BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI
O. A. No. 404 OF 2025

IN THE MATTER OF:

RAM KISHORE YADAV ...APPLICANT

VERSUS

MINISTRY OF ENVIRONMENT,
FORESTS & CLIMATE CHANGE & ORS. ...RESPONDENTS

INDEX FOR VOLUME-VI

S.NO	PARTICULARS	PAGES
10.	**ANNEXURE-R5** A copy of the Environmental Impact Assessment (EIA) Report submitted vide Letter dated 19.03.2024.	993 – 1193

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[KARANJAWALA & CO.]
ADVOCATES FOR RESPONDENT NO. 6
FIRST FLOOR, 212, ROUSE AVENUE,
DEEN DAYAL UPADHYAY MARG,
NEW DELHI-110002
EMAIL: service@karanjawala.in;
karanjawala@karanjawala.in

PLACE: NEW DELHI
DATE: 19.12.2025

ANNEXURE-R5(CONTD.)

LIST OF APPLICABLE INDIAN STANDARDS FOR ELECTRIFICATION WORK

S.No.	STANDARDS	TITLE
(1)	IS.732 - 1989	Code of practice for electrical wiring installations.
(2)	IS. 4648 - 1968	Guide for electrical layout in residential buildings.
(3)	IS.8061 - 1976	Code of practice for design, installation and maintenance of service lines upto and including 650V
(4)	IS. 8884 - 1978	Code of practice for installation of electric bells and call system.
(5)	IS. 5578 - 1985	Guide for marking of insulated conductor.
(6)	IS. 11353- 1985	Guide for uniform system of marking and identification of conductors and apparatus terminals.
(7)	IS. 5728 - 1970	Guide for short-circuit calculations.
(8)	IS. 7752(Part-1)-1975	Guide for improvement of power factor in consumer installation. Low and medium supply voltages.
(9)	IS. 3646(Part-1)-1966	Code of practice for interior illumination. Principles for good lighting and aspects of design.
(10)	IS. 3646(Part-2)-1966	Code of practice for interior illumination. Schedule of illumination and glare index.
(11)	IS. 2672 - 1966	Code of practice for library lighting.
(12)	IS.10118(Part-1)-1982	Code of practice for selection, installation and maintenance of switchgear and control gear . General.
(13)	IS. 10118(Part-2)-1982	Code of practice for selection, installation and maintenance of switchgear and control gear.
(14)	IS. 10118(Part-3)-1982	Code of practice for selection, installation and maintenance of switchgear and control gear. Installation.
(15)	IS. 10118(Part-4)-1982	Code of practice for selection, installation and maintenance of switchgear and control gear. Maintenance.

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(16)	IS : 2309 - 1989	Code of practice for the protection and allied structures against lightning.
(17)	IS. 3043 - 1987	Code of practice for earthing.
(18)	IS. 5216(Part-1)-1982	Guide for safety procedures and practices in electrical work: General.
(19)	IS.4237 - 1983	General requirements for switchgear and control gear for voltages not exceeding 1000 V AC or 1200 V DC
(20)	IS. 6875(Part-1)-1973	Control switches (switching devices for control and auxiliary circuits including contractor relays) for voltages upto and including 1000 V AC and 1200 DC : General requirements and tests.
(21)	IS.4064(Part-1)-1978	Air break switches, air break dis-connectors, air-break switch disconnectors and fuse-combination units for voltages not exceeding 1000 V AC or 1200 DC : General requirements.
(22)	IS. 8828 - 1978	Miniature air break circuit breakers for voltages not exceeding 1000 volt.
(23)	IS.13032 - 1991	Miniature circuit breaker boards for voltages upto and including 1000 volts AC.
(24)	IS.12640 - 1988	Residua current operated circuit breakers.
(25)	IS.2959 - 1985	Contactors for voltages not exceeding 1000 V AC or 1200 V DC.
(26)	IS.8623(Part-1)-1977	Factory built assemblies of switchgear and control gear for voltages upto and including 1000 V AC and 1200 V DC: General requirements.
(27)	IS.8623(Part-2)-1980	Factory assemblies of switchgear and control gear for voltages upto and including 1000 V AC and 1200 V DC : Particular requirements for busbar trunking system (busways).
(28)	IS.694 - 1990	PVC Insulated cables for working voltages upto and including 1100 V.

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(29)	IS.1554(Part-1)-1988	PVC insulated (heavy duty) electric cables .For working voltages upto and including 1100 V.
(30)	IS.3961 (Part-5)-1968	Recommended current ratings for cables. PVC insulated light duty cables.
(31)	IS.9537(Part-1)-1980	Conduits for electrical installations .General requirements.
(32)	IS.9537(Part-2)-1981	Conduits for electrical installations Rigid steel conduits.
(33)	IS.3480 - 1966	Flexible steel conduits for electrical wiring.
(34)	IS.2667 - 1988	Fittings for rigid steel conduits for electrical wiring.
(35)	IS.3837 - 1976	Accessories for rigid steel conduits for electrical wiring.
(36)	IS. 5133(Part-1)-1969	Boxes for enclosure of electrical accessories .Steel and cast iron boxes.
(37)	IS. 371 - 1979	Ceiling roses.
(38)	IS. 3854 - 1988	Switches for domestic and similar purposes.
(39)	IS. 4615 - 1968	Switch socket outlets (non-interlocking type).
(40)	IS. 4160 - 1967	Interlocking switch socket outlet.
(41)	IS.1293 - 1988	Plugs and socket outlets of rated voltage upto and including 250 volts and rated current upto and including 16 amperes.

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ELECTRICAL SAFETY MEASURES

- Lightning Protection to be done as per the IS Codes applicable.
- Safety parameters as indicated under Indian Electricity Rules 1956 and ECBC shall be complied. The following safety measurement are considered
- Earth resistivity test shall be carried out in accordance with IS Code of Practice for earthing IS 3043
- Specifications in respect of conductor material, their installation & jointing and providing earth electrode shall be as stipulated in "EARTHING" sections of Technical Specifications of this tender document.
- The lightning protection system shall use either copper or GI as stipulated in Bill of quantities as conducting material throughout. Galvanizing shall conform class – IV of IS 4736 , 1986. Longest possible unbroken lengths of conductors shall be used to eliminate or at least minimize mid run jointing.
- No work shall be undertaken on live installations, or on installations which could be energized unless one another person is present to immediately isolate the electric supply in case of any accident and to render first aid, if necessary.

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FIRE SOP

Fire

Fire could take place through various means; one of them is through electrical fire. Hence, all the electrical works and material of the building would adhere to the standards. Regular maintenance and audit of the electrical systems would be carried out by external auditors.

Mitigation measures proposed

- Fire Alarm system and Fire Hose located on each residential floor.
- Fire extinguishers located at all important locations.
- Common Assembly Point shall be demarcated and its location shall be displayed at the lift lobby for easy sighting.
- Mock drills shall be carried out with the help of Fire and Emergency Services
- Refuge floors provided in the buildings shall be highlighted and kept empty at all times for emergency evacuation. The following resources shall be available on the Refuge Area.
  - ✓ Copies of the Disaster Management Plan.
  - ✓ Layout Plan of proposed project.
  - ✓ Information regarding Safety Equipment, Fire Fighting material.
  - ✓ A list of important telephone numbers like those of neighbouring police station
  - ✓ Fire Brigade, Hospitals etc.

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ANNEXURE-17

Average rainfall data of last 5 years

Month/ Year	2018	2019	2020	2021	2022
January	1.8	27.24	23.23	31.53	93.88
February	0.00	15.89	1.34	1.76	17.68
March	0.00	7.35	65.01	4.21	0.00
April	9.15	10.65	9.65	2.19	0.18
May	5.4	23.53	26.42	119.58	52.43
June	82.82	5.81	49.08	25.43	37.55
July	176.87	153.67	64.1	347.9	211.89
August	105.39	135.5	285.61	144.02	82.1
September	127.9	42.64	22.78	249.28	233.22
October	0.00	18.69	0.00	57.78	112.89
November	3.84	1.58	1.84	0.00	0.00
December	0.43	21.58	0.14	4.77	0.00
Total Rainfall	513.6mm	464.13mm	549.2mm	988.45mm	841.82mm

(Source: Indian Water Resource and Information System https://indiawris.gov.in/wris/#/rainfall *)*

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PALM/NORTH/B/121523/854817

एएआई/आर.एच.क्यू/एन आर/टीएम/एनओसी/2023/888/3614-17

मालिक का नाम एवं पता	DLF Limited	**दिनांक/DATE:**	27-12-2023
OWNERS Name & Address	Shopping Mall 3rd Floor Arjun Marg DLF City Ph-I Gurugram 122002	**वैधता/ Valid Up to:**	26-12-2031

ऊँचाई की अनुमति हेतु अनापत्ति प्रमाण पत्र(एनओसी)
No Objection Certificate for Height Clearance

1) यह अनापत्ति प्रमाण पत्र भारतीय विमानपत्तन प्राधिकरण (भाविप्रा) द्वारा प्रदत्त दायित्वों के अनुक्रम तथा सुरक्षित एवं नियमित विमान प्रचालन हेतु भारत सरकार (नागर विमानन मंत्रालय) की अधिसूचना जी. एस. आर. 751 (ई) दिनांक 30 सितम्बर, 2015, जी. एस. आर. 770 (ई) दिनांक 17 दिसंबर 2020 द्वारा संशोधित, के प्रावधानों के अंतर्गत दिया जाता है।
1. This NOC is issued by Airports Authority of India (AAI) in pursuance of responsibility conferred by and as per the provisions of Govt. of India (Ministry of Civil Aviation) order GSR751 (E) dated 30th Sep.2015 amended by GSR770(E) dated 17th Dec 2020 for safe and Regular Aircraft Operations.

2). इस कार्यालय को निम्नलिखित विवरण के अनुसार प्रस्तावित संरचना के निर्माण पर कोई आपत्ति नहीं है।
2. This office has no objection to the construction of the proposed structure as per the following details:

अनापत्ति प्रमाणपत्र आईडी / NOC ID	PALM/NORTH/B/121523/854817
आवेदक का नाम / Applicant Name*	Pawan Chawla
स्थल का पता / Site Address*	Group Housing at Park Drive (Off Ch. Raghvendra Marg), DLF-5, Sector 54, Gurugram (Haryana),Gurugram,Gurgaon,Haryana
स्थल के निर्देशांक / Site Coordinates*	28 26 45.34N 77 06 43.65E, 28 26 47.25N 77 06 44.09E, 28 26 41.93N 77 06 46.25E, 28 26 44.35N 77 06 46.56E, 28 26 40.67N 77 06 51.01E, 28 26 50.25N 77 06 51.72E, 28 26 50.27N 77 06 52.02E, 28 26 42.75N 77 06 52.19E, 28 26 46.93N 77 06 52.38E, 28 26 46.46N 77 06 53.01E, 28 26 48.73N 77 06 53.24E, 28 26 45.21N 77 06 53.27E, 28 26 48.52N 77 06 55.41E, 28 26 49.93N 77 06 55.43E
स्थल की ऊँचाई एएमएसएल मीटर में (औसतन समुद्र तल से ऊपर), (जैसा आवेदक द्वारा उपलब्ध कराया गया) / Site Elevation in mtrs AMSL as submitted by Applicant*	256.62 M
अनुमन्य अधिकतम ऊँचाई एएमएसएल मीटर में (औसतन समुद्र तल से ऊपर) / Permissible Top Elevation in mtrs Above Mean Sea Level(AMSL)	375.77 M (Restricted)

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*** जैसा आवेदक द्वारा उपलब्ध कराया गया / As provided by applicant***

3) यह अनापत्ति प्रमाण पत्र निम्नलिखित नियम व शर्तों के अधीन है: -
3. This NOC is subject to the terms and conditions as given below:

क) आवेदक द्वारा उपलब्ध कराए गए स्थल की ऊँचाई तथा निर्देशांक को, प्रस्तावित संरचना हेतु अनुमन्य अधिकतम ऊँचाई जारी करने के लिए प्रयोग किया गया है। भारतीय विमान पत्तन प्राधिकरण, आवेदक द्वारा उपलब्ध कराये गए स्थल की ऊँचाई तथा निर्देशांक की यथार्थता का ना तो उत्तरदायित्व वहन करता है, और ना ही इनको प्रमाणीकृत करता है। यदि किसी भी स्तर पर यह पता चलता है कि वास्तविक विवरण, आवेदक द्वारा उपलब्ध कराए गए विवरण से भिन्न है, तो यह अनापत्ति प्रमाण पत्र अमान्य माना जाएगा तथा क़ानूनी कार्यवाही की जाएगी। सम्बंधित विमान क्षेत्र के प्रभारी अधिकारी द्वारा एयरक्राफट नियम 1994 (भवन, वृक्षों आदि के कारण अवरोध का विध्वंस) के अधीन कार्यवाही की जायगी ।

a. Permissible Top elevation has been issued on the basis of Site coordinates and Site Elevation submitted by Applicant. AAI neither owns the responsibility nor authenticates the correctness of the site coordinates & site elevation provided by the applicant. If at any stage it is established that the actual data is different, this NOC will stand null and void and action will be taken as per law. The officer in-charge of the concerned aerodrome may initiate action under the Aircraft (Demolition of Obstruction caused by Buildings and Trees etc.) Rules, 1994",

ख) अनापत्ति प्रमाण पत्र के आवेदन में आवेदक द्वारा उपलब्ध कराए गए स्थल निर्देशांक को सड़क दृश्य मानचित्र और उपग्रह मानचित्र पर अंकित किया गया है जैसा कि अनुलग्नक में दिखाया गया है। आवेदक / मालिक यह सुनिश्चित करे कि अंकित किए गए निर्देशांक उसके स्थल से मेल खाते हैं। किसी भी विसंगति के मामले में, नामित अधिकारी को अनापत्ति प्रमाण पत्र रद्द करने के लिए अनुरोध किया जाएगा।

b. The Site coordinates as provided by the applicant in the NOC application has been plotted on the street view map and satellite map as shown in ANNEXURE. Applicant/Owner to ensure that the plotted coordinates corresponds to his/her site. In case of any discrepancy, Designated Officer shall be requested for cancellation of the NOC.

ग) एयरपोर्ट संचालक या उनके नामित प्रतिनिधि, अनापत्ति प्रमाण पत्र नियमों और शर्तों का अनुपालन सुनिश्चित करने के लिए स्थल (आवेदक या मालिक के साथ पूर्व समन्वय के साथ) का दौरा कर सकते हैं।

c. Airport Operator or his designated representative may visit the site (with prior coordination with applicant or owner) to ensure that NOC terms & conditions are complied with.

घ) संरचना की ऊँचाई (सुपर स्ट्रक्चर सहित) की गणना अनुमन्य अधिकतम ऊँचाई (ए एम एस एल) से स्थल की ऊँचाई को घटाकर की जायेगी। अर्थात, संरचना की अधिकतम ऊँचाई = अनुमन्य अधिकतम ऊँचाई (-) स्थल की ऊँचाई।

d. The Structure height (including any superstructure) shall be calculated by subtracting the Site elevation in AMSL from the Permissible Top Elevation in AMSL i.e. Maximum Structure Height = Permissible Top Elevation minus (-) Site Elevation.

च) अनापत्ति प्रमाण पत्र जारी करना, भारतीय एयरक्राफ्ट एक्ट 1934 , के सैक्शन 9-A तथा इसके अंतर्गत समय-समय पर जारी अधिसूचनाएं तथा एयरक्राफट नियम (1994 भवन, वृक्षों आदि के कारण अवरोध का विध्वंस) के अधीन है ।

e. The issue of the 'NOC' is further subject to the provisions of Section 9-A of the Indian Aircraft Act, 1934 and any notifications issued there under from time to time including, "The Aircraft (Demolition of Obstruction caused by Buildings and Trees etc.) Rules, 1994".

छ) कोई भी रेडियो/ टीवी एन्टीना, लाइटनिंग अरैस्टर, सीढ़िया, मुमटी, पानी की टंकी अथवा कोई अन्य वस्तु तथा किसी भी प्रकार के संलग्नक उपस्कर पैरा 2 में उल्लेखित अनुमन्य अधिकतम ऊँचाई से ऊपर नहीं जानी चाहिए ।

f. No radio/TV Antenna, lightening arresters, staircase, Mumty, Overhead water tank or any other object and attachments of fixtures of any kind shall project above the Permissible Top Elevation as indicated in para 2.

For DLF LIMITED

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ज) विमानक्षेत्र संदर्भ बिंदु के 8 KM के भीतर तेल, बिजली या किसी अन्य ईंधन का उपयोग जो उड़ान संचालन के लिए धुएं का खतरा पैदा नहीं करता है, ही मान्य है।
g. Use of oil, electric or any other fuel which does not create smoke hazard for flight operation is obligatory, within 8 KM of the Aerodrome Reference Point

झ) यह प्रमाणपत्र इसके जारी होने की तारीख से 8 साल की अवधि के लिए वैध है। एक बार रिवेलीडेशन की अनुमति दी जा सकती है, बशर्ते कि इस तरह का अनुरोध एनओसी की समाप्ति की तारीख से छह महीने के भीतर किया जाए और प्रारंभिक प्रमाणपत्र 8 साल की वैधता अवधि के भीतर प्राप्त किया जाए ।
h. The certificate is valid for a period of 8 years from the date of its issue. One-time revalidation shall be allowed, provided that such request shall be made within six months from the date of expiry of the NOC and commencement certificate is obtained within initial validity period of 8 years.

ट) भवन के निर्माण के दौरान या उसके बाद किसी भी समय स्थल पर ऐसी कोई भी लाइट या लाइटो का संयोजन नही लगाया जाएगा जिसकी तीव्रता, आकृति या रंग के कारण वैमानिक ग्राउन्ड लाइटों के साथ भ्रम उत्पन्न हो । विमान के सुरक्षित प्रचालन को प्रभावित करने वाली कोई भी गतिविधि मान्य नहीं होगी ।
i. No light or a combination of lights which by reason of its intensity, configuration or colour may cause confusion with the aeronautical ground lights of the Airport shall be installed at the site at any time, during or after the construction of the building. No activity shall be allowed which may affect the safe operations of flights.

ठ) आवेदक द्वारा विमानपत्तन पर या उसके आसपास विमान से उत्पन्न शोर, कंपन या विमान प्रचालन से हुई किसी भी क्षति के विरूद्ध कोई शिकायत/दावा नहीं किया जाएगा ।
j. The applicant will not complain/claim compensation against aircraft noise, vibrations, damages etc. caused by aircraft operations at or in the vicinity of the airport.

ड) डे मार्किंग तथा सहायक विद्युत आपूर्ति सहित नाइट लाइटिंग (डीजीसीए भारत की वेबसाइट www.dgca.nic.in पर उपलब्ध) नागर विमानन आवश्यकताएं श्रंखला 'बी' पार्ट । सैक्शन-4 के चैप्टर 6 तथा अनुलग्नक 6 में विनिर्दिष्ट दिशानिर्देशों के अनुसार उपलब्ध कराई जाएंगी ।
k. Day markings & night lighting with secondary power supply shall be provided as per the guidelines specified in chapter 6 and appendix 6 of Civil Aviation Requirement Series 'B' Part I Section 4, available on DGCA India website: www.dgca.nic.in

ढ) भवन के नक्शे के अनुमोदन सहित अन्य सभी वैधानिक अनापत्ति, संबंधित प्राधिकरणों से लेना आवेदक की जिम्मेदारी होगी, क्योंकि इस ऊँचाई हेतु अनापत्ति प्रमाणपत्र लेने का उद्देश्य सुरक्षित एवं नियमित विमान प्रचालन सुनिश्चित करना है तथा इसे भूमि के स्वामित्व आदि सहित किसी अन्य उद्देश्य/ दावे के लिए दस्तावेज के रूप में प्रयोग नहीं किया जा सकता ।
l. The applicant is responsible to obtain all other statutory clearances from the concerned authorities including the approval of building plans. This NOC for height clearances is only to ensure safe and regular aircraft operations and shall not be used as document for any other purpose/claim whatsoever, including ownership of land etc.

ण) इस अनापत्ति प्रमाणपत्र आईडी का मूल्यांकन Chillarki,I.G.I Airport,Rohini Heliport,Safdarjung Airport,Sampla विमानक्षेत्रो के संबंध में किया गया है। यह अनापत्ति प्रमाणपत्र भारतीय विमान पत्तन प्राधिकरण के विमानक्षेत्रो और अन्य लाइसेंस प्राप्त सिविल विमानक्षेत्रो, जो जी. एस. आर. 751 (ई) जी. एस. आर. 770 (ई) द्वारा संशोधित के अनुसूची - III, अनुसूची - IV (भाग- I), अनुसूची- IV (भाग -2; केवल RCS हवाई अड्डे) और अनुसूची- VII में सूचीबद्ध हैं, के लिए जारी किया गया है ।
m. This NOC ID has been assessed with respect to theChillarki,I.G.I Airport,Rohini Heliport,Safdarjung Airport,Sampla Airports. NOC has been issued w.r.t. the AAI Aerodromes and other licensed Civil Aerodromes as listed in Schedule – III, Schedule – IV(Part-I), Schedule- IV (Part-2; RCS Airports Only) and Schedule-VII of GSR 751(E) amended by GSR770(E)

For DLF LIMITED

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भारतीय विमानपत्तन प्राधिकरण
AIRPORTS AUTHORITY OF INDIA

PALM/NORTH/B/121523/854817

त) यदि स्थल रक्षा विभाग के विमान क्षेत्र के अधिकार क्षेत्र में आता है, जैसा कि जीएसआर 751 (ई) की अनुसूची-V में सूचीबद्ध है, तो आवेदक को रक्षा विभाग से अलग से अनापत्ति प्रमाणपत्र लेना होता है। जीएसआर 751 (ई) जी. एस. आर. 770 (ई) द्वारा संशोधित के नियम 13 के अनुसार, आवेदकों को उन स्थलों के लिये, जो जीएसआर 751 (ई) जी. एस. आर. 770 (ई) द्वारा संशोधित के अनुसूची- IV (भाग -2; आरसीएस हवाई अड्डों के अलावा) के रूप में सूचीबद्ध बिना लाइसेंस वाले विमान क्षेत्र के अधिकार क्षेत्र में आता है, तो संबंधित राज्य सरकार से भी अनापत्ति प्रमाणपत्र लेने की आवश्यकता है।

n. Applicant needs to seek separate NOC from Defence, if the site lies within the jurisdiction of Defence Aerodromes as listed in Schedule – V of GSR 751 E amended by GSR770(E). As per rule 13 of GSR 751 E amended by GSR770(E), applicants also need to seek NOC from the concerned state government for sites which lies in the jurisdiction of unlicensed aerodromes as listed in Schedule-IV (Part-2; other than RCS airports) of GSR 751 E amended by GSR770(E)

थ) अनापत्ति प्रमाण पत्र (एनओसी) की किसी भी त्रुटि/व्याख्या की स्थिति में अंगरेजी अनुवाद ही मान्य होगा।

o. In case of any discrepancy/interpretation of NOC letter, English version shall be valid.

द) स्थल की ऊँचाई और/या संरचना की ऊँचाई के किसी भी विवाद में अनुमन्य अधिकतम ऊँचाई एएमएसएल में ही मान्य होगी।

p. In case of any dispute with respect to site elevation and/or AGL height, Permissible Top Elevation in AMSL shall prevail.

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PALM/NORTH/B/121523/854817

क्षेत्र का नाम / Region Name: उत्तर/NORTH

पदनामित अधिकारी/Designated Officer नाम/ पदनाम/दिनांक सहित हस्ताक्षर Name/Designation/Sign with date	U. D. उत्पल दत्ता बरुआ / UTPAL DUTTA BARUAH महाप्रबंधक (एटीएम) / General Manager (ATM)
द्वारा तैयार Prepared by	27.12.2023 NAVEEN JAIN DGM(ATM)
द्वारा जांचा गया Verified by	27/12/2023 Yashwant Sharan JGM (ATM)

ईमेल आईडी / EMAIL ID : noc_nr@aai.aero

फोन/ Ph: 011-25653551

ANNEXURE/अनुलग्नक

Distance From Nearest Airport And Bearing/निकटतम विमानक्षेत्र से दूरी और बीयरिंग

Airport Name/ विमानक्षेत्र का नाम	Distance (Meters) from Nearest ARP/निकटतम विमानक्षेत्र संदर्भ बिंदु से दूरी (मीटर मे)	Bearing(Degree) from Nearest ARP/निकटतम विमानक्षेत्र संदर्भ बिंदु से बीयरिंग (डिग्री
Chillarki	45047.47	75.09
I.G.I Airport	13462.18	178.03
Rohini Heliport	34218.53	169.79
Safdarjung Airport	17654.21	209.45
Sampla	50316.1	144.37
NOCID	PALM/NORTH/B/121523/854817	

For DLF LIMITED

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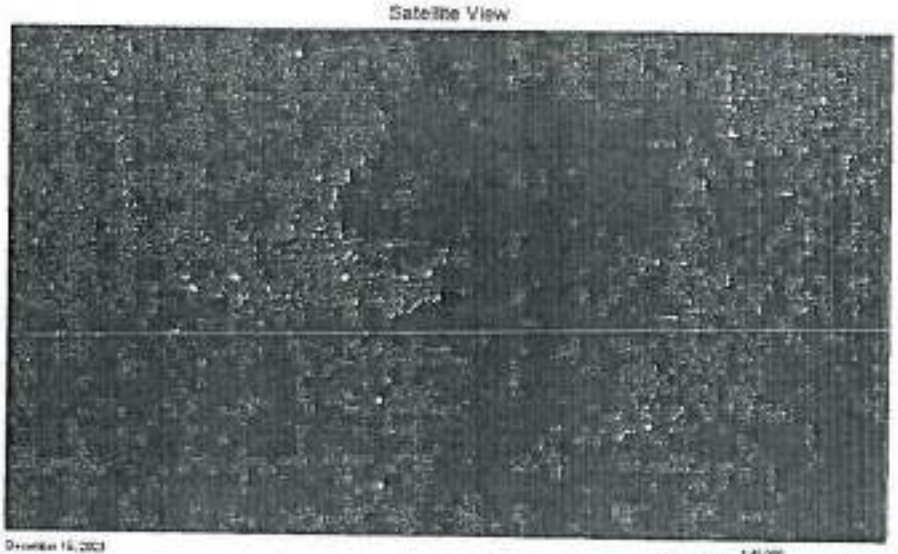
PALM/NORTH/B/121523/854817

Street View

Satellite View



For DLF LIMITED

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ANNEXURE-19

प्रेषक,

उपायुक्त, गुरूग्राम।

सेवा में

M/s DLF Limited,
Gateway Tower(2nd Floor),
DLF City, Phase III, Gurugram.

क्रमांक 47 /एम0वी0 दिनांक 6/5/22

विषयः— Report of Tehsildar Gurugram through the office of DC that the land of the project does not fall under MoEF Aravalli Notification S.O 319(E) dated 7th May 1992: NOC Forest and Aravalli Certificate for project site of "Proposed Group Housing Buildings in part of DLF 5, Zone 10, Village Wazirabad, Gurugram, Haryana.

उपरोक्त विषय के संदर्भ में।

विषयाधीन मामले में उक्त के सम्बन्ध में तहसीलदार, वजीराबाद व उप वन संरक्षक, गुरूग्राम से रिपोर्ट प्राप्त की गई जो निम्न प्रकार है:—

तहसीलदार, वजीराबाद ने अपने कार्यालय के पत्र क्रमांक 161/रीडर दिनांक 19.04.2022 के द्वारा रिपोर्ट इस कार्यालय में प्रेषित की है जिसमें लिखा है कि पटवारी हल्का से रिपोर्ट प्राप्त की गई। रिपोर्ट अनुसार मांगी गई सूचना मौजा वजीराबाद, तहसील वजीराबाद जिला गुरूग्राम के खसरा न0 2046/1/1(1—12—19), 2046/1/2(1—2—14), 2046/2(1—6—7), 2047/1(1—19—3), 2047/2(1—11—17), 2048(3—7—0), 2049(4—4—0), 2050/1(1—7—10), 2050/2(2—13—18), किता 9 रकबा 19 बीघा 5 बिस्वा 8 बिस्वांसी का राजस्व रिकार्ड का अवलोकन किया गया। अवलोकन उपरान्त मांगी गई रिपोर्ट बिन्दूवार निम्न प्रकार है:—

1. उपरोक्त अराजी दिनांक 07.05.1992 के नोटिफिकेशन के राजस्व रिकार्ड अनुसार जमाबन्दी की खाना कैफियत में अरावली क्षेत्र का कोई इन्दाज दर्ज नही है।
2. उपरोक्त अराजी भूमि दिनांक 07.05.1992 के नोटिफिकेशन से पूर्व व उसके पश्चात उपरोक्त अराजी की किस्म गैर मुमकिन पहाड, गैर मुमकिन राडा, गैर मुमकिन बीहड, बंजर या रूख का इन्दाज जमाबन्दी की खाना कैफियत में दर्ज नही रही है।
3. उपरोक्त अराजी भूमि की किस्म दिनांक 07.05.1992 के नोटिफिकेशन से पूर्व मगदा व हाल किस्म गैर मुमकिन है।
4. उपरोक्त अराजी मिसल हकीयत ता हाल कभी भी शामलात देह, पंचायत देह, नगर पालिका, नगर निगम की मलकियत नही रही है।
5. अराजी मुतनाजा का किसी भी न्यायालय में किसी कोर्ट केस बारे कोई हवाला/जमाबन्दी के खाना कैफियत में दर्ज नही है।
6. उपरोक्त अराजी का SEZ(Special Economical Zone) बारे कोई इन्दाज जमाबन्दी की खाना कैफियत में दर्ज नही है।
7. उपरोक्त अराजी पर धारा 4, 6 व अवार्ड बारे कोई हवाला जमाबन्दी की खाना कैफियत में दर्ज नही है।

उप वन संरक्षक, गुरुग्राम ने अपने कार्यालय के पत्र क्रमांक 243—जी0 दिनांक 25.04.2022 के द्वारा अवगत कराया है कि उनके कार्यालय द्वारा ऑनलाईन दिनांक 01.04.2022 (M/s DLF Limited) को मार्फ वजीराबाद, जिला गुरूग्राम के 12.043 एकड एरिया की फोरेस्ट क्लेरिफिकेशन ऑनलाईन जारी की जा चुकी है जिसकी छाया प्रति इस कार्यालय में प्रेषित की है जिसमें लिखा है कि Applicant M/s DLF Limited, Land Measuring 12.043(Acre) having Khasra No. 2046/1/1(1-12-19), 2046/1/2(1-2-14), 2046/2(1-6-7), 2047/1(1-19-3), 2047/2(1-11-17), 2048(3-7-0), 2049(4-4-0), 2050/1(1-7-10), 2050/2(2-13-18), Land located at village Wazirabad District Gurugram made a proposal to use this land for Building Construction. It is made clear that:-

For DLF LIMITED

Authorised Signatory

A) As per records available above said land is not part of notified Reserved Forest, protected Forest under Indian Forest Act, 1927 or any area closed under section 4 of Punjab Land Preservation Act 1900.

B) It is clarified that by the Notification No. S.O 8/P.A 2/1900/S. 4/2013 dated 04-01-13 all Revenue Estate of Gurgaon is notified u/s 4 of PLPA 1900 and S.O 81/PA.2/1900/S.3/2012 u/s 3 of PLPA 1900. The area is however not recorded as Forest in the Government record but felling of any tree is strictly prohibited without the permission of Divisional Forest officer, Gurgaon.

C) If approach is required from Protected forest by the user agency, the clearance/regularization under Forest Conservation Act 1980 will be required. Without prior clearance from Forest Department, the use of Forest land for approach road is strictly prohibited. M/s DLF Limited whose land is located at Village/City Wazirabad District Gurgaon must obtain clearance as applicable under Forest Conservation Act, 1980.

D) As per the records available with the Forest Department Gurgaon the area does not fall in areas where plantations were raised by the Forest Department under Aravali project.

E) All other statutory clearances mandated under the Environment protection Act, 1986, as per the notification of Ministry of Environment and Forest, Government of India dated 07-05-1992 or any other Act/Order shall be obtained as applicable by the project proponents from the concerned authorities.

F) The project proponent will not violate any Judicial Order/Direction issued by the Hon'ble Supreme Court/High Courts.

G) It is clarified that the Hon'ble Supreme Court has issued various judgments dated 07-05-2002, 29-10-2002, 16-12-2002, 18-03-2004, 14-05-2008 etc. pertaining to Aravali region in Haryana, which should be complied with.

H) It shall be the responsibility of user agency/applicant to get necessary clearances/ permissions under various Acts and Rules applicable if any, from the respective authorities/department.

I) This certificate is not applicable in case of Environment Department notification dated 10.03.2016 for Screening Plant, and notification dated 11.05.2016 for Stone Crusher. Investor/Applicant has to take clearance from Environment Department in case of Screening Plant and Stone Crusher.

It is subject to the following conditions:

1. Clarification Is Hereby Issued Subject To The Conditions Mentioned Above and Proposed Site Falls Within 5 Km of Delhi Boundary Hence Necessary Permission May Be Obtained From Competent Authority As Per Supreme Court Various Judgements Regarding Aravali Region In Haryana.

अतः तहसीलदार, वजीराबाद व उप वन संरक्षक, गुरुग्राम की रिर्पोट अनुसार आपको Village Wazirabad, District Gurugram की उक्त वर्णित भूमि की Aravalli Clearance/Non Forest Land रिर्पोट इस शर्त पर जारी की जानी उचित होगी कि प्रार्थी कम्पनी को दी गई एन0ओ0सी मे यदि किसी नम्बरो पर हरियाणा सरकार के किसी भी विभाग द्वारा किसी प्रकार की भूमि अर्जन कार्यवाही धारा 4, 6 व अवार्ड आदि राजस्व रिकार्ड अनुसार पाया गया तो सम्बधित नम्बरो की अरावली एन0ओ0सी0 स्वतः रद् समझी जावेगी जिसके लिए प्रार्थी कम्पनी स्वयं जिम्मेवार होगी। इसके अतिरिक्त प्रार्थी वर्णित भूमि पर कोई भी परियोजना शुरू करने से पूर्व उप वन संरक्षक, गुरुग्राम की रिर्पोट मे दर्शाई गई शर्त अनुसार Competent Authority से अनुमति लेकर इस कार्यालय को अवगत करवाना सुनिश्चित करे क्योकि **Proposed Site Falls Within 5 Km Of Delhi Boundary Hence Necessary Permission Need To Be Obtained From Competent Authority As per Supreme Court Various Judgments Regarding Aravali Region In Haryana.** अन्यथा सम्बंधित किला नम्बरान की अरावली एन0ओ0सी0 स्वतः रद् समझी जावेगी।

उपायुक्त, गुरुग्राम।

प्रभागीय वन अधिकारी द्वारा स्पष्टीकरण पत्र
Clarification letter by
Concerned Divisional Forest Officer
हरियाणा सरकार / Government of Haryana

हरियाणा भू-मरिक्षण अधिनियम,1900 (1900 का पंजाब का अधिनियम II) अथवा वन अथवा प्रतिबंधित भूमि से संबंध मे निरापेक्ष प्रमाण पत्र।
NOC in respect of Haryana Land and Preservation Act, 1900 (Punjab Act, II of 1900) or Forest or Restricted lands.

नाम Name	अलोक कुमार Alok Kumar
संगठन का नाम Organisation Name	Dlf Limited
वर्तमान पता Current Address	Gateway Tower, 2nd Floor, Dlf City Phase III
भूमि स्थान Land Location	WAZIRABAD,Gurgaon,Wazirabad
भूमि मापन Land Measurements	16.975 (Acre)
आयत नम्बर / मुरबा नम्बर Rectangle No./ Murba No.	Not Applicable, Applicable Khasra Nos : 2037/4 Min (0-2-6), 2038/6 Min(0 -1- 8), 2043/3min (0- 0- 14), 2044/3min (0- 0- 16), 2044/4min (0- 8- 6), 2045/1min (0- 1- 16), 2045/2min (0- 12- 9), 2046/1/1(1- 12- 19), 2046/1/2(1- 2- 14), 2046/2(1- 6- 7), 2047/1(1- 19- 3), 2047/2(1- 11- 17), 2048(3- 7- 0), 2049(4- 4- 0), 2050/1(1- 7- 10), 2050/2min (1- 2- 8), 2051min (1- 18- 8), 2052/1min (0- 2- 0), 2052/2min(0- 1- 3), 2056/2min(6- 0- 0) Total Area : 16.975 Acers;

For DLF LIMITED

Authorised Signatory

Reference No. (SRN):- XUU-N8F-HHUW
जारी करने की तिथि / Date of Issuance: 18-03-2024
जारी करने का स्थान / Place of Issuance: Gurgaon
जारी करने वाला प्राधिकरण / Issuing Authority: Divisional Forest Officer

This is a Digitally Signed Certificate and does not require physical signature. The authenticity of this certificate can be verified from the verification link mentioned below:
https://164.100.137.243/eservices/mobileapi/verify/clarification/XUUN8FHHUW

प्रभागीय वन अधिकारी द्वारा स्पष्टीकरण पत्र
Clarification letter by
Concerned Divisional Forest Officer
हरियाणा सरकार / Government of Haryana

हरियाणा भू-परिक्षण अधिनियम,1900 (1900 का पंजाब का अधिनियम II) अथवा वन अथवा प्रतिबंधित भूमि से संबंध मे निराक्षेप प्रमाण पत्र।
NOC in respect of Haryana Land and Preservation Act, 1900 (Punjab Act, II of 1900) or Forest or Restricted lands.

किला नम्बर Killa Number	Not Applicable, Applicable Khasra Nos : 2037/4 Min (0-2-6), 2038/6 Min(0 -1- 8), 2043/3min (0- 0- 14), 2044/3min (0- 0- 16), 2044/4min (0- 8- 6), 2045/1min (0- 1- 16), 2045/2min (0- 12- 9), 2046/1/1(1- 12- 19), 2046/1/2(1- 2- 14), 2046/2(1- 6- 7), 2047/1(1- 19- 3), 2047/2(1- 11- 17), 2048(3- 7- 0), 2049(4- 4- 0), 2050/1(1- 7- 10), 2050/2min (1- 2- 8), 2051min (1- 18- 8), 2052/1min (0- 2- 0), 2052/2min(0- 1- 3), 2056/2min(6- 0- 0) Total Area : 16.975 Acers
प्रयोजन Purpose	Building Construction

For DLF LIMITED

Authorised Signatory

जारी करने की तिथि / Date of Issuance: 18-03-2024
जारी करने का स्थान / Place of Issuance: Gurgaon
जारी करने वाला प्राधिकरण / Issuing Authority: Divisional Forest Officer

This is a Digitally Signed Certificate and does not require physical signature. The authenticity of this certificate can be verified from the verification link mentioned below:
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प्रभागीय वन अधिकारी द्वारा स्पष्टीकरण पत्र
Clarification letter by
Concerned Divisional Forest Officer
हरियाणा सरकार / Government of Haryana

हरियाणा भू-परिरक्षण अधिनियम,1900 (1900 का पंजाब का अधिनियम II) अथवा वन अथवा प्रतिबंधित भूमि से संबंध में निरक्षेप प्रमाण पत्र।
NOC in respect of Haryana Land and Preservation Act, 1900 (Punjab Act, II of 1900) or Forest or Restricted lands.
Applicant Alok Kumar located at village /city WAZIRABAD district Gurgaon
made a proposal to use this land for Building Construction. It is made clear that:

a) As per records available above said land is not part of notified Reserved Forest, Protected Forest under Indian Forest Act, 1927 or any area closed under section 4 of Punjab Land Preservation Act, 1900.

b) It is clarified that by the Notification No. S.O.8/P.A 2/1900/S. 4/2013 dated 4th January, 2013, all Revenue Estate of Gurgaon is notified u/s 4 of PLPA 1900 and S.O.81/PA.2/1900/S.3/2012 u/s 3 of PLPA 1900. The area is however not recorded as forest in the Government record but felling of any tree is strictly prohibited without the permission of Divisional Forest Officer, Gurgaon.

c) If approach is required from Protected Forest by the user agency, the clearance/ regularization under Forest Conservation Act 1980 will be required. Without prior clearance from Forest Department, the use of Forest land for approach road is strictly prohibited. M/s Dlf Limited whose land is located at village/city, WAZIRABAD District Gurgaon must obtain clearance as applicable under Forest Conservation Act 1980.

d) As per the records available with the Forest Department, Gurgaon the area does not fall in areas where plantations were raised by the Forest Department under Aravalli project.

e) All other statutory clearances mandated under the Environment Protection Act, 1986, as per the notification of Ministry of Environment and Forests, Government of India, dated 07-05-1992 or any other Act/ order shall be obtained as applicable by the project proponents from the concerned authorities.

f) The project proponent will not violate any Judicial Order/ direction issued by the Hon'ble Supreme Court/ High Courts.

g) It is clarified that the Hon'ble Supreme Court has issued various judgments dated 07.05.2002, 29.10.2002, 16.12.2002, 18.03.2004, 14.05.2008 etc. pertaining to Aravalli region in Haryana, which should be complied with.

h) It shall be the responsibility of user agency/ applicant to get necessary clearances/ permissions under various Acts and Rules applicable if any, from the respective authorities/ Department.

i) This certificate is not applicable in case of Environment Department notification dated 10.03.2016 for Screening Plant, and notification dated 11.05.2016 for Stone Crusher. Investor/Applicant has to take clearance from Environment Department in case of Screening Plant and Stone Crusher .

It is subject to the following conditions:

1.Clarification Is Hereby Issued Subject To The Conditions Mentioned Above.

For DLF LIMITED

Authorised Signatory

Date: 18-03-2024
Place: Gurgaon

Rajeev Tejyan,
(Divisional Forest Officer)

This is a Digitally Signed Certificate and does not require physical signature. The authenticity of this certificate can be verified from the verification link mentioned below:
https://164.100.137.243/eservices/mobileapi/verify/clarification/XUUN8FHHUW

ANNEXURE-21

Input data

Stack Attached to	Capacity KVA	Fuel Used	PM10 g/s	SO2 g/s	NOx g/s	CO g/s	PM2.5
8 -DG Set	2000	HSD	0.006444	0.161111	0.292004	0.063585	0.002578

Parking Provided: 2,610 ECS

In the absence of specific PM-2.5 emission limit, the emission rate is calculated based on the composition of PM2.5 recorded during ambient air monitoring

Output Data-

The Results are based on **24 hours of all DG Sets Winter Season (December- 2023 to February 2024).** The predicted incremental GLC is the maximum value predicted study area.

For DLF LIMITED

Authorised Signatory

For DLF LIMITED

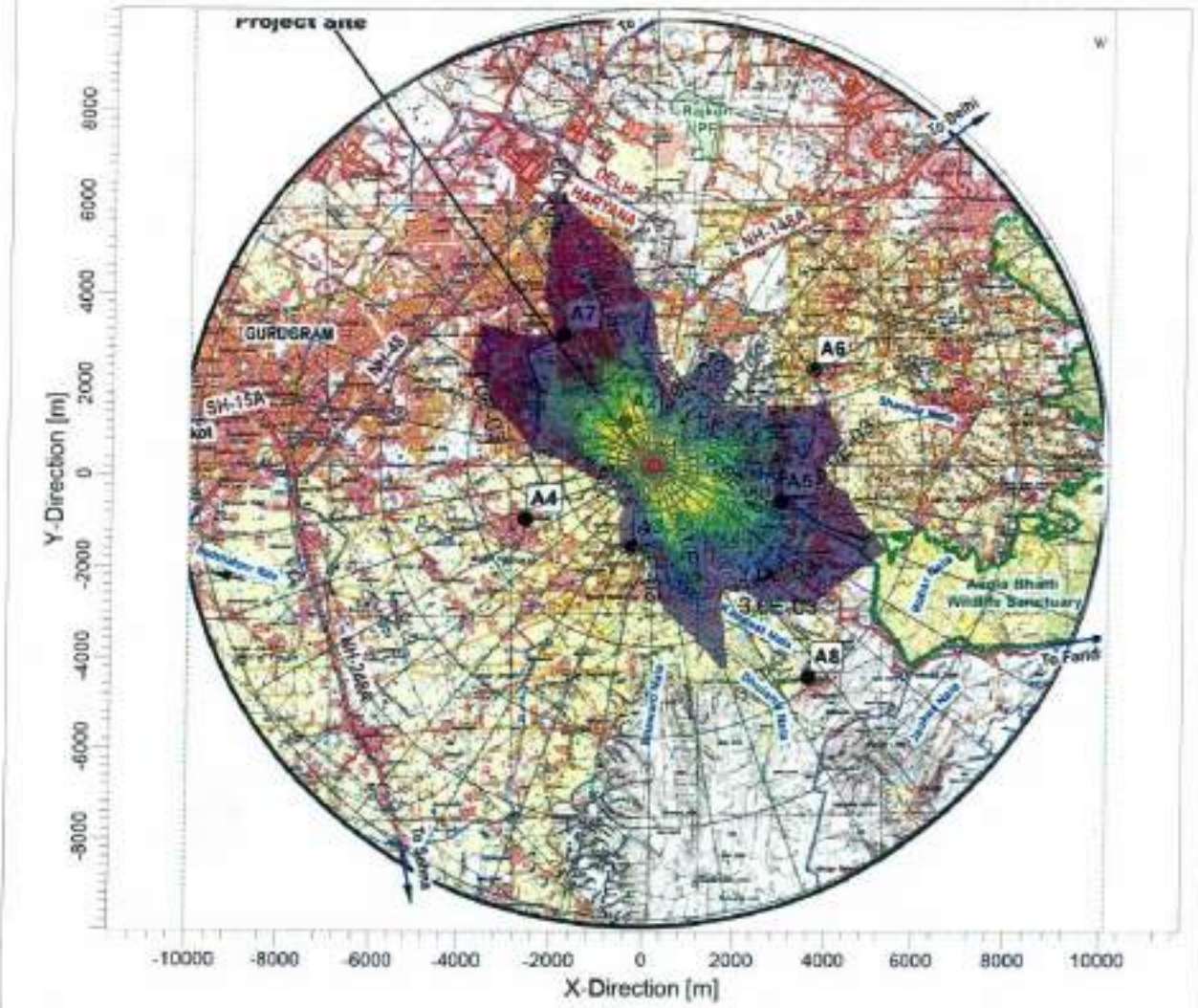
Authorised Signatory

Predicted GLC at Ambient Air Quality Monitoring Stations

Location	Village	Max Baseline Concentrations					Predicted GLC – AERMOD					Cumulative GLC				
		PM10	PM2.5	Nox	SO2	CO	PM10	PM2.5	Nox	SO2	CO	PM10	PM2.5	Nox	SO2	CO
		(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(mg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(mg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)	(mg/m³)
A1	Project site	144.90	77.40	36.40	15.20	0.98	0.00909	0.00568	0.02842	0.02273	0.0000035	144.90909	77.40568	36.42842	15.22273	0.9800035
A2	Near DLF Phase 5	134.80	69.00	29.80	10.80	1.16	0.00897	0.00561	0.02804	0.02244	0.000003	134.80897	69.00561	29.82804	10.82244	1.160003
A3	near Sec 55	130.60	65.80	26.90	9.60	0.92	0.00211	0.00132	0.00659	0.00528	0.0000008	130.60211	65.80132	26.90659	9.60528	0.9200008
A4	Near Village Wazirabad	134.80	69.00	29.80	10.80	1.20	0.00087	0.00055	0.00273	0.00219	0.0000003	134.80087	69.00055	29.80273	10.80219	1.2000003
A5	Near Village mandi	142.70	76.50	33.90	13.90	1.49	0.00457	0.00285	0.01427	0.01142	0.0000017	142.70457	76.50285	33.91427	13.91142	1.4900017
A6	Near Village Junagur	133.00	68.00	27.90	10.00	1.08	0.002	0.00125	0.00624	0.00499	0.0000007	133.002	68.00125	27.90624	10.00499	1.0800007
A7	Near DLF Phase 1	125.00	63.00	24.70	8.90	0.89	0.003	0.00188	0.00938	0.00751	0.0000011	125.003	63.00188	24.70938	8.90751	0.8900011
A8	Village Bandhwari	140.40	75.30	33.90	13.90	1.49	0.00173	0.00108	0.00541	0.00433	0.0000006	140.40173	75.30108	33.90541	13.90433	1.4900006

PROJECT TITLE:

M/s DLF LTD, Sector 54 Gurugram
Isopleth of PM10



PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL ug/m^3

Max: 0.031 (ug/m^3) at (-96.81, 427.84)

0.003 0.004 0.005 0.006 0.007 0.009 0.010 0.020 0.030 0.031

COMMENTS:	SOURCES: 4	COMPANY NAME: Vardan Environet
	RECEPTORS: 368	MODELER: Surbhi Makwana
	OUTPUT TYPE: Concentration	SCALE: 1:147,212 (0 — 5 km)
	MAX: 0.031 ug/m^3	PROJECT NO.:

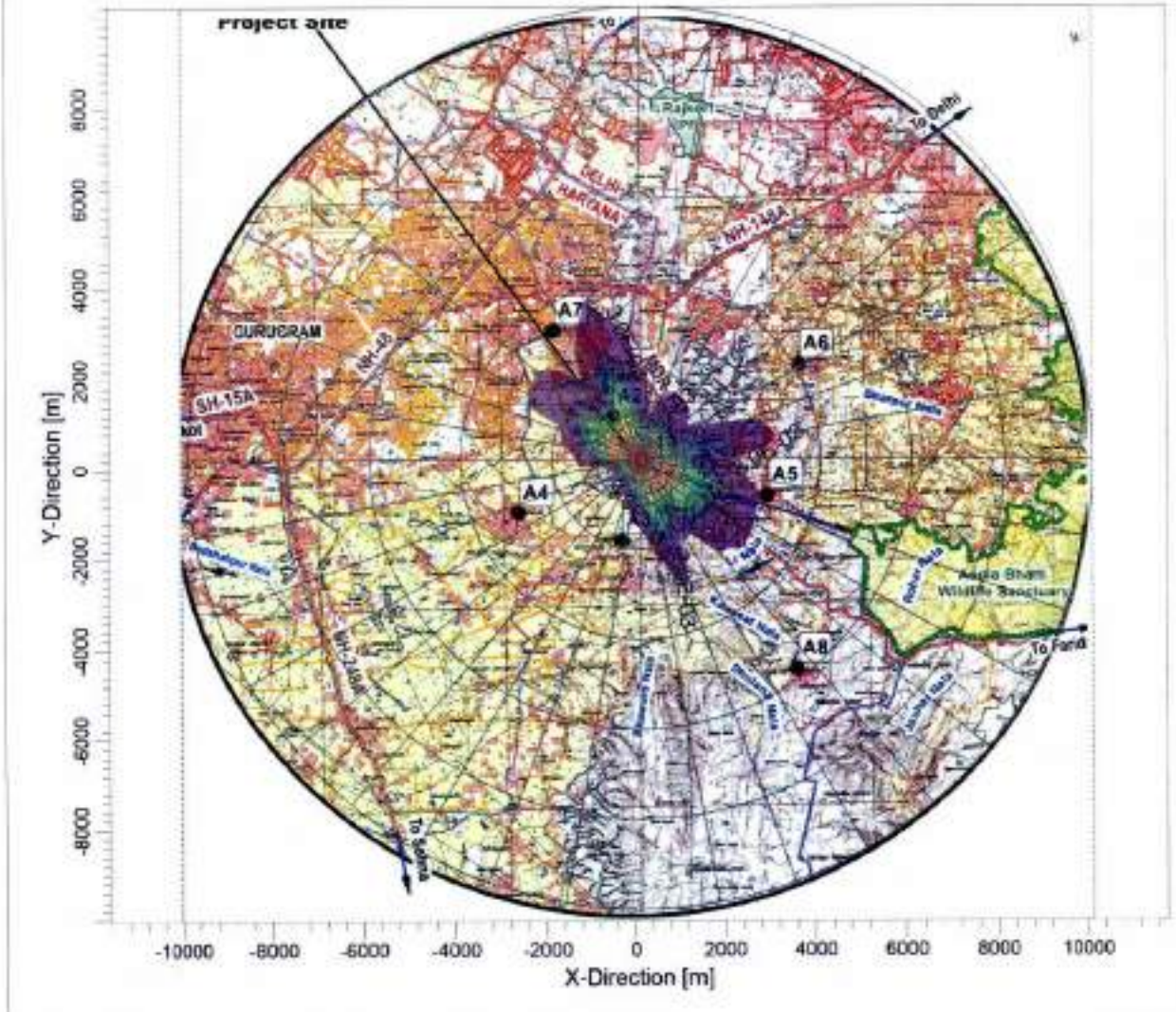
AERMOD View - Lakes Environmental Software

For DLF LIMITED

Authorised Signatory

PROJECT TITLE:

M/s DLF LTD, Sector 54 Gurugram
Isopleth of PM2.5



PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL

ug/m^3

Max: 0.019 [ug/m^3] at (-96.81, 427.84)

0.003 0.004 0.005 0.006 0.007 0.008 0.009 0.010 0.019

COMMENTS:	SOURCES: 4	COMPANY NAME: Vardan Environet	
	RECEPTORS: 368	MODELER: Surbhi Makwana	
	OUTPUT TYPE: Concentration	SCALE: 1:147,212 (0 — 5 km)	
	MAX: 0.019 ug/m^3		PROJECT NO.:

