Draft Environmental Impact Assessment Report for proposed Onshore Oil and Gas Exploration and Appraisal in CB-ONHP-2017/10 block in Banskantha District, Gujarat and Jalore District, Rajasthan

Vedanta Limited (Division: Cairn Oil & Gas)

September 2019

Project Proponent

EIA Consultant

ABC Techno Labs
India Private Limited

Declaration by ABC Techno Labs India Pvt. Ltd.

Vedanta Limited (Division: Cairn Oil & Gas) has proposed Onshore Oil and Gas Exploration and Appraisal in CB-ONHP-2017/10 block in Banskantha District, Gujarat and Jalore District, Rajasthan. In this regard Vedanta Limited (Division: Cairn Oil & Gas) appointed ABC Techno Labs India Pvt. Ltd. to conduct the Environmental Impact Assessment (EIA) study as per the Terms of Reference (TOR) for carrying out the EIA/EMP study vide F. No. IA-J-11011/108/2019-IA-II(I) dated 26th April 2019 issued by Expert Appraisal Committee (EAC)- Industry 2, Ministry of Environment, Forest & Climate Change (MoEF&CC).

ABC Techno Labs has taken all reasonable precautions in the preparation of this EIA report. ABC Techno Labs also believes that the facts presented in this report are accurate as on date it was written.

ABC Techno Labs confirm that the mentioned experts prepared the EIA Report for proposed Onshore Oil and Gas Exploration and Appraisal in CB-ONHP-2017/10 block in Banskantha District, Gujarat and Jalore District, Rajasthan. ABC Techno Labs also confirm that the consultant organisation shall be fully accountable for any misleading information mentioned in this statement.

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Name: Mr. G. Murugesh

Designation: Chairman & Managing Director

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QCI

Quality Council of India

National Accreditation Board for Education & Training

NABET

CERTIFICATE OF ACCREDITATION

ABC Techno Labs India Private Limited

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are accredited as Category - A organization under the QCI-NABET Scheme for Accreditation of EIA Consultant Organizations: Version 3 for preparing EIA/EMP reports in the following sectors:

Sl.No.	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1	Mining of minerals (open cast and underground)	1	1 (a) (i)	B
	Mining of minerals (open cast only)			A
2	Offshore and onshore oil and gas exploration	2	1 (b)	A
3	River Valley projects-Irrigation projects only	3	1 (c)	A
4	Thermal power plants	4	1 (d)	A
5	Mineral beneficiation	7	2 (b)	B
6	Metallurgical industries (Secondary ferrous only)	8	3 (a)	B
7	Petroleum refining industry	10	4 (a)	A
8	Leather/skin/hide processing industry	15	4 (f)	A
9	Chemical fertilizers	16	5 (a)	A
10	Petro-chemical complexes	18	5 (c)	A
11	Synthetic organic chemicals industry	21	5 (f)	A
12	Distilleries	22	5 (g)	A
13	Sugar Industry	25	5 (j)	B
14	Oil & gas transportation pipeline	27	6 (a)	A
15	Isolated storage & handling of Hazardous chemicals	28	6 (b)	B
16	Air ports	29	7 (a)	A
17	Industrial estates/ parks, (EPZs), (SEZs), Biotech Parks, Leather Complexes	31	7 (c)	B
18	Ports, harbours, break waters and dredging	33	7 (e)	A
19	Highways	34	7 (f)	A
20	Common Effluent Treatment Plants (CETPs)	36	7 (h)	B
21	Common Municipal Solid Waste Management Facility (CMSWMF)	37	7 (i)	B
22	Building and construction projects	38	8 (a)	B
23	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 Jan 13, 2017 posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in NABET's letter of accreditation bearing no. QCI/NABET/ENV/ACO/17/0319 dated 29 May 2017. The accreditation needs to be renewed before the expiry date by ABC Techno Labs. Pvt. Ltd., following due process of assessment.

C.E.O NABET	*Certificate No.* *NABET/ EIA/1619/ RA 0048*	*Issue date* *May 29, 2017*	*Expiry Date* *May 25, 2019*

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May 16, 2019

QCI/NABET/EIA/ACO/19/0982
ABC Techno Labs India Private Limited
400, 13th Street, SIDCO Industrial Estate (North Phase),
Ambattur, Chennai, Tamilnadu - 600098
(Kind Attention: **Mr. Pargunan T**)

Sub: Validity of Accreditation

Dear Sir,

This has reference to the accreditation of your organization under QCI-NABET EIA Scheme, the validity of **ABC Techno Labs India Private Limited** is hereby extended till November 15, 2019 or completion of assessment process, whichever is earlier.

The above extension is subject to the submission of required information/documents related to assessment on time to NABET.

You are requested not to use this letter after expiry of the above stated date.

With best regards,

16/05/2019

A.K Jha
Senior Director| NABET

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PROJECT DETAILS

Name of Project	***Environmental Impact Assessment Report for proposed Onshore Oil and Gas Exploration and Appraisal in CB-ONHP-2017/10 block in Banskantha District, Gujarat and Jalore District, Rajasthan by Vedanta Limited (Division: Cairn Oil & Gas)***
Project Number	***Version 2 Released September 2019***

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CONTENTS

ABBREVIATIONS

APHA	:	*American Public Health Association*
ASTM	:	*American Society for Testing and Materials*
AWWA	:	*American Water Works Association*
bbl	:	*Billion Barrels*
BDL	:	*Below Detection Level*
BOD	:	*Biological Oxygen Demand*
BTEX	:	*Benzene Toluene Ethylene Xylene*
CAGR	:	*Compound Annual Growth Rate*
CCoE	:	*Chief Controller of Explosives*
CF	:	*Contamination Factor*
CI	:	*Corrosion Inhibitor*
COD	:	*Chemical Oxygen Demand*
CPCB	:	*Central Pollution Control Board*
CRZ	:	*Coastal Regulation Zone*
DGH	:	*Directorate General of Hydrocarbons*
DO	:	*Dissolved Oxygen*
DTS	:	*Distributed Temperature System*
EC	:	*Electrical Conductivity*
ECP	:	*External Casing Packers*
EIA	:	*Environmental Impact Assessment*
EMMP	:	*Environmental Monitoring and Management Plan*
GBHOB	:	*Girth at breast height over bark*
GPS	:	*Geographical Positioning System*
GPCB	:	*Gujarat Pollution Control Board*
HAZOP	:	*Hazard Operability*
HC	:	*Hydrocarbons*
HDPE	:	*High Density Poly Ethylene*
HSE	:	*Health Safety & Environment*
IPSEM	:	*Institute of Petroleum Safety and Environment Management*
ISRS	:	*International Safety Rating System*
MMSCMD	:	*Metric Standard Cubic Meters per Day*
MOEF&CC	:	*Ministry of Environment, Forests & Climate Change*
MSDS	:	*Material Safety Data Sheet*
NABET	:	*National Accreditation Board of Education and Training*
ND	:	*Not Detected*
NELP	:	*New Exploration Licensing Policy*
OALP	:	*Open Acreage Licensing Policy*
OHSMS	:	*Occupational Health & Safety Management System*
PAH	:	*Polycyclic Aromatic Hydrocarbon*
PEL	:	*Petroleum Exploration License*
PFP	:	*Flare Platform*
PHC	:	*Petroleum Hydrocarbon Content*
PPE	:	*Personal Protective Equipment*

PVC	:	*Polyvinyl Chlroide*
QCI	:	*Quality Council of India*
RSPCB	:	*Rajasthan State Pollution Control Board*
SS	:	*Suspended Solids*
TDS	:	*Total Dissolved Solids*
TOR	:	*Terms of Reference*
TPH	:	*Total Petroleum Hydrocarbon*
TSS	:	*Total Suspended Solids*
USEPA	:	*United States Environmental Protection Agency*

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

1.1 PREAMBLE

Vedanta Limited (Division: Cairn Oil & Gas) has been allocated the CB-ONHP-2017/10 hydrocarbon block under the OALP (Open Acreage Licensing Policy) by MoP&NG, Govt. of India. RSC (Revenue Sharing Contract) has been signed between Vedanta Limited and MoP&NG on 1st October, 2018 for the exploration and exploitation of hydrocarbons.

Vedanta Limited (Division: Cairn Oil & Gas) proposes to carry out exploratory and appraisal well drilling and early production of oil and gas in the block. In case of a discovery (ies), the exploratory and appraisal well(s) will be tested for extended duration by flowing hydrocarbons to ascertain the reservoir parameters and assess the quality and commercial viability. Moreover, in case of commercially viable discovery (s) of hydrocarbons in the block and having established the size of the hydrocarbon field (s), field will be immediately brought into early production of crude oil and associated gas using some of the successful exploratory/appraisal wells by setting up of temporary and mobile Early Production Units (EPUs)/Quick Production Units (QPUs) for the processing of produced well fluids..

The proposed project is green field in nature. The block covers an area of 2100 Sq.Km in Banaskantha District of Gujarat and 666 Sq.Km in Jalore District of Rajasthan. It is planned to drill 70 Exploratory and Appraisal wells.

ABC Techno Labs India Pvt. Ltd., NABET Accredited Environmental Consultant Organization has been engaged by Vedanta Limited (Division: Cairn Oil & Gas) to carry out Environment Impact Assessment (EIA) study and to prepare an Environment Management Plan (EMP) for getting environment clearance for Proposed project activities. The study has been carried out as per the guidelines of Ministry of Environment, Forests & Climate Change (MoEF&CC).

1.2 OBJECTIVE OF THE STUDY

The EIA/EMP study is a planning tool to confirm the environmental acceptability, in addition to the statutory requirements. The main objectives of the EIA study are as follows:

- Establish the prevailing baseline environmental and socio-economic condition of proposed project and its surroundings along with the compliance needs for environmental approvals to carry out hydrocarbon exploration.

- Assessing environmental and socioeconomic impacts arising out of the proposed drilling activities;
- Recommend appropriate preventive and mitigation measures to eliminate or minimize pollution, environmental & social disturbances during the life-cycle of the project, ensuring compliance with environmental laws and regulations applicable;
- Identifying and proposing alternative actions in terms of technology and practices that may help in abating environmental or socio-economic impacts due to the project;

The proposed project designated to be developed under the Environmental Impact Assessment (EIA) Notification and amendments under Environment (Protection) Act, 1986. As per notification dated 14th September 2006, proposed project is designated as ***"Category A"*** project and require environment clearance from Ministry of Environment, Forest and Climate Change, Govt. of India, Delhi. The present proposal is classified under ***Schedule 1 (b) - Offshore and Onshore oil and gas exploration, development & production, Category 'A'*** according to EIA Notification 2006 & subsequent amendments.

1.3 PROJECT STATUS

Vedanta Limited (Division: Cairn Oil & Gas) had submitted Form-1 of the EIA Notification, along with a draft Terms of Reference (ToR) for scoping to MoEF&CC. MoEF&CC has issued an approved ToR vide letter No. IA-J-11011/108/2019-IA-II(I) dated 26th April 2019. The approved ToR is attached as Annexure 2.

The baseline monitoring and all primary data collection was conducted for the summer season (March to June) of 2019, as per the requirements of the ToR. Draft EIA report has been prepared for public hearing.

1.4 BRIEF DETAILS OF THE PROJECT

CB-ONHP-2017/10 block is located in Banskantha District, Gujarat and Jalore District, Rajasthan. Vedanta Limited (Division: Cairn Oil & Gas) proposes to carry out:

1. *Drilling of 70 exploratory (including appraisal) wells*
2. *Setting up of Early Production Units (EPUs)/Quick Production Units (QPU) for produced well fluid processing and production of upto 28000 BOPD of crude oil and up to 4.2 MMSCFD of associated natural gas.*

1.5 NEED FOR THE PROJECT AND ITS IMPORTANCE

India is largely dependent on import of petroleum goods to meet its requirements. Facing an environment of increasing consumption, static reserves, increasing imports and increasing costs of crude as well as decreasing value of the Indian Rupee vis-à-vis the US Dollar, it follows that any accretion of hydrocarbon reserves in the country, is welcome.

Vedanta's proposed exploratory drilling project could possibly result in the discovery of hydrocarbon and subsequent development and production would help in reducing India's dependence on imports. Consequently, the need for the project is evident. The proposed project would also contribute to the state Governments in terms of royalty through the mining lease. Additionally the proposed project would generate direct and indirect employment in the region.

1.6 SCOPE AND METHODOLOGY OF THE STUDY

The scope of the EIA Study considers the impact due to drilling of 70 onshore exploratory and appraisal wells and setting up of EPU/QPU in CB-ONHP-2017/10 on physical, biological and socio-economic environment of the surrounding areas in compliance to the approved ToR provide by MoEF&CC. The scope of the EIA study includes the following:

- *To establish the prevailing environmental and socio-economic condition of the study area;*
- *To assess environmental and socioeconomic impacts arising out of the proposed activities;*
- *To recommend appropriate preventive and mitigation measures to eliminate or minimize pollution;*
- *To identify and propose management plans in terms of good practices that may help in abating environmental or socio-economic impacts due to the project.*
- *To prepare a Disaster Management Plan (DMP) based on Risk Assessment/studies;*

Environmental baseline monitoring has been carried out during **March 2019 to June 2019** representing summer season and used to identify potential significant impacts. EIA study has been carried out with the following activities:

- ❑ A collection of baseline attributes within the study area (10 Km surrounding of Block) covered one season environmental data, as per the guidelines of MoEF&CC, New Delhi. The scope includes a collection of baseline data, identify the various environmental parameters such as Meteorology, Ambient Air Quality, Ambient

Noise levels, Traffic status, Water Quality (Surface & Ground), Soil Quality, Biological Environment, Socio -economic factors, land use factors, within the study area of proposed block.

- ❑ Identification, prediction, evaluation & mitigation of biophysical, social & otherrelevant effects of exploration activities on the environment. Accordingly mitigation measures to be adopted have been recommended for critical environment impacts.
- ❑ Preparation of Risk Assessment & Emergency Preparedness/Disaster Management Plan for the proposed project.
- ❑ Delineation of the post-project environmental quality monitoring program as per the requirements of the regulatory authorities.
- ❑ Preparation of Environmental Management Plan (EMP) to be adopted for mitigation of the anticipated adverse impacts of the proposed project activities.

1.7 STRUCTURE OF EIA REPORT

The EIA report has been presented in order to group the environmental parameters under physical, biological, demographic & socio-economic environments, anticipated impacts and mitigation measures. The EIA report has been prepared as contents given in EIA Notification 2006 and subsequent amendments. The structure of EIA Report is as given below:

Executive Summary:	Given in the beginning of the report
Chapter 1: Introduction	This chapter provides background information, brief location settings of the area along with the scope and objectives of the EIA/ EMP study also been described in this chapter
Chapter 2: Project Description	This chapter deals project details, project layout, process details, operating parameters, power requirements, water requirement and sources pollution and it management, cost etc.
Chapter 3: Description of the Environment	This chapter presents existing environmental status of the 10 Km radius (surrounding of the block) study area around the block including topography, geological, drainage pattern, water environment, climate & meteorology, Ambient Air Quality, Ambient Noise levels, Traffic status, Water Quality

	(Surface & Ground), Soil Quality, Biological Environment, Socio -economic factors etc.
Chapter 4: Anticipated Environmental Impacts and its Mitigation Measures	This chapter describes the anticipated impact on the environment and mitigation measures for proposed exploratory drilling project. It gives the details of the impact on the baseline parameters, both during the construction and operational phases and suggests the mitigation measures to be implemented by the Vedanta Limited (Division: Cairn Oil & Gas).
Chapter 5: Alternative Analysis	This chapter examines alternatives analysis with respect to site and technology for the proposed project activities.
Chapter 6: Environmental Monitoring Plan	This chapter describes Environmental Monitoring Plan for the proposed project activities during construction and operation phases.
Chapter 7: Risk Assessment and Disaster Management Plan	This chapter spelled out hazard identification, risk analysis and disaster management plan for an unlikely event of emergency for proposed project activities.
Chapter 8: Project Benefits	This chapter includes the benefits in terms of improvement in physical infrastructure, social infrastructure, employment potential, etc.
Chapter 9: Environmental Management Plan	This chapter describes environmental management plan to mitigate adverse environmental impacts and to strengthen beneficial impacts.
Chapter 10: Summary & Conclusions	This chapter provides overall summary and conclusion of the EIA study
Chapter 11: Disclosure of Consultants	This chapter comprises the details of ABC Techno Labs India Pvt. Ltd. and respective experts engaged and nature of consultancy rendered.

1.8 COMPLIANCE OF TOR

Compliance of TOR Issued by MoEF&CC, New Delhi vide F.No. IA-J-11011/108/2019-IAII(I) Dated 26th April 2019.

Sl. No.	Description	Details
A.	**STANDARD TERMS OF REFERENCE**	
1	Executive summary of a project	Attached separately
2	Project description, project objectives and project benefits	Project Description in section 2.6 of Chapter 2, project objectives in section 2.2 of Chapter 2, project benefits in Chapter 8 of EIA
3	Cost of project and period of completion	Cost of project provided in section 2.10 of Chapter 2
4	Site details within 1 km of the each proposed well, any habitation, any other installation/activity, flora and fauna, approachability to site, other activities including agriculture/land, satellite imagery for 10 km area. All the geological details shall be mentioned in the Topo sheet of 1:40000 scale, superimposing the well locations and other structures of the projects. Topography of the project site	The areas within 1 km of the proposed wells are open land and agricultural land area. The site details within 1 km radius of each well are provided at Annexure 3, Satellite imagery provided at section 3.10 of chapter. Geological structure description provided in section 3.7
5	Details of sensitive areas such as National Park, Wildlife sanctuary and any other eco-sensitive area alongwith map indicating distance	No Reserve Forest found around 10 km radius from the project. There are no National Parks/ wildlife sanctuary present with 10 km surrounding of the block.
6	Approval for the forest land from the State/Central Govt. under Forest (Conservation) Act, 1980, if applicable.	Not applicable
7	Recommendation of SCZMA/CRZ clearance as per CRZ Notification dated 6th January, 2011 (if applicable).	Not applicable
8	Distance from nearby critically/severely polluted area as per Notification, if applicable. Status of moratorium imposed on the area.	No critically/severely polluted area is present within 10 Km surrounding of the CB-ONHP-2017/10 block
9	Does proposal involve rehabilitation and resettlement? If yes, details thereof.	The proposed project will not require rehabilitation and resettlement. Details provided in section 2.6 of

Sl. No.	Description	Details
		Chapter 2.
10	Environmental considerations in the selection of the drilling locations for which environmental clearance is being sought. Present any analysis suggested for minimizing the foot print giving details of drilling and development options considered.	The environmental considerations are given in Section 2.5 of chapter 2.
11	Baseline data collection for air, water and soil for one season leaving the monsoon season in an area of 10 km radius with centre of Oil Field as its centre covering the area of all proposed drilling wells	Please refer Section 3.11 for baseline air quality, Section 3.14 baseline water quality, Section 3.15 for baseline soil quality respectively.
12	Climatology and Meteorology including wind speed, wind direction, temperature rainfall relative humidity etc.	Provided at section 3.4 of Chapter 3
13	Details of Ambient Air Quality monitoring at 8 locations for PM2.5, PM10, SO2, NOx, CO, VOCs, Methane and non-methane HC.	Ambient Air Quality provided in Section 3.11 of Chapter 3
14	Soil sample analysis (physical and chemical properties) at the areas located at 5 locations.	Result of Soil Sample Analysis Section 3.15.2 of Chapter 3
15	Ground and surface water quality in the vicinity of the proposed wells site.	Result of Ground and Surface Water given in Section 3.14.2 of Chapter 3
16	Measurement of Noise levels within 1 km radius of the proposed wells.	Provided at Section 3.12 of Chapter 3
17	Vegetation and land use; flora/fauna in the block area with details of endangered species, if any.	LU details provided at section 3.10 Ecological details provided in 3.16
18	Incremental GLC as a result of DG set operation, flaring etc.	Incremental GLC Concentrations are provided at section 4.7 of Chapter 4
19	Potential environmental impact envisaged during various stages of project activities such as site activation, development, operation/ maintenance and decommissioning.	Potential Environmental Impacts envisaged during various stages of Project activities is given in Chapter 4
20	Actual source of water and 'Permission' for the drawl of water from the Competent Authority. Detailed water balance,	Refer section 2.8.1.2 of chapter 2.

Sl. No.	Description	Details
	wastewater generation and discharge.	
21	Noise abatement measures and measures to minimize disturbance due to light and visual intrusions.	Abatement of visual intrusions and noise have been provided at Sections 4.8 of Chapter 4
22	Details on wastewater generation, treatment and utilization/discharge for produced water/formation water, cooling waters, other wastewaters, etc. during all project phases	Refer section 2.9.1 of Chapter 2
23	Details on solid waste management for drill cuttings, drilling mud and oil sludge, produced sand, radioactive materials, other hazardous materials, etc. including its disposal options during all project phases.	Details provided in section 2.9.1 of Chapter 2 and section 9.3.6 of chapter 9
24	Disposal of spent oil and lube.	Details provided in section 2.9.1 of Chapter 2 and section 9.3.6 of chapter 9
25	Storage of chemicals and diesel at site. Hazardous material usage, storage and accounting.	Chemicals and diesels will be stored on paved areas, Bund wall will be provided to diesel storage area, Spill kits will be made available in chemical and diesel storage area, covered shed will be constructed for storage areas. Details in 2.9.1 of Chapter 2
26	Commitment for the use of water based mud (WBM) only.	Details provided at table 2.6.1.2
27	Oil spill emergency plans for recovery/reclamation.	Detail plan provided in section 7.2.15 of chapter 7 and in section 9.3.8 in chapter 9
28	H_2S emissions control.	As per available data, there is no chance of presence of H_2S in the hydrocarbon present within block, however, as a hypothetical case, scenario of presence of 3% H_2S has been considered for consequence analysis. Detail plan provided in section 7.2.3.2
29	Produced oil/gas handling, processing and	Refer section 2.6.2 of Chapter 2

Sl. No.	Description	Details
	storage/transportation.	
30	Details of control of air, water and noise pollution during production phase.	Not applicable
31	Measures to protect ground water and shallow aquifers from contamination.	Measures to protect groundwater and shallow aquifers provided in section 9.3.4 of chapter 9.
32	Whether any burn pits being utilised for well test operations.	Burn Pits will not be used.
33	Risk assessment and disaster management plan for independent reviews of well designed construction etc. for prevention of blow out. Blowout preventer installation.	Please refer section 7.2 of Chapter 7
34	Environmental management plan.	Please refer Chapter 9
35	Total capital and recurring cost for environmental control measures.	Please refer section 9.4 of Chapter 9
36	Emergency preparedness plan.	Details provided in section 7.4.8 of chapter 7.
37	Decommissioning and restoration plans	Details provided in section 9.3.12 of chapter 9.
38	Documentary proof of membership of common disposal facilities, if any.	Currently we do not have certificate and same will be obtained before execution of the project.
39	Details of environmental and safety related documentation within the company including documentation and proposed occupational health and safety Surveillance Safety Programme for all personnel at site. This shall also include monitoring programme for the environmental.	Details in section 9.3.9, Chapter 9.
40	A copy of Corporate Environment Policy of the company as per the Ministry's O.M. No. J-11013/41/2006-IA.II(I) dated 26th April, 2011 available on the Ministry's website	Refer Chapter 9, section 9.2
41	Any litigation pending against the project and or any direction/order passed by any court of law against the project. If so details thereof.	There is not litigation pending.

1.9 LIMITATIONS

This EIA study is based on certain scientific principles and professional judgment to certain facts with resultant subjective interpretation. Professional judgment expressed herein is based on the available data and information.

This report has been developed based on the project related information provided by Vedanta Limited (Division: Cairn Oil & Gas) with the assumption that the information gathered is representative for the proposed drilling of 70 onshore exploratory and appraisal wells in Banaskantha district of Gujarat and Jalore district of Rajasthan. If information to the contrary is discovered, the findings in this EIA may need to be modified accordingly. The impact assessment for the Project is based on the project configuration as described in Section 2 on Project Description.

CHAPTER 2: PROJECT DESCRIPTION

2.1 INTRODUCTION

The proposed project includes drilling of 70 onshore exploratory and appraisal wells and Setting up of Early Production Units (EPUs)/Quick Production Units (QPUs) for produced well fluid processing and production of up to 28000 BOPD crude oil and up to 4.2 MMSCFD associated natural gas in CB-ONHP-2017/10 block located in Banaskantha District of Gujarat & Jalore District of Rajasthan.

In case of a discovery (ies), the exploratory and appraisal well(s) will be tested for extended duration by flowing hydrocarbons to ascertain the reservoir parameters and assess the quality and commercial viability. Moreover, in case of commercially viable discovery (ies) of hydrocarbons in the block and having established the size of the hydrocarbon field (s), field will be immediately brought into early production of crude oil and associated gas using some of the successful exploratory/ appraisal wells by setting up of temporary and mobile EPU/QPU for the processing of produced well fluids.

Table 2.1: Salient Features of the proposed Oil & Gas block

Particulars	Details
Name of block	CB-ONHP-2017/10
Land required	For well site during drilling will be 9.0 ha
Depth of well	3500 m (Approx)
Duration of Drilling	60-90 Days per Well (approx.)
Spent /Residual drilling mud	250-500 tons/well
Quantity of drill cutting	Drill cuttings associated with WBM - 250-750 tons/well Drill cuttings associated with SBM - 500-1500 tons/well
Drilling mud composition	Water Base Mud (WBM) will be used as drilling fluid for initial, shallower sections where massive shale not encountered. The deeper and difficult to drill geological formations will be drilled using Synthetic Base Mud (SBM) as drilling fluid
Estimated project cost	INR 1663.641 Crore
Manpower Requirement	Total Manpower: 30-35 (Site preparation Phase), 80-100 (during drilling)
Seismic zone	The proposed block area falls in Seismic Zone III as per IS 1893:2002 (Part-1), which is a Moderately sensitive seismic zone.

Source: Vedanta Limited (Division: Cairn Oil & Gas)

2.2 OBJECTIVE OF THE PROPOSED DRILLING ACTIVITY

The proposed project will ultimately cater to fulfil the energy requirement of India. The dependency of India on other countries will be lessened to an extent. Additionally, the project will benefit people living in neighbouring villages within the block in relation to direct & indirect employment associated with various project activities and will boost the local economy. The benefits of the project are listed below;

- Provision of more royalty to Gujarat and Rajasthan Government and more cess to Govt. of India
- Development of infrastructure (roads, culverts, bridges etc.) in the area
- Provision of more employment opportunity to local people
- Increase in direct and indirect business opportunity for the local people
- Energy security for the country.

2.3 SITE CHARACTERISTICS

2.3.1 LOCATION OF BLOCK

The block CB-ONHP-2017/10 is located in Banaskantha district of Gujarat and Jalore district in Rajasthan. It encloses an area of 2100 Sq.Km in Banaskantha District of Gujarat and 666 Sq. km in Jalore District of Rajasthan and is bounded by the points having following coordinates provided in Table 2.2.

Table 2.2: Co-ordinates of Block CB-ONHP-2017/10 boundary (as per RSC)

Points	Longitude	Latitude	Points	Longitude	Latitude
1	71° 50'	24° 40'	12	71° 38'	24° 18'
2	72° 0'	24° 40'	13	71° 38'	24° 19'
3	72° 0'	24° 10'	14	71° 37'	24° 19'
4	71° 50'	24° 10'	15	71° 37'	24° 21'
5	71° 50'	24° 16'	16	71° 36'	24° 21'
6	71° 49'	24° 16'	17	71° 36'	24° 22'
7	71° 49'	24° 17'	18	71° 35'	24° 22'
8	71° 47'	24° 17'	19	71° 35'	24° 31'
9	71° 47'	24° 16'	20	71° 30'	24° 31'
10	71° 39'	24° 16'	21	71° 30'	24° 50'
11	71° 39'	24° 18'	22	71° 50'	24° 50'

Source: Vedanta Limited (Division: Cairn Oil & Gas)

The proposed well locations with Village and Taluka/Tehsil as follows:

Table 2.3: Proposed Well Locations

Well id	Latitude	Longitude	Present Land use	Village Name	Taluka/Tehsil	District	State
1	71° 53' 25.979" E	24° 11' 59.463" N	Agricultural Fallow	Navapura	Deodar	Banaskantha	Gujarat
2	71° 56' 58.336" E	24° 12' 3.753" N	Agricultural Fallow	Nesda nava	Deesa	Banaskantha	Gujarat
3	71° 53' 21.250" E	24° 15' 14.267" N	Agricultural Fallow	Dera	Deodar	Banaskantha	Gujarat
4	71° 56' 53.696" E	24° 15' 18.568" N	Agricultural Fallow	Dharanva	Deesa	Banaskantha	Gujarat
5	71° 42' 38.986" E	24° 18' 15.638" N	Agricultural Fallow	Sanav	Deodar	Banaskantha	Gujarat
6	71° 46' 11.479" E	24° 18' 20.197" N	Agricultural Fallow	Kuwana	Deodar	Banaskantha	Gujarat
7	71° 49' 43.986" E	24° 18' 24.674" N	Agricultural Fallow	Ganeshpura	Tharad	Banaskantha	Gujarat
8	71° 53' 16.508" E	24° 18' 29.069" N	Agricultural Fallow	Agthala	Deesa	Banaskantha	Gujarat
9	71° 56' 49.043" E	24° 18' 33.381" N	Open Jungle	Agthala	Deesa	Banaskantha	Gujarat
10	71° 39' 1.391" E	24° 21' 25.752" N	Agricultural Fallow	Malupur	Tharad	Banaskantha	Gujarat
11	71° 42' 33.959" E	24° 21' 30.405" N	Agricultural Fallow	Padadar	Tharad	Banaskantha	Gujarat
12	71° 46' 6.542" E	24° 21' 34.976" N	Agricultural Fallow	Peparal	Tharad	Banaskantha	Gujarat
13	71° 49' 39.140" E	24° 21' 39.464" N	Agricultural Fallow	Gela	Tharad	Banaskantha	Gujarat
14	71° 53' 11.751" E	24° 21' 43.869" N	Agricultural Fallow	Vasna	Deesa	Banaskantha	Gujarat
15	71° 56' 44.377" E	24° 21' 48.193" N	Agricultural Fallow	Chekra	Deesa	Banaskantha	Gujarat
16	71° 36' 17.467" E	24° 24' 30.373" N	Agricultural Fallow	Chudmer	Tharad	Banaskantha	Gujarat
17	71° 38' 56.260" E	24° 24' 40.505" N	Agricultural Fallow	Budhanpur	Tharad	Banaskantha	Gujarat
18	71° 42' 28.918" E	24° 24' 45.170" N	Agricultural Fallow	Kothigam	Tharad	Banaskantha	Gujarat
19	71° 46' 1.591" E	24° 24' 49.752" N	Agricultural Fallow	Undrana	Tharad	Banaskantha	Gujarat
20	71° 49' 34.279" E	24° 24' 54.252" N	Agricultural Fallow	Bhimgadh	Tharad	Banaskantha	Gujarat
21	71° 53' 6.981" E	24° 24' 58.668" N	Agricultural Fallow	Detal Darbari	Tharad	Banaskantha	Gujarat
22	71° 56' 39.696" E	24° 25' 3.002" N	Agricultural Fallow	Bhakadiyal	Deesa	Banaskantha	Gujarat
23	71° 36' 12.231" E	24° 27' 45.113" N	Agricultural Fallow	Jamda	Tharad	Banaskantha	Gujarat
24	71° 38' 51.114" E	24° 27' 55.257" N	Agricultural Fallow	Lunal	Tharad	Banaskantha	Gujarat
25	71° 42' 23.862" E	24° 27' 59.934" N	Agricultural Fallow	Vedala	Tharad	Banaskantha	Gujarat
26	71° 45' 56.626" E	24° 28' 4.527" N	Agricultural Fallow	Khengarpura	Tharad	Banaskantha	Gujarat
27	71° 49' 29.404" E	24° 28' 9.038" N	Agricultural Fallow	kochala	Tharad	Banaskantha	Gujarat
28	71° 53' 2.196" E	24° 28' 13.466" N	Agricultural Fallow	Sidhotara	Tharad	Banaskantha	Gujarat
29	71° 56' 35.002" E	24° 28' 17.811" N	Agricultural Fallow	Yavarpura	Deesa	Banaskantha	Gujarat
30	71° 36' 6.979" E	24° 30' 59.851" N	Agricultural Fallow	Bhadodra	Tharad	Banaskantha	Gujarat

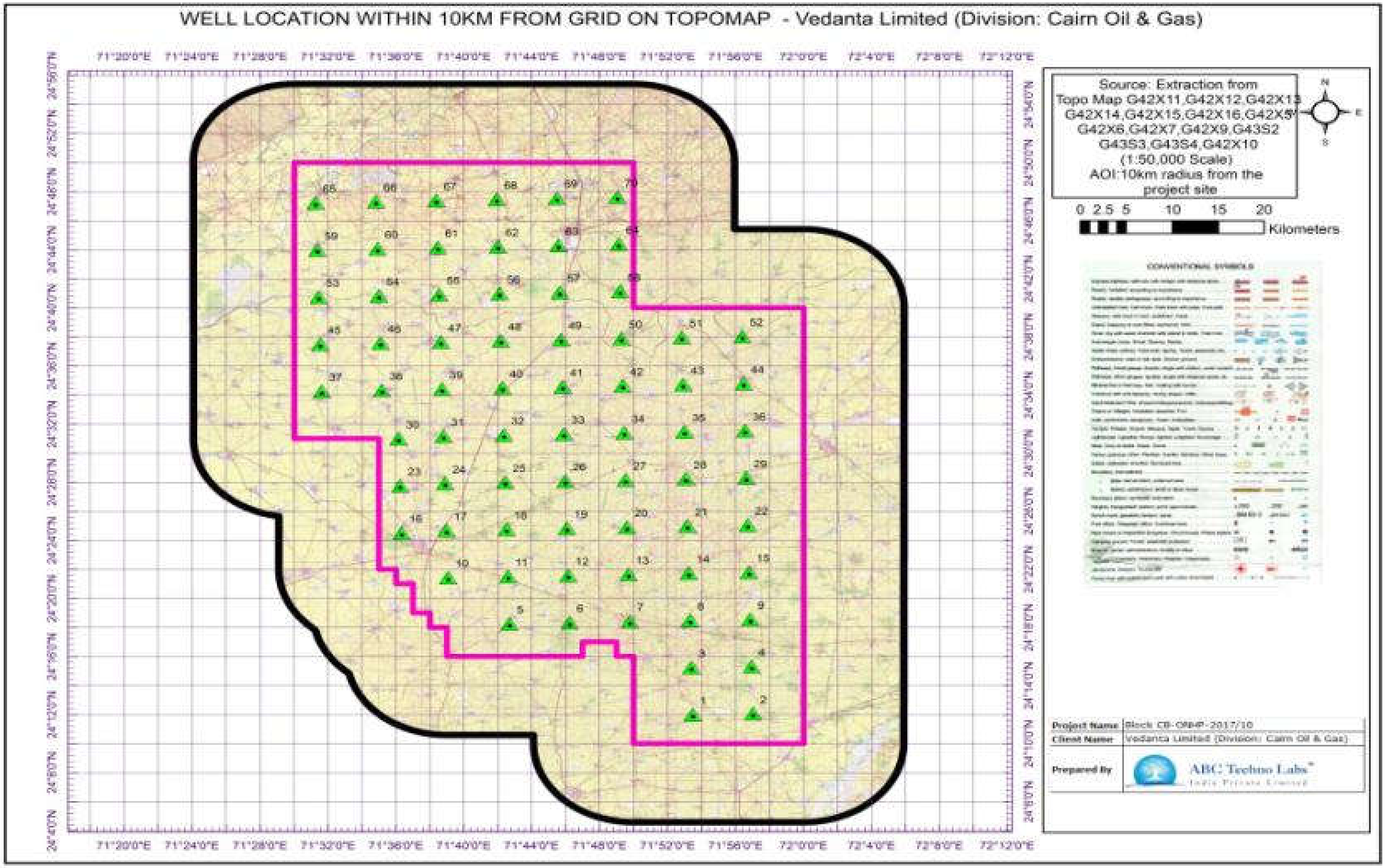
Well id	Latitude	Longitude	Present Land use	Village Name	Taluka/Tehsil	District	State
31	71° 38' 45.952" E	24° 31' 10.007" N	Agricultural Fallow	Hathawada	Tharad	Banaskantha	Gujarat
32	71° 42' 18.791" E	24° 31' 14.696" N	Fairly Dense Scrub	Magrol	Tharad	Banaskantha	Gujarat
33	71° 45' 51.646" E	24° 31' 19.301" N	Agricultural Fallow	Changada	Tharad	Banaskantha	Gujarat
34	71° 49' 24.514" E	24° 31' 23.823" N	Agricultural Fallow	Thara	Tharad	Banaskantha	Gujarat
35	71° 52' 57.397" E	24° 31' 28.261" N	Open scrub	Kiyal	Tharad	Banaskantha	Gujarat
36	71° 56' 30.294" E	24° 31' 32.617" N	Agricultural Fallow	Ramuna	Dhanera	Banaskantha	Gujarat
37	71° 31' 34.961" E	24° 34' 15.106" N	Agricultural Fallow	Jampur	Tharad	Banaskantha	Gujarat
38	71° 35' 7.861" E	24° 34' 19.973" N	Agricultural Fallow	Rampura	Tharad	Banaskantha	Gujarat
39	71° 38' 40.776" E	24° 34' 24.756" N	Agricultural Fallow	Karbun	Tharad	Banaskantha	Gujarat
40	71° 42' 13.706" E	24° 34' 29.456" N	Agricultural Fallow	Nana Mesara	Tharad	Banaskantha	Gujarat
41	71° 45' 46.651" E	24° 34' 34.072" N	Agricultural Fallow	Jadara	Tharad	Banaskantha	Gujarat
42	71° 49' 19.611" E	24° 34' 38.606" N	Agricultural Fallow	Morthal	Tharad	Banaskantha	Gujarat
43	71° 52' 52.585" E	24° 34' 43.056" N	Agricultural Fallow	Bhajna	Dhanera	Banaskantha	Gujarat
44	71° 56' 25.573" E	24° 34' 47.422" N	Agricultural Fallow	Vinchhivadi	Dhanera	Banaskantha	Gujarat
45	71° 31' 29.587" E	24° 37' 29.829" N	Agricultural Fallow	Sherau	Tharad	Banaskantha	Gujarat
46	71° 35' 2.578" E	24° 37' 34.708" N	Agricultural Fallow	Antrol	Tharad	Banaskantha	Gujarat
47	71° 38' 35.584" E	24° 37' 39.503" N	Agricultural Fallow	Naroli	Tharad	Banaskantha	Gujarat
48	71° 42' 8.605" E	24° 37' 44.214" N	Built up	Vaghasan	Tharad	Banaskantha	Gujarat
49	71° 45' 41.642" E	24° 37' 48.842" N	Agricultural Fallow	Kharakhoda	Tharad	Banaskantha	Gujarat
50	71° 49' 14.692" E	24° 37' 53.387" N	Agricultural Fallow	Virol	Dhanera	Banaskantha	Gujarat
51	71° 52' 47.758" E	24° 37' 57.848" N	Agricultural Fallow	Nenava	Dhanera	Banaskantha	Gujarat
52	71° 56' 20.837" E	24° 38' 2.225" N	Agricultural Fallow	Magarawa	Dhanera	Banaskantha	Gujarat
53	71° 31' 24.198" E	24° 40' 44.550" N	Agricultural Fallow	Kasavi	Tharad	Banaskantha	Gujarat
54	71° 34' 57.280" E	24° 40' 49.441" N	Agricultural Fallow	Takhuva	Tharad	Banaskantha	Gujarat
55	71° 38' 30.377" E	24° 40' 54.248" N	Agricultural Fallow	Kailashnagar	Hindaun	Jalore	Rajasthan
56	71° 42' 3.490" E	24° 40' 58.971" N	Agricultural Fallow	Lalpura	Sujangarh	Jalore	Rajasthan
57	71° 45' 36.618" E	24° 41' 3.611" N	Built up	Gardali	Sanchore	Jalore	Rajasthan
58	71° 49' 9.760" E	24° 41' 8.167" N	Fairly dense Jungle	Paladar	Sanchore	Jalore	Rajasthan
59	71° 31' 18.792" E	24° 43' 59.269" N	Agricultural Fallow	Sarawanaa	Sanchore	Jalore	Rajasthan
60	71° 34' 51.966" E	24° 44' 4.172" N	Agricultural Fallow	Amarpura	Sanchore	Jalore	Rajasthan
61	71° 38' 25.155" E	24° 44' 8.991" N	Agricultural Fallow	Chhajara	Sanchore	Jalore	Rajasthan

Well id	Latitude	Longitude	Present Land use	Village Name	Taluka/Tehsil	District	State
62	71° 41' 58.359" E	24° 44' 13.726" N	Agricultural Fallow	Kilawa	Sanchore	Jalore	Rajasthan
63	71° 45' 31.579" E	24° 44' 18.378" N	Agricultural Fallow	Itada	Sanchore	Jalore	Rajasthan
64	71° 49' 4.813" E	24° 44' 22.945" N	Agricultural Fallow	Jajoosan	Sanchore	Jalore	Rajasthan
65	71° 31' 13.371" E	24° 47' 13.987" N	Agricultural Fallow	Kesoori	Sanchore	Jalore	Rajasthan
66	71° 34' 46.637" E	24° 47' 18.902" N	Agricultural Fallow	Janvi	Sanchore	Jalore	Rajasthan
67	71° 38' 19.918" E	24° 47' 23.733" N	Agricultural Fallow	Vishnu nagar	Sanchore	Jalore	Rajasthan
68	71° 41' 53.214" E	24° 47' 28.480" N	Agricultural Fallow	Dadoosan	Sanchore	Jalore	Rajasthan
69	71° 45' 26.526" E	24° 47' 33.143" N	Agricultural Fallow	Siddheshwar	Sanchore	Jalore	Rajasthan
70	71° 48' 59.852" E	24° 47' 37.721" N	Agricultural Fallow	Phalna	Sanchore	Jalore	Rajasthan

Source: ABC Techno Labs India Pvt. Ltd.

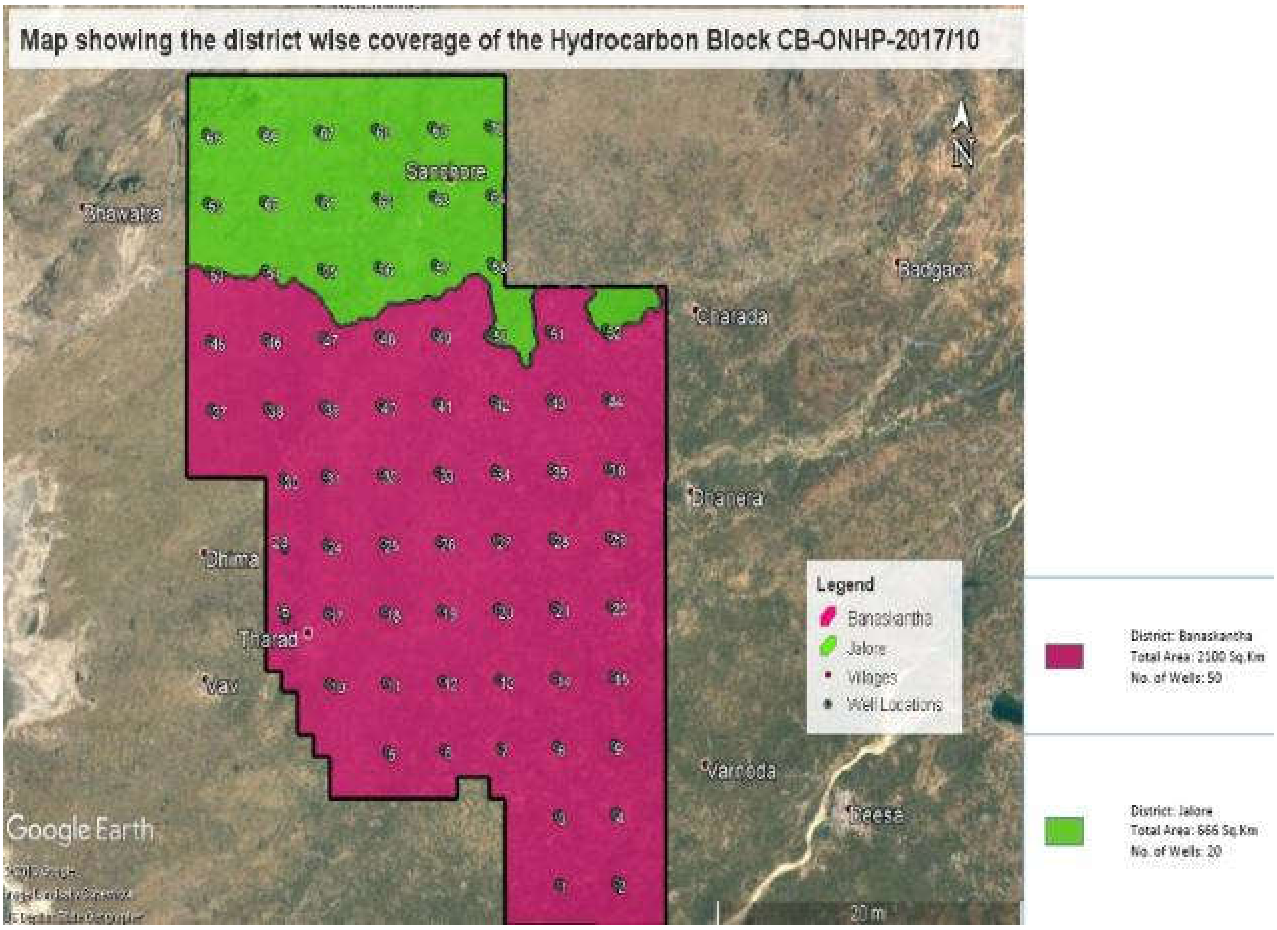
Note: Actual geo-graphical surface coordinates of exploratory and appraisal well locations would be within 2000 m radius of the proposed coordinates.

The location of the project area is shown in Figure 2.1.



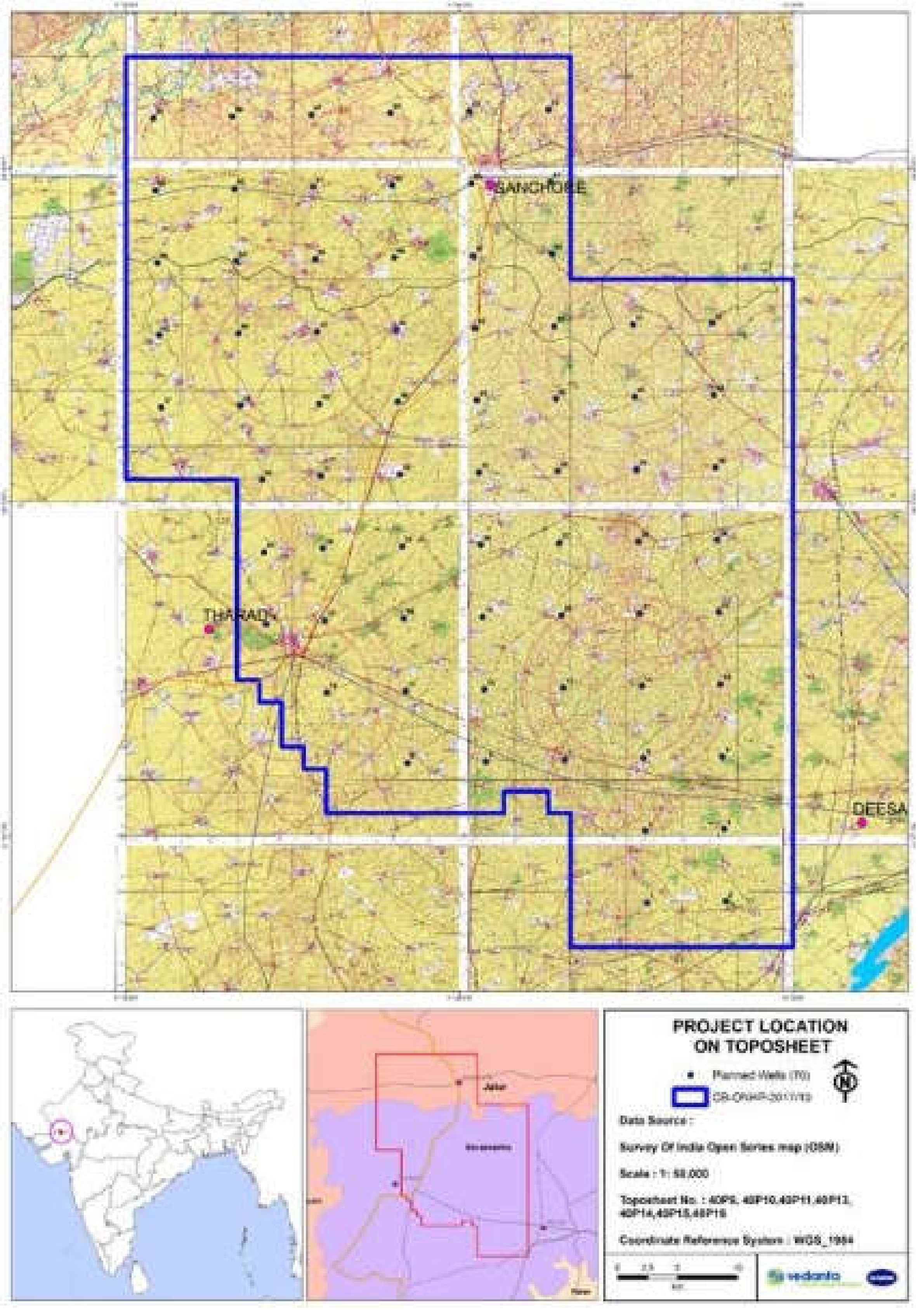
Source: Survey of India

Figure 2.1: Toposheet of CB-ONHP-2017/10 block



Source: Google Earth

Figure 2.2: Google image of block Location



Source: Vedanta Limited (Division: Cairn Oil & Gas)

Figure 2.3: Location map of Project site

2.3.2 CONNECTIVITY

The project location is situated in Banskantha District, Gujarat and Jalore District, Rajasthan. The project location is well connected by road, rail and by air.

Road Network:	*The CB-ONHP-2017/10 block is connected to through Roads (NH-15, NH-68, SH-54, SH-128 and SH-129 passes through the block). Nearest major town is Deesa (Gujarat) which is 19 Km towards East direction from the block boundary.*
Railway Network:	*Bhildi Railway Station is 900m, East from the block, Dhanera Railway Station is 3.2 Km, East from the block and Diyodar Railway Station is 8.8Km, South from the block).*
Airport Connectivity:	*Nearest Airport: Ahmedabad Airport (137 Km, South from the block boundary).*

The map showing the road network around the site is given in Figure 2.4.

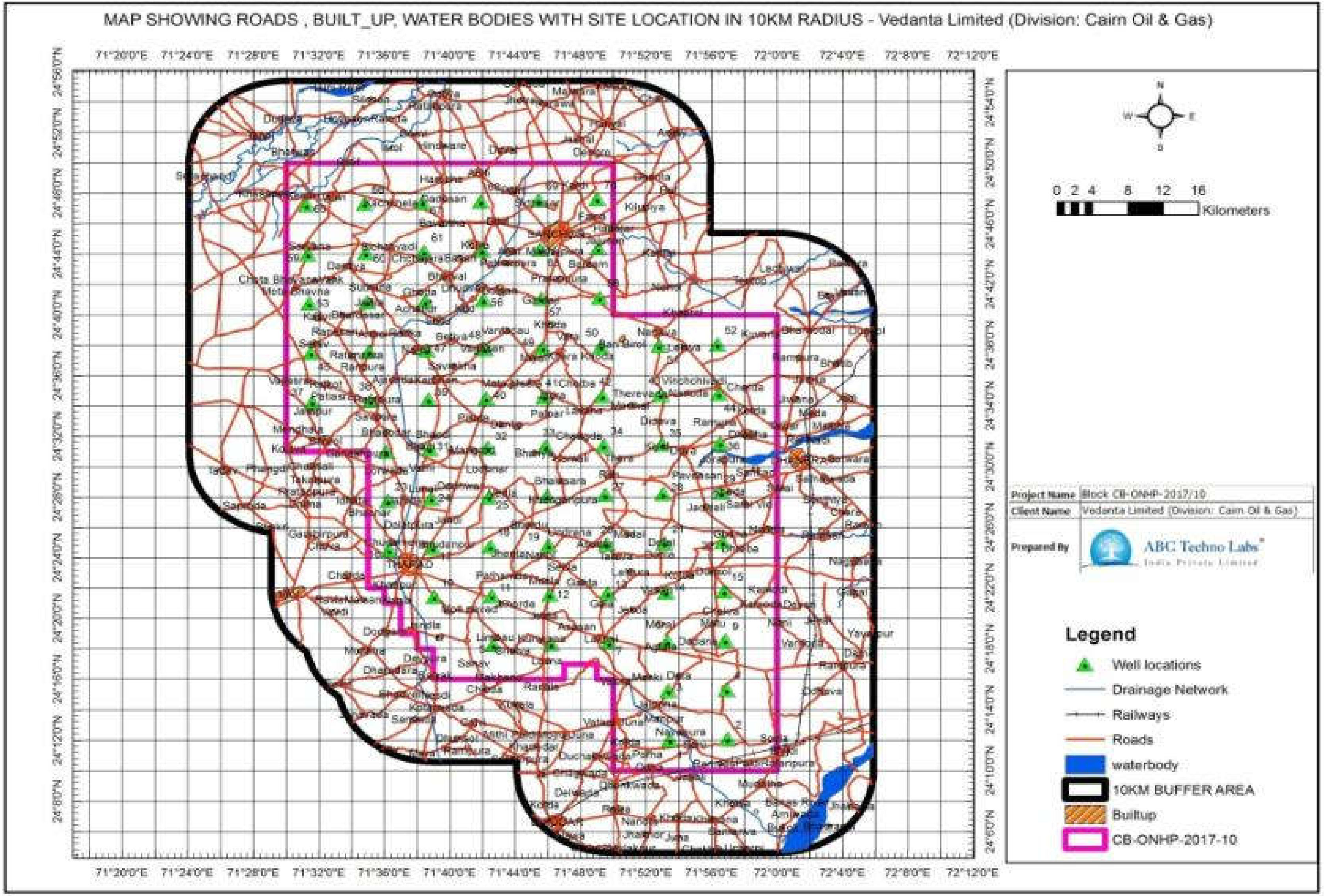


Figure 2.4: Connectivity shown in the map

2.4 MAGNITUDE OF OPERATION

The proposed project is expected to carry out:

1. Drilling of 70 exploratory (including appraisal) wells
2. Setting of facilities (EPU/QPU) for oil & gas processing and production of 28000 BOPD of crude oil and 4.2 MMSCFD of associated natural gas.

The exploratory and appraisal wells will be drilled to explore the reservoirs up to a depth of 3500 m approx.

2.5 ENVIRONMENTAL SETTING

The Block spreads across the Banaskantha District of Gujarat and Jalore District of Rajasthan. Environmental settings around 1 km radius area of each well site was carried out during field survey and the same has been checked with toposheet and satellite imagery. Presently all the proposed well locations are located in agricultural land. Settlements/houses and Tankas were observed in vicinity of well locations. Village roads are also located close to well locations. Well profile including environmental setting and environmental settings map of each well is given in Appendix 3.

- The water bodies cover Luni River is flowing within the block from west to east on North side of the Block (in Rajasthan) and Banas River is flowing at 5.3 Km, South from the block boundary (in Gujarat).
- There is no wildlife sanctuary and national park located within the 10 Km surrounding of the block boundary.
- Land use classes with the proposed block comprise of fallow land

2.6 PROJECT DESCRIPTION WITH PROCESS DETAILS

2.6.1 DRILLING OF EXPLORATION AND APPRAISAL WELL

Vedanta Limited (Division: Cairn Oil & Gas) proposed to drill 70 exploration & appraisal wells within the present block boundary of CB-ONHP-2017/10. The basic objective of the exploratory drilling will be as follows:-

- To determine the presence of potential hydrocarbon
- To appraise discovered oil & gas
- *To determine the presence of potential hydrocarbon*
- *To appraise discovered oil & gas*

The lifecycle of drilling activities involve well site selection, site and access road preparation and its maintenance, construction of drilling well, drilling activities, well testing and decommissioning and closure of wells, if not proved economically viable for production of oil and gas. The following are the commonly used terms in an oil and gas project.

Exploration Wells:

An Exploration Well is a hole drilled deep into the earth's surface; the hole is thought to contain hydrocarbon deposits. Areas that are inferred to contain oil or natural gas undergo a gravity survey, magnetic survey, seismic survey to discover the features of sub-surface geology. After a prospective area is detected, identified and evaluated, an Exploration Well is drilled to confirm the availability of oil or natural gas.

Appraisal Wells:

When, exploratory drilling is successful and a discovery is made, more wells (termed as Appraisal wells) will be drilled to determine the size and the extent of the field. Wells drilled to quantify the hydrocarbon reserves found are called as 'appraisal' wells. This is an intermediate step between exploration and development which is necessary to confirm the reserve size and field deliverability to an acceptable degree of accuracy. This may be in order to determine whether the discovery is commercial, or to establish the parameters necessary to define the optimal development scheme for the field. Appraisal may consist of additional seismic, further drilling or extended testing of an existing well. Any or all of these types of operations may be deemed desirable or necessary. The technical procedures and activities in appraisal drilling will be the same as those employed for exploration wells. A number of wells may be drilled from a single well pad/ drill site. Deviated or directional drilling at an angle from a site adjacent to the original discovery well may be used to appraise other parts of the reservoir, in order to reduce the land requirement.

Well Testing:

During the exploration and appraisal drilling, where a hydrocarbon formation is found, initial well tests (about one month of duration) will be carried out to establish flow rates, formation pressure and other parameters. However, depending on the need, based on nature of the reservoir, the exploratory and appraisal wells will be tested for longer/extended duration to ascertain the reservoir parameters. During the well testing, crude oil, natural gas and produced water could be generated and will be treated/disposed appropriately. Hydrocarbons will be flared. Efficient test flare burner will be used to minimize incomplete combustion. As an alternative option, if feasible, crude oil/ slop oil will be transferred to nearby refinery for processing or will be sent to authorized recyclers.

The project lifecycle has been classified into four phases:

- **Pre-drilling activity**
  - ✓ Site selection
  - ✓ Land procurement
  - ✓ Site Preparation
  - ✓ Site access road and drill site construction
  - ✓ Pre-drilling activities, mobilization and Rigging up
- **Drilling activity**
  - ✓ Drilling of wells
  - ✓ Testing of wells
- **Early Production- When, exploratory drilling leads to commercially viable discover (ies)**
  - ✓ Drilling of Appraisal wells to quantify the hydrocarbon reserves
  - ✓ Setting up of Early Production Units (EPUs)/Quick Production Units (QPUs).
- **Well decommissioning**
  - ✓ Well abandonment
  - ✓ Site closure and decommissioning
  - ✓ Site Restoration

2.6.1.1 PRE-DRILLING ACTIVITY

The pre-drilling phase will involve the following activities:

- ***Site Selection***

The exploration history of the area exhibits the potential presence of the oil and gas in the region. The seismic data interpretation of the seismic survey would decide the exact locations of the drilling well. The proposed exploratory well sites have been identified based on the study and interpretation of the stratigraphy and seismic data. Within the identified location the actual well drilling sites have been selected based on the following factors:

- Located at suitable distance from the nearest habitat/sensitive receptors
- Located at a safe distance (at least the boom/mast length away) from public road
- To ensure natural drainage channels are avoided
- Unhindered flow of rain/flood water. Where necessary adequate erosion control measures will be provided.

- ***Land requirement***

An area of approximately 300m X 300m would be taken on temporary short-term lease basis for the construction of well pad (drill site) for exploratory and appraisal wells. For the preparation of suitable access roads connecting to well pads, accommodating OHL and other utilities in future, a width of 30m (approx.) RoU would be required.

- ***Site Preparation***

Site preparation will involve all activities required to facilitate the operation of the drilling rig and associated equipment and machineries. At the initial stage, the drilling site will be elevated to about 2.0 m from the existing ground level with minimal clearance of existing ground vegetation. The existing trees would be retained to the extent possible. All efforts would be made during the design of the drill pad to prevent felling of any mature trees.

The loose top soil will be removed by using mechanical means like bulldozer and saved at a nearby place (away from the water channels) for later use during site restoration. Levelling and compaction will be done with the help of graders and mechanical rollers. The land filling materials and rubbles will be required for the purpose for site preparation in sufficient amount.

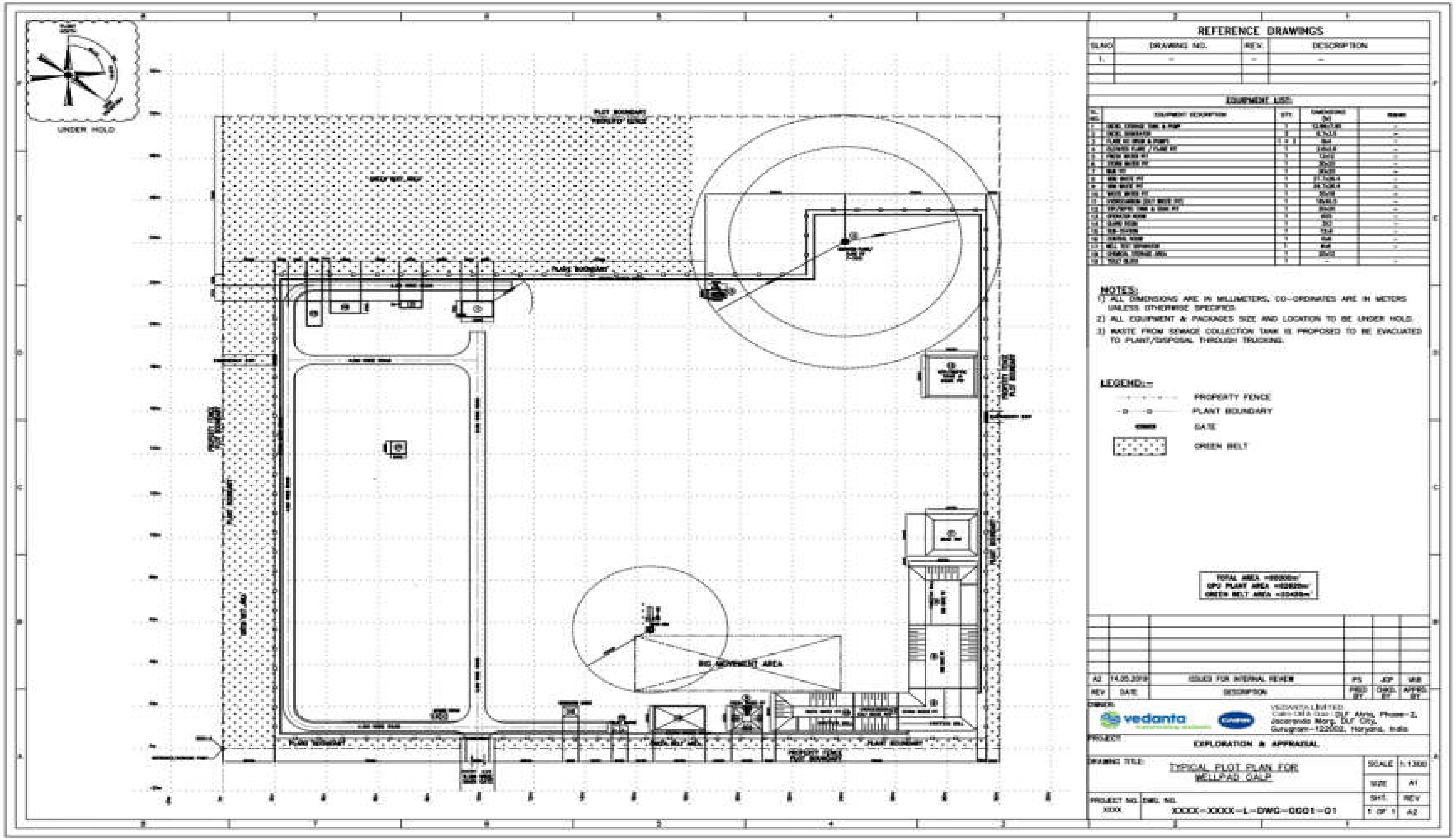
Subsequently, the proposed well site & campsite will be duly fenced using chain link and barbed wires.

Platforms for drill pad and all other heavy equipment systems or machinery, cast in-situ Reinforced Cement Concrete (RCC) would be used for the construction of foundation system. The rig foundation will be of 20m X 20m in size and will have an elevation of 0.6 m. For making the foundations of main rig structure, cast in-situ bored under- reamed piles of specified lengths will also be used. The elevated structures will have proper garland drains for storm water with sufficient gradient, made of brick masonry, to take care of surface runoff water.

Specially designed pit of an impervious HDPE liner will be provided as part of the site development for disposal of drilling waste in the form of spent drilling mud and cuttings. A Campsite, elevated to the height as that of the drilling site (approx. 2.0 m), will be set up adjoining the well site.

Local earth and rubble will be used as the fill material. Proper surface gradients and brick masonry drains will take care of the run-off water, where as separate septic tanks and soak pits will be provided along with the labour camp for disposal of domestic waste water.

Though the rig and related equipment's will be directly brought to site, spares, mud preparing chemicals and other materials will be stored at a warehouse near to the site and will be received to the site from that intermediate storage area. The rig equipment will however be transported directly to the drilling site during mobilization and will be de-mobilized directly from the site. The materials will be intermittently supplied from warehouse to the drilling site, during the operations - with some stock at the drilling site itself. A Typical drill site is given in Figure 2.5.



Source: Vedanta Limited (Division: Cairn Oil & Gas)

Figure 2.5: Drill Site Layout

2.6.1.2 EXPLORATORY WELL DRILLING PROCESS

The exploitation of hydrocarbons requires the construction of a conduit between the surface and the reservoir, which is achieved by the drilling process. Exploration and appraisal wells will be drilled using an Electric Land Rig of around 1200-1500 HP capacity, equipped with a Rotory/Top Drive System.

To support the drilling operation, the following systems and services will be included at the rig package:

- Portable Living Quarters – to house essential personnel on site on a 24 hr basis.
- These units are provided with Bath/Washroom.
- Crane-age - cranes for loading/off loading equipment and supplies.
- Emergency Systems - it includes fire detection and protection equipment.
- Environmental Protection – Blow out Prevention (BOP) system, wastewater treatment unit, cuttings handling equipment.

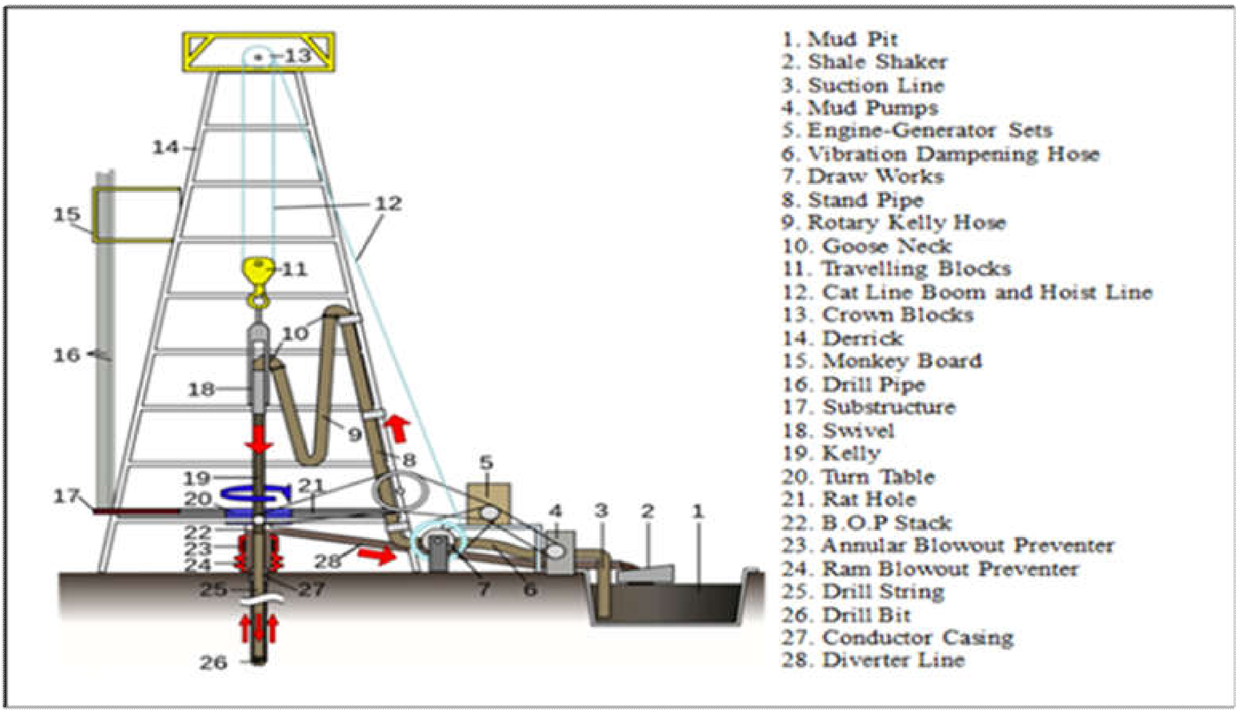
The various activities involved as a part of the drilling of exploration wells are described in detail in the subsequent sections.

- **Mobilization of Rig**

The proposed drilling shall be carried out by using a standard land rig or a "Mobile Land Rig" with standard water based drilling fluid treatment system. This rig will be suitable for deep drilling up to the desired depth of 3500 meters (TVDSS) as planned for the project. The typical configuration of a Drilling Rig is shown in the **Figure 2.6** and given in Table 2.4. Additionally, there will be other ancillary facilities like Drilling mud system, ETP, Cuttings disposal, Drill Cementing equipment etc. and utilities to supply power (DG sets), water, fuel (HSD) to the drilling process and will be set up as a part of the Project.

Table 2.4: Details of the drilling rig

Type of Rig	Electrical Rig
Drilling mud composition	Water based Mud (WBM) & Synthetic Based Mud (SBM)
Power generator type & nos.	AC – SCR Type. (03 Nos.)
Details of solids handling systems on rig	Shale Shakers - 1200 GPM Capacity Desander – 1200 GPM Capacity Desilter – 1200 GPM Capacity



Source: Vedanta Limited (Division: Cairn Oil & Gas)

Figure 2.6: Typical configuration of a Drilling Rig

- **Drilling Activities**

Initial Well Construction

Wells will be drilled in sections, with the diameter of each section decreasing with increasing depth. Before commencing the actual drilling, large diameter pipe (Conductor) will be lowered into a hole and cemented/grouted. Conductor pipes provide a conduit for the return fluid during drilling next section and also prevent whole unconsolidated material falling into hole and potential washout problems. Typical depths of such pipes are 6m. The lengths and diameters of each section of the well will be determined prior to the starting of the drilling activities and are dependent on the geological conditions through which the well is to be drilled. Once each section of the well is completed, the drill string is lifted and protective steel pipe or casing lowered into the well and cemented into place. The casing helps to maintain the stability of the hole and reduce fluid losses from the well bore into surrounding rock formations.

The following Figure 2.7 shows the various phases of the drilling activities and model of drilling process respectively:

Source: Vedanta Limited (Division: Cairn Oil & Gas)

Figure 2.7: Model of Drilling Process

The Drilling Process

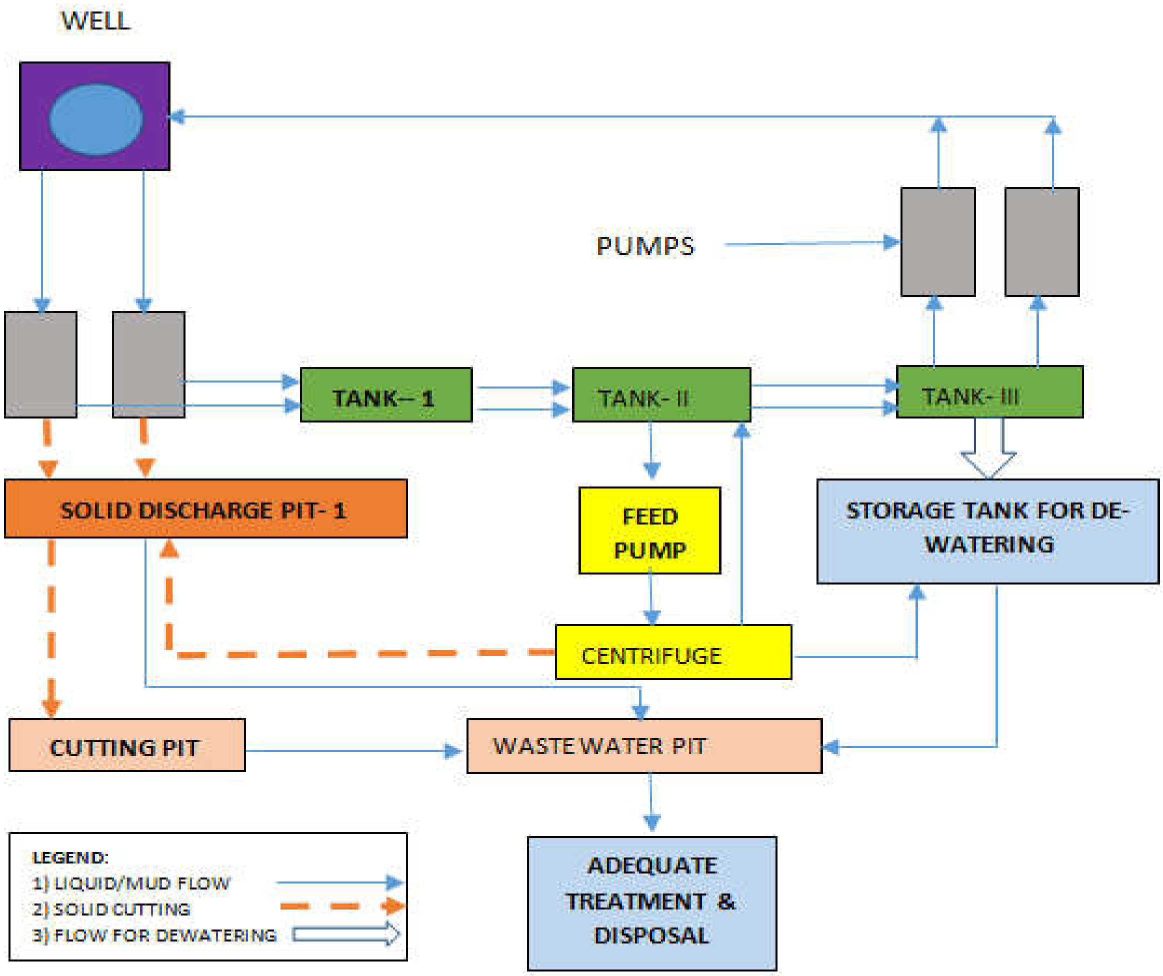
A rig will be installed at the potential site of drilling after thorough inspection for its working capability and quality standards. Well spudding shall be the start of drilling activity. Top-hole section will be drilled to a desired depth based on well design. After drilling top-hole section, it will be cased with a pipe called "Casing". "Casing" provides support to hole wall and secures hole section. Other than that, it isolates problematic hole sections such as loss zones, shale sections, over pressurized formations etc. After running casing, space between hole wall and "Casing" (annulus) will be cemented. This process of drilling and casing the hole section continues until the final well depth (target) is achieved. Drilling process is associated with various hazards such as well active situation (kicks), blowouts, H_2S situation etc.

Mud System and Cuttings

During drilling operations, the drilling fluid (or mud) is pumped through the drill string down to the drilling bit and returns at the drill pipe–casing annulus up to surface back into the circulation system after separation of drill cuttings/solids through solids control equipment. The primary function of drilling fluid is to ensure that the rock cuttings generated by the drill bit are continuously removed from the wellbore. The mud must be designed such that it can carry the cuttings to surface while circulating, suspend the cuttings while not circulating and drop the cuttings out of suspension at the surface. The drilled solids are removed at the surface by mechanical devices such as shale shakers, de-sanders and de-silters. The hydrostatic pressure exerted by the mud column prevents influx of formation fluids into the wellbore. The instability caused by the pressure differential between the borehole and the pore pressure can be overcome by increasing the mud weight. Hydration of the clays can be overcome by using non aqueous based muds, or partially addressed by treating the mud with chemicals which will reduce the ability of the water in the mud to hydrate the clays in the formation. Water based mud will be used for initial, shallower sections where massive shales are not encountered. The deeper and difficult to drill formations will be drilled using Synthetic Base Mud (SBM). At the end of drilling a well almost the entire amount of the SBM is collected for re-use in next drilling operation. SBM systems promote good hole cleaning and cuttings suspension properties. They also suppress gas hydrate formation and exhibit improved conditions for well bore stability compared to most WBM. WBM typically consists of water, bentonite, polymers and barite. Other chemical additives viz. glycols and salts may be used in conjunction to mitigate potential problems related to hydrate formation. The mud to be used will be continuously tested for its density, viscosity, yield point, water loss, pH value etc. The mud will be prepared onsite (drill location) using centrifugal pumps, hoppers and treatment tanks.

During drilling activity, cuttings will be generated due to crushing action of the drill bit. These cuttings will be removed by pumping drilling fluid into the well via triplex mud pumps. The mud used during such operation will flush out formation cuttings from the well hole. Cuttings will be then separated from drilling mud using solids-control equipment. This will comprise a stepped system of processes consisting of linear motion vibrating screens called shale shakers, hydro-cyclones (including de-sanders and de-silters), and centrifuges to mechanically separate cuttings from the mud.

Figure 2.8 shows the schematic layout of drilling mud & solids discharge involved as a part of the drilling system for exploratory wells.



Source: Vedanta Limited (Division: Cairn Oil & Gas)

Figure 2.8: Flow Chart for Drilling Mud & Solid Discharge

Cementing Programme

Cementing is a necessary aspect of exploratory drilling oil and gas wells. Cement is used to fulfill the following works:

- Secure/support casing strings
- Isolate zones for production purposes

Well Evaluation

During the drilling operations for different zones, logging operations will be undertaken to get information on the potential type and quantities of hydrocarbons present in the target formations. Technicians employed by a specialist logging service company will do well logging by different well logging techniques including electric, sonic and radioactive techniques. Logging instruments (sensors) are attached to the bottom of a wire line and lowered to the bottom of the well and they are then slowly brought back. The devices read different data as they pass each formation and record it on graphs, which will be interpreted by the geologist, geophysicist and drilling engineer. No emissions to the environment or any environmental harm is associated with wire line logging operations. The radioactive source required for well logging operations will be kept in specially designed container. In this drilling procedure, once the drilling is over, the well evaluation will be done by using electric wire line logs to assess the potential of the reservoir. This typically involves sampling the reservoir formation and pressure points during logging operations and reduces the requirement to flow hydrocarbons to the surface, significantly reducing the atmospheric emissions associated with the testing operation. Normally, in the event that hydrocarbons are encountered in sufficient quantities, as determined by electric wire line logs, a temporary drill stem test string may be run and the well fluids flowed to surface and processed using a surface well testing package, involving the oil being stored and trucked off the site and associated gas being flared to atmosphere.

Hydraulic Fracturing – for Tight Rock Reservoirs of Hydrocarbons

Hydraulic fracturing is used in tight rock reservoirs with low permeability, such as shale (i.e., the conductivity or ability of hydrocarbons to flow in the formation is low because of the small pore size in the rock). The goal of hydraulic fracturing in tight reservoir (shale) formations is to enable a well to produce the resource or to increase the rate at which a well is able to produce the resource. Hydraulic fracturing may be conducted in wells with low permeability formation and low pressure. Wells requiring hydraulic fracturing and numbers of stages of hydraulic fracturing per well will depend on seismic data acquired & interpreted and data acquired during the drilling phase of the project.

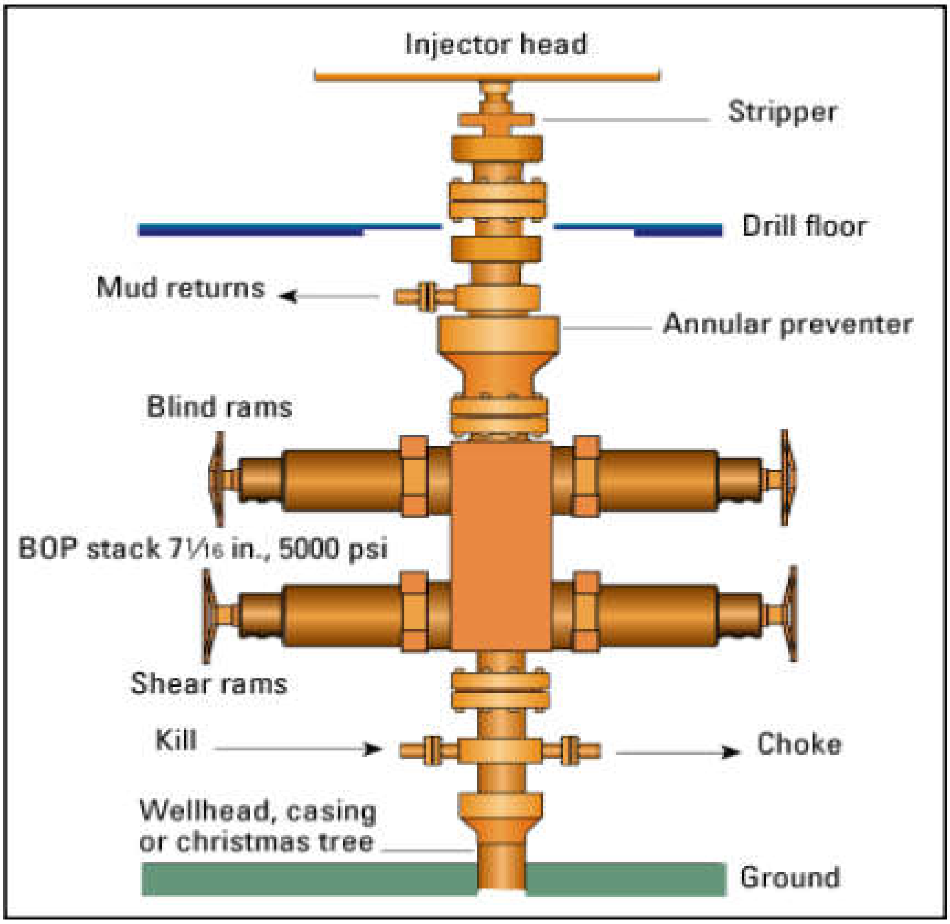
Hydraulic fracturing is a common technique used to stimulate the production of oil and natural gas by creating fractures or cracks that extend from the well hole into the rock formations. This is accomplished by injecting fluid, which is usually a mixture of water and high viscosity fluid additives, under extremely high pressure. The pressure of the water will then exceed the strength of the rock, causing fractures to enlarge. After the fractures take place, a “propping agent” known as proppant (which is usually sand) is injected into the fractures to keep them from closing. This allows the hydrocarbon to move more efficiently from the rock to the well. A single well may require up to 15,000 m^3 of water which may vary depending on the fracking requirements. For the hydraulic fracturing in a well, proppant mass of 150,000 – 200,000 lbs per stage and fluid volume of 2500 bbls – 4000 bbls per stage will be required.

