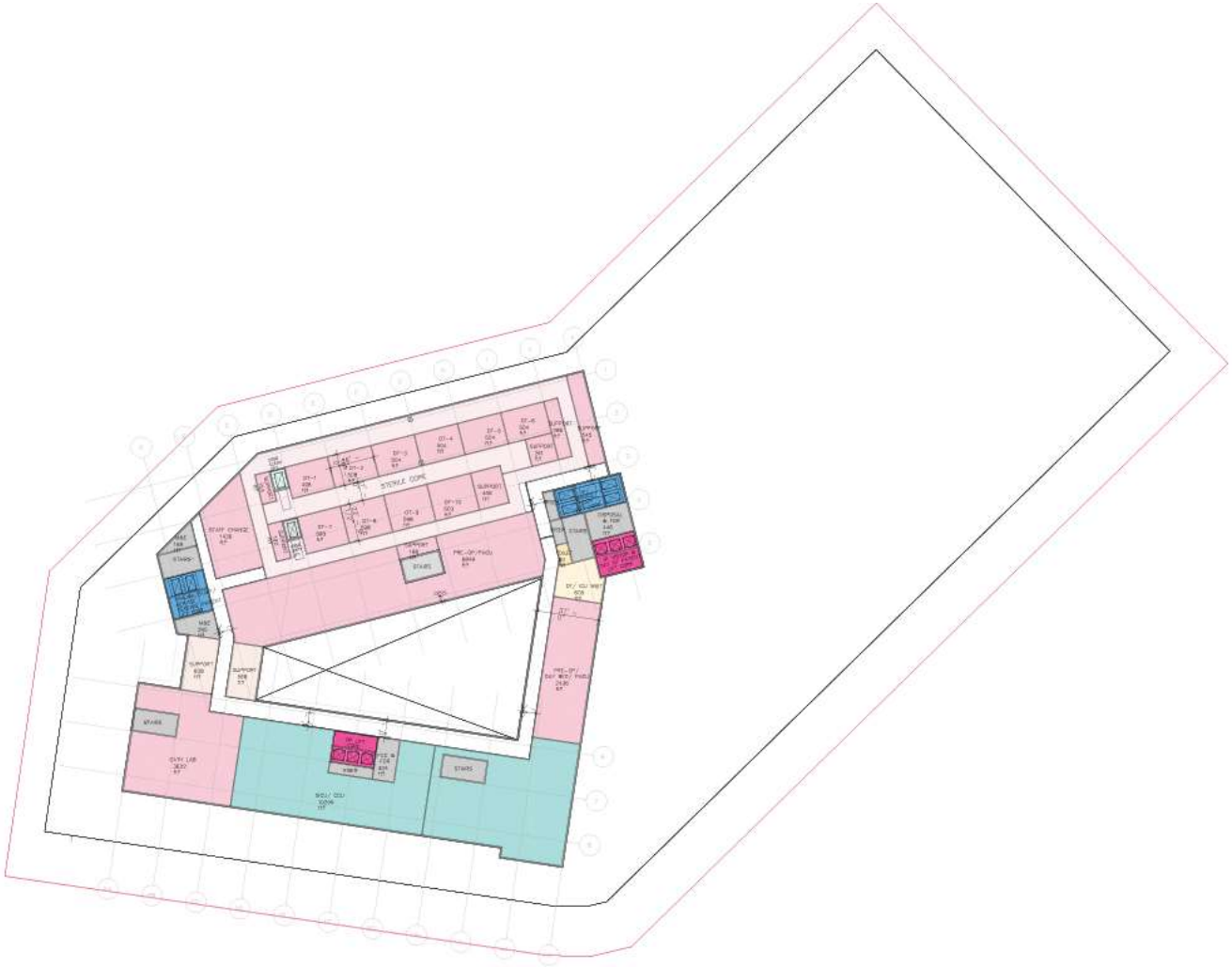


**Figure 3.6: Fourth Floor Plan of Novacare Hospital Project**

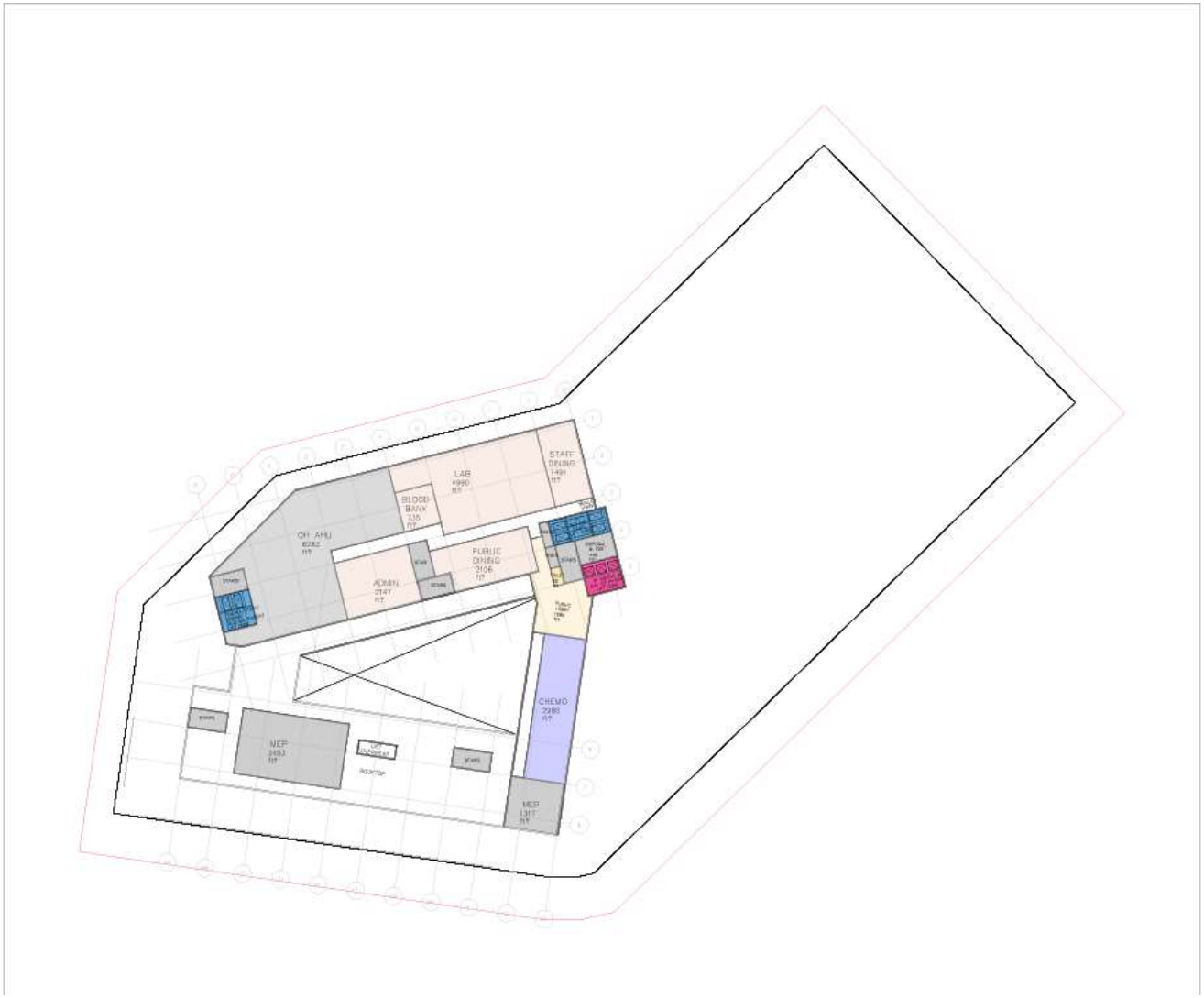


**Figure 3.7: Fifth Floor Plan of Novacare Hospital Project**

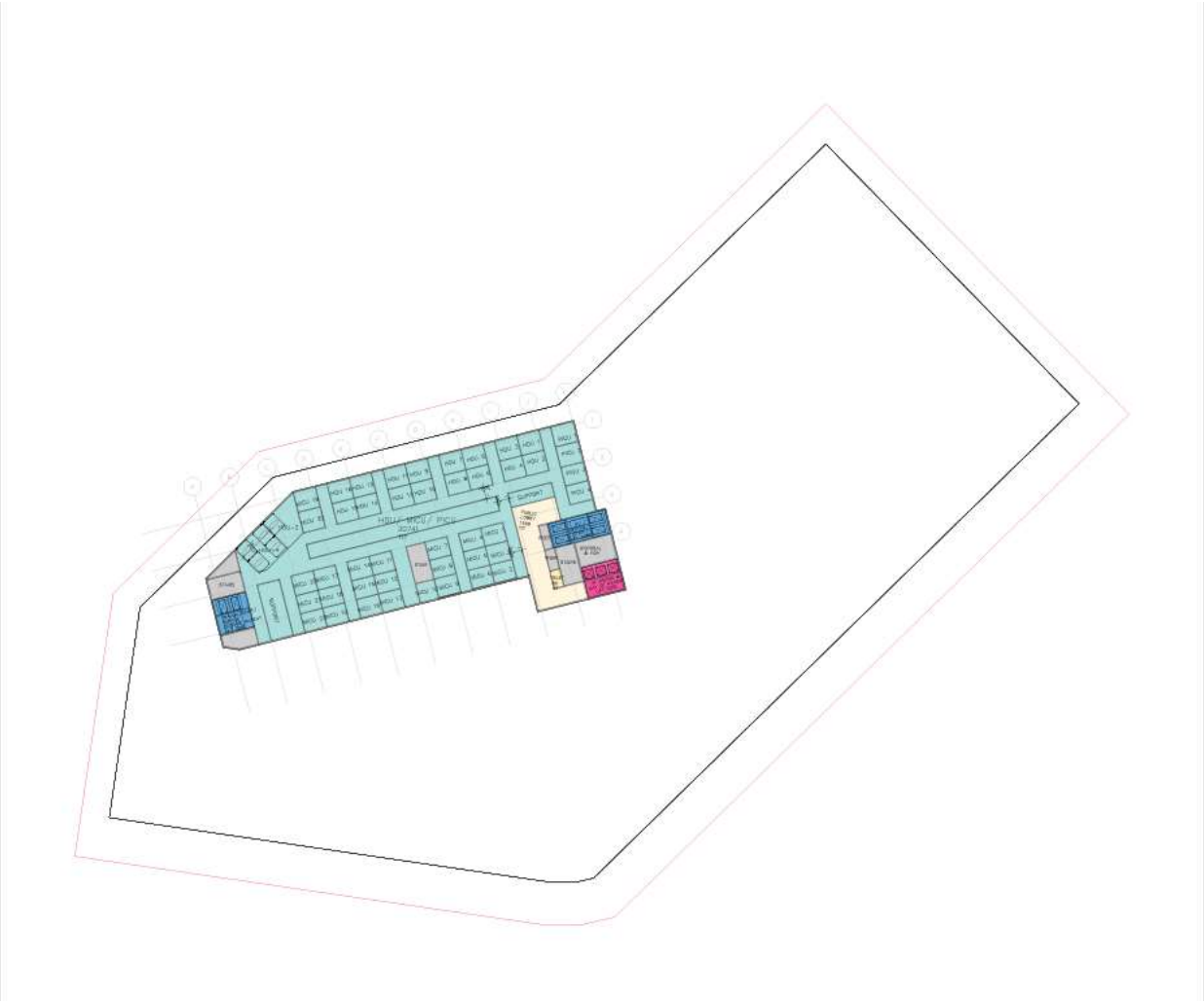
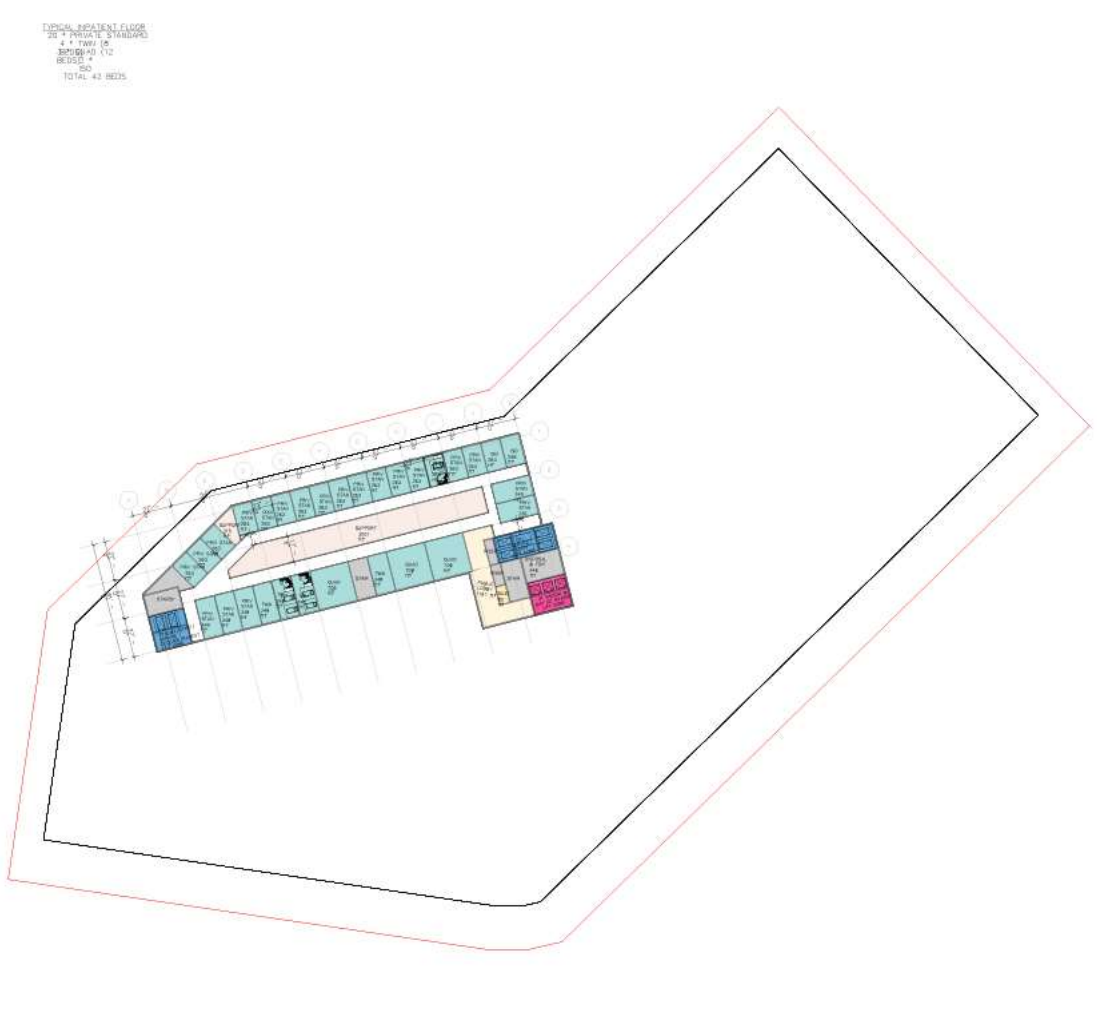


**Figure 3.8: Sixth to Ninth Floor Plan of Novacare Hospital Project**



## 3.9 Land use on the site

Presently, the project site has shrubs and grass on the plot. The proposed land use is in line with the Master Plan of Phase V, DHA Lahore.

## 3.10 Carbon Footprint of the construction of building

The global quest for development and increase in population growth has accelerated construction activity. Greenhouse Gases (GHGs) are those gases which trap heat in the atmosphere.

Construction material usage generates a significant amount of carbon dioxide. **Table 3.1** shows the GHG Emission factors of the more commonly used construction items. It is has been estimated that per sq.ft 26.09 kg $CO_2e$ is generated[3]. It is estimated that the hospital will generate **11,740.5 tons $CO_2e$**.

**Table 3.1: GHG Emissions Factor**

| Sr. # | Description of Items | Carbon Conversion Factor (kg-CO2e) |
|---|---|---|
| 1 | Plain Cement Concrete | 0.1 |
| 2 | RCC Concrete (1:2:4) | 0.107 |
| 3 | Stainless Steel | 3.27 |
| 4 | Ceramic Tile | 0.7 |
| 5 | Steel | 2.77 |
| 6 | Paint | 0.87 |
| 7 | Aluminium | 9.16 |
| 8 | Glass | 0.91 |
| 9 | Brick | 0.24 |
| 10 | Paint | 0.87 |
| 11 | Brick | 0.24 |
| 12 | Brick Mortar | 0.13 |
| 13 | Plaster | 0.13 |
| 14 | False Ceiling | 0.47 |

## 3.11 Operational Phase of the Novacare Hospital Project, DHA, Islamabad

Pakistan is one of the developing countries suffering from lack of healthcare facilities. Besides other reasons, one of the major reasons causing this is the lack of access to modern healthcare services. The delivery of good medical care to patients is one of the ultimate goals of the health care system. Achievement of this goal is possible by the creation of state-of-the-art medical facilities with modern equipment and technologies.

Furthermore, the tremendous public benefit will be accrued from this institution, especially:

- Decrease in Mortality rate.
- Enhancement of better health standard.

[3] Syed Mohsin Hussain Shah et al., 2019, Assessment of Embodied Carbon Footprint of an Educational Building in Pakistan using Building Information Modelling (BIM). CTIC Global

- Provision of better health facilities at doorsteps

**Technical Parameters:**

The operational plan of Novacare Hospital Project shall envisage the concept of modern curative, preventive and specialist services starting with the building design to cater for prompt resuscitation, intensive care, monitoring, infection control, dedicated operation theatres and appropriate patient accommodation.

Key Design Features:

- Dedicated entrances.
- Emergency block, paeds block, opd block.
- Emergency exit and fire escape (as per IBC 2009 1016.1).
- Cavity walls and double-glazed windows to provide better thermal comfort and lower operational and maintenance cost of HVAC.
- Change rooms and lockers for doctors, patients, and staff.
- Clean and Semi Clean corridors are also provided in operation theatres.
- Ramps with 1:12 ratio (as per ADA).
- Accessible toilets (ANSI A117.1).

### 3.12 Cost and Magnitude of operation

The project cost is estimated to be **Rs 24 Billion**.

### 3.13 Land Acquisition

As the project is proposed in DHA Phase V and land is owned by proponent, there is no issue of land acquisition or resettlement of the community due to the project.

### 3.14 Vegetation Features of the Site

The project area is an urban settlement. There are no trees at the project site.

### 3.15 Schedule of Implementation

The construction of the project will be completed in a period of 30 months. **Table 3.1** shows the work plan of the Novacare Hospital project.

**Table 3.2: Time Schedule for Novacare Hospital Project, DHA, Islamabad**

| Activity/Month | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Construction works Commencement Date | | | | | | | | | | | | | | | |
| Mobilization of Contractor | | | | | | | | | | | | | | | |
| Sub/Super Structural Works | | | | | | | | | | | | | | | |
| Architectural Finishing and MEP Works | | | | | | | | | | | | | | | |
| Testing and Commissioning | | | | | | | | | | | | | | | |
| Snag list | | | | | | | | | | | | | | | |
| Handing/Taking over | | | | | | | | | | | | | | | |

## 3.16 Services Requirements

### 3.16.1 Water Demand

The estimated domestic water demand of the Novacare Hospital Project, DHA, Islamabad will be between 100,000 liter to 150,000 liter per day. DHA Islamabad - Rawalpindi is responsible to provide the required water to the project via their supply line.

### 3.16.2 Water Drainage System

The drainage system of the Novacare Hospital Project, DHA, Islamabad, will dispose the excess rainwater to the drainage network of DHA Phase V.

### 3.16.3 Wastewater Treatment Plant

Sewerage Treatment Plant will be constructed to manage the wastewater generated during the operational phase of the Novacare Hospital Project, DHA, Islamabad. A wastewater treatment plant has been proposed at the Novacare Hospital Project; having capacity of the wastewater treatment plant to treat entire liquid waste generated from clinical areas including CSSD, Labs, OTs etc. The wastewater will be treated on continuous basis.

### 3.16.4 Solid Waste Management

According to an estimate, the project will produce approximately 1,500 kg of solid waste per day during the operational phase, with an average of 0.5 kg/capita/day.

For the proper management of the infectious waste, a yellow room will be constructed. The temperature of the yellow room will be maintained at 4°C for not more than 24 hours.

The Novacare Hospital will comply with all the clauses of the Hospital Waste Management Rules, 2005.

## 3.17 Restoration and rehabilitation plans

The proposed project will be comprised of the following components to be considered in the design:

### 3.17.1 Traffic Plan and Transportation

A comprehensive Traffic Impact Assessment study has been undertaken by the proponent through Halcrow Pakistan. The summary of the Traffic Impact Study is provided in **Heading 5.5 of Chapter 5**.

### 3.17.2 Project Phases

The construction of the Project will be implemented in three phases, i.e., Pre-construction/ Design, Construction, and Operation.

### 3.17.3 Pre-construction/Design Phase

**Suitability of a site:** The geotechnical and soil investigation of the project site will be carried out for determining the suitability of a site to support the structures and other development works.

**Geotechnical/Soil Investigation:** An extensive soil investigation of the project site will be carried out. The topographical survey will be undertaken by the surveying consultant to demarcate the area and measure the ground elevation.

Subsequently, engineering details will be worked out, and working drawings, specifications for equipment and material will be prepared.

**Selection of Contractor:** Once the detailed engineering design is available. M/s Novacare Hospitals Pvt. Limited will start to work on the project.

### 3.17.4 Construction Phase

**Contractor Mobilization:** This component involves the transportation of construction machinery and equipment to the project site and the establishment of the contractor's camp and office. The contractor will be responsible for the activities being carried out at the project site.

**Site Preparation:** Usually, this activity involves the operation of heavy earth-moving machinery and substantial land clearing, levelling and grading, as well as cutting and filling activities.

The first task of this activity is to demarcate the site and other benchmarks with the help of drawings prepared during the pre-construction and design phase of the project. Once marking is complete, the land will be cleared and prepared for subsequent construction activities. The whole purpose is to maintain the harmony of the area during construction.

**Construction Activities:** The construction activities will be carried out using the conventional methodology and sequence of work. The activities will include excavation, masonry work, carpentry, wiring, piping and plumbing, flooring, painting and installation of fixtures. Other activities will include the laying of cables, water supply, sewerage and storm drainage systems, junction boxes and providing connections to the individual buildings. Supervision of this whole activity will be carried out by the Novacare Project management and the consultant.

**Staffing:** Construction crews will be the responsibility of the civil contractor and its petty contractor. It is estimated that a maximum of 750 personnel will be working at the site at a given time during the peak construction period.

These will essentially include masons, carpenters, electricians, painters, plumbers, and general labourers. For unskilled employment, preference will be given to residents of the project area. **Table 3.3** details the staffing requirement during the construction phase of the project.

**Table 3.3: Staff for the Construction Phase of the Project**

| No. | Description | For construction |
|---|---|---|
| 1 | Technical staff | 50 |
| 2 | Skilled workers (technicians, plumbers, labour) | 300 |
| 3 | Unskilled labour/ helper | 400 |
| | **Total** | **750** |

Following steps will be taken for effective management of construction crew:

- A complaint cell for the workforce will be established, where they can register their reservations related to work.
- M/s Novacare Hospitals Pvt. Limited will develop an effective system of communication/consultation and will ensure that the staff concerns are addressed.
- Employees will be discouraged from working excessive hours and/or missing break periods (this may involve a detailed job evaluation).
- Child labour will be avoided.
- Incidents of bullying, sexual and racial harassment will be monitored, and, where necessary disciplinary actions will be taken.
- Clear job descriptions will be developed for the workforce, and it will be ensured that the individual is matched to them.

Construction Machinery:

The following construction machinery is expected to be present at the project site:

- Dozer/ Loader
- Excavators/Jack Hammer
- Tractor Trolley
- Water tanker
- Water and concrete pumps
- Tower Crane

The exact number of the above equipment and vehicles will vary depending upon the work schedule.

Construction Material: The construction material will include cement, sand, crush, bricks, steel bars, paint, piping material, electrical material and finishing material. The Bills of Quantities of the material will depend upon the construction activities.

Disposal of Excavated/ Construction Waste**:** Construction waste will be recycled by the contractor if possible. Otherwise, it will be disposed of at a designated site for excavated material/construction waste.

Electricity**:** The project will get proper electricity connection from Islamabad Electric Supply Company (IESCO) for the construction activities and camp.

Camp Supplies**:** Camp supplies will be procured from Islamabad and transported to the project site.

Camp Site Sanitation Facilities**:** Septic tank with a soakage pit at the construction will be constructed to treat sewerage generated by the campsite.

Traffic Load during Mobilization (and Demobilization): All of the constructions equipment and vehicles will be transported to the site via Islamabad Expressway.

Traffic Load for Construction Materials Supplies: It is estimated that, on average, 8-10 truckloads per day during the peak construction period will be supplying different types of construction materials to the project site during the peak construction period.

Other Supplies Water: During the construction phase, a maximum of about 5,000 gallons per day of water will be required for construction activities and human consumption. The water supply will be arranged through water tankers.

Fuels: For the construction equipment and vehicle, diesel will be required. The peak consumption of diesel would be 1000 litres per day during the peak construction period.

### 3.17.5 Operational Phase

The Project Manager, Novacare Hospital Project, Islamabad, will be responsible for the operation and maintenance of the project during the operational phase of the project.

## Figure 3.9: Pictorial Presentation of Project Site

**Exhibit 3.1:** View of the project site

**Exhibit 3.2:** Another view of project site

**Exhibit 3.3:** Land depression in project Area

**Exhibit 3.4:** View of Access Road

**Exhibit 3.5:** View of Streets Adjacent to the Project Site

**Exhibit 3.6:** Street adjacent to the Project Site

# 4 Project Alternatives

## 4.1 Background

An analysis of available alternatives is necessary to establish that the most suitable management and technology options will opt for the project.

## 4.2 Management Option

The two significant alternative management options are the 'No Project Option', 'Site Alternatives' and 'Build as Proposed Option', were considered.

### 4.2.1 No Project Option

The 'no-action alternative', which serves as a baseline for comparative analysis, is included where the environmental impact of taking the proposed action is high compared to the impact of not taking the proposed action. The no-project alternative option in respect to the proposed project implies that the status quo is maintained. This option is the most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. Under the no-project option, the proponent's proposal would not receive the necessary approval from authorities. The proposed construction would not be implemented. This option would, however, involve several losses both to the proponent and the community.

If we consider no project option, then we will lose all positive impacts associated with the project, such as providing quality healthcare facility to people living in nearby residential areas of Islamabad Expressway, DHA Phase II, V, VI, reduction in hospital overcrowding in Islamabad and Rawalpindi and provision of hospital staff and other medical facilities. Furthermore, the patients of DHA Phase V will have to go to hospitals of other areas which are far away or in Islamabad and Rawalpindi for treatment as the influx of patients in the existing hospitals is already very high.

The "No Project Option" does not appear reasonable considering the above facts. However, the expected negative environmental impacts can be minimized by adopting appropriate mitigation measures.

## 4.3 Site Alternatives

The project site has access from DHA Expressway and is easily accessible for the population of DHA phase V. Relocation of the proposed Project is also one of the alternatives in ensuring the environmental status of the area is not affected. But it is quite clear that as per the current situation, the proposed project cannot be relocated because as per Master Layout Plan of DHA Phase V, the site is reserved for Hospital. Hence getting an alternative site will not be as per the approved Layout Plan of Phase V, DHA. It is important to note that there is no tertiary care Hospital of similar size and capacity in 5 km radius of the project site. Hence this is not an economically viable alternative and will be away from the approach of the people and vulnerable patients.

