Six-Monthly Environmental Compliance Report of Stipulated Conditions of Environmental Clearance
(April 2016 to September 2016)

FOR

Group Housing Project "Sunworld Arista" at Plot no.GH-01/C, Sector-168, Noida,
M/s Sunworld Residency Pvt. Ltd.

Submission to:

Ministry of Environment, Forests & Climate Change

Submitted by:

M/s Sun World Residency Pvt. Ltd.

December, 2016

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CHAPTER-1

INTRODUCTION AND PROJECT DESCRIPTION

1.1 INTRODUCTION

The Group Housing project **"Sun World Arista"** at Plot No.-GH-01/C, Sector-168, Noida, U.P. is being developed by M/s Sunworld Residency Pvt. Ltd.

Building plans of the project have been approved by the Greater New Okhla Industrial Development Authority, Govt. of Uttar Pradesh.

This project has been granted environmental clearance vide letter no. 220/praya/SEAC/1143/2013/DD (Sh), dated 30th July, 2013 by the State Level Environment Impact Assessment Authority, Uttar Pradesh.

1.2 PROJECT DESCRIPTION

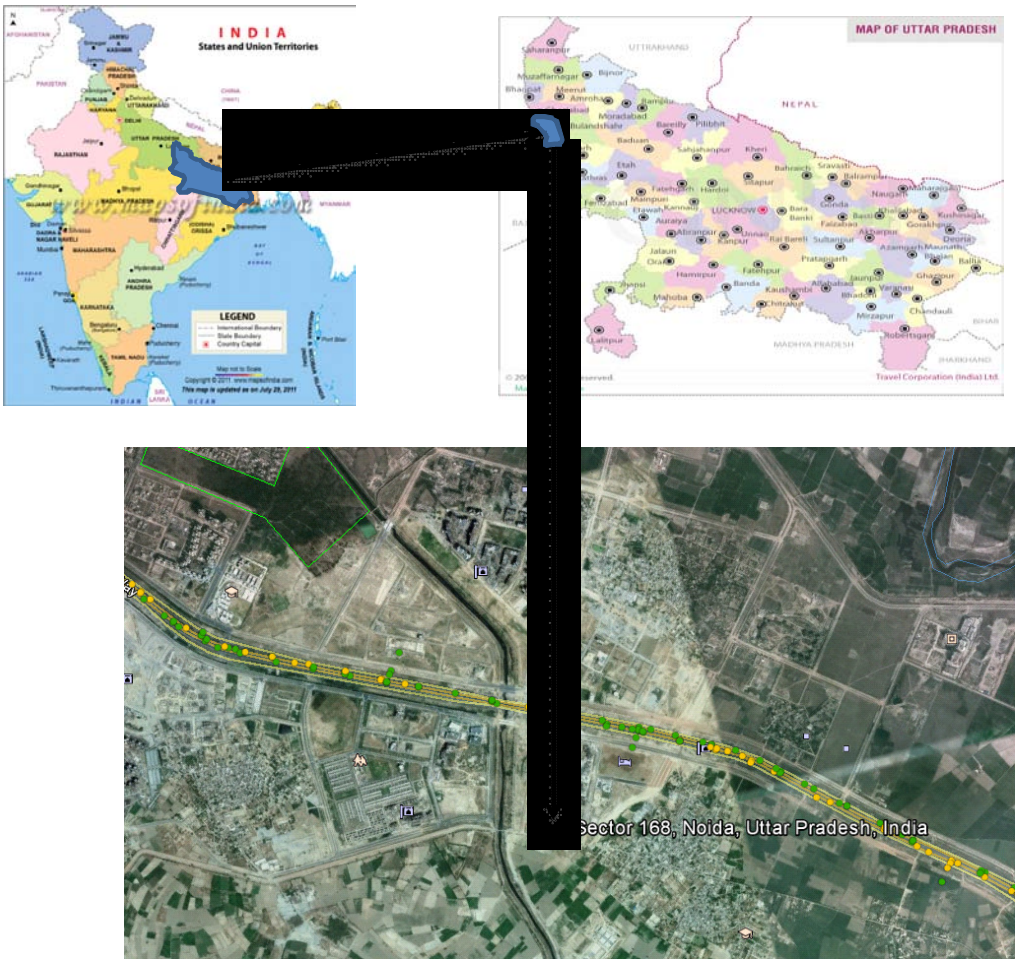
The proposed project will involve construction of multistory residential units along with development of parks and green areas and ancillary facilities for the residents. Out of the total plot area of 40221.30 m^2, only 11393.798 m^2 of the ground will be covered for residential block and ancillary facilities construction.

S.No.	Salient Features	Description
1.	Plot Area	40221.30 m^2
2.	Category of the Project as per EIA notification	8b
3.	Green Area for the proposed project	16767.9 m^2 (41.6% of the Total Plot Area)
4.	Quantity of Waste Water generated	351.5 KLD
5.	STP capacity	420 KLD
6.	Rain Water Harvesting Pit	10 nos.
6.	Parking Space	2163 ECS
7.	Total Water Requirement	471 KLD
8.	Power Requirement	9162 KVA
9.	DG Sets	8 X 1500 + 1X 1000KVA

1.3 PROJECT LOCATION

The proposed project site is located at Noida near the National Capital- New Delhi, in the State of Uttar Pradesh. The site is located at plot no. GH-01/C, Sector 168, Noida.