Fracturing effluent generated will be discharged in the HDPE lined pits at the drilling well sites. For effective recycling and reuse of the frac fluid, Effluent Treatment Plant (ETP) will be installed, thus raw water required for fracturing will be minimized.

Well kick situation & Control measures

While drilling, if the formation pressure exceeds the hydrostatic pressure exerted by the drilling fluid, formation fluids break out in to the well bore. This is called kick. Primary means of well control is to have sufficient over-balance over formation pressure. For some reason if an unexpected over-pressurized formation is encountered while drilling and if the well control situation arises, rig is equipped with equipment to control this situation. This set of equipment is called "Blowout Preventers (BOP)". Blow Out Preventer consists of, "Annular Preventer", which can generally close on any size or shape of tubular in the well bore and closes the annular space between drill string and casing. Another type of blowout preventer is a "Ram Preventer". Ram preventers are of two types i.e., Pipe Rams and Shear Rams. Pipe rams also close the annulus between drill string and casing, but they have a fixed size. As such a specific pipe rams can be closed on a specific size of pipe. Shear rams are generally the last choice of preventer to be operated as they shear drill string and shut off the well bore. After determining the existing formation pressure and other geological complexities from the seismic data, appropriate BOP will be used as per standard oil field guideline for the same.

All these preventers will be stacked in a sequence and such assembly of preventers is termed as BOP stack. A typical BOP stack is illustrated in figure below. Blowout prevention equipment shall be installed, tested and operated according to the well control procedures of Vedanta Limited (Division: Cairn Oil & Gas).



Source: Vedanta Limited (Division: Cairn Oil & Gas)

Figure 2.9: A Typical Blowout Separator

Well Testing & Flaring

During the exploration and appraisal drilling, where a hydrocarbon formation is found, initial well tests (generally about one month of duration) will be carried out to establish flow rates, formation pressure and other parameters. However, depending on the need, based on nature of the reservoirs, the exploratory and appraisal wells will be tested for longer/extended durations to ascertain the reservoir parameters. During the well testing, crude oil, natural gas and produced water could be generated and will be treated/disposed appropriately. Hydrocarbons will be flared. Efficient test flare burner will be used to minimize incomplete combustion. As an alternative option, if feasible, crude oil/slop oil will be transferred to nearby refinery (terminals/depots) for processing or will be sent to a SPCB authorized recyclers.

Completion of Drilling

On completion of activities, the well will be either plugged and suspended (if the well evaluations indicate commercial quantities of hydrocarbons) or will be killed and permanently abandoned. In the event of a decision to suspend the well, it will be filled with a brine solution containing very small quantities of inhibitors to protect the well. The well will be sealed with cement plugs and some of the wellhead equipment (Blind Flange) will be left on the surface (Cellar). If the well is abandoned it will be sealed with a series of cement plugs, all the wellhead equipment will be removed, by leaving the surface clear of any debris and the site will be restored. The Crude oil produces during the well testing at appraisal stage will be collected and sent to nearly and approved waste oil recyclers.

Decommissioning & closure of wells

After the completion of the drilling activity, partial de-mobilization of the drilling rig and associated infrastructure will be initiated. As discussed earlier, well testing may be carried out immediately after the drilling is completed. The complete de-mobilization of the facilities at site will happen once well-testing completed successfully. This will involve the dismantling of the rig, all associated equipment and the residential camp, and transporting it out of the project area. It is expected that demobilization will take approximately 20-25 days and will involve the trucking away of materials, equipment and other materials from the site to bring it back to its original condition. It is estimated that about 50 truckloads will be transported out of site during this period. If no indication of any commercially viable amount of oil or gas is encountered either before or after testing, the well will be declared dry and accordingly will be plugged of and abandoned, and the site will be restored in line with applicable regulations and good industry practice.

2.6.2 DESCRIPTION OF EPU/QPU

Early Production Units (EPUs) or Quick Production Units (QPUs) will be installed for the processing of produced well fluid. An EPU/QPU will be a packaged/modular mobile unit and will mainly consists of a heater-treater separator or a production heater followed with a three phase separator, electrostatic coalescer, oil storage tanks, oil tanker loading system, produced water separation and disposal system, power generation (GEG or DG), test separator skid, utility systems such as fuel gas, flare, Inst. Air package, diesel storage, firefighting equipment, etc. An EPU/QPU will be designed for a capacity of 2,000 BLPD (Barrels of liquid per Day) with water cut variation from 0 – 50 vol%.

Produced well fluid from one or more successful exploratory/ appraisal wells will be gathered & sent to heater-treater separator skid for primary separation & heating purpose. Gathered produced fluid will be heated & degassed in heater-treater separator skid operating at ~2.5 – 3 Barg and ~70 – 80°C and separated in to gas, oil and water streams. The separated produced (associated) gas will be either routed to fuel gas system or to flare depending on the quantity of produced (associated) gas. In case of sufficient quantity of produced gas, a part of the produced gas will be used for power generation (using GEG), for firing in heater-treater separator skid and for blanketing & purging purpose. The surplus gas post internal consumption (if any) will be routed to flare for safe disposal purpose.

Separated oil from heater-treater separator skid will be sent to electrostatic coalescer separator (if needed, based on oil properties) to separate the residual water and achieve BS&W specifications. The treated crude oil from electrostatic coalescer separator will be sent to oil storage tanks. From oil storage tanks, oil will be pumped &loaded in to road tanker using the tanker loading facility for evacuation of crude oil to the nearby available facilities like terminals/depots of consumers.

Separated produced water (PW) from heater-treater separator skid will be sent to degasser vessel operating at low pressure. The evolved HC gases from degasser vessel will be routed to flare for safe disposal and the degassed water sent to PW treatment package.

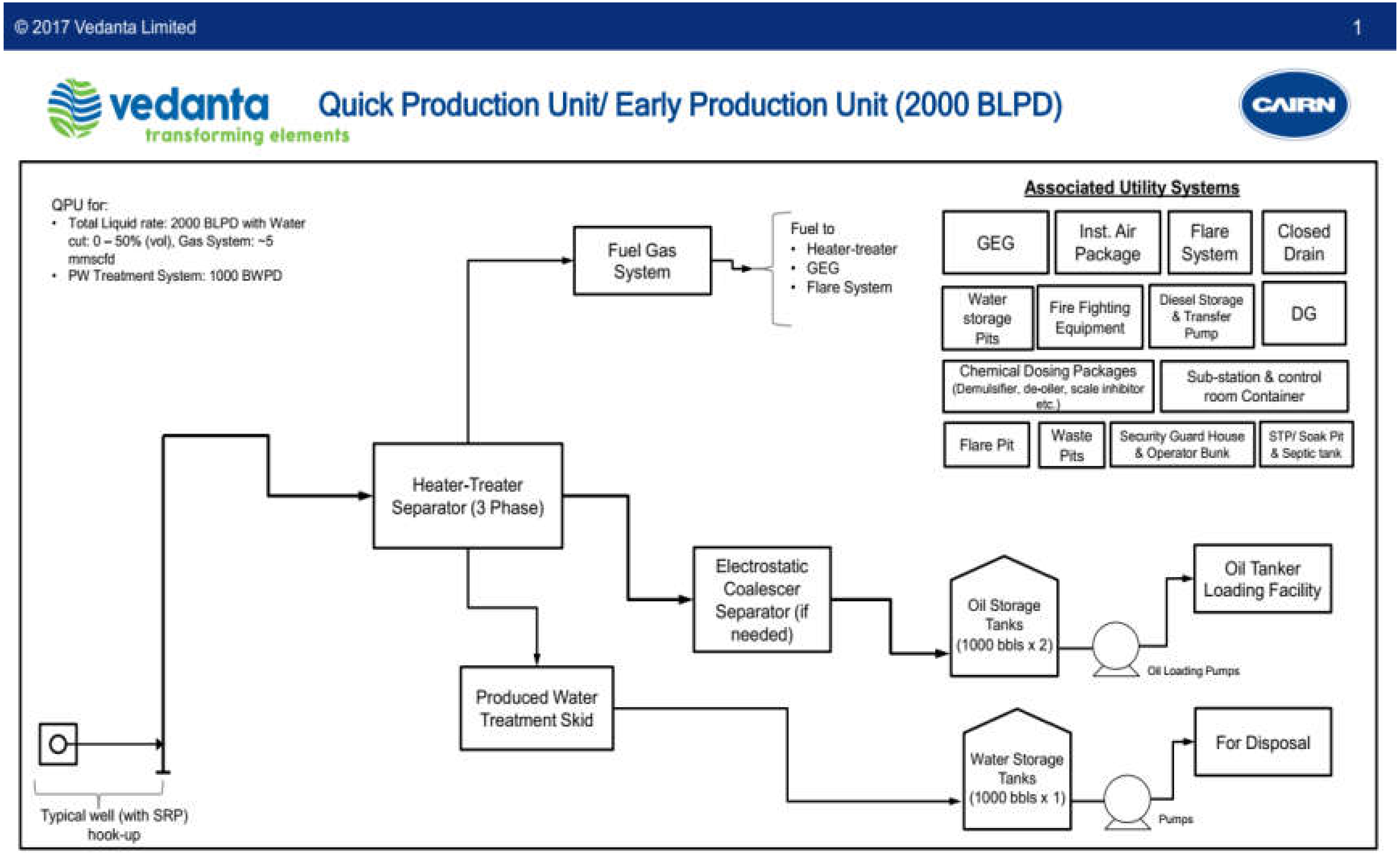
The PW treatment package will consists of a compact flotation unit or other equivalent gas floatation based de-oiling (oil removal) system and a filtration system. The treated water from PW treated skid will be stored in PW storage tanks. The produced water will be treated to achieve MoEF&CC/CPCB/SPCB specifications (discharge standards) and will be disposed off. The treated effluent (i.e. produced water) will be disposed-off using either a nearby down hole disposal well (by reinjection in abandoned well) or other available and suitable onshore disposal medium or solar/ mechanical evaporators depending on the quantity and feasibility.

The power requirement will be met through either state electricity grid and/ or installation of Diesel/Gas Engine Generator(s) using produced gas. If produced gas is sufficient quantity then power generation using produced gas will be preferred.

Along with above processing facility, a well test separator skid will be installed at pad. It will be used for well testing purpose. Well under testing will be routed to test separator skid. The separated gas, oil & water will be sent back to inlet of heater-treater separator skid for further processing.

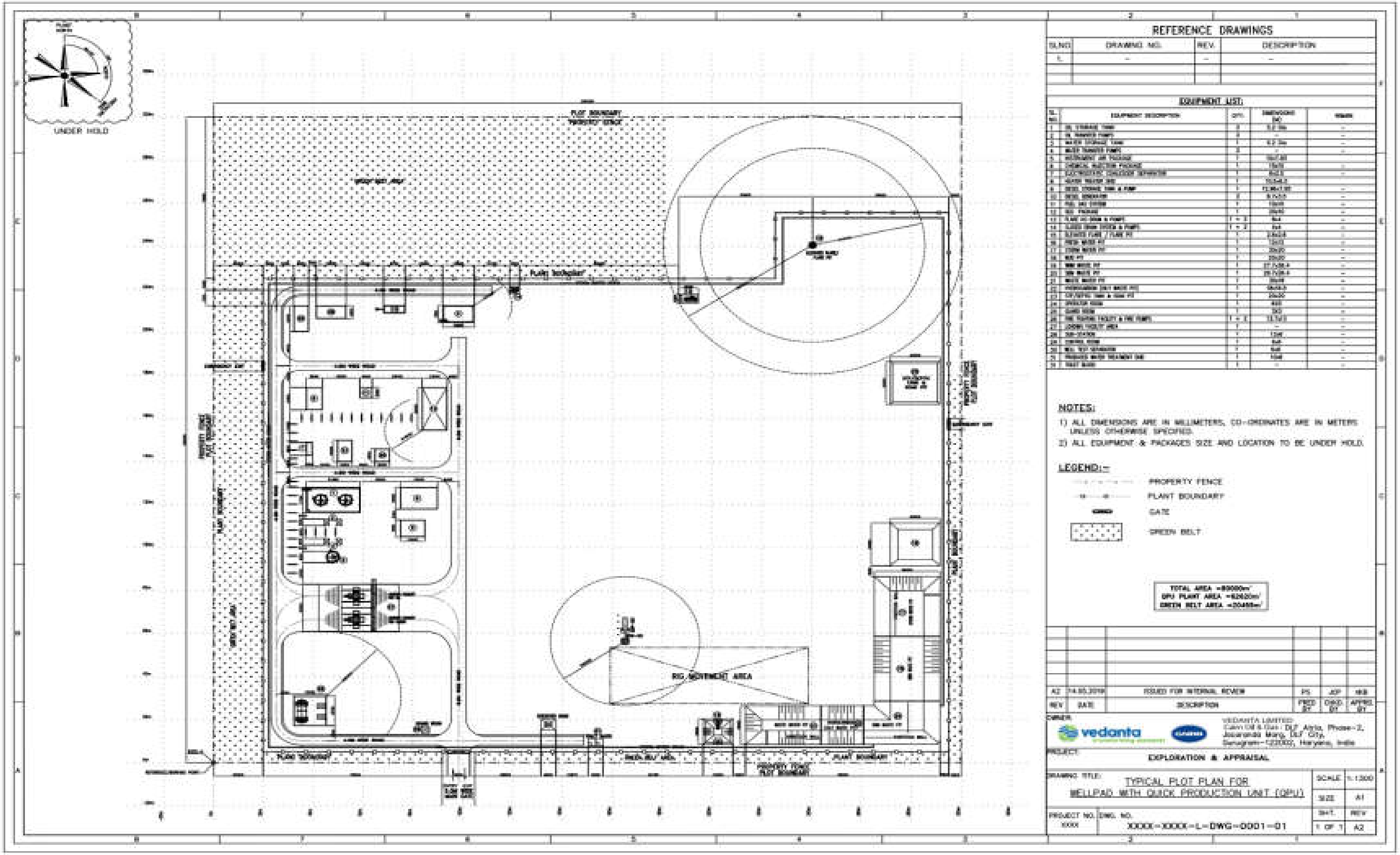
Quick production set-up will have following utility systems & infrastructure for supporting the operations.

- Wells with selected artificial lift and flow lines
- Fuel gas system consisting of filters & a super-heater
- Instrument Air package or Instrument as system
- Chemical dosing packages i.e. corrosion inhibitor, de-mulsifier & scale inhibitor etc.
- Elevated flare system or enclosed ground flare or ground flare
- Closed drain system, storm water drain system
- Fresh water storage
- Diesel storage
- Power generation (GEG and/or DG)
- Fire fighting equipment
- Domestic sewage treatment facility (Mobile STP or septic tank & soak pit system);



Source: Vedanta Limited (Division: Cairn Oil & Gas)

Figure 2.10: Flow Chart for EPU/QPU



Source: Vedanta Limited (Division: Cairn Oil & Gas)

Figure 2.11: Layout of Wellpad including EPU/QPU

2.7 RAW MATERIALS REQUIRED AND SOURCE

Drilling Activities

During drilling activities, materials like HSD, Steel (in the form of casings & tubulars) and chemicals like barite, oil well cement and bentonite will be required. Other production equipment like tubular (Casing and tubings), wellhead assembly, packer etc, and chemicals for mud and cementing required for the drilling operations and shall be procured by the company from within the country and from abroad before the commencement of operations.

Water Based Mud (WBM) will be used for initial, shallower sections where massive shales are not encountered. The deeper and difficult to drill formations will be drilled using Synthetic Base Mud (SBM).

WBM typically consists of water, bentonite, polymers and barite. Other chemical additives viz. glycols and salts may be used in conjunction to mitigate potential problems related to hydrate formation.

1. Requirement WBM (approx.) - 800-1000 m^3/well
2. Requirement SBM (approx.) - 600-800 m^3/well

The role of the mud in pressure control is especially important. If the drill bit penetrates a formation containing oil, gas or water under pressure these fluids are prevented from flowing into the borehole by ensuring that the drilling mud is of sufficient density to the natural formation pressures. The density of the mud can be increased by the addition of barite weighting material. Bentonite is employed to improve the theological properties and enable the drill cuttings to be transported from the hole while drilling and also be suspended in the fluid while the drill bit is being changed. The barite used in the drilling mud would be as per American Petroleum Institute (API) standard specifications.

2.8 PROPOSED INFRASTRUCTURE

The Infrastructure demand will be very less as the number of employee at drilling wells is about 50. Temporary road facility will be taken up by Vedanta Limited (Division: Cairn Oil & Gas) for the drilling well site for the movement of equipment.

2.8.1 General Requirements of Drilling Activities

Exploratory & Appraisal drilling programme requires the following facilities:

2.8.1.1 Power Requirement

The power requirement in the drilling site and the campsites will be provided through diesel generator (DG) sets. The rated capacity of the DG sets required for onshore drilling site is provided in following table.

Table 2.5: Details of DG sets of Onshore Drilling Activity

Location	DG Capacity	Fuel Requirement (KLD)	Stack Height (m)	Stack dia (m)
Camp Site	2 X 350 KVA (one working and one standby)	3-4 KLD	7	0.21
Drilling Site	3 x 1000 KVA (two working and one standby) OR 2 x1850 (one working and one standby)* * Depending on the rig capacity & rig availability during E&A drilling phase.	15-18 KLD	10	0.2
Radio Room	2X100 KVA	1-2 KLD	10	0.305
Early Production for each EPU	1X500 KVA (Emergency Backup), GEG 1 MW	3-4 KLD	9	0.15

Source: Vedanta Limited (Division: Cairn Oil & Gas)

2.8.1.2 Water Requirements

During Drilling Operations

The water requirement in drilling rig is mainly meant for preparation of drilling mud apart from washings and domestic use. While former constitutes majority of water requirement, latter or the water requirement for domestic and wash use is minor. Water for both process and domestic uses would be procured through surface water sources. The water requirement per well is shown in Table 2.6.

Table 2.6: Water requirement

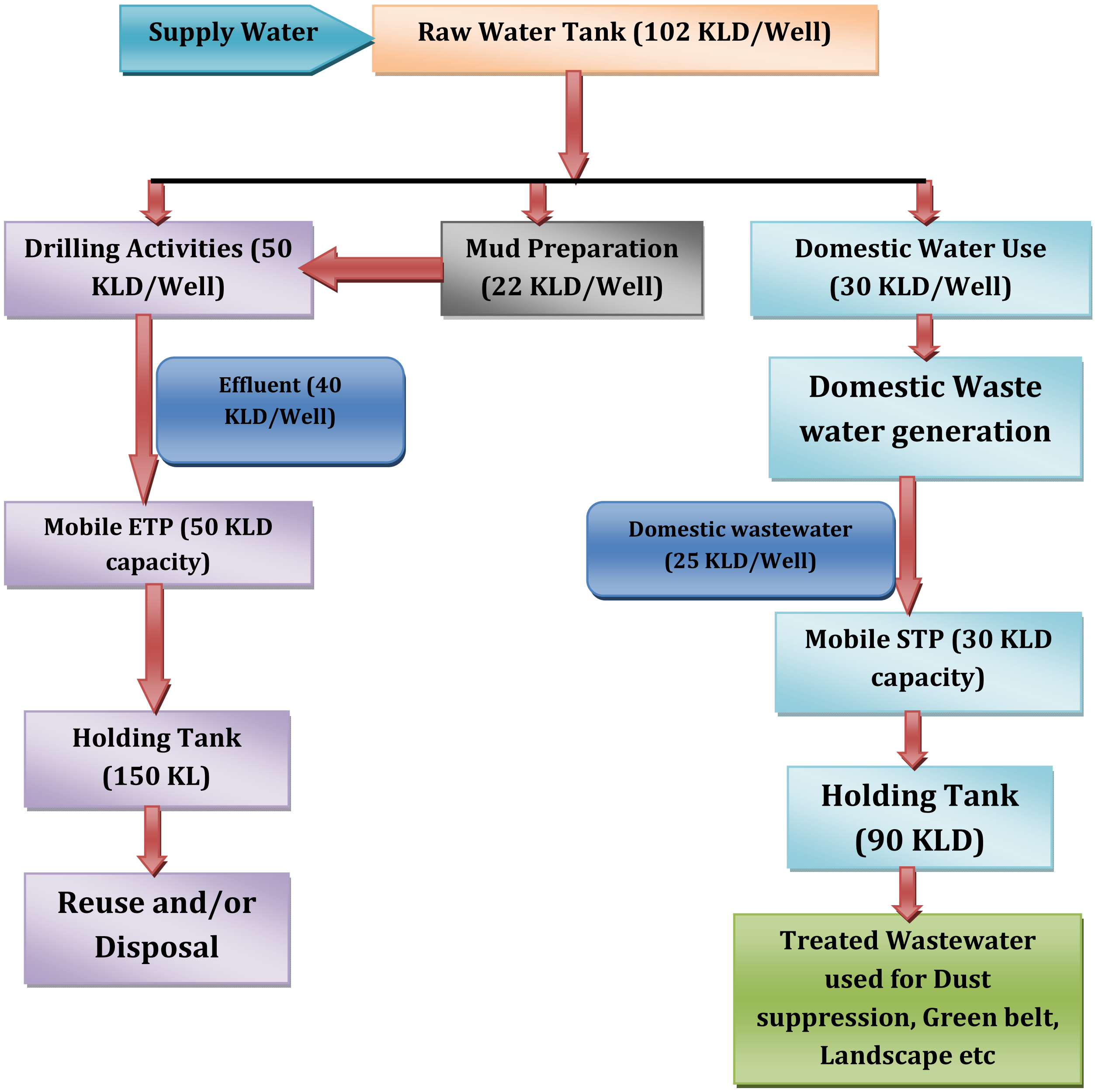
Description	Quantity
Water for domestic use	30 KLD/well
Drilling water consumption for mud preparation	600-1000 KL/well (WBM) and 150-300 KL/well (SBM) = 22 KLD/well (Approx)

Description	Quantity
Water requirement for miscellaneous use (Engine cooling, floor/equipment/string wasteline, fire fighting, storage/makeup) during drilling phase	50 KLD/well
Total Water Requirement	**102 KLD/well**

Source: Vedanta Limited (Division: Cairn Oil & Gas)

Early production Water requirement: 15-18 KLD for each EPU.

The water requirement for all the project activities will be sourced locally through approved/authorized sources of surface water and/or ground water (e.g. PHD bore wells, privately owned bore wells, Irrigation Dept./Water Resources Dept. of State Govt.). In case, required water could not be sourced from locally available approved sources, ground water will be extracted after obtaining permission from CGWA/State Govt.



**Note: Estimation of mud preparation water consumption is based on the assumption that the period of drilling well is 60 Days.*

Source: Vedanta Limited (Division: Cairn Oil & Gas)

Figure 2.12: Water Balance

2.8.1.3 Other Requirements

1. Liquid Mud Plant

The Liquid Mud Plant (LMP) shall be located at various locations of the fields to prepare synthetic based mud for the drilling operations. It is estimated around 3 – 5 LMP's will be set-up at any a given point of time for the proposed drilling operations. All the tanks, equipment's, civil works, pumps, mud laboratory with testing equipment along with the mud waste disposal pits will be constructed within a single location.

The entire LMP area shall be provided with containment area and with facilities for fork lift movement and transportation of solid waste skips. The area shall be designed to facilitate tanks for SBM mixing/storage, tanks of base oil storage and another tank for brine mixing/storage. These tanks are interconnected with piping and manifold with mixing hoppers, pumps connections, centrifuges connection with complete mud conditioning set-up, loading-unloading piping/hoses connections.

The Mud Plant area will be surrounded with a containment boundary wall. All the liquid transferred from the LMP to the drilling site will be through road tankers. For power supply requirement DG sets shall be required with one operational and one standby.

The LMP shall have water storage tanks, bunk houses for operating office and site laboratory, dry chemical storage area in paved surface, truck loading and unloading area with parking facility, cranes & forklifts maintenance and parking facility, septic tank with soak pits, DG area, diesel storage area and power distribution panel & facility.

2. Chemical Storage

The drilling rig will have normal storage facilities for fuel oil, required chemicals and the necessary tubulars and equipment. The storage places will be clearly marked with safe operating facilities and practices.

3. Manpower

The project will be employing considerable manpower for all the phases. The sites preparation phase of 60 days will employ on an average about 30-35 workmen.

The total number of personnel involved in the drilling activities is expected to be about 80-100. At any time there will be around 80-100 staff including security personnel on the well site, thus a camp site will be set up to provide boarding & lodging.

It is to be mentioned here, that the site preparation activities including the transportation of heavy equipment and machinery to site.

Drilling camp sites will be set-up within the drilling sites to allow for easy movement of the crew between the camp and the drilling sites. The camp site would generally comprise of

30-40 transportable container cabins (portable cabin) of 20 feet and 40 feet size to provide accommodation to operational crew and the contractor personnel. Each cabin will house 2 to 4 persons. Toilet facilities will be built as part of the accommodation unit. The sewage lines from the units shall be connected through a pipeline system to a septic tank and soak pit system. Additionally, there will be dedicated cabins to serve as kitchen, cold storage, dining area, recreation area, laundry etc.

4. Logistics

Crew transfers to and from the drilling rig, materials, diesel and chemicals will be made through light vehicles, trucks and trailers.

The approach road to drill sites will be constructed and/or existing roads will be strengthened for movement of construction machinery, drilling rig, material supply vehicles, passenger vehicles etc. depending on the location of drill site. In general, it is intended to make the maximum use of the existing road infrastructure.

5. Water Storage Pit

The water storage pit contains the water used for preparing drilling fluid and domestic purpose. Provision for additional water storage will be kept in case multi-stage fracturing is planned.

6. Sewerage System

Mobile STP or septic tank and soak pits combined will be provided.

7. Drilling Waste Management

Waste management plans will be prepared in-line with the best international practices for the project and the same will be implemented during the project execution stage.

Spent Drilling Fluid Disposal Pits

All wastewater from the drilling operations will be collected in the drilling fluid storage pit. The wastewater in this storage pits will be recycled and reused during drilling phase. The residual wastewater will be sent to solar evaporation pit for natural solar drying. The pits will be lined with HDPE sheet.

Drill Cutting Disposal Pit

All drill cuttings, spent mud and used oil and other hazardous waste will be disposed as per Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.

While recycling the mud, the drill cutting will be separated through shale shaker, which will be disposed off to cutting disposal pit. This pit will be similar in construction to the solar pit. It will be lined to avoid contamination of land and groundwater. The pit will be soil bunded and HDPE lined to prevent any overflow to the surroundings.

8. Flare System

A flare system consists of the flare stack or boom and pipes which collect the gases to be flared. The flare tip at the end of the stack or boom is designed to assist entrainment of air into the flare to improve burn efficiency. Seals installed in the stack prevent flashback of the flame, and a vessel at the base of the stack removes and conserves any liquids from the gas passing to the flare. For effective flaring CPCB's document "Oil & Gas drilling and extraction industry" June 2006 will be followed as follows:

- Standard flare design - An efficient test flare burner head will be selected to minimize incomplete combustion, black smoke, and hydrocarbon fallout. Volumes of hydrocarbons flared will be recorded.
- Location and height of the flare stack based on maximum ground level concentration criteria & maximum radiation intensity exposure criteria
- Flare stack- Minimum physical height of stack should be 30 m from ground level. Only in those situations and or locations where elevated flares are not technical feasible, then ground flaring may be resorted.

9. Storm Water Drainage System

Adequate drain will be provided all around the drilling site to prevent runoff of any oil containing waste water into the nearby natural drainage area. The storm water drain shall be provided with oil trap and the collected water shall be sent to storm water pit.

10. Waste storage

Hazardous wastes generated from drilling activities such as used oil from pumps and machinery, empty chemical and fuel barrels, contaminated oil rags and soil etc will be collected and stored in a designated storage area. The storage area will have paved flooring, containment bund and roof. Waste oil from pumps and machinery will be collected and stored in used oil barrels and shall be kept in a designated storage area. The contaminated soil and cotton rags will be disposed of at approved secured Land fill as per the legal provision. Used oil will be disposed off through recyclers/re-processors registered with the Central Pollution Control Board (CPCB) and authorized by State Pollution Control Board (SPCB).

11. Spill Containment system

Containment systems and oil traps will be provided to trap any spillage of oil at the drilling site. All potential sources of spillage will be equipped with drip pans in order to contain spills.

2.9 POLLUTION CONTROL MEASURES

2.9.1 POLLUTION CONTROL MEASURES DURING DRILLING OPERATIONS

A. Air Emissions and Control Measure

The emissions to the atmosphere from the drilling operations shall be from the diesel engines, and power generator and temporary from flaring activity (during testing).

B. Noise Emissions and Control Measure

The source of noise generation during this phase of operations would be the operation of rig and diesel generator sets. Besides, certain pumps are expected to be in operation during this phase, for mud circulation. The noise generation work however is transient and limited to the drilling period only. Adequate control measures will be taken to minimize exposure of noise to drilling personnel.

C. Wastes treatment and disposal

The expected waste generation from well drilling will be as per Table below.

Table 2.7: Waste Generation

Sl. No	Nature of waste	Quantity during Drilling Activities	Mode of Disposal
A	**Hazardous Waste**		
1	Drill cuttings associated with WBM Drill cuttings associated with SBM	250-750 tons/well 500-1500 tons/well	Cuttings will be washed and contained in cuttings disposal area (HDPE lined collection pit) provided per the requirement of HW(MHTM), 2016 Rules
2	Spent /Residual drilling mud	250-500 tons/well	The mud will be disposed as per Hazardous Waste Rules, 2016
3	Used Lubricating oil, Sludge containing oil and other	1-2 tons/well 250-500 tons/well	Used oil will be sent CPCB authorized recyclers.

Sl. No	Nature of waste	Quantity during Drilling Activities	Mode of Disposal
	drilling work		The oil contaminated sludge will disposed as per Hazardous Waste Rules, 2016
B	**Non Hazardous Waste**		
4	Food waste	25-30 Kg per well	Food waste to be stored in a closed container and composted.
5	Non-combustible waste containing metallic residues, glass	1000-1200 Kg/well	To be disposed of their registered vendors on periodic basis.
6	Packaging wastes including drums, wooden pallets, plastic containers, plastic foils.	1000 kg/well	To be analysed for the trace/heavy metals content before disposing suitably
7	Left over chemicals and materials, scrap metal, sludges, scales, batteries, spent acids, spent lubricants, filters etc.	250-300 kg/well	Scrap metal and recoverable material to the salvages before dispose of balance material the registered vendors
8	Cement, grit, blasting and painting wastes.	500 kg per well	To be disposed of their registered vendors on periodic basis.

Source: Vedanta Limited (Division: Cairn Oil & Gas)

2.10 PROJECT COST

The estimated Investment Cost for the project is **INR 1663.641 Crores**.

CHAPTER 3: DESCRIPTION OF ENVIRONMENT

3.1 INTRODUCTION

Baseline Environmental Studies have been conducted to determine the existing status of various Environmental attributes viz., Climate and atmospheric conditions, ambient air, ambient noise, traffic study, water (ground & surface), soil, hydrogeological, sand use pattern, ecological and socio-economic environment, of proposed project within the block. This study would help to undertake corrective mitigation measures for the protection of the environment on account of any change, deviation of attributes due to the proposed project activities in the Block CB-ONHP-2017/10 in Banaskantha District of Gujarat & Jalore District of Rajasthan.

The reconnaissance survey of the area around the CB-ONHP-2017/10 Block covers an area of 2100 Sq.Km in Banaskantha District of Gujarat and 666 Sq. km in Jalore District of Rajasthan was carried out from March 2019 to June 2019 and the field studies were carried out for one season during Summer season for the EIA studies to collect baseline primary and secondary data for the present environmental scenario in the study area.

3.2 SCOPE OF BASELINE STUDY

An area, covering a 10 Km surrounding around the proposed hydrocarbon block covering the area of all proposed wells for the purpose of the baseline studies. Primary data on Micrometeorology, ambient air, ambient noise, traffic, soil, water, flora-fauna & socio-economic data were collected by a team of experts. Secondary data was collected from various Departments of State/Central Government Organizations, Semi-Government and Public Sector Organizations. Table 3.1 gives various environmental attributes considered for formulating environmental baseline and Table 3.2 gives the frequency and monitoring methodology for various environmental attributes.

Table 3.1: Environmental Attributes

S.No.	Attribute	Parameter	Source of Data
1	Climatology & Meteorology	Wind speed, Wind direction, Dry bulb temperature, Wet bulb temperature, Relative humidity, Rainfall, Solar radiation, Cloud cover and Environmental Lapse	Indian Meteorological Department and Site specific Data-at 2 Locations at Deesa (Gujarat) and Ratanpura (Rajasthan)

S.No.	Attribute	Parameter	Source of Data
2	Geology	Geological history	Field survey and Secondary sources
3	Land Use	Trend of land use change for different categories	Secondary data/Satellite imagery/ Topo sheet etc.
4	Ambient Air Quality	PM10, PM2.5, SO_2, NOx, CO, O_3, Benzene (C6H6), Benzo alpha pyrene (BaP), Lead (Pb), Arsenic (As), Nickel (Ni), Ammonia (NH_3), Hydrocarbons-Methane & Non Methane,VOC,	Monitored Data (28 locations)
5	Ambient Noise Quality	Noise levels in dB (A)	Monitored Data (28 locations)
6	Traffic Study	Traffic data of vehicles	4 Locations
7	Water Quality	Physical and Chemical parameters	Monitored Data (Surface water – 8 locations and Ground water – 28 locations)
8	Soil	Soil types and samples analyzed for physical and chemical parameters.	Analysis of soil samples at 8 locations
9	Ecology	Existing terrestrial flora and fauna within the study area	Field survey and Secondary sources
10	Socioeconomic Aspects	Socioeconomic characteristics of the affected area	Based on field survey and data collected from secondary sources

Source: ABC Techno Labs India Pvt. Ltd.

Table 3.2: Frequency and Monitoring Methodology

Attributes	Sampling		Measurement Method	Remarks
	Network	Frequency		
Meteorology				
Wind speed, Wind direction, Dry bulb temperature, Wet bulb temperature, Relative humidity, Rainfall, Solar radiation, Cloud cover and Environmental Laps	Project site	Continuous for 3 months	Weather monitors with the database	
Air Environment				
Particulate Matter (PM10)	Requisite locations in	24 hourly- Twice a	Gravimetric (High-Volume with Cyclone)	As per CPCB standards

Attributes	Sampling		Measurement Method	Remarks
	Network	Frequency		
Particulate Matter (PM2.5)	the project influence area	week for 3 months in Non-Monsoon season	Gravimetric (High-Volume with Cyclone)	under 18th November 2009 Notification for National Ambient Air Quality Standards (NAAQS)
Oxides of Sulphur (SO_2)			EPA Modified West & Gaeke method	
Oxides of Nitrogen (NOx)		--	Arsenite Modified Jacob & Hochheiser	
Carbon Monoxide (CO)			Gas Analyzer (NDIR)	
Ozone (O_3)			UV photometric	
Ammonia (NH_3)			Indophenol Blue Method	
Volatile Organic Compound (VOC)			Ion Sense PID Detector	
Methane			ABCTL/ SOP/INS/32	
Non Methane			GC-FID	
Lead (Pb)			Atmospheric Absorption Spectrometer	
Arsenic (As)				
Nickel (Ni)				
Benzene			GC-MS/MS	
Benzo Alpha Pyrene			GC-MS/MS	
Noise				
Hourly equivalent noise levels	Requisite locations in the project influence area	Once	Instrument: Sound level meter	IS: 4954 1968
Water				
Parameters for water quality: Colour, Odour, Temperature, pH, Conductivity, Turbidity, TDS, Total Hardness, Total Alkalinity, Cl, SO_4, F, NO_3, NH_3, Na, K, Ca, Mg, Fe, Phenolic compounds, Mn, Cu, Hg, Cd, As, CN, Pb, Zn, Cr, Ni, Se, Al, As, Pb, Zn, COD,	Set of grab samples At requisite locations for ground and surface water	Once in season	Samples for water quality collected and analyzed as per IS: 2488 (Part 1-5) methods for sampling and testing of Industrial effluents Standard methods for the examination of water and wastewater analysis published by American Public Health Association.	IS:10500:2012 (GW) CPCB Class C (SW)

Attributes	Sampling		Measurement Method	Remarks
	Network	Frequency		
BOD, DO, Total Coliform, Faecal Coliform etc				
Land Environment				
Parameter for soil quality: pH, texture, electrical conductivity, organic matter, nitrogen, phosphate, sodium, calcium, potassium and Magnesium.	Requisite soil samples were collected as per BIS specification within project influence area	Once in season	Collected and analyzed as per soil analysis reference book, M.L. Jackson	
Biological Environment				
Terrestrial & Aquatic Flora and Fauna	Requisite locations in the project influence area	Once in season	Collected and analyzed as per IUCN Red Data book.	

Source: ABC Techno Labs India Pvt. Ltd.

3.3 ADMINISTRATIVE SETUP

Banaskantha District, Gujarat: The district is situated in the north western part of the state and is bounded by state of Rajasthan in north, Rann of Kachchh in west, by Sabarkantha, Mahesana and Patan districts in east, south and south west respectively. The district with its headquarter at Palanpur is consists of 12 taluks and 1251 villages. The talukas are Palanpur, Danta, Vadgam, Amirgadh, Dantiwada, Deesa, Dhanera, Kankrej, Diyodar, Bhabhar, Vav and Tharad. Total population of the district, as per 2011 census, is 3,120,506.

Jalore District, Rajasthan: The district is part of Jodhpur Division. The district is composed of five sub-divisions viz. Jalore, Ahore, Bhinmal, Sanchore, Raniwara which cover seven tehsils viz: Jalore, Ahore, Bhinmal, Sanchore, Raniwara, Sayala, Bagora and seven blocks viz: Jalore, Ahore, Bhinmal, Sanchore, Raniwara, Sayala & Jaswantpura. Total number of villages in the district is 802 and it also has 3 urban towns. Total population of the district as per Census 2011 is 1828730.

Districts	Sub-divisions & Blocks	Taluks	Villages
Banaskantha	7	12	1251
Jalore	7	9	802

Source: ABC Techno Labs India Pvt. Ltd.

3.4 METEOROLOGY AND CLIMATE

3.4.1 CLIMATIC CONDITION

The region experiences a semi-arid hot climate. The weather and climate in the region is largely influenced by the Arabian Sea. Aside from the monsoon season, the climate is extremely dry. Cold northerly winds are responsible for a mild chill in January. The southwest monsoon brings a humid climate from mid-July to mid-September.

3.4.2 REGIONAL METEOROLOGY

Historical data on meteorological parameters will also play an important role in identifying the general meteorological will also play an important role in identifying the general meteorological regime of the region. The study area is primarily semi arid zone and climate of the region is characterised by its dryness and erratic rainfall. There are four seasons each characterised by a different set of weather conditions:

- Monsoon season (winter) from November to March;
- Summer season during April to June;
- Southwest monsoon or rainy season during mid of July to September; and
- Transition or post monsoon season from October to mid November.

1. Deesa IMD Station

The regional meteorology summary details (from 1971 to 2000) monitored at nearest IMD station at Vadodara are given in below;

A. Temperature

The monthly mean maximum temperature varied from 26.8°C in January to 40.3°C in May while monthly mean minimum varied from 10.1°C in January to 26.9°C in May indicating January as the coldest while May as hottest month.

B. Relative Humidity

During the month of August the relative humidity was highest (86%). The annual average Relative humidity is 68% (at 08:30 Hours) and 39% (at 17:30 Hours). Generally, the weather during other seasons was observed to be dry.

C. Rainfall

The rainfall occurred maximum in July (229.0 mm) followed by August (195.3 mm). The total rainfall received in the year is about 602.3 mm. Total rainy days observed about 25.5 days. The monsoon sets in the month of July and continues till September.

D. Wind Speed/ Direction

The maximum mean wind speed observed during the month of June is 10.8 Kmph and minimum mean wind speed observed during the month of November is 4.8 Kmph. The annual average wind speed calculated is 6.8 Kmph.

Table 3.3: Historical Meteorological Data at IMD Deesa (1971-2000)

Month	Daily mean Temp. (^{0}C)		Relative Humidity (%)		Rainfall (mm)		Cloud cover (in Okta)		Station Level Pressure (hPa)		Mean Wind Speed (KMPH)
	Max	Min	08:30	17:30	Monthly Total	No. of Rainy days	08:30	17:30	08:30	17:30	
January	26.8	10.1	67	36	2.6	0.3	1.1	1.1	1000.7	997.9	6.0
February	29.2	12.1	61	30	1.8	0.2	1.3	1.4	999.4	996.1	6.2
March	34.6	17.2	53	25	0.5	0.1	1.4	1.6	996.9	993.5	6.1
April	38.7	22.0	55	23	0.5	0.1	1.2	1.4	993.8	989.8	6.7
May	40.3	25.2	67	26	4.3	0.5	2.0	0.9	991.0	986.6	8.8
June	38.6	26.9	74	40	72.2	2.7	4.4	3.2	986.9	982.7	10.8
July	33.7	25.6	83	62	229.0	8.6	6.4	6.2	985.8	982.7	9.2
August	32.2	24.7	86	67	195.3	7.8	6.3	6.3	987.7	984.8	7.4
September	34.4	24.0	79	52	75.4	3.4	3.6	4.0	992.1	988.6	6.0
October	36.1	20.6	64	35	15.7	1.0	1.2	1.6	996.2	992.9	4.8
November	32.7	15.7	60	35	4.0	0.5	1.0	1.2	999.4	996.4	4.8
December	28.7	11.6	66	37	1.1	0.2	1.2	1.3	1001.4	998.5	5.3
Annual or Mean	**33.8**	**19.6**	**68**	**39**	**602.3**	**25.5**	**2.6**	**2.5**	**994.3**	**990.9**	**6.8**

Source: IMD Station, Deesa

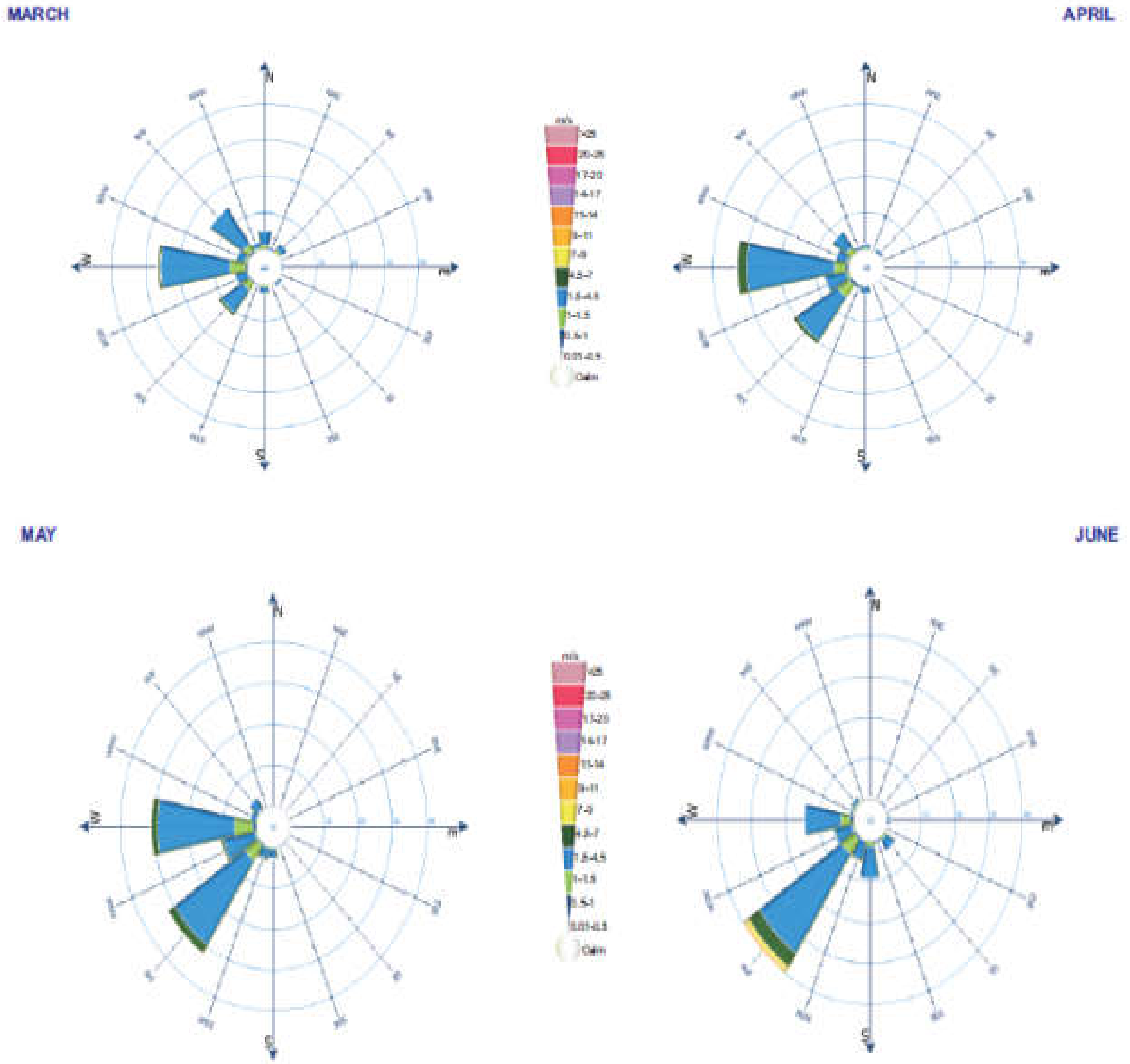


Figure 3.1: Windrose diagrams for the month of March, April, May & June - IMD, Deesa

2. Barmer IMD station

The regional meteorology summary details (from 1971 to 2000) monitored at nearest IMD station at Barmer are given below;

A. Temperature

The monthly mean maximum temperature varied from 25.6°C in January to 41.7°C in May while monthly mean minimum varied from 10.4°C in January to 27.5°C in June indicating January as the coldest while May as hottest month.

B. Relative Humidity

During the month of August the relative humidity was highest (79%). The annual average Relative humidity is 59% (at 08:30 Hours) and 32% (at 17:30 Hours). Generally, the weather during other seasons was observed to be dry.

C. Rainfall

The rainfall occurred maximum in August (91.9 mm). The total rainfall received in the year is about 270.6 mm. Total rainy days observed about 14.8 days. The monsoon sets in the month of July and continues till September.

D. Wind Speed/ Direction

The maximum mean wind speed observed during the month of June is 10.8 Km/hr and minimum mean wind speed observed during the month of November is 3.3 Km/hr. The annual average wind speed calculated is 6.8 Km/hr.

Table 3.4: Historical Meteorological Data at IMD Barmer (1971-2000)

Month	Daily mean Temp. (^{0}C)		Relative Humidity (%)		Rainfall (mm)		Cloud cover (in Okta)		Station Level Pressure (hPa)		Mean Wind Speed (KMPH)
	Max	Min	08:30	17:30	Monthly Total	No. of Rainy days	08:30	17:30	08:30	17:30	
January	25.6	10.4	54	30	1.2	0.2	1.8	1.9	994.7	991.9	4.3
February	28.4	12.9	51	26	2.4	0.3	1.9	2.1	992.8	989.7	5.0
March	34.1	18.7	47	22	0.9	0.1	2.2	2.7	990.3	986.8	6.1
April	39.1	24.1	45	21	4.1	0.7	1.6	2.4	986.5	982.8	7.9
May	41.7	26.6	56	23	11.4	0.8	1.1	1.5	983.1	979.2	9.9
June	40.5	27.5	68	33	30.9	1.8	3.2	2.4	979.2	975.2	10.8
July	36.7	26.5	77	49	88.0	4.3	5.6	5.1	978.1	974.4	9.4
August	35.1	25.6	79	53	91.9	4.1	5.4	5.2	980.2	977.1	8.5
September	36.3	24.7	73	42	34.6	1.8	2.7	3.3	984.7	981.5	7.1
October	36.9	22.0	54	30	3.6	0.4	1.0	1.9	989.5	986.4	4.7
November	32.3	16.3	50	30	1.4	0.2	0.9	1.2	993.6	990.6	3.3
December	27.5	11.7	52	31	0.4	0.0	1.6	1.9	995.3	992.6	3.7
Annual or Mean	**34.6**	**20.7**	**59**	**32**	**270.6**	**14.8**	**2.4**	**2.6**	**987.4**	**984.1**	**6.8**

Source: IMD Station, Barmer

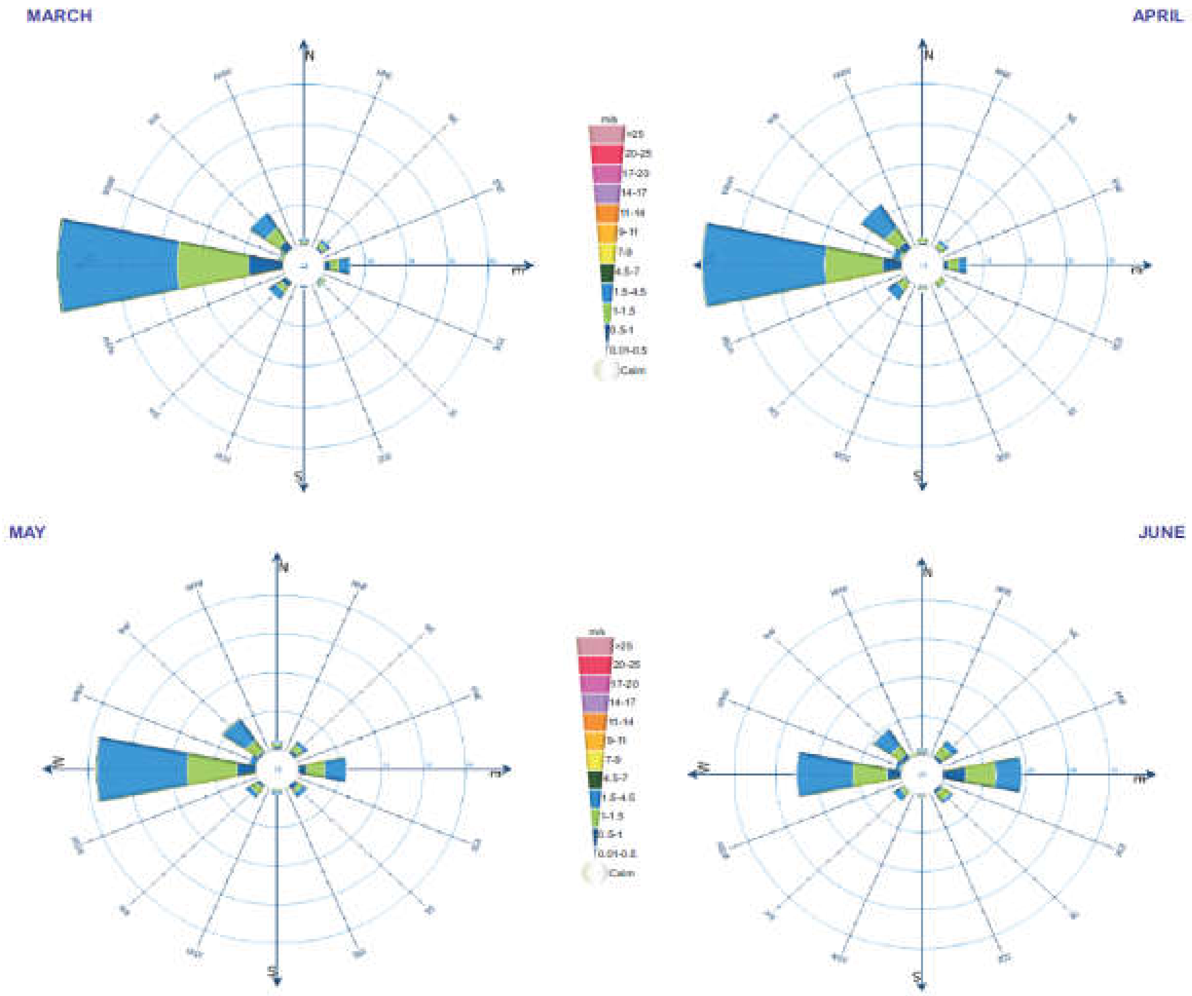


Figure 3.2: Windrose diagrams for the month of March, April, May & June - IMD, Barmer

3.4.3 Site Specific Meteorology

The continuous weather monitoring station was installed at Deesa (Deesa) and Ratanpur village (Jalore). On site monitoring was undertaken for various meteorological parameters in order to generate the site specific data. The Central Monitoring Station (CMS), equipped with continuous monitoring equipment to record wind speed, wind direction, temperature, humidity and rain fall was set up at the top of the building at a height of ~5.0 m above the ground level. The methodology adopted for monitoring surface observations was as per the Standard norms laid down by the Bureau of Indian Standards (IS: 8829:1978) and IMD.

Data was collected at every hour continuously from **March 2019 to June 2019** for 13 weeks.

Table 3.5: Site specific Weather Report for the Study period

Sl. No.	Parameters	Observations (18th March 2019 to 15th June 2019)	
		Deesa (Gujarat)	Ratanpura (Rajasthan)
1	**Dry Bulb Temperature (ºC)**		
	Maximum	44	45
	Minimum	26	15
	Average	35	32.7
2	**Relative Humidity (%)**		
	Maximum	77	68
	Minimum	7	5
	Average	36	22.33
3	**Wind Speed (Km/hr)**		
	Maximum	10.2	10.6
	Minimum	1.6	0
	Average	4	4.4
	Predominant Wind Direction (From)	W	SW
4	**Rainfall (in mm)**		
	Total (mm)	3.6	10.8

Source: ABC Techno Labs India Pvt. Ltd.

A. Temperature

The average temperature during study period in the site locations Deesa and Ratanpura varied from 26°C to 44°C and 15°C to 45°C respectively.

B. Relative Humidity

The average relative humidity during study period in the site locations Deesa and Ratanpura varied from 7% to 77% and 5% to 68% respectively.

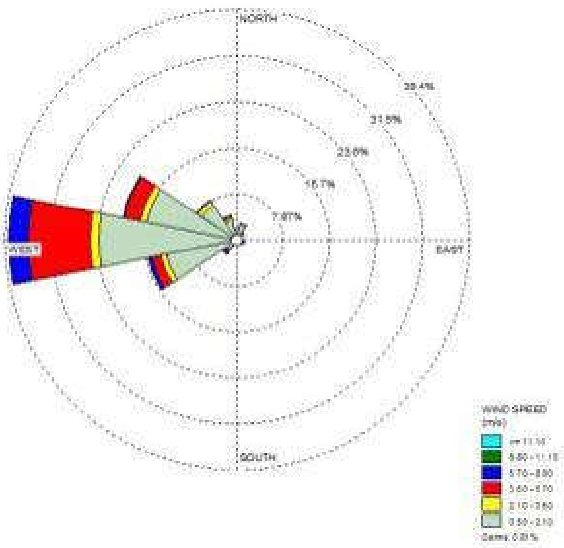
C. Rainfall

Slight rainfall was observed during the study period at Deesa and Ratanpura.

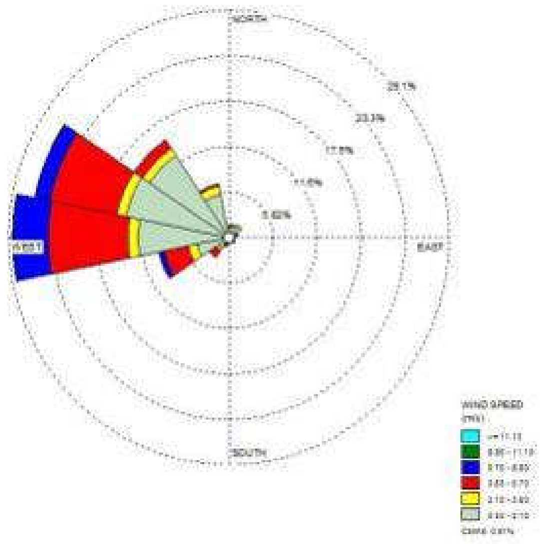
D. Wind

The monthly wind speed in the site locations Deesa and Ratanpura varied from 2.5 Km/hr to 10.8 Km/hr and 2.67 Km/hr to 16 Km/hr occurring during 3 months study period respectively.

It can be observed that during study period wind blows mostly from West direction to East Direction. The wind rose for the study period in the districts of Deesa and Ratanpura is given in Figure 3.3.



M 1- Deesa (Gujarat)



M 2- Ratanpura (Rajasthan)

Source: ABC Techno Labs India Pvt. Ltd.

Figure 3.3: Windrose for the Study Period

3.5 PHYSIOGRAPHY OF THE REGION

Banakantha District, Gujarat:

The district has a diverse landscape, it is characterized by hilly upland in the northeast with intermountain valleys, followed by piedmont zone with alluvium and residual hills/inselbergs and gently sloping vast alluvial – aeolian plain. The Rann in the west forms a totally different landscape in which a few isolated islands (Bets) are inhabited. The elevation in the district ranges from less than 10 m in the western part to more than 800 m amsl in the northeastern part.

Jalore District, Rajasthan:

The topography of the Patan district is flat level plain with an altitude ranging from 50 m to 100 m above MSL. The slope gradient of this district is from NE to SW. The eastern part of the district is relatively higher and attains the maximum altitude of 100 m above MSL and the elevation gradually decreases towards south and west.

The district is characterized by landscape of alluvial plains of hill ranges, and isolated hillocks. Jalore district has almost an even topography in its western section, the lowest point being around 17.0 meter above mean sea level and is marked by sand dunes. The sand dunes trend NE-SW, indicating prevalent wind direction in the area. The eastern section is dominantly hilly, forming the flank of Mount Abu range and the highest point is 991 m above mean sea level (amsl). The elevation of the area ranges from more than 600 m amsl in the east to 75m amsl in the west at the confluence of the Luni and Jawai-Sukri Rivers. Generally the terrain slopes westwards. The valley floor has an area elevation ranging from 60m amsl to 215m amsl. The hill tops are normally shaped by weathering phenomena, which have caused tors and boulders of various shapes and sizes. These features are well developed in the eastern part of the area. In the mid eastern and western parts, sand dunes are a common topographic feature. Jalore district is often called "Delta of West Rajasthan" and all the principal rivers of western Rajasthan flow through this district.

Topography of the Project area

The block area is almost flat topography with elevation varying approximately 22m to 128m across area. The terrain of the Banaskantha district, Gujarat is flat level plain with an altitude ranging from 49 m to 128 m above MSL. The slope gradient of this district is from North to South. The south eastpart of the district is relatively higher and attains the maximum altitude of 128 m above MSL and the elevation gradually decreases towards North. The terrain of the Jalore district, Rajasthan is flat level plain with an altitude ranging from 19 m to 122 m above MSL. The slope gradient of this district is from NorthwesttoNorth east. The NE part of the district is relatively higher and attains the maximum altitude of 122 m above MSL and the elevation gradually decreases towards NW.

3.6 DRAINAGE PATTERN

Banaskantha District, Gujarat:

The drainage network in the district is constituted mainly by the Banas and Sarashwati rivers and their tributaries. Since the district experiences a semi-arid type of climate, the rivers flowing through it are of ephemeral nature i.e. have water during monsoon only and dry up after monsoon. Some of the rivers like Banas and Saraswati however carry fairly good amount of water during rainy season. There are few important lakes in the district i.e

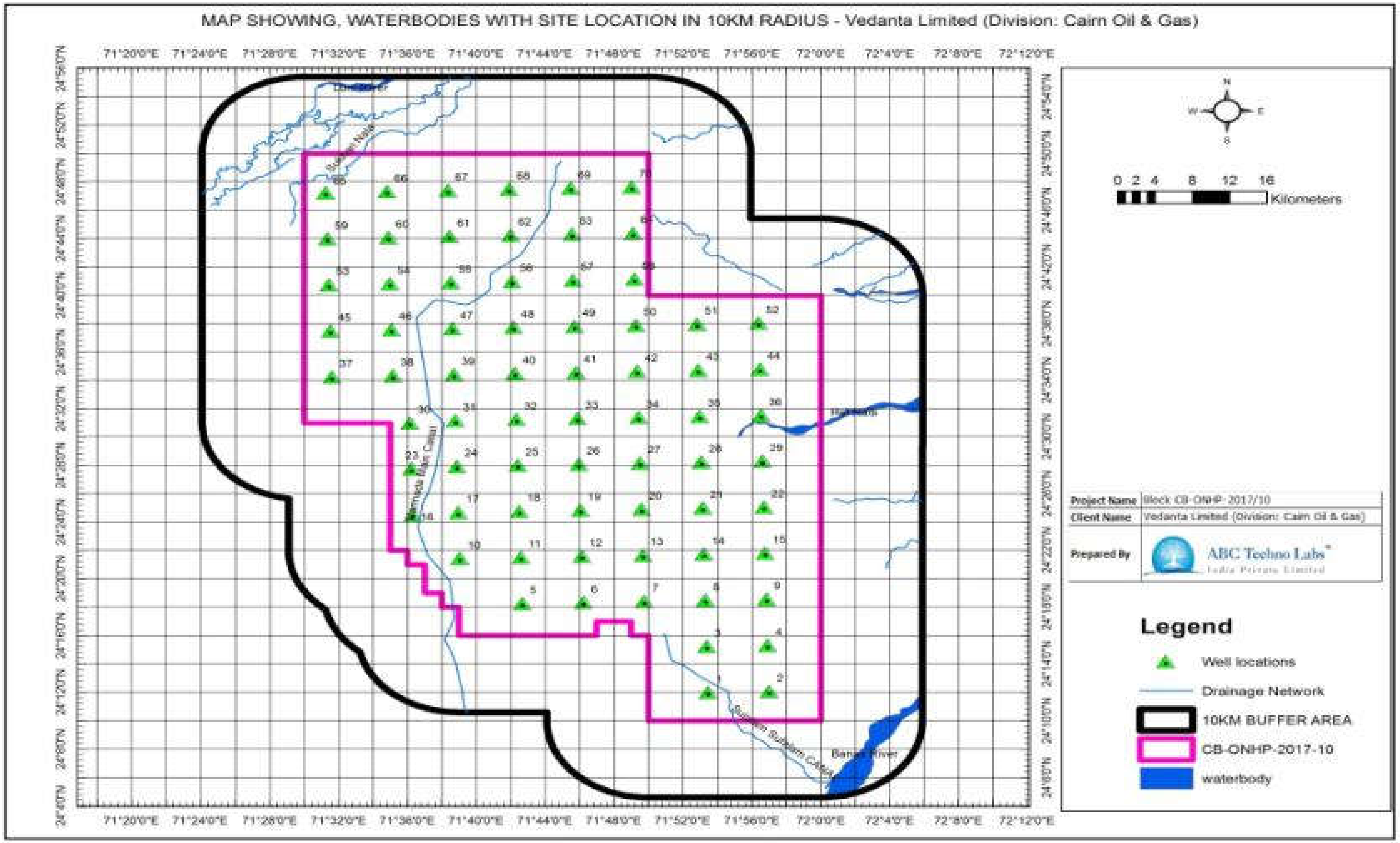
Ganga Saragar near Jethi Village in Palanpur taluka, Man Sarover near Chitrasani village and Dantiwala Lake constructed near Dantiwada Dam.

Jalore District, Rajasthan:

The Jalore district forms a part of the Central Luni Basin and is drained by the Luni drainage system, which passes only through the southwestern tip of the district near Sanchore before shedding its load into Runn of Kutch, originating from the Aravalli hill ranges. The main rivers in the district are Jawai, Sukri, Khari, Bandi and Sagi, which are tributaries of the Luni River and form a trellis pattern of drainage flowing due northwest. All rivers are ephemeral with graded and meandering courses and wide flood plains.

Drainage of the Project area

Onshore block is mainly drained by Luni River is Flowing within the block from west to east on North side of the Block boundary and Banas River Flowing at 5.3Km, South from the block boundary. The area is characterized by sub dendritic to dendritic nature of drainage pattern. The Drainage Map (10 Km) of the CB-ONHP-2017/10 block is given as Figure 3.4.



Source: ABC Techno Labs India Pvt. Ltd.

Figure 3.4: Drainage Map (10 Km) of the CB-ONHP-2017/10 Block

3.7 GEOMORPHOLOGY

Banaskantha District, Gujarat:

The Banaskantha district can be divided in three main parts – the hilly- mountainous region having high relief and rugged topography covering parts of Dhanera, Palanpur, Vadgaon and entire Danta taluka in the east, the piedmont zone all along the periphery of hilly area, and west and southwest of River Banas the area is flat plain with occasional undulations given rise to by sand dunes and mounds in the west. The western extension of this plain merges into the marshy area of Rann of Kutch.

The proposed block is predominantly the Fluvial Origin with the Aluvial Plain and the northern side of the block is Aeolian origin.

Jalore District, Rajasthan:

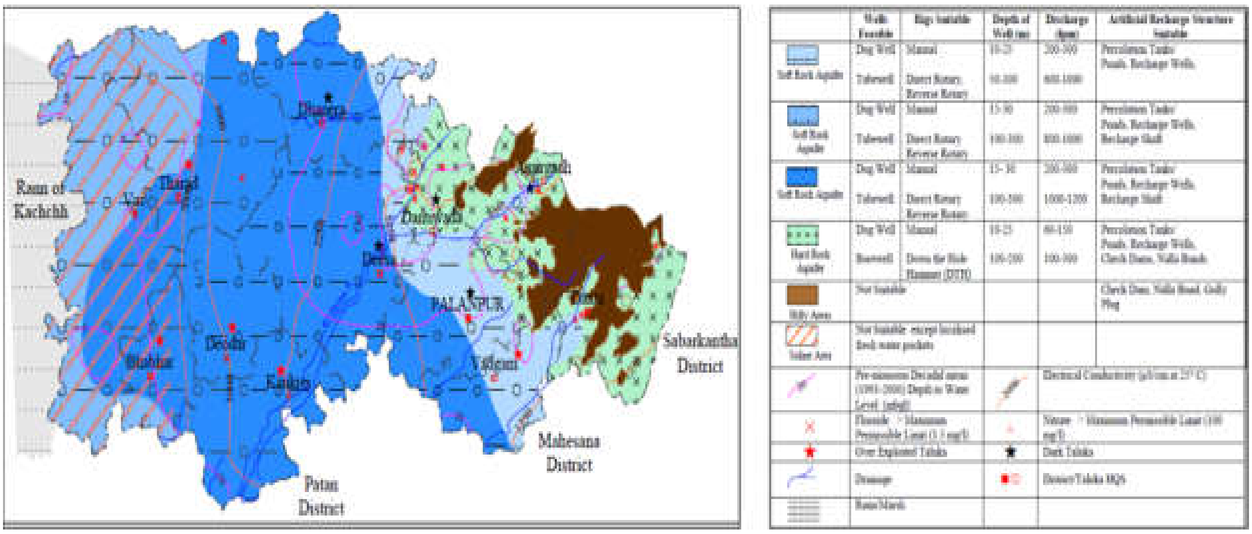
Geomorphologically, the alluvial valley floor belongs to mature landscape system and present landform units are the products of the past meandering courses and wide flood plains. Additionally, there are innumerable old channels buried under wind-blown sand.

3.8 HYDROGEOLOGY

Banaskantha District, Gujarat:

Ground water in fissured formation (Hard rock): The north-eastern part of the district is mainly occupied by meta sediments and Post Delhi intrusives. The occurrence and movement of ground water is governed by secondary porosity i.e. thickness and extent of weathering and size & interconnections of fractures/joints.

These formations generally do not form very good aquifer system. The depth of dugwells ranges from 15-30 mbgl and of borewells ranges from 100-200 mbgl. Depth to water level in the dug wells varies from 5 -14 mbgl and in borewells from 15 to 60 mbgl. The successful borewells drilled so far, yielded in the range of 30-1036 m^3/day with an average yield of 240 m^3/day.

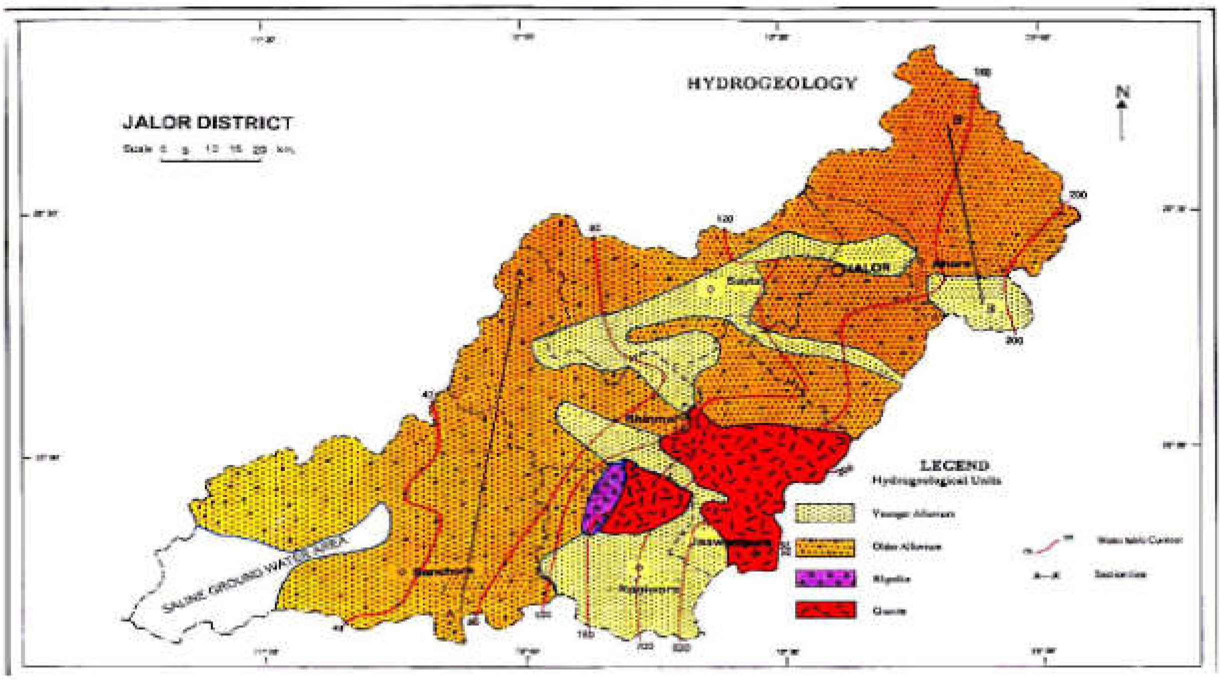


Source: Central Ground Water Board

Figure 3.5: Hydro geology and Ground water Use Map of Banaskantha District

Jalore District, Rajasthan:

Ground water occurs under unconfined condition in saturated zone of rock formation. Its occurrence is controlled by topography, physiography and structural features of the geological formations. The movement of the ground water in hard rock areas is governed by size, openness, interconnection and continuity of structurally weak planes while in unconsolidated rocks, ground water movement takes places through pore space between grains.



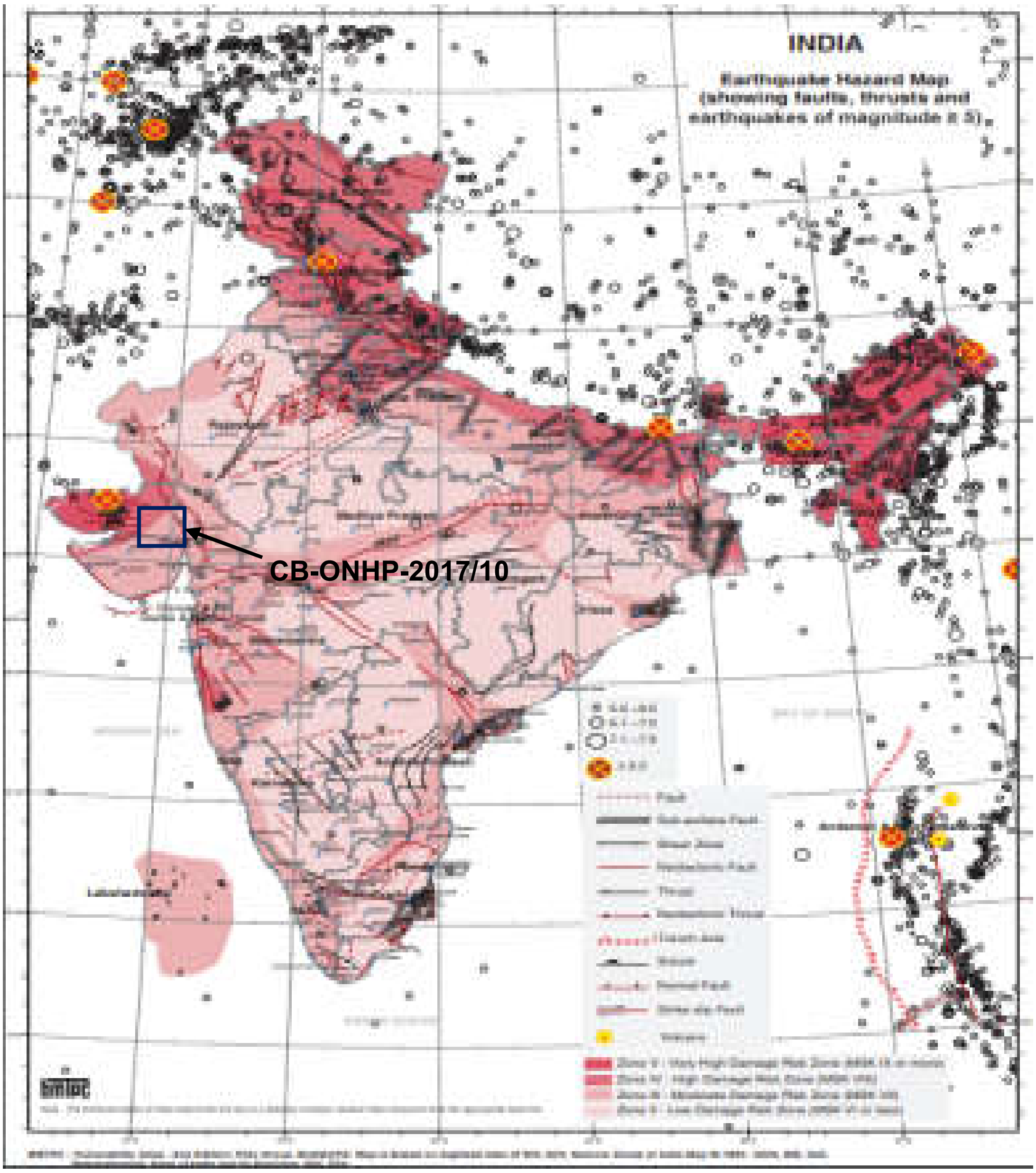
Source: Central Ground Water Board

Figure 3.6: Hydrogeological map of Jalore District

3.9 NATURAL HAZARDS

3.9.1 SEISMICITY

There are 4 major seismic zones (zones II, III, IV and V) in India, based on the seismo tectonic parameters, history of seismicity and certain geophysical parameters. The Study Area is categorized in the seismic zone III, which is classified as having a fairly high probability of earthquake shocks measuring 5 or 6 on the Richter scale, low probability of shocks of 6 or 7 on the Richter scale and Seismic Zone IV which is referred as High damage risk Zone.

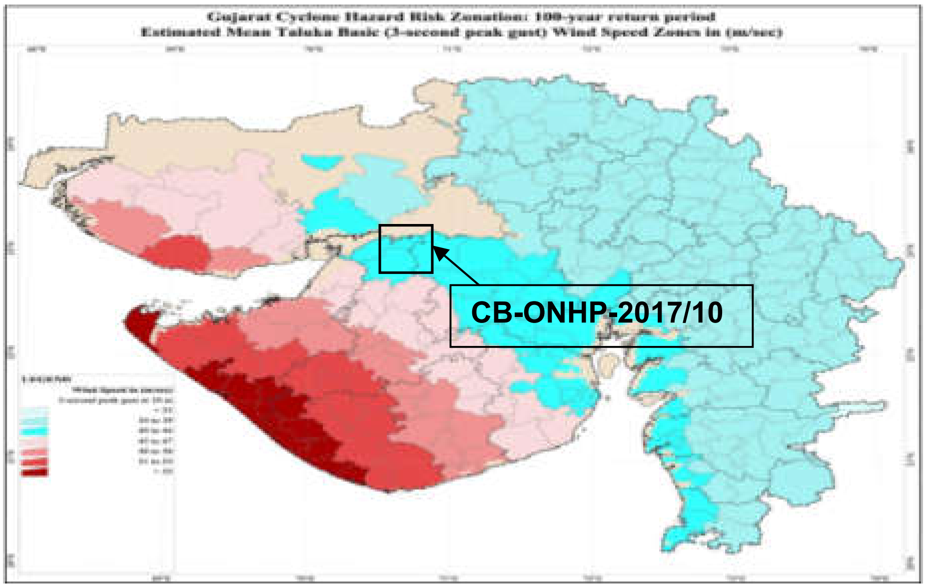


Source: BMTPC

Figure 3.7: Map showing seismic tectonic zone

3.9.2 CYCLONE

Gujarat falls in the region of tropical cyclone. Most of the cyclones affecting the state are generated in the Arabian Sea. They move North East and hit the coast particularly the Southern Kutch and Southern Saurashtra and the Western part of Gujarat. The project site falls within Banaskantha district which is least prone to cyclone hazards.



Source: Gujarat State Disaster Management Authority

Figure 3.8: Cyclone Hazard Risk Zone, Gujarat

The yearly distribution of tropical cyclones in the north Indian Ocean indicates large year to-year variations in the frequency of cyclonic disturbances and tropical cyclones, but no distinct periodicity. However, the trend indicates a slight decrease with time.

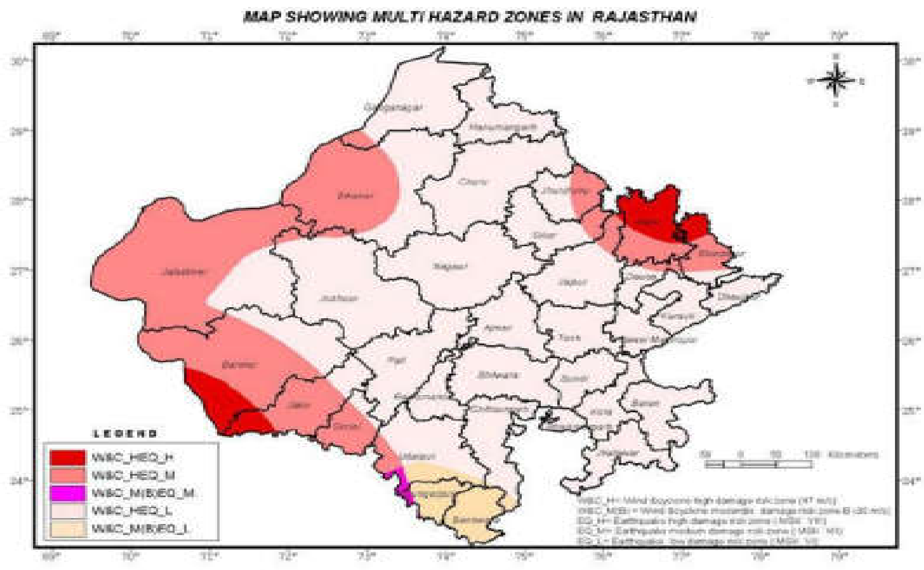


Figure 3.9: Cyclone Hazard Risk Zone, Rajasthan

3.10 LAND USE PATTERN

The block CB-ONHP-2017/10 is located within Banaskantha District of Gujarat & Jalore District of Rajasthan.

- ***Data Acquisition:***

Topographical Data: Topographical maps of Survey of India (SOI) were obtained for land use study as well to develop contour and drainages pattern of area from G43S4, G42X10, G42X11, G42X12, G42X13, G42X14, G42X15, G42X6, G42X7, G42X9, G43S2, G42S3.

Satellite Data: The Satellite IRS P-6 LISSIV images are obtained from National Remote Sensing Centre (NRSC) Hyderabad.

- ***Methodology***

The overall methodology adopted and followed to achieve the objectives of the present study involves the following steps:

- ✓ Collection of source data of Survey of India (SOI) toposheets. These are the main inputs for the preparation of essential layers
- ✓ Satellite data of IRS P-6 LISSIV sensor is geometrically corrected and enhanced using principal component method and nearest neighborhood resampling technique
- ✓ Preparation of basic themes like layout map, transport & settlement map and contour map from the source data. Then updating of layout map, transport map and drainage map from the satellite image by visual interpretation
- ✓ Essential maps (related to natural resources) like Land use/Land cover map are prepared by visual interpretation of the satellite imagery. Visual interpretation is carried out based on the image characteristics like tone, size, shape, pattern, texture, location, association, background etc. in conjunction with existing maps/ literature
- ✓ Preliminary quality check and necessary corrections are carried out for all the maps prepared
- ✓ All the maps prepared are converted into soft copy by digitization of contours and drainages. In that process editing, labeling, mosaicking, quality checking, data integration etc. are done, finally Land use areas are measured in Sq.km.