Apart from that, it is a prerequisite that hospitals should be established near or adjacent to the main road so that they can be easily accessible. The hospital at the allocated project site will be easily accessible to patients from all corners of the project area. Therefore, no alternative site has been considered for the project.

### 4.3.1 Build as Proposed

The existing Clinics and Hospitals in DHA are not enough for catering the needs of patients of DHA Islamabad – Rawalpindi and other adjoining communities. There is no proper healthcare facility in the Phase V, due to which the residents go to hospitals of other areas or in Islamabad and Rawalpindi which are far from their residence. Inaccessibility to timely and quality health care is a major setback in treating local patients.

Therefore, the proposed project will help reduce the burden of the large influx of patients having to travel due to inadequate facilities available in their own area. It will aid in sustainable and balanced growth by providing state of the art medical facility in DHA Phase V.

Therefore, building as proposed is the best option. However, the negative impacts due to the project construction and operation can be minimized, controlled, or eliminated if the proposed mitigation measures, as suggested in the EIA report, are effectively implemented.

## 4.4 Economic Alternative

The proposed project will harness the substantive role by increased bed capacity and will improve access to quality healthcare facility. The immediate benefits of the proposed project are the provision of routine medical and surgical services to population of surrounding areas. The land use will be changed from vacant land into a Novacare Hospital Project building which will return more benefits during the operational phase as compared to the current land use of the project site.

The Novacare Hospital Project, DHA, Islamabad will provide aesthetically pleasing state-of-art healthcare facility and will ensure excellence in operative and post-operative patient care to reduce the likelihood of precious lives being lost. The net present value of future benefits exceeds the initial investment cost for the proposed project, which is an indication of the economic feasibility of a project, considering all the mitigation measures suggested as part of this EIA report are implemented during construction as well as operational phase of the project.

## 4.5 Environmental Alternative

The proposed project site is in an urban setting in DHA phase V. There may be potential environmental and human health impacts of the proposed project during the construction phase of the project. However, the proposed project has been planned to introduce the concept of green building and to contribute towards sustainable development. The building will be designed keeping in view of LEED and EDGE guidelines and will strive to obtain the relevant certifications. All the sustainable features required for a green building have been incorporated into the building design. Following green features is part of the proposed project.

- Energy Efficiency and Renewable Energy.
- Water Efficiency.
- Environmentally Preferable Building Materials and Specifications.
- Waste Reduction.
- Toxics Reduction.
- Indoor Air Quality.
- Smart Growth and Sustainable Development.

Considering the environmental protection measures to be taken during the construction and operational phase of the project and the sustainable features of the proposed project, it can be implied that the proposed project will enhance the environment of the project area during the operational phase of the project.

## 4.6 Conclusion

No alternative site has been identified. If the project is not implemented, then all positive impacts related to the proposed project will be lost. So, the best option is to ‘build as proposed’ by mitigating its potential negative impacts.

# 5 Description of the Existing Environment

## 5.1 Introduction

This chapter describes the existing environment of the project area. In order to assess the impacts and related mitigation measures, existing environmental conditions of the physical, biological and socio-economic environment of the project area were studied.

The project site is the area falling in DHA Phase V, Islamabad whereas the project area is the area surrounding the 3 km of the project site.

## 5.2 Islamabad

Islamabad Capital Territory is the capital and the ninth-largest city in the country, which is spread over an area of 906 sq. km., and is divided into three segments; namely, (i) Islamabad Urban Area, including institutional and industrial area, covering 220 sq. km. (ii) Islamabad Park occupies 220 sq. km., and (iii) Islamabad rural area is measuring 446 sq. km.

Islamabad Capital Territory is divided into eight zones: Administrative Zone, Commercial District, Educational Sector, Industrial Sector, Diplomatic Enclave, Residential Areas, Rural Areas and Green Area. Islamabad city is divided into five major zones: Zone I, Zone II, Zone III, Zone IV, and Zone V. The rural area of Islamabad encompasses 132 villages and administratively consists of 12 Union Councils. Islamabad has been planned in parallel belts with Administrative Sector, Diplomatic Enclave, Public Building Area, Residential Sectors, a Commercial area called the Blue Area and Industrial areas.

Islamabad is located at 33.43°N 73.04°E, at the northern edge of the Potohar Plateau and at the foot of the Margalla Hills in Islamabad Capital Territory. Its elevation is 540 meters (1,770 ft.). The modern capital and the ancient Gakhar city of Rawalpindi stand side by side and are commonly referred to as the Twin Cities, where no exact boundary exists between the two cities.

To the northeast of the city lies the hill station of Murree, and to the north lies the Haripur District of Khyber Pakhtunkhwa. Kahuta lies on the southeast, Taxila, Wah Cantt, and Attock District to the northwest, Gujar Khan, Rawat, and Mandrah on the southeast, and the metropolis of Rawalpindi to the south and South-West.

The area of Islamabad is 906 square kilometres (350 sq. mi). A further 2,717 square kilometres (1,049 sq. mi) area is known as the Specified Area, with the Margalla Hills in the north and northeast. The southern portion of the city is an undulating plain. It is drained by the Kurang River, on which Rawal Dam is located.

## 5.3 Physical Environment

### 5.3.1 Topography

Islamabad is located at the edge of the Potohar Plateau and at the foot of the Margalla Hills in Islamabad Capital Territory.

The Potohar Plateau has an uneven table and land is gradually rising in elevation from 500 to 600 meters above the sea level, and the highest point is 1,600 meters above mean sea level. The land gradually slopes towards the South. The land is composed either of alluvium (clay or silt) or of gravel caps. The plains are formed of alluvial deposits laid by the past and the present river systems of varying thickness. A large part of the area is undulating, and at various places, it is badly dissected by gullies and ravines.

The topography of Islamabad consists of plains and mountains. The northern part of the metropolitan area comprises mountains terrain of the Margalla Hills, and Rawal Lake lies in the northeast just below the hills. The southern portion of this city is an undulating plain drained

by Korang River followed by its tributaries. Towards the east is a relatively flat area with bare soil and settlements.

### 5.3.2 Geology and Soils

The Islamabad-Rawalpindi area can be divided into three structural zones, generally trending east-northeast, that reflects compression and movement-oriented. In the north, the mountainous Margalla Hills consist of Jurassic through Eocene limestone and shale that are complexly folded and thrust along the Hazara fault zone. The uplift of these mountains probably formed a major topographic barrier during the last centuries. South of the mountains, a southward-sloping piedmont bench, the piedmont fold belt, is underlain primarily by truncated folds in the sandstone and shale of the Rawalpindi Group. In the southernmost part of the area, the Soan River generally flows along the axis of the Soan syncline. The soil of the project area is heterogeneous, consisting of soil mixed with gravel, cobbles and boulders. The soil composed of clay/ silt formed of alluvial deposits exists in stiff to dense conditions of compactness. A large part of the area is undulating, and at various places, it is dissected by gullies and ravines.

The Potohar region has a complex geological history of mountain formation, alluvial-loessic depositions, and erosion cycles. The soil in the Potohar region is shallow clayey of low productivity. Mostly, on the Southern and Western aspects of the Potohar plateau, the soil is thin and infertile. Streams and ravines cut the loose plain, affected by gully erosion and steep slopes. Such land is unsuitable for cultivation. However, large patches of deep fertile soil are found in the depressions and sheltered localities supporting quality small forests (Rakh) and rain-fed agriculture.

The soil of the project area is composed of clay/silt formed of alluvial deposits laid by past and present river systems in varying thicknesses. As per the geotechnical investigation report of the project site, the site is classified as Soil Profile Type SC.

The proposed site is not prone to liquefaction at its present state as mainly comprises of very hard cohesive soils or geo-materials and rocks or near to rocks sub-strata. No loose SANDY layer is present at this site. Thus, liquefaction is no concern at the project site.

### 5.3.3 Land Use

Patterns of land use in Islamabad have evolved through years and have been influenced by environmental and physical factors such as landforms, climate, and water availability as well as human factors such as population size, growth, economic demands and cultural practices or customs.

The proposed project is located in DHA Phase V and the proposed landuse is as per the Master Plan of DHA Phase V.

### 5.3.4 Seismic Risk

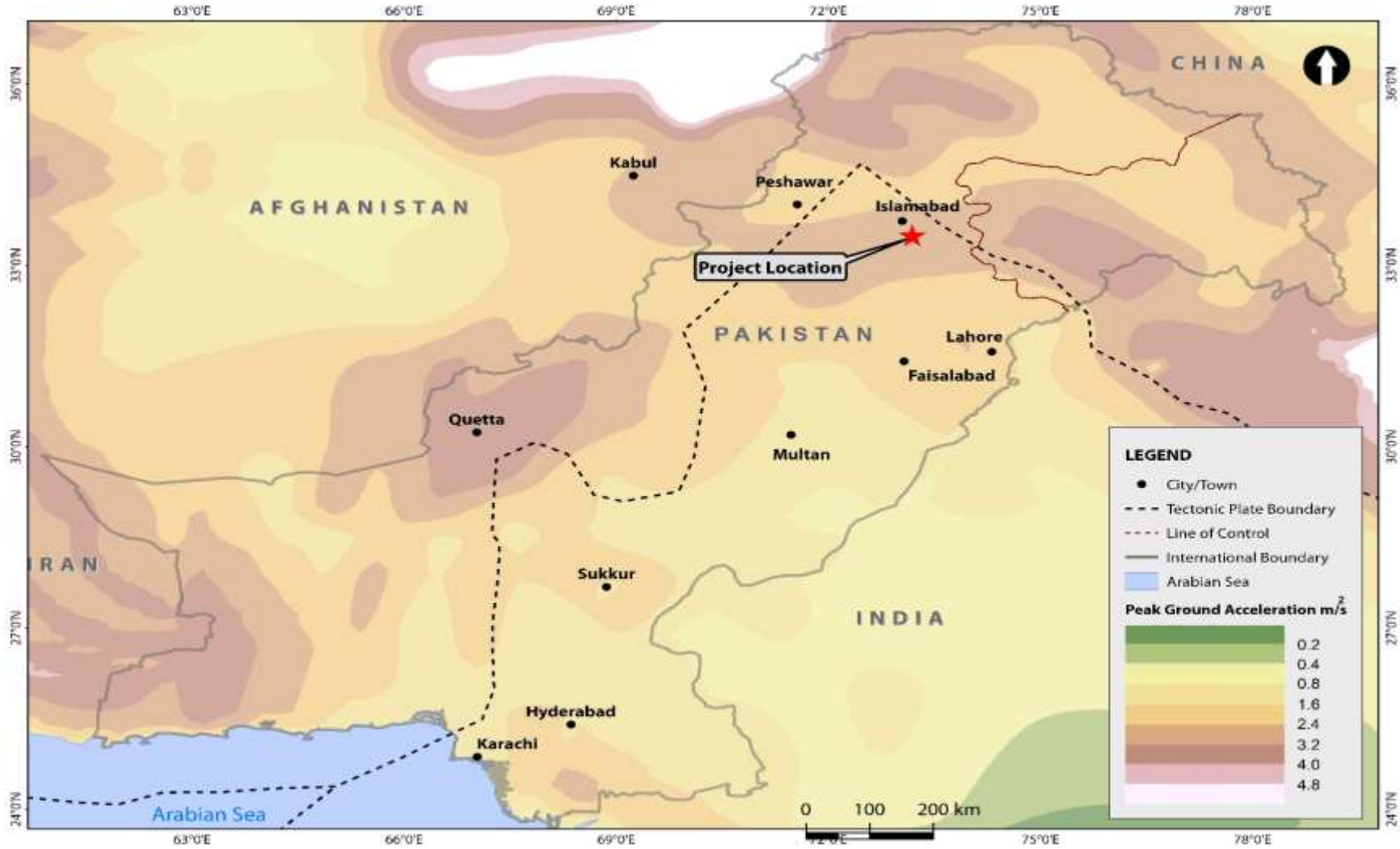
Islamabad region can be divided into three major structural zones. The mountainous north, including Margalla Hills, is complexly folded and thrust along the Hazara Fault Zone. Southwards the mountains are a sloping piedmont bench that is truncated in sandstone and shale. The Soan River flows along the axis of Soan syncline. Islamabad lies just at the edge of Hazara Fault Zone that consists of an arc of thrust and folded rocks about 25km wide and 150 km long that is convex to the south and extends west-southward away from the Himalayan syntaxis. There are many thrust sheets in Islamabad area, some of these thrust faults are in front of Margalla Hills which extends north of Fateh Jang and form Kala Chita Range.

The Islamabad region lies in a tectonically active zone, where earthquakes have been frequent in the recent geological history due to faulting and folding of the structure. Geological past shows that there were many activities of earthquakes in the past in the region. The Soan syncline is an asymmetric, faulted fold of regional extent, plunging west southward. Although

earthquake shaking is not confined to areas near-surface faults, the risk of surface rupture is greater where the surface has been broken previously. Earthquakes in 2005 (7.6 magnitudes) resulted in large area destruction in Islamabad.

The Seismic Map of Islamabad is given in **Figure 5.1.**

**Figure 5.1: Seismic Map of Islamabad**



### 5.3.5 Surface Water

The Soan and Kurang Rivers are the main streams draining the area. Their primary tributaries are the Ling River, draining north-westward into the Soan; Gumreh Kas, draining westward into the Kurang from the area between the Kurang and Soan; and Lei Nala, draining southward into the Soan from the mountain front and urban areas. The Kurang and Soan Rivers are dammed at Rawal and Sambli Lakes, respectively, to supply water for the urban area. Extensive forest reserves in the Kurang and Soan Rivers' headwaters benefit the quality and quantity of water supply.

There is a Rainfed Nullah passing in the vicinity (850m) of the project site. This Nullah then falls into the Ling River.

### 5.3.6 Ground Water

A chemical analysis test of the ground water in the project site was conducted. The samples of ground water were collected on 23rd October 2023, and were received by the Environmental Services Pakistan on 24th October 2023 for analysis.

**Table 5.1: Chemical Analysis of Ground water at the project site**

| S.No | Parameters | Reference values | Concentration | Method/ Equipment Used | Remarks |
|---|---|---|---|---|---|
| **1** | pH* | 6.5-8.5 | 7.5 | SMWW 4500H+B | Within Limits |
| **2** | Total Dissolved Solids (TDS)* | <1000 mg/L | 509 mg/L | SMWW 2540C | Within Limits |
| **3** | Chloride (as $Cl^-$) * | <250 mg/L | 30 mg/L | SMWW 4500Cl- B | Within Limits |
| **4** | Cadmium (Cd) * | 0.01 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| **5** | Chromium (Cr) * | ≤ 0.05 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| **6** | Copper (Cu) * | 2.0 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| **7** | Lead (Pb) * | ≤ 0.05 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| **8** | Manganese (Mn) * | ≤ 0.5 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| **9** | Nickel (Ni) * | ≤ 0.02 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| **10** | Zinc (Zn) * | 5.0 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| **11** | Antinomy (Sb) | ≤ 0.005 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| **12** | Aluminum (Al) | ≤ 0.2 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| **13** | Arsenic (As) | ≤ 0.05 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| **14** | Boron (B) | 0.3 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| **15** | Barium (Ba) | 0.7 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| **16** | Mercury (Hg) | ≤ 0.001 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| **17** | Selenium (Se) | 0.01 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| **18** | Total Coliforms | ---- | ND | SMWW 9222 B | ---- |
| **19** | Fecal Coliforms Bacteria | Must not be detectable in any 100ml sample | ND | SMWW 9222 H | Within Limits |
| **20** | E. Coli | Must not be detectable in any 100ml sample | ND | SMWW 9222 H | Within Limits |
| **21** | Color | ≤ 15 TCU | ND | SMWW 2120 C | Within Limits |

| | | | | | |
|---|---|---|---|---|---|
| **22** | Taste | Non Objectionable / Acceptable | Acceptable | Organoleptic | Within Limits |
| **23** | Odor | Non Objectionable / Acceptable | Acceptable | Organoleptic | Within Limits |
| **24** | Turbidity | <5NTU | 1.2 NTU | SMWW 2130 B | Within Limits |
| **25** | Total Hardness as $CaCO_3$ | <500 mg/L | 356 mg/L | SMWW 2340 C | Within Limits |
| **26** | Cyanide ($CN^-$) | ≤ 0.05 mg/L | ND | SMWW 4500 $CN^-$ F | Within Limits |
| **27** | Flouride ($Fl^-$) | ≤ 1.5 mg/L | 0.1 mg/L | U.S. EPA-9214 | Within Limits |
| **28** | Nitrate ($NO_3^-$) | ≤ 50 mg/L | 7.0 mg/L | SMWW 4500 $NO_3^-$B | Within Limits |
| **29** | Nitrite ($NO_2^-$) | ≤ 3 mg/L | ND | SMWW 4500 $NO_2^-$B | Within Limits |
| **30** | Residual Chlorine | 0.2-0.5 mg/L | ND | SMWW 4500-Cl B | ---- |
| **31** | Phenolic Compounds (as Phenols) | No Guideline Value Set | ND | SMWW 5530 C | ---- |

The results indicate that the water is fit for drinking and other purposes as all of the parameters are within specified NEQS limits.

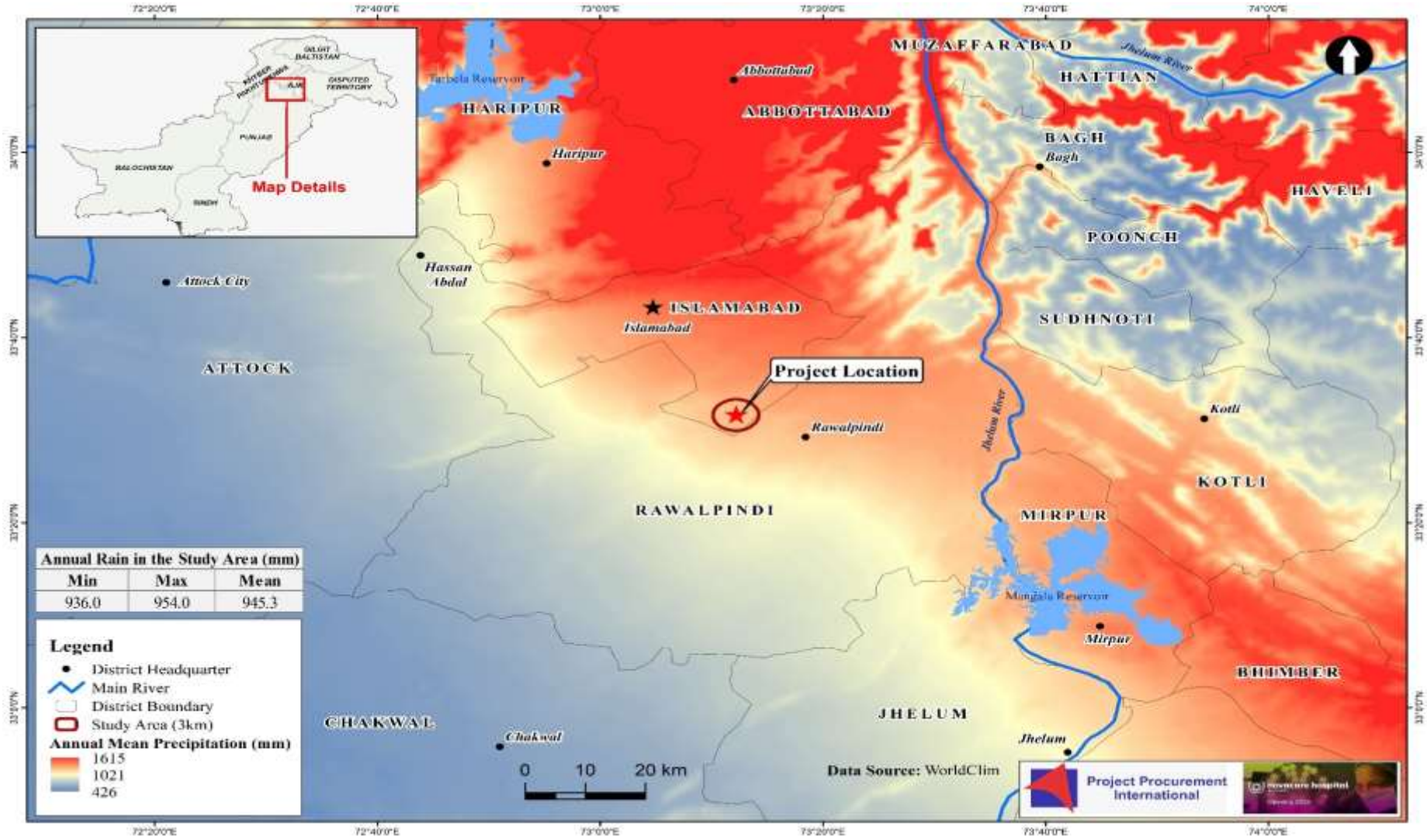
### 5.3.7 Climate

Islamabad has distinct seasons marked by the wide variation in temperature. The climate remains very salubrious from April to October, but the winters get very cold due to snowfall (in Murree). The coldest months are December, January, and February. The hottest months are June and July. Rainfall in April and May is occasional, but the heaviest rain is in July and August.

The temperature of capital territory Islamabad ranges between -1 $^0$C to 46 $^0$C. The coldest month is January when the mean maximum temperature is 18.3 $^0$C, and the mean minimum is 3.8 $^0$C. From February to May the temperature rises at the rate of 5.0 $^0$C per month. The highest temperature reached in May when the mean maximum temperature remains 39.1 $^0$C. Humidity varies greatly in Islamabad.

Metrological Data of Islamabad, including rainfall in **Figures 5.2.**

**Figure 5.2: Annual Rainfall Data of Islamabad**



### 5.3.8 Air Quality and Noise Level Monitoring

The ambient air quality and noise level monitoring was conducted and compared against the National Environmental Quality Standards (NEQS) for Sulphur dioxide ($SO_2$), Oxide of Nitrogen (as NO), oxide of Nitrogen (as $NO_2$), Ozone ($O_3$), Suspended Particulate Matter (as SPM), Respirable Particulate Matter (as $PM_{10}$), Respirable Particulate Matter (as $PM_{2.5}$), and Carbon monoxide (CO) during 24 hours at the project site.

The ambient air and noise level monitoring was conducted on 23rd to 24th October 2023 for 24 hours at the project site of Novacare Hospital, Phase V, DHA, Islamabad.

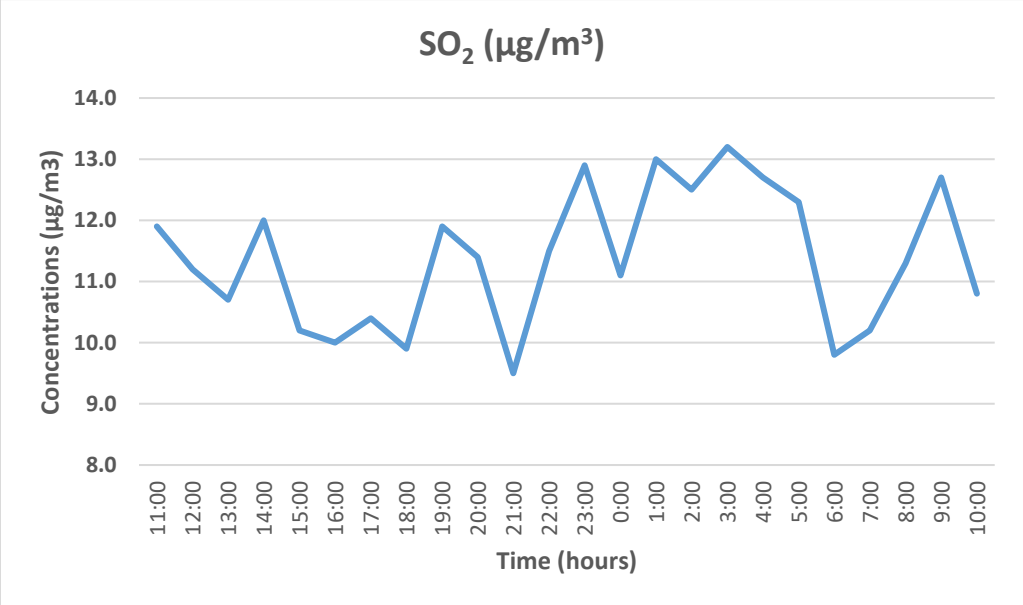
The ambient air quality and noise monitoring was carried out by Pak-EPA Certified laboratory, Environmental Services Pakistan (ESPAK).

**Ambient Air Quality Monitoring**

Sulphur dioxide ($SO_2$): Sulphur dioxide ($SO_2$) is a colourless, poisonous gas with a strong odour. Coal and petroleum containing Sulphur compounds produce Sulphur dioxide after their combustion. It is one of the main contributors of acid rains because of oxidation of $SO_2$ in the presence of a catalyst such as $NO_2$ forms $H_2SO_4$. It irritates eyes, nose and throat. It may impair lung function and aggravate respiratory diseases.

The 24h average concentration of $SO_2$ at the monitoring site was 11.4 µg/m$^3$, which is in compliance with the NEQS (120 µg/m$^3$) of Pakistan.

**Figure 5.3: Hourly variation of Sulphur dioxide ($SO_2$) at the project site**

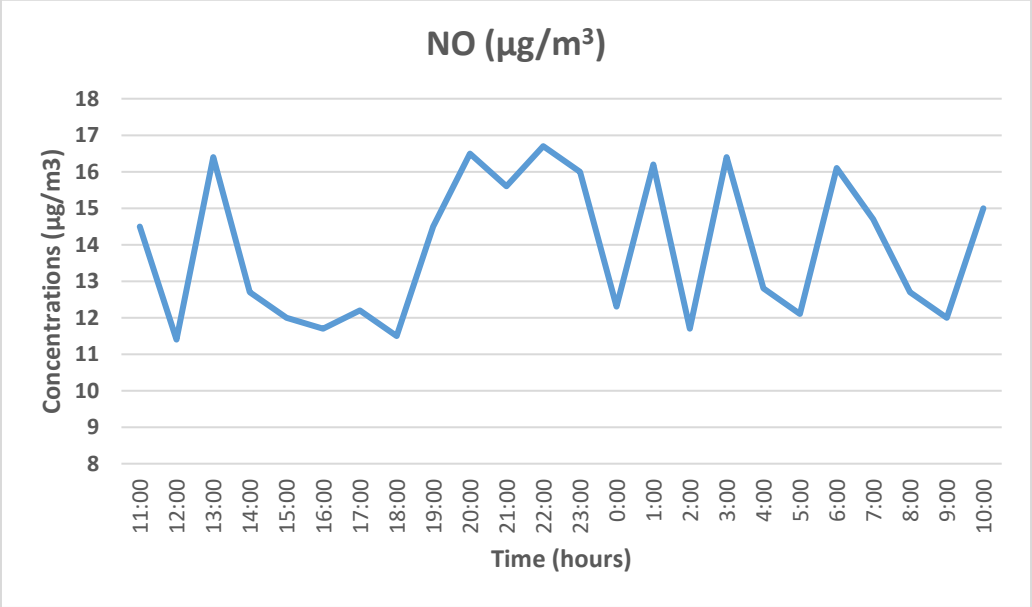



Nitrogen Monoxide (NO): Nitric oxide (nitrogen oxide, nitrogen monoxide) is a molecular, chemical compound with a chemical formula of NO. One of several oxides of nitrogen, it is a colourless gas under standard conditions. It is also produced naturally by the extremely high air temperatures produced along the path of lightning in thunderstorms.

Nitric oxide should not be confused with nitrous oxide ($N_2O$), an anesthetic, or with nitrogen dioxide ($NO_2$), a brown toxic gas and a major air pollutant, the latter being a product to which nitric oxide is rapidly oxidized in air.

The averaged (24h) concentration of NO (13.9 µg/m$^3$) remained within compliance with NEQS (40 µg/m$^3$) at the ambient air quality monitoring site.