AERMOD View - Lakes Environmental Software

For DLF LIMITED

Authorised Sig

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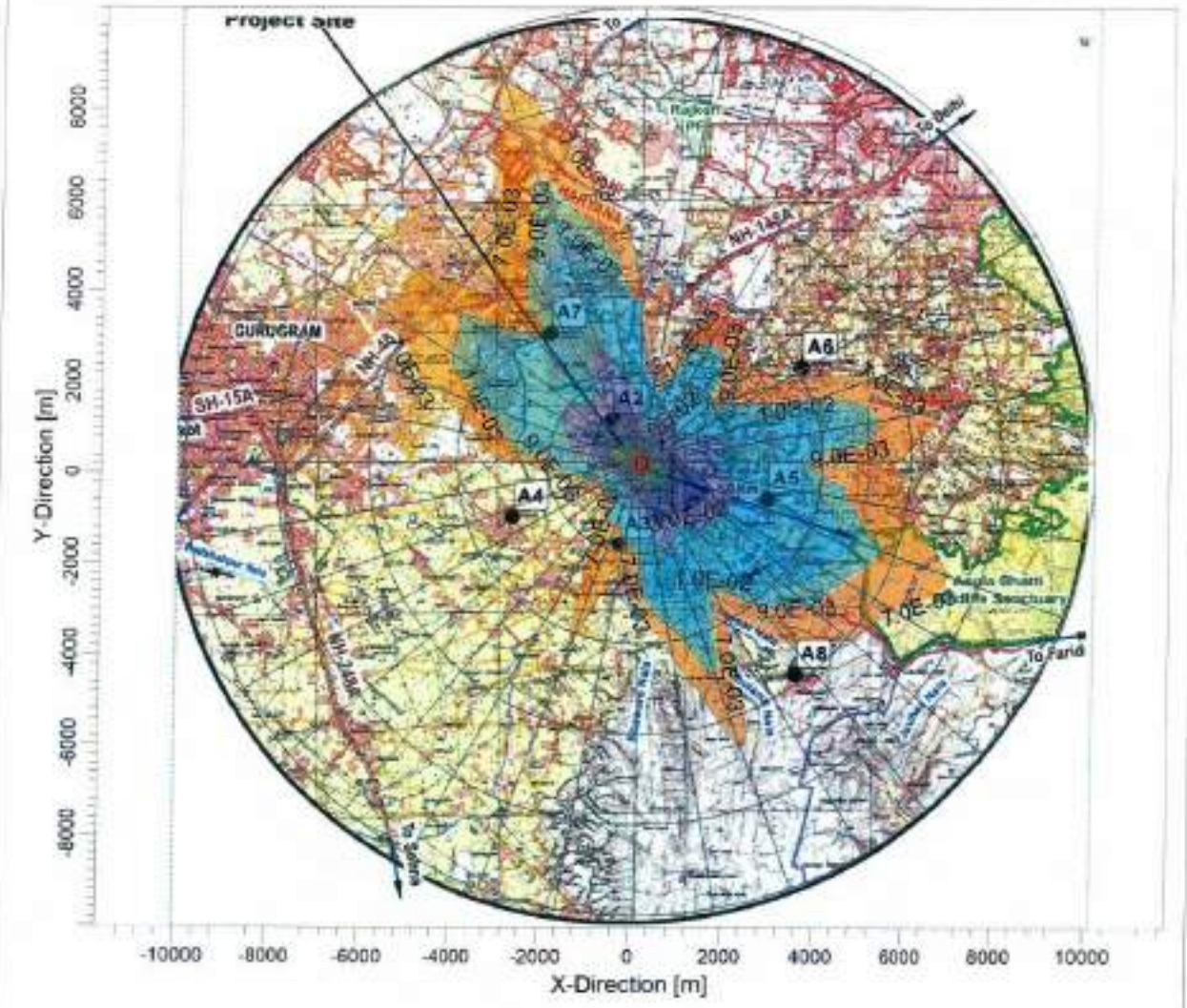
PROJECT TITLE:

M/s DLF LTD, Sector 54 Gurugram
Isopleth of NO2



PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL

ug/m^3

Max: 0.095 [ug/m^3] at (-96.81, 427.84)

0.007 0.009 0.010 0.020 0.030 0.050 0.060 0.080 0.090 0.095

COMMENTS:	SOURCES: 4	COMPANY NAME: Vardan Environet	
	RECEPTORS: 368	MODELER: Surbhi Makwana	
	OUTPUT TYPE: Concentration	SCALE: 1:147,212 (0 — 5 km)	
	MAX: 0.095 ug/m^3		PROJECT NO.:

AERMOD View - Lakes Environmental Software

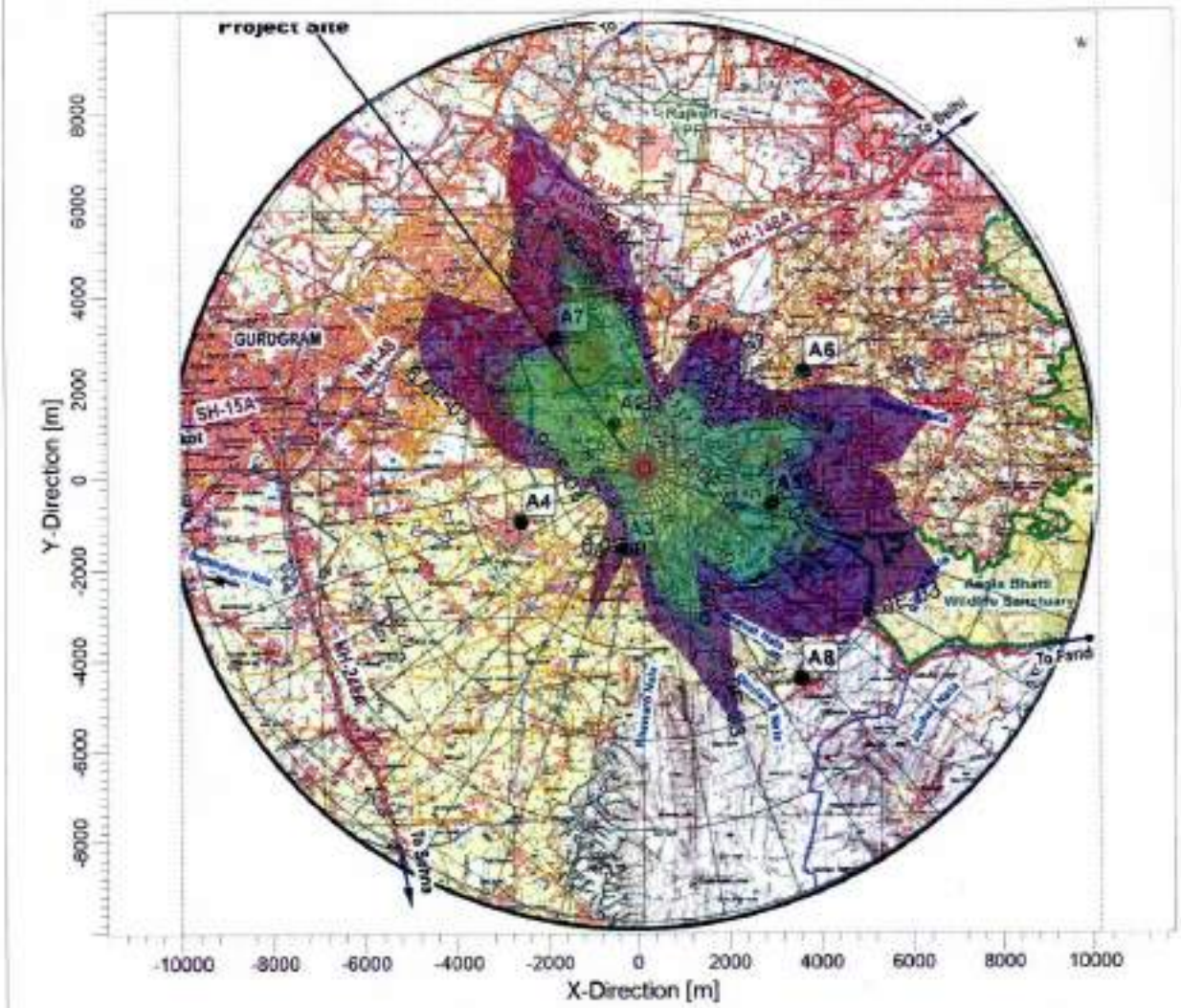
For DLF LIMITED

Authorised Signatory

287

PROJECT TITLE:

M/s DLF LTD, Sector 54 Gurugram
Isopleth of SO2



PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL

ug/m^3

Max: 0.076 [ug/m^3] at (-96.81, 427.84)

0.006 0.008 0.009 0.010 0.020 0.030 0.050 0.060 0.070 0.076

COMMENTS:	SOURCES: 4	COMPANY NAME: Vardan Environet	
	RECEPTORS: 368	MODELER: Surbhi Makwana	
	OUTPUT TYPE: Concentration	SCALE: 1:147,212 (0 — 5 km)	
	MAX: 0.076 ug/m^3		PROJECT NO.:

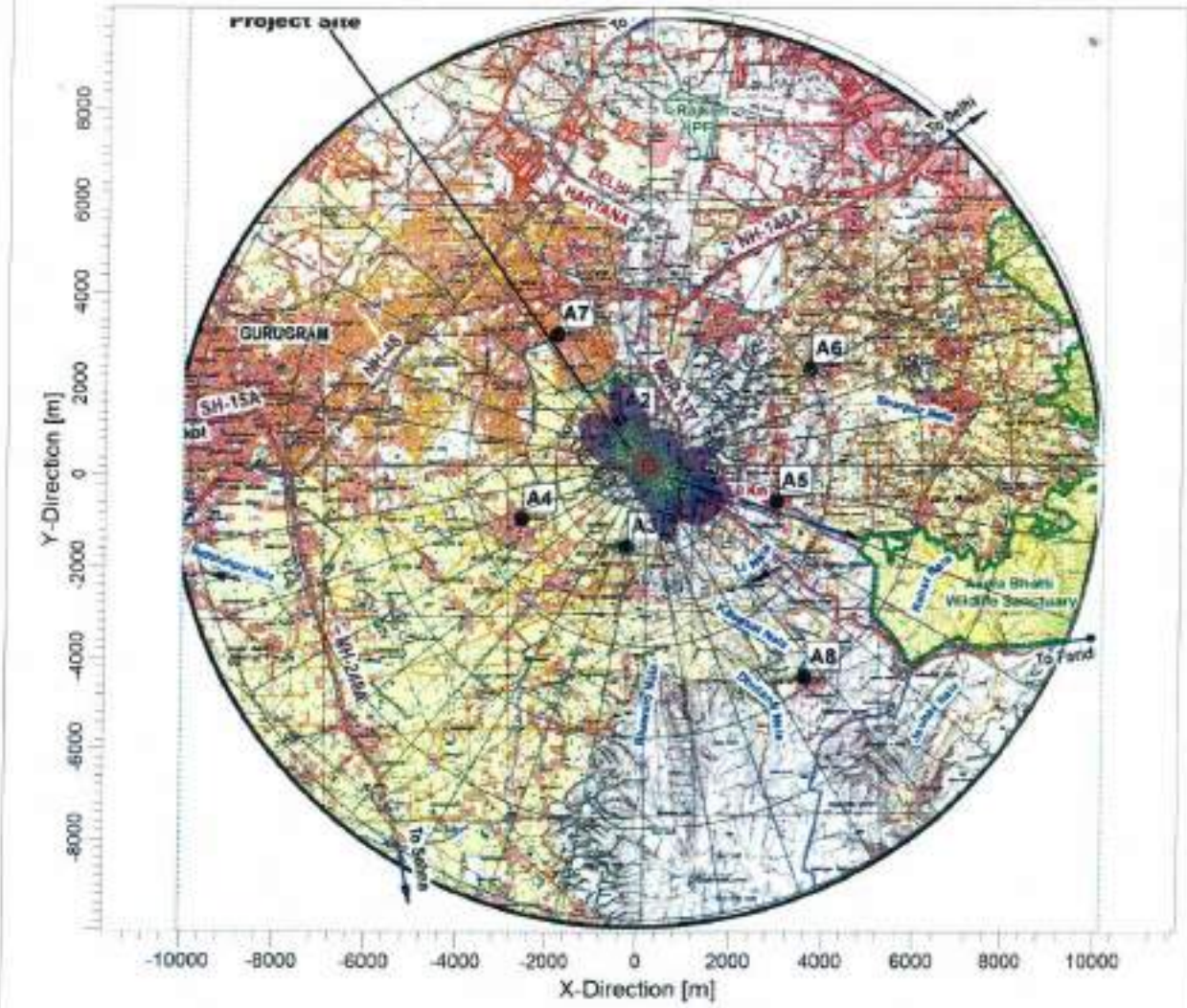
AERMOD View - Lakes Environmental Software

For DLF LIMITED

Authorised Signatory

PROJECT TITLE:

M/s DLF LTD, Sector 54 Gurugram
Isopleth of CO



PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL ug/m^3

Max: 0.012 [ug/m^3] at (-96.81, 427.84)

0.003 0.004 0.005 0.006 0.007 0.008 0.009 0.010 0.012

COMMENTS:	SOURCES: **4**	COMPANY NAME: **Vardan Environet**	
	RECEPTORS: **368**	MODELER: **Surbhi Makwana**	
	OUTPUT TYPE: **Concentration**	SCALE: 1:147,212 0 5 km	
	MAX: **0.012 ug/m^3**		PROJECT NO.:

AERMOD View - Lakes Environmental Software

For DLF LIMITED

Authorised Signatory

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No:	**VEL/DL/AA/001-026**	**Report No:**	**VEL/AA/001-026**
Name & Address of the Project:	**M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .**	**Reporting Date:**	**15/03/2024**
		Ref. No:	**NIL**
		Monitoring Period:	**December-2023 to February 2024**
Sample Collected By:	**Vardan Envirolab Representative**	**Equipment Used:**	**RDS & FPS with all accessories**
Sample Description:	**Ambient Air Quality Monitoring**	**Protocol Used:**	**IS-5182 & CPCB Guidelines**
Location:	**Project Site (A1)**	**Parameter Required:**	**As per TOR Letter**

RESULTS

Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
01-12-2023	124.2	77.4	36.4	13.4	0.75
02-12-2023	139.4	72.2	33.9	15.2	0.65
08-12-2023	144.9	71.4	31.4	14.8	0.78
09-12-2023	137.6	74.4	31.6	10.2	0.45
15-12-2023	141.3	75.4	34.9	10.9	0.65
16-12-2023	141.2	76.2	35.6	14.2	0.69
22-12-2023	142.3	73.9	32.5	12.8	0.78
23-12-2023	138.7	71.2	30.9	11.6	0.95
29-12-2023	137.5	70.0	32.4	10.7	0.41
30-12-2023	139.1	72.9	31.8	9.0	0.52
05-01-2024	118.5	73.8	34.6	13.7	0.62
06-01-2024	123.6	74.1	33.7	12.1	0.87
12-01-2024	142.5	75.9	31.5	14.6	0.98
13-01-2024	138.3	71.4	35.2	11.7	0.66
19-01-2024	137.1	72.9	34.6	10.8	0.62
20-01-2024	140.2	70.4	33.1	9.5	0.64
26-01-2024	141.9	75.3	31.8	11.0	0.52
27-01-2024	142.5	74.8	32.0	13.7	0.58
02-02-2024	140.2	72.9	34.9	12.5	0.45
03-02-2024	136.9	70.4	35.7	14.0	0.61
09-02-2024	124.2	77.4	36.4	13.4	0.48

(Checked By)

For DLF LIMITED

Authorised Signatory

(Approved By)

Ph: 0124-4343750/752/753, 9810355569, 9953147268 E-mail: lab@vardan.co.in, bd@vardan.co.in

Vardan EnviroLab

Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Report No:	VEL/AA/001-026				
Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m3)
10-02-2024	136.5	74.1	32.4	10.6	0.46
16-02-2024	140.4	73.5	33.2	10.6	0.57
17-02-2024	143.4	74.2	29.5	9.9	0.52
23-02-2024	142.7	77.4	31.4	11.7	0.42
24-02-2024	136.5	74.1	32.4	10.6	0.54

Limit as per NAAQS	Parameter	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
	--	100	60	80	80	4

*National Ambient Air Quality Standards.

(Checked By)

(Approved By)

For DLF LIMITED

Authorised Signatory

Ph: 0124-4343750/752/753, 9810355569, 9953147268 E-mail: lab@vardan.co.in, bd@vardan.co.in

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No:	**VEL/DL/AA/027-052**	**Report No:**	**VEL/AA/027-052**
Name & Address of the Project:	**M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .**	**Reporting Date:**	**15/03/2024**
		Ref. No:	**NIL**
		Monitoring Period:	**December-2023 to February 2024**
Sample Collected By:	**Vardan Envirolab Representative**	**Equipment Used:**	**RDS & FPS with all accessories**
Sample Description:	**Ambient Air Quality Monitoring**	**Protocol Used:**	**IS-5182 & CPCB Guidelines**
Location:	**Near DLF Phase 5 (A2)**	**Parameter Required:**	**As per ToR Letter**

RESULTS

Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
01-12-2023	126.7	63.4	25.7	8.6	0.32
02-12-2023	129.4	62.8	24.9	9.1	0.36
08-12-2023	131.9	65.9	27.3	7.2	0.42
09-12-2023	130.7	66.1	28.1	10.6	0.55
15-12-2023	128.3	67.0	29.6	8.9	0.51
16-12-2023	127.4	68.1	23.5	7.3	0.48
22-12-2023	132.9	66.9	24.3	8.4	0.46
23-12-2023	131.2	63.8	26.7	9.1	0.48
29-12-2023	130.5	64.2	25.8	8.3	0.55
30-12-2023	131.6	65.9	29.0	10.7	0.56
05-01-2024	132.5	62.3	26.1	9.9	0.96
06-01-2024	133.7	65.9	25.3	8.7	0.54
12-01-2024	134.5	69.0	24.8	10.2	0.62
13-01-2024	131.0	67.4	29.8	10.3	0.65
19-01-2024	126.8	68.0	29.1	10.8	0.71
20-01-2024	128.6	66.9	23.7	9.1	0.76
26-01-2024	134.8	62.8	24.6	7.6	0.69
27-01-2024	129.3	63.4	27.1	10.1	0.69
02-02-2024	131.4	64.1	26.3	8.2	0.85
03-02-2024	132.8	65.9	24.9	9.6	0.45
09-02-2024	126.7	63.4	25.7	8.6	0.64

(Checked By)

For DLF LIMITED

Authorised Signatory

(Approved By)

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Report No:	VEL/AA/027-052				
Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
10-02-2024	129.4	67.1	28.1	7.5	0.85
16-02-2024	131.5	65.3	29.4	8.3	0.96
17-02-2024	133.6	64.8	26.4	9.5	1.07
23-02-2024	134.2	62.9	25.8	7.1	1.16
24-02-2024	130.8	62.2	23.2	0.81	1.11

Limit as per NAAQS	Parameter	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
	–	100	60	80	80	4

*National Ambient Air Quality Standards.

(Checked By)

(Approved By)

For DLF LIMITED

Authorised Signatory

Ph: 0124-4343750/752/753, 9810355569, 9953147268 E-mail: lab@vardan.co.in, bd@vardan.co.in

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No:	VEL/DL/AA/053-078	Report No:	VEL/AA/053-078
Name & Address of the Project:	M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .	Reporting Date:	15/03/2024
		Ref. No:	NIL
		Monitoring Period:	December-2023 to February 2024
Sample Collected By:	Vardan Envirolab Representative	Equipment Used:	RDS & FPS with all accessories
Sample Description:	Ambient Air Quality Monitoring	Protocol Used:	IS-5182 & CPCB Guidelines
Location:	Near Sector 55 (A3)	Parameter Required:	As per ToR Letter

RESULTS

Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
01-12-2023	123.6	62.9	22.3	8.3	0.73
02-12-2023	121.8	61.3	21.5	7.2	0.84
08-12-2023	125.9	60.8	26.7	6.9	0.92
09-12-2023	126.4	59.3	24.3	8.1	0.81
15-12-2023	127.8	58.7	21.9	9.5	0.73
16-12-2023	129.3	64.5	22.7	7.3	0.68
22-12-2023	130.4	63.9	20.8	8.4	0.64
23-12-2023	127.5	61.0	25.9	9.1	0.75
29-12-2023	124.6	59.3	26.4	6.4	0.81
30-12-2023	122.4	58.4	21.8	7.7	0.90
05-01-2024	121.9	62.8	20.4	6.2	0.75
06-01-2024	123.4	63.4	26.8	8.4	0.64
12-01-2024	129.1	64.9	22.4	7.6	0.63
13-01-2024	130.6	65.7	21.3	9.4	0.61
19-01-2024	125.8	62.5	20.8	8.5	0.74
20-01-2024	124.9	61.9	25.9	7.1	0.81
26-01-2024	129.5	63.8	22.7	8.9	0.86
27-01-2024	128.4	59.7	21.6	9.4	0.90
02-02-2024	122.6	58.3	20.8	8.5	0.81
03-02-2024	125.9	64.8	22.9	7.5	0.77
09-02-2024	123.6	62.9	22.3	8.3	0.73

(Checked By)

For DLF LIMITED

Authorised Signatory

(Approved By)

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Vardan EnviroLab

Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Report No:	VEL/AA/053-078				
Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
10-02-2024	121.3	65.8	20.9	6.1	0.73
16-02-2024	122.4	63.5	26.9	5.0	0.68
17-02-2024	129.8	61.8	26.7	9.6	0.64
23-02-2024	120.1	60.8	22.4	6.8	0.75
24-02-2024	124.6	58.1	20.1	4.8	0.81

Limit as per NAAQS	Parameter	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
	--	100	60	80	80	4

*National Ambient Air Quality Standards.

(Checked By)

(Approved By)

For DLA LIMITED

Authorised Signatory

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No:	VEL/DL/AA/079-104	**Report No:**	VEL/AA/079-104
Name & Address of the Project:	M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .	**Reporting Date:**	15/03/2024
		Ref. No:	NIL
		Monitoring Period:	December-2023 to February 2024
Sample Collected By:	Vardan Envirolab Representative	**Equipment Used:**	RDS & FPS with all accessories
Sample Description:	Ambient Air Quality Monitoring	**Protocol Used:**	IS-5182 & CPCB Guidelines
Location:	Near Village Wazirabad (A4)	**Parameter Required:**	As per ToR Letter

RESULTS

Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
03-12-2023	126.7	63.4	25.7	8.6	0.98
04-12-2023	129.4	62.8	24.9	9.1	1.06
10-12-2023	131.9	65.9	27.3	7.2	1.14
11-12-2023	130.7	66.1	28.1	10.6	0.84
17-12-2023	128.3	67.0	29.6	8.9	1.06
18-12-2023	127.4	68.1	23.5	7.3	1.17
24-12-2023	132.9	66.9	24.3	8.4	1.09
25-12-2023	131.2	63.8	26.7	9.1	1.10
31-12-2023	130.5	64.2	25.8	8.3	0.96
01-01-2024	131.6	65.9	29.0	10.7	0.87
07-01-2024	132.5	62.3	26.1	9.9	0.88
08-01-2024	133.7	65.9	25.3	8.7	1.06
14-01-2024	134.5	69.0	24.8	10.2	1.13
15-01-2024	131.0	67.4	29.8	10.3	1.07
21-01-2024	126.8	68.0	29.1	10.8	0.94
22-01-2024	128.6	66.9	23.7	9.1	1.2
28-01-2024	134.8	62.8	24.6	7.6	0.89
29-01-2024	129.3	63.4	27.1	10.1	0.88
04-02-2024	131.4	64.1	26.3	8.2	0.94
05-02-2024	132.8	65.9	24.9	9.6	1.08
11-02-2024	126.7	63.4	25.7	8.6	0.98

(Checked By)

For DLF LIMITED

Authorised Signatory

(Approved By)

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Report No:	VEL/AA/079-104				
Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
12-02-2024	129.4	67.1	28.1	7.5	0.85
18-02-2024	131.5	65.3	29.4	8.3	0.96
19-02-2024	133.6	64.8	26.4	9.5	1.07
25-02-2024	134.2	62.9	25.8	7.1	1.16
26-02-2024	129.4	67.1	28.1	7.5	0.85

Limit as per NAAQS*	Parameter	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
	--	100	60	80	80	4

*National Ambient Air Quality Standards.

(Checked By)

(Approved By)

For DLE LIMITED

Authorised Signatory

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No:	VEL/DL/AA/105-130	**Report No:**	VEL/AA/105-130
Name & Address of the Project:	M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .	**Reporting Date:**	15/03/2024
		Ref. No:	NIL
		Monitoring Period:	December-2023 to February 2024
Sample Collected By:	Vardan Envirolab Representative	**Equipment Used:**	RDS & FPS with all accessories
Sample Description:	Ambient Air Quality Monitoring	**Protocol Used:**	IS-5182 & CPCB Guidelines
Location:	Near Village Mandi (A5)	**Parameter Required:**	As per ToR Letter

RESULTS

Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
03-12-2023	136.7	71.5	31.6	12.6	1.36
04-12-2023	134.9	70.9	30.8	11.4	1.42
10-12-2023	139.0	69.8	33.9	10.3	1.29
11-12-2023	138.3	67.2	28.6	13.7	1.33
17-12-2023	137.5	68.3	29.7	11.9	1.32
18-12-2023	136.1	73.8	30.2	12.8	1.47
24-12-2023	134.2	72.7	28.3	10.7	1.24
25-12-2023	135.9	74.9	32.7	13.3	1.20
31-12-2023	137.8	73.3	31.0	10.7	1.36
01-01-2024	136.4	71.0	30.8	12.6	1.47
07-01-2024	138.1	70.8	28.3	11.8	1.49
08-01-2024	140.3	68.7	29.7	12.6	1.20
14-01-2024	133.9	69.3	32.4	13.4	1.28
15-01-2024	139.6	67.2	31.2	11.5	1.37
21-01-2024	135.7	70.9	30.9	10.7	1.39
22-01-2024	134.6	72.4	33.8	13.9	1.43
28-01-2024	140.5	70.9	32.4	12.8	1.45
29-01-2024	138.2	71.3	30.5	11.7	1.37
04-02-2024	134.9	69.3	28.6	10.9	1.39
05-02-2024	135.7	68.4	29.1	13.4	1.24

(Checked By)

FOR DLF LIMITED
Authorised Signatory

(Approved By)

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Vardan EnViroLab

Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Report No:	VEL/AA/105-130				
Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
11-02-2024	137	73.8	31.8	11.3	1.35
12-02-2024	140.5	74.2	32.5	10.5	1.37
18-02-2024	142.7	75.9	30.7	9.8	1.29
19-02-2024	141.6	76.5	32.9	11.3	1.36
25-02-2024	137	73.8	31.8	11.3	1.35
26-02-2024	140.5	74.2	32.5	10.5	1.37

Limit as per NAAQS	Parameter	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
	–	100	60	80	80	4

*National Ambient Air Quality Standards.

(Checked By)

(Approved By)

For DLF LIMITED

Authorised Signatory

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No:	VEL/DL/AA/131-156	**Report No:**	VEL/AA/131-156
Name & Address of the Project:	M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .	**Reporting Date:**	15/03/2024
		Ref. No:	NIL
		Monitoring Period:	December-2023 to February 2024
Sample Collected By:	Vardan Envirolab Representative	**Equipment Used:**	RDS & FPS with all accessories
Sample Description:	Ambient Air Quality Monitoring	**Protocol Used:**	IS-5182 & CPCB Guidelines
Location:	Near Village Junapur (A6)	**Parameter Required:**	As per ToR Letter

RESULTS

Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
03-12-2023	126.3	66.3	23.5	7.5	0.86
04-12-2023	125.2	64.8	22.9	9.2	0.91
10-12-2023	124.9	62.9	26.7	8.1	1.05
11-12-2023	129.3	61.8	25.4	6.8	1.04
17-12-2023	130.7	60.3	27.3	7.6	0.76
18-12-2023	127.6	67.9	24.9	8.5	0.85
24-12-2023	128.4	64.9	25.1	9.4	0.93
25-12-2023	126.9	63.8	26.7	8.3	1.06
31-12-2023	125.4	62.6	23.0	7.8	1.08
01-01-2024	124.8	61.8	22.8	9.9	0.95
07-01-2024	133.0	60.8	25.3	6.8	0.76
08-01-2024	131.2	68.0	26.7	9.4	0.84
14-01-2024	130.5	66.2	23.1	8.6	0.93
15-01-2024	128.9	65.1	22.6	7.6	0.84
21-01-2024	124.6	62.9	25.9	8.1	1.06
22-01-2024	125.9	61.8	26.4	7.2	0.76
28-01-2024	127.2	60.8	27.9	6.8	0.88
29-01-2024	129.3	66.8	25.4	10	0.98
04-02-2024	130.7	67.2	23.9	7.8	0.81
05-02-2024	131.6	63.9	22.7	8.5	0.73

(Checked By)

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Vardan EnviroLab

Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Report No:	VEL/AA/131-156				
Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
11-02-2024	129.3	60.1	27.2	9.3	0.84
12-02-2024	127.4	67.9	22.3	7.5	0.79
18-02-2024	124.8	65.8	24.6	6.2	0.89
19-02-2024	129.3	66.2	23.8	9.3	0.71
25-02-2024	131.8	61.2	22.4	6.8	1.03
26-02-2024	129.3	60.1	27.2	9.3	0.84

Limit as per NAAQS	Parameter	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
	--	100	60	80	80	4

*National Ambient Air Quality Standards.

(Checked By)

(Approved By)

For VLE LIMITED

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No:	VEL/DL/AA/157-182	**Report No:**	VEL/AA/157-182
Name & Address of the Project:	M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .	**Reporting Date:**	15/03/2024
		Ref. No:	NIL
		Monitoring Period:	December-2023 to February 2024
Sample Collected By:	Vardan Envirolab Representative	**Equipment Used:**	RDS & FPS with all accessories
Sample Description:	Ambient Air Quality Monitoring	**Protocol Used:**	IS-5182 & CPCB Guidelines
Location:	Near DLF Phase 1 (A7)	**Parameter Required:**	As per ToR Letter

RESULTS

Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
05-12-2023	121.3	56.7	19.4	7.3	0.63
06-12-2023	120.4	55.1	21.3	5.6	0.71
12-12-2023	119.6	59.8	20.5	6.4	0.59
13-12-2023	122.4	57.3	22.9	8.1	0.73
19-12-2023	121.5	61.4	23.6	7.9	0.81
20-12-2023	123.8	60.5	24.7	5.7	0.54
26-12-2023	122.2	59.4	20.5	7.7	0.77
27-12-2023	123.4	58.3	18.6	8.9	0.62
02-01-2024	122.8	62.7	19.4	5.3	0.89
03-01-2024	117.5	61.6	21.7	7.1	0.56
09-01-2024	122.0	60.8	20.6	6.0	0.63
10-01-2024	121.9	59.6	22.5	8.4	0.77
16-01-2024	119.5	58.4	23.1	7.9	0.69
17-01-2024	122.1	57.3	24.5	5.3	0.85
23-01-2024	122.4	63	19.8	6.4	0.57
24-01-2024	119.2	61.5	21.6	8.4	0.73
30-01-2024	120.1	60.9	22.4	6.9	0.84
31-01-2024	120.8	58.3	23.8	6.8	0.76
06-02-2024	121.2	57.4	19.1	8.0	0.52
07-02-2024	125.0	56.2	18.4	6.4	0.59

(Checked By) For DLF LIMITED Authorised Signatory

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Report No:	VEL/AA/157-182				
Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
13-02-2024	121.2	54.9	21.8	6.6	0.57
14-02-2024	121.6	58.3	22.9	8.4	0.73
20-02-2024	122.2	57.4	24.6	7.9	0.84
21-02-2024	122.6	56.1	23.5	8.4	0.76
27-02-2024	121.5	60.9	21.7	5.0	0.52
28-02-2024	121.2	54.9	21.8	6.6	0.57

Limit as per NAAQS	Parameter	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
	--	100	60	80	80	4

*National Ambient Air Quality Standards.

(Checked By)

(Approved By)

For DLF LIMITED

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® Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No:	VEL/DL/AA/183-208	**Report No:**	VEL/AA/183-208
Name & Address of the Project:	M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .	**Reporting Date:**	15/03/2024
		Ref. No:	NIL
		Monitoring Period:	December-2023 to February 2024
Sample Collected By:	Vardan Envirolab Representative	**Equipment Used:**	RDS & FPS with all accessories
Sample Description:	Ambient Air Quality Monitoring	**Protocol Used:**	IS-5182 & CPCB Guidelines
Location:	Village Bandhwari (A8)	**Parameter Required:**	As per ToR Letter

RESULTS

Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
05-12-2023	135.9	71.5	31.6	12.6	1.36
06-12-2023	134.9	75.3	30.8	11.4	1.42
12-12-2023	139.5	69.8	33.9	10.3	1.11
13-12-2023	138.6	67.2	28.6	13.7	1.33
19-12-2023	137.4	68.3	29.7	11.9	1.32
20-12-2023	136.2	73.8	30.2	12.8	1.47
26-12-2023	134.4	72.7	28.3	10.7	1.24
27-12-2023	135.7	74.5	32.7	13.3	1.20
02-01-2024	137.7	73.1	31.0	10.7	1.20
03-01-2024	136.4	72.2	30.8	12.6	1.47
09-01-2024	138.2	70.9	28.3	11.8	1.49
10-01-2024	140.4	68.7	29.7	12.6	1.20
16-01-2024	137.6	69.3	32.4	13.4	1.28
17-01-2024	137.5	67.7	31.2	11.5	1.37
23-01-2024	134.5	71.3	30.9	10.7	1.39
24-01-2024	133.3	72.6	33.8	13.9	1.43
30-01-2024	139.5	71.2	32.4	12.8	1.45
31-01-2024	138.2	71.6	30.5	11.7	1.37
06-02-2024	134.9	69.4	28.4	10.9	1.39
07-02-2024	135.7	68.6	29.6	13.4	1.24

For DLF LIMITED

(Checked By) Authorised Signatory (Approved By)

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Report No:	VEL/AA/183-208				
Date	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
13-02-2024	134.6	75.2	30.1	12.0	1.39
14-02-2024	134.1	71.2	28.3	13.6	1.45
20-02-2024	139.2	70.9	32.5	11.8	1.40
21-02-2024	140.2	68.7	33.7	12.6	1.28
27-02-2024	137.6	67.5	29.3	10.8	1.49
28-02-2024	134.6	75.2	30.1	12.0	1.39

Limit as per NAAQS	Parameter	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	CO (mg/m^3)
	--	100	60	80	80	4

*National Ambient Air Quality Standards.

(Checked By)

(Approved By)

For DLF LIMITED

Authorised Signatory

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	VEL/DL/AN/01	Report No:	VEL/AN/2401/02/001
Name & Address of the Project:	M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana	Format No:	7.8 F-03
		Party Reference No:	NIL
		Reporting Date:	08/01/2024
		Receipt Date:	02/01/2024

Sample Description: AMBIENT NOISE LEVEL MONITORING

General Information:-

Sample collected by	:	Vardan Envirolab Representative
Sampling Location	:	**Project Site (N1)**
Instrument Used	:	Sound Level Meter- 15
Instrument Calibration Status	:	Calibrated
Meteorological condition during monitoring	:	Clear Sky
Date of Monitoring	:	**30/12/2023-31/12/2023**
Time of Monitoring	:	06:00 AM to 06:00 AM
Surrounding Activity	:	Vehicular & Human Activities
Scope of Monitoring	:	Regulatory Requirement
Sampling & Analysis Protocol	:	IS-9989
Sampling Duration	:	24 Hours
Parameter Required	:	L_{max},L_{min},L_{eq}

RESULT

S. No.	Parameters	Protocol	Test Result dB (A)		Unit
			Day Time (6:00 am to 10:00 pm)	Night Time (10:00 pm to 06:00 am)	
1.	L_{max}	IS -9989	78.2	68.4	dB(A)
2.	L_{min}	IS- 9989	49.6	39.5	dB(A)
3.	L_{eq}	IS -9989	53.02	41.20	dB(A)
4.	Limits in dB(A) Leq (Residential Area)	-	**55.0**	**45.0**	dB(A)

Note*The Principal Rules were published in the Gazette of India, vide S.O. 123(E), dated 14.2.2000 and subsequently amended by the Noise Pollution (Regulation and Control) (Amendment) Rules, 2000 vide S.O. 1046(E), dated 22.11.2000 and by the Noise Pollution (Regulation and Control) (Amendment) Rules, 2002 vide S.O. 1088(E), dated 11.10.2002, under the Environment (Protection) Act, 1986.

For DLF LIMITED

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ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	**VEL/DL/AN/02**	**Report No:**	**VEL/AN/2401/02/002**
Name & Address of the Project:	**M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana**	**Format No:**	**7.8 F-03**
		Party Reference No:	**NIL**
		Reporting Date:	**08/01/2024**
		Receipt Date:	**02/01/2024**

Sample Description: **AMBIENT NOISE LEVEL MONITORING**

General Information:-

Sample collected by	:	Vardan Envirolab Representative
Sampling Location	:	**Near DLF Phase 5 (N2)**
Instrument Used	:	Sound Level Meter- 16
Instrument Calibration Status	:	Calibrated
Meteorological condition during monitoring	:	Clear Sky
Date of Monitoring	:	**30/12/2023-31/12/2023**
Time of Monitoring	:	06:00 AM to 06:00 AM
Surrounding Activity	:	Human & Vehicular Activities
Scope of Monitoring	:	Regulatory Requirement
Sampling & Analysis Protocol	:	IS-9989
Sampling Duration	:	24 Hours
Parameter Required	:	L_{max},L_{min},L_{eq}

RESULT

S. No.	Parameters	Protocol	Test Result dB (A)		Unit
			Day Time (6:00 am to 10:00 pm)	Night Time (10:00 pm to 06:00 am)	
1.	L_{max}	IS -9989	69.8	58.9	dB(A)
2.	L_{min}	IS- 9989	43.6	35.1	dB(A)
3.	L_{eq}	IS -9989	52.02	42.20	dB(A)
4.	**Limits in dB(A) Leq (Residential Area)**	-	**55.0**	**45.0**	dB(A)

Note:*The Principal Rules were published in the Gazette of India, vide S.O. 123(E), dated 14.2.2000 and subsequently amended by the Noise Pollution (Regulation and Control) (Amendment) Rules, 2000 vide S.O. 1046(E), dated 22.11.2000 and by the Noise Pollution (Regulation and Control) (Amendment) Rules, 2002 vide S.O. 1088(E), dated 11.10.2002, under the Environment (Protection) Act, 1986.

(Checked By)

(Approved By)

For DLF LIMITED

Authorised Signatory

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	**VEL/DL/AN/03**	**Report No:**	**VEL/AN/2401/02/003**
Name & Address of the Project:	**M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana**	**Format No:**	**7.8 F-03**
		Party Reference No:	**NIL**
		Reporting Date:	**08/01/2024**
		Receipt Date:	**02/01/2024**

Sample Description: **AMBIENT NOISE LEVEL MONITORING**

General Information:-

Sample collected by	:	Vardan Envirolab Representative
Sampling Location	:	**Near Sector 55 (N3)**
Instrument Used	:	Sound Level Meter- 17
Instrument Calibration Status	:	Calibrated
Meteorological condition during monitoring	:	Clear Sky
Date of Monitoring	:	**30/12/2023-31/12/2023**
Time of Monitoring	:	06:00 AM to 06:00 AM
Surrounding Activity	:	Human, Vehicular & Agricultural Activities
Scope of Monitoring	:	Regulatory Requirement
Sampling & Analysis Protocol	:	IS-9989
Sampling Duration	:	24 Hours
Parameter Required	:	L_{max},L_{min},L_{eq}

RESULT

S. No.	Parameters	Protocol	Test Result dB (A)		Unit
			Day Time (6:00 am to 10:00 pm)	Night Time (10:00 pm to 06:00 am)	
1.	L_{max}	IS -9989	61.8	52.9	dB(A)
2.	L_{min}	IS- 9989	45.8	36.9	dB(A)
3.	L_{eq}	IS -9989	52.87	42.11	dB(A)
4.	**Limits in dB(A) Leq (Residential Area)**	-	**55.0**	**45.0**	dB(A)

Note:*The Principal Rules were published in the Gazette of India, vide S.O. 123(E), dated 14.2.2000 and subsequently amended by the Noise Pollution (Regulation and Control) (Amendment) Rules, 2000 vide S.O. 1046(E), dated 22.11.2000 and by the Noise Pollution (Regulation and Control) (Amendment) Rules, 2002 vide S.O. 1088(E), dated 11.10.2002, under the Environment (Protection) Act, 1986.

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Test Report

Sample Number:	**VEL/DL/AN/04**	**Report No:**	**VEL/AN/2401/02/004**
Name & Address of the Project:	**M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana**	**Format No:**	**7.8 F-03**
		Party Reference No:	**NIL**
		Reporting Date:	**08/01/2024**
		Receipt Date:	**02/01/2024**

Sample Description: **AMBIENT NOISE LEVEL MONITORING**

General Information:-

Sample collected by	:	Vardan Envirolab Representative
Sampling Location	:	**Near Village Wazirabad (N4)**
Instrument Used	:	Sound Level Meter- 18
Instrument Calibration Status	:	Calibrated
Meteorological condition during monitoring	:	Clear Sky
Date of Monitoring	:	**31/12/2023 – 01/01/2024**
Time of Monitoring	:	06:00 AM to 06:00 AM
Surrounding Activity	:	Forest & Mountain Area
Scope of Monitoring	:	Regulatory Requirement
Sampling & Analysis Protocol	:	IS-9989
Sampling Duration	:	24 Hours
Parameter Required	:	L_{max},L_{min},L_{eq}

RESULT

S. No.	Parameters	Protocol	Test Result dB (A)		Unit
			Day Time (6:00 am to 10:00 pm)	Night Time (10:00 pm to 06:00 am)	
1.	L_{max}	IS -9989	57.2	51.4	dB(A)
2.	L_{min}	IS- 9989	41.6	33.7	dB(A)
3.	L_{eq}	IS -9989	46.96	39.98	dB(A)
4.	**Limits in dB(A) Leq (Residential Area)**	-	**55.0**	**45.0**	dB(A)

Note*The Principal Rules were published in the Gazette of India, vide S.O. 123(E), dated 14.2.2000 and subsequently amended by the Noise Pollution (Regulation and Control) (Amendment) Rules, 2000 vide S.O. 1046(E), dated 22.11.2000 and by the Noise Pollution (Regulation and Control) (Amendment) Rules, 2002 vide S.O. 1088(E), dated 11.10.2002, under the Environment (Protection) Act, 1986.

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Test Report

Sample Number:	**VEL/DL/AN/05**	**Report No:**	**VEL/AN/2401/02/005**
Name & Address of the Project:	**M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana**	**Format No:**	**7.8 F-03**
		Party Reference No:	**NIL**
		Reporting Date:	**08/01/2024**
		Receipt Date:	**02/01/2024**

Sample Description: **AMBIENT NOISE LEVEL MONITORING**

General Information:-

Sample collected by	:	Vardan Envirolab Representative
Sampling Location	:	**Near Village Mandi (N5)**
Instrument Used	:	Sound Level Meter- 15
Instrument Calibration Status	:	Calibrated
Meteorological condition during monitoring	:	Clear Sky
Date of Monitoring	:	**31/12/2023 – 01/01/2024**
Time of Monitoring	:	06:00 AM to 06:00 AM
Surrounding Activity	:	Human & Vehicular Activities
Scope of Monitoring	:	Regulatory Requirement
Sampling & Analysis Protocol	:	IS-9989
Sampling Duration	:	24 Hours
Parameter Required	:	L_{max},L_{min},L_{eq}

RESULT

S. No.	Parameters	Protocol	Test Result dB (A)		Unit
			Day Time (6:00 am to 10:00 pm)	Night Time (10:00 pm to 06:00 am)	
1.	L_{max}	IS -9989	64.9	56.1	dB(A)
2.	L_{min}	IS- 9989	44.1	36.6	dB(A)
3.	L_{eq}	IS -9989	50.43	43.86	dB(A)
4.	**Limits in dB(A) Leq (Residential Area)**	-	**55.0**	**45.0**	dB(A)

Note:*The Principal Rules were published in the Gazette of India, vide S.O. 123(E), dated 14.2.2000 and subsequently amended by the Noise Pollution (Regulation and Control) (Amendment) Rules, 2000 vide S.O. 1046(E), dated 22.11.2000 and by the Noise Pollution (Regulation and Control) (Amendment) Rules, 2002 vide S.O. 1088(E), dated 11.10.2002, under the Environment (Protection) Act, 1986.

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ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	**VEL/DL/AN/06**	**Report No:**	**VEL/AN/2401/02/006**
Name & Address of the Project:	**M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana**	**Format No:**	**7.8 F-03**
		Party Reference No:	**NIL**
		Reporting Date:	**08/01/2024**
		Receipt Date:	**02/01/2024**

Sample Description: **AMBIENT NOISE LEVEL MONITORING**

General Information:-

Sample collected by	:	Vardan Envirolab Representative
Sampling Location	:	**Near Village Junapur (N6)**
Instrument Used	:	Sound Level Meter- 16
Instrument Calibration Status	:	Calibrated
Meteorological condition during monitoring	:	Clear Sky
Date of Monitoring	:	**31/12/2023 – 01/01/2024**
Time of Monitoring	:	06:00 AM to 06:00 AM
Surrounding Activity	:	Human & Vehicular Activities
Scope of Monitoring	:	Regulatory Requirement
Sampling & Analysis Protocol	:	IS-9989
Sampling Duration	:	24 Hours
Parameter Required	:	L_{max},L_{min},L_{eq}

RESULT

S. No.	Parameters	Protocol	Test Result dB (A)		Unit
			Day Time (6:00 am to 10:00 pm)	Night Time (10:00 pm to 06:00 am)	
1.	L_{max}	IS -9989	66.2	58.5	dB(A)
2.	L_{min}	IS- 9989	44.8	38.2	dB(A)
3.	L_{eq}	IS -9989	52.02	42.89	dB(A)
4.	**Limits in dB(A) Leq (Residential Area)**	-	**55.0**	**45.0**	dB(A)

Note'*The Principal Rules were published in the Gazette of India, vide S.O. 123(E), dated 14.2.2000 and subsequently amended by the Noise Pollution (Regulation and Control) (Amendment) Rules, 2000 vide S.O. 1046(E), dated 22.11.2000 and by the Noise Pollution (Regulation and Control) (Amendment) Rules, 2002 vide S.O. 1088(E), dated 11.10.2002, under the Environment (Protection) Act, 1986.

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Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	**VEL/DL/AN/07**	**Report No:**	**VEL/AN/2401/02/007**
Name & Address of the Project:	**M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana**	**Format No:**	**7.8 F-03**
		Party Reference No:	**NIL**
		Reporting Date:	**08/01/2024**
		Receipt Date:	**02/01/2024**
Sample Description:	**AMBIENT NOISE LEVEL MONITORING**		

General Information:-

Sample collected by	:	Vardan Envirolab Representative
Sampling Location	:	**Near DLF Phase 1 (N7)**
Instrument Used	:	Sound Level Meter- 17
Instrument Calibration Status	:	Calibrated
Meteorological condition during monitoring	:	Clear Sky
Date of Monitoring	:	**01/01/2024-02/01/2024**
Time of Monitoring	:	06:00 AM to 06:00 AM
Surrounding Activity	:	Human & Vehicular Activities
Scope of Monitoring	:	Regulatory Requirement
Sampling & Analysis Protocol	:	IS-9989
Sampling Duration	:	24 Hours
Parameter Required	:	L_{max},L_{min},L_{eq}

RESULT

S. No.	Parameters	Protocol	Test Result dB (A)		Unit
			Day Time (6:00 am to 10:00 pm)	Night Time (10:00 pm to 06:00 am)	
1.	L_{max}	IS -9989	62.7	57.2	dB(A)
2.	L_{min}	IS- 9989	43.8	35.1	dB(A)
3.	L_{eq}	IS -9989	50.19	42.75	dB(A)
4.	**Limits in dB(A) Leq (Residential Area)**	-	**55.0**	**45.0**	dB(A)

Note'*The Principal Rules were published in the Gazette of India, vide S.O. 123(E), dated 14.2.2000 and subsequently amended by the Noise Pollution (Regulation and Control) (Amendment) Rules, 2000 vide S.O. 1046(E), dated 22.11.2000 and by the Noise Pollution (Regulation and Control) (Amendment) Rules, 2002 vide S.O. 1088(E), dated 11.10.2002, under the Environment (Protection) Act, 1986.

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
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Test Report

Sample Number:	**VEL/DL/AN/08**	**Report No:**	**VEL/AN/2401/02/008**
Name & Address of the Project:	**M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana**	**Format No:**	**7.8 F-03**
		Party Reference No:	**NIL**
		Reporting Date:	**08/01/2024**
		Receipt Date:	**02/01/2024**
Sample Description:	**AMBIENT NOISE LEVEL MONITORING**		

General Information:-

Sample collected by	:	Vardan Envirolab Representative
Sampling Location	:	**Village Bandhwari (N8)**
Instrument Used	:	Sound Level Meter- 18
Instrument Calibration Status	:	Calibrated
Meteorological condition during monitoring	:	Clear Sky
Date of Monitoring	:	**01/01/2024-02/01/2024**
Time of Monitoring	:	06:00 AM to 06:00 AM
Surrounding Activity	:	Human & Vehicular Activities
Scope of Monitoring	:	Regulatory Requirement
Sampling & Analysis Protocol	:	IS-9989
Sampling Duration	:	24 Hours
Parameter Required	:	L_{max},L_{min},L_{eq}

RESULT

S. No.	Parameters	Protocol	Test Result dB (A)		Unit
			Day Time (6:00 am to 10:00 pm)	Night Time (10:00 pm to 06:00 am)	
1.	L_{max}	IS -9989	52.7	45.1	dB(A)
2.	L_{min}	IS- 9989	45.1	37.2	dB(A)
3.	L_{eq}	IS -9989	48.26	38.51	dB(A)
4.	**Limits in dB(A) Leq (Residential Area)**	-	**55.0**	**45.0**	dB(A)

Note:*The Principal Rules were published in the Gazette of India, vide S.O. 123(E), dated 14.2.2000 and subsequently amended by the Noise Pollution (Regulation and Control) (Amendment) Rules, 2000 vide S.O. 1046(E), dated 22.11.2000 and by the Noise Pollution (Regulation and Control) (Amendment) Rules, 2002 vide S.O. 1088(E), dated 11.10.2002, under the Environment (Protection) Act, 1986.

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Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
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Test Report

Sample Number:	**VEL/DL/W/01**	**Report No.:**	**VEL/W/2401/02/001**
Name &Address of the Project:	**M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .**	**Format No.:**	**7.8 F-03**
		Party Reference No.:	**NIL**
		Reporting Date:	**08/01/2024**
		Period of Analysis:	**02/01/2024– 08/01/2024**
		Receipt Date:	**02/01/2024**
Sample Description:	**Ground Water Sample**	**Sampling Date:**	**02/01/2024**
Sample Location:	**Dlf Phase 5 (GW1)**	**Sampling Quantity:**	**5.0 Ltr + 250ml.**
Sample Collected by:	**Vardan Enviro Lab Representative**	**Sampling Type:**	**Grab**
Sampling and Analysis Protocol:	**IS, APHA, 23rd Edition 2017 & STP**	**Preservation:**	**Ice Box**

S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable Limit)	Permissible limit in the Absence of Alternate Source
1.	pH (at 25 °C)	IS3025 (P-11)	7.70	--	6.5 to 8.5	No Relaxation
2.	Colour	IS3025 (P-4)	*BLQ (**LOQ 1.0)	Hazen	5	15
3.	Turbidity	IS3025 (P-10)	*BLQ (**LOQ 1.0)	NTU	1	5
4.	Odour	IS3025 (P-5)	Agreeable	--	Agreeable	Agreeable
5.	Taste	IS3025 (P-8)	Agreeable	--	Agreeable	Agreeable
6.	Total Hardness as $CaCO_3$	IS3025 (P-21)	272.04	mg/l	200	600
7.	Calcium as Ca	IS3025 (P-40)	48.10	mg/l	75	200
8.	Alkalinity as $CaCO_3$	IS3025 (P-23)	186.15	mg/l	200	600
9.	Chloride as Cl	IS 3025 (P-32)	90.52	mg/l	250	1000
10.	Cyanide as CN	IS 3025 (P-27)	*BLQ (**LOQ 0.02)	mg/l	0.05	No Relaxation
11.	Magnesium as Mg	APHA , 3500 Mg B	36.94	mg/l	30	100
12.	Total Dissolved Solids	IS3025 (P-16)	414.00	mg/l	500	2000
13.	Sulphate as SO_4	IS3025 (P-24)	54.98	mg/l	200	400
14.	Fluoride as F	APHA , 4500-F D	0.22	mg/l	1.0	1.5
15.	Nitrate as NO_3	IS3025 (P-34), Chromotropic method	16.24	mg/l	45	No Relaxation
16.	Iron as Fe	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.16	mg/l	1.0	No relaxation
17.	Aluminium as Al	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.005)	mg/l	0.03	0.2
18.	Boron	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.01)	mg/l	0.5	2.4
19.	Chromium as Cr	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.05	No Relaxation

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ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: VEL/DL/W/01					Report No.: VEL/W/2401/02/001	
S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable Limit)	Permissible limit in the Absence of Alternate Source
20.	Conductivity (at 25°C)	IS3025 (P-14)	636	µS/cm	--	--
21.	Phenolic Compounds	IS3025 (P-43)	*BLQ (**LOQ 0.0005)	mg/l	0.001	0.002
22.	Mineral Oil	IS 3025 (P-39)	*BLQ (**LOQ 0.1)	mg/l	1.0	No Relaxation
23.	Anionic Detergents as MBAS	IS3025 (P-68)	*BLQ (**LOQ 0.05)	mg/l	0.2	1.0
24.	Zinc as Zn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.74	mg/l	5	15
25.	Copper as Cu	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.10	mg/l	0.05	1.5
26.	Manganese as Mn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.01)	mg/l	0.1	0.3
27.	Cadmium as Cd	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.003	No Relaxation
28.	Lead as Pb	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.01	No Relaxation
29.	Selenium as Se	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.001)	mg/l	0.01	No Relaxation
30.	Arsenic as As	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.005)	mg/l	0.01	No Relaxation
31.	Mercury as Hg	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.0005)	mg/l	0.001	No Relaxation

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: **VEL/DL/W/01**					Report No.: VEL/W/2401/02/001	
S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable Limit)	Permissible limit in the Absence of Alternate Source
1.	Total Coliform	APHA 9221 B	<1.8	MPN/100ml	-	
2.	E. Coli	APHA 9221 F	<1.8	MPN/100ml	-	

Note:-*BLQ-Below Limit of Quantification, **LOQ- Limit of Quantification.