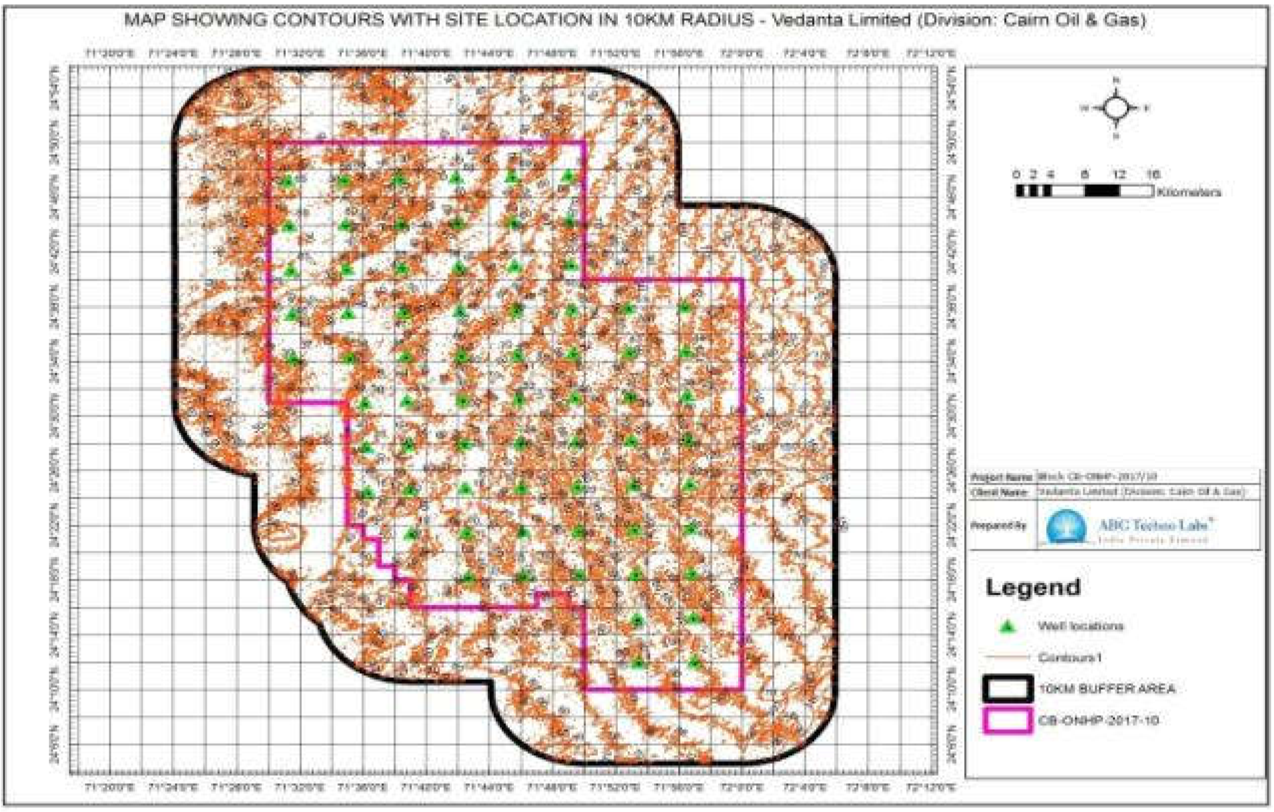
Spatial Data from SOI Topographical Sheets

In the present study, the essential maps generated from SOI topographical maps. Using the topographical maps, the drainage map and contour Map were also developed. The maps are prepared to a certain scale and with attributes complying with the requirement of terms of reference (ToR). The location of entities on the earth's surface is then specified by means of an agreed co-ordinate system. For most GIS, the common frame of co-ordinate system used for the study is UTM co-ordinates system. All the maps are first Geo-referenced. The same procedure is also applied on remote sensing data before it is used to prepare the Essential maps.

There is a road network connecting built-up areas. As the terrain conditions are alluvial type soil and site elevation bit undulations also there is a drainage network around the site location, there is no chance of flooding. Hence risk factors are less. Wild life sanctuaries located in the study area.

3.10.1 CONTOUR MAP AND ELEVATIONS OF STUDY AREA

The contours in Toposheet have been digitized in the GIS environment and assigned the respective elevation values in meters with reference to the mean sea level. Using the SRTM (Shuttle Radar Topography Mission) data, the elevation values has been verified. Thereafter final contour map has been prepared with combination of Toposheet and SRTM ith contour interval of 10 m. Project site contours vary from 20 m to 120 m above MSL and the study area contours vary from 20 m to 150 m above MSL.From the project site the No high range hill area were observed towards North West direction and the lowest contours were observed in South west direction. While the remaining areas showed variations with respect to contours.While the remaining areas showed variations with respect to contours. Contour Map and Elevations of Study Area is presented in Fig. 3.10.



Source: ABC Techno Labs India Pvt. Ltd.

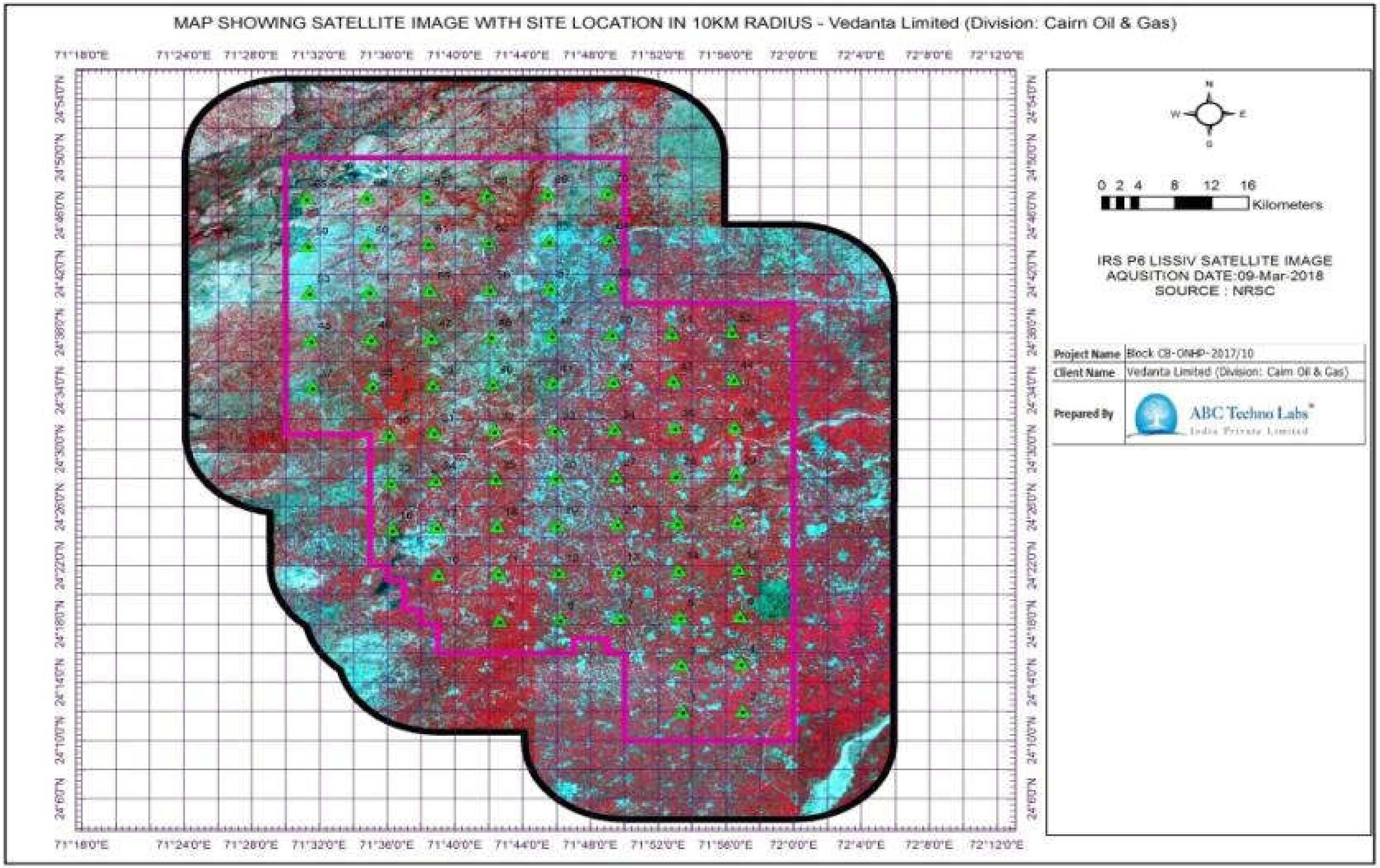
Figure 3.10: Contour map of study area (CB-ONHP-2017/10 Block)

3.10.2 TOPOGRAPHY (DIGITAL ELEVATION MODEL)

A digital elevation model (DEM) is a digital representation of ground surface topography or terrain. It is also widely known as a digital terrain model (DTM). A DEM can be represented as a raster (a grid of squares, also known as a height map when representing elevation) or as a triangular irregular network. The proposed plant location is shown in that Relief map. For the relief study of the area very higher quality SRTM (Shuttle Radar Topography Mission) and DEM is downloaded. These DEMs of the Terra represents elevation at a 30 m resolution.

Source: ABC Techno Labs India Pvt. Ltd.

Figure 3.11: DEM of the Study Area (CB-ONHP-2017/10 Block)



Source: ABC Techno Labs India Pvt. Ltd.

Figure 3.12: Satellite Image of the study area (CB-ONHP-2017/10 Block)

3.10.3 MAP FOR THE LAND USE LAND COVER IN THE STUDY AREA

Map showing the Land Use Land Cover classification in the study area is presented in Fig. 3.14 it is clearly that the area is covered with Agricultural Fallow around 48% respectively of the total area which is taken up for non-cultivation but is temporarily allowed to rest, un-cropped for one or more season, but not less than one year. Thus, total non-cultivable land is 48%. Other class is around the Agricultural fallow edges the Settlement (Built-up area) is located and occupies around 9%, and Roads 11% of the total study area. It is an area of human habitation developed due to non-agricultural use and that has a cover of buildings, transport and communication, utilities in association with water, vegetation and vacant lands. The Open scrub is 6% respectively in the total study area. Fairly dense scrub is 3%. The proposed project wells are on Agricultural Fallow and dense jungle is an area of 2% with bit undulations terrain and with impact on the surrounding villages and habitation. The water bodies cover 7% of the total area. The water bodies cover Banas River, Rel Nadi etc and connecting to small dry ponds. Fairly dense jungle is covering 3%. These area have a very prominent signature and can be seen as almost Dark blue and light blue in the satellite image. The statistical break-up of the land use classes of buffer zone are presented in Table 3.6 and depicted in Fig. 3.14.

National Park/Wildlife sanctuary/Reserve Forest within 10 Km radius of the project:

- There are no Forests found around 10 Km radius. However, no reserve forest area falls within the block area.
- No National parks and wild life sanctuaries located in the study area.

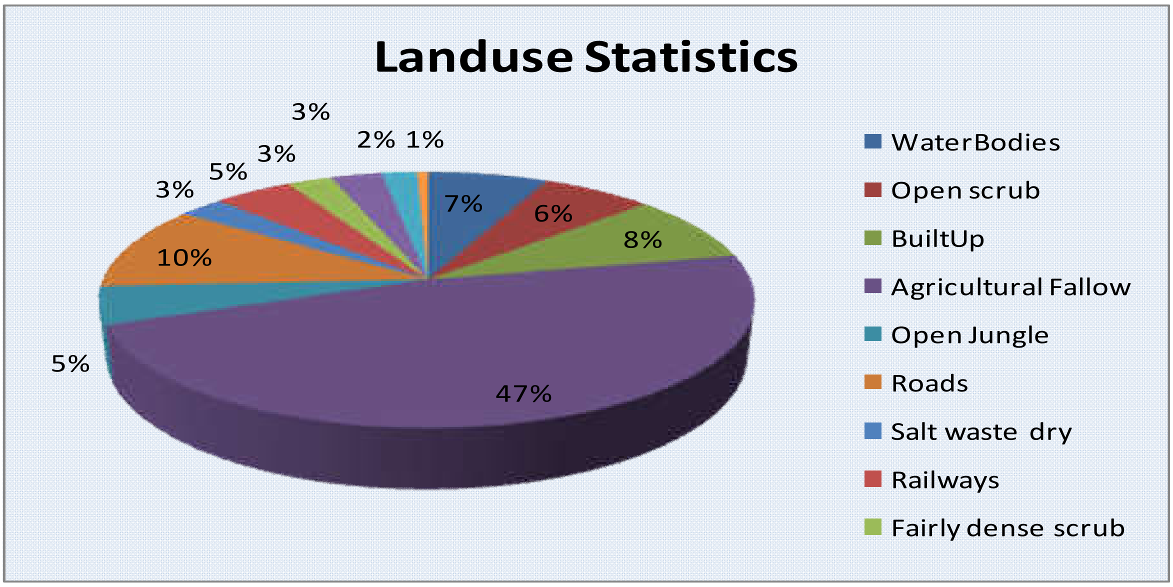
The statistical break-up of the land use classes of buffer zone are presented in Table 3.6 and depicted in Fig. 3.13.

Table 3.6: Land use land cover statistics of buffer zone

Sl. No	LULC Class	Area (Ha)	Area (%)
1	Water Bodies	37800	7%
2	Open scrub	35000	6%
3	BuiltUp	46700	9%
4	Agricultural Fallow	260000	48%
5	Open Jungle	26200	5%
6	Roads	57700	11%
7	Salt waste dry	14100	3%
8	Railways	25000	5%
9	Fairly dense scrub	14000	3%
10	Fairly dense jungle	16000	3%

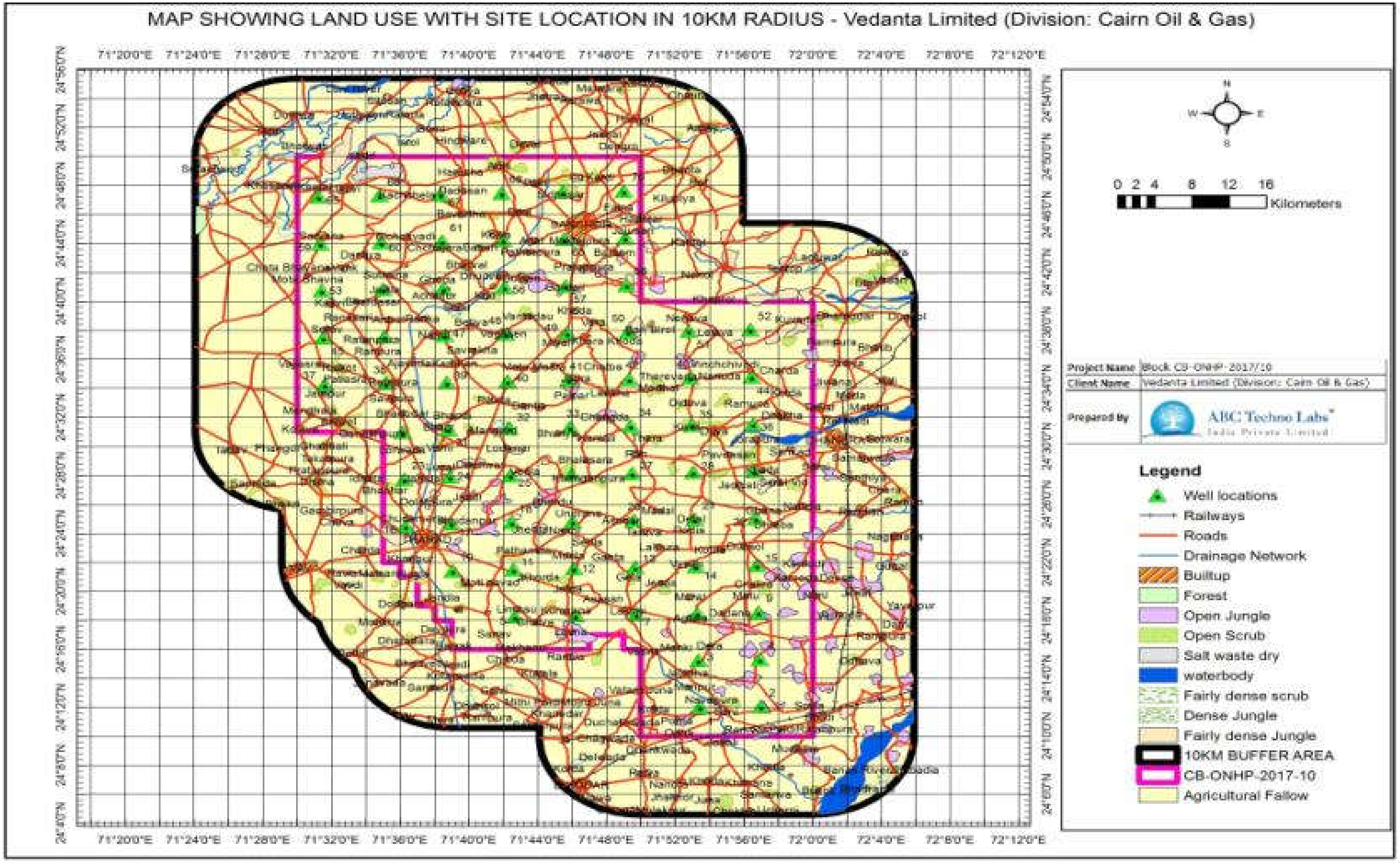
Sl. No	LULC Class	Area (Ha)	Area (%)
11	Dense Jungle	11001	2.01%
12	Forest	3500	1%
Total		547001	100%

Source: ABC Techno Labs India Pvt. Ltd.



Source: ABC Techno Labs India Pvt. Ltd.

Figure 3.13: Graphical Presentation of Land use pattern



Source: ABC Techno Labs India Pvt. Ltd.

Figure 3.14: Land Use/ Land Cover Map within 10 km Study Area (CB-ONHP-2017/10 Block)

3.11 AIR ENVIRONMENT

The prime objective of baseline air monitoring is to evaluate the existing air quality of the study area around the block. This will also be useful for assessing the conformity to standards of the ambient air quality during the exploratory operation of the proposed wells. This section describes the selection of sampling locations, the methodology adopted for sampling, analysis techniques and frequency of sampling. The results of ambient air monitoring carried out during the study during **March 2019 to June 2019** for 13 weeks.

Ambient air quality of the study area has been assessed through a network of 28 ambient air quality stations designed keeping in view the meteorological conditions of the study region and others such as major habitation, environment sensitivity etc. It was observed that no habitats present near the well locations and all the proposed exploratory wells fall within the open land area. The AAQ locations selected based on the predominant wind directions and major habitation area. The methodology adopted for the air quality survey is given below.

3.11.1 SELECTION OF SAMPLING LOCATIONS

The locations for air quality monitoring were scientifically selected based on the following considerations using climatological data.

- ✓ *Topography / Terrain of the study area*
- ✓ *Human Settlements*
- ✓ *Health status*
- ✓ *Accessibility of monitoring site*
- ✓ *Resource Availability*
- ✓ *Representativeness of the region for establishing baseline status*
- ✓ *Representativeness with respect to likely impact areas.*

The Ambient Air Quality monitoring locations are given in Table 3.7.

Table 3.7: Ambient Air Quality Monitoring Locations

Air sampling location code	Location	Coordinates		Direction with respect to project site	Type
AAQ1	Hadecha	24°48'56.37"N	71°39'35.97"E	NNW	Crosswind
AAQ2	Mendhala	24°32'12.67"N	71°30'43.75"E	WNW	Upwind
AAQ3	Taanpi	24°51'36.08"N	71°28'31.01"E	NNW	Upwind
AAQ4	Khimana	24° 6'43.91"N	71°56'5.65"E	SSE	Crosswind
AAQ5	Lakhapura	24°30'28.42"N	71°47'41.17"E	E	Downwind

Air sampling location code	Location	Coordinates		Direction with respect to project site	Type
AAQ6	Achalpur	24°40'22.05"N	71°38'3.98"E	NW	Upwind
AAQ7	Sarawanaa	24°44'28.69"N	71°31'32.18"E	NW	Upwind
AAQ8	Tharad	24°23'56.80"N	71°37'45.38"E	SW	Upwind
AAQ9	Magarawa	24°37'36.02"N	71°57'34.85"E	ENE	Downwind
AAQ10	Dhanera	24°30'13.86"N	72° 1'22.68"E	E	Downwind
AAQ11	Ganata	24°22'20.35"N	71°48'6.12"E	SSE	Downwind
AAQ12	Sanadhar	24°17'48.81"N	71°39'0.53"E	SSW	Upwind
AAQ13	Nana Kapra	24°16'43.87"N	71°59'9.30"E	SE	Downwind
AAQ14	Duchakwada	24°11'6.85"N	71°48'55.26"E	SSE	Downwind
AAQ15	Pechhdal	24°22'40.30"N	72° 3'1.71"E	ESE	Downwind
AAQ16	Akoli	24°35'22.33"N	71°24'50.35"E	WNW	Upwind
AAQ17	Chitalwana	24°54'30.83"N	71°39'39.77"E	NNW	Crosswind
AAQ18	Sanchore	24°45'13.33"N	71°46'37.89"E	NNE	Downwind
AAQ19	Lachhiwar	24°42'50.54"N	72° 0'20.52"E	NE	Downwind
AAQ20	Hathawada	24°30'58.54"N	71°40'4.95"E	W	Downwind
AAQ21	Vaghasan	24°37'35.21"N	71°42'14.79"E	NNW	Downwind
AAQ22	Bhildi	24°11'25.68"N	72° 0'36.95"E	SE	Downwind
AAQ23	Manpura Dhunsol	24°11'24.02"N	71°39'36.78"E	SSW	Upwind
AAQ24	Arnay	24°51'54.24"N	71°53'33.17"E	NNE	Crosswind
AAQ25	Ajavaadaa	24°35'53.37"N	71°36'28.94"E	NW	Downwind
AAQ26	Daiyap	24°39'34.55"N	71°29'56.44"E	WNW	Upwind
AAQ27	Surachand	24°49'6.30"N	71°25'2.83"E	NW	Upwind
AAQ28	Vav	24°21'55.01"N	71°30'48.50"E	WSW	Upwind

Source: ABC Techno Labs India Pvt. Ltd.

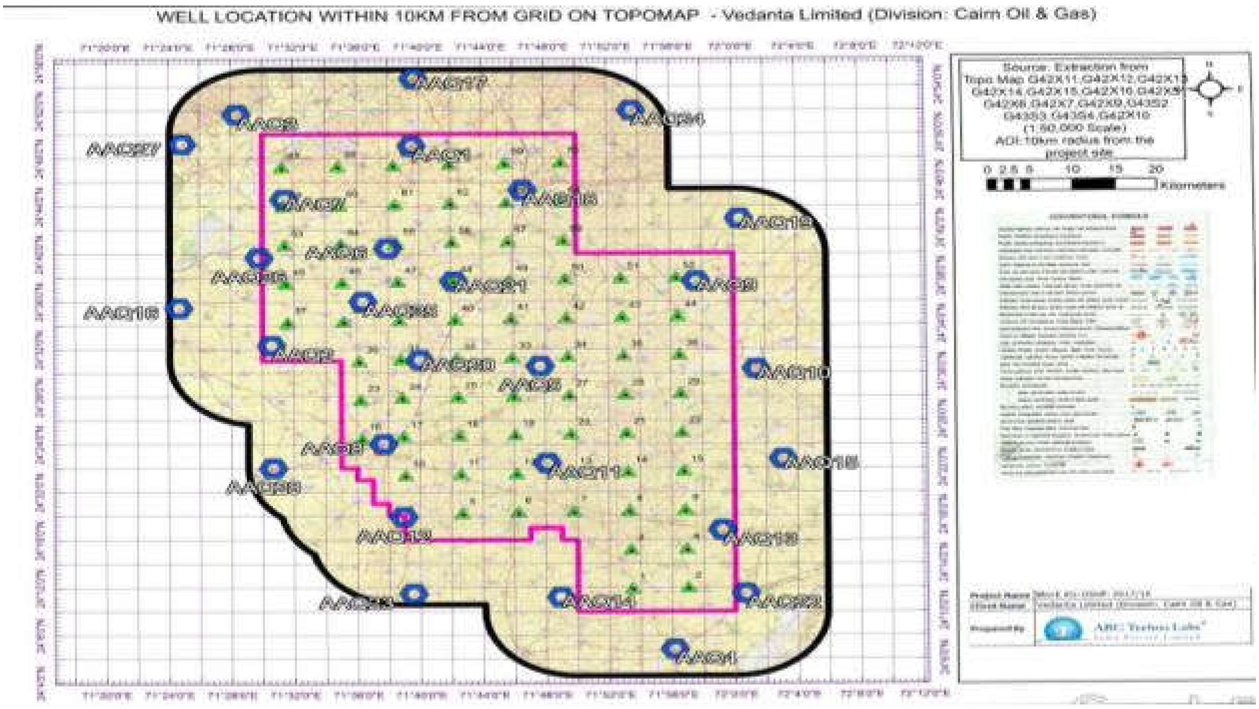


Figure 3.15: Ambient Air quality monitoring locations

3.11.2 PARAMETERS FOR SAMPLING

Ambient air quality monitoring was carried out at a frequency of two days per week at each location for continuous three months. The baseline data of air environment was generated for the parameters namely Particulate Matter size less than 10 µm (PM10), Particulate Matter size less than 2.5 µm (PM2.5), Sulphur dioxide (SO_2), Nitrogen dioxide (NOX), Carbon Monoxide (CO), Ammonia (NH_3), Ozone (O_3), Benzene (C_6H_6), Benzo alpha pyrene (BaP), Lead (Pb), Arsenic (As), Nickel (Ni), Volatile Organic Compounds (VOCs) and Hydrocarbon (Methane & Non-Methane). Concentrations of pollutant parameter monitored have been compared with National Ambient Air Quality standards.

3.11.3 INSTRUMENTS USED FOR SAMPLING

Respirable Dust Samplers APM 460 BL of Envirotech, Fine Particulate Samplers APM 550 of Envirotech & Combo PM10 & PM 2.5 sampler and AAS 271 of Envirotech were used for monitoring the Particulate matter PM10 & PM 2.5. The Gaseous pollutant samplers AAS 109 of Ecotech & APM 411 along with APM 460 Envirotech were used for sampling of gaseous pollutant like SO_2, NO_X, O_3, NH_3, VOCs, HC. Carbon Monoxide was measured by electro chemical sensor method. The instruments used for monitoring are periodically calibrated every year or after in case of any repair.

3.11.4 SAMPLING AND ANALYTICAL TECHNIQUES

The sampling and analytical techniques used for the monitoring of Ambient Air quality is given in Table 3.2. The power supply for operation of AAQ instruments were utilized from nearest available sources like Government building as Panchayat office, Schools, Temple or residential buildings at each AAQ station.

3.11.5 RESULTS

Various parameters like maximum, minimum and average have been computed from the monitored data for all the locations and summary of Ambient Air Quality test results are presented in Tables 3.8.

Table 3.8: Summary of Ambient Air Quality Result

Location	Statistics	PM10 µg/m³	PM2.5 µg/m³	SO_2 µg/m³	NO_2 µg/m³	CO mg/m³	NH_3 µg/m³	O_3 µg/m³	Lead µg/m³	Benzene µg/m³	BaP µg/m³	As ng/m³	Ni ng/m³	Methane HC µg/m³	Non Methane HC µg/m³	Total VOC's µg/m³
AAQ1	Minimum	42.7	17.5	5.3	12.5	0.13	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	58.9	26.8	9.9	19.7	0.28	BDL(<5)	9.7	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	51.5	22.0	7.7	17.1	0.20	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98th Percentile	58.9	26.8	9.8	19.7	0.28	BDL(<5)	9.7	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ2	Minimum	40.2	17.8	5.9	12.5	0.16	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	59.4	26.9	9.7	19.4	0.29	BDL(<5)	9.9	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	52.5	22.0	8.1	16.1	0.21	BDL(<5)	7.9	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98th Percentile	59.3	26.9	9.7	19.4	0.29	BDL(<5)	9.9	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ3	Minimum	43.7	17.8	5.2	12.8	0.13	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	59.8	26.5	9.7	19.8	0.27	BDL(<5)	9.4	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	51.9	21.9	7.6	17.2	0.20	BDL(<5)	7.5	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98th Percentile	59.4	26.2	9.6	19.8	0.27	BDL(<5)	9.4	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ4	Minimum	44.0	17.9	5.7	12.4	0.15	BDL(<5)	5.2	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	59.7	26.9	9.8	19.8	0.28	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	51.7	22.5	7.3	16.7	0.21	BDL(<5)	7.9	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98th Percentile	59.3	26.9	9.7	19.7	0.28	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ5	Minimum	41.3	17.6	5.5	12.3	0.15	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)

Location	Statistics	PM10 µg/m³	PM2.5 µg/m³	SO_2 µg/m³	NO_2 µg/m³	CO mg/m³	NH_3 µg/m³	O_3 µg/m³	Lead µg/m³	Benzene µg/m³	BaP µg/m³	As ng/m³	Ni ng/m³	Methane HC µg/m³	Non Methane HC µg/m³	Total VOC's µg/m³
	Maximum	58.6	26.8	9.7	19.7	0.29	BDL(<5)	9.7	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	50.7	21.6	7.4	17.1	0.22	BDL(<5)	7.5	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98th Percentile	58.1	26.6	9.6	19.7	0.29	BDL(<5)	9.5	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ6	Minimum	41.3	17.6	5.3	12.5	0.15	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	59.6	26.8	9.6	19.8	0.28	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	52.1	22.0	7.6	16.6	0.21	BDL(<5)	7.7	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98th Percentile	59.6	26.6	9.5	19.7	0.28	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ7	Minimum	40.6	17.6	5.3	12.3	0.15	BDL(<5)	5.1	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	59.6	26.3	9.6	19.6	0.28	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	50.4	21.6	7.6	16.8	0.21	BDL(<5)	7.5	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98th Percentile	59.6	26.3	9.6	19.6	0.28	BDL(<5)	9.7	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ8	Minimum	42.3	17.3	5.6	12.3	0.15	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	60.1	26.5	9.6	19.6	0.28	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	51.8	22.0	7.8	16.1	0.22	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98th Percentile	59.7	26.1	9.5	19.6	0.27	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ9	Minimum	42.3	17.2	5.3	12.1	0.16	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	59.6	26.8	9.8	25.3	0.30	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	51.6	22.0	7.8	17.1	0.23	BDL(<5)	8.0	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)

Location	Statistics	PM10 µg/m³	PM2.5 µg/m³	SO_2 µg/m³	NO_2 µg/m³	CO mg/m³	NH_3 µg/m³	O_3 µg/m³	Lead µg/m³	Benzene µg/m³	BaP µg/m³	As ng/m³	Ni ng/m³	Methane HC µg/m³	Non Methane HC µg/m³	Total VOC's µg/m³
	98th Percentile	59.1	26.6	9.7	22.6	0.30	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ10	Minimum	40.3	17.6	5.3	12.3	0.15	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	59.6	26.8	9.6	19.8	0.28	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	52.0	21.4	7.7	17.0	0.21	BDL(<5)	8.1	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98th Percentile	59.5	26.6	9.5	19.8	0.28	BDL(<5)	9.5	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ11	Minimum	43.5	17.6	5.6	13.2	0.15	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	59.6	26.8	9.6	19.6	0.29	BDL(<5)	9.7	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	52.8	22.3	7.8	16.7	0.22	BDL(<5)	7.9	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98th Percentile	59.5	26.7	9.6	19.6	0.29	BDL(<5)	9.7	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ12	Minimum	40.5	17.5	5.3	12.3	0.16	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	59.3	26.9	9.6	19.6	0.29	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	52.8	21.3	7.7	17.0	0.23	BDL(<5)	8.1	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98th Percentile	59.0	26.7	9.6	19.6	0.29	BDL(<5)	9.5	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ13	Minimum	40.3	17.3	5.3	13.2	BDL (<0.1)	BDL(<5)	5.4	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	59.6	25.7	9.6	19.6	BDL (<0.1)	BDL(<5)	9.9	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	51.5	20.6	7.5	16.9	BDL (<0.1)	BDL(<5)	7.8	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98th Percentile	59.6	25.2	9.5	19.6	BDL (<0.1)	BDL(<5)	9.9	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ14	Minimum	44.3	17.8	5.2	12.3	0.15	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)

Location	Statistics	PM10 $\mu g/m^3$	PM2.5 $\mu g/m^3$	SO_2 $\mu g/m^3$	NO_2 $\mu g/m^3$	CO mg/m^3	NH_3 $\mu g/m^3$	O_3 $\mu g/m^3$	Lead $\mu g/m^3$	Benzene $\mu g/m^3$	BaP $\mu g/m^3$	As ng/m^3	Ni ng/m^3	Methane HC $\mu g/m^3$	Non Methane HC $\mu g/m^3$	Total VOC's $\mu g/m^3$
	Maximum	59.3	26.7	9.6	19.6	0.29	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	52.7	22.1	7.6	16.2	0.23	BDL(<5)	7.4	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98^{th} Percentile	59.3	26.7	9.5	19.6	0.29	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ15	Minimum	44.3	16.7	5.6	12.4	0.14	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	60.1	26.7	9.7	19.7	0.29	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	53.6	21.6	8.2	16.0	0.21	BDL(<5)	7.5	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98^{th} Percentile	59.7	26.6	9.7	19.7	0.29	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ16	Minimum	45.2	17.3	5.3	12.3	0.15	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	59.9	26.9	9.9	19.8	0.28	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	53.2	22.2	7.5	17.1	0.22	BDL(<5)	7.5	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98^{th} Percentile	59.9	26.9	9.8	19.7	0.28	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ17	Minimum	42.3	17.3	5.3	12.6	0.13	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	59.8	26.8	9.9	19.8	0.26	BDL(<5)	9.9	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	52.0	21.4	7.7	16.9	0.21	BDL(<5)	7.5	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98^{th} Percentile	59.7	26.7	9.6	19.7	0.26	BDL(<5)	9.9	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ18	Minimum	43.2	17.6	5.6	12.8	0.13	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	60.5	26.9	9.9	19.8	0.26	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	52.5	22.2	7.8	17.4	0.20	BDL(<5)	8.0	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)

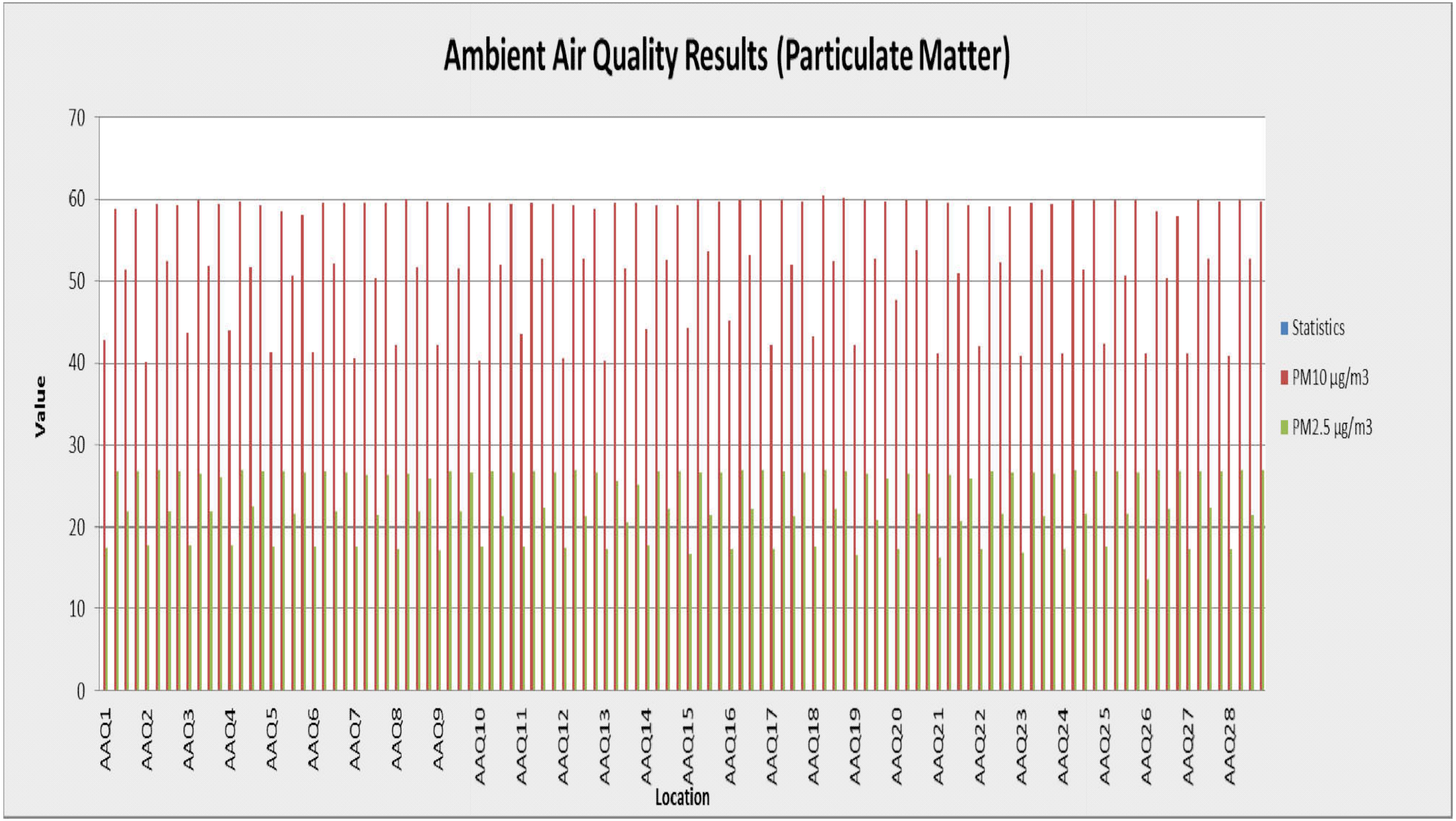
Location	Statistics	PM10 µg/m³	PM2.5 µg/m³	SO_2 µg/m³	NO_2 µg/m³	CO mg/m³	NH_3 µg/m³	O_3 µg/m³	Lead µg/m³	Benzene µg/m³	BaP µg/m³	As ng/m³	Ni ng/m³	Methane HC µg/m³	Non Methane HC µg/m³	Total VOC's µg/m³
	98th Percentile	60.2	26.9	9.8	19.8	0.26	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ19	Minimum	42.3	16.5	5.4	12.4	0.13	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	59.8	26.5	9.9	19.9	0.29	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	52.9	20.9	7.8	16.8	0.22	BDL(<5)	7.9	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98th Percentile	59.7	26.1	9.9	19.9	0.29	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ20	Minimum	47.8	17.3	5.3	12.3	0.15	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	59.9	26.5	9.7	19.5	0.28	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	53.8	21.6	7.8	16.0	0.22	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98th Percentile	59.9	26.5	9.5	19.5	0.28	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ21	Minimum	41.2	16.3	5.1	12.6	0.15	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	59.6	26.3	9.1	19.6	0.29	BDL(<5)	9.9	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	51.0	20.8	7.3	16.3	0.21	BDL(<5)	8.0	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98th Percentile	59.3	26.0	9.1	19.4	0.29	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ22	Minimum	42.1	17.3	5.2	12.6	0.14	BDL(<5)	5.1	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	59.1	26.8	9.6	19.7	0.29	BDL(<5)	9.9	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	52.4	21.7	7.9	16.3	0.22	BDL(<5)	7.7	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98th Percentile	59.1	26.6	9.6	19.7	0.29	BDL(<5)	9.9	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ23	Minimum	40.8	16.8	5.3	12.6	0.16	BDL(<5)	5.2	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)

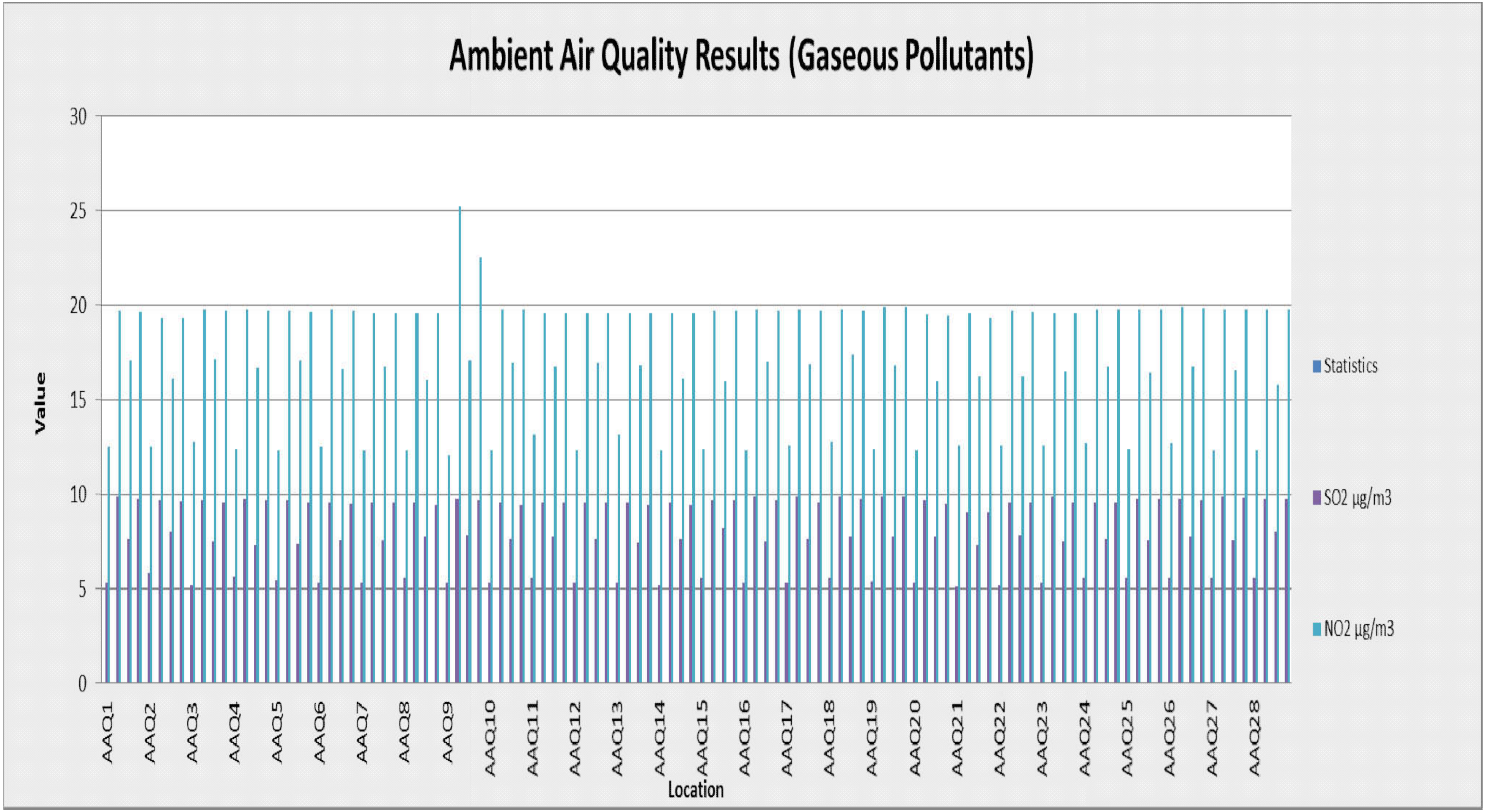
Location	Statistics	PM10 µg/m³	PM2.5 µg/m³	SO_2 µg/m³	NO_2 µg/m³	CO mg/m³	NH_3 µg/m³	O_3 µg/m³	Lead µg/m³	Benzene µg/m³	BaP µg/m³	As ng/m³	Ni ng/m³	Methane HC µg/m³	Non Methane HC µg/m³	Total VOC's µg/m³
	Maximum	59.5	26.7	9.9	19.6	0.29	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	51.3	21.3	7.5	16.5	0.23	BDL(<5)	7.8	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98th Percentile	59.4	26.5	9.6	19.6	0.29	BDL(<5)	9.7	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ24	Minimum	41.2	17.4	5.6	12.7	0.15	BDL(<5)	5.2	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	59.8	26.9	9.6	19.8	0.29	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	51.4	21.7	7.7	16.8	0.22	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98th Percentile	59.8	26.9	9.6	19.8	0.29	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ25	Minimum	42.5	17.6	5.6	12.4	0.15	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	59.9	26.8	9.8	19.8	0.29	BDL(<5)	9.9	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	50.7	21.7	7.6	16.4	0.23	BDL(<5)	7.9	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98th Percentile	59.9	26.6	9.8	19.8	0.29	BDL(<5)	9.7	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ26	Minimum	41.2	13.6	5.6	12.7	0.15	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	58.6	26.9	9.8	19.9	0.29	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	50.4	22.2	7.8	16.8	0.22	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98th Percentile	58.0	26.9	9.7	19.9	0.29	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ27	Minimum	41.2	17.3	5.6	12.3	0.15	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	59.8	26.8	9.9	19.8	0.28	BDL(<5)	9.9	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	52.8	22.3	7.6	16.6	0.21	BDL(<5)	8.7	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)

Location	Statistics	PM10 µg/m^3	PM2.5 µg/m^3	SO_2 µg/m^3	NO_2 µg/m^3	CO mg/m^3	NH_3 µg/m^3	O_3 µg/m^3	Lead µg/m^3	Benzene µg/m^3	BaP µg/m^3	As ng/m^3	Ni ng/m^3	Methane HC µg/m^3	Non Methane HC µg/m^3	Total VOC's µg/m^3
	98th Percentile	59.7	26.8	9.9	19.8	0.28	BDL(<5)	9.9	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
AAQ28	Minimum	40.9	17.3	5.6	12.3	0.15	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Maximum	59.8	26.9	9.8	19.8	0.29	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	Average	52.9	21.5	8.1	15.8	0.23	BDL(<5)	7.8	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
	98th Percentile	59.7	26.9	9.8	19.8	0.29	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL (<0.1)	BDL (<1)	BDL (<1)	BDL (<0.1)	BDL (<0.1)	BDL (<1)
NAAQS Standard		100	60	80	80	2	400	100	1	5	1	6	20	NS	NS	NS

N.B: BDL- Below Detection Level

Source: ABC Techno Labs India Pvt. Ltd


Ambient Air Quality Results (Particulate Matter)
Value
Location
Statistics
PM10 µg/m3
PM2.5 µg/m3
AAQ1
AAQ2
AAQ3
AAQ4
AAQ5
AAQ6
AAQ7
AAQ8
AAQ9
AAQ10
AAQ11
AAQ12
AAQ13
AAQ14
AAQ15
AAQ16
AAQ17
AAQ18
AAQ19
AAQ20
AAQ21
AAQ22
AAQ23
AAQ24
AAQ25
AAQ26
AAQ27
AAQ28



Source: ABC Techno Labs India Pvt. Ltd.

3.11.6 Observations

PM10: The maximum and minimum concentrations of PM10 were recorded as 60.5 μg/m^3 and 40.2 μg/m^3 respectively. The maximum concentration was recorded at the Sanchore (AAQ18) and the minimum concentration was recorded at Mendhala (AAQ2). The average concentrations were ranged between 50.4 to 53.8 μg/m^3.

PM2.5: The maximum and minimum concentrations for PM2.5 were recorded as 26.9 μg/m^3 and 13.6 μg/m^3 respectively. The maximum concentration was recorded at the Mendhala (AAQ2) and the minimum concentration was recorded at Daiyap (AAQ26). The average values were observed to be in the range of 20.6 to 22.5 μg/m^3.

SO_2: The maximum and minimum SO_2 concentrations were recorded as 9.9 μg/m^3 and 5.1 μg/m^3. The maximum concentration was recorded at Hadecha (AAQ1) and the minimum concertration was recorded at Vaghasan (AAQ21). The average values were observed to be in the range of 7.3 μg/m^3 to 8.2 μg/m^3.

NOx: The maximum and minimum NOx concentrations were recorded as 25.3 μg/m^3 and 12.1 μg/m^3. The maximum concentration was recorded at Magarawa (AAQ9) and the minimum concertration was recorded at Magarawa (AAQ9). The average values were observed to be in the range of 15.8 to 17.4 μg/m^3.

CO: The maximum and minimum CO concentrations were recorded as 0.29 mg/m^3 and BDL (<0.1 mg/m^3). The maximum concentration was recorded at Magarawa (AAQ9) and the minimum concertration was recorded at Nana Kapra (AAQ13). The average values were observed to be in the range of BDL (<0.1 mg/m^3) to 0.23 mg/m^3.

HC (methane and non-methane) and Volatile Organic Compounds (VOCs): The HC and VOCs at all the location were observed below detection limit.

The concentrations of Benzene (C_6H_6), BaP, Lead, Arsenic, Nickel and Ammonia were below detectable limits at all locations and O_3 present in locations are well within the standards prescribed by the Central Pollution Control Board (CPCB) for Industrial, Rural, Residential and Other area.

3.12 Noise Environment

The main objective of monitoring of ambient noise levels was to establish the baseline noise levels in the surrounding areas and to assess the total noise level in the environment of the study area. The measurements were carried out using Type 1 noise level integrated sound level meter. Monitoring was done at each location during the study period for 24 hrs on hourly basis to obtain hourly equivalent sound pressure level. A digital noise level meter was used to record the noise levels. From these values, day time and night time and 24-hrs Leq values were calculated. Day time is considered from 0600 hrs to 2200 hrs and night from 2200 hrs to 0600 hrs.

3.12.1 IDENTIFICATION OF SAMPLING LOCATIONS

A preliminary reconnaissance survey was undertaken to identify the major noise sources in the area. The noise monitoring has been conducted at 28 locations within near exploratory wells which are presented in Table 3.9.

Table 3.9: Noise Quality monitoring stations

Sampling Location Code & Name	Location	Zone	Coordinates	
			Latitude	Longitude
N1	Lakhani	Residential	24°18'28.94"N	71°49'17.11"E
N2	Dhanera	Residential	24°30'41.21"N	72° 1'20.47"E
N3	Taanpi	Residential	24°51'39.05"N	71°28'36.55"E
N4	Chekhala	Residential	24° 4'51.52"N	71°56'22.14"E
N5	Dama	Residential	24°17'57.55"N	72° 5'12.32"E
N6	Zenta	Residential	24°24'17.31"N	71°43'50.67"E
N7	Ratanpura	Residential	24°53'40.50"N	71°39'9.16"E
N8	Tharad	Residential	24°23'44.14"N	71°37'5.83"E
N9	Magarawa	Residential	24°44'39.99"N	71°31'26.63"E
N10	Dhanera	Residential	24°43'42.07"N	71°28'27.66"E
N11	Arnay	Residential	24°51'59.71"N	71°53'31.36"E
N12	Sanadhar	Residential	24°17'51.21"N	71°39'1.62"E
N13	Nana Kapra	Residential	24°16'46.97"N	71°59'18.72"E
N14	Duchakwada	Residential	24°10'53.47"N	71°48'53.22"E
N15	Sanchore	Residential	24°44'58.44"N	71°46'45.40"E
N16	Hadecha	Residential	24°48'50.30"N	71°39'38.74"E
N17	Amli	Residential	24°49'21.95"N	71°41'43.54"E
N18	Rajkot	Residential	24°35'27.62"N	71°32'22.48"E
N19	Akoli	Residential	24°35'18.62"N	71°24'54.13"E
N20	Piluda	Residential	24°33'17.34"N	71°41'26.19"E
N21	Kelashnagar	Residential	24°40'48.62"N	71°38'47.09"E
N22	Bhildi	Residential	24°11'12.90"N	72° 0'33.27"E
N23	Manpura Dhunsol	Residential	24°11'23.18"N	71°39'34.31"E
N24	Rah	Residential	24°29'21.23"N	71°49'44.23"E
N25	Magarawa	Residential	24°37'37.31"N	71°57'36.00"E
N26	Daiyap	Residential	24°39'32.74"N	71°30'4.01"E
N27	Pechhdal	Residential	24°22'42.04"N	72° 3'7.86"E
N28	Vav	Residential	24°22'3.44"N	71°30'54.10"E

Source: ABC Techno Labs India Pvt. Ltd.

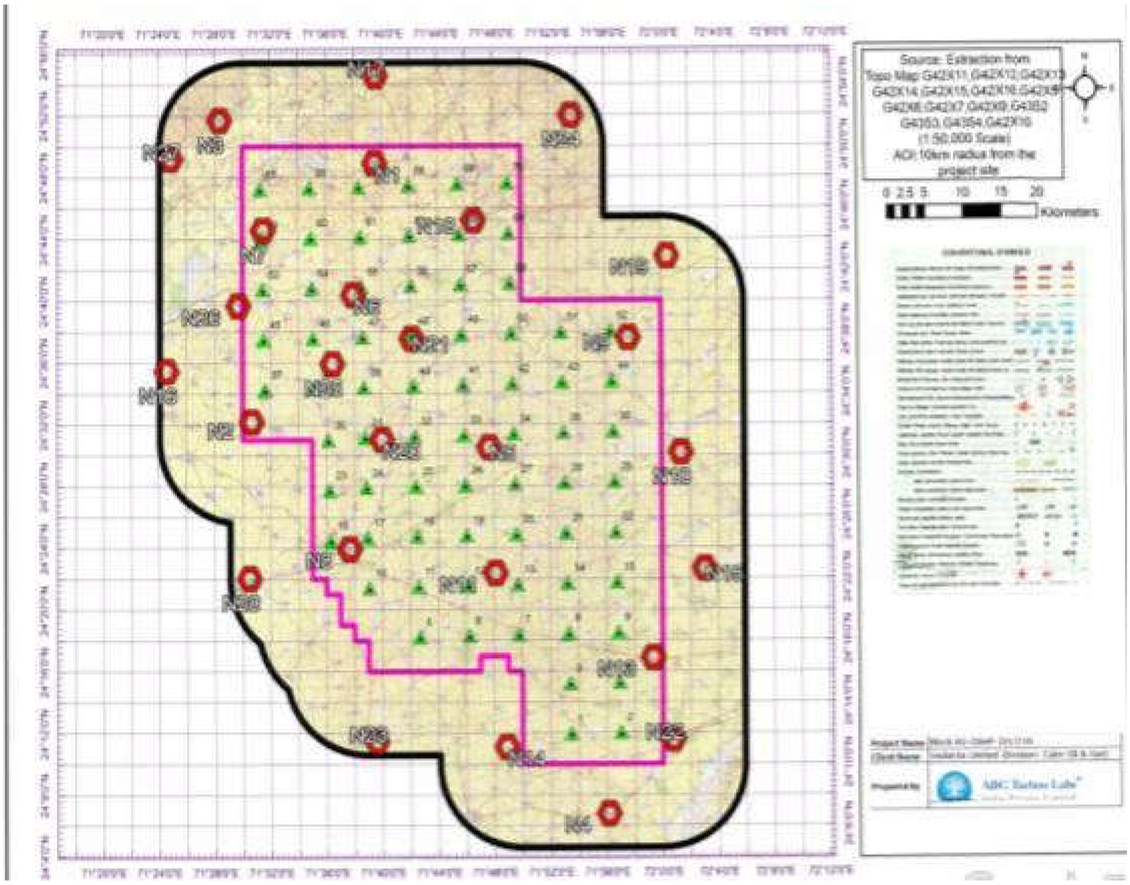


Figure 3.16: Ambient Noise monitoring locations

3.12.2 INSTRUMENT USED FOR SAMPLING

Noise levels were measured using a sound level meter. The sound level meter measures the equivalent continuous noise level (Leq) by switching to the corresponding function mode.

3.12.3 METHOD OF MONITORING

Sound Pressure Level (SPL) measurements were measured at all locations. The readings were taken for every hour for 24 hours. The day noise levels have been monitored during 6 am to 10 pm and night levels during 10 pm to 6 am at all the locations covered in a 10 Km radius of the study area. The noise levels were measured once during the study period. These readings were later tabulated and the frequency distribution table was prepared. Finally, hourly and 24 hourly values for various noise parameters viz. L_{day} and L_{night} were calculated.

For noise levels measured over a given period of time, it is possible to describe important features of noise using statistical quantities. This is calculated using the percent of the time certain noise levels exceed the time interval. The notations for the statistical quantities of noise levels are described below:

L_{10} is the noise level exceeded 10 percent of the time

L_{50} is the noise level exceeded 50 percent of the time and

L_{90} is the noise level exceeded 90 percent of the time

Equivalent Sound Pressure Level (Leq)

The Leq is the equivalent continuous sound level, which is equivalent to the same sound energy as the actual fluctuating sound measured in the same period. This is necessary because the sound from a noise source often fluctuates widely during a given period of time. This is calculated from the following equation:

$$\mathbf{Leq = L50 + (L_{10} - L_{90})^2/60}$$

Parameters Measured During Monitoring

For noise levels measured over a given period of the time interval, it is possible to describe important features of noise using statistical quantities. This is calculated using the percent of the time, certain noise levels are exceeded during the time interval. The notation for the statistical quantities of noise levels id described below:

Hourly Leq day: Equivalent noise levels between 6.00 hours to 22.00 hours.

Leq night: Equivalent noise levels between 22.00 hours to 6.00 hours.

3.12.4 RESULTS

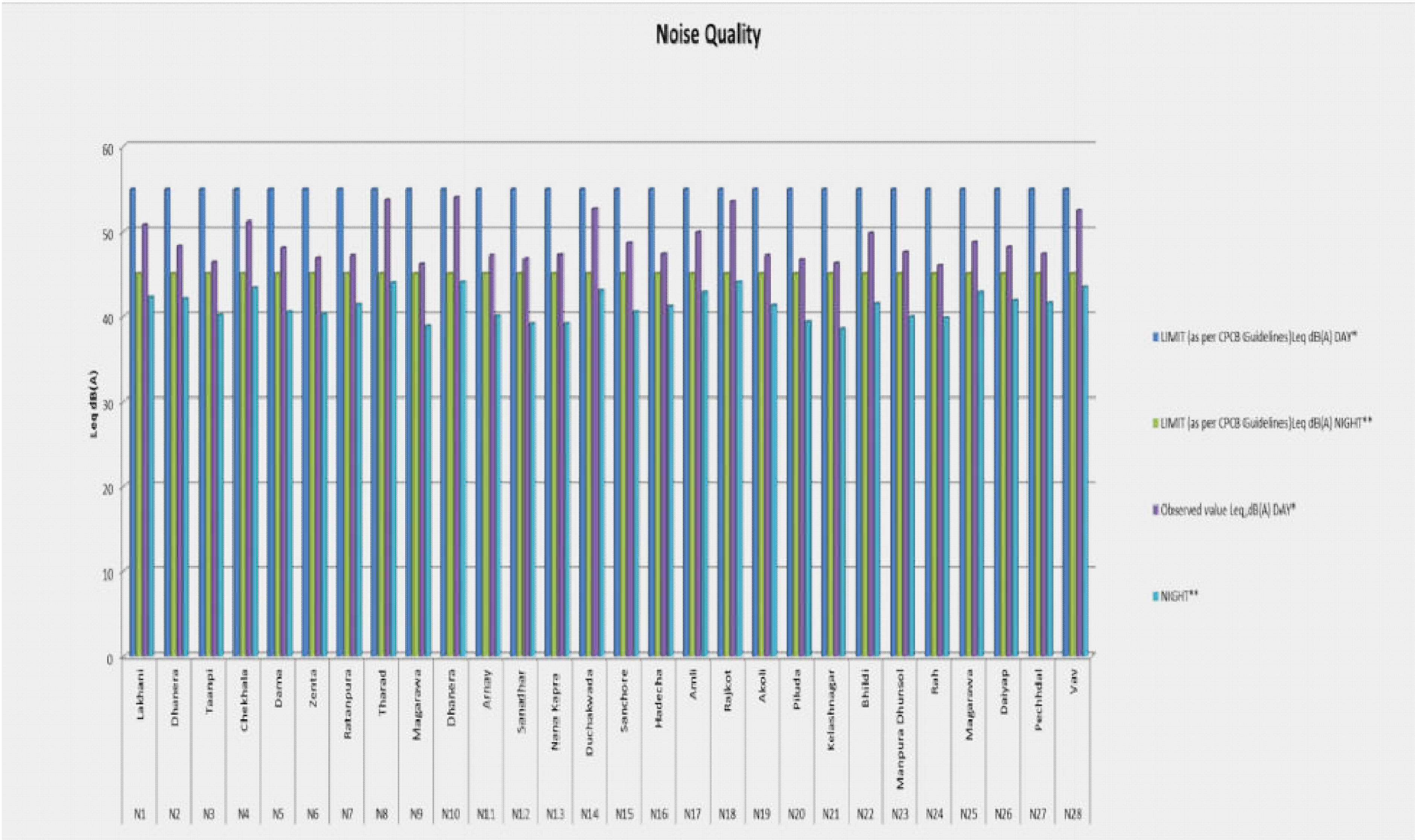
The summary of computed ambient noise level parameters like L_{day} and L_{night} are presented in Table 3.10 and compared to the standards specified by CPCB mentioned.

Table 3.10: Ambient Noise Level

S.No.	Location code	Location	Zone	LIMIT (as per CPCB Guidelines) Leq dB(A)		Observed value Leq,dB(A)	
				DAY*	NIGHT**	DAY*	NIGHT**
1	N1	Lakhani	Residential	55	45	50.8	42.3
2	N2	Dhanera	Residential	55	45	48.2	42.1
3	N3	Taanpi	Residential	55	45	46.4	40.1
4	N4	Chekhala	Residential	55	45	51.1	43.3
5	N5	Dama	Residential	55	45	48	40.5
6	N6	Zenta	Residential	55	45	46.9	40.2
7	N7	Ratanpura	Residential	55	45	47.1	41.4
8	N8	Tharad	Residential	55	45	53.7	43.9
9	N9	Magarawa	Residential	55	45	46.2	38.8

S.No.	Location code	Location	Zone	LIMIT (as per CPCB Guidelines) Leq dB(A)		Observed value Leq,dB(A)	
				DAY*	NIGHT**	DAY*	NIGHT**
10	N10	Dhanera	Residential	55	45	54	44
11	N11	Arnay	Residential	55	45	47.1	40
12	N12	Sanadhar	Residential	55	45	46.8	39.1
13	N13	Nana Kapra	Residential	55	45	47.2	39.1
14	N14	Duchakwada	Residential	55	45	52.6	43
15	N15	Sanchore	Residential	55	45	48.6	40.5
16	N16	Hadecha	Residential	55	45	47.3	41.2
17	N17	Amli	Residential	55	45	49.9	42.8
18	N18	Rajkot	Residential	55	45	53.5	44
19	N19	Akoli	Residential	55	45	47.1	41.3
20	N20	Piluda	Residential	55	45	46.7	39.3
21	N21	Kelashnagar	Residential	55	45	46.3	38.5
22	N22	Bhildi	Residential	55	45	49.8	41.5
23	N23	Manpura Dhunsol	Residential	55	45	47.5	39.9
24	N24	Rah	Residential	55	45	46	39.8
25	N25	Magarawa	Residential	55	45	48.7	42.8
26	N26	Daiyap	Residential	55	45	48.1	41.9
27	N27	Pechhdal	Residential	55	45	47.3	41.6
28	N28	Vav	Residential	55	45	52.4	43.4

Note: Daytime shall mean from 6.00 a.m. to 10.00 p.m.
Night time shall mean from 10.00 p.m. to 6.00 a.m.



Source: ABC Techno Labs India Pvt. Ltd.

3.12.5 OBSERVATIONS

Day time Noise Levels

Noise levels during daytime were found to be in the range 46 to 54 dB(A). The maximum noise level was observed to be 54 dB(A) at Dhanera (N10) and a minimum of 46 dB(A) was observed at Rah (N24).

Night time Noise Levels

Noise levels observed to fall in the range 38.5 to 44 dB (A) during the night time. A maximum of 44 dB (A) was observed at Dhanera & Rajkot (N10 & N18) and a minimum of 38.5 dB (A) was observed at Kelashnagar (N21).

Measured noise levels are observed to be in compliance with prescribed standards for ambient noise for the respective applicable categories except at monitoring location.

3.13 TRAFFIC STUDY

The purpose of this study is to assist the client to study the regional transportation and traffic connectivity to the site and to ensure that the proposed development is able to have access to infrastructures needed for the future development and its functionality.

This will also help in assessing the impact of increase in traffic due to the proposed project.

Vehicle Count

The vehicles passing through the road (in both ways) were counted separately for 24 hours at the two selected locations from 0600 hrs to 0600 hrs next day continuously. Category-wise vehicle counting has been done continuously and recorded in the traffic volume count on daily basis under respective categories.

Categorization of Traffic

The engine driven vehicles were categorized into various heads viz. Trucks/Bus, Light Carriage Vehicles (LCV), Car/Jeep, Multi Axle Vehicles, Two/Three Wheelers and Cycles/others.

3.13.1 OBSERVATIONS AND RESULTS

Traffic study was conducted at 4 locations for 2 days (week days & weekends) during April 2019 at NH-15, SH 128, SH 11, SH 54 to cover all possible traffic variations and to assess the peak traffic flow.

1. NH-15

National Highway 15 is one of the busiest highways in Northern India. The highway starts from Pathankot in Punjab and connects Amritsar, Jaisalmer, Barmer, Sanchore, Tharad and leads till Samkhiyali in Gujarat.

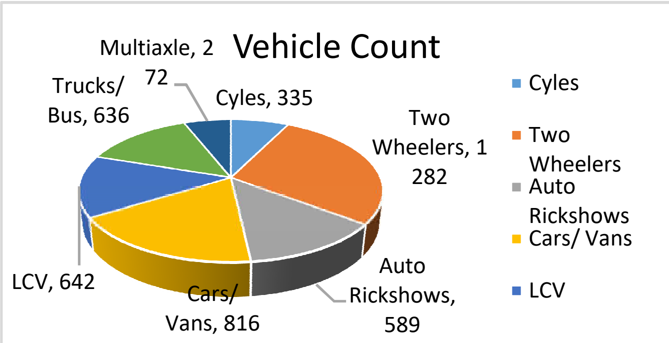
Traffic flow patterns (Weekday)

The traffic study was conducted for National Highway 15 road which is one of the main access to the project site to the city. The average traffic on State Highway 15 is observed as 324 PCUs/day. The peak traffic on SH 10 road is observed from 11:00 AM – 12:00 PM of 394 PCUs & the peak traffic during night time is observed from 5:00 – 6:00 PM of 453 PCUs.

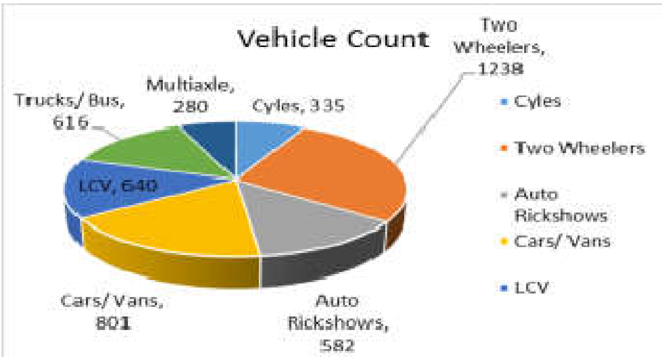
Traffic flow patterns (Weekend)

The traffic study was conducted for State Highway 15 road which are the main access to the project site to the city. The average traffic on State Highway 15 is observed as 321 PCUs/day. The peak traffic on SH 10 road is observed from 8:00 AM – 9:00 AM of 375 PCUs & the peak traffic during night time is observed from 6:00 – 7:00 PM of 446 PCUs.

Weekdays		
Total	**7116**	**PCUs/day**
Min	**177**	**PCUs/day**
Max	**403**	**PCUs/day**
Average	**297**	**PCUs/day**



Weekend		
Total	**4506**	**PCUs/day**
Min	**96**	**PCUs/hr**
Max	**268**	**PCUs/hr**
Average	**361**	**PCUs/hr**



2. SH 128

State Highway 128 is one of the busiest highways in Northern India. The highway starts from Bhordu connecting Dhanera, Dhima, Duva, Godasar, Khinmat till Tharad.

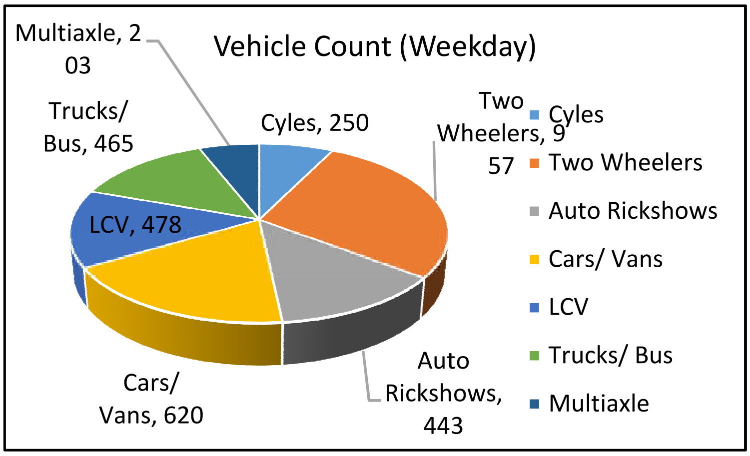
Traffic flow patterns (Weekday)

The traffic study was conducted for State Highway 128 road which are the main access to the project site to the city. The average traffic on State Highway 128 is observed as 137 PCUs/day. The peak traffic on SH 128 road is observed from 11:00 AM – 12:00 AM of 200 PCUs & the peak traffic during night time is observed from 6:00 – 7:00 PM of 159 PCUs.

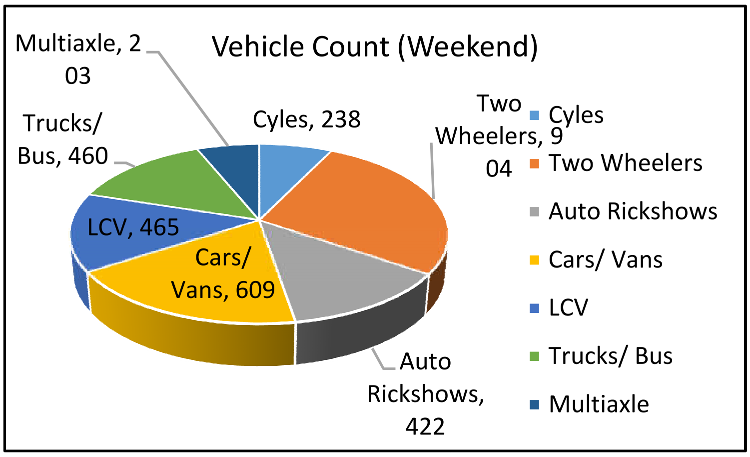
Traffic flow patterns (Weekend)

The traffic study was conducted for State Highway 128 road which are the main access to the project site to the city. The average traffic on State Highway 128 is observed as 156 PCUs/day. The peak traffic on SH 130 road is observed from 9:00 AM – 10:00 AM of 200 PCUs & the peak traffic during night time is observed from 5:00 – 6:00 PM of 118 PCUs.

Weekdays		
Total	**5862**	**PCUs/day**
Min	**133**	**PCUs/hour**
Max	**332**	**PCUs/hour**
Average	**244**	**PCUs/hour**



Weekend		
Total	**5737**	**PCUs/day**
Min	**133**	**PCUs/hour**
Max	**319**	**PCUs/hour**
Average	**239**	**PCUs/hour**



3. SH 11

State Highway 11 is one of the busiest highways in Rajasthan. The study site is in Sanchore town which is connected by the State Highway. The highway starts from Abu Road and connects Badgaon, Bapla, Barman, Mandar, Mawaland leads to Sarnau.

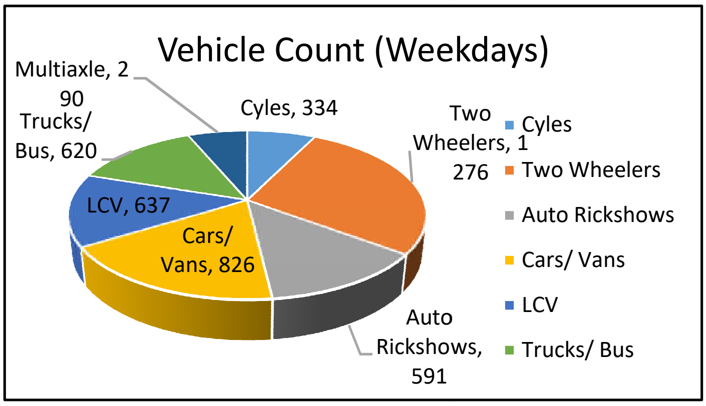
Traffic flow patterns (Weekday)

The traffic study was conducted for State Highway 11 road which are the main access to the project site to the city. The average traffic on State Highway 11 is observed as 328 PCUs/day. The peak traffic on SH 11 road is observed from 11:00 AM – 12:00 AM of 389 PCUs & the peak traffic during night time is observed from 6:00 – 7:00 PM of 447 PCUs.

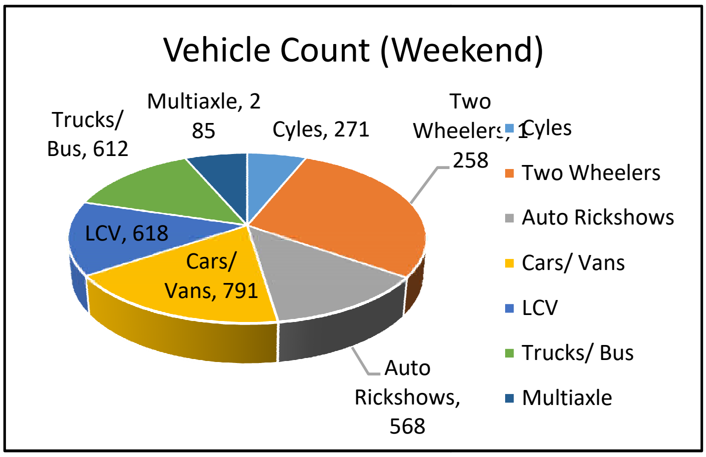
Traffic flow patterns (Weekend)

The traffic study was conducted for State Highway 11 road which are the main access to the project site to the city. The average traffic on State Highway 11 is observed as 318 PCUs/day. The peak traffic on SH 11 road is observed from 11:00 AM – 12:00 AM of 378 PCUs & the peak traffic during night time is observed from 7:00 – 8:00 PM of 442 PCUs.

Weekdays		
Total	7884	PCUs/day
Min	177	PCUs/hour
Max	447	PCUs/hour
Average	328	PCUs/hour



Weekend		
Total	7633	PCUs/day
Min	177	PCUs/hour
Max	442	PCUs/hour
Average	318	PCUs/hour



4. SH 54

State Highway 54 is one of the busiest highways in Gujarat. The highway starts from Dama connecting Dhareda, Disa, Hasanpur, Kotada, Makdala, Tharad and leads to Vajapur.

Traffic flow patterns (Weekday)

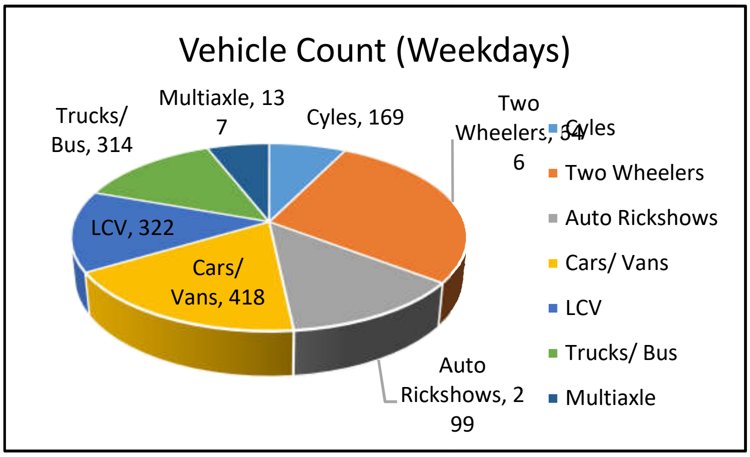
The traffic study was conducted for State Highway 54 road which are the main access to the project site to the city. The average traffic on State Highway 54 is observed as 165

PCUs/day. The peak traffic on SH 54 road is observed from 8:00 AM – 9:00 AM of 196 PCUs & the peak traffic during night time is observed from 6:00 – 7:00 PM of 224 PCUs.

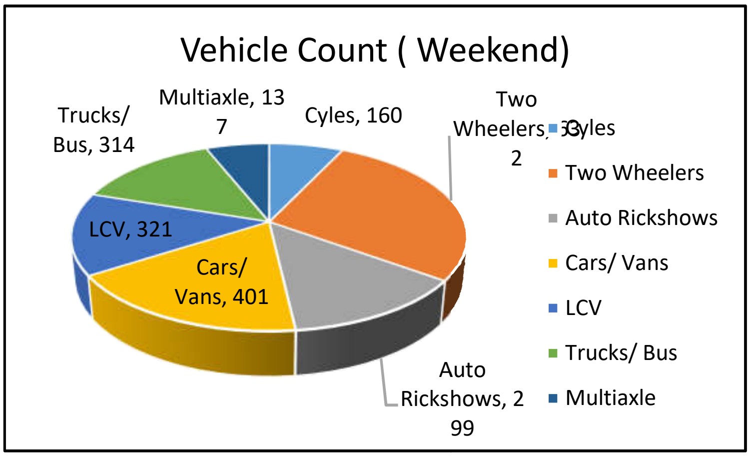
Traffic flow patterns (Weekend)

The traffic study was conducted for State Highway 54 road which are the main access to the project site to the city. The average traffic on State Highway 54 is observed as 164 PCUs/day. The peak traffic on SH 54 road is observed from 8:00 AM – 9:00 AM of 198 PCUs & the peak traffic during night time is observed from 6:00 – 7:00 PM of 223 PCUs.

Weekdays		
Total	**3953**	**PCUs/day**
Min	**90**	**PCUs/hour**
Max	**224**	**PCUs/hour**
Average	**165**	**PCUs/hour**



Weekend		
Total	**3932**	**PCUs/day**
Min	**92**	**PCUs/hour**
Max	**223**	**PCUs/hour**
Average	**164**	**PCUs/hour**



3.14 Water Environment

The quality of ground and surface water is influenced by surface and sub-surface environmental conditions. The quantity and quality of water entering the underground regime is another important parameter which influences underground water quality.

Water sampling has been conducted to establish baseline water quality in the area. Water analysis was carried out for physical and chemical parameters as per the methods prescribed in IS and *"Standard Methods for the Examination of Water and Wastewater*

(American Public Health Association)". The water samples were collected as grab samples and were analyzed for physical, chemical and biological characteristics.

3.14.1 SAMPLING LOCATIONS

The sampling locations were selected based on reconnaissance survey with the following consideration:

- Location of water courses; and
- Location of residential areas representing different activities

The details of the water sampling (Ground & Surface) stations are presented in the Table 3.11.

Table 3.11: Water quality monitoring locations

Location Code	Location	Geographical location		Type of water
		Latitude	Longitude	
Ground Water				
GW1	Lakhani	24°18'34.81"N	71°49'13.92"E	Borewell
GW2	Dhanera	24°29'57.61"N	72° 1'30.17"E	Borewell
GW3	Taanpi	24°51'38.24"N	71°28'23.30"E	Borewell
GW4	Chekhala	24° 4'47.58"N	71°56'21.19"E	Borewell
GW5	Dama	24°17'53.29"N	72° 5'14.33"E	Borewell
GW6	Zenta	24°24'21.93"N	71°43'49.93"E	Borewell
GW7	Ratanpura	24°53'43.51"N	71°39'10.10"E	Borewell
GW8	Tharad	24°23'30.85"N	71°37'25.76"E	Borewell
GW9	Magarawa	24°44'31.20"N	71°31'21.64"E	Borewell
GW10	Dhanera	24°43'46.09"N	71°28'30.16"E	Borewell
GW11	Arnay	24°51'54.92"N	71°53'36.95"E	Borewell
GW12	Sanadhar	24°17'43.89"N	71°38'59.66"E	Borewell
GW13	Nana Kapra	24°16'51.26"N	71°59'11.06"E	Borewell
GW14	Duchakwada	24°10'53.61"N	71°48'59.85"E	Borewell
GW15	Sanchore	24°44'52.59"N	71°46'31.36"E	Borewell
GW16	Hadecha	24°48'56.29"N	71°39'38.47"E	Borewell
GW17	Amli	24°49'29.89"N	71°41'43.98"E	Borewell
GW18	Rajkot	24°35'18.88"N	71°32'27.67"E	Borewell
GW19	Akoli	24°35'22.02"N	71°24'48.18"E	Borewell
GW20	Piluda	24°33'9.70"N	71°41'34.09"E	Borewell
GW21	Kelashnagar	24°40'52.32"N	71°38'42.03"E	Borewell
GW22	Bhildi	24°11'16.58"N	72° 0'41.28"E	Borewell
GW23	Manpura Dhunsol	24°11'21.19"N	71°39'36.28"E	Borewell
GW24	Rah	24°29'27.17"N	71°49'40.24"E	Borewell
GW25	Magarawa	24°37'32.96"N	71°57'34.21"E	Borewell
GW26	Daiyap	24°39'37.55"N	71°29'53.22"E	Borewell
GW27	Pechhdal	24°22'42.04"N	72° 3'7.86"E	Borewell
GW28	Vav	24°21'43.80"N	71°30'40.37"E	Borewell
Surface Water				

Location Code	Location	Geographical location		Type of water
		Latitude	Longitude	
SW1	Banas River	24° 8'55.44"N	72° 3'28.26"E	River
SW2	Canal Near Khodla village	24° 8'6.16"N	71°57'22.47"E	Canal
SW3	Canal Near Barnawa village	24°46'21.27"N	71°29'27.97"E	Canal
SW4	Luni River Near Taanpi Village	24°51'11.21"N	71°28'56.48"E	River
SW5	Narmada Main Canal (D/S)	24°50'55.06"N	71°44'56.86"E	Canal
SW6	Narmada Main Canal (U/S)	24°33'26.05"N	71°37'13.07"E	Canal
SW7	Banas River	24°30'43.86"N	71°59'30.78"E	River
SW8	Narmada Main Canal	24°39'50.52"N	71°40'11.80"E	River

Source: ABC Techno Labs India Pvt. Ltd.