**Figure 5.4: Hourly variation of Oxide of Nitrogen (as NO) at the project site**

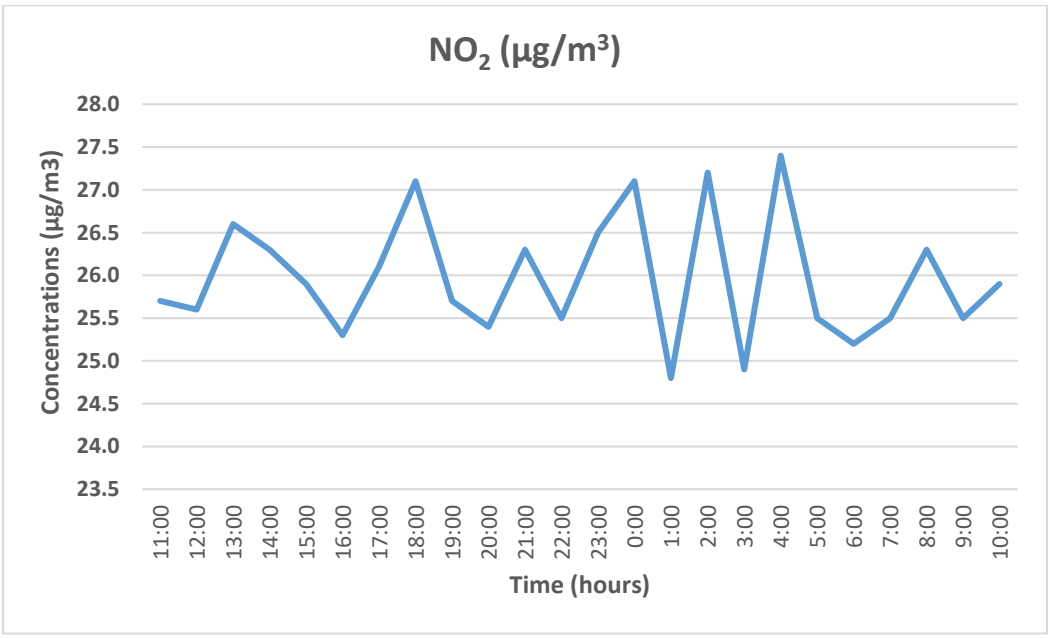



Nitrogen dioxide ($NO_2$): Nitrogen dioxide ($NO_2$) is a light brown gas that can become an important component of urban haze. It is likely that oxides of nitrogen are the second most abundant atmospheric contaminants in many cities, ranking next to Sulphur dioxide.

Nitrogen oxides usually enter the air as a result of high-temperature combustion processes, such as those occurring in automobiles and power plants.

The primary sources of nitrogen oxides ($NO_X$) are motor vehicles and thermal power generation. The averaged (24h) concentration of $NO_2$ (26 µg/m$^3$) remained within compliance with NEQS (80 µg/m$^3$) at the project site.

**Figure 5.5: Hourly variation of oxide of Nitrogen (as $NO_2$) at the project site**



Ozone (O3):

Ozone or tri-oxygen is an inorganic molecule with the chemical formula $O_3$. It is a pale blue gas with a distinctively pungent smell. It is an allotrope of oxygen that is much less stable than the diatomic allotrope $O_2$, breaking down in the lower atmosphere to normal oxygen.

The 1 hr average concentration of Ozone was 23.2 µg/m$^3$ at the project site which remained within compliance limits of NEQS.

Particulate Matter: Particulate matter (PM) is a solid matter from smoke, dust, fly ash, or condensing vapours that can remain suspended in the air for a long period of time. $PM_{10}$ means the particulate matter is having an aerodynamic diameter of 10 micrometres while $PM_{2.5}$ means the particulate matter is having an aerodynamic diameter of 2.5 micrometres or less. Particulates include an array of atmospheric materials, carbon-based matter such as soot, ashes, windblown dirt, sand, soil dust, metals, and plant matter such as pollens. The composition of particulate matter varies with the place, season and weather conditions.

The fine PM can be sulfates, nitrates, organic matter (organic carbon compounds), elemental carbon (soot), and soil dust (crustal materials).

The time-averaged (24h) concentration of $PM_{10}$ is 141 µg/m$^3$ which is within limits and for $PM_{2.5}$ is 32.1 µg/m$^3$ which is also within the permissible limit of NEQs.

The concentration of $PM_{10}$ was within limits during the 24h monitoring at the project site.

The $PM_{10}$ and $PM_{2.5}$ hourly variation in concentrations are shown in **Figure 5.6**.

**Figure 5.6: Hourly variation of Respirable Particulate Matter ($PM_{10}$ and $PM_{2.5}$) at the Project Site**

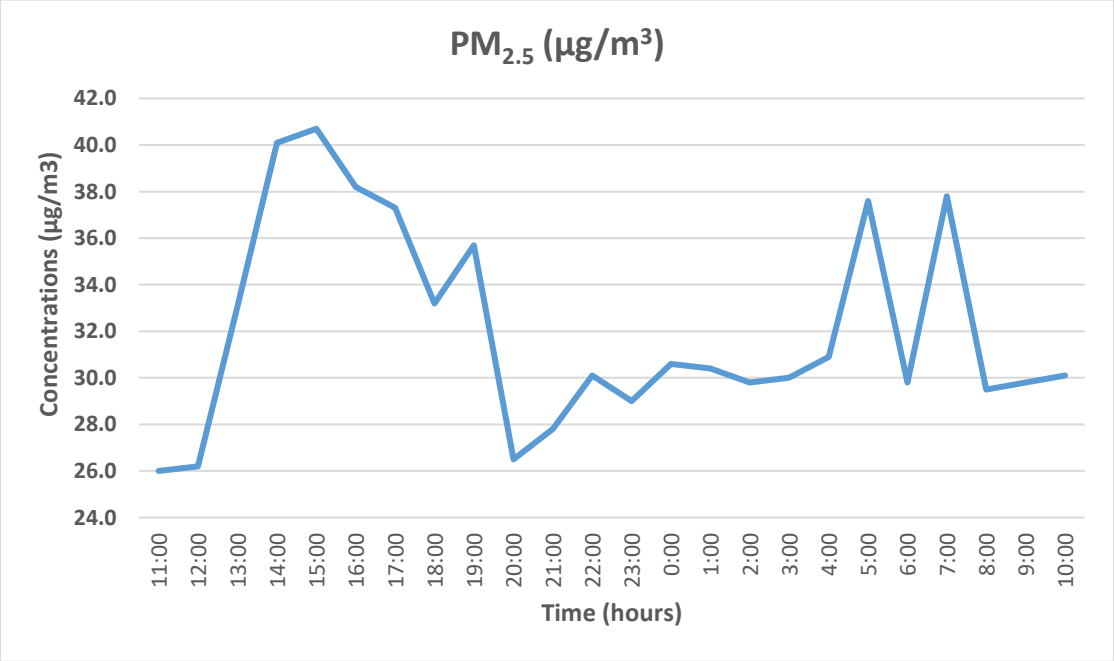
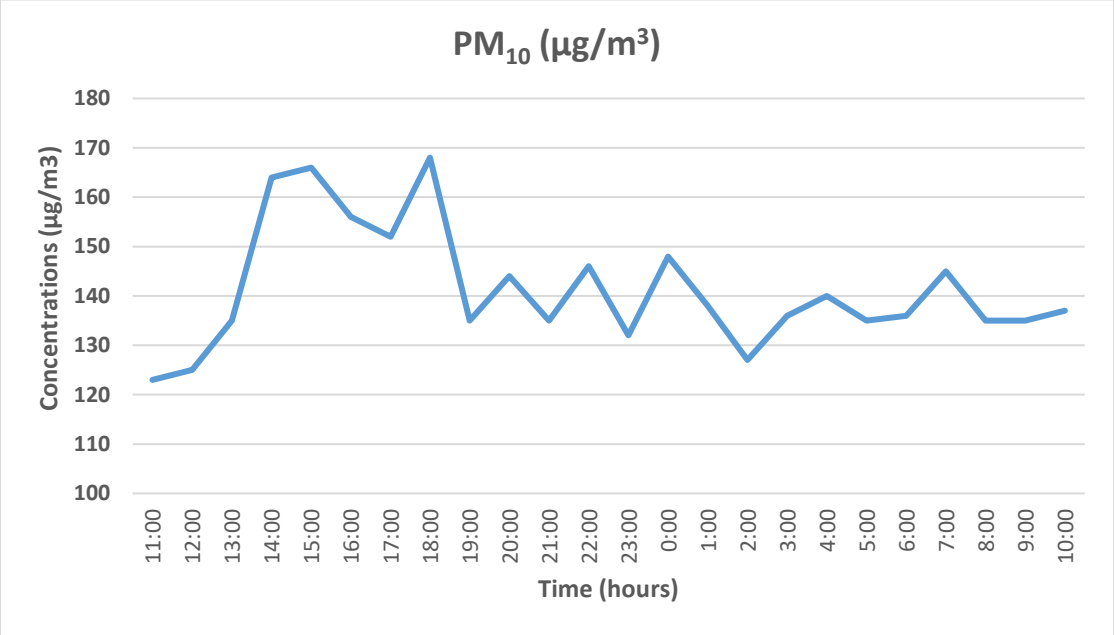


**Figure 5.7: Hourly variation of Respirable Particulate Matter ($PM_{10}$ and $PM_{2.5}$) at the Project Site**

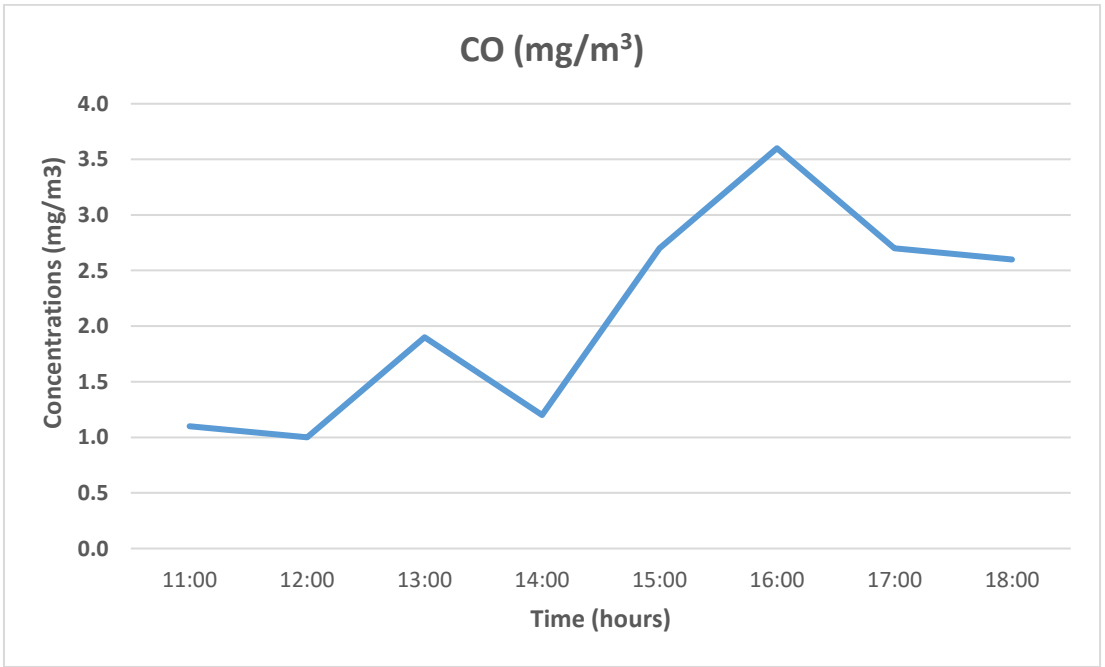



Carbon monoxide (CO): Carbon monoxide is an odourless, colourless and highly poisonous gas that has its major origin in the incomplete combustion of carbonaceous materials. Although industrial processes contribute to CO pollution levels, however, the principal source of CO is automobiles.

Vehicles operating at colder temperatures (in winter, during engine warm-up or in stop-and-go traffic) produce significant quantities of this deadly gas and is of particular concern in urban areas.

The Carbon monoxide (CO) concentration was monitored for 8h interval at the selected site. The average 8h concentration of CO at the project site was found to be 2.1 mg/$m^3$ which is within the compliance limit of NEQS (i.e., 5 mg/$m^3$).

**Figure 5.8: Hourly variation of Carbon Monoxide (CO) at the Project Site**



**Noise Level Monitoring**

Ambient noise levels were also continuously recorded at the project site for 24 hours. The sound pressure level (dB) was frequency weighted on A-curve (dB (A)) and time-weighted (dB (A) $L_{eq}$) on an hourly basis.

The 24-hour monitoring period for noise level was carried out at the project site. The low noise level data was 51.1 dB, and the highest was 69.5 dB which maybe corresponds to nearby road i.e. DHA Expressway.

The hourly noise variation throughout the day reveals that noise levels were within the compliance limit of NEQS (i.e., 65 dB) most of the time but exceeded the values for some peak hours at the project site. The average noise level during the daytime was observed to be 62 dB whereas the noise level at night was 55 dB respectively.

**The conclusion of ambient air quality and noise level monitoring**

The ambient air and noise level monitoring was conducted on 23rd to 24th October 2023 for 24 hours at the project site of Novacare Hospital Project, DHA Phase V, Islamabad. All averaged values were observed to be within range.

Proper plantation on open spaces of the project site will be promoted to help enhance and maintain the air quality of the area in future.

The laboratory report detailing the ambient air and noise level monitoring report is attached in **Annexure-8.**

The $SO_2$, NO, $NO_2$, $O_3$, CO concentrations meets the NEQS limits. A summary of ambient air quality and noise levels results are given in **Table 5.2** below:

**Table 5.2: Summary of Ambient Air Quality and Noise Results at the Project Site**

| Parameters | Limit Values (NEQS-24 hrs) | Concentration (Project Site) | Method/Equipment Used | Remarks |
|---|---|---|---|---|
| **Carbon Monoxide** | 5 mg/m$^3$ (8 Hours) | 2.1 mg/m$^3$ | Non-Dispersive Infrared Absorption (NDIR) | Within Prescribed Limits |
| **Sulfur Dioxide ($SO_2$)** | 120 µg/m$^3$ | 11.4 µg/m$^3$ | UV Fluorescence (UVF) | Within Prescribed Limits |
| **Ozone ($O_3$)** | 130 µg/m$^3$ (1 Hour) | 23.2 µg/m$^3$ | Non-Dispersive UV Absorption | Within Prescribed Limits |
| **Oxides of Nitrogen (NO)** | 40 µg/m$^3$ | 13.9 µg/m$^3$ | Chemiluminescence Detection | Within Prescribed Limits |
| **Oxides of Nitrogen ($NO_2$)** | 80 µg/m$^3$ | 26 µg/m$^3$ | Chemiluminescence Detection | Within Prescribed Limits |
| **Particulate Matter $PM_{2.5}$** | 35 µg/m$^3$ | 32.1 µg/m$^3$ | β-Ray Absorption Method | Within Prescribed Limits |
| **Particulate Matter $PM_{10}$** | 150 µg/m$^3$ | 141 µg/m$^3$ | β-Ray Absorption Method | Within Prescribed Limits |
| **Suspended Particulate matter (SPM)** | 500 µg/m$^3$ | 389 µg/m$^3$ | Particulate Sensor | Within Prescribed Limits |
| **Noise Level Day Time** | 65 dB(A) | 62 dB(A) | Sound Level Meter | Within Prescribed Limits |
| **Noise Level Night-Time** | 55 dB(A) | 55 dB(A) | Sound Level Meter | Within Prescribed Limits |

## 5.4 Biological Environment

### 5.4.1 Flora

According to the natural vegetation of Pakistan, ecologically Islamabad lies under the thorny zone of vegetation. The vegetation is a representative of Dry Subtropical Scrub Forest which is dominated by *Acacia Modesta* (Phulai), *Ziziphus mauritiana* (Ber), etc.

The most common trees in Islamabad are of Amal Tas (*Casia fistulla*), Chinar (*Platanus orientalis*), Phulai (*Acacia modesta*), Dharek (*Melia zardorachita*), Jangali ber (*Zizyphus maurantiana*), Kiker (*Acacia nilotica*), Mulberry-Shahtoot (*Morus alba*), Safaida (*Eucalyptus camaldulensis*), Shisham (*Dalbergia sissoo*), Coconut (*Cocos nucifera*), Papeta (*Manilkara zapota*), Jaman (*Syzygium cumini*),Peli Kaner (*Thevetia peruviana*), Shireen (*Albizia lebbek*), Bamboo (*Bambusa*), Semal (*Bombax ceiba*), Palm (*Arecaceae*), Mango (*Mangifera indica*), etc. In the undergrowth *Cannabis sativa* (Bhang), *Calotropis procera* (Desi Ak), *Parthenium hysterophorous* (Gandi Booti) and *Ocimum bacilicum* (Niazbo) are predominant.

The project site does not have trees except for natural vegetation. However, few shrubs and tree species, including Shisham, Paper Mulbery, Dharek, Silver Oak and Euclyptas were found surrounding the project area.

### 5.4.2 Fauna

In its original form, the Dry Sub Tropical Semi-Evergreen Scrub Forest constitutes the habitat of wild fauna consisting of a host of animals and birds. As the disturbances increased to a maximum level with complete inhabitation, wildlife abundance and diversity decreased to a minimum degree.

The major wildlife of the area is jackal, fox, hare, wild boar, and grey partridges. The ecology of project area is very low because of already ongoing development activities.

The species found in the Islamabad are:

Mammals

- *Canis aureus* (Asian Jackal)
- *Rattus rattus* (Rat)
- *Herpestes javanicus* (Grey Mangoos)
- *Felis chaus* (Jungle Cat)
- *Lepus negricollis* (Indian Hare)
- *Hystrix indica* (Porcupine)
- *Sus scrofa* (Wild Boar)

Reptiles

- *Calotes Versicolor* (Garden Lizard)
- *Eschis carinatus* (Saw scaled viper)
- *Passer domesticus* (House Sparrow)
- *Spalerosophis diadema* *(Diadem Snake),*
- *Uromastix hardwicki* *(Spiny Tailed Lizard),*

Birds

- *Coturnix coturnix* (Quail)
- *Centropus sinensis* (Common Crow)
- *Alcedo atthis* (Kingfisher)

- *Passer domesticus* (House Sparrow)
- *Corvus splendons* (House Crow)

## 5.5 Traffic Impact Study

Traffic counts were undertaken in the project area. A traffic model was built of the surrounding area and the calculated increased traffic applied. Further, some calculations were made of the hospital generated traffic. The modeling and analysis showed that without further actions undertaken, if DHA progresses as the masterplan suggests, significant traffic issues would occur.

The study recommends the below measures:

Encouragement of other transport options including cycling, walking and use of local available public transport.

**Traffic management - Short term:**

- Aiming to get allow pedestrian access from the north
- The traffic exiting back to Islamabad expressway should be channelized to end up using next LILO on the DHA Expressway instead of the Second Avenue LILO. This should be matched with a one-way system, clockwise around the society to the east of 2nd Avenue.

**Traffic management - Long term (by the time the hospital is running at full capacity at around 2035):**

- An underpass from the 2nd Avenue to the west-bound DHA Expressway

**Figure 5.9** shows the location of traffic count survey while **Table 5.3** represents the summary of traffic count survey:

**Figure 5.9: Map of Survey Location**

**Table 5.3: Summary of Traffic Count Survey**

| 02 October 2023-Monday | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Time | | | Hourly Volume | | | | | |
| Hour | Start | End | EB-T | EB-L | SB-L | WB-T | LILO Junction EB-T + EB-L + SB-L | Total Hourly Volume EB-T + EB-L + SB-L + WB-T |
| Hour 1 | 6:30 | 7:30 | 207 | 86 | 150 | 476 | 443 | 919 |
| Hour 2 | 7:30 | 8:30 | 500 | 149 | 219 | 393 | 868 | 1261 |
| Hour 3 | 8:30 | 9:30 | 582 | 100 | 185 | 522 | 867 | 1389 |
| Hour 4 | 9:30 | 10:30 | 496 | 99 | 123 | 428 | 718 | 1146 |
| Hour 5 | 10:30 | 11:30 | 307 | 85 | 77 | 278 | 469 | 747 |
| Hour 6 | 11:30 | 12:30 | 200 | 67 | 40 | 266 | 307 | 573 |
| Hour 7 | 12:30 | 13:30 | 356 | 57 | 85 | 338 | 498 | 836 |
| Hour 8 | 13:30 | 14:30 | 305 | 75 | 73 | 286 | 453 | 739 |

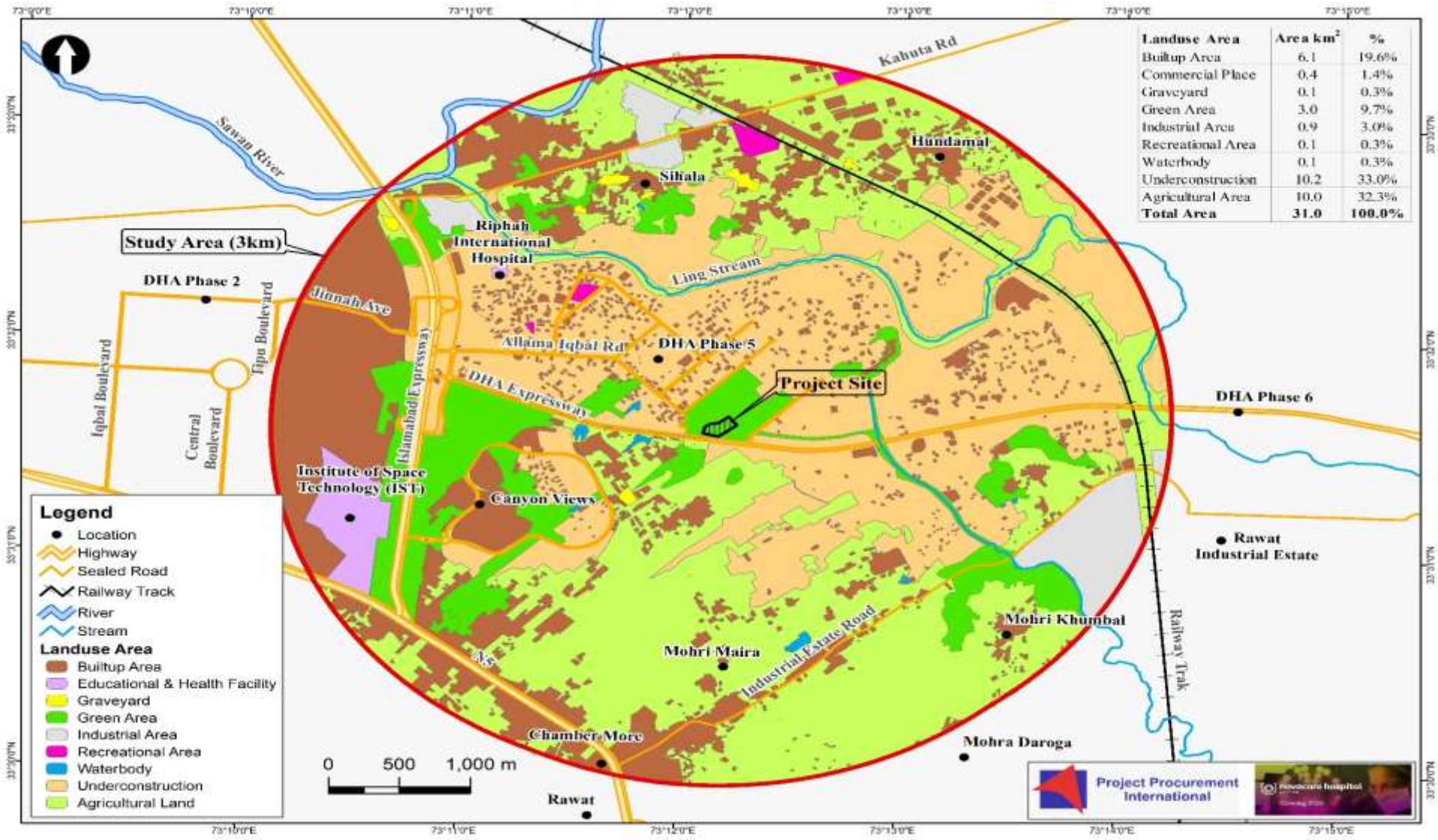
| Time | | | Hourly Volume | | | | | |
|---|---|---|---|---|---|---|---|---|
| Hour | Start | End | EB-T | EB-L | SB-L | WB-T | LILO Junction EB-T + EB-L + SB-L | Total Hourly Volume EB-T + EB-L + SB-L + WB-T |
| Hour 1 | 14:30 | 15:30 | 184 | 70 | 64 | 142 | 318 | 460 |
| Hour 2 | 15:30 | 16:30 | 311 | 156 | 148 | 272 | 615 | 887 |
| Hour 3 | 16:30 | 17:30 | 379 | 141 | 195 | 400 | 715 | 1115 |
| Hour 4 | 17:30 | 18:30 | 351 | 105 | 222 | 503 | 678 | 1181 |
| Hour 5 | 18:30 | 19:30 | 309 | 408 | 131 | 105 | 848 | 953 |
| Hour 6 | 19:30 | 20:30 | 187 | 62 | 81 | 207 | 330 | 537 |
| Hour 7 | 20:30 | 21:30 | 120 | 49 | 51 | 179 | 220 | 399 |
| Hour 8 | 21:30 | 22:30 | 70 | 41 | 10 | 72 | 121 | 193 |

| Time | | | Hourly Volume | | | | | |
|---|---|---|---|---|---|---|---|---|
| Hour | Start | End | EB-T | EB-L | SB-L | WB-T | LILO Junction EB-T + EB-L + SB-L | Total Hourly Volume EB-T + EB-L + SB-L + WB-T |
| Hour 1 | 6:30 | 7:30 | 287 | 114 | 224 | 352 | 625 | 977 |
| Hour 2 | 7:30 | 8:30 | 454 | 142 | 191 | 362 | 787 | 1149 |
| Hour 3 | 8:30 | 9:30 | 288 | 140 | 156 | 276 | 584 | 860 |
| Hour 4 | 9:30 | 10:30 | 241 | 114 | 139 | 173 | 494 | 667 |
| Hour 5 | 10:30 | 11:30 | 155 | 168 | 9 | 280 | 513 | 793 |
| Hour 6 | 11:30 | 12:30 | 302 | 111 | 184 | 294 | 597 | 891 |

## 5.6 Socio-economic and Cultural Environment

This section describes the socio-economic and cultural environment of the project area. There are residential housing societies and their commercial area, hospitals, petrol pumps, mosques and schools in project area. **Figure 5.11** shows the project area map.

**Figure 5.10: Project Area Map**



The housing societies in the project area are under development and the area is gradually becoming populated. The project area includes DHA Phase V, II and Institute of Space Technology.

### 5.6.1 DHA Phase V

DHA Phase V is spread over 7000 kanals. DHA Phase V was formerly launched as Commoner's Town in 2006, over an area of approx 7000 kanals, it has been renamed as DHA Phase V with Sector A, B, C, D, E, F, G & H. Phase-V is located along the Main Islamabad Highway, having dual access through DHA Expressway and L.A.K Boulevard. It exists in the area, which has tremendous landscape and natural beauty.

### 5.6.2 DHA Phase II

Nestled between Grand Trunk Road and Islamabad Highway lies our DHA phase II comprising of approx. 15,075 kanals. All the sectors are fully urbanized and now home to a number of families. This Phase exhibits peace, harmony, security, luxury and convenience.

Most of the residents are working in the private sector while others are doing their own business. The housing society has all the amenities and facilities for its residents. It has schools, mosques, parks, and private clinics within its vicinity.