The area is under the administrative jurisdiction of New Okhla Industrial Development Authority. The geographical location map is given below.



Geographical Location Maps

1.4 PRESENT STATUS

Project site is in constructional phase.

1.5 PURPOSE OF THE REPORT

This six-monthly report is being submitted as per the condition stipulated in the Environmental Clearance letter. Further, the study will envisage the environmental impacts that have generated in the local environment due to the project.

The environmental assessment is being carried out to verify:

- That the project does not have any adverse environmental impacts in the project area and its surrounding
- Compliance with the conditions stipulated in the Environmental Clearance Letter.

- The Project Management is implementing the environmental mitigation measures as suggested in the approved Form-1, Form-1A, Environmental Management Plan (EMP) and building plans.
- The project proponent is implementing the environmental safeguards in true spirit.
- Any non-conformity in the project with respect to the environmental implication of the project.

CHAPTER-2

COMPLIANCE OF STIPULATED CONDITIONS OF ENVIRONMENTAL CLEARANCE

Name Of project : Project "Sunworld Arista" at Plot no.GH-01/C, Sector-168, Noida

Clearance No. : 220/praya/SEAC/1143/2013/DD (Sh), dated 30th July,2013

Period of Compliance Report : April 2016 to September 2016

PART A – GENERAL CONDITIONS

S. No.	Conditions of Environmental Clearance	Reply
1.	It shall be ensured that all standards related to ambient environmental quality and the emission/effluent standards as prescribed by the MoEF are strictly complied with.	The construction phase of the project is in progress. Necessary environmental safeguards are being taken care of.
2.	It shall be ensured to obtain the NOC from UP Pollution Control Board before start of construction.	NOC from Uttar Pradesh Pollution Control Board obtained.
3.	It shall be ensured that no construction work or preparation of land by the project management except for securing the land is started on the projector the activity without the prior environmental clearance.	Construction work at project site was started after obtaining environmental clearance, vide SEIAA letter no. **220 / praya / SEAC / 1143 / 2013 / DD (Sh), dated 30th July, 2013**. Copy of EC letter is attached as **Annexure-I**.
4.	The proposed Land use shall be in accordance with the prescribed land use. A land use certificate issued by the competent authority shall be obtained in this regards.	The proposed project is in accordance with the land use prescribed by Noida Authority.
5.	All trees felling in the project area shall be as permitted by the forest department under the prescribed rules. Suitable clearance in this regard shall be obtained from the competent authority.	The project site is vacant and free from any type of vegetation; therefore, tree felling/cutting is not involved in this project.
6.	Impact of drainage pattern on environment should be provided.	There would be no impact due to runoff as the storm water drainage network would be developed & connected to RWH pits.

7.	Surface hydrology and water regime of the project area within 10 km should be provided.	Already submitted along with EC application.
8.	A suitable plan for providing shelter, light, fuel water and wastewater disposal for construction labour during the construction phase shall be provided along with the no. of proposed workers.	All requisite facilities and services is provided to the labour.
9.	Measures shall be undertaken to recycle and reuse treated effluents for horticulture and plantation. A suitable plan for waste water recycling shall be submitted.	Yes, measure will be taken during appropriate stage of construction. Plan for waste water recycling has already been submitted.
10.	It shall be ensured to obtain proper permission from competent authorities regarding enhanced traffic during and due to construction and operation of project.	Parking plan has been already approved by Noida authority and has been submitted along with EC application.
11.	It shall be ensured to obtain necessary clearances from the competent authorities on the abstraction and use of ground water during the construction and operation of phase.	It is ensured that there will be no use of under-ground water during construction and operation stage, in any manner. Treated water confirming the IS standards (IS 456:2000), will be used for building construction.
12.	Hazardous/inflammable/explosive materials likely to be stored during the construction and operation phases shall be as per standard procedure as prescribed under law, necessary clearances in this regard shall be obtained.	Since this is a building construction project, no major hazardous / inflammable / explosive materials will be used. However material including paints, fuels, and lubricants will be stored securely as per material handling guideline.
13.	Solid waste shall be suitably segregated and disposed. A separate and isolated municipal waste collection center should be provided. Necessary plans should be submitted in this regards.	Solid waste will be collected by the NOIDA Authority for disposal into authorized disposal ground, developed by NOIDA Authority.
14.	Suitable rain water harvesting systems as per designs of ground water department shall be installed. Complete proposal in this regard should be submitted.	RWH design system has been prepared as per the design norms of CGWA and had submitted with the EC application.
15.	The emissions and effluents etc from machines, instruments and transport during construction and operation phases should be according to the prescribed standards. Necessary plans in this regard shall be submitted.	During construction phase all equipment machines and transportation vehicle have pollution under control certified. During operation phase only emission from DG sets will occur and the same will be managed by inbuilt APCM.