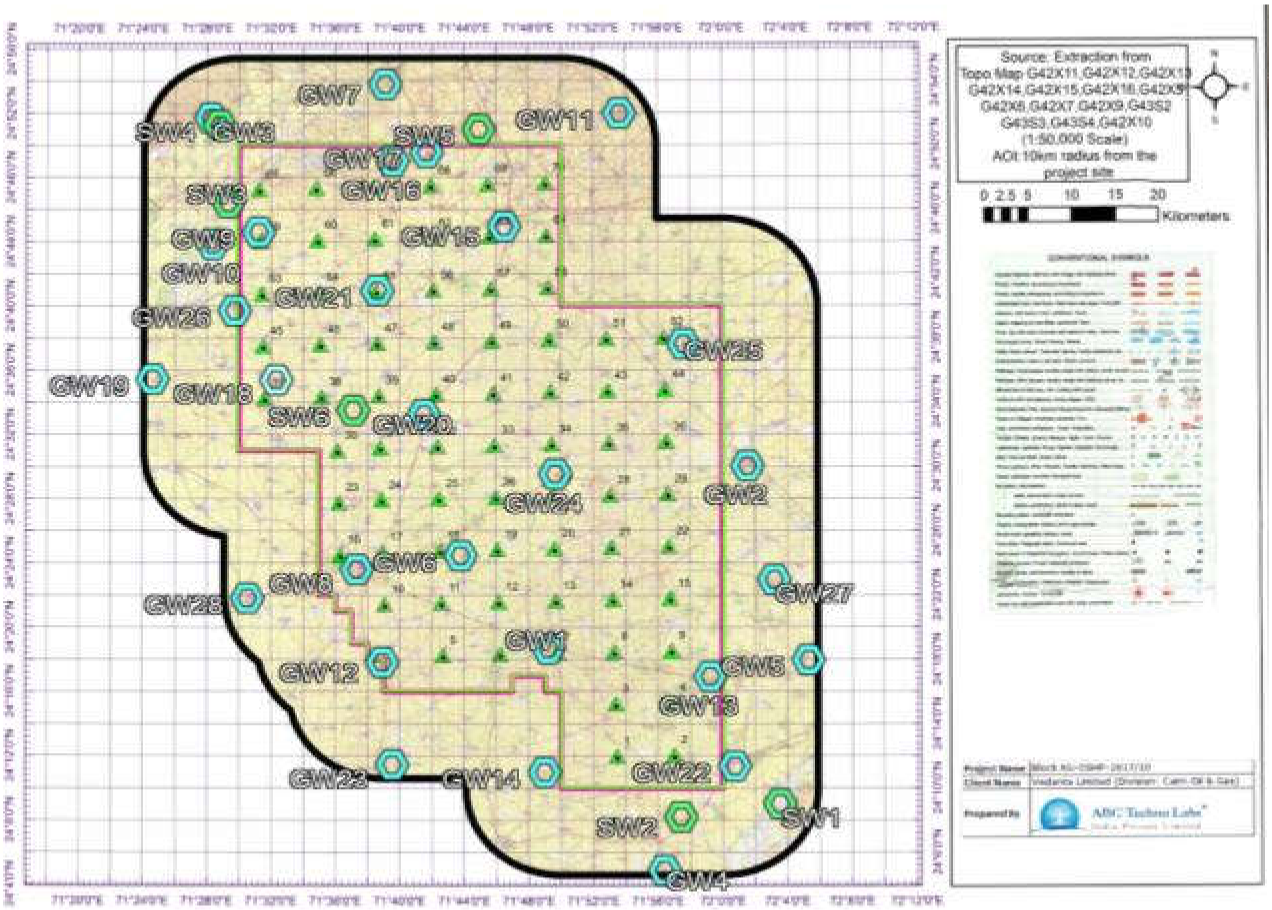


Figure 3.17: Water quality monitoring locations

Ground water samples for chemical analysis were collected in polyethylene carboys. Water samples collected for metal content were acidified with 1 ml HNO_3. Selected physico-chemical and heavy metal have been analysed for ground water quality status in the study area.

3.14.2 RESULTS

A. Ground Water

The physicochemical characteristics of ground water in the study area are presented in the Tables 3.12 and is compared with the standards (IS 10500: Indian Standards/Specifications for Drinking Water) reference values.

A. Physical Parameters

- **Colour:** The colour of ground water samples was 1 to 2 Hazen unit and meets the desirable limit of drinking water standards.
- **Odour:** Ground water samples were found No Odour Observed.
- **Turbidity:** The turbidity of water samples ranges from 0.5 NTU to 1.0 NTU and meets permissible limit at all the ground water sampling locations.
- **pH:** The pH value of all ground water samples ranges from 7.13 to 8.24 and meets the desirable limit of drinking water standards.
- **Total Dissolved Solids (TDS):** The TDS in ground water samples range from 218 to 3060 mg/l and meets permissible limit of 2000 mg/l in the ground water sampling locations.

B. Chemical Parameters

- **Total Alkalinity:** Total alkalinity in ground water samples ranges from 80 mg/l to 710 mg/l and meets permissible limit of 600 mg/l at all the ground water sampling locations.
- **Total Hardness:** The total hardness of ground water samples range between 96 mg/l to 1350 mg/l and doesn't meet the permissible limit of drinking water standards for GW11, GW13, GW15, GW18, GW19, GW23 & GW26.
- **Calcium:** The Calcium content in ground water samples range from 29 mg/l to 241 mg/l and meets permissible limit of 200 mg/l at the ground water sampling locations except GW15, GW23 & GW26.
- **Magnesium:** The Magnesium content in ground water samples range from 9 mg/l to 181 mg/l and meets permissible limit of 100 mg/l at the ground water sampling locations except GW13, GW15, GW18, GW23 & GW26.
- **Chloride:** The chloride content in ground water samples range from 62 mg/l to 1015 mg/l and meets permissible limit of 1000 mg/l at the ground water sampling locations except GW26.

- **Sulphate:** Sulphate content in ground water sample ranges from 14 mg/l to 512 mg/l and meets the acceptable limit of 200 mg/l at all the ground water sampling locations except GW15 & GW26.
- **Nitrate:** Nitrate content in ground water samples ranges from 1 to 13 mg/l and meets the acceptable limit of 45 mg/l at all the ground water sampling locations.
- **Iron:** The iron content in all ground water sample ranges from 0.05 to 0.18 mg/l and meets acceptable limit of 0.3 mg/l at all the ground water sampling locations.
- **Manganese:** Manganese content in ground water samples found to be Below Detection Level (<0.02 mg/l).
- **Fluoride:** Fluoride content in ground water samples ranges from 0.29 mg/l to 1.12 mg/l and meets the permissible limit of drinking water standards.
- **Sodium:** Sodium content in ground water samples ranges from 29 mg/l to 620 mg/l.
- **Potassium:** Potassium content in ground water samples ranges from 2.8 mg/l to 52 mg/l.
- **Lead:** Lead content in ground water samples found to be Below Detection Level (<0.01 mg/l) at all the ground water sampling locations.
- **Zinc:** Zinc content in ground water samples ranges from 0.03 mg/l to 0.32 mg/l and meets the acceptable limit 5 mg/l at all the ground water sampling locations.
- **Total Nitrogen:** Total Nitrogen content in ground water samples range from 1.5 mg/l to 6.3 mg/l.
- **Total Phosphorus:** Total Phosphorus content in ground water samples range from 0.02 mg/l to 0.17 mg/l.

C. Biological Parameters

- **Total Coliform:** Total coliform content in ground water samples ranges from <2 to 7 which doesn’t meet the IS 10500:2012 standards for drinking water.

D. Other Parameters

Aluminum, Selenium, Phenolic Compounds, Copper, Cadmium, Mercury, Nickel, Total Arsenic, Total Chromium, Cyanide and Mineral Oil, Poly Chlorinated Biphenyls (PCBs), Poly Nuclear Aromatic Hydrocarbon (PAH) in all ground water samples were found below detection limit (BDL).

Conclusions

The results of ground water samples were compared to Indian Standard Specification of drinking water IS: 10500:2012. Analyzed parameters meet permissible limits for drinking standards except GW11, GW13, GW15, GW18, GW19, GW23 & GW26. Other Ground water samples need filtration and other treatment before usage.

Table 3.12: Results for Ground Water Analysis
Part 1

S. No	Parameters	Unit	Test Method	Limits as per IS 10500:2012		GW1	GW2	GW3	GW4	GW5	GW6	GW7
				Acceptable	Permissible							
1	Colour	Hazen	APHA 23rd EDITION 2120 C	5	15	<1	<1	<1	<1	<1	1	<1
2	Odour	-	APHA 23rd EDITION 2150 B	Agreeable	Agreeable	No Odour Observed	No Odour Observed	No Odour Observed	No Odour Observed	No Odour Observed	No Odour Observed	No Odour Observed
3	Taste	-	IS 3025 Part 8 (Reaff:2017)	Agreeable	Agreeable	Agreeable	Not agreeable	Agreeable	Not agreeable	Not agreeable	Agreeable	Not agreeable
4	Turbidity	NTU	IS : 3025 Part 10-1987 (Reaff: 2017)	1	5	BDL (<0.5)	0.5	BDL (<0.5)	0.5	BDL (<0.5)	0.5	BDL (<0.5)
5	pH at 25 °C	-	IS : 3025 Part 11- 1987 (Reaff: 2017)	6.5-8.5	No Relaxation	7.13	7.54	7.68	7.84	7.6	8.08	7.77
6	Electrical Conductivity @25°C	µS/cm	IS : 3025 Part 14- 1987 (Reaff: 2019)	Not Specified	Not Specified	404	894	474	680	574	450	602
7	Total dissolved solids	mg/l	IS : 3025 Part 16-1987 (Reaff: 2017)	500	2000	238	512	260	379	321	245	328
8	Total Alkalinity as $CaCO_3$	mg/l	IS : 3025 Part 23-1987(Reaff:2019)	200	600	132	240	112	166	140	110	102
9	Total Hardness as $CaCO_3$	mg/l	IS : 3025 Part 21-1987 (Reaff:2019)	200	600	140	290	120	160	172	136	118
10	Calcium as Ca	mg/l	IS : 3025 Part 40-1991 (Reaff:2003)	75	200	36	58	32	44	51	40	38
11	Magnesium as Mg	mg/l	APHA 23rd EDN-3500 Mg B	30	100	12	35	9.7	12	11	9	12
12	Chloride as Cl^-	mg/l	IS : 3025 Part 32-1987 (Reaff: 2019)	250	1000	65	154	75	98	89	62	83
13	Sulphate as SO_4	mg/l	APHA 23rd EDN -4500-SO42- E	200	400	18	48	14	38	25	18	32
14	Nitrate as NO_3	mg/l	APHA 23rd EDN -4500-NO3- B	45	No Relaxation	3	2	8	5	2	6	1
15	Iron as Fe	mg/l	IS : 3025 Part 53-1987 (Reaff:2019)	0.3	No Relaxation	0.05	0.06	BDL (<0.5)	0.05	BDL (<0.5)	BDL (<0.5)	0.05
16	Manganese as Mn	mg/l	APHA 23rd EDN -3500-Mn D	0.1	0.3	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)

S. No	Parameters	Unit	Test Method	Limits as per IS 10500:2012		GW1	GW2	GW3	GW4	GW5	GW6	GW7
				Acceptable	Permissible							
17	Fluoride as F	mg/l	APHA 23rd EDN -4500-F B&D	1	1.5	0.36	0.55	0.36	0.47	0.48	0.36	0.42
18	Ammonia as N	mg/l	APHA 23rd EDN -4500- NH3 B&C	0.5	No Relaxation	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)
19	Barium as Ba	mg/l	APHA 23rd EDN -3111 D	0.7	No Relaxation	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)
20	Residual free Chlorine as Cl_2	mg/l	APHA 23rd EDN -4500 Cl G	0.2	1	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)
21	Sodium as Na	mg/l	IS : 3025 Part 45-1987 (Reaff:2019)	Not Specified	Not Specified	40	100	48	78	56	40	52
22	Potassium as K	mg/l	IS : 3025 Part 45-1987 (Reaff:2019)	Not Specified	Not Specified	3.6	3.9	5.8	4.7	2.8	4.4	3.6
23	Nickel as Ni	mg/l	APHA 23rd EDN -3111 B	0.02	No Relaxation	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)
24	Chloromines	mg/l	IS 3025 Part 26 (Reaff:2019)	4	No Relaxation	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)
25	Aluminium as Al	mg/l	IS:3025 Part:55-1987 (Reaff:2019)	0.03	0.2	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)
26	Cadmium as Cd	mg/l	APHA 23rd EDN -3111 B	0.003	No Relaxation	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)
27	Lead as Pb	mg/l	IS:3025 Part 47-1987 (Reaff:2019)	0.01	No Relaxation	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
28	Copper as Cu	mg/l	APHA 23rd EDN -3111 B	0.05	1.5	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)
29	Zinc as Zn	mg/l	IS:3025 Part:49-1987 (Reaff:2019)	5	15	0.14	0.09	0.05	0.06	0.03	0.05	0.1
30	Total Chromium as Cr	mg/l	APHA 23rd EDN -3111 B	0.05	No Relaxation	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
31	Arsenic as As	mg/l	IS:3025 Part:37-1987 (Reaff:2019)	0.01	0.05	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
32	Cyanide as CN	mg/l	APHA 23rd EDN -4500-CN E	0.05	No Relaxation	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
33	Selenium as Se	mg/l	APHA 23rd EDN -3114 B	0.01	No	BDL	BDL	BDL	BDL	BDL	BDL	BDL

S. No	Parameters	Unit	Test Method	Limits as per IS 10500:2012 Acceptable	Limits as per IS 10500:2012 Permissible	GW1	GW2	GW3	GW4	GW5	GW6	GW7
					Relaxation	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)
34	Mercury as Hg	mg/l	IS:3025 Part 48-1987 (Reaff:2019)	0.001	No Relaxation	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
35	Anionic Surfactants as MBAS	mg/l	APHA 23rd EDN 5540 C	0.2	1	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)
36	Phenolic Copounds as Phenol	mg/l	APHA 23rd EDN 5530 B,C	0.001	0.002	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
37	Total Nitrogen as N	mg/l	IS 3025 Part 34 (Reaff:2019)	Not Specified	Not Specified	1.5	2.8	3.3	2	3.1	3.1	3.9
38	Total Phosphorous	mg/l	IS 3025 Part 31 (Reaff:2019)	Not Specified	Not Specified	0.02	0.05	0.03	0.02	0.02	0.05	0.15
39	Chemical Oxygen Demand	mg/l	IS 3025 Part 58 (Reaff:2017)	Not Specified	Not Specified	4	<4	<4	<4	<4	<4	4
40	Dissolved Oxygen as O2	mg/l	IS 3025 Part 38 (Reaff:2019)	Not Specified	Not Specified	5.5	5.4	5.6	5.7	5.2	5.4	5.1
41	Biochemical Oxygen Demand @ 27 for 3 days	mg/l	IS 3025 Part 44 (Reaff:2019)	Not Specified	Not Specified	<2	<2	<2	<2	<2	<2	<2
42	Sodium Absorbtion Ratio	mg/l	By Calculation	Not Specified	Not Specified	1.47	2.56	1.91	2.69	1.85	1.49	1.88
43	Mineral Oil *	mg/l	FI-IR	0.5	No Relaxation	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)
44	Poly Chlorinated Biphenyls (PCBs)	mg/l	APHA 23rd EDN -6630 B	0.0005	No Relaxation	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
45	Poly Nuclear Aromatic Hydrocarbon as PAH	mg/l	APHA 23rd EDN -6440 B	0.0001	No Relaxation	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
46	Bromoform	mg/l	APHA 23rd EDN -6200 B	0.1	No Relaxation	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)
47	Dibromochloromethane	mg/l		0.1	No Relaxation	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)

S. No	Parameters	Unit	Test Method	Limits as per IS 10500:2012		GW1	GW2	GW3	GW4	GW5	GW6	GW7
				Acceptable	Permissible							
48	Bromodichloromethane	mg/l		0.06	No Relaxation	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)
49	Chloroform	mg/l		0.2	No Relaxation	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)
50	Total Coliforms	MPN/ 100ml	IS 1622: 1982 (RA 2014)	Absent/ 100 ml	Absent/ 100 ml	<2	4	<2	<2	<2	2	<2
51	E.Coli	MPN/ 100ml	IS 1622: 1982 (RA 2014)	Absent/ 100 ml	Absent/ 100 ml	<2	<2	<2	<2	<2	<2	<2
52	DDT (Dichloro-Diphenyl-Trichloroethane)	mg/l	EPA 525.2	1	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
53	Lindane(γ-hexachlorocyclohexane)	mg/l		2	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
54	α-HCH	mg/l		0.01	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
55	β-HCH	mg/l		0.04	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
56	δ-HCH	mg/l		0.04	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
57	2, 4-dichlorophenoxyacetic acid	mg/l		30	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
58	Endosulphon	mg/l		0.4	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
59	Manocrotophos	mg/l		1	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
60	Ethion	mg/l		3	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
61	Chlorpyrifos	mg/l		30	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
62	Phorate	mg/l		2	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
63	Butalchlor	mg/l		125	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)

S. No	Parameters	Unit	Test Method	Limits as per IS 10500:2012		GW1	GW2	GW3	GW4	GW5	GW6	GW7
				Acceptable	Permissible							
64	Alachlor	mg/l		20	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
65	Atrazine	mg/l		2	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
66	Methyl Parathion	mg/l		0.3	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
67	Malathion	mg/l		190	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
68	Aldrin	mg/l		0.03	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)

Part 2

S. No	Parameters	Unit	Test Method	Limits as per IS 10500:2012		GW8	GW9	GW10	GW11	GW12	GW13	GW14
				Acceptable	Permissible							
1	Colour	Hazen	APHA 23rd EDITION 2120 C	5	15	<1	<1	<1	<1	1	<1	1
2	Odour	-	APHA 23rd EDITION 2150 B	Agreeable	Agreeable	No Odour Observed	No Odour Observed	No Odour Observed	No Odour Observed	No Odour Observed	No Odour Observed	No Odour Observed
3	Taste	-	IS 3025 Part 8 (Reaff:2017)	Agreeable	Agreeable	Agreeabl e	Not agreeable	Not agreeable	Not agreeable	Not agreeable	Not agreeable	Not agreeable
4	Turbidity	NTU	IS : 3025 Part 10-1987 (Reaff: 2017)	1	5	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)
5	pH at 25 °C	-	IS : 3025 Part 11- 1987 (Reaff: 2017)	6.5-8.5	No Relaxation	7.78	8.24	8.07	8.24	7.97	7.78	7.56
6	Electrical Conductivity @25°C	µS/cm	IS : 3025 Part 14- 1987 (Reaff: 2019)	Not Specified	Not Specified	378	770	1020	2910	745	4110	1190
7	Total dissolved solids	mg/l	IS : 3025 Part 16-1987 (Reaff: 2017)	500	2000	218	418	590	1578	412	2358	658
8	Total Alkalinity as $CaCO_3$	mg/l	IS : 3025 Part 23-1987(Reaff:2019)	200	600	80	180	220	420	190	610	260

S. No	Parameters	Unit	Test Method	Limits as per IS 10500:2012		GW8	GW9	GW10	GW11	GW12	GW13	GW14
				Acceptable	Permissible							
9	Total Hardness as $CaCO_3$	mg/l	IS : 3025 Part 21-1987 (Reaff:2019)	200	600	96	220	300	750	200	1038	350
10	Calcium as Ca	mg/l	IS : 3025 Part 40-1991 (Reaff:2003)	75	200	29	52	66	141	66	198	71
11	Magnesium as Mg	mg/l	APHA 23rd EDN-3500 Mg B	30	100	16	22	33	96	15.1	132	42
12	Chloride as Cl^-	mg/l	IS : 3025 Part 32-1987 (Reaff: 2019)	250	1000	74	105	156	564	115	814	187
13	Sulphate as SO_4	mg/l	APHA 23rd EDN -4500-SO42- E	200	400	19	41	68	180	30	320	72
14	Nitrate as NO_3	mg/l	APHA 23rd EDN -4500- NO3-B	45	No Relaxation	3	6	3	5	6	8	3
15	Iron as Fe	mg/l	IS : 3025 Part 53-1987 (Reaff:2019)	0.3	No Relaxation	0.1	0.05	0.05	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)
16	Manganese as Mn	mg/l	APHA 23rd EDN -3500-Mn D	0.1	0.3	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)
17	Fluoride as F	mg/l	APHA 23rd EDN -4500-F B&D	1	1.5	0.29	0.33	0.41	0.96	0.63	1.12	0.55
18	Ammonia as N	mg/l	APHA 23rd EDN -4500- NH3 B&C	0.5	No Relaxation	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)
19	Barium as Ba	mg/l	APHA 23rd EDN -3111 D	0.7	No Relaxation	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)
20	Residual free Chlorine as Cl_2	mg/l	APHA 23rd EDN -4500 Cl G	0.2	1	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)
21	Sodium as Na	mg/l	IS : 3025 Part 45-1987 (Reaff:2019)	Not Specified	Not Specified	29	71	102	310	74	510	120
22	Potassium as K	mg/l	IS : 3025 Part 45-1987 (Reaff:2019)	Not Specified	Not Specified	4.1	6.3	6.3	18	5.5	9	7.1
23	Nickel as Ni	mg/l	APHA 23rd EDN -3111 B	0.02	No Relaxation	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)
24	Chloromines	mg/l	IS 3025 Part 26 (Reaff:2019)	4	No Relaxation	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)
25	Aluminium as Al	mg/l	IS:3025 Part:55-1987 (Reaff:2019)	0.03	0.2	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)

S. No	Parameters	Unit	Test Method	Limits as per IS 10500:2012		GW8	GW9	GW10	GW11	GW12	GW13	GW14
				Acceptable	Permissible							
26	Cadmium as Cd	mg/l	APHA 23rd EDN -3111 B	0.003	No Relaxation	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)
27	Lead as Pb	mg/l	IS:3025 Part 47-1987 (Reaff:2019)	0.01	No Relaxation	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
28	Copper as Cu	mg/l	APHA 23rd EDN -3111 B	0.05	1.5	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)
29	Zinc as Zn	mg/l	IS:3025 Part:49-1987 (Reaff:2019)	5	15	0.06	0.08	0.08	0.15	0.03	0.23	0.09
30	Total Chromium as Cr	mg/l	APHA 23rd EDN -3111 B	0.05	No Relaxation	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
31	Arsenic as As	mg/l	IS:3025 Part:37-1987 (Reaff:2019)	0.01	0.05	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
32	Cyanide as CN	mg/l	APHA 23rd EDN -4500-CN E	0.05	No Relaxation	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
33	Selenium as Se	mg/l	APHA 23rd EDN -3114 B	0.01	No Relaxation	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
34	Mercury as Hg	mg/l	IS:3025 Part 48-1987 (Reaff:2019)	0.001	No Relaxation	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
35	Anionic Surfactants as MBAS	mg/l	APHA 23rd EDN 5540 C	0.2	1	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)
36	Phenolic Copounds as Phenol	mg/l	APHA 23rd EDN 5530 B,C	0.001	0.002	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
37	Total Nitrogen as N	mg/l	IS 3025 Part 34 (Reaff:2019)	Not Specified	Not Specified	2.5	3.2	4.1	3.6	6	4.1	5.4
38	Total Phosphorous	mg/l	IS 3025 Part 31 (Reaff:2019)	Not Specified	Not Specified	0.08	0.05	0.05	0.09	0.1	0.06	0.13
39	Chemical Oxygen Demand	mg/l	IS 3025 Part 58 (Reaff:2017)	Not Specified	Not Specified	6	<4	8	4	12	<4	<4
40	Dissolved Oxygen as O2	mg/l	IS 3025 Part 38 (Reaff:2019)	Not Specified	Not Specified	4.9	5.5	5.2	5.1	5.5	4.9	5.4
41	Biochemical Oxygen Demand @ 27 for 3 days	mg/l	IS 3025 Part 44 (Reaff:2019)	Not Specified	Not Specified	<2	<2	<2	<2	<2	<2	<2
42	Sodium Absorbtion	mg/l	By Calculation	Not	Not	1.07	2.08	2.56	4.93	2.13	6.88	2.79

S. No	Parameters	Unit	Test Method	Limits as per IS 10500:2012		GW8	GW9	GW10	GW11	GW12	GW13	GW14
				Acceptable	Permissible							
	Ratio			Specified	Specified							
43	Mineral Oil *	mg/l	FI-IR	0.5	No Relaxation	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)
44	Poly Chlorinated Biphenyls (PCBs)	mg/l	APHA 23rd EDN -6630 B	0.0005	No Relaxation	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
45	Poly Nuclear Aromatic Hydrocarbon as PAH	mg/l	APHA 23rd EDN -6440 B	0.0001	No Relaxation	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
46	Bromoform	mg/l	APHA 23rd EDN -6200 B	0.1	No Relaxation	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)
47	Dibromochlorometha ne	mg/l		0.1	No Relaxation	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)
48	Bromodichlorometha ne	mg/l		0.06	No Relaxation	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)
49	Chloroform	mg/l		0.2	No Relaxation	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)
50	Total Coliforms	MPN/ 100ml	IS 1622: 1982 (RA 2014)	Absent/ 100 ml	Absent/ 100 ml	<2	<2	7	<2	7	<2	<2
51	E.Coli	MPN/ 100ml	IS 1622: 1982 (RA 2014)	Absent/ 100 ml	Absent/ 100 ml	<2	<2	<2	<2	<2	<2	<2
52	DDT (Dichloro-Diphenyl-Trichloroethane)	mg/l	EPA 525.2	1	-	BDL(<0.0 001)	BDL(<0.0 001)	BDL(<0.0 001)	BDL(<0.0 001)	BDL(<0.0 001)	BDL(<0.0 001)	BDL(<0.0 001)
53	Lindane(γ-hexachloro cyclohexane)	mg/l		2	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
54	α-HCH	mg/l		0.01	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
55	β-HCH	mg/l		0.04	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
56	δ-HCH	mg/l		0.04	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)

S. No	Parameters	Unit	Test Method	Limits as per IS 10500:2012		GW8	GW9	GW10	GW11	GW12	GW13	GW14
				Acceptable	Permissible							
57	2, 4-dichlorophenoxy acetic acid	mg/l		30	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
58	Endosulphon	mg/l		0.4	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
59	Manocrotophos	mg/l		1	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
60	Ethion	mg/l		3	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
61	Chlorpyrifos	mg/l		30	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
62	Phorate	mg/l		2	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
63	Butalchlor	mg/l		125	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
64	Alachlor	mg/l		20	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
65	Atrazine	mg/l		2	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
66	Methyl Parathion	mg/l		0.3	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
67	Malathion	mg/l		190	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
68	Aldrin	mg/l		0.03	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)

Part 3

S. No	Parameters	Unit	Test Method	Limits as per IS 10500:2012		GW15	GW16	GW17	GW18	GW19	GW20	GW21
				Acceptable	Permissible							
1	Colour	Hazen	APHA 23rd EDITION 2120 C	5	15	<1	<1	2	<1	<1	<1	<1
2	Odour	-	APHA 23rd EDITION 2150 B	Agreeable	Agreeable	No Odour Observed	No Odour Observed	No Odour Observed	No Odour Observed	No Odour Observed	No Odour Observed	No Odour Observed
3	Taste	-	IS 3025 Part 8 (Reaff:2017)	Agreeable	Agreeable	Not agreeable	Not agreeable	Not agreeable	Not agreeable	Not agreeable	Not agreeable	Not agreeable
4	Turbidity	NTU	IS : 3025 Part 10-1987 (Reaff: 2017)	1	5	BDL (<0.5)	BDL (<0.5)	1	BDL (<0.5)	0.6	BDL (<0.5)	BDL (<0.5)
5	pH at 25 °C	-	IS : 3025 Part 11- 1987 (Reaff: 2017)	6.5-8.5	No Relaxation	7.69	7.98	7.45	7.82	7.66	7.58	7.74
6	Electrical Conductivity @25°C	µS/cm	IS : 3025 Part 14- 1987 (Reaff: 2019)	Not Specified	Not Specified	4850	1390	1010	3610	3120	2010	1950
7	Total dissolved solids	mg/l	IS : 3025 Part 16-1987 (Reaff: 2017)	500	2000	2802	749	580	1909	1786	1153	1075
8	Total Alkalinity as $CaCO_3$	mg/l	IS : 3025 Part 23-1987(Reaff:2019)	200	600	600	310	240	550	420	280	300
9	Total Hardness as $CaCO_3$	mg/l	IS : 3025 Part 21-1987 (Reaff:2019)	200	600	1200	450	330	980	810	440	410
10	Calcium as Ca	mg/l	IS : 3025 Part 40-1991 (Reaff:2003)	75	200	208	71	62	171	180	92	92
11	Magnesium as Mg	mg/l	APHA 23rd EDN-3500 Mg B	30	100	165	66	42	134	87	51	43.7
12	Chloride as Cl^-	mg/l	IS : 3025 Part 32-1987 (Reaff: 2019)	250	1000	989	198	156	632	654	375	315
13	Sulphate as SO_4	mg/l	APHA 23rd EDN -4500-SO42-E	200	400	480	84	60	284	230	202	180
14	Nitrate as NO_3	mg/l	APHA 23rd EDN -4500- NO3-B	45	No Relaxation	9	6	11	4	7	5	4
15	Iron as Fe	mg/l	IS : 3025 Part 53-1987 (Reaff:2019)	0.3	No Relaxation	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)
16	Manganese as Mn	mg/l	APHA 23rd EDN -3500-Mn D	0.1	0.3	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)
17	Fluoride as F	mg/l	APHA 23rd EDN -4500-F B&D	1	1.5	0.96	0.56	0.71	0.47	0.66	0.85	0.82

S. No	Parameters	Unit	Test Method	Limits as per IS 10500:2012		GW15	GW16	GW17	GW18	GW19	GW20	GW21
				Acceptable	Permissible							
18	Ammonia as N	mg/l	APHA 23rd EDN -4500- NH3 B&C	0.5	No Relaxation	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)
19	Barium as Ba	mg/l	APHA 23rd EDN -3111 D	0.7	No Relaxation	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)
20	Residual free Chlorine as Cl_2	mg/l	APHA 23rd EDN -4500 Cl G	0.2	1	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)
21	Sodium as Na	mg/l	IS : 3025 Part 45-1987 (Reaff:2019)	Not Specified	Not Specified	580	130	90	340	370	250	238
22	Potassium as K	mg/l	IS : 3025 Part 45-1987 (Reaff:2019)	Not Specified	Not Specified	11	8	3.6	14	6.5	9.1	9.2
23	Nickel as Ni	mg/l	APHA 23rd EDN -3111 B	0.02	No Relaxation	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)
24	Chloromines	mg/l	IS 3025 Part 26 (Reaff:2019)	4	No Relaxation	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)
25	Aluminium as Al	mg/l	IS:3025 Part:55-1987 (Reaff:2019)	0.03	0.2	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)
26	Cadmium as Cd	mg/l	APHA 23rd EDN -3111 B	0.003	No Relaxation	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)
27	Lead as Pb	mg/l	IS:3025 Part 47-1987 (Reaff:2019)	0.01	No Relaxation	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
28	Copper as Cu	mg/l	APHA 23rd EDN -3111 B	0.05	1.5	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)
29	Zinc as Zn	mg/l	IS:3025 Part:49-1987 (Reaff:2019)	5	15	0.25	0.13	0.05	0.22	0.06	0.14	0.05
30	Total Chromium as Cr	mg/l	APHA 23rd EDN -3111 B	0.05	No Relaxation	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
31	Arsenic as As	mg/l	IS:3025 Part:37-1987 (Reaff:2019)	0.01	0.05	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
32	Cyanide as CN	mg/l	APHA 23rd EDN -4500-CN E	0.05	No Relaxation	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
33	Selenium as Se	mg/l	APHA 23rd EDN -3114 B	0.01	No Relaxation	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
34	Mercury as Hg	mg/l	IS:3025 Part 48-1987	0.001	No	BDL	BDL	BDL	BDL	BDL	BDL	BDL

S. No	Parameters	Unit	Test Method	Limits as per IS 10500:2012 Acceptable	Limits as per IS 10500:2012 Permissible	GW15	GW16	GW17	GW18	GW19	GW20	GW21
			(Reaff:2019)		Relaxation	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
35	Anionic Surfactants as MBAS	mg/l	APHA 23rd EDN 5540 C	0.2	1	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)
36	Phenolic Copounds as Phenol	mg/l	APHA 23rd EDN 5530 B,C	0.001	0.002	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
37	Total Nitrogen as N	mg/l	IS 3025 Part 34 (Reaff:2019)	Not Specified	Not Specified	6	3.2	3.7	5.2	4.9	3.5	5.2
38	Total Phosphorous	mg/l	IS 3025 Part 31 (Reaff:2019)	Not Specified	Not Specified	0.14	0.09	0.05	0.13	0.02	0.12	0.05
39	Chemical Oxygen Demand	mg/l	IS 3025 Part 58 (Reaff:2017)	Not Specified	Not Specified	8	4	<4	8	<4	4	<4
40	Dissolved Oxygen as O2	mg/l	IS 3025 Part 38 (Reaff:2019)	Not Specified	Not Specified	5.3	5.5	5.1	4.9	5.5	5.2	5.2
41	Biochemical Oxygen Demand @ 27 for 3 days	mg/l	IS 3025 Part 44 (Reaff:2019)	Not Specified	Not Specified	<2	<2	<2	<2	<2	<2	<2
42	Sodium Absorbtion Ratio	mg/l	By Calculation	Not Specified	Not Specified	7.28	2.67	2.16	4.72	5.66	5.18	5.11
43	Mineral Oil *	mg/l	FI-IR	0.5	No Relaxation	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)
44	Poly Chlorinated Biphenyls (PCBs)	mg/l	APHA 23rd EDN -6630 B	0.0005	No Relaxation	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
45	Poly Nuclear Aromatic Hydrocarbon as PAH	mg/l	APHA 23rd EDN -6440 B	0.0001	No Relaxation	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
46	Bromoform	mg/l	APHA 23rd EDN -6200 B	0.1	No Relaxation	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)
47	Dibromochlorometha ne	mg/l		0.1	No Relaxation	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)
48	Bromodichlorometha ne	mg/l		0.06	No Relaxation	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)
49	Chloroform	mg/l		0.2	No Relaxation	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)

S. No	Parameters	Unit	Test Method	Limits as per IS 10500:2012		GW15	GW16	GW17	GW18	GW19	GW20	GW21
				Acceptable	Permissible							
50	Total Coliforms	MPN/ 100ml	IS 1622: 1982 (RA 2014)	Absent/ 100 ml	Absent/ 100 ml	<2	<2	<2	2	<2	<2	<2
51	E.Coli	MPN/ 100ml	IS 1622: 1982 (RA 2014)	Absent/ 100 ml	Absent/ 100 ml	<2	<2	<2	<2	<2	<2	<2
52	DDT (Dichloro-Diphenyl-Trichloroethane)	mg/l	EPA 525.2	1	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
53	Lindane(γ-hexachlorocyclohexane)	mg/l		2	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
54	α-HCH	mg/l		0.01	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
55	β-HCH	mg/l		0.04	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
56	δ-HCH	mg/l		0.04	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
57	2, 4-dichlorophenoxy acetic acid	mg/l		30	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
58	Endosulphon	mg/l		0.4	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
59	Manocrotophos	mg/l		1	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
60	Ethion	mg/l		3	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
61	Chlorpyrifos	mg/l		30	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
62	Phorate	mg/l		2	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
63	Butalchlor	mg/l		125	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
64	Alachlor	mg/l		20	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)

S. No	Parameters	Unit	Test Method	Limits as per IS 10500:2012		GW15	GW16	GW17	GW18	GW19	GW20	GW21
				Acceptable	Permissible							
65	Atrazine	mg/l		2	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
66	Methyl Parathion	mg/l		0.3	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
67	Malathion	mg/l		190	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
68	Aldrin	mg/l		0.03	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)

Part 4

S. No	Parameters	Unit	Test Method	Limits as per IS 10500:2012		GW22	GW23	GW24	GW25	GW26	GW27	GW28
				Acceptable	Permissible							
1	Colour	Hazen	APHA 23rd EDITION 2120 C	5	15	<1	<1	<1	<1	<1	<1	1
2	Odour	-	APHA 23rd EDITION 2150 B	Agreeable	Agreeable	No Odour Observed	No Odour Observed	No Odour Observed	No Odour Observed	No Odour Observed	No Odour Observed	No Odour Observed
3	Taste	-	IS 3025 Part 8 (Reaff:2017)	Agreeable	Agreeable	Not agreeable	Not agreeable	Not agreeable	Not agreeable	Not agreeable	Not agreeable	Not agreeable
4	Turbidity	NTU	IS : 3025 Part 10-1987 (Reaff: 2017)	1	5	0.6	BDL (<0.5)	BDL (<0.5)	0.7	1	0.8	BDL (<0.5)
5	pH at 25 °C	-	IS : 3025 Part 11- 1987 (Reaff: 2017)	6.5-8.5	No Relaxation	7.41	7.66	7.58	7.66	7.89	7.58	7.41
6	Electrical Conductivity @25°C	µS/cm	IS : 3025 Part 14- 1987 (Reaff: 2019)	Not Specified	Not Specified	902	4210	1312	1074	5640	930	1120
7	Total dissolved solids	mg/l	IS : 3025 Part 16-1987 (Reaff: 2017)	500	2000	487	2484	731	611	3060	491	632
8	Total Alkalinity as	mg/l	IS : 3025 Part 23-	200	600	170	670	280	220	710	180	240

S. No	Parameters	Unit	Test Method	Limits as per IS 10500:2012 Acceptable	Limits as per IS 10500:2012 Permissible	GW22	GW23	GW24	GW25	GW26	GW27	GW28
	$CaCO_3$		1987(Reaff:2019)									
9	Total Hardness as $CaCO_3$	mg/l	IS : 3025 Part 21-1987 (Reaff:2019)	200	600	193	1150	390	282	1350	250	310
10	Calcium as Ca	mg/l	IS : 3025 Part 40-1991 (Reaff:2003)	75	200	45	214	82	61	241	57	66
11	Magnesium as Mg	mg/l	APHA 23rd EDN-3500 Mg B	30	100	19	149	45	31	181	26	35
12	Chloride as Cl^-	mg/l	IS : 3025 Part 32-1987 (Reaff: 2019)	250	1000	154	814	211	197	1015	147	185
13	Sulphate as SO_4	mg/l	APHA 23rd EDN -4500-SO42-E	200	400	52	384	76	60	512	63	80
14	Nitrate as NO_3	mg/l	APHA 23rd EDN -4500- NO3-B	45	No Relaxation	2	7	5	5	13	7	2
15	Iron as Fe	mg/l	IS : 3025 Part 53-1987 (Reaff:2019)	0.3	No Relaxation	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	0.18
16	Manganese as Mn	mg/l	APHA 23rd EDN -3500-Mn D	0.1	0.3	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)
17	Fluoride as F	mg/l	APHA 23rd EDN -4500-F B&D	1	1.5	0.45	0.71	0.41	0.54	0.99	0.71	0.77
18	Ammonia as N	mg/l	APHA 23rd EDN -4500- NH3 B&C	0.5	No Relaxation	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)	BDL (<0.05)
19	Barium as Ba	mg/l	APHA 23rd EDN -3111 D	0.7	No Relaxation	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)
20	Residual free Chlorine as Cl_2	mg/l	APHA 23rd EDN -4500 Cl G	0.2	1	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)
21	Sodium as Na	mg/l	IS : 3025 Part 45-1987 (Reaff:2019)	Not Specified	Not Specified	108	500	140	120	620	95	114
22	Potassium as K	mg/l	IS : 3025 Part 45-1987 (Reaff:2019)	Not Specified	Not Specified	5.4	14	4.7	8.4	52	5.5	3.9
23	Nickel as Ni	mg/l	APHA 23rd EDN -3111 B	0.02	No Relaxation	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)
24	Chloromines	mg/l	IS 3025 Part 26 (Reaff:2019)	4	No Relaxation	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)
25	Aluminium as Al	mg/l	IS:3025 Part:55-1987	0.03	0.2	BDL	BDL	BDL	BDL	BDL	BDL	BDL

S. No	Parameters	Unit	Test Method	Limits as per IS 10500:2012		GW22	GW23	GW24	GW25	GW26	GW27	GW28
				Acceptable	Permissible							
			(Reaff:2019)			(<0.03)	(<0.03)	(<0.03)	(<0.03)	(<0.03)	(<0.03)	(<0.03)
26	Cadmium as Cd	mg/l	APHA 23rd EDN -3111 B	0.003	No Relaxation	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)
27	Lead as Pb	mg/l	IS:3025 Part 47-1987 (Reaff:2019)	0.01	No Relaxation	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
28	Copper as Cu	mg/l	APHA 23rd EDN -3111 B	0.05	1.5	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)
29	Zinc as Zn	mg/l	IS:3025 Part:49-1987 (Reaff:2019)	5	15	0.07	0.03	0.05	0.05	0.32	0.17	0.05
30	Total Chromium as Cr	mg/l	APHA 23rd EDN -3111 B	0.05	No Relaxation	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
31	Arsenic as As	mg/l	IS:3025 Part:37-1987 (Reaff:2019)	0.01	0.05	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
32	Cyanide as CN	mg/l	APHA 23rd EDN -4500-CN E	0.05	No Relaxation	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
33	Selenium as Se	mg/l	APHA 23rd EDN -3114 B	0.01	No Relaxation	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
34	Mercury as Hg	mg/l	IS:3025 Part 48-1987 (Reaff:2019)	0.001	No Relaxation	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
35	Anionic Surfactants as MBAS	mg/l	APHA 23rd EDN 5540 C	0.2	1	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)
36	Phenolic Copounds as Phenol	mg/l	APHA 23rd EDN 5530 B,C	0.001	0.002	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
37	Total Nitrogen as N	mg/l	IS 3025 Part 34 (Reaff:2019)	Not Specified	Not Specified	4.7	6.3	4.7	5.5	5.5	2.9	3.3
38	Total Phosphorous	mg/l	IS 3025 Part 31 (Reaff:2019)	Not Specified	Not Specified	0.1	0.02	0.1	0.05	0.14	0.17	0.02
39	Chemical Oxygen Demand	mg/l	IS 3025 Part 58 (Reaff:2017)	Not Specified	Not Specified	6	<4	6	<4	8.1	4	<4
40	Dissolved Oxygen as O2	mg/l	IS 3025 Part 38 (Reaff:2019)	Not Specified	Not Specified	5.1	5.7	5.1	5.4	5.7	5.2	5.5
41	Biochemical Oxygen Demand @ 27 for 3	mg/l	IS 3025 Part 44 (Reaff:2019)	Not Specified	Not Specified	<2	<2	<2	<2	<2	<2	<2

S. No	Parameters	Unit	Test Method	Limits as per IS 10500:2012 Acceptable	Limits as per IS 10500:2012 Permissible	GW22	GW23	GW24	GW25	GW26	GW27	GW28
	days											
42	Sodium Absorbtion Ratio	mg/l	By Calculation	Not Specified	Not Specified	3.40	6.42	3.08	3.12	7.34	2.61	2.82
43	Mineral Oil *	mg/l	FI-IR	0.5	No Relaxation	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)	BDL (<0.5)
44	Poly Chlorinated Biphenyls (PCBs)	mg/l	APHA 23rd EDN -6630 B	0.0005	No Relaxation	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
45	Poly Nuclear Aromatic Hydrocarbon as PAH	mg/l	APHA 23rd EDN -6440 B	0.0001	No Relaxation	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
46	Bromoform	mg/l	APHA 23rd EDN -6200 B	0.1	No Relaxation	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)
47	Dibromochloromethane	mg/l		0.1	No Relaxation	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)
48	Bromodichloromethane	mg/l		0.06	No Relaxation	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)
49	Chloroform	mg/l		0.2	No Relaxation	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)
50	Total Coliforms	MPN/ 100ml	IS 1622: 1982 (RA 2014)	Absent/ 100 ml	Absent/ 100 ml	<2	<2	2	<2	7	7	<2
51	E.Coli	MPN/ 100ml	IS 1622: 1982 (RA 2014)	Absent/ 100 ml	Absent/ 100 ml	<2	<2	<2	<2	<2	<2	<2
52	DDT (Dichloro-Diphenyl-Trichloroethane)	mg/l	EPA 525.2	1	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
53	Lindane(γ-hexachlorocyclohexane)	mg/l		2	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
54	α-HCH	mg/l		0.01	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
55	β-HCH	mg/l		0.04	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)

S. No	Parameters	Unit	Test Method	Limits as per IS 10500:2012		GW22	GW23	GW24	GW25	GW26	GW27	GW28
				Acceptable	Permissible							
56	δ-HCH	mg/l		0.04	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
57	2, 4-dichlorophenoxyacetic acid	mg/l		30	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
58	Endosulphon	mg/l		0.4	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
59	Manocrotophos	mg/l		1	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
60	Ethion	mg/l		3	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
61	Chlorpyrifos	mg/l		30	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
62	Phorate	mg/l		2	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
63	Butalchlor	mg/l		125	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
64	Alachlor	mg/l		20	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
65	Atrazine	mg/l		2	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
66	Methyl Parathion	mg/l		0.3	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
67	Malathion	mg/l		190	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
68	Aldrin	mg/l		0.03	-	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)

Source: ABC Techno Labs India Pvt. Ltd.

B. Surface Water

The collected surface water samples were analyzed and results of surface water analysis are given in Table 3.13.

A. Physical Parameters

- **Colour:** The colour of surface water samples was found in the range of 1 Hazen unit to 7 Hazen unit.
- **Odour:** Surface water samples were found odourless.
- **Turbidity:** The turbidity of surface water samples was found in the range 2.0 to 6.0 NTU.
- **pH:** The pH value of all surface water samples ranges from 7.68 to 8.14.
- **Electrical Conductivity:** Electrical conductivity in surface water samples ranges from 312 µS/c0.0m to 512 µS/cm.
- **Total Dissolved Solids (TDS):** The TDS in surface water samples range from 160 to 271 mg/l.

B. Chemical Parameters

- **Total Alkalinity:** The total alkalinity of surface water samples range between 82 mg/l to 123 mg/l.
- **Total Hardness:** The total hardness of surface water samples range between 74 mg/l to 124 mg/l.
- **Calcium:** The Calcium content in surface water samples range from 19 mg/l to 36 mg/l.
- **Magnesium:** The Magnesium content in surface water samples range from 5.7 mg/l to 10 mg/l.
- **Chloride:** The chloride content in surface water samples range from 42 mg/l to 71 mg/l.
- **Sulphate:** Sulphate content in surface water sample ranges from 6 to 20 mg/l.
- **Nitrate:** Nitrate content in surface water samples ranges from 1.0 mg/l to 9.0 mg/l.
- **Iron:** The iron content in all surface water sample ranges from 0.15 to 0.45 mg/l.
- **Fluoride:** Fluoride content in surface water samples ranges from 0.05 mg/l to 0.62 mg/l.

- **Sodium:** Sodium content in surface water samples ranges from 32 mg/l to 48 mg/l.
- **Potassium:** Potassium content in surface water samples ranges from 1.9 mg/l to 6.5 mg/l.
- **Zinc:** Zinc content in all surface water samples found to be 0.05 mg/l to 0.18 mg/l.
- **Total Nitrogen:** Total Nitrogen content in surface water samples range from 1.9 mg/l to 3.7 mg/l.
- **Total Phosphorus:** Total Phosphorus content in surface water samples range from 0.08 mg/l to 0.21 mg/l.
- **Chemical Oxygen Demand (COD):** The COD level of the SW samples found to be in the range between 10 mg/l to 20 mg/l.
- **Dissolved Oxygen (DO):** The DO level of the SW samples found to be in the range between 5.20 mg/l to 6 mg/l.
- **Bio-chemical Oxygen Demand (BOD):** The BOD level of the SW samples found to be in the range between <2 mg/l to 2.3 mg/l.

C. Biological Parameters

- **Total Coliform Count:** Total Coliform Count in surface water samples ranges from 80 to 350 MPN/ 100ml.
- **Faecal Coliform:** Faecal Coliform in surface water samples ranges from 4 to 40 MPN/ 100ml.

D. Other Parameters

Aluminum, Selenium, Phenolic Compounds, PCBs, PAH, Mineral oil, Pesticides and Cadmium, Mercury, Nickel, Total Arsenic, Total Chromium, Selenium, Cyanide in all surface water samples were found below detection limit (BDL).

Conclusions

The results of surface water samples were compared to CLASS – C category. Analysed parameters meet permissible limits.

Table 3.13: Results for Surface Water Analysis

S. No	Parameters	Unit	Test method	Tolerance Limits For Inland Surface Waters, (IS: 2296-1982) CLASS – C	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
1	Colour	Hazen	APHA 23rd EDITION 2120 C	300	7	3	1	3	4	3	4	4
2	Odour	-	APHA 23rd EDITION 2150 B	Not Specified	No Odour Observed	No Odour Observed	No Odour Observed	No Odour Observed	Odour Observed	No Odour Observed	No Odour Observed	No Odour Observed
3	Taste	-	IS 3025 Part 8 (Reaff:2017)	Not Specified	Not agreeable	Not agreeable	Not agreeable	Not agreeable	Not agreeable	Not agreeable	Not agreeable	Not agreeable
4	Turbidity	NTU	IS : 3025 Part 10-1987 (Reaff: 2017)	1	6	3.3	2.7	2.4	2	2.7	4.1	2.1
5	pH at 25 °C	-	IS : 3025 Part 11- 1987 (Reaff: 2017)	6.5-8.5	8.14	7.84	7.84	8.05	7.68	7.85	8.05	7.69
6	Electrical Conductivity @25°C	µS/cm	IS : 3025 Part 14- 1987 (Reaff: 2019)	Not Specified	402	370	398	352	348	312	512	340
7	Total dissolved solids	mg/l	IS : 3025 Part 16-1987 (Reaff: 2017)	1500	221	193	217	178	188	160	271	184
8	Total Alkalinity as CaCO3	mg/l	IS : 3025 Part 23-1987(Reaff:2019)	Not Specified	115	101	104	90	93	82	123	92
9	Total Hardness as CaCO3	mg/l	IS : 3025 Part 21-1987 (Reaff:2019)	Not Specified	112	92	98	82	86	74	124	80
10	Calcium as Ca	mg/l	IS : 3025 Part 40-1991 (Reaff:2003)	Not Specified	28	24	23	20	25	19	36	22
11	Magnesium as Mg	mg/l	APHA 22nd EDN-3500 Mg B	Not Specified	10	7.7	9.8	7.7	5.7	6.4	8.2	6
12	Chloride as Cl-	mg/l	IS : 3025 Part 32-1987 (Reaff: 2019)	600	55	50	61	44	50	42	71	48
13	Sulphate as SO4	mg/l	APHA 22nd EDN -4500-SO42- E	400	12	6	10	11	9	6	20	10
14	Nitrate as NO3	mg/l	APHA 23rd EDN -4500-NO3- B	50	2	5	7	2	5	1	9	3
15	Iron as Fe	mg/l	IS : 3025 Part 53-1987 (Reaff:2019)	50	0.36	0.25	0.18	0.28	0.21	0.15	0.45	0.21
16	Manganese as Mn	mg/l	APHA 23rd EDN -3500-	Not Specified	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

S. No	Parameters	Unit	Test method	Tolerance Limits For Inland Surface Waters, (IS: 2296-1982) CLASS – C	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
			Mn D		(<0.02)	(<0.02)	(<0.02)	(<0.02)	(<0.02)	(<0.02)	(<0.02)	(<0.02)
17	Fluoride as F	mg/l	APHA 23rd EDN -4500-F B&D	1.5	0.41	0.33	0.44	0.05	0.26	0.14	0.62	0.35
18	Ammonia as N	mg/l	APHA 23rd EDN -4500-NH3 B&C	Not Specified	BDL (<0.05)	0.12	0.16	0.11	0.06	BDL (<0.05)	0.11	0.09
19	Barium as Ba	mg/l	APHA 23rd EDN -3111 D	Not Specified	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)
20	Residual free Chlorine as Cl2	mg/l	APHA 23rd EDN -4500 Cl G	Not Specified	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)
21	Sodium as Na	mg/l	IS : 3025 Part 45-1987 (Reaff:2019)	Not Specified	41	36	46	35	38	32	48	38
22	Potassium as K	mg/l	IS : 3025 Part 45-1987 (Reaff:2019)	Not Specified	3.3	5.1	4.2	2.5	1.9	4.1	6.5	5
23	Nickel as Ni	mg/l	APHA 23rd EDN -3111 B	Not Specified	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)	BDL (<0.02)
24	Chloromines	mg/l	IS 3025 Part 26 (Reaff:2019)	Not Specified	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)
25	Aluminium as Al	mg/l	IS:3025 Part:55-1987 (Reaff:2019)	Not Specified	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)
26	Cadmium as Cd	mg/l	APHA 23rd EDN -3111 B	0.01	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)	BDL (<0.003)
27	Lead as Pb	mg/l	IS:3025 Part 47-1987 (Reaff:2019)	0.1	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
28	Copper as Cu	mg/l	APHA 23rd EDN -3111 B	1.5	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)	BDL (<0.03)
29	Zinc as Zn	mg/l	IS:3025 Part:49-1987 (Reaff:2019)	15	0.14	0.08	0.11	0.05	0.12	0.06	0.18	0.11
30	Total Chromium as Cr	mg/l	APHA 23rd EDN -3111 B	0.05	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
31	Arsenic as As	mg/l	IS:3025 Part:37-1987 (Reaff:2019)	0.2	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
32	Cyanide as CN	mg/l	APHA 22nd EDN -4500-CN E	0.05	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)

S. No	Parameters	Unit	Test method	Tolerance Limits For Inland Surface Waters, (IS: 2296-1982) CLASS – C	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
33	Selenium as Se	mg/l	APHA 23rd EDN -3114 B	0.05	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)	BDL (<0.01)
34	Mercury as Hg	mg/l	IS:3025 Part 48-1987 (Reaff:2019)	0.005	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
35	Anionic Surfactants as MBAS	mg/l	APHA 23rd EDN 5540 C	1	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)	BDL (<0.025)
36	Phenolic Copounds as Phenol	mg/l	APHA 23rd EDN 5530 B,C	0.005	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)	BDL (<0.001)
37	Total Nitrogen as N	mg/l	IS 3025 Part 34 (Reaff:2019)	Not Specified	2.3	2.9	3.7	2.9	1.9	2.1	3.7	2
38	Total Phosphorous	mg/l	IS 3025 Part 31 (Reaff:2019)	Not Specified	0.18	0.14	0.11	0.21	0.11	0.08	0.21	0.13
39	Chemical Oxygen Demand	mg/l	IS 3025 Part 58 (Reaff:2017)	Not Specified	10	18	20	16	18	14	20	16
40	Dissolved Oxygen as O2	mg/l	IS 3025 Part 38 (Reaff:2019)	4	5.9	5.6	5.2	5.7	5.5	6	5.3	5.7
41	Biochemical Oxygen Demand @ 27 for 3 days	mg/l	IS 3025 Part 44 (Reaff:2019)	3	<2	2.1	2.3	<2	2.2	<2	2.1	<2
42	Sodium Absorbtion Ratio	mg/l	By Calculation	Not Specified	1.69	1.63	2.02	1.68	1.78	1.62	1.88	1.85
43	Mineral Oil *	mg/l	FI-IR	Not Specified	BDL (<0.5)	BDL(<0.5)	BDL(<0.5)	BDL(<0.5)	BDL(<0.5)	BDL(<0.5)	BDL(<0.5)	BDL(<0.5)
44	Poly Chlorinated Biphenyls (PCBs)	mg/l	APHA 23rd EDN -6630 B	Not Specified	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
45	Poly Nuclear Aromatic Hydrocarbon as PAH	mg/l	APHA 23rd EDN -6440 B	Not Specified	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
46	Bromoform	mg/l	APHA 23rd EDN -6200 B	Not Specified	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)
47	Dibromochloromethane	mg/l		Not Specified	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)
48	Bromodichloromethane	mg/l		Not Specified	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)

S. No	Parameters	Unit	Test method	Tolerance Limits For Inland Surface Waters, (IS: 2296-1982) CLASS – C	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
49	Chloroform	mg/l		Not Specified	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)	BDL (<0.005)
50	Total Coliforms	MPN/ 100ml	IS 1622: 1982 (RA 2014)	5000	110	350	240	170	240	80	350	170
51	E.Coli	MPN/ 100ml	IS 1622: 1982 (RA 2014)	Not Specified	17	40	33	14	26	4	26	21
52	DDT (Dichloro-Diphenyl-Trichloroethane)	mg/l	EPA 525.2	1	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
53	Lindane(γ-hexachlorocyclohexane)	mg/l		2	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
54	α-HCH	mg/l		0.01	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
55	β-HCH	mg/l		0.04	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
56	δ-HCH	mg/l		0.04	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
57	2, 4-dichlorophenoxyacetic acid	mg/l		30	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
58	Endosulphon	mg/l		0.4	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
59	Manocrotophos	mg/l		1	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
60	Ethion	mg/l		3	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
61	Chlorpyrifos	mg/l		30	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
62	Phorate	mg/l		2	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
63	Butalchlor	mg/l		125	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)

S. No	Parameters	Unit	Test method	Tolerance Limits For Inland Surface Waters, (IS: 2296-1982) CLASS – C	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
64	Alachlor	mg/l		20	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
65	Atrazine	mg/l		2	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
66	Methyl Parathion	mg/l		0.3	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
67	Malathion	mg/l		190	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)
68	Aldrin	mg/l		0.03	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)	BDL (<0.0001)

Source: ABC Techno Labs India Pvt. Ltd.
Date of sampling: 29-31st March 2019

3.15 Soil Environment

3.15.1 Soil analysis

The present study of the soil quality establishes the baseline characteristics and this will help in future in identifying the incremental concentrations if any, due to the operation of the proposed exploratory drilling of wells. The sampling locations have been identified with the following objectives;

- To determine the baseline soil characteristics of the study area and
- To determine the impact of the proposed project activities within block on soil characteristics

Twenty Eight (28) locations within the study area were selected for soil sampling. At each location, soil samples were collected from three different depths viz., 30 cm, 60 cm and 100 cm below the surface. The samples were analyzed for physical and chemical characteristics.

The details of the soil sampling location are presented in Table 3.14**.** The results are presented in Table 3.15 and compared with Standard Soil Classification presented in Table 3.16.

Table 3.14: Soil Sampling Locations

Location Code	Sample location	Type of Land	Geographical location	
			Latitude	Longitude
S1	Lakhani	Agriculture	24°18'28.94"N	71°49'17.11"E
S2	Dhanera	Agriculture	24°30'41.21"N	72° 1'20.47"E
S3	Taanpi	Industrial	24°51'39.05"N	71°28'36.55"E
S4	Chekhala	Agriculture	24° 4'51.52"N	71°56'22.14"E
S5	Dama	Agriculture	24°17'57.55"N	72° 5'12.32"E
S6	Zenta	Agriculture	24°24'17.31"N	71°43'50.67"E
S7	Ratanpura	Agriculture	24°53'40.50"N	71°39'9.16"E
S8	Tharad	Agriculture	24°23'44.14"N	71°37'5.83"E
S9	Magarawa	Agriculture	24°44'39.99"N	71°31'26.63"E
S10	Dhanera	Agriculture	24°43'42.07"N	71°28'27.66"E
S11	Arnay	Agriculture	24°51'59.71"N	71°53'31.36"E
S12	Sanadhar	Agriculture	24°17'51.21"N	71°39'1.62"E
S13	Nana Kapra	Agriculture	24°16'46.97"N	71°59'18.72"E
S14	Duchakwada	Agriculture	24°10'53.47"N	71°48'53.22"E
S15	Sanchore	Agriculture	24°44'58.44"N	71°46'45.40"E
S16	Hadecha	Agriculture	24°48'50.30"N	71°39'38.74"E
S17	Amli	Agriculture	24°49'21.95"N	71°41'43.54"E
S18	Rajkot	Agriculture	24°35'27.62"N	71°32'22.48"E
S19	Akoli	Agriculture	24°35'18.62"N	71°24'54.13"E
S20	Piluda	Agriculture	24°33'17.34"N	71°41'26.19"E
S21	Kelashnagar	Agriculture	24°40'48.62"N	71°38'47.09"E
S22	Bhildi	Agriculture	24°11'12.90"N	72° 0'33.27"E
S23	Manpura Dhunsol	Agriculture	24°11'23.18"N	71°39'34.31"E

Location Code	Sample location	Type of Land	Geographical location	
			Latitude	Longitude
S24	Rah	Agriculture	24°29'21.23"N	71°49'44.23"E
S25	Magarawa	Agriculture	24°37'37.31"N	71°57'36.00"E
S26	Daiyap	Agriculture	24°39'32.74"N	71°30'4.01"E
S27	Pechhdal	Agriculture	24°22'42.04"N	72° 3'7.86"E
S28	Vav	Agriculture	24°22'3.44"N	71°30'54.10"E

Source: ABC Techno Labs India Pvt. Ltd.

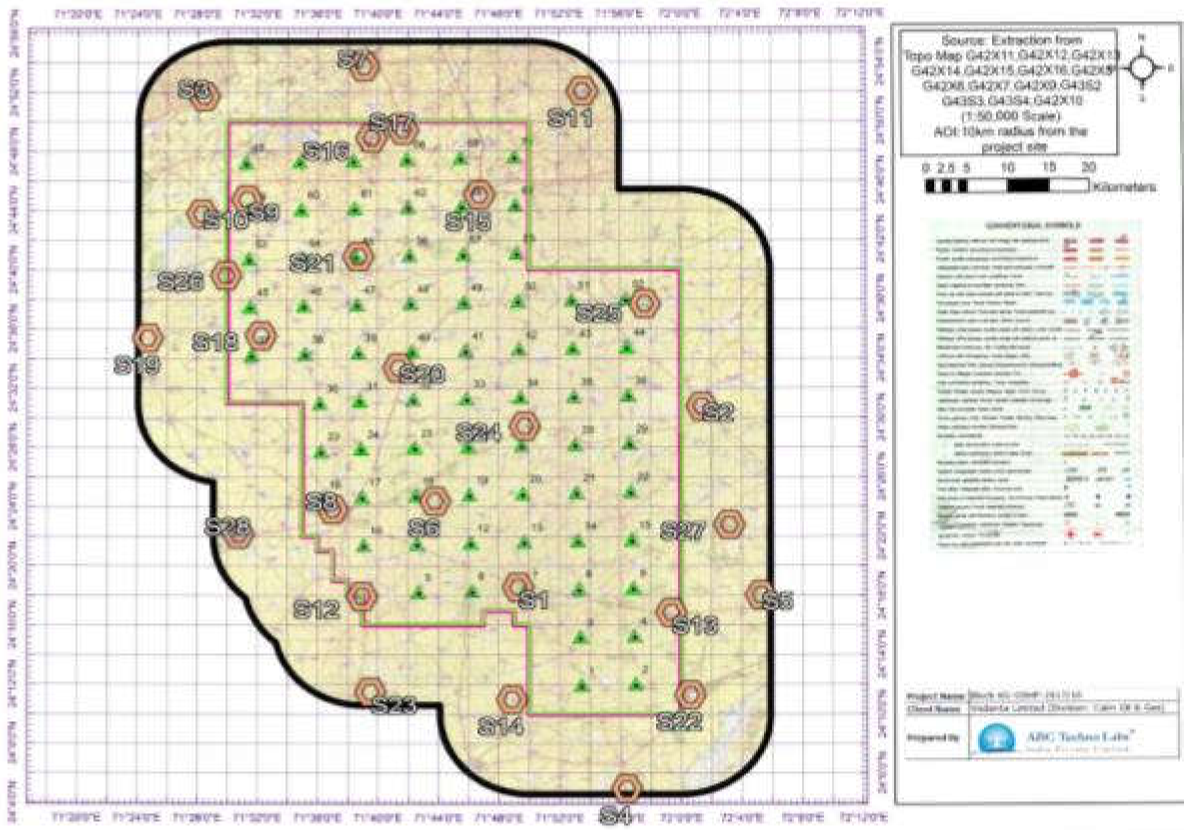


Figure 3.18: Soil quality monitoring locations

3.15.2 RESULTS

The results of the soil analysis are tabulated in Table 3.15. Standard soil classification is given in Table 3.16.

Table 3.15: Soil Quality Results

Part-1

Sl. No	Parameters	Unit	Test Method	S1	S2	S3	S4	S5	S6	S7	S8	S9
1	pH (1:5 Suspension)	-	IS -2720(Part 26) 1987(RA 2016)	8.41	8.26	8.47	8.63	8.41	8.18	8.63	8.47	8.25
2	Electrical conductivity (1:5 Suspension)	mS/cm	IS -14767:2000 (RA 2016)	0.171	0.096	0.652	0.324	0.254	0.311	0.196	0.245	0.325
3	Moisture	%	IS -2720(Part 2) 1987(RA 2015)	3.66	4.05	2.96	2.87	3.15	4.15	4.96	5.24	3.96
4	Bulk Density	g/cc	FAO Chapter 3, ABCTL/ SOIL/SOP 1	1.36	1.38	1.15	1.29	1.31	1.28	1.33	1.17	1.16
5	Water Holding Capacity	%	Soil Chemical Analysis By M. L. Jackson	32.8	33.9	42.5	35.9	36.8	37.7	36.7	42.9	43.6
6	Permeability	cm/hr	Soil Chemical Analysis By M. L. Jackson	1.3	1.4	0.4	0.8	0.7	0.9	0.7	0.3	0.5
7	Cyanide as CN	mg/kg	APHA 23rd Edn 4500 CN C & E	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)
8	Acidity as $CaCO_3$	mg/kg	APHA 23rd Edn 2310 B	nil	nil	50	nil	nil	nil	nil	nil	nil
9	Alkalinity as $CaCO_3$	%	IS -3025 Par 23	4.7	3.6	5.8	5.1	5.9	6.1	5.4	4.8	6.1
10	Specific Gravity	-	IS -2720 -Part 3	2.36	2.28	2.61	2.55	2.47	2.49	2.45	2.66	2.61
11	Porosity	%	IS -2720 -Part 36	32.8	33.3	42.5	35.8	36.9	38.1	37.5	44.2	43.9
12	Infiltration Rate	mm/hr	Soil Chemical Analysis By M. L. Jackson	14	12	4	9	8	9	10	4	3
13	Total Nitrogen as N	Kg/ha	IS -14684:1999, Reaff:2008	254	312	477	515	354	296	384	456	412
14	Available Phosphorous	Kg/ha	FAO Chapter 3, ABCTL/ SOIL/SOP 2	26.6	27.1	35.4	32.8	54.1	36.9	42.8	51.7	19.8
15	Available Potassium	Kg/ha	FAO Chapter 3, ABCTL/ SOIL/SOP 7	241	236	312	374	418	463	358	325	396
16	Exchangeable Calcium as Ca	m.eq/ 100g	FAO Chapter 3, ABCTL/ SOIL/SOP 4	9.6	10.4	18.4	15.1	13.6	12.8	15.1	18	16.9
17	Exchangeable Magnesi um as Mg	m.eq/ 100g	FAO Chapter 3, ABCTL/ SOIL/SOP 5	2.54	2.63	3.65	3.75	4.52	4.18	3.64	3.05	1.96
18	Exchangeable Sodium as Na	m.eq/ 100g	FAO Chapter 3, ABCTL/ SOIL/SOP 6	1.96	2.13	3.02	3.22	1.87	2.62	1.93	2.21	2.87
19	Cation Exchange Capacity	m.eq/ 100g	IS -2720(Part 24) (RA 2015)	12.5	11.8	19	12.2	13.6	15.8	17	21	22.5
20	Organic Carbon	%	IS 2720 (Part 22):1972	0.57	0.50	0.71	0.81	0.72	0.79	0.61	0.81	0.74

Sl. No	Parameters	Unit	Test Method	S1	S2	S3	S4	S5	S6	S7	S8	S9
21	Organic matter	%	(RA 2015)	0.98	0.87	1.23	1.41	1.25	1.36	1.05	1.41	1.29
22	Texture Classification		Robinson Pipette Method	Loam	Loam	Clay	Silty Clay Loam	Silty Clay Loam	Silty Clay Loam	Silty Clay Loam	Clay	Clay
	Sand	%		42.1	38.5	25.8	18.5	19.1	16.6	17	26.9	31.4
	Clay	%		26.4	24.8	61.4	36.8	39.2	35.4	36.8	58.4	60.5
	Silt	%		31.5	36.7	12.8	44.7	41.7	48	46.2	14.7	8.1
23	Copper as Cu	mg/kg	EPA 3050 B & 7000B	6.11	5.96	10.5	12	7.41	3.65	4.85	9.11	12.2
24	Zinc as Zn	mg/kg		15.5	16.8	12.2	10.7	8.74	18.2	21.4	17.4	16.6
25	Manganese as Mn	mg/kg		15.8	21.7	16.6	18.8	25.4	31.7	12.8	16.6	14.8
26	Nickel as Ni	mg/kg		BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)
27	Iron as Fe	mg/kg		174	152	841	523	198	452	984	521	378
28	Lead as Pb	mg/kg		BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)
29	Cadmium as Cd	mg/kg		BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)
30	Chromium as Cr^{3+}	mg/kg	By Calculation	9.63	4.41	8.41	2.96	3.87	5.87	10.1	13.6	8.47
31	Chromium as Cr^{6+}	mg/kg	EPA 7196 A	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)
32	Antimony as Sb	mg/kg	EPA 3050 B & 7000B	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)
33	Arsenic as As	mg/kg		BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)
34	Barium as Ba	mg/kg		BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)
35	Cobalt as Co	mg/kg		BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)	BDL (<2)
36	Molybdenum as Mo	mg/kg		BDL (<5)	BDL (<5)	BDL (<5)	BDL (<5)	BDL (<5)	BDL (<5)	BDL (<5)	BDL (<5)	BDL (<5)
37	Mercuryas Hg	mg/kg	EPA 7471A	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)
38	Sodium absorbtion ratio	-	By Calculatuion	2.52	2.64	2.88	3.32	1.96	2.84	1.99	2.15	2.96
39	Boron as B	mg/kg	ABCTL/SOP/ S/13	3.78	2.21	4.36	2.84	3.96	4.51	3.36	2.58	4.15
40	Chloride as Cl	mg/kg	IS -3025 Par 32	178	112	269	314	268	369	256	310	196
41	Sulphate as SO_4	mg/kg	IS -2720 -Part 27	284	198	424	365	312	381	410	456	520
42	Carbonate as CO_3	%	Titration with Acid	2.82	2.16	3.48	3.06	3.54	3.66	3.24	2.88	3.66

Part-2

Sl. No	Parameters	Unit	Test Method	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19
1	pH (1:5 Suspension)	-	IS -2720(Part 26) 1987(RA 2016)	8.63	8.47	8.25	8.34	8.22	8.41	8.56	8.47	8.41	7.99
2	Electrical conductivity (1:5 Suspension)	mS/cm	IS -14767:2000 (RA 2016)	0.384	0.415	0.312	0.274	0.632	0.418	0.214	0.231	0.185	0.236
3	Moisture	%	IS -2720(Part 2) 1987(RA 2015)	5.84	5.74	5.96	5.11	4.87	3.56	5.22	4.74	5.63	2.98
4	Bulk Density	g/cc	FAO Chapter 3, ABCTL/ SOIL/SOP 1	1.14	1.19	1.18	1.37	1.29	1.27	1.28	1.37	1.26	1.28
5	Water Holding Capacity	%	Soil Chemical Analysis By M. L. Jackson	44.1	43.6	42.8	34.5	37.5	38.1	36.6	31.8	39.4	38.2
6	Permeability	cm/hr	Soil Chemical Analysis By M. L. Jackson	0.4	0.3	0.6	1.3	0.7	0.8	0.6	1.14	0.7	0.6
7	Cyanide as CN	mg/kg	APHA 23rd Edn 4500 CN C & E	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)
8	Acidity as $CaCO_3$	mg/kg	APHA 23rd Edn 2310 B	nil	nil	80	nil	nil	80	nil	nil	80	nil
9	Alkalinity as $CaCO_3$	%	IS -3025 Par 23	6.2	5.8	6	4.4	3.9	4.7	5.2	3.3	4.7	5.2
10	Specific Gravity	-	IS -2720 -Part 3	2.69	2.71	2.54	2.35	2.42	2.52	2.53	2.31	2.48	2.41
11	Porosity	%	IS -2720 -Part 36	42.8	43.7	43.1	32.9	42.9	43.6	44.1	33.5	38.4	37.5
12	Infiltration Rate	mm/hr	Soil Chemical Analysis By M. L. Jackson	5	2	6	16	8	6	9	17	8	9
13	Total Nitrogen as N	Kg/ha	IS -14684:1999, Reaff:2008	387	541	530	284	291	364	328	451	378	352
14	Available Phosphorous	Kg/ha	FAO Chapter 3, ABCTL/ SOIL/SOP 2	25.7	19.1	25.8	36.6	45.2	47.1	32.5	24.1	44.6	36.9
15	Available Potassium	Kg/ha	FAO Chapter 3, ABCTL/ SOIL/SOP 7	487	258	269	325	374	263	281	369	426	412
16	Exchangeable Calcium as Ca	m.eq/ 100g	FAO Chapter 3, ABCTL/ SOIL/SOP 4	17.2	18.8	19.1	10.5	14.2	13.8	15.6	8.9	12.9	13.5
17	Exchangeable Magnesi um as Mg	m.eq/ 100g	FAO Chapter 3, ABCTL/ SOIL/SOP 5	3.58	3.97	4.52	2.47	2.85	2.96	3.54	2.11	2.98	3.64
18	Exchangeable Sodium as Na	m.eq/ 100g	FAO Chapter 3, ABCTL/ SOIL/SOP 6	1.66	2.48	3.47	1.68	2.55	3.63	1.98	2.57	3.36	3.97
19	Cation Exchange Capacity	m.eq/ 100g	IS -2720(Part 24) (RA 2015)	21.7	18.8	19.3	12	17.5	16.9	18.2	10.7	14.1	15.3
20	Organic Carbon	%	IS 2720 (Part 22):1972 (RA 2015)	0.80	0.56	0.81	0.70	0.90	1.00	0.72	0.65	0.62	0.49
21	Organic matter	%		1.38	0.97	1.41	1.22	1.56	1.74	1.25	1.13	1.07	0.85

Sl. No	Parameters	Unit	Test Method	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19
22	Texture Classification		Robinson Pipette Method	Clay	Clay	Clay	Loam	Silty Clay Loam	Silty Clay Loam	Silty Clay Loam	Loam	Silty Clay Loam	Silty Clay Loam
	Sand	%		28.2	30.2	33.6	38.8	15.8	18.7	16.7	42.5	17.1	15.2
	Clay	%		54.8	58.7	63.6	27.4	37.4	33.6	38.2	27.4	38.9	36
	Silt	%		17	11.1	2.8	33.8	46.8	47.7	45.1	30.1	44	48.8
23	Copper as Cu	mg/kg	EPA 3050 B & 7000B	10.4	8.74	5.63	6.98	7.14	3.69	6.65	8.14	10.6	5.87
24	Zinc as Zn	mg/kg		10.5	12.7	13.7	15.8	17.1	8.74	9.63	12.8	15.4	13.3
25	Manganese as Mn	mg/kg		9.1	15.8	22.7	13.6	18.1	15.7	13.2	19.3	14.7	20.2
26	Nickel as Ni	mg/kg		BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)
27	Iron as Fe	mg/kg		512	1062	815	369	547	320	880	1326	580	712
28	Lead as Pb	mg/kg		BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)
29	Cadmium as Cd	mg/kg		BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)
30	Chromium as Cr^{3+}	mg/kg	By Calculation	2.55	3.98	7.14	3.63	5.82	3.65	8.54	10.6	8.47	11.5
31	Chromium as Cr^{6+}	mg/kg	EPA 7196 A	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)
32	Antimony as Sb	mg/kg	EPA 3050 B & 7000B	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)
33	Arsenic as As	mg/kg		BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)
34	Barium as Ba	mg/kg		BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)
35	Cobalt as Co	mg/kg		BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)
36	Molybdenum as Mo	mg/kg		BDL(<5)	BDL(<5)	BDL(<5)	BDL(<5)	BDL(<5)	BDL(<5)	BDL(<5)	BDL(<5)	BDL(<5)	BDL(<5)
37	Mercuryas Hg	mg/kg	EPA 7471A	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)
38	Sodium absorbtion ratio	-	By Calculatuion	1.63	2.32	3.19	2.09	2.76	3.97	2.02	3.46	3.77	4.29
39	Boron as B	mg/kg	ABCTL/SOP/ S/13	2.69	3.54	2.88	5.14	4.47	2.36	2.85	2.93	3.14	4.58
40	Chloride as Cl	mg/kg	IS -3025 Par 32	354	254	211	296	187	363	287	377	245	310
41	Sulphate as SO_4	mg/kg	IS -2720 -Part 27	384	562	321	284	362	510	482	412	368	274
42	Carbonate as CO_3	%	Titration with Acid	3.72	3.48	3.6	2.64	2.34	2.82	3.12	1.98	2.82	3.12

Part-3

Sl. No	Parameters	Unit	Test Method	S20	S21	S22	S23	S24	S25	S26	S27	S28
1	pH (1:5 Suspension)	-	IS -2720(Part 26) 1987(RA 2016)	8.54	8.23	8.61	8.45	8.66	8.41	8.63	8.27	8.24
2	Electrical conductivity (1:5 Suspension)	mS/cm	IS -14767:2000 (RA 2016)	0.471	0.254	0.512	0.632	0.312	0.389	0.152	0.269	0.314

Sl. No	Parameters	Unit	Test Method	S20	S21	S22	S23	S24	S25	S26	S27	S28
3	Moisture	%	IS -2720(Part 2) 1987(RA 2015)	4.45	3.87	4.84	3.62	2.78	3.96	3.14	2.85	3.84
4	Bulk Density	g/cc	FAO Chapter 3, ABCTL/ SOIL/SOP 1	1.16	1.25	1.23	1.14	1.16	1.18	1.37	1.34	1.18
5	Water Holding Capacity	%	Soil Chemical Analysis By M. L. Jackson	44.8	36.8	39.1	42.5	43.6	44.1	34.1	32.8	45.1
6	Permeability	cm/hr	Soil Chemical Analysis By M. L. Jackson	0.3	0.8	0.7	0.4	0.3	0.2	1.16	0.15	0.4
7	Cyanide as CN	mg/kg	APHA 23rd Edn 4500 CN C & E	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)
8	Acidity as $CaCO_3$	mg/kg	APHA 23rd Edn 2310 B	nil	80	nil	nil	80	nil	nil	80	nil
9	Alkalinity as $CaCO_3$	%	IS -3025 Par 23	6.3	4.2	4.9	5.8	5.4	5.6	3.9	4.3	5.5
10	Specific Gravity	-	IS -2720 -Part 3	2.58	2.51	2.45	2.65	2.58	2.66	2.36	2.31	2.59
11	Porosity	%	IS -2720 -Part 36	45.6	42.7	39.4	44.1	43.9	42.8	34.2	31.9	43.6
12	Infiltration Rate	mm/hr	Soil Chemical Analysis By M. L. Jackson	4	9	8	5	3	4	15	17	5
13	Total Nitrogen as N	Kg/ha	IS -14684:1999, Reaff:2008	288	263	248	385	418	465	352	280	374
14	Available Phosphorous	Kg/ha	FAO Chapter 3, ABCTL/ SOIL/SOP 2	52.1	48.5	32.8	41.9	32.4	28.1	39.4	41.8	26.8
15	Available Potassium	Kg/ha	FAO Chapter 3, ABCTL/ SOIL/SOP 7	362	198	254	302	197	212	354	182	210
16	Exchangeable Calcium as Ca	m.eq/ 100g	FAO Chapter 3, ABCTL/ SOIL/SOP 4	17.1	13.6	15.4	19	16.9	18.2	11.1	9.84	16.7
17	Exchangeable Magnesium as Mg	m.eq/ 100g	FAO Chapter 3, ABCTL/ SOIL/SOP 5	2.78	4.15	4.63	3.84	3.28	4.25	3.26	2.94	3.66
18	Exchangeable Sodium as Na	m.eq/ 100g	FAO Chapter 3, ABCTL/ SOIL/SOP 6	4.25	3.63	3.87	3.11	2.87	3.85	3.02	2.47	4.18
19	Cation Exchange Capacity	m.eq/ 100g	IS -2720(Part 24) (RA 2015)	19.9	14.8	15.5	19.2	20.4	18.7	11.5	10.9	18.2
20	Organic Carbon	%	IS 2720 (Part 22):1972 (RA 2015)	0.79	0.70	0.84	0.59	0.56	0.67	0.44	0.47	0.73
21	Organic matter	%		1.36	1.22	1.46	1.03	0.97	1.16	0.76	0.81	1.26
22	Texture Classification		Robinson Pipette Method	Clay	Silty Clay Loam	Silty Clay Loam	Clay	Clay	Clay	Loam	Loam	Clay
	Sand	%		25.1	19	14.8	28	29.6	24.8	40.5	38.5	26.3

Sl. No	Parameters	Unit	Test Method	S20	S21	S22	S23	S24	S25	S26	S27	S28
	Clay	%		60.6	37.4	39.1	54.7	61.4	56.6	25.9	28.2	62.8
	Silt	%		14.3	43.6	46.1	17.3	9	18.6	33.6	33.3	10.9
23	Copper as Cu	mg/kg	EPA 3050 B & 7000B	13.3	4.87	6.97	8.14	8.24	5.12	8.45	6.64	9.63
24	Zinc as Zn	mg/kg		12.1	18.1	11.5	10.4	8.56	15	13.6	12.1	14.4
25	Manganese as Mn	mg/kg		17.1	26.6	32.7	28.4	31.4	15.8	12.2	10.7	19.3
26	Nickel as Ni	mg/kg		BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)
27	Iron as Fe	mg/kg		336	563	287	425	1147	923	212	258	763
28	Lead as Pb	mg/kg		BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)
29	Cadmium as Cd	mg/kg		BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)
30	Chromium as Cr^{3+}	mg/kg	By Calculation	8.41	7.96	12.2	6.36	5.87	4.96	10.1	8.41	7.26
31	Chromium as Cr^{6+}	mg/kg	EPA 7196 A	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)
32	Antimony as Sb	mg/kg	EPA 3050 B & 7000B	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)
33	Arsenic as As	mg/kg		BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)
34	Barium as Ba	mg/kg		BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)
35	Cobalt as Co	mg/kg		BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)	BDL(<2)
36	Molybdenum as Mo	mg/kg		BDL(<5)	BDL(<5)	BDL(<5)	BDL(<5)	BDL(<5)	BDL(<5)	BDL(<5)	BDL(<5)	BDL(<5)
37	Mercuryas Hg	mg/kg	EPA 7471A	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)	BDL (<0.1)
38	Sodium absorbtion ratio	-	By Calculatuion	4.26	3.85	3.87	2.91	2.86	3.63	3.56	3.09	4.14
39	Boron as B	mg/kg	ABCTL/SOP/ S/13	4.12	5.36	3.78	2.98	5.16	3.21	2.98	3.52	2.87
40	Chloride as Cl	mg/kg	IS -3025 Par 32	287	240	298	387	210	325	198	187	365
41	Sulphate as SO_4	mg/kg	IS -2720 -Part 27	215	365	457	286	432	354	148	220	452
42	Carbonate as CO_3	%	Titration with Acid	3.78	2.52	2.94	3.48	3.24	3.36	2.34	2.58	3.3

Source: ABC Techno Labs India Pvt. Ltd.
Date of sampling: 29-31st March 2019

The physic-chemical concentrations of the soil samples are determined and compared with the standard soil classification provided by the Indian Council of Agricultural Research (ICAR) and as given in table 3.16.