DHA Phase II has adequate sewerage and stormwater drainage system. Electricity, natural gas, and telephone service are available to the residents with other facilities like banks and courier services. The housing society has its own security system.

### 5.6.3 Institute of Space Technology

IST is accessible from Islamabad Expressway. The Institute of Space Technology is a public university located in Islamabad, Pakistan. It is focused on the study of astronomy, aerospace engineering, avionics engineering and astronautics. Established in 2002 under the auspices of the Pakistan National Space Agency.

# 6 Stakeholder Consultation

## 6.1 Approach to Public Consultation

The public consultation process with various stakeholders has been approached to involve public and other stakeholders from the earliest stages. Public consultation has taken place during the planning and design phase of the project. The focus of attention has been the population near the proposed project site that may be affected by the project.

The viewpoints of the stakeholders have been taken into account, and their concerns and suggestions for possible improvements have been included in the EIA where appropriate.

The project will create both positive and negative impacts on the project area that may affect the local population and other stakeholders, both directly and indirectly.

A series of roadside discussions were carried out with the local community. During the roadside discussion, the community was informed about the salient features of the project, its location, and activities.

## 6.2 Objectives of Consultation

The overall objective of the consultation with stakeholders is to verify the environmental and social issues that have been presumed to arise and to identify those which are not known or are unique to the project.

The important general objectives of the consultation process are:

- Providing key project information to the stakeholders, and to solicit their views on the project's potential or perceived impacts,
- Identification of potential problems and needs,
- To devise the way for collaborative problem solving,
- Develop and maintain communication links between the project proponents and stakeholders, providing opportunities to the public to influence the project design in a positive manner, and
- Ensure that views and concerns of the stakeholders are incorporated into the project design and implementation with the objectives of reducing or offsetting negative impacts and enhancing benefits of the proposed project.

## 6.3 Categories of Stakeholders Contacted

Potential stakeholders for consultation and participation were identified, and discussions were held with the people living in the project area of impact, college/university students, pedestrians, property dealers and business/shop owners. Moreover, government and private employees, Public/private University Professors, national organizations, and local public representative were also contacted.

## 6.4 Major Stakeholders Involved

The stakeholders contacted during the survey belonged to different categories of people, as shown in **Table 6.1**.

**Table 6.1: Categories of Stakeholders Interviewed in the Project Area**

| No. | Stakeholder Category |
|---|---|
| 1 | Local People (living in the vicinity of Novacare Hospital Project site) |
| 3 | Government Organizations |
| 4 | Environment & Social Experts (Public and Private Institutes/Academia) |
| 5 | Grass-root stakeholder discussions |

## 6.5 Scoping Session

During the public consultation process, both primary and secondary stakeholders were consulted. A scoping session was carried out with Pakistan Environmental Protection Agency on 9th October 2023. Similarly, consultation with the stakeholders was in the form of informal meetings and interviews.

During these interviews, the simple, non-technical description of the project was given, along with an overview of the project's likely impacts on people and the environment. Following the project description, a discussion was held so that people could voice their concern.

Generally, the community is aware of the proposed project of establishment of Novacare Hospital and indicated their support as it will provide healthcare facilities in the area as well as employment opportunities and enhance the socio-economic status of the area as well as of the country.

## 6.6 Issues Discussed

Following issues were discussed during the stakeholder consultation:

- Overall activities of the project and their possible impacts;
- Possible impacts on natural vegetation, flora and fauna;
- Possible mitigation measures and
- Beneficial factors and involvement opportunities for the local people in the set of activities of Project.

## 6.7 Major Stakeholders and their Apprehensions

Meetings with major stakeholders were organized to discuss project-specific issues and their potential impacts on the local and regional environment.

Stakeholders consulted, and their valuable suggestions and comments are described below:

| Name and Designation | Location | Opinions/Concerns/Issues/Suggestions |
|---|---|---|
| Mr. Ghalib Hafiz, Director<br>Mr. Shafqat Hussain, Project Manager | M/s Novacare Hospital Limited | ▪ The establishment of Novacare Hospital in DHA Phase V has been proposed to provide quality teritary healthcare to the residents of Islamabad and Rawalpindi.<br>▪ Novacare Hospital will be one of the Hospitals in Pakistan to get certification in **LEED** and **EDGE**. This shows the comittment of M/s Novavcare Hospital Pvt. Limited towards environment protection.<br>▪ Proponent gives special attention to environmental compliance of its project during the design and construction phases of the project. During the design phase, we do ensure the use of energy-efficient and environmentally friendly products and technologies that are available in Pakistan.<br>▪ This project is targeted to the public to boost their confidence in the local health care system. This will also enable them to obtain the requisite medical treatment to enable them to live a healthy life and can play a positive role in the progress of the country. |
| Mr. Sher Afzal, Assistant Director, IESCO | E&SS, PMU, IESCO | ▪ The project must incorporate sustainable technology in the design to make it more environment friendly.<br>▪ Efficient use of solar energy by installing solar panels will be beneficial for the developer and environment, making the project environmentally and economically sustainable.<br>▪ The increased population and demand for healthcare facilities necessitate the establishment of such projects.<br>▪ The electrical wiring system must be done carefully to avoid any short circuit, and fire safety with emergency exit must be part of the building layout plan duly approved by the concerned departments. Any incident within the building can cause the loss of many lives.<br>▪ Water and electricity should be used responsibly.<br>▪ The proponent should ensure appropriate Environmental, Occupational Health and Safety measures during construction phase of the project. |
| Mr. Ammad Ud Din Muhammad | Additional Director (Building Safety Division)<br>E&DM | ▪ MCI is aware that the proposed project might pose negative Environmental Health and Safety Impacts.<br>▪ Emergency and Disaster Risk Management should be an integral part of the operational phase of the Project; however, it should also be considered during the construction phase of the Project.<br>▪ During the construction phase, there is a risk of fire outbreak in the contractor's camp due to |

| Name and Designation | Location | Opinions/Concerns/Issues/Suggestions |
|---|---|---|
| | | Short-circuiting owing to the use of faulty equipment, carelessness of the associated staff and lack of standard check and balance. A proper audit of the HSE of the contractor's camp should be carried out. |
| Mr. Anwar Kamal<br>Mr. Zulqarnain | Emergency & Disaster Management Directorate | ▪ A proper Fire Safety Plan is mandatory part of designing and planning.<br>▪ Awareness is necessary for workers, staff and patients (during operational phase) regarding fire safety and evacuation in case of emergency. |
| Dr Musharib Ali, Lecturer, NUST | National University of Sciences and Technology | ▪ Construction period should be short and multiple parallel activities should be carried out so that environmental impacts of construction phase are minimized.<br>▪ Negative impacts during operational phase should be mitigated according to international standards, and new green and energy efficient technologies should be adopted in the Novacare Hospital.<br>▪ Hazardous waste should be handled properly and colour coded bins should be used effectively.<br>▪ Water resources in the urban areas are already limited, so wastewater treatment plant should be part of the project. Standard piping colour codes should be developed for water and wastewater treatment plants. |
| Mr. Farhan Lodhi, Chief Executive Officer, Environmental and Waste Management Solutions | Islamabad | ▪ The establishment of Novacare Hospital, will strengthen healthcare facility.<br>▪ The management of Novacare Hospital must comply with Hospital Waste Management Rules and Guidelines.<br>▪ The construction of the hospital with an increased number of beds will improve the overall health care system in DHA phase V which is basic need of residents.<br>▪ The management of Novacare Hospital, must increase green cover within their premises and use solar energy. |
| Dr. Asif Ali, Consultant (Cardiologist) | Islamabad | ▪ There is great need of hospital infrastructure in the country particularly in the Capital, where patients from all over the country come.<br>▪ Moreover, Islamabad recieves additional load of patients of Afghanistan. If quality hospitals are developed in Pakistan, the country can introduce medical tourism much similar to what Turkey, India are implementing. |

## 6.8 Consultation with the Communities

A series of roadside discussions were carried out with the local community. During the roadside discussion, the community was informed about the salient features of the project, its location, and activities. Exhibits of roadside public consultation are in **Figure 6.1**.

Respondents in the majority showed a positive attitude towards the project. The viewpoints of respondents are as follows:

Location: Majority of respondents showed a positive attitude towards the project location. They stated that the project would bring further development in the area and as it is located on DHA Expressway, it will be easier to access.

Job creation: Almost all respondents agreed that the project would create job opportunities for local populations. They viewed the project positively from an economic point of view. Others believe that the project will benefit labours as well as professionals.

Traffic load: Respondents had their concerns related to traffic. A traffic management plan should be developed.

Healthcare facility: Respondents agreed that healthcare facilities are required and high in demand in Rawalpindi and Islamabad and especially in DHA because all other hospitals are far from location and already are under stress due to large influx of patients. People cited that in the project area, there is no existing healthcare facility which can fulfil the needs of DHA phase V or nearby villages. Hence, it is need of the residents to have proper medical and surgical facility in their area for timely access in case of emergencies.

## 6.9 Address of Concerns

Efforts have been made in the preparation of this Environmental Impact Assessment Report to address all the concerns raised by the stakeholders during the consultation meetings.

Proper management plans have been proposed in the relevant sections to deal with all the issues related to biodiversity conservation, management and disposal of solid/hazardous waste, wastewater disposal and safeguarding interests of the local people.

**Figure 6.1: Pictorial presentation of the public consultation at DHA Phase V**

**Exhibit 1**: Consultation with the Resident of the Project Area

**Exhibit 2:** View of consultation with a Business Owner of the Area

**Exhibit 3**: Consultation with CEO of BM Property and Builders in DHA phase V

**Exhibit 4**: Roadside Consultation in project area

**Exhibit 5**: Consultation with community of the Project Area


**Exhibit 6**: View of Unity Real Estate & Builders Office visited for consultation

# 7 Impact Assessment and Mitigation Measures

## 7.1 Introduction

This chapter provides screening of potential environmental impacts of the proposed project, discusses the stakeholders' views, assesses the significance of the potential impacts, and recommends mitigation measures to minimize if not eliminate the potentially adverse impacts of the proposed activities.

## 7.2 Environmental Screening of the Project

To examine the environmental impact of the project, an Environmental Screening Matrix has been developed as part of the present EIA study that focuses on the potential environmental impacts of the project during pre-construction/design, construction and operational phases.

### 7.2.1 Impact Identification with Matrices

Environmental metrics are designed to assess the environmental impact of technology or activity. Such impacts are primarily related to using natural resources (lifecycle INPUTS) and generating waste and emissions (lifecycle OUTPUTS). The ultimate sustainability goal is to minimize the environmental impacts due to using non-renewable resources and minimizing waste and pollution. Since the complete elimination of these impacts is hardly possible (any technology has its environmental costs), it is also important to evaluate the rate at which environment can absorb the impacts and become remediated.

Impact Identification with Matrices:

A Matrix has been prepared for the identification of different environmental impacts and their associated risks or benefits. The Matrix also presents the mitigation measures or environmental enhancement measures for the identified impacts and the change in risk after the mitigation techniques have been adopted.

*Risk Assessment*

The risk assessment of the project activities is carried out for all the negative impacts following the basic steps listed below:

- Identify the potential impact
- Assess the risk
- Apply the appropriate measure

Risk is assessed as the likelihood that the activity will influence the environment as well as the consequence of the effect occurring. It is often described as this:

**Risk = Likelihood X Consequence**

The likelihood is further classified and relatively valued into: Certain (5), Likely (4), Possible (3), Unlikely (2), Rare (1)

Certain: Will undoubtedly happen/recur on a frequent basis.

- Likely: Will probably happen/recur, but it is not a persisting issue/circumstances.
- Possible: Might happen or recur occasionally
- Unlikely: Do not expect it to happen/recur but it may do so
- Rare: This will probably never happen/recur

The consequence is further classified and relatively valued into: Remarkable (5), Major (4), Moderate (3), Minor (2), Insignificant (1).

- *Remarkable:* Impact on a larger area and highly sensitive receptors.

- Major: Impact on a large area and slightly sensitive receptors.
- Moderate: Impact on a small area with few receptors.
- Minor: Impact on a very small area with almost no receptors.
- Insignificant: Almost no impact.

Based on the classification and values, a risk analysis matrix has been developed and presented in **Table 7.1.**

**Table 7.1: Environmental Screening Matrix (un-mitigated) of Novacare Hospital, Islamabad**

| Likelihood | Consequence and Value | | | | |
|---|---|---|---|---|---|
| | Remarkable (5) | Major (4) | Moderate (3) | Minor (2) | Insignificant (1) |
| Certain (5) | 25 | 20 | 15 | 10 | 5 |
| Likely (4) | 20 | 16 | 12 | 8 | 4 |
| Possible (3) | 15 | 12 | 9 | 6 | 3 |
| Unlikely (2) | 10 | 8 | 6 | 4 | 2 |
| Rare (1) | 5 | 4 | 3 | 2 | 1 |

Based on the related values in **Table 7.1** following risk impact categories are identified:

- Extreme Risk (score 20-25): require more intensive mitigation measures
- High Risk (score 10-19): Will have a large impact which requires specific mitigations
- Medium Risk (score 5-9): Will have a small impact which can be mitigated easily
- Low Risk (score 1-4): professional judgment

*Positive impacts*

Positive impacts are also evaluated in the Matrix using the same methodology; however, a different colour scheme is used.

Based on the classification and values, a positive impact analysis matrix has been developed and presented in **Table 7.2.**

**Table 7.2: Positive Impact Analysis Matrix**

| Likelihood | | Consequence and Value | | | |
|---|---|---|---|---|---|
| | Remarkable (5) | Major (4) | Moderate (3) | Minor (2) | Insignificant (1) |
| Certain (5) | 25 | 20 | 15 | 10 | 5 |
| Likely (4) | 20 | 16 | 12 | 8 | 4 |
| Possible (3) | 15 | 12 | 9 | 6 | 3 |

| | | | | | |
|---|---|---|---|---|---|
| Unlikely (2) | 10 | 8 | 6 | 4 | 2 |
| Rare (1) | 5 | 4 | 3 | 2 | 1 |

Based on the related values in **Table 7.2** following positive impact categories are identified.

- Extremely Beneficial (score 20-25): Will add a lot of value to the local environment
- Highly Beneficial (score 10-19): Will have a large positive impact on the environment
- Medium (score 5-9): Will have a small positive impact
- Low (score 1-4): Will not have any significant impact

**Table 7.3: Impact Identification with Matrix**

| Project activity | Environmental and Social issues | Risk Assessment | | | Mitigation Measures for risks/Enhancement measures for positive impacts | Risk Assessment after taking mitigation Measures | | |
|---|---|---|---|---|---|---|---|---|
| | | Likelihood | Consequence | Significance | | likelihood | Consequence | Significance |
| **Pre-construction Phase Impacts** | | | | | | | | |
| Site Selection | Encroachment on historic/cultural values | 1 | 1 | 1 | Site selection has been done in a way to ensure no historical site in a 500 m radius. | 1 | 1 | 1 |
| | Disruption of Flora and Fauna | 3 | 6 | 9 | No trees will be cut. Project site only have scarce vegetation. | 1 | 3 | 3 |
| | Resettlement | 2 | 5 | 10 | No resettlement will be caused by the project. | 1 | 3 | 3 |
| Site Preparation | Noise | 5 | 3 | 15 | Noise barriers around the construction site along with mufflers (silencers) for vehicles and construction equipment to minimize noise. | 4 | 2 | 8 |
| | Dust generation | 5 | 3 | 15 | Additional water to be applied for dust suppression during dry weather. | 3 | 2 | 6 |
| | Damage to vegetation | 3 | 6 | 9 | No trees will be cut, there will be minimal impact on the local bird population. | 2 | 2 | 4 |

| Project activity | Environmental and Social issues | Risk Assessment | | | Mitigation Measures for risks/Enhancement measures for positive impacts | Risk Assessment after taking mitigation Measures | | |
|---|---|---|---|---|---|---|---|---|
| | | Likelihood | Consequence | Significance | | likelihood | Consequence | Significance |
| **Construction Phase Impacts** | | | | | | | | |
| Construction Works | Soil Erosion and degradation | 5 | 3 | 15 | Minimal land clearing, levelling and grading to reduce soil erosion. Construction of temporary reinforced walls to contain debris. Waste to be categorized and recycled. Slope stabilization measures to be taken during the project. | 3 | 2 | 6 |
| | Air Quality Deterioration | 5 | 3 | 15 | Construction equipment to be well maintained to reduce exhaust emissions. Workers to be provided with Personal Protective Gears (e.g., masks). Water to be used for dust suppression. | 3 | 2 | 8 |
| | Loss of vegetation | 5 | 3 | 15 | Spilling of chemicals and other effluents on the soil will be avoided. Tree plantation will also be carried out. | 3 | 2 | 6 |
| | Damage to Wildlife | 3 | 6 | 9 | Minimal impacts on the local bird population | 3 | 2 | 6 |
| | Noise and Vibration | 4 | 3 | 12 | Barriers to be constructed in sensitive areas. Night-time activities will not be held unless unavoidable. | 3 | 2 | 6 |
| | Quarrying Hazards | 3 | 4 | 12 | Exposed soils to be stabilized with mulch and grass to prevent hazards. | 3 | 2 | 6 |
| Waste Disposal | Surface (and Groundwater) quality | 4 | 3 | 12 | Wastewater will be properly drained into the DHA sewerage line. | 3 | 2 | 6 |
| | Solid Waste Disposal | 4 | 4 | 16 | Any solid waste generated during construction will be recycled or disposed of in the nearest waste disposal site after consultation with DHA Phase V. | 2 | 3 | 6 |

| Project activity | Environmental and Social issues | Risk Assessment | | | Mitigation Measures for risks/Enhancement measures for positive impacts | Risk Assessment after taking mitigation Measures | | |
|---|---|---|---|---|---|---|---|---|
| | | Likelihood | Consequence | Significance | | likelihood | Consequence | Significance |
| | Waste Effluent Disposal | 4 | 4 | 16 | Waste effluent generated from the septic tank will be properly drained into the nearest sewerage line on the site. | 3 | 3 | 9 |
| Positive impact | Job opportunities | 4 | 4 | 16 | Training will be arranged to hire a local crew for the project. | 5 | 4 | 20 |
| **Operational Phase Impacts** | | | | | | | | |
| Operation of Novacare Hospital | Air Quality | 3 | 5 | 15 | The building will install proper HVAC system to facilitate ventilation in the building. | 2 | 4 | 8 |
| | Safety Hazard, Public Health & Nuisance | 4 | 4 | 16 | The building will be properly monitored by the HSE Officer to ensure that all the health and safety measures are applied. | 3 | 3 | 9 |
| | Noise | 4 | 3 | 12 | Noise barrier and mufflers will be used to minimize noise generation. | 3 | 3 | 9 |
| | Wastewater | 4 | 3 | 12 | Wastewater will be properly drained into the DHA sewerage line or Nullah after proper treatment. | 3 | 2 | 6 |
| | Traffic congestion | 3 | 3 | 9 | Defensive and best driving practices will be inculcated in the project drivers. | 2 | 2 | 4 |
| | Solid waste | 4 | 4 | 16 | Solid waste will be disposed properly at a designated disposal site. | 3 | 3 | 9 |
| Positive impact | Employment | 4 | 4 | 16 | Hospital project will increase the employment opportunities both for labour and professionals. | 5 | 4 | 20 |
| | Efficient land use | 4 | 4 | 16 | Local Healthcare facility will help in efficient land use as people will get better health facilities near their | 5 | 4 | 20 |

| Project activity | Environmental and Social issues | Risk Assessment | | | Mitigation Measures for risks/Enhancement measures for positive impacts | Risk Assessment after taking mitigation Measures | | |
|---|---|---|---|---|---|---|---|---|
| | | Likelihood | Consequence | Significance | | likelihood | Consequence | Significance |
| | | | | | residence. It can save lives in case of emergencies. | | | |
| | Reduction of energy consumption | 4 | 4 | 16 | The building will use innovative and advanced energy saving technologies such as double-glazing glass, emergency lights, LED energy savers etc. | 4 | 5 | 20 |
| | Business opportunities | 4 | 3 | 12 | The project will give rise to small scale businesses in the vicinity. | 4 | 4 | 16 |

## 7.3 Environmental Impact Characterization

During the environmental impact assessment process of Novacare Hospital, Islamabad, the predicted impacts were characterized. Various aspects of the impact characterization include:

- Nature (direct/indirect)
- Duration of impact (short term, medium-term, long-term)
- Geographical extent (local, regional)
- Timing (Project phase)
- Reversibility of impact (reversible/irreversible)
- Likelihood of the impact (certain, likely, unlikely)
- Impact consequence severity (severe, moderate, mild)
- Significance of impact (High, medium, low)

The above aspects of environmental characterization are defined in **Table 7.4**.

**Table 7.4: Impact Characterization of Novacare Hospital, Islamabad,**

| Categories | Characteristics |
|---|---|
| Nature | Direct: The environmental parameter is directly changed by the project.<br>Indirect: The environmental parameter changes because of a change in another parameter. |
| Duration of impact | Short-term: Lasting only for the duration of the project, such as noise from the construction activities.<br>Medium-term: Lasting for a period of a few months to a year before naturally reverting to the original condition such as loss of vegetation due to the clearing of the campsite, contamination of soil or water by fuels or oil. |

| Categories | Characteristics |
|---|---|
| | Long-term: Lasting for a period much greater than medium-term impact before naturally reverting to the original condition such as loss of soil due to soil erosion. |
| Geographical extent | Local, regional (spatial dimension) |
| Timing | Construction and operation |
| Reversibility of impact | Reversible: When a receptor resumes its pre-project condition.<br>Irreversible: When a receptor does not or cannot resume its pre-project condition. |
| Likelihood of the impact | Almost Certain: Impact expected to occur under most circumstances.<br>Likely: Impact will probably occur under most circumstances<br>Possibly: Impact may possibly occur at some time<br>Unlikely: Impact could occur at some time<br>Rare: Impact may occur but only under exceptional circumstances |
| Impact consequence severity | Major: When an activity causes irreversible damage to a unique environmental feature; causes a decline in abundance or change in distribution over more than one generation of an entire population of species of flora or fauna; has long-term effects (period of years) on socio-economic activities of significance or regional level.<br>Moderate: When an activity causes long-term (period of years), reversible damage to a unique environmental feature; causes reversible damage or change in abundance or distribution over one generation of a population of flora or fauna; has short-term effects (period of months) on socioeconomic activities of significance on a regional level.<br>Minor: When an activity causes short-term (period of few months) reversible damage to an environmental feature; sight reversible damage to a few species of flora or fauna within a population over a short period; has short-term (period of months) effects on socio-economic activities of local significance.<br>Negligible: When no measurable damage to the physical, socio-economic, or biological environment above the existing level of public concern; and conformance with legislative of statutory requirements. |
| Significance of impact | Categorized as High, Medium, or Low<br>Based on the consequence, likelihood, reversibility, geographical extent, and duration; the level of public concern; and conformance with legislative of statutory requirements. |

Subsequent to the characterization, appropriate mitigation measures were identified, in order to minimize, if not completely eliminate, the adverse impacts associated with project activities. Finally, residual impacts were identified.

The impact characterization of the predicted impacts, mitigation measures and residual impacts are discussed below:

## 7.4 Pre-Construction/Design Phase Impacts

### 7.4.1 Project Sitting Impacts

The impacts associated with the project sitting are those which relate to its location at the designated site in Islamabad. These impacts are different from those which are associated with the project's construction and operation phases, in the sense that the construction and

operation impacts are associated with the activities such as land clearing, waste disposal, whereas the sitting impacts relate to the mere presence of a facility at the given location.

For the proposed project, the

- The project site, land use and design
- Visual Impacts

These are characterized in **Table 7.3**, and discussed below:

**Project Site, Land Use, and Design**

The project site of Novacare Hospital, Islamabad, should be in line with the guidelines for commercial buildings. The land use and design should be in accordance with the building codes and by-laws of for the construction of high-rise buildings.

The design of the project should be able to withstand seismic activity, and necessary arrangements are in place for the health and safety of the workers and patients.

The project might increase energy consumption and will put the burden on the already existing energy crisis in the country. Furthermore, the extraction of water to meet the construction as well as operational needs of the project might put pressure on ground water resources.

In addition, more solid waste will have to be collected, transported, and disposed of at the dumping site of Islamabad. The proposed project can contribute towards the landfill crises indirectly.

The unmitigated impact associated with not following the building guidelines are characterized as follows:

- Nature : Indirect
- Duration : Long-term
- Geo extent : Local
- Reversibility : Irreversible
- Likelihood : Possibly
- Consequence : Severe
- Impact significance : High

**Mitigation Measures**

**Project Site:** The land of project site is located in residential area on a plot already owned by the proponent.

**Land Use**: The land use of Novacare Hospital, Islamabad, will be in accordance with the building by-laws. The land-use plan of the project will be approved by DHA.

**Design:** The proposed structure of Novacare Hospital, Islamabad will be in accordance with existing building by-laws, and its design will be approved by the DHA Islamabad - Rawalpindi. The following mitigation measures are proposed for earthquake and firefighting:

- The Building By-Laws and Codes will be strictly adopted.
- Complete equipment control system, fire escape stairs and secured access system supplemented with close circuit surveillance equipment/alarms will be included in the design of the building.
- The adequate internal and external water distribution system will be designed, with a standby system for sufficient water, which could also supply adequate quantity for firefighting.

- Adequate space will be provided for parking firefighting vehicle at the front and backside of the project. The designated space will be able to withstand the load of the firefighting vehicle, which is 30-40 tons.
- Sufficient access points should be provided for access of firefighting staff to enter into the project building.
- Provision for pumping out water from the basement will be kept, to meet any emergency in case of water flooding the basement.
- DHA supply will be used as the primary source of water.
- The solid waste reduction, reuse and recycling will be encouraged during operational phase of the project.
- Infectious or biohazard waste will be properly incinerated.
- Adequate water storage for firefighting will be provided in the building. The pumps for firefighting will maintain constant pressure in the system.
- Standpipes, connected with fire pumps, will be provided in the building with fire hose cabinets on each floor. Each cabinet will house one 1.5 diameter hose of 100 ft. the length and attached to a gate valve of the same diameter.
- Orifice plates will be provided at the hose cabinets to control pressure at required level as per manufacturer's requirements.

**Visual Impacts**

The Novacare Hospital, Islamabad can potentially damage the natural landscape, and visual impact will be impacted. The unmitigated impact associated with the aesthetic value of the area is characterized as follows:

- Nature : Direct
- Duration : Long-term
- Geo extent : Local
- Reversibility : Irreversible
- Likelihood : Possibly
- Consequence : Severe
- Impact significance : High

**Mitigation Measures**

For the project, the visual impact has been minimized at different levels, as described below:

- First of all, the design of the hospital building should be adopted in a manner that minimizes the changes in the topography, landscape and damage to the natural vegetation.
- A plantation plan has been proposed for the Novacare Hospital, Islamabad which should be followed.
- Certain areas must be marked and left untouched to preserve natural vegetation.

**Residual Impacts**

As a result of the above mitigation measures, the visual impact of the project will be greatly reduced. There will be some residual impact; however, its significance is expected to be low.

## 7.5 Construction Phase Impacts

The construction phase will be by far the most significant part of the project with respect to environmental considerations since most of the impacts are likely to take place during this period. Various construction activities will invariably create environmental disturbances, which may have impacts on the physical, biological and social environment of the area and nearby community. Such impacts include the following:

**Physical Environment**

- Soil degradation and contamination
- Air quality deterioration
- Surface and groundwater contamination
- Solid Waste Management

**Biological Environment**

- Loss of/damage to the floral resources (natural vegetation) of the area
- Loss of/damage to faunal resources (wildlife) of the area
- Social Environment
- Compensation for land acquisition
- Noise and vibration
- Safety hazards
- Public health and nuisance issue
- Sites of Archaeological or Historical Significance

These impacts are characterized in **Table 7.3** and can be readily pre-empted and mitigated.