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Vardan EnviroLab

Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
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Test Report

Sample Number:	**VEL/DL/W/02**	**Report No.:**	**VEL/W/2401/02/002**
Name &Address of the Project:	**M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .**	**Format No.:**	**7.8 F-03**
		Party Reference No.:	**NIL**
		Reporting Date:	**08/01/2024**
		Period of Analysis:	**02/01/2024– 08/01/2024**
		Receipt Date:	**02/01/2024**
Sample Description:	**Ground Water Sample**	**Sampling Date:**	**02/01/2024**
Sample Location:	**Village Wazirabad (GW2)**	**Sampling Quantity:**	**5.0 Ltr + 250ml.**
Sample Collected by:	**Vardan Enviro Lab Representative**	**Sampling Type:**	**Grab**
Sampling and Analysis Protocol:	**IS, APHA, 23rd Edition 2017 & STP**	**Preservation:**	**Ice Box**

S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 - 2012	
					Requirement (Acceptable Limit)	Permissible limit in the Absence of Alternate Source
1.	pH (at 25 °C)	IS3025 (P-11)	7.62	--	6.5 to 8.5	No Relaxation
2.	Colour	IS3025 (P-4)	*BLQ (**LOQ 1.0)	Hazen	5	15
3.	Turbidity	IS3025 (P-10)	*BLQ (**LOQ 1.0)	NTU	1	5
4.	Odour	IS3025 (P-5)	Agreeable	--	Agreeable	Agreeable
5.	Taste	IS3025 (P-8)	Agreeable	--	Agreeable	Agreeable
6.	Total Hardness as $CaCO_3$	IS3025 (P-21)	291.98	mg/l	200	600
7.	Calcium as Ca	IS3025 (P-40)	57.76	mg/l	75	200
8.	Alkalinity as $CaCO_3$	IS3025 (P-23)	179.42	mg/l	200	600
9.	Chloride as Cl	IS 3025 (P-32)	123.64	mg/l	250	1000
10.	Cyanide as CN	IS 3025 (P-27)	*BLQ (**LOQ 0.02)	mg/l	0.05	No Relaxation
11.	Magnesium as Mg	APHA , 3500 Mg B	35.93	mg/l	30	100
12.	Total Dissolved Solids	IS3025 (P-16)	458.00	mg/l	500	2000
13.	Sulphate as SO_4	IS3025 (P-24)	51.77	mg/l	200	400
14.	Fluoride as F	APHA , 4500-F D	0.25	mg/l	1.0	1.5
15.	Nitrate as NO_3	IS3025 (P-34), Chromotropic method	20.58	mg/l	45	No Relaxation
16.	Iron as Fe	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.13	mg/l	1.0	No relaxation
17.	Aluminium as Al	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.005)	mg/l	0.03	0.2
18.	Boron	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.01)	mg/l	0.5	2.4
19.	Chromium as Cr	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.05	No Relaxation

(Checked By)

For DLF LIMITED

Authorised Signatory

(Approved By)

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: VEL/DL/W/02			Report No.: VEL/W/2401/02/002			
S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable Limit)	Permissible limit in the Absence of Alternate Source
20.	Conductivity (at 25°C)	IS3025 (P-14)	708	µS/cm	--	--
21.	#Phenolic Compounds	IS3025 (P-43)	*BLQ (**LOQ 0.0005)	mg/l	0.001	0.002
22.	Mineral Oil	IS 3025 (P-39)	*BLQ (**LOQ 0.1)	mg/l	1.0	No Relaxation
23.	Anionic Detergents as MBAS	IS3025 (P-68)	*BLQ (**LOQ 0.05)	mg/l	0.2	1.0
24.	Zinc as Zn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.79	mg/l	5	15
25.	Copper as Cu	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.05	mg/l	0.05	1.5
26.	Manganese as Mn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.01)	mg/l	0.1	0.3
27.	Cadmium as Cd	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.003	No Relaxation
28.	Lead as Pb	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.01	No Relaxation
29.	Selenium as Se	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.001)	mg/l	0.01	No Relaxation
30.	Arsenic as As	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.005)	mg/l	0.01	No Relaxation
31.	Mercury as Hg	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.0005)	mg/l	0.001	No Relaxation

(Checked By)

(Approved By)

For DLF LIMITED

Authorised Signatory

Ph: 0124-4343750/752/753, 9810355569, 9953147268 E-mail: lab@vardan.co.in, bd@vardan.co.in

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: VEL/DL/W/02			Report No.: VEL/W/2401/02/002			
S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable Limit)	Permissible limit in the Absence of Alternate Source
3.	Total Coliform	APHA 9221 B	<1.8	MPN/100ml	-	
4.	E. Coli	APHA 9221 F	<1.8	MPN/100ml	-	

Note:- *BLQ-Below Limit of Quantification, **LOQ- Limit of Quantification.

(Checked By)

(Approved By)

For DLF LIMITED

Authorised Signatory

Ph: 0124-4343750/752/753, 9810355569, 9953147268 E-mail: lab@vardan.co.in, bd@vardan.co.in

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	VEL/DL/W/03	**Report No.:**	VEL/W/2401/02/003
Name & Address of the Project:	M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .	**Format No.:**	7.8 F-03
		Party Reference No.:	NIL
		Reporting Date:	08/01/2024
		Period of Analysis:	02/01/2024- 08/01/2024
		Receipt Date:	02/01/2024
Sample Description:	Ground Water Sample	**Sampling Date:**	02/01/2024
Sample Location:	Near Dlf Phase 5 (GW3)	**Sampling Quantity:**	5.0 Ltr + 250ml.
Sample Collected by:	Vardan Enviro Lab Representative	**Sampling Type:**	Grab
Sampling and Analysis Protocol:	IS, APHA, 23rd Edition 2017 & STP	**Preservation:**	Ice Box

S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable Limit)	Permissible limit in the Absence of Alternate Source
5.	pH (at 25 °C)	IS3025 (P-11)	7.36	--	6.5 to 8.5	No Relaxation
6.	Colour	IS3025 (P-4)	*BLQ (**LOQ 1.0)	Hazen	5	15
7.	Turbidity	IS3025 (P-10)	*BLQ (**LOQ 1.0)	NTU	1	5
8.	Odour	IS3025 (P-5)	Agreeable	--	Agreeable	Agreeable
9.	Taste	IS3025 (P-8)	Agreeable	--	Agreeable	Agreeable
10.	Total Hardness as $CaCO_3$	IS3025 (P-21)	258.84	mg/l	200	600
11.	Calcium as Ca	IS3025 (P-40)	43.39	mg/l	75	200
12.	Alkalinity as $CaCO_3$	IS3025 (P-23)	192.9	mg/l	200	600
13.	Chloride as Cl	IS 3025 (P-32)	81.43	mg/l	250	1000
14.	Cyanide as CN	IS 3025 (P-27)	*BLQ (**LOQ 0.02)	mg/l	0.05	No Relaxation
15.	Magnesium as Mg	APHA , 3500 Mg B	36.59	mg/l	30	100
16.	Total Dissolved Solids	IS3025 (P-16)	384.00	mg/l	500	2000
17.	Sulphate as SO_4	IS3025 (P-24)	41.08	mg/l	200	400
18.	Fluoride as F	APHA , 4500-F D	0.24	mg/l	1.0	1.5
19.	Nitrate as NO_3	IS3025 (P-34), Chromotropic method	10.46	mg/l	45	No Relaxation
20.	Iron as Fe	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.14	mg/l	1.0	No relaxation
21.	Aluminium as Al	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.005)	mg/l	0.03	0.2
22.	Boron	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.01)	mg/l	0.5	2.4
23.	Chromium as Cr	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.05	No Relaxation

(Checked By) For DLF LIMITED (Approved By)

Authorised Signatory

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: VEL/DL/W/03			Report No.: VEL/W/2401/02/003			
S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable Limit)	Permissible limit in the Absence of Alternate Source
24.	Conductivity (at 25°C)	IS3025 (P-14)	590	µS/cm	--	--
25.	#Phenolic Compounds	IS3025 (P-43)	*BLQ (**LOQ 0.0005)	mg/l	0.001	0.002
26.	Mineral Oil	IS 3025 (P-39)	*BLQ (**LOQ 0.1)	mg/l	1.0	No Relaxation
27.	Anionic Detergents as MBAS	IS3025 (P-68)	*BLQ (**LOQ 0.05)	mg/l	0.2	1.0
28.	Zinc as Zn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.46	mg/l	5	15
29.	Copper as Cu	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.11	mg/l	0.05	1.5
30.	Manganese as Mn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.01)	mg/l	0.1	0.3
31.	Cadmium as Cd	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.003	No Relaxation
32.	Lead as Pb	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.01	No Relaxation
33.	Selenium as Se	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.001)	mg/l	0.01	No Relaxation
34.	Arsenic as As	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.005)	mg/l	0.01	No Relaxation
35.	Mercury as Hg	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.0005)	mg/l	0.001	No Relaxation

(Checked By)

(Approved By)

For DLF LIMITED

Authorised Signatory

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: VEL/DL/W/03			Report No.: VEL/W/2401/02/003			
S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable Limit)	Permissible limit in the Absence of Alternate Source
36.	Total Coliform	APHA 9221 B	<1.8	MPN/100ml	-	
37.	E. Coli	APHA 9221 F	<1.8	MPN/100ml	-	

Note:-*BLQ-Below Limit of Quantification, **LOQ- Limit of Quantification.

(Checked By)

(Approved By)

For DLF LIMITED

Authorised Signatory

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	VEL/DL/W/04	**Report No.:**	VEL/W/2401/02/004
Name &Address of the Project:	M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .	**Format No.:**	7.8 F-03
		Party Reference No.:	NIL
		Reporting Date:	08/01/2024
		Period of Analysis:	02/01/2024– 08/01/2024
		Receipt Date:	02/01/2024
Sample Description:	Ground Water Sample	**Sampling Date:**	02/01/2024
Sample Location:	Near Arjungarh (GW4)	**Sampling Quantity:**	5.0 Ltr + 250ml.
Sample Collected by:	Vardan Enviro Lab Representative	**Sampling Type:**	Grab
Sampling and Analysis Protocol:	IS, APHA, 23rd Edition 2017 & STP	**Preservation:**	Ice Box

S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable Limit)	Permissible limit in the Absence of Alternate Source
1.	pH (at 25 °C)	IS3025 (P-11)	7.72	--	6.5 to 8.5	No Relaxation
2.	Colour	IS3025 (P-4)	*BLQ (**LOQ 1.0)	Hazen	5	15
3.	Turbidity	IS3025 (P-10)	*BLQ (**LOQ 1.0)	NTU	1	5
4.	Odour	IS3025 (P-5)	Agreeable	--	Agreeable	Agreeable
5.	Taste	IS3025 (P-8)	Agreeable	--	Agreeable	Agreeable
6.	Total Hardness as $CaCO_3$	IS3025 (P-21)	288.11	mg/l	200	600
7.	Calcium as Ca	IS3025 (P-40)	46.84	mg/l	75	200
8.	Alkalinity as $CaCO_3$	IS3025 (P-23)	188.40	mg/l	200	600
9.	Chloride as Cl	IS 3025 (P-32)	116.14	mg/l	250	1000
10.	Cyanide as CN	IS 3025 (P-27)	*BLQ (**LOQ 0.02)	mg/l	0.05	No Relaxation
11.	Magnesium as Mg	APHA , 3500 Mg B	41.61	mg/l	30	100
12.	Total Dissolved Solids	IS3025 (P-16)	444.00	mg/l	500	2000
13.	Sulphate as SO_4	IS3025 (P-24)	59.10	mg/l	200	400
14.	Fluoride as F	APHA , 4500-F D	0.26	mg/l	1.0	1.5
15.	Nitrate as NO_3	IS3025 (P-34), Chromotropic method	14.28	mg/l	45	No Relaxation
16.	Iron as Fe	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.16	mg/l	1.0	No relaxation
17.	Aluminium as Al	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.005)	mg/l	0.03	0.2
18.	Boron	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.01)	mg/l	0.5	2.4
19.	Chromium as Cr	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.05	No Relaxation

(Checked By)

(Approved By)

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: VEL/DL/W/04			Report No.: VEL/W/2401/02/004			
S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable Limit)	Permissible limit in the Absence of Alternate Source
20.	Conductivity (at 25°C)	IS3025 (P-14)	683	µS/cm	--	--
21.	#Phenolic Compounds	IS3025 (P-43)	*BLQ (**LOQ 0.0005)	mg/l	0.001	0.002
22.	Mineral Oil	IS 3025 (P-39)	*BLQ (**LOQ 0.1)	mg/l	1.0	No Relaxation
23.	Anionic Detergents as MBAS	IS3025 (P-68)	*BLQ (**LOQ 0.05)	mg/l	0.2	1.0
24.	Zinc as Zn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	1.45	mg/l	5	15
25.	Copper as Cu	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.16	mg/l	0.05	1.5
26.	Manganese as Mn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.01)	mg/l	0.1	0.3
27.	Cadmium as Cd	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.003	No Relaxation
28.	Lead as Pb	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.01	No Relaxation
29.	Selenium as Se	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.001)	mg/l	0.01	No Relaxation
30.	Arsenic as As	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.005)	mg/l	0.01	No Relaxation
31.	Mercury as Hg	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.0005)	mg/l	0.001	No Relaxation

(Checked By)

(Approved By)

For DLP LIMITED

Authorised Signatory

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: **VEL/DL/W/04**				Report No.: **VEL/W/2401/02/004**		
S. No.	**Parameter**	**Test-Method**	**Result**	**Unit**	**Limits of IS:10500 -2012**	
					Requirement (Acceptable Limit)	**Permissible limit in the Absence of Alternate Source**
38.	Total Coliform	APHA 9221 B	<1.8	MPN/100ml	-	
39.	E. Coli	APHA 9221 F	<1.8	MPN/100ml	-	

Note:-*BLQ-Below Limit of Quantification, **LOQ- Limit of Quantification.

(Checked By)

(Approved By)

For SLE LIMITED

Authorised Signatory

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	**VEL/DL/W/05**	**Report No.:**	**VEL/W/2401/02/005**
Name &Address of the Project:	**M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .**	**Format No.:**	**7.8 F-03**
		Party Reference No.:	**NIL**
		Reporting Date:	**08/01/2024**
		Period of Analysis:	**02/01/2024– 08/01/2024**
		Receipt Date:	**02/01/2024**
Sample Description:	**Ground Water Sample**	**Sampling Date:**	**02/01/2024**
Sample Location:	**Near Gwalpahari (GW5)**	**Sampling Quantity:**	**5.0 Ltr + 250ml.**
Sample Collected by:	**Vardan Enviro Lab Representative**	**Sampling Type:**	**Grab**
Sampling and Analysis Protocol:	**IS, APHA, 23rd Edition 2017 & STP**	**Preservation:**	**Ice Box**

S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable Limit)	Permissible limit in the Absence of Alternate Source
1.	pH (at 25 ^{0}C)	IS3025 (P-11)	7.78	--	6.5 to 8.5	No Relaxation
2.	Colour	IS3025 (P-4)	*BLQ (**LOQ 1.0)	Hazen	5	15
3.	Turbidity	IS3025 (P-10)	*BLQ (**LOQ 1.0)	NTU	1	5
4.	Odour	IS3025 (P-5)	Agreeable	--	Agreeable	Agreeable
5.	Taste	IS3025 (P-8)	Agreeable	--	Agreeable	Agreeable
6.	Total Hardness as $CaCO_3$	IS3025 (P-21)	281.00	mg/l	200	600
7.	Calcium as Ca	IS3025 (P-40)	56.42	mg/l	75	200
8.	Alkalinity as $CaCO_3$	IS3025 (P-23)	174.98	mg/l	200	600
9.	Chloride as Cl	IS 3025 (P-32)	112.65	mg/l	250	1000
10.	Cyanide as CN	IS 3025 (P-27)	*BLQ (**LOQ 0.02)	mg/l	0.05	No Relaxation
11.	Magnesium as Mg	APHA , 3500 Mg B	34.08	mg/l	30	100
12.	Total Dissolved Solids	IS3025 (P-16)	434.00	mg/l	500	2000
13.	Sulphate as SO_4	IS3025 (P-24)	54.90	mg/l	200	400
14.	Fluoride as F	APHA , 4500-F D	0.25	mg/l	1.0	1.5
15.	Nitrate as NO_3	IS3025 (P-34), Chromotropic method	16.82	mg/l	45	No Relaxation
16.	Iron as Fe	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.12	mg/l	1.0	No relaxation
17.	Aluminium as Al	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.005)	mg/l	0.03	0.2
18.	Boron	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.01)	mg/l	0.5	2.4
19.	Chromium as Cr	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.05	No Relaxation

(Checked By)

For DLF LIMITED

Authorised Signatory

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: VEL/DL/W/05					Report No.: VEL/W/2401/02/005	
S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable Limit)	Permissible limit in the Absence of Alternate Source
20.	Conductivity (at 25°C)	IS3025 (P-14)	669	µS/cm	--	--
21.	#Phenolic Compounds	IS3025 (P-43)	*BLQ (**LOQ 0.0005)	mg/l	0.001	0.002
22.	Mineral Oil	IS 3025 (P-39)	*BLQ (**LOQ 0.1)	mg/l	1.0	No Relaxation
23.	Anionic Detergents as MBAS	IS3025 (P-68)	*BLQ (**LOQ 0.05)	mg/l	0.2	1.0
24.	Zinc as Zn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	1.05	mg/l	5	15
25.	Copper as Cu	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.11	mg/l	0.05	1.5
26.	Manganese as Mn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.01)	mg/l	0.1	0.3
27.	Cadmium as Cd	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.003	No Relaxation
28.	Lead as Pb	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.01	No Relaxation
29.	Selenium as Se	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.001)	mg/l	0.01	No Relaxation
30.	Arsenic as As	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.005)	mg/l	0.01	No Relaxation
31.	Mercury as Hg	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.0005)	mg/l	0.001	No Relaxation

(Checked By)

(Approved By)

For DLF LIMITED

Authorised Signatory

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: VEL/DL/W/05				Report No.: VEL/W/2401/02/005		
S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable Limit)	Permissible limit in the Absence of Alternate Source
40.	Total Coliform	APHA 9221 B	<1.8	MPN/100ml	-	
41.	E. Coli	APHA 9221 F	<1.8	MPN/100ml	-	

Note:-*BLQ-Below Limit of Quantification, **LOQ- Limit of Quantification.

(Checked By)

(Approved By)

For DLF LIMITED
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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	VEL/DL/W/06	**Report No.:**	VEL/W/2401/02/006
Name &Address of the Project:	M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .	**Format No.:**	7.8 F-03
		Party Reference No.:	NIL
		Reporting Date:	08/01/2024
		Period of Analysis:	02/01/2024– 08/01/2024
		Receipt Date:	02/01/2024
Sample Description:	Ground Water Sample	**Sampling Date:**	02/01/2024
Sample Location:	Sector 55 (GW6)	**Sampling Quantity:**	5.0 Ltr + 250ml.
Sample Collected by:	Vardan Enviro Lab Representative	**Sampling Type:**	Grab
Sampling and Analysis Protocol:	IS, APHA, 23rd Edition 2017 & STP	**Preservation:**	Ice Box

S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable Limit)	Permissible limit in the Absence of Alternate Source
1.	pH (at 25 °C)	IS3025 (P-11)	7.64	--	6.5 to 8.5	No Relaxation
2.	Colour	IS3025 (P-4)	*BLQ (**LOQ 1.0)	Hazen	5	15
3.	Turbidity	IS3025 (P-10)	*BLQ (**LOQ 1.0)	NTU	1	5
4.	Odour	IS3025 (P-5)	Agreeable	--	Agreeable	Agreeable
5.	Taste	IS3025 (P-8)	Agreeable	--	Agreeable	Agreeable
6.	Total Hardness as $CaCO_3$	IS3025 (P-21)	252.09	mg/l	200	600
7.	Calcium as Ca	IS3025 (P-40)	58.73	mg/l	75	200
8.	Alkalinity as $CaCO_3$	IS3025 (P-23)	179.20	mg/l	200	600
9.	Chloride as Cl	IS 3025 (P-32)	118.28	mg/l	250	1000
10.	Cyanide as CN	IS 3025 (P-27)	*BLQ (**LOQ 0.02)	mg/l	0.05	No Relaxation
11.	Magnesium as Mg	APHA , 3500 Mg B	25.65	mg/l	30	100
12.	Total Dissolved Solids	IS3025 (P-16)	426.00	mg/l	500	2000
13.	Sulphate as SO_4	IS3025 (P-24)	45.82	mg/l	200	400
14.	Fluoride as F	APHA , 4500-F D	0.25	mg/l	1.0	1.5
15.	Nitrate as NO_3	IS3025 (P-34), Chromotropic method	16.80	mg/l	45	No Relaxation
16.	Iron as Fe	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.18	mg/l	1.0	No relaxation
17.	Aluminium as Al	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.005)	mg/l	0.03	0.2
18.	Boron	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.01)	mg/l	0.5	2.4
19.	Chromium as Cr	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.05	No Relaxation

(Checked By)

For DLF LIMITED

Authorised Signatory

(Approved By)

Ph: 0124-4343750/752/753, 9810355569, 9953147268 E-mail: lab@vardan.co.in, bd@vardan.co.in

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: VEL/DL/W/06			Report No.: VEL/W/2401/02/006			
S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable Limit)	Permissible limit in the Absence of Alternate Source
20.	Conductivity (at 25°C)	IS3025 (P-14)	655	µS/cm	--	--
21.	#Phenolic Compounds	IS3025 (P-43)	*BLQ (**LOQ 0.0005)	mg/l	0.001	0.002
22.	Mineral Oil	IS 3025 (P-39)	*BLQ (**LOQ 0.1)	mg/l	1.0	No Relaxation
23.	Anionic Detergents as MBAS	IS3025 (P-68)	*BLQ (**LOQ 0.05)	mg/l	0.2	1.0
24.	Zinc as Zn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.83	mg/l	5	15
25.	Copper as Cu	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.10	mg/l	0.05	1.5
26.	Manganese as Mn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.01)	mg/l	0.1	0.3
27.	Cadmium as Cd	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.003	No Relaxation
28.	Lead as Pb	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.01	No Relaxation
29.	Selenium as Se	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.001)	mg/l	0.01	No Relaxation
30.	Arsenic as As	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.005)	mg/l	0.01	No Relaxation
31.	Mercury as Hg	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.0005)	mg/l	0.001	No Relaxation

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(Approved By)

For DLF LIMITED

Authorised Signatory

Ph: 0124-4343750/752/753, 9810355569, 9953147268 E-mail: lab@vardan.co.in, bd@vardan.co.in

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: VEL/DL/W/06			Report No.: VEL/W/2401/02/006			
S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable Limit)	Permissible limit in the Absence of Alternate Source
42.	Total Coliform	APHA 9221 B	<1.8	MPN/100ml	-	
43.	E. Coli	APHA 9221 F	<1.8	MPN/100ml	-	

Note:-*BLQ-Below Limit of Quantification, **LOQ- Limit of Quantification.

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For DLF LIMITED

Authorised Signatory

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	VEL/DL/W/07	**Report No.:**	VEL/W/2401/02/007
Name &Address of the Project:	M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .	**Format No.:**	7.8 F-03
		Party Reference No.:	NIL
		Reporting Date:	08/01/2024
		Period of Analysis:	02/01/2024- 08/01/2024
		Receipt Date:	02/01/2024
Sample Description:	Ground Water Sample	**Sampling Date:**	02/01/2024
Sample Location:	Village Qadirpur (GW7)	**Sampling Quantity:**	5.0 Ltr + 250ml.
Sample Collected by:	Vardan Enviro Lab Representative	**Sampling Type:**	Grab
Sampling and Analysis Protocol:	IS, APHA, 23rd Edition 2017 & STP	**Preservation:**	Ice Box

S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable Limit)	Permissible limit in the Absence of Alternate Source
1.	pH (at 25 °C)	IS3025 (P-11)	7.85	--	6.5 to 8.5	No Relaxation
2.	Colour	IS3025 (P-4)	*BLQ (**LOQ 1.0)	Hazen	5	15
3.	Turbidity	IS3025 (P-10)	*BLQ (**LOQ 1.0)	NTU	1	5
4.	Odour	IS3025 (P-5)	Agreeable	--	Agreeable	Agreeable
5.	Taste	IS3025 (P-8)	Agreeable	--	Agreeable	Agreeable
6.	Total Hardness as $CaCO_3$	IS3025 (P-21)	279.32	mg/l	200	600
7.	Calcium as Ca	IS3025 (P-40)	48.59	mg/l	75	200
8.	Alkalinity as $CaCO_3$	IS3025 (P-23)	164.90	mg/l	200	600
9.	Chloride as Cl	IS 3025 (P-32)	136.74	mg/l	250	1000
10.	Cyanide as CN	IS 3025 (P-27)	*BLQ (**LOQ 0.02)	mg/l	0.05	No Relaxation
11.	Magnesium as Mg	APHA , 3500 Mg B	38.42	mg/l	30	100
12.	Total Dissolved Solids	IS3025 (P-16)	448.00	mg/l	500	2000
13.	Sulphate as SO_4	IS3025 (P-24)	56.82	mg/l	200	400
14.	Fluoride as F	APHA , 4500-F D	0.30	mg/l	1.0	1.5
15.	Nitrate as NO_3	IS3025 (P-34), Chromotropic method	24.06	mg/l	45	No Relaxation
16.	Iron as Fe	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.18	mg/l	1.0	No relaxation
17.	Aluminium as Al	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.005)	mg/l	0.03	0.2
18.	Boron	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.01)	mg/l	0.5	2.4
19.	Chromium as Cr	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.05	No Relaxation

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For DLF LIMITED

Authorised Signatory

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: **VEL/DL/W/07**					**Report No.: VEL/W/2401/02/007**	
S. No.	**Parameter**	**Test-Method**	**Result**	**Unit**	**Limits of IS:10500 -2012**	
					Requirement (Acceptable Limit)	**Permissible limit in the Absence of Alternate Source**
20.	Conductivity (at 25°C)	IS3025 (P-14)	688	µS/cm	--	--
21.	#Phenolic Compounds	IS3025 (P-43)	*BLQ (**LOQ 0.0005)	mg/l	0.001	0.002
22.	Mineral Oil	IS 3025 (P-39)	*BLQ (**LOQ 0.1)	mg/l	1.0	No Relaxation
23.	Anionic Detergents as MBAS	IS3025 (P-68)	*BLQ (**LOQ 0.05)	mg/l	0.2	1.0
24.	Zinc as Zn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	1.54	mg/l	5	15
25.	Copper as Cu	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.16	mg/l	0.05	1.5
26.	Manganese as Mn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.01)	mg/l	0.1	0.3
27.	Cadmium as Cd	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.003	No Relaxation
28.	Lead as Pb	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.01	No Relaxation
29.	Selenium as Se	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.001)	mg/l	0.01	No Relaxation
30.	Arsenic as As	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.005)	mg/l	0.01	No Relaxation
31.	Mercury as Hg	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.0005)	mg/l	0.001	No Relaxation

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For DLF LIMITED

Authorised Signatory

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: VEL/DL/W/07				Report No.: VEL/W/2401/02/007		
S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable Limit)	Permissible limit in the Absence of Alternate Source
44.	Total Coliform	APHA 9221 B	<1.8	MPN/100ml	-	
45.	E. Coli	APHA 9221 F	<1.8	MPN/100ml	-	

Note:-*BLQ-Below Limit of Quantification, **LOQ- Limit of Quantification.

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For DLF LIMITED
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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	**VEL/DL/W/08**	**Report No.:**	**VEL/W/2401/02/008**
Name &Address of the Project:	M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .	**Format No.:**	**7.8 F-03**
		Party Reference No.:	**NIL**
		Reporting Date:	**08/01/2024**
		Period of Analysis:	**02/01/2024- 08/01/2024**
		Receipt Date:	**02/01/2024**
Sample Description:	**Ground Water Sample**	**Sampling Date:**	**02/01/2024**
Sample Location:	**Village Bandhwari (GW8)**	**Sampling Quantity:**	**5.0 Ltr + 250ml.**
Sample Collected by:	**Vardan Enviro Lab Representative**	**Sampling Type:**	**Grab**
Sampling and Analysis Protocol:	**IS, APHA, 23rd Edition 2017 & STP**	**Preservation:**	**Ice Box**

S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable Limit)	Permissible limit in the Absence of Alternate Source
1.	pH (at 25 °C)	IS3025 (P-11)	7.69	--	6.5 to 8.5	No Relaxation
2.	Colour	IS3025 (P-4)	*BLQ (**LOQ 1.0)	Hazen	5	15
3.	Turbidity	IS3025 (P-10)	*BLQ (**LOQ 1.0)	NTU	1	5
4.	Odour	IS3025 (P-5)	Agreeable	--	Agreeable	Agreeable
5.	Taste	IS3025 (P-8)	Agreeable	--	Agreeable	Agreeable
6.	Total Hardness as $CaCO_3$	IS3025 (P-21)	289.12	mg/l	200	600
7.	Calcium as Ca	IS3025 (P-40)	53.76	mg/l	75	200
8.	Alkalinity as $CaCO_3$	IS3025 (P-23)	186.15	mg/l	200	600
9.	Chloride as Cl	IS 3025 (P-32)	90.24	mg/l	250	1000
10.	Cyanide as CN	IS 3025 (P-27)	*BLQ (**LOQ 0.02)	mg/l	0.05	No Relaxation
11.	Magnesium as Mg	APHA , 3500 Mg B	37.66	mg/l	30	100
12.	Total Dissolved Solids	IS3025 (P-16)	420.00	mg/l	500	2000
13.	Sulphate as SO_4	IS3025 (P-24)	54.98	mg/l	200	400
14.	Fluoride as F	APHA , 4500-F D	0.27	mg/l	1.0	1.5
15.	Nitrate as NO_3	IS3025 (P-34), Chromotropic method	16.24	mg/l	45	No Relaxation
16.	Iron as Fe	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.14	mg/l	1.0	No relaxation
17.	Aluminium as Al	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.005)	mg/l	0.03	0.2
18.	Boron	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.01)	mg/l	0.5	2.4
19.	Chromium as Cr	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.05	No Relaxation

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For DLF LIMITED

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: VEL/DL/W/08			Report No.: VEL/W/2401/02/008			
S. No.	Parameter	Test-Method	Result	Unit	Limits of IS:10500 -2012	
					Requirement (Acceptable Limit)	Permissible limit in the Absence of Alternate Source
20.	Conductivity (at 25°C)	IS3025 (P-14)	646	µS/cm	--	--
21.	#Phenolic Compounds	IS3025 (P-43)	*BLQ (**LOQ 0.0005)	mg/l	0.001	0.002
22.	Mineral Oil	IS 3025 (P-39)	*BLQ (**LOQ 0.1)	mg/l	1.0	No Relaxation
23.	Anionic Detergents as MBAS	IS3025 (P-68)	*BLQ (**LOQ 0.05)	mg/l	0.2	1.0
24.	Zinc as Zn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.90	mg/l	5	15
25.	Copper as Cu	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.14	mg/l	0.05	1.5
26.	Manganese as Mn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.01)	mg/l	0.1	0.3
27.	Cadmium as Cd	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.003	No Relaxation
28.	Lead as Pb	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.002)	mg/l	0.01	No Relaxation
29.	Selenium as Se	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.001)	mg/l	0.01	No Relaxation
30.	Arsenic as As	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.005)	mg/l	0.01	No Relaxation
31.	Mercury as Hg	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ (**LOQ 0.0005)	mg/l	0.001	No Relaxation

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For DLF LIMITED
Authorised Signatory

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: **VEL/DL/W/08**				Report No.: **VEL/W/2401/02/008**		
S. No.	**Parameter**	**Test-Method**	**Result**	**Unit**	**Limits of IS:10500 -2012**	
					Requirement (Acceptable Limit)	**Permissible limit in the Absence of Alternate Source**
46.	Total Coliform	APHA 9221 B	<1.8	MPN/100ml	-	
47.	E. Coli	APHA 9221 F	<1.8	MPN/100ml	-	

Note:-*BLQ-Below Limit of Quantification, **LOQ- Limit of Quantification.

(Checked By)

(Approved By)

For D.L.F LIMITED

Authorised Signatory

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® Vardan EnviroLab
Laboratory: Plot No. B2A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	**VEL/DL/W/09**	**Report No.:**	**VEL/W/2401/02/009**
Name & Address of the Project:	**M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .**	**Format No.:**	**7.8 F-03**
		Party Reference No.:	**NIL**
		Reporting Date:	**08/01/2024**
Sample Description:	**Surface Water Sample**	**Period of Analysis:**	**02/01/2024– 08/01/2024**
Sampling Location:	**Pond Near DLF Phase 5 (SW1)**	**Receipt Date:**	**02/01/2024**
Sample Collected by:	**Vardan Enviro Lab Representative**	**Sampling Date:**	**02/01/2024**
Preservation:	**Ice Box**	**Sampling Quantity:**	**5.0 Ltr + 250ml**
Sampling and Analysis Protocol:	**IS, APHA 23rd Edition 2017 & STP**	**Sampling Type:**	**Composite**

S. No.	Parameter	Test-Method	Result	Unit
1.	pH (at 25 °C)	IS3025 (P-11)	7.75	--
2.	Colour	IS3025 (P-4)	13.0	Hazen
3.	Turbidity	IS3025 (P-10)	86.00	NTU
4.	Odour	IS3025 (P-5)	Agreeable	--
5.	Total Hardness as $CaCO_3$	IS3025 (P-21)	718.04	mg/L
6.	Calcium as Ca	IS3025 (P-40)	131.06	mg/L
7.	Alkalinity as $CaCO_3$	IS3025 (P-23)	535.27	mg/L
8.	Chloride as Cl	IS 3025 (P-32)	231.86	mg/L
9.	Residual free Chlorine	IS 3025 (P-26)	*BLQ(**LOQ 0.15)	mg/L
10.	Cyanide as CN	IS 3025 (P-27)	*BLQ(**LOQ 0.02)	mg/L
11.	Magnesium as Mg	APHA , 3500 Mg B Calculation method	94.86	mg/L
12.	Total Dissolved Solids	IS3025 (P-16)	1036.00	mg/L
13.	Total Suspended solids	IS 3025 (P-17)	92.00	mg/L
14.	Dissolved Oxygen	IS 3025 (P-38)	6.4	mg/L
15.	Sulphate as SO_4	IS3025 (P-24)	64.87	mg/L
16.	Fluoride as F	APHA , 4500-F B & D	0.42	mg/L
17.	BOD (3 Days at 27°C)	IS 3025.P-44	10.00	mg/L
18.	COD	APHA, 5220 B, Open Reflux Method	52.00	mg/L

For DLF LIMITED

(Checked By) Authorised Signatory (Approved By)

Vardan EnViroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: VEL/DL/W/09				Report No.: VEL/W/2401/02/009
S. No.	Parameter	Test-Method	Result	Unit
19.	Conductivity (at 25 °C)	IS3025 (P-14)	1.682	mS/cm
20.	Nitrate as NO_3	IS3025 (P-34)	31.49	mg/L
21.	Sodium as Na	IS3025 (P-45)	107.00	mg/L
22.	Potassium as K	IS3025 (P-45)	33.86	mg/L
23.	Iron as Fe	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	1.85	mg/L
24.	Aluminium as Al	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.005)	mg/L
25.	Boron	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.34	mg/L
26.	Chromium as Cr	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.002)	mg/L
27.	Phenolic Compounds	IS3025 (P-43)	*BLQ(**LOQ 0.0005)	mg/L
28.	Mineral Oil	IS 3025 (P-39)	*BLQ(**LOQ 0.1)	mg/L
29.	Anionic Detergents as MBAS	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.05)	mg/L
30.	Zinc as Zn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	1.47	mg/L
31.	Copper as Cu	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.23	mg/L
32.	Manganese as Mn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.01)	mg/L
33.	Cadmium as Cd	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.002)	mg/L

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(Approved By)

For DLF LIMITED

Vardan EnviroLab

Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: **VEL/DL/W/09**			Report No.: **VEL/W/2401/02/009**	
S. No.	**Parameter**	**Test-Method**	**Result**	**Unit**
1.	Total Coliform	APHA 23rd edition, 9221 B	1200	MPN/100ml
2.	Fecal Coliform	APHA 23rd edition, 9221 E	900	MPN/100ml

Note:. *BLQ-Below Limit of Quantification, **LOQ- Limit of Quantification

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For DLF LIMITED

Authorised Signatory

Vardan EnviroLab

Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	**VEL/DL/W/10**	**Report No.:**	**VEL/W/2401/02/010**
Name & Address of the Project:	**M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .**	**Format No.:**	**7.8 F-03**
		Party Reference No.:	**NIL**
		Reporting Date:	**08/01/2024**
Sample Description:	**Surface Water Sample**	**Period of Analysis:**	**02/01/2024– 08/01/2024**
Sampling Location:	**Pond Near Mandi Village (SW2)**	**Receipt Date:**	**02/01/2024**
Sample Collected by:	**Vardan Enviro Lab Representative**	**Sampling Date:**	**02/01/2024**
Preservation:	**Ice Box**	**Sampling Quantity:**	**5.0 Ltr + 250ml**
Sampling and Analysis Protocol:	**IS, APHA 23rd Edition 2017 & STP**	**Sampling Type:**	**Composite**

S. No.	Parameter	Test-Method	Result	Unit
1.	pH (at 25 °C)	IS3025 (P-11)	7.69	--
2.	Colour	IS3025 (P-4)	18.0	Hazen
3.	Turbidity	IS3025 (P-10)	63.00	NTU
4.	Odour	IS3025 (P-5)	Agreeable	--
5.	Total Hardness as $CaCO_3$	IS3025 (P-21)	727.06	mg/L
6.	Calcium as Ca	IS3025 (P-40)	129.10	mg/L
7.	Alkalinity as $CaCO_3$	IS3025 (P-23)	616.48	mg/L
8.	Chloride as Cl	IS 3025 (P-32)	284.11	mg/L
9.	Residual free Chlorine	IS 3025 (P-26)	*BLQ(**LOQ 0.15)	mg/L
10.	Cyanide as CN	IS 3025 (P-27)	*BLQ(**LOQ 0.02)	mg/L
11.	Magnesium as Mg	APHA , 3500 Mg B Calculation method	98.18	mg/L
12.	Total Dissolved Solids	IS3025 (P-16)	1300.0	mg/L
13.	Total Suspended solids	IS 3025 (P-17)	64.00	mg/L
14.	Dissolved Oxygen	IS 3025 (P-38)	6.1	mg/L
15.	Sulphate as SO^{4}	IS3025 (P-24)	80.15	mg/L
16.	Fluoride as F	APHA , 4500-F B & D	0.23	mg/L
17.	BOD (3 Days at 27°C)	IS 3025,P-44	16.00	mg/L
18.	COD	APHA, 5220 B, Open Reflux Method	35.00	mg/L

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
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Test Report

Sample No.: VEL/DL/W/10			Report No.: VEL/W/2401/02/010	
S. No.	Parameter	Test-Method	Result	Unit
19.	Conductivity (at 25 °C)	IS3025 (P-14)	1.81	mS/cm
20.	Nitrate as NO_3	IS3025 (P-34)	34.80	mg/L
21.	Sodium as Na	IS3025 (P-45)	160.00	mg/L
22.	Potassium as K	IS3025 (P-45)	49.12	mg/L
23.	Iron as Fe	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	2.75	mg/L
24.	Aluminium as Al	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.005)	mg/L
25.	Boron	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.31	mg/L
26.	Chromium as Cr	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.002)	mg/L
27.	Phenolic Compounds	IS3025 (P-43)	*BLQ(**LOQ 0.0005)	mg/L
28.	Mineral Oil	IS 3025 (P-39)	*BLQ(**LOQ 0.1)	mg/L
29.	Anionic Detergents as MBAS	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.05)	mg/L
30.	Zinc as Zn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.82	mg/L
31.	Copper as Cu	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.25	mg/L
32.	Manganese as Mn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.01)	mg/L
33.	Cadmium as Cd	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.002)	mg/L

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
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Test Report

Sample No.: **VEL/DL/W/10**			Report No.: **VEL/W/2401/02/010**	
S. No.	**Parameter**	**Test-Method**	**Result**	**Unit**
1.	Total Coliform	APHA 23rd edition, 9221 B	1600	MPN/100ml
2.	Fecal Coliform	APHA 23rd edition, 9221 E	800	MPN/100ml

Note: *BLQ-Below Limit of Quantification, **LOQ- Limit of Quantification

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Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
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Test Report

Sample Number:	**VEL/DL/W/11**	**Report No.:**	**VEL/W/2401/02/011**
Name & Address of the Project:	M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .	**Format No.:**	7.8 F-03
		Party Reference No.:	NIL
		Reporting Date:	08/01/2024
Sample Description:	**Surface Water Sample**	**Period of Analysis:**	02/01/2024- 08/01/2024
Sampling Location:	**Pond Near Sukhrali Village (SW3)**	**Receipt Date:**	02/01/2024
Sample Collected by:	**Vardan Enviro Lab Representative**	**Sampling Date:**	02/01/2024
Preservation:	**Ice Box**	**Sampling Quantity:**	5.0 Ltr + 250ml
Sampling and Analysis Protocol:	**IS, APHA 23rd Edition 2017 & STP**	**Sampling Type:**	Composite

S. No.	Parameter	Test-Method	Result	Unit
1.	pH (at 25 °C)	IS3025 (P-11)	7.56	--
2.	Colour	IS3025 (P-4)	21.0	Hazen
3.	Turbidity	IS3025 (P-10)	86.00	NTU
4.	Odour	IS3025 (P-5)	Agreeable	--
5.	Total Hardness as $CaCO_3$	IS3025 (P-21)	826.90	mg/L
6.	Calcium as Ca	IS3025 (P-40)	130.48	mg/L
7.	Alkalinity as $CaCO_3$	IS3025 (P-23)	676.11	mg/L
8.	Chloride as Cl	IS 3025 (P-32)	360.62	mg/L
9.	Residual free Chlorine	IS 3025 (P-26)	*BLQ(**LOQ 0.15)	mg/L
10.	Cyanide as CN	IS 3025 (P-27)	*BLQ(**LOQ 0.02)	mg/L
11.	Magnesium as Mg	APHA , 3500 Mg B Calculation method	121.38	mg/L
12.	Total Dissolved Solids	IS3025 (P-16)	1428.00	mg/L
13.	Total Suspended solids	IS 3025 (P-17)	75.00	mg/L
14.	Dissolved Oxygen	IS 3025 (P-38)	6.0	mg/L
15.	Sulphate as SO^4	IS3025 (P-24)	89.02	mg/L
16.	Fluoride as F	APHA , 4500-F⁻ B & D	0.46	mg/L
17.	BOD (3 Days at 27°C)	IS 3025.P-44	18.00	mg/L
18.	COD	APHA, 5220 B, Open Reflux Method	45.00	mg/L

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Vardan EnViroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
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Test Report

Sample No.: VEL/DL/W/11				Report No.: VEL/W/2401/02/011
S. No.	**Parameter**	**Test-Method**	**Result**	**Unit**
19.	Conductivity (at 25 ^{0}C)	IS3025 (P-14)	2.10	mS/cm
20.	Nitrate as NO_3	IS3025 (P-34)	25.48	mg/L
21.	Sodium as Na	IS3025 (P-45)	210.00	mg/L
22.	Potassium as K	IS3025 (P-45)	43.00	mg/L
23.	Iron as Fe	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	2.10	mg/L
24.	Aluminium as Al	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.005)	mg/L
25.	Boron	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.84	mg/L
26.	Chromium as Cr	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.002)	mg/L
27.	Phenolic Compounds	IS3025 (P-43)	*BLQ(**LOQ 0.0005)	mg/L
28.	Mineral Oil	IS 3025 (P-39)	*BLQ(**LOQ 0.1)	mg/L
29.	Anionic Detergents as MBAS	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.05)	mg/L
30.	Zinc as Zn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	2.68	mg/L
31.	Copper as Cu	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.43	mg/L
32.	Manganese as Mn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.01)	mg/L
33.	Cadmium as Cd	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.002)	mg/L

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
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Test Report

Sample No.: **VEL/DL/W/11**			Report No.: **VEL/W/2401/02/011**	
S. No.	**Parameter**	**Test-Method**	**Result**	**Unit**
1.	Total Coliform	APHA 23rd edition, 9221 B	1500	MPN/100ml
2.	Fecal Coliform	APHA 23rd edition, 9221 E	900	MPN/100ml

Note: *BLQ-Below Limit of Quantification, **LOQ- Limit of Quantification

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
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Test Report

Sample Number:	**VEL/DL/W/12**	**Report No.:**	**VEL/W/2401/02/012**
Name & Address of the Project:	**M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .**	**Format No.:**	**7.8 F-03**
		Party Reference No.:	**NIL**
		Reporting Date:	**08/01/2024**
Sample Description:	**Surface Water Sample**	**Period of Analysis:**	**02/01/2024– 08/01/2024**
Sampling Location:	**Pond Near Ghitorni Village (SW4)**	**Receipt Date:**	**02/01/2024**
Sample Collected by:	**Vardan Enviro Lab Representative**	**Sampling Date:**	**02/01/2024**
Preservation:	**Ice Box**	**Sampling Quantity:**	**5.0 Ltr + 250ml**
Sampling and Analysis Protocol:	**IS, APHA 23rd Edition 2017 & STP**	**Sampling Type:**	**Composite**

S. No.	Parameter	Test-Method	Result	Unit
1.	pH (at 25 °C)	IS3025 (P-11)	7.61	--
2.	Colour	IS3025 (P-4)	14.0	Hazen
3.	Turbidity	IS3025 (P-10)	82.00	NTU
4.	Odour	IS3025 (P-5)	Agreeable	--
5.	Total Hardness as $CaCO_3$	IS3025 (P-21)	802.86	mg/L
6.	Calcium as Ca	IS3025 (P-40)	140.11	mg/L
7.	Alkalinity as $CaCO_3$	IS3025 (P-23)	658.25	mg/L
8.	Chloride as Cl	IS 3025 (P-32)	352.07	mg/L
9.	Residual free Chlorine	IS 3025 (P-26)	*BLQ(**LOQ 0.15)	mg/L
10.	Cyanide as CN	IS 3025 (P-27)	*BLQ(**LOQ 0.02)	mg/L
11.	Magnesium as Mg	APHA , 3500 Mg B Calculation method	109.91	mg/L
12.	Total Dissolved Solids	IS3025 (P-16)	1300.00	mg/L
13.	Total Suspended solids	IS 3025 (P-17)	90.00	mg/L
14.	Dissolved Oxygen	IS 3025 (P-38)	5.2	mg/L
15.	Sulphate as SO^4	IS3025 (P-24)	81.50	mg/L
16.	Fluoride as F	APHA , 4500-F⁻ B & D	0.35	mg/L
17.	BOD (3 Days at 27°C)	IS 3025,P-44	18.00	mg/L
18.	COD	APHA, 5220 B, Open Reflux Method	54.00	mg/L

For DLF LIMITED

(Checked By)

Authorised Signatory

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: **VEL/DL/W/12**			Report No.: **VEL/W/2401/02/012**	
S. No.	**Parameter**	**Test-Method**	**Result**	**Unit**
19.	Conductivity (at 25 °C)	IS3025 (P-14)	2.08	mS/cm
20.	Nitrate as NO_3	IS3025 (P-34)	24.10	mg/L
21.	Sodium as Na	IS3025 (P-45)	187.00	mg/L
22.	Potassium as K	IS3025 (P-45)	30.00	mg/L
23.	Iron as Fe	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	1.32	mg/L
24.	Aluminium as Al	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.005)	mg/L
25.	Boron	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.52	mg/L
26.	Chromium as Cr	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.002)	mg/L
27.	Phenolic Compounds	IS3025 (P-43)	*BLQ(**LOQ 0.0005)	mg/L
28.	Mineral Oil	IS 3025 (P-39)	*BLQ(**LOQ 0.1)	mg/L
29.	Anionic Detergents as MBAS	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.05)	mg/L
30.	Zinc as Zn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	2.49	mg/L
31.	Copper as Cu	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.33	mg/L
32.	Manganese as Mn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.01)	mg/L
33.	Cadmium as Cd	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.002)	mg/L

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For DLF LIMITED
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Vardan EnViroLab

Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: **VEL/DL/W/12**			Report No.: **VEL/W/2401/02/012**	
S. No.	**Parameter**	**Test-Method**	**Result**	**Unit**
1.	Total Coliform	APHA 23rd edition, 9221 B	1300	MPN/100ml
2.	Fecal Coliform	APHA 23rd edition, 9221 E	700	MPN/100ml

Note: *BLQ-Below Limit of Quantification, **LOQ- Limit of Quantification

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	**VEL/DL/W/13**	**Report No.:**	**VEL/W/2401/02/013**
Name & Address of the Project:	**M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .**	**Format No.:**	**7.8 F-03**
		Party Reference No.:	**NIL**
		Reporting Date:	**08/01/2024**
Sample Description:	**Surface Water Sample**	**Period of Analysis:**	**02/01/2024- 08/01/2024**
Sampling Location:	**Pond Near Dera Mandi Village (SW5)**	**Receipt Date:**	**02/01/2024**
Sample Collected by:	**Vardan Enviro Lab Representative**	**Sampling Date:**	**02/01/2024**
Preservation:	**Ice Box**	**Sampling Quantity:**	**5.0 Ltr + 250ml**
Sampling and Analysis Protocol:	**IS, APHA 23rd Edition 2017 & STP**	**Sampling Type:**	**Composite**

S. No.	Parameter	Test-Method	Result	Unit
1.	pH (at 25 °C)	IS3025 (P-11)	7.48	--
2.	Colour	IS3025 (P-4)	16.0	Hazen
3.	Turbidity	IS3025 (P-10)	64.00	NTU
4.	Odour	IS3025 (P-5)	Agreeable	--
5.	Total Hardness as $CaCO_3$	IS3025 (P-21)	710.86	mg/L
6.	Calcium as Ca	IS3025 (P-40)	142.10	mg/L
7.	Alkalinity as $CaCO_3$	IS3025 (P-23)	614.93	mg/L
8.	Chloride as Cl	IS 3025 (P-32)	304.48	mg/L
9.	Residual free Chlorine	IS 3025 (P-26)	*BLQ(**LOQ 0.15)	mg/L
10.	Cyanide as CN	IS 3025 (P-27)	*BLQ(**LOQ 0.02)	mg/L
11.	Magnesium as Mg	APHA , 3500 Mg B Calculation method	86.34	mg/L
12.	Total Dissolved Solids	IS3025 (P-16)	1234.00	mg/L
13.	Total Suspended solids	IS 3025 (P-17)	61.00	mg/L
14.	Dissolved Oxygen	IS 3025 (P-38)	6.3	mg/L
15.	Sulphate as SO^{-1}	IS3025 (P-24)	80.62	mg/L
16.	Fluoride as F	APHA , 4500-F⁻ B & D	0.40	mg/L
17.	BOD (3 Days at 27°C)	IS 3025,P-44	15.00	mg/L
18.	COD	APHA, 5220 B, Open Reflux Method	54.00	mg/L

For DLF LIMITED
Authorised Signatory

(Checked By)

(Approved By)

Ph: 0124-4343750/752/753, 9810355569, 9953147268 E-mail: lab@vardan.co.in, bd@vardan.co.in

Vardan EnViroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: VEL/DL/W/13			Report No.: VEL/W/2401/02/013	
S. No.	**Parameter**	**Test-Method**	**Result**	**Unit**
19.	Conductivity (at 25 °C)	IS3025 (P-14)	1.82	mS/cm
20.	Nitrate as NO_3	IS3025 (P-34)	16.07	mg/L
21.	Sodium as Na	IS3025 (P-45)	184.00	mg/L
22.	Potassium as K	IS3025 (P-45)	17.11	mg/L
23.	Iron as Fe	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.94	mg/L
24.	Aluminium as Al	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.005)	mg/L
25.	Boron	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.40	mg/L
26.	Chromium as Cr	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.002)	mg/L
27.	Phenolic Compounds	IS3025 (P-43)	*BLQ(**LOQ 0.0005)	mg/L
28.	Mineral Oil	IS 3025 (P-39)	*BLQ(**LOQ 0.1)	mg/L
29.	Anionic Detergents as MBAS	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.05)	mg/L
30.	Zinc as Zn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	2.35	mg/L
31.	Copper as Cu	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.22	mg/L
32.	Manganese as Mn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.01)	mg/L
33.	Cadmium as Cd	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.002)	mg/L

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® Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: VEL/DL/W/13				Report No.: VEL/W/2401/02/013
S. No.	Parameter	Test-Method	Result	Unit
1.	Total Coliform	APHA 23rd edition, 9221 B	1200	MPN/100ml
2.	Fecal Coliform	APHA 23rd edition, 9221 E	800	MPN/100ml

Note: -*BLQ-Below Limit of Quantification, **LOQ- Limit of Quantification

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For DLF LIMITED

Authorised Signatory

Vardan EnviroLab

Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)

ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	VEL/DL/W/14	**Report No.:**	VEL/W/2401/02/014
Name & Address of the Project:	M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .	**Format No.:**	7.8 F-03
		Party Reference No.:	NIL
		Reporting Date:	08/01/2024
Sample Description:	Surface Water Sample	**Period of Analysis:**	02/01/2024– 08/01/2024
Sampling Location:	Pond Near Bhaundsi Village (SW6)	**Receipt Date:**	02/01/2024
Sample Collected by:	Vardan Enviro Lab Representative	**Sampling Date:**	02/01/2024
Preservation:	Ice Box	**Sampling Quantity:**	5.0 Ltr + 250ml
Sampling and Analysis Protocol:	IS, APHA 23rd Edition 2017 & STP	**Sampling Type:**	Composite

S. No.	Parameter	Test-Method	Result	Unit
1.	pH (at 25 °C)	IS3025 (P-11)	7.53	--
2.	Colour	IS3025 (P-4)	17.0	Hazen
3.	Turbidity	IS3025 (P-10)	52.00	NTU
4.	Odour	IS3025 (P-5)	Agreeable	--
5.	Total Hardness as $CaCO_3$	IS3025 (P-21)	730.61	mg/L
6.	Calcium as Ca	IS3025 (P-40)	134.09	mg/L
7.	Alkalinity as $CaCO_3$	IS3025 (P-23)	602.86	mg/L
8.	Chloride as Cl	IS 3025 (P-32)	296.11	mg/L
9.	Residual free Chlorine	IS 3025 (P-26)	*BLQ(**LOQ 0.15)	mg/L
10.	Cyanide as CN	IS 3025 (P-27)	*BLQ(**LOQ 0.02)	mg/L
11.	Magnesium as Mg	APHA , 3500 Mg B Calculation method	96.01	mg/L
12.	Total Dissolved Solids	IS3025 (P-16)	1012.00	mg/L
13.	Total Suspended solids	IS 3025 (P-17)	64.00	mg/L
14.	Dissolved Oxygen	IS 3025 (P-38)	6.2	mg/L
15.	Sulphate as SO^{4}	IS3025 (P-24)	82.90	mg/L
16.	Fluoride as F	APHA , 4500-F⁻ B & D	0.54	mg/L
17.	BOD (3 Days at 27°C)	IS 3025,P-44	10.00	mg/L
18.	COD	APHA, 5220 B, Open Reflux Method	54.00	mg/L

(Checked By)

For DLF Ltd.