Table 3.16: Standard Soil Classification

Chemical Parameters	Ranking				
	Very Low	**Low**	**Moderate**	**High**	**Very High**
pH	<4, very Strongly Acidic	4-5, Strongly Acidic	5-8, Ideal for Plant Growth	8-9 Strongly Basic	>9 Very Strongly Basic
Electrical conductivity (μS/cm)	<2000, Non-saline	2000-4000 Saline	4000-8000 Moderately Saline	8000-16000 Highly Saline	>16000 Extremely Saline
Total Nitrogen (%)	<0.05 Very Low	0.05-0.15 Low	0.15-0.25 Moderate	0.25-0.5 High	>0.5 Very High
Total Phosphorous (mg/kg)	<5 Very Low	5-10 Low	10-30 Moderate	30-60 High	>60 Very High
Sodium (mg/kg)	-	<200 Non Sodic	200-500 Moderate	>500 Sodic	
Potassium (mg/kg)	-	<150 Low	150-250 Moderate	250-800 High	>800 Very High
Calcium (mg/kg)	-	<1000 Low	1000-2000 Moderate	>2000 High	-
Magnesium (mg/kg)	<40 Very Low	40-100 Low	100-300 Moderate	>300 High	-
% Organic Matter	0.5-1.0 Very Low	1.0-2.0 Low	2.0-3.0 Moderate	3.0-5.0 High	>5 Very High

Source: Handbook of Agriculture, ICAR, New Delhi

3.15.3 OBSERVATION

- The pH values ranging from 7.99 to 8.66 indicating the moderate and ideal of plant growth properties.
- The texture of the soil sample is predominantly Silty Clay Loam in most of the places with Silt Loam in some locations. The sand, silt and clay properties were found to be in the range of 14.8% to 42.5.6%, 2.80% to 48.8% and 24.8% to 63.6%.
- The conductivity of the soil ranges from 0.1 mS/cm to 0.65 mS/cm.
- The moisture content in the study locations ranged from 2.78% to 5.96%.
- The available nitrogen content ranges between 248 kg/Ha to 541 kg/Ha in the locality and the value of phosphorus content varies between 19.10 kg/Ha to 54.1 kg/Ha. This indicates that the soil has very high quantities of Nitrogen and Phosphorus.

- The potassium content varies from 182 kg/Ha to 487 kg/Ha, which indicates that the soils have medium levels of potassium.
- The organic carbon properties of the soil was found to be in the range of 0.44% to 1.0% and Organic Matter was found to be in the range of 0.76% to 1.74%.

From the above observations, it was found that the soil in the Study area shows moderate fertility.

3.16 ECOLOGICAL ENVIRONMENT

Ecosystem shows complex inter-relationships between biotic and abiotic components leading to dependence, competition and mutualism. Biotic components comprise both plant and animal communities, interacting not only within and between themselves but also with the abiotic components of the environment. The map showing the bio-geographic provinces of India is shown in Figure 3.13.

3.16.1 OBJECTIVES OF ECOLOGICAL STUDIES

The objectives of ecological study during the study period of EIA study may be outlined as follows:

- To characterize the environmental components like land, water, flora and fauna;
- To understand their present status;
- To understand carrying capacity of the ecosystem;
- To assess present bio-diversity; and
- To identify susceptible and sensitive areas.

This study has been carried out during the summer season during May 2019 of study period for the purpose of providing an independent and comprehensive baseline assessment of the flora, terrestrial vertebrate, aquatic fauna and associated habitat values of the site and within block area and a subsequent assessment of potential ecological impacts. The study area falls under semi-arid category as far as the Indian biogeographical zones (*Rodger, Panwar, Mathur 2000*) are concerned. Under the biogeographical provinces, the study area falls under the category of 4B- Gujarat Rajputana. The study area does not have any forest land or permanent natural vegetation and the main land use feature of the study area is comprised habitation and cultivating lands. From the primary observation, the tree species recorded in the plantation area were *Acacia nilotica, Azadirachta indica, Prosopis cineraria, Vachellia nilotica, Ziziphus mauritiana, Tamarindus indica, Dalbergia latifolia* etc.

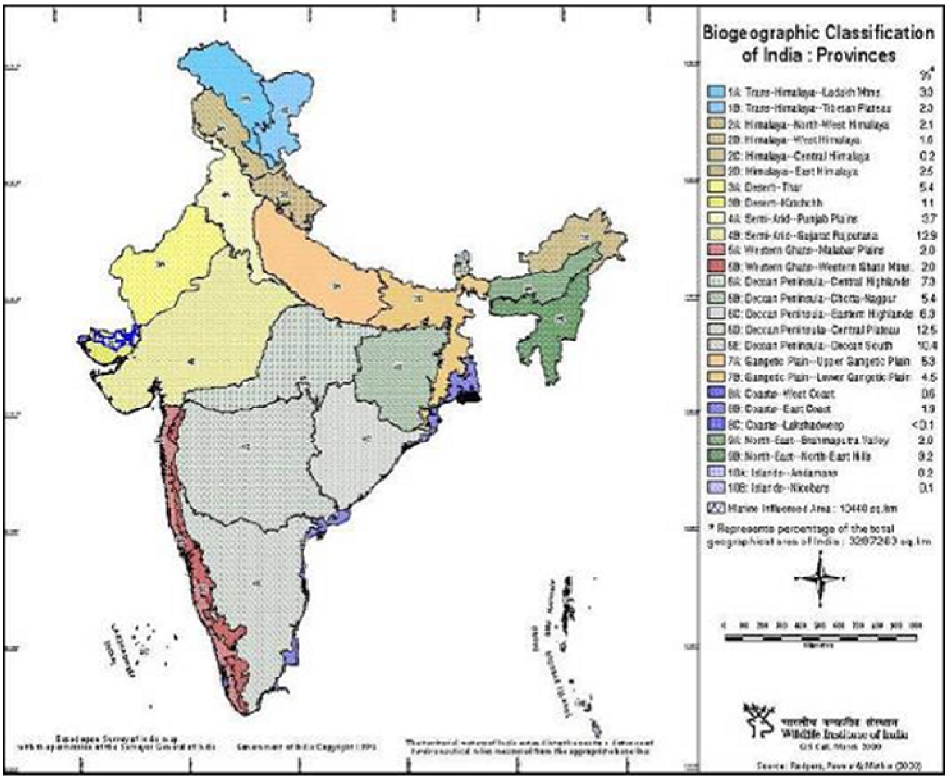


Figure 3.19: Map showing the Bio-geographic Provinces of India

3.16.2 METHODOLOGY ADOPTED FOR THE STUDY

Terrestrial investigations for flora and fauna records were collected by random field survey and a checklist was prepared. During field survey, discussions with the local people were carried-out to collect information related to local biodiversity in and around the villages. The ecological status of the study area has been assessed based on the following methodology:

- Primary field surveys to establish primary baseline of the study area;
- Compilation of secondary information available in published literatures/ working plan was referred from State Forest Department.
- Site Verification and finalization in consultation with local inhabitants.
- Vegetation analysis through quadrate method using sampling plots of 20m x 20m.
  - ✓ 20m X 20m for tree species (record trees >20 cm in GBHOB /species);
  - ✓ 5m X 5m [four plots] was laid along diagonals wherein all the shrubs recorded.
  - ✓ 1m X 1m [five plots], one at the centre and four at one per quadrate] was laid and herbs, grasses in five plots to be noted.

❑ Protocol for Sampling through Quadrate Method

The standard method chosen for the assessment of plant diversity involves the use of square vegetation quadrates ('plots'). These quadrates were used to measure most vegetation attributes in most vegetation types. Quadrate locations marked by pegs or sometimes by grid system.

The study area is demarcated as 10 Km surrounding of well locations based on the MoEF&CC guidelines. After demarcation, the areas which are approximately true representative of the whole area, and were sampled for the identification of plant and animal species.

A. Floral Study

The assessment of the flora of the study area is done by an extensive field survey of the area.

- Plants species were identified based on their specific diagnostics characters of family, genus and species using available floral, other related literature.
- Besides the identification of plant species, information was collected on the vernacular names and uses of plants made by local inhabitants.
- Qualitative analysis of vegetation is made by two different methods such as floristic (by simple studying various genera and species of various plant groups i.e. herbs, shrubs, trees etc).

B. Phyto-sociology

A nested quadrates technique was used for sampling the vegetation. All the plots sampled were representative of most common types, sampling 20m x 20m for trees and 5m x 5m for shrubs, 1m x 1m for herbs square meter quadrates were laid. Selection of sites for sampling of vegetation is done by random sampling procedure. However, in general to study the phytosociological attributes, quadrates of 20m × 20m size for tree species are randomly laid out at each site at different elevations. Then the observation on the following parameters is recorded:

1. Name of the species.
2. Number of the occurrence of each species in each quadrate.
3. Vegetation data was quantitatively analyzed for frequency, density and dominance using standard methodologies.

4. The relative values of frequency, density, and dominance of all the recorded species was summed up to represent Importance Value Index (IVI).

IVI = Relative frequency + Relative density + Relative dominance

C. Faunal Study

Ground surveys are carried out by trekking the study area for identification of important animal groups such as birds, mammals and reptiles for sampling of animals through the following methods.

- For sampling birds/ avifauna 'point sampling' along the fixed transects (foot trails) were done to record all the species of birds with the help of binoculars; field guides and photography for more than 1 hour on each transect (n=4).
- For sampling mammals, 'direct count on open width (20 m) transect' were used on the same transects. Besides, information on recent sightings/records of mammals by the locals was also collected from the study areas.
- 'Reptiles' mainly lizards were sampled by 'direct count on open width transects'.
- Secondary information collected from local villagers, published government data etc.

- **List of the endangered and endemic species as per the schedule of The Wildlife Protection Act, 1972**

Emphasis is given to identify avifauna and mammals to determine the presence and absence of Schedule-1 species, listed in The Wildlife Protection Act 1972, as well as in Red List of IUCN. Various methods used for study animals are as follows:

1. Point Survey Method: Observations were made at each site for 15-20 min duration.
2. Road Side Counts: The observer travelled by motor vehicles from site to site and all sightings were recorded.

3.16.3 SAMPLING LOCATIONS

The ecology and diversity survey was conducted in 10 sampling locations within the proposed block near exploratory well location. It is observed that human settlements present within the block area and many of villages had ponds harboring moderate diversity of water birds. During site assessment several floral species encountered within the block area. The Following species were enlisted within the proposed block area during the field visits as given in Table 3.17.

Table 3.17: Details of locations for plot survey

Sl.No.	Name of village	Plot No.	Lattitude	Longitude
Banaskantha (Gujarat)				
1	Near Dera	EB1	24°16'7.72"N	71°54'14.24"E
2	Near Jetda	EB2	24°20'27.80"N	71°44'56.99"E
3	Near Tharad	EB3	24°24'11.97"N	71°38'0.53"E
4	Near Arantva	EB4	24°29'18.90"N	71°52'18.65"E
5	Near Lawara	EB5	24°36'39.88"N	71°55'30.37"E
6	Near Mota Mesara	EB6	24°35'18.27"N	71°43'31.57"E
7	Near Ratanpura	EB7	24°37'11.20"N	71°34'0.22"E
Jalore (Rajasthan)				
8	Near Dantiya	EB8	24°43'33.66"N	71°33'41.64"E
9	Near Dadoosan	EB9	24°47'38.14"N	71°39'57.93"E
10	Near Jajoosan	EB10	24°44'53.53"N	71°48'19.59"E

Source: ABC Techno Labs India Pvt. Ltd.

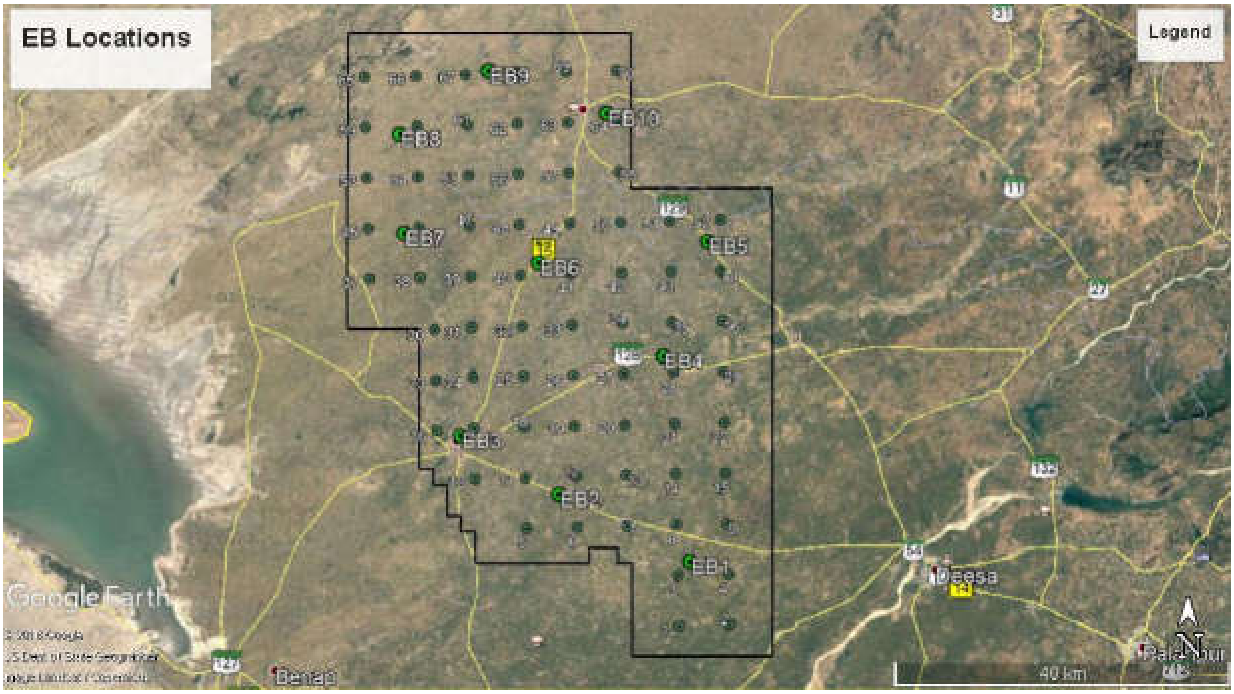


Figure 3.20: Locations of sampling for plot survey

3.16.4 FLORA IN THE STUDY AREA

Most of the block area is covered with agriculture lands and the dominant agriculture crops in these regions are Rice, cotton, tomato, wheat and ricinus. Tree species in the study area was dominated by *Acacia nilotica, Azadirachta indica, Prosopis cineraria, Vachellia nilotica, Ziziphus mauritiana, Tamarindus indica, Dalbergia latifolia*;

Most dominant shrubs in the study area were *Calotropis procera, Prosopis juliflora, Lantana camara, Datura metel, Solanum incanum, Xanthium strumarium, Gossypium* *herbaceum, Euphorbia neriifolia, Salvadora persica, Ziziphus nummularia*; Among the herb species observed are *Trichodesma indicum, Typha angustata, Cynodon dactylon, Achyranthes aspera, Crotalaria burhia* etc.

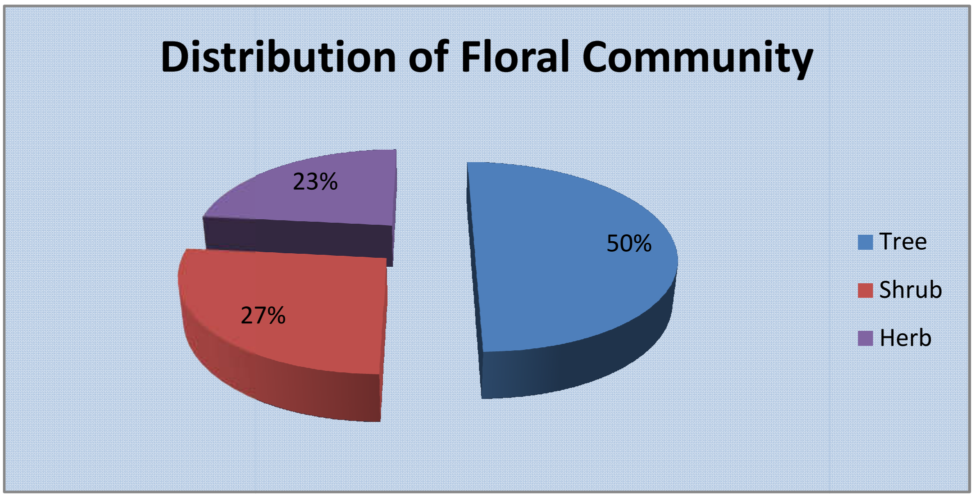
The list of flora observed in the buffer zone is given below:

Table 3.18: List of Flora observed in the study area

Sl.No	Scientific Name	Local name	Family	IUCN Conservation Status
Tree				
1	*Acacia nilotica*	Babool	Mimosaceae	Not assessed
2	*Acacia auriculiformis*	Khair	Fabaceae	Least Concern
3	*Leucaena leucocephala*	Safed Babool	Fabaceae	Not assessed
4	*Azadirachta indica*	Neem	Meliaceae	Not assessed
5	*Ziziphus mauritiana*	Ber	Rhamnaceae	Not assessed
6	*Emblica officinalis*	Ambala	Phyllanthaceae	Not assessed
7	*Salvadora oleoides*	Pilu	Salvadoraceae	Not assessed
8	*Cocos nucifera*	Naariyal	Arecaceae	Not assessed
9	*Ailanthus excelsa*	Araduso	Simaroubaceae	Not assessed
10	*Mangifera indica*	Aam	Anacardiaceae	Data Deficient
11	*Polyalthia longifolia*	Debadaru	Annonaceae	Not assessed
12	*Tamarindus indica*	Mange	Fabaceae	Not assessed
13	*Anogeissus latifolia*	Dhaura	Combretaceae	Not assessed
14	*Bombax ceiba*	Sawar	Bombacaceae	Not assessed
15	*Delonix regia*	Gulmohar	Ceasalpiniaceae	Least Concern
16	*Acacia jacomorbi*	kher	Fabaceae	Not assessed
17	*Albizia procera*	Siris	Fabaceae	Not assessed
18	*Butea monosperma*	Palash	Fabaceae	Not assessed
19	*Ficus religiosa*	Peepal	Moraceae	Not assessed
20	*Bauhinia purpurea*	Jasud	Fabaceae	Least Concern
21	*Acacia catechu*	Mulga	Fabaceae	Not assessed
22	*Albizia lebbeck*	Kala siris	Fabaceae	Not assessed
23	*Ficus benghalensis*	Bargat	Moraceae	Not assessed
24	*Tectona grandis*	saag	Lamiaceae	Not assessed
25	*Dalbergia latifolia*	kala-shisham	Fabaceae	Vulnerable
26	*Carica papaya*	Papaiya	Caricaceae	Data Deficient
27	*Terminalia catappa*	Badamalili	Combretaceae	Not assessed
28	*Moringa oleifera*	Senjana	Moringaceae	Not assessed
29	*Prosopis cineraria*	Jand	Fabaceae	Not assessed
30	*Vachellia nilotica*	Kikar	Fabaceae	Least Concern
Shrub				
1	*Calotropis procera*	Akado	Apocynaceae	Not assessed
2	*Prosopis juliflora*	Gando baval	Fabaceae	Not assessed

Sl.No	Scientific Name	Local name	Family	IUCN Conservation Status
3	*Musa Paradisiaca*	Kela	Musaceae	Not assessed
4	*Lantana camara*	Putush	Verbenaceae	Not assessed
5	*Datura metel*	Daturo	Solanaceae	Not assessed
6	*Solanum incanum*	Ubhi ringan	Solanaceae	Not assessed
7	*Xanthium strumarium*	Gokhru	Asteraceae	Not assessed
8	*Gossypium herbaceum*	Kapas	Malvaceae	Not assessed
9	*Euphorbia neriifolia*	Thor	Euphorbiaceae	Not assessed
10	*Ipomea fistulosa*	Nasarmo	Convolvulaceae	Not assessed
11	*Tecoma stans*	Peilafol	Bignoniaceae	Not assessed
12	*Nerium indicum*	Lalkaren	Apocynaceae	Not assessed
13	*Capparis decidua*	Karel	Capparaceae	Not assessed
14	*Fagonia indica*	Dhamasa	Zygophyllaceae	Not assessed
15	*Salvadora persica*	meswak	Salvadoraceae	Least Concern
16	*Ziziphus nummularia*	Jhar ber	Rhamnaceae	Not assessed
Herb & Grasses				
1	*Achyranthes aspera*	Anghedi	Amaranthaceae	Not assessed
2	*Crotalaria burhia*	Kharshan	Nyctagineaceae	Not assessed
3	*Tridax procumbens*	Pardesi Bhangro	Asteraceae	Not assessed
4	*Trichodesma indicum*	Undhanphuli	Boraginaceae	Not assessed
5	*Aerva javanica*	Gorakhganjo	Amaranthaceae	Not assessed
6	*Typha angustata*	Ramban	Poaceae	Least Concern
7	*Eclipta prostrata*	Bhangro	Asteraceae	Least Concern
8	*Commelina benghalensis*	Kanshira	Commelinaceae	Least Concern
9	*Boerhavia diffusa*	Satodi	Nyctagineaceae	Not assessed
10	*Euphorbia hirta*	Ghaopata	Euphorbiaceae	Not assessed
11	*Cynodon dactylon*	Durba	Poaceae	Not assessed
12	*Ocimum sanctum*	Tulsi	Labiatae	Not assessed
13	*Mimosa pudica*	Lajwanti	Fabaceae	Least Concern
14	*Cassia tora*	Kuvandio	Caesalpiniaceae	Not assessed

Source: ABC Techno Labs India Pvt. Ltd.



A. Economically Important Flora of the study area

Agricultural Crops: Most of the villages in the study area are engaged in monsoon depended agriculture activities. The major agricultural crops practiced during monsoon season in the study area are; Rice (*Oryza sativa*) and Castor (*Ricinus communis*), while during winter Wheat (*Triticum aestivum*) is cultivated as major crop. Bajra (*Pennisetum typhoides*) cultivation practiced in restricted fields by villagers for their own consumption. Minor crop practiced in this region during monsoon season is Cotton (*Gossypium herbaceum*), and Variyali (*Foeniculum vulgare*). Vegetables growing in this region are Bhindi (*Abelmoschus esculentus*), Brinjal (*Solanum melongena*).

Horticulture plant species: Bor (*Zizyphus glabrata*) and Amla (*Emblica officinalis*) cultivation were observed at manyparts of study area. Other fruit yielding varieties observed in the study area were Chikoo (*Manilkara zapota*), Papaya (*Carica papaya*), Gundi (*Cordia ghraf*), Rayan (*Manilkara hexandra*), Gorasamali (*Pithelellobium dulce*), and Amali (*Tamarindus indicum*).

Rare and Endangered Floral Species: Among the enumerated flora in the study area, none of them were assigned any threat category by RED data book of Indian Plants, (*Nayar and Sastry, 1990*) and Red list of threatened Vascular plants (IUCN, 2010, BSI, 2003)'. No species observed in the study region comes under the category of threatened species out of 60 plant species.

❑ Phytosociological Analysis

Phytosociological parameters, such as, density, frequency, basal area and importance value index of individual species were determined in randomly placed quadrats in the study area. Relative frequency and relative density were calculated and the sum of these three represented Importance Value Index (IVI) for various species. For shrubs, herbs and seedlings, the IVI was calculated by summing up relative frequency, relative density and relative abundance. Phytosociological analysis of tree species is shown in Table 3.19.

Table 3.19: Phytosociological Analysis of Tree Species

Sl.No.	Scientific name	Local name	Total No.	Total no. of quad with sp.	Total No. of quad	Density	Relative Density	Frequency %	Relative Frequency	Abundance	Relative Abundance	IVI
Tree Species												
1	*Acacia nilotica*	Babool	7	7	10	0.70	6.60	70.0	6.8	1.00	0.07	13.47
2	*Acacia auriculiformis*	Khair	3	3	10	0.30	2.83	30.0	2.9	1.00	0.03	5.77
3	*Leucaena leucocephala*	Safed Babool	3	3	10	0.30	2.83	30.0	2.9	1.00	0.03	5.77
4	*Azadirachta indica*	Neem	5	5	10	0.50	4.72	50.0	4.9	1.00	0.05	9.62
5	*Ziziphus mauritiana*	Ber	6	6	10	0.60	5.66	60.0	5.8	1.00	0.06	11.54
6	*Emblica officinalis*	Ambala	4	4	10	0.40	3.77	40.0	3.9	1.00	0.04	7.69
7	*Salvadora oleoides*	Pilu	2	2	10	0.20	1.89	20.0	1.9	1.00	0.02	3.85
8	*Cocos nucifera*	Naariyal	3	3	10	0.30	2.83	30.0	2.9	1.00	0.03	5.77
9	*Ailanthus excelsa*	Araduso	2	2	10	0.20	1.89	20.0	1.9	1.00	0.02	3.85
10	*Mangifera indica*	Aam	2	2	10	0.20	1.89	20.0	1.9	1.00	0.02	3.85
11	*Polyalthia longifolia*	Debadaru	3	3	10	0.30	2.83	30.0	2.9	1.00	0.03	5.77
12	*Tamarindus indica*	Mange	5	5	10	0.50	4.72	50.0	4.9	1.00	0.05	9.62
13	*Anogeissus latifolia*	Dhaura	4	4	10	0.40	3.77	40.0	3.9	1.00	0.04	7.69
14	*Bombax ceiba*	Sawar	3	3	10	0.30	2.83	30.0	2.9	1.00	0.03	5.77
15	*Delonix regia*	Gulmohar	2	2	10	0.20	1.89	20.0	1.9	1.00	0.02	3.85
16	*Acacia jacomorbi*	kher	2	2	10	0.20	1.89	20.0	1.9	1.00	0.02	3.85
17	*Albizia procera*	Siris	3	3	10	0.30	2.83	30.0	2.9	1.00	0.03	5.77
18	*Butea monosperma*	Palash	2	2	10	0.20	1.89	20.0	1.9	1.00	0.02	3.85
19	*Ficus religiosa*	Peepal	3	3	10	0.30	2.83	30.0	2.9	1.00	0.03	5.77
20	*Bauhinia purpurea*	Jasud	2	2	10	0.20	1.89	20.0	1.9	1.00	0.02	3.85
21	*Acacia catechu*	Mulga	1	1	10	0.10	0.94	10.0	1.0	1.00	0.01	1.92

Sl.No.	Scientific name	Local name	Total No.	Total no. of quad with sp.	Total No. of quad	Density	Relative Density	Frequency %	Relative Frequency	Abundance	Relative Abundance	IVI
22	*Albizia lebbeck*	Kala siris	4	4	10	0.40	3.77	40.0	3.9	1.00	0.04	7.69
23	*Ficus benghalensis*	Bargat	3	3	10	0.30	2.83	30.0	2.9	1.00	0.03	5.77
24	*Tectona grandis*	saag	3	2	10	0.30	2.83	20.0	1.9	1.50	0.03	4.80
25	*Dalbergia latifolia*	kala-shisham	5	5	10	0.50	4.72	50.0	4.9	1.00	0.05	9.62
26	*Carica papaya*	Papaiya	4	4	10	0.40	3.77	40.0	3.9	1.00	0.04	7.69
27	*Terminalia catappa*	Badamalili	3	3	10	0.30	2.83	30.0	2.9	1.00	0.03	5.77
28	*Moringa oleifera*	Senjana	4	4	10	0.40	3.77	40.0	3.9	1.00	0.04	7.69
29	*Prosopis cineraria*	Jand	6	6	10	0.60	5.66	60.0	5.8	1.00	0.06	11.54
30	*Vachellia nilotica*	Kikar	7	5	10	0.70	6.60	50.0	4.9	1.40	0.07	11.52
	Total		106	103	300							
Shrub Species												
1	*Calotropis procera*	Akado	12	10	10	1.20	11.32	100.0	9.7	1.20	0.11	21.14
2	*Prosopis juliflora*	Gando baval	7	7	10	0.70	6.60	70.0	6.8	1.00	0.07	13.47
3	*Musa Paradisiaca*	Kela	5	4	10	0.50	4.72	40.0	3.9	1.25	0.05	8.65
4	*Lantana camara*	Putush	6	6	10	0.60	5.66	60.0	5.8	1.00	0.06	11.54
5	*Datura metel*	Daturo	8	7	10	0.80	7.55	70.0	6.8	1.14	0.08	14.42
6	*Solanum incanum*	Ubhi ringan	6	6	10	0.60	5.66	60.0	5.8	1.00	0.06	11.54
7	*Xanthium strumarium*	Gokhru	7	7	10	0.70	6.60	70.0	6.8	1.00	0.07	13.47
8	*Gossypium herbaceum*	Kapas	10	7	10	1.00	9.43	70.0	6.8	1.43	0.09	16.32
9	*Euphorbia neriifolia*	Thor	5	5	10	0.50	4.72	50.0	4.9	1.00	0.05	9.62
10	*Ipomea fistulosa*	Nasarmo	3	3	10	0.30	2.83	30.0	2.9	1.00	0.03	5.77
11	*Tecoma stans*	Peilafol	3	3	10	0.30	2.83	30.0	2.9	1.00	0.03	5.77
12	*Nerium indicum*	Lalkaren	5	5	10	0.50	4.72	50.0	4.9	1.00	0.05	9.62

Sl.No.	Scientific name	Local name	Total No.	Total no. of quad with sp.	Total No. of quad	Density	Relative Density	Frequency %	Relative Frequency	Abundance	Relative Abundance	IVI
13	*Capparis decidua*	Karel	5	5	10	0.50	4.72	50.0	4.9	1.00	0.05	9.62
14	*Fagonia indica*	Dhamasa	2	2	10	0.20	1.89	20.0	1.9	1.00	0.02	3.85
15	*Salvadora persica*	meswak	6	6	10	0.60	5.66	60.0	5.8	1.00	0.06	11.54
16	*Ziziphus nummularia*	Jhar ber	6	6	10	0.60	5.66	60.0	5.8	1.00	0.06	11.54
	Total		96	89	160						0.91	
Herb Species												
1	*Achyranthes aspera*	Anghedi	6	6	10	0.60	5.66	60.0	5.8	1.00	0.06	11.54
2	*Crotalaria burhia*	Kharshan	6	6	10	0.60	5.66	60.0	5.8	1.00	0.06	11.54
3	*Tridax procumbens*	Pardesi Bhangro	5	5	10	0.50	4.72	50.0	4.9	1.00	0.05	9.62
4	*Trichodesma indicum*	Undhanphuli	11	7	10	1.10	10.38	70.0	6.8	1.57	0.10	17.28
5	*Aerva javanica*	Gorakhganjo	4	4	10	0.40	3.77	40.0	3.9	1.00	0.04	7.69
6	*Typha angustata*	Ramban	10	6	10	1.00	9.43	60.0	5.8	1.67	0.09	15.35
7	*Eclipta prostrata*	Bhangro	4	4	10	0.40	3.77	40.0	3.9	1.00	0.04	7.69
8	*Commelina benghalensis*	Kanshira	4	4	10	0.40	3.77	40.0	3.9	1.00	0.04	7.69
9	*Boerhavia diffusa*	Satodi	5	5	10	0.50	4.72	50.0	4.9	1.00	0.05	9.62
10	*Euphorbia hirta*	Ghaopata	4	4	10	0.40	3.77	40.0	3.9	1.00	0.04	7.69
11	*Cynodon dactylon*	Durba	14	8	10	1.40	13.21	80.0	7.8	1.75	0.13	21.11
12	*Ocimum sanctum*	Tulsi	5	4	10	0.50	4.72	40.0	3.9	1.25	0.05	8.65
13	*Mimosa pudica*	Lajwanti	6	5	10	0.60	5.66	50.0	4.9	1.20	0.06	10.57
14	*Cassia tora*	Kuvandio	7	7	10	0.70	6.60	70.0	6.8	1.00	0.07	13.47
	Total		91	75	140						0.86	

Source: ABC Techno Labs India Pvt. Ltd.

The interpretation vegetation study results of the study area are presented in the following Table 3.20.

Table 3.20: Interpretation of Vegetation Results in the Study Area

Relative density	Relative density is found to be maximum for *Acacia nilotica*– 6.60	Density of primary species is found to be much higher in comparison with the other species.
Relative frequency	Maximum RF found to be 6.8 in case of *Acacia nilotica*	Vegetation community is heterogenous in nature
Relative Abundance	Maximum value observed in case of *Acacia nilotica* is about 0.07.	*Acacia nilotica* is the most common species found in the area.
Importance Value Index (IVI	The maximum IVI value observed in case of *Acacia nilotica* is about 13.47.	The dominant species are *Acacia nilotica*.

Source: ABC Techno Labs India Pvt. Ltd.

- **Biodiversity Indices**

Biodiversity index is a quantitative measure that reflects how many different types species, there is in a dataset, and simultaneously takes into account how evenly the basic entities (such as individuals) are distributed among those types of species. The value of biodiversity index increases both when the number of types increases and when evenness increases. For a given number of type of species, the value of a biodiversity index is maximized when all type of species are equally abundant. Interpretation of Vegetation results in the study area is given in Table 3.21.

Table 3.21: Biodiversity Indices results

Community	Biodiversity indices		
	Shannon-Wiener Index (H)	Simpson Diversity Index (1/D)	Species Evenness
Tree	3.31	0.97	0.33
Shrub	2.53	0.94	0.52
Herbs	2.32	0.92	0.56

Source: ABC Techno Labs India Pvt. Ltd.

From Table 3.23, it can be interpreted that tree community has highest diversity. While the shrub community shows less diversity. It is also observed that most of the quadrates have controlled generation of plant species with older strands. Higher tree species diversity can be interpreted as a greater number of successful species and a more stable ecosystem where more ecological niches are available and the environment is less likely to be hostile, environmental change is less likely to be damaging to the ecosystem as a whole.

3.16.5 Fauna in the study area

To prepare a detailed report on the status of faunal diversity within study area, field studies were conducted. Both direct (sighting) and indirect (evidences) observations methods were used to survey the faunal species around the study area. Additionally reference of relevant literatures (published/ unpublished) and dialogues with local villagers were also carried out to consolidate the presence of faunal distribution in the area.

There is no notified/ protected ecologically sensitive area including national park, sanctuary, Elephant/ Tiger reserves existing in the study area covering 10 Km surrounding of the block.

Mammals: No wild mammalian species was directly sighted during the field survey. Dialogue with local villagers located within the study area also could not confirm presence of any wild animal in that area. Rhesus Macaque, Indian Grey Mongoose, Small Indian Civet, Nilgai, Common Langur, Indian Hare, Five striped squirrel were observed during primary survey. However, Striped Hyaena, Indian Wild Pig, Jungle Cat, Indian Fox were reported within the study area.

Avifauna: From the primary survey, a total of 28 species of avifauna were identified and recorded from the entire block area and surrounding area. The diversity of avifauna from this region was found to be quite high and encouraging. None of the bird species found to be of threatened or endangered category as per IUCN Red list.

List of animals present in the study area are given below:

Table 3.22: List of Fauna observed in the study area

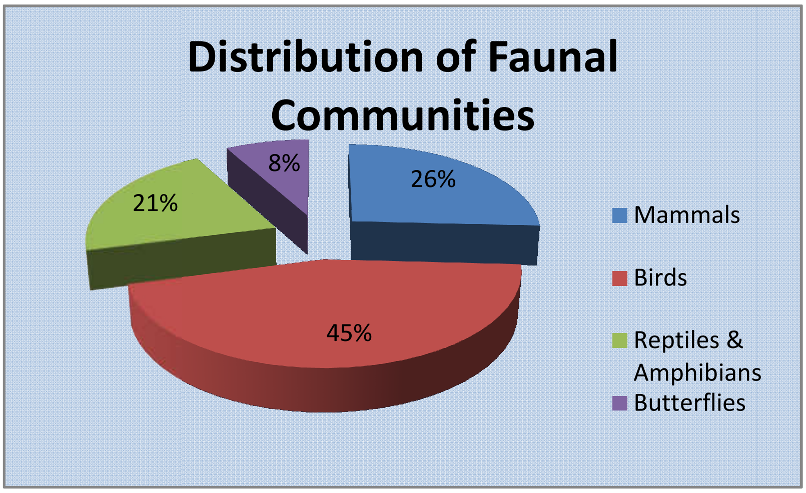
Sl.No	Scientific name	English Name	Schedule of Wildlife Protection Act	Status as per IUCN Red Data List	Method
Mammals					
1	*Macaca mulatta*	Rhesus Macaque	II	Least Concern	DS
2	*Herpestes edwardsii*	Indian Grey Mongoose	II	Least Concern	DS
3	*Hyaena hyaena*	Striped Hyaena	III	Least Concern	NS
4	*Sus scrofa*	Indian Wild Pig	III	Least Concern	NS
5	*Felis chaus*	Jungle Cat	II	Least Concern	NS
6	*Viverricula indica*	Small Indian Civet	II	Least Concern	DS

Sl.No	Scientific name	English Name	Schedule of Wildlife Protection Act	Status as per IUCN Red Data List	Method
7	*Boselaphus tragocamelus*	Nilgai	III	Least Concern	DS
8	*Presbytis entellus*	Common Langur	II	Not assessed	DS
9	*Vulpes bengalensis*	Indian Fox	II	Least Concern	NS
10	*Suncus murinus*	House Shrew	-	Least Concern	DS
11	*Golunda ellioti*	Indian Bush Rat	V	Least Concern	DS
12	*Bandicota bengalensis*	Bandicoot Rat	V	Least Concern	DS
13	*Lepus nigricollis*	Indian Hare	IV	Least Concern	DS
14	*Rattus rattus*	Common house Rat	V	Least Concern	DS
15	*Mus booduga*	Indian Field Mouse	V	Least Concern	DS
16	*Funambulus pennantii*	Five striped squirrel	IV	Least Concern	DS
Birds					
1	*Francolinus pondecerianus*	Grey Francolin	IV	Least Concern	DS
2	*Milvus migrans*	Common Pariah Kite	IV	Least Concern	DS
3	*Pavo cristatus*	Indian Peafowl	I	Least Concern	DS
4	*Corvus splendens*	House crow	V	Least Concern	DS
5	*Pycnonotus cafer*	Red-vented Bulbul	IV	Least Concern	DS
6	*Passer domesticus*	House Sparrow	-	Least Concern	DS
7	*Apus affinis*	Little Swift	-	Least Concern	DS
8	*Athene brama*	Spotted Owlet	IV	Least Concern	DS
9	*Aquila rapax*	Tawny Eagle	IV	Least Concern	DS
10	*Threskiornis melanocephalus*	Black-headed Ibis	IV	Near Threatened	DS
11	*Bubulcus ibis*	Cattle Egret	IV	Least Concern	DS
12	*Coracias benghalensis*	Indian Roller	IV	Least Concern	DS
13	*Ardeola grayii*	Indian Pond-Heron	IV	Least Concern	DS
14	*Turdoides caudatus*	Common Babbler	IV	Least Concern	DS
15	*Egretta garzetta*	Little Egret	IV	Least Concern	DS
16	*Psittacula krameri*	Rose ringed Parakeet	IV	Least Concern	DS
17	*Phalacrocorax fuscicollis*	Indian Cormorant	IV	Least Concern	DS
18	*Himantopus himantopus*	Black-winged Stilt	IV	Least Concern	DS
19	*Alcedo atthis*	Common kingfisher	IV (37)	Least Concern	DS
20	*Acridotheres tristis*	Common Maina	IV (45)	Least Concern	DS
21	*Hirundo rustica*	Common Swallow	IV	Least Concern	DS
22	*Merops orientalis*	Green bee eater	IV	Least Concern	DS
23	*Columba livia*	Rock Pigeon	IV	Least Concern	DS
24	*Anas crecca*	Common Teal	IV	Least Concern	DS
25	*Pterocles exustus*	Chestnut-bellied Sandgrouse	IV	Least Concern	DS

Sl.No	Scientific name	English Name	Schedule of Wildlife Protection Act	Status as per IUCN Red Data List	Method
26	*Vanellus indicus*	Red-wattled Lapwing	IV	Least Concern	DS
27	*Grus grus*	Common crane	IV (16)	Least Concern	DS
28	*Fulica atra*	Common Coot	IV	Least Concern	DS
Reptiles & Amphibians					
1	*Ptyas mucosa*	Yellow Rat Snake	II	Not assessed	NS
2	*Eryx conicus*	Common Sand Boa	IV	Not assessed	DS
3	*Boiga trigonata*	Indian Gamma Snake	IV	Least Concern	DS
4	*Daboia russelii*	Russell's Viper	II	Least Concern	NS
5	*Bungarus caeruleus*	Common Indian Krait	IV	Not assessed	DS
6	*Naja naja*	Indian Cobra	II	Not assessed	NS
7	*Chamaeleo zeylanicus*	South Asian Chamaeleon	II	Least Concern	DS
8	*Crossobamon orientalis*	Sindh Sand Gecko	-	Not assessed	DS
9	*Calotes versicolor*	Common garden lizard	-	Not assessed	DS
10	*Hemidactylus flaviviridis*	House lizard	IV	Not assessed	DS
11	*Euphlyctis hexadactylus*	Indian Pond Frog	-	Least Concern	DS
12	*Bufo melanostictus*	Common Indian Toad	IV	Least Concern	DS
13	*Rana tigrina*	Indian bull frog	IV	Least Concern	DS
Butterflies					
1	*Neptis hylas*	Common sailor	-	Not assessed	DS
2	*Pachliopta hector*	Crimson rose	-	Not assessed	DS
3	*Papilio demoleus*	Lime Butterfly	-	Not assessed	DS
4	*Danaus chrysippus*	Plain Tiger	-	Not assessed	DS
5	*Junonia almana*	Peacock pansey	-	Least Concern	DS

N.B: NS= Not sighted but included as per the information provided by villagers, DS = Direct Sighting

Source: ABC Techno Labs India Pvt. Ltd.



Apart from agriculture locals of the all the villages were involved in livestock keeping and each of the individual had a substantial number of cattle. Livestock like cattle, goat, poultry, duck, and pig are reared for dairy products, meat, egg and for agriculture purpose. Majority of cattles are of local variety. Backyard poultry farms are mostly common in this area; however, some commercial poultry farms are also recorded in the study area.

There is no rare or endangered fauna observed in the study area. None of the sighted animal species can be assigned endemic species category of the study area.

The study area is marked with moderate population of flora and fauna. With reference to the Wildlife Protection Act 1972 total number of wildlife tabulated in this study can be characterized as given in the Table 3.23.

Table 3.23: Characterization of Fauna in the Study Area (As Per W.P Act, 1972)

Sl.No.	Schedule of Wildlife Protection Act 1972	No. of species	Remark
1	Schedule I	1	-
2	Schedule II	10	-
3	Schedule III	3	-
4	Schedule IV	33	-
5	Schedule V	4	-
6	Schedule VI	0	-

Source: ABC Techno Labs India Pvt. Ltd.

The detailed interpretation of flora and fauna identified within 10 Km surrounding of the project site are tabulated In Table 3.24.

Table 3.24: Description of Flora & Fauna

Sl.No.	Type of Species	Core Zone
Flora		
1	Endangered species	None of the species found
2	Endemic species	None of the species found
3	Grass lands	No grass lands
4	Natural vegetation/ Forest type	Type 5A Tropical Dry Deciduous Forest & Type 6B/C1 Northern Tropical Thorn Forests
Fauna		
1	Endangered species	None
2	Endemic Species	Not present
3	Migratory species	None
4	Migratory Corridors & Flight Paths	No corridors & flight paths
5	Breeding & Spawning grounds	None within Study area

Source: ABC Techno Labs India Pvt. Ltd.

3.16.6 AQUATIC ECOLOGY

An essential pre requisite for thesuccessful solution to these problems is to evaluate ecological impacts from thebaseline information and undertake effective management plan. So the objective ofaquatic ecological study may be outlined as follows:

- To characterize water bodies like fresh waters;
- To understand their present biological status;
- To characterize water bodies with the help of biota;
- To understand the impact of industrial and urbanization activities; and
- To suggest recommendations to counter adverse impacts, if any on theecosystem.

To meet these objectives following methods were followed:

- Generating data by actual field sampling and analysis in these areas through field visits during study period; and
- Discussion with local people to get the information for aquatic plants and aquatic animals.

A number of samples were investigated for enumeration of aquatic fauna. In order to study aquatic flora and faunal life one time survey was conducted during the summer season. Major component of the aquatic life under the study area are listed below.

- *Aquatic macrophytes*
- *Phytoplankton and zooplankton*
- *Aquatic vertebrates like fish, amphibians etc.*

To assess the planktonic profile of Phytoplankton and Zooplankton, 2 water samples from Banas River, Narmada Main Canal were collected at sub surface level. The aquatic ecological study was conducted in different water bodies of the study area and the flora and fauna was recorded.

- **Macrophytes**

The following macrophytes observed within the study area:

Sl.No.	Scientific name	Common name	Type
1	*Eichhornia crassipes*	Common water hyacinth	Free floating hydrophytes
2	*Lemna sp.*	Common duckweed	Free floating hydrophytes
3	*Vallisneria spiralis*	Tapegrass	Submerged hydrophytes
4	*Ceratophyllum sp*	Hornwort	Submerged hydrophytes
5	*Nymphaea pubescens*	Pink Water Lily	Floating hydrophytes
6	*Nelumbo nucifera*	Lotus	Floating hydrophytes

Sl.No.	Scientific name	Common name	Type
7	*Typha angustifolia*	Lesser Bulrush	Emergent hydrophytes
8	*Sagittaria sp*	Bulltongue arrowhead	Emergent hydrophytes
9	*Ipomea aquatica*	Water Morning Glory	Marshy amphibious hydrophytes
10	*Najas indica*	Waternymph	Submerged hydrophytes
11	*Marsilea minuta*	Dwarf Water Clover	Marshy amphibious hydrophytes
12	*Pistia stratiotes*	Water lettuce	Free floating hydrophytes
13	*Azolla pinnata*	Mosquito Fern	Free floating pterophyte
14	*Potamogeton crispus*	Curled pondweed	Submerged hydrophytes

Source: ABC Techno Labs India Pvt. Ltd.

- **Phytoplankton and Zooplankton**

Planktons can be broadly grouped into two categories those with plant origin are called 'Phytoplankton' and those with animal origin are called 'Zooplankton'.

A. Phytoplankton

Phytoplanktons are the major primary producers of organic matter in the aquatic ecosystem and especially oceans whose 90% productivity is from the planktons. Phytoplankton samples were collected without filtering the water. To preserve, 0.3 mL lugol's solution was added to 100 ml sample. Subsequently phytoplankton were concentrated by centrifugation and analysed microscopically in laboratory. Identification of phytoplankton was done using standard taxonomic keys.

The Lackey Drop (microtransect) method (Lackey 1938) is a simple method for obtaining counts of considerable accuracy (APHA 2012).

Chemicals/reagents used: Lugol's iodine

Equipments used: Centrifuge tubes of 15ml capacity, cover slips, glass slides, dropper, plastic bottles (100 ml capacity)

Instruments used: Centrifuge and Microscope.

Table 3.25: Phytoplankton Species

Sl.No	Phytoplankton	Family
1	*Navicula sp.*	*Bacillariophyceae*
2	*Melosira sp.*	
3	*Cyclotella sp.*	
4	*Synedra sp.*	
5	*Fragillaria sp.*	
6	*Nitzschia sp.*	
7	*Gomphonema sp.*	
8	*Merismopedia sp.*	*Cyanophyceae*
9	*Spirulina sp.*	

Sl.No	Phytoplankton	Family
10	*Anabaena sp.*	
11	*Oscillatoria sp.*	
12	*Anacystis sp.*	
13	*Spirulina sp.*	
14	*Scenedesmus quadricauda*	*Chlorophyceae*
15	*Ankistrdesmus sp.*	
16	*Chlorella Vulgaris*	
17	*Chlorococcum sp.*	
18	*Cosmerium sp.*	
19	*Ankistrodesmus sp.*	
20	*Oocystis sp.*	
21	*Euglena sp.*	*Euglenophyceae*

Source: ABC Techno Labs India Pvt. Ltd.

B. Zooplankton

The significance of zooplanktons is found in their role in transferring biological production from phytoplankton to larger organisms in the food web. Sample collection was carried out in the similar method as that of phytoplankton. The result of the zooplankton analysis is tabulated in table 3.26.

Table 3.26: Zooplankton Species

Sl.No	Phytoplankton	Family
1	*Nauplius larvae*	*Copepoda*
2	*Cyclops sp.*	
3	*Diaptomus sp.*	
4	*Brachionus calyciflorus*	*Rotifera*
5	*Brachionus angularis*	
6	*Keratella cochlearis*	
7	*Tricocerca sp.*	
8	*Filinia sp.*	
9	*Ceriodaphnia sp.*	*Cladocera*

Source: ABC Techno Labs India Pvt. Ltd.

❑ Fish Species

The following fish species reported within the study area:

Sl.No.	Scientific name	Common name
1	*Labeo rohita*	Rohu
2	*Pethia ticto*	Ticto Barb
3	*Cirrhina mrigale*	Mrigel
4	*Puntius sophore*	Swamp Barb
5	*Mystus tengara*	Tangra
6	*Channa punctata*	Spotted Snakehead
7	*Clarius batrachus*	Magur

Sl.No.	Scientific name	Common name
8	*Heteropheustis fossilis*	Singi
9	*Ophicephalus punctatus*	Lata
10	*Labeo bata*	Bata
11	*Catla Catla*	Catla

- **Benthos**

The following Benthos species observed within the study area:

Sl. No.	Groups	Types
1	Polychaetes	Macrobenthos
2	Gastropods	Macrobenthos
3	Bivalves	Macrobenthos
4	Amphipods	Macrobenthos
5	Copepods	Macrobenthos
6	Crustacean eggs	Macrobenthos
1	Nematodes	Meiobenthos
2	Polychaetes	Meiobenthos
3	Turbellaria	Meiobenthos
4	Copepods	Meiobenthos
5	Amphipods	Meiobenthos
6	Foramniferans	Meiobenthos
7	Ostracods	Meiobenthos

Source: ABC Techno Labs India Pvt. Ltd.

3.16.7 ENVIRONMENTAL SENSITIVITY

The proposed block is well connected by road through road and by rail network. The CB- ONHP-2017/10 block located a Banaskantha District of Gujarat & Jalore District of Rajasthan.

- ✓ **National Parks and Wild Life Sanctuaries**

There is no Reserve Forest found around 10 Km surrounding of the block.

There is no National Parks/wildlife sanctuary present within 10 Km surrounding of the block.

- ✓ **Rivers and Streams**

Banas River, Rel and Luni river, Narmada main Canal & Sujalam Sufalam flowing through the block along with network of canals. There are several medium lakes observed within block area.

3.17 SOCIOECONOMIC ENVIRONMENT

Any developmental project of any magnitude will have a bearing on the living conditions and on the economic base of the population in particular and the region as a whole. Similarly, the proposed project activities will have its share of socio-economic influence in the study area. The section delineates the overall appraisal of society relevant attributes. The data collection for evaluation of the impact of the proposed exploratory drilling within CB-ONHP-2017/10 block on socioeconomic aspects in the study area has been done through a primary household survey and through the analysis of secondary data available for the study area.

3.17.1 METHODOLOGY

The methodology adopted in the assessment of socio-economic condition in the study area is as given below:

- The primary data on socioeconomic profile was collected through site observation, interviews with the key-informants and group discussions in the selected villages. Pradhan of Gram Panchayat, respondent (male-female) and school teachers were interviewed and also stakeholder consultations conducted for the collection of socio-economic baseline information during the site visit by ABC team. The secondary data includes demographic profile, and employment pattern have been sourced from Primary Census Abstract-2011 of Gujarat and Rajasthan and Infrastructure resource base has been extracted from District Census Handbook; Census of India, 2011. (http://www.censusindia.gov.in/2011census/dchb/DCHB.html)
- The socio-economic survey pertaining to the subjective analysis of the socio-economic indicators was carried in habitation/villages within block area.
- The survey focused on these selected villages with aimed to collect relevant information for understanding the perception of the local inhabitants and affected people about the proposed exploratory drilling of wells activities as these villages are located in close vicinity of CB-ONHP-2017/10 Block.

3.17.2 SOURCES OF INFORMATION

As per the scope of this study, the information on socio-economic aspects has been gathered and compiled from several secondary sources. These include Taluk Office, Collectorate, Agriculture Department, Irrigation Department, Central Ground Water Board, Directorate of Census Operation, Gujarat & Rajasthan etc. The demographic data have mainly been compiled from the Census of India 2011. The socio-economic details are briefly described in the following sections. This section includes the present status of the Socio-Economic Environment in the study area. To determine the baseline socio-economic pattern, at and around the project site, the required data have been obtained from the published data. Socio-economic baseline data were collected for the following indicators:

- Demographic Structure
- Economic Structure
- Availability of Basic Amenities

The major demographic and economic structure of the study area are classified into the population, literacy rate and workers details.

3.17.3 SOCIO-ECONOMIC STRUCTURE

The demographic the study area was derived primarily from data of Census record of Banaskantha, covering one districts and Four taluka of Gujarat state and Jalor covering one districts and three taluka of Rajasthan state. The Demographic structures of each village in the study area as per Census 2011 are presented in Table 3.27.

Table 3.27: Summary of Demographic Structure in Study Area

Sl. No	Demographic Parameters	Study Area Details
1.	No. of State	2 (Gujarat & Rajasthan)
2.	No. of District	2
3.	No. of Taluka	7
4.	No. of Total Villages	67
5.	Total No. of Households	24712
6.	Total Population	152234
7.	Density of Population (sq.km)	228
8.	Sex ratio (No. of female/1000 males)	926
9.	Scheduled castes	2016 (13.54%)
10.	Scheduled Tribes	5383 (3.54%)
11.	Literate	73108 (48.02%)
11.	Total Illiterate	79126 (51.98%)
12.	Total Worker	69843 (45.88%)
13.	Non Worker	82391(54.12%)

Source: ABC Techno Labs India Pvt. Ltd.

The salient features of Socio-economic Profile are as follows:

A. Demographic Structure

- The study area covers the two districts Banaskantha and Jalor in Gujarat and Rajasthan state respectively. There are total 7 talukas and total 67 villages within the study area. Total study area consisting of 66850 Ha with the population density of 228 Person/sq.km.

- Total population in the study region (as per Census 2011) is 152234 with 79058 male and 73176 female populations. Overall sex ratio is 926 Female per 1000 male, indicating male population is marginally higher in the region as compared with the female.
- Out of the total population, Scheduled Caste and Scheduled Tribe are 20616 (13.54%) and 5383 (3.54%) respectively.

B. Educational Structure

- The literacy rate of the total population is worked out to 73108 (48.02%). Male literacy 47612 (65.13%), and female literacy is 25496 (34.87%).

C. Occupational Pattern

- The total population of main worker, marginal worker and non-worker category are 53003 (34.82%), 16840 (11.06%) and 82391 (54.12%) respectively.
- The majority patterns of the cultivator worker and main other worker 32662 (61.62%) and is 10675 (20.14%). There are 8999 (16.98%) and 667 (1.26%) as agriculture worker and household worker.

3.17.4 INFRASTRUCTURE RESOURCES

Gujarat & Rajasthan state is under the developmental process. The infrastructure resources in the study area with reference to education, medical facility, water supply, post, transportation, communication and power supply are satisfactory.

❑ **Education Facilities**

Literacy rate found to be quite encouraging within the study areaas that education level inthe villages is comparatively good, i.e. more than 48.02% people are literate. Primary education and high schools are available within the villages. Government is putting up many efforts to promote primary education. In the villages, mindset of people have been changed compare to past, parents are taking interest in their children education. Due to better transport facilities within the study area students have opportunity to travel to Banaskantha and Jalor for better education.

❑ **Health Facilities**

Very few villages in the study area are having medical facilities. While conducting surveys, within this area some villages have Health facility like; Sub center, praimary health center, petha aarogya kendra and some villages have private clinic, for better medical treatment, most of the people move to nearby town and district of Banaskantha (Gujarat) and Jalor (Rajasthan) where medical facilities are available.

No major diseases were reported by local people in the study area except routine cough, cold and fever etc. Local people mentioned about the lack of equipments, infrastructure and poor coverage of the existing health services.The PHCs in the study area are lack of basic equipments and trained staffs and hence people are expecting health infrastructure with adequate staff.

- **Sanitation and Drinking water facilities**

One of the most important factors responsible for the emergence of a settlement is availability of water. In surveyed all villages, it was found that people are using Tap water, tank, tubewell, Reverse Osmosis (RO) water for drinking purposes; however, pond water also used for other purpose. Some villages have drinking water problem due to saline water which was reported during survey.

During the field study and interaction with local people, it is observed that sanitation is very poor in nearby villages. Government has launched the scheme for sanitation and provide subsidy for toilet construction, but still they are not ready to build toilets at home. From the data we can say that there is good facility of the drinking water in all the study villages. Awareness level about sanitation is very low despite government subsidy to construct toilets.

- **Power Supply**

Electricity is available in all the surveyed villages. During the survey it was found that there is frequent load shedding. Electricity use in the study area is for all purposes.

- **Communication and Transportation**

Almost all the villages have good road facility in the study area and some villages have kachha road. It was observed that bus services are limited and available on state and national highway. Regular local transport facilities are available in the villages. Some villages have sub post office facilities.

3.17.5 LIVELIHOOD IN THE LOCAL VILLAGES

During survey and interaction with local people it was revealed that majority of people are engaged as agricultural works, small business etc. as a source of livelihood. Most of the farmers are taking about crops (Rice, groundnut, eranda, Pearl Millet, maize, wheat, tobacco and soyabean). Castor and cotton plantation were also observed and practiced by small farmers. Proposed study area does not involve any major place with religious, archaeological and historical importance.

3.17.6 COMMUNITY PERCEPTION

Field survey and observations is made at each sampling villages and the quality of life of that region is studied. Visits are made at hospitals, primary health centres and sub-centres to know the health status of the region. Various governmental organizations such as statistical department, department of census operations are visited to collect the population details of that region. An attempt has been made to know the awareness and opinion of the people about proposed project.

- Almost villages having Gram panchyat and some villages having group grampanchayat.
- All villages are having Anganwadi facilities.
- The survey reported that most of the villages have primary and middle school facility, for further education student have to go about 3 to 25 km away. Maximum educational level of the study area is up to 10th standard. In the study area observed that most of student choose English medium for education .For higher & technical education people have to go to Taluka place and District place.
- Communication facilities are very good; people are using mobile phone. Dish TV are also available in the study area.
- A road approach is mainly pakka road. Road construction is very good. Each and every village connects to the pakka (main) road. For travelling purpose government bus service and auto are sources available for villagers in this region.
- They are unaware about the pollution generation from these project activities.
- People within the study area expecting better supply of drinking water, road infrastructure development and primarily job opportunities.
- Due to lack of health infrastructure, people have to travel to Banaskantha or Jalore. They expect betterment of the local clinins or primary health Centres and availability of doctors.
- Hindi is the official language in Jalore, Churu and Karauli in Rajasthan. But people known Rajasthani marwadi and few people know English, because day by day increasing English medium educational facility.

Plate No. 1.1: Discussion with villagers

Plate No. 1.2: Discussion with villagers

Plate No. 1.3: Discussion with villagers

Plate No. 1.4: Discussion with villagers

Plate No. 1.5: Discussion with villagers

Plate No. 1.6: Discussion with villagers

Source: ABC Techno Labs India Pvt. Ltd.

CHAPTER 4: ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

4.1 INTRODUCTION

The anticipated impacts of the proposed project activities on the environment have been evaluated and predicted based on the information collected at the site and the information provided by the Vedanta Limited (Division: Cairn Oil & Gas).

Actual and foreseeable events, including operational and typical events are discussed in this chapter. Processes that may create risk to the environment are considered and are analyzed in terms of key potential environmental impacts.

No such impact is anticipated during site preparation and operation phases of proposed project activities which would create an impact on the environment in two distinct phases:

- During the site preparation phase as temporary or short-term;
- During the operational phase which would have long-term effects during the life cycle of the project.

The site preparation and operation phases of the proposed project activities which have been considered to assess the impact on one or other environmental parameters as follows.

- ✓ Topography,
- ✓ Land Use Pattern,
- ✓ Air Quality,
- ✓ Noise Levels,
- ✓ Water Resources and Quality,
- ✓ Soil,
- ✓ Road and Traffic,
- ✓ Biological environment,
- ✓ Occupational Health & Safety
- ✓ Community Health & Safety

The main procedural steps of environmental impact assessment can be summarized as follows:

4.2 IDENTIFICATION

This involves identification of the major project activities, environmental attributes, the impacts of the activities on the environmental attributes and formulation of 'activity-impact' matrix.

The impact of proposed project activities on each environmental attribute was assessed. The operation phase considered to identify the possible impacts due to Exploration and Appraisal activities and testing of hydrcarbons. The matrix method has been chosen to list the potential impacts of the proposed project activities. The activities have been arranged in columns and the environmental attributes in the row of the matrix. The beneficial and adverse impacts have been analyzed in the following section on prediction and evaluation of impacts

4.3 PREDICTION

This involves prediction of the nature, magnitude and significance of the impacts. It also includes analysis of the possibilities and/or probabilities of occurrences of the impacts. The matrix establishes 'Cause-effect' relationship between the project activities and the environmental factors responsible for them as shown in Table 4.1.

Table 4.1: Impact Prediction Matrix for proposed project activities

Activities	Air	Noise	Traffic	Topography & Drainage	Land use	Surface Water	Ground Water	Soil	Ecology & Biodiversity	Loss of livelihood	Disruption on infrastructure	Job Opportunities	Common Property Resources	Loss of crop/agriculture	Population influx	Occupational Health & Safety	Community Health & Safety	Aesthetics
Pre Drilling activities																		
Site selection and land acquisition			✓		✓					✓			✓					
Site preparation	✓	✓						✓	✓					✓		✓		✓
Well site & access road widening/strenghting	✓	✓	✓		✓											✓	✓	✓
Sourcing & transportation of borrow material etc	✓	✓	✓					✓	✓		✓	✓				✓	✓	✓
Storage and handling of construction waste	✓															✓		✓
Transportation of drilling rig and ancillaries	✓	✓	✓								✓					✓	✓	
Operation of DG sets	✓	✓																
Consumption of water for construction & domestic use for workers							✓						✓					
Generation of domestic solid waste & disposal							✓	✓									✓	✓
Generation of waste water & discharge from construction activity & worker camp						✓	✓										✓	

Activities	Air	Noise	Traffic	Topography & Drainage	Land use	Surface Water	Ground Water	Soil	Ecology & Biodiversity	Loss of livelihood	Disruption on infrastructure	Job Opportunities	Common Property Resources	Loss of crop/agriculture	Population influx	Occupational Health & Safety	Community Health & Safety	Aesthetics
Surface run-off from construction site						✓	✓	✓					✓					
Drilling & Testing																		
Physical Presence of drill site	✓																✓	✓
Operation of DG sets and machinery	✓	✓														✓		
Operation of drilling rig																✓		
Storage and disposal of drill cuttings and mud	✓					✓	✓	✓										✓
Generation of process waste water & discharge						✓												
Surface run-off from drill site							✓	✓										
Generation of domestic waste water & discharge							✓	✓										
Generation of Municipal waste & disposal	✓						✓	✓										✓
Workforce engagement & accommodation at drill site												✓	✓		✓		✓	
Flaring during testing	✓	✓														✓	✓	
Blow out	✓					✓	✓	✓	✓							✓	✓	

Activities	Air	Noise	Traffic	Topography & Drainage	Land use	Surface Water	Ground Water	Soil	Ecology & Biodiversity	Loss of livelihood	Disruption on infrastructure	Job Opportunities	Common Property Resources	Loss of crop/agriculture	Population influx	Occupational Health & Safety	Community Health & Safety	Aesthetics
Spillage of chemical & oil						✓	✓	✓								✓	✓	
Operation of EPU/QPU																		
Operation of EPU/QPU																		
GEG/ DG set emission	✓	✓																
Flaring of Gas	✓	✓														✓		
Produced Water						✓		✓										
Decommissioning and Reinstatement																		
Dismantling of rig and associated facilities	✓	✓														✓	✓	
Transportation of drilling rig and ancillaries	✓	✓	✓														✓	
Removal of well site construction materials & disposal	✓	✓						✓										

Source: ABC Techno Labs India Pvt. Ltd.

4.4 EVALUATION

The significance of each impact is determined by assessing the impact severity against the likelihood of the impact occurring as summarized in the impact significance assessment matrix provided below in Table 4.2.

Table 4.2: Impact Rating Assessment Matrix

Impact Severity	Impact Likelihood			
	Unlikely (e.g. Not expected to occur during project lifetime)	**Low Likelihood (e.g. may occur once or twice during project lifetime)**	**Medium Likelihood (e.g. may occur every few year)**	**High Likelihood (e.g. Routine, happens several times a year)**
Slight	Negligible Impact	Negligible Impact	Negligible Impact	Negligible Impact
Low	Negligible Impact	Negligible Impact	Negligible to Minor Impact	Minor Impact
Medium	Negligible Impact	Minor Impact	Minor–Moderate Impact	Moderate Impact
High	Minor Impact	Moderate Impact	Major Impact	Major Impact

Notes:

Negligible Impact : Defined as magnitude of change comparable to natural variation
Minor Impact : Defined as detectable but not significant
Moderate Impact : Defined as insignificant; amenable to mitigation; should be mitigated where practicable
Major Impact : Defined as significant; amenable to mitigation; must be mitigated

All the potentially significant environmental impacts are evaluated and a qualitative assessment is made. An impact level is rated as "Slight", "Low", "Medium" or "High". The impact rating is based on two parameters i.e. the "severity of impact" and the "likelihood of occurrence of impact".

- *Severity of Impact: The severity of an impact is a function of a range of considerations including impact magnitude, impact duration, impact extent, compliance of prescribed legal framework and the characteristics of the receptors/ resources; and*
- *Likelihood of Occurrence: How likely is the impact (this is particularly important consideration in the evaluation of unplanned/ accidental events)*

4.5 IMPACTS/RISKS ASSESSMENT

The assessment of impacts in this section is confined within CB-ONHP-2017/10 block only. The drilling sites will contain all equipment, storage, workshops, etc. using distances between various rig components in line with existing rules and regulations for the area of operation and the hazardous area drawing of the drilling rig.

Drilling operation basically involves two steps; first – drilling of exploratory wells and second – appraisal of well in addition to discharges of air emissions, waste water and solid wastes. It is however important to remember that operations related to Exploration and Appraisal well drilling, testing and early production activities also include positive socioeconomic impacts in terms of increase in local business opportunities and on a larger perspective, by providing potential energy security at a national level. During drilling and during operation of EPU/QPU, the well site shall be unmanned and cordoned off adequately. One guard shall be stationed to ensure restricted entry. Impacts on various aspects are described below.

4.6 IMPACT ON TOPOGRAPHY

4.6.1 TOPOGRAPHY AND DRAINAGE

Potential impact on drainage and topography viz. alteration of drainage pattern and water logging are anticipated during well site preparation, widening/strengthening of access roads and restoration of exploratory well facilities.

- **Impacts during road & site development**

There would be slight change in topography at the drill site as it will be elevated from ground level to avoid storm water accumulation. The study area has flat terrain and is almost devoid of approach roads with elevations vary from 80m to 160m above MSL. There would be minor changes in the natural drainage pattern at immediate vicinity of the well site. This impact would be substantially further reduced as the identification of wells sites would consider local drainage patterns in the area. Additionally the grading of the drilling site will be done keeping in mind that the existing aerial drainage flow pattern of the well site location. As drilling is a single point activity at each well location there will not be any change in sub-soil drainage patterns. The remaining land will be restored to its original state by laying topsoil.

Unplanned restoration may lead to the long term disruption in natural drainage pattern and water logging in neighbouring agricultural land abutting the site. The land has to be restored taking into consideration the originally existing contours and pre-dominant slope. The impact is considered to be of low significance as onsite drainage will be taken care of during site restoration.

EPU/QPU

The major impacts arising out of site preparation and set up of EPU/QPU is alteration of local topography. The raising of the height of the construction site above the surrounding land may lead to water logging of the adjacent land or disrupt the existing drainage pattern. A storm water drain will be built at the periphery of the EPU/QPU to contain the site drainage during excessive rain.

Mitigation Measure

- ✓ Disruption/alteration of micro-watershed drainage pattern will be minimized to the extent possible.
- ✓ Leveling and grading operations will be undertaken with minimal disturbance to the existing contour, thereby maintaining the general slope of site;
- ✓ Loss of micro-watershed drainage, if any, is to be compensated through provision of alternate drainage.
- ✓ Provision of drainage system will be made for surface run-off.
- ✓ Proper engineering control must be employed as mitigation measures so that the flow and the course of the stream are not altered.

Hence, the impact on the Topography & Drainage pattern of the exploratory drilling activities are as per given below.

Impact Rating	Topography & Drainage pattern
Significance and Nature of impact	Negligible and Adverse
Duration of impact	Long term
Impacted Area	Localized
Severity of impact	Slight

4.6.2 Land Use Pattern

- ❑ **Site preparation and road construction/strengthening**

Potential impact on drainage is primarily anticipated in the form of disruption of natural drainage pattern during site preparation and approach road construction. Since site preparation involves rising of acquired land to about 2m from the ground level it may lead to alteration of onsite micro-drainage pattern leading to potential problems of obstruction of natural flow of water.

The access to majority of the drill sites in CB-ONHP-2017/10 block is characterized by paved and unpaved rural roads. Well specific environmental setting study shows that most of the wells can be approached by an existing road. However, for site approach a road need to be constructed. Widening and strengthening of existing paved/unpaved road will be required for transportation of drilling rig to the well site. Widening/ new construction of roads could result in the alteration of drainage unless proper cross drainage structures are provided and may lead to water-logging of adjacent lands.

- **Exploration and Appraisal and Testing**

Approximately 9.0 ha of land for Exploratory Drilling of each well would be impacted within the CB-ONHP-2017/10 block. For the preparation of suitable access roads connecting to well pads, accommodating OHL and other utilities in future, a width of 30m (approx.) RoU will be required. The land to be acquired for well site will be on temporary short term lease basis.

Drilling rig activities will result in disturbance and compaction of soils around the drilling rig due to equipment, vehicles. Access roads to the drilling sites will also impact top soils. The total loss of soils as a result of exploratory drilling with probably will be in the order of 2-3 ha for each well, depending on the length of access road required to access each site.

- **Well Site Restoration**

Site restoration will be initiated for well site not indicative of any commercially exploitable hydrocarbon reserves. Unplanned restoration may lead to the long-term disruption in natural drainage pattern and water logging in neighbouring agricultural land abutting the site. However, adequate care will be taken by Vedanta Limited (Division: Cairn Oil & Gas) to restore the site back to its original condition based on the originally existing contours and predominant slope to prevent any such adverse drainage impacts. The impact is considered to be of medium significance with onsite drainage being dependent on the proper site restoration.

Mitigation Measures

- ✓ During the construction of the access road adequate cross drainage structures to be provided considering the topography of the alignment. In addition, traditional knowledge about location of micro drainage would also be sought from local people. The bottom level of the cross-drainage structure should be same as the ground level to prevent any backflow/water logging;
- ✓ Leveling and grading operations will be undertaken with minimal disturbance to the existing contour, thereby maintaining the general slope of site;

Hence, the impact on the land use pattern of the study area is as per given below.

Impact Rating	Land Use pattern
Significance and Nature of impact	Negligible and Adverse
Duration of impact	Long term
Impacted Area	Localized
Likelihood of occurrence	Low
Severity of impact	Slight

4.7 IMPACT ON AIR ENVIRONMENT

During exploratory drilling activities, the potential sources of air emissions during the drilling operation would be as follows:

1. ***Pre-drilling phase, set up of early production units:***
   - ✓ Site development;
   - ✓ Operation of vehicles and machinery;
   - ✓ Transportation, storage, handling of site preparation material;
   - ✓ Operation of DG sets.
2. ***Drilling phase:***
   - ✓ Operation of DG sets;
   - ✓ Emissions from flare stack;
   - ✓ Transport of drilling chemical and manpower etc.
3. ***De-commissioning phase:***
   - ✓ Decommissioning of rig and associated facilities;
   - ✓ Transport of de-mobilised rigs and machineries.
4. ***Operation of EPU/QPU facilities***
   - ✓ Emission from DG sets and GEG
   - ✓ Emission from flare stacks

The potential impact due to above mentioned activities has been discussed in below:

Fugitive emission: Fugitive dust emissions due to the proposed project will be principally associated with emissions of dust during the site preparation. The dust generated would be primarily from the handling and transportation of fill material and re-entrainment of dust during movement of the vehicles on unpaved roads. The generation of such fugitive dust is likely to be governed by wind speed and direction. Effects of dust emissions are heightened by dry weather and high wind speeds and effectively reduced to zero when soils and/or ambient conditions are wet. However, dust generated from the site development and site preparation activity will generally settle down on the adjacent areas within a short period due to its larger particle size.

Emissions from Vehicles/Equipment: The pre-drilling and decommissioning operations would involve movement of diesel operated vehicles and operation of machineries and equipment. Heavy vehicles will be particularly intense during site preparation and decommissioning phases. Gaseous pollutants such as NOx, SO_2, PM10 and CO are likely to be emitted from operation of vehicles and machineries.

Impacts from Operation of DG sets and Flaring: There will be three (03) DG sets of capacity 1000 KVA (one standby) each at drilling site OR 2 x 1850 (1 working + 1 standby) Depending on the rig capacity & rig availability during E&A drilling phase and two (02) DG sets of capacity 350 KVA (one standby) at camp site and two (02) DG set at Radio room (one standby) will be installed. The operation of DG sets will therefore result in the generation of air pollutants viz. PM, SOx & NO_2 thereby affecting the ambient air quality. The dispersion of these air pollutants may affect the receptors viz. village settlements located in near vicinity of the well site only under exceptional combination of meteorological conditions. Emissions from DG Set will be continuous throughout the drilling operations.

Flaring of gases primarily during the well testing phase will contribute to additional air pollution. Flaring involves high temperature oxidation process to burn combustible gases that may be generated from the proposed well sites.

Elevated flaring (30m)/Ground Flaring will be done during EPU/QPU. The test flaring will result in temporary emissions of CO_2, water vapours, NOx and other trace gases. It is assumed that the occurrence of SO_2 in the flare gas would be in traces or negligible as gas shall not have H_2S. The pollutants of concerns from DG Sets are NOx, SO_2, CO, CO_2, particulate and un-burnt hydrocarbons. However pollutants such as PM, SO_2 and NOx have been considered for dispersion modeling.

Movement of traffic shall be very minimum as same shall be used only for mobilization of manpower and consumable materials on continuous basis.

- Prediction of the Ground level concentration (GLC) of emissions are made using software of Industrial Sources Complex Short Term model version 3 (ISCST3) approved by Environment Protection Agency (EPA) USA. ISCST3 which is a Gaussian Plume based model and is executed using stability classes developed by Pasquill and Gifford. Following are the assumptions made while using the model:
  - ✓ No dry and wet depletion of pollutants; and

✓ Receptors are on flat terrain with no flagpole.

GLCs are calculated by using meteorological data collected from the meteorological station at site during the monitoring period i.e. from **March 2019 to June 2019 for 13 weeks**. The emission characteristics and other details from DG Set and flaring assumed for the modeling are summarized below in Table 4.3.

Table 4.3: Source and Emission Characteristics for Dispersion Modeling

Emission Sources	Stack Height (m)	Stack dia (m)	Stack Gas Temp. (K)	Stack Gas Velocity m/s	Emission rate (g/s)		
					NO_2	SO_2	PM_{10}
Scenario 1 (During Drilling Process)							
350 KVA DG*	7	0.21	583	14	0.265	-	0.017
350 KVA DG*	7	0.21	583	14	0.265	-	0.017
1000 KVA DG*	10	0.2	673	18	0.687	-	0.043
1000 KVA DG*	10	0.2	673	18	0.687	-	0.043
1000 KVA DG*	10	0.2	673	18	0.687	-	0.043
100 KVA DG*	10	0.305	518	14	0.466	-	0.029
100 KVA DG*	10	0.305	518	14	0.466	-	0.029
Flare Stack	30	0.21	1273	20	0.018	0.063	0.012
Scenario 2 (During operation of EPU/QPU)							
QPU Flare	30	0.21	1273	20	0.018	0.063	0.012
500 KVA DG*	9	0.15	483	14	0.180	-	0.011

**Emission for flare is calculated using Emission Factors as described in US EPA AP42, fifth edition, January 1995.*
Source: ABC Techno Labs India Pvt. Ltd.

Ground Level Concentrations (GLCs) for pollutants as mentioned above have been calculated for following:

✓ An area of 5 km x 5 km with 200m x 200m grids;

❑ Presentation of Results

The predicted ground level concentrations (GLC) were estimated around 442, 882 receptors to obtain an optimum description of variations in concentrations over the site covering 16 directions. The incremental concentrations are estimated for the whole period. The results for SO2, NO2 and PM10 are presented in Table 4.4 & 4.5. The isopleths for SO2, NOx and PM10 concentrations of Banaskantha (Gujarat) and Jalore (Rajasthan) are depicted in Figure 4.1 to 4.12 respectively.

Table 4.4: Resultant Concentrations in Air Quality monitoring locations (S-1)

Receptor	PM10µg/m³			NOx, µg/m³			SO_2, µg/m³		
	Baseline	Predicted	Resultant	Baseline	Predicted	Resultant	Baseline	Predicted	Resultant
AQ1	58.9	0.04	58.94	19.7	0.78	20.48	9.9	0.002	9.902
AQ2	59.4	0.04	59.44	19.4	0.78	20.18	9.7	0.002	9.702
AQ3	59.8	0.04	59.84	19.8	0.78	20.58	9.7	0.002	9.702

Receptor	PM10µg/m³			NOx, µg/m³			SO_2, µg/m³		
	Baseline	Predicted	Resultant	Baseline	Predicted	Resultant	Baseline	Predicted	Resultant
AQ4	59.7	0.02	59.72	19.8	0.45	20.25	9.8	0.002	9.802
AQ5	58.6	0.02	58.62	19.7	0.45	20.15	9.7	0.002	9.702
AQ6	59.6	0.04	59.64	19.8	0.78	20.58	9.6	0.002	9.602
AQ7	59.6	0.04	59.64	19.6	0.78	20.38	9.6	0.002	9.602
AQ8	60.1	0.02	60.12	19.6	0.45	20.05	9.6	0.002	9.602
AQ9	59.6	0.02	59.62	25.3	0.45	25.75	9.8	0.002	9.802
AQ10	59.6	0.02	59.62	19.8	0.45	20.25	9.6	0.002	9.602
AQ11	59.6	0.02	59.62	19.6	0.45	20.05	9.6	0.002	9.602
AQ12	59.3	0.02	59.32	19.6	0.45	20.05	9.6	0.002	9.602
AQ13	59.6	0.02	59.62	19.6	0.45	20.05	9.6	0.002	9.602
AQ14	59.3	0.02	59.32	19.6	0.45	20.05	9.6	0.002	9.602
AAQ15	60.1	0.02	60.12	19.7	0.45	20.15	9.7	0.002	9.702
AAQ16	59.9	0.04	59.94	19.8	0.78	20.58	9.9	0.002	9.902
AAQ17	59.8	0.04	59.84	19.8	0.78	20.58	9.9	0.002	9.902
AAQ18	60.5	0.04	60.54	19.8	0.78	20.58	9.9	0.002	9.902
AAQ19	59.8	0.04	59.84	19.9	0.78	20.68	9.9	0.002	9.902
AAQ20	59.9	0.02	59.92	19.5	0.45	19.95	9.7	0.002	9.702
AAQ21	59.6	0.02	59.62	19.6	0.45	20.05	9.1	0.002	9.102
AAQ22	59.1	0.02	59.12	19.7	0.45	20.15	9.6	0.002	9.602
AAQ23	59.5	0.02	59.52	19.6	0.45	20.05	9.9	0.002	9.902
AAQ24	59.8	0.04	59.84	19.8	0.78	20.58	9.6	0.002	9.602
AAQ25	59.9	0.02	59.92	19.8	0.45	20.25	9.8	0.002	9.802
AAQ26	58.6	0.02	58.62	19.9	0.45	20.35	9.8	0.002	9.802
AAQ27	59.8	0.04	59.84	19.8	0.78	20.58	9.9	0.002	9.902
AAQ28	59.8	0.04	59.84	19.8	0.78	20.58	9.8	0.002	9.802
Max	78.6	0.092	60.09	19.9	1.44	21.34	10	0.001	10.001
NAAQ Standard	**100 µg/m3**			**80 µg/m3**			**80 µg/m3**		

Source: ABC Techno Labs India Pvt. Ltd.