The mitigation measures recommended in this section will need to be incorporated into the construction of the project.

These impacts and their respective mitigation measures are discussed below:

### 7.5.1 Soil Degradation and Contamination

The soil-related issues include soil erosion, slope stability, and soil contamination. These may be caused by the land clearing, levelling and grading, excavation and filling, construction activities and maintenance of equipment/vehicles.

Soil may be contaminated as a result of fuel/oils/chemical spillage and leakage, and inappropriate waste (solid as well as liquid) disposal.

Extraction of stone and gravel from the area may potentially lead to soil erosion.

The unmitigated impacts related to soil erosion and contaminations are characterized below.

- Nature : Direct
- Duration : Long-term
- Geo extent : Local
- Reversibility : Irreversible
- Likelihood : Certain
- Consequence : Moderate
- Impact significance : High

**Mitigation Measures**

The followings mitigation measures will minimize soil erosion and contamination:

- Land clearing, levelling and grading be minimized and carried out in a manner to minimize soil erosion.
- Good management of topsoil should be done to prevent the loss of soil fertility.
- Excavated slopes will not be left untreated/unattended for long durations. Appropriate slope stabilization measures will be taken per the design (i.e. Stone pitching). Temporary measures, such as the construction of temporary walls reinforced with brick lining bordering the construction areas to contain debris and spoil, will also be undertaken to avoid soil erosion and water contamination.
- The stone and gravel will not be extracted from Islamabad.
- Vehicles and equipment will not be repaired at the project site. If unavoidable, impervious sheathing will be used to avoid any soil contamination.
- For the domestic sewage from the contractor's camp, septic tanks with soaking pits will be constructed having adequate capacity. Waste oils (if any) will be collected in drums and sold to the recycling contractors.
- The recyclable waste from the project site (such as cardboard, drums, broken/used parts, etc.) will be sold to recycling contractors, or where appropriate reuse/recycle it.
- The hazardous waste should be kept separate and handled according to the nature of the waste. While storing, hazardous waste will be marked.
- Domestic solid waste will be disposed of in a manner that does not cause soil contamination/water contamination.

**Residual Impacts**

Appropriate construction practices and management actions as listed above, will greatly minimize the soil erosion and contamination. The significance of the residual impacts is therefore expected to be 'low'.

### 7.5.2 Air Quality Deterioration

Construction machinery and project vehicles will release exhaust emissions, containing Carbon Monoxide (CO), Oxides of Sulfur (SOx), Oxides of Nitrogen ($NO_x$) and Particulate Matter (PM).

These emissions can deteriorate the ambient air quality in the immediate vicinity of the project site. Furthermore, construction activities such as excavation, land levelling, filling and vehicular movement on unpaved tracks may also cause fugitive dust emissions.

The unmitigated impacts related to air quality deterioration are characterized below:

- Nature : Direct
- Duration : Short-term
- Geo extent : Local
- Reversibility : Reversible
- Likelihood : Likely
- Consequence : Minor
- Impact significance : Medium.

**Mitigation Measures**

The following mitigation measures will minimize the emission and their impacts:

- Construction machinery and vehicles will be kept in good working condition and properly tuned, in order to minimize the exhaust emissions.
- Fugitive dust emissions will be minimized by spraying water on the soil, where required and appropriate.

**Residual Impacts**

The above measures will reduce the magnitude of the adverse impacts on ambient air quality. The significance of the residual impacts on air quality is expected to be low.

### 7.5.3 Noise and Vibration

Noise and vibration will be generated by the construction machinery and vehicles during construction activities.

The unmitigated impacts related to the noise and vibrations caused by the project are characterized as follows:

- Nature : Direct
- Duration : Short-term
- Geo extent : Local
- Reversibility : Reversible
- Likelihood : Certain
- Consequence : Moderate
- Impact significance : High

**Mitigation Measures**

- Construction equipment and vehicles will have exhaust mufflers (silencers) to minimize noise generation.
- Noise monitoring will be done at the project site, and if found more than 55 dBA, appropriate sound reduction mechanism (such as a noise barrier) will be put in place.
- Blasting will not be allowed as part of the proposed construction activities.

**Residual Impact**

With the implementation of the above mitigation measures, the residual noise impact will be low to medium.

### 7.5.4 Surface Water and Groundwater Contamination

The project activities that can contaminate soil may also contaminate the surface water and groundwater. These include:

- Solid waste disposal
- Sewerage disposal
- Equipment/ vehicles maintenance
- Spillage/ leakage of fuels, oils and chemicals
- Campsite sanitation facilities

The unmitigated impacts of the proposed construction activities on the water resources of the area characterized below:

- Nature : Direct and indirect
- Duration : Short to medium term

- Geo extent : Local
- Reversibility : Reversible
- Likelihood : Likely
- Consequence : Major
- Impact significance : High

**Mitigation Measures**

The mitigation measures recommended to forestall soil contamination will also prevent surface and groundwater contamination.

**Residual Impacts**

If the recommended mitigation measures are effectively employed, the residual impacts of the project activities on the water resources of the area will be negligible.

### 7.5.5 Loss of Vegetation

There are no trees on the proposed site of Hospital. Damage and/or loss of vegetation and clearing of other indigenous and introduced species, as well as undergrowth species which comprising bushes, grass, etc., can occur.

The construction crew might also indulge in tree/shrub cutting to obtain fuelwood for the camp.

The unmitigated impacts of the proposed activities on the floral resources of the area are characterized below.

- Nature : Direct
- Duration : Medium to long-term
- Geo extent : Local
- Reversibility: Irreversible (reversible in medium to long-term)
- Likelihood : Certain
- Consequence : Severe
- Impact significance : High

**Mitigation Measures**

The follows mitigation measures will further minimize any negative impacts on the floral resources of the area:

- Endeavours will be made to compensate for the loss by enhancing the environment, through a plantation of trees and ornamental plants.
- A plantation plan for the project has been prepared. The plan has a mix of appropriate trees/bushes which will be planted within the premises as well as any designated plantation site.
- All preventive measures will be adopted to control the spill-over of chemicals and other effluents on the ground to protect soil fauna and ensure microbial activity.
- Cutting of trees and other natural vegetation will be minimized as far as possible through astute planning.
- A record will be maintained for any tree cutting.
- The construction crew will be provided with LPG as cooking (and heating, if required) fuel. Use of fuelwood will not be allowed at the contractor camp.

**Residual Impact**

The trees planted under the plantation plan will take some time to grow and mature. Therefore, there will be some reduction of vegetation cover in the area. This impact cannot be fully mitigated, and the residual impact would be medium, at least in the medium term. In the longer run, however, the planted trees and vegetation will be more than compensate for any vegetation loss.

### 7.5.6 Damage to Wildlife

The project site is located in urban area of Islamabad, which provides little to no habitat for wildlife. The construction activities will not have adverse impact considering the mitigation measures are implemented during project execution. The loss of natural vegetation discussed above and other project activities will potentially have adverse impacts on the faunal resources and habitats of the area as well. Smoke, chemicals, dust particles, and noise generated by heavy machinery are a scaring factor for wildlife. Rodents, hedgehogs, porcupines would lose their abode.

The unmitigated impacts of the proposed activities on the faunal resources of the area are characterized below:

- Nature: Direct
- Duration: Medium to long-term
- Geo extent: Local
- Reversibility: Irreversible (reversible in medium to long-term)
- Likelihood: Certain
- Consequence: Low
- Impact significance: Low

**Mitigation Measures**

- The measures to prevent soil and water contamination will forestall any adverse impact on the faunal resources of the area.
- Special measures will be adopted to minimize impacts on birds, such as avoiding noise-generating activities.
- Solid waste from the contractor's site office and construction waste will not be left in the open and be disposed of properly.
- The measures to restore natural vegetation loss in the area will benefit the area's fauna as well.
- The project staff will not be allowed to indulge in any hunting or trapping activities.
- Illumination levels at the site will be minimized, as far as possible.
- Appropriate diffusers should be used to restrict the illumination within the project site.
- Blasting should not be undertaken at the site for excavation purposes.
- Destruction of habitat and consequent check on the population of pest rodents may prove to be boon to maintain ecological balance.

**Residual Impact**

Despite the above mitigation measures, there will be some residual impacts of the project on the faunal resources of the area. The significance of these residual impacts is expected to be medium.

### 7.5.7 Disposal of Construction Waste/Excavated Material

Dumping of construction wastes/excavated material, in the surrounding area, may limit the use of land in the project area. The solid waste may be generated due to different construction activities, and it will mainly include surplus excavated and construction material. It may also be generated from the construction camp.

The indiscriminate disposal of solid waste may cause dust emissions due to the wind blowing thereby affecting the health of the workers working or passing in the immediate vicinity of solid waste heaps. The impacts of solid waste would be temporary and minor negative in nature.

The unmitigated impacts of the proposed activities area are characterized below:

- Nature: Direct
- Duration: Medium to long-term
- Geo extent: Local
- Reversibility: Irreversible (reversible in medium to long-term)
- Likelihood: Certain
- Consequence: Severe
- Impact significance: Moderate

**Mitigation Measures**

- Management of construction activities will be done in a way to ensure minimal degradation to the soil around the project site.
- Dumping of excavated waste and waste generated from the construction camp will be done at a designated site approved by local authorities.

The contractors will be bound by contractual obligations to take care of the waste generated from the construction activities.

### 7.5.8 Traffic Management

During the construction phase, the movement of heavy machinery and transportation of construction material and equipment may cause traffic problems on DHA Expressway Road. As a result, the daily activities of the people living in DHA Islamabad as well as the normal traffic may be disturbed, which will require proper mitigation measures. This impact is temporary and minor negative in nature.

**Mitigation Measures**

- Traffic Impact Study has been conducted.
- A traffic management plan will be prepared to avoid traffic jams/public inconvenience.
- Movement of vehicles carrying construction materials will be restricted during the night time to reduce traffic load and inconvenience to the local residents.

The management is required to maintain liaison between the Traffic Police, local residents/ travellers and the contractor to facilitate traffic movement during the construction stage.

### 7.5.9 Safety Hazards, Public Health and Nuisance

The project is located close to a residential area and may pose some safety hazards to the public.

The public health issues related to the project location are the possibility of contamination of local drinking water resources and dust emissions during the construction phase. The anticipated health impacts are classified into the following categories:

Dust and Pollen Allergy: One of the main problem people are facing here is of dust and pollen allergy.

Eye and Respiratory Diseases: Construction workers may be susceptible to the eye and respiratory diseases due to their routine exposure to dust and exhaust emissions on site. These effects could possibly be mitigated by routine health screening and training of contractor's employees.

Physical Injuries: Injuries could happen primarily by occupational-related accidents, animal bites, etc. Activities such as land clearing, tree felling, earthworks, and construction of facilities present various occupational hazards to the workers on site. These risks can be mitigated through the provision of appropriate training and emergency response procedures.

Psychological Disorders: Some workers may suffer from depression and anxiety disorders due to working and accommodation conditions, and their relationship with fellow workers. The psychological wellbeing of some members of the community may be affected due to disturbances created by the project activities. Mitigation measures for workers include the devotion to standards regarding working conditions.

Excessive illumination at the construction site may potentially cause light pollution, creating a public nuisance.

The unmitigated impacts related to the safety hazards; public health and nuisance are characterized as follows:

- Nature: Direct and indirect
- Duration: Short to medium term
- Geo extent: Local
- Reversibility: Reversible
- Likelihood: Likely
- Consequence: Major
- Impact significance: High.

**Mitigation Measures**

- Protected fencing will be fixed around the construction site. Unauthorized access within the construction area will not be allowed.
- The local community will be educated regarding the safety hazards at the site.
- The mitigation measures discussed under air quality deterioration, soil and water contamination will address the public health concerns as well.
- Defensive driving practices will be inculcated in the project drivers through training, posters and other similar measures.
- Vehicle speeds of 15 km/hr at the project site will be implemented.
- Appropriate light diffusers and reflectors will be used, if required, to minimize the public nuisance caused by light pollution.
- A traffic management plan will be prepared and implemented during the construction phase to control the accidents.
- The contractor will ensure better working conditions for its employees.
- Regular routine health screening of the staff should be carried out.
- Firefighting equipment will be made available at the camp.
- The camp staff will be provided with firefighting training.

- The construction camps and site offices will have first-aid kits.
- The construction crew will be provided with an awareness of the transmissible diseases (such as HIV/AIDS, hepatitis B, and C).
- All safety precautions will be taken to transport, handle and store hazardous substances such as fuel.
- Road signage will be fixed at appropriate locations to reduce safety hazard associated with project-related vehicular traffic.

**Residual Impacts**

There will be a moderate level of the residual impact of safety hazard associated with the vehicular traffic and construction activities.

The residual public health and nuisance issues will be quite negligible after the effective implementation of the mitigation measures.

### 7.5.10 Sites of Archaeological or Historical Significance

There are no reported sites of archaeological or historical significance at the land acquired for the project. However, in case an artifact of such significance is found during the construction activities, the Archaeology Department, Government of Pakistan will be informed.

## 7.6 Operational Phase Impacts

The operation of Novacare Hospital, Islamabad will interact with different components of the environment. This interaction may result in the following adverse impacts:

- Soil contamination
- Contamination of Surface and Groundwater
- Safety hazards, public health and nuisance

However, the magnitude of some of the above impacts is likely to be lesser as compared to the construction phase impacts.

To ensure the harmony of the project with the environment, the management will implement sound environmental management practices to handle the basic environmental issues effectively

- Landscaping and plantation
- Noise and another public nuisance abatement.

The potential environmental impacts of the project during operational phase are discussed below:

### 7.6.1 Solid Waste Management

The solid waste generated during operational activities will be safely disposed of at an approved waste disposal site. The management will prepare a solid waste management plan which details municipal waste collection and disposal as well as promotes recycling.

The unmitigated impacts related to solid waste management caused by the project are characterized as follows:

- Nature: Direct to indirect
- Duration: Medium-term
- Geo extent: Local
- Reversibility: Reversible
- Likelihood: Certain

- Consequence: Moderate
- Impact significance: Medium

**Mitigation Measures**

Solid Waste Management will also be an important issue during the operational phase of Novacare Hospital, Islamabad.

- Color Coded Bins should be used for source segragation.
- A small secondary point should be available at the project site where segregation of recyclable and non-recyclable waste can take place.
- All the solid waste from the building will be collected at one location and will be transported for disposal and the designated dumping site.
- Proper treatment method for hazardous waste is highly recommended.
- Any infectious or biohazard waste will be incinerated.

**Residual Impact**

The residual impacts of the implementation of the above measures will be low if Solid Waste is collected and disposed of properly.

### 7.6.2 Contamination of Surface and Groundwater

The nature of the impact of the project's operation activities on the surface and groundwater quality is expected to be quite similar to those predicted for the construction phase, except that the magnitude is likely to be lesser.

The unmitigated impacts on the surface and groundwater resources of the area are characterized below:

- Nature: Direct
- Duration: Short-term
- Geo extent: Local
- Reversibility: Reversible
- Likelihood: Likely
- Consequence: Major
- Impact significance: High

**Mitigation Measures**

The mitigation measures against soil contamination discussed above for the operation activities will forestall any possible water contamination as well.

**Residual Impact**

After the effective implementation of the above measures, the residual impacts of the operation of Novacare Hospital, Islamabad on the water resources of the area will be negligible.

### 7.6.3 Safety Hazard, Public Health and Nuisance

The nature of impacts of the project's operation activities relating to safety hazards, public health and nuisance is expected to be quite similar to those predicted for the construction phase.

These unmitigated impacts are characterized below:

- Nature: Direct and indirect

- Duration: Short-term
- Geo extent: Local
- Reversibility: Reversible
- Likelihood: Likely/possible
- Consequence: Moderate
- Impact significance: High to medium.

**Mitigation Measures**

The following mitigation measures will forestall any possible impact during the operation phase:

- The mitigation measures discussed under air quality deterioration, soil and water contamination will address the public health concerns as well.
- Appropriate solid waste disposal mechanisms will be implemented, as described earlier.
- Appropriate light diffusers and reflectors will be used where required to minimize the public nuisance caused by light pollution.
- Provision of firefighting arrangements in each floor of the project.

**Residual Impact**

After the effective implementation of the above-mentioned measures, the residual impacts of the estate operation activities relating to safety hazards, public health and nuisance will be negligible.

## 7.7 Positive Impacts of the Project

The positive impacts of Novacare Hospital, Islamabad are as follows:

Novacare Hospital, Islamabad will provide state of the art healthcare facilities to the population of DHA, Islamabad and nearby areas where no such facility is present at the moment.

The multi-dimensional impact of the proposed project will be to:

- Provide sustainable development.
- Provide better healthcare facilities.
- Enhance economic activities.
- Contribute to the promotion of skill applications.

### 7.7.1 Business Opportunity

With the start-up of operation of Novacare Hospital, Islamabad, business opportunities in the area will be enhanced, thus, boosting up the local economy.

### 7.7.2 Employment

The operation of the project will improve the employment opportunities in the project area. It is anticipated that the local community will get direct or indirect employment due to the project. Employment will have a positive impact on the local economy.

### 7.7.3 Healthcare Facilities

By providing easy accessibility to a state-of-the-Art hospital facility, the local communities will gain access to prompt health care. This will help in reducing the mortality rate of patients due to the unavailability of proper medical amenities. Such an initiative also helps in reducing the out-migration trend of the population towards the developed and overburdened cities, which in return encourages balanced growth. This is the goal of the project.

## 7.8 Summary of Impacts and their Mitigation Measures

The impacts, mitigation measures have been developed to minimize the likelihood, extent or duration of their occurrence and any associated adverse effects. **Table 7.5** summarizes potential impacts and proposed avoidance and mitigation measures associated with construction camps.

**Table 7.5: Summary of Impacts and Mitigation Measures**

| Impact | Mitigation Measures |
|---|---|
| **Pre-construction Phase Impacts** | |
| Project Site, Land Use, and Design | Novacare Hospital, Islamabad is being constructed in an urban area and is accessible by DHA Expressway.<br><br>The land use and design of the project will be in line with the existing by-laws. |
| Air Quality Deterioration | The project site should be monitored throughout to keep a record of air quality and any change in it.<br><br>Vehicular traffic on unpaved track will be avoided as far as possible, and the track will be sprinkled with water to control dust. |
| Surface Water and Groundwater Contamination | Protection of the groundwater reserves from any contamination.<br><br>Excavation should be done in the supervision of the site engineer so he can decide up to which limit excavation should be done.<br><br>Prohibit the washing of vehicles and machinery in the project area. |
| Noise and Vibration | To mitigate these impacts noise barriers should be constructed in sensitive areas.<br><br>Construction equipment and vehicles will have exhaust mufflers (silencers) to minimize noise generation.<br><br>Premix Concrete will be hauled in to reduce the noise that is generated due to preparation of concrete at the site. |
| Safety Hazards, Public Health and Nuisance | There should be proper check and balance on construction activities.<br><br>There should be proper control on oil spillage and leakage of vehicles.<br><br>Firefighting equipment will be made available at the camps.<br><br>The camp staff will be provided for firefighting training. |
| Sites of Archaeological or Historical Significance | There are no reported sites of archaeological or historical significance at the land acquired for the project. However, in case an artefact of such significance is found during the construction activities, the Archaeology Department, Government of Pakistan will be informed. |
| **Operational Phase** | |

| **Impact** | **Mitigation Measures** |
|---|---|
| Contamination of Surface and Ground Water | The mitigation measures against soil contamination discussed above for the operation activities will forestall any possible water contamination as well. |
| Hospital Waste Management | The Novacare Hospital, Islamabad will have a proper Hospital waste management system.<br><br>All collected waste will be segregated, the infectious or biohazard waste will be incinerated/microwaved shredder and the rest will be disposed on an approved and designated landfill site. |

# 8 Environmental Management and Monitoring Program

## 8.1 Introduction

The EIA report has identified the potential impacts that are likely to arise during the construction and operational phase of the project. The EIA report has identified both positive and negative impacts at each stage of the project.

To minimize the effects of adverse impacts, the EIA has recommended mitigation measures. These mitigation measures include the use of alternative technologies, management and physical control or compensation in monetary terms.

The proposed mitigation measures have been based on the understanding of the sensitivity and behaviour of environmental receptors in the project area. The legislation controls that apply to the project and a review of good industry practices while operating in sensitive environments.

For residual impacts (impacts remaining after applying the recommended mitigation measures) and for impacts in which there can be a level of uncertainty in prediction at the EIA stage, monitoring measures have been recommended to ascertain these impacts during the project.

For the effective implementation and management of mitigation measures, an environmental management plan (EMP) has been prepared. The EMP satisfies the requirement of the Pakistan Environmental Protection Act, 1997.

This chapter outlines the implementation mechanism for the EMP and defines the institutional arrangements required for the implementation of the plan. The EMP provides the implementation mechanism for the mitigation measures identified during the EIA.

## 8.2 Purpose and Objectives of EMP

An Environmental Management Plan (EMP) provides a delivery mechanism to address the adverse environmental impacts of a project during its execution, to enhance project benefits, and to introduce standards of best practices to be adopted for all phases of the project.

The primary objectives of the EMP are to:

- Facilitate the implementation of identified mitigation measures.
- Develop a proper monitoring mechanism and identify requisite monitoring parameters to confirm the effectiveness of the proposed mitigation measures.
- Define the responsibilities of the project proponent, design and supervision consultant and contractor, and provide a means of effectively communicating environmental issues among themselves.

## 8.3 Management Approach/ Institutional Capacity

### 8.3.1 Pre-Construction and Construction Phase

The organizational roles and responsibilities are summarized below:

a) M/s Novacare Hospitals Private Limited

The overall responsibility of supervision of all the project activities rests with the project proponent, M/s Novacare Hospitals Private Limited and proponent will ensure monitoring of environmental compliance at the hospital level.

b) Project Manager

The Project Manager will be responsible for environmental compliance during the design and construction phases of the project.

The Project Manager, Novacare Hospital Project, will carry out field activities and will be responsible for implementing various mitigation actions prescribed in the EIA report relevant to the contract. The Project Manager will make sure the Environmental Monitoring Plan is being followed and complied with on the project site. The management of Novacare Hospital Project will monitor the implementation of the EMP and the EIA report.

c) Pak EPA

The Pakistan Environmental Protection Agency, Government of Pakistan, will periodically visit the project site to monitor the compliance of environmental protection measures detailed in the EIA report.

### 8.3.2 Organizational Structure and Responsibilities

The organisational structure for the construction phase EMP is described as follows:

Primary Responsibilities: The primary responsibilities for the environmental performance of the project proponent, engineering consultant, and contractor will be assumed by respective highest-ranking officers during the project.

The Project Manager, will be responsible for the compliance with the EMP of the project.

Field Management and Quality Control: The construction activities will be carried out in an environmentally sound manner during the construction phase of the project and will be the responsibility of the Site Engineer. He will be responsible for implementing EMP and EIA recommendations.

The Project Manager, will be responsible for ensuring the overall environmental soundness of all construction activities. He will ensure the implementation of EMP and EIA.

Environmental Monitoring: M/s Novacare Hospitals Private Limited will make necessary arrangements through Engineering Consultant to monitor the key environmental data during the construction phase.

These will include the quantity of water used, record of waste produced, a record of waste disposal and project-related vehicular traffic.

### 8.3.3 Operation Phase

M/s Novacare Hospitals Private Limited will assume the main responsibility for the environmental performance of the Novacare Hospital Project during its operational phase.

An environmental monitoring plan has been developed as part of the Novacare Hospital Project. The key environmental parameters, such as solid waste management, infectious hospital waste management, sewerage treatment plant, traffic count, noise, and status of implementation of plantation plan, will be monitored on a regular basis. The environmental monitoring reports will be produced and shared with the concerned authorities if required.

## 8.4 Legislation and Guidelines

The EIA of the Novacare Hospital Project has discussed national and international legislation and guidelines that are relevant. The proponent will ensure that his staff and all its assigned design & supervision consultant and contractor are aware of this legislation and guidelines prior to the start of the project activities.

The Pakistan Environmental Protection Act, 1997 is the basic environmental legislation. The act also requires that no person shall emit pollutants or noise in amount, concentration or level that exceeds the National Environmental Quality Standards (NEQS). The NEQS will be followed throughout the construction and operational phases of the project

## 8.5 Environmental Management Cell and Responsibilities

During the construction phase of the Novacare Hospital Project, proponent will form an Environmental Management Cell, which will be responsible for the environmental management and supervisory affairs during the construction and operational phases of the project. The responsibilities of the Environmental Improvement Cell are as follows:

- To ensure implementation of all the proposed mitigation measures during the installation, commissioning, and operational phase of the project.
- Capacity building of the staff regarding environmental improvement and awareness.
- To develop operational guidelines and implementation schedules.
- Receiving complaints from the community. To ensure that the proposed project is implemented in an environmentally friendly manner, causing the least harm to the existing environment.

## 8.6 Approvals

Novacare Hospital Project will obtain environmental approvals from the Pakistan Environmental Protection Agency, Islamabad.

## 8.7 Contractual Provisions

Adherence to the requirements of the EMP and EIA in terms of environmental mitigation will be required from the civil works contractor, and thus EMP will form part of their contract agreements signed.

The contractor shall be responsible for implementing the mitigation measures and monitoring various environmental parameters. The Project Manager shall monitor the contractor's performance with respect to EMP implementation.

## 8.8 Environmental Mitigation Matrix

An Environmental Management Matrix has been developed, which is given in **Table 8.1**.

This Environmental mitigation matrix provides details about potential environmental impacts, where the impact will happen, where the impact will occur, mitigation measures, responsibility and parameters for monitoring.