16.	Water sprinklers and other dust control measures should be under taken to take care to take care of dust generated during construction and operation phases Necessary plans in this regard shall be submitted.	Water sprinkling is being done, to minimize dust generation from the site, due to construction activities.
17.	Suitable noise abatement measures shall be adopted during the construction and operation phases in order to ensure that the noise emissions do not violate the prescribed ambient noise standards. Necessary plans in this regard shall be submitted.	No construction activity is carried out during night time. All vehicles, equipments and construction machines are idle when not in use.
18.	Separate stock piles shall be maintained for excavated top soil and the top soil should be utilized for the preparation of green belt.	Excavated soil is stored at separate place and will be used for site leveling, back filling/filling raft and road construction. Top layer of soil will be stored and used for landscaping /horticulture development work.
19.	Sewage effluents shall be kept separate from rain water collection and storage systems and separately disposed .Other effluents should not be allowed to mix with domestic effluents.	Sewage effluent system has been kept separate from Rain Water Collection and Storage Systems.
20.	Hazardous/solid wastes generated during construction and operation phases should be disposed off as prescribed under law. Necessary clearance in this regard shall be obtained.	Hazardous Waste generated in the form of spent oil will be handed over to the authorized recyclers for disposal in accordance with the rule.
21.	Alternate technologies for solid waste disposal (like vermin-culture etc.) should be used in consultation with expert organization.	Project is under construction. This aspect will be taken care of during operation phase.
22.	No wetland should be infringed during construction and operation phases. Any wetland coming in the project area should be suitably rejuvenated and conserved.	Not applicable as no wetland falls under project area.
23.	Pavements shall be so constructed as to allow infiltration of surface run-off rain water. Fully impermeable pavements shall not be constructed. Construction of pavements around trees shall be as per scientifically accepted principles in order to provide suitable watering, aeration and nutrition to the tree.	Porous/ Green pavers shall be used in parking lots to increase infiltration of surface water.

24.	The green building concept suggested by Indian green Building Council, which is a part of CII-Godrej GBC, shall be studied and followed as far as possible.	The green building concept of conservation of natural resources is adopted in this project. The design and construction materials to be used for group housing project are based on green building principles.
25.	Compliance with the safety procedures, norms and guidelines as outlined in NBC 2005 shall be compulsory ensured.	Safety procedure norms laid down in NBC 2005 shall be complied.
26.	It is to ensure usage of dual flush systems for flush cisterns and explore options to use sensor based fixtures, waterless urinals and other water saving techniques.	Dual flushing cisterns have been provided in this group housing project.
27.	It is to ensure exploration of options for use of dual pipe plumbing for use of water with different qualities such as municipal supply, recycle water ground water etc.	Dual Plumbing system has been provided in this project. However, water requirement for flushing and horticulture, will be met from the waste water, treated in onsite STP.
28.	It is to ensure usage of measures for reducing water demand for landscaping and use xeriscaping, efficient irrigation equipments and controlled watering systems.	Plant species selected for the project are mostly indigenous type with less water demand.
29.	It shall be ensured to make suitable provisions for using solar energy as an alternative source of energy. Solar energy applications should be in corporate for illumination of common areas, lighting for gardens and street lighting in addition to provision for solar heating. Present a detailed report showing how much percentage of backup power for institution can be provided through solar energy so that use and polluting effects of DG sets can be minimized.	Solar lighting has been proposed, however installation shall be taken up during site development stage of the project.
30.	Make separate provision for segregation, collection, transport and disposal of e-waste.	Separate provision of e-waste will be done during operation phase for segregation, collection, transportation. The e-waste generated will be handed over to the PCB authorized e-waste recyclers
31.	Educate citizens and other stake holders by putting up hoardings at different places to create environmental awareness.	Signage for environmental awareness will be displayed at appropriate locations within the project site.

32.	Traffic congestion near the entry and exit points from the roads adjoining the proposed project site must be avoided. Parking should be fully internalized and no public space should be utilized.	Fully internalized parking has been provided. No traffic congestion near the entry and exit point will occur.
33.	It shall be ensured to prepare and present disaster management plan.	Disaster management plan has been submitted along with EC application.
34.	The project proponent shall ensure that no construction activity is undertaken without obtaining pre environmental clearance.	The construction work for the project was started after getting the environmental clearance for the project.
35.	A report on the energy conservation measures confirming the energy conservation norms finalize by BEE should be prepare incorporating details about building materials and technology, R & U factors etc.	Energy conservation measures confirming to ECBC norms was submitted with EC application.
36.	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 August2003 (the above condition is applicable only if the project lies within 100 km of thermal power station.)	It is ensured that ready mix concrete or fly ash would be used during the course of construction.
37.	The DG sets to be used during construction phase should use low sulphur diesel type and should confirm to E.P. rules prescribed for Air and Noise emission standard.	It is ensured that only low sulphur variety of high speed diesel (HSD) will be used for the diesel generator sets.
38.	Alternate technologies to chlorination (for disinfection of waste water) including methods like ultra violet radiation, ozonization, etc. shall be examined and report submitted with justification for selection technology.	Same will be complied.
39.	The green belt design along the periphery of the plot shall be achieved attenuation factor conforming to the day and night noise standard prescribed for residential landuse .The open spaces inside the plot should be suitably landscaped and covered with vegetation of indigenous variety.	Proper green belt has been designed with peripheral shelter belt. Desired Noise level within the site will be maintained. Landscape and covered vegetation proposed are of indigenous variety.