Table 4.5: Resultant Concentrations in Air Quality monitoring locations (S-2)

Receptor	PM10µg/m³			NOx, µg/m³			SO_2, µg/m³		
	Baseline	Predicted	Resultant	Baseline	Predicted	Resultant	Baseline	Predicted	Resultant
AQ1	58.9	0.009	58.909	19.7	0.041	19.741	9.9	0.631	10.531
AQ2	59.4	0.009	59.409	19.4	0.041	19.441	9.7	0.631	10.331
AQ3	59.8	0.009	59.809	19.8	0.041	19.841	9.7	0.631	10.331
AQ4	59.7	0.004	59.704	19.8	0.041	19.841	9.8	0.002	9.802
AQ5	58.6	0.004	58.604	19.7	0.041	19.741	9.7	0.002	9.702
AQ6	59.6	0.009	59.609	19.8	0.041	19.841	9.6	0.631	10.231
AQ7	59.6	0.009	59.609	19.6	0.041	19.641	9.6	0.631	10.231
AQ8	60.1	0.004	60.104	19.6	0.041	19.641	9.6	0.002	9.602

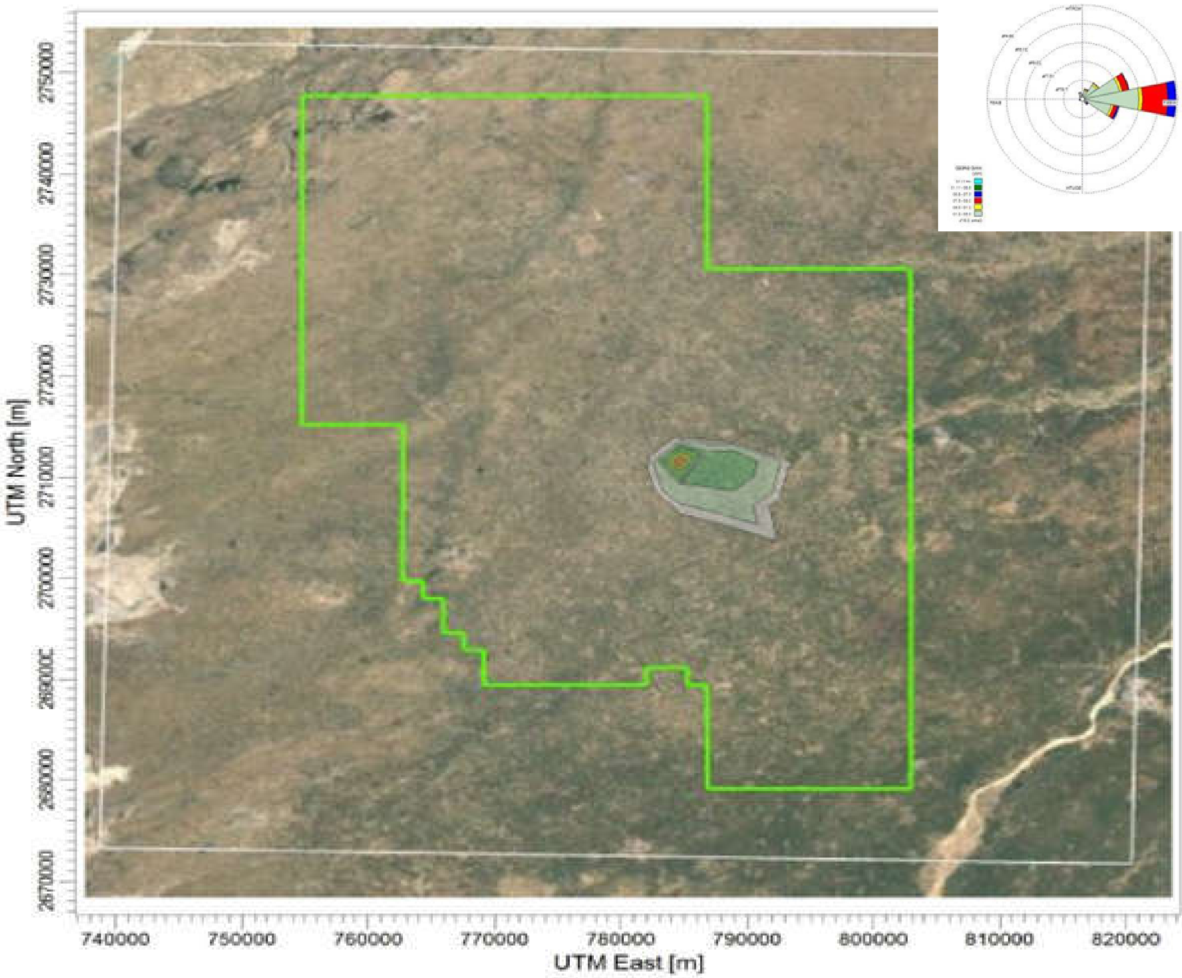
Receptor	PM10µg/m³			NOx, µg/m³			SO_2, µg/m³		
	Baseline	Predicted	Resultant	Baseline	Predicted	Resultant	Baseline	Predicted	Resultant
AQ9	59.6	0.004	59.604	25.3	0.041	25.341	9.8	0.002	9.802
AQ10	59.6	0.004	59.604	19.8	0.041	19.841	9.6	0.002	9.602
AQ11	59.6	0.004	59.604	19.6	0.041	19.641	9.6	0.002	9.602
AQ12	59.3	0.004	59.304	19.6	0.041	19.641	9.6	0.002	9.602
AQ13	59.6	0.004	59.604	19.6	0.041	19.641	9.6	0.002	9.602
AQ14	59.3	0.004	59.304	19.6	0.041	19.641	9.6	0.002	9.602
AAQ15	60.1	0.004	60.104	19.7	0.041	19.741	9.7	0.002	9.702
AAQ16	59.9	0.009	59.909	19.8	0.041	19.841	9.9	0.631	10.531
AAQ17	59.8	0.009	59.809	19.8	0.041	19.81	9.9	0.631	10.531
AAQ18	60.5	0.009	60.509	19.8	0.041	19.81	9.9	0.631	10.531
AAQ19	59.8	0.009	59.809	19.9	0.041	19.941	9.9	0.631	10.531
AAQ20	59.9	0.004	59.904	19.5	0.041	19.541	9.7	0.002	9.702
AAQ21	59.6	0.004	59.604	19.6	0.041	19.641	9.1	0.002	9.102
AAQ22	59.1	0.004	59.104	19.7	0.041	19.741	9.6	0.002	9.602
AAQ23	59.5	0.004	59.504	19.6	0.041	19.641	9.9	0.002	9.902
AAQ24	59.8	0.009	59.809	19.8	0.041	19.841	9.6	0.631	10.231
AAQ25	59.9	0.004	59.904	19.8	0.041	19.841	9.8	0.002	9.802
AAQ26	58.6	0.004	58.604	19.9	0.45	20.35	9.8	0.002	9.802
AAQ27	59.8	0.009	59.809	19.8	0.041	19.841	9.9	0.002	9.802
AAQ28	59.8	0.009	59.809	19.8	0.78	20.58	9.8	0.002	9.802
Max	60.5	0.009	60.509	25.3	0.78	25.341	9.9	9.802	19.602
NAAQ Standard	**100 µg/m3**			**80 µg/m3**			**80 µg/m3**		

Source: ABC Techno Labs India Pvt. Ltd.

The maximum GLCs for SO_2, NOx and PM10 after implementation of the proposed project will be within the prescribed standards for rural and residential areas. However, the maximum GLCs are occurring during test flaring which is for a period of 21 days at each location. Further considering that the maximum GLCs occur which is in the vicinity of the site boundary, no impact on outside environment is envisaged. Based on the above details, it can be inferred that proposed project would have an insignificant impact on the prevailing ambient air quality.

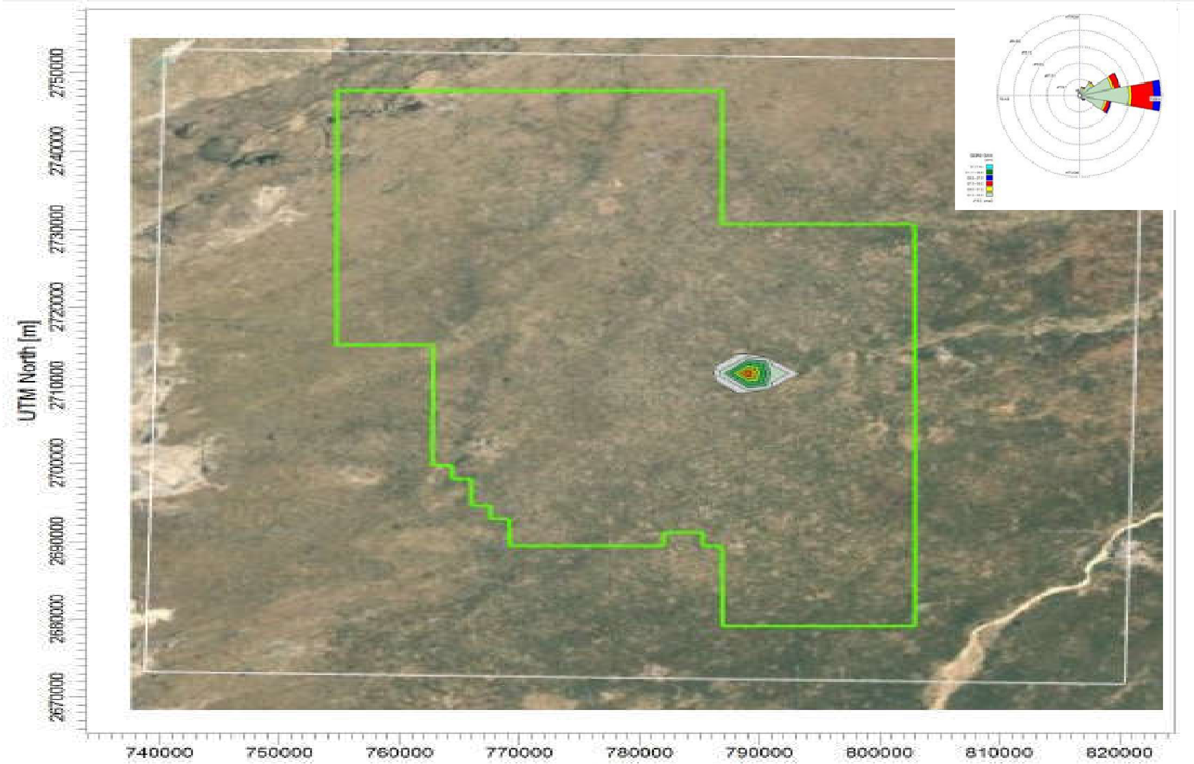
A. Isopleths for Scenario 1 (During Drilling activities)

1. Banaskantha District, Gujarat



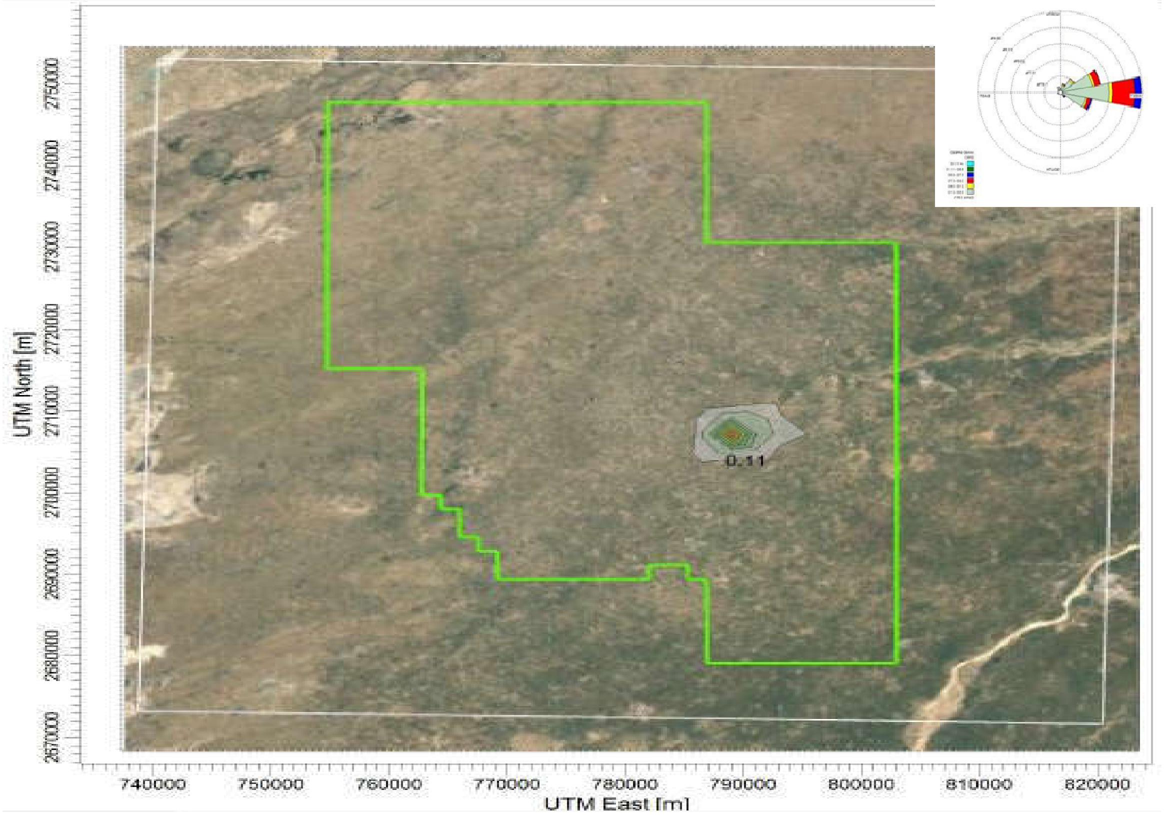
Source: ABC Techno Labs India Pvt. Ltd.

Figure 4.1: Maximum GLC Increase of PM of Banaskantha District, Gujarat (S-1)



Source: ABC Techno Labs India Pvt. Ltd.

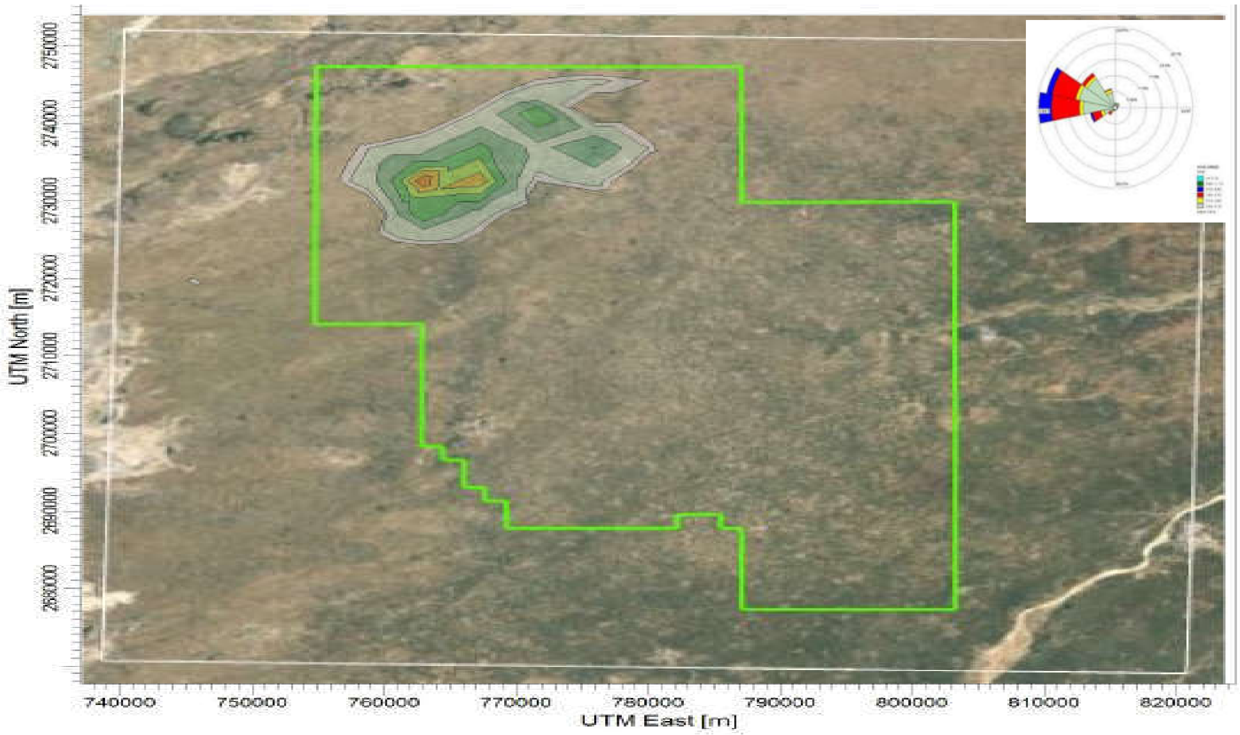
Figure 4.2: Maximum GLC Increase of SO_2 of Banaskantha District, Gujarat (S-1)



Source: ABC Techno Labs India Pvt. Ltd.

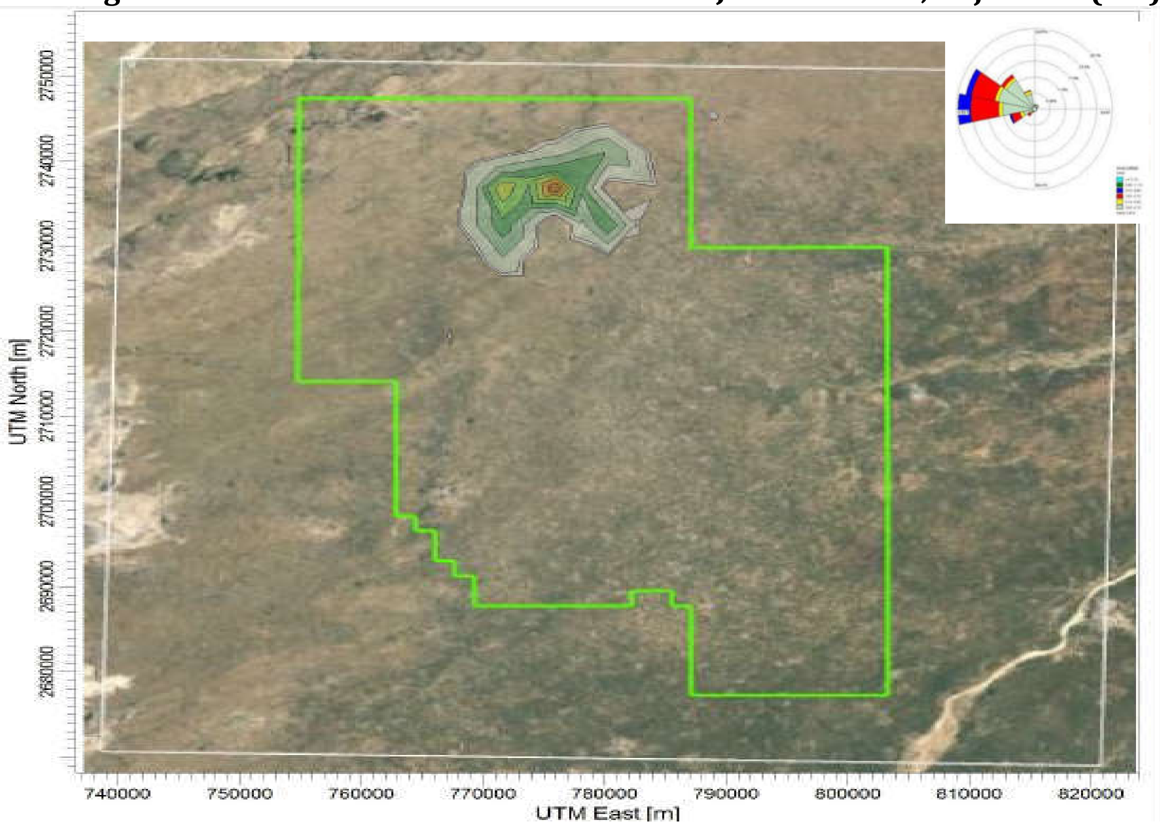
Figure 4.3: Maximum GLC Increase of NOx of Banaskantha District, Gujarat (S-1)

2. Jalore District, Rajasthan



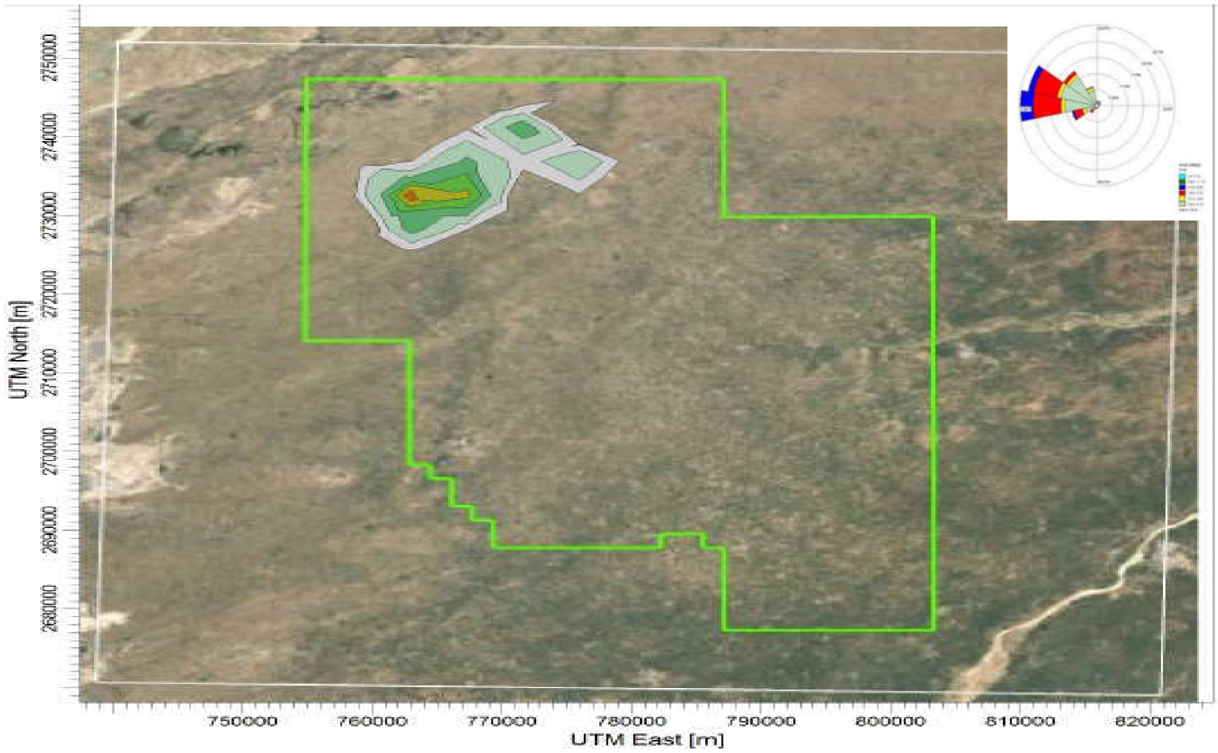
Source: ABC Techno Labs India Pvt. Ltd.

Figure 4.4: Maximum GLC Increase of PM of Jalore District, Rajasthan (S-1)



Source: ABC Techno Labs India Pvt. Ltd.

Figure 4.5: Maximum GLC Increase of SO_2 of Jalore District, Rajasthan (S-1)



Source: ABC Techno Labs India Pvt. Ltd.

Figure 4.6: Maximum GLC Increase of NOx of Jalore District, Rajasthan (S-1)

B. Isopleths for Scenario 2 (During QPU Operation)

1. Bansakantha District Gujarat

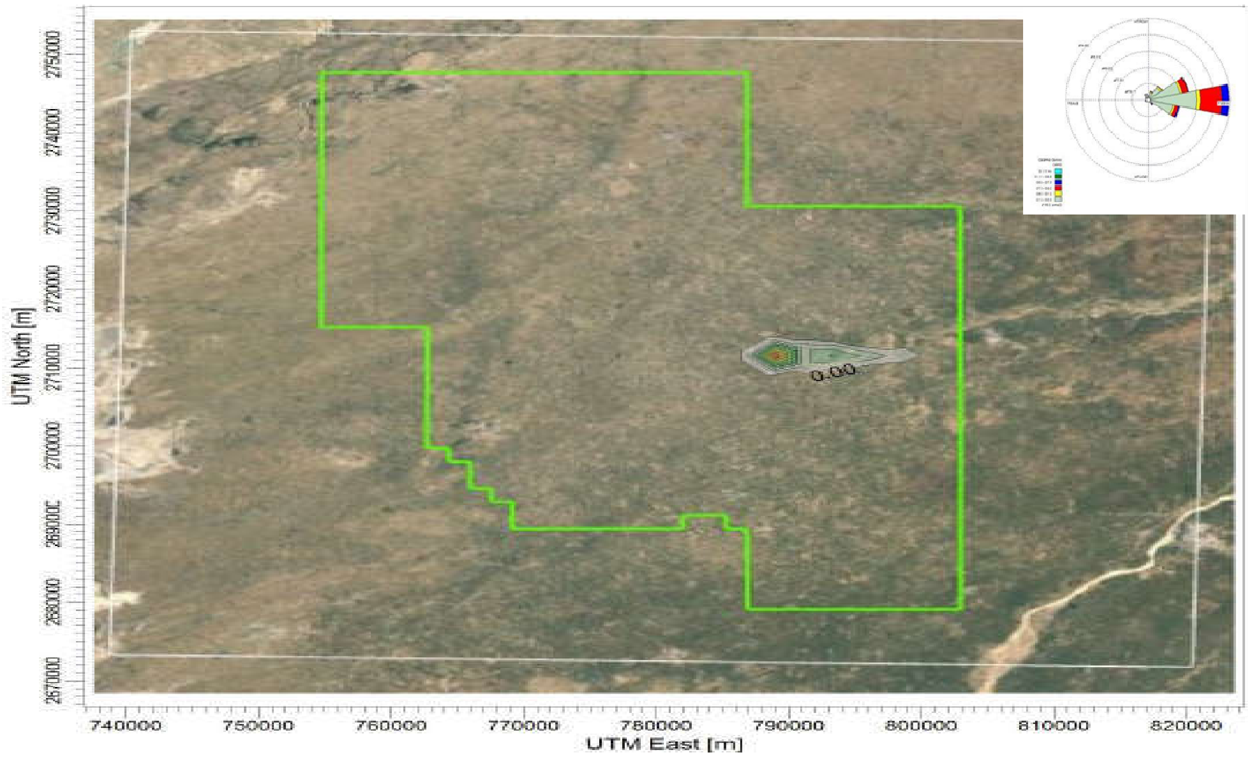


Figure 4.7: GLC Increase of PM of Banaskantha District, Gujarat (S-2)

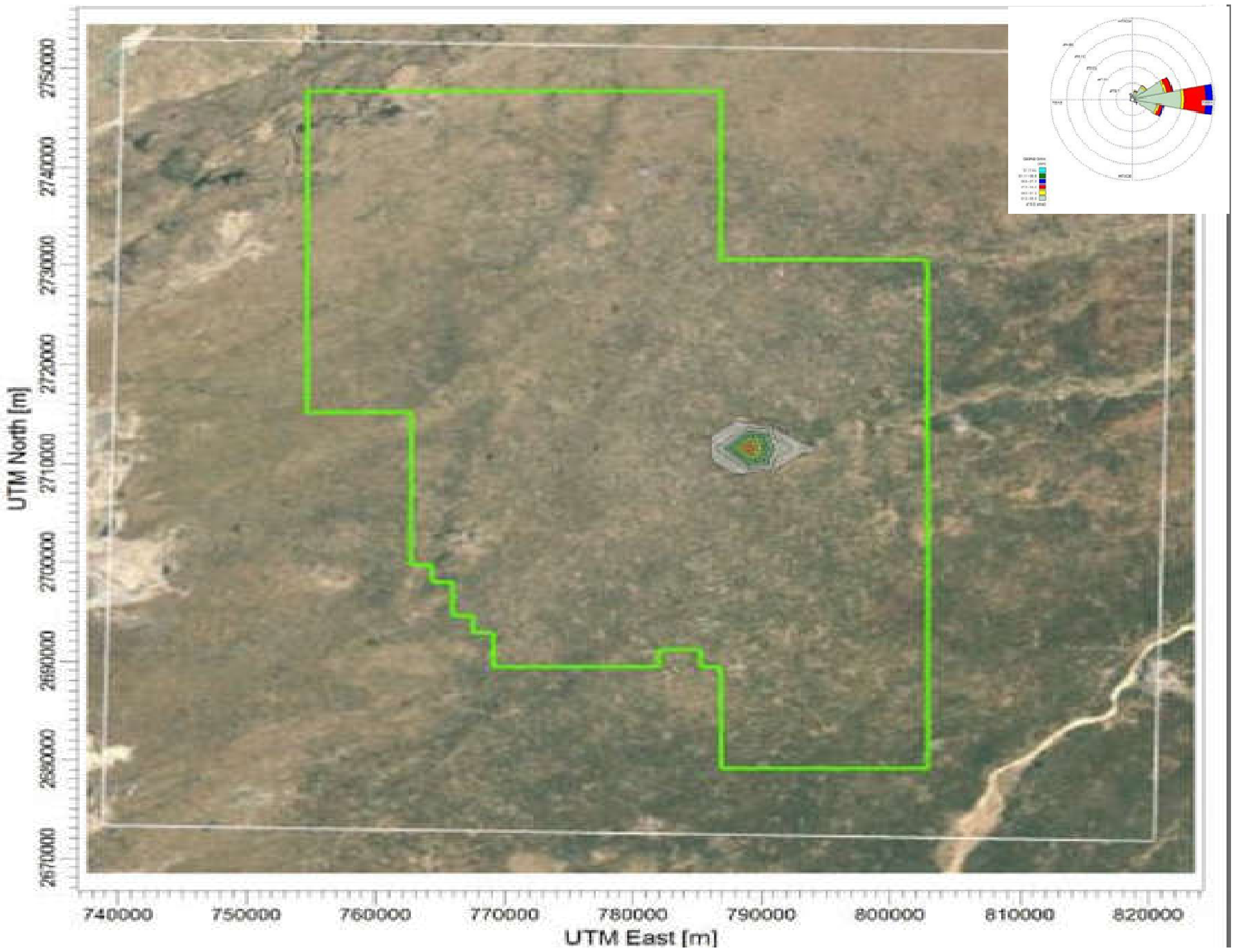


Figure 4.8: GLC Increase of SO_2 of Banaskantha District, Gujarat (S-2)

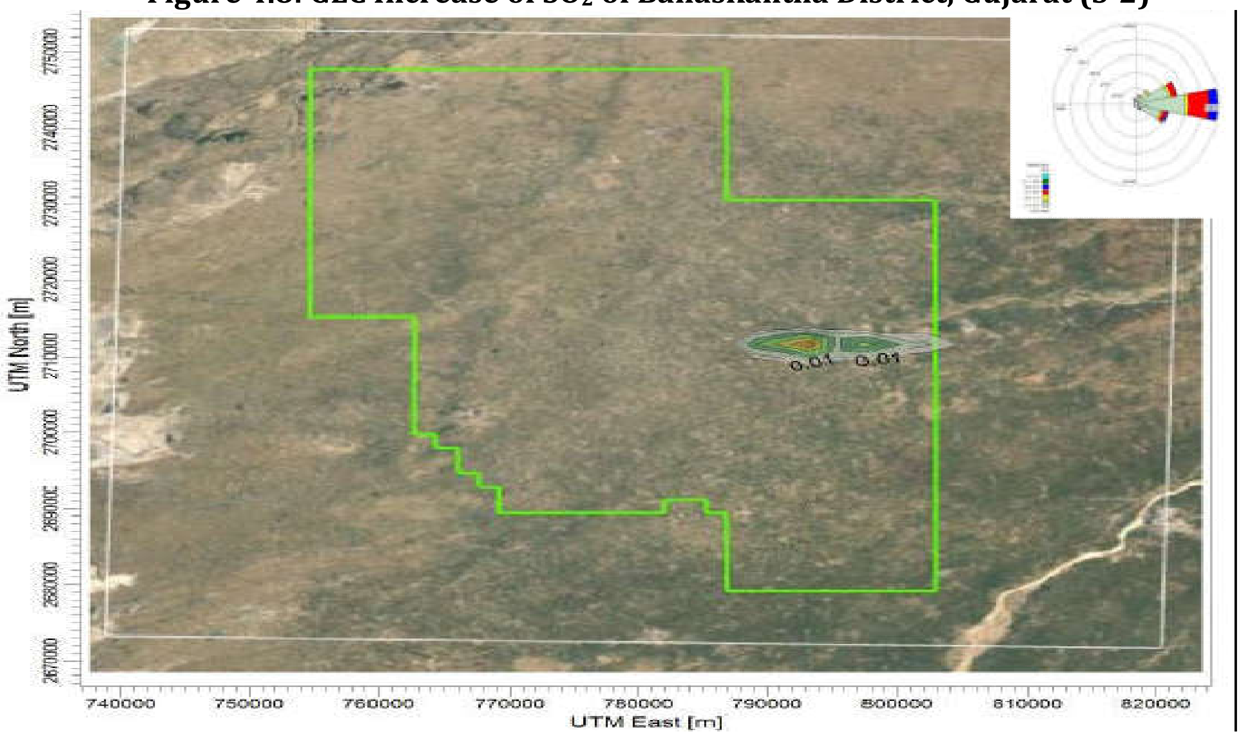
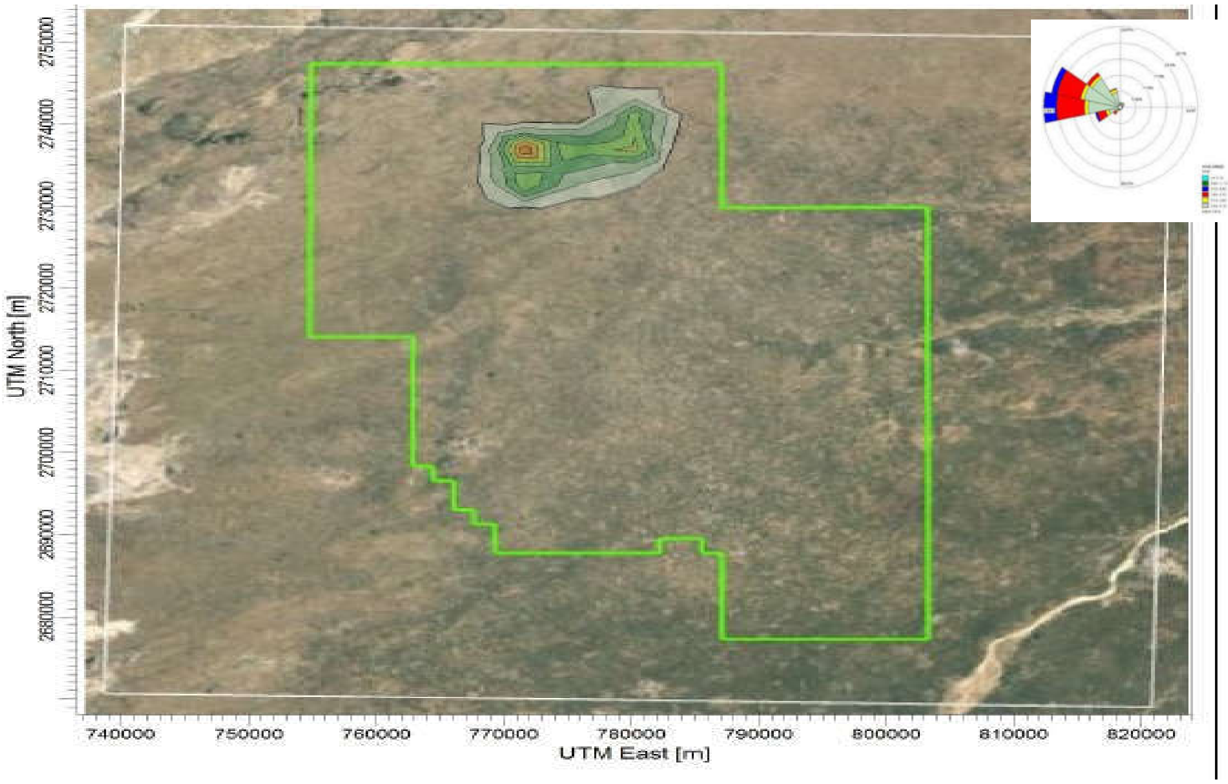


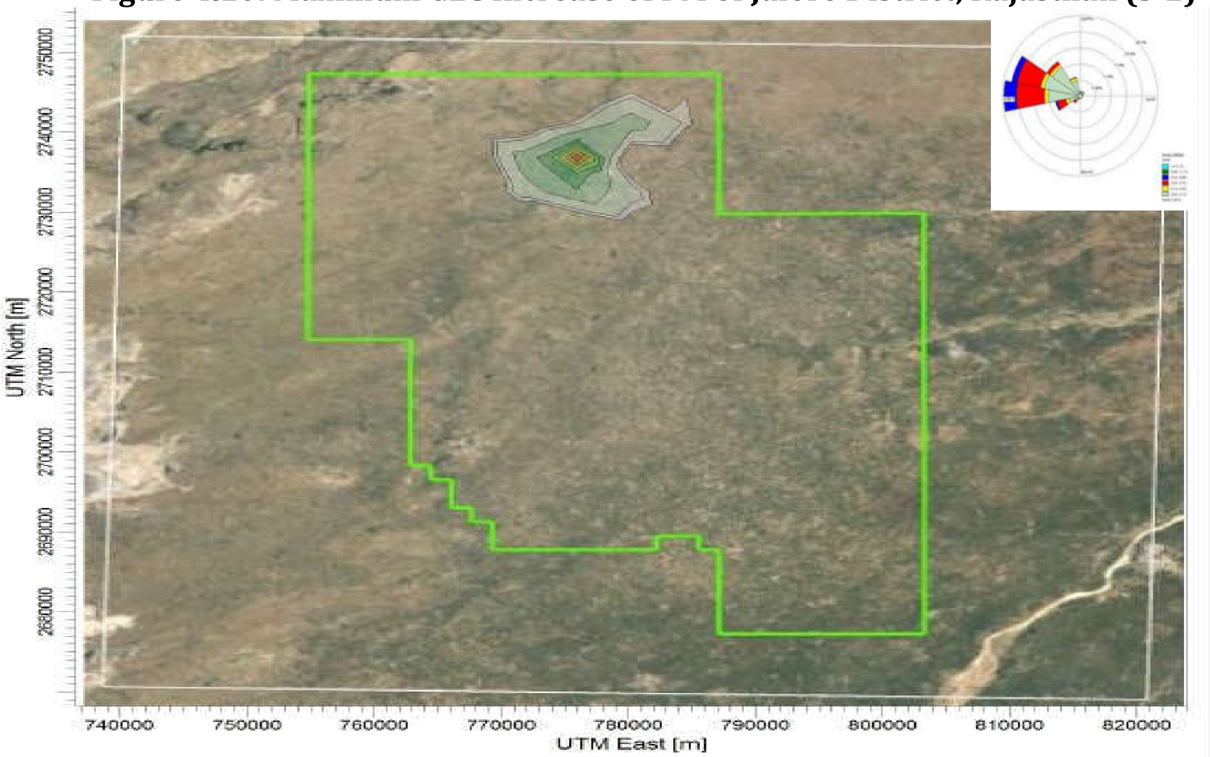
Figure 4.9: GLC Increase of NOx of Banaskantha District, Gujarat (S-2)

2. Jalore District, Rajasthan



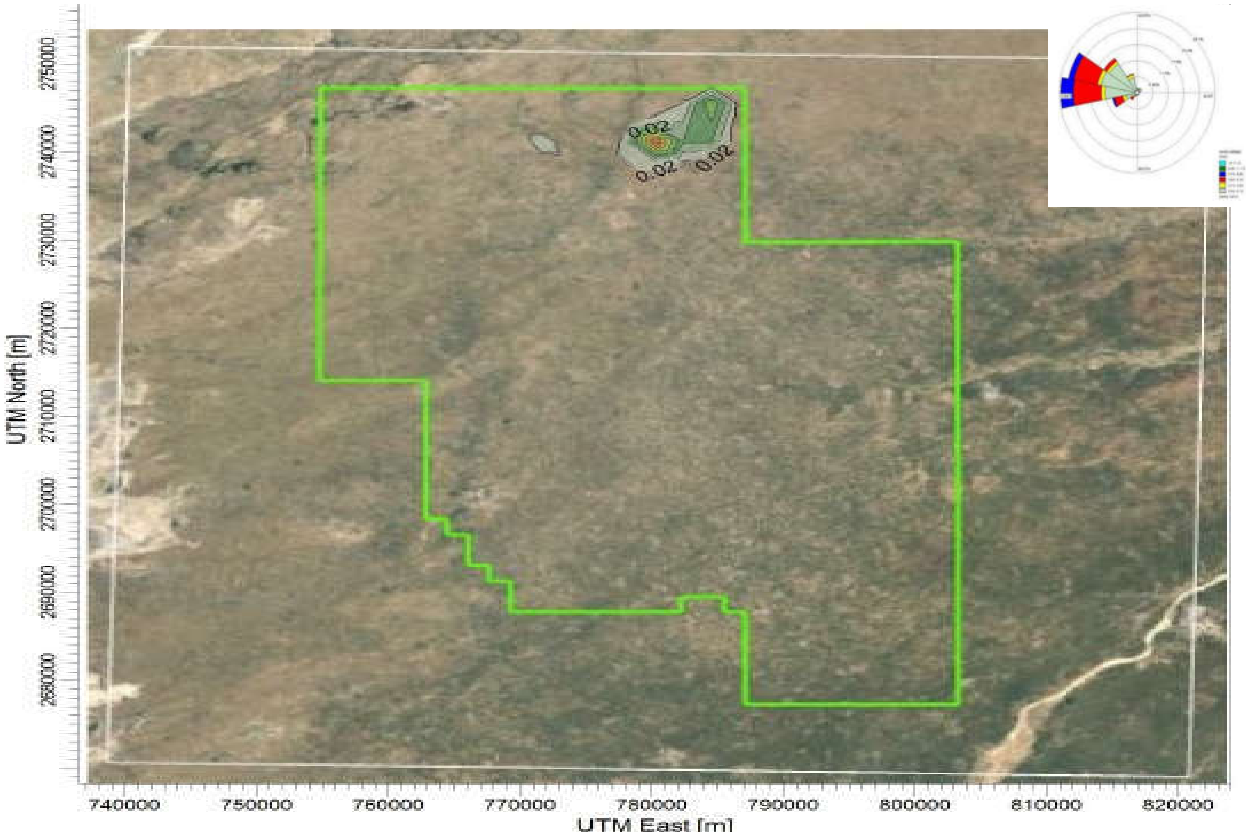
Source: ABC Techno Labs India Pvt. Ltd.

Figure 4.10: Maximum GLC Increase of PM of Jalore District, Rajasthan (S-2)



Source: ABC Techno Labs India Pvt. Ltd.

Figure 4.11: Maximum GLC Increase of SO_2 of Jalore District, Rajasthan (S-2)



Source: ABC Techno Labs India Pvt. Ltd.

Figure 4.12: Maximum GLC Increase of NOx of Jalore District, Rajasthan (S-2)

Mitigation Measures

The proposed mitigation measures are as follows:

To minimise emission of fugitive dusts the following measures would be adopted:

- ✓ Carry out regular water sprinkling at the site during dry season especially during the site preparation and decommissioning activities;
- ✓ The trucks used for transport of fill material during the site preparation and debris transport during the decommissioning shall be covered;
- ✓ Location of construction/site preparation materials will be away from nearby worker's camps;
- ✓ Proper handling of materials to ensure minimal emission of dust.

To minimise emission from the vehicles, equipment and machinery the following measures would be adopted:

- ✓ Movement of vehicles will be minimised and minimum speed will be enforced along the access and approach roads;

- ✓ All diesel-powered equipment will be regularly maintained and idling time reduced to minimise emissions;
- ✓ Low sulphur diesel will be used in diesel powered equipment and best management practices would be adhered to;

To minimise the adverse impacts of flaring the following measures should be adopted:

- ✓ Proper engineering controls to ensure complete combustion of gas;
- ✓ No cold venting will be resorted instead flaring will be done with combustion efficient elevated flare tip; and
- ✓ Location of flare stacks to be chosen considering the sensitive receptors adjoining the site.

Hence impact on ambient air quality is rated as shown below:

Impact Rating	Ambient Air
Significance and Nature of impact	Negligible and Adverse
Duration of impact	Short term
Impacted Area	Localized
Likelihood of occurrence	Low
Severity of impact	Slight

4.8 IMPACT ON NOISE ENVIRONMENT

Potential impact on noise quality is anticipated from vehicular movement, operation of construction machinery, access road strengthening during well site preparation and operation of drilling rig and ancillary equipment during drilling operation.

The potential impacts on noise quality may arise out of the following:

- ❑ **Pre-drilling phase, Early Production facilities:**
  - ✓ Operation of machineries & equipment;
  - ✓ Vehicular traffic;
  - ✓ Operation of DG sets.
- ❑ **Drilling phase:**
  - ✓ Operation of DG sets and drilling rig
  - ✓ Operation of machineries & equipment;
  - ✓ Vehicular traffic.
- ❑ **Decommissioning phase:**
  - ✓ Demobilization activity
  - ✓ Vehicular traffic.

- **Operation of EPU/QPU:**
  - ✓ Flaring of the Gas
  - ✓ GEG, DG set

Assessment of Noise Impacts due to Site Activities

Driller rotors and the power generators and pumps would be the main sources of noise pollution during the drilling activity. Noise due to vehicular movement will be intermittent but will also add to the background noise levels. Typically, the noise generating sources for the onshore drilling activity (in the immediate vicinity) are provided below:

GEG, Diesel Generator:	*75 dB(A)*
Pumps at the Rig:	*85 to 90 dB(A)*
Mud pumps:	*73.3-80.5 dB (A)*
Drilling activities:	*85-90 dB (A)*

In order to predict ambient noise levels due to the proposed drilling of exploratory wells. The preparative modeling has been done.

- **Modeling for Noise Emissions Drilling Site**

For dispersion modeling of noise, standard mathematical model for sound wave propagation have been used. The sound pressure level generated by noise sources decrease with increase in distance from the source due to wave divergence. An additional decrease in sound pressure level from the source is expected due to atmospheric effect or its interaction with objects in the transmission path.

For hemispherical sound wave propagation through homogeneous loss free medium, one can estimated noise levels at various locations due to different sources using model based on first principles, as per the following equation.

Noise (Receptor) = Noise (Source) - 20 Log [distance (Receptor) /distance (Source)]

The combined effect of all the sources then can be determined at various locations by the following equation:

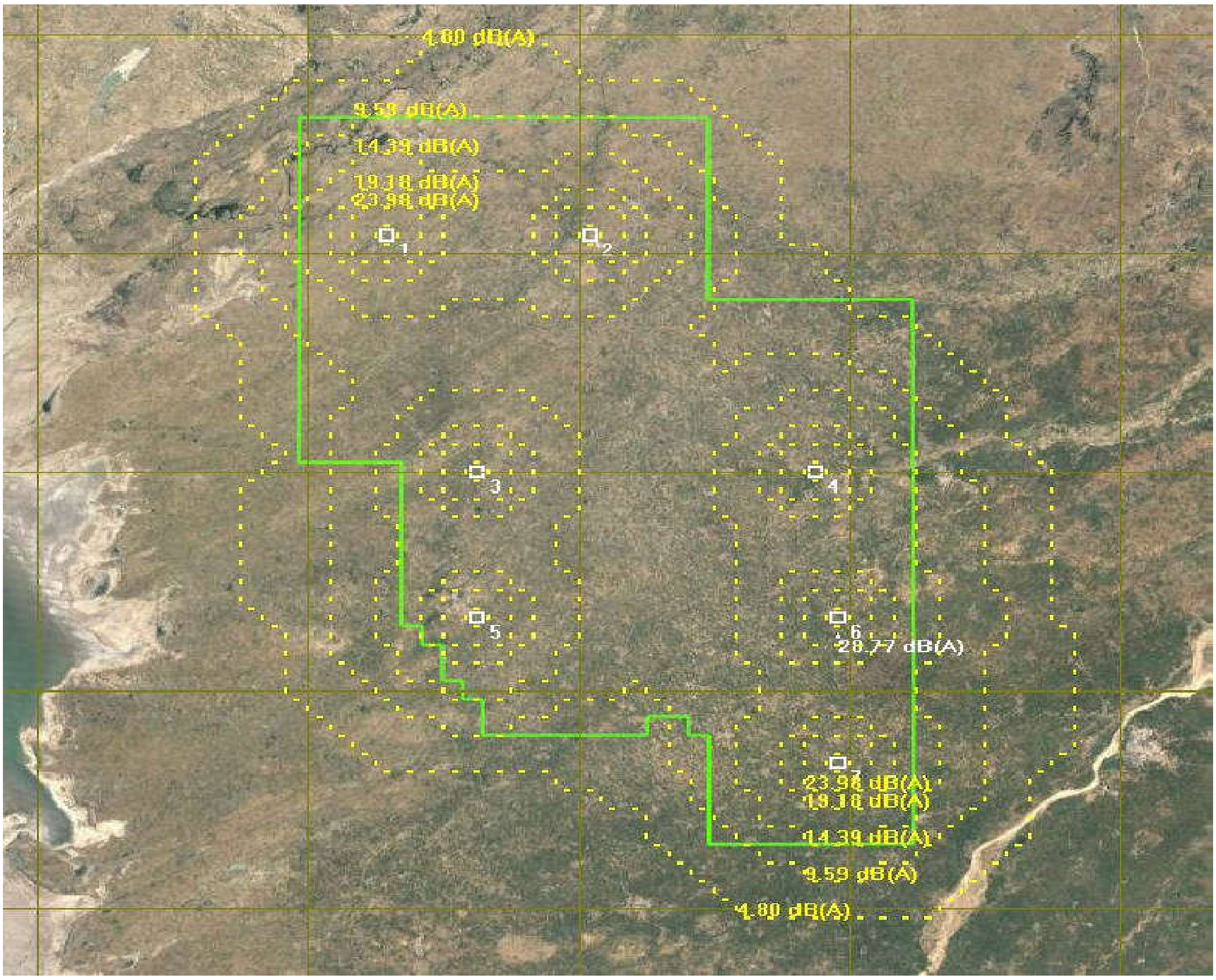
Lp (total) = 10 Log (10(Lp1/10) +10(Lp2/10)+10(Lp3/10) ………………)

Where Lp1, LP2, LP3 are noise pressure levels at a point due to different sources.

For an approximate estimation of dispersion of noise in the ambient from the source point, a standard mathematical model for sound wave propagation is used. For the modeling purposes, flat terrain is considered and environmental attenuation factors are not considered.

Noise modeling for the project site from DG sets(s):

In the proposed project, 2 Nos. of 350 KVA DG set (1 SB), 3 Nos. of 1000 KVA (1 SB) OR OR 2*1850 (1 working + 1 standby) depending on the rig capacity & rig availability during E&A drilling phase, 2Nos. of 100 KVA (1 SB) have been proposed to meet the power requirement. In the noise modeling, each flat and Transformer area is considered as source (7 Nos.). Noise modeling software has taken the predefined noise value of 75 dB for power generators. As per the primary baseline study conducted at the site, average temperature is 30°C and relative humidity is 40%, same has been considered in the noise modeling. Figure showing noise modeling for the project site from DG sets(s) is given in Figure 4.13.



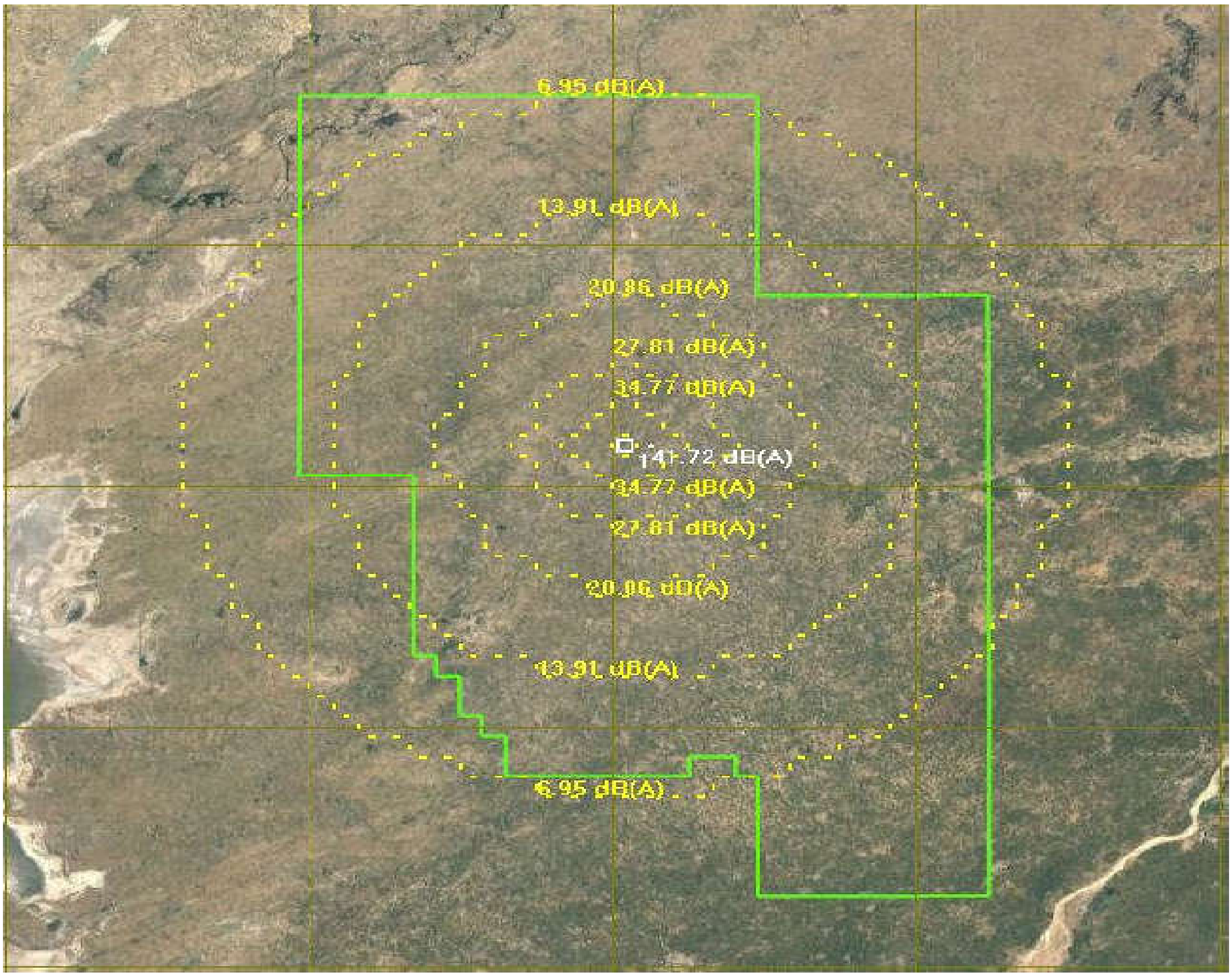
Source: ABC Techno Labs India Pvt. Ltd.

Figure 4.13: Noise Model Showing Noise levels from the DG Set(s)

From the noise modeling the Hydrocarbon Block is expected to receive a noise level of around 28.77 dB(A). This noise modeling has been carried out considering worst conditions, in actual; the noise level is expected to be very less than the calculated value.

Noise modeling for the project site from Pumps at the Rig:

In the proposed project, Oil Rigs are used during the operational phase in an Oil drilling Site. Noise model software has been assigned the noise value of 88 dB for Pumps. As per the primary baseline study conducted at the site, average temperature is 30°C and relative humidity is 40%, same has been considered in the noise modeling. Figure showing noise modeling for the project site from Pumps at the Rig is given in Figure 4.14.



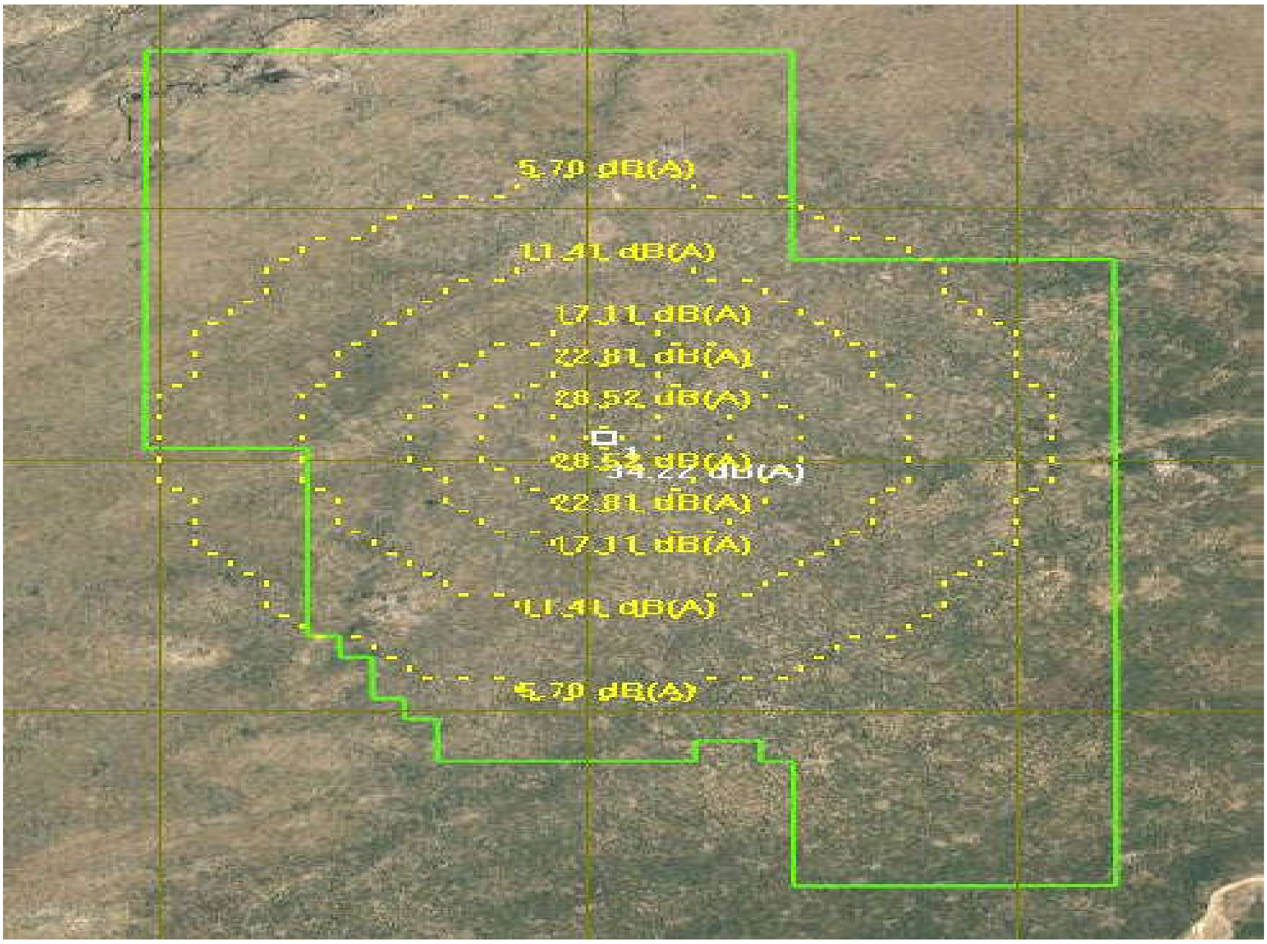
Source: ABC Techno Labs India Pvt. Ltd.

Figure 4.14: Noise Model Showing Noise levels from the pumps at Oil Rig

From the noise modeling the Hydrocarbon Block is expected to receive a noise level of around 41.72 dB(A). This noise modeling has been carried out considering worst conditions, in actual; the noise level is expected to be very less than the calculated value.

Noise modeling for the project site from Mud Pumps:

A mud pump (sometimes referred to as a mud drilling pump or drilling mud pump), is a reciprocating piston/plunger pump designed to circulate drilling fluid under high pressure down the drill string and back up the annulus. A mud pump is an important part of the equipment used for oil well drilling. Noise level of 80.5 dB (A) has been considered in the noise modeling software. As per the primary baseline study conducted at the site, average temperature is 30°C and relative humidity is 40%, same has been considered in the noise modeling. Figure showing noise modeling for the project site from Pumps at the Rig is given in Figure 4.15.



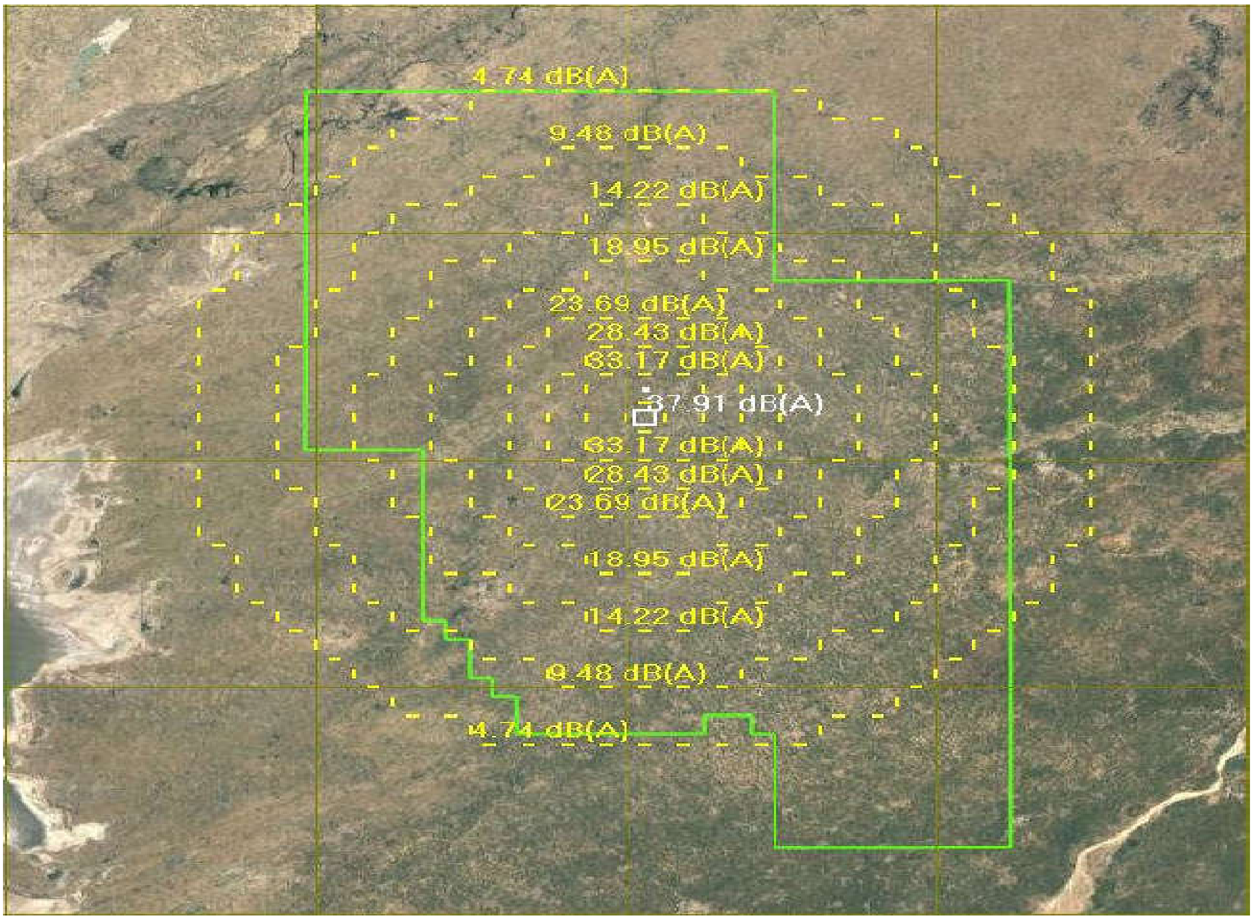
Source: ABC Techno Labs India Pvt. Ltd.

Figure 4.15: Noise Model Showing Noise levels from the Mud Pump

From the noise modeling the Hydrocarbon Block is expected to receive a noise level of around 34.22 dBA. This noise modeling has been carried out considering worst conditions, in actual; the noise level is expected to be very less than the calculated value.

Noise modeling for the project site for Drilling:

Drilling process is the primary source of noise impact in the Hydrocarbon block.Noise modelsoftware has been assigned the noise value of 90 dB(A) for Pumps. As per the primary baseline study conducted at the site, average temperature is 30°C and relative humidity is 70%, same has been considered in the noise modeling. Figure showingnoise modeling for the project site from Drilling process is given in Figure 4.16. From the noise modeling the Hydrocarbon Block is expected to receive a noise level of around 37.91 dB(A). This noise modeling has been carried out considering worst conditions, in actual; the noise level is expected to be very less than the calculated value.



Source: ABC Techno Labs India Pvt. Ltd.

Figure 4.16: Noise Model Showing Noise levels from the Drilling process

Mitigation Measures

- ✓ Installation of sufficient engineering control on equipment and machinery (like mufflers & noise enclosures for DG sets and PC pumps) to reduce noise and vibrationemission levels at source, carrying out proper maintenance and subjecting them to rigid noise and vibration control procedures.
- ✓ Providing Personnel Protective Equipments (PPEs) like ear plugs/muffs to workers at site.
- ✓ Undertaking periodic maintenance of vehicles and machinery to reduce noise levels.

Hence the impact on the noise level during drilling is rated as per given below:

Impact Rating	Noise Level
Significance and Nature of impact	Negligible and Adverse
Duration of impact	Short term
Impacted Area	Localized
Likelihood of occurrence	Low
Severity of impact	Slight

4.9 Impact on Water Environment

4.9.1 Water Resource

The Onshore block is mainly drained by Luni River is Flowing within the block from west to east on North side of the Block boundary and Banas River Flowing at 5.3 Km, South from the block boundary. The area is characterized by sub dendritic to dendritic nature of drainage pattern. Location of well sites near to the rivers and major water bodies is however ruled out and thus any direct impact on water bodies is not anticipated. Therefore considering the water availability and abundant sources, there would be insignificant impacts on water resources due to usage in the project. Surface water quality in the region has been found to be of good quality and is being used by villagers for irrigation and other domestic purposes. Ground water in the region is potable in nature.

Typically, the water consumption including domestic for proposed project activity will be 102 KLD for 45-60 days per well. The camp will normally consume water @30 KLD for domestic purpose only. However, the drilling and domestic water requirement would depend on the time required to drill the well, which is primarily dependent on the proposed depth. However, the drilling and domestic water requirement would depend on the time required to drill the well, which is primarily dependent on the proposed depth. The water requirement will be met from bore well or local sources through water tankers. Therefore considering the water availability and abundant sources, there would be insignificant impacts on water resources due to usage in the project.

Hence, the impact on the water resources of the study area is as per given below.

Impact Rating	Water Resources
Significance and Nature of impact	Negligible and Adverse
Duration of impact	Short term
Impacted Area	Localized
Likelihood of occurrence	Low
Severity of impact	Slight

Mitigation Measures

- ✓ Proper engineering controls will be used for drilling and cementing operations;
- ✓ Water requirement will be sourced locally through approved authorised process.

4.9.2 Surface & Ground Water Quality

Exploration and Appraisal and Testing

Impact on surface water quality of natural drainage channels and community water bodies may arise from discharge of contaminated surface run-off, sewage and process waste water generated during various phases of the proposed project.

Potential wastewater discharges may arise from the following sources during drilling:

- ✓ Spent drilling muds, cuttings and completion fluids disposal;
- ✓ Treated domestic effluent (sewage and kitchen waste);
- ✓ Any produced water and liquid hydrocarbon fractions collected in the test separator during well testing.
- ✓ Potential contaminated storm water drainage from the derrick floor and other systems;

- ❑ ***Process wastewater***

Approximately 40 KLD of wastewater would be generated from the exploratory drilling operation including minor quantities from cooling, washing and cleaning of rig floor and other equipments. The primary pollutants in the wastewater would thus be suspended solids, dissolved solids and traces of floating oil from washing of rig floor and other equipments.

Wastewater will be collected in lined pits and clarified wastewater will be treated in mobile ETP and the treated effluent will be collected in a treated water holding tank, from which it is re-circulated for drilling equipment washing, plantation purposes.

Vedanta Limited (Division: Cairn Oil & Gas) proposes to use water based non-toxic biodegradable fluids with inhibitive and encapsulative characteristics as drilling mud. Additionally, the drilling mud collection and recirculation pond is lined with impervious layer to prevent seepage and loss of drilling fluid into the subsoil. Further, proper casing installation and cementing will ensure least groundwater contact.

Water based drilling mud is non-hazardous in nature. The primary pollutants in the wastewater would thus be suspended solids, dissolved solids and traces of floating oil from washing of rig floor and other equipments.

Apart from the mud characteristics, the waste and spent mud would be disposed in polyethylene propylene lined pits for all the storage areas. The mud components during the storage form a bentonite (clay) lining along the pit wall preventing the seepage of water to the underground strata. Any hydrocarbons contamination will be skimmed off from site before proceeding to the next site so as to ensure that no leaching or subsurface contamination finally reaches the groundwater table. The waste oils and the skimmed oils collected from the drill site will be sent to the GPCB and RSPCB authorized recyclers.

- ***Discharge of Spent /Residual drilling mud and waste water***

It is estimated that nearly about 250-500 tons/well of drilling waste fluid and process waste water is likely to be generated during drilling operation. The drilling waste fluid so generated will be characterized by the presence of oil & grease, barites and heavy metal which on discharge to nearby natural drainage channels and little streams may lead to possible surface water contamination. However considering usage of water based mud for the proposed project, temporarily storage of drilling waste in an HDPE lined pit and subsequent treatment to ensure conformance with CPCB Designated Best Use Standards and Oil Drilling & Gas Extraction Industry Standards and guidelines provided by the MoEF&CC under the Hazardous & Other Wastes (Management & Transboundary Movement) Rules, 2016 the impact is not considered to be of significance.

- ***Sewage***

It is estimated that approximately 25 KLD of sewage will be generated from each well site. The sewage will be treated in mobile STP and will be utilized for Dust suppression, Green belt, Landscape. No impacts are thus envisaged from sewage disposal from site.

- ***Surface Runoffs***

Due to Site clearance and stripping of top soil during site preparation will result in an increase in soil erosion that might lead to an increased silt load when there is surface run-off during rainfall. The surface run off over drilling waste (cuttings and drilling mud), hazardous waste (waste oil, used oil, etc) and chemical storage areas on open soil is likely to be contaminated. Further the surface run-off problem may be compounded by the unquantified flow of formation water. To prevent these run-offs, waste pits, storm water drains and tankers that will regularly carry the treated water will be provided during drilling phase. Further, the boundaries of the pits will be raised to prevent any runoff.

As the area experiences high rainfall, the site will generate considerable volume of runoffs during such rainy periods. The storm water generally contains high concentration of suspended matter eroded from the soil by the runoff. There is also a potential for contamination of the storm-water if the runoff picks up contaminants in the form of chemicals, oil and lubricants, etc. that could have been spilled or if material is stored in open areas (uncovered) in any particular area like the fuel storage or the non-hazardous chemical storage areas. This may result in a potential impact to the receiving water body.

- ***Ground water Pollution***

The compaction of the working areas for setting up machineries and equipments like the rig may lead to increased runoff and reduced infiltration, thereby affecting localised subsurface groundwater recharge. However, given that the occupation of the area is temporary and the area experiences high rainfall and thereby high recharge potential, the effect on the groundwater regime of the area will not affect water availability in neighbouring wells and tube wells and any resulting conflict with other users of groundwater in the area.

Overall, with the appropriate management practices in place impacts on groundwater quality at the site is likely to be insignificant.

EPU/QPU

It is estimated that the concretization of the EPU/QPU site will be completed within a very short duration. This will reduce the probability of surface wash-out of silty material if there is no rain within the construction period. Further the surface run off from the site after it is concretized will be collected in a storm water drain that will have requisite silt trap and oil trap. The filtered water of the storm water drain will further be discharged after compliance with the CPCB Inland Water Discharge Standards.

The EPU/QPU will generate produced water of approximately 5 KLD. A mobile ETP will be installed at the EPU/QPU to treat this produced water and will be adequately disposed after meeting the GSR 546 Rules. As the surface run off will hardly have any silt or oil and grease load that will impact the adjoining area or contaminate the natural drainage, the significance of impact will be low.

Mitigation Measures

- ✓ Water drainage outlet, to prevent discharge of contaminated run-off
- ✓ Drainage and sediment control systems at the well site will be efficiently designed
- ✓ Proper treatment of all wastewater will be made to ensure that they comply with criteria set by the regulatory body (MoEF&CC and GPCB, RSPCB)
- ✓ All chemical and fuel storage areas, process areas will have proper bunds so that contaminated run-off cannot escape into the storm-water drainage system.

Hence, the impact on the water quality of the Exploratory Drilling activities are as per given below.

Impact Rating	Water Quality
Significance and Nature of impact	Negligible and Adverse
Duration of impact	Short term
Impacted Area	Localized
Likelihood of occurrence	Low
Severity of impact	Slight

4.10 IMPACT ON SOIL ENVIRONMENT

Potential impact on soil quality is envisaged in the form of increase in soil erosion and loss of soil fertility resulting site clearance and top soil stripping due to well site preparation. Accidental spillage resulting from storage and handling of mud chemicals is potential soil abuser. Soil quality impacts so identified have been assessed and evaluated below:

- **Pre-drilling Phase and set up of EPU/QPU facilities:**
  - ✓ Removal of top soil from the land procured;
  - ✓ Compaction of soil;
  - ✓ Disposal of construction waste/MSW in non-designated area;
  - ✓ Spillage of chemical/oil on open soil;
  - ✓ Surface runoff from material & waste storage areas and oil spillage area.
- **Drilling Phase/Operation of EPU/QPU:**
  - ✓ Spillage of chemical, spent mud, hazardous waste, etc.;
  - ✓ Surface runoff from waste storage area and spillage area.
- **Decommissioning Phase:**
  - ✓ Disposal of decommissioning waste materials in open soil.

Site clearance and stripping of top soil

As discussed in the baseline section, the soil of the proposed block is characterized by silty clay soil. This soil is poor in terms of fertility. However, to preserve the topsoil has been planned before the start of site preparation activity at the drill site to reduce the impact on the already poor fertility of the land. It is estimated that only 20-30% soil will be removed from entire area. However, such impact is considered to be temporary as the proper reinstatement of site will be undertaken by Vedanta Limited (Division: Cairn Oil & Gas) in case the wells are not indicative of any commercially exploitable hydrocarbon reserves. Necessary surface run-off control measures will be adopted by the proponent during construction phase to prevent sediment flow to abutting agricultural land. Further specific mitigation measures will be implemented by Vedanta Limited (Division: Cairn Oil & Gas) to stabilize the topsoil and to preserve their fertility characteristics during site restoration. The impact is therefore considered to be of medium significance.

Sourcing of borrow material

The drill sites will also be raised. Site preparatory activities will involve the sourcing of earth-fill from borrow areas. Since in most of the cases efforts would be made to procure the fill material from nearby existing borrow areas/quarries the impact is considered to be of low significance.

Storage and disposal of drill cuttings and drilling mud

As an embeded mitigation measures HDPE lined impervious pits would be constructed at each of the drill sites for temporary storage of drill cuttings and drilling fluid. The disposal of the drill cuttings and the drilling mud would be carried out in accordance with "CPCB Oil & Extraction Industry Standard – Guidelines for Disposal of Solid Wastes" no significant impact to this regard is envisaged.

Storage and handling of fuel and chemicals

Fuels, lubricants and chemical used for the drilling operations (especially daily consumption) would be stored at site. In addition spent lube, and waste oil would also be stored temporarily at site before it is disposed as per the regulatory requirements. Improper storage and handling of the chemicals and fuels, spent lubricants can lead to contamination of soil. Accidentally, spillage of chemicals, oil and lubricants, either during transportation or handling, on soil may contribute to soil contamination. Considering the accidental nature of the event the impact is considered to be of low significance.

Mitigation Measures

- ✓ The top soil will be preserved;
- ✓ Ensuring proper storage of fuels and chemicals to prevent any potential contamination from spillage and implementing appropriate spill prevention and control measures;
- ✓ Storage of Solid Waste in designated areas within well pad.

Embeded controls have been considered in the project design to reduce the impact on soil. Also, most of these impacts on the soil fertility are reversible as the drill sites would be reinstated after the drilling. The contamination of soil due to spillage of chemical and fuel is likely to happen only in case of accidents. Hence, the significance of the impact is medium.

Impact Rating	Soil Quality & Contamination
Significance and Nature of impact	Negligible and Adverse
Duration of impact	Short term
Impacted Area	Localized
Likelihood of occurrence	Low
Severity of impact	Slight

4.11 ROAD & TRAFFIC

During various phases of projects like site preparation, drilling, early production and decommissioning various types of vehicle/equipment movement will be involved. The vehicular movement is expected to be more in construction/site preparation phase due to movement of machinery & manpower.

Vedanta Limited (Division: Cairn Oil & Gas) will ensure that traffic management plan is implemented so that proper vehicular movement is done with minimal disturbance to nearby communities. The impacts will be for limited duration. Thus, the impacts are temporary in nature and limited mostly within the drill site.

Mitigation Measures

- ✓ Speed limits will be maintained by vehicles involved in transportation of raw material and drilling rig.
- ✓ Regular supervision will be done to control vehicular traffic movement along defined traffic routes particularly near identified sensitive receptors.
- ✓ Entry of vehicles into the drilling site area is prohibited except for material movement.
- ✓ Adequate parking will be provided outside the drilling location.

Hence, the impact on the roads and traffic due to the Exploratory Drilling activities is as per given below:

Impact Rating	Roads & Traffic
Significance and Nature of impact	Negligible and Adverse
Duration of impact	Short term
Impacted Area	Localized
Likelihood of occurrence	Low
Severity of impact	Slight

4.12 BIOLOGICAL ENVIRONMENT

Impact on the ecology will be mainly confined to drilling site and approach road and will vary with the proximity from the drilling locations. Beyond the drilling site and approach road, impacts may be during flaring to be carried out for testing.

Source of Impact:

- *Vegetation Clearance.*
- *Illimitation from Site.*
- *Fugitive Dust Emission.*
- *Generation of Noise*

Vegetation Clearance

It is proposed to develop 70 exploratory and appraisal well in Block CB-ONHP-2017/10 which mainly agricultural fallow land. Besides this some well locations are also located in vegetation area. During primary survey, it has been observed that removal of ground vegetation is required for site preparation.

The vegetation observed in the study area is common to these climatological conditions and no endangered floral species is observed in the study area. Further the distribution of vegetation is scattered in nature and no well is located inside the forest land. Clearance of vegetation for site preparation would not require cutting of any mature trees. It is observed that approximately 9 Ha land is required for each drill site and clearance of only shrubs and herbs are required. Therefore, the scale of Impact can be considered as low, extent of impact within site.

There are no significant impacts envisaged on the ecological environment of the region as the area is almost covered with fallow land devoid of any considerable ecological conditions. The impact due to air pollution on flora & fauna can be expected to be negligible, as the impact predictions based on the dispersion modelling do not indicate any significant release of the pollutants and ground level concentrations.

Generation of Noise and Illumination from site

It is anticipated that noise would be generated particularly during the site development period and and various operational activities from the drilling site. It is expected to get attenuated to baseline level of noise within 200-300m from the proposed drilling locations. It is also found during the field visit and confirmed by the Forest Department of Government of Gujarat that there is no ecologically sensitive area such as National Park, Wild Life Sanctuary within the Block area, the potential impacts on existing wildlife due to generation of noise can be considered as low.

The drill site would be illuminated during both site preparation and operational phase as drilling will be conducted continuously for 24 hrs and thus may cause significant disturbance to local faunal population particularly avifauna.

Fugitive Dust emission

The fugitive dust emission is likely to be generated during site preparation, drilling activity and decommissioning phase. Therefore, is anticipated that minimum area around the proposed well site would be impacted due to dust generation. Short release height of the dust particle will also facilitate deposition of such dust particles on the surrounding vegetation. The impact magnitude for fugitive dust emission can be considered as medium during the drilling phase and impact will be site specific. Overall the impact on vegetation due to dust generation can be considered as low.

Mitigation Measures

The mitigative measures pertain to surface run-off from well site, wastewater discharges, solid waste disposal, erosion abatement measures, etc;

- ✓ The working area will always be kept minimum
- ✓ The vegetation removal should be minimum to meet the need of the project activity. For felling of trees prior approval from concerned Department shall be obtained;
- ✓ Fencing would be done on the camp site to avoid any unfortunate encounter with faunal species.

As long as strict environmental management measures are put in place, including adequate measures for supervision of contractors and staff, negative effects on fauna will be minimized. There are however, likely to be some residual unavoidable, impacts, linked to the requirement of optimal clearing the vegetation to facilitate drilling activities. Hence, the impact on the ecology of the exploratory drillingis as per given below.

Impact Rating	Ecology
Significance and Nature of impact	Negligible and Adverse
Duration of impact	Long term
Impacted Area	Localized
Likelihood of occurrence	High
Severity of impact	Minor

4.13 Impact on Occupational Health and Safety

Exploration and Appraisal and Testing, EPU/QPU

Occupational injuries and ill-health have huge socio-economic implications on individuals, their families and communities. They also have economic impacts in form of direct and indirect costs for society as a whole. Major occupational health risks encountered in proposed drilling activity include noise from drilling activity, operation of vehicles and machinery, handing of chemicals.

However, the Vedanta Limited (Division: Cairn Oil & Gas) will adopt necessary control measures through implementation of mitigation measures and provision of proper PPEs to workers operating in aforesaid area to prevent and/or mitigate adverse health related impacts. Hence any possible occupational health impact from exposure to such fugitive dust is not likely to be of major significance.

Mitigation Measures

- ✓ Periodic onsite surveillance to be conducted so that the workers use the designated PPEs all the time;
- ✓ Health surveillance would be conducted of personnel working in the aforesaid areas;
- ✓ Regular health and safety training to be provided to workers.

Hence the impact on the Occupational Health & Safety level during drilling & testing, EPU/QPU is rated as per given below:

Impact Rating	Occupational health & safety
Significance and Nature of impact	Negligible and Adverse
Duration of impact	Short term
Impacted Area	Localized
Likelihood of occurrence	Low
Severity of impact	Slight

4.14 Impact on Community Health and Safety

Community health and safety of inhabitants residing close to the drilling site stands to get affected from frequent heavy vehicular movement along village access roads and due to noise from drilling rig operations. Health and safety impact arising from technological emergencies viz. well blow outs, explosions will be dealt separately in the Risk Assessment section. Although the aforesaid activities are temporary in nature it may not adversely affect community health and safety in the long term. Mitigation measures will be taken to reduce the impacts arising out of project activities and hence significance will reduce from medium to low significance.

EPU/QPU shall ensure that all activities should be under proper fencing and proper hoardings in should be displayed during site preparation to prevent people from encroachment within the fenced area or to make them aware of the danger associated with the construction/site preparation.

Mitigation Measures

- ✓ All activities should be under proper fencing;
- ✓ Proper hoardings should be displayed during construction to prevent people from encroaching the fenced area;

Hence the impact on the Community health and safety level during drilling & testing, EPU/QPU is rated as per given below:

Impact Rating	Community health and safety
Significance and Nature of impact	Negligible and Adverse
Duration of impact	Short term
Impacted Area	Localized
Likelihood of occurrence	Low
Severity of impact	Slight

4.15 Socio-Economic Environment

The components of the exploratory drillingof wells at CB-ONHP-2017/10 block that could result in effects on the socio-economic environment include the following:

- ***Stress on Infrastructure***

The width of some of the access and approach roads are not wide enough to support the movement of heavy vehicles to drill site, hence they have to be widened and strengthened. Transportation of drilling rig and associated facilities to drill and decommissioning of rig and associated structure will increase traffic movement. Increase in vehicular fleet may cause damage to road infrastructure if not properly maintained. The strengthening and widening of the existing road will reduce the significance of impact from medium to low.

- ***Influx of Population***

Influx of population is anticipated in all stages of the project cycle particularly during exploratory drilling. The drill site will involve the operation of about 50 onsite workers during drilling phase.

- ***Employment opportunities***

Project will benefit people living in the neighbouring villages temporarily by creating opportunity for direct & indirect employment associated with the various project activities. Site preparation phase will involve certain number of laborers and there is a possibility that local people can be engaged for this purpose. Drilling process will involve a number of skilled and unskilled workers. Generation of short time employment opportunities during the project phase would improve the employment scenario of the area.

❑ ***Cultural & Heritage Site***

Impact on cultural environment may occur due to site preparation, operation of drilling rig and also during vehicular movement with respect to the proposed exploration activities. There are no designated historical or cultural spots close to the well sites or access roads hence; no impact in this regard is envisaged.

Mitigation Measures

- ✓ The shortest distance as far as available/feasible would be considered for access road, with additional care to avoid division of land parcels into agriculturally unviable fractions;
- ✓ The village road identified for accessing proposed project footprints, would be strengthened and widened as per requirement;
- ✓ Appropriate awareness program on grievance redressal mechanism, would be designed and implemented for local community around proposed project footprints;

Hence, the impacts may be as per given below.