**Table 8.1: Environmental Mitigation Matrix of Establishment of Novacare Hospital Project**

| Potential Environmental Impact | Where the impact is likely to happen | When the impact likely to occur | Mitigation Measures | Responsibility | | Parameters for Monitoring |
|---|---|---|---|---|---|---|
| | | | | Implementation | Supervision | |
| **Pre-construction Phase Impacts** | | | | | | |
| Seismic activities may damage structures, environment, health, and lives | At the Novacare Hospital Project Islamabad Project site. | After an earthquake with an intensity higher than design. | The project will be designed in accordance with the revised seismic codes | Engineering Consultant | M/s Novacare Hospitals Private Limited | Land |
| **Construction Phase** | | | | | | |
| Contamination of soil and groundwater | At the project site. | Construction of campsite and buildings. | ▪ A Septic tank with a soakage pit will be constructed for domestic wastewater from the construction camp. The outflow from the septic tank will relate to the sanitary sewerage system of the hospital to prevent contamination of soil and groundwater.<br>▪ Vehicles and equipment will not be repaired at the project site. If unavoidable, an impervious shield will be used to avoid any soil contamination.<br>▪ Waste oils (if any) will be collected in drums and sold to the recycling contractor.<br>▪ Solid waste will not be disposed of in the open, and on-site burning of solid waste will be not allowed.<br>▪ Waste bins/containers will be placed at appropriate locations.<br>▪ The recyclable waste from the project site (such as cardboard, drums, broken/used | Contractor | M/s Novacare Hospitals Private Limited | Water and Soil |

| Potential Environmental Impact | Where the impact is likely to happen | When the impact likely to occur | Mitigation Measures | Responsibility | | Parameters for Monitoring |
|---|---|---|---|---|---|---|
| | | | | Implementation | Supervision | |
| | | | parts, etc.) will be used as appropriate or to be sold to a recycling contractor.<br>▪ All preventive measures will be adopted to control the spill-over of chemicals and other effluents on the ground to protect the soil. | | | |
| Soil Erosion | At the project site. | Construction of campsite and land levelling for construction activities. | ▪ Campsite area to be kept the minimum.<br>▪ The construction of a campsite in the levelled area will minimize disturbance to the soil.<br>▪ Construction activities are carried out in a manner to minimize soil erosion.<br>▪ Land clearing, levelling and grading be minimized.<br>▪ The exposed surface will be re-surfaced and stabilized as soon as possible.<br>▪ Existing pathways and access roads will be used as much as possible.<br>▪ Appropriate slope stabilization measures will be taken as per the design (i.e., Stone pitching).<br>▪ Temporary measures, such as the construction of temporary walls reinforced with brick lining bordering the construction areas to contain debris and spoil, will also be undertaken to avoid soil erosion and water contamination.<br>▪ The hazardous waste will be kept separate and handled according to the nature of the waste. While storing, hazardous waste will be marked. | Contractor | M/s Novacare Hospitals Private Limited | Land |

| Potential Environmental Impact | Where the impact is likely to happen | When the impact likely to occur | Mitigation Measures | Responsibility | | Parameters for Monitoring |
|---|---|---|---|---|---|---|
| | | | | Implementation | Supervision | |
| Air Quality Deterioration | At the project site | Construction of campsite and buildings | ▪ Construction machinery and vehicles will be kept in good working condition and properly tuned in order to minimize exhaust emissions.<br>▪ Fugitive dust emissions will be minimized by spraying water on the soil, where required and appropriate.<br>▪ Vehicular traffic on unpaved tracks will be avoided as far as possible. | Contractor | M/s Novacare Hospitals Private Limited | Air Quality Report |
| Ground Water Quality | At the project site | Construction of campsite and buildings | ▪ The solid waste generated will be reused where possible. If not reused, they will be disposed of at the hospital designated solid waste disposal site from where the municipal committee will take it. | Contractor | M/s Novacare Hospitals Private Limited | Water Quality Report |
| Loss of Vegetation | At the project site | Construction of campsite and buildings | ▪ Removal of vegetation cover will be kept at a minimum.<br>▪ Un-necessary clearing will be avoided.<br>▪ Tree plantation will be carried out after the completion of construction activities.<br>▪ The construction workforce will be provided with LPG as cooking and heating (if required) fuel. The burning of fuelwood will be strictly prohibited. | Contractor | M/s Novacare Hospitals Private Limited | Plantation plan implementation |
| Damage to Wildlife | At the project site | Construction of campsite and buildings | ▪ The measures to prevent soil and water contamination will forestall any adverse impact on the faunal resources of the area.<br>▪ The measures to enhance natural vegetation in the area will benefit the area's fauna as well. | Contractor | M/s Novacare Hospitals Private Limited | Ambient Air and Noise Monitoring |

| Potential Environmental Impact | Where the impact is likely to happen | When the impact likely to occur | Mitigation Measures | Responsibility | | Parameters for Monitoring |
|---|---|---|---|---|---|---|
| | | | | Implementation | Supervision | |
| | | | ▪ The movement of construction machinery and equipment will be restricted to work areas only to avoid necessary disturbance of the wildlife. | | | |
| Noise and Vibration | At the project site | Construction of campsite and buildings | ▪ Construction equipment and machinery will have exhaust mufflers (silencers) to minimize noise generation.<br>▪ Noise construction activities will be carried out only during normal working hours.<br>▪ It will be ensured that the generator, vehicles and other potentially noisy equipment used are in good condition.<br>▪ The use of pressure horns will not be allowed inside the hospital premises.<br>▪ Nighttime traffic and construction activities will be avoided. The Medical Superintendent of the hospital will be taken in confidence if such work is unavoidable. | Contractor | M/s Novacare Hospitals Private Limited | Noise Monitoring |
| Health and Safety of the workforce | At the project site | Construction of campsite and buildings | ▪ All occupational and health, and safety requirements for the workforce will be adhered to.<br>▪ Special safety measures will be adopted during the lifting and unloading of the infectious waste.<br>▪ Protected sheet/fencing will be fixed around the construction site. Unauthorized access to the construction area will not be allowed.<br>▪ To minimize the occupational health hazard, proper personal protective gear, i.e. masks, shall be provided to the | Contractor | M/s Novacare Hospitals Private Limited | Health and Safety Environment Report |

| Potential Environmental Impact | Where the impact is likely to happen | When the impact likely to occur | Mitigation Measures | Responsibility | | Parameters for Monitoring |
|---|---|---|---|---|---|---|
| | | | | Implementation | Supervision | |
| | | | workers who are engaged in dust generation activity. | | | |
| Public Health, Safety and Nuisance | At the project site | Construction of campsite and buildings | ▪ The hospital staff will be educated regarding the safety hazards at the project site.<br>▪ Defensive driving practices will be inculcated in the project drivers through training.<br>▪ Vehicle speeds of 20 km/hr at the project site will be implemented.<br>▪ Appropriate light diffusers and reflectors will be used, if required, to minimize the public nuisance caused by light pollution. | Contractor | M/s Novacare Hospitals Private Limited | Public Health and Safety |
| Site Restoration | At the project site | Upon completion of construction activities | ▪ All equipment and machinery at the project site will be demolished.<br>▪ All temporary structures will be demolished, the land levelled and re-contoured to the original condition or better. All debris and any other material will be removed from the site. | Contractor | M/s Novacare Hospitals Private Limited | Demobilization of contractor |
| **Operational Phase** | | | | | | |
| Hospital Waste Generation | At the hospital | During Operation and maintenance period | ▪ The infection control protocol will be strictly implemented to minimize health risks for the staff and patients.<br>▪ The hospital waste will be properly managed.<br>▪ The infectious waste storage facility will be marked properly, and unauthorized personals will not be allowed there.<br>▪ While dealing with the waste, workers will wear personal protective equipment | Housekeeping Department, M/s Novacare Hospitals Private Limited | M/s Novacare Hospitals Private Limited | Infectious solid waste |

| Potential Environmental Impact | Where the impact is likely to happen | When the impact likely to occur | Mitigation Measures | Responsibility | | Parameters for Monitoring |
|---|---|---|---|---|---|---|
| | | | | Implementation | Supervision | |
| | | | like a gas mask, gloves, safety shoes etc.<br>▪ Thick/puncture resistant plastic bags will be used to collect Hospital Waste and rigid/puncture-proof boxes to dispose of needles/other sharps. | | | |
| Traffic Congestion | DHA Expressway | During Operation and maintenance period | ▪ Traffic management plan to be developed.<br>▪ Traffic control measures, including speed limit, are to be enforced.<br>▪ Mass awareness regarding traffic rules | Engineering Department, M/s Novacare Hospitals Private Limited | M/s Novacare Hospitals Private Limited | Traffic |
| Public Health and Safety hazards | At the hospital | During Operation and maintenance period | ▪ The infection control protocol will be strictly implemented to minimize health risks for the staff and patients.<br>▪ Proper management of hospital waste can minimize the risks both within and outside healthcare facilities.<br>▪ Strict compliance with the procedures specified in the Hospital Waste Management Rules, 2004 (and other similar standards), in close coordination with the infection control protocols mentioned above.<br>▪ Infectious Hospital waste will be incinerated on a daily basis. If not, the infectious hospital waste (yellow bag) will not be stored for more than 24 hours.<br>▪ The infectious waste storage facility will be marked properly, and unauthorized personals will not be allowed there. | Engineering Department, M/s Novacare Hospitals Private Limited | M/s Novacare Hospitals Private Limited | Public Health and Safety Hazard |

| Potential Environmental Impact | Where the impact is likely to happen | When the impact likely to occur | Mitigation Measures | Responsibility | | Parameters for Monitoring |
|---|---|---|---|---|---|---|
| | | | | Implementation | Supervision | |
| | | | ▪ While dealing with the storage facility, workers will wear personal protective equipment like a gas mask, gloves, safety shoes etc.<br>▪ Housekeeping around and inside the incinerator facility area will be ensured.<br>▪ Vaccination of the staff, particularly for Hepatitis A and B and tetanus.<br>▪ Thick/puncture resistant plastic bags to collect Hospital Waste and rigid/puncture-proof boxes to dispose of needles/other sharps will be used. | | | |

## 8.9 Solid Waste Management Plan

Construction Phase: Several solid waste bins will be placed at the construction site for the collection of solid waste.

The civil work contractor will be responsible for the disposal of solid waste generated by the project.

Empty chemical drums, iron cuttings, etc., will be collected separately at the project site within an area marked as "Scrap Yard". After a suitable time-frame, scrap will be sold to a recycling contractor.

The construction waste generated will be recycled to the extent possible. Open burning of solid waste will not be allowed.

Operational Phase: The infectious waste produced will be collected and stored in yellow bags for not more than 24 hours. The infectious waste will be disposed of using an incinerator.

## 8.10 Hospital Waste Management

The main categories of Hospital Waste Management Rules 2005 include:

- **"Hospital waste"** includes both risk waste and non-risk waste.
- **"Infectious waste"** means waste contaminated by any type of pathogens such as bacteria, viruses, parasite or fungi and includes cultures from laboratory work, waste from surgeries and autopsies, waste from infected patients, discarded or disposable materials and equipment which have been in contact with such patients and infected animals from laboratories.
- **"Pathological waste"** includes tissues, organs, body parts, fetuses, blood and body fluids.
- **"Pharmaceutical waste"** includes expired or unused pharmaceutical products, spilled contaminated pharmaceutical products, surplus drugs, vaccines or sera, and discarded items used in handling pharmaceuticals such as bottles, boxes, gloves, masks, tubes, or vails;
- **"Radioactive waste"** includes liquid, solid and gaseous waste contaminated with radionuclides generated from in-vitro analysis of body tissue and fluid, in-vivo body organ imaging and tumour localization, and investigation and therapeutic procedures.
- **"Risk waste"** means infectious waste, pathological waste, sharps, pharmaceutical waste, genotoxic waste, chemical waste, and radioactive waste.
- "sharp" includes whether infected or not, needles, syringes, scalpels, infusion sets, saws and knives, blades, broken glass, and any other item that could cut or puncture; and (r) "waste management" includes waste segregation, waste collection, waste transportation, waste storage, waste disposal and waste minimization and reuse
- **Sharps:** Sharp waste. e.g., needles, infusion sets, scalpels, knives, blades, broken glass that may cause punctures and cuts. This includes both used and unused sharps.
- **Genotoxic Waste:** Waste containing substances with genotoxic properties. e.g., waste containing cytostatic drugs (often used in cancer therapy), genotoxic chemicals.
- **Chemical waste:** Waste containing chemical substances, e.g., laboratory reagents; film developer, disinfectants (disinfectants) that are expired or no longer needed solvents
- **Waste with high content of heavy metals**: Batteries, broken thermometers, blood-pressures gauges, etc.
- **Pressurized containers**: Gas cylinders, gas cartridges, aerosol cans.

- **General solid waste**: Waste generated from offices, kitchens, packaging material from stores.
- **Microorganisms**: Any biological entity, cellular or non-cellular capable of replication or of transferring genetic material.

**Responsibility for waste management:**

Every hospital shall be responsible for the proper management of the waste generated by it till its final disposal in accordance with the provisions of the Act and the rules 16 to 22. These constitute a grave risk if they are not properly treated or disposed of or are allowed to mix with other municipal waste. Where potentially hazardous substances are being disposed of, a chain of custody document should be kept with the environmental register as proof of final disposal.

**Waste Management Plan (WMP):**

A WMP shall be prepared by a WM Officer for approval by the WM Team and shall be based on internationally recognized environmental management standards such as the International Organization for Standardization 14000 series.

The WMP shall include:

- A plan of the hospital showing the waste disposal points for every ward and department, indicating whether each point is for risk waste or non-risks waste, and showing the sites of the central storage facility for risk waste and the central storage facility for non-risk waste.
- Details of the types, numbers and estimated costs of containers, waste bags and trolleys required annually.
- Timetables include the frequency of waste collection from each ward and department.
- Duties and responsibilities for each of the different categories of the hospital. Staff members who shill generate hospital waste and be involved in the management of the waste.
- An estimate of the number of staff members required for waste collection.
- Procedures for the management of waste require special treatment, such as autoclaving before final disposal.
- Contingency plans for storage or disposal of risk waste in the event of breakdowns of incinerators or of maintenance or collection arrangements.
- Training courses and programmes on waste management; and
- Emergency procedures.
- Representatives of a local MC responsible for the collection and disposal of waste from the hospital shall be consulted in preparing and finalization of the WMP.
- The WMP shall be regularly monitored, reviewed, and revised and updated by the Waste Management Team as and when necessary.

**Table 8.2** shows Hospital Solid Waste Management and Disposal plan

**Table 8.2**: **Hospital Solid Waste Management and Disposal plan**

| Component | Actions/recommendations |
|---|---|
| **Waste Minimization, Reuse, and Recycling** | ▪ Consider practices and procedures to minimize waste generation without sacrificing patient hygiene and safety considerations<br>▪ Use of efficient stock management practices and monitoring e.g.<br>▪ For chemical and pharmaceutical stocks, Small/frequent orders for products that spoil quickly and strict monitoring of expiry dates |

| | |
|---|---|
| | ▪ Complete use of the old product before new stock is used<br>▪ Maximization of safe equipment reuse practices, including Reuse of equipment following sterilization and disinfection (e.g., sharps containers) |
| **Waste Segregation** | ▪ Waste should be identified and segregated at the point of generation.<br>▪ ***Non-hazardous waste***, such as paper and cardboard, glass, aluminium and plastic, should be collected separately and recycled. Food waste should be segregated for composting.<br>▪ ***Infectious and/or hazardous wastes*** should be identified and segregated according to their category using a colour-coded system<br>▪ Other segregation considerations include the following: Avoid mixing general health care waste with hazardous health care waste to reduce disposal costs; Segregate waste containing mercury for special disposal. Aerosol cans and other gas containers should be segregated to avoid disposal via incineration and related explosion hazard; Segregate health care products containing PVC to avoid disposal via incineration or MW Shredders and subsequent harmful air emissions |
| **On-site Handling, Collection, Transport and Storage** | ▪ Seal and replace waste bags and containers when they are approximately three-quarters full. Full bags and containers should be replaced immediately.<br>▪ Identify/label waste bags/containers properly prior to removal.<br>▪ Transport waste to storage areas on designated trolleys/carts, which should be cleaned/disinfected regularly; Waste storage areas should be located within the facility & sized to the quantities of waste generated, with the following design considerations:<br>▪ Hard, impermeable floor with drainage, and designed for cleaning/disinfection with available water supply.<br>▪ Secured by locks with restricted access.<br>▪ Designed for access and regular cleaning by authorized cleaning staff and vehicles.<br>▪ Protected from the sun and inaccessible to animals/rodents.<br>▪ Equipped with appropriate lighting and ventilation.<br>▪ Segregated from food supplies and preparation areas.<br>▪ Equipped with supplies of protective clothing, and spare bags/containers<br>▪ Store mercury separately in sealed and impermeable containers in a secure location.<br>▪ Store cytotoxic waste separately from other waste in a secure location.<br>▪ Store radioactive waste in containers to limit dispersion, and secure behind lead shields. |
| **Transport to Outside facilities for treatment** | ▪ If the proponent does not have an onsite waste treatment facility now, therefore, during operation, solid waste segregation, collection, and storage shall be the responsibility of the hospital, whereas waste transportation to treatment facility and treatment shall be the work of a contracted biomedical waste handler. Therefore, the proponent shall:<br>▪ Appoint a waste handler who is licensed by NEMA and permitted by the local government to handle, transport, and treat biomedical wastes at approved treatment sites using recommended treatment procedures given by the legal framework and respective government agencies.<br>▪ The contractor shall transport waste destined for off-site treatment facilities according to the guidelines for transport of hazardous wastes / biomedical wastes in EPA HWM Rules 2005.<br>▪ Packaging for infectious waste should include an inner, watertight layer of metal or plastic with a leak-proof seal. Outer packaging should be of adequate strength and capacity for the specific type and volume of waste;<br>▪ Packaging containers for sharps should be puncture-proof;<br>▪ Waste should be labelled appropriately, noting the substance class, packaging symbol (e.g. infectious waste, radioactive waste), waste category, mass/volume, place of origin within the hospital, and final destination; |

| | |
|---|---|
| | ▪ Transport vehicles should be dedicated to waste and the vehicle compartments carrying waste sealed. |

## 8.11 Wastewater Management Plan

During the operational phase of the Novacare Hospital Project, various wastewater will be generated:

- Blackwater (sewage) will be generated from the washrooms and kitchen of the hospital, which will contain a high concentration of faecal matter and urine, food residues, and toxic chemicals.
- Greywater (sullage) will be generated from washing, bathing, laboratory processes, laundry or technical processes such as cooling water or the rinsing of X-ray films.
- Stormwater will be generated from the hospital roofs, grounds, and paved surfaces.

The wastewater generated should be treated by taking into consideration the following wastewater management plan

- Two separate collection systems for sewage and stormwater should be constructed where the wastewater will be collected.
- The medical laboratory waste should be pretreated by using acid-base neutralization, filtration or autoclaving options.
- The blackwater should be pretreated with lime milk (hydrated calcium oxide or calcium hydroxide).
- Blood should be pretreated by using a thermal method or disposed of directly to the septic tank if safety measures are used.
- After pretreatment, the heavy solids should be removed from the wastewater through primary treatment processes, i.e., sedimentation.
- After the primary treatment, the wastewater should be treated by using indigenous bacteria to remove the dissolved and suspended biological matter.
- Finally, the wastewater should be treated with chlorine to further reduce the remaining pathogens, suspended solids and other chemical contaminants.
- After the treatment, sludge will be produced, which should be treated in the anaerobic digestor or used for composting.
- The treated water should be released in any water body or should be used for horticulture purposes.

## 8.12 HSE Management Plan

- Health Safety and Environment (HSE) induction/orientation will be provided to the workforce at the project site.
- Assembly points will be established for the gathering of the workforce regarding the daily HSE Toolbox Talk at the project site.
- HSE Toolbox Meeting will be held by HSE Manager on a weekly basis.
- Special education sessions will be conducted properly at the project site.
- The daily walkthrough will be conducted at the project site.
- All the Mandatory PPE's (Safety Helmet, Safety Jacket, Safety Shoes, Coverall, Full body Harness, Safety Goggles, Earplug, Earmuff, Dust mask/Special, Safety Gloves, Masks etc.).
- Proper and safe scaffolding will be provided at the site for safe work at height.

- All the construction machinery will be inspected properly at the site.
- All cranes and lifting gears will be inspected/checked on a regular basis.
- Inspection and Tagging system will be maintained at the project site.
- Safety signage will be provided at the project site.
- Fire posts will be established at the project site at an easy approach location.
- HSE Signboard will be installed at the project site for emergency response.
- Regular First Aid Center, along with all required medicines 24/7, will be available at the project site.

The civil work contractor will develop his HSE policy, roles and responsibilities of the HSE Manager and staff. It also provides information about HSE objectives, Personal Protective Equipment (PPE's) to be used at the site, first aid training and communication and documentation regarding HSE.

- First Aid Boxes: First aid boxes will be provided at the construction sites to cope up the emergency situations. Usually, a typical first aid box mainly contains antibiotics, basic medicines, cotton, bandages, sunny plast, healing balms, pyodine, spirit, painkiller, etc.
- Dispensaries: Medical facilities will be established by the contractor. A dedicated room will be established as a dispensary and first aid services at the construction site.
- PPEs: The site Engineer and HSE Manager will be responsible for providing PPEs to all workers.
- Safety Signs: Relevant safety signboards will be displayed on the worksites to make aware of / train workers about safety rules. Mainly safety signs include signs of speed limits, electric spark, etc.
- TBTs: Toolbox Talks (TBTs) will be delivered on a regular basis, and when a new team of workers start a new activity like shuttering, steel fixing, steel cutting, steel bending, scaffolding, concrete pouring, mechanical works, electrical works, etc. at sites to promote safety culture.
- Barricading: The contractor will put up barricade tape at all the active work sites. Hard barricading (scaffolding pipes) will be used to cover exposed areas where excavation is more than 10 feet.
- Training: Safety training will be delivered by the HSE Manager to achieve its objectives. Training will be conducted for capacity building of employees/workers/labour / sub-contractors to make them well effective to respond to any kind of emergency situation.

The breakup cost for the safety of workers is described in **Table 8.3.**

**Table 8.3: Estimated Cost for the Implementation of Environmental Monitoring Plan for Establishment of Novacare Hospital Project**

| No | Item | Quantity | Unit Cost (Rs.) | Total Cost (Rs.) |
|---|---|---|---|---|
| **Personal Protective Equipment (A)** | | | | |
| 1 | Dust Masks | 90,000 | 10 | 900,000 |
| 2 | Safety Shoes | 1,875 | 3000 | 5,625,000 |
| 3 | Gloves | 45,000 | 400 | 18,000,000 |
| 4 | First Aid Box | 15 | 3000 | 45,000 |

| No | Item | Quantity | Unit Cost (Rs.) | Total Cost (Rs.) |
|---|---|---|---|---|
| 5 | Ear Plugs | 3,750 | 400 | 1,500,000 |
| 6 | Safety Helmets | 1,875 | 1500 | 2,812,500 |
| 7 | Safety Jackets (Hi Vis) | 3,750 | 700 | 2,625,000 |
| **Others (B)** | | | | |
| 8 | Provision of Dust Bins | 15 | 2000 | 30,000 |
| 9 | Warning Tape | 5 | 500 | 2,500 |
| 10 | Safety Cones | 5 | 1000 | 5,000 |
| 11 | Safety Sign Boards | 5 | 1500 | 7,500 |
| 12 | Raincoat | 750 | 1000 | 750,000 |
| | | | **Total (A + B)** | **32,302,500** |

- Time Required for Construction Period = 30 months (2.5 years)
- Number of Labor Required during peak Construction = 750
- Personal Protective Equipment PPEs
- Dust Mask: 1 Dust Mask to be used in a week by each labourer
- Safety Shoes: 1 Safety shoe for 1 year for each labourer
- Gloves 2 pairs of gloves for each labourer for each month
- First Aid Box 1 first aid box for every 50 labourer
- Ear Plug 1 set of the earplug to be used for 6 months for each labourer
- Safety Helmet 1 safety helmet for each labourer for 12 months
- Safety Jackets 2 safety Jackets (Hi-Vis) for each labourer for 12 months
- Dust Bin: Rough estimate
- Water Sprinkling the whole construction period
- Rain Cost: 1 Raincoat for each labourer

## 8.13 Traffic Management and Construction Material Transportation Plan

- The construction material will be transported to the project site via DHA Expressway as per requirement and ease of access.
- 10 km/hr speed limited will be being maintained at the project site.
- All the light vehicles, cars, jeeps etc., are being parked in a designated area.
- Speed breakers will be followed properly.
- The experienced and license holders (drivers and operators) will be hired for transportation.
- All the heavy machinery will be checked properly and inspected on a regular basis.
- Speed limit signboards have been installed at the project site.
- All the headlights, backlights, indicators etc., of vehicles and machines, will be checked and maintained regularly.
- All the warning lights, reverse back alarms will be maintained properly.

## 8.14 Emergency Preparedness, Response and Site Evacuation Plan

- The contractor will always be ready for response in any kind of emergency at the project site.
- Special assembly points will be established at the project site (offices and site).
- The emergency siren will be installed at assembly points.
- Contact numbers of the emergency response team will be circulated at the project site.
- Close coordination will be carried out with 1122 in the case of any serious injury/accident.
- Close coordination will be carried out with all law enforcement agencies (police) in case of an aggressive mob of people in the shape of any kind of protest.
- An emergency response drill will be carried out once a month for the provision of awareness to the workforce at the project site.
- First Aid Box will be available at the project site around the clock.
- Experienced and qualified paramedic staff will be available at First Aid Post at the site under the command of the HSE Manager.
- All the new entrants will be oriented by HSE Manager regarding the required awareness towards the infectious and risky situation and control.
- The entire workforce will be provided with all mandatory PPEs for a risk-free environment.
- Special in-house training (TBT) will be conducted by the HSE Manager regarding awareness of any emergency condition and control.
- Proper water sprinkling will be carried out at the service road along with the project site for dust control to avoid any hazardous and risky situation which a cause of transport emergency can be.

## 8.15 Fire Fighting Plan

- The construction site will be equipped with fire extinguishers as well as communication equipment for contacting the appropriate emergency response teams.
- At all the project sites, emergency alarms will be installed. Persons will be nominated to ring the emergency alarm in case of an emergency situation or any emergency risk.
- All the workers will be trained and well communicated on how to respond to the emergency alarm and reach the assembly point immediately. Workers will be trained to respond to an emergency alarm, as discussed below:
- If the alarm rings for 20 seconds, only once, then it is a less severe emergency. If it rings for 20 seconds thrice after intervals, then it is medium to a severe high emergency, but it can be much severe, and If it rings for 60 seconds or more continuously, then the emergency situation is most difficult so, everyone should respond to it immediately, evacuate the workplace and move towards the assembly point.
- Proper evacuation routes will be designated, nominated, and well communicated to all. All the workers will be trained to follow the particular evacuation routes and reach the assembly point in case of an emergency situation.

## 8.16 Plantation Plan

The plantation plan recommends planting 4,000 mature plants having 4-5 feet height and 1.0 to 1.5 inches stem diameter within the green areas of DHA Phase V.

The Novacare Hospital Project will ensure the provision of staff and budget for the implementation of the plantation plan.

The practice of plantation of mature plants will be an effective compensation for carbon sequestration against the expected damages to the environment during the operational phase. The plantation of recommended indigenous species will be carried out at a distance of 8 feet, having a distance of 8-10 feet among rows in case of multiple rows.

The plantation of recommended indigenous species will be carried out at a distance of 8 feet, having a distance of 8-10 feet among rows (in case of multiple rows).

The plantation plan consists of trees, shrubs and flowering plants, which are recommended for Novacare Hospital Project.

Trees (20 ft. and above): A total of 10 trees comprising of shady, flowering, fruit trees have been recommended for plantation at Novacare Hospital Project Islamabad.

**Table 8.4: Recommended Trees for Novacare Hospital Project**

| Sr.# | Botanical Name | Description | Estimated Unit Cost |
|---|---|---|---|
| 1 | Azadirachta indica | Commonly known as neem, it has medicinal value | 200 |
| 2 | Bombax ceiba | A deciduous tree with a tall, straight trunk | 200 |
| 3 | Cassia fistula | Known as the golden rain tree. | 200 |
| 4 | Eugenia jambolana | Commonly known as Jamun | 200 |
| 5 | Mangifera indica | A fruiting plant that can easily be grown in a semi-arid climate | 500 |
| 6 | Moringa oleifera | Native to the Indian subcontinent is quite adaptable to the harsh climate | 500 |
| 7 | Psidium guajava | An evergreen shrub or small tree | 100 |
| 8 | Albizia lebbek | Siris tree is a very fast-growing deciduous tree with an open, large, spreading crown | 100 |
| 9 | Bauhinia variegata | Semi-deciduous tree to 15 m (50 ft) tall, with a spreading crown | 100 |
| 10 | Ficus religiousa | F. religiosa is a fast-growing, small tree | 500 |

Flowering Plants: A total of 6 flowering plants having positive psychological effects have been recommended at Novacare Hospital Project.

**Table 8.5: Recommended Flowering Plants for Novacare Hospital Project**

| No. | Scientific Name | Description |
|---|---|---|
| 1 | Meri gold | An evergreen flowering vine |
| 2 | Petunia | An evergreen flowering vine |
| 3 | Pansy | An evergreen flowering vine |
| 4 | Calendula | An evergreen flowering vine |
| 5 | Nausturcium | An evergreen flowering vine |
| 6 | Rose | Perennial flowering plant |

**Plantation Plan Cost**

A total number of 4,000 trees will be planted. The cost of plantation includes the cost of equipment, initial planting (including restocking during the first 2 years) and maintenance cost

for the first four years of plantation. The total estimated cost of implementation of the plantation plan is Rs. 3.32 million. The Cost of raising one plant and its maintenance for 4 years is Rs. 830.