40.	The constructions of the building and the consequent increased traffic load should be such that the micro climate of the area is not adversely affected.	Ground coverage will be deliberately kept minimum to increase green area, peripheral and avenue plantation grass paved lawn planned in the project will shed hard surface reducing heat gain and formation of heat island effect, hence alteration in microclimate with these measure will be negligible.
41.	The building should be designed so as to take sufficient safeguard regarding seismic zone sensitivity.	The building has been designed for seismic zone IV as per NBC 2005.
42.	High rise building should be obtaining clearance from aviation department or concerned authority.	Height clearance has been obtained from Aviation Authority of India.
43.	Suitable measures shall be taken to restrain the development of small commercial activities or slum sin the vicinity of the complex. All commercial activities should be restricted to special area earmarked for the purpose.	This is controlled residential development in accordance with master (Land use Plan) plan, hence, commercial activities are not involved.
44.	It is suggested that literacy program for weaker section of society/women/adults (including domestic help) and under privileged children could be providing in a formal way.	Literacy program for weaker section of society/women/adults (including domestic help) and under privileged children will be provided in a formal way
45.	The use of compact fluorescent lamps should be encouraged. A management plan for the safe disposal of use/damaged CFLs should be submitted.	The project will use energy efficient luminaries like CFL and disposal of the CFL will be along with the e-waste
46.	It shall be ensured that all street and park lighting is solar power 50% of the same may be provide with the dual (solar/electrical) alternative.	All street and park lighting is solar power 50% of the same will be provided with the dual (solar/electrical) alternative.
47.	Solar water heater shall be installed to be maximum possible capacity. Plants may be drawn up accordingly and submitted with justification.	Same has been complied; details have been submitted with EC application.
48.	Treated effluents shall be maximally reused to aim for zero discharge. Where ever not possible a detailed management plan for disposal should be provide with quantities and quality of waste water.	Waste water will be treated in onsite STP. Treated water shall be used for flushing, gardening etc

49.	The treated effluents should be normally not be discharged into public sewer with terminal treatment facilities as the adversely affect hydraulic capacity of STP /If unable necessary permission from authorities should be taken.	Excess treated waste water shall be discharged in the NOIDA authority Sewage collection line with permission.
50.	Construction activities including movements of vehicles should be so managed so that no disturbance is caused to nearby residents.	All precaution to avoid disturbance shall be taken.
51.	All necessary statutory clearance should be obtained and submitted before start of any construction activity and if this condition is violated the clearance, if and when given shall be automatically deemed to have been cancelled.	Statutory clearances have already been obtained.
52.	Parking areas should be accordance with the norms of MOEF, GOI Plans may be drawn up accordingly and submitted	Parking area provided meets the requirement of MOEF as well as local building by laws. Approved parking plan has been submitted along with EC application.
53.	The location of the STP should be such that it is away from human habitation and does not cause problem of odor. Odorless technology options should be examined and report submitted.	Details of onsite STP - Location, capacity, process & technology already submitted along with EC application.
54.	The environment management plan should also include the break up costs on various activities and the management issues also so that the residents also participate in the implementation of the environment management plan.	Resident's participation in preparation of EMP & Budget may be invited during operation phase of the project.
55.	Detailed plans for safe disposal of STP sludge shall be provided along with ultimate disposal location, quantitative estimates and measures proposed.	Yes, shall be complied at appropriate stage of project.
56.	Status of the project as on date shall be submitted along with photographs from north, south, west and east side facing camera and adjoining areas should be provided.	Noted
57.	Specific location along with dimensions with reference to STP, parking open areas and green belt etc. should be provided on the layout plan.	Parking, Open Areas, Green Belt, plans have already submitted along with the EC application.

58.	The DG sets shall be so installed so as to confirm to prescribed stack height and regulation and also to the noise standards as prescribed .Details should be submitted	Proposed DG set will be installed during operation phase and stack height of DG set will be as per CPCB norms
59.	E-waste management should be done as per MOEF guidelines.	E-waste will be segregated and disposed through UPPCB authorized recycler as per MoEF guideline.
60.	Electrical-waste should be segregated and disposed suitably as not to impose environmental risk.	Electrical waste generated from the project site will be segregated and disposed off suitably without having any environmental risk
61.	The use of suitably processed plastic waste in the constructions of road should be considered.	Processed plastic waste will be used in the constructions of road.
62.	Displaced persons shall be suitably rehabilitated as per prescribed norms.	There is no displacement of any person, therefore R&R plan is not required.
63.	Dispensary for first aid shall be provided.	Dispensaries for first aid will be provided.
64.	Safe disposal arrangements of used toiletries items in hotels should be ensured. Toiletries items could be given complimentary to waste, adopting suitable measures.	This condition is not applicable, as this is residential group housing project.
65.	Diesel generating set stacks should be monitored for CO and HC.	During operation phase, DG Stack monitoring will also include CO and HC parameters
66.	Ground water downstream of rain water harvesting pit nearest to STP should be monitored for bacterial contamination .Necessary hand pump Should be provided for sampling .The monitoring is to be done both in pre and post monsoon ,season.	The same will be done during operation phase.
67.	The green belt shall consist of 50% trees, 25% shrubs and 25% grass as per MoEF norms.	Green belt development scheme based on guideline has already been submitted for EC.
68.	A separate electric meter shall be provided to monitor consumption of energy for the operation of sewage/effluent treatment in tanks.	The same will provided during operation phase
69.	An energy audit should be annually carried out during the operation phase and submitted to the authority.	Annual energy auditing will be carried out during operational stage of the project.