Impact Rating	Socio-economic
Significance and Nature of impact	Negligible and adverse
Duration of impact	Short term
Impacted Area	Localized
Likelihood of occurrence	Low
Severity of impact	Slight

4.16 RISK/ IMPACT MITIGATION TECHNIQUES

The well site supervisor shall carry out regular safety checks. All crew members would be reminded frequently of working safety aspects as part of work procedure.

In order to minimize environmental impacts, the following section conveniently classified the mitigation measures (in continuation to suggested DMP and EMP in chapters 7 & 9 respectively) based on the various activities performed during the exploratory drilling operation:

❑ **Mobilization of Drilling Equipment**

- ✓ Existing road network shall be utilized up to maximum extent;
- ✓ Periodic maintenance and check-up record shall be maintained of all vehicles used for the transportation of the men and machinery to the site;

- **Drilling Site Preparation**
  - ✓ Conserve topsoil;
  - ✓ Limit leveling activity;
  - ✓ Do not burn brush and uprooted materials;
  - ✓ Natural drainage patterns of the area should be considered during commissioning of equipment, pads, and pits;
  - ✓ Mud and burn pits, if used, must have adequate contingency capacity to account for rainfall, and must be fully lined and bunded.
  - ✓ Incorporate drainage and minimize disturbance to natural drainage patterns.
  - ✓ Provide base material compatible with local ground conditions. Hard core should;
  - ✓ As the site is graded and leveled, site berms, culverts, drains and drainage treatment facilities will be provided to control run-off and enable the site to be operational throughout the dry season;
- **Drilling Operation**

The approximate area of one well site would be about 9 Ha. As per the standard practice of operation, in practice, waste minimization and safety will be achieved through a number of measures:

- ✓ Employing industry standard technologies and practices;
- ✓ Extremities of flare lines will be located at adequate distance from roads, public works, processing units or tanks. They will be at adequate distance from a well, gas/oil separator, site drainage or other possible source of ignitable vapours. The flaring would be elevated type with a height of 30m or enclosed ground flaring;
- ✓ Carefully designing the fluid handling system so as to maximize recycling of fluids and treatment of cuttings;
- ✓ Maintain good housekeeping to avoid any accidental spill;
- ✓ Loading & unloading of fuel and various materials should be properly handled and controlled;
- ✓ Drip trays will be required to contain any leaks under stationary vehicles, items of rig and large vehicles carrying such fuels;
- ✓ Provide spill kit near oil storage area i.e. sand bags, absorbing pad, shovels etc;
- ✓ Any soil contaminated at the site will be removed and disposed off at the landfill, burn pit, as appropriate;

- ✓ Bulk storage of lubricants and fuels will be permitted only within the designated places and fuel tanks must be properly marked by content and chemicals;
- ✓ Provision of treatment facilities so as to maximize recycling of fluids and minimizing quantities of effluents;
- ✓ Equipment maintained in good working order. Workers near noise source provided with noise protection equipment (ear muffs);
- ✓ Acoustic mufflers in where practicable;
- ✓ Duration of well testing shall be minimized by careful planning;
- ✓ Any dry, dusty materials shall be sealed in containers;
- ✓ Adequate and properly maintained firefighting equipment would be present at the site and all fires and ignition sources to be controlled to prevent fire; etc.

❑ **Demobilization**

- ✓ All residual solids and liner will be covered with thick column of native soil. The cutting mud is inert and with appropriate lining of the pit in place it does not pose any scope of environmental hazard;
- ✓ Grading will take place to ensure natural run-off;
- ✓ Mud pits, where used, will be de-watered and filled in with1m cover of soil;
- ✓ Facility will be suspended with a wellhead in place, but all other equipment and materials will be removed from the site;
- ✓ The access road(s) would be reinstated; and
- ✓ Document and monitor site recovery;

❑ **Campsite and Access**

- ✓ Ensure all requirements addressed in planning phase are fully met;
- ✓ Initiate consultation and liaison with local authorities;
- ✓ Use local expertise;
- ✓ Adequate and properly maintained firefighting equipment will be present at the campsite and all fires and ignition sources to be controlled to prevent bush fire;
- ✓ Choose site to encourage natural rehabilitation by indigenous flora/ avoid removal of vegetation and topsoil/ preserve topsoil, and seed source for decommissioning;
- ✓ Select site to minimize effects on environment and local communities/minimize clearing;
- ✓ Use existing access if available;

- ✓ Minimize size of camp/ facilities consistent with operational, health and safety requirements;
- ✓ Take account of topography, natural drainage and site runoff;
- ✓ Ensure adequate and proper drainage;
- ✓ Ensure proper handling and storage of fuels and hazardous materials;
- ✓ Minimize waste, control waste disposal (solids, sewerage);

4.17 IMPACT EVALUATION

The evaluation of the impacts of the proposed exploratory drilling activity on the environment, both in terms of quality & quantity have been made. For quantification of impacts, matrix system as modified to some extent has been used as per given below:

For quantifying impacts on the environment, the guidelines and standards prescribed by national and international agencies are being considered. 1000 numbers are distributed as per the weightage to each parameter considered based on its importance as per given below in Table 4.6.

Table 4.6: Evaluation of Impact Prediction

Parameters	Importance Value
Air Quality	200
Water quality	100
Water resources	100
Noise and vibration	200
Soil & Solid waste	200
Land Use Pattern	50
Forest & Vegetation and wild life	50
Socio – economic	50
Employment	50

The severity has been divided in impact scores from 0-5 for calculating the severity of impacts on the environmental parameters due to various project activities as given below in Table 4.7.

Table 4.7: Impact Assessment Score

Severity criteria	Impact score
No impact	0
Significant impact-slight and short term	1
Significant impact-slight and long term	2
Moderate impact- short term	3
Moderate impact- long term	4
Major Impact - Permanent	5

The impact score can be negative or positive depending on whether the impact is adverse or beneficial. Based on the above importance values and impact scores, the impact value (impact score x importance value) for each environmental parameters is calculated. The impact value for individual parameter is added to arrive at the total impacts value. The criterion used to make conclusive statement is based on the total impacts value without control measures is defined as given below in Table 4.8.

Table 4.8: Impact Assessment Criterion

Total impact value	Conclusions
Upto (-)1000	No appreciable impact on environment
(-) 1000 to (-) 2000	Appreciable but reversible impact. Mitigation measures important.
(-) 2000 to (-) 3000	Significant impact which is mostly irreversible. Mitigation measures crucial.
(-) 3000 to (-) 4000	Major impact which is mostly Irreversible. Selection of process and raw material to be crucial.
Above (-) 4000	Permanent irreversible impact, alternative sites to be considered.

The environmental impact matrix based on the above principles has been attempted for the proposed exploratory drilling and are given in Table 4.9.

Table 4.9: Impact Evaluations – Exploratory Drilling/Testing, EPU/QPU

Environmental parameters	Importance value	Impact Score		Overall Value	
		Without EMP	With EMP	Without EMP	With EMP
Air Quality	200	-1	-1	-200	-200
Water quality	100	-3	-1	-300	-100
Water resources	100	-1	-1	-100	-100
Noise and vibration	200	-1	-1	-200	-200
Soil Quality & Solid waste	200	-4	-1	-800	-200
Land Use Pattern	50	-2	-1	-100	-50
Forest & Vegetation and wild life	50	-2	-1	-100	-50
Socio – economic	50	1	1	50	50
Employment	50	1	1	50	50
Total				**-1700**	**-800**

Source: ABC Techno Labs India Pvt. Ltd.

Thus, it can be evaluated that there will be no appreciable impact on environment is envisaged with proper mitigation measures.

CHAPTER 5: ANALYSIS OF ALTERNATIVES

Consideration of alternatives to a project proposal is a requirement of the EIA process. During the scoping process, alternatives to a proposal can be considered or refined, either directly or by reference to the key issues identified. A comparison of alternatives helps to determine the best method of achieving the project objectives with minimum environmental impacts or indicate the most environmentally friendly and cost effective options. The consideration of alternatives is most useful when the EIA is undertaken early in the projects cycle. The type and range of alternatives open for consideration include:

- *Site alternatives (e.g. advantage of proposed site, details of any other sites, if explored, etc)*
- *Input or supply alternatives (e.g. use of raw materials, sourcing, etc)*
- *Technology alternatives (e.g. feasibility of different technologies available and advantage of proposed technology, etc)*

After analysis of the various factors the most environmentally compatible alternative is selected. Reference may be made to available technologies, policy objectives, social attitudes, environmental and site constraints, projects economic etc.

This section provides an analysis of alternatives in relation to the conception and planning phase of the project. This includes the following:

5.1 NO PROJECT SCENARIO

The no project scenario has been analyzed to understand what would be reasonably expected to occur in the near future if the proposed project is not conducted in the area. In such a scenario, there would not be any pressure on use of local resources and infrastructure, and no adverse effect on local ecology or incremental pollution to baseline environmental components (air, water and noise levels). At the same time, there would not be any positive impact on socioeconomic status of the area resulting from direct/ indirect employment and economic benefits that such a project can provide. With no project scenario, dependence of the country on import of crude oil and demand for foreign exchange will grow.

5.2 ALTERNATIVE LOCATION FOR THE PROPOSED PROJECT

The block is allocated by the Government of India under the Revenue Sharing Contract (RSC). Vedanta Limited (Division: Cairn Oil & Gas) is the Operator for this block. Drilling locations are proposed based on geo-scientific information and alternate sites cannot be considered for the proposed project facilities due to the following reasons:

The location is within the existing RSC boundary of the block. The surface locations of wells are selected considering the drilling configuration (reach to potential reservoirs).

5.3 Alternative Drilling Locations

The seismic data interpretation of the seismic survey would decide the exact locations of the drilling well. The proposed exploratory well sites have been identified based on the preliminary study and interpretation of the stratigraphy and already available secondary seismic data. Within the identified location the actual well drilling site will be selected based on the following factors:

- Located at suitable distance from the nearest habitat/sensitive receptors
- Located at a safe distance from public road
- Ensure natural drainage channels are avoided or drainage channels rerouted to ensure unhindered flow of rain/flood water. Where necessary adequate erosion control measures will be provided.

5.4 Alternative Drilling Technologies

Standard practice shall be followed in which a standard mobile rig of 1000 HP with Rotary/Top drive System will be used (rotary drilling with WBM stabilization). Elevated flaring is considered for well testing. Therefore, alternative drilling technology is not necessary.

5.5 Use of Water Based Mud and Synthetic Based Mud

During drilling operation, drilling mud will be used, which is essential to lubricate and cool drill bits, removal of drilled rock (i.e. cuttings) from the bottom of the hole and transporting it to the surface and maintaining hydrostatic head in the well to counter natural formation pressures.

Drilling mud is basically a suspension/mixture of solids suspended in a liquid phase, which is blended with clays, polymers, salts and weighting agents. The main component/ solvent of drilling fluid are water, oil or synthetic and accordingly they are called as oil-based, water-based, and synthetic-based muds (OBMs, WBMs, and SBMs). All the three types of muds have certain advantages and disadvantages as discussed below.

Though the WBMs is a least cost option and widely used but is not found efficient in high temperature and also for water sensitive substrata, i.e., shales and mud. To overcome these limitations, OBM and SBM are used and of the two, SBM is preferred choice and it may be used in different set of environments like high temperatures, hydratable shales, high-angle, extended-reach wells, high-density mud and drilling through salt.

Table 5.1: Comparison of Different Types of Mud

Aspects	Water Based Mud	Oil Based Mud	Synthetic Based Mud
Least Cost	Preferable	Less Preferable	Least Preferable
Quantity of Waste discharge	Least Preferable	Less Preferable	Preferable
Least Quantity of Water Required for Preparation	Least Preferable	Less Preferable	Preferable
Toxicity	Preferable	Least Preferable	Less Preferable
Reduced drill time	Least Preferable	Less Preferable	Preferable

Source: ABC Techno Labs India Pvt. Ltd.

The WBM produces large quantity of drill waste as the mud is not recyclable. Moreover, the clay in WBM absorbs water and expands to disperse into the drilling fluid. These fine clay particles increase mud viscosity and inhibit its upward flow. To lower the mud viscosity, water is added to lower the concentration of fine solids and mud products are added to give the drilling fluid the correct density and flow properties. As a result, large volumes of mud are produced to be discharged as waste. On the other hand, the OBM and SBM are recycled several times and only drill cutting are disposed off.

The water requirement of SBM is highest as compared to OBM and WBM. Though, OBM are considered more efficient and has wider application in different conditions but recently their use is restricted due to environmental considerations. OBM are considered toxic due to the use of hydrocarbons as solvents and need a proper disposal through land fill. The water based muds are considered safest in this regard followed by SBM.

If all the three types of mud are compared on the drill time, SBM is far superior then OBM and WBM. The less drill time mean shorter operation and hence less emissions from various drilling equipments and limited engagement of workforce.

The SBMs have the potential to drill wells more quickly and efficiently than WBMs, while avoiding some of the disposal costs and environmental difficulties associated with OBMs.

Water based mud will be used for initial, shallower sections where massive shales are not encountered. The deeper and difficult to drill formations will be drilled using synthetic base mud (SBM). Synthetic base mud can be re-used. At the end of drilling a well almost the entire amount of the SBM is collected for re-use in next drilling operation. SBM systems promote good hole cleaning and cuttings suspension properties.

5.6 CONCLUSION

This project activity is of national importance as it helps to achieve energy security. The project will have positive benefits in terms of revenue generation to state and central government, increase in job opportunity. Site selection would be carried out taking into consideration the nearest habitation, proximity to any sensitive receptor and natural drainage.

In addition, Vedanta Limited (Division: Cairn Oil & Gas) will ensure that the final site selection is made after due consideration to all environmental considerations mentioned. Also use of alternate method technology to avoid sensitive locations will be made to the extent possible. Consideration of these alternatives with strict compliance to the Environment Management and Monitoring Plans suggested will ensure minimal impact on the Environment.

CHAPTER 6: ENVIRONMENTAL MONITORING PROGRAMME

6.1 INTRODUCTION

Environmental monitoring program for the environmental parameters is proposed to measure the changes in the environment due to during drilling and post drilling stages. To ensure the effective implementation of the mitigation measures and environmental management plan of the project activities. Normally, an Impact Assessment study is carried overshort period of time and the data cannot bring out all variations induced by the natural or human activities.

6.2 OBJECTIVES OF MONITORING PROGRAMME

The objectives of environmental monitoring plan for proposed project activities are:

- ✓ To verify the results of the impact assessment study;
- ✓ To follow the trend of concentration values of the parameters which have been identified as critical;
- ✓ To check or assess the efficiency of the mitigation measures; and
- ✓ To ensure that new parameters, other than those identified in the impact assessment study, do not become critical at proposed project activities.

The environmental monitoring is the primary tool for assessing the prevailing quality of air, water, noise, land etc. The environmental monitoring helps in suggesting and taking corrective course corrections, monitored parameters are exceeding. The monitoring of various environmental parameters for ambient air quality, water quality, noise levels, soil quality will be carried out at and around the exploratory wells to ascertain the following:

- ✓ Pollution caused due to operations of proposed project activities.
- ✓ Change in environmental quality within and outside the proposed project activities
- ✓ To assess environmental impacts after set up of proposed project activities

The environmental monitoring shall be periodic and comply with the promulgated standards. The frequency of monitoring of various environmental components and frequency to be monitored is given in Table 6.1.

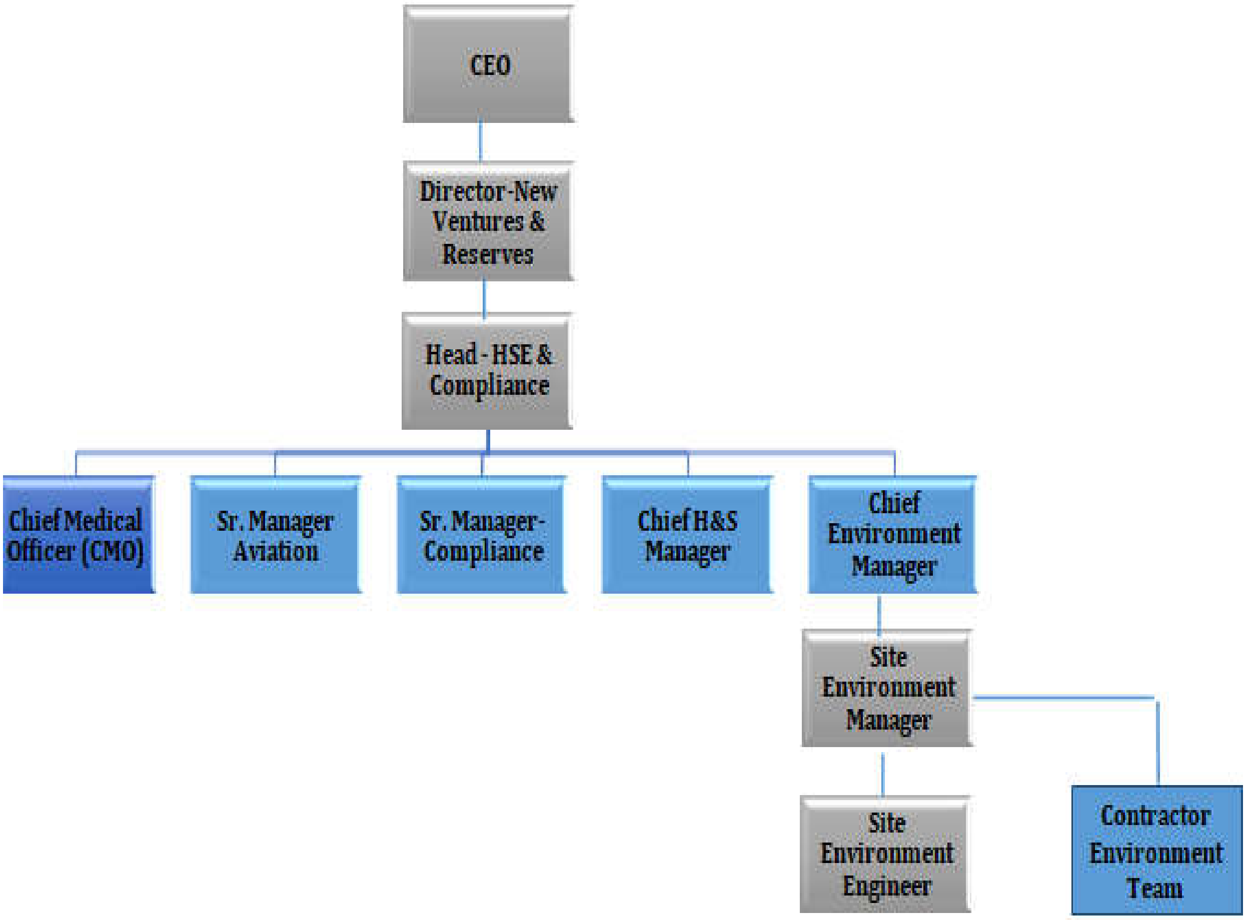
Table 6.1: Environmental Monitoring Program for Exploratory Drilling Activities

Monitoring	Locations	Frequency	Parameters
Ambient Air Quality (AAQ) monitoring	Adequate number of representative locations	Pre-drilling, during drilling and post-drilling	As per NAAQS and HC, NMHC, H_2S and VOC
Stack Monitoring		Once during operation	As per GSR 771 (E) or as specified by Consent to operate issued by Gujarat pollution control board (GPCB)
Ambient Noise Level at Fence/ boundary	Adequate number of representative locations	Pre-drilling, during drilling and post-drilling	Leq (night), Leq (day), Leq (24hourly)
Work Place noise Monitoring	Monitoring at point sources of noise emissions	During drilling	8 Hourly (TWA)
Sewage Water Quality Monitoring	Treated domestic waste water	Once during operation	pH, TSS, TDS, BOD, COD, oil & grease, faecal coliform (MPN per 100 milliliter, MPN/100 ml or as per CTE/CTO issued by GPCB
Ground water monitoring	Adequate number of representative locations	Pre-drilling and post-drilling	As per IS 10500: 2012
Soil Quality	Adequate number of representative locations	Pre-drilling and post-drilling	pH, conductivity, texture, bulk density, Ca, Mg, Na, K, P, N, organic matter, organic carbon, Cl, SO4, sodium absorption ratio, Al, Fe, Mn, Boron, Zn, Hg and PAH
Fresh Synthetic Based Mud (SBM)	During drilling	One sample/well during drilling	Aromatic content, Toxicity, (LC50, 96 hours), Hg
Fresh Water Based Mud (WBM)	During drilling	One sample/well during drilling	(LC50, 96 hours), Mercury
Barite used for mud preparation	During drilling	One sample/well during drilling	Hg, Cd
Drill cuttings associated with WBM	During drilling	One sample/well during drilling	Oil and grease, (LC50, 96 hours), Hg and parameters for disposal of waste
Drill cuttings associated with SBM	During drilling	One sample/well during drilling	Oil and grease, (LC50, 96 hours), Hgand parameters for disposal of waste
Spent WBM before disposal	During drilling	One sample/well during drilling	(LC50, 96 hours), Hg and parameters for disposal of waste

Source: Vedanta Limited (Division: Cairn Oil & Gas)

6.3 HEALTH, SAFETY & ENVIRONMENTAL MANAGEMENT CELL

In order to implement the environmental management program efficiently within the organization, periodical monitoring as per statutory guidelines and mid course corrections/actions, if required based on the environmental monitoring results, management intends to establish environmental cell for successful implementation. The roles & responsibilities are clearly defined among the personnel within the environmental cell as per Figure 6.1.



Source: Vedanta Limited (Division: Cairn Oil & Gas)

Figure 6.1: Environment Management Cell

CHAPTER 7: ADDITIONAL STUDIES

Based on the TOR specified by the Ministry of Environment & Forest and Climate Change (MoEF&CC) issued vide letter no. F. No. IA-J-11011/108/2019-IA-II(I) dated 26th April 2019 for preparation of EIA/EMP Report for proposed project, several studies were conducted and planned to be conducted to provide a clear picture of the project area. The studies and activities suggested in EIA Notification includes: -

- *Public Hearing and Consultation*
- *Risk Assessment Study*
- *Disaster Management plan*

7.1 PUBLIC HEARING AND CONSULTATION

As per the Environment Impact Assessment Notification, 2006, a public hearing will be carried out by State Pollution Control Board (SPCB).

After completion of the Public Hearing, the applicant shall address all the environmental concerns expressed during this process and make appropriate changes in the draft EIA and EMP Report. The final EIA report, so prepared, shall be submitted by the applicant to MoEF&CC for appraisal.

7.2 RISK ASSESSMENT

7.2.1 INTRODUCTION

The objective of the RA study is to identify major risk contributing events, demarcate vulnerable zones and evaluate the nature of risk posed to nearby areas due to proposed drilling activity, in addition to ensure compliance to statutory rules and regulations. The scope of work for the study is described below:

- ✓ Identify potential risk scenarios that may arise from the proposed drilling and other associated activities
- ✓ Analyze the possible likelihood and frequency of such risk scenarios by reviewing historical accident related data.
- ✓ Predict the consequences of such potential risk scenarios and if consequences are high, establish the same by through application of quantitative simulations.
- ✓ Recommend feasible preventive and risk mitigation measures as well as provide inputs for drawing up of Emergency Response Plan (ERP) for the project.

- ✓ The assessments to be based on various existing documents including Emergency Response Plan (ERP), Disaster Management Plan (DMP).

The scope involves risk assessment of Well Pad including Diesel Day Tank located at project site that would have a detrimental impact to the personnel and plant properties.

7.2.2 METHODOLOGY & APPROACH

Risk analysis consists of hazard identification studies to provide an effective means to identify different types of hazard during the operation of the facility. This is followed by an assessment of the impacts of these hazards.

Hazard is present in any system, plant or unit that handles or stores flammable materials. The mere existence of hazards, however, does not automatically imply the existence of risk. Screening & ranking methodologies based on Preliminary Hazard Analysis (PHA) techniques have to be adopted for risk to be evaluated.

The approach and methodology by ABC Techno Labs followed for the Risk Assessment study are described hereunder:

The study comprises of the following stages:

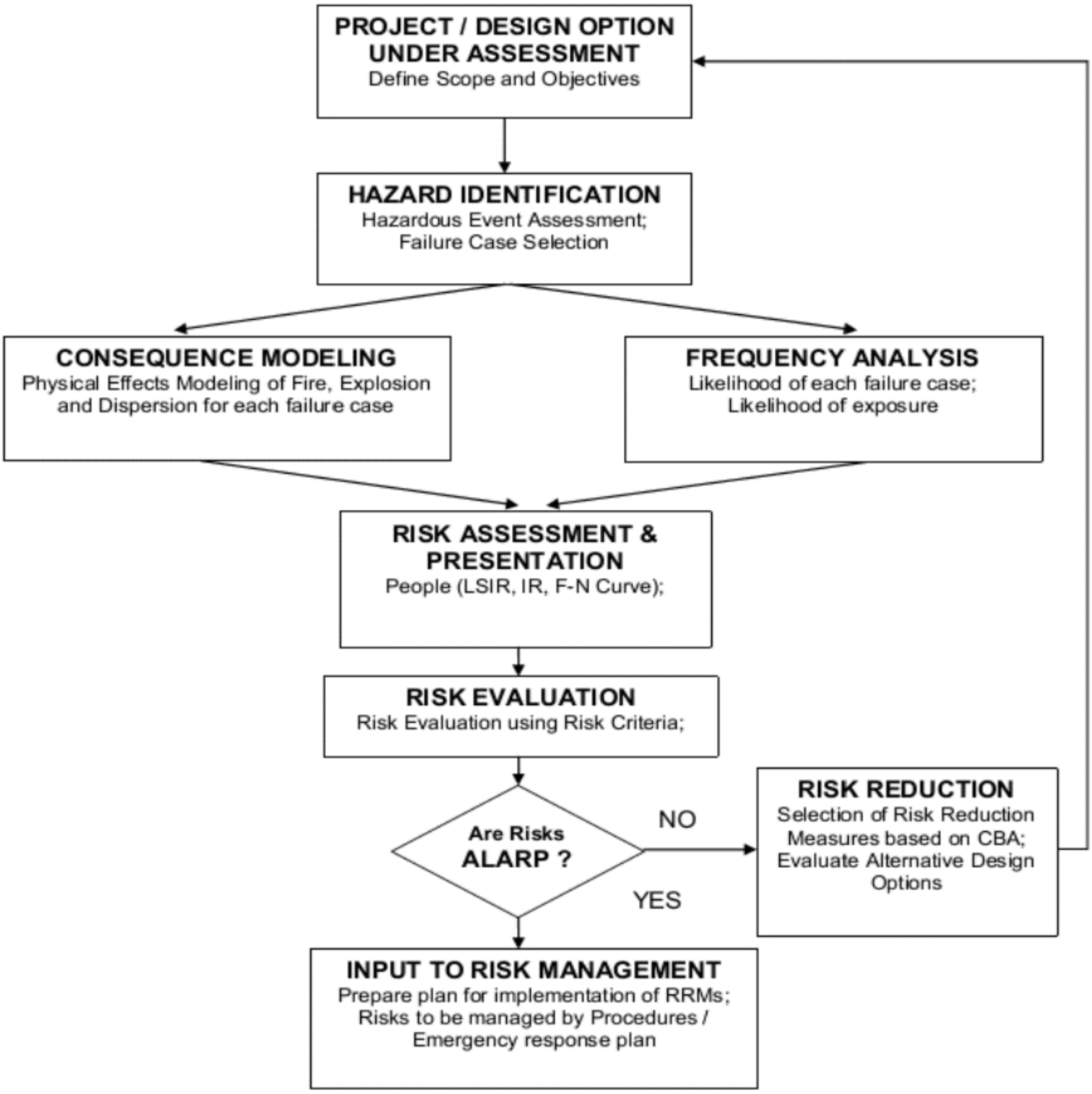
- ✓ Identification of potential major hazard scenarios;
- ✓ Assessment of the likelihood and consequences of identified hazards;
- ✓ Estimation of the impact of identified hazards on personnel; and
- ✓ Assessment of the risks against tolerance criteria.

The Risk Assessment (RA)uses conventional risk assessment techniques as shown in Figure 7.1 and described as follows:

- ✓ Identify the preliminary causes of major accidents associated with the process, and develop a list of representative potential events involving the release of hazardous materials or other events, which could lead to loss of life or damage to infrastructure.
- ✓ Model the possible scale of severity of the physical effects of each identified hazardous event. Predict the criticality of the damage that could be caused and the potential for escalation, developing rule sets and assumptions to form the basis of an analysis of the possible outcomes.
- ✓ For each identified hazard, use appropriate models and data to estimate its frequency, taking into account any site-specific features that may influence the likelihood of the scenarios. Compare the event frequency estimates with historical data to confirm the validity of the model.

- ✓ Combine the predicted consequences of each event with its frequency to estimate the risks to personnel. Assess the Individual Risk (IR) for the facilities.
- ✓ Compare the results of the study with Company Risk Tolerance Criteria to establish whether the operation of the project can be regarded as adequately safe. Consider the risk mitigation provided by other measures such as the gas detection and shutdown system.
- ✓ Propose additional Risk Reduction Measures (RRM).

The methodology is presented pictographically in the following section:



Source: ABC Techno Labs India Pvt. Ltd.

Figure 7.1: Risk Assessment Methodology

7.2.3 HAZARD IDENTIFICATION

Hazard scenario development is carried out considering the activities at the facilities and the inherent hazardous properties of the material being handled.

The Hazard Identification looks into all incidents, which could result in possible fatalities. For drilling, such incidents typically include the following:

- Well fluid releases - small, medium and large well fluid releases from exploratory/appraisal drilling wells. Possibilities include blowouts (due to either downhole or surface abnormality or possible cratering (a basin like opening in the Earth surface surrounding a well caused by erupted action of gas, oil or water flowing uncontrolled)) or other incidents involving drilling fluids, leakage from mud degassing stacks/ vents and others- these are the major category and are deliberated later.
- Possibility of dropped objects on the drilling platform due to lifting of heavy equipment including components like draw works, drilling pipe, tubing, drill bits, Kelly, mud equipment, shale shakers, BOP components, power generating equipment and others
- Single fatality occupational incidents such as trips and falls. These are more likely in drilling rigs due to the hazardous nature of operations and general high congestion and large extent of the manual operation involved.
- Structural failure of the drilling rig due to excessive static or rotating loads, earthquake, and design defect, construction defect etc. It may be noted that rotating loads are induced due to the specific rotating actions of the rotary drilling mechanism (Drill string rotated by means of rotary table etc.).
- Loss of containment of fuels (HSD) and consequent pool fire on encountering an ignition source.

The HAZID would select the Scenarios for further modeling in the next sections. The HAZID is derived mainly from incidents in similar drilling installations based on worldwide experience and includes generic data sources.

Table 7.1: Accidents due to types of hazardous events

Type of Hazardous Event	*Specific Accident Events included in RA*
Hydrocarbon Release	• *Uncontrolled Blow out-medium, large, small* • *Release from diesel tanks- Catastrophic failure, medium and small risks*
Occupational accidents	• *Single fatality accidents such as slips, trips, falls, dropped objectives etc.*
Other Hazards during drilling	• *Structural collapse of drilling rig due to static or*

Type of Hazardous Event	*Specific Accident Events included in RA*
Rig operation	*rotating load, fatigue, construction defect, design defect, earthquakes etc* – *Hazards during Installing the Auxiliary Equipment* – *Hazard in Rigging Up the Circulating System* – *Hazards during Setting Up the Rig Floor and Mast or Derrick* – *Hazards During Preparation for Setting Up the Substructure*

Source: Vedanta Limited (Division Cairn Oil & Gas)

7.2.3.1 HYDROCARBON RELEASE

The events of blowouts during drilling are divided in the databases according to the consequences and well control success. Such blow outs can be ignited or un-ignited. Blow outs are uncontrolled sudden expulsions of oil, gas, water or drilling fluids from wells to the surface which result in loss of control of the well.

Sources of hydrocarbon release during the drilling phase include the following:

- Dissolved gas which comes out of solution under reduced pressure often while drilling at near balance or under balance hydrostatically or as trip gas during a round trip to pull the drill string around from the hole. Such sources could include releases at bell nipple and around mud return flow line outlet, shale shakers and active mud pits.
- As a "kick", which occurs as the down hole formation pressure unexpectedly exceeds the hydrostatic head of the circulating mud column. Significant releases can occur from the vent lines of the mud /gas separator and other locations.
- From residual mud on the surface of the drill pipe being racked in the derrick during the round trip, or on production of coil tubing being withdrawn from the hole, or from core samples laid out for inspection. Usually any liquid hydrocarbon system entering the down hole under normal circumstances are very much diluted by the mud system. However, under conditions of under balanced drilling, the proportion of hydrocarbons in mud returns may be significant with a potential for continuous release.
- Small hydrocarbon release from rotating equipment, pipes and pump work occurring during normal operations/ maintenance during drilling. These are not likely to be significant in open derrick or mast structures.
- Possible shallow gas blowout – these may occur at sumps or drainage tanks and be conveyed by vents or drains to areas of potential ignition sources resulting in fire/ explosion.

- Vapour present in oily drainage systems, vents, and ducting.
- Flammable materials used in drilling operations (oil based drilling fluids)- release points could include high pressure mud points, mud degassing equipment, shale shaker, mud pits and active tanks etc.

7.2.3.2 BLOWOUT PREVENTION

If the hydrostatic head exerted by the column of drilling fluid is allowed to drop below the formation pressure then formation fluids will enter the well bore (this is known as a kick) and a potential blowout situation has developed. Blowout means uncontrolled violent escape of hydrocarbon fluids from a well. Blowout followed by ignition, is a major hazard. Major contributors to blowout are:

Primary

- Failure to keep the hole full;
- Too low mud weight;
- Swabbing during trips;
- Lost circulation; and
- Failure of differential fill-up equipment.

Secondary

- Failure to detect and control a kick as quickly as possible;
- Mechanical failure of Blow Out Preventer (BOP);
- Failure to test BOP equipment properly;
- Damage to or failure of wellhead equipment;
- Failure of casing; and
- Failure of formation or cement bond around casing.
- Fast and efficient action by operating personnel in recognizing the above situations and taking precautionary measure can avert a blowout.

❑ ***Presence of Sour Gas (Hydrogen Sulphide-H_2S)***

Presence of Sour Gas (H_2S) in hydrocarbon during blowout of well can pose immediate dangers to life and health at and around the rig area. On ignition, H_2S is converted to Sulfur dioxide (SO_2) which is also highly toxic. Therefore, a safety system should be in place to monitor H_2S.

Hydrogen Sulphide gas (H_2S) is extremely toxic and even very low concentrations can be lethal depending upon the duration of exposure. Additionally it is corrosive and can lead to failure of the drill string or other tubular components.

Important characteristics of H_2S gas are briefed below:

1. H_2S is a toxic colourless gas heavier than air.
2. In concentrations greater than 100 ppm, it causes loss of senses in 3 to 15 minutes and death within 48 hours.
3. The safe concentration for a normal working period without protection is 10 ppm.
4. It has an odour of rotten eggs.
5. In concentration greater than 10 ppm, the olfactory sense to smell the gas is lost, hence need for detectors is apparent.
6. It dissolves in the blood and attacks through the nervous system.
7. It is very irritating for the eyes as it forms sulphurous acid together with water.
8. It attacks the body through the respiratory organs.
9. The Occupational Safety and Health Act (OSHA) sets a 10 ppm ceiling for an (eight) hour continuous exposure (TWA limit), a limit of 15 ppm for short term exposure limit for 15 minutes (STEL) and a peak exposure concentration of 50 ppm for 10 minutes.
10. The best protection is breathing apparatus, with mask covering the whole face and a bottle containing breathing air.
11. H_2S burns with a blue flame to sulphur dioxide which is also dangerous
12. It forms an explosive mixture with air at concentrations from 4% to 46%.
13. Short exposure of high tensile steel to as little as 1 ppm in aqueous solution can cause failures.
14. Concentrations greater than 15 ppm can cause failure to steel harder than Rockwell C-22. High stress levels and corrosive environments accelerate failures.
15. When pH is above 9 and solubility is relatively high, it is readily soluble in mud and especially in oil mud.
16. A 30% hydrogen peroxide solution will neutralize H_2S gas in the mud or 20 gallons of H_2O_2 per 100 barrels of mud. It occurs together with natural gas in all oil provinces of the world.

17. Coughing, eye burning and pain, throat irritation, and sleepiness are observed from exposure to low concentrations of H_2S.
18. Exposure to high concentrations of H_2S results in panting, pallor, cramps, paralysis of the pupil and loss of speech. This is generally followed by immediate loss of consciousness. Death may occur quickly from respiratory and cardiac paralysis.

Concentrations	Symptoms/ Effects
100 ppm	Coughing, eye irritation, loss of smell after 2-15 minutes (olfactory fatigue). Altered breathing, drowsiness after 15-30 minutes. Throat irritation after 1 hour. Gradual increase in severity of symptoms over several hours. Death may occur after 48 hours.
Greater than 100 ppm	Loss of smell (olfactory fatigue or paralysis).
500-700 ppm	Staggering, collapse in 5 minutes. Serious damage to the eyes in 30 minutes. Death after 30-60 minutes.
700-1000 ppm	Rapid unconsciousness, "knockdown" or immediate collapse within 1 to 2 breaths, breathing stops, death within minutes.
1000-2000 ppm	Nearly Instant Death

As per available data, there is no chance of presence of H2S in the hydrocarbon present within block, however, as a hypothetical case, scenario of presence of 3% H2S has been considered for consequence analysis.

7.2.3.3 OTHER HAZARDS DURING DRILLING RIG OPERATIONS

- **Hazards During Preparation for Setting Up the Substructure**

Equipment(s) are unloaded and positioned at or near the exact location of drilling point. The substructure is assembled, pinned together, leveled, and made ready for other rig components on the floor. Equipping the cellar begins but can be done throughout the rigging up process. This includes welding on a drilling nipple to the conductor pipe and attaching a flow line.

Potential Hazards:

- Pinched fingers when assembling equipment.
- Burns from cutting and welding on the drilling nipple.
- Temporary eye irritation from welding light flash.
- Falling from heights.

- **Hazards during Setting Up the Rig Floor and Mast or Derrick**

Once the substructure is set in place, the process of setting up the rig floor begins by installing stairways and guardrails to allow access to the rig floor. Then, the draw works is set in place and secured to the substructure. On mechanical rigs, the engines are set in place and the compound and associated equipment connected to the draw works. On electric rigs, the electric cables (lines) are strung to the draw works.

The bottom of the mast is raised to the rig floor and pinned in place. The crown section is then raised into place on the derrick stand. The "A-legs" are raised and pinned into place. The monkey board is pinned in place on the mast and all lines and cables are laid out to prevent tangling when the mast is raised. A thorough inspection of the mast should be made before raising the mast/derrick. The mast is now ready to be raised. The engines are started, and the drilling line is spooled onto the draw works drum. Once the mast has been raised and pinned, the remaining floor equipment can be set into place. If the rig has safety guy lines, they must be attached to the anchors and properly tensioned prior to continuing the rigging up process. A derrick emergency escape device is installed on the mast.

Potential Hazards:

- Falling or tripping during rigging up;
- Falling from rig floor;
- Being struck by swinging equipment;
- Being struck by falling tools;
- Being crushed or struck by equipment due to failure or overloading of hoisting equipment;
- Getting entangled in lines during rising of the derrick or mast;
- Failure to properly install derrick emergency escape device; etc.

❑ **Hazard in Rigging Up the Circulating System**

While one crew finishes preparing the rig floor, another crew might be rigging up the circulating system. The mud tanks and mud pumps are set into the pre-determined location. The mud lines are then connected and electric cords are strung.

Potential Hazards:

- Being struck by or crushed by equipment being set into place;
- Getting caught in pinch points;
- Being struck by crane, load, truck or forklift tipping;
- Being struck by hammer when connecting mud line unions; etc.

❑ **Hazards during Installing the Auxiliary Equipment**

All remaining drilling and auxiliary equipment must be set into place and installed where needed. The catwalk and pipe racks are positioned and the pipe and drill collars are set on the racks.

Potential Hazards:

- Getting struck or pinched by, or caught in between, tubulars being loaded onto racks.
- Having feet pinched or crushed when setting up the pipe racks and catwalk.

7.2.4 Consequence Analysis

Consequence analysis involves the calculation of the initial "release rate" and then predicting the consequence of the release through computer modeling- it forms an important ingredient in the RA approach. Consequence analysis is a complex procedure involving numerous calculations. It must also be noted that a single starting incident could have numerous outcomes depending upon factors such as escalation, ignition and others. The various factors of importance in this drilling rig study with respect to consequence analysis are described below.

Table 7.2: List of Isolatable Sections

IS	Scenario
IS 01	From Well Fluid from Well to Inlet of Heater Separator
IS 02	Heater Treater Separator – Oil Case
IS 03	Oil from Heater Treater Separator to inlet of Oil Storage Tanks including coaleser separator
IS 04	From XSV of storage tank inlet to pump inlet including oil storage tank
IS 05	From Oil Transfer pump outlet to Road tanker loading
IS 06	Road Tanker Failure
IS 07	Diesel Storage Tank
IS 08	Fuel Gas System
IS 09	Flare System

Source: ABC Techno Labs India Pvt. Ltd.

Depending on the type of liquid handled and process conditions, one or more of the following potential hazards/consequences could be encountered due to loss of containment of hydrocarbons:

- ✓ Un-ignited release;
- ✓ Jet Fire;
- ✓ Pool Fire;
- ✓ Flash Fire;

- ✓ Vapour Cloud Explosion; and
- ✓ Toxic Impact (Not applicable for this project)

7.2.4.1 Un-ignited Gas Release / Dispersion

A vapour cloud may be formed when a vaporizing liquid is released for an extended duration. If the gas cloud does not immediately ignite, it disperses based on the prevalent wind direction, speed and stability category (i.e. degree of turbulence).

The cloud dispersion simulation is carried out to provide the distance (from the leak) at which the concentration of flammable material falls below the Lower Flammability Limit (LFL).

7.2.4.2 Jet Fire

Jet fire causes damage due to the resulting heat radiation. The working level heat radiation impact will vary widely depending on the angle of the flame to the horizontal plane, which mainly depends on the location of the leak. The flame direction was considered horizontal for consequence analysis of leaks and ruptures from Piping and Tanks.

Upon accidental leakage, the pressurized fluid will disperse as a jet, initially moving forward in the spatial direction of the leak till the kinetic energy is lost and gravity slumping or lifting of the cloud occurs, dependent upon whether the fluid is heavier or lighter than air.

Source term modelling has been conducted for each identified study area at all the locations at the full stream operating pressure to determine the initial release rate. The release rates and material properties were used to calculate the flame length and distance to relevant heat radiation levels.

Two models are available for jet fire modelling in PHAST V8.2 – the cone model and the API-RP 521 model, of which the cone model is considered to be more conservative, and presents the jet fire as a tilted cone frustum, as opposed to a banana shaped plume in the API-RP 521 model, i.e. tapered at the end and bent by the wind. Thus, the cone model has been selected for jet-fire modelling.

The primary hazard associated with jet fires is thermal radiation and potential for flame impingement on adjacent pipelines/equipment, resulting in escalation. High pressure releases have the potential to cover large areas due to its relatively large flame length. However, the effects of escalation are minimized if the flame length reduces to less than the separation distance between other equipment and the jet fire source.

7.2.4.3 POOL FIRES

A liquid pool is formed during a prolonged leakage if the rate of leakage exceeds the rate of vaporization. On ignition, this would result in a pool fire whose size/radius would depend on the mass flow rate, ambient temperature, and heat of vaporization of material released, vapour pressure, duration of discharge and effects of containment or dykes.

The pool fire could cause damage to equipment or injury/fatality to personnel due to thermal radiation effects.

A pool fire is not envisaged for liquid systems which are highly pressurized. Any leak or rupture would result in a pressurized release leading to a liquid jet fire or flash fire.

7.2.4.4 FLASH FIRE

The vapour/gas release from a pool would disperse under the influence of the prevailing wind; with material concentration in air reducing with distance. At a particular location downwind, the concentration will drop below its lower flammable level (LFL) value. If ignited within the flammable envelope, the mass of the material available between the LFL and ½ LFL will be likely to burn as a flash fire; rapidly spreading through the cloud from the point of ignition back to the source of release.

Although flash fires are generally low intensity transitory events, the burning velocity is quite high and escape following ignition is not possible. Flash fires often remain close to the ground, where most ignition sources are present. It is assumed that personnel caught inside a flash fire will not survive while those outside suffer no significant harm. If other combustible material is present within the flash fire it is also likely to ignite and a secondary fire could result.

7.2.4.5 VAPOUR CLOUD EXPLOSION

The magnitude of the vapour cloud explosion is dependent on the size of the gas cloud that has formed and the degree of congestion in the area, as these determine the acceleration of the flame front. The TNO GAMES model is used for modelling of vapour cloud explosions, as the model incorporates the characteristics of the explosion, such as the type of fuel, its reactivity, the effect of obstacles in the congested region.

7.2.4.6 TOXIC EFFECTS

There is no toxic impact in this project as there are no toxic materials handled.

7.2.4.7 Consequence Impact Criteria

The damage potential associated with the various hazardous outcomes described above is assessed based on pre-defined impairment criteria for losses.

Estimate of damage or impact caused due to thermal radiation, explosion overpressure and toxic effects is generally based on the published literature on the subject. Probit relations are used for these calculations. The actual potential consequences from these likely impacts can then be visualized by superimposing the damage effect zones on the proposed layouts and identifying the elements within the project which might be adversely affected, should one or more hazards materialize in practice. The damage criteria used in the present study is described in the following sections.

7.2.4.8 Thermal Damage/ Radiation Damage

As per OGP-14;

4.73 kW/m²	*Maximum radiant heat intensity in areas where emergency actions lasting 2 min to 3 min can be required by personnel without shielding but with appropriate clothing. Corresponds to of painful burns and blistering after 20 second exposure (0% lethality)*
6.31 kW/m²	*Indicative of second degree burns after 20 second exposure (1% fatality)*
12.5 kW/m²	*Indicative of piloted ignition for susceptible structures (50% fatality)*
37.5 kW/m²	*Indicative of total asset loss (100% fatality)*

Hence, following heat radiation levels are considered to determine physical effects of hazard events:

4.73 kW/m²;

6.31 kW/m²,

12.5 kW/m²,

37.5 kW/m²

7.2.4.9 Flash Fire

The consequence distances should be identified for the following Lower Explosive Limit:

- 50 % Lower Explosive Limit
- 100 % Lower Explosive Limit

7.2.4.10 EXPLOSION

Blast peak overpressure from explosion for buildings should not exceed the following levels provided in Table below. Internationally recognized and globally accepted TNO Multi energy model was used for the explosion modeling for this Project

Table 7.3: Overpressure level criteria

Level of Concern	Type of Damage
0.02068 bar	"Safe distance" (probability 0.95 of no serious damage1 below this value); projectile limit; some damage to house ceilings; 10% window glass broken.
0.07 bar	General buildings, offices
0.2068 bar	Partial collapse of wells, concreate Block wells, not reinforced, shattered
1 bar	Range for 1-99% fatalities among exposed population due to direct blast effects

Hence, following over pressure levels are considered to determine physical effects of hazard events:

- 0.02068 bar
- 0.07 bar
- 0.1379 bar
- 0.2068 bar
- 1 bar

7.2.4.11 TOXIC GAS

No toxic gas dispersion envisaged in this project.

7.2.4.12 CONSEQUENCE ANALYSIS AND CALCULATIONS

❑ **Hole Size Distribution**

For each isolatable section and its study areas, a range of leaks have been considered for the assessment of hydrocarbon hazards arising from facility is described in section, these leaks are defined on the basis of hole sizes.

❑ **Meteorological Data**

The consequences of material released being toxic and flammable are largely dependent on the prevailing weather conditions. For the assessment of various scenarios involving release of toxic or flammable materials, the most important meteorological parameters are those that affect the atmospheric dispersion of the leaking material. The crucial variables are wind direction, wind speed, atmospheric stability and temperature. Rainfall does not have any direct bearing on the results of the risk analysis; however, it can have beneficial effects by absorption/washout of released materials. Actual behavior of any release would largely depend on prevailing weather condition at the time of release.

❑ Atmospheric Stability Classes

The tendency of the atmosphere to resist or enhance vertical motion and thus turbulence is termed as stability. Stability is related to both the change of temperature with height (the lapse rate) driven by the boundary layer energy budget, and wind speed together with surface characteristics (roughness).

A neutral atmosphere neither enhances nor inhibits mechanical turbulence. An unstable atmosphere enhances turbulence, whereas a stable atmosphere inhibits mechanical turbulence.

Stability classes are defined for different meteorological situations, characterized by wind speed and solar radiation (during the day) and cloud cover during the night. The so called Pasquill-Turner stability classes' dispersion estimates include six (6) stability classes as below:

A – Very Unstable B – Unstable C – Slightly Unstable

D – Neutral E – Stable F–Very Stable

For the study purpose, following weather conditions are taken forward for modelling purposes:

- 2F - F stability class and wind speed of 2m/sec
- 5D - D stability class and wind speed of 5m/sec

❑ Release Rates

The release rates were determined based on the release size and the process conditions i.e. temperature and pressure. Depending on the operating conditions, the release state of the fluid could be liquid, gas or two-phase. The release rates were estimated using the software. The release rates and the phase would give an indication of severity of the leak and influence the flammable and toxic impacts.

A. Jet & Pool Fire Radiation Distances

The Jet Fire Radiation distances are not generated for the scenarios considered in this project.

Table 7.4: Jet and Pool Fire Radiation Distances

IS no	Leak Size mm	Jet fire results			Pool Fire	
		Radiation Level KW/m2	Downwind Distance 5D (m)	Downwind Distance 2F (m)	Downwind Distance 5D (m)	Downwind Distance 2F (m)
IS 01	5	4	16.0234	14.3951	Not Reached	Not Reached
		12.5	12.3335	10.6995	Not Reached	Not Reached

IS no	Leak Size mm	Jet fire results			Pool Fire	
		Radiation Level KW/m2	Downwind Distance 5D (m)	Downwind Distance 2F (m)	Downwind Distance 5D (m)	Downwind Distance 2F (m)
		37.5	10.0215	8.42658	Not Reached	Not Reached
	25	4	68.3742	62.0859	33.4042	Not Reached
		12.5	52.1429	45.7914	25.4918	Not Reached
		37.5	42.3929	36.1896	18.1147	Not Reached
	100	4	236.032	212.74	75.0577	87.6676
		12.5	177.707	155.435	42.4845	47.0493
		37.5	142.95	121.7	Not Reached	Not Reached
	FBR	4	338.15	293.492	81.4094	96.0262
		12.5	253.804	215.328	47.0326	52.3467
		37.5	203.536	169.125	Not Reached	Not Reached
IS 02	5	4	14.2904	15.9012	Not Reached	Not Reached
		12.5	10.6189	12.2382	Not Reached	Not Reached
		37.5	8.35937	9.93856	Not Reached	Not Reached
	25	4	62.0859	68.3742	33.4042	Not Reached
		12.5	45.7914	52.1429	25.4918	Not Reached
		37.5	36.1896	42.3929	18.1147	Not Reached
	100	4	212.74	236.032	61.4108	55.8812
		12.5	155.435	177.707	46.3809	38.6361
		37.5	121.7	142.95	33.9597	30.4647
	FBR	4	293.492	338.15	67.5165	60.728
		12.5	215.328	253.804	50.2966	42.4116
		37.5	169.125	203.536	38.5244	34.621
IS 03	5	4	14.2904	15.9012	Not Reached	Not Reached
		12.5	10.6189	12.2382	Not Reached	Not Reached
		37.5	8.35937	9.93856	Not Reached	Not Reached
	25	4	76.8662	83.1224	Not Reached	Not Reached
		12.5	56.3307	63.2803	Not Reached	Not Reached
		37.5	44.2904	51.5159	Not Reached	Not Reached
	100	4	212.74	236.032	61.4108	55.8812
		12.5	155.435	177.707	46.3809	38.6361
		37.5	121.7	142.95	33.9597	30.4647
	FBR	4	293.492	338.15	67.5165	60.728
		12.5	215.328	253.804	50.2966	42.4116
		37.5	169.125	203.536	38.5244	34.621
IS 04	5	4	14.2904	15.9012	Not Reached	Not Reached
		12.5	10.6189	12.2382	Not Reached	Not Reached
		37.5	8.35937	9.93856	Not Reached	Not Reached
	25	4	62.0859	68.3742	40.3277	Not Reached
		12.5	45.7914	52.1429	28.1985	Not Reached
		37.5	36.1896	42.3929	19.173	Not Reached

IS no	Leak Size mm	Jet fire results			Pool Fire	
		Radiation Level KW/m2	Downwind Distance 5D (m)	Downwind Distance 2F (m)	Downwind Distance 5D (m)	Downwind Distance 2F (m)
	50	4	115.972	127.258	68.5035	62.9141
		12.5	84.9922	96.397	40.2242	34.8257
		37.5	66.7855	77.9689	Not Reached	Not Reached
	CR	4	Not Reached	Not Reached	154.773	129.638
		12.5	Not Reached	Not Reached	59.0754	58.8311
		37.5	Not Reached	Not Reached	Not Reached	Not Reached
IS 05	5	4	17.0931	18.7703	Not Reached	Not Reached
		12.5	12.6645	14.4513	Not Reached	Not Reached
		37.5	9.98748	11.7922	Not Reached	Not Reached
	25	4	72.2706	78.4889	Not Reached	Not Reached
		12.5	53.033	59.7707	Not Reached	Not Reached
		37.5	41.7394	48.6386	Not Reached	Not Reached
	100	4	239.354	271.52	71.6275	65.6425
		12.5	175.292	204.257	62.8415	51.5485
		37.5	137.527	164.388	50.91	42.6676
	FBR	4	330.539	389.148	84.927	74.8009
		12.5	243.108	291.91	71.8274	58.4006
		37.5	191.349	234.213	58.9784	49.9984
IS 06	10	4	31.3999	34.285	Not Reached	Not Reached
		12.5	23.2117	26.3225	Not Reached	Not Reached
		37.5	18.3699	21.5338	Not Reached	Not Reached
	CR	4	Not Reached	Not Reached	76.3202	59.2431
		12.5	Not Reached	Not Reached	30.472	24.5466
		37.5	Not Reached	Not Reached	Not Reached	Not Reached
IS 07	5	4	Not Reached	Not Reached	17.0403	16.6609
		12.5	Not Reached	Not Reached	12.2525	11.4612
		37.5	Not Reached	Not Reached	7.127	6.34728
	25	4	Not Reached	Not Reached	26.4619	25.0922
		12.5	Not Reached	Not Reached	17.5607	14.9737
		37.5	Not Reached	Not Reached	5.49157	5.19136
	50	4	Not Reached	Not Reached	26.4619	25.0922
		12.5	Not Reached	Not Reached	17.5607	14.9737
		37.5	Not Reached	Not Reached	5.49157	5.19136
	CR	4	Not Reached	Not Reached	26.4619	25.0922
		12.5	Not Reached	Not Reached	17.5607	14.9737
		37.5	Not Reached	Not Reached	5.49157	5.19136
IS 08	5	4	Not Reached	Not Reached	Not Reached	Not Reached
		12.5	Not Reached	Not Reached	Not Reached	Not Reached
		37.5	Not Reached	Not Reached	Not Reached	Not Reached
	25	4	Not Reached	Not Reached	Not Reached	Not Reached

IS no	Leak Size mm	Jet fire results			Pool Fire	
		Radiation Level KW/m2	Downwind Distance 5D (m)	Downwind Distance 2F (m)	Downwind Distance 5D (m)	Downwind Distance 2F (m)
		12.5	Not Reached	Not Reached	Not Reached	Not Reached
		37.5	Not Reached	Not Reached	Not Reached	Not Reached
	100	4	23.8248	17.2367	Not Reached	Not Reached
		12.5	5.93366	Not Reached	Not Reached	Not Reached
		37.5	Not Reached	Not Reached	Not Reached	Not Reached
	CR	4	Not Reached	Not Reached	Not Reached	Not Reached
		12.5	Not Reached	Not Reached	Not Reached	Not Reached
		37.5	Not Reached	Not Reached	Not Reached	Not Reached
IS 09	5	4	Not Reached	Not Reached	Not Reached	Not Reached
		12.5	Not Reached	Not Reached	Not Reached	Not Reached
		37.5	Not Reached	Not Reached	Not Reached	Not Reached
	25	4	Not Reached	Not Reached	Not Reached	Not Reached
		12.5	Not Reached	Not Reached	Not Reached	Not Reached
		37.5	Not Reached	Not Reached	Not Reached	Not Reached
	100	4	23.8248	17.2367	Not Reached	Not Reached
		12.5	5.93366	Not Reached	Not Reached	Not Reached
		37.5	Not Reached	Not Reached	Not Reached	Not Reached

Source: ABC Techno Labs India Pvt. Ltd.

B. Flash Fire Radiation Distances

Flammable Dispersion Distances are provided below;

Table 7.5: Flammable Dispersion Distances

IS no	Leak Size mm	Radiation Level KW/m2	Downwind Distance 5D wind condition (m)	Downwind Distance 2F wind condition (m)
IS 01	5	0.5 LFL	25.8135	9.53625
		LFL	13.6157	5.6919
	25	0.5 LFL	131.985	89.5236
		LFL	97.3656	64.0797
	100	0.5 LFL	459.411	283.1
		LFL	331.915	207.183
	FBR	0.5 LFL	673.595	383.472
		LFL	473.362	279.942
IS 02	5	0.5 LFL	9.26375	25.4613
		LFL	5.60673	12.8696
	25	0.5 LFL	89.5236	131.985
		LFL	64.0797	97.3656
	100	0.5 LFL	279.88	453.642
		LFL	204.366	326.925
	FBR	0.5 LFL	381.561	670.178
		LFL	278.182	470.255
IS 03	5	0.5 LFL	9.26375	25.4613
		LFL	5.60673	12.8696
	25	0.5 LFL	121.303	155.725
		LFL	85.0564	119.459

IS no	Leak Size mm	Radiation Level KW/m2	Downwind Distance 5D wind condition (m)	Downwind Distance 2F wind condition (m)
	100	0.5 LFL	279.88	453.642
		LFL	204.366	326.925
	FBR	0.5 LFL	381.561	670.178
		LFL	278.182	470.255
IS 04	5	0.5 LFL	9.26375	25.4613
		LFL	5.60673	12.8696
	25	0.5 LFL	89.5236	131.985
		LFL	64.0797	97.3656
	50	0.5 LFL	167.419	246.762
		LFL	122.437	182.211
	CR	0.5 LFL	170.856	261.212
		LFL	128.575	195.62
IS 05	5	0.5 LFL	13.8881	32.2294
		LFL	6.96923	14.8189
	25	0.5 LFL	110.833	151.507
		LFL	78.2425	117.033
	100	0.5 LFL	416.101	712.647
		LFL	303.72	487.322
	FBR	0.5 LFL	565.419	1037.19
		LFL	409.616	649.042
IS 06	10	0.5 LFL	41.1908	65.9019
		LFL	22.7062	43.7239
	CR	0.5 LFL	195.148	191.538
		LFL	142.043	151.176
IS 07	5	0.5 LFL	2.97225	2.59942
		LFL	2.93802	2.59923
	25	0.5 LFL	4.18489	4.19016
		LFL	4.1784	4.18894
	50	0.5 LFL	4.1905	4.18951
		LFL	4.18964	4.18766
	CR	0.5 LFL	5.14787	5.03176
		LFL	5.13588	5.01977
IS 08	5	0.5 LFL	0.143638	0.0738066
		LFL	0.0524907	0.0210799
	25	0.5 LFL	0.143638	0.0738066
		LFL	0.0524907	0.0210799
	100	0.5 LFL	4.16992	3.41508
		LFL	1.21201	1.75796
	CR	0.5 LFL	4.72297	2.84142
		LFL	2.78919	2.08837
IS 09	5	0.5 LFL	0.143638	0.0738066
		LFL	0.0524907	0.0210799
	25	0.5 LFL	0.143638	0.0738066
		LFL	0.0524907	0.0210799
	100	0.5 LFL	4.16992	3.41508
		LFL	1.21201	1.75796
	CR	0.5 LFL	4.72297	2.84142
		LFL	2.78919	2.08837

Source: ABC Techno Labs India Pvt. Ltd.

C. Toxic Dispersion

There is no toxic hazard in the facility.

D. Vapour Cloud Explosion

A vapour cloud explosion involves a flame moving through a fuel-air mixture. In absence of turbulence generation, the cloud will burn as a flash fire without generation of high over pressure. However significant turbulence can be generated by obstacle encountered by a flame as it is propagated through the vapour cloud in obstructed region. It is that explosion that occurs in the presence of obstacle that can generate overpressure with potential for extensive damage.

In order to model vapour cloud explosion, the Obstructed Region Explosion Model available in SAFETI 8.2 has been used and a brief overview has been provided below.

OREM in PHAST would enable a user to model the blast effects from vapour clouds dispersing through regions containing obstacles.

Explosions in Obstructed Regions have been modeled in the Multi-Energy (ME) Model. ME Obstruction set has been used for defining Obstructed Regions and it consider the following:

- *Degree of expansion (2D/ 3D);*
- *Volume (Blockage ratio):*
- *Surface of area of obstruction source and Flame path length*

Late Explosion Overpressure Distances is provided below;

Table 7.6: Late Explosion Overpressure Distances

IS No	Scenario	Weather	Overpressure (bar)	Distance [m]
IS 04	CR	2F	0.02068	555.2
			0.2068	302.2
			1	274.1
		5D	0.02068	321.1
			0.2068	150.7
			1	132.2
IS 06	10mm	2F	0.02068	158.2
			0.2068	95.67
			1	86.23
		5D	0.02068	81.6
			0.2068	48.34
			1	43.31
	CR	2F	0.02068	452.2
			0.2068	214.8
			1	181.8
		5D	0.02068	422.9
			0.2068	194
			1	179.1

Source: ABC Techno Labs India Pvt. Ltd.

E. Fire Ball

Fire ball distances are provided below;

IS no	Leak Size	Radiation Level	Downwind Distance	Downwind Distance
	mm	KW/m2	5D wind condition	2F wind condition
			(m)	(m)
IS 08	100	4	17.3973	17.3973
		12.5	7.14028	7.14028
		37.5	Not Reached	Not Reached
	CR	4	17.3973	17.3973
		12.5	7.14028	7.14028
		37.5	Not Reached	Not Reached
IS 09	100	4	17.3973	17.3973
		12.5	7.14028	7.14028
		37.5	Not Reached	Not Reached
	CR	4	17.3973	17.3973
		12.5	7.14028	7.14028
		37.5	Not Reached	Not Reached

Source: ABC Techno Labs India Pvt. Ltd.

The contour diagrams for the above scenarios are attached as Annexure 11.

7.2.5 Failure Frequency Analysis

As a part of the process of determining risk the failure frequencies of the hazard events are calculated. Component failures are the primary initiating events for most hazards and accidents and there are various potential causes for component failure resulting in sources of leakage, which may release contained fluids to the atmosphere. Failure scenarios can range from small gasket leaks in a flange joint to rupture resulting in catastrophic failure of a pipeline section. Major failure modes associated with different operational areas are listed below:

- *Failure of weld joints / gaskets (sample points, instrument connections etc.);*
- *Valve gland leakages; and*
- *Leaks/ full bore rupture of the pipe work.*
- *Tank Rupture*

These part counts are combined with historical data from the OGP database to give an overall potential leak frequency for each isolatable section which are then divided into small, medium, large and full bore as described in the methodology section of this report.

The base failure frequency for Valves, Flanges and Pumps are sourced from OGP 434-1.

7.2.5.1 Calculation of Individual & Societal Risk

Individual Risk or IR represents the geographical distribution of risk to any individual.

Societal Risk is representing the risk the project poses to society as a whole. The Societal Risk or Group risk (F-N) curves indicate the cumulative frequency (F) of (N) number of fatalities. Society is typically not willing to accept industrial installations that result in many fatalities, even with a low frequency rate!

The estimation of risks in the software is done through estimation of "risks" attributed to each failure case by determining the impact in terms of fatalities. In this step, the hazard or effect zone information, ignition source, population distribution, meteorological data and other relevant details are combined to determine risks.

In order to estimate risks (IR or SR), the number of fatalities for each incident outcome case is calculated and the frequencies of outcomes with equal fatalities summed up.

After determination of potential sources of accidents and their zone of effect, the risk is quantified in terms of likelihood of fatalities due to these accidents by combining the frequency and severity (consequences). The commonly used risk indicators for onshore facilities are:

- Individual Risk per Annum (IRPA),
- Potential Loss of Life (PLL) and
- Societal Risk for the facilities

The risk at any particular location is expressed as Location Specific Individual Risk (LSIR). The LSIR is then combined with personnel occupancy levels to obtain the fatality risk expressed as individual risk. The estimated risk levels are assessed against Company Individual risk tolerable criteria for existing facilities to establish whether the project facilities can be regarded as in compliance with them.

- **Individual Risk**

Individual risk is defined as the frequency at which a named individual would be killed as a result of exposure to a hazard.

Individual Risk = LSIR X Occupancy

Where,

'Occupancy' is the proportion of time the individual is exposed to the hazard.

- **Societal Risk**

Assessment of societal risks is even more important than assessment of individual risk because they involve the likelihood of multiple fatalities. Societal risk is the risk to any person or group of persons who are not connected to project facilities and are outside the facility fence line.

- **F-N Curve**

It is helpful to consider group risk in the demonstration that risks are ALARP. This allows consideration to be given to events, which, although low in frequency, may cause multiple injuries or fatalities. Group risk can be presented in the form of a plot of cumulative frequency versus number of fatalities (F-N curve).

F = frequency (experienced or predicted)

N = no. of multiple fatalities.

'N' includes indirect deaths caused as a result of the main event occurring and can therefore be difficult to predict e.g. many people may die years after exposure to a toxic chemical.

7.2.5.2 Event Tree Analysis

This task involves a probabilistic risk assessment to determine the probability of occurrence of a hazardous outcome following a failure event e.g. the probability of occurrence of gas cloud, fire or explosion event following a leak.

Operational probability is considered as 1 as the facility is in operation continuously.

Event Trees for small, medium, large and rupture release sizes for the present study have been used for RA. Each route in the tree has a corresponding impact event tree, which contains probabilities for immediate ignition for obtaining different types of flammable effects and for dispersion of the un-ignited releases. Total ignition probabilities have been sourced from the IP database.

The potential for ignition mainly depends upon the size and composition of a given release and the number of potential ignition sources available. Electrical equipment in hazardous areas is usually designed such that it will not present a potential ignition source (e.g. Intrinsically Safe). As such, in most cases (excluding hot surfaces or auto ignition of gas due to static charge) a fault would have to be present in an item of equipment before it becomes a potential ignition source.

However, should a flammable mixture be of sufficient size, then non-rated equipment outside the hazardous area could provide source of ignition. The Event Tree adopted for this project is provided in the following Figures;

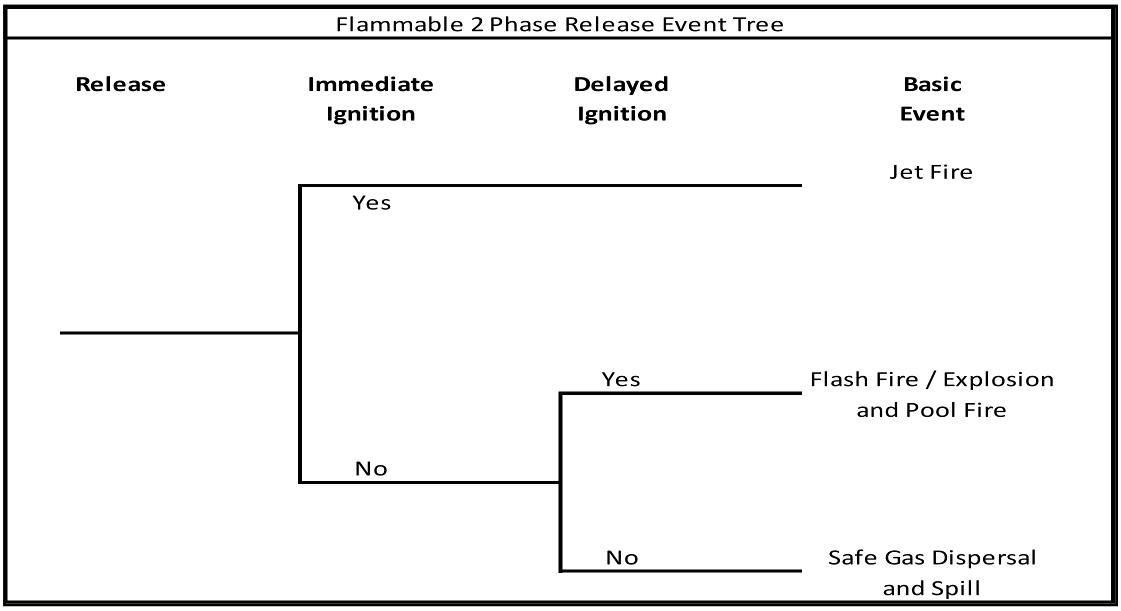


Figure 7.2: Flammable 2 Phase Release Event Tree

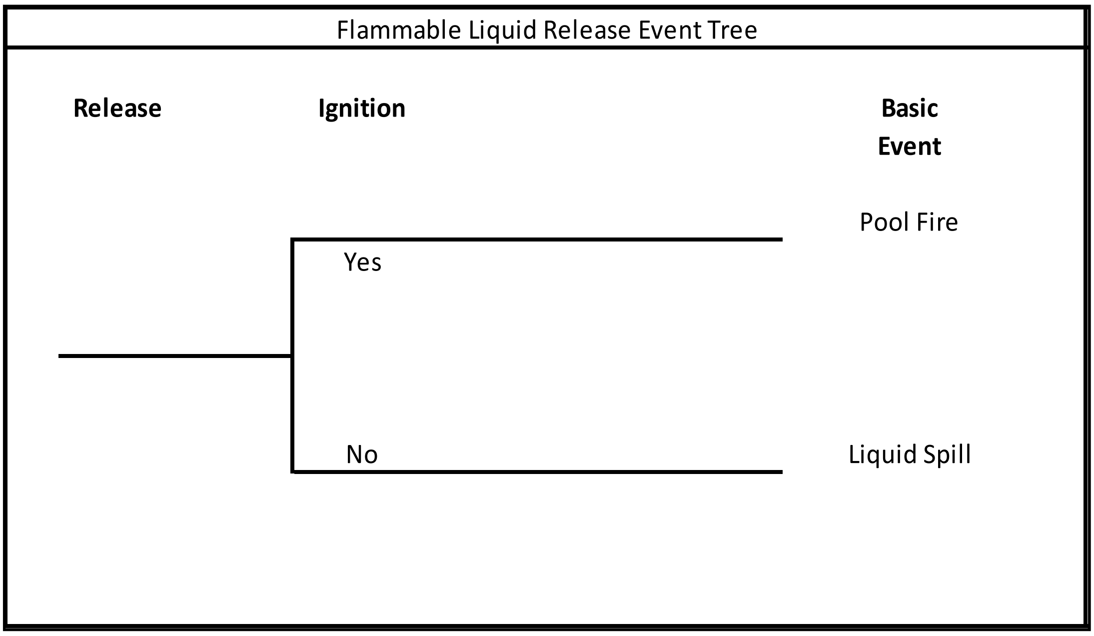


Figure 7.3: Flammable Liquid Release Event Tree

As described above, other potential ignition sources may be hot surfaces, sparks caused by mechanical impact or static charge auto ignition due to high pressure gas escaping through an orifice.

7.2.5.3 COMPARISON TO RISK ACCEPTANCE CRITERIA

This penultimate step compares the estimated risk with respect to the Company's internal risk acceptability criteria or specific legislative or regulatory (as applicable in the country of operation) risk acceptability criteria. In this step, the risk "band" is determined- typically, the project risk band is determined to be negligible, acceptable, not acceptable are the risk assessment stage determines whether the risks are "Broadly Acceptable", "Intolerable" or "Tolerable if ALARP".

Vedanta Limited (Division: Cairn Oil & Gas) Risk Acceptability Criteria

Vedanta Limited (Division: Cairn Oil & Gas) risk acceptability criteria are derived from interpretation of the risk acceptability criteria published by UK HSE-92 and are applied when assessing the tolerability of risk to persons for Vedanta Limited (Division: Cairn Oil & Gas) facilities, sites, combined operations or activities. It broadly indicates as follows:

- Individual risk to any worker above 10^{-3} per annum shall be considered intolerable and fundamental risk reduction improvements are required.
- Individual risk below 10^{-3} for but above 10^{-6} per annum for any worker shall be considered tolerable if it can be demonstrated that the risks are As Low As Reasonably Practicable (ALARP).
- Individual risk below 10^{-6} per annum for any worker shall be considered as broadly acceptable and no further improvements are considered necessary provided documented control measures are in place and maintained.
- Individual risk to any member of the general public as a result of Vedanta Limited (Division: Cairn Oil & Gas) Businesses activities shall be considered as intolerable if greater than10^{-4} per annum, broadly acceptable if less than 10^{-6} per annum and shall be reduced to As Low As Reasonably Practicable (ALARP) between these limits.
- For new facilities, Vedanta Limited (Division: Cairn Oil & Gas) shall strive to achieve lower risks compared with that typical for existing facilities, down at least to an individual risk to any worker of 10^{-4} per annum, by the appropriate use of best practice including technology and management techniques.
- For existing facilities, higher risk levels may be tolerated provided that they are As Low As Reasonably Practicable (ALARP) and meet the minimum standards given herein. As facilities under Vedanta Limited (Division: Cairn Oil & Gas) expansion may be considered as "new" facilities; it is proposed that individual risk to any worker above 10^{-4} per annum shall be considered intolerable.

Individual Risk Criteria (IR)

The Vedanta Limited (Division: Cairn Oil & Gas) Individual Risk Criteria is provided below.

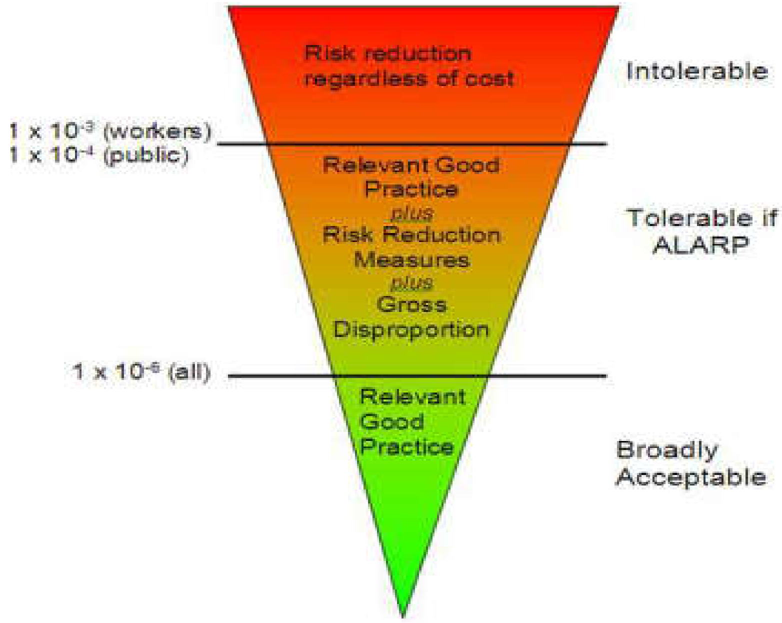
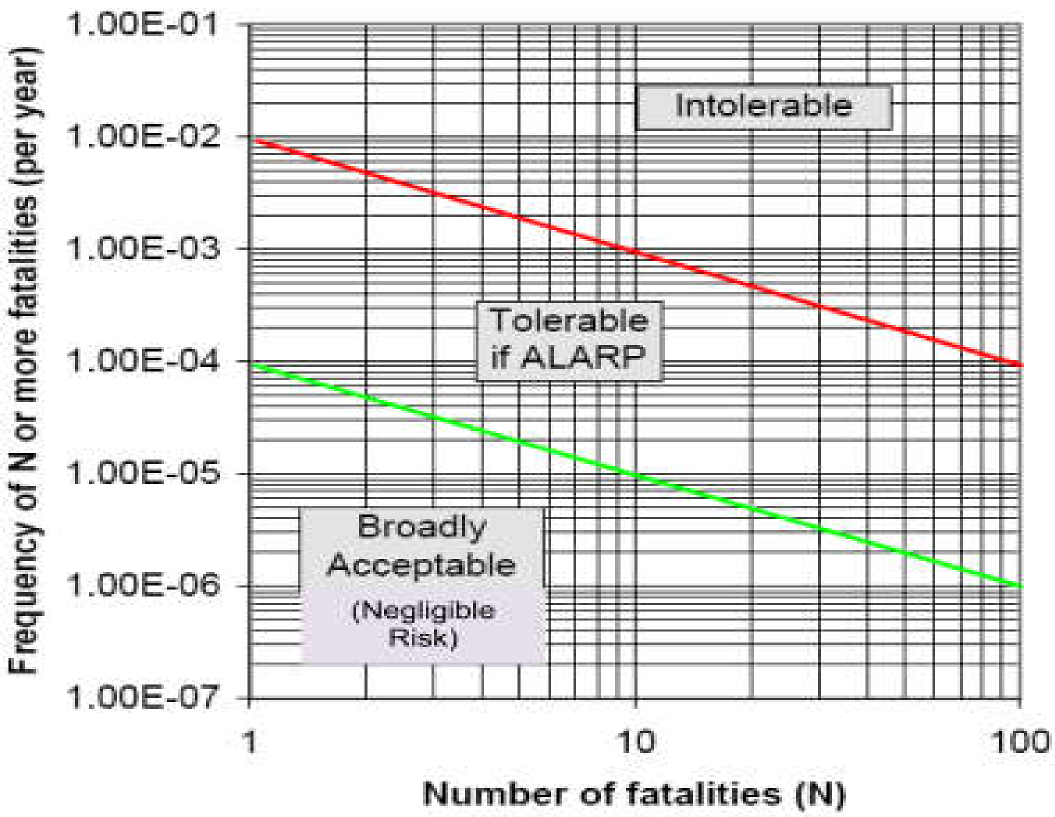


Figure 7.4: Individual Risk Criteria

Societal Risk Criteria

Societal risk criteria for Vedanta Limited (Division: Cairn Oil & Gas) are used to limit the risks to a group of people and it is expressed as an F-N Curve.



Source: ABC Techno Labs India Pvt. Ltd.

Figure 7.5: Societal Risk Criteria

7.2.5.4 FAILURE FREQUENCY ANALYSIS

As a part of the process of determining risk the failure frequencies of the hazard events are calculated. Component failures are the primary initiating events for most hazards and accidents and there are various potential causes for component failure resulting in sources of leakage, which may release contained fluids to the atmosphere. Failure scenarios can range from small gasket leaks in a flange joint to rupture resulting in catastrophic failure of a pipeline section. Major failure modes associated with different operational areas are listed below:

- Failure of weld joints / gaskets (sample points, instrument connections etc.);
- Valve gland leakages; and
- Leaks/ full bore rupture of the pipe work.
- Tank Rupture

These part counts are combined with historical data from the OGP database to give an overall potential leak frequency for each isolatable section which are then divided into small, medium, large and full bore as described in the methodology section of this report.
The base failure frequency for Valves, Flanges and Pumps are sourced from OGP 434-1.

7.2.5.5 IGNITION PROBABILITIES

The potential for ignition mainly depends upon the size and composition of a given release and the number of potential ignition sources available. Electrical equipment in hazardous areas is usually designed such that it will not present a potential ignition source (e.g. flameproof/intrinsically safe). As such, in most cases (excluding hot surfaces or auto ignition of gas due to static charge) a fault would have to be present in an item of equipment before it becomes a potential ignition source.

However, a flammable mixture is of sufficient size and then non-rated equipment outside the hazardous area could provide a source of ignition. Other potential ignition sources may be hot surfaces such as heaters, sparks caused by mechanical impact or static charge auto ignition due to high pressure gas escaping through an orifice.

Ignition Probabilities used for the RA study has been taken from Institute of Petroleum Database. The various ignition probabilities have been calculated based on the release rate of each identified scenarios.

The following Look-Up Curves from OGP 434-6 has been used to calculate the Ignition Probability;

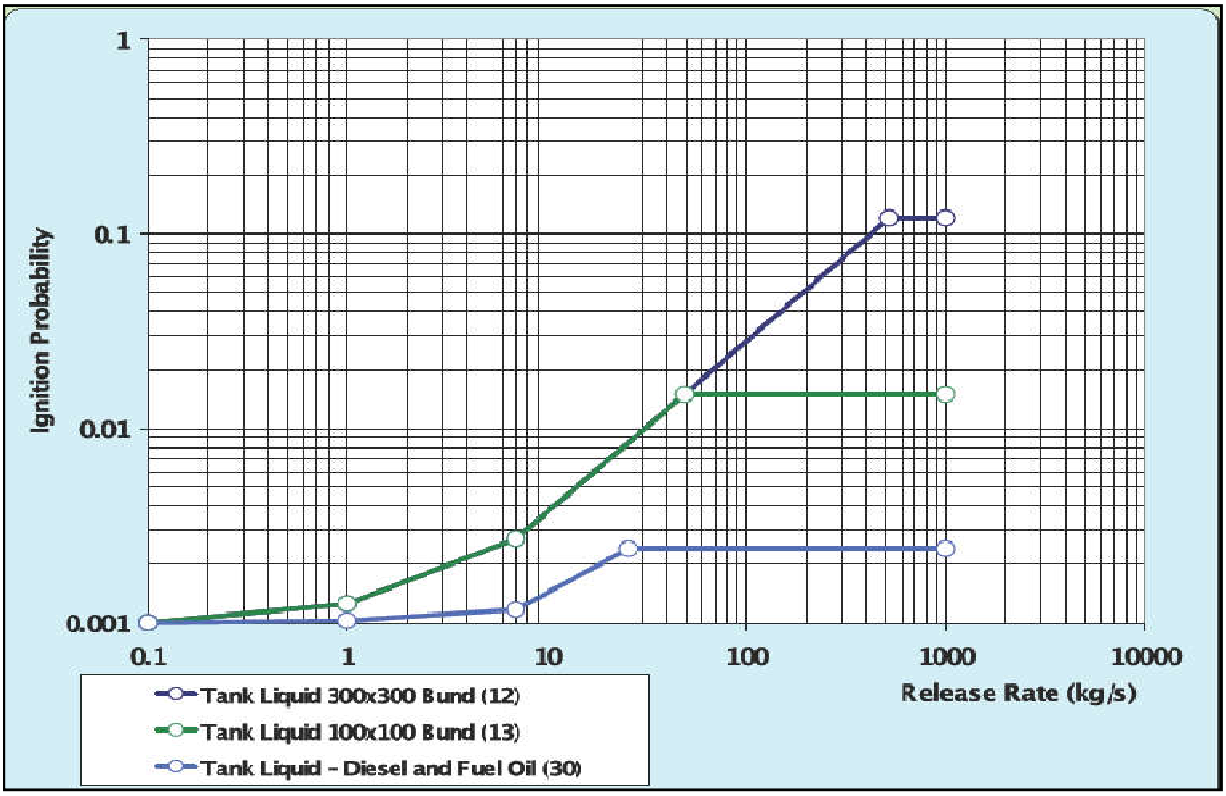


Figure 7.6: IP Look Up Curve

This RA Study as per OGP 434-6 has considered immediate ignition probability as 0.001 and it is independent of the release rate. The delayed ignition probability is calculated based on the Total ignition probability taken from the Look Up Curve and Immediate ignition probability.

7.2.6 Risk Estimation

The individual risk levels to personnel and potential loss of life levels at each study area were calculated by combining the consequences and frequencies of the accident scenarios; in accordance with the Company Risk Tolerable Criteria as described in earlier section. All the hazard scenarios that have the potential to impact these areas were included in the risk assessment.

7.2.6.1 Location Specific Individual Risk

The LSIR was estimated based on component failure frequencies and event probability for release scenarios. Note that the LSIR levels represent the cumulative risk from all the major accident events at the project facilities without taking into account personnel exposure factor, vulnerability and probability of escape. The overall Location Specific Individual Risk contours and FN Curve are developed considering all scenarios pertaining to all Isolatable Sections and are provided in Sections below.

The LSIR levels at different locations are provided in the Table below.

Table 7.7: LSIR level at different locations

Location	Individual Risk Ranking values
Diesel Storage area	1.86 E-07
Oil Tank area	1.44 E-06
Process area	1.87 E-04
Rig area	8.01 E-08
Tanker area	5.69 E-09

The LSIR contour is provided in the below Figure below.

Figure 7.7: LSIR Contour

The above Risk Contour (LSIR) is generated on the basis that each target location considered is permanently inhabited by a single individual. LSIR Contours are indicative of the potential magnitude or intensity of the risk, but the risks will only be realised at a given location if personnel will be present at that location 24/7.

It may be noted that the above risk estimation is based on the basic failure frequency listed for the various components. Consequences were assessed based on the tank inventory. Some of the specific design aspects such as design overpressure and corrosion allowance, provision of PSVs, Material of Construction complying with NACE can bring down the failure frequency by an order of magnitude. Detection and control such as Fire & Gas detection systems which generate alarm drawing the attention of operators and/or activate safe shutdown with a minimum PFD of 1E-01 should also be considered as risk management hierarchy.

7.2.6.2 Incremental Individual Risk Per Annum

Individual Risk or Individual Risk Per Annum is determined on a case by case basis for each individual working. The individual risk levels have been calculated by multiplying the above LSIR levels by the exposure factor (Occupancy Level).

The results of these calculations based on worker groups are presented in below Table;

Table 7.8: Incremental Individual Risk Per Annum (IRPA)

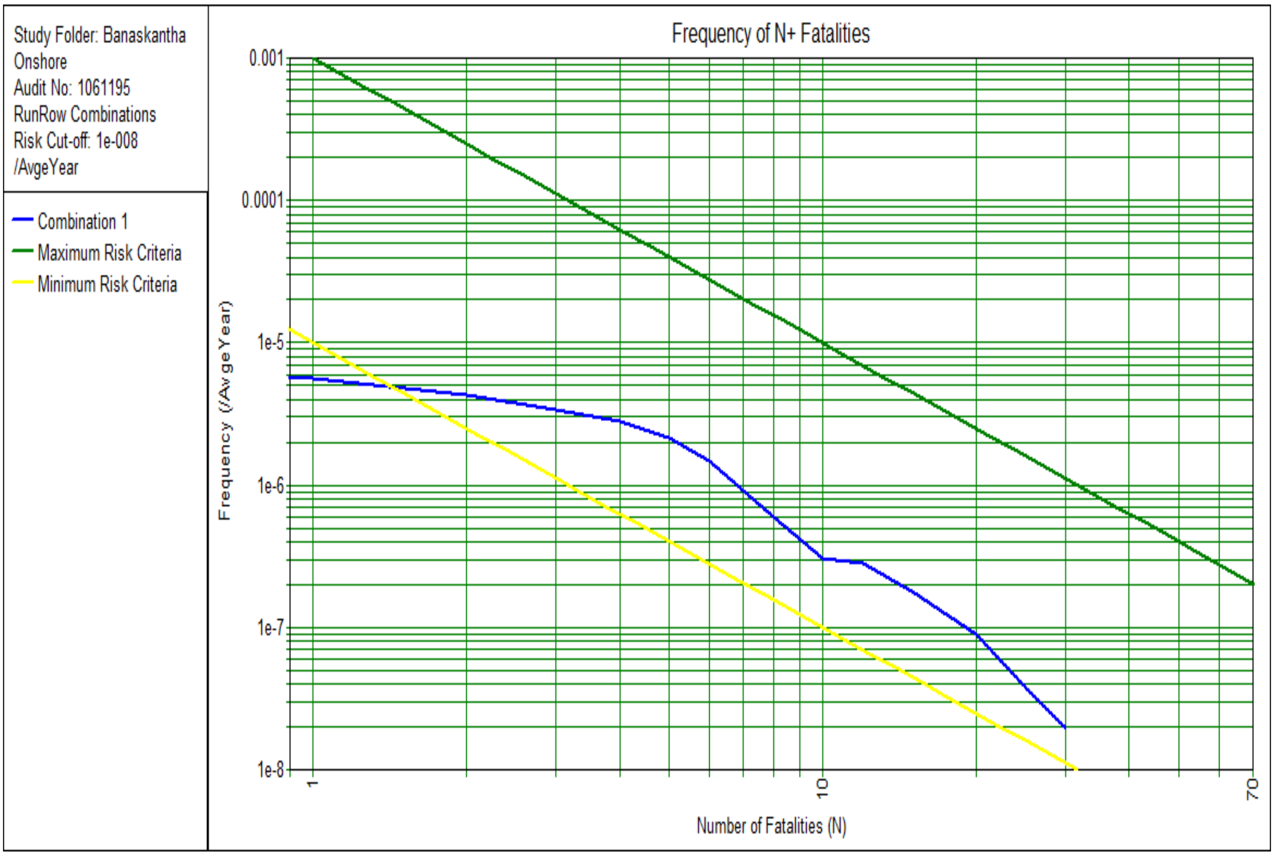
S. No.	Worker Groups	LSIR (Avg/ year)	Occupancy	IRPA (Avg/ Year)
1	Operators	1.87E-04	0.22	4.11E-05
2	Maintenance	1.73E-05	0.33	5.71E-06

Source: ABC Techno Labs India Pvt. Ltd.

From the above Table, the Individual Risk is following into Acceptable Region.

7.2.6.3 Societal Risk

The FN Curve is provided in the following Figure.



Source: ABC Techno Labs India Pvt. Ltd.

From the above Figure, the societal risk falls into Acceptable Region.

7.2.7 RISK EVALUATION

As per Risk Tolerance Criteria for Individual Risk and Societal Risk, the Individual Risk and Societal Risk value for all Worker groups falls within the Acceptable Region.

7.2.8 ALARP DEMONSTRATION AND COST BENEFIT ANALYSIS (CBA)

ALARP Demonstration is not necessary as the Individual Risk and Societal Risk falls in Acceptable Region.

7.2.9 RISK REDUCTION MEASURES

Though the risk falls under the Risk Tolerance Criteria for Individual and Societal Risk, the following recommendations are made with respect to continual improvement and to increase the reliability of the conditional modifiers:

- Ensure that the portable fire extinguishers are provided at strategic locations as per OISD-117 and it is inspected at regular intervals.
- Fire and Gas Detectors can be provided for early detection warning.
- As Operator Room are likely to be affected due to Blowout scenario, it is essential to ensure the upkeep of the safety devices (Smoke Detection, Fast Rescue Craft (FRC), escape routes and it must be ensured that Mock evacuation drills are carried out periodically.
- The correct installation of Safety Critical Equipment and their operational reliability are essential for the safety of the facility. In addition, initial and periodic testing of the Safety Critical Equipment before installation and periodically is absolutely essential and the same must be ensured.
- Active fire protection should be provided for all equipment falling within the heat radiation intensity of 12.5 KW/m^2.
- The Closed Room such as Control Room, Operator Room, etc. should be positively pressurized higher than the atmospheric pressure.
- Ignition controls such as maintenance of electrical equipment is recommended as per Hazardous Area Classification Study.
- Detection arrangements for Bund fires for HSD Tank through leak detection within the bund and monitoring with CCTV cameras can be followed.
- Ensure that the bund provided can contain the entire Tank Capacity (110%).

- Periodic On Site Emergency Mock Drills and occasional Off Site Emergency Mock Drills to be conducted, so those staffs are trained and are in a state of preparedness to tackle any emergency.
- It must be ensured that Storage Tanks and Road Tankers are NOT overfilled (not more than 80%)- set points/SOP to capture the same.
- Emergency Response Plan should be prepared based on this QRA Study result identifying the required emergency facilities and the detailed procedure for Shutdown, Evacuation and Rescue.
- Permit to work system to be implemented 100 % for hazardous work in the plant.
- Manual call points for fire location identification to be installed in plant premises.
- Fire Fighting System to be made available.
- Escape routes for personnel must be properly protected and kept free of any debris/obstructions etc.
- Ensuring that the public in vicinity of the facility is made aware of the hazards and also the hazards of unplanned and irregular third-party activities- this may be done through frequent safety awareness programmes, warning signage, explicit display of Do's and Don'ts etc.
- Key non-routine activities must be preceded by a Job Safety Analysis and Job or Task Risk Assessment involving key personnel that would be working on the facility.
- Trips and falls hazard, electrical hazards etc. must be minimized through periodic safety audits and site inspections using third party and Internal audit teams. Actions arising out of the audits must be implemented in a time bound manner and followed up for closure.
- Vedanta Limited (Division: Cairn Oil & Gas) must ensure suitable training to all personnel (Company as well as Contractor personnel) to help prevent incidents/accidents- such training must be refreshed periodically, and a list of trained personnel must be maintained by Vedanta Limited (Division: Cairn Oil & Gas).
- Ensure proper (metallic/metal braided) hoses, gaskets etc. and Road tanker earthing are properly executed.

As the risk is acceptable, the above recommendations are not mandatory for life safety point of view and are aimed to mitigate the asset damage should the fire occur.

The safeguarding of human life is Vedanta top most priority. To this effect, Vedanta Limited (Division: Cairn Oil & Gas) has issued and implemented a comprehensive HSE POLICY backed up with appropriate safety management systems and procedures.

- Vedanta Limited (Division: Cairn Oil & Gas) operating procedures lay a strong focus on hazard identification and risk assessment covering each and every hazardous operation, procedure and equipment. Risks and mitigating measures for each are clearly carried out and measures implemented and monitored. This ensures risk minimization to the worker group.
- The facility is built based on the highest international standards and global best practice. Individual equipment is of highest quality, certified and of highest safety integrity. This ensures risk minimization to the worker group through operational and maintenance periods. In addition, equipment hazard identification has to be carried out for each of the equipment time to time.

The following are some of the protections provided for Blowout scenario.

- The primary protections against blow outs during drilling are the BOPs or Blow out Preventers. These are used to shut in and control the well in the event of gas or oil being encountered at pressures higher than those exerted by the column of mud in the hole.
- BOPs typically consist of 2-3 ram preventers designed at high pressures. The BOPs are hydraulically operated with a second remote control panel situated someway away from the rig for use in emergencies when the rig is unapproachable. Connected to the side of the ram type preventers (usually below the blind rams) are the kill and choke lines which are used to control the well in the event of any imbalance between the drilling fluid column pressure and the formation pressure. Both lines are high pressure 2-3 inch hydraulic pipes, the kill line being connected to the mud circulation system and the high pressure cement pumps and the choke line leading to a back pressure control Manifold and the mud degasser unit.
- In the event of the high pressure kick with the drill string in the hole, the BOP is closed around the drill pipe and the mud is circulated down the drill string and back to the mud tanks through the choke line and back pressure manifold. The manifold consists of a series of valves and chokes - the choke can be adjusted to give the orifice

opening required such as to give a back pressure on the well in order to control it. There would be two chokes in order to allow maintenance on one.

- If a kick or blow out occurs with the drill string out of the hole, the blind rams are closed and heavy mud is pumped into the well through the kill line. Any gas can be bled off through the choke line and fluids are usually squeezed back into the formation.
- The correct installation of the drilling equipment and the operational reliability of the BOPs are essential for the safety of well drilling operation. In addition, initial and periodic testing of the BOPs, choke and kill manifolds, high pressure/ heavy mud system etc. before installation and periodically is absolutely essential. Most important is the presence of highly trained skilled personnel on the rig! In addition, the use of the correct drilling fluid in the circulatory system is extremely vital.
- The drilling fluid basically does the following:
  - To cool and lubricate the drilling bit and the drill string
  - To remove drill solids and allowing the release at their surface.
  - To form a gel to suspend the drill cuttings and any fluid material when the column is static
  - To control sub surface pressures
  - To prevent squeezing and caving if formations
  - To plaster the sides of the borehole
  - To minimize the damage to any potential production zone.
- Pressures associated with the sub surface oil, gas or water can be controlled by increasing the specific gravity of the fluid and thereby by reducing the hydrostatic head of the drilling fluid column. The squeezing of formations in the drilled hole can be checked by increasing the hydrostatic head of the drilling fluid. Special additives for the drilling fluid for controlling viscosity, lubricating properties, gelling properties etc. play an important role in the drilling fluid integrity. Sealing agents such as cellulose, mica can also be added to make up the drilling fluid loss into the porous and fractured formations.
- The historical records show that the drilling of an exploration well has a higher chance of blow out occurring than does drilling a development well. A blow out can be expected for about 400 exploration wells drilled. As a well takes about 60-90 days

to drill this equates to one blow out approximately every 50 years if drilling was continuous.

7.2.10 SAFETY SYSTEM FOR DRILLING RIGS

Operational Safety is the foremost concern while working on drilling rig. Derrick floor is the center stage of all the operations and it is most susceptible to accidents. Safety precaution with utmost care is required to be taken as per the prevailing regulation and practice so that accidents can be avoided. Due to advancement in technology, number of equipment has been developed over a period to cater the need of smooth operation on derrick floor. Various standards are required to be referred to cover the variety of equipment used for safe operation in drilling and become cumbersome at times to refer standards for each equipment as per given hereunder;

- ✓ Twin stop safety device (crown-o-matic and floor-o-matic);
- ✓ Fall prevention device on mast ladder with safety belt;
- ✓ Emergency Escape device for top man;
- ✓ First aid box with Stretcher and Blanket;
- ✓ Fire bell /siren;
- ✓ Emergency vehicle;
- ✓ Fire extinguishers;
- ✓ Flame proof portable hand lamp /safety torch;
- ✓ Railling with toe board;
- ✓ Guards on all moving parts;
- ✓ Breathing apparatus (wherever required);
- ✓ Gas detector for hydrocarbon gas &H_2S gas (if required);
- ✓ Safety lines for power tongs;
- ✓ Rotary brake;
- ✓ Hoisting brake lever with safety chain;
- ✓ Emergency shutoff system for draw works;
- ✓ Safety chain for inclined ramp (to prevent fall of any person);
- ✓ Safety belt for top-man with lane yard;
- ✓ Railing on stair case at mud tank/walkways and derrick floor; etc.

7.2.11 General Safe Practices during Drilling Operation

- ✓ Penetration rate will be monitored. In case of any drilling break, stop rotary table, pull out the Kelly, stop mud pump and check for self flow;
- ✓ Different type of drill pipes should not be mixed up during making up the string;
- ✓ Protectors should be used on drill pipes while lifting and laying down the pipes on catwalk;
- ✓ Drill pipe rubber protector should be installed on drill pipes body while being used inside the casing;
- ✓ Before starting drilling, hole should be centered to avoid touching of kelly with casing / wellhead and ensure that no damage is done to well head and BOP;
- ✓ Continuous monitoring of the gain/loss of mud during;
- ✓ BOP mock drill should be carried during drilling/tripping and under mentioned operations;
- ✓ Safe Working Conditions and Practices to be adopted during exploratory drilling operations; etc

7.2.12 Emergency Preparedness

- ✓ BOP drills and trip drills should be done once a week;
- ✓ Deficiency observed in BOP drill should be recorded and corrective measures should be taken; etc

7.2.13 Fire Fighting Facility for Drilling Rig

For the drilling rigs following fire fighting system/equipments should be provided:

- ✓ Fire water system; and
- ✓ First aid fire fighting system

7.2.14 Control of Hydrocarbon release and Subsequently Fire & Explosion during drilling and testing

To detect the release of hydrocarbon during exploratory drilling and testing, hydrocarbon detectors should be placed, so that control measures may be taken to prevent fire and explosion.

Emergency control measures should also be adopted as per Mines Act 1952, Oil Mines Regulation 1984 and Oil Industry Safety Directorate Standard 2000.

As per Oil Industry Safety Directorate (OISD) Standard, for the drilling rigs and well testing following fire fighting system/equipments will be provided:

- ✓ Fire water system; and
- ✓ First aid fire fighting system.

A temporary closed grid hydrant system with monitors, hydrant points and fire hose boxes will be installed to cover well location, and oil and diesel fuel storage tanks. Portable fire extinguishers of DCP, mechanical foam and CO_2 types of sufficient capacity and in sufficient numbers along with sand buckets will also be placed at strategic locations. Electrical and manual siren systems will be provided at the Security Gate of the experimental production facility. Electrically operated siren of 500 m range along with push buttons at appropriate locations to operate the siren will be installed.

Adequate personal protective equipments including sufficient number of breathing apparatus must also be kept ready in proper working condition.

- ❑ **Fire Water System**
  - ✓ One water tank/pit of minimum capacity of 50 Kl should be located at the approach of the drilling site.
  - ✓ For experimental production testing, one additional tank/pit of 40 Kl should be provided.
  - ✓ One diesel engine driven trailer fire pump of capacity 1800 lpm should be placed at the approach area of drilling site.
  - ✓ One fire water distribution single line with minimum 4 " size pipe/casing should be installed at drilling site with a minimum distance of 15 m from the well.
- ❑ **First Aid Fire Fighting Equipments at Drilling Rig**

Portable fire extinguisher on the drilling rig will be installed in line with IS: 2190.

7.2.15 MINOR OIL SPILL

During exploratory drilling of wells and testing operations, details of classification of possible oil spill scenario(s) and respective activities are as follows:

Table 7.9: Classification of Oil spill during Exploratory & Appraisal Drilling

Classification of spill	Extent of spill	Impact	Scenarios	Preventive Measures
Tier 1 ***Response can be adequately addressed using equipment and materials available at the site.***	Spill contained on site.	Minor equipment damage. Brief disruption to operations.	• Diesel fuel refueling (i.e. drill rig hose leaks, overfilling or connection/disconnection incidents). • Drilling fluid (i.e. leaks from tanks, pumps or other associated equipment within the closed loop circuit system). • Drilling fluid chemicals (i.e. chemicals used during drilling; note that the volumes are limited by the storage containers used i.e. 200 L drums etc.). • Hydraulic oil (i.e. leaks from a split hydraulic hose or failed connector; moderate pressure, low volume lines).	One of the following preventive systems or its equivalent shall be used as a minimum for onshore facilities: • Dykes, berms or retaining walls sufficiently impervious to contain spilled oil
Tier 2 ***Response requires additional oversight expertise, equipment, and materials available***	Localized spill with potential for escaping the site or that has escaped the site but is of limited extent	Moderate to major equipment damage/loss. Partial or short-term shutdown of operations.	• Transportation incidents associated with the delivery of diesel fuel to the drill-site (i.e. third party supplier's truck rollover or collision). • Complete failure of an on-site storage tank (e.g. diesel fuel for generators).	
Tier 3 ***Response requires oversight, expertise, equipment, and materials available***	Major incident or a spill that has extended beyond the site.	Extensive equipment damage/loss. Long-term shutdown of operations.	• Uncontrolled fluid flow (blowout) from a well during exploratory drilling in case oil is part of fluid.	

Source: ABC Techno Labs India Pvt. Ltd.

Spill response strategies for combating incidents include:

- **Prevent or reduce further spillage:** One of the first response actions, if safe to do so, is the isolation of the source and prevention of further discharge.
- **Monitoring and evaluation:** Monitoring and evaluation are used to: Determine the location and movement (if any) of the spill, its appearance, its size and quantity, changes in the appearance and distribution of the spill over time and potential threat to the environment and the resources required to combat the spill (i.e. a more effective and coordinated response).
- **Mechanical containment and recovery:** restriction of spill movement through the use of physical barriers (e.g. bunds, booms, diversion swales). Containment would be followed by the physical removal of the spilled material. This may be accomplished using sorbent pads, vacuum trucks, skimmers or other mechanical means appropriate to the material spilled.
- **Protection of sensitive areas:** Bunds or booms will be used to prevent spills from migrating down a watercourse or stream.
- **Clean-up:** This involves earthmoving equipment used to recover the absorbed spill and affected soil. Such operations may involve the collection of significantly greater volumes of material than was originally released.
- Combinations of the above strategies.

Affected area due to oil spill will be isolated. Spilled oil will be recovered and stored. Contaminated earth will be collected and disposed in consultation with Gujarat Pollution Control Board.

7.2.16 MEDICAL FACILITIES

First aids facilities should be made available at the core drilling site and a 24 hour standby vehicle (ambulance) should also be available at the well site for quick transfer of any injured personnel to the nearest hospital, in case an accident occurs and medical emergency arises. Prior arrangements should be made with the nearby hospitals to look after the injured persons in case of medical emergency during core hole drilling and experimental production testing operations.

7.3 RECOMMENDATIONS

Drilling Operations

A majority of accidents occur during drilling operation on the drill floor and may be associated with moving heavy tubular, which may strike or crush personnel. Being struck by objects, falling and crushing usually make up maximum occupational risk of fatality. Mechanical pipe handling, minimizing the requirement of personnel on the drill floor exposed to high level of risk, may be an effective way of reducing injuries and deaths. Good safety management, strict adherence to safety management procedures and competency assurance will reduce the risk. Some of the areas in drilling operations where safety practices are needed to carry out jobs safely and without causing any injury to self, colleagues and system are given below:

Maintenance of Mud Weight

It is very crucial for the safety of drilling well. Drilling Mud Engineer should check the in-going & out-coming mud weight at the drilling well, at regular intervals. If mud weight is found to be less, barytes should be added to the circulating mud, to raise it to the desired level. Failure to detect this decrease in level may lead to well kick and furthermore, a well blow out, which can cause loss of equipments and injury to or death of the operating personnel.

Monitoring of Active Mud Tank Level

Increase in active tank level indicates partial or total loss of fluid to the well bore. This can lead to well kick. If any increase or decrease in tank level is detected, shift personnel should immediately inform the Shift Drilling Engineer and take necessary actions as directed by him.

Monitoring of Hole Fill-up / return mud volume during tripping

During swabbing or pulling out of string from the well bore, the hole is filled with mud for metallic displacement. When this string runs back, the mud returns back to the pit. Both these hole fill up & return mud volumes should be monitored, as they indicate any mud loss or inflow from well bore, which may lead to well kick.

Monitoring of Inflow

Any inflow from the well bore during tripping or connection time may lead to well kick. So, it is needed to keep watch on the flow nipple during tripping or connection time.

7.4 DISASTER MANAGEMENT PLAN

7.4.1 INTRODUCTION

In view of the hazards associated with the Oil Exploration and Production industry, it is essential that a disaster control plan be evolved to effectively deal with the situation utilizing the available resources. There are many agencies involved in the activities associated with a disaster e.g. Government, Fire Service, Medical, Police, Army, Voluntary Organization etc. besides the various departments of the concerned organization itself which requires an organized multi - disciplinary approach to the problem.

7.4.2 OBJECTIVE OF DMP

The following are the main objective of Disaster Management Plan:

- Safeguard personnel to prevent injuries or loss of life by protecting personnel from the hazard and evacuating personnel from an installation when necessary
- Immediate response to emergency scene with effective communication network and organized procedures.
- Obtain early warning of emergency conditions so as to prevent impact on personnel, assets and environment;
- Identifying persons and to extend necessary welfare assistance to causalities
- Finally, when situation is controlled, efforts are to be made to return to normal or near normal conditions.
- Minimise the impact of the event on the installation and the environment, by:
    - ✓ Minimizing the hazard as far as possible
    - ✓ Minimizing the potential for escalation
    - ✓ Containing any release.

7.4.3 EMERGENCY IDENTIFIED

Typical emergency situations which the Vedanta Limited (Division: Cairn Oil & Gas) business has identified that could occur within its field of operations are:

- Well Blowout
- Fire / Explosion
- Gas Leakage (H_2S, Natural Gas, etc.)
- Natural disaster such as earthquake, floods, storms, etc.
- Human injuries from accidents, falls, etc.

7.4.4 Legal Requirements for Disaster Planning

Relevant statutory requirements, as given below and as amended from time to time, inter alia, are applicable for emergency response preparedness in E&P industry:

- *Oil Mines Regulation (OMR), 1984;*
- *Central Electricity Authority Regulation, 2010;*
- *Manufacture, Storage and Import of Hazardous Chemicals (MSHIC) Rules, 1989 and amended thereof;*
- *The Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996;*
- *Explosives Rules, 2008;*
- *Atomic Energy (Radiation Protection) Rules, 2004; etc*

Additionally, all statutory requirements notified by the Central Government or States, from time to time, shall be complied with, as applicable. Clause-72 of Oil Mines Regulations (OMR), 1984 requires the Mines owner to formulate a contingency plan for fire and clause-64 requires development of an emergency plan for petroleum pipelines specifying actions to be taken in the event of fire, uncontrolled escape of petroleum from pipelines. Also, Clause -45(3) requires preparation of emergency plan for blow-out of oil and gas wells. The rules on "Chemical Accidents (Emergency Planning, Preparedness and Response) – 1996 compliments the set of rules on accident prevention and preparedness notified under the Environment (Protection) Act, 1986, in 1989 entitled "Manufacture, Storage and Import of Hazardous Chemicals Rules" and envisages a 4-tier crisis management system in the country. Vedanta Limited (Division: Cairn Oil & Gas) will follows safety guidelines and emergency response procedures as per the detailed regulations given in the Oil Mines Regulation 1984 and Oil Industry Safety Directorate (OISD) Standard 2000.

7.4.5 Emergency Classification

Severity of accident and its likely impact area will determine the level of emergency and the disaster management plan required for appropriate handling of an emergency. Emergency levels and the action needed for each level are indicated below:

Table 7.10: Emergency classification and response team

Emergency Levels	Category	Response	Health & Safety	Environment	Security / Community
Tier 1 *Local Reactive*	✓ A minor Incident where site / location team requires no external assistance and can control the incident with local resources ✓ Incident Controller must notify the leader of the ERT or EMT as applicable	✓ Emergency Response Teams (IRT)/(ERT)	✓ Minor medical or injury case requiring no external support ✓ Equipment damage with loss of production ✓ Minor fire with minor injury or plant damage ✓ Rescue of trapped and injured personnel	✓ Minor oil spill < 100T(700b bls) ✓ Onsite environmental Exposure contained with internal efforts e.g. chemical spill ✓ Notification of cyclone within 72 hrs	✓ Minor security breach ✓ Theft from site ✓ Local unrest
Tier 2 *Tactical*	✓ Substantial Incident ✓ EMT leader decides to activate EMT ✓ EMT leader must notify CMT Leader	✓ Emergency Management Team (EMT)	✓ Any incident requiring additional/external resources ✓ Fire or Explosion ✓ Injury or illness requires evacuation ✓ Traffic accident requires external assistance ✓ Well blow out	✓ Oil spill from >100T but <1000T (700–7000bbls) ✓ Environmental exposure requiring outside help ✓ Earthquake ✓ Flood or Cyclone warning Yellow alert –within 12 hours	✓ Community protest or security breach ✓ Major criminal activity
Tier 3 *Strategic*	✓ Crisis situation ✓ CMT leader decides to activate CMT CMT leader must notify the Chief Executive Officer	✓ Crisis Management Team (CMT)	✓ Incident leading to loss of facility ✓ Incident leading to significant financial loss ✓ Incident leading to multiple injuries or fatality ✓ Well blowout ✓ Incident which could lead to international media interest ✓ Major traffic incident with multiple casualties	✓ Oil spill more than 1000T (7000bbls) ✓ Major Earthquake	✓ Terrorist activities/bomb threat ✓ Kidnap or extortion/threat ✓ Major civil unrest/community protest

Source: ABC Techno Labs India Pvt. Ltd.

7.4.6 ON-SITE EMERGENCY RESPONSE PLAN

The Onsite & Offsite Disaster Management Plan (DMP) and Emergency Response Plan (ERP) are planned for facilities, which are also extended to proposed activities. The scope of the DMP On-site Emergency Preparedness Plan is to evaluate the various types of emergencies that can occur at rig installations and processing/production facilities (Drilling and Production activities) and to formulate emergency plans, procedures that can be implemented by Vedanta Limited (Division: Cairn Oil & Gas) in house. In case the contingency exceed in dimension or geographical coverage beyond Vedanta Limited (Division: Cairn Oil & Gas)'s capability, the offsite Emergency plan shall be activated concurrently with the help of District administration. Based on the incident classification and response team matrix mentioned above, Incident Response Team, Emergency Response Team and Emergency Management Team gets involved).

Tier 1 Incident Response Team (IRT):

- The emergency or incident can be effectively and safely managed, and contained within the site, location or facility by local staff.
- Emergency or incident has no impact outside the site, location or facility. IRT may provide support through effective interaction with local stakeholders.
- Loss of life or severe environmental damage or material loss of asset or organisation's reputation is not a consequence of event / emergency.

Tier 1 incidents are managed by Site IRT, each site has own IRT.

Tier 1 Emergency Response Team (ERT):

- The ERT provide assistance and local support to the IRT's in relevant area.
- The ERT have access to local outside site / external emergency services.
- For tier 2 emergency events.

Tier 2 Emergency Management Team (EMT)

- The incident cannot be effectively and safely managed or contained at the site location or facility by operational local staff and additional support is required.
- The incident is having or has potential of impact beyond the site, location or facility and external support may be required.
- Loss of life or severe environment damage or loss of asset or organisation's reputation is possible consequence of event / emergency.
- IRT may provide support through effective interactions with local stakeholders.

- ERT acts as interface between EMT and IRT for Midstream pipeline operations.

Tier 2 EMT is primarily for tactical response to the incident but may on occasions required to act in reactive mode.

Tier 3 Crisis Management Team (CMT):

- The incident has escalated to a level having potential of loss of life, adverse effect on public or company's operations / reputation.
- Incident may have requirement of immediate action / guidance from Top Management.

Tier 3 incidents are incident escalating to the point requiring involvement of CMT

7.4.7 Roles and Respobsibilities of Individual Response Organisation

The Incident Response Team is responsibility for managing all incidents and emergencies which may occur at or in close proximity to their operational area. For emergencies where additional/external support is required the person in charge of the incident response, the Incident Controller at a remote location, site or facility must notify and request support and assistance from the next level in the emergency management organisation. The ERT/EMT should be notified of all incidents within 30 minutes of the IRT activation at a remote location, site or facility.

The key role and responsibilities of the IRT Leader will be

- To manage the response to any and all incident or emergencies at the Site, Plant or Field Location
- To Control the incident by preventing escalation and minimizing risk to personnel
- Direct and coordinate the activities of the Incident Control and Forward Response Teams.
- Ensuring sufficient trained and competent personnel are available to support the Response Teams.
- Ensuring the safety of all personnel working at the Site, Plant or Field location
- Evaluate and initiate immediate actions, to contain and mitigate effects of the incident or emergency. Monitor the situation & determine need for evacuation.
- Establish head count and potential whereabouts of any missing personnel and if necessary prepare search, rescue and recovery plan.
- Follow Incident Response Plan and if required develop a plan of action to deal with the incident or emergency and communicating this plan to the IRT members.

❑ ***Emergency Management Team (EMT) – Tactical/Strategic Response***

In the event of an incident or emergency the Emergency Management Team Leader will make a decision whether or not to mobilise the EMT. If the decision is taken to mobilise the EMT then all EMT duty personnel are required to proceed promptly to the Emergency Management Team Room and manage emergency in accordance with their role, responsibility and as directed by the duty EMT Leader. DOA shall be nominated for absence.

The EMT organisation has following roles and responsibilities:

- EMT Leader – In overall in-charge/team leader, responsible for Company's tactical response to all emergency situations in respective SBU. They are also responsible for reporting incidents to the regulating authorities.
- Human Resources Coordinator – Responsible for providing HR services advice and support
- Logistics Co-ordinator – Responsible for providing transport and logistics support as required
- Operation and Technical Coordinator – Responsible for providing operational and technical support and advice
- Finance – Responsible for providing financial support and advice.
- HSE Coordinator – Responsible for providing health, safety, environmental support and response.
- Recorder – Responsible for maintaining a timed log of key events and actions
- Security Coordinator – Responsible for providing security support advice and assisting others as required by EMT Leader

The above list identifies a number of key EMT roles, following additional supporting roles may be called on when as and when required, typical roles being:

- Air Medevac Nodal Officer – Responsible for facilitating air medevac.
- IT/Telecommunication Co-ordinator – Responsible for providing the EMT with technical support associated with the communications hardware and software
- Company Medical Officer – Responsible for providing advice and assistance on health and medical issues.
- Legal – Responsible for providing support on legal / regulatory aspects.
- Public Relation/Corp Com – Responsible for communication with media and external stake holders.

- Contractor's representatives – who may be called in to assist the EMT should the incident involve members of their organisation

❑ ***Crisis Management Team (CMT) Roles***

The Crisis Management Team is comprised of small core of senior executives. The CMT will collectively have responsibility for all major actions taken before; during, and after the crisis situation has occurred.

The role and responsibilities of the CMT will be:

- Select additional specialist resources to join the CMT or to advise the CMT during a crisis, depending on the nature of the crisis
- Develop and implement crisis management strategy
- Develop and communicate the operating mandate of the CMT to those with responsibility for the on-scene activities
- Nominate spokesperson to cover media interviews
- Establish contact and communicate with appropriate government or other agencies
- Prepare to coordinate business continuity and recovery strategy.

7.4.8 Emergency Response Strategies / Evacuation Plan

Emergency response strategies (ERS) are the documented decisions on required emergency response measures for identified emergencies, based on risk evaluation and assessment process. It shall consider all statutory requirements applicable to the installations.

The objective of ERS is to identify the means to be used to secure adequate emergency response. It provides basis for monitoring of the adequacy of the emergency response measures so that they can be modified when essential. ERS should include appropriate standard of performance for response measures associated with each type of identified major accident hazard and installation specific factors.

ERS should include the following elements:

- Organisation
- Procedures
- Equipment
- Information
- Competency building measures (Training & refresher courses and Drills & exercises)
- The role of any other measure essential for achieving successful emergency response

Emergency response measures shall consider the available resources as below:

- Installation resources: They are immediately available on the installation and are under control of installation Manager / In-charge. These include personnel and equipment that can be assigned emergency role.
- Area resources: These resources are available on the installations in the vicinity, within same area and are not under control of Installation In-charge. The resources may be available within the Vedanta Limited (Division: Cairn Oil & Gas) or available by a mutual aid or cooperation agreement.
- External resources: These resources are available by a mutual aid or cooperation agreement at regional, national or international level and include organisations, professional bodies and resource persons.

The general requirements as per Vedanta Technical Standard VED/CORP/SUST/TS 13 on Emergency and Crisis Management are:

- Crisis situations shall be managed centrally by Vedanta Limited (Division: Cairn Oil & Gas) business, in accordance with the requirements outlined in the standard.
- SBU operations shall also have procedures in place to ensure crisis situations are escalated to Vedanta Limited (Division: Cairn Oil & Gas) business and Vedanta Group as appropriate.
- Emergency situations shall be managed by SBU operations and reported to Vedanta Limited (Division: Cairn Oil & Gas) business and Vedanta Group as appropriate.
- Incidents shall be managed at the SBU operation level and reported in accordance with SBU operations, Vedanta Limited (Division: Cairn Oil & Gas) business, Vedanta Group and regulatory reporting requirements. Also refer Management Standard MS11 on Incident Reporting, Escalation and Investigation.
- Emergency Preparedness and Response Plans shall be developed, implemented and maintained at the SBU operation, Vedanta Limited (Division: Cairn Oil & Gas) business and Group level to deal with incidents, emergencies and crisis situations.

Additional Vedanta Limited (Division: Cairn Oil and Gas) requirements are:

- The objective of emergency response planning is to have clear written procedures for expected actions during anticipated emergencies. Emergency response plan includes operational and procedural requirements for various emergency scenarios that are relevant for the installation.

- Ensure that appropriate resources and incident/emergency response plans are prepared, practiced and available. The procedures shall include provision for emergency arrangements with contractors.
- Critical resources of emergency response should include:
  - Emergency power systems
  - Fire and gas detection systems
  - Active fire protection
  - Passive fire protection
  - Shutdown system
  - Explosion mitigation and protection systems
  - Evacuation escape and rescue arrangements
- Business continuity and recovery programme (BCRP) to be developed, implemented, tested and maintained. The BCRP shall be risk-based, documented and communicated.
- Every Cairn business unit (including projects and offices) shall be covered by trained Incident and Emergency Management Teams who will manage and execute the emergency plans.
- All members of the emergency organisations should be trained and competent to perform their assigned role within the incident response team (IRT)/emergency response team (ERT)/ emergency management team (EMT).
- Arrangements for emergency medical treatment shall consider injuries to persons as a result of minor accidents & major accidental events, illness of persons on installation, transportation & evacuation of sick and injured personnel.
- Controlled medicines shall be stored in a secure place accessible only to those who are trained to administer these.
- The level of medical facilities and trained personnel provided should be in line with the requirements identified in emergency response strategy. Key points to be considered is identification of medical facilities/hospitals
- Emergency response plans shall comply with all relevant legislative and regulatory requirements to ensure emergency capabilities are maintained and achieved.

Procedure for designing emergency response measures should be based on:

- Integration of emergency response with / into design and operations
- Automatic or remotely operated safety systems to mitigate the effects of an incident

- Emergency response organisation structure
- Wherever applicable offsite emergency response / disaster management plans shall be ensured.
- Essential safety system (such as control stations, temporary refuge, muster areas, fire pumps) shall be located where they are least likely to be affected by fires and explosions.
- Emergency shut down (ESD) system shall be designed such, that it is capable of fulfilling its function under the conditions of incident. If installation is in operation, the essential shutdown functions shall be available during maintenance activities, which affect the operation of the ESD system. ESD system shall contain facilities for testing of input/output devices and internal functions.
- Evacuation and escape routes shall be provided from all areas of an installation where personnel may be expected to be present during their normal activities. Alternative means to allow persons to safely leave the installation in an emergency shall be provided.
- Evacuation and escape routes shall have adequate illumination with emergency lighting and shall be marked to ensure that 'they can be used during emergency conditions'. All escape routes shall be unobstructed (including vertical clearance) and readily accessible.
- Personal protective equipment for use in major accident hazards should be suitable for the circumstances in which it may have to be used and the individuals who may have to use it.
- PPE for use in an emergency should be for all persons on the installation for use in condition of fire, heat, gas release or smoke to enable them to reach muster areas, temporary refuges and evacuation or escape points. Those with specific emergency duties shall also be provided appropriate PPE for use like fire suits and breathing apparatus etc.
- During an emergency, security arrangements shall ensure that unauthorised persons do not enter the incident site by controlling assess and if need arises the area around the site can be evacuated and cordoned to ensure safety of the persons.
- Environmental emergency response should consider:
  - Oil-pollution control equipment that should be located on the installation
  - Environmental conditions that may be present when the equipment is deployed
  - Capacity of the oil recovery system

- Characteristics of the oil / emulsion to be recovered
- Means to identify the extent of the spill
- Facilities to handle any recovered oil.

- International conventions have introduced the requirements to develop national plans for oil-spill response in offshore, and Offshore Assets/SBUs/Operations should ensure that their installations' emergency response plans are aligned with the national requirements.

❑ Responsibilities of the Employees

The establishment and maintenance of best possible conditions of work is, no doubt, the responsibility of the Project Management. It is also necessary that each employee follows prescribed safe methods of work. He should take reasonable care for the health and safety of himself, or his fellow employees and of other persons who may be affected by his action at work. With this in mind, employees shall be trained to be health and safety conscious in the following aspects:

Report	***Potential Hazards***
Observe	Safety rules, procedures and codes of practice
Use	Tools and equipments with all care and responsibility
Participate	In safety training course when called upon to do so.
Make	Use Of safety suggestion schemes
Take	An active and personal interest in promoting health and safety

Each unit shall identify and document the resources required to ensure the effective implementation of the emergency and crisis management procedures. Resource requirements shall meet the requirements of the Vedanta Management Standard MS01 on Leadership, Responsibilities and Resources. The following resources shall be considered and made available as necessary:

- Trained and competent personnel;
- Equipment and other materials including Personal Protective Equipment (PPE); Warning devices;
- Medical services, including personnel trained in first aid, and medical equipment that is appropriate to the type of operation;
- Emergency services support; and
- Emergency funding, along with an appropriate mechanism for delivering funds.

The capacity of external resources, such as local firefighting capacity, shall be assessed, and additional resources acquired and maintained at the operation where external resources are deemed insufficient.

The resources identified shall be maintained and tested on a regular basis, and their adequacy reviewed periodically.

- **Communication Systems**

Emergency response relies upon effective and reliable communication between all personnel involved in response. Communication systems shall:

- Provide sufficient reliable information/alarm to personnel on the installation to enable them to take the appropriate emergency actions.
- Provide means for those on the installation to communicate with the person in overall charge.
- Provide reliable arrangements to allow the person in overall charge to communicate with all personnel on the installation regarding the nature of any emergency and the actions they are required to take.
- Provide reliable means to allow the person in overall charge to communicate with area and external resources who have a role in emergency response.
- Suitable equipment, information processing and procedures shall be in place to enable effective communications. The means of communication shall be selected based on the need for communication in likely scenarios including operational conditions under which they are to function like, noise, ambient conditions and susceptibility to damage. So far as reasonable, communication arrangements should remain available throughout the emergency
- Alarm signals used and their meanings should be described in the emergency response plan along with the procedures to be followed in the event of an alarm. Persons should be provided with adequate information to allow them to, initiate alarms where necessary, distinguish between alarms and respond to alarms.
- Adequate alarms and warning devices, along with other forms of communication, shall be maintained to reliably alert persons across the whole site in the event of an emergency.
- Independent secondary/back-up communications systems shall be provided in case the emergency incident makes the normal communication system inoperable.

- Ensure that the means are in place to alert to the connected installations, the local community/neighboring businesses in the event of an emergency that has the potential interface with them.

❑ **Training and Emergency Response Drills/Mock**

All persons on the installation or in connected activities (including contractor's personnel) shall be trained periodically for emergency response and evacuation procedures. Training for employees having assigned roles in emergency response shall be completed before they are called upon to perform in real emergencies. Emergency response organisation structure (IRT/ERT/EMT/CMT) shall ensure command by competent persons, which can be maintained, so far as is practicable, throughout an emergency.

- Key persons such as the Installation Incharge and Shift Incharge/control room operator shall be assessed for required competence to perform emergencies duties before assigning of duties. As far as possible, assessment should be under simulated emergency conditions.
- Competency and training needs shall meet the requirements of the Vedanta management Standard MS06 on Competency, Training and Awareness
- An emergency response table top exercise/emergency response drill is a focused activity that places the participants in a simulated situation requiring them to function in the capacity that would be expected of them in a real event. Its purpose is to ensure preparedness by testing policies and plans and by training personnel. One objective of an exercise is to be able to identify problem areas for resolution/corrective action before an actual emergency occurs.
- The drills need to address the readiness of personnel and their familiarity / proficiency with emergency equipment and procedures. All personnel on the installation involved including contractor's employees should participate in the drills.
- The drills and table top exercises shall be carried out as often as appropriate, against documented schedule. To be scheduled regularly, at least once a year for full drills and six monthly for desk-based exercises, although the exact frequency and type of drills may depend on the nature and scale of the operations, and the associated risks.
- Emergency response plan shall be reviewed and revised as appropriate in line with the findings from drills and table top exercises.

- Involve external emergency response agencies and other external stakeholders, where appropriate.

Performance Measures

- Key elements of functionality, survivability, reliability and availability shall be included in performance standards. Achievability of performance standards should be validated.
- Effective operations, inspection, testing and maintenance procedures shall be established to ensure that the functional requirements of the equipment and systems provided for emergency escape, evacuation and rescue response are maintained.
- A written scheme shall be prepared, detailing the inspection, testing and maintenance routines and frequencies to be followed. All emergency equipment and systems shall be thoroughly inspected, following established procedures. Adequate records of the results of the inspection, testing and maintenance shall be kept and shall be periodically reviewed to confirm that the written scheme is appropriate and is being adequately implemented.

Monitoring, Evaluation and Review

Documented reviews should be carried out after all drills and actual emergency responses to determine the effectiveness of the Emergency Preparedness and Response Plans, with a full debrief to identify what worked well and what aspects require improvement.

Lessons learned following exercises or actual emergency situations/incidents shall be documented, and any gaps in planning and implementation shall be addressed in revised versions of the Emergency Preparedness and Response Plans. Lessons learned shall be shared across Vedanta Limited (Division: Cairn Oil & Gas)'s operations where appropriate.

All Emergency Preparedness and Response Plans shall be reviewed and updated periodically, at least on an annual basis, to ensure they remain appropriate and relevant. Reviews shall also meet the requirements of the Vedanta Management Standard MS14 on Management Review and Continual Improvement.

Preventive and Mitigation Measures for Well Blow out

Blow-out (uncontrolled gushing of oil & gas) is the worst situation, which may arise at oil wells during drilling, work-over operations, perforation, and reservoir studies at active wells, etc. or due to some unforeseen reasons.

A blow out, though rare, in a drilling operation is often accompanied by fire and explosion exposing workers to serious danger to their lives, burns and poisoning. To understand the failure modes resulting to formation of kick and subsequent blow outs, one has to understand the safety systems installed for blow out prevention.

Prevention of blow outs rests primarily on control of any kick in the well bore. A kick means entry of formation fluids into well bore in large enough quantity to require shutting in the well under pressure. Once a kick is detected, steps can be taken to control entry of formation fluids into the well bore by over balancing the expected bottom hole pressure with properly conditioned mud and operation of safety valves i.e. Blow Out Preventer (BOP), whereby the space between the drill pipes and the casings can be closed and well itself shut off completely. Several instruments are provided on a drilling rig for detection of kicks.

❑ **Instrumentation in Mud System**

Continuous monitoring of condition of mud in the well provides information useful for well control. The following processes are used in the drilling mud system for this purpose:

- A pit level indicator registering increase or decrease in drilling mud volume. It is connected with an audio-visual alarm near the drillers control panel.
- A trip with float-marking device to accurately measure the volume of mud going in to the well. This is useful to keep the well fed with required quantity of mud at all times.
- A gas detector or explosive meter installed at the primary shale shaker together with an audio-visual alarm at the drillers control panel to indicate the well presence of gas-cut mud in the well.
- The kick in the well is prevented by keeping the hydrostatic head of the drilling fluid greater than the formation pressure. The primary control can be lost in the following situations:
- If there is reduction in hydrostatic pressure in the well due to swabbing, which maybe caused if the drilling string is pulled out too fast or by a balled-up or clogged bit, which is indicated by insufficient filling of mud.

❑ **Preventive Measures for Handling Natural Gas**

The natural gas is a colourless, odourless, flammable gas, mainly methane which may cause flash fire. Electrostatic charge may be generated by flow, agitation etc. No occupational exposure limits have been established for natural gas. The preventive measures to be taken to avoid impact due to leakages are

- Provide local exhaust ventilation system: Ventilation equipment should be explosion-resistant if explosive concentrations of material are present.
- Gloves: Wear appropriate chemical resistant gloves.
- Respirator: Under conditions of frequent use or heavy exposure, respiratory protection may be needed.

❑ **Leakage of H_2S Gas**

Hydrogen sulphide is a colourless, flammable, extremely hazardous gas with "rotten egg" smell. Low concentrations of H_2S irritate the eyes, nose, throat and respiratory system e.g. burning / tearing of eyes, cough, and shortness of breath. Repeated or prolonged exposures may cause eye inflammation, headache, fatigue, irritability, insomnia, digestive disturbances and weight loss.

The preventive measures to be taken up in case of presence of H_2S in geological formation, appropriate mitigation measure will be taken up:

- Stop the source of leakage (i.e. close the well)
- Remove victim, if any to fresh air, if breathing, maintain victim at rest & administer oxygen, if available, if person is not breathing, start artificial respiration immediately or start mechanical/automatic resuscitator. Call ambulance and sent victim to hospital or doctor.
- Pull out all inflammable material i.e. HSD, Gas Cylinders, Chemicals etc. from the premises of well/installation.
- Pull out all possible equipment to safe distances.
- Call for fire tender and start spraying water on the sources of leakage to dissolve H_2S in water.
- Evacuate personnel in 500 mts area from down wind direction.
- Warn nearby inhabitants, if required.

Vedanta Limited (Division: Cairn Oil & Gas)'s operations in the Block have indicated that there is no naturally occurring H_2S in the reservoir and therefore release of H_2S during drilling operations is not expected.

❑ **Preventing Fire and Explosion Hazards**

Fire is one of the major hazards, related to oil and natural gas well. Fire prevention and code enforcement is the area of responsibility of the fire service. Safe operating practices reduce the probability of an accidental fire on a platform. Personnel should understand their duties and responsibilities and be attentive to conditions that might lead to fire. The following precautions are recommended:

- Fire control cannot be achieved until the source of fuel and ignition is isolated. Fire control cannot be achieved until the source of fuel and ignition is isolated. An emergency shut down (ESD) system shall be provided to isolate the installation from the major hydrocarbon inventories within pipelines and reservoirs, which if released on failure, would pose an intolerable risk to personnel, environment and the equipment/assets.
- There should be provision for safe handling and storage of dirty rags, trash and waste oil. Flammable liquids and chemicals spilled on platform should be immediately cleaned.
- Containers of paints and HC samples, gas cylinders should be stored properly. Gas cylinders should be transported in hand-carts
- Cutting and welding operations should be conducted in accordance with safe procedures
- Smoking should be restricted to designated platform areas and “no smoking” areas should be clearly identified by warning signs
- Platform equipment should be maintained in good operating condition and kept free from external accumulation of dust and hydrocarbons. Particular attention should be given to crude oil pump, seals, diesel and gas engines which could be potential source of ignition in the event of a failure
- The Disaster Management Plan will address the issue of a fire event at any location on the well and the procedure to be adopted in the very unlikely event of this occurring. If a fire starts in any well, that section of the well will be isolated by closing the section (block) valves, as quickly as possible and surrounding facilities will be cooled with water.

7.4.9 Off-Site Disaster Management Plan

The Off-Site Emergency Plan is a compilation of various emergency scenarios and also includes the probable impact off-site locations due to emergency and the action plan to combat/mitigate the consequences of a disaster situation. Emergency is a sudden unexpected event, which can cause serious damage to personnel life, property and environment as a whole, which necessitate evolving off-site emergency plan to combat any such eventuality. Emergencies can be handled by an organized multi-disciplinary approach. If it becomes necessary to evacuate people, then this can be done in orderly way.

Under the Environmental (Protection) Act 1986, the responsibility of preparation of Off-Site Emergency Plan lies with the State Government. The Collector/Deputy Collector by virtue of their occupation is normally nominated by the concerned State Government to plan Off-Site Emergency Plan. The different agencies involved in evacuation of people are civil administration (both state and central) and police authorities.

Purpose

- To save life and prevent/reduce loss of properties
- To make explicit inter related set of actions to be undertaken in the event of an accident posing hazards to the community
- To plan for rescue and recuperation of casualties and injuries. To plan for relief and rehabilitation
- To plan for prevention of harms, total loss and recurrence of disaster. It will be ensured that absolute safety and security is achieved within the shortest time

The activities of the government, Non-Government organizations and concerned personnel involved in off-site disaster management plan are as follows:

These will include the safety procedures to be followed during emergencies such as posters, talks and mass media in different languages including local language. Leaflets containing do's/don'ts should be circulated to educate the people in vicinity

Medical Help consisted of doctors and supporting staff for medical help to the injured persons because of disaster should be formed. Functions and duties of the committee include, providing first Said treatment for injured at the spot or at some convenient place and shift those to nearby hospitals for further treatment if required

The police will assist in controlling of the accident site, organizing evacuation and shifting of injured people to nearby hospitals.

The fire brigade shall organize to put out fires other than gas fires and provide assistance as required. Approach roads to accident site and means of escape should be properly identified. Chief fire officer should co-ordinate entire fire control measures. Routine training of fire fighting equipment and special rescue equipment should be carried out. Concerned officer should ensure adequate supply of fire water and fire fighting agents at the site of emergency. Maintenance of standby equipment/personnel for fire fighting should be ready at any given time.

- **Mutual Aid**

Disaster/emergency/risk, when becomes difficult to control by in house team/management, help from nearby industries, institutions, etc. can be taken. A group of mutual aid can be formed where emergency control systems like ambulance, fire fighting equipments, medical & fire-fighting team, etc. can be shared in the event of need.

Post Emergency Relief to the Victims.

- **General Health and Safety**

The project will adhere to health & safety norms of The Factories Act, 1948, as applicable along with Best Industry Practices.

General health and safety issues during various project activities are similar to those of most large infrastructure and industrial facilities and their prevention and control. These issues include among others, exposure to dust and hazardous materials, hazardous materials components, and physical hazards associated with the use of heavy equipment, etc.

Specific health and safety issues primarily include the following:

- Physical hazards
- Chemical hazards
- Confined spaces

Physical Hazards - The main sources of physical hazards are associated with machinery and vehicles. General electrical equipment safety, working in confined spaces, hot work, high temperature areas are expected to be present.

Chemical Hazards - workers may be exposed to chemical hazards especially if their work entails direct contact with fuels or chemicals, flare & DG set emission or depending on the nature of activities.

Noise - Noise sources include drilling, DG operations, including vehicular traffic. In order to evaluate the impacts of proposed project on the health of workers, baseline health studies will be carried out on every worker before joining their duties.

The hierarchy of control specific for health & safety (in order of priority):

- Eliminate the use of a harmful product or substance and use a safer one;
- Substituting wherever reasonably practicable, a non-hazardous material which presents no risk to health, where a hazardous material is used intentionally, i.e. use a safer form of the product;

- Modifying a process to eliminate the use of risk, the production of a hazardous by-product or waste product, including reducing the quantities of the hazardous material which are used & stored, i.e. change the process to emit less of the substance;
- Enclose the process so that the product does not escape;
- Extract emissions of the substance near the source;
- Provide personal protective equipment (PPE) such as gloves, coveralls and a respirator. PPE must fit the wearer.

❑ **Personal Protective Equipment**

Often it is not possible, or practicable, to eliminate exposure to materials hazardous to health completely. In such cases, operations should consider how to prevent employees being exposed and the prevention of exposure should be achieved by measures other than the use of PPE or Respiratory Protective Equipment (RPE), which is the last line of defence.

Situations where PPE/RPE will normally be necessary include:

- where adequate control of exposure cannot be achieved solely by good practice and the application of operational or engineering measures;
- where new or revised assessment shows that PPE/RPE is necessary until adequate control is achieved by other means;
- where there is temporary failure to achieve adequate control of the process, e.g. because of plant failure, and the only practicable solution to maintain adequate control in the time available may be the provision and use of suitable PPE/RPE; and
- where maintenance operations have to be carried out.

Key personal protective equipments will include:

- Hand gloves
- Helmet
- Safety shoes
- Safety harness
- Eye shield
- Ear muffs

❑ **First Aid**

Medical services, including personnel trained in first aid, and medical equipment that is appropriate to the type of operation will be provided at project.

All persons on an installation should have at least basic training in emergency response, basic first aid, use of life saving appliances and firefighting. Individual competencies shall be periodically tested to identify further requirement of training and knowledge to perform emergency duties.

It will be ensured that any auxiliary medical team e.g. nurses and first aid personnel are fully trained and conversant with their roles and responsibilities.

Contact details & capacities of nearby medical facilities and medical experts will be made available at strategic locations.

7.4.10 DISASTER MANAGEMENT PLAN FOR NATURAL HAZARD

Key natural hazards that occur in Gujarat are earthquake, flood, hailstorms storm, etc.

- Earthquake - As per the BMPTC Atlas, various parts of the State of Gujarat and Rajasthan fall under earthquake zones III. General awareness and wide dissemination of do's and don'ts through electronic and print media issued by state disaster management agency should be followed.
- Flood - Though most parts of Gujarat and Rajasthan receive scanty rainfall, the State has a history of floods and inundations, mostly along the basins of rivers like Banas and Luni. Besides the floods in natural drainage systems, there are other reasons for inundation. Changes in rainfall patterns have also increased the risk of flash floods in many areas that were not flood prone historically. IMD and other government department warnings should be monitored and in case of any such warning, relevant steps as guided by on site disaster management plan should be followed. Instruction given by key departments like IMD, district disaster management center, etc. to be followed.
- Human Epidemics - Although, Gujarat and Rajasthan has a history of disease outbreaks such as Cholera, Gastroenteritis, Acute Diarrhoea/Dysentery, Infective Hepatitis, Encephalitis, Poliomyelitis, Typhoid and recently H1NI; the State is particularly prone to Malaria. Conduct regular hygeine awareness and conduct targeted vaccination drives as required. Workers to be trained for hygienic work environment, sanitation & living conditions.

It has been observed that natural hazards can be minimized by the presence of a well functioning communication/warning system. A well prepared administration needs to have its communication/early warning system in place to enable precautionary & mitigation measures on receiving warning for impending disasters and in the process minimise loss of life & property.

Data from different reliable sources should collected and monitored in real or near real time and analysed to generate a warning alert in the event of likelihood of a disaster.

- The Indian Meteorological Department (IMD) will be the nodal agency for the monitoring of seismic activity, flood, etc.
- Tie up/contacts/communication with State Disaster Response Force (SDRF), district disaster management center should be maintained; SDRF has been constituted in the State with stations at locations i.e. Banaskantha (Gujarat) &Jalore (Rajasthan).
- Local Search and Rescue Team at the local level comprising of retired Army and Police personnel, Civil Defence and Home Guard, volunteers can be identified and trained to perform initial Search and Rescue operations.
- Apart from the above, Community volunteers/representatives would be identified and trained on search and rescue operations through community Based Disaster Management programme.
- Disaster Management and Relief Department website/communication along with other line departments like fire, police, health, etc. will be checked.

CHAPTER 8: PROJECT BENEFITS

8.1 INTRODUCTION

The proposed project activities will result in considerable growth of service sector and will also generate direct/indirect employment and commercial opportunities in the area. The proposed exploratory & appraisal well drilling could possibly result in the discovery of hydrocarbon and would help in reducing India's dependence on imports.

8.2 BENEFITS TO CENTRAL AND STATE GOVERNMENT

The proposed project would contribute to the Central and State Government of Gujarat and Rajasthan in terms of Royalty.

8.3 EMPLOYMENT POTENTIAL

The employment of local/nearby people in proposed project will upgrade the prosperity of the region. This in-turn will improve the socio-economic conditions of the area.

- During operation phase of the project, project would generate direct/indirect employment to skilled/unskilled and semi-skilled workers;
- During the drilling phase, about 50 workmen per shift will be working on site. This will include technical experts, who will be responsible for various drilling related activities and some technical manpower. It is anticipated that, at any given time, there will be about 80 - 100 personnel working on site including technical staff, drilling crew, security staff etc.
- This project will also help in generation of indirect employment to those people who render their services for the personnel directly working in the project; and
- Local/nearby people will be benefited by provision of services like hotels, restaurants, transport services etc. Thus, the direct and indirect employment generation by this project.

8.4 CORPORATE SOCIAL RESPONSIBILITY

CSR measures will be taken up by Vedanta Limited (Division: Cairn Oil & Gas) in case of commercially viable hydrocarbon discovery & further full-fledged development of the fields and production and associated facilities as per the provision of Govt. regulations and guidelines.

8.5 PROPOSED CORPORATE ENVIRONMENTAL RESPONSIBILITY (CER)

Vedanta Limited (Division: Cairn Oil & Gas) will comply with the 1st May 2018 OM w.r.t. CER and the cost will be assessed on actual project capex expenditure of that particular financial year.

CHAPTER 9: ENVIRONMENTAL MANAGEMENT PLAN

9.1 INTRODUCTION

Environment Management Plan (EMP) for proposed project activities is required to ensure that mitigation of adverse impacts and strengthening of positive impact resulting from the proposed activities.

It is a planned and integrated programme aimed at ensuring that both identified and unidentified impacts that may arise during the various phases of the project are brought to an acceptable level.

This Environmental Management Plan has the following specific long-term objectives:

- *Ensure compliance with legislation and Company policy;*
- *Achieve, enhance and demonstrate sound environmental performance built around the principle of continuous improvement;*
- *Integrate environment fully into the business;*
- *Rationalise and streamline existing environmental activities to add value in efficiency and effectiveness;*
- *Encourage and achieve the highest performance and response from individual employees and contractors;*
- *Provide standards for overall planning, operation, audit and review;*
- *Enable management to establish environmental priorities;*
- *Be applicable throughout the organisation.*
- *Hold early consultations with communities and regulating authorities to ensure hitch free operations*

9.2 HEALTH, SAFETY AND ENVIRONMENT (HSE) POLICY

Vedanta Limited (Division: Cairn Oil & Gas) will conduct its activities in a professional and responsible manner. The company, not only will comply with the laid down legislation requirements but when found inadequate will promote creative measures and internal standards for the protection of health, safety & the environment of the highest order for all who may directly or indirectly be affected by any of the activities.

Vedanta Limited (Division: Cairn Oil & Gas) would have the ultimate responsibility of implementing the environment management plan along with drilling contractor. The drilling contractor will have an HSE management system.

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HSE Policy

At Vedanta Resources Plc, we believe in sustainable development and are committed to effective management of health, safety and the environment as an integral part of our business. The health and safety of our employees and stakeholders who may be impacted by the company's operations is of paramount importance and our aim is zero harm to people and to the environment.

Vedanta Resources and its subsidiaries strive to:

- Comply with applicable national, regional and local Health, Safety and Environment ('HSE') regulations and statutory obligations and other requirements as appropriate. The company develops, implements and maintains HSE management systems aligned with our sustainable commitments and beliefs and consistent with world-class standards. We will drive continuous improvement in HSE through setting and reviewing targets, assessing and reporting HSE performance, using appropriate best available practices and providing all employees with appropriate training;
- Prevent injury and ill health to the company's employees and contractor' s employee's by providing a safe and healthy work environment and by minimising risks associated with occupational hazards;
- Improve and enhance environmental conditions and avoid, reduce, mitigate or compensate the environmental impacts to neighbouring communities in which we operate including air, water emissions and noise;
- Conserve natural resources, through adopting environmentally friendly and energy efficient technology and process improvements. The Company is committed to managing waste of our operations and we adopt the principles of waste avoidance, reuse, recycling and beneficial utilisation to minimise discharge and disposal to the environment;
- Promote a positive HSE culture within our organisation through effective communication, participation and consultation with employees in the workplace;
- Implement regular health surveillance and risk-based monitoring of all employees;
- Influence our contractors and suppliers to adopt principles and practices adopted by us and in accordance with our own policies;
- Communicate with all our stakeholders on the progress and performance of HSE management.

Vedanta Ltd. and Konkola Copper Mines (KCM) the wholly owned subsidiaries of Vedanta Resources sign this policy, which is implemented throughout their businesses. The content and robustness of implementation of this policy will be reviewed periodically and revised accordingly, and includes sharing best practices throughout the group.

We will also measure progress against this policy and review performance on a periodic basis to ensure ongoing management of Health, Safety and Environment.

Signed by:

Tom Albanese
Group CEO, Vedanta Resources plc

Date: *1st April 2014*

Source: Vedanta Limited (Division: Cairn Oil & Gas)

Figure 9.1: HSE Policy of Vedanta Limited (Division: Cairn Oil & Gas)

9.3 ENVIRONMENTAL MANAGEMENT PLAN

Environmental management plan (EMP) includes action to protect environment by using instruments, adoption of industrial best practices, surveillance and statutory norms. To mitigate the adverse impacts, if any, caused due to proposed project activities at CB-ONHP-2017/10 block area, the EMP has been formulated. The EMP has prescribed environmental monitoring and implementation of environmental protection measures during all phases of the proposed activities. The environmental and socio-economic aspects are dealt with likely environmental control measures are suggested as under:

9.3.1 AIR QUALITY MANAGEMENT PLAN

The Air Quality Management Plan (AQMP) encompasses both constructions, drilling and early production phase activities for the proposed project that has the potential to affect ambient air quality due to the proposed project.

The AQMP establishes specific measures and guidelines aimed at effectively addressing and mitigating the air quality impacts that may arise as result of construction of well sites, EPU/QPU, drilling operations and decommissioning/site closure of well sites. The plan also details out roles and responsibilities of Vedanta Limited (Division: Cairn Oil & Gas) and the contractors to ensure effective implementation of the plan.

Phase	*Mitigation Measures*
Construction/drill Site Preparation	**Designing, Planning & Procurement** ✓ Vehicles will have valid Pollution under Control Certificate (PUC); ✓ The excavated top soil will be stored properly. ✓ Adequate stack height to be provided to DG sets in accordance with CPCB standards.Storage and handling of construction material and debris to be carefully managed to prevent generation of fugitive dust;
	Dust Suppression ✓ Sprinkling of water on earthworks, material haulage and transportation routes on a regular basis, especially in dry season.
Drilling Activities	**Operation of Machineries, Vehicle & Drilling Rig** ✓ Vehicles involved in the transportation of project personnel will have valid PUC Certificate and will be subjected to periodic maintenance; ✓ Exhausts of diesel generators will be positioned at a sufficient height to ensure dispersal of exhaust emissions;
	Periodic Maintenance of Machinery and Vehicles ✓ Periodic maintenance of DG sets will be undertaken;
EPU/QPU operations	Periodic maintenance of GEG/DG sets will be undertaken;

9.3.2 Noise quality Management Plan

The noise control plan is applicable for construction of well sites, early production system, drilling operations and decommissioning/site closure of well sites.

The noise control plan to ensure specific measures to minimize noise levels in the project site as 75 dB(A) per CPCB noise rules. The plan also outlines roles and responsibilities of both Vedanta Limited (Division: Cairn Oil & Gas) and the contractors involved in the implementation of the plan.

Phase	*Mitigation Measures*
Construction/ drill Site Preparation	✓ Selection and use of low noise generating equipment equipped with engineering controls viz. mufflers, silencers etc. ✓ Periodic maintenance of vehicles as per manufacturer's schedule to ensure compliance with the vehicular noise limits specified by CPCB ✓ Engines of vehicles and construction equipment would be turned off when not in use for long periods.
Drilling Activities	✓ Siting of drilling rig and facilities away from sensitive receptors viz. schools, settlements etc. with all reasonable screening being utilized where necessary. ✓ Acoustic enclosures and muffler on engine exhaust of DG sets to ensure compliance with generator noise limits specified by CPCB. ✓ Periodic monitoring of noise levels
EPU/QPU operations	✓ Periodic maintenance of GEG/DG sets will be undertaken;
Decommissioning/Site Closure	✓ Management measures to address noise impacts with respect to operation of heavy equipment/machinery and movement of vehicles during decommissioning/site closure phase are similar to those discussed in the "Site Preparation Phase" of this section

9.3.3 Surface Water Quality Management

The Surface Water Quality Management Plan is applicable during construction of well sites, drilling operations, operation of early production facilities and decommissioning/site closure of well sites that has the potential to affect the surface water quality. The Surface Water Quality Management Plan establishes specific measures and guidelines aimed at addressing and mitigation of surface water quality impacts that may arise at different phases of the project.

Phase	*Mitigation Measures*
Construction/drill Site Preparation	✓ During site preparation, surface water run-off will be managed through implementation of proper drainage system

Phase	Mitigation Measures
Drilling Activities	✓ Drip trays would be used during preventive maintenance of rig installations, vehicles and machinery. ✓ Chemicals and fuel container will be stored in bunded and lined area equipped with proper spill control equipment and secondary containment.
Decommissioning/Site Closure	✓ No significant impacts to surface water quality can be associated with activities during decommissioning/site closure phase. Any possible impacts that may arise due to surface run-off will be mitigated in manner similar to that discussed during site preparation phase activities.

9.3.4 Ground Water Quality Management

Ground Water Quality Management Plan is applicable for construction of well sites and drilling operations, operation of early production facilities and decommissioning/site closure of well sites that has the potential to adversely affect the ground water quality.

Phase	Mitigation Measures
Construction/drill Site Preparation	✓ No significant impact on the ground water quality can be associated with the site preparation phase activities
Drilling Activities	✓ Proper casing and cementing of well will be done ✓ Periodic monitoring of ground water quality will be carried out for surrounding wells. ✓ Storage and disposal of drill cutting and waste mud to be planned in accordance with "Solid & Hazardous Waste Management Plan
Decommissioning/Site Closure	✓ No significant impacts to ground water quality can be associated with activities during decommissioning/site closure phase

9.3.5 Storm Water Management

The following mitigation measures need to be adopted and implemented by Vedanta Limited (Division: Cairn Oil & Gas) in site preparation, operation and decommissioning phase.

- ✓ Necessary measures would be undertaken during site preparation phase to prevent earth and stone material from blocking cross drainage structures.
- ✓ Periodic cleaning will be undertaken to cross drainage structures and road drainage system to maintain uninterrupted storm water flow.

9.3.6 Waste Management Plan

The Waste Management Plan (WMP) is applicable for all process and non-process waste streams which are generated during various phases of Vedanta Limited (Division: Cairn Oil & Gas) proposed drilling and testing of hydrocarbons in this block. The major waste streams covered under this plan includes drill cuttings, waste drilling mud, drilling wash water, kitchen waste and sewage. In addition, waste oil and lead acid batteries generated from the proposed project operations have also been dealt in this plan.

The WMP establishes specific measures to ensure proper collection, storage, treatment and disposal of the identified process and non-process waste streams in accordance with the applicable national regulations and guidelines and also to ensure compliance with Vedanta Limited (Division: Cairn Oil & Gas) corporate HSE Policy.

The plan also outlines roles and responsibilities of both Vedanta Limited (Division: Cairn Oil & Gas) and the contractors involved in the implementation of the plan.

Waste	***Quantity***	***Mitigation Measures***
Drill Cuttings	Drill cuttings associated with WBM: 250-750 tons/well, Drill Cuttings associated with SBM (500-1500 tons/well)	✓ Drill cuttings separated from drilling fluid will be adequately washed and temporarily stored and disposed in an impervious pit lined by High Density Poly Ethelyn (HDPE) ✓ All drill cuttings will be disposed as per Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016;
Spent/Residual Drilling Mud	25-500 tons/well	✓ Effluent would be treated as per the CPCB effluent standard prescribed for oil and gas industry or as specified by SPCB
Waste oil/ Used oil	1-2 tons/well	✓ Hazardous waste (waste and used oil) would be managed in accordance with Hazardous Waste (Management, Handling & Transboundary Movement) Rules, 2008. ✓ The used/waste oil will be sent to authorized recyclers.
Municipal Solid Waste	25-30 kg/well	✓ The waste will be segregated at source (organic/inorganic) and disposed accordingly. ✓ All kinds of waste will be disposed in accordance with the requirement of CPCB/ SPCB.
Sewage	16-25 KLD per well	✓ Sewage generated from campsite would be treated through mobile STP. ✓ Treated waste water will be used for dust suppression, green belt, landscape, etc

Waste	Quantity	Mitigation Measures
Recyclables viz. paper, plastic, packaging waste etc.	Depending on usage	✓ Proper segregation and storage of recyclable waste in designated bins.

9.3.7 Soil Quality Management Plan

Soil Quality Management Plan is applicable for site preparation of well sites, drilling operations, operation of early production facilities and decommissioning/site closure that has the potential to impact the soil quality.

Phase	Mitigation Measures
Construction/ drill Site Preparation	✓ Debris and excavated material generated during construction activities would be stored properly. ✓ Drip trays to be used during vehicular/equipment maintenance and during refueling operations. ✓ In case of a spill, the spilled soil is to be removed and stored in hazardous waste storage area.
Drilling Activities	✓ Fuel and chemical storage areas would be paved and properly bunded. ✓ Spill kits would be made available at all fuel and chemical storage areas. All spills/leaks contained, reported and cleaned up immediately. ✓ Drip pans/trays would be used in areas identified having spillage potential but not limited to drill rig engine; electric generator engine; pumps or other motors; maintenance areas; fuel transfer areas. ✓ Management of drill cuttings, waste drilling mud, waste oil and domestic waste would be made in accordance with “Waste Management Plan”
EPU/QPU operations	✓ Spill kits would be made available at all fuel and chemical storage areas. All spills/leaks contained, reported and cleaned up immediately. ✓ Used/spent oil to be collected and stored properly
Decommissioning/Site Closure	✓ Decommissioning at the end of project life/drilling would have some impacts in terms of increase in soil erosion and would require adequate mitigation measures to minimize any potential impacts. The mitigation measures would be similar to those outlined for construction phase activities as discussed earlier.

9.3.8 Spill/Release Management Plan

- **Potential spill / release scenarios**

The following section details the potential spill scenarios associated with the drilling activities as well as the oil spill incident responses. Spill incidents from drilling activities can be classified into three types based on the level of response required. Descriptions of the three types are as follows:

Type 1

A small oil or chemical spill incident which can respond to and can be controlled with the existing resources, equipment and resources at the site and without any further escalation.

Most of the potential drill stage spill risks are Type 1. As the spill / release incident as the volumes involved are limited due to the extent of hydrocarbons or chemicals used or stored at site. Such possible incidents are likely to include:

- ✓ Diesel spills from refuelling i.e., drill rig - hose leaks, overfilling or connection/disconnection incidents.
- ✓ The use of liquid chemicals i.e., during drilling the volumes are limited by the storage containers used, drums etc.
- ✓ Hydraulic oil spill resulting from a split hydraulic hose or failed connector (moderate pressure, low volume lines).
- ✓ Drilling fluid leaks from tanks, pumps or other associated equipment within the closed loop recirculation system.

Type 2

Type 2 spill/release incidents are those that are beyond capability of the immediate resources on-site to effectively manage and contain, requiring additional external resources to assist with the response to the spill incident. Type 2 spill incidents may require initiate Emergency operations and will involve call out of the Fire Service (in the event of danger to people) and/or regional resources. For such potential spill incidents, the resources of the local administration or suppliers may be required. Such possible incidents are likely to include:

- ✓ Transportation incidents associated with the delivery of diesel or drilling fluids to site i.e., truck rollover or collision from external suppliers (drilling fluids and diesel).
- ✓ Complete failure of an on-site drilling fluid (base oil) storage tank(s).

Type 3

Type 3 spill/release incidents are significant spill incidents that escalate from a Type 1 or 2 and exceed the capabilities of the on-site and local administrative resources to respond, requiring a State/National response. An uncontrollable well blow out scenario would fall into this category.

- **Spill/Release Response Strategies**

Spill/release response strategies for combating spill/release incidents include:

- ✓ Prevent or reduce further spillage.
- ✓ Monitoring and evaluation (no active intervention but the spill is under observation).
- ✓ Mechanical containment and recovery.
- ✓ Protection of sensitive areas.
- ✓ Clean-up, and
- ✓ Any combination of the above strategies.

A brief explanation of these various response strategies is provided in the following sections.

Prevent or reduce a spill/release incident

One of the first response actions, if safe to do so, is the isolation or prevention of the source of the spill/release in an attempt to limit any further discharge. Such first response actions can involve an emergency shutdown of the particular equipment, isolation of a valve or line causing the spill or providing some immediate containment to prevent the further spread of a spill/release. Such measures are only a first immediate response prior to a more coordinate effort being planned and undertaken.

Monitoring and Evaluation

Knowing the position of spillage/release source and having the ability to forecast its movement or direction is an essential component of spill response. Monitoring and evaluation is used to:

- ✓ Determine the location and movement of the spill/release (if any).
- ✓ Describe its appearance.
- ✓ Estimate the size and quantity of the spill/release
- ✓ Note changes in the appearance and distribution of the spill over time.
- ✓ Assess the potential threat to the environment and the resources required to combat the spill/release (more effective and coordinate response)

Mechanical Containment and Recovery

Mechanical containment and recovery is the restriction of a spill/release movement through the use of booms or some other form of physical barriers and its subsequent removal using skimmers and other mechanical means.

These operations may be required for large spills or spills/release which may impact environmentally sensitive areas.

Clean-up

Oil or chemical spills may be allowed to collect or strand on a specific location in order to assist with clean-up operations. Regardless of land type the spill impacts on, the method of clean-up is usually labour intensive. Once a spill is controlled in terms of isolating the source, a response to a spill normally changes from an emergency to a project and needs to be managed as such. This may involve earthmoving equipment used to recover the absorbed spill and contaminated soil. Such operations usually involve the collection of significantly greater volumes of material than was originally spilt.

Waste Management

Soild waste due to clean up operation will be collected and disposed in line with the Hazardous Waste Guideline.

9.3.9 Occupational Health & Safety Management Plan

The Occupational Health & Safety Management Plan (OHSMP) has been formulated to address the occupational health and safety related impacts that may arise from proposed project activities viz. drilling and testing and decommissioning/site closure.

The following mitigation measure need to be adopted and implemented by Vedanta Limited (Division: Cairn Oil & Gas) and its contractors in site preparation, drilling, and early production and decommissioning phase.

- ✓ All workers will be provided with proper PPEs viz. safety boots, masks, protected glass etc.
- ✓ Provision of ear plugs/ear muffs etc. and rotation of workers operating near high noise generating areas, would be ensured.
- ✓ Hazardous and risk prone areas, installations, materials, safety measures etc. would be appropriately marked in every conspicuous location.
- ✓ All chemicals and hazardous materials storage container will be properly labeled and marked according to national and internationally recognized requirements and standards. Materials Safety Data Sheets (MSDS) or equivalent data/information in an easily understood language must be readily available to exposed workers and first-aid personnel.

- ✓ Workplace must be equipped with fire detectors, alarm systems and fire-fighting equipment. Equipment shall be periodically inspected and maintained to keep in good working condition.
- ✓ Adequate sanitation facilities will be provided onsite for the operational
- ✓ Garbage bins would be provided in the camp and regularly removed and the garbage disposed off in a hygienic manner.
- ✓ Training programs would be organized for the operational workforce regarding proper usage of PPEs, handling and storage of fuels and chemicals etc.

9.3.10 Flare and Illumination Management Plan

Work Zone Illumination- designing, planning & procurement

Low height (less than 8 m), low-pressure sodium lamp or LED lights to be installed that are most energy efficient to reduce the ecological impacts. Further, illumination has been provided only in required locations. UV filtered lights have been found to less distractive to migrating birds.

9.3.11 Road Safety and Traffic Management Plan

The Road Safety & Traffic Management Plan is applicable to all operation pertaining to Vedanta Limited (Division: Cairn Oil & Gas) and contractor vehicular movement viz. vehicle involved in the transportation of raw materials, drilling rig and other equipment transportation to well site and decommissioning.

9.3.12 Site Closure Plan

In case the well site is not commercially viable, the well site the approach road connecting the wells will be restored accordingly. Chronological inventory of activities which would be performed during the closure of the site are detailed in this section:

A. Well sites

The following activities have been considered in the closure plan for well sites:

- Plugging & Abandonment of well: Close the well head properly to prevent any furtherleakage
- Decommissioning Phase: Removal of the materials form the site
- Waste/mud pit closure and reclamation
- Reinstatement Phase: regeneration of the land

As and when the well will be declared as non productive, plugging of the well will be performed to close and abandon the well to prevent any leakage of oil or gas.

B. Decommissioning

The decommissioning phase includes activities dismantling and removal of surface facilities from the well site and storage in the Material Dumping Area. The activities which are envisaged during this phase are:

- Waste Management: clean up the site and remove all waste materials e.g. HDPE liners, any waste material etc. The waste will be dumped in the designated area as per the guidelines of local pollution control board

C. Waste and mud pit closure and reclamation

Following decommissioning and abandonment of the well site the waste and mud pits will be subject to closure through onsite burial of solids in accordance with lease and landowner obligations and with local, state and national regulations. Reclamation of closed pits or any other temporary retaining pits, including reserve pits, will be carried out within a period ofone year from well closure/abandonment. All such reclamation activities will be carried outbased on the climatic conditions and will be in accordance with reasonable landowner's wishes, and/or resemble and contour of the adjoining lands.

9.3.13 MANAGEMENT OF SOCIAL ISSUES AND CONCERNS

Mitigation measure have been outlined to address project related social issues and concernsin order for Vedanta Limited (Division: Cairn Oil & Gas) to take proactive steps and adopt best practices, which are sensitive to the socio-cultural setting of the region. The plans will include people residing in proximity to the proposed well sites, pipeline alignment and access routes.

Employement Opportunities

During the project execution phase direct/indirect employment opportunities will be generated.

Corporate Environmental Responsibility

- From inception of its activities Vedanta Limited (Division: Cairn Oil & Gas) will take up various Vedanta Limited (Division: Cairn Oil & Gas) initiatives in and around operational areas for the benefit of the residents as per the MoEF&CC guidelines.

Table 9.1: Environment Management Plan

Sl. No.	Activities	Potential Impacts	Management/Mitigation Measures	Responsibility
1	Land requirement	• Issues pertaining to compensation	*If the identified lands are of private landowners then land lease mode will be applied and in case of govt. land, land allotment from Govt. to be applied. Initially temporary and short-term lease will be taken for 3 - 5 years for exploration purpose and in case of commercially viable discovery of hydrocarbon resources; the land lease would be converted into long term lease up till life of the project. For sites selected are having any settlements, Resettlement & rehabilitation (R&R) plan will be developed and implemented as per the applicable State/ Central Govt. policy. Compensation to the affected landowners for any loss of land will be ensured by Vedanta Limited (Division: Cairn Oil & Gas) and also will ensure the livelihood of local community, if any affected by the proposed land procurement, will be identified and compensated through adequate compensation and other livelihood restoration activities directly or indirectly through CSR activities.*	Vedanta Limited (Division: Cairn Oil & Gas)
2	Site Clearance and Grading	• Fugitive dust Generation • Loss of top soil	• *Top soil would be properly stored for future use.* • *Water sprinkling to be carried out while working in proximity of agricultural fields or settlements/habitations;*	• Vedanta Limited (Division: Cairn Oil & Gas)
3	Construction/ preparation of Drill Site