The tentative cost of equipment is given below in **Table 8.6.**

**Table 8.6: Tentative Cost of Equipment**

| Sr. | Equipment | Numbers | Cost in PKR |
|---|---|---|---|
| 1 | Grub hoe (earth digging tool) and others | Lump-sum | 100,000 |
| | | **Total cost of equipment** | **100,000** |

The cost break-up of plantation and maintenance for a period of four years is mentioned in **Table 8.7** to **Table 8.12.**

**Table 8.7: Estimated Cost of Unit Plantation (4,000 Plants) for 1st Year**

| Sr. # | Activity | Quantity | Rate (PKR) | Amount (PKR) |
|---|---|---|---|---|
| 1 | Clearance of Site (2,000 plants) | 4,000 | 5/plant | 20,000 |
| 2 | Layout/ unit | 4,000 | 2/plant | 8,000 |
| 3 | Digging of Pits | 4,000 | 50/pit | 200,000 |
| 4 | Average cost per unit plant | 4,000 plants | 215/plant | 860,000 |
| 5 | Carriage/unit of plants from Nursery to Site including loading/unloading | 4,000 plants | 10/plant | 40,000 |
| 6 | Plantation of plants with ball of earth/unit | 4,000 | 30/plant | 120,000 |
| 7 | Addition of Manure 1 cft. / Pit | 4,000 cft. | Lump Sum | 50,000 |
| 8 | Hand watering 100 times Approx. x4,000=400,000 | 400,000 | 1/watering | 400,000 |
| 9 | Weeding 4 times 4,000x4=16,000 | 16,000 | 5/plant | 80,000 |
| 10 | Miscellaneous/ Contingencies | Nil | Lump Sum | 50,000 |
| | **Total** | | | **1,828,000** |
| | **Say** | | | **1,850,000** |

**Table 8.8: Estimated Unit Cost of Plantation of (400 Plants) & Maintenance for 2nd Year in case of 20% Mortality**

| Sr. # | Activity | Quantity | Rate (PKR) | Amount (PKR) |
|---|---|---|---|---|
| 3 | Re-Digging of Pits | 400 | 50/pit | 20,000 |
| 4 | Average cost per unit plant | 400 plants | 215/plant | 86,000 |
| 5 | Carriage/unit of plants from Nursery to Site including loading/unloading | 400 plants | 10/plant | 4,000 |
| 6 | Plantation of plants with ball of earth/unit | 400 | 30/plant | 12,000 |
| 7 | Addition of Manure 1 cft. / pit | 1,000 cft. | Lump Sum | 25,000 |
| 8 | Hand watering 100 times Approx. x4,000=400,000 | 400,000 | 1/watering | 400,000 |

| | | | | |
|---|---|---|---|---|
| 9 | Weeding 4 times 4,000x4=16,000 | 16,000 | 5/plant | 80,000 |
| 10 | Miscellaneous/ Contingencies | Nil | Lump Sum | 50,000 |
| | **Total** | | | **677,000** |
| | **Say** | | | **680,000** |

**Table 8.9: Estimated Cost of Plantation Unit (200 Plants) & Maintenance for 3rd Year**

| Sr. # | Activity | Quantity | Rate (PKR) | Amount (PKR) |
|---|---|---|---|---|
| 3 | Re-Digging of Pits | 200 | 50/pit | 10,000 |
| 4 | Average cost per unit plant | 200 plants | 215/plant | 43,000 |
| 5 | Carriage/unit of plants from Nursery to Site including loading/unloading | 200 plants | 15/plant | 3,000 |
| 6 | Plantation of plants with ball of earth/unit | 200 | 30/plant | 6,000 |
| 7 | Addition of Manure 1 cft. / pit | 1,000 cft. | Lump Sum | 25,000 |
| 8 | Hand watering 50 times Approx. x4,000=200,000 | 200,000 | 1/watering | 200,000 |
| 9 | Weeding 3 times 4,000x3=12,000 | 12,000 | 5/plant | 60,000 |
| 10 | Miscellaneous/ Contingencies | Nil | Lump Sum | 50,000 |
| | **Total** | | | **397,000** |
| | **Say** | | | **400,000** |

**Table 8.10: Estimated Cost of Maintaining 4,000 plants for 4th Year**

| Sr. # | Activity | Quantity | Rate (PKR) | Amount (PKR) |
|---|---|---|---|---|
| 1 | Hand watering 50 times 4,000x50=100,000 | 200,000 | 1/time | 200,000 |
| 2 | Weeding | 4000 | 5/unit | 20,000 |
| 3 | Trimming/pruning of plants | 4,000 | 5/unit | 20,000 |
| 4 | Miscellaneous | | | 50,000 |
| | | | **Total** | **290,000** |

**Table 8.11: Total Cost of Plantation Plan for Four years**

| Activity | Amount (PKR) |
|---|---|
| Estimated Cost of Unit Plantation (4,000 Plants) for 1st Year | 1,850,000 |
| Estimated Unit Cost of Plantation of (400 Plants) & Maintenance for 2nd Year in case of 20% Mortality | 680,000 |
| Estimated Cost of Plantation Unit (200 Plants) & Maintenance for 3rd Year | 400,000 |
| Estimated Cost of Maintaining 4,000 plants for 4th Year | 290,000 |
| **Total** | **3,220,000** |

**Table 8.12: Final Cost per Tree Planted**

| Activity | Amount (PKR) |
|---|---|
| Cost for maintenance of cultivated plants for 4 years | 3,220,000 |
| Cost of equipment | 100,000 |
| Total cost | 3,320,000 |
| **Cost for raising one plant and its maintenance for 3 years** | **830** |

## 8.17 Restoration and Rehabilitation Plan

Restoration of the project site and associated facilities, including access tracks, is of utmost importance. Improper disposal of the waste left at the end of the construction activities would lead to extensive disturbance to the environment.

Following measures will be adopted for site restoration and rehabilitation:

- All equipment and machinery at the project site will be de-mobilized.
- All waste at the project site will be disposed of according to the requirement of EIA.
- The Septic tank with soakage pit will be properly dismantled.
- All temporary concrete structures at the project site will be dismantled, and construction and demolition material will be handed over to the concerned contractor for reuse or disposal.
- All the unnecessary pits at the project site will be backfilled.

## 8.18 Proposed monitoring program to access performance or output of EMP

The Novacare Hospital Project will make necessary arrangements to monitor the key environmental data during the construction and operational phases for the first three years after the operational phase. These will include the quantity of water used, a record of waste produced, a record of waste disposal, and project-related vehicular traffic.

The Project coordinator, Novacare Hospital Project, will monitor project activities while working in the project area. He will keep a record of all non-conformances observed and report these along with actions to the Novacare Hospital Project for further action. He will also have to report any impacts anticipated along with his recommendations for further action.

## 8.19 Proposed EMP reporting and reviewing procedures

Environmental Monitoring is normally undertaken during both the construction and operational phases of the project to ensure the effectiveness of the proposed mitigation measures.

In order to respond to unanticipated environmental concerns at an early stage and to determine the accuracy of impact, predictions are also required. Specific monitoring programs are outlined below as well as responsibilities for the collection and analysis of data and the reporting requirements.

The various purposes of the environmental monitoring plan are:

- To evaluate the effectiveness of mitigation measures.
- To respond to the unanticipated environmental impacts when the project is under implementation.
- To make regulations and improve management and environmental controls based on the monitoring data. Pakistan Environmental Protection Agency is entrusted with the overall responsibility of monitoring the environment in Islamabad.

An Environmental Monitoring Plan for the establishment of Novacare Hospital Project has been provided in **Table 8.13**. The plan will be used as a management and monitoring tool for

the implementation of the mitigation measures required by the EIA. The plan entails the required mitigation measures recommended in the EIA.

**Table 8.13: Environmental Monitoring Plan for Establishment of 250 Bedded Novacare Hospital Project**

| Environmental Component | Project Phase | Parameters | Locations | Frequency | Standards | Implementation | Supervision |
|---|---|---|---|---|---|---|---|
| **Construction Phase** | | | | | | | |
| Air Quality | Construction | $SO_2$, NO, $NO_2$, $O_3$, $PM_{10}$, $PM_{2.5}$, and CO | At one location in Novacare Hospital Project Site | $PM_{10}$, for continuous 8 hours, on a quarterly basis | WHO/USEPA guidelines, PEQS | Civil Work Contractor | M/s Novacare Hospitals Private Limited |
| Roadside Plantation | Construction | Visual inspection of plant species survival rate and status of maintenance | At sites where the plantation was carried out | (1) One month after the plantation<br>(2) One year after the plantation<br>1 month, 3 months, 6 months, and 12 months after planting | 75 % survival rate | Civil Work Contractor | M/s Novacare Hospitals Private Limited |
| Noise Levels | Construction | dB (A) | At a central location in Novacare Hospital Project | Twice in 8 hours at a selected site on a quarterly basis. | EPA Ambient Noise standards | Civil Work Contractor | M/s Novacare Hospitals Private Limited |
| Water Quality | Construction | pH, BOD, COD, TDS, TSS, DO, coliforms, hardness, nitrate, chloride, sulphate, hydrocarbon, | At two locations, i.e., start and end of the Project site | Quarterly | WHO and PEQS | Civil Work Contractor | M/s Novacare Hospitals Private Limited |
| **Operational Phase** | | | | | | | |
| Plantation | Operation (First three years) | Visual inspection of plant species survival rate and status of maintenance | At sites where the plantation was carried out | (1) 2.5 years after plantation | 75% survival rate | M/s Novacare Hospitals Private Limited | M/s Novacare Hospitals Private Limited |

| Environmental Component | Project Phase | Parameters | Locations | Frequency | Standards | Implementation | Supervision |
|---|---|---|---|---|---|---|---|
| Hospital Waste Management | Operational phase | Infectious hospital waste | Hospital Waste Management facility | Quarterly | NEQS | M/s Novacare Hospitals Private Limited | M/s Novacare Hospitals Private Limited |

**Key:**

**dBA =** decibels (measured in the audible range)

**EPA =** Environmental Protection Authority

**$PM_{10}$ =** Particulate Matter smaller than about 10 micrometres

**ROW** = Right-of-Way

**NEQS** = National Environmental Quality Standards

**SPM =** Suspended Particulate Matter

**TSS =** Total Suspended Solids

**USEPA =** United States Environmental Protection Agency

**WHO =** World Health Organization

**Table 8.14** shows the estimated cost for the EMP.

**Table 8.14: Estimated Cost for the Implementation of Environmental Monitoring Plan for the establishment of Novacare Hospital Project, DHA, Islamabad**

| Environmental Monitoring Activities | Units/ No. of Samples | Unit Cost specification | Cost (Rs) |
|---|---|---|---|
| **Construction phase** | | | |
| Ambient air quality monitoring Quarterly basis for 30 months | 7.5 | @ 50,000 per sample for 24 hr monitoring | 375,000 |
| Ambient water quality monitoring Quarterly basis on one location for 30 months | 7.5 | @ 15,000 per sample | 112,500 |
| Noise levels, quarterly basis for 30 months | 7.5 | @ 5,000 per sample | 37,500 |
| Environment , Health Safety Engineer at the project site | 30 months | @ 100,000 | 3,000,000 |
| | | **Total** | **3,525,000** |

## 8.20 Training needs required to ensure implementation of EMP and Monitoring plans

Training programs are a necessary agenda that has to be implemented to implement the Environmental Management and Monitoring Plan effectively. The Environment, Health and Safety Officer will impart training to the contractor's staff. The key objective of the training program is to ensure that the requirement of EMP is clearly understood and followed throughout the project. The training shall cover the following areas:

- Environmental sensitivity of the project area.
- EMP communication and documentation requirement.
- Vegetation and community issues and their mitigation measures.
- Safe construction practices
- Use of personal protective equipment's (PPEs)
- Environmentally sound construction practices
- Vehicular safety.
- Site restoration requirement.
- Solid Waste Disposal

M/s Project Procurement International, Punjab will be primarily responsible for providing training to all project personnel. Lump-sum fees of Rs. 2,000,000/= should be kept for the training management plan. Framework for the environmental and social training program is being provided in **Table 8.15.**

**Table 8.15: Framework for Environmental & Social Training Program of Establishment of Novacare Hospital Project Project**

| Type of Training | Training Description | Period | Duration | Training By | Trainee |
|---|---|---|---|---|---|
| Occupational Health and Safety staff | Training should be provided to aware staff to conform to safety codes | Before Commencement of Project Activities | Full day | External Sources | EHS Manager |
| Environment and Social Laws, Regulations, procedure and guidelines of the government | The training should detail the laws and regulations concerning the environment, Labour laws and compliance with government regulation. | Before Commencement of Project Activities | Full day | External Sources | EHS Staff, Site Supervisors, Site Engineers. |
| Occupational Health and Safety for workers | Health, safety and hygiene. Proper usage of Personal Protective Equipment (PPE's), Precautions to be taken for working in confined areas. | Before Construction Activities | Full Day | EHS Manager | Workers |
| Solid Waste Management | Waste segregation, identification of infectious Waste, Use of PPEs and waste Handling | Before Commencement of Project Activities | Full Day | External Sources | Relevant workers and staff |
| Vehicular safety | Safe operation and maintenance of all vehicles, insurance in accordance with the applicable local and federal laws | Before Commencement of Project Activities | Full Day | EHS Manager | Relevant workers and staff |
| Vegetation and community issues and their mitigation measures | To analyze the community problems and how to cater to serious issues relevant to vegetation and agricultural land of the community | Before Commencement of Project Activities | Full Day | EHS Manager | Relevant workers and staff |
| Safe construction practices | To upgrade local craftsmen's skill in quality construction and develop skilful working human resources in hazard-resistant construction | Before Commencement of Project Activities | Full Day | EHS Manager | Relevant workers and staff |
| Health Safety and Environmental Auditing | Health Safety and Environmental Audits, Reporting Requirements | Before Commencement of Project Activities | Full Day | External Sources | Relevant Department |
| Implementation of environmental management and monitoring plan | Explanation of Environment Management and Monitoring Program | Quarterly. As soon as the project activities start | Full Day | External Sources | EHS Staff |

## 8.21 Environmental Budget

The cost required to implement the mitigation measures effectively is important for the sustainability of the project both in the construction and operational phases of Project. The summary of the cost of monitoring the environment and mitigation cost is shown in **Table 8.16**.

**Table 8.16: Summary of Environmental Budget**

| Activity | Basis | Cost (Rs) |
|---|---|---|
| Environmental Monitoring Cost | Ambient Air, Noise and Water Quality Monitoring | 3,525,000 |
| Plantation Plan | Implementation of plantation plan | 3,320,000 |
| Health and Safety of Workers | For 750 employees for the provision of dust masks, safety shoes, gloves, first aid box, ear plugs, safety helmets and safety jackets (Hi-Vis) and Provision of dustbins, warning tap, safety cones, safety signboards and water sprinkling | 32,302,500 |
| Solar System | It is expected that a Solar System between 300kw to 400 kw will be installed on building roof to generate clean electricity. | 45,000,000 |
| Rainwater Storage Tank | Underground water storage tank to catch the surface runoff and treatment of this water using RO Plant upto NEQS level. | 30,000,000 |
| Reverse Osmosis Plant | To treat supply water and rainwater for potable use. | 10,000,000 |
| Wastewater Treatment Plant | To treat liquid waste generated onsite. | 40,000,000 |
| LED Lights | Efficient and low impact lights to be installed in the building. | 48,000,000 |
| Efficient HVAC System | HVAC with ERR of 11.8 is selected in comparison with standard requirement of 9.0 which will increase the cost of HVAC Chiller procurement by PKR 65 million, but will reduce the electricity consumption. | 65,000,000 |
| Water Efficient Plumbing Fixtures | All plumbing fixtures to be installed will use 40% less water then the baseline established by International Plumbing Code. | 30,000,000 |
| Efficient Building Envelope | Project is installing all external glass with a Heat Transmission Coefficient (U) value of 1.6W/m$^2$K against the requirement of 3.5W/m$^2$K which adds PKR 55 million to our budget but reduces the building energy requirements significantly. | 55,000,000 |
| Excavation Protection System | EPS to be installed for safety of workforce. | 140,000,000 |
| Cost for LEEDS, EDGE and WELL Certification | | 24,000,000 |
| Cost of Environmental Training | For the whole construction period | 2,000,000 |
| | **Grand Total** | **528,147,500** |

## 8.22 Reporting/Communication and Documentation

An effective program for storing and communicating environmental information during the project is an essential requirement of an EMP. This activity will be done by an independent monitoring consultant. The key features of such a mechanism are:

- Precise recording and maintenance of all information generated during the monitoring in a predetermined format.
- Communicating the information to a central location
- Storing the raw information in a central database
- Processing the information to produce periodic reports

Data recording and maintenance: All forms will be numbered, and a tracking system will be developed for each. Whenever a form is released for use in the field, its number will be recorded. The monitors will be required to account for each form after completion. In this manner, it will be ensured that all forms are returned to the office, be they filled, unused or discarded.

Storage of information: A database for information collected during the project will be prepared. The database may include information on training programs, staff deployment, non-compliance, corrective actions, water resources, results of effects monitoring.

Meeting: For effective monitoring, management, and documentation, of the environmental performance during the operation, environmental matters will be discussed during a daily meeting held on-site. Environmental concerns raised during the meetings will be mitigated after discussions with the proponent site representatives.

Reporting: The monitoring body will produce daily, weekly, monthly and another periodic report, as well as a final report of the project based on the information collected. The proponent site representative and the contractors will also prepare a weekly environmental report. Copies of the proponent will be provided to the proponent and contractor's higher management.

## 8.23 Change Management Plan

The EIA for Novacare Hospital Project recognizes that changes in the EMP may be required and therefore provides a Change Management Plan to manage such changes.

The overall responsibility for the preparation of change management statements will lay with the project Manager, Novacare Hospital Project. However, if major changes are envisaged, then the environmental consultant will review the entire process and formulate the Change Management Plan to be implemented by the Project Manager, Novacare Hospital Project.

## 8.24 Quarterly Environmental Monitoring Report

The contractor will prepare a Quarterly Environmental Monitoring Report of project activities carried out during the specified period of the proposed project.

M/s Novacare Hospitals Pvt. Limited will submit the Quarterly Environmental Monitoring Report of the project to the Pakistan Environmental Protection Agency. A format of the Quarterly Environmental Monitoring Report has been provided in **Annexure 9.**

## 8.25 Post Project Monitoring

The Novacare Hospital Project or the representative shall prepare a brief post-project report describing the conduct of the actual operation, any changes from the operation for which approval was obtained, the degree to which the recommendations of the EIA were adhered to, any damages to the environment and the mitigation or compensation provided, and monitoring information of scientific or environmental interest that is not propriety in nature. This report should be submitted to the Pakistan Environmental Protection Agency.

# 9 Conclusion and Recommendations

## 9.1 Introduction

This chapter presents the assessment of the possible environmental impacts of the establishment of the Novacare Hospital Project. The study presents the purpose of the EIA as to the description of the site, the impact of the project during and after implementation, the mitigation measures, and residual impacts.

The EIA also includes the justification and detailed description of the project, with an evaluation of the potential impacts and effects on the environment, including economic and social consequences. This chapter describes the conclusion and recommendation of the EIA study of the project.

## 9.2 Conclusions

The major conclusions of the EIA are:

- The primary objective of the project is to provide quality health care to local community of DHA and nearby villages through provision of high quality healthcare services in DHA Phase V.
- M/s Novacare Hospitals Pvt. Limited intends to construct a 250 Bedded Novacare Hospital in DHA Phase V, Islamabad.
- The Novacare Hospital Project has been proposed at a piece of land having an area of 225,000 sq.ft. Proposed hospital has a functional covered area of 450,000 sq.ft and an additional subgrade covered parking area of 150,000 sq.ft.
- The proposed project will comprise of 2 basements, Ground floor plus 9 floors and a mumty floor for MEP services. The facilities and departments provided at the Novacare Hospital, DHA Phase V, Islamabad include various outpatient clinics, emergency and trauma Services, lab and imaging, surgical facilities, ICUs, and inpatient facilities.
- The estimated cost of the project is Rs 24 Billion and is expected to be completed in 30 months.
- The potential impacts during the construction phase include loss of flora (shrubs and grass only), soil erosion and contamination, water contamination, deterioration of ambient air quality caused by the construction activities.
- The significant environmental management issues during the operational phase include air pollution, sewage disposal, solid waste and noise pollutions, and ash disposal.
- The project construction and operational activities can potentially affect the people living in the vicinity of the project site. These adverse impacts can be largely reduced by implementing the appropriate mitigation measures, which has been discussed in this report.
- The mitigation measures have been identified for impacts expected during the different phases of the project.

Based on the recommended mitigation measures in chapter 7, the impacts identified will be reduced, with residual impacts having insignificant levels.

## 9.3 Recommendations

- A plantation plan has been proposed in the EIA report, which will be developed and implemented for the establishment of the Novacare Hospital Project.

- M/s Novacare Hospitals Pvt. Limited should properly implement the sewerage treatment plant for the Novacare Hospital Project.
- M/s Novacare Hospitals Pvt. Limited should properly design and implement a hospital waste management plan for the Novacare Hospital Project during operational phase.

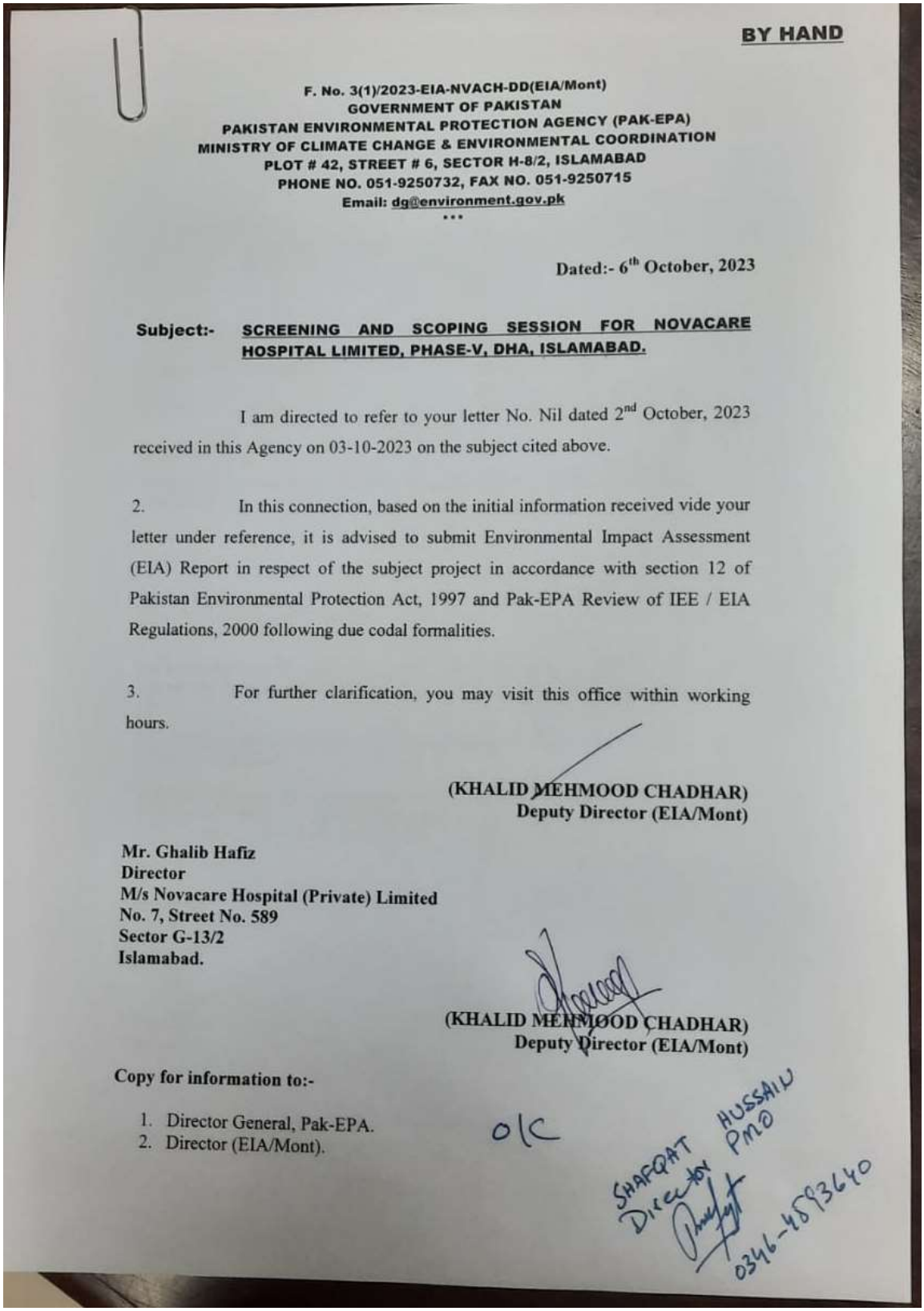
On the basis of the overall impact assessment, more specifically, the nature and magnitude of the residual environmental impacts identified during the present EIA, it is concluded that the establishment of Novacare Hospital Project is likely to cause environmental impacts during its construction and operational phase. However, these impacts can be mitigated by the implementation of proposed mitigation measures. M/s Novacare Hospital Limited will ensure the effective implementation of mitigation measures during the construction and operational phase.

There are no remaining issues that warrant further investigation. This EIA is considered adequate for the environmental and social justification of the project.

# Annexure-1: List of Name, Qualification and Roles of EIA Team Members

| Name | Project Position | Qualification and Experience | Tasks assigned / TORs of individual Specialist |
|---|---|---|---|
| Mr. Saadat Ali | Team Leader/ Environmental Engineer | Postgraduate Diploma in Sanitary Engineering, International Institute for Hydraulic and Environmental Engineering, 1984<br>B. Sc Civil Engineering, Engineering College, University of Peshawar, 1978 | ▪ Overall management of the Project (Supervision, site visits, guidance, inputs and suggestion, recommendation and discussion and report presentations<br>▪ To review overall environmental issues and mitigation measures.<br>▪ To prepare the draft and final study reports. |
| Mr. Ali Abdullah | Environmental Engineer | M. Sc. Environmental Engineering, Newcastle University (2016)<br>B. Sc. Civil Engineering, The University of Lahore, Lahore (2010-1014)<br>A Levels, The City School (2008-2010) | ▪ Suggest mitigation measures for impacts that impact the environment.<br>▪ Identification of site for baseline data collection for water, wastewater, noise, soil, traffic and ambient air quality. |
| Ms. Amna Saeed | Environmental Engineer | B. Sc. Environmental Engineering, UET Lahore (2018-2022) | ▪ Preparation of draft report<br>▪ Field work for baseline data collection in the area under study<br>▪ Secondary data collection for desk review<br>▪ Field work for baseline data collection in the area under study<br>▪ Identifying any rare, endemic, protected or endangered species in the Project area<br>▪ Public Consultation<br>▪ Draft Environmental management plan for successful management of expected environmental impacts from the Project. |
| Mr. M. Ali Qureshi | Environmental Engineer | M. Sc. Environmental Engineering, NUST Islamabad (2022-ongoing)<br>B. Sc. Environmental Engineering, UET Taxila (2018-2022) | ▪ Field work for baseline data collection in the area under study<br>▪ Secondary data collection for desk review<br>▪ Public Consultation |

# Annexure – 2: Screening and Scoping Letter



**BY HAND**

F. No. 3(1)/2023-EIA-NVACH-DD(EIA/Mont)
GOVERNMENT OF PAKISTAN
PAKISTAN ENVIRONMENTAL PROTECTION AGENCY (PAK-EPA)
MINISTRY OF CLIMATE CHANGE & ENVIRONMENTAL COORDINATION
PLOT # 42, STREET # 6, SECTOR H-8/2, ISLAMABAD
PHONE NO. 051-9250732, FAX NO. 051-9250715
Email: dg@environment.gov.pk

Dated:- 6th October, 2023

**Subject:- SCREENING AND SCOPING SESSION FOR NOVACARE HOSPITAL LIMITED, PHASE-V, DHA, ISLAMABAD.**

I am directed to refer to your letter No. Nil dated 2nd October, 2023 received in this Agency on 03-10-2023 on the subject cited above.