70.	Project proponent shall endeavor to obtain ISO:14000 certification. All general and specific conditions mentioned under this environmental clearance should be included in the environmental manual to be prepared for the certification purposes and compliance.	Shall be complied.
71.	Appropriate safety measures should be made for accidental fire.	Appropriate safety measures will be taken for accidental fire.
72.	Smoke meters should be installed as warning measures for accidental fire.	Smoke meters will be installed as warning measures for accidental fire during operation phase.
73.	A compliance report of the similar project under taken earlier is to be submitted. This report is to be certified by RO of UPPCB.	Not Applicable.
74.	Plan for safe disposal of R.O. reject is to be submitted.	The same will be complied.
75.	Project falling in 10 km area of wild life (NBWL) even if the eco sensitive zone is not earmarked.	Not Applicable

PART B – SPECIFIC CONDITIONS

S. No.	Conditions of Environmental Clearance	Reply
1.	All entry/exit point should be bell mouth shaped.	All entry/exit point will be bell mouth shaped.
2.	Use of LED shall be explored and solar light instead of CFL be used in common areas.	CFLs will be used in the common area. Damaged / used CFLs will be stored at designated places and handed over to authorized recyclers.
3.	STP should be installed and treated water should be used for construction phase.	STP is installed and the treated water is being used in construction phase.
4.	For the treatment of total sewage a full-fledged STP is to be provided with 20% more capacity than waste water generated during operation phase. 100% waste water is to be treated in captive STP conforming to prescribed standards of receiving body for designated use. Monitoring of STP to be done daily till its stabilizations than weekly.	The same will be complied.
5.	To discharge excess treated waste water in to public drainage system permission from the competent authority to be taken prior to any discharge.	Same will be complied.

6.	Dedicated power supply for STPs is to be ensured during operation phase. Sludge of STP is to be used in house as manure and surplus manure should be managed by giving to end users.	Dedicated power supply for STPs will be ensured during operation phase. Sludge of STP will be used as manure and surplus manure will be managed by giving to end users.
7.	All internal roads should not be less than 9 m wide.	Same will be complied.
8.	100% provision of rain water harvesting is to be made. RWH shall initially done only from roof top. RWH from the green and other open areas shall be done only after permission from CGWS.	Same will be complied.
9.	Height of the stack should be provided as discussed based on combined DG sets capacity and be 6m higher than the tallest building.	Same will be complied.
10.	Post project monitoring for air, water (Surface + Ground), Stack noise of DG sets, STP to be carried out as CPCB guidelines.	Monitoring of Air, water has been done and results are attached as **Annexure-II**.
11.	Wheel wash arrangement is to be made at exit point during construction phase.	Same will be complied.
12.	Environmental Corporate Responsibility (ECR) plan alongwith budgetary provision amounting to 2% of total project cost shall be submitted (with in the month) on need base assessment study in the study area. Income generating measures which can help in up-liftment of weaker section of society consistent with the traditional skills of the people identified. The programme can include activities such as old age homes, rain water harvesting provisions in nearby areas, development of fodder farm fruit bearing orchards, vocational training etc. In addition, vocational training for individuals shall be imparted so that poor section of society can take upself employment and jobs. Separate budget for community development activities and income generating programmers shall be specified.	Same will be complied.
13.	Creche to be provided during the construction/operation phase.	The same will be complied during operation stage.

14.	Provision of separate room for senior citizens with proper amenities commensuration with age in and around the club house.	Separate rooms for senior citizens will be provided.
15.	E-waste shall be managed as per e-waste notification. Temporary storage for MSW for two days should be provided with the project.	E-waste shall be managed as per e-waste notification.
16.	The project proponent will manage disposal of excavated soil left in house in Landscaping and land leveling. Excess excavated soil is managed in eco friendly manner a plan may be submitted in 3 months.	Top soil will be used for landscaping.
17.	Ground water should not be extracted for the purpose of construction or otherwise. In case of default the Environmental Clearance will deem to cancelled.	No ground water extraction is involved.
18.	Central RO system should not be provided.	Noted for action.

CHAPTER-3

DETAILS OF ENVIRONMENTAL MONITORING

3.1 AMBIENT AIR QUALITY MONITORING

3.1.1 Ambient Air Quality Monitoring Stations

Ambient air quality monitoring has been carried out at one location in the month of September, 2016, one being behind the site office to assess the ambient air quality of Project Site. This will enable to have an analytical understanding about air quality and the changes in the air environment in the study area with respect to the condition prevailing. The locations of the ambient air quality monitoring stations are given in **Table 3.1**.

Table 3.1: Details of Ambient Air Quality Monitoring Stations

S. No.	Location Code	Location Name/ Description	Environmental Setting
1.	AAQ-1	Project Site	Residential

3.1.2 Ambient Air Quality Monitoring Methodology

Monitoring was conducted in respect of the following parameters:

- Particulate Matter 2.5 (PM 2.5)
- Particulate Matter 10 (PM 10)
- Sulphur Dioxide (SO_2)
- Oxides of Nitrogen (NO_x)
- Carbon Monoxide (CO)

The duration of sampling of PM2.5, PM10, SO_2 and NOx was 24 hourly continuous sampling per day and CO was sampled for 1 hour continuous, thrice in 24 hour duration monitoring. The monitoring was conducted for one day at the location. This is to allow a comparison with the National Ambient Air Quality Standards.

The air samples were analyzed as per standard methods specified by Central Pollution Control Board (CPCB) and IS: 5182. The techniques used for ambient air quality monitoring and minimum detectable levels are given in **Table 3.2**.