Authorised Signatory

(Approved By)

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: VEL/DL/W/14			Report No.: VEL/W/2401/02/014	
S. No.	Parameter	Test-Method	Result	Unit
19.	Conductivity (at 25 °C)	IS3025 (P-14)	1.84	mS/cm
20.	Nitrate as NO_3	IS3025 (P-34)	17.10	mg/L
21.	Sodium as Na	IS3025 (P-45)	174.00	mg/L
22.	Potassium as K	IS3025 (P-45)	18.09	mg/L
23.	Iron as Fe	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	1.25	mg/L
24.	Aluminium as Al	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.005)	mg/L
25.	Boron	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.34	mg/L
26.	Chromium as Cr	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.002)	mg/L
27.	Phenolic Compounds	IS3025 (P-43)	*BLQ(**LOQ 0.0005)	mg/L
28.	Mineral Oil	IS 3025 (P-39)	*BLQ(**LOQ 0.1)	mg/L
29.	Anionic Detergents as MBAS	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.05)	mg/L
30.	Zinc as Zn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	1.72	mg/L
31.	Copper as Cu	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.17	mg/L
32.	Manganese as Mn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.01)	mg/L
33.	Cadmium as Cd	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.002)	mg/L

(Checked By)

(Approved By)

For VPS LIMITED

Authorised Signatory

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: VEL/DL/W/14				Report No.: VEL/W/2401/02/014
S. No.	Parameter	Test-Method	Result	Unit
1.	Total Coliform	APHA 23rd edition, 9221 B	1400	MPN/100ml
2.	Fecal Coliform	APHA 23rd edition, 9221 E	900	MPN/100ml

Note: *BLQ-Below Limit of Quantification, **LOQ- Limit of Quantification

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	VEL/DL/W/15	**Report No.:**	VEL/W/2401/02/015
Name & Address of the Project:	M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .	**Format No.:**	7.8 F-03
		Party Reference No.:	NIL
		Reporting Date:	08/01/2024
Sample Description:	Surface Water Sample	**Period of Analysis:**	02/01/2024– 08/01/2024
Sampling Location:	Pond Near Nurpur Jharsa Village (SW7)	**Receipt Date:**	02/01/2024
Sample Collected by:	Vardan Enviro Lab Representative	**Sampling Date:**	02/01/2024
Preservation:	Ice Box	**Sampling Quantity:**	5.0 Ltr + 250ml
Sampling and Analysis Protocol:	IS, APHA 23rd Edition 2017 & STP	**Sampling Type:**	Composite

S. No.	Parameter	Test-Method	Result	Unit
1.	pH (at 25 °C)	IS3025 (P-11)	7.58	--
2.	Colour	IS3025 (P-4)	14.0	Hazen
3	Turbidity	IS3025 (P-10)	62.00	NTU
4.	Odour	IS3025 (P-5)	Agreeable	--
5.	Total Hardness as $CaCO_3$	IS3025 (P-21)	728.90	mg/L
6.	Calcium as Ca	IS3025 (P-40)	134.59	mg/L
7.	Alkalinity as $CaCO_3$	IS3025 (P-23)	615.81	mg/L
8.	Chloride as Cl	IS 3025 (P-32)	306.26	mg/L
9.	Residual free Chlorine	IS 3025 (P-26)	*BLQ(**LOQ 0.15)	mg/L
10.	Cyanide as CN	IS 3025 (P-27)	*BLQ(**LOQ 0.02)	mg/L
11.	Magnesium as Mg	APHA , 3500 Mg B Calculation method	95.52	mg/L
12..	Total Dissolved Solids	IS3025 (P-16)	1210.00	mg/L
13.	Total Suspended solids	IS 3025 (P-17)	63.00	mg/L
14.	Dissolved Oxygen	IS 3025 (P-38)	6.1	mg/L
15.	Sulphate as SO^4	IS3025 (P-24)	82.90	mg/L
16.	Fluoride as F	APHA , 4500-F B & D	0.42	mg/L
17.	BOD (3 Days at 27°C)	IS 3025,P-44	17.00	mg/L
18.	COD	APHA, 5220 B, Open Reflux Method	56.00	mg/L

(Checked By)

For DLF LIMITED

Authorised Signatory

(Approved By)

Vardan EnViroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: VEL/DL/W/15			Report No.: VEL/W/2401/02/015	
S. No.	Parameter	Test-Method	Result	Unit
19.	Conductivity (at 25 °C)	IS3025 (P-14)	1.84	mS/cm
20.	Nitrate as NO_3	IS3025 (P-34)	16.90	mg/L
21.	Sodium as Na	IS3025 (P-45)	188.00	mg/L
22.	Potassium as K	IS3025 (P-45)	18.72	mg/L
23.	Iron as Fe	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.95	mg/L
24.	Aluminium as Al	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.005)	mg/L
25.	Boron	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.42	mg/L
26.	Chromium as Cr	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.002)	mg/L
27.	Phenolic Compounds	IS3025 (P-43)	*BLQ(**LOQ 0.0005)	mg/L
28.	Mineral Oil	IS 3025 (P-39)	*BLQ(**LOQ 0.1)	mg/L
29.	Anionic Detergents as MBAS	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.05)	mg/L
30.	Zinc as Zn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	2.38	mg/L
31.	Copper as Cu	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	0.28	mg/L
32.	Manganese as Mn	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.01)	mg/L
33.	Cadmium as Cd	VEL/STP/ICP/W-01, Issue date.-01, 01/11/21	*BLQ(**LOQ 0.002)	mg/L

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(Approved By)

For DL[illegible]MITED

Authorised Signatory

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample No.: VEL/DL/W/15			Report No.: VEL/W/2401/02/015	
S. No.	Parameter	Test-Method	Result	Unit
34.	Total Coliform	APHA 23rd edition, 9221 B	1200	MPN/100ml
35.	Fecal Coliform	APHA 23rd edition, 9221 E	800	MPN/100ml

Note: -*BLQ-Below Limit of Quantification, **LOQ- Limit of Quantification

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(Approved By)

Vardan EnViroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	**VEL/DL/S/01**	**Report No:**	**VEL/S/2401/02/001**
Name & Address of the Project:	**M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .**	**Format No:**	**7.8 F-03**
		Party Reference No:	**NIL**
		Reporting Date:	**08/01/2024**
		Period of Analysis:	**02/01/2024 – 08/01/2024**
		Receipt Date:	**02/01/2024**
Sample Description:	**SOIL SAMPLE**	**Sampling Date:**	**02/01/2024**
Sample Location:	**Project Site (S1)**	**Sample Quantity:**	**2.0 Kg**
Sample Collected by:	**Vardan Envirolab Representative**	**Sampling Type:**	**Composite**
Sampling and Analysis Protocol:	**IS & STP**	**Packing Status:**	**Sealed Packed**
		Parameter Required:	**As Per ToR Letter**

S. No.	Parameter	Test-Method	Result	Unit
1.	pH (at 25 ^{0}C)	IS : 2720 (P-26)	7.30	--
2.	Conductivity	IS:14767	0.252	mS/cm
3.	Soil Texture	VEL/STP/EN/64, Issue No.-01, 01/11/2021	Sand – 48 Silt - 31 Clay – 21	%
4.	Color	VEL/STP/EN/67, Issue No.-01, 01/11/2021	Brownish	--
5.	Water holding capacity	VEL/STP/EN/86, Issue No.-01, 01/11/2021	33.47	%
6.	Bulk density	VEL/STP/EN/59, Issue No.-01, 01/11/2021	1.40	gm/cc
7.	Chloride as Cl	VEL/STP/EN/69, Issue No.-01, 01/11/2021	17.85	mg/100g
8.	Calcium as Ca	VEL/STP/EN/72, Issue No.-01, 01/11/2021	24.65	mg/100g
9.	Sodium as Na	VEL/STP/EN/62, Issue No.-01, 01/11/2021	35.90	mg/kg
10.	Potassium as K	VEL/STP/EN/61, Issue No.-01, 01/11/2021	117.51	mg/kg
11.	Organic Matter	IS : 2720 (P-22), Titrimetric Method	0.34	%
12.	Magnesium as Mg	VEL/STP/EN/72, Issue No.-01, 01/11/2021	5.81	mg/100g
13.	Available Nitrogen as N	IS:14684 Distillation Method	180.5	kg./hec.
14.	Available Phosphorus	VEL/STP/EN/73, Issue No.-01, 01/11/2021	22.6	kg./hec.
15.	Zinc (as Zn)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	8.96	mg/kg
16.	Manganese (as Mn)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	31.30	mg/kg
17.	Lead (as Pb)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	5.66	mg/kg
18.	Cadmium (as Cd)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	BLQ (LOQ – 0.5)	mg/kg
19.	Chromium (as Cr)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	1.98	mg/kg
20.	Copper (as Cu)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	2.72	mg/kg

(Checked By)

For DLF LIMITED

Authorised S.

(Approved By)

Ph: 0124-4343750/752/753, 9810355569, 9953147268 E-mail: lab@vardan.co.in, bd@vardan.co.in

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	**VEL/DL/S/02**	**Report No.:**	**VEL/S/2401/02/002**
Name & Address of the Project:	**M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .**	**Format No.:**	**7.8 F-03**
		Party Reference No.:	**NIL**
		Reporting Date:	**08/01/2024**
		Period of Analysis:	**02/01/2024- 08/01/2024**
		Receipt Date:	**02/01/2024**
Sample Description:	**SOIL SAMPLE**	**Sampling Date:**	**02/01/2024**
Sample Location:	**Near Village Haiderpur (S2)**	**Sample Quantity:**	**2.0 Kg**
Sample Collected by:	**Vardan Envirolab Representative**	**Sampling Type:**	**Composite**
Sampling and Analysis Protocol:	**IS & STP**	**Packing Status:**	**Sealed Packed**
		Parameter Required:	**As Per ToR Letter**

S. No.	Parameter	Test-Method	Result	Unit
1.	pH (at 25 °C)	IS : 2720 (P-26)	7.38	--
2.	Conductivity	IS:14767	0.246	mS/cm
3.	Soil Texture	VEL/STP/EN/64, Issue No.-01, 01/11/2021	Sand – 52	%
			Silt - 29	
			Clay – 19	
4.	Color	VEL/STP/EN/67, Issue No.-01, 01/11/2021	Yellowish Brown	--
5.	Water holding capacity	VEL/STP/EN/86, Issue No.-01, 01/11/2021	31.20	%
6.	Bulk density	VEL/STP/EN/59, Issue No.-01, 01/11/2021	1.53	gm/cc
7.	Chloride as Cl	VEL/STP/EN/69, Issue No.-01, 01/11/2021	13.66	mg/100g
8.	Calcium as Ca	VEL/STP/EN/72, Issue No.-01, 01/11/2021	22.12	mg/100g
9.	Sodium as Na	VEL/STP/EN/62, Issue No.-01, 01/11/2021	140.0	mg/kg
10.	Potassium as K	VEL/STP/EN/61, Issue No.-01, 01/11/2021	111.06	mg/kg
11.	Organic Matter	IS : 2720 (P-22), Titrimetric Method	0.27	%
12.	Magnesium as Mg	VEL/STP/EN/72, Issue No.-01, 01/11/2021	3.98	mg/100g
13.	Available Nitrogen as N	IS:14684 Distillation Method	115.30	kg./hec.
14.	Available Phosphorus	VEL/STP/EN/73, Issue No.-01, 01/11/2021	10.48	kg./hec.
15.	Zinc (as Zn)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	3.07	mg/kg
16.	Manganese (as Mn)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	22.34	mg/kg
17.	Lead (as Pb)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	9.86	mg/kg
18.	Cadmium (as Cd)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	BLQ (LOQ – 0.5)	mg/kg
19.	Chromium (as Cr)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	1.62	mg/kg
20.	Copper (as Cu)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	2.04	mg/kg

For DLF LIMITED

(Checked By)

Authorised Signatory

(Approved By)

Ph: 0124-4343750/752/753, 9810355569, 9953147268 E-mail: lab@vardan.co.in, bd@vardan.co.in

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	**VEL/DL/S/03**	**Report No.:**	**VEL/S/2401/02/003**
Name & Address of the Project:	**M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .**	**Format No.:**	**7.8 F-03**
		Party Reference No.:	**NIL**
		Reporting Date:	**08/01/2024**
		Period of Analysis:	**02/01/2024– 08/01/2024**
		Receipt Date:	**02/01/2024**
Sample Description:	**SOIL SAMPLE**	**Sampling Date:**	**02/01/2024**
Sample Location:	**Near Village Wazirabad (S3)**	**Sample Quantity:**	**2.0 Kg**
Sample Collected by:	**Vardan Envirolab Representative**	**Sampling Type:**	**Composite**
Sampling and Analysis Protocol:	**IS & STP**	**Packing Status:**	**Sealed Packed**
		Parameter Required:	**As Per ToR Letter**

S. No.	Parameter	Test-Method	Result	Unit
1.	pH (at 25 °C)	IS : 2720 (P-26)	7.36	–
2.	Conductivity	IS:14767	0.216	mS/cm
3.	Soil Texture	VEL/STP/EN/64, Issue No.-01, 01/11/2021	Sand – 46	%
			Silt - 36	
			Clay – 18	
4.	Color	VEL/STP/EN/67, Issue No.-01, 01/11/2021	Brownish	–
5.	Water holding capacity	VEL/STP/EN/86, Issue No.-01, 01/11/2021	36.82	%
6.	Bulk density	VEL/STP/EN/59, Issue No.-01, 01/11/2021	1.35	gm/cc
7.	Chloride as Cl	VEL/STP/EN/69, Issue No.-01, 01/11/2021	23.04	mg/100g
8.	Calcium as Ca	VEL/STP/EN/72, Issue No.-01, 01/11/2021	30.48	mg/100g
9.	Sodium as Na	VEL/STP/EN/62, Issue No.-01, 01/11/2021	148.0	mg/kg
10.	Potassium as K	VEL/STP/EN/61, Issue No.-01, 01/11/2021	87.2	mg/kg
11.	Organic Matter	IS : 2720 (P-22), Titrimetric Method	0.39	%
12.	Magnesium as Mg	VEL/STP/EN/72, Issue No.-01, 01/11/2021	9.82	mg/100g
13.	Available Nitrogen as N	IS:14684 Distillation Method	148.26	kg./hec.
14.	Available Phosphorus	VEL/STP/EN/73, Issue No.-01, 01/11/2021	19.18	kg./hec.
15.	Zinc (as Zn)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	11.49	mg/kg
16.	Manganese (as Mn)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	43.35	mg/kg
17.	Lead (as Pb)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	3.66	mg/kg
18.	Cadmium (as Cd)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	BLQ (LOQ – 0.5)	mg/kg
19.	Chromium (as Cr)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	1.02	mg/kg
20.	Copper (as Cu)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	3.11	mg/kg

(Checked By)

For DLF LIMITED

Authorised Sign

(Approved By)

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Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	VEL/DL/S/04	**Report No.:**	VEL/S/2401/02/004
Name & Address of the Project:	M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .	**Format No.:**	7.8 F-03
		Party Reference No.:	NIL
		Reporting Date:	08/01/2024
		Period of Analysis:	02/01/2024– 08/01/2024
		Receipt Date:	02/01/2024
Sample Description:	SOIL SAMPLE	**Sampling Date:**	02/01/2024
Sample Location:	Near DLF Phase 5(S4)	**Sample Quantity:**	2.0 Kg
Sample Collected by:	Vardan Envirolab Representative	**Sampling Type:**	Composite
Sampling and Analysis Protocol:	IS & STP	**Packing Status:**	Sealed Packed
		Parameter Required:	As Per ToR Letter

S. No.	Parameter	Test-Method	Result	Unit
1.	pH (at 25 °C)	IS : 2720 (P-26)	7.43	–
2.	Conductivity	IS:14767	0.228	mS/cm
3.	Soil Texture	VEL/STP/EN/64, Issue No.-01, 01/11/2021	Sand – 49	%
			Silt - 35	
			Clay – 16	
4.	Color	VEL/STP/EN/67, Issue No.-01, 01/11/2021	Yellowish Brown	–
5.	Water holding capacity	VEL/STP/EN/86, Issue No.-01, 01/11/2021	34.98	%
6.	Bulk density	VEL/STP/EN/59, Issue No.-01, 01/11/2021	1.34	gm/cc
7.	Chloride as Cl	VEL/STP/EN/69, Issue No.-01, 01/11/2021	13.74	mg/100g
8.	Calcium as Ca	VEL/STP/EN/72, Issue No.-01, 01/11/2021	28.11	mg/100g
9.	Sodium as Na	VEL/STP/EN/62, Issue No.-01, 01/11/2021	97.2	mg/kg
10.	Potassium as K	VEL/STP/EN/61, Issue No.-01, 01/11/2021	110.7	mg/kg
11.	Organic Matter	IS : 2720 (P-22), Titrimetric Method	0.31	%
12.	Magnesium as Mg	VEL/STP/EN/72, Issue No.-01, 01/11/2021	8.11	mg/100g
13.	Available Nitrogen as N	IS:14684 Distillation Method	151.2	kg./hec.
14.	Available Phosphorus	VEL/STP/EN/73, Issue No.-01, 01/11/2021	16.11	kg./hec.
15.	Zinc (as Zn)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	7.08	mg/kg
16.	Manganese (as Mn)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	36.35	mg/kg
17.	Lead (as Pb)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	4.66	mg/kg
18.	Cadmium (as Cd)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	BLQ (LOQ – 0.5)	mg/kg
19.	Chromium (as Cr)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	1.12	mg/kg
20.	Copper (as Cu)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	2.86	mg/kg

(Checked By)

For DLF LIMITED

Authorised Signatory

(Approved By)

Ph: 0124-4343750/752/753, 9810355569, 9953147268 E-mail: lab@vardan.co.in, bd@vardan.co.in

Vardan EnViroLab

Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	VEL/DL/S/05	**Report No.:**	VEL/S/2401/02/005
Name & Address of the Project:	M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .	**Format No.:**	7.8 F-03
		Party Reference No.:	NIL
		Reporting Date:	08/01/2024
		Period of Analysis:	02/01/2024- 08/01/2024
		Receipt Date:	02/01/2024
Sample Description:	SOIL SAMPLE	**Sampling Date:**	02/01/2024
Sample Location:	Near Village Behrampur (S5)	**Sample Quantity:**	2.0 Kg
Sample Collected by:	Vardan Envirolab Representative	**Sampling Type:**	Composite
Sampling and Analysis Protocol:	IS & STP	**Packing Status:**	Sealed Packed
		Parameter Required:	As Per ToR Letter

S. No.	Parameter	Test-Method	Result	Unit
1.	pH (at 25 ^{0}C)	IS : 2720 (P-26)	7.16	--
2.	Conductivity	IS:14767	0.314	mS/cm
3.	Soil Texture	VEL/STP/EN/64, Issue No.-01, 01/11/2021	Sand – 45	%
			Silt - 36	
			Clay – 19	
4.	Color	VEL/STP/EN/67, Issue No.-01, 01/11/2021	Brownish	--
5.	Water holding capacity	VEL/STP/EN/86, Issue No.-01, 01/11/2021	33.85	%
6.	Bulk density	VEL/STP/EN/59, Issue No.-01, 01/11/2021	1.46	gm/cc
7.	Chloride as Cl	VEL/STP/EN/69, Issue No.-01, 01/11/2021	17.74	mg/100g
8.	Calcium as Ca	VEL/STP/EN/72, Issue No.-01, 01/11/2021	29.12	mg/100g
9.	Sodium as Na	VEL/STP/EN/62, Issue No.-01, 01/11/2021	34.78	mg/kg
10.	Potassium as K	VEL/STP/EN/61, Issue No.-01, 01/11/2021	122.10	mg/kg
11.	Organic Matter	IS : 2720 (P-22), Titrimetric Method	0.34	%
12.	Magnesium as Mg	VEL/STP/EN/72, Issue No.-01, 01/11/2021	12.92	mg/100g
13.	Available Nitrogen as N	IS:14684 Distillation Method	170.5	kg./hec.
14.	Available Phesphorus	VEL/STP/EN/73, Issue No.-01, 01/11/2021	18.5	kg./hec.
15.	Zinc (as Zn)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	1.50	mg/kg
16.	Manganese (as Mn)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	2.40	mg/kg
17.	Lead (as Pb)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	0.64	mg/kg
18.	Cadmium (as Cd)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	BLQ (LOQ – 0.5)	mg/kg
19.	Chromium (as Cr)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	0.56	mg/kg
20.	Copper (as Cu)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	1.34	mg/kg

(Checked By)

For DLF LIMITED

Authorised Signatory

(Approved By)

Ph: 0124-4343750/752/753, 9810355569, 9953147268 E-mail: lab@vardan.co.in, bd@vardan.co.in

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	VEL/DL/S/06	**Report No.:**	VEL/S/2401/02/006
Name & Address of the Project:	M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .	**Format No.:**	7.8 F-03
		Party Reference No.:	NIL
		Reporting Date:	08/01/2024
		Period of Analysis:	02/01/2024- 08/01/2024
		Receipt Date:	02/01/2024
Sample Description:	SOIL SAMPLE	**Sampling Date:**	02/01/2024
Sample Location:	Near Gwalpahari (S6)	**Sample Quantity:**	2.0 Kg
Sample Collected by:	Vardan Envirolab Representative	**Sampling Type:**	Composite
Sampling and Analysis Protocol:	IS & STP	**Packing Status:**	Sealed Packed
		Parameter Required:	As Per ToR Letter

S. No.	Parameter	Test-Method	Result	Unit
1.	pH (at 25 °C)	IS : 2720 (P-26)	7.51	--
2.	Conductivity	IS:14767	0.243	mS/cm
3.	Soil Texture	VEL/STP/EN/64, Issue No.-01, 01/11/2021	Sand – 45 Silt - 38 Clay – 17	%
4.	Color	VEL/STP/EN/67, Issue No.-01, 01/11/2021	Yellowish Brown	--
5.	Water holding capacity	VEL/STP/EN/86, Issue No.-01, 01/11/2021	37.06	%
6.	Bulk density	VEL/STP/EN/59, Issue No.-01, 01/11/2021	1.28	gm/cc
7.	Chloride as Cl	VEL/STP/EN/69, Issue No.-01, 01/11/2021	15.82	mg/100g
8.	Calcium as Ca	VEL/STP/EN/72, Issue No.-01, 01/11/2021	27.96	mg/100g
9.	Sodium as Na	VEL/STP/EN/62, Issue No.-01, 01/11/2021	39.42	mg/kg
10.	Potassium as K	VEL/STP/EN/61, Issue No.-01, 01/11/2021	144.11	mg/kg
11.	Organic Matter	IS : 2720 (P-22), Titrimetric Method	0.41	%
12.	Magnesium as Mg	VEL/STP/EN/72, Issue No.-01, 01/11/2021	10.82	mg/100g
13.	Available Nitrogen as N	IS:14684 Distillation Method	152.14	kg./hec.
14.	Available Phosphorus	VEL/STP/EN/73, Issue No.-01, 01/11/2021	26.11	kg./hec.
15.	Zinc (as Zn)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	14.66	mg/kg
16.	Manganese (as Mn)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	52.35	mg/kg
17.	Lead (as Pb)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	2.05	mg/kg
18.	Cadmium (as Cd)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	BLQ (LOQ – 0.5)	mg/kg
19.	Chromium (as Cr)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	1.88	mg/kg
20.	Copper (as Cu)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	4.66	mg/kg

(Checked By)

For DLF LIMITED

Authorised Signatory

(Approved By)

Ph: 0124-4343750/752/753, 9810355569, 9953147268 E-mail: lab@vardan.co.in, bd@vardan.co.in

® Vardan EnViroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	**VEL/DL/S/07**	**Report No.:**	**VEL/S/2401/02/007**
Name & Address of the Project:	M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-54, Gurugram, Haryana .	**Format No.:**	**7.8 F-03**
		Party Reference No.:	**NIL**
		Reporting Date:	**08/01/2024**
		Period of Analysis:	**02/01/2024– 08/01/2024**
		Receipt Date:	**02/01/2024**
Sample Description:	**SOIL SAMPLE**	**Sampling Date:**	**02/01/2024**
Sample Location:	**Near Village Junapur (S7)**	**Sample Quantity:**	**2.0 Kg**
Sample Collected by:	**Vardan Envirolab Representative**	**Sampling Type:**	**Composite**
Sampling and Analysis Protocol:	**IS & STP**	**Packing Status:**	**Sealed Packed**
		Parameter Required:	**As Per ToR Letter**

S. No.	Parameter	Test-Method	Result	Unit
1.	pH (at 25 °C)	IS : 2720 (P-26)	7.54	--
2.	Conductivity	IS:14767	0.248	mS/cm
3.	Soil Texture	VEL/STP/EN/64, Issue No.-01, 01/11/2021	Sand – 40	%
			Silt - 40	
			Clay – 20	
4.	Color	VEL/STP/EN/67, Issue No.-01, 01/11/2021	Yellowish Brown	--
5.	Water holding capacity	VEL/STP/EN/86, Issue No.-01, 01/11/2021	39.40	%
6.	Bulk density	VEL/STP/EN/59, Issue No.-01, 01/11/2021	1.20	gm/cc
7.	Chloride as Cl	VEL/STP/EN/69, Issue No.-01, 01/11/2021	16.47	mg/100g
8.	Calcium as Ca	VEL/STP/EN/72, Issue No.-01, 01/11/2021	28.74	mg/100g
9.	Sodium as Na	VEL/STP/EN/62, Issue No.-01, 01/11/2021	140.30	mg/kg
10.	Potassium as K	VEL/STP/EN/61, Issue No.-01, 01/11/2021	145.21	mg/kg
11.	Organic Matter	IS : 2720 (P-22), Titrimetric Method	0.42	%
12.	Magnesium as Mg	VEL/STP/EN/72, Issue No.-01, 01/11/2021	10.77	mg/100g
13.	Available Nitrogen as N	IS:14684 Distillation Method	153.25	kg./hec.
14.	Available Phosphorus	VEL/STP/EN/73, Issue No.-01, 01/11/2021	25.95	kg./hec.
15.	Zinc (as Zn)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	13.78	mg/kg
16.	Manganese (as Mn)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	50.25	mg/kg
17.	Lead (as Pb)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	2.10	mg/kg
18.	Cadmium (as Cd)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	BLQ (LOQ – 0.5)	mg/kg
19.	Chromium (as Cr)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	1.80	mg/kg
20.	Copper (as Cu)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	4.58	mg/kg

(Checked By)

For DLF LIMITED

Authorised Signatory

(Approved By)

Ph: 0124-4343750/752/753, 9810355569, 9953147268 E-mail: lab@vardan.co.in, bd@vardan.co.in

Vardan EnviroLab
Laboratory: Plot No. 82A, Sector - 5, IMT Manesar, Gurugram - 122051 (Haryana)
ISO 9001 | ISO 14001 | ISO 45001

Test Report

Sample Number:	**VEL/DL/S/08**	**Report No.:**	**VEL/S/2401/02/008**
Name & Address of the Project:	**M/s DLF Ltd. expansion of Group Housing Building in Zone-10 of DLF-5 at Village- Wazirabad, Sector-84, Gurugram, Haryana .**	**Format No.:**	**7.8 F-03**
		Party Reference No.:	**NIL**
		Reporting Date:	**08/01/2024**
		Period of Analysis:	**02/01/2024– 08/01/2024**
		Receipt Date:	**02/01/2024**
Sample Description:	**SOIL SAMPLE**	**Sampling Date:**	**02/01/2024**
Sample Location:	**Asola Wildlife Sanctuary (S8)**	**Sample Quantity:**	**2.0 Kg**
Sample Collected by:	**Vardan Envirolab Representative**	**Sampling Type:**	**Composite**
Sampling and Analysis Protocol:	**IS & STP**	**Packing Status:**	**Sealed Packed**
		Parameter Required:	**As Per ToR Letter**

S. No.	Parameter	Test-Method	Result	Unit
1.	pH (at 25 °C)	IS : 2720 (P-26)	7.56	--
2.	Conductivity	IS:14767	0.252	mS/cm
3.	Soil Texture	VEL/STP/EN/64, Issue No.-01, 01/11/2021	Sand – 35 Silt - 40 Clay – 25	%
4.	Color	VEL/STP/EN/67, Issue No.-01, 01/11/2021	Yellowish Brown	--
5.	Water holding capacity	VEL/STP/EN/86, Issue No.-01, 01/11/2021	38.65	%
6.	Bulk density	VEL/STP/EN/59, Issue No.-01, 01/11/2021	1.24	gm/cc
7.	Chloride as Cl	VEL/STP/EN/69, Issue No.-01, 01/11/2021	16.98	mg/100g
8.	Calcium as Ca	VEL/STP/EN/72, Issue No.-01, 01/11/2021	29.40	mg/100g
9.	Sodium as Na	VEL/STP/EN/62, Issue No.-01, 01/11/2021	127.0	mg/kg
10.	Potassium as K	VEL/STP/EN/61, Issue No.-01, 01/11/2021	144.33	mg/kg
11.	Organic Matter	IS : 2720 (P-22), Titrimetric Method	0.44	%
12.	Magnesium as Mg	VEL/STP/EN/72, Issue No.-01, 01/11/2021	11.11	mg/100g
13.	Available Nitrogen as N	IS:14684 Distillation Method	152.40	kg./hec.
14.	Available Phosphorus	VEL/STP/EN/73, Issue No.-01, 01/11/2021	24.87	kg./hec.
15.	Zinc (as Zn)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	13.67	mg/kg
16.	Manganese (as Mn)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	49.47	mg/kg
17.	Lead (as Pb)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	2.10	mg/kg
18.	Cadmium (as Cd)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	BLQ (LOQ – 0.5)	mg/kg
19.	Chromium (as Cr)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	1.69	mg/kg
20.	Copper (as Cu)	VEL/STP/EN/165, Issue No.-01, 20/06/2022	4.48	mg/kg

(Checked By) (Approved By)

For DLF LIMITED

Authorised Signatory

Ph: 0124-4343750/752/753, 9810355569, 9953147268 E-mail: lab@vardan.co.in, bd@vardan.co.in

DAKSHIN HARYANA BIJLI VITRAN NIGAM
(A Govt. of Haryana Undertaking)
Office of
Superintending Engineer (OP) Circle-II, DHBVN, Gurugram
2nd Floor, Housing Board Office Complex, Sareswati Vihar, M.G. Road,
Gurugram, Haryana-122002
0124-2582100, 0124-4378109
E-mail – seop2gurugram@dhbvn.org.in Website - www.dhbvn.org.in

To,

M/s DLF Ltd ,
DLF Gateway Tower, R-Block,
DLF City, Phase-III, Gurugram.

Memo No. Ch- 6 /DGR- 26B Dated: 29 /01/2024

Sub: Assurance certificate of DHBVN for power supply of M/s DLF Ltd., for proposed Group Housing Buildings over an area measuring total 16.975 acres (License No. 52 of 1996, License No. 38 of 1996, License No. 40 of 1996, License No. 129 of 1995, License No. 131 of 1995, License No. 119 of 1995, License No. 121 of 1995, License No. 57 of 1996, License No. 2 of 2002, License No. 6 of 2002, License No. 4 of 2004, License No. 53 of 1996) in Zone-10, Sector-54 in DLF5, Gurugram.

Refer to your letter no. DLF-GRTP-HSG-ZN10-02382012-2023 dated 03.01.2024.

It is hereby assured that the power requirement of tentative load of **11082 KW** shall be considered from the nearest sub-station at 33 KV level at the time of actual requirement as per DHBVN norms, subject to the following conditions:-

1. Subject to availability of power and infrastructure at the time of actual release of connection.
2. Necessary charges will be got deposited by you as per latest Nigam instructions and compliance of all other instructions of Nigam will be ensured as per standing instructions of Nigam/HERC Regulations.
3. The necessary infrastructure will be laid by you at your own cost. The piece of land will be provided by you for the switching station / sub-station as per instructions of the Nigam.
4. The validity of this letter will be till the validity of licenses issued by Town & Country Planning, Haryana in view of Sales Circular no. D-6/2022 issued by CE/Commercial, DHBVN, Hisar vide memo no. Ch-06/SE/C/R-16/380/Vol-I dated 10.03.2022.

For DLF LIMITED
Authorised Signatory

S.E (OP) Circle –II
DHBVN, Gurugram

Copy to:-
The Xen 'OP' Sub Urban Divn. DHBVN, Gurugram for information please.

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ANNEXURE-4 1101

DLF LIMITED
DLF Gateway Tower, R Block,
DLF City Phase – III, Gurugram – 122 002,
Haryana (India)
Tel.: (+91-124) 4396000, investor-relations@dlf.in

CERTIFIED TRUE COPY OF THE RESOLUTION PASSED BY THE FINANCE COMMITTEE OF THE BOARD OF DIRECTORS OF DLF LIMITED AT ITS MEETING HELD ON 11TH SEPTEMBER 2020

"RESOLVED THAT in partial modification of the resolution dated 7th March 2020 of the Finance Committee of the Board of Directors of the Company, Mr. Devinder Singh[1], Director, Ms. Neelu Goel[2], Sr. Vice President (Planning), Mr. Lok Pal Singh[3], Sr. Vice President, (Co-ordination), Mr. Deepak Bhandari[4], General Manager (Co-ordination), Ms. Vandana Arora[4], Assistant General Manager (Planning), DLF Home Developers Limited and Ms. Akansha Moudgil[5], General Manager, DLF Home Developers Limited, be and are hereby severally authorized to sign and submit various license applications including application for change/ modification of developer company, transfer of licenses, withdraw of license(s), adjustment/ seek refund of Government fee, charges and to sign and execute related letters, documents, papers, plans, undertakings etc.; to deal with the office of Director General, Town & Country Planning, Haryana/ Haryana, Shahari Vikas Pradhikaran (HSVP)/ Gurugram Metropolitan Development Authority (GMDA)/ Haryana State Industrial and Infrastructure Development Corporation (HSIIDC), Chandigarh/ Panchkula/ Gurugram and other authorities/ offices of Haryana Government including under the provisions of the Haryana Development and Regulations of Urban Areas Act, 1975, the Punjab Scheduled Roads & Controlled Areas Restrictions of Unregulated Development Act, 1963 and Haryana Building Code, for and on behalf of the Company and to sign and execute related letters, documents, papers, plans, undertakings etc. and to deal with the office(s) of State Environment Impact Assessment Authority; State Expert Appraisal Committee; Haryana State Pollution Control Board; Ministry of Environment, Forest & Climate Change and Forest Department in the State of Haryana and to obtain Environmental Clearance in relation to the Company's projects situated in the state of Haryana.

RESOLVED FURTHER THAT the Common Seal of the Company may be affixed, if required, on any of such documents as per the provisions contained in the Articles of Association of the Company.

RESOLVED FURTHER THAT the aforesaid powers entrusted to the above executive(s) shall be valid, effective and exercisable by them, so long as they are in the employment of the Company or its associate/ subsidiary companies, unless revoked earlier by the Board or this Committee.

RESOLVED FURTHER THAT all acts, deeds and things done and documents executed aforesaid shall be deemed to be valid and enforceable only, if the same are consistent with this Resolution and that the Board or this Committee shall not be responsible for any illegal and invalid acts and any other act beyond the scope of the aforesaid powers executed by the above

For DLF LIMITED

Authorised Signatory

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DLF LIMITED
DLF Gateway Tower, R Block,
DLF City Phase – III, Gurugram – 122 002,
Haryana (India)
Tel.: (+91-124) 4396000, investor-relations@dlf.in

executive(s) and shall not bind the Company against any third party(ies) or before any authority (ies) in any manner and that the Board or this Committee shall not be answerable in that behalf.

RESOLVED FURTHER THAT a certified copy of this Resolution be furnished to anyone concerned or interested in the matter under the signatures of any Director or the Company Secretary of the Company."

Certified True Copy
For DLF Limited

R.P. Punjani
Company Secretary
FCS: 3757
Date of issue: 07.02.2024

*since separated
[1]re-designated as Managing Director
[2] re-designated as Executive Vice President (Planning)
[3] re-designated as Sr. Vice President (Approvals & Co-ordination), DLF Home Developers Limited
[4] re-designated as Deputy General Manager (Planning)
[5] re-designated as Vice President (Design)

For DLF LIMITED
Authorised Signatory

DLF Limited
DLF Gateway Tower, R Block, DLF City,
Phase III, Gurugram-122 002, Haryana
Tel.: (+91-124) 4396000

DLF
BUILDING INDIA

Date: 28/02/2022

To,
Member Secretary
State Level Expert Appraisal Committee,
Bays 55-58,3rd Floor, Paryatan Bhawan, Sector-2,
Panchkula, Haryana.

Subject: Authorization Letter for Consultant

Dear Sir,

M/s DLF Ltd. having its registered Office at DLF Shopping Mall. 3rd Floor. Arjun Marg, DLF City, Phase-1. Gurugram-122002 Haryana is undertaking for proposed expansion cum modification of Group Housing Buildings in Zone 10, DLF 5, at Sector-54, Gurugram, and Haryana

We have appointed M/s Vardan Environet, having its Corp. office at Plot no.82A, Sector-5, IMT Manesar, Gurugram, Haryana as our environmental consultant. Mr. RS Yadav and Mr. Aman Sharma of M/s Vardan Environet are hereby authorized as our representatives for all matters related to this case from SEIAA and SEAC, including submission of all documents and shortcomings to SEIAA, presentation before SEAC and collecting of final EC from SEIAA.

Thanking You

Yours Sincerely,

For M/s DLF Ltd.

For DLF Limited

Authorised Signatory
(Authorised Signatory)

For DLF LIMITED

Authorised Signatory

Quality Council of India

National Accreditation Board for Education & Training

Certificate of Accreditation

Vardan Environet, Gurugram

Plot No. 82-A, Sector 5, IMT Manesar, Gurugram, Haryana

The organization is accredited as ***Category-A*** *under the QCI-NABET Scheme for Accreditation of EIA Consultant Organization, Version 3: for preparing EIA-EMP reports in the following Sectors –*

S. No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1	Mining of minerals including opencast/ underground mining	1	1 (a) (i)	A
2	Offshore & Onshore Oil and gas exploration, development & production	2	1 (b)	B
3	River Valley projects	3	1 (c)	A
4	Thermal power plants	4	1 (d)	B
5	Coal washeries	6	2 (a)	A
6	Mineral beneficiation	7	2 (b)	A
7	Metallurgical industries (ferrous & non-ferrous)	8	3 (a)	A
8	Cement Plants	9	3(b)	A
9	Coke oven plants	11	4 (b)	A
10	Chemical fertilizers	16	5 (a)	A
11	Petro-chemical complexes	18	5 (c)	A
12	Synthetic organic chemicals industry	21	5 (f)	A
13	Distilleries	22	5 (g)	A
14	Sugar Industry	25	5 (j)	B
15	Oil & gas transportation pipeline, passing through national parks/ sanctuaries/coral reefs /ecologically sensitive Areas including LNG terminal	27	6 (a)	A
16	Isolated storage & handling of hazardous chemicals	28	-	B
17	Airports	29	7 (a)	A
18	Industrial estates/ parks/ complexes/ Areas, export processing zones (EPZs), Special economic zones (SEZs), Biotech parks, Leather complexes	31	7 (c)	A
19	Highways	34	7 (f)	A
20	Building and construction projects	38	8 (a)	B
21	Townships and Area development projects	39	8 (b)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in RAAC minutes dated April 21, 2023 posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no. QCI/NABET/ENV/ACO/23/2751 dated May 01, 2023. The accreditation needs to be renewed before the expiry date by Vardan Environet, Gurugram following due process of assessment.

Sr. Director, NABET	Certificate No.	Valid up to
Dated: May 01, 2023	NABET/EIA/2326/RA 0284	May 04, 2026

For the updated List of Accredited EIA Consultant Organizations with approved Sectors please refer to QCI-NABET website.

For DLF LIMITED

Authorised Signatory

GMDA

GURUGRAM METROPOLITAN DEVELOPMENT AUTHORITY

E-mail: xen3infra2.gmda@gov.in

To

M/s DLF Limited
DLF Gateway Tower,
R Block, DLF City, Phase-III, Gurugram

Gurugram/Date 20.02.2024.

Subject: - **Assurance of fresh water supply of 719 KLD for drinking purpose for Group Housing colony over an area measuring 16.975 acres, (License No. 129 of 1995, 131 of 1995, 117 of 1995, 121 of 1995, 52 of 1996, 38 of 1995, 40 of 1996, 57 of 1996, 2 of 2002, 6 of 2022 and 4 of 2006) in Zone 10, DLF-5, Sector 54, Gurugram.**

Please refer to your application dated 01.02.2024, In this regard, it is to inform that master water supply of GMDA in the area stands laid and commissioned from where potable water supply can be drawn. Thus, assurance to provide fresh water supply as per the approved service estimate is hereby accorded.

Further, the fresh water supply connection will be released after completing the required formality as per the latest notification of GMDA in this regard.

It is for your information and further necessary action please.

Executive Engineer-IV
W/S Division, Infra-II
GMDA, Gurugram

For DLF LIMITED
Authorised Signatory

This communication is computer generated and does not contain any signature in pen. This is signed with the digital signature obtained from a certifying authority under the Information Technology Act, 2000. For any queries, please quote the letter Number and e-mail at the mail address provided above.

OFFICE OF ADMINISTRATOR,
HARYANA SHEHRI VIKAS PRADHIKARAN
हरियाणा शहरी विकास प्राधिकरण

Address :- Old Delhi Road, Sector-14, Gurugram.
Tel. : 0124-2321650
Email id : admggnhuda@gmail.com

To

M/s DLF Ltd.
Regd Office: DLF Shopping Mall, 3rd Floor,
Arjun Marg, DLF City, Phase-I,
Gurugram 122002

Memo No. Admn./ A-1/2022/NOC/ 8081 Dated: 25/04/22

Subject: Issue of NOC for Construction purpose for use of Sewage Treated Water for construction purpose of proposed Group Housing Buildings in Zone 10, Sector 54, DLF 5, Gurugram area measuring 233378 Sq. mtr. (M/s DLF Ltd.) License No. 110 to 133 of 1995, 1 to 6 of 2002 and 38 to 53 of 1996)

Keeping in view the undertaking given by you that you will not use underground water for construction purpose and treat HSVP/HSIIDC STP water by package units or any other alternative ways and means to make it suitable for construction purpose, you are hereby issued Consent for approval of building plan only and you will have to install package unit before the start of construction work at site.

The No Objection Certificate to use the sewage treated water will be issued after the installation of package unit at sites based on estimated water demand for construction purpose. The colonizer/firms will produce the HSVP/HSIIDC certified details of the actual consumed sewerage treated water during the construction of project, while applying for occupation certificate of the project. This consent is issued only for approval of Building Plan only.

This is issued with approval of Worthy Administrator, HSVP, Gurugram.

SUPERINTENDENT
For Administrator,
HSVP, Gurugram.

Endst. No. Admn./ A-1/2022/NOC/..... Dated.....

A copy of the above is forwarded to the following for information and further necessary action:-

1. The Director General Town & Country Planning, Sector-17-C, Chandigarh.
2. The Chief Executive Officer, GMDA, Gurugram.
3. The Chief Administrator, HSVP, Panchkula.
4. The Deputy Commissioner, Gurugram.
5. The Chief Engineer, HSVP, Panchkula.
6. The Senior Town Planner, Gurugram.
7. The Superintending Engineer, HSVP, Circle-I & II, Gurugram.
8. The Executive Engineer, HSVP, Division No. V, Gurugram.

SUPERINTENDENT
For Administrator,
HSVP, Gurugram

For DLF LIMITED

Authorised Signatory

1300

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INDIA NON JUDICIAL

Chandigarh Administration

e-Stamp

Certificate No.	:	**IN-CH48276894199692W**
Certificate Issued Date	:	07-Mar-2024 04:21 PM
Certificate Issued By	:	chnitkpou
Account Reference	:	NEWIMPACC (GV)/ chspicg07/ E-SAMPARK SEC-07/ CH-CH
Unique Doc. Reference	:	SUBIN-CHCHSPICG07943945991071112W
Purchased by	:	ANIRUDH
Description of Document	:	Article 4 Affidavit
Property Description	:	Not Applicable
Consideration Price (Rs.)	:	0 (Zero)
First Party	:	DLF LIMITED
Second Party	:	Not Applicable
Stamp Duty Paid By	:	DLF LIMITED
Stamp Duty Amount(Rs.)	:	100 (One Hundred only)

NOTARY SHASHI KANT GALHOTRA 9 MAR 2024 Commission Expires on 16/01/2025 GOVT. OF INDIA

AFFIDAVIT CUM UNDERTAKING

I, Lok Pal Singh, Authorized Signatory of M/s DLF Ltd. having its Reg. Office at DLF Shopping Mall, 3rd Floor, Arjun Marg, DLF City, Phase-1, Gurugram, Haryana-122002, do hereby solemnly affirm, declare and undertake as under: -

- That as per the proposed expansion cum modification of Group Housing Buildings in Zone 10, DLF 5 at Sector-54 Gurugram, Haryana, we have not carried out the construction activity at the site beyond the built-up area that is 2,33,377.998 sqm mentioned in our EC letter dated: 17.08.2022 or in the additional land area of 9.401

RD 0021405413

NOTARY SHASHI KANT GALHOTRA 2024

Statutory Alert:

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3. In case of any discrepancy please inform the Competent Authority.

Warning

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"Any alteration to this certificate renders it invalid. Use of an altered certificate without all the security features could constitute a criminal offence."

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Certificate No. IN-CH48276894199692W

Acres. We shall commence construction work for expansion phase only after obtaining EC from Govt. & the receipt of NOCs/permission from the prescribed competent authorities of State and Central Govt.

- That Sultanpur National Park and Asola Bhatti Wildlife Sanctuary is at a distance of approx. 21 km in WNW direction and approx. 5 km in E direction respectively.
- That there is no litigation pending against the project.

Date:

Place:

For DLF LIMITED

DEPONENT

Authorised Signatory

NOTARY SHASHI KANT GALHOTRA GOVT. OF INDIA 19 MAR 2024

VERIFICATION:

The content of the above undertaking is true and correct to the best of my knowledge as per record & nothing has been concealed therein.

Date: 19 March '2024.

Place: Chandigarh.

ATTESTED AS IDENTIFIED / VERIFIED 19 MAR 2024 S.K. GALHOTRA NOTARY PANCHKULA

Deponent/Declarant/Executant/Signatory Testator was witnessed/identified/verified

19-03-2024

DEPONENT

For DLF LIMITED

Authorised Signatory

SCHEME OF COMMON STP IN DLF5
LOCATED AT DLF5, SECTOR-43, GURGAON, HARYANA.

1.0 INTRODUCTION

Sewage Treatment Plant (STP) of 15 MLD Capacity" is a Common STP located in Zone-6, DLF5, Sector-43, Gurgaon, Haryana, to treat the sewage of all buildings located in DLF5. The STP is under operation. It is operated & maintained by DLF Limited. The location of the STP is shown in Figure 1. The total capacity of Common STP is 15 MLD (9 MLD based on SBR technology & 6 MLD based on MBR technology).

2.0 TREATMENT TECHNOLOGY AND CAPACITY OF STP

2.1 Wastewater Treatment Technology

The total capacity of Common STP is 15 MLD (9 MLD based on SBR technology & 6 MLD based on MBR technology).

Technology	Capacity (MLD)
Sequential Batch Reactor (SBR)	9.0
Membrane Bio-reactor (MBR)	6.0
Total	15.0

2.2 Schematic Flow Diagram of STP

The raw sewage from various buildings reaches to the STP through sewer lines. At the STP the raw sewage first passes through coarse & fine screens before entering the lifting sump. From the sump one part of sewage is pumped into the equalization tank and SBR. After treatment in SBR the decanted water is subjected to tertiary treatment through MGF, ACF & chlorination/ ozonation, ultra-filtration etc. and stored in treated water tanks for recycle. The other part from the lifting sump enters into MBR system (pre-anoxic, aeration, post-anoxic & membrane tank). The treated sewage from MBR is subjected to chlorination before storing in treated water tanks for recycle. The schematic flow diagram of the overall treatment process is given below.

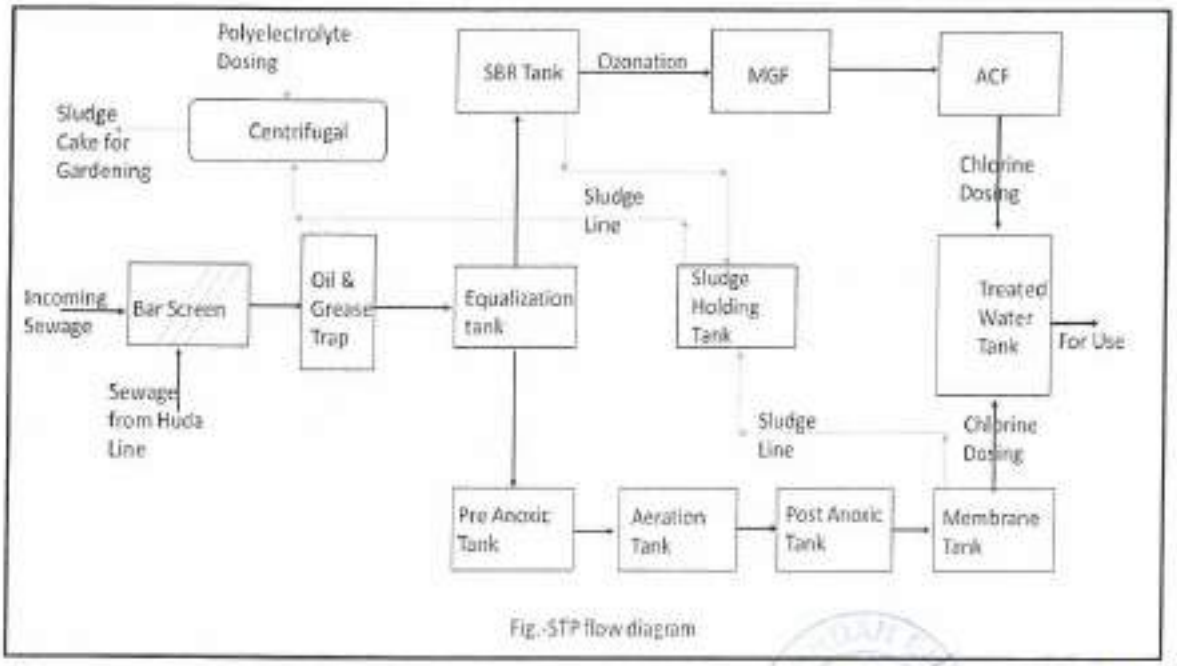


Fig.-STP flow diagram

3.0 DETAILS OF SBR PROCESS (9 MLD)

For DLF LIMITED

3.1 Design Parameters

Capacity	9.0 MLD
Process	Aerobic treatment in SBR reactor

3.2 Estimated Characteristics of Raw & Treated Sewage

Parameter	Raw Sewage (Influent)	Treated Sewage (After Secondary Treatment)	Treated Sewage (After Tertiary Treatment)
pH	6.5-8.5	6.5-8.5	6.5-8.5
BOD_3 at 27℃ (mg/l)	250-300	<15	<5
COD (mg/l)	600-800	<100	<30
TSS (mg/l)	300-400	<20	<10
Nitrogen (mg/l)	20-25	<10	<5
Phosphorus (mg/l)	up to 10	<5	<5
Oil & grease (mg/l)	Up to 100	<5	<2

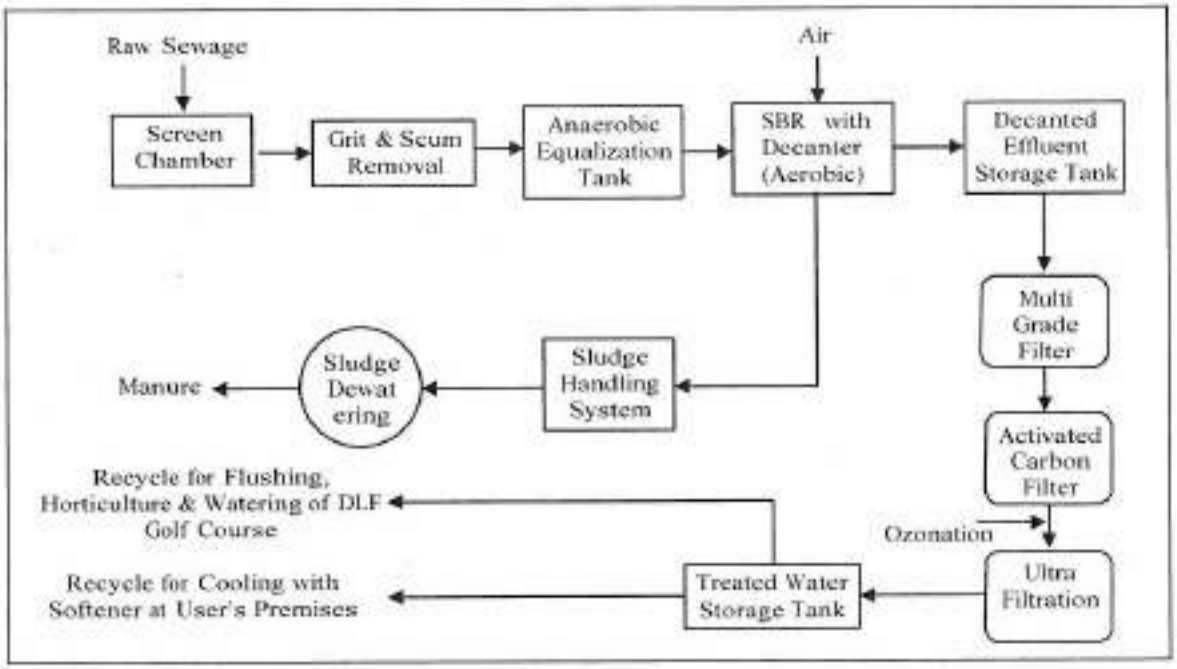
3.3 Treatment Units

The STP includes the following unit operations:

- Primary treatment : Bar Screen, Grit Removal, Scum Removal and Equalization Tank
- Secondary treatment: Batch Reactors (SBR) with Floating Decanters
- Tertiary treatment : Ozonation, Multigrade Filter, Activated Carbon Filter, Ultra Filtration
- Sludge conditioning : Sludge Thickener, Centrifuge

3.4 Process Flow Diagram

The schematic flow diagram of the STP is shown in the following Figure.



Schematic Flow Diagram of Sewage Treatment Plant (STP)

3.5 Process Description

The treatment process includes:

- Screening of influent through trash rack and fine screen
- Lifting of sewage and grit and scum removal
- Anaerobic equalization tank
- Aerobic biological treatment in 4 nos. of batch reactors (SBRs)
- Ozonation for odour control
- Filtration through multi-grade filter (MGF) and polishing in activated carbon filter (ACF)
- Sludge dewatering by centrifuge and sludge disposal

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Technology

Sequential Batch Reactor (SBR) is simple yet a controlled process with good degree of automation to perform the functions in batches. The SBR has four major steps, as discussed below, completed in about 4 hours per batch:

Fill	:	0.5 hours
React/Aerate	:	2.5 hours
Settle	:	0.5 hours
Decant	:	0.5 hours

Total time for a single batch is 4 hours.

Capacity = 450 kl per reactor x 4 reactors = 1.8 MLD per batch x 5 batches = 9 MLD

- Inlet line, trash rack, screen, lifting sump, grit removal, scum removal and equalization tank are designed for 14 MLD capacity.
- Batch process tanks are designed for 9 MLD in 5 batches.
- Equipments could be added later on for capacity expansion along with one additional batch reactor tanks.

In order to conserve water, the STP has been designed to ensure that the treated effluent quality is well within the permissible limits, even under the varying flow conditions which are typical for such systems. The main components of the process adopted for the STP include the following:

Primarytreatment:

- Sewage from various buildings in DLF City Phase-V flows into the intake chamber of the STP by gravity for treatment. The pipe line size selected is adequate to meet the requirement. In this chamber Bioculture, if required, can be added to control odor (as the whole plant is being installed in the basement).

- The raw sewage then passes through a motorized valve (to regulate the flow) to trash rack, where large size undesirable material is trapped. The motorized valve is interlinked with the level sensor of lifting sump for maintaining uniform/proper conditions.

- The trash rack retains material larger than 50 mm size, which is lifted to a trolley by an automatic mechanism with vertical hoist. After removal of large particles from trash rack, the sewage passes through fine mechanical screen to retain particles below 50 mm but larger than 2-3 mm. The mechanical screen is equipped with an arrangement to scrap the particles mechanically and transport the same for disposal in to the hoist bucket. Operation of screen and the operation of motorized valve of intake line are interlinked to maintain proper water level in the intake chamber and prevent flooding in the screening section. The screen operates in a way so as to ensure that it is free from surface clogging.

- After removal of trash and fine screening, sewage flows to lifting sump. The lifting sump is designed with the proper retention time to avoid settling. From the lifting sump, sewage is pumped to the receiving tank of the grit chamber. These pumps are special pumps having cutter attachment to prevent any choking problem/flow reduction.

- The grit chamber is designed to reduce the sewage velocity and give adequate retention time for the grit and silt to settle down. In order to avoid turbulence, the sewage overflows from receiving tank to the grit chamber, maintaining a linear flow and hence allowing the grit particles to settle down in the grit chamber. The grit chamber has a screw mechanism starting from the bottom for removal of grit periodically. The separated grit is lifted by a hoist and loaded in a trolley.

- From the grit separators, sewage overflows to scum trap which takes care of scum, oil and grease. The scum trap is designed with proper retention time. The separated scum and grease/oil is collected in a drum for disposal by a suitable method.

- The sewage relatively free from trash, grit, scum and oil and grease is collected in anaerobic equalization tank. Bioculture is added, if required, in the intake chamber (discussed above) which reduces/ controls the odor. The rate of Bioculture addition governs the extent of biodegradation and odor control. This anaerobic equalization is designed on 8 hours retention time basis. Submersible mixers have been provided in this tank to prevent settling of any suspended particles.Air dispersion grid have also been provided in equalization tank for mixing of sewage with air.

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Secondarytreatment:

- The sewage from the anaerobic equalization tank is lifted by dry pit pumps to the Sequential Batch Reactors (SBRs). These pumps have enough capacity to pump the entire batch of 450 kl in half an hour, as per the time cycle.

- The SBR system has four numbers of reactors, each designed with time cycle to handle over 5 batches per day. The time cycle is: filling 0.5 hours, settling 0.5 hours, reaction time 2.5 hours and decanting time 0.5 hours.

- Aeration in SBR tank is done by diffused aeration system with the help of air blower and diffusers. For better monitoring of process parameters, one DO sensor is mounted in each tank. After filling the SBR tank with sewage, blower starts and once bio degradation has taken place, blower is shut off for some time to allow settling of the sludge. After settling, the sludge decanting process is started. Decanter is well designed to decant one batch in 0.5 hours. Floating type decanter is designed to obtain the desired efficiency.

- Decanter is designed for half hour decanting time and to take care of sufficient lifting up of mix liquor, when aeration is going on.

- Aeration system and decanting system are automated for smooth operation. Level sensor is mounted in SBR tank to prevent overloading and under loading.

Tertiarytreatment:

- Decanted treated effluent is stored in intermediate storage tank for uniform feeding in filters. Six numbers of working filters is selected, each with a flow rate of 80 m^3/h for uniform operation during a day. Decanted treated effluent is first fed into multigrade filter (MGF) for removing any suspended particles, followed by activated carbon filter (ACF) for color and odor removal. Filtered water is recycled for horticulture in various group housings in DLF City Phase-V and irrigation of DLF Golf Course, and also for use of cooling tower makeup purpose in commercial buildings in DLF City Phase-V. Filtered water is passed through softener (located in the premises of end user) for reduction of hardness.

- Ozonation is done for disinfection of decanted water after SBR and additional reduction of BOD and COD. Ozonation is done online in filtered water.

- After passing through softener, water is ready for cooling tower makeup but some residual chlorine is maintained to prevent bio-fouling in cooling tower. For this purpose, some chlorine is dosed in soft water tank (located in the premises of end user).

Sludgehandling:

- Total sludge generated from plant is dewatered by Centrifuge. Liquid form centrifuge is recycled to the equalization tank and the solid sludge cakes are used as manure in horticulture. Sludge wasted from batch reactor can be directly fed into centrifuge or stored in sludge thickener.

3.6 Automation

- SBR process is a fully automatic process; to avoid manual mistakes, certain level sensors are used to sense the level and release some feed back to controller.
- Motorized sluice knife valve is used for inlet isolation in case of any miss happening in plant, or in case of overloading of lifting sump or equalization tank. Level sensors mounted in lifting sump and equalization tank give feedback to controller, and controller gives some command to the motorized valve for opening or closing of valve.
- Mechanical screen with auto operation is installed for smooth operation. Also, operation of screen is interlinked with motorized valve. If motorized valve is fully closed then operation of screen should stop.
- Trash lifting assembly is installed for automatic lifting of the trash collected in trash rack, to the hoist bucket.
- Vertical hoist with load cell arrangement is installed for lifting of grit, and particles collected in trash rack and screen.

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- Grit and scum removal from grit chamber and scum trap is automatic, having mechanical systems interlinked with operation of lifting sump pumps.
- Submersible mixers in anaerobic equalization tank is provided for homogeneity of sewage water in the tank. The operation of mixers is either continuous or periodic depending on the requirement. Operation of mixers is interlinked with timer (if operation is periodic) and level sensor of equalization tank.
- Biological treatment process is controlled by level and time process along with DO and sludge blanket motoring. Filling and decanting of batch is level controlled and operation of batch is time controlled. All the phases of batch process is in auto mode but sludge disposal is in manual mode.
- Filtration and ozonation is done in auto mode.

4.0 DETAILS OF MBR PROCESS (6 MLD)

4.1 Basis of Design

The installed ZeeWeed® Membrane Bio-reactor (MBR) System for DLF5 Project is offered based on MBR permeate requirement of 6 MLD.

4.2 Design Influent Flow Data to MBR System

Parameter	Unit	Design
Average influent daily flow at inlet	m3/d	6000
Average daily MBR permeate flow when one train down for 24 hr	m3/d	5250
Feed Temperature	Deg C	15-35
Design Bioreactor Temperature	Deg C	15-35
Approximate Sludge generated from MBR system	m3/day	136 @ 1% consistency

4.3 Design Influent & Effluent Quality

Parameter	Unit	Influent	Expected Treated Effluent
pH	NU	7.5	
Turbidity	NTU		< 0.3
Biological Oxygen Demand (BOD5)	mg/L	250	< 5
COD	mg/L		< 20
Total Suspended Solids (TSS)	mg/L	300	< 5
TKN	mg/L	35	TN < 5
Ammonical Nitrogen (NH4 as N)	mg/L	30	< 1
Nitrate	mg/L	< 1	
Total Phosphorous	mg/L	7	< 0.5
Oil and grease	mg/L	10	

4.4 Operation Basis

Hours per day of operation	24 hrs for MBR
Days per year of operation	330 days (Consider maintenance time and twice a year, once in six months the plant will be shut down for recovery cleans)
Redundancy	N-1 condition (one train down for maintenance, for <1 days period, the remaining train will produce 5.25 MLD MBR permeate.

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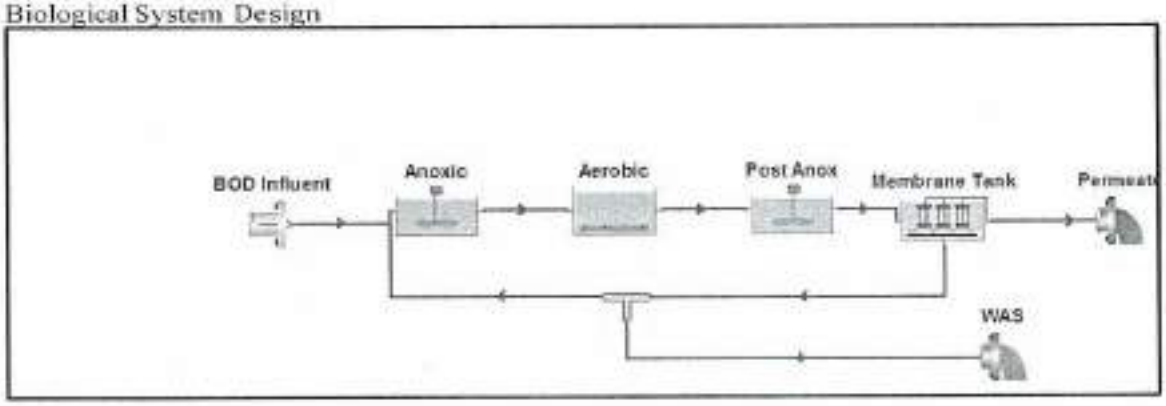
4.5 Biological System Design



4.6 GEWPT's Recommended Preliminary Biological Process Design Parameter

Parameter	LEAP	Unit
Flow basis of biological design	6000	m3/day
Number of MBR trains	2	Nos
Pre-anoxic tank working volume per train	400	m3
Aerobic working volume (excluding membranes) per train	830	m3
Post-anoxic tank working volume per train	155	m3
Membrane tank working volume per train	90	m3
Total bioreactor working volume including membrane tank (400+830+155+180) = 1565	1565	m3
Specific sludge yield	0.6	kg/kg BOD
Observed sludge yield	53.0%	kg VSS/kg BOD
Design HRT	6	hrs
Design SRT	9	days
F/M Ratio	0.18	kg BOD/kg MLSS/d
Design MLSS in aeration tank	8,400	mg/L
Minimum water depth in aeration tank	6.5	M
Recirculation rate from membrane tank to pre-anoxic zone	5.5Q	
Total oxygen requirement for design aerobic zone	2100	kg of O2/day
Total oxygen requirement for operating aerobic zone	2100	kg of O2/day
Total waste sludge from MBR	136	m3/day

4.7 Membrane System Design

Parameter	LEAP MBR
Net permeate flow rate	6 MLD
Number of membrane trains	2
Number of cassettes installed per train	3
Number of spare cassette spaces per train	0
Numbers of cassettes fully filled / max. no. of module spaces per cassette	2/48
Number of membrane modules installed per train	136 (2*48+1*40)
Total number of cassettes in plant	6 (2*3)
Total number of modules installed in plant	272 (136*2)
Surface area of each membrane module	34.37 m2
Design Net Flux @ Average Daily Flow (lmh)	26.7
N-1 Net Flux @ 5000 m3/d (lmh) for 24 hr	46.7
Spare space	5.5%
Membrane tank simensions per train (LxWxH) m	2.74 x 8.8 x 3.96
Operating membrane tank liquid depth	3.0 m
Membrane blower design capacity per train	1087 dm3/hr

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4.8 Process Description

The following gives an overview of various unit operations considered for the 6.0 MLD MBR system.

1) Coarse Screens
6 mm automatic motorized screens are recommended for removal of suspended particles greater than 6 mm.

2) Fine Screens
Drum screens with <2mm punched hole screens are recommended for removal of suspended particles greater than 2mm, which otherwise would enter membrane tank and cause damage to membranes.

3) Bio Reactor
A two train system with each train having a pre-anoxic followed by aerobic reactor followed by post-anoxic tank is considered. The pre and post anoxic zones shall be provided with submersible mixers to ensure complete mixing of MLSS. Fine bubble diffusers shall be provided in the aerobic tank to diffuse air for oxygen supply. MLSS up to 8400 mg/l shall be maintained in the bioreactor. The mixed liquor shall overflow from post anoxic chamber to membrane tank.

4) Membrane Tank
Six trains of membrane systems are considered. Each membrane tank shall have 3 Nos. of 48 module cassettes loaded with 136 number of ZW500 370 ft2 modules.

5) Permeate/Backpulse Equipment
One permeate pump per membrane train plus one common store standby for all membrane trains is employed to draw water through the membranes. Clean water (permeate) is suctioned through ZW500D membranes by variable-speed centrifugal permeate pumps. Same permeate pumps will be used for back pulse purpose.

6) Membrane Scour Aeration System
The membranes are air scoured with six duty membrane aeration and one common standby membrane aeration blowers. Three blowers shall be operated during operation.

7) Mixed Liquor Recirculation Equipment
Recirculation pumps are used to transfer mixed liquor from the Membrane Tank to Bioreactor at the rate of 5×ADF.There are two numbers of recirculation pumps for recirculation. The sludge recirculation transfers solids away from the membranes and provides proper distribution within the bioreactor. The same pumps are also used for sludge wasting.

8) Sodium Hypochlorite Dosing System
The Sodium Hypochlorite Dosing system is used during membrane cleaning applications to remove organic fouling from the membrane surface.

9) Citric Acid Dosing System
The Citric Acid Dosing system is used during membrane cleaning applications to remove inorganic scaling from the membrane surface.

10) Effluent Turbidity Analyzer
An effluent turbidity analyzer can monitor effluent water quality and alert operators if effluent turbidity rises beyond acceptable parameters. For optimal performance monitoring, one turbidity analyzer per train is recommended.

11) Sludge Wasting System
Sludge wasting is accomplished by periodically diverting mixed liquor from the recirculation return line, via manual control or by pulling directly from the bioreactor. The frequency of wasting is a function of influent characteristics, reactor design and operator preference.

12) Centrifuge System
A centrifuge system is recommended to concentrate the sludge and recycle the concentrate to bioreactor. The concentrated sludge will be sent for final disposal.

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13) Programable Logic Control (PLC)

The ZeeWeed® membrane filtration system will be controlled by a Programmable Logic Control (PLC). All valves and control devices will be interlocked through the PLC to allow smooth and continuous automatic operation. Valves will open, close and/or modulate, depending on signals from the PLC. These signals will be predetermined through PLC programming and allow the system to operate at optimal conditions. Variable speed pumps will also be controlled by the PLC and vary their vacuum/flow output based on level signals from the process tanks.

All operating parameters will be continuously monitored by the PLC. If an alarm or emergency condition occurs, the PLC program will instruct the various components to change operation conditions and/or shut down the system and alert the operator. The system control logic will be designed with the ability to shut down the system in the event of an alarm condition that could be detrimental to the equipment.

5.0 SIZE AND CAPACITY OF STP PROCESS UNITS

5.1 Size and Capacity of Various Process Units

SN	Process Unit	Number	Size	Capacity	Material
	A) Common Units:				
1.	Coarse Screen	2	1.7m x 2.5m		SS
2.	Fine Mechanical Screen	2			
3.	Lifting Sump	1			
3.	Sludge Thickener	1		90 KL	RCC
4.	Intermediate Clear Water Tank	2		554.4 KL	RCC
5.	Treated Water Tank (TWT)	4			
	B) Units for SBR Process:				
1.	Anaerobic Equalization Tank	1		5391.65 KL	RCC
2.	SBR Tank (Reactor)	4		1170.12 KL	RCC
3.	Multi Grade Filter (MGF)	8	2.6m dia x 2.2m ht	80.0 m^3/hr	MSEP
4.	Activated Carbon Filter (ACF)	8	2.6m dia x 2.2m ht	80.0 m^3/hr	MSEP
	B) Units for MBR Process:				
1.	Pre-anoxic Tank	1		400 KL	RCC
2.	Aeration Tank	1		940 KL	RCC
3.	Post-anoxic Tank	1		155 KL	RCC
4.	Membrane Tank	1	3.05m x 6.6m x 4.0m		RCC

5.2 Size and Capacity of Various Pumps & Blowers

SN	Process Unit	Number	Capacity (m^3/hr)	Head (m)	Motor Capacity	Material of Const
	A) Common:					
1.	Lifting Sump Pump	3 (2w+1s)	135 m^3/hr	15 m	22 kW	CI
2.	Raw Transfer Pump	3 (2w+1s)	690 m^3/hr			
3.	SBR Feed Pump	3 (2w+1s)	450 m^3/hr	8 m	20 hp	CI
4.	Air Blower	6 (5w+1s)	1000 Nm^3/hr		50 hp	CI
5.	Process Blower	2 (1w+1s)	2820 Nm^3/hr			
6.	Membrane Blower	3 (2w+1s)	570 Nm^3/hr			
7.	Sludge Feed Pump	4 (2w+2s)	50 m^3/hr	12 m	7.5 hp	CI
8.	Screw Pump	2 (1w+1s)	10 m^3/hr	25 m	3 hp	CI
9.	Filter Feed Pump	10 (8w+2s)	80 m^3/hr	30 m	15 hp	CI
10.	Ozonator Pump	10 (8w+2s)	80 m^3/hr	30 m	15 hp	CI
11.	Re-circulation Pump	2 (1w+1s)	15 m^3/hr	5 m	1 hp	CI
12.	Drain Pit-1 Pump	2 (1w+1s)	132 m^3/hr	16 m	9.5 kW	CI
13.	Drain Pit-2 Pump	2 (1w+1s)	132 m^3/hr	16 m	9.5 kW	CI
14.	Centrifugal Pump	2	10 m^3/hr		20 hp	CI

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SN	Process Unit	Number	Capacity (m^3/hr)	Head (m)	Motor Capacity	Material of Const
15.	Electro Magnetic flow meter	2	80 m^3/hr			
16.	Electric control panel	2				

5.3 Size and Capacity of Units Pertaining to MBR System

SN	Description	Qty	Capacity for LEAP Option	Operation Hours (Avg)
1.	Membrane Aeration Blowers	3 Nos (2W+1S)	Design: 1060 dm3/hr/blower @ 0.45 bar Operating: 894 dm3/hr/blower @ 0.35 bar	24
2.	Permeate/ Backpulse Pumps	3 Nos (2W+1SS)	Design: 152-305 m3/hr/pump @ 10 mwc Operating permeate flow: 152 m3/hr @ 6.0 m, Operating backpulsing flow: 256 m3/hr @ 7.5 m	Permeation: 21.5 hrs Backpulsing: 2.5 hrs
3.	RAS (Recycle from Membrane tank to Aerobic 5 Q submersible)	3 Nos (2W+1S)	687.5 m3/hr/pump @ 5 mwc	24
4.	Anoxic mixer in pre-anoxic tank	1	To suit pre-anoxic tank size-400 m3	24
5.	Anoxic mixer for post-anoxic tank	1	To suit post-anoxic tank size-155 m3	24
6.	Sodium Hypo Dosing pump	2(1W+1S)	168-1600 LPH @ 2 bar	During MC/RC
7.	Citric Acid Dosing pump	2 (1W+1S)	325-600 LPH @ 2 bar	During MC/RC
8.	EQ tank transfer Pumps-submersible	2 (1W+1S)	250 m3/hr @ 5mwc	24
9.	Back pulse tank	1 No	Eff. Capacity: 20 m3	
10	Process Blowers	2 (1W+1S)	2618 Nm3/hr @0.7 bar	24

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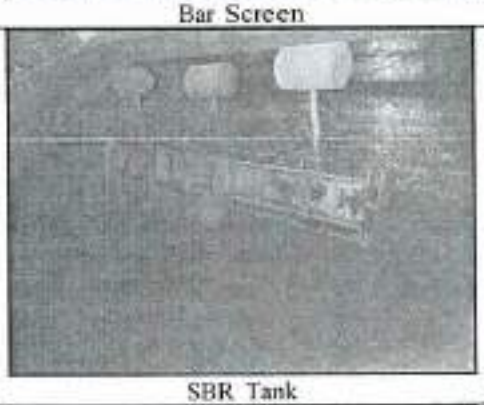
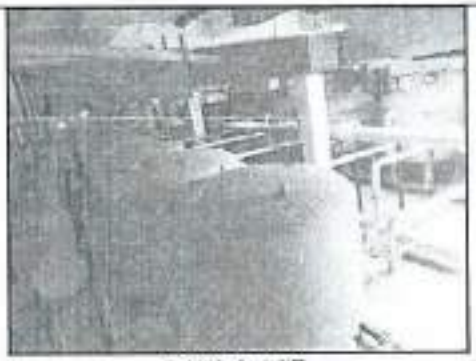
6.0 Photographs of Various Treatment Units

Bar Screen

Equalization Tank



SBR Tank



MGF & ACF

Centrifugal Sludge Thickener

Sludge Holding Tank

MBR Tank

7.0 STP DRAWINGS

Following STP drawings are enclosed.

- Hydraulic Flow Diagram (9 MLD SBR)
- Hydraulic Flow Diagram (6 MLD MBR)

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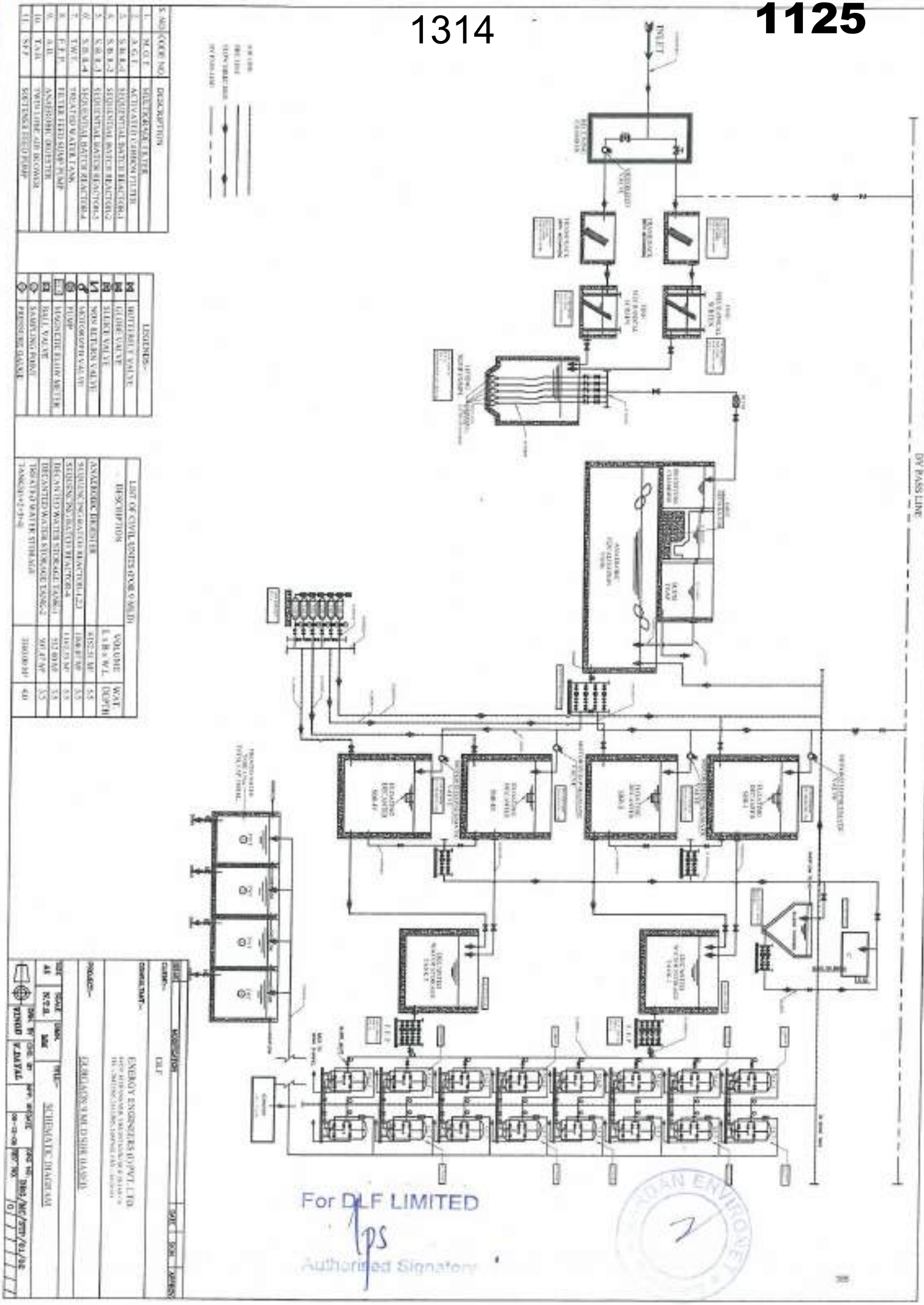
INLET
BY PASS LINE
For DLF LIMITED
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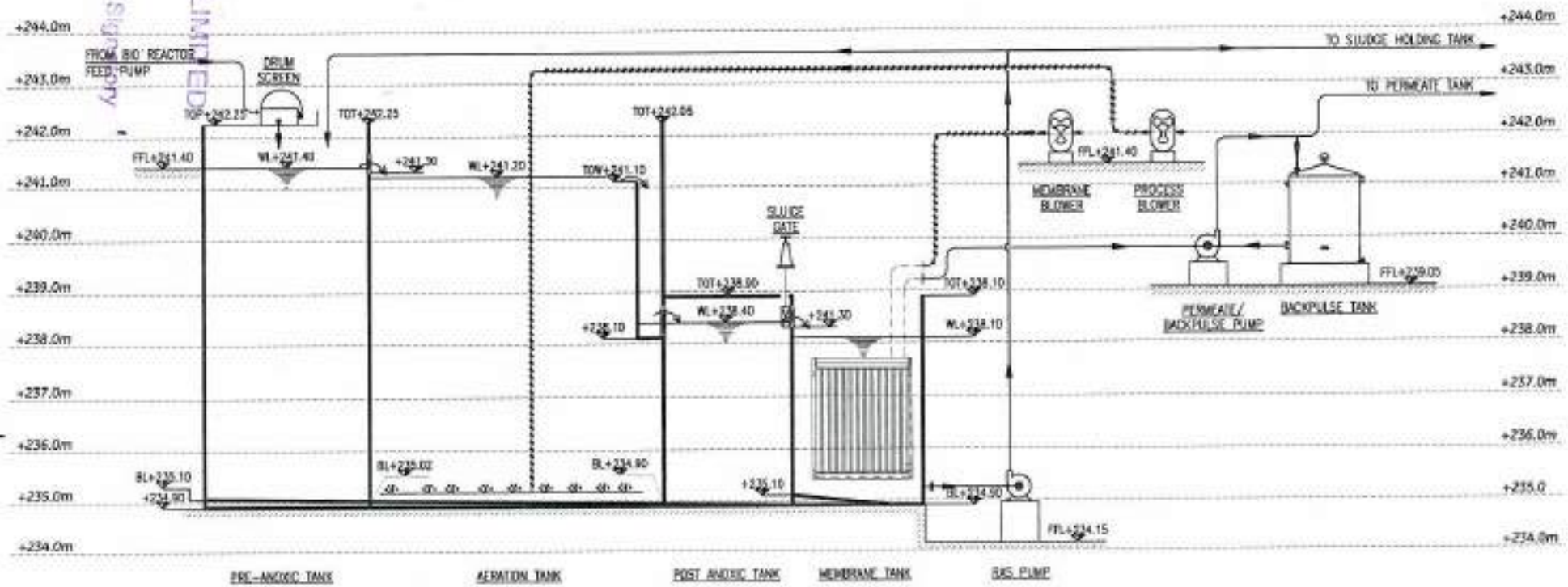

LEGEND
FFL : FINISHED FLOOR LEVEL
TOP : TOP OF PLATFORM
TOT : TOP OF TANK
TOW : TOP OF OVERFLOW WEIR
WL : WATER LEVEL
BL : BOTTOM LEVEL

REV	DESCRIPTION	DD	DRN	APVD	DATE	CHKD
A	RELEASED FOR REFERENCE		AK	MR	18NOV15	PA

GE Water & Process Technologies

DRAWN BY	AK 18NOV15
CHECKED BY	PA 18NOV15
APPROVED BY	MR 18NOV15
APPROVED BY	DATE

CLIENT/JOB: DLF LIMITED
6MLD STP MBR RETROFIT SYSTEM
FILE: AUTOCAD

TITLE: HYDRAULIC FLOW DIAGRAM
MATERIAL:

SIZE	DRAWING NO.	REV
A3	5383670-AH-01	A
PROJECT	5383670	
SCALE NTS	SHEET 1OF1	

13|15

1126

ARUP

DLF Home Developers Limited

DLF LUX5

Geotechnical Interpretive Report

Reference:

| 21 December 2023

For DLF LIMITED

Authorised Signatory

Job number 289539-00

Arup India Private Limited
Reg No U29141MH2005PTC224826

Arup India Private Limited
5th Floor, Jet Prism, Suren Road
Off Western Express Highway
Andheri (East)
Mumbai 400 093
India
arup.com

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Appendices

For Arup India Private LIMITED

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1. Introduction

Arup has been commissioned to provide a geotechnical design service as the consultant by DLF for its prestigious group housing project named "LUX5" in which multi storey towers are planned at sector-54, Gurugram, Haryana.

Arup identified the need for detailed ground investigation across the project site to support design development. On instruction from the Client, this additional ground investigation (GI) was specified by Arup and was carried out by M/s Cengers Geotechnica Pvt. Ltd. in 2023.

The geotechnical investigation work has been carried out in three phases as detailed below:

Phase 1 (completed)– 23 boreholes, 7 Cone penetration tests (CPTu), 8 trial pits, 28 pressure meter tests (PMT), 2 Cross hole sonic tests (CHST) and SPT energy measurements for each rig.

Phase 2 (completed)– 28 boreholes, 40 PMT and 2 CHST

Phase 3 (to be started) - `21 boreholes, 3 PMT, 2 CHST, 4 Trial pits and 3 Footing load tests.

Detailed test results, interpretation of the results and foundation recommendations based on phase 1 and II investigations are presented in the attached report by Cengers. It is to be noted that these recommendations are preliminary and final geotechnical recommendations in the form of geotechnical interpretive report (GIR) will be provided by Arup after the phase 3 investigation is completed and the iteration between structural and geotechnical consultants are finalised and approved by the peer reviewers.

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Appendix A

Geotechnical Interpretive Report

For DLF LIMITED

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Report by :

CENGRS GEOTECHNICA PVT. LTD.
SOIL AND FOUNDATION EXPERTS

Geotechnical Investigation for Proposed Group Housing Project, Crest-II, DLF Phase-5 at Sector-54, Gurugram, Haryana

VOLUME-3: GEOTECHNICAL INTERPRETATIVE REPORT

For DLF LIMITED

Authorised Signatory

Submitted to:

M/s. DLF Limited
Gateway Tower, 7th Floor, DLF Cyber City, DLF Phase-III, Gurgaon-122002

ProjectNo.223007D | Date: 25th August, 2023 | Revision:1

25th August, 2023

Project No. 223007D-Vol-3-R1

M/s. DLF Limited
Gateway Tower,
7th Floor, DLF Cyber City,
DLF Phase-III, Gurgaon-122002

Kind Attn: **Mr. Amber Jain**

Subject: **Geotechnical Investigation for Proposed Group Housing Project, Crest-II, DLF Phase-5 at Sector-54, Gurugram, Haryana**
Volume-3: Geotechnical Interpretative Report

We have carried out the captioned study in accordance with your LOI No. DLFL/CENGRS/LOI/GTI/CREST-II/2022-23 dated 16th February 2022. We thank you for your business, and hope that you are satisfied with our services rendered.

This Draft Final Report designated as Vol-3, presents our geotechnical recommendation findings based on the geotechnical investigation conducted by us for the proposed facilities and structure. This report presents our geotechnical engineering recommendations, which shall help you in deciding the optimum foundation arrangement for use on site.

We have prepared this report based on our findings on site, as well as our experience gained in over 6700 projects completed over the past 33 years. We are pleased to have been of service to you on this project and will be glad to consult further with you and your design team.

Yours faithfully,
CENGRS GEOTECHNICA PVT. LTD.
Reviewed and Approved by

Sanjay Gupta
Managing Director

For DLF LIMITED
Authorised signatory

Ravi Sundaram
Director

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For DLF LIMITED

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ILLUSTRATIONS

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DEFINITION OF ACRONYMS

CENGRS	Cengrs Geotechnica Pvt. Ltd.
UTM	Universal Transverse Mercator coordinates system
NABL	National Accreditation Board for Testing and Calibration Laboratories
ISO	International Standards Organization
BIS	Bureau of Indian Standards
EGL	Existing Ground Level
NGL	Natural Ground Level
SPT	Standard Penetration Test

BIS REFERENCES

- Compendium of Indian Standard on Soil Engineering ***(Part-2, Field Testing of Soils for Civil Engineering Purposes) SP36 (Part-2:1988) RA 2006***
- Compendium of Indian Standard on Soil Engineering ***(Part-1, Laboratory Testing of Soils for Civil Engineering Purposes) SP36 (Part-1:1987) RA 2006***

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1.0 INTRODUCTION

1.1 Project Description

M/s. DLF Limited is planning to construct a high-rise tower at Sector-54, Gurugram, Haryana. The structure at site will comprise of five towers (Towers A to E) having thirty-four (34)-storeys with stilt+ four (4) levels of basement. The proposed height of the each tower is about 124 m.

The towers will have a ground coverage of about 40 m x 50 m each and these towers will be constructed over 4 basements levels occupying an area about 250,000 m^2 of the site area. The total built-up area will be approximately 4 million m^2.

The following agencies are involved with the design and construction of the project:

Client	:	M/s. DLF Limited
Project Consultant	:	M/s. Arup
Geotechnical Investigation	:	**M/s. Cengrs Geotechnica Pvt. Ltd.**

M/s. DLF Ltd. has awarded the work of geotechnical investigation and ground penetrating radar Survey (GPR) to M/s. Cengrs Geotechnica Pvt. Ltd. (CENGRS).

The following structures are planned:

- Tower A
- Tower B
- Tower C
- Tower D
- Tower E
- Club Houses
- Basement Car Parking
- Emergency Vehicle Access

The geotechnical investigation work has been carried out in two phases as detailed below:

- **Phase 1**: 23 boreholes, 7 CPTu (Electronic Cone Penetration tests using piezocone), 8 Trial Pits, 28 PMT (Pressuremeter tests), 2 CHST (Cross Hole seismic tests) and SPT Energy measurement for each rig.
- **Phase 2**: 38 boreholes, 2 CHST (Cross Hole seismic tests), 38 PMT (Pressuremeter tests).

The field and laboratory data for Phases 1 and 2 have been submitted to DLF vide Volume 1 and Volume 2 reports respectively. This report volume (Volume 3) presents the ***Engineering analysis* and recommendations** for both phases,(51 boreholes, 7 CPTu, 8 Trial Pits, 66 PMT & 4 CHST) for the CREST-2 towers and associated facilities.

1.2 Purposes of Study

The overall purposes of this study are to investigate the stratigraphy at the site and to develop geotechnical parameters for foundation design of planned structure. To accomplish these purposes, the study in Phases 1 & 2 part of the work included the following:

1.2.1 Phase-1

The scope in Phase 1 includes the following:

(i) conducting GPR survey of site to identify the location of buried services (within 5 x 5 m area of each test point);

(ii) drilling two (2) boreholes (T-6 and T-15) to about 100-m depth in soil and rock or as per site instructions in order to evaluate the stratigraphy and to collect samples for laboratory testing;

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(iii) drilling six (6) boreholes (T-4, T-5, T-7, T-10, T-12& T-13) to about 50-m depth in soil and rock or as per site instructions in order to evaluate the stratigraphy and to collect samples for laboratory testing;

(iv) drilling fifteen (15) boreholes (P-1 to P-3 & P-5 to P-16) to about 30-m depth in soil and rock in order to evaluate the stratigraphy and to collect samples for laboratory testing;

(v) measuring Energy Transfer Ratio (ETR) on all SPT hammers brought to site using SPT energy analyzer;

(vi) performing deviation survey in 6 boreholes (source and receiver borehole of cross hole seismic test)to compute true horizontal distance between the source and receiver boreholes with depth;

(vii) conducting two (2) cross hole seismic tests (CHST) at T-6, T-15 borehole locations, including performing deviation survey, in order to determine the dynamic properties of the soil;

(viii) excavating 8 trial pits upto maximum 4m depth or above ground water table or above refusal strata or as per instruction by site engineer, whichever is earlier;

(ix) conducting 6 nos. CPTu's (Electronic Cone Penetration tests using piezocone) as per ASTM D-5778 using 20 T mechanically operated equipment upto maximum 30m depth or refusal, whichever is shallower;

(x) conducting 28 cyclic pressuremeter tests (2 cycles per test) tests at specified boreholes(near T-6, & T-10 borehole locations) and at specified depth intervals up to 48-60-m depth to evaluate the in-situ pressure vs deformation characteristics of the soil /rock;

(xi) testing selected soil samples in our laboratory to determine the pertinent index and engineering properties of the soils and rock recovered;

(xii) analyzing all field and laboratory data to develop geotechnical recommendations for foundations of various plant structures.

1.2.2 Phase-2

(i) conducting GPR survey of site to identify the location of buried services (within 5 x 5 m area of each test point);

(ii) drilling five (5) boreholes (T-8, T-11, T18, T-22 and T-25) to about 100-m depth in soil and rock or as per site instructions in order to evaluate the stratigraphy and to collect samples for laboratory testing;

(iii) drilling four (4) boreholes (T-1, T-14, T-21 & T-27) to about 75-m depth in soil and rock or as per site instructions in order to evaluate the stratigraphy and to collect samples for laboratory testing;

(iv) drilling ten (10) boreholes (T-2, T-3, T-9, T-11A, T-17, T-19, T-20, T-23, T-24 & T-26) to about 50-m depth in soil and rock or as per site instructions in order to evaluate the stratigraphy and to collect samples for laboratory testing;

(v) drilling ten (10) boreholes (BH-1 to 10 & BH-3A) to about 20-m depth in soil and rock or as per site instructions in order to evaluate the stratigraphy and to collect samples for laboratory testing;

(vi) measuring Energy Transfer Ratio (ETR) on all SPT hammers brought to site using SPT energy analyzer;

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(vii) performing deviation survey in 6 boreholes (source and receiver borehole of cross hole seismic test)to compute true horizontal distance between the source and receiver boreholes with depth;

(viii) conducting two (2) cross hole seismic tests (CHST) at T-18, T-25 borehole locations, including performing deviation survey, in order to determine the dynamic properties of the soil;

(ix) conducting 1 nos. CPTu's (Electronic Cone Penetration tests using piezocone) as per ASTM D-5778 using 20 T mechanically operated equipment upto maximum 30m depth or refusal, whichever is shallower;

(x) conducting 38 cyclic pressuremeter tests (2 cycles per test) tests at specified boreholes (near T-11, & T-22 borehole locations) and at specified depth intervals up to 90 m depth to evaluate the in-situ pressure vs deformation characteristics of the soil /rock;

(xi) testing selected soil samples in our laboratory to determine the pertinent index and engineering properties of the soils and rock recovered; and

(xii) analyzing all field and laboratory data to develop geotechnical recommendations for foundations of various plant structures.

1.3 Report Format

The scope of work at the site has been divided into two Phases and the submission of report has been distributed in two five parts as follows. The content of each of this phase is presented below:

S. No.	Volume No.	Scope of Work included	Report comprises
1	**Phase-1**	**BH-** T4 to T7, T10, T12,T13 & T15; **BH-** P1 to P3, P5 to P16; **CPTu-** P1 to P6 **CHST-** T6 & T15; **PMT-** T6 & T10 and **TP-** TP1 to TP8	**Volume-1:**Data Report of Phase 1 **Volume 2:**Data Report of Phase 2 Compilation of the field and laboratory test results. **Volume3:**Geotechnical Interpretative Report: Engineering analysis using data collected in both phases: It includes: ➢ Liquefaction Assessment of the soil; ➢ Geotechnical Design Profile; ➢ Foundation analysis and recommendations; Foundation Construction Considerations **Volume 4:** GPR Survey for Phase 1 **Volume 5:** GPR Survey for Phase 2
2	**Phase-2**	**BH-** T1 to T3, T8, T9, T11, T14, T17 to T27; **BH-**1 to 8; **CPTu-** T2 **CHST-** T18 & T25 and **PMT-**T11 & T22	

1.4 Contents of Volume 3

The initial sections of this engineering analysis report represent brief description of the project. The section on "**General Site Conditions**" includes the site history, regional geology/ soil classification along with geological map of the area.This is followed by site stratigraphy and groundwater conditions of the site.

All field results are summarized in the next section. This includes SPT energy measurement, cyclic pressuremeter tests and cross hole seismic test.

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The section on '**Foundation Analysis and Recommendations**' is then representing the general section on foundation followed by liquefaction susceptibility assessment. Below this an average design profile is illustrated based on the available data of SPT, CPTU and pressure meter test.

The illustrations section of the report includes the following:

- A layout plan showing the test locations and a Google satellite image with test locations uploaded on it
- Pictorial summary of borehole profiles.
- SPT Energy measurement results.
- Graphical plots of field and corrected SPT values.
- Pressuremeter plots.
- CPTu results
- CHST Test Plots
- Design Profile

1.5 Scope of Geotechnical Investigation covered in Phase-1& 2

Details of boreholes drilled on site and presented in this report are as follows:

- **Exploratory Boreholes (BH)**

S. No.	Scope covered In	Structure	Borehole Designation	UTM Coordinates, m [Zone-43 R]		Borehole RL, m	Final Termination Depth, m
				Easting	Northing		
1	Phase-1	Tower-E	BH-P1	706852	3148446	259.088	30.0
2		Club House	BH-P2	707074	3148526	265.693	30.0
3			BH-P3	707075	3148369	258.420	30.0
4			BH-P5	706961	3148476	260.180	30.0
5			BH-P6	706952	3148510	260.622	30.0
6		Tower-D	BH-P7	706940	3148419	260.081	30.0
7		Club House	BH-P8	706982	3148370	259.894	30.0
8			BH-P9	706944	3148323	259.598	30.0
9			BH-P10	706993	3148312	259.466	30.0
10			BH-P11	706955	3148363	259.774	30.0
11			BH-P12	707040	3148325	259.698	30.0
12			BH-P13	706985	3148436	261.177	30.0
13			BH-P14	707068	3148474	261.742	30.0
14			BH-P15	706902	3148478	259.940	30.0
15			BH-P16	706891	3148413	254.712	30.0
16			BH-T4	707019	3148554	266.060	46.5
17			BH-T5	706980	3148546	265.088	50.0
18		Tower-A	BH-T6	707015	3148528	264.190	90.0
19			BH-T7	707036	3148507	265.368	50.0
20		Tower-B	BH-T10	707007	3148464	261.558	50.0
21		Club House	BH-T12	707074	3148425	261.270	50.0
22		Tower-C	BH-T13	707016	3148417	261.142	50.0
23		Club House	BH-T15	707015	3148364	260.439	103.0

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S. No.	Scope covered In	Structure	Borehole Designation	UTM Coordinates, m [Zone-43 R]		Borehole RL, m	Final Termination Depth, m
				Easting	Northing		
24	Phase-2	Boundary wall	BH-1	707026	3148569	266.277	20.0
25			BH-2	707071	3148552	265.277	20.0
26			BH-3	707083	3148453	254.056	11.0
27			BH-3A	707085	3148435	254.056	20.0
28			BH-4	707074	3148349	258.052	20.0
29			BH-5	707034	3148287	258.870	20.0
30			BH-6	706913	3148341	254.734	20.0
31			BH-7	706916	3148367	254.145	20.0
32			BH-8	706855	3148422	254.601	20.0
33			BH-9	706854	3148498	259.328	20.0
34			BH-10	706922	3148502	259.587	20.0
35	Phase-2	Tower-A	BH-T1	707047	3148531	263.761	75.0
36			BH-T2	707035	3148521	264.474	50.0
37			BH-T3	707063	3148515	262.389	50.0
38			BH-T8	707045	3148509	264.439	100.0
39			BH-T9	707028	3148492	264.115	50.0
40		Tower-B	BH-T11A	707042s	3148475	261.945	52.0
41			BH-T14	707026	3148454	261.496	75.0
42			BH-T17	707020	3148439	261.314	50.0
43		Tower-C	BH-T18	706997	3148412	259.616	100.0
44			BH-T19	706975	3148412	256.209	50.0
45			BH-T20	706970	3148421	256.021	50.0
46		Tower-D	BH-T21	706943	3148394	259.860	75.0
47			BH-T22A	706928	3148420	260.195	100.0
48		Tower-E	BH-T23	706905	3148448	259.735	50.0
49			BH-T24	706900	3148429	259.491	50.0
50			BH-T25	706881	3148439	259.540	100.0
51			BH-T26	706863	3148444	259.498	50.0
52			BH-T27	706859	3148474	259.195	75.0

* Drilling of boreholes is currently in progress.

- **Electric cone penetration test (CPTu)**

Scope covered In	Structure	CPTU Designation	UTM Coordinates, m [Zone-43 R]		Final Termination Depth, m
			Easting	Easting	
Phase-1	Tower-E	CPTu-P1	706885	3148413	18.84*
Phase-1	Open Area in North-East	CPTu-P2	707066	3148475	8.00*
Phase-1	Open Area in North-West	CPTu-P3	706899	3148486	22.81*
Phase-1	Tower-C	CPTu-P4	706982	3148442	20.11*
Phase-1	Club House	CPTu-P5	706954	3148370	18.30*
Phase-1	Open Area in South-East	CPTu-P6	707040	3148328	18.34*
Phase-2	Tower-A	CPTu-T2	707037	3148512	19.85*

* Test terminated due to refusal being encountered.

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- **Trial Pits (TP)**

Scope covered In	Structure	Trial pit designation	UTM Coordinates, m [Zone-43 R]		Final Termination Depth, m
			Easting	Northing	
Phase-1	Tower-E	TP-1	706860	3148458	4.00
Phase-1	Tower-A	TP-2	707041	3148547	4.00
Phase-1	Open Area in North-East	TP-3	706988	3148540	4.00
Phase-1	Tower-A	TP-4	707060	3148544	4.00
Phase-1	Club House	TP-5	707005	3148483	4.00
Phase-1		TP-6	707051	3148421	4.00
Phase-1	Tower-C	TP-7	707004	3148419	4.00
Phase-1	Open Area in South-West	TP-8	706997	3148345	4.00

- **Pressuremeter-Test**

Scope covered In	Structure	Test designation	UTM Coordinates, m [Zone-43 R]		Test depth, m
			Easting	Northing	
Phase-1	(Tower-A)	BH-T6	707015	3148528	3, 6, 9, 12, 15,18, 21, 24, 27, 30, 36, 42, 48
Phase-1	(Tower-B)	BH-T10	707007	3148464	3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 36, 42, 48, 54, 60
Phase-2	(Tower-B)	BH-T11	707042	3148475	3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 36, 42, 48, 54, 60, 66, 72, 78, 84, 90
	(Tower-D)	BH-T22	706928	3148420	5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90

- **Cross hole-Seismic Test**

Scope covered In	Structure	Test designation	UTM Coordinates, m [Zone-43 R]		RL, m	Final Termination Depth, m
			Easting	Northing		
Phase-1	Tower-A	BH-T6	707015	3148528	264.190	100.0
Phase-1	Club House	BH-T15	707015	3148364	260.439	100.0
Phase-2	Tower-C	BH-T18	706992	3148426	259.616	100.0
Phase-2	Tower-E	BH-T25	706882	3148440	259.540	100.0

- A layout plan indicating the site is presented on Plate 1.
- The test locations coordinated were provided by the client and recorded by us using a hand-held Global Positioning System (GPS). A satellite image indicating the borehole locations (as recorded by survey coordinates) is presented on Plate 2.

2.0 GENERAL SITE CONDITIONS

2.1 Site Description

The site is situated on the at Sector-54, Gurugram, Haryana and lies at 28°26'51.04"N latitude and77° 6'47.20"E longitude. The site is situated adjacent to the Countryside Avenue Road and is 100 m east of DLF Summit Plaza. DLF Crest Tower-A is located about 200 m south from the site. The site is easily accessible from Gurgaon-Faridabad Road which is located 800 m towards the west.

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The site is an open land and has level variation of about 10 m from north to south. Ground level in the southern part of the site ranges from RL 259.7 to 259.7 m. In the central portion of the site, the level varies from RL 260.1 to 261.8 m. However, in the northern portion of the site, the ground level ranges from RL 264.19 to 266.066 m. In the western part, the ground level ranges from RL 254.7 to 259.1 m.

During construction of utility pit at the site it was observed that upper soil is backfill/construction debris dump of near building located along the side. Below this backfill material a RCC pavement is met which has thickness varying about 0.10 to 0.14 m.

2.2 Site History

An Aerial imagery from the past 18 years (2004-2022) is readily available through Google Earth Images. A few important changes which were observed are highlighted in the following table:

Year	Satellite Image	Site Condition	In the vicinity of site
2004		The site is open land having no building constructed over it. No construction observed in the 800 m periphery of the site. The site is covered with small trees.	The area of DLF Golf Course is not fully developed; however, two or three small buildings are clearly seen.

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2008		The site is similar as the previous observation; no construction has been done on the site yet.	A shed like structure can be seen in the north direction of the site having roof on top
2012		The vegetation on the site seems to be lesser than the previous observation, however no construction appears to have taken place.	K-block Park tower has been constructed at the south end portion of the site
2014		Some structure has been constructed at the site having temporary roof shed.	A new closed boundary is seen on the west portion of the site having temporary shed over them
2016		The site seems same as previous observation done. The vegetation is lesser than the past years.	The warehouse located in the north direction of the site has been removed While the construction of the Crest Tower-A is seems to have started.
2018		Number of warehouses as observed earlier seems to be reduced to some extent.	The construction of the Crest-Tower A seems completed. The vegetation along the site is observed to be more than that in the past year

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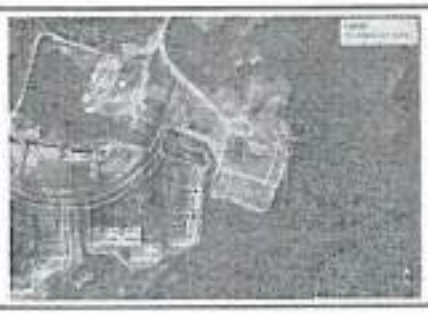
2022		The structure constructed over the site is completed removed and the site is observed as barren land.	Some buildings are constructed adjacent to DLF crest A tower may be as a part of the extensions of the tower.