2. In this connection, based on the initial information received vide your letter under reference, it is advised to submit Environmental Impact Assessment (EIA) Report in respect of the subject project in accordance with section 12 of Pakistan Environmental Protection Act, 1997 and Pak-EPA Review of IEE / EIA Regulations, 2000 following due codal formalities.

3. For further clarification, you may visit this office within working hours.

(KHALID MEHMOOD CHADHAR)
Deputy Director (EIA/Mont)

**Mr. Ghalib Hafiz**
**Director**
**M/s Novacare Hospital (Private) Limited**
**No. 7, Street No. 589**
**Sector G-13/2**
**Islamabad.**

(KHALID MEHMOOD CHADHAR)
Deputy Director (EIA/Mont)

**Copy for information to:-**

1. Director General, Pak-EPA.
2. Director (EIA/Mont).

O/C

SHAFQAT HUSSAIN
PMO
Director
0346-4593640

# Annexure-3: Terms of Reference

An EIA will be carried out for all stages of the projects, i.e. preconstruction, construction and post-construction, with the following objectives:

- Establishing the environmental baseline in the study area and identifying any significant environmental issues.
- Assessing these impacts and providing for the requisite avoidance, mitigation and compensation measures.
- Integrating the identified environmental issues in project planning and design.
- Developing appropriate management plans for implementing, monitoring and reporting the environmental mitigation and enhancement measures suggested.
- Give presentation during a public hearing of the EIA of the Novacare Project and respond to queries generated by Pak EPA until issuance of the NOC.

# Annexure-4: References


- Astha Kumari et al., Current Developments in Biotechnology and Bioengineering, Hospital wastewater treatment scenario around the globe 2020;68: 549–570
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- Wassermann D. A decade of change in clinical waste treatment and disposal in Scotland. Health Estate, 1999; 53:6–12.

# Annexure-5: Glossary

| | |
|---|---|
| **Air pollution** | Air is a composition of several gases, mostly nitrogen and oxygen and smaller amounts of water vapour, carbon dioxide, argon and other trace gases. Air pollution occurs when harmful chemicals and particles are emitted to the air – due to human activity or natural forces – at a concentration that interferes with human health or welfare or that harms the environment in other ways. |
| **Ambient air quality** | Ambient air quality refers to the quality of outdoor air in our surrounding environment. It is typically measured near ground level, away from direct sources of pollution. |
| **Anatomical Waste** | Anatomical waste is a subtype of pathological waste, materials that are recognizably human or animal body parts, such as an amputated limb. |
| **Archaeology** | The study of human history and prehistory through the excavation of sites and the analysis of artefacts and other physical remains. |
| **Biodiversity** | The variety of plant and animal life in the world or in a particular habitat, a high level of which is usually considered to be important and desirable. |
| **By-law** | A rule made by a local authority to govern activities within the area it controls. Examples include by-laws covering waste disposal, traffic or public events or signs. |
| **Carbon dioxide ($CO_2$)** | A colourless gas that is naturally produced by animals and people in the exhaled air and the decay of plants. |
| **Carbon monoxide** | A highly poisonous, odourless, tasteless and colourless gas that is formed when carbon material burns without enough oxygen. |
| **Climate** | The pattern of weather in a particular region over a set period of time, usually 30 years. |
| **Cytotoxic & Cytostatic Waste** | Cytotoxic and cytostatic waste includes medicines in tablet, liquid, cream or aerosol form. Cytotoxic and cytostatic medicines are medicines that are either toxic, carcinogenic, mutagenic or toxic for reproduction. |
| **Clinical Waste** | Clinical waste is the term used for waste generated from healthcare and similar activities that may pose a risk of infection, e.g. bandages, swabs. |
| **Conservation** | Preserving or protecting animals and resources such as minerals, water and plants through planned action (such as breeding endangered species) or non-action (such as not letting taps run unnecessarily). |
| **Deforestation** | The reduction of trees in a wood or forest due to natural forces or human activity such as burning or logging. |
| **Effluent** | Liquid wastes such as sewage and liquid waste from industries. |
| **Energy efficiency** | Actions to save fuels, for example, better building design, changing production processes, developing better transport policies, using better road vehicles and using insulation and double glazing in homes. |
| **EIA** | An environmental impact assessment (EIA) is an analytical process that systematically examines the possible environmental consequences of the implementation of projects, programs and policies. |
| **EMP** | An environmental management plan (EMP) is a site-specific plan developed to ensure that all necessary measures are identified and implemented in order to protect the environment and comply with environmental legislation. |
| **Fauna** | The animals of a particular region, habitat, or geological period. |
| **Flora** | The plants of a particular region, habitat, or geological period. |

| | |
|---|---|
| **Habitat** | The area occupied by a community or species (a group of animals or plants), such as a forest floor, desert or seashore. |
| **Initial Environmental Examination** | Initial environmental examinations describe the environmental condition of a project, including potential impact, formulation of mitigation measures, and preparation of institutional requirements and environmental monitoring. |
| **Landfill** | A site that is specially designed to dispose of waste and operates with a license granted by the Environmental Protection Agency (EPA). |
| **Medical Waste** | Medical waste is any kind of waste that contains infectious material. E.g. anything that is soaked in blood, any waste produced in the patient's room. |
| **Offensive/Hygiene Waste** | Any waste that is not infectious and does not contain pharmaceutical or chemical substances and is likely to cause offence to the senses is an offensive waste. |
| **Pyrolytic Combustion** | Pyrolysis is the thermal decomposition of materials at elevated temperatures in an inert atmosphere. Pyrolysis is considered as the first step in the combustion process, and extreme pyrolysis leaves mostly carbon as the residue, which is called carbonization. |
| **Noise Pollution** | Noises that disturb the environment and people's ability to enjoy it, for example, continually sounding house alarms, loud music, air conditioning or other electrical units and aircraft or motor engines. |
| **Seismology** | The branch of science is concerned with earthquakes and related phenomena. |
| **Topography** | The arrangement of the natural and artificial physical features of an area. |

# Annexure-6: List of People Met During EIA

| No. | | Name of Person | Designation |
|---|---|---|---|
| 1 | Stakeholders | Mr. Ghalib Hafiz | Director, M/s Novacare Hospital Limited |
| 2 | | Mr. Sher Afzal | Assistant Director E&SS, Islamabad Electric Supply Company |
| 3 | | Mr. Ammad Ud Din Muhammad | Additional Director (Building Safety Division), E&DM |
| 4 | | Mr. Anwar Kamal | Assistant Director, Emergency and Disaster Management Directorate |
| 5 | | Mr. Zulqarnain | Emergency and Disaster Management Directorate |
| 6 | | Dr. Asif Ali | Medical Doctor, Cardiologist |
| 7 | | Dr. Musharib Ali | Lecturer, National University of Sciences and Technology |
| 8 | | Mr. Farhan Lodhi | Chief Executive Officer, Environmental and Waste Management Solutions, Islamabad |

| No. | Name | Age | Gender | Education | Designation |
|---|---|---|---|---|---|
| 9 | Khurram Shehzad | 35 | Male | Middle | Hardware Store |
| 10 | Muhammad Kamran | 28 | Male | Middle | Shopkeeper |
| 11 | Sahib Zaman | 32 | Male | Matric | Business |
| 12 | Muhammad Rehmat | 35 | Male | Middle | Resident |
| 13 | Saad Jamil | 35 | Male | Bachelors | Property Dealer |
| 14 | Abdul Majid | 27 | Male | Intermediate | Property Dealer |
| 15 | Tahir Bhatti | 48 | Male | Intermediate | CEO, BM Property & Builders |
| 16 | Ijaz Hussain | 28 | Male | Primary | Labour |
| 17 | Shehzad Ahmad | 30 | Male | Intermediate | Private Job |
| 18 | Muhammad Azeem | 27 | Male | Intermediate | Contractor |
| 19 | Syed Akhtar | 35 | Male | Middle | Contractor |
| 20 | Muhammad Sultan | 30 | Male | Intermediate | Labour |

# Annexure-7: Groundwater Quality Report

ESPAK

ENVIRONMENTAL SERVICES PAKISTAN

PAK EPA & PUNJAB EPD CERTIFIED

## CHEMICAL ANALYSIS TEST REPORT (GROUND WATER)

| | | | |
|---|---|---|---|
| **Reference Number:** | ESPAK/0228I/23/GW/6322/01335 | **Date:** | 30/10/2023 |
| **Name of Industry / Client:** | Project Procurement International | | |
| **Address:** | Office #26, 2nd Floor, Silver City Plaza, G11 Markaz, Islamabad | | |
| **Telephone No.:** | --- | | |
| **Nature of Sample:** | Ground Water (33.526541,73.1992244) | | |
| **Date Sample Received:** | 24/10/2023 | **Grab / Composite:** | Grab |
| **Date of Sample Collection:** | 23/10/2023 | | |
| **Sample Collected / Sent By:** | Farhan Ali, Analyst (Field), ESPAKt | | |
| **Date of Completion of Analysis:** | 30/10/2023 | | |

| S. No | Parameters | Limit Values (NSDWQ) | Concentration | Method / Equipment Used | Remarks |
|---|---|---|---|---|---|
| 1 | Total Coliforms | --- | ND | SMWW 9222 B | --- |
| 2 | Fecal Coliform Bacteria | Must not be detectable in any 100mL sample | ND | SMWW 9222 H | Within Limits |
| 3 | E. Coli | Must not be detectable in any 100mL Sample | ND | SMWW 9222 H | Within Limits |
| 4 | Color | ≤15 TCU | ND | SMWW 2120 C | Within Limits |
| 5 | Taste | Non Objectionable / Acceptable | Acceptable | Organoleptic | Within Limits |
| 6 | Odor | Non Objectionable / Acceptable | Acceptable | Organoleptic | Within Limits |
| 7 | Turbidity | <5 NTU | 1.2 NTU | SMWW 2130B | Within Limits |
| 8 | Total Hardness as $CaCO_3$* | <500 mg/L | 356 mg/L | SMWW 2340C | Within Limits |
| 9 | Total Dissolved Solids (TDS)* | <1000 mg/L | 509 mg/L | SMWW 2540C | Within Limits |
| 10 | pH* | 6.5-8.5 | 7.5 | SMWW 4500H*B | Within Limits |
| 11 | Chloride (as $Cl^-$)* | <250 mg/L | 30 mg/L | SMWW 4500Cl*B | Within Limits |
| 12 | Cyanide ($CN^-$) | ≤0.05 mg/L | ND | SMWW 4500 $CN^-$ F | Within Limits |
| 13 | Nitrate ($NO_3^-$) | ≤50 mg/L | 7.0 mg/L | SMWW 4500$NO_3^-$B | Within Limits |
| 14 | Nitrite ($NO_2^-$) | ≤3 mg/L | ND | SMWW 4500$NO_2^-$B | Within Limits |
| 15 | Residual Chlorine | 0.2-0.5 mg/L | ND | SMWW 4500-Cl B | --- |
| 16 | Phenolic Compounds (as Phenols) | NGVS | ND | SMWW 5530 C | --- |
| 17 | Fluoride ($F^-$)* | ≤1.5 mg/L | 0.1 mg/L | U.S. EPA 9214 | Within Limits |
| 18 | Aluminum (Al) | ≤0.2 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| 19 | Chromium (Cr) | ≤0.05 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| 20 | Copper (Cu) | 2.0 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| 21 | Antimony (Sb) | ≤0.005 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| 22 | Lead (Pb) | ≤0.05 mg/L | ND | U.S. EPA-200.7 | Within Limits |

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Peshawar, Pakistan.
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ESPAK

# ENVIRONMENTAL SERVICES PAKISTAN

PAK EPA & PUNJAB EPD CERTIFIED

## CHEMICAL ANALYSIS TEST REPORT (DRINKING WATER)

**Reference Number:** ESPAK/0228I/23/GW/6322/01335 **Date:** 30/10/2023

**Name of Industry / Client:** Project Procurement International

| S. No | Parameters | Limit Values (NSDWQ) | Concentration | Method / Equipment Used | Remarks |
|---|---|---|---|---|---|
| 23 | Manganese (Mn) | ≤0.5 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| 24 | Mercury (Hg) | ≤0.001 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| 25 | Nickel (Ni) | ≤0.02 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| 26 | Arsenic (As) | ≤0.05 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| 27 | Barium (Ba) | 0.7 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| 28 | Cadmium (Cd) | 0.01 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| 29 | Selenium (Se) | 0.01 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| 30 | Boron (B) | 0.3 mg/L | ND | U.S. EPA-200.7 | Within Limits |
| 31 | Zinc (Zn) | 5.0 mg/L | ND | U.S. EPA-200.7 | Within Limits |

**NSDWQ:** National Standards for Drinking Water Quality, 2010
**SMWW:** Standard Methods for the Examination of Water and Waste Water 23rd Edition, American Public Health Association, American Water Works Association, Water Environment Federation USA (2017)
**ND:** Not Detected

- Laboratory tests and measurements were carried out at 25 ± 5 °C and 50 ± 20 % Relative Humidity conditions unless required otherwise.
- Uncertainty of Measurement (UoM) data will be provided on request, where available. The statement of conformity, if provided in the report, is based on the decision rule of simple acceptance or rejection with equal shared risk due to measurement uncertainty.

Note:

- **The report should be reproduced as a whole and not in parts.**
- **The responsibility of the ethical use of this report lies with the client.**
- **The values represent sample conditions when monitoring/testing was carried out.**
- **The report data is not intended to be used legally by the client.**
- **Only parameters marked with asterisk (*) are ISO 17025:2017 accredited.**

1. **Sample Analyzed By:** Khizra Bano (Analyst (Microbiology)), Waqas Ahmad (Analyst (ICP-AES)), Abdul Aziz (Analyst (Chemical)), Muhammad Shahid (Analyst (Chemical)), Saima Riaz (Analyst (Chemical))
2. **Name of Chief Analyst with Seal:** Muhammad Arfan
3. **Signature of Incharge of the Environmental Laboratory:**

**Name:** Imran Malik
General Manager
**Date:** 30/10/2023

---------- End of Report ----------

Environmental Services Pakistan ESPAK



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# Annexure-8: Ambient Air and Noise Monitoring Reports

ESPAK

ENVIRONMENTAL SERVICES PAKISTAN

## CHEMICAL ANALYSIS TEST REPORT (AMBIENT AIR)

**Reference Number:** ESPAK/0228I/23/AA/6320/00570 **Date:** 26/10/2023
**Name of Industry/Client:** Project Procurement International
**Address:** Office #26, 2nd Floor, Silver City Plaza, G11 Markaz, Islamabad
**Telephone No.:** -----
**Nature of Sample:** Ambient Air **Monitoring Location:** DHA Phase-5 (GPS: 35.525937°N, 73.203672°E)
**Date of Sample Collection:** 23/10/2023 **Grab / Composite:** Continuous 24-Hours
**Sample Collected/Sent By:** Farhan Ali, Analyst (Field), ESPAK
**Date of Completion of Analysis:** 24/10/2023

| S. No | Parameters | Limit Values (NEQS-24 hours) | Concentration | Method / Equipment Used | Remarks |
|---|---|---|---|---|---|
| 1 | Carbon Monoxide (CO) | 5 mg/m³ (8 Hours) | 2.1 mg/m³ | Non Dispersive Infrared Absorption (NDIR) | Within Prescribed Limits |
| 2 | Sulfur Dioxide ($SO_2$) | 120 µg/m³ | 11.4 µg/m³ | UV Fluorescence (UVF) | Within Prescribed Limits |
| 3 | Ozone ($O_3$) | 130 µg/m³ (1 Hour) | 23.2 µg/m³ | Non Dispersive UV Absorption | Within Prescribed Limits |
| 4 | Oxides of Nitrogen as NO | 40 µg/m³ | 13.9 µg/m³ | Chemiluminescence Detection | Within Prescribed Limits |
| 5 | Oxides of Nitrogen as $NO_2$ | 80 µg/m³ | 26 µg/m³ | Chemiluminescence Detection | Within Prescribed Limits |
| 6 | Particulate Matter $PM_{2.5}$ | 35 µg/m³ | 32.1 µg/m³ | β -Ray Absorption Method | Within Prescribed Limits |
| 7 | Particulate Matter $PM_{10}$ | 150 µg/m³ | 141 µg/m³ | β -Ray Absorption Method | Within Prescribed Limits |
| 8 | Suspended Particulate Matter (SPM) | 500 µg/m³ | 389 µg/m³ | Particulate Sensor | Within Prescribed Limits |

**NEQS:** National Environmental Quality Standards for Ambient Air, 2010
• Uncertainty of Measurement (UoM) data will be provided on request, where available. The statement of conformity, if provided in the report, is based on the decision rule of simple acceptance or rejection with equal shared risk due to measurement uncertainty.

**Note:**
- **The report should be reproduced as a whole and not in parts.**
- **The responsibility of the ethical use of this report lies with the client.**
- **The values represent sample conditions when monitoring/testing was carried out.**
- **The report data is not intended to be used legally by the client.**

1. **Sample Analyzed By:** Farhan Ali, Analyst Field
2. **Name of Chief Analyst with Seal:** Muhammad Arfan
3. **Signature of Incharge of the Environmental Laboratory:**
   **Name:** Imran Malik
   General Manager
   **Date:** 26/10/2023

---------- End of Report ----------

Environmental Services Pakistan

Page 1 of 1

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ENVIRONMENTAL SERVICES PAKISTAN

ESPAK

| Reference Number | ESPAK/0228I/23/AA/6320/00570 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Name of Industry/ Client | Project Procurement International | | | | | | | |
| Address | Office #26, 2nd Floor, Silver City Plaza, G11 Markaz, Islamabad | | | | | | | |
| Monitoring Location | DHA Phase-5 | | | | | | | |
| GPS Coordinates | 35.525937°N, 73.203672°E | | | | | | | |
| Monitoring Date | 23-10-2023 to 24-10-2023 | | | | | | | |
| Date - Time | CO | $SO_2$ | $O_3$ | NO | $NO_2$ | $PM_{2.5}$ | $PM_{10}$ | TSP |
| | $mg/m^3$ | $ug/m^3$ | $ug/m^3$ | $ug/m^3$ | $ug/m^3$ | $ug/m^3$ | $ug/m^3$ | $ug/m^3$ |
| 23-10-23 11:00 | 1.1 | 11.9 | 23.2 | 14.5 | 25.7 | 26.0 | 123 | |
| 23-10-23 12:00 | 1.0 | 11.2 | | 11.4 | 25.6 | 26.2 | 125 | |
| 23-10-23 13:00 | 1.9 | 10.7 | | 16.4 | 26.6 | 33.1 | 135 | |
| 23-10-23 14:00 | 1.2 | 12.0 | | 12.7 | 26.3 | 40.1 | 164 | |
| 23-10-23 15:00 | 2.7 | 10.2 | | 12.0 | 25.9 | 40.7 | 166 | |
| 23-10-23 16:00 | 3.6 | 10.0 | | 11.7 | 25.3 | 38.2 | 156 | |
| 23-10-23 17:00 | 2.7 | 10.4 | | 12.2 | 26.1 | 37.3 | 152 | |
| 23-10-23 18:00 | 2.6 | 9.9 | | 11.5 | 27.1 | 33.2 | 168 | |
| 23-10-23 19:00 | | 11.9 | | 14.5 | 25.7 | 35.7 | 135 | |
| 23-10-23 20:00 | | 11.4 | | 16.5 | 25.4 | 26.5 | 144 | |
| 23-10-23 21:00 | | 9.5 | | 15.6 | 26.3 | 27.8 | 135 | |
| 23-10-23 22:00 | | 11.5 | | 16.7 | 25.5 | 30.1 | 146 | |
| 23-10-23 23:00 | | 12.9 | | 16.0 | 26.5 | 29.0 | 132 | 389 |
| 24-10-23 0:00 | | 11.1 | | 12.3 | 27.1 | 30.6 | 148 | |
| 24-10-23 1:00 | | 13.0 | | 16.2 | 24.8 | 30.4 | 138 | |
| 24-10-23 2:00 | | 12.5 | | 11.7 | 27.2 | 29.8 | 127 | |
| 24-10-23 3:00 | | 13.2 | | 16.4 | 24.9 | 30.0 | 136 | |
| 24-10-23 4:00 | | 12.7 | | 12.8 | 27.4 | 30.9 | 140 | |
| 24-10-23 5:00 | | 12.3 | | 12.1 | 25.5 | 37.6 | 135 | |
| 24-10-23 6:00 | | 9.8 | | 16.1 | 25.2 | 29.8 | 136 | |
| 24-10-23 7:00 | | 10.2 | | 14.7 | 25.5 | 37.8 | 145 | |
| 24-10-23 8:00 | | 11.3 | | 12.7 | 26.3 | 29.5 | 135 | |
| 24-10-23 9:00 | | 12.7 | | 12.0 | 25.5 | 29.8 | 135 | |
| 24-10-23 10:00 | | 10.8 | | 15.0 | 25.9 | 30.1 | 137 | |
| | | | | | | | | |
| Average | 2.1 | 11.4 | 23.2 | 13.9 | 26.0 | 32.1 | 141 | 389 |
| Maximum | 3.6 | 13.2 | 23.2 | 16.7 | 27.4 | 40.7 | 168 | 389 |
| Minimum | 1.0 | 9.5 | 23.2 | 11.4 | 24.8 | 26.0 | 123 | 389 |
| | | | | | | | | |
| Monitored By: | Farhan Ali | | | | | | | |

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ESPAK

# ENVIRONMENTAL SERVICES PAKISTAN

PAK EPA & PUNJAB EPD CERTIFIED

## NOISE MONITORING REPORT

| | | | |
|---|---|---|---|
| **Reference Number:** | ESPAK/0228I/23/N/6321/00661 | **Date:** | 26/10/2023 |
| **Name of Industry/Client:** | Project Procurement International | | |
| **Address:** | Office #26, 2nd Floor, Silver City Plaza, G11 Markaz, Islamabad | | |
| **Telephone No.:** | ---- | | |
| **Nature of Sample:** | Noise | | |
| **Date of Sample Collection:** | 23/10/2023 | **Grab / Composite:** | Continuous - 24 Hours |
| **Sample Collected/Sent By:** | Farhan Ali, Analyst (Field), ESPAK | | |
| **Date of Completion of Analysis:** | 24/10/2023 | | |
| **Method/Equipment Used:** | Sound Level Meter | | |

| S. No | Measurement Point | Limit Values (NEQS) | Noise Level in dB(A) Leq | Remarks |
|---|---|---|---|---|
| 1 | DHA Phase 5 (GPS: 35.525937°N, 73.203672°E) - Day Time | 65 dB(A) | 62 dB(A) | Within Prescribed Limits |
| 2 | DHA Phase 5 (GPS: 35.525937°N, 73.203672°E) - Night Time | 55 dB(A) | 55 dB(A) | Within Prescribed Limits |

**NEQS:** National Environmental Quality Standards for Noise in Commercial Area, 2010 Day Time Hours (6:00 am to 10:00 pm) Night Time Hours (10:00 pm to 6:00 am)

- Uncertainty of Measurement (UoM) data will be provided on request, where available. The statement of conformity, if provided in the report, is based on the decision rule of simple acceptance or rejection with equal shared risk due to measurement uncertainty.

Note:

- **The report should be reproduced as a whole and not in parts.**
- **The responsibility of the ethical use of this report lies with the client.**
- **The values represent sample conditions when monitoring/testing was carried out.**
- **The report data is not intended to be used legally by the client.**

1. **Sample Analyzed By:** Farhan Ali, Analyst (Field)
2. **Name of Chief Analyst with Seal:** Muhammad Arfan
3. **Signature of Incharge of the Environmental Laboratory:**

**Name:** Imran Malik
General Manager
**Date:** 26/10/2023

---------- End of Report ----------

Environmental Services Pakistan ESPAK

Page 1 of 1

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ENVIRONMENTAL SERVICES PAKISTAN
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| | | |
|---|---|---|
| Report Referance | | ESPAK/0228I/23/N/6321/00661 |
| Client Name | | Project Procurement International |
| Address | | Office #26, 2nd Floor, Silver City Plaza, G11 Markaz, Islamabad |
| Monitriong Location | | DHA Phase 5 |
| GPS Coordinates | | 35.525937°N, 73.203672°E |
| Monitoring Date | | 23/10/2023 to 24/10/2023 |
| Day/Night | Date & Ending Hour | Noise |
| | | dB (A) Leq |
| Day Time | 23-10-23 11:00 | 59.8 |
| | 23-10-23 12:00 | 66.3 |
| | 23-10-23 13:00 | 58.7 |
| | 23-10-23 14:00 | 64.1 |
| | 23-10-23 15:00 | 67.3 |
| | 23-10-23 16:00 | 63.0 |
| | 23-10-23 17:00 | 66.3 |
| | 23-10-23 18:00 | 69.5 |
| | 23-10-23 19:00 | 61.9 |
| | 23-10-23 20:00 | 66.3 |
| | 23-10-23 21:00 | 58.7 |
| | 23-10-23 22:00 | 61.2 |
| | 24-10-23 7:00 | 53.3 |
| | 24-10-23 8:00 | 55.4 |
| | 24-10-23 9:00 | 61.9 |
| | 24-10-23 10:00 | 65.2 |
| Average Day time | | 62 |
| Night Time | 23-10-23 23:00 | 57.0 |
| | 24-10-23 0:00 | 56.7 |
| | 24-10-23 1:00 | 55.6 |
| | 24-10-23 2:00 | 52.9 |
| | 24-10-23 3:00 | 55.4 |
| | 24-10-23 4:00 | 51.1 |
| | 24-10-23 5:00 | 53.3 |
| | 24-10-23 6:00 | 55.0 |
| Average Night time | | 55 |
| Monitored By: | | Farhan Ali |

Environmental Services Pakistan (Pvt) Ltd.

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# Annexure-9: Quarterly Environmental Report

| Chapter No. | Description |
|---|---|
| | Executive Summary |
| Chapter 1.0 | Project Summary (One page) |
| Chapter 2.0 | Construction Summary |
| Chapter 3.0 | Project's Progress Up to date. |
| Chapter 4.0 | Environmental Monitoring |
| Chapter 5.0 | External Environmental Monitoring |
| Chapter 6.0 | Internal Environmental Monitoring |
| Chapter 7.0 | Communicable Disease Testing |
| Chapter 8.0 | Environmental Audit |
| Chapter 9.0 | Monthly Progress |
| Chapter 10 | Safeguard Plans and their Implementation Status |
| | HSE Management Plan |
| | Fire Fighting Plan |
| | Hospital/Solid Waste Management |
| | Fatal Incidents |
| | Workmen Compensation |
| | Borrow Area Management Plan |
| | Site Restoration Plan. |
| | Emergency Preparedness, Response and Site Evacuation Plan |
| | Traffic Management & Construction Material transportation |
| | Implementation of Social Safeguard Policies |
| | Local Employment |
| Annex | Pictorial Presentation of Environmental Monitoring Plan |