Fine Particulate Sampler APM 550 instruments have been used for monitoring Particulate Matter 2.5 (PM2.5 i.e. <2.5 microns), and Respirable Dust Sampler APM 450 was used for sampling Respirable fraction (<10 microns), gaseous pollutants like SO2, and NOx. Bladder and Aspirator bags were used for collection Carbon monoxide samples. Gas Chromatography techniques have been used for the estimation of CO.

Table 3.2: Techniques used for Ambient Air Quality Monitoring

S. No.	Parameter	Technique	Technical Protocol
1	Particulate Matter 2.5	Fine Particulate Sampler APM 550, Gravimetric Method	IS-5182 (Part-IV)
2	Particulate Matter 10	Respirable Dust Sampler APM 450, with cyclone separator, Gravimetric Method	IS-5182 (Part-23)
3	Sulphur dioxide	Modified West and Gaeke	IS-5182 (Part- II)
4	Oxides of Nitrogen	Jacob & Hochheiser	IS-5182 (Part-VI)
5	Carbon Monoxide	Gas Chromatography	IS-5182 (Part-X)

3.1.3 Ambient Air Quality Monitoring Results

The detailed on-site monitoring results of PM $_{2.5}$, PM $_{10}$, SO_2, NO_x and CO are presented in **Table 3.3**.

Table 3.3: Ambient Air Quality Monitoring Results

S. No.	Location Code	Location	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_x ($\mu g/m^3$)	CO (mg/m^3)
		Limit	**100**	**60**	**80**	**80**	**4**
1.	AAQ1	Project Site	158	77	14	38	1.11

3.1.4 Discussion on Ambient Air Quality in the Study Area

The levels of PM_{10} and $PM_{2.5}$ at the project site were higher than the permissible limit of 100 $\mu g/m^3$ and 60 $\mu g/m^3$ respectively (for residential, rural and other areas as stipulated in the National Ambient Air Quality Standards). SO_2, NOx and CO were also observed within the corresponding stipulated limits (Limit for SO_2 and NOx: 80 $\mu g/m^3$ and limit for CO: 4.0 mg/m^3) at the monitoring location. Station wise variation of ambient air quality parameters has been pictorially shown in **Figure 3.1.**

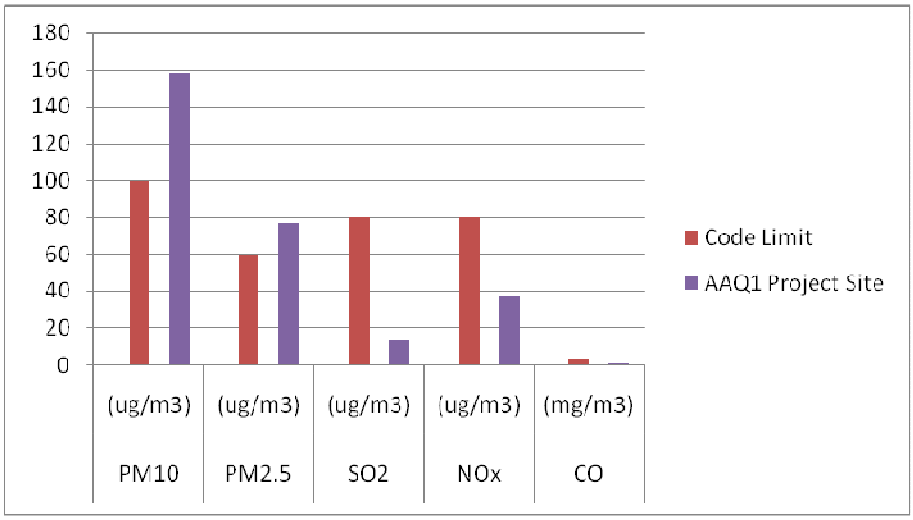


Figure 3.1 Location-wise Variation of Ambient Air Quality

3.2 AMBIENT NOISE MONITORING

3.2.1 Ambient Noise Monitoring Locations

The main objective of noise monitoring in the study area is to assess the present ambient noise levels in project site & project boundary due to various construction allied activities and increased vehicular movement. A preliminary reconnaissance survey has been undertaken to identify the major noise generating sources in the area. Ambient noise monitoring was conducted at 1 location at the project in the month of September, 2016 as given in **Table 3.4**.

Table 3.4: Details of Ambient Noise Monitoring Stations

S. No.	Location Code	Location Name/ Description	Present Land use
1.	ANQ1	Project Site	Residential

3.2.2 Methodology of Noise Monitoring

Noise levels were measured using integrated sound level meter manufactured by Quest Technologies. The integrating sound level meter is an integrating/ logging type with Octave filter attachment with frequency range of 31.5 to 16000 Hz. This instrument is capable of measuring the Sound Pressure Level (SPL), Leq and octave band frequency analysis.

Noise level monitoring was carried out continuously for 24-hours with one hour interval starting at 0030 hrs to 0030 hrs next day. The noise levels were monitored on working days only. During each hour Leq were directly computed by the instrument based on the sound pressure levels. Lday (Ld), Lnight (Ln) and Ldn values were computed using corresponding hourly Leq. Monitoring was carried out at 'A' response and fast mode.

3.2.3 Ambient Noise Monitoring Results

The locations wise ambient noise monitoring result are summarized in **Table 3.5**. The location-wise variation of noise levels are graphically presented in **Figure 3.2**.