2.3 Regional Geology

The deposits in the project area belong to the "Indo Gangetic Alluvium" and are river deposits of the Yamuna, and its tributaries. The alluvial tract[1] is in the nature of a synclinal basin formed concomitantly with the elevation of the Himalayas to its north. It was formed during the later stages of the Himalayan Orogeny by the buckling down of the northern border of the peninsular shield beneath the sediments thrust over it from the north.

The Pleistocene and Recent Deposits of the Indo-Gangetic basin are composed of gravels, sands, silts and clays with remains of animal and plants. A generalized description of geological formations encountered in Gurgaon and Delhi is as follows:

Period	Formation	Description
Recent	Newer Alluvium (Younger alluvium)	Unconsolidated, inter-bedded lenses of sand, silt gravel and clay confined to flood plains of Yamuna River.
Quaternary	Older Alluvium	Unconsolidated inter-bedded, inter-fingering deposit sand, clay and kankar, moderately sorted, thickness variable, at places more than 300 m.
Pre-Cambrian	Pegmatite and Quartz Veins Quartzites and minor Schist Bands	Well stratified, thick-bedded brown to buff colour, hard and compact, intruded locally by pegmatite and quartz veins inter-bedded with mica schists.

The older alluvium is rather dark colored (locally called "Bhanger") and is generally, rich in concretions or nodules of impure calcium carbonate (kankars). The kankars are of all shapes and sizes, varying from small sand sized grains to big grains and big lumps. The age of the "Bhanger" alluvium is Middle to Upper Pleistocene.

The newer alluvium (locally called "Khadar") is light colored and poor in concretions. It contains lenticular beds of sand and gravel as well as peat beds. It is merged by insensible gradations into the Recent or deltaic alluvia and its age is Upper Pleistocene to Recent.

Gurgaon is mainly dominated by the Post-Siwalik Quaternary alluvium and aeolian sediments with occasional occurrences of lacustrine lenses, which unconformably overlie the Proterozoic and Tertiary rocks in the southern districts. The geological formations belonging to the period between Proterozoic (Precambrian) (represented by the Delhi Super Group) and Tertiary (represented by the Siwalik Super Group). The generalized geology of Haryana showing Gurgaon and surrounding areas is presented in the geological map below[2]:

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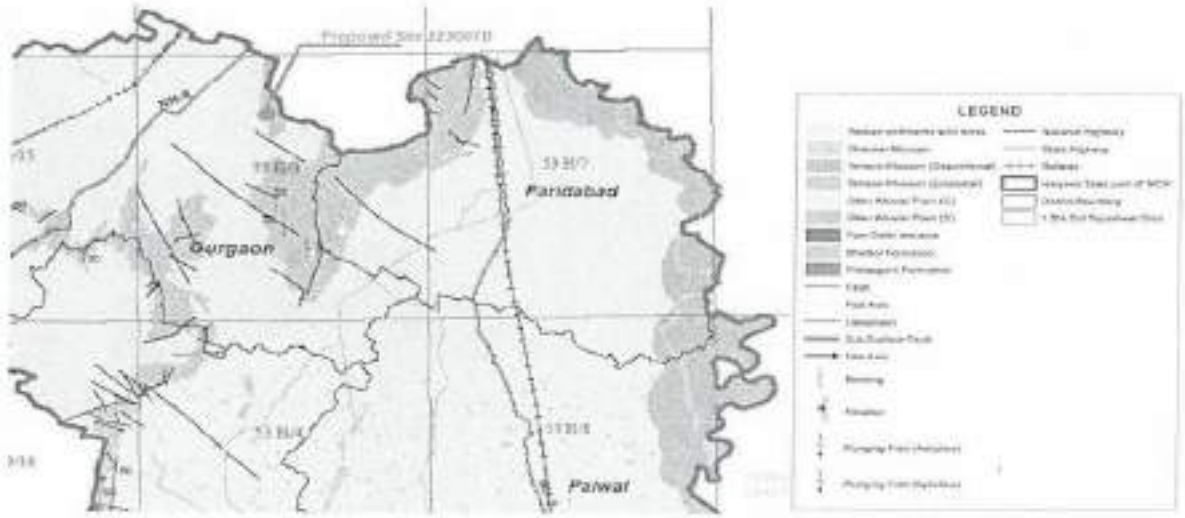
(1) Krishnan, M.S. (1986), ***"Geology of India & Burma"***, CBS Publishers, New Delhi
(2) "Report on Aquifer Mapping and Management plan "Central Ground Water Board"Ministry of Water Resources, River Development and Ganga Rejuvenation Government of India



Generalized Stratigraphy of Haryana State (after GSI, 2012)

Age	SuperGroup	Group/Formation	Lithology
Quaternary		Older and Newer Alluvium and Aeolian Deposits	Grey and brown sand, silt, silt-clay, clay with calcrete, limestone and gypsum.
Tertiary	Siwalik Super Group	Upper Siwalik	Boulder conglomerate, Sandstones, clay/ mudstone and pebble beds.
		Middle Siwalik	Sandstone with variegated Clay/mudstone.
		Lower Siwalik	Sandstone, mudstone/ shale
		Subathu	Fine-grained sandstone, clay and Limestone.
Pre-Tertiary		Tunda pathar 'Series' (Lower Paleozoic)	Stromalitic, limestone, Tosham Rhyolite, granite (Erinpura), migmatite, ultramafic and pegmatite.
	Unconformity		
Proterozoic	Delhi Super Group	Ajabgarh Group (Divided into 5 Formations)	Quartzite and basic flows, mica-Schist, carbonaceous Phyllites and slates, Calc-schist, dolomite, marble, calc-silicate, amphibolites, hornblende-schist, Phyllites.
		Alwar Group	Quartzite, conglomerate, Amphibolites, mica-schist and arkosic quartzite.

A geological map downloaded from Geological Survey of India's website Bhukosh[3] is presented below:

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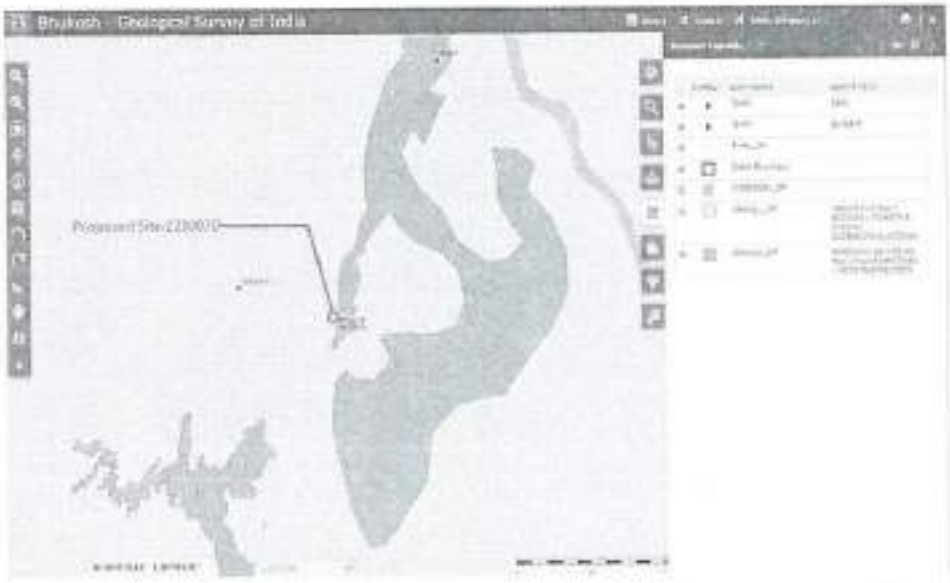
(3) Geological Survey of India https://bhukosh.gsi.gov.in/Bhukosh/Public



Yamuna River is at a distance of 24 km from the project site. The project site located at the edge of the Delhi Ridge in which rocks of the Delhi Supergroup are exposed. Rock is encountered in part of the site below 11-30 m depth.

The Gurgaon district is occupied by Quaternary alluvium and Pre-Cambrian meta-sediments of Delhi Super Group. The alluvium comprises of thick beds of fine to coarse-grained sand with alternating layers of thin clays.

2.4 Site Stratigraphy

The site belongs to the old Precambrian era and the rock present at the site is classified as Ajabgarh rock/Delhi super group rock. The overburden soils consist primarily of sandy silt of low plasticity underlain by quartzite. The depth to rock varies substantially across the site.

The borehole wise stratigraphy encountered at the site is presented in the following table:

Borehole No.	Depth, m		Reduced Level, m		Soil Classification	Field SPT 'N' Values	Core Recovery, (%)	RQD, (%)	RMR
	From	To	From	To					
BH-P1 (Tower-E)	0.0	1.2	259.088	257.888	Inspection Pit for utility check	-	-	-	-
	1.2	6.0	257.888	253.088	Stiff sandy silt	12-14	-	-	-
	6.0	16.5	253.088	242.588	Very stiff sandy silt	21-28	-	-	-
	16.5	29.0	242.588	230.088	Hard sandy silt	32-Refusal	-	-	-
	29.0	30.0	230.088	229.088	Very dense silty fine sand	Refusal	-	-	-
BH-P2 (Open Area in North-East)	0.0	1.2	265.693	264.493	Inspection Pit for utility check	-	-	-	-
	1.2	2.7	264.493	262.993	Very stiff sandy silt	28	-	-	-
	2.7	4.2	262.993	261.493	Hard sandy silt	34	-	-	-
	4.2	4.8	261.493	260.893	Very stiff sandy silt	22	-	-	-
	4.8	7.8	260.893	257.893	Medium dense silty fine sand	21-27	-	-	-
	7.8	12.2	257.893	253.493	Very stiff sandy silt	24-28	-	-	-
	12.2	17.3	253.493	248.393	Hard sandy silt	36-59	-	-	-
	17.3	23.3	248.393	242.393	Very dense silty fine sand	56-Refusal	-	-	-
	23.3	25.0	242.393	240.693	Hard sandy silt	Refusal	-	-	-
	25.0	26.5	240.693	239.193	Quartzite (Rock)	Refusal	98	91	55
	26.5	34.0	239.193	234.693			78-100	27-55	35-40

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Borehole No.	Depth, m		Reduced Level, m		Soil Classification	Field SPT 'N' Values	Core Recovery, (%)	RQD, (%)	RMR
	From	To	From	To					
BH-P3 (Open Area in South-East)	0.0	1.2	258.420	257.220	Inspection Pit for utility check	-	-	-	-
	1.2	6.0	257.220	252.420	Very stiff sandy silt	19-20	-	-	-
	6.0	10.5	252.420	247.920	Hard sandy silt	39-44	-	-	-
	10.5	12.0	247.920	246.420	Dense silty fine sand	47	-	-	-
	12.0	24.0	246.420	234.420	Very dense silty fine sand	51-99	-	-	-
	24.0	30.0	234.420	228.420	Hard sandy silt	42-76	-	-	-
BH-P5 (Club House)	0.0	1.2	260.180	258.980	Inspection Pit for utility check	-	-	-	-
	1.2	2.7	258.980	257.480	Very stiff sandy silt	16	-	-	-
	2.7	5.7	257.480	254.480	Stiff sandy silt	14-15	-	-	-
	5.7	9.2	254.480	250.980	Very stiff sandy silt	21-23	-	-	-
	9.2	10.7	250.980	249.480	Stiff sandy silt	13	-	-	-
	10.7	13.7	249.480	246.480	Very stiff sandy silt	17-29	-	-	-
	13.7	14.3	246.480	245.880	Hard sandy silt	41	-	-	-
	14.3	18.2	245.880	241.980	Dense silty fine sand	33-47	-	-	-
	18.2	26.3	241.980	233.880	Hard sandy silt	37-55	-	-	-
	26.3	30.0	233.880	230.180	Very dense silty fine sand	82-100	-	-	-
BH-P6 (Open Area in North-West)	0.0	1.2	260.622	259.422	Inspection Pit for utility check	-	-	-	-
	1.2	4.2	259.422	256.422	Stiff sandy silt	11-12	-	-	-
	4.2	9.2	256.422	251.422	Very stiff sandy silt	16-24	-	-	-
	9.2	10.7	251.422	249.922	Hard sandy silt	32	-	-	-
	10.7	12.2	249.922	248.422	Very stiff sandy silt	20	-	-	-
	12.2	18.2	248.422	242.422	Hard sandy silt	32-35	-	-	-
	18.2	19.7	242.422	240.922	Very stiff sandy silt	25	-	-	-
	19.7	21.2	240.922	239.422	Hard sandy silt	36	-	-	-
	21.2	22.7	239.422	237.922	Very stiff sandy silt	27	-	-	-
	22.7	26.3	237.922	234.322	Hard sandy silt	34-65	-	-	-
	26.3	30.0	234.322	230.622	Very dense silty fine sand	69-Refusal	-	-	-
BH-P7 (Tower-D)	0.0	1.2	260.081	258.881	Inspection Pit for utility check	-	-	-	-
	1.2	4.5	258.881	255.581	Stiff sandy silt	15	-	-	-
	4.5	6.0	255.581	254.081	Very stiff sandy silt	16	-	-	-
	6.0	7.5	254.081	252.581	Stiff sandy silt	14	-	-	-
	7.5	10.5	252.581	249.581	Very stiff sandy silt	21-26	-	-	-
	10.5	13.5	249.581	246.581	Hard sandy silt	34-38	-	-	-
	13.5	18.0	246.581	242.081	Dense silty fine sand	40-42	-	-	-
	18.0	19.5	242.081	240.581	Very dense silty fine sand	65	-	-	-
	19.5	21.0	240.581	239.081	Dense silty fine sand	48	-	-	-
	21.0	22.5	239.081	237.581	Very dense silty fine sand	51	-	-	-
	22.5	23.0	237.581	237.081	Dense silty fine sand	46	-	-	-
	23.0	30.0	237.081	230.081	Hard brown sandy silt	52-104	-	-	-
BH-P8 (Club House)	0.0	1.2	259.894	258.694	Inspection Pit for utility check	-	-	-	-
	1.2	4.5	258.694	255.394	Stiff sandy silt	11	-	-	-
	4.5	6.0	255.394	253.894	Very stiff sandy silt	18	-	-	-
	6.0	9.0	253.894	250.894	Hard sandy silt	31-34	-	-	-
	9.0	10.5	250.894	249.394	Very stiff sandy silt	28	-	-	-
	10.5	18.0	249.394	241.894	Hard sandy silt	31-44	-	-	-
	18.0	21.0	241.894	238.894	Dense brown silty fine sand	41-46	-	-	-
	21.0	30.0	238.894	229.894	Hard sandy silt	33-103	-	-	-
BH-P9 (Open Area in South-West)	0.0	1.2	259.598	258.398	Inspection Pit for utility check	-	-	-	-
	1.2	4.5	258.398	255.098	Stiff sandy silt	8	-	-	-
	4.5	5.0	255.098	254.598	Very stiff sandy silt	16	-	-	-
	5.0	6.0	254.598	253.598	Medium dense silty fine sand	-	-	-	-
	6.0	13.5	253.598	246.098	Very stiff sandy silt	19-25	-	-	-
	13.5	19.5	246.098	240.098	Hard sandy silt	33-51	-	-	-
	19.5	22.5	240.098	237.098	Dense silty fine sand	43-49	-	-	-
	22.5	30.0	237.098	229.598	Hard sandy silt	44-92	-	-	-

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Borehole No.	Depth, m		Reduced Level, m		Soil Classification	Field SPT 'N' Values	Core Recovery, (%)	RQD, (%)	RMR
	From	To	From	To					
BH-P10 (Open Area in South-West)	0.0	1.2	259.466	258.266	Inspection Pit for utility check	-	-	-	-
	1.2	2.7	258.266	256.766	Medium dense silty fine sand	14	-	-	-
	2.7	5.0	256.766	254.466	Very stiff sandy silt	30	-	-	-
	5.0	6.0	254.466	253.466	Medium dense silty fine sand	-	-	-	-
	6.0	9.0	253.466	250.466	Very stiff sandy silt	23-30	-	-	-
	9.0	27.0	250.466	232.466	Hard sandy silt	31-81	-	-	-
	27.0	30.0	232.466	229.466	Very dense silty fine sand	88-110	-	-	-
BH-P11 (Club House)	0.0	1.2	259.774	258.574	Inspection Pit for utility check	-	-	-	-
	1.2	4.5	258.574	255.274	Stiff sandy silt	10	-	-	-
	4.5	7.5	255.274	252.274	Very stiff sandy silt	17-23	-	-	-
	7.5	9.0	252.274	250.774	Hard sandy silt	34	-	-	-
	9.0	10.5	250.774	249.274	Very stiff sandy silt	30	-	-	-
	10.5	13.5	249.274	246.274	Hard sandy silt	31-34	-	-	-
	13.5	16.5	246.274	243.274	Very stiff sandy silt	19-25	-	-	-
	16.5	18.0	243.274	241.774	Hard sandy silt	72	-	-	-
	18.0	19.5	241.774	240.274	Very dense silty fine sand	58	-	-	-
	19.5	22.5	240.274	237.274	Dense silty fine sand	47	-	-	-
	22.5	30.0	237.274	229.774	Hard sandy silt	40-100	-	-	-
BH-P12 (Open Area in South-East)	0.0	1.2	259.698	258.498	Inspection Pit for utility check	-	-	-	-
	1.2	4.5	258.498	255.198	Stiff sandy silt	11	-	-	-
	4.5	9.0	255.198	250.698	Very stiff sandy silt	23-28	-	-	-
	9.0	16.5	250.698	243.198	Hard sandy silt	36-57	-	-	-
	16.5	20.0	243.198	239.698	Very dense silty fine sand	52-61	-	-	-
	20.0	30.0	239.698	229.698	Hard sandy silt	49-99	-	-	-
BH-P13 (Tower-C)	0.0	1.2	261.177	259.977	Inspection Pit for utility check	-	-	-	-
	1.2	4.5	259.977	256.677	Firm sandy silt	7	-	-	-
	4.5	5.0	256.677	256.177	Stiff sandy silt	8	-	-	-
	5.0	9.0	256.177	252.177	Medium dense silty fine sand	15-18	-	-	-
	9.0	10.5	252.177	250.677	Very stiff sandy silt	29	-	-	-
	10.5	12.0	250.677	249.177	Hard sandy silt	34	-	-	-
	12.0	13.5	249.177	247.677	Very stiff sandy silt	20	-	-	-
	13.5	15.0	247.677	246.177	Hard sandy silt	33	-	-	-
	15.0	18.0	246.177	243.177	Dense silty fine sand	38-44	-	-	-
	18.0	27.0	243.177	234.177	Hard sandy silt	39-74	-	-	-
	27.0	30.0	234.177	231.177	Very dense silty fine sand	54-Refusal	-	-	-
BH-P14 (Open Area in North-East)	0.0	1.2	261.742	260.542	Inspection Pit for utility check	-	-	-	-
	1.2	1.8	260.542	259.942	Medium dense silty fine sand	22	-	-	-
	1.8	4.2	259.942	257.542	Very stiff sandy silt	26	-	-	-
	4.2	21.2	257.542	240.542	Hard sandy silt	31-96	-	-	-
	21.2	23.3	240.542	238.442	Very dense silty fine sand	69-78	-	-	-
	23.3	30.0	238.442	231.742	Hard sandy silt	57-74	-	-	-
BH-P15 (Open Area in North-West)	0.0	1.2	259.940	258.740	Inspection Pit for utility check	-	-	-	-
	1.2	4.5	258.740	255.440	Loose silty fine sand	8	-	-	-
	4.5	5.0	255.440	254.940	Medium dense silty fine sand	14	-	-	-
	5.0	15.0	254.940	244.940	Very stiff sandy silt	16-30	-	-	-
	15.0	27.0	244.940	232.940	Hard sandy silt	35-78	-	-	-
	27.0	30.0	232.940	229.940	Very dense silty fine sand	59-98	-	-	-

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Borehole No.	Depth, m		Reduced Level, m		Soil Classification	Field SPT 'N' Values	Core Recovery, (%)	RQD, (%)	RMR
	From	To	From	To					
BH-P16 (Tower-E)	0.0	1.2	254.712	253.512	Inspection Pit for utility check	-	-	-	-
	1.2	4.2	253.512	250.512	Stiff sandy silt	10-15	-	-	-
	4.2	5.7	250.512	249.012	Firm sandy silt	6	-	-	-
	5.7	10.7	249.012	244.012	Very stiff sandy silt	18-21	-	-	-
	10.7	12.2	244.012	242.512	Hard sandy silt	34	-	-	-
	12.2	13.7	242.512	241.012	Very stiff sandy silt	30	-	-	-
	13.7	23.3	241.012	231.412	Hard sandy silt	34-Refusal	-	-	-
	23.3	30.0	231.412	224.712	Very dense silty fine sand	80-Refusal	-	-	-
BH-T4 (Open Area in North-West)	0.0	1.2	266.060	264.860	Inspection Pit for utility check	-	-	-	-
	1.2	4.2	264.860	261.860	Very stiff sandy silt	16-23	-	-	-
	4.2	5.7	261.860	260.360	Hard sandy silt	73	-	-	-
	5.7	10.7	260.360	255.360	Very stiff sandy silt	22-29	-	-	-
	10.7	18.2	255.360	247.860	Hard sandy silt	42-58	-	-	-
	18.2	19.7	247.860	246.360	Very stiff sandy silt	26	-	-	-
	19.7	23.3	246.360	242.760	Hard sandy silt	35-61	-	-	-
	23.3	27.0	242.760	239.060	Very dense silty fine sand	79-88	-	-	-
	27.0	38.5	239.060	227.560	Hard sandy silt	54-85	-	-	-
	38.5	46.5	227.560	219.560	Quartzite (Rock)	Refusal	40-74	0-45	25-43
BH-T5 (Open Area in North-West)	0.0	1.2	265.088	263.888	Inspection Pit for utility check	-	-	-	-
	1.2	4.5	263.888	260.588	Stiff sandy silt	8	-	-	-
	4.5	6.0	260.588	259.088	Very stiff sandy silt	17	-	-	-
	6.0	7.5	259.088	257.588	Hard sandy silt	35	-	-	-
	7.5	9.0	257.588	256.088	Very stiff sandy silt	28	-	-	-
	9.0	35.0	256.088	230.088	Had sandy silt	34-100	-	-	-
	35.0	41.0	230.088	224.088	Very dense silty fine sand	103-104	-	-	-
	41.0	50.0	224.088	215.088	Hard sandy silt	61-77	-	-	-
BH-T6 (Tower-A)	0.0	1.2	264.190	262.990	Inspection Pit for utility check	-	-	-	-
	1.2	2.7	262.990	261.490	Very stiff sandy silt	21	-	-	-
	2.7	4.2	261.490	259.990	Stiff sandy silt	9	-	-	-
	4.2	5.7	259.990	258.490	Firm sandy silt	5	-	-	-
	5.7	7.2	258.490	256.990	Stiff sandy silt	11	-	-	-
	7.2	9.2	256.990	254.990	Very stiff sandy silt	26	-	-	-
	9.2	16.7	254.990	247.490	Hard sandy silt	31-35	-	-	-
	16.7	18.2	247.490	245.990	Very stiff sandy silt	28	-	-	-
	18.2	45.5	245.990	218.690	Hard sandy silt	32-58	-	-	-
	45.5	60.5	218.690	203.690	Quartzite (Rock)	Refusal	13-33	0	25
	60.5	65.0	203.690	199.190		Refusal	51-88	0-10	30
BH-T7 (Tower-A)	0.0	1.2	265.368	264.168	Inspection Pit for utility check	-	-	-	-
	1.2	2.7	264.169	262.668	Very stiff sandy silt	16	-	-	-
	2.7	3.3	262.668	262.068	Stiff sandy silt	14	-	-	-
	3.3	7.2	262.068	258.168	Very stiff sandy silt	23-30	-	-	-
	7.2	7.8	258.168	257.568	Dense silty fine sand	32	-	-	-
	7.8	16.7	257.569	248.668	Hard sandy silt	37-50	-	-	-
	16.7	18.2	248.668	247.168	Very dense silty fine sand	88	-	-	-
	18.2	27.2	247.168	238.168	Hard sandy silt	46-72	-	-	-
	27.2	28.7	238.168	236.668	Very dense silty fine sand	67	-	-	-
	28.7	33.0	236.668	232.368	Hard sandy silt	51-Refusal	-	-	-
	33.0	50.0	232.368	215.368	Quartzite (Rock)	Refusal	-	-	-

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Borehole No.	Depth, m		Reduced Level, m		Soil Classification	Field SPT 'N' Values	Core Recovery, (%)	RQD, (%)	RMR
	From	To	From	To					
BH-T10 (Tower-B)	0.0	1.2	261.558	260.358	Inspection Pit for utility check	-	-	-	-
	1.2	4.5	260.358	257.058	Stiff sandy silt	8	-	-	-
	4.5	5.0	257.058	256.558	Medium dense silty fine sand	24	-	-	-
	5.0	7.5	256.558	254.058	Hard sandy silt	37	-	-	-
	7.5	10.5	254.058	251.058	Very stiff sandy silt	23-28	-	-	-
	10.5	15.0	251.058	246.558	Hard sandy silt	36-39	-	-	-
	15.0	16.5	246.558	245.058	Very sandy silt	30	-	-	-
	16.5	27.0	245.058	234.558	Hard sandy silt	44-57	-	-	-
	27.0	33.0	234.558	228.558	Very dense silty fine sand	52-101	-	-	-
	33.0	50.0	228.558	211.558	Hard sandy silt	44-Refusal	-	-	-
BH-T12 (Club House)	0.0	1.2	261.270	260.070	Inspection Pit for utility check	-	-	-	-
	1.2	2.7	260.070	258.570	Stiff sandy silt	15	-	-	-
	2.7	5.0	258.570	256.270	Medium dense silty fine sand	18	-	-	-
	5.0	13.5	256.270	247.770	Very stiff sandy silt	20-26	-	-	-
	13.5	15.0	247.770	246.270	Hard sandy silt	37	-	-	-
	15.0	21.0	246.270	240.270	Very dense silty fine sand	51-87	-	-	-
	21.0	32.0	240.270	229.270	Hard sandy silt	45-71	-	-	-
	32.0	36.0	229.270	225.270	Dense brown silty fine sand	45	-	-	-
	36.0	50.0	225.270	211.270	Hard sandy silt	75-Refusal	-	-	-
BH-T13 (Tower-C)	0.0	1.2	261.142	259.942	Inspection Pit for utility check	-	-	-	-
	1.2	2.7	259.942	258.442	Stiff sandy silt	12	-	-	-
	2.7	7.2	258.442	253.942	Very stiff sandy silt	19-26	-	-	-
	7.2	27.2	253.942	233.942	Hard sandy silt	34-70	-	-	-
	27.2	36.0	233.942	225.142	Very dense silty fine sand	83-Refusal	-	-	-
	36.0	50.0	225.142	211.142	Hard sandy silt	79-Refusal	-	-	-
BH-T15 (Club House)	0.0	1.2	260.439	259.239	Inspection Pit for utility check	-	-	-	-
	1.2	3.0	259.239	257.439	Firm sandy silt	6	-	-	-
	3.0	4.5	257.439	255.939	Stiff sandy silt	9	-	-	-
	4.5	8.0	255.939	252.439	Medium dense silty fine sand	11-24	-	-	-
	8.0	10.5	252.439	249.939	Very stiff sandy silt	29	-	-	-
	10.5	32.0	249.939	228.439	Hard sandy silt	38-79	-	-	-
	32.0	36.0	228.439	224.439	Very dense silty fine sand	122	-	-	-
	36.0	38.0	224.439	222.439	Hard sandy silt	Refusal	-	-	-
	38.0	39.0	222.439	221.439	Very dense silty fine sand	-	-	-	-
	39.0	98.0	221.439	162.439	Hard sandy silt	38-Refusal	-	-	-
	98.0	103.0	162.439	157.439	Quartzite (Rock)	Refusal	27-67	0-8	25-33
BH-1	0.0	1.2	266.277	265.077	Inspection Pit for utility check	-	-	-	-
	1.2	5.7	265.077	260.577	Hard sandy silt	31-34	-	-	-
	5.7	9.2	260.577	257.077	Very stiff sandy silt	19-21	-	-	-
	9.2	20.4	257.077	245.877	Hard sandy silt	32-62	-	-	-
BH-2	0.0	1.2	265.277	264.077	Inspection Pit for utility check	-	-	-	-
	1.2	2.7	264.077	262.577	Firm sandy silt	7	-	-	-
	2.7	5.7	262.577	259.577	Very stiff sandy silt	22-24	-	-	-
	5.7	7.2	259.577	258.077	Medium dense silty fine sand	16	-	-	-
	7.2	10.7	258.077	254.577	Very stiff sandy silt	20-30	-	-	-
	10.7	20.0	254.577	245.277	Hard sandy silt	32-58	-	-	-
	20.0	20.4	245.277	244.877	Very dense silty fine sand	100	-	-	-

For DLF LIMITED

Borehole No.	Depth, m		Reduced Level, m		Soil Classification	Field SPT 'N' Values	Core Recovery, (%)	RQD, (%)	RMR
	From	To	From	To					
BH-3	0.0	1.2	254.06	252.86	Inspection Pit for utility check	-	-	-	-
	1.2	4.8	252.86	249.26	Hard sandy silt	43-56	-	-	-
	4.8	5.7	249.26	248.36	Dense silty fine sand	-	-	-	-
	5.7	9.2	248.36	244.86	Hard sandy silt	39-46	-	-	-
	9.2	10.7	244.86	243.36	Dense silty fine sand	47	-	-	-
	10.7	11.0	243.36	243.06	Very dense silty fine sand	100	-	-	-
BH-4	0.0	1.2	258.052	256.852	Inspection Pit for utility check	-	-	-	-
	1.2	2.7	256.852	255.352	Stiff sandy silt	13	-	-	-
	2.7	5.7	255.352	252.352	Very stiff sandy silt	22-25	-	-	-
	5.7	14.3	252.352	243.752	Hard sandy silt	43-54	-	-	-
	14.3	18.2	243.752	239.852	Dense silty fine sand	31-40	-	-	-
	18.2	20.4	239.852	237.652	Hard sandy silt	49-50	-	-	-
BH-5	0	1.2	258.87	257.67	Inspection Pit for utility check	-	-	-	-
	1.2	2.7	257.67	256.17	Firm sandy silt	5	-	-	-
	2.7	20.4	256.17	238.47	Hard sandy silt	37-69	-	-	-
BH-6	0.0	1.2	254.734	253.534	Inspection Pit for utility check	-	-	-	
	1.2	4.2	253.534	250.534	Stiff sandy silt	10-14	-	-	-
	4.2	9.2	250.534	245.534	Very stiff sandy silt	16-22	-	-	-
	9.2	11.3	245.534	243.434	Hard sandy silt	35-37	-	-	-
	11.3	15.2	243.434	239.534	Dense silty fine sand	32-39	-	-	-
	15.2	20.4	239.534	234.334	Hard sandy silt	50-58	-	-	-
BH-7	0.0	1.2	254.145	252.945	Inspection Pit for utility check	-	-	-	
	1.2	4.2	252.945	249.945	Firm sandy silt	5-7	-	-	-
	4.2	12.2	249.945	241.945	Stiff sandy silt	8-13	-	-	-
	12.2	14.3	241.945	239.845	Hard sandy silt	33-37	-	-	-
	14.3	16.7	239.845	237.445	Dense silty fine sand	43	-	-	-
	16.7	17.3	237.445	236.845	Very dense silty fine sand	53	-	-	-
	17.3	20.4	236.845	233.745	Hard sandy silt	42-50	-	-	-
BH-8	0.0	1.2	254.601	253.401	Inspection Pit for utility check	-	-	-	-
	1.2	2.7	253.401	251.901	Firm sandy silt	4	-	-	-
	2.7	13.7	251.901	240.901	Very stiff sandy silt	15-30	-	-	-
	13.7	16.7	240.901	237.901	Dense silty sand	31-38	-	-	-
	16.7	20.0	237.901	234.601	Hard sandy silt	48-49	-	-	-
	20.0	20.4	234.601	234.201	Very stiff sandy silt	28	-	-	-
BH-9	0.0	1.2	259.328	258.128	Inspection Pit for utility check	-	-	-	-
	1.2	5.7	258.128	253.628	Very stiff sandy silt	16-19	-	-	-
	5.7	20.4	253.628	238.928	Hard sandy silt	35-64	-	-	-
BH-10	0.0	1.2	259.587	258.387	Inspection Pit for utility check	-	-	-	-
	1.2	2.7	258.387	256.887	Firm sandy silt	5	-	-	-
	2.7	5.7	256.887	253.887	Stiff sandy silt	9-12	-	-	-
	5.7	11.7	253.887	247.887	Very stiff sandy silt	20-25	-	-	-
	11.7	14.7	247.887	244.887	Hard sandy silt	43-46	-	-	-
	14.7	16.2	244.887	243.387	Very stiff sandy silt	24			
	16.2	20.4	243.387	239.187	Hard sandy silt	36-44	-	-	-

For DLF LIMITED

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Borehole No.	Depth, m		Reduced Level, m		Soil Classification	Field SPT 'N' Values	Core Recovery, (%)	RQD, (%)	RMR
	From	To	From	To					
BH-3A	0.0	1.2	254.06	252.86	Inspection Pit for utility check	-	-	-	-
	1.2	17.7	252.86	236.36	Hard sandy silt	37-61	-	-	-
	17.7	20.0	236.36	234.06	Very dense silty fine sand	64	-	-	-
	20.0	20.4	234.06	233.66	Hard sandy silt	52	-	-	-
BH-T1	0.0	1.2	263.761	262.561	Inspection Pit for utility check	-	-	-	-
	1.2	2.7	262.561	261.061	Hard sandy silt	37	-	-	-
	2.7	4.2	261.061	259.561	Stiff sandy silt	13	-	-	-
	4.2	7.2	259.561	256.561	Very stiff sandy silt	19-21	-	-	-
	7.2	17.3	256.561	246.461	Hard sandy silt	31-53	-	-	-
	17.3	21.2	246.461	242.561	Very dense silty fine sand	56-64	-	-	-
	21.2	24.2	242.561	239.561	Dense silty fine sand	30-49	-	-	-
	24.2	27.0	239.561	236.761	Hard sandy silt	64-67	-	-	-
	27.0	32.0	236.761	231.761	Quartzite (Rock)	100+	90-100	24-51	35-48
	32.0	35.0	231.761	228.761	Quartzite (Rock)	-	23-36	0	22
	35.0	36.5	228.761	227.261	Quartzite (Rock)	-	67	60	40
	36.5	47.0	227.261	216.761	Quartzite (Rock)	-	21-97	0-15	22-30
BH-T2	0.0	1.2	264.474	263.274	Inspection Pit for utility check	-	-	-	-
	1.2	4.2	263.274	260.274	Very stiff sandy silt	17-20	-	-	-
	4.2	5.7	260.274	258.774	Stiff sandy silt	13	-	-	-
	5.7	15.2	258.774	249.274	Very stiff sandy silt	16-29	-	-	-
	15.2	21.2	249.274	243.274	Hard sandy silt	37-43	-	-	-
	21.2	24.2	243.274	240.274	Very stiff sandy silt	27-28	-	-	-
	24.2	35.0	240.274	229.474	Hard sandy silt	33-55	-	-	-
	35.0	36.5	229.474	227.974	Quartzite (Rock)	100+	16	0	20
	36.5	38.0	227.974	226.474	Quartzite (Rock)	100+	32	8	28
	38.0	39.5	226.474	224.974	Quartzite (Rock)	100+	55	35	38
	39.5	41.0	224.974	223.474	Quartzite (Rock)	100+	26	0	20
	41.0	42.5	223.474	221.974	Dense silty fine sand	43	-	-	-
	42.5	45.5	221.974	218.974	Very dense silty fine sand	81-96	-	-	-
	45.5	47.0	218.974	217.474	Quartzite (Rock)	Refusal	13	0	20
	47.0	50.0	217.474	214.474	Quartzite (Rock)	-	29-40	10-17	28-30
BH-T3	0.0	1.2	262.389	261.189	Inspection Pit for utility check	-	-	-	-
	1.2	4.2	261.189	258.189	Stiff sandy silt	8-11	-	-	-
	4.2	7.2	258.189	255.189	Very stiff sandy silt	19-26	-	-	-
	7.2	9.2	255.189	253.189	Hard sandy silt	31	-	-	-
	9.2	12.2	253.189	250.189	Very stiff sandy silt	18-26	-	-	-
	12.2	24.0	250.189	238.389	Hard sandy silt	31-57	-	-	-
	24.0	25.5	238.389	236.889	Quartzite (Rock)	Refusal	58	17	35
	25.5	33.0	236.889	229.389	Quartzite (Rock)	-	44-83	22-58	35-45
	33.0	36.0	229.389	226.389	Quartzite (Rock)	-	95-100	76-100	52-60
	36.0	46.5	226.389	215.889	Quartzite (Rock)	-	48-95	23-73	30-50
	46.5	50.0	215.889	212.389	Quartzite (Rock)	-	80-87	80-87	55

For DLF LIMITED

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Borehole No.	Depth, m		Reduced Level, m		Soil Classification	Field SPT 'N' Values	Core Recovery, (%)	RQD (%)	RMR
	From	To	From	To					
BH-T8	0.0	1.2	264.439	263.239	Inspection Pit for utility check		-	-	-
	1.2	2.7	263.239	261.739	Firm sandy silt	4	-	-	-
	2.7	4.2	261.739	260.239	Stiff sandy silt	11	-	-	-
	4.2	7.2	260.239	257.239	Very stiff sandy silt	20-29	-	-	-
	7.2	8.7	257.239	255.739	Hard brown sandy silt	41	-	-	-
	8.7	10.2	255.739	254.239	Very stiff sandy silt	29	-	-	-
	10.2	22.2	254.239	242.239	Hard brown sandy silt	30-89	-	-	-
	22.2	23.7	242.239	240.739	Dense silty fine sand	30	-	-	-
	23.7	26.7	240.739	237.739	Hard brown sandy silt	51-49	-	-	-
	26.7	28.2	237.739	236.239	Very dense silty fine sand	68	-	-	-
	28.2	38.5	236.239	225.939	Hard sandy silt	64-83	-	-	-
	38.5	52.0	225.939	212.439	Quartzite (Rock)	Refusal	27-40	0-17	22-30
	52.0	58.0	212.439	206.439	Quartzite (Rock)	-	30-52	17-29	35
	58.0	76.0	206.439	188.439	Quartzite (Rock)	-	24-46	0-8	22-30
	76.0	82.0	188.439	182.439	Quartzite (Rock)	-	35-66	9-31	30-35
	82.0	100.0	182.439	164.439	Quartzite (Rock)	-	24-41	0-13	25-30
BH-T9	0.0	1.2	264.115	262.915	Inspection Pit for utility check	-	-	-	-
	1.2	2.7	262.915	261.415	Fill: Stiff sandy silt	9	-	-	-
	2.7	4.2	261.415	259.915	Firm sandy silt	5	-	-	-
	4.2	5.7	259.915	258.415	Stiff sandy silt	14	-	-	-
	5.7	7.2	258.415	256.915	Very stiff sandy silt	26	-	-	-
	7.2	28.8	256.915	235.315	Hard sandy silt	30-101	-	-	-
	28.8	31.2	235.315	232.915	Very dense silty fine sand	105	-	-	-
	31.2	50.4	232.915	213.715	Hard sandy silt	56-110	-	-	-
BH-T11A	0.0	1.2	261.945	260.745	Inspection Pit for utility check	-	-	-	-
	1.2	4.2	260.745	257.745	Stiff sandy silt	11-12	-	-	-
	4.2	7.2	257.745	254.745	Very stiff sandy silt	15-25	-	-	-
	7.2	17.7	254.745	244.245	Hard sandy silt	30-54	-	-	-
	17.7	19.2	244.245	242.745	Very stiff sandy silt	28	-	-	-
	19.2	23.7	242.745	238.245	Hard sandy silt	36-54	-	-	-
	23.7	25.2	238.245	236.745	Dense silty fine sand	47	-	-	-
	25.2	37.8	236.745	224.145	Very dense silty sand	52-61	-	-	-
	37.8	52.52	224.145	209.425	Hard sandy silt	59-Ref*	-	-	-
BH-T14	0.0	1.2	261.496	260.296	Inspection Pit for utility check	-	-	-	-
	1.2	2.0	260.296	259.496	Fill: sandy silt with traces of sub rounded gravel	9	-	-	-
	2.0	2.7	259.496	258.796	Stiff sandy silt	13	-	-	-
	2.7	8.7	258.796	252.796	Very stiff sandy silt	21-22	-	-	-
	8.7	59.7	252.796	201.796	Hard brown sandy silt	30-Ref*	-	-	-
	59.7	73.0	201.796	188.496	Quartzite (Rock)	Refusal	13-47	0	20-25
	73.0	75.0	188.496	186.496	Quartzite (Rock)		73	7	30

For DLF LIMITED

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Borehole No.	Depth, m		Reduced Level, m		Soil Classification	Field SPT 'N' Values	Core Recovery, (%)	RQD, (%)	RMR
	From	To	From	To					
BH-T17	0.0	1.2	261.314	260.114	Inspection Pit for utility check	-	-	-	-
	1.2	5.7	260.114	255.614	Stiff sandy silt	8-15	-	-	-
	5.7	7.2	255.614	254.114	Medium dense silty fine sand	27	-	-	-
	7.2	7.8	254.114	253.514	Dense silty fine sand	32	-	-	-
	7.8	12.2	253.514	249.114	Hard sandy silt	31-32	-	-	-
	12.2	15.2	249.114	246.114	Very stiff sandy silt	19-27	-	-	-
	15.2	26.3	246.114	235.014	Hard sandy silt	40-100+	-	-	-
	26.3	30.2	235.014	231.114	Very dense silty fine sand	75-76	-	-	-
	30.2	50.4	231.114	210.914	Hard sandy silt	55-100+	-	-	-
BH-T18	0.0	1.2	259.616	258.416	Inspection Pit for utility check	-	-	-	-
	1.2	7.2	258.416	252.416	Sandy silt	36-41	-	-	-
	7.2	11.7	252.416	247.916	Dense silty sand	38-44	-	-	-
	11.7	17.7	247.916	241.916	Very dense silty sand	51-100+	-	-	-
	17.7	19.2	241.916	240.416	Dense silty sand	46	-	-	-
	19.2	28.8	240.416	230.816	Very dense silty sand	54-Ref*	-	-	-
	28.8	79.0	230.816	180.616	Hard sandy silt	59-Ref*	-	-	-
	79.0	100.0	180.616	159.616	Quartzite (Rock)	Refusal	23-55	0	22-28
BH-T19	0.0	1.2	256.209	255.009	Inspection Pit for utility check	-	-	-	-
	1.2	2.7	255.009	253.509	Very stiff sandy silt	26	-	-	-
	2.7	11.7	253.509	244.509	Hard sandy silt	34-44	-	-	-
	11.7	13.2	244.509	243.009	Very dense silty fine sand	53	-	-	-
	13.2	23.7	243.009	232.509	Hard sandy silt	31-54	-	-	-
	23.7	25.2	232.509	231.009	Very dense silty fine sand	108	-	-	-
	25.2	50.4	231.009	205.809	Hard sandy silt	43-100+	-	-	-
BH-T20	0.0	1.2	256.021	254.821	Inspection Pit for utility check	-	-	-	-
	1.2	2.7	254.821	253.321	Very stiff sandy silt	22	-	-	-
	2.7	7.2	253.321	248.821	Hard sandy silt	33-42	-	-	-
	7.2	8.7	248.821	247.321	Very stiff sandy silt	26	-	-	-
	8.7	22.2	247.321	233.821	Hard sandy silt	35-79	-	-	-
	22.2	22.8	233.821	233.221	Dense silty fine sand	40	-	-	-
	22.8	50.3	233.221	205.721	Hard sandy silt	47-Ref	-	-	-
BH-T21	0.0	1.2	259.86	258.66	Inspection Pit for utility check	-	-	-	-
	1.2	4.2	258.66	255.66	Firm sandy silt	6-8	-	-	-
	4.2	11.7	255.66	248.16	Very stiff sandy silt	22-27	-	-	-
	11.7	16.8	248.16	243.06	Hard sandy silt	31-52	-	-	-
	16.8	20.7	243.06	239.16	Very dense silty sand	96-99	-	-	-
	20.7	22.2	239.16	237.66	Dense silty sand	38	-	-	-
	22.2	75.3	237.66	184.56	Hard sandy silt	43-100+	-	-	-

For DLF LIMITED

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Borehole No.	Depth, m		Reduced Level, m		Soil Classification	Field SPT 'N' Values	Core Recovery, (%)	RQD, (%)	RMR
	From	To	From	To					
BH-T22A	0.0	1.2	260.195	258.995	Inspection Pit for utility check	-	-	-	-
	1.2	1.8	258.995	258.395	Loose silty fine sand with traces of sub rounded gravel	4	-	-	-
	1.8	4.2	258.395	255.995	Firm sandy silt	5	-	-	-
	4.2	5.7	255.995	254.495	Loose silty fine sand	9	-	-	-
	5.7	8.7	254.495	251.495	Very stiff sandy silt	16-20	-	-	-
	8.7	22.2	251.495	237.995	Hard sandy silt	30-87	-	-	-
	22.2	23.7	237.995	236.495	Very dense silty fine sand	62	-	-	-
	23.7	28.8	236.495	231.395	Hard sandy silt	38-70	-	-	-
	28.8	41.7	231.395	218.495	Very dense silty fine sand	Refusal	-	-	-
	41.7	47.7	218.495	212.495	Hard sandy silt	96-Refusal	-	-	-
	47.7	53.7	212.495	206.495	Very dense silty fine sand	Refusal	-	-	-
	53.7	100.3	206.495	159.895	Hard sandy silt	57-Refusal	-	-	-
BH-T23	0.0	1.2	259.735	258.535	Inspection Pit for utility check	-	-	-	-
	1.2	2.7	258.535	257.035	Firm sandy silt	4	-	-	-
	2.7	11.7	257.035	248.035	Very stiff sandy silt	17-28	-	-	-
	11.7	50.4	248.035	209.335	Hard sandy silt	38-101	-	-	-
BH-T24	0.0	1.2	259.491	258.291	Inspection Pit for utility check	-	-	-	-
	1.2	2.7	258.291	256.791	Firm sandy silt	5	-	-	-
	2.7	5.7	256.791	253.791	Stiff sandy silt	10-13	-	-	-
	5.7	16.2	253.791	243.291	Very stiff sandy silt	20-30	-	-	-
	16.2	17.7	243.291	241.791	Hard sandy silt	35	-	-	-
	17.7	19.2	241.791	240.291	Dense silty fine sand	48	-	-	-
	19.2	19.8	240.291	239.691	Very dense silty fine sand	54	-	-	-
	19.8	28.2	239.691	231.291	Hard sandy silt	31-45	-	-	-
	28.2	28.8	231.291	230.691	Very dense silty fine sand	57	-	-	-
	28.8	50.4	230.691	209.091	Hard sandy silt	56-105	-	-	-
BH-T25	0.0	1.2	259.54	258.34	Inspection Pit for utility check	-	-	-	-
	1.2	1.8	258.34	257.74	Loose silty fine sand	9	-	-	-
	1.8	5.7	257.74	253.84	Stiff sandy silt	8-13	-	-	-
	5.7	8.7	253.84	250.84	Very stiff sandy silt	24-27	-	-	-
	8.7	28.8	250.84	230.74	Hard sandy silt	39-99	-	-	-
	28.8	38.7	230.74	220.84	Very dense silty fine sand	56-Refusal	-	-	-
	38.7	47.7	220.84	211.84	Hard sandy silt	97-100+	-	-	-
	47.7	64.8	211.84	194.74	Very dense silty fine sand	67-Refusal	-	-	-
	64.8	77.7	194.74	181.84	Hard sandy silt	70-100+	-	-	-
	77.7	100.2	181.84	159.34	Very dense silty fine sand	90-Refusal	-	-	-
BH-T26	0.0	1.2	259.498	258.298	Inspection Pit for utility check	-	-	-	-
	1.2	2.7	258.298	256.798	Very stiff sandy silt	26	-	-	-
	2.7	5.7	256.798	253.798	Stiff sandy silt	9-11	-	-	-
	5.7	13.2	253.798	246.298	Very stiff sandy silt	18-29	-	-	-
	13.2	14.7	246.298	244.798	Hard sandy silt	34	-	-	-
	14.7	16.2	244.798	243.298	Very stiff sandy silt	28	-	-	-
	16.2	28.2	243.298	231.298	Hard sandy silt	33-86	-	-	-
	28.2	34.8	231.298	224.698	Very dense silty fine sand	71-100	-	-	-
	34.8	44.7	224.698	214.798	Hard sandy silty	72-101	-	-	-
	44.7	50.3	214.798	209.198	Very dense silty fine sand	89-102	-	-	-
BH-T27	0.0	1.2	259.195	257.995	Inspection Pit for utility check	-	-	-	-
	1.2	2.7	257.995	256.495	Firm sandy silt	5	-	-	-
	2.7	5.7	256.495	253.495	Stiff sandy silt	9-11	-	-	-
	5.7	8.7	253.495	250.495	Very stiff sandy silt	27-28	-	-	-
	8.7	14.7	250.495	244.495	Hard sandy silt	35-51	-	-	-
	14.7	16.2	244.495	242.995	Very stiff sandy silt	28	-	-	-
	16.2	75.4	242.995	183.795	Hard sandy silt	34-104	-	-	-

The depth at which rock is encountered varies across the site from 24 m (RL 238.4 m) at BH T-3 to more than 100 m. The rock profile at the site is given below:

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Borehole Designation	Depth of Rock, m*	RL of top of Rock, m
BH-P2 (Open Area in North-East)	25.0	240.69
BH-T4 (Open Area in North-West)	38.5	227.56
BH-T6 (Tower A)	45.5	218.69
BH-T7 (Tower A)	33.0	232.37
BH-T15 (Club House)	98.0	162.44
BH-T1	27.0	236.76
BH-T2	35.0	229.76
BH-T3	24.0	238.39
BH-T14	59.7	201.80
BH-T18	79.0	180.62
BH-P1	Rock not encountered to 30 m depth (RL 229.09 m)	
BH-P3	Rock not encountered to 30 m depth (RL 228.42 m)	
BH-P5	Rock not encountered to 30 m depth (RL 230.18 m)	
BH-P6	Rock not encountered to 30 m depth (RL 230.62 m)	
BH-P7	Rock not encountered to 30 m depth (RL 230.08 m)	
BH-P8	Rock not encountered to 30 m depth (RL 229.89 m)	
BH-P9	Rock not encountered to 30 m depth (RL 229.60 m)	
BH-P10	Rock not encountered to 30 m depth (RL 229.47 m)	
BH-P11	Rock not encountered to 30 m depth (RL 229.77 m)	
BH-P12	Rock not encountered to 30 m depth (RL 229.70 m)	
BH-P13	Rock not encountered to 30 m depth (RL 231.18 m)	
BH-P14	Rock not encountered to 30 m depth (RL 231.74 m)	
BH-P15	Rock not encountered to 30 m depth (RL 229.94 m)	
BH-P16	Rock not encountered to 30 m depth (RL 224.71 m)	
BH-T5	Rock not encountered to 50 m depth (RL 215.09 m)	
BH-T10	Rock not encountered to 50 m depth (RL 211.56 m)	
BH-T12	Rock not encountered to 50 m depth (RL 211.27 m)	
BH-T13	Rock not encountered to 50 m depth (RL 211.14 m)	
BH-1	Rock not encountered to 20 m depth (RL 246.28 m)	
BH-2	Rock not encountered to 20 m depth (RL 245.28 m)	
BH-3	Rock not encountered to 20 m depth (RL 243.06 m)	
BH-3A	Rock not encountered to 11 m depth (RL 234.06 m)	
BH-4	Rock not encountered to 20 m depth (RL 238.05 m)	
BH-5	Rock not encountered to 20 m depth (RL 238.87 m)	
BH-6	Rock not encountered to 20 m depth (RL 234.73 m)	
BH-7	Rock not encountered to 20 m depth (RL 234.15 m)	
BH-8	Rock not encountered to 20 m depth (RL 234.60 m)	
BH-9	Rock not encountered to 20 m depth (RL 239.33 m)	
BH-10	Rock not encountered to 20 m depth (RL 239.59 m)	
BH-T8	Rock not encountered to 100 m depth (RL 164.44 m)	
BH-T9	Rock not encountered to 50 m depth (RL 214.12 m)	
BH-T11A	Rock not encountered to 52 m depth (RL 209.95 m)	
BH-T17	Rock not encountered to 50 m depth (RL 211.31 m)	
BH-T19	Rock not encountered to 50 m depth (RL 206.21 m)	
BH-T20	Rock not encountered to 50 m depth (RL 206.02 m)	
BH-T21	Rock not encountered to 75 m depth (RL 184.86 m)	
BH-T22A	Rock not encountered to 100 m depth (RL 160.20 m)	
BH-T23	Rock not encountered to 50 m depth (RL 209.74 m)	
BH-T24	Rock not encountered to 50 m depth (RL 209.49 m)	
BH-T25	Rock not encountered to 100 m depth (RL 159.54 m)	
BH-T26	Rock not encountered to 50 m depth (RL 209.50 m)	
BH-T27	Rock not encountered to 75 m depth (RL 184.20 m)	

* Based on available borehole data.

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A summary of the borehole profiles is illustrated on Plate 4 to 13. Sectional profile of boreholes is illustrated on Plates 14 to 20. Plots of field and corrected SPT values versus depth along with calculation sheet are presented on Plates 78 to 189. Please refer to Volumes 1 and 2 for the borelogs and laboratory test results.

Reviewing the trend of rock level across the site, we have prepared contours of the rock level which is presented on Plate 3. Please note that the rock level has been identified at the borehole locations only and may be used as a guideline for initial planning. The rock level between boreholes may vary somewhat from that shown on this contour drawing.

The following table summarizes the results of the cone penetration tests performed:

Test No.	Depth, m		Average Cone Tip Resistance, qc, MPa	Mean Friction Resistance, kPa	Interpreted N_{60}	Interpreted Soil Classification
	From	To				
CPTu-P1 (Tower-E)	0.0	4.0	Utility Pit; Inspection Pit			
	4.0	5.5	4.83	99.66	17	Silty sand & sandy silt
	5.5	6.5	8.56	159.01	25	Silty sand & sandy silt
	6.5	9.0	4.52	98.18	17	Clay & silty clay
	9.0	11.0	8.82	309.21	33	Clay & silty clay
	11.0	14.0	8.82	309.21	33	Clay & silty clay
	14.0	17.0	10.3	332.15	41	Clay & silty clay
	17.0	19.0	13.2	356.78	49	Clay & silty clay
CPTu-P2 (Open Area in North-East)	0.0	4.0	Utility Pit; Inspection Pit			
	4.0	4.5	4.43	100.93	17	Silty sand & sandy silt
	4.5	5.5	14.57	619.32	46	Very dense/stiff soil
	5.5	7.5	17.1	817.72	57	Very dense/stiff soil
	7.5	8.0	20.55	777.86	62	Very dense/stiff soil
CPTu-P3 (Open Area in North-West)	0.0	4.0	Utility Pit; Inspection Pit			
	4.0	5.0	2.89	51.49	11	Silty sand & sandy silt
	5.0	6.0	5.19	77.1	17	Silty sand & sandy silt
	6.0	8.0	7.05	134.24	23	Silty sand & sandy silt
	8.0	10.0	9.43	275.44	33	Silty sand & sandy silt
	10.0	14.0	7.07	237.67	29	Clay & silty clay
	14.0	16.0	12.66	372.42	47	Clay & silty clay
	16.0	18.0	12.55	500.74	51	Clay & silty clay
	18.0	20.0	19.31	592.98	70	Clay & silty clay
	20.0	23.0	17.09	705.24	69	Clay & silty clay
CPTu-P4 (Tower-C)	0.0	4.0	Utility Pit; Inspection Pit			
	4.0	6.0	4.1	77.08	15	Silty sand & sandy silt
	6.0	9.0	8.18	166.22	26	Silty sand & sandy silt
	9.0	14.0	8.18	166.22	26	Silty sand & sandy silt
	14.0	17.0	8.65	263.94	36	Clay & silty clay
	17.0	20.0	16.72	480.26	61	Clay & silty clay
CPTu-P5 (Club House)	0.0	4.0	Utility Pit; Inspection Pit			
	4.0	5.5	4.66	95.78	17	Silty sand & sandy silt
	5.5	7.0	7.74	214.25	26	Silty sand & sandy silt
	7.0	10.5	15.78	609.68	53	Clay & silty clay
	10.5	14.5	15.25	673.9	57	Clay & silty clay
	14.5	16.0	16.76	585.14	61	Clay & silty clay
	16.0	18.5	16.32	488.37	59	Clay & silty clay

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Test No.	Depth, m		Average Cone Tip Resistance, qc, MPa	Mean Friction Resistance, kPa	Interpreted N_{60}	Interpreted Soil Classification
	From	To				
CPTu-P6 (Open Area in South-East)	0.0	4.0	Utility Pit; Inspection Pit			
	4.0	6.0	1.17	12.49	5	Clay & silty clay
	6.0	8.5	3.69	73.41	14	Clay & silty clay
	8.5	10.0	6.75	218.05	26	Clay & silty clay
	10.0	14.0	12.14	439.91	44	Clay & silty clay
	14.0	17.0	13.3	540.48	52	Clay & silty clay
	17.0	18.5	14.66	423.41	53	Clay & silty clay
CPTu-T2 (Tower-A)	0.0	4.0	Utility Pit; Inspection Pit			
	4.0	6.0	6.43	259.1	24	Silty sand & sandy silt
	6.0	8.0	7.7	286.1	27	Clay & silty clay
	8.0	10.0	7.7	286.1	27	Clay & silty clay
	10.0	12.0	12.52	443.96	43	Clay & silty clay
	12.0	15.0	15.98	718.88	59	Clay & silty clay
	15.0	18.0	16.74	801.9	65	Clay & silty clay
	18.0	20.0	20.99	651.75	74	Clay & silty clay

A summary of the CPTu profiles with Plots of friction ratio, cone resistance and sleeve friction values versus depth presented in Volumes 1 & 2.

2.5 Groundwater

Based on our measurements in the completed boreholes, the groundwater was not met to the final explored depth of 103 m depth during the period of our field investigation (January-March, 2023). We anticipate groundwater level in this area to be fairly deep. However, a localized perched water table was met at BH-T-11A, T-14 & T-25 at 46-56 m depth.

3.0 FIELD TEST RESULTS

3.1 Pressuremeter Test Results

Results of pressuremeter tests conducted at site presented in Volumes 1 and 2. The limit pressure and deformation modulus values are given in the table below:

S. No.	Test Designation	Depth Below EGL, m	Reduced level, m	Limit Pressure, p_L (bars)	Deformation Modulus, E (kg/cm^2)	p_o (bar)	Unload/Reload Modulus, (kg/cm^2)	
							Cycle-1	Cycle-2
1	BH-T6	3.0	261.19	12.1	195.3	0.3	35.0	9.0
2		6.0	258.19	17.0	310.2	0.6	83.0	9.0
3		9.0	255.19	27.0	567.4	0.9	124.0	28.0
4		12.0	252.19	32.3	681.1	1.2	157.0	28.0
5		15.0	249.19	37.0	965.5	1.7	192.0	33.0
6		18.0	246.19	31.8	1050.9	1.9	129.9	24.0
7		21.0	243.19	37.3	1165.2	2.2	100.0	34.0
8		24.0	240.19	42.3	1574.2	2.5	134.0	36.0
9		27.0	237.19	46.3	1672.3	2.8	159.0	33.0
10		30.0	234.19	47.0	1897.2	3.1	221.0	25.0
11		36.0	228.19	51.3	2028.0	3.8	195.0	26.0
12		42.0	222.19	55.0	2386.7	4.3	208.0	36.0
13		48.0	216.19	49.3	2722.7	5.1	93.0	38.0
14		54.0	210.19	66.3	4094.1	5.8	648.0	52.0
15		60.0	204.19	71.0	6076.3	5.6	322.0	82.0

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S. No.	Test Designation	Depth Below EGL, m	Reduced level, m	Limit Pressure, p_L (bars)	Deformation Modulus, E (kg/cm^2)	p_0 (bar)	Unload/Reload Modulus, (kg/cm^2)	
							Cycle-1	Cycle-2
16	BH-T10	3.0	258.5	14.3	141.4	0.3	12.0	16.0
17		6.0	255.5	20.3	188.7	0.7	8.0	8.0
18		9.0	252.5	24.0	434.0	1.0	18.0	16.0
19		12.0	249.5	27.0	420.7	1.4	48.0	24.0
20		15.0	246.5	29.8	713.5	1.7	36.0	10.0
21		18.0	243.5	37.3	978.9	2.0	59.0	19.0
22		21.0	240.5	40.4	1029.7	2.2	69.0	19
23		24.0	237.5	36.3	1162.8	2.6	123.0	47.0
24		27.0	234.5	44.8	1314.5	2.9	132.0	22.0
25		30.0	231.5	41.9	1544.8	3.2	141.0	48.0
26		36.0	225.5	35.3	1621.8	3.9	163.0	35.0
27		42.0	219.5	45.3	1962.2	4.5	163.0	42.0
28		48.0	213.5	43.8	2217.4	5.1	166.0	113.0
29	BH-T11	3.0	258.95	8.3	108.1	0.68	10	9
30		6.0	255.95	11.5	144.1	0.93	18	12
31		9.0	252.95	22.5	596.3	0.85	19	14
32		12.0	249.95	17.0	766.9	1.20	14	12
33		15.0	246.95	15.5	896.2	1.76	45	22
34		18.0	243.95	24.9	1003.2	1.80	23	33
35		21.0	240.95	18.8	594.4	2.40	14	14
36		24.0	237.95	24.5	697.1	2.60	61	24
37		27.0	234.95	21.5	1117.3	2.90	24	12
38		30.0	231.95	22.0	1322.5	3.15	16	12
39		36.0	225.95	42.3	2510.1	3.80	356	47
40		42.0	219.95	31.9	1276.8	4.70	17	41
41		48.0	213.95	40.0	1703.9	5.10	43	43
42		54.0	207.95	68.0	4647.5	5.70	34	13
43		60.0	201.95	69.4	5050.7	6.30	36	72
44		66.0	195.95	69.9	6317.2	7.40	21	27
45		72.0	189.95	>80.0	7364.7	7.90	334	404
46		78.0	183.95	>80.0	7924.8	8.70	503	183
47		84.0	177.95	>80.0	8501.0	9.90	592	195
48		90.0	171.950	>80.0	9274.4	10.60	579	280
49	BH-T22	5.0	255.195	14.5	375.4	0.70	13	16
50		10.0	250.195	18.5	507.6	1.00	6	17
51		15.0	245.195	18.5	593.2	1.85	40	25
52		20.0	240.195	30.5	619.4	2.05	61	34
53		25.0	235.195	18.5	663.8	2.70	65	74
54		30.0	230.195	31.8	1110.1	3.12	85	51
55		35.0	225.195	30.3	1197.2	3.95	186	44
56		40.0	220.195	33.8	1525.7	4.75	37	22
57		45.0	215.195	39.5	1917.0	4.95	42	17
58		50.0	210.195	42.5	2229.5	5.30	29	17
59		55.0	205.195	46.7	2357.2	6.40	177	139
60		60.0	200.195	50.3	2590.6	6.75	60	94
61		65.0	195.195	51.9	2643.5	6.95	132	95
62		70.0	190.195	56.3	2891.0	7.50	166	40
63		75.0	185.195	59.5	3356.9	8.30	186	42
64		80.0	180.195	58.1	3591.3	8.70	68	32
65		85.0	175.195	61.5	3424.8	9.20	102	27
66		90.0	170.195	63.3	4271.5	9.70	58	33

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where:

p_L	=	Limit Pressure
p_0	=	Corrected pressure
E	=	Modulus of Elasticity

3.2 Cross-Hole Seismic Test Results

The cross-hole seismic test consists of generation of horizontally traveling P and S-waves at a particular depth/elevation in one borehole (source hole), and recording their arrivals at same level in two nearby receiver boreholes. The standard for the test is as per ASTM D4426/D4428M-00[4].

At each location, the test was repeated three times, choosing the each of three boreholes as source borehole in sequence and the balance two boreholes as receiver boreholes. The test was then repeated by changing the source and receiver boreholes.

3.2.1 Presentation of Test Results

Results of cross-hole seismic test are presented in Appendix-A. This contains the following information:

a) Table of test results, including measured values of shear and compression wave velocities, as well as computed dynamic moduli& coefficients.

b) Graphical plots of measured wave velocities and computed dynamic soil parameters.

3.2.2 Discussion of Test Results

The range of measured wave velocities is tabulated below:

Test Designation	Depth, m		Reduced Level, m		Shear wave velocity (V_s), m/s		Compression wave velocity (V_p), m/s		UBC Classification
	From	To	From	To	Measured Values	Suggested Design Value	Measured Values	Suggested Design Value	
BH-T6A (Club House)	0.0	6.0	261.19	255.19	170-179	**175**	326-366	**346**	S_E
	6.0	9.0	255.19	252.19	186-193	**190**	374-385	**380**	S_D (Stiff Soil)
	9.0	15.0	252.19	246.19	197-218	**208**	384-440	**412**	S_D (Stiff Soil)
	15.0	21.0	246.19	240.19	224-239	**232**	449-488	**469**	S_D (Stiff Soil)
	21.0	29.0	240.19	232.19	242-265	**254**	492-568	**530**	S_D (Stiff Soil)
	29.0	36.0	232.19	225.19	260-273	**267**	536-569	**553**	S_D (Stiff Soil)
	36.0	42.0	225.19	219.19	252-265	**259**	505-532	**519**	S_D (Stiff Soil)
	42.0	46.0	219.19	215.19	270-285	**278**	540-609	**575**	S_E (Stiff Soil)
	46.0	54.0	215.19	207.19	1453-1498	**1476**	2949-3210	**3080**	S_B (Rock)
	54.0	61.0	207.19	200.19	1508-1550	**1529**	3007-3280	**3144**	S_A (Hard Rock)
	61.0	71.0	200.19	190.19	1557-1620	**1589**	3312-3453	**3383**	S_A (Hard Rock)
	71.0	86.0	190.19	175.19	1625-1691	**1658**	3290-3530	**3410**	S_A (Hard Rock)
	86.0	90.0	175.19	171.19	1700-1711	**1706**	3386-3673	**3530**	S_A (Hard Rock)

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(4) American Society for Testing and Materials, "***Standard Test Methods for Cross-hole Seismic Testing.***" ASTM D4428-D4428M-00.

Test Designation	Depth, m		Reduced Level, m		Shear wave velocity (V_s), m/s		Compression wave velocity (V_p), m/s		UBC Classification
	From	To	From	To	Measured Values	Suggested Design Value	Measured Values	Suggested Design Value	
BH-T15A (Club House)	0.0	5.0	260.44	255.44	189-203	**196**	397-455	**426**	S_D (Stiff Soil)
	5.0	12.0	255.44	248.44	213-248	**231**	474-525	**500**	S_D (Stiff Soil)
	12.0	16.0	248.44	244.44	255-280	**268**	558-594	**576**	S_C (Stiff Soil)
	16.0	20.0	244.44	240.44	280-292	**286**	602-617	**610**	S_D (Stiff Soil)
	20.0	30.0	240.44	230.44	299-323	**311**	626-662	**644**	S_D (Stiff Soil)
	30.0	36.0	230.44	224.44	323-333	**328**	646-687	**667**	S_D (Stiff Soil)
	36.0	50.0	224.44	210.44	333-359	**346**	687-756	**722**	S_D (Stiff Soil)
	50.0	62.0	210.44	198.44	364-382	**373**	739-787	**763**	S_C (Very Dense Soil)
	62.0	70.0	198.44	190.44	382-415	**399**	781-819	**800**	S_C (Very Dense Soil)
	70.0	79.0	190.44	181.44	416-438	**427**	833-850	**842**	S_C (Very Dense Soil)
	79.0	83.0	181.44	177.44	447-463	**455**	876-907	**892**	S_C (Very Dense Soil)
	83.0	90.0	177.44	170.44	465-536	**501**	926-1042	**984**	S_C (Very Dense Soil)
BH-T18A	0.0	6.0	259.61	253.61	175-179	**177**	347-366	**357**	S_E
	6.0	11.0	253.61	248.61	185-209	**197**	381-449	**415**	S_D (Stiff Soil)
	11.0	15.0	248.61	244.61	214-226	**220**	452-458	**455**	S_D (Stiff Soil)
	15.0	25.0	244.61	234.61	232-250	**241**	470-507	**489**	S_D (Stiff Soil)
	25.0	34.0	234.61	225.61	229-255	**242**	479-500	**490**	S_D (Stiff Soil)
	34.0	40.0	225.61	219.61	258-277	**268**	499-527	**513**	S_D (Stiff Soil)
	40.0	48.0	219.61	211.61	282-304	**293**	546-637	**592**	S_D (Stiff Soil)
	48.0	56.0	211.61	203.61	310-335	**323**	642-700	**671**	S_D (Stiff Soil)
	56.0	64.0	203.61	195.61	339-359	**349**	690-705	**698**	S_D (Stiff Soil)
	64.0	71.0	195.61	188.61	363-378	**371**	696-737	**717**	S_C (Very Dense Soil)
	71.0	79.0	188.61	180.61	383-403	**393**	730-840	**785**	S_C (Very Dense Soil)
	79.0	85.0	180.61	174.61	1528-1554	**1541**	2999-3191	**3095**	S_B (Hard Rock)
	85.0	90.0	174.61	169.61	1563-1634	**1599**	2982-3163	**3073**	S_B (Hard Rock)
BH-T25A	0.0	5.0	259.54	254.54	164-179	**172**	320-366	**343**	S_E
	5.0	9.0	254.54	250.54	187-211	**199**	380-453	**417**	S_D (Stiff Soil)
	9.0	15.0	250.54	244.54	217-228	**223**	453-497	**475**	S_D (Stiff Soil)
	15.0	21.0	244.54	238.54	221-234	**228**	460-515	**488**	S_D (Stiff Soil)
	21.0	30.0	238.54	229.54	240-276	**258**	511-600	**556**	S_D (Stiff Soil)
	30.0	38.0	229.54	221.54	282-310	**296**	556-722	**639**	S_D (Stiff Soil)
	38.0	43.0	221.54	216.54	314-329	**322**	677-733	**705**	S_D (Stiff Soil)
	43.0	49.0	216.54	210.54	335-356	**346**	699-728	**713**	S_D (Stiff Soil)
	49.0	58.0	210.54	201.54	361-383	**372**	703-857	**780**	S_C (Very Dense Soil)
	58.0	65.0	201.54	194.54	372-397	**385**	738-875	**807**	S_C (Very Dense Soil)
	65.0	74.0	194.54	185.54	400-412	**406**	836-882	**859**	S_C (Very Dense Soil)
	74.0	81.0	185.54	178.54	395-416	**406**	819-868	**844**	S_C (Very Dense Soil)
	81.0	90.0	178.54	169.54	420-441	**431**	865-902	**884**	S_C (Very Dense Soil)

The range of interpreted dynamic soil parameters is tabulated below:

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Test Designation	Depth, m		Reduced Level, m		Dynamic Young's Modulus, E_{dy} (MPa)	Dynamic Shear Modulus, G_{max} (MPa)	Coefficient of Elastic Uniform Compression, c_u (kg/cm^3)	Coefficient of Elastic Uniform Shear, c_u (kg/cm^3)	Coefficient of Elastic Non-Uniform Compression, c_ϕ (kg/cm^3)	Coefficient of Elastic non-uniform Shear, c_τ (kg/cm^3)
	From	To	From	To						
BH-T6A	1.0	6.0	261.19	255.19	135.2-157.7	51.4-58.7	5.5-6.5	3.3-3.9	11.4-13.5	4.9-5.9
	6.0	9.0	255.19	252.19	171.6-188.5	63.7-71.4	7.1-7.6	4.2-4.6	14.7-15.9	6.4-6.9
	9.0	15.0	252.19	246.19	196.5-243.1	74.3-90.8	8.0-10.0	4.8-6.0	16.6-20.8	7.2-9.0
	15.0	21.0	246.19	240.19	259.3-301.0	96.0-113.3	10.7-12.3	6.4-7.4	22.2-25.5	9.6-11.1
	21.0	29.0	240.19	232.19	314.0-397.2	115.5-146.0	13.1-16.6	7.9-10.0	27.3-34.5	11.8-15.0
	29.0	36.0	232.19	225.19	381.0-414.9	140.8-155.0	15.9-17.1	9.5-10.2	32.9-35.4	14.3-15.4
	36.0	42.0	225.19	219.19	356.8-389.7	131.9-146.5	14.6-15.9	8.8-9.6	30.3-33.1	13.1-14.3
	42.0	46.0	219.19	215.19	409.6-459.6	151.6-169.0	16.8-19.2	10.1-11.5	34.9-39.9	15.1-17.3
	46.0	54.0	215.19	207.19	11965-12514	4388-4664	495.1-516.1	297.1-309.6	1027.9-1071.4	445.6-464.5
	54.0	61.0	207.19	200.19	12684.8-13548.3	4731.0-4996.0	519.3-565.1	311.6-339.1	1078.0-1173.1	467.3-508.6
	61.0	71.0	200.19	190.19	13785.2-14736.6	5043.4-5460.2	576.2-614.5	345.7-368.7	1196.2-1275.7	518.6-553.1
	71.0	86.0	190.19	175.19	14726.6-16044.1	5490.7-5945.4	607.0-665.6	364.2-399.4	1260.2-1381.8	546.3-599.1
	86.0	90.0	175.19	171.19	16099.5-16576.0	6008.3-6087.6	660.2-694.5	396.1-416.7	1370.5-1441.9	594.2-625.1
BH-T15A	0.0	5.0	260.44	255.44	162.9-189.3	60.2-69.4	6.8-8.0	4.1-4.8	14.1-16.7	6.1-7.2
	5.0	12.0	255.44	248.44	209.3-322.7	76.2-118.9	8.9-13.5	5.3-8.1	18.4-28.0	8.0-12.1
	12.0	16.0	248.44	244.44	345.4-412.3	126.3-151.9	14.5-17.2	8.7-10.3	30.2-35.7	13.1-15.5
	16.0	20.0	244.44	240.44	414.6-448.4	152.3-165.4	17.4-18.7	10.4-11.2	36.1-38.8	15.6-16.8
	20.0	30.0	240.44	230.44	475.0-541.8	173.6-201.9	19.9-22.3	11.9-13.4	41.2-46.4	17.9-20.1
	30.0	36.0	230.44	224.44	542.9-591.8	202.5-220.4	22.3-24.4	13.4-14.7	46.3-50.7	20.1-22.0
	36.0	50.0	224.44	210.44	593.0-690.1	220.2-256.2	24.5-28.7	14.7-17.2	51.0-59.6	22.1-25.8
	50.0	62.0	210.44	198.44	711.0-781.2	263.1-290.3	29.5-32.3	17.7-19.4	61.3-67.1	26.6-29.1
	62.0	70.0	198.44	190.44	777.4-910.0	289.4-343.0	32.1-37.1	19.3-22.3	66.6-77	28.9-33.4
	70.0	79.0	190.44	181.44	919.1-1006.2	344.6-381.3	37.7-40.8	22.6-24.5	78.2-84.7	33.9-36.7
	79.0	83.0	181.44	177.44	1050.8-1126.5	396.8-425.4	42.8-45.9	25.7-27.5	88.8-95.2	38.5-41.3
	83.0	90.0	177.44	170.44	1143.5-1507.2	429.3-570.7	46.8-61.2	28.1-36.7	97.2-127.0	42.1-55.1
BH-T18A	0.0	6.0	259.61	253.61	144.5-154.3	54.3-57.9	5.9-6.3	3.5-3.8	12.3-13.1	5.3-5.7
	6.0	11.0	253.61	248.61	166.7-223.7	61.9-82.1	6.9-9.4	4.1-5.6	14.3-19.5	6.2-8.4
	11.0	15.0	248.61	244.61	235.0-257.0	86.4-96.0	9.8-10.6	5.9-6.3	20.4-21.9	8.9-9.5
	15.0	25.0	244.61	234.61	271.2-316.5	101.2-118.2	11.2-13.0	6.7-7.8	23.2-27.0	10.1-11.7
	25.0	34.0	234.61	225.61	273.9-343.4	101.3-129.9	11.4-14.0	6.8-8.4	23.6-29.0	10.3-12.6
	34.0	40.0	225.61	219.61	350.3-402.3	132.6-153.7	14.2-16.2	8.5-9.7	29.5-33.6	12.8-14.6
	40.0	48.0	219.61	211.61	418.9-500.4	156.9-185.0	17.0-20.8	10.2-12.5	35.2-43.2	15.3-18.7
	48.0	56.0	211.61	203.61	518.5-607.0	192.4-224.7	21.5-25.2	12.9-15.1	44.6-52.4	19.3-22.7
	56.0	64.0	203.61	195.61	619.2-678.4	229.6-257.5	25.6-27.5	15.4-16.5	53.1-57.0	23.0-24.7
	64.0	71.0	195.61	188.61	692.7-755.5	262.6-286.0	28.1-30.7	16.8-18.4	58.3-63.7	25.3-27.6
	71.0	79.0	188.61	180.61	769.1-875.2	293.6-324.0	31.0-36.4	18.6-21.8	64.3-75.5	27.9-32.7
	79.0	85.0	180.61	174.61	12515.5-12744.9	4662.8-4824.9	512.0-526.8	307.2-316.1	1062.9-1093.5	460.8-474.1
	85.0	90.0	174.61	169.61	12794.5-13902.5	4881.0-5334.5	515.8-557.6	309.5-334.6	1070.9-1157.7	464.2-501.9
BH-T-25A	0.0	5.0	259.54	254.54	123.2-149.1	46.6-55.5	5.0-6.1	3.0-3.7	10.4-12.9	4.5-5.5
	5.0	9.0	254.54	250.54	161.9-220.5	60.4-81.0	6.7-9.2	4-5.5	13.9-19.2	6.0-8.3
	9.0	15.0	250.54	244.54	231.6-254.9	85.7-94.0	9.6-10.7	5.8-6.4	20.0-22.2	8.7-9.6
	15.0	21.0	244.54	238.54	239.3-282.2	88.7-103.0	9.9-11.9	6.0-7.1	20.6-24.7	8.9-10.7
	21.0	30.0	238.54	229.54	296.0-403.6	109.0-151.3	12.4-16.6	7.4-9.9	25.7-34.4	11.1-14.9
	30.0	38.0	229.54	221.54	419.2-525.5	157.9-190.6	17.1-22.4	10.3-13.4	35.5-46.4	15.4-20.1
	38.0	43.0	221.54	216.54	542.1-582.5	196.4-215.6	23.1-24.2	13.8-14.5	47.9-50.2	20.8-21.8
	43.0	49.0	216.54	210.54	602.6-677.1	223.1-252.4	25.0-27.9	15-16.7	52.0-58.0	22.5-25.1
	49.0	58.0	210.54	201.54	683.2-798.6	258.6-291.6	27.7-33.7	16.6-20.2	57.6-69.9	25.0-30.3
	58.0	65.0	201.54	194.54	773.3-893.5	286.4-326.7	32.1-37.6	19.3-22.6	66.6-78.1	28.9-33.9
	65.0	74.0	194.54	185.54	902.5-954.3	331.1-350.7	37.4-40.0	22.5-24.0	77.7-82.9	33.7-36.0
	74.0	81.0	185.54	178.54	870.7-966.2	322.9-357.6	36.1-40.1	21.7-24.1	74.9-83.3	32.5-36.1
	81.0	90.0	178.54	169.54	985.0-1072.4	365.0-403.1	40.9-43.8	24.5-26.3	84.8-91.0	36.8-39.5

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General guidelines for selection of design dynamic parameters are presented in the following section.

3.2.3 Selection of Dynamic Parameters

The selection of dynamic parameters must be done based on the project specifications, as well as the general guideline given in IS: 5249-1992 RA 2020.

As per IS 5249:1992 (Clause 9.0), the value of dynamic shear modulus, G, is affected by a number of parameters; out of which confining pressure, shear strain amplitude, and relative density are

most important. In the range of strains associated with properly designed machine foundations, the effect of variation in strain on shear modulus is small and the values of G for design purposes may be determined from the in-situ test values using the relation given below:

$$\frac{G_1}{G} = \left(\frac{\sigma_{01}}{\sigma_0}\right)^m$$

where:

G_1 and G	=	Dynamic shear modulus for the prototype and from field test, respectively
σ_{01} and σ_0	=	Mean effective confining pressure, associated with the prototype foundation and the in-situ test, respectively, and
m	=	Constant depending upon the type of soil/rock, shape of grains, etc.

Since the cross-hole seismic tests completed on site are low-strain methods, the dynamic soil parameters computed here correspond to very low strains. However, actual design strains on the site are usually much higher (often in the range of 2~3%); particularly for earthquake conditions. Hence, the design dynamic parameters should be selected carefully as per the anticipated strain levels[5].

IS: 5249 states that in situations where high strain levels are associated (*as in the case of analysis for earthquake conditions*), the effect of strain level shall be considered along with that of confining pressure. In such a case, the values of G from different field tests may first be reduced to the same confining pressure (expected below the footing) and their variation with strain levels may be studied to arrive at an appropriate value corresponding to the expected strain level[5].

The four parameters (C_u, C_r, C_ϕ and C_γ) are highly dependent on strain levels. Keeping this in view, we suggest that a range of ± 20 percent of the above values be used for design. The higher values of these coefficients may be used for machines having an operating frequency higher than that of the machine-foundation-soil system. Similarly, the lower values of the coefficients may be used for machines operating at frequency that is lower than that of the system.

4.0 FOUNDATION ANALYSIS AND RECOMMENDATIONS

4.1 General

A suitable foundation for any structure should have an adequate factor of safety against exceeding the bearing capacity of the supporting soils. Also, the vertical movements due to compression of the soils should be within tolerable limits for the structure. We consider that foundation designed in accordance with the recommendations given herein will satisfy these criteria.

4.2 Liquefaction Susceptibility Assessment

Liquefaction is defined as the transformation of a granular material from a solid to a liquefied state as a consequence of increased pore-water pressure and reduced effective stress (Marcuson, 1978[6]). Increased pore pressure may be induced by the tendency of granular materials to compact when subjected to cyclic shear deformation, such as in the event of an earthquake.

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[5] Steven L. Kramer (1996), "***Geotechnical Earthquake Engineering***", Pearson Education, Inc., Section 6.4, pp. 232-238.

[6] Marcuson, W.F. (III) (1978), "***Definition of terms related to liquefaction***", J. Geotech Engrg. Div., ASCE, 104(9), 1197-1200.

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As per IS: 1893 (Part 1) - 2016, liquefaction is likely in loose fine sand (SP) below water table. The following points are highlighted for the soils with regard to liquefaction susceptibility assessment:

1. The soils at site classify primarily as sandy silt of low plasticity with minor discontinuous sand zones. Rock is encountered in BH- P2 (Open Area in North-East), BH-T4 (Open Area in North-West), BH-T6 (Tower A), BH-T7 (Tower A), BH-T15 (Club House), BH-T1, BH-T2, BH-T3, BH-T14 and BH-T18.

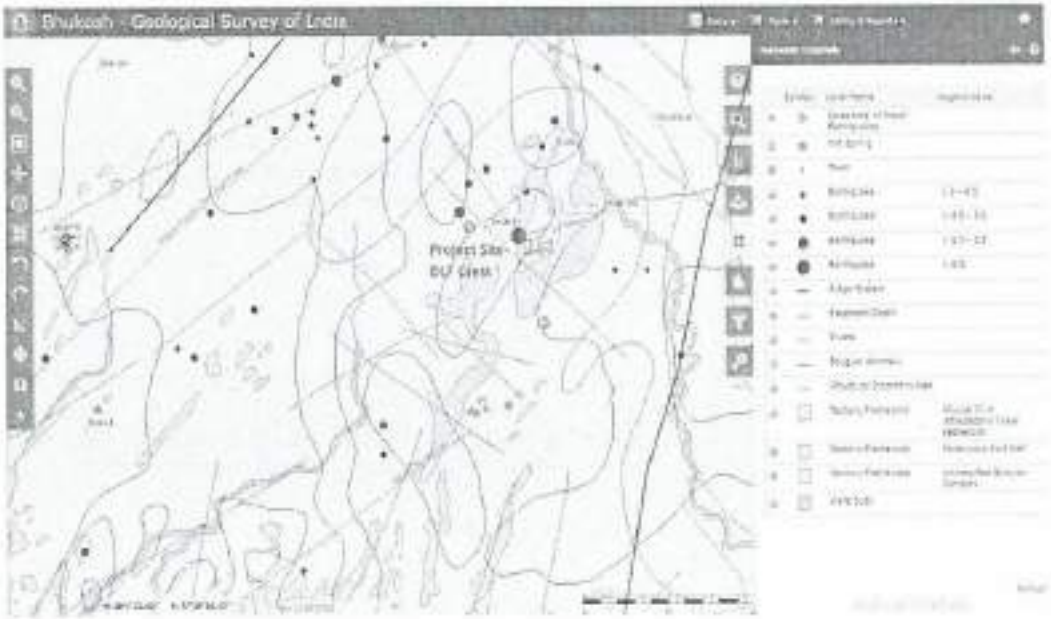
2. As mentioned in Section 2.5, groundwater was not met till the final exploration depth of 103.0 m depth during the period of our field investigation (January-March, 2023). However, a localized perched water table was met at BH-T-11A, T-14 & T-25 at 46-56 m depth.

Reviewing the soil conditions, we are of the opinion that the soils at this site are not likely to liquefy in the event of a design earthquake.

According to Fig.1 of IS: 1893 (Part1)-2016 showing seismic zones, the proposed site falls under Zone-IV. The design for seismic forces should be done considering the project in Zone-IV.

4.3 Seismicity

Gurgaon is situated in seismic Zone-IV and is vulnerable to earthquakes. A seismic tectonic map downloaded from Geological Survey of India's website Bhukosh[3] is presented below:



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The major tectonics features affecting Gurgaon are as follows:

- Sohna Fault
- Junction of Aravalli and Alluvium near Delhi
- Moradabad Fault
- Delhi Moradabad Fault
- Delhi-Haridwar Fault

The NCR has fairly high seismicity with general occurrence of earthquakes of 5-6 magnitude, a few of magnitude 6-7 and occasional incident of 7.5-8.0 magnitude shocks[7]. The most important earthquake which affected Gurgaon was on 27th August, 1960 with the magnitude of 6.0. The presence of these faults makes earthquake condition more vulnerable because fault and ridges is very sensitive to primary and secondary waves which produce from earthquake.

4.4 Foundation Type and Depth

As conveyed to us, the proposed building shall have four levels of basements for residential parking. The overburden soil is firm to stiff sandy silt. The depth to rock in eastern portion varies at the site from 24.0-98.0 m (RL 234.9 to 162.4) as illustrated on Plate 3 (contours of rock level). In the southern and eastern part of the site, rock was not encountered to 100 m depth.

Reviewing the rock level and the planned founding levels, we have divided the site into five areas. These areas are identified on Plate 3. The trend of rock in these areas is as follows:

- **Area 1**: Rock is met at RL 340 to 234 m.
- **Area 2**: Rock is met at RL 234 to 195 m
- **Area 3**: Rock is met at RL 195 to 162.4 m
- **Area 4**: Rock is not met to RL 160 m
- **Area 5**: Rock is not met to RL 215 m

For founding level at RL 233.275 m, the foundation bearing material shall vary from rock in the northeastern part of the site (Area 1) to soil in most of the other areas. However, since the thickness of the soil cover over the rock varies substantially in the eastern part of the site, there is a potential for differential settlement. The following table summarizes the trends:

Area	Facilities Planned	RL of Rock, m*	Remarks
Area 1	Tower A & Part of Club House	RL 240-230 m	For Foundation level at 233.275 m, most foundations are likely to bear on rock. Any soil at foundation level in this area may be over-excavated to the top of rock and replaced by lean concrete
Area 2	Club House, Part of Tower A, Tower B	RL 230-195 m	Foundations may bear on soil
Area-3	Club House, Part of Tower-C	RL 195-162.4 m	Foundations may bear on soil
Area-4	Club House, Part of Tower-C	Rock not met to RL 160.0 m	Foundations may bear on soil
Area-5	Club House & facilities in northern part	Rock not met to RL 215.0 m	Foundations may bear on soil

To assess the extent of differential settlement, analysis in each area has been done for two cases[8]:

- Best Case Scenario: where thickness of overburden above the rock is minimum.
- Worst Case Scenario: where thickness of overburden is maximum.

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(7) Satish Kumar (2015),"Planning Strategy for Earthquake Prone AreaCase Study- Gurgaon", International Journal of Research, Volume 02, Issue 07.

(8) Ravi Sundaram, Sorabh Gupta and Sanjay Gupta (2023), ***"Geotechnical and Geophysical Characterization - Case Study of a Site with Steeply Dipping Rock"***, Soil Behaviour and Characterization of Geomaterials, Proceedings of Indian Geotechnical Conference IGC-2021 (Vol-1), K. Muthukkumaran et.al (eds), Springer Nature, Singapore, pp 209-218.

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As per IS: 1904-2021, the structure may be considered safe if the angular distortion / tilt is less than 1/500. Foundation analysis has been done for the following cases:

Structure	Location	RL of Rock, m*	Foundation Bearing Material	Analysis Case	BH & eCPT Data used	Remarks
Tower A	Northeastern part	RL 235-240	Rock or lean concrete placed above rock	Foundations on rock	BH-T1 & T3	Area 1
	Southern part	RL 235-215	Soil – Thickness of overburden soil above rock may range from 1 to 18 m	Case 1: Soil Cover = 1 m Case 2: Soil Cover = 18 m	BH-T2, T6 to T9 and CPT-2	Area 2
Tower B		RL 215 to 195	Soil – Thickness of overburden soil above rock may range from 18 to 31 m	Foundation on soil	BH-T10, T11, T14, T17	Partly in Area 2 and Area 3
Tower C	Eastern part	RL 195 to 162.4	Soil – Thickness of overburden soil above rock may range from 31 to 79m	Foundation on soil	BH- T18, CPT-4	Area 3
	Western part	Rock not met to RL 160 m	Soil to 100 m depth	Foundation on Soil	BH-T19 & T20	Area 4
Tower D		Rock not met to RL 160 m	Soil to 100 m depth	Foundation on Soil	BH-P-7, T-21 & T22	Area 4
Tower E		Rock not met to RL 160 m	Soil to 100 m depth	Foundation on Soil	BH-P1, T23 toT27	Area 4
Club House & facilities in northern part of site	Northeastern part	RL 227.5	Soil: For foundations at shallow depths	Foundations on soil at 3, 6, 9 m depth (RL 263, 260 & 257 m)	BH-T4	Area 2
	Northwestern part	Rock not met to RL 215 m	Soil to 50 m depth	Foundation on Soil at 3, 6 & 9 m depth (RL 257, 254 & 251 m)	BH-T5, P5, P6, P13 & P15 CPT-3 & 4	Area 5
Club House & facilities in southeastern part of site		RL 215-162.4	Soil - Thickness of overburden soil above rock may range from 18 to 70 m	Foundation on Soil at 3, 6 & 9 (RL 257, 254 & 251 m)	BH-P12, P13, P14 & T15 CPT-P6	Area 3
Club House & facilities in southwestern part of site		Rock not met to RL 215 m	Soil to 50 m depth	Foundation on Soil at 3, 6 & 9 depth (RL 256, 253 & 250 m)	BH-P8 to P11 & P16 CPT-P1 & P5	Area 4

A connecting beam interconnecting isolated foundations (if planned) should be provided at foundation level to restrict the potential for differential settlement.

We suggest the following schemes for the proposed multi-storeyed buildings:

Planned	Type of foundation	Likely Foundation Bearing Material	Depth, m
Tower-A	Isolated footing with connecting beams / Raft foundation	Soil/Rock	30-32 m depth (RL 233.28) below EGL
Tower-B	Isolated footing with connecting beams/Raft	Soil	28 m depth (RL 233.28) below EGL
Tower-C	Isolated footing with connecting beams/Raft	Soil	23 m depth (RL 233.28) below EGL

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Structure Planned	Type of foundation	Likely Foundation Bearing Material	Depth, m
Tower-D	Isolated footing with connecting beams/Raft	Soil	27 m depth (RL 233.28) below EGL
Tower-E	Isolated footing with connecting beams/Raft	Soil	27 m depth (RL 233.28) below EGL
Club Houses	Isolated footing with connecting beams / Raft Foundation	Soil	3.0-9.0 m depth below EGL
Boundary Wall	Isolated footing with connecting beams	Soil	1.5 & 2.5 m below EGL

Our recommended value for net and gross bearing pressure is given here in Section 6.7 to 6.12.

4.5 Concepts of Analysis

4.5.1 Concepts for Analysis on soil

Bearing capacity analysis for isolated / raft foundations has been done in general accordance with IS: 6403-1981.The bearing capacity equation used is as follows:

$$q_{net\,safe} = \frac{1}{F}\left[cN_c\zeta_c\, d_c + q(N_q - 1)\,\zeta_q d_q + 0.5\,B\,\gamma\,N_\gamma\zeta_\gamma\, d_\gamma R_w\right]$$

where:

$q_{net\,safe}$ = safe net bearing capacity of soil based on the shear failure criterion.
q = overburden pressure
R_w = water table correction factor,
F = Factor of safety, taken as equal to 2.5 in accordance with IS: 1904-1986.
$\zeta_c, \zeta_q, \zeta_\gamma$ = Shape factors.
For Strip footings, $\zeta_c = \zeta_q = \zeta_\gamma = 1$
For Square footing, $\zeta_c = 1.3$, $\zeta_q = 1.2$, $\zeta_\gamma = 0.8$
d_c, d_q, d_γ = Depth factors
For $\phi \leq 10$, $d_c = 1 + 0.2 \tan(45 + \phi/2)\, D/B$, $d_q = d_\gamma = 1$
For $\phi > 10$, $d_q = d_\gamma = 1 + 0.1 \tan(45 + \phi/2)\, D/B$

Appropriate values have been substituted into the bearing capacity equation given above to compute the safe net bearing capacity. The values have been checked to determine the settlement of the foundation under the safe bearing pressure. The allowable bearing pressure has been taken as the lower of the two values computed from the bearing capacity shear failure criterion as well as that computed from the tolerable settlement criterion.

Settlement for foundations bearing on soil has been computed as the sum of immediate and consolidation settlement. Since, weathered rock is encountered at 4.5-7.5 m depth and high SPT values are met below the foundation level, therefore consolidation settlement is expected to be negligible.

The immediate settlement has been computed using the following equation [Clause 9.2.3 of IS 8009 Part 1-1976 RA 2003[9].

$$S = \frac{qB'(1-\mu^2)}{E} I_d d_r$$

[9] Bowles, J.E. (1996),"***Foundation Analysis and Design***", The McGraw Hill Companies Inc., International Edition, pp. 303-317.

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where:

S_i	=	immediate (elastic) settlement
B	=	foundation width, $B' = B/2$
μ	=	Poisson's ratio
q	=	applied bearing pressure
E	=	modulus of elasticity
d_f	=	depth factor
d_r	=	rigidity factor
I	=	influence factor at corner of rectangular loaded area (B'x L')

4.5.2 Foundations on Rock

Analysis for allowable bearing capacity on rock has been done using the following methods:

(i) Presumptive values as published in IS: 12070
(ii) Based on rock mass rating (RMR values) as per IS:12070.
(iii) Using Bearing Capacity Factors, as given in "*Foundation on Rock*" by Duncan C.Wyllie (1992)

- **Presumptive Values:**

The classification of rock mass for assessing safe bearing pressure based on rock type is as follows:

Material	q_{ns} (T/m^2)
Bedded limestone in sound condition	400
Sedimentary rock, including hard shales and sandstones	250
Soft or broken bed rock (excluding shale), and soft limestone	100
Soft shale	30

Reduction factors are to be applied on the above presumptive values for saturation and orientation of joints.

- **Based on Rock Mass Rating (RMR)**

Analysis has been carried out using the RMR also known as Geo-mechanics classification [10] by considering classification parameters and their ratings. Depending upon the quality of rock as assessed from the RMR values, the net safe allowable bearing pressures are specified in IS: 12070.

- **Using Bearing Capacity Factors (Duncan C. SWyllie[11])**

Based on our evaluation of rock characteristics, parameters may be selected for foundation analysis by using following equation.

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$$Q_{all} = c\,N_c C_c + 0.5\,B\gamma\,N_\gamma C_\gamma + \gamma D\,N_q$$

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(10) Bieniawaski, Z.T (1989)"**Engineering Rock Mass Classifications**", A Complete Manual for Engineers and Geologists in Mining, Civil & Petroleum Engineering, John Wiley Publication, New York
(11) Duncan C.Wyllie (1992) "**Foundation on Rock**" by E&FN SPON(An imprint of Chapman & Hall) pp.114

where:

c	=	cohesion intercept
ϕ	=	angle of internal friction of the rock mass
B	=	width of foundation
D	=	depth of foundation
Υ	=	effective unit weight of rock
C_γ, C_γ	=	correction factors for foundation shape
C_c	=	1.20 for circular foundation
	=	1.25 for square foundation
C_γ	=	0.70 for circular foundation
	=	0.85 for square foundation
N_c, N_q, N_γ	=	bearing capacity factors which are a function of ϕ.

The bearing capacity factors may be calculated using the following equations:

$N_c = 2 N_q^{0.5} (N_q + 1)$
$N_\gamma = N_q^{0.5} (N_q^2 - 1)$
$Nq = N_q^2$
$N_q = \tan^2(45 + \phi/2)$

The net safe bearing capacity may be worked out using the following equation:

$$q_{ns} = \frac{1}{F}[q_{ult} - \Upsilon D]$$

where:

q_{ns} = *net safe bearing capacity*
F = *factor of safety (taken as 3.0)*

4.6 Tower A

This tower is located in Area partly in Area 1 and partly in Area 2. The northern part of the tower is in Area 1, where the rock was encountered at RL 240 to 234 m. For founding level at RL 233.275 m, foundations in the northern part are expected to bear on rock. In the southern part which falls in Area 2, the rock level ranges from RL 234 to 215 m. For founding level at RL 233.275 m, the soil cover below the foundation in the southern part of Tower A may range from 1 to 18 m.

4.6.1 Design Profile

The design parameters for foundations on rock in the northern part of Tower A are as follows:

Analysis Case	Design Parameters
Depth	Foundation Depth = 30.0 m (RL 233.275 m)
Presumptive Value	q_s = 230 T/m^2 c_{sub} = 0.60 c_s = 0.60 c_c = 1.00
RMR	RMR = 35
Bearing Capacity Factors	c = 18 T/m^2 ϕ = 23°

Design Parameters for southern Tower A have been prepared for two cases:

Best Case : Soil thickness above rock = 1 m
Worst Case : Soil thickness above rock = 18 m

The parameters selected for Tower-A based on field and laboratory test results are given below:

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Case	Depth below EGL, m		Soil Classification	Average N-Value	c, T/m^2	ϕ, degrees	γ, T/m^3	E, T/m^2
	From	To						
Best Case (BH-T-7)	0.0	5.0	Sandy silt	18	8.0	4.0	1.80	1000
	5.0	15.0		37	14.0	5.0	1.86	1900
	15.0	25.0		59	22.0	5.0	1.91	3000
	25.0	33.0		84	24.0	5.0	2.02	4500
	33.0	50.0	Quartzite rock	Ref	0.0	35.0	2.20	12000
Worst Case (BH-T-9)	0.0	5.0	Sandy silt	9	5.0	4	1.76	650
	5.0	15.0		35	14.0	5	1.84	2000
	15.0	28.0		52	19.0	5	1.92	2700
	28.0	38.0		73	22.0	5	1.99	5000
	38.0	50.0		66	25.0	5	2.03	7000

where:

γ	=	bulk density
c	=	cohesion intercept
ϕ	=	angle of internal friction
E	=	Modulus of Elasticity

4.6.2 Computed Net and Gross Bearing Pressures

To assess the settlement between foundations on different bearing materials and different thickness of compressible stratum above rock, analysis has been done for the best-case scenario and worst-case scenario. For the purpose of analysis,

- The best case has been taken for BH-T7 where rock is met at 33.0 m (RL 232.27 m)
- The worst-case has been done for BH-T9 where rock is not met to 50.0 m (RL 214.12 m)

For foundations of Tower-A bearing at 32 m depth (RL 233.28 m), results are summarized below:

Case	Foundation Type	Foundation Embedment Depth, m	Net Allowable Bearing Pressure, T/m^2	Likely Foundation Bearing Material	Total settlement, mm
Worst case	Isolated Foundation*	32.0 (RL 233.28)	45.0	Soil	11.1
Best case				Soil	3.5
Worst case	Raft Foundation			Soil	49.4
Best case				Soil	3.1

* Including extended basement

Our recommended net and gross bearing pressures for isolated foundations with connecting beams and raft foundations in Tower A are presented below:

- **Foundation on Rock**

Foundation Type	Foundation Embed-ment Depth, m	RL of Founda tion, m	Likely Foundation Bearing Material	Recommended Net Allowable Bearing Pressure, T/m^2	Recommended Gross Allowable Bearing Pressure, T/m^2	Estimated Settlement, mm	Modulus of Subgrade Reaction*, k, kN/m^3
Isolated Foundation including extended basement	30.0	233.28	Rock	80.0	-	< 12	66000
Raft Foundation	30.0	233.28	Rock	80.0	93.2	< 12	66000

* Modulus of subgrade reaction = Vertical spring constant of soil

- **Foundation on Soil**

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Foundation Type	Foundation Embedment Depth, m	RL of Foundation, m	Likely Foundation Bearing Material	Recommended Net Allowable Bearing Pressure, T/m²			Recommended Gross Allowable Bearing Pressure, T/m²			Estimated Settlement, mm	Modulus of Subgrade Reaction*, k, kN/m³
				Settlement, mm			Settlement, mm				
				50	75	125	50	75	125		
Isolated Foundation including extended basement	32.0	233.28	Soil	45.0	-	-	-	-	-	3.5-11.1	9000
Raft Foundation	32.0	233.28		45.0	67.5	99.8#	68.4	90.9	123.7#	3.1-49.4	9000

* Modulus of subgrade reaction = Vertical spring constant of soil # Restricted in shear criterion

As given in the above table, settlement of foundations on rock is expected to be less than 12 mm, more likely to be on the order of 4 to 8 mm. Foundations on soil may experience substantial settlement. Foundations may experience different magnitudes of settlement depending on the thickness of the soil cover over the rock.

As per IS: 1904:2021 and IS: 16700, the permissible differential settlement should be restricted to 1/500. We suggest that a finite element analysis using PLAXIS 3D or other suitable software be done to assess the differential settlements. If the analysis indicates that the tilt may exceed the permissible limit, the bearing pressures on the raft may be reduced suitably.

The following points are highlighted with regard to the above recommended net bearing pressures:

1. The above bearing pressures include a bearing capacity safety factor of 2.5 for soil and 3.0 for rock. The appropriate value of net bearing pressure may be selected based on the settlement criterion.
2. For isolated foundations, an interconnecting beam should be provided to restrict the potential for differential settlement.
3. The soils at foundation level should be compacted thoroughly using a heavy roller. It should be ensured that there are no loose pockets at foundation level.
4. Where rock is encountered at foundation grade, the exposed rock surface should be roughened, scarified and watered to ensure proper bond between rock and concrete.
5. For tall buildings (height exceeding 50 m), it is feasible to design the piled-raft foundation for higher settlement of up to 125 mm as per IS: 16700-2017. However, this requires the following:
   a. The maximum angular distortion of the raft should be less than 1/500.
   b. A detailed soil-structure interaction analysis by finite element method to ensure that the deflections and stresses are within permissible limits. We suggest using a suitable finite element analysis program such as PLAXIS [12].

(12) Ravi Sundaram, Sanjay Gupta, Sorabh Gupta (2019), ***"Foundationsfor Tall Buildings on Alluvial Deposits – Geotechnical Aspects"***, FRONTIERS IN GEOTECHNICAL ENGINEERING, MadhaviLatha (editor), Developments in Geotechnical Engineering, Springer Nature, Singapore, Chapter 18, pp. 369-384.

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c. It may also be backed up by a footing load test to assess the modulus of subgrade reaction of soil realistically.

6. The suggested modulus of sub grade reaction (k) has been estimated as the ratio of the computed net bearing pressure and corresponding total settlement, and is applicable at the centre of the loaded area[13].

7. As mentioned in IS: 16700-2017, raft foundations should be instrumented for long term monitoring of pressures and displacements.

i. At least 5 points on the raft should have pressure measuring sensors and/or strain gauges.

ii. Permanent settlement markers (preferably at corners and centre) should be provided at raft top level and referenced to a permanent stable benchmark.

iii. Settlement monitoring should continue till end of construction and preferably for 2-3 years after construction.

4.7 Tower B

This tower is located in Area in Area 2. In this area the rock was encountered at RL 215 to 195 m. For founding level at RL 233.275 m, the soil cover below the foundation in the southern part of Tower B may range from 18 to 31 m. As per our assessment, since the thickness of the soil cover below foundation level is more than 18 m, the differential settlement due to different thicknesses of soil at different locations is expected to be small. For the purpose of analysis, we have considered the rock level at 31 m depth below the planned founding level.

4.7.1 Design Profile

The parameters selected for Tower-B based on field and laboratory test results are given below:

Structure	Depth below GL, m		Soil Classification	c, T/m^2	ϕ, degrees	γ, T/m^3	E, T/m^2
	From	To					
Tower-B	0.0	5.0	Sandy silt	9.0	4.0	1.75	1200
	5.0	15.0		12.0	5.0	1.85	3000
	15.0	26.0		17.0	6.0	1.92	4800
	26.0	40.0		20.0	7.0	1.97	6700
	40.0	59.0		22.0	7.0	2.02	9000
	59.0	75.0	Quartzite rock	0.0	35.0	2.10	12000

where:

γ = bulk density
c = cohesion intercept
ϕ = angle of internal friction
E = *Modulus of Elasticity*

4.7.2 Computed Net and Gross Bearing Pressures

Our recommended net and gross bearing pressures for isolated foundations with connecting beams and raft foundations in Tower B are presented below:

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[13] Bowles, J.E. (1996), ***"Foundation Analysis and Design Fifth Edition"***, The McGraw-Hill Companies Inc., pp. 503

Foundation Type	Foundation Embedment Depth, m	RL of Foundation, m	Likely Foundation Bearing Material	Recommended Net Allowable Bearing Pressure, T/m²			Recommended Gross Allowable Bearing Pressure, T/m²			Modulus of Subgrade Reaction*, k, kN/m³
				Settlement, mm			Settlement, mm			
				50	75	125	50	75	125	
Isolated Foundation incl. extended basement	28.0	233.28	Soil	44.0	-	-	-	-	-	8800
Raft Foundation	28.0	233.28		44.0	66.0	97.2#	67.4	89.4	120.9#	8800

* Modulus of subgrade reaction = Vertical spring constant of soil # Restricted in shear criterion

Since the soil thickness below the foundation is significant, the differential settlement due to varying depth of rock may be small. However, we suggest that a finite element analysis using PLAXIS 3D or other suitable software be done to assess the differential settlements. If the analysis indicates that the tilt may exceed the permissible limit, the bearing pressures on the raft may be reduced suitably.

The following points are highlighted with regard to the above recommended net bearing pressures:

1 The above bearing pressures include a bearing capacity safety factor of 2.5. The appropriate value of net bearing pressure may be selected based on the settlement criterion.

2 For isolated foundations, an interconnecting beam should be provided to restrict the potential for differential settlement.

3 The soils at foundation level should be compacted thoroughly using a heavy roller. It should be ensured that there are no loose pockets at foundation level.

4 Where rock is encountered at foundation grade, the exposed rock surface should be roughened, scarified and watered to ensure proper bond between rock and concrete.

5 For tall buildings (height exceeding 50 m), it is feasible to design the piled-raft foundation for higher settlement of up to 125 mm as per IS: 16700-2017. However, this requires the following:

a. The maximum angular distortion of the raft should be less than 1/500.

b. A detailed soil-structure interaction analysis by finite element method to ensure that the deflections and stresses are within permissible limits. We suggest using a suitable finite element analysis program such as PLAXIS [11].

c. It may also be backed up by a footing load test to assess the modulus of subgrade reaction of soil realistically.

6 The suggested modulus of sub grade reaction (k) has been estimated as the ratio of the computed net bearing pressure and corresponding total settlement, and is applicable at the centre of the loaded area[12].

7 As mentioned in IS: 16700-2017, raft foundations should be instrumented for long term monitoring of pressures and displacements.

i. At least 5 points on the raft should have pressure measuring sensors and/or strain gauges.

ii. Permanent settlement markers (preferably at corners and centre) should be provided at raft top level and referenced to a permanent stable benchmark.

iii. Settlement monitoring should continue till end of construction and preferably for 2-3 years after construction.

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4.8 Tower C

This tower is located in partly in Area-3 and partly in Area-4. In this area the rock was encountered at RL 195 to 162 m. For founding level at RL 233.275 m, the soil cover below the foundation in the southern part of Tower C (Area 3) may range from 31 to 79 m. In the western part (Area 4), rock is not encountered to 100 m depth.

Since the depth to rock at this tower location is expected to range from 31 to more than 100 m below the planned founding level, the differential settlement is likely to be small and may not be a matter of concern. However, finite element analysis should be done to model the ground and assess the differential settlement. For the purpose of analysis, the design profile is based on the depth to rock in Area 3.

4.8.1 Design Profile

The parameters selected for Tower-C based on field and laboratory test data are given below:

Structure	Depth below GL, m		Soil Classification	c, T/m^2	ϕ, degrees	γ, T/m^3	E, T/m^2
	From	To					
Tower-C	0.0	10.0	Sandy silt	10.0	5.0	1.75	1800
	10.0	25.0		15.0	6.0	1.80	4000
	25.0	35.0		20.0	7.0	1.85	6000
	35.0	55.0		22.0	7.0	1.91	7700
	55.0	79.0		23.0	8.0	1.98	9000
	79.0	100.0	Quartzite rock	0.0	35.0	2.04	10000

where:

γ	=	bulk density
c	=	cohesion intercept
ϕ	=	angle of internal friction
E	=	Modulus of Elasticity

4.8.2 Computed Net and Gross Bearing Pressures

Our recommended net and gross bearing pressures for isolated foundations with connecting beams and raft foundations In Tower C are presented below:

Foundation Type	Foundation Embedment Depth, m	RL of Foundation, m	Likely Foundation Bearing Material	Recommended Net Allowable Bearing Pressure, T/m^2			Recommended Gross Allowable Bearing Pressure, T/m^2			Modulus of Subgrade Reaction*, k, kN/m^3
				Settlement, mm			Settlement, mm			
				50	75	125	50	75	125	
Isolated Foundation incl. extended basement	23.0	233.28	Soil	36.0	-	-	-	-	-	7200
Raft Foundation	23.0	233.28		36.0	54.0	90.0	58.8	76.8	112.8	7200

* Modulus of subgrade reaction = Vertical spring constant of soil

The following points are highlighted with regard to the above recommended net bearing pressures:

1 The above bearing pressures include a bearing capacity safety factor of 2.5. The appropriate value of net bearing pressure may be selected based on the settlement criterion.

2 For isolated foundations, an interconnecting beam should be provided to restrict the potential for differential settlement.

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3 The soils at foundation level should be compacted thoroughly using a heavy roller. It should be ensured that there are no loose pockets at foundation level.

4 Where rock is encountered at foundation grade, the exposed rock surface should be roughened, scarified and watered to ensure proper bond between rock and concrete.

5 For tall buildings (height exceeding 50 m), it is feasible to design the piled-raft foundation for higher settlement of up to 125 mm as per IS: 16700-2017. However, this requires the following:

a. The maximum angular distortion of the raft should be less than 1/500.

b. A detailed soil-structure interaction analysis by finite element method to ensure that the deflections and stresses are within permissible limits. We suggest using a suitable finite element analysis program such as PLAXIS [11].

c. It may also be backed up by a footing load test to assess the modulus of subgrade reaction of soil realistically.

6 The suggested modulus of sub grade reaction (k) has been estimated as the ratio of the computed net bearing pressure and corresponding total settlement, and is applicable at the centre of the loaded area [12].

7 As mentioned in IS: 16700-2017, raft foundations should be instrumented for long term monitoring of pressures and displacements.

i. At least 5 points on the raft should have pressure measuring sensors and/or strain gauges.

ii. Permanent settlement markers (preferably at corners and centre) should be provided at raft top level and referenced to a permanent stable benchmark.

iii. Settlement monitoring should continue till end of construction and preferably for 2-3 years after construction.

4.9 Tower D

This tower is located in Area 4. In this area the rock was not met to RL 160 m. Therefore analysis has been done considering soil strata only.

4.9.1 Design Profile

The parameters selected for Tower-D based on field and laboratory test data are given below:

Structure	Depth below GL, m		Soil Classification	c, T/m^2	ϕ, degrees	γ, T/m^3	E, T/m^2
	From	To					
Tower-D	0.0	5.0	Sandy silt	8.0	4.0	1.75	1100
	5.0	15.0		15.0	5.0	1.82	3000
	15.0	30.0		20.0	7.0	1.87	5000
	30.0	50.0		22.0	7.0	1.95	7500
	50.0	70.0		24.0	8.0	2.03	9000
	70.0	100.0		25.0	9.0	2.07	12000

where:

γ = bulk density
c = cohesion intercept
ϕ = angle of internal friction
E = Modulus of Elasticity

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4.9.2 Computed Net and Gross Bearing Pressures

Our recommended net and gross bearing pressures for isolated foundations with connecting beams and raft foundations in Tower D are presented below:

Foundation Type	Foundation Embedment Depth, m	RL of Foundation, m	Likely Foundation Bearing Material	Recommended Net Allowable Bearing Pressure, T/m²			Recommended Gross Allowable Bearing Pressure, T/m²			Modulus of Subgrade Reaction*, k, kN/m³
				Settlement, mm			Settlement, mm			
				50	75	125	50	75	125	
Isolated Foundation inc. extended basement	27.0	233.28	Soil	42.0	-	-	-	-	-	8400
Raft Foundation	27.0	233.28		42.0	63.0	96.7#	64.4	85.4	119.1#	8400

* Modulus of subgrade reaction = Vertical spring constant of soil # Restricted in shear criterion

The following points are highlighted with regard to the above recommended net bearing pressures:

1 The above bearing pressures include a bearing capacity safety factor of 2.5. The appropriate value of net bearing pressure may be selected based on the settlement criterion.

2 For isolated foundations, an interconnecting beam should be provided to restrict the potential for differential settlement.

3 The soils at foundation level should be compacted thoroughly using a heavy roller. It should be ensured that there are no loose pockets at foundation level.

4 Where rock is encountered at foundation grade, the exposed rock surface should be roughened, scarified and watered to ensure proper bond between rock and concrete.

5 For tall buildings (height exceeding 50 m), it is feasible to design the piled-raft foundation for higher settlement of up to 125 mm as per IS: 16700-2017. However, this requires the following:

a. The maximum angular distortion of the raft should be less than 1/500.

b. A detailed soil-structure interaction analysis by finite element method to ensure that the deflections and stresses are within permissible limits. We suggest using a suitable finite element analysis program such as PLAXIS [11].

c. It may also be backed up by a footing load test to assess the modulus of subgrade reaction of soil realistically.

6 The suggested modulus of sub grade reaction (k) has been estimated as the ratio of the computed net bearing pressure and corresponding total settlement, and is applicable at the centre of the loaded area[12].

7 As mentioned in IS: 16700-2017, raft foundations should be instrumented for long term monitoring of pressures and displacements.

i. At least 5 points on the raft should have pressure measuring sensors and/or strain gauges.

ii. Permanent settlement markers (preferably at corners and centre) should be provided at raft top level and referenced to a permanent stable benchmark.

iii. Settlement monitoring should continue till end of construction and preferably for 2-3 years after construction.

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4.10 Tower E

This tower is located in Area 4. In this area the rock was not met to RL 159 m. Therefore analysis has been done considering soil strata only.

4.10.1 Design Profile

The parameters selected for Tower-E based on field and laboratory test data are given below:

Structure	Depth below GL, m		Soil Classification	c, T/m^2	ϕ, degrees	γ, T/m^3	E, T/m^2
	From	To					
Tower-E	0.0	6.0	Sandy silt	9.0	4.0	1.78	1700
	6.0	15.0		13.0	5.0	1.85	3500
	15.0	35.0		20.0	7.0	1.94	5000
	35.0	55.0		22.0	7.0	2.00	7500
	55.0	75.0		24.0	8.0	2.03	9000
	75.0	100.0		25.0	8.0	2.07	12000

where:

γ	=	bulk density
c	=	cohesion intercept
ϕ	=	angle of internal friction
E	=	Modulus of Elasticity

4.10.2 Computed Net and Gross Bearing Pressures

Our recommended net and gross bearing pressures for isolated foundations with connecting beams and raft foundations in Tower E are presented below:

Foundation Type	Foundation Embedment Depth, m	RL of Foundation, m	Likely Foundation Bearing Material	Recommended Net Allowable Bearing Pressure, T/m^2			Recommended Gross Allowable Bearing Pressure, T/m^2			Modulus of Subgrade Reaction*, k, kN/m^3
				Settlement, mm			Settlement, mm			
				50	75	125	50	75	125	
Isolated Foundation including extended basement	27.0	233.28	Soil	40.0	-	-	-	-	-	8000
Raft Foundation	27.0	233.28		40.0	60.0	97.1#	63.2	83.2	120.4#	8000

* Modulus of subgrade reaction = Vertical spring constant of soil # Restricted in shear criterion

The following points are highlighted with regard to the above recommended net bearing pressures:

1 The above bearing pressures include a bearing capacity safety factor of 2.5 for soil. The appropriate value of net bearing pressure may be selected based on the settlement criterion.

2 For isolated foundations, an interconnecting beam should be provided to restrict the potential for differential settlement.

3 The soils at foundation level should be compacted thoroughly using a heavy roller. It should be ensured that there are no loose pockets at foundation level.

4 Where rock is encountered at foundation grade, the exposed rock surface should be roughened, scarified and watered to ensure proper bond between rock and concrete.

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5 For tall buildings (height exceeding 50 m), it is feasible to design the piled-raft foundation for higher settlement of up to 125 mm as per IS: 16700-2017. However, this requires the following:

a. The maximum angular distortion of the raft should be less than 1/500.

b. A detailed soil-structure interaction analysis by finite element method to ensure that the deflections and stresses are within permissible limits. We suggest using a suitable finite element analysis program such as PLAXIS [11].

c. It may also be backed up by a footing load test to assess the modulus of subgrade reaction of soil realistically.

6 The suggested modulus of sub grade reaction (k) has been estimated as the ratio of the computed net bearing pressure and corresponding total settlement, and is applicable at the centre of the loaded area[12].

7 As mentioned in IS: 16700-2017, raft foundations should be instrumented for long term monitoring of pressures and displacements.

i. At least 5 points on the raft should have pressure measuring sensors and/or strain gauges.

ii. Permanent settlement markers (preferably at corners and centre) should be provided at raft top level and referenced to a permanent stable benchmark.

iii. Settlement monitoring should continue till end of construction and preferably for 2-3 years after construction.

4.11 Minor Facilities

Boundary wall and club house facilities are planned for the proposed structure. We understand that shallow foundations are planned for these minor facilities.

4.11.1 Design Profile

The parameters selected based on field and laboratory test data are given below:

Structure	Depth below GL, m		Soil Classification	c, T/m^2	ϕ, degrees	γ, T/m^3	E, T/m^2
	From	To					
Boundary wall	0.0	2.0	Sandy silt	8.0	4.0	1.75	800
	2.0	7.0		11.0	4.0	1.80	1500
	7.0	13.0		13.0	5.0	1.85	2200
	13.0	20.0		16.0	5.0	1.90	2800
Club house	0.0	4.0	Sandy silt	9.0	4.0	1.75	1000
	4.0	11.0		13.0	5.0	1.81	1500
	11.0	16.0		15.0	5.0	1.86	2200
	16.0	25.0		17.0	6.0	1.90	3500
	25.0	30.0		19.0	6.0	1.94	4500

where:

γ = bulk density
c = cohesion intercept
ϕ = angle of internal friction
E = Modulus of Elasticity

4.11.2 Isolated/Raft Foundations for Club Houses and Boundary wall

Isolated foundations / strip may be provided for boundary wall / Club Houses and other minor facilities. We recommend a minimum foundation embedment depth of 1.5 m for boundary wall and 3.0 m for Club Houses.

The following tables present our recommended values of net allowable bearing pressures for isolated foundations for boundary wall / Club Houses and other minor facilities:

Structure Type	Foundation Type	Foundation Embedment Depth below EGL, m	Recommended Net Allowable Bearing Pressure, T/m^2	Estimated Modulus of Subgrade Reaction, k, kN/m^3
Boundary Wall	Isolated Foundations	1.5	10.0	2000
		2.5	13.0	2600
Club Houses	Isolated Foundation	3.0	20.0	4000
		6.0	22.0	4400
		9.0	24.0	4800
	Raft Foundation	3.0	22.0	4400
		6.0	24.0	4800
		9.0	26.0	5200

The following points are highlighted with regard to the above recommended net bearing pressures:

1 The above bearing pressures include a bearing capacity safety factor of 2.5. Total settlement of foundations designed for the above values of net bearing pressure is expected to be about 50 mm.

2 Net bearing pressures for foundations at intermediate depths may be interpolated linearly between the values given above.

3 The soils at foundation level should be compacted thoroughly using a heavy roller. It should be ensured that there are no loose pockets at foundation level.

4 The suggested modulus of sub grade reaction (k) has been estimated as the ratio of the computed net bearing pressure and corresponding total settlement, and is applicable at the centre of the loaded area[12].

4.12 Definition of Gross and Net Bearing Pressure

For the purposes of this report, the net allowable bearing pressure should be calculated as the difference between total load on the foundation and the weight of the soil overlying the foundation divided by the effective area of the foundation. The gross bearing pressure is the total pressure at the foundation level including overburden pressure and surcharge load. The following equations may be used:

$$q_{net} = [(P_s + W_f + W_s) / A_f] - S_v$$
$$q_{gross} = q_{net} + S_v = (P_s + W_f + W_s) / A_f$$

where:

q_{net} = net allowable bearing pressure
q_{gross} = gross bearing pressure
P_s = superimposed static load on foundation
W_f = weight of foundation
W_s = weight of soil overlying foundation
A_f = effective area of foundation
S_v = overburden pressure at foundation level prior to excavation for foundation.

It may please be noted that safe bearing pressures recommended in this report refer to **"net values"**. The gross bearing pressure may be computed by adding the overburden pressure to the net bearing pressure. The advantage of this gross bearing pressure may be taken while designing basements. Fill placed above EGL should be treated as a surcharge load.

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4.13 Basement Design

The basement should be designed to resist lateral earth pressure as well as hydrostatic pressure. Groundwater was not met at till the final exploration depth of 103 at the time of our field investigation (January-March, 2023). However, a localized perched water table was met at BH-T-11A, T-14 & T-25 at 46-56 m depth

For the worst condition, we suggest that a 1-m head of water be considered in the design for the worst condition to account for seepage from external sources and leaking water pipes. The basement floor slab should be checked to ensure that it can resist the consequent hydrostatic uplift with an adequate factor of safety. The basement retaining wall should be designed to resist horizontal earth pressure as well as hydrostatic pressure.

We suggest the following preliminary values of coefficients of lateral earth pressure for design of basement retaining walls:

Depth, m		Reduced Level, m		ϕ, degrees	k_a	k_p	k_o
From	To	From	To				
0.0	5.0	261.0	256.0	30	0.33	3.00	0.50
5.0	15.0	256.0	246.0	31	0.32	3.12	0.48
15.0	25.0	246.0	236.0	32	0.31	3.25	0.47
25.0	30.0	236.0	231.0	33	0.29	3.39	0.46

where:

k_a = Co-efficient of active earth pressure
k_p = Co-efficient of passive earth pressure
k_o = Co-efficient of earth pressure at rest

A suitable safety factor should be applied on the passive earth pressures in the design of the wall.

5.0 FOUNDATION CONSTRUCTION CONSIDERATIONS

5.1 Excavation

Temporary open cut excavations to about 26~30 m depth through soil may be cut using the following side slopes:

0-6 m depth : 1-vertical on 0.1 to 0.2 horizontal with 1.5 m wide horizontal berms at 3 and 6 m depths
6-12 m depth : 1-vertical on 0.4 to 0.6 horizontal with 1.5 m wide horizontal berms at 9 & 12 m depths
12-20 m depth: 1-vertical on 0.5 to 0.7 horizontal with 1.5 m wide horizontal berms at 16 & 20 m depths
20-24 m depth: 1-vertical on 0.4 to 0.6 horizontal with 1.0 m wide horizontal berm at 24 m depth
24-32 m depth: 1-vertical on 0.2 to 0.3 horizontal with 1.0 m wide horizontal berm at 28 m depth

In north-eastern part of Tower A, rock may be encountered at founding level. Excavation through the fractured rock formation may be cut nearly vertically using jack hammers or rock breakers or using a JCB (or equivalent) excavator. Any soft zones or loose wedges of rock should be removed for safety purpose. We anticipate that most excavations through rock can be completed mechanically without the need of blasting. If localized zones of hard rock are met, controlled blasting may be done, if required.

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If sufficient space is not available for sloped excavation, consideration may be given to provision of diaphragm walls, multi-stage sheet piles or contiguous piles as a temporary / permanent earth retention system for excavation. Special care should be taken to ensure that adjacent structures beyond the excavation line are not affected by the deep excavation.

If excessive sloughing or caving is observed, the slopes may be flattened further to ensure stability. The engineer should monitor the excavation of slopes.

5.2 Foundation Level Preparation

The area shall be excavated up to the foundation level. All loose soils should be removed and the exposed foundation bearing surface should be watered and compacted properly using rammers / rollers.

In case of rock area shall be excavated up to the foundation level for foundations on rock, all loose, weathered or fragmented rock should be removed so that foundations may bear on the natural undisturbed rock formation. The rock surface should be roughened, scarified and watered thoroughly to ensure proper bond between rock and concrete.

In case mechanical means like excavators are deployed for excavation for foundations bearing on soil, the excavation should be carried out up to 0.5 m above the proposed level. The last 0.5 m depth of excavation should be carried out manually, so that the founding soils are not disturbed / loosened.

The surface should be protected from disturbances due to construction activities so that the foundations may bear on the natural undisturbed ground. We recommend the placement of a 75 to 100 mm thick "blinding layer" of lean concrete to facilitate placement of reinforcing steel and to protect the soils from disturbance.

5.3 Chemical Attack

Results of chemical test on selected soil samples are presented on Plate 198 & 200. The results indicate that the soils contain 0.09-0.15 percent sulphates and 0.02-0.09 percent chlorides.The pH value of soil is 7.3-8.2.

IS: 456-2000 recommends that precautions should be taken against chemical degradation of concrete if

- sulphates content of the soils exceeds 0.2 percent, or
- groundwater contains more than 300 mg /litre of sulphates (SO_3).

Comparing the test results with these specified limits, the sulphate content of the soils is less than the specified limit in project area. The groundwater was not met to the final explored depth of 103 m depth. Sulphate in groundwater indicates marginal higher values than specified limit. Therefore, strata at project site may be treated in ***Class-1*** category as described on IS: 456-2000.

We recommend the following measures to limit the potential for chemical attack on foundation concrete:

i. Foundation concrete should contain minimum cement content of 280 kg/m^3 of cement.

ii. Water cement ratio in foundation concrete should not exceed 0.55.

iii. A clear concrete cover over the reinforcement steel of at least 50 mm should be provided for all foundations.

iv. Foundation concrete should be densified adequately using a vibrator so as to form a dense impervious mass.

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6.0 VARIABILITY IN SUBSURFACE CONDITIONS

Subsurface conditions encountered during construction may vary somewhat from the conditions encountered during the site investigation. In case significant variations are encountered during construction, we request to be notified so that our engineers may review the recommendations in this report in light of these variations.

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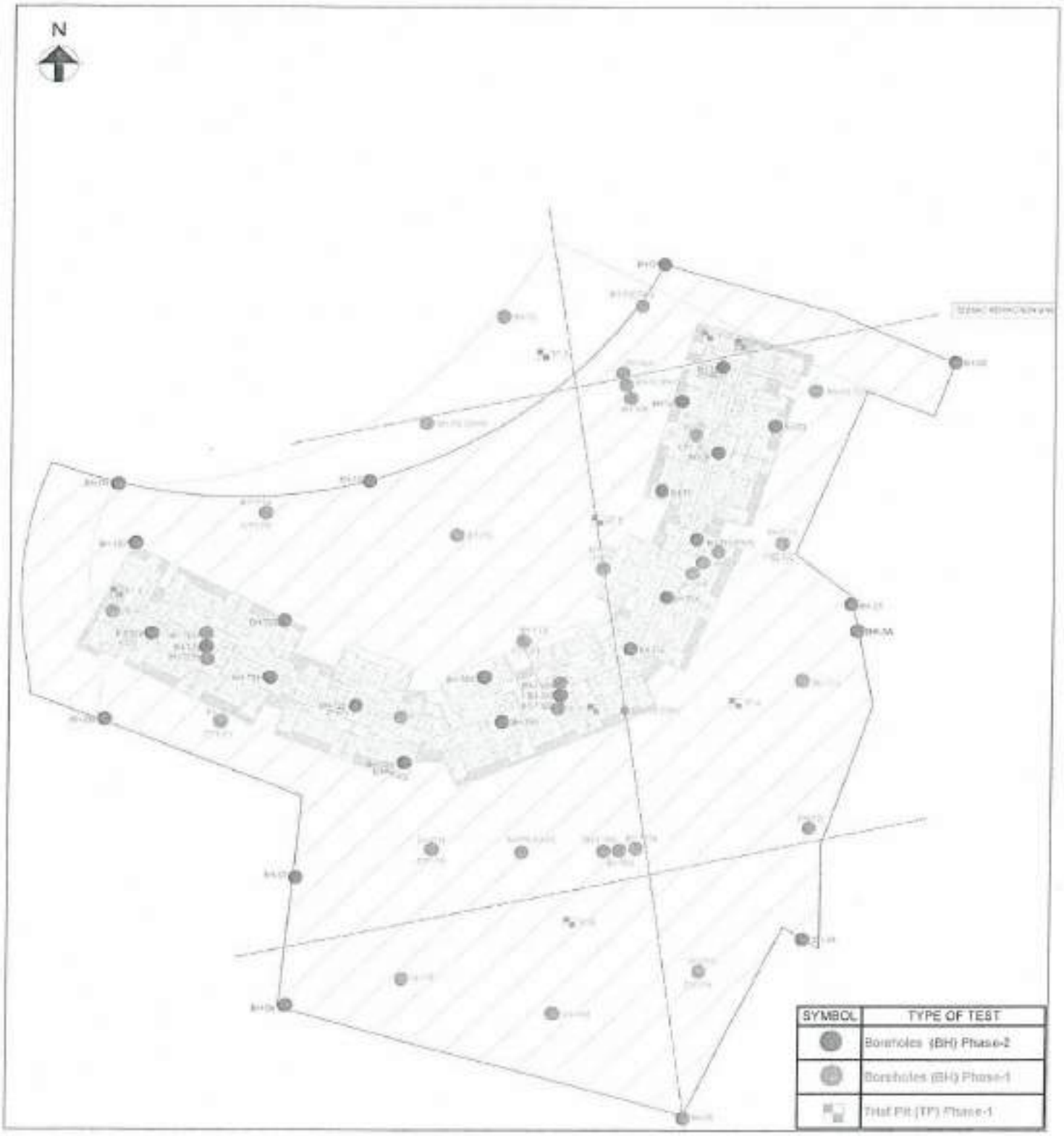

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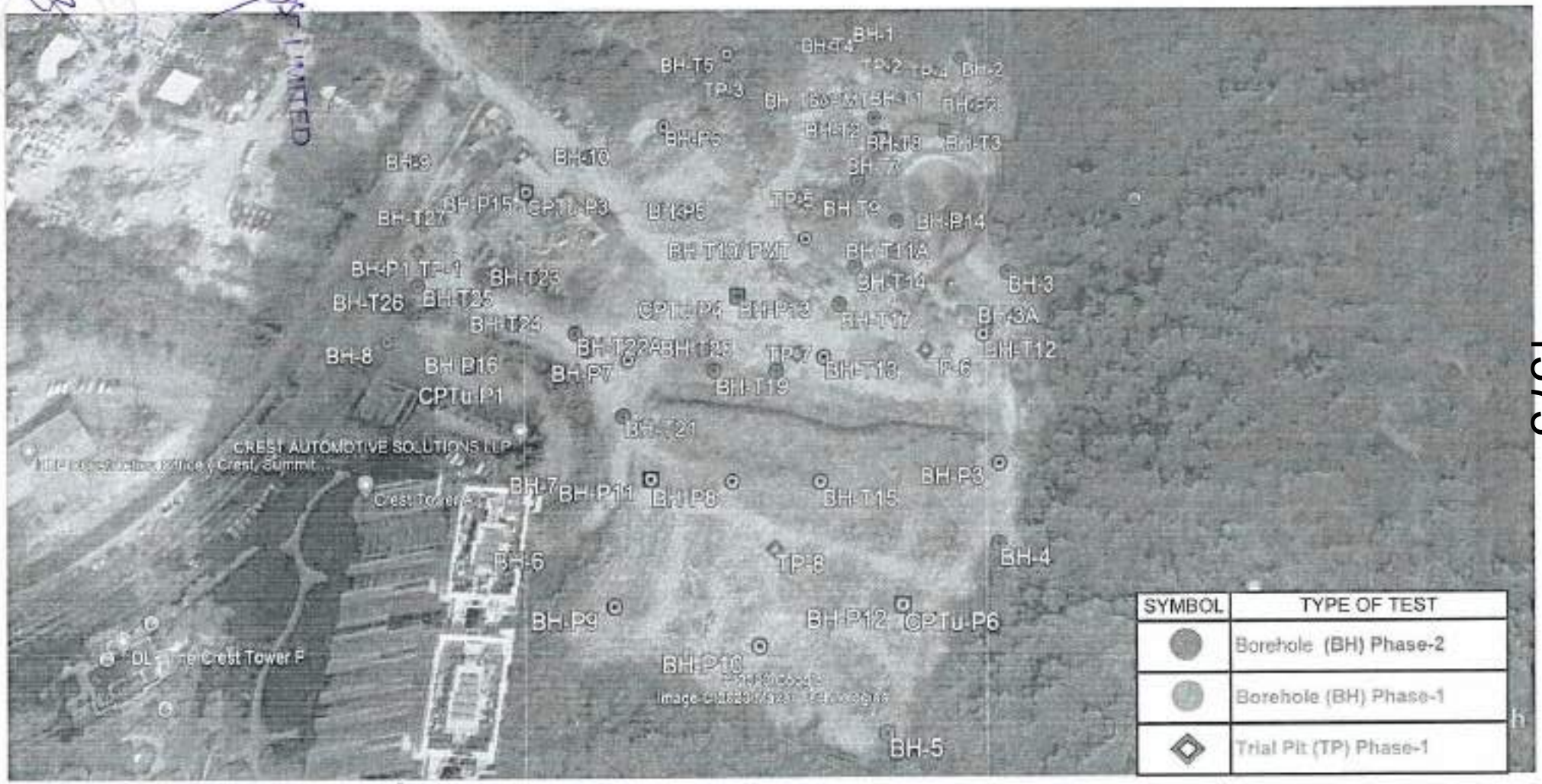
Plan of Field Investigation



- Satellite image taken from Google Earth®
- Test Locations marked as per GPS coordinates taken on site using hand-held Garmin ® device
- Accuracy of hand-held GPS device generally ranges from 4-6m, and varies depending on the availability of satellite connection at the site

Satellite Image of Site and Test Locations

1373

1184

ENVIRONMENTAL CLEARANCE

PARIVESH

(Pro-Active and Responsive Facilitation by Interactive, and Virtuous Environmental Single-Window Hub)

Government of India
Ministry of Environment, Forest and Climate Change
(Issued by the State Environment Impact Assessment Authority(SEIAA), Haryana)

To,

The Authorized Signatory
DLF LIMITED
At DLF Shopping Mall, 3rd Floor,Arjun Marg, DLF City, Phase-1, Gurugram, Haryana -122002

Subject: Grant of Environmental Clearance (EC) to the proposed Project Activity under the provision of EIA Notification 2006-regarding

Sir/Madam,

This is in reference to your application for Environmental Clearance (EC) in respect of project submitted to the SEIAA vide proposal number SIA/HR/MIS/76126/2022 dated 28 Apr 2022. The particulars of the environmental clearance granted to the project are as below.

1.	**EC Identification No.**	**EC22B039HR111216**
2.	**File No.**	SEIAA/HR/2022/181
3.	**Project Type**	New
4.	**Category**	B1
5.	**Project/Activity including Schedule No.**	8(b) Townships and Area Development projects.
6.	**Name of Project**	Proposed Group Housing Buildings in Zone 10, DLF 5, at Sector-54 Gurugram, Haryana by M/s DLF Ltd
7.	**Name of Company/Organization**	DLF LIMITED
8.	**Location of Project**	Haryana
9.	**TOR Date**	08 Apr 2022

The project details along with terms and conditions are appended herewith from page no 2 onwards.

(e-signed)
S. Narayanan, IFS
Member Secretary
SEIAA - (Haryana)

Date: 17/08/2022

Note: A valid environmental clearance shall be one that has EC identification number & E-Sign generated from PARIVESH.Please quote identification number in all future correspondence.

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For DLF LIMITED

Authorised Signatory

State Environment Impact Assessment Authority, Haryana,
Bays No.55-58, Prayatan Bhawan, Sector-2 Panchkula.

Tel: 0172-2565232, 4043956
E-mail Id: seiaa-21.env@hry.gov.in

Subject: **EC for Proposed Group Housing Buildings in Zone 10, DLF 5 at Sector 54, Gurgaon, Haryana by M/s DLF Limited.**

This has reference to your Proposal No. SIA/HR/MIS/76126/2022 dated 28.04.2022 and subsequent letter dated 09.07.2022 for seeking prior Environmental Clearance (EC) for the above project under the EIA Notification, 2006 along with submission of required Scrutiny Fee amounting of Rs. 2,00,000/- vide DD No. 520455 dated 09.03.2022 in compliance of Haryana Government, Environment & Climate Change Notification No. DE&CCH/3060 dated 14th October, 2021. The proposal has been appraised as per prescribed procedure in the light of provisions under the EIA Notification, 2006 on the basis of the mandatory documents enclosed with the application viz., Form-1, Form1-A, Conceptual Plan, EIA/EMP Report and additional clarifications furnished in response to the observations of the State Expert Appraisal Committee (SEAC) constituted by MoEF & CC, GoI vide their Notification dated 21.02.2022, in its meeting held on 08.07.2022 awarded **"Gold"** rating / grading to the Project.

2. It is inter-alia, noted that the project involves in Proposed Group Housing Buildings in Zone 10, DLF 5 at Sector 54, Gurgaon, Haryana.

3. The details of project are as under:

Table 1 Summary of Far

Sr. No.	Particulars		
1	Permissible FAR	32122149.73 sqm	A
2.	EC obtained till date for earlier project upto the ground housing (The CREST) falling in DLF5 as per plan submitted	1975616.401 sqm	B
3.	Balance FAR for (A-B)	1146524.33 sqm	C
4.	Proposed FAR for the Group Housing Zone-10, DLF5	143937.51 sqm	D
5.	Net Balance FAR (C-D)	1002586.82 sqm	E

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Table 2 – Basic Details

Sr. No.	Particulars	
1.	**Online Project Proposal Number**	**SIA/HR/MIS/76126/2022, Dated 28.04.2022**
2.	Latitude	28°26'44.55"N
3.	Longitude	77°06'48.93"E
4.	Plot Area	30,653.317m^2 (7.574 acres)
5.	Proposed Ground Coverage	6,369.381 m^2 (20.77%)
6.	Proposed FAR	1,43,937.510 m^2
7.	Non FAR Area	89,440.488 m^2
8.	Total Built Up area	2,33,377.998 m^2
9.	Total Green Area with Percentage	9,195.995 m^2 (30% plot area)
10.	Rain Water Harvesting Pits	8 Nos.
11.	STP Capacity	DLF-5 Common STP of 15 MLD
12.	Total Parking	1,615 ECS

13.	Organic Waste Converter		Total 1 nos. of Organic waste converters of capacity 1,500 Kg/day
14.	Maximum Height of the Building (till terrace)		109.350 m
15.	Power Requirement		5,874 KW (DHBVN)
16.	Power Backup		9 DG sets of total capacity 8,250 KVA (7×1,000 KVA + 2×625 KVA).
17.	Total Water Requirement		391 KLD
18.	Domestic Water Requirement		255 KLD
19.	Fresh Water Requirement		255 KLD
20.	Treated Water		136 KLD
21.	Waste Water Generated		294 KLD
22.	Solid Waste Generated		2,069 kg/day
23.	Biodegradable Waste		1,241 kg/day
24.	Number of Blocks		4 nos
25.	No. of Floors for Blocks		S+33
26.	Dwelling Units		520 nos
27.	Service personnel units		50 nos
28.	Basement		4 nos
29.	Community Building		1483.404 m^2
30.	Stories		S+33 Floors
31.	R+U Value of Material used (Glass)		U-Value: <2.8 W/m^2K SHGC: <0.60
32.	Total Cost of the project:	i) Land Cost	1,076 Cr.
		ii) Construction Cost	
33.	EMP Cost/Budget		3,130.09 Lakhs
34.	Incremental Load in respect of:	PM 2.5	0.00794 $\mu g/m^3$
		PM 10	0.00983$\mu g/m^3$
		SO_2	0.0994 $\mu g/m^3$
		NO_2	0.0631 $\mu g/m^3$
		CO	0.0000049 mg/m^3
35.	Construction Phase	Power Back-up	Temporary Connection
		Water Requirement & Source	DLF Water Tanks+ STP WATER (common STP Plan DLF Phase V)
		STP (Modular)	5 KLD
		Anti-Smoke Gun	1

Table 3 EMP

Total Project Cost: **107600** **Lakhs**

Total EMP Proposed Budget **3,130.09** **Lakhs**

During Construction Phase				During Operation Phase			
Description	**Capital Cost (In Lakhs)**	**Recurring Cost**		**Description**	**Capital Cost (in Lakhs)**	**Recurring Cost**	
		(In Lakhs for 3 Year)	**Per Annum**			**(In Lakhs for 10 Year)**	**Per Annum**
Sanitation and Wastewater Management	2	3	1	Solid Waste Management	27	30	3
Mobile STP	3	6	2	(Dust bins &			

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				OWC)			
Disinfection / pest control	0	3	1				
Dust Mitigation Measures Including site barricading, water sprinkling and anti-smog gun, Wheel Washing	417	36	3	Green Belt Developmen t	100	250	25
Traffic management	3	1.5	0.5	Monitoring for Air, Water, Noise & Soil	0	50	5
Waste Managemen t	1.5	2	0.5				
PPE for workers & welfare	2	1.5	0.5	Rainwater harvesting system	48	15	1.5
Medical cum First Aid facility	2	1.5	0.5	DG Sets including stack height and acoustics	638.09	875	87.5
wheel washing	1	1.5	0.5	Sewerage Treatment plant	200	300	30
				Solar lighting / solar Panel (158.6kwp)	70	35	3.5
Monitoring / testing (air, noise, water, soil, stack emission, STP effluent, DG noise)	0	4.5	1.5				
Total	**431.5**	**60.5**	**11**	**Total**	**1083.09**	**1555**	**155.5**

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4. The State Expert Appraisal Committee, Haryana after due consideration of the relevant documents submitted by the project proponent and additional clarification furnished in response to its observations, have recommended this project for grant of environmental clearance. Accordingly, the State Environment Impact Assessment Authority in its **144th meeting held on 8th – 9th August 2022** decided to agree with the recommendations of SEAC to accord necessary Environmental Clearance for the project under **Category 8(b)** of EIA Notification 2006 subject to the **strict compliance with the following stipulations depicted below:-**

A. Specific conditions:-

1. Sewage shall be treated in the STP based on latest Technology to achieve standards ordered by NGT. The Treated effluent from STP shall be recycled /reused for flushing, DG cooling and Gardening
2. The PP shall also develop the Miyawaki Forest as proposed in the EMP with the capital cost and maintain the same. The Miyawaki forest shall be developed under the guidance of MD Forest Corporation Haryana.
3. PP shall submit revised Solar panel capacity as per HAREDA norms.
4. The Project Proponent would devise a monitoring plan to the satisfaction of the State Pollution Control Board so as to continuously monitor the treated waste water being used for flushing in terms of faecal coli forms and other pathogenic bacteria.
5. The PP shall ensure that total 2% of the cost of project shall be spent on EMP Budget. However, the amount and component shown in EMP table above shall also be included for the purpose of 2% amount. The EMP cost on Socio Economic activities shall be used before the commencement of the project & EMP recurring inside the project shall be implemented throughout the operation of the project. The PP shall establish Environment monitoring cell as per documents submitted.
6. The PP shall not carry out any constract above and below revenue rasta if passing through the project and ensure that permission of the competent authority shall be obtained before carry out any construction above or below the revnue rasta. The PP shall put notice board on the revenue rasta for the passer byes.
7. The project proponent shall upload the status of compliance of the basic details (given in above tables), stipulated environment clearance conditions, including results of monitored data on their website and update the same on half-yearly basis.
8. The Project Proponents would commission a third party study on the implementation of conditions related to quality and quantity of recycle and reuse of treated water, efficiency of treatment systems, quality of treated water being supplied for flushing (specially the bacterial counts), comparative bacteriological studies from toilet seats using recycled treated waters and fresh waters for flushing, and quality of water being supplied through spray faucets attached to toilet seats.
9. Separate wet and dry bins must be provided in each unit and at ground level for facilitating segregation of waste. Solid Waste shall be segregated into wet garbage and inert materials. Wet Garbage shall be composted in Organic waste convertor. Adequate area shall be provided for solid waste management within the premises which will include area for segregation, composting. The Inert waste from the project will be sent to solid waste dumping site through authorized vender.
10. Traffic management plan as submitted shall be implemented in letter and spirit. Apart, a detailed traffic management and traffic decongestion plan shall be drawn up to ensure that the current level of service of the roads within a 05 kms radius of the project is marinated and improved upon after the implementation of the project. This plan should be based on cumulative impact of all development and increased habilitation being carried out or purpose to be carried out by the project or other agencies in this 05kms radius of the site in different scenarios of space and time
11. No tree cutting has been proposed in the instant project. A minimum of 1 tree for every 80 sqm of land should be planted and maintained. The Existing trees will be counted for this purpose. The landscape planning should include plantation of native species. The species with heavy foliage, broad leaves and wide canopy cover are desirable. Water intensive and/or invasive species should not be used for landscaping. As proposed 9,195.995 m^2 (30% plot area) shall be provided for Green Area development for whole project, excluding plot areas.
12. The Project Proponent shall obtain all necessary clearance/permission from all relevant agencies including town planning authority before commencement of work. All the construction shall be done in accordance with the local building byelaws.
13. Consent to establish/operate for the project shall be obtained from the State Pollution Control Board as required under the Air (Prevention and Control of pollution) Act, 1981 and the Water (Prevention and control of pollution) Act, 1974.
14. The Approval of the Competent Authority shall be obtained for structural safety of building code due to earthquakes, adequacy of fire fighting equipments etc. as per National Building Code including protection measures from lightening etc.
15. The PP shall obtain the Fire NOC from the Competent Authority before taking the occupation of the building.
16. The PP shall install the Eco Friendly Green Transformer based on ester oil to reduce the carbon footprint. The PP shall shift to gas based generator set when the gas is available. The PP shall install APCM for the DG set. The PP shall reduce the So2 load by 30% if HSD is used. The DG sets will be operated for maximum 04 hours during power failure through Executing Agency
17. The PP shall not give occupation or possession before the water supply and sewage connection permitted by the competent authority.
18. The PP shall not give occupation or possession before the electricity connection permitted by the competent Authority.
19. The PP shall obtain the permission regarding withdrawal of ground water, if any from HWRA/CGWA before the start of the project and also obtained the CTO from HSPCB after the approval from HWRA/CGWA.
20. The PP shall carry out the quarterly awareness programs for the stakeholders of the project.

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21. 08 Rain water harvesting recharge pits shall be provided for ground water recharging as per the CGWB norms
22. The PP shall install Digital water level recorder for monitoring the water recharge and carry out quarterly maintenance and cleaning of 08 RWH pits
23. The PP shall ensure the compliance of provisions of Plastic Waste Management (Amendment) Rules, 2022 relevant for the project.
24. The PP may provide electric charging stations to facilitate electric vehicle commuters.
25. The PP shall provide the Anti smog gun mounted on vehicle in the project for suppression of dust during construction & operational phase and shall use the treated water, if feasible.
26. The PP shall take all preventive measures including water sprinkles to control dust during construction and operational phase.
27. Any change in stipulations of EC will lead to Environment Clearance void-ab-initio and PP will have to seek fresh Environment Clearance

B. Statutory Compliance:

[1] The project proponent shall obtain all necessary clearance/ permission from all relevant agencies including town planning authority for ground coverage, FAR and should be in accordance with zoning plan approved by Competent Authority before commencement of work. All the construction shall be done in accordance with the local building byelaws.

[2] The approval of the Competent Authority shall be obtained for structural safety of buildings due to earthquakes, adequacy of firefighting equipment etc as per National Building Code including protection measures from lightening etc.

[3] The project proponent shall obtain forest clearance under the provisions of Forest (Conservation) Act, 1986, in case of the diversion of forest land for nonforest purpose involved in the project.

[4] The project proponent shall obtain clearance from the National Board for Wildlife, if applicable. [5] The project proponent shall obtain Consent to Establish/Operate under the provisions of Air (Prevention & Control of Pollution) Act, 1981 and the Water (Prevention & Control of Pollution) Act, 1974 from the Haryana State Pollution Control Board.

[6] The project proponent shall obtain the necessary permission for drawl of ground water /surface water required for the project from the competent authority.

[7] A certificate of adequacy of available power from the agency supplying power to the project along with the load allowed for the project should be obtained.

[8] All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire Department, Civil Aviation Department shall be obtained, as applicable, by project proponents from the respective competent authorities.

[9] The provisions of the Solid Waste (Management) Rules, 2016, e-Waste (Management) Rules, 2016, the Plastics Waste (Management) Rules, 2016 and Batteries waste (Management Handling Rules2001 as amended in 2020) shall be followed.

[10] The project proponent shall follow the ECBC Act/ECBC-Rules prescribed by Bureau of Energy Efficiency, Ministry of Power strictly in addition of bylaws of the State Government.

I Air Quality Monitoring and Preservation

Notification GSR 94(E) dated 25.01.2018 of MoEF&CC regarding Mandatory Implementation of Dust Mitigation Measures for Construction and Demolition Activities for projects requiring Environmental Clearance shall be complied with.

2) A management plan shall be drawn up and implemented to contain the current exceedance in ambient air quality at the site.

3) The project proponent shall install system to carryout Ambient Air Quality monitoring for common/criterion parameters relevant to the main pollutants released (e.g. PM10 and PM2.5) covering upwind and downwind directions during the construction period.

4) Diesel power generating sets proposed as source of backup power should be of enclosed type and conform to rules made under the Environment (Protection) Act, 1986. The height of stack of DG sets should be equal to the height needed for the combined capacity of all proposed DG sets. Use of ultra low sulphur diesel. The location of the DG sets may be decided with in consultation with State Pollution Control Board

5) Construction site shall be adequately barricaded before the construction begins. Dust, smoke & other air pollution prevention measures shall be provided for the building as well as the site. These measures shall include screens for the building under construction, continuous dust/ wind breaking walls all around the site (at least 3 meter height). Plastic/tarpaulin sheet covers shall be provided for vehicles bringing in sand, cement, murram and other construction materials prone to causing dust pollution at the site as well as taking out debris from the site.

6) Sand, murram, loose soil, cement, stored on site shall be covered adequately so as to prevent dust pollution.
7) Wet jet shall be provided for grinding and stone cutting.
8) Unpaved surfaces and loose soil shall be adequately sprinkled with water to suppress dust.
9) All construction and demolition debris shall be stored at the site (and not dumped on the roads or open spaces outside) before they are properly disposed. All demolition and construction waste shall be managed as per the provisions of the Construction and Demolition Waste Rules 2016.
10) The diesel generator sets to be used during construction phase shall be ultra low sulphur diesel type and shall conform to Environmental (Protection) prescribed for air and noise emission standards.
11) The gaseous emissions from DG set shall be dispersed through adequate stack height as per CPCB standards. Acoustic enclosure shall be provided to the DG sets to mitigate the noise pollution. Ultra low sulphur diesel shall be used. The location of the DG set and exhaust pipe height shall be as per the provisions of the Central Pollution Control Board (CPCB) norms.
12) For indoor air quality the ventilation provisions as per National Building Code of India.

II Water Quality Monitoring and Preservation

1) The natural drain system should be maintained for ensuring unrestricted flow of water. No construction shall be allowed to obstruct the natural drainage through the site, on wetland and water bodies. Check dams, bio-swales, landscape, and other sustainable urban drainage systems (SUDS) are allowed for maintaining the drainage pattern and to harvest rain water.
2) Buildings shall be designed to follow the natural topography as much as possible. Minimum cutting and filling should be done.
3) Total fresh water use shall not exceed the proposed requirement as provided in the project details. The per capita supply should adhere to NBC 2016 and CGWA Notification dated 12.12.2018.
4) The quantity of fresh water usage, water recycling and rainwater harvesting shall be measured and recorded to monitor the water balance as projected by the project proponent. The record shall be submitted to the Regional Office, MoEF&CC along with six monthly Monitoring reports.
5) A certificate shall be obtained from the local body supplying water, specifying the total annual water availability with the local authority, the quantity of water already committed the quantity of water allotted to the project under consideration and the balance water available. This should be specified separately for ground water and surface water sources, ensuring that there is no impact on other users.
6) At least 20% of the open spaces as required by the local building bye-laws shall be pervious. Use of Grass pavers, paver blocks with at least 50% opening, landscape etc. would be considered as pervious surface.
7) Installation of dual pipe plumbing for supplying fresh water for drinking, cooking and bathing etc and other for supply of recycled water for flushing, landscape irrigation, car washing, thermal cooling, conditioning etc. shall be done.
8) Use of water saving devices/ fixtures (viz. low flow flushing systems; use of low flow faucets tap aerators etc) for water conservation shall be incorporated in the building plan.
9) Separation of grey and black water should be done by the use of dual plumbing system. In case of single stack system separate recirculation lines for flushing by giving dual plumbing system be done.
10) Water demand during construction should be reduced by use of pre-mixed concrete, curing agents and other best practices referred.
11) The local bye-law provisions on rain water harvesting should be followed. If local byelaw provision is not available, adequate provision for storage and recharge should be followed as per the Ministry of Urban Development Model Building Byelaws, 2016. Rain Water Harvesting pits shall be provided for ground water recharging as per the CGWB norms.
12) A rain water harvesting plan needs to be designed where the recharge bores of minimum one recharge bore per 5,000 square meters of built up area and storage capacity of minimum one day of total fresh water requirement shall be provided. In areas where ground water recharge is not feasible, the rain water should be harvested and stored for reuse. The ground water shall not be withdrawn without approval from the Competent Authority.
13) All recharge should be limited to shallow aquifer.
14) No ground water shall be used during construction phase of the project.
15) Any ground water dewatering should be properly managed and shall conform to the

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approvals and the guidelines of the CGWA in the matter. Formal approval shall be taken from the CGWA for any ground water abstraction or dewatering.

16) The quantity of fresh water usage, water recycling and rainwater harvesting shall be measured and recorded to monitor the water balance as projected by the project proponent. The record shall be submitted to the Regional Office, MoEF&CC along with six monthly Monitoring reports.
17) Sewage shall be treated in the STP with tertiary treatment. The treated effluent from STP shall be recycled/re-used for flushing, AC make up water and gardening. As proposed, no treated water shall be disposed in to municipal drain.
18) No sewage or untreated effluent water would be discharged through storm water drains.
19) Onsite sewage treatment of capacity of treating 100% waste water to be installed. The installation of the Sewage Treatment Plant (STP) shall be certified by an independent expert and a report in this regard shall be submitted to the Ministry before the project is commissioned for operation. Treated waste water shall be reused on site for landscape, flushing, cooling tower, and other end-uses. Excess treated water shall be discharged as per statutory norms notified by Ministry of Environment, Forest and Climate Change. Natural treatment systems shall be promoted.
20) Periodical monitoring of water quality of treated sewage shall be conducted. Necessary measures should be made to mitigate the odour problem from STP.
21) Sludge from the onsite sewage treatment, including septic tanks, shall be collected, conveyed and disposed as per the Ministry of Urban Development, Central Public Health and Environmental Engineering Organization (CPHEEO) Manual on Sewerage and Sewage Treatment Systems, 2013.

III Noise Monitoring and Prevention

1) Ambient noise levels shall conform to residential area/commercial area both during day and night as per Noise Pollution (Control and Regulation) Rules, 2000. Incremental pollution loads on the ambient air and noise quality shall be closely monitored during construction phase. Adequate measures shall be made to reduce ambient air and noise level during construction phase, so as to conform to the stipulated standards by CPCB / SPCB.
2) Noise level survey shall be carried as per the prescribed guidelines and report in this regard shall be submitted to Regional Officer of the Ministry as a part of six-monthly compliance report.
3) Acoustic enclosures for DG sets, noise barriers for ground-run bays, ear plugs for operating personnel shall be implemented as mitigation measures for noise impact due to ground sources.

IV Energy Conservation Measures

1) Compliance with the Energy Conservation Building Code (ECBC) of Bureau of Energy Efficiency as per ECBC Act, 2017 read with ECBC Rules, 2018 shall be ensured. Buildings in the States which have notified their own ECBC, shall comply with the State ECBC also which is in no case should be less than 25% as prescribed.
2) Outdoor and common area lighting shall be LED.
3) Concept of passive solar design that minimize energy consumption in buildings by using design elements, such as building orientation, landscaping, efficient building envelope, appropriate fenestration, increased day lighting design and thermal mass etc. shall be incorporated in the building design. Wall, window, and roof R & U-values shall be as per ECBC specifications.
4) Energy conservation measures like installation of CFLs/ LED for the lighting the area outside the building should be integral part of the project design and should be in place before project commissioning.
5) Solar, wind or other Renewable Energy shall be installed to meet electricity generation equivalent to 1% of the demand load or as per the state level/ local building bye-laws requirement, whichever is higher.
6) Solar power shall be used for lighting in the apartment to reduce the power load on grid. Separate electric meter shall be installed for solar power. Solar water heating shall be provided to meet 20% of the hot water demand of the commercial and institutional building or as per the requirement of the local building bye-laws, whichever is higher. Residential buildings are also recommended to meet its hot water demand from solar water heaters, as far as possible.

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7) The PP will submit report indicating compliance of each parameter of ECBC requirement and submit quantification saving report for each component.

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VI Waste Management

1) A certificate from the competent authority handling municipal solid wastes, indicating the existing civic capacities of handling and their adequacy to cater to the M.S.W. generated from project shall be obtained.
2) Disposal of muck during construction phase shall not create any adverse effect on the neighboring communities and be disposed taking the necessary precautions for general safety and health aspects of people, only in approved sites with the approval of competent authority.
3) Separate wet and dry bins must be provided in each unit and at the ground level for facilitating segregation of waste. Solid waste shall be segregated into wet garbage and inert materials.
4) Organic Waste Converter within the premises with a minimum capacity of 0.5 kg /person/day must be installed. Leaves to be put in earmarked pits for converting them into compost to be used as manure
5) All non-biodegradable waste shall be handed over to authorized recyclers for which a written tie up must be done with the authorized recyclers.
6) Any hazardous waste generated during construction phase, shall be disposed of as per applicable rules and norms with necessary approvals of the State Pollution Control Board.
7) Use of environment friendly materials in bricks, blocks and other construction materials, shall be required for at least 20% of the construction material quantity. These include Fly Ash bricks, hollow bricks, AACs, Fly Ash Lime Gypsum blocks, Compressed earth blocks, and other environment friendly materials.
8) Fly ash should be used as building material in the construction as per the provision of Fly Ash Notification of September, 1999 and amended as on 27th August, 2003 and 25th January, 2016.Ready mixed concrete must be used in building construction.
9) Any wastes from construction and demolition activities related thereto shall be managed so as to strictly conform to the Construction and Demolition Rules, 2016.
10) Used CFLs and TFLs should be properly collected and disposed off/sent for recycling as per the prevailing guidelines/rules of the regulatory authority to avoid mercury contamination.

VII Green Cover

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