Table 3.5: Ambient Noise Monitoring Results

Sr. No.	Test Locations	Day Time - dB(A)		Night Time - dB(A)	
		Results	Limits as per CPCB guideline	Results	Limits as per CPCB guideline
ANQ1	Project Site	53.2	55	42.8	45

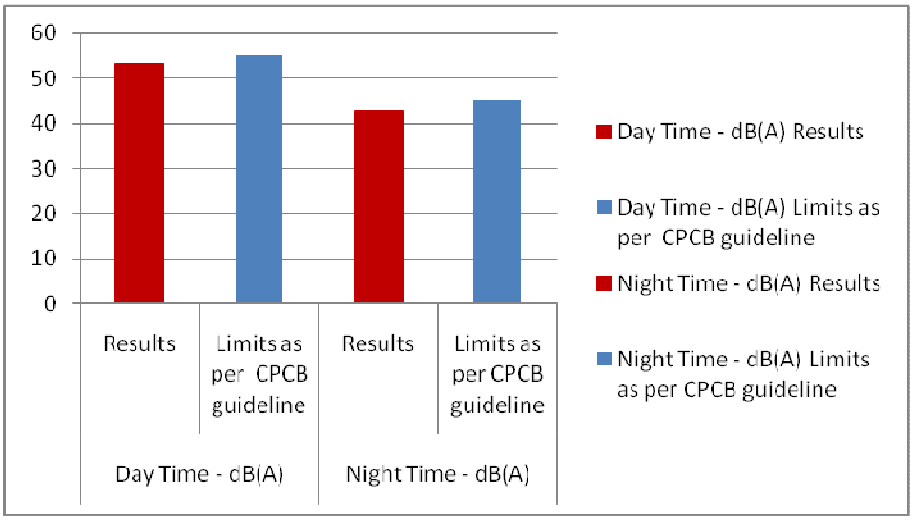


Figure 3.2 Variations of Ambient Noise Levels

3.2.4. Discussion on Ambient Noise Levels in the Study Area

Day Time Noise Levels (L_{day}):
The day time noise level at the project site was found within the limit prescribed for Residential area i.e. 55 db(A).

Night Time Noise Levels (L_{night}):
The night time noise level at the project site was found within the limit prescribed for Residential area i.e. 45 db(A).

3.3 GROUNDWATER QUALITY MONITORING

3.3.1 Groundwater Quality Monitoring Locations

Keeping in view the importance of groundwater as an important source of drinking water to the local population, sample of ground water was collected from the project site for the assessment of impacts of the project on the groundwater quality.

Water sample was collected from one location from nearby village from the project site. The sample was analyzed for various parameters to compare with the standards for drinking water as per IS: 10500 for ground water sources. The details of water sampling locations are given in **Table 3.6**.

Table 3.6 Details of Water Quality Monitoring Station

S. No.	Locn. Code	Location Name/ Description
1.	GW 1	Near project Site

3.3.2 Methodology of Groundwater Quality Monitoring

Sampling of ground water was carried out in September, 2016. Samples were collected as grab sample and sampling forms are filled in as per the sampling plan. The preservative sample were properly added to preserve as per standard operating procedures (SOP) and stored immediately in ice boxes, which were ensured for appropriate temperatures. Sample for chemical analysis was collected in polyethylene carboys. Sample collected for metal content were acidified to <2 pH with 1 ml HNO_3. A sample for bacteriological analysis was collected in sterilized glass bottles.

Soon after the completion of sampling, chain of custody sheets for the samples are filled in and then they were transported by road to IR&DH for further analysis. Proper care was taken during packing and transportation of samples. All the samples reached the central laboratory within the holding times for different parameters. After ensuring the same the samples were forwarded immediately for analysis.

The samples were analyzed as per the standard procedures specified in 'Standard Methods for the Examination of Water and Wastewater' published by American Public Health Association (APHA) and CPCB. The analytical techniques and the test methods adopted for testing of ground water are given in **Table 3.7**.

3.3.3 Groundwater Quality Monitoring Results

The detailed groundwater quality monitoring results are presented in **Table 3.7**.

Table 3.7: Groundwater Quality Monitoring Results

S.N	Parameter	Test Protocol	Results	Unit	Requirements as per IS 10500- 2012	
					Acceptable Limit (Max)	Permissible limits(Max)
1.	pH	IS 3025 P-11 1983	8.14	--	6.5-8.5	No Relaxation
2.	Turbidity	IS 3025 P-10 (1984)	1.16	NTU	1	5
3.	Free Residual Chlorine	IS 3025 P-26 (1986)	<0.2	mg/l	0.2	1
4.	Total Hardness	IS 3025 P-21 (2009)	492.0	mg/l	200	600
5.	Total Dissolved Solids (TDS)	IS 3025 P-16(1984)	836.0	mg/l	500	2000
6.	Calcium as Ca	IS 3025 P-40 (1991)	94.4	mg/l	75	200
7.	Magnesium as Mg	IS 3025 P-46 (1994)	62.20	mg/l	30	100
8.	Total Alkalinity as CaCO3	IS 3025 P-23(1986)	436.0	mg/l	200	600
9.	Chloride as Cl	IS 3025 P-32 (1988)	128.0	mg/l	250	1000
10.	Barium as Ba	Annex F of IS:13428	<0.05	mg/l	0.7	No Relaxation
11.	Ammonia as N	IS 3025 P-34 (1988)	<0.1	mg/l	0.5	No Relaxation
12.	Sulphate as SO4	IS 3025 P-24 (1986)	82.0	mg/l	200	400
13.	Nitrate as NO3	IS 3025 P-34 (1988)	11.8	mg/l	45	No Relaxation
14.	Fluoride as F	IS 3025 P-60 (2008)	0.30	mg/l	1	1.5
15.	Iron as Fe	IS 3025 P-53 (2003)	0.12	mg/l	0.3	No Relaxation
16.	Aluminium as Al	IS 3025 P-55(2003)	BDL	mg/l	0.03	0.2
17.	Anionic Detergent	Annex K of IS:13428	<0.05	mg/l	0.2	1
18.	Phenolic Compounds	IS 3025 P-43 (1992)	<0.01	mg/l	0.001	0.002
19.	Boron as B	IS 3025 P-57 (2005)	<0.1	mg/l	0.5	1
20.	Chromium as Cr	IS 3025 P-52	BDL	mg/l	0.05	No Relaxation
21.	Lead as Pb	IS 3025 P47 (1994)	BDL	mg/l	0.01	No Relaxation
22.	Copper as Cu	IS 3025 P42 (1992)	<0.02	mg/l	0.05	1.5
23.	Mercury as Hg	IS 3025 P-48 (1994)	BDL	mg/l	0.01	No Relaxation
24.	Manganese as Mn	IS 3025 P-59 (2006)	<0.05	mg/l	0.1	0.3

25.	Zinc as Zn	IS 3025 P-49 (1994)	<0.05	mg/l	5	15
26.	Arsenic as As	IS 3025 P-37 (1988)	BDL	mg/l	0.01	0.05
27.	Nickel as Ni	IS 3025 P-54 (2003)	<0.05	mg/l	0.02	No Relaxation
28.	Cadmium as Cd	IS 3025 P-41 (1992)	BDL	mg/l	0.003	No Relaxation

3.3.4 Discussion on Groundwater Quality in the Study Area

The ground water quality in the project area is observed to having total alkalinity up to 436 mg/l which is above than the desirable limit of 200 mg/L and the total dissolved solids up to 836 mg/l which is above than the desired limit of 500 mg/l.

3.4 SOIL MONITORING

3.4.1 Soil Monitoring Locations

The objective of the soil monitoring is to identify the impacts of ongoing project activities on soil quality and also predict impacts, which have arisen due to execution of various constructions allied activities. Accordingly, a study of assessment of the soil quality has been carried out in the month of September, 2016.

To assess impacts of ongoing project activities on the soil in the area, the physico-chemical characteristics of soils were examined by obtaining soil samples from selected points and analysis of the same. One sample of soil was collected from the project site for studying soil characteristics, the location of which is listed in **Table 3.8**.

Table 3.8 Details of Soil Quality Monitoring Location

S. No.	Locn. Code	Location Name/ Description
1.	S1	Site Office

3.4.2 Methodology of Soil Monitoring

The sampling has been done in line with IS: 2720 & Methods of Soil Analysis, Part-1, 2nd edition, 1986 of American Society for Agronomy and Soil Science Society of America. The homogenized samples were analyzed for physical and chemical characteristics (physical, chemical and heavy metal concentrations). The soil samples were collected in the month of September, 2016.

The samples have been analyzed as per the established scientific methods for physico-chemical parameters. The heavy metals have been analyzed by using Atomic Absorption Spectro-photometer and Inductive Coupled Plasma Analyzer.

3.4.3 Soil Monitoring Results

The physico-chemical characteristics of the soil, as obtained from the analysis of the soil sample, are presented in **Table 3.9**.

S.No.	Parameter	Test Method	Results	Unit
1.	pH	IS 2720 P-26 (1987)	7.81	--
2.	Conductivity	IS 14767 (2002)	518.0	µS/cm
3.	Moisture	IS 2720 P-22 (1972)	9.90	% by mass
4.	Water Holding Capacity	USDA Method	24.0	%
5.	Specific Gravity	IS 2720 P-3 (1980)	1.62	-
6.	Bulk density	USDA Method	1.38	gm/cc
7	Chloride	USDA Method	206.0	mg/kg
8	Calcium	USDA Method	2024.0	mg/kg
9	Sodium	USDA Method	168.0	mg/kg
10.	Potassium	USDA Method	90.0	mg/kg
11.	Magnesium	USDA Method	178.0	mg/kg
12.	Organic matter	IS 2720 P-22 (1972)	0.63	% by mass
13.	Cation Exchange Capacity(CEC)	IS 2720 P- 24 (1976)	14.0	meq/100gm
14.	Available nitrogen	USDA Method	98.0	mg/kg
15.	Available Phosphorous	USDA Method	5.2	mg/kg
16.	Zinc as Zn	USDA Method	0.44	mg/kg
17.	Iron as Fe	USDA Method	0.38	mg/kg
18.	Boron as B	USDA Method	0.03	mg/kg
19.	Copper as Cu	USDA Method	0.46	mg/kg
20.	Texture	IS 2720 P-4 (1985)		% by mass
	Sand		58.4	
	Clay		21.9	
	Silt		19.7	
21.	Sodium Absorption Ratio(SAR)	USDA Method	0.96	By calculation

Table 3.9 Physico-Chemical Characteristics of Soil in the Study Area

3.5 Discussion on Soil Characteristics in the Study Area

The soil in study area is characterized by moderate organic content. The soil quality in the project area has not been affected by the project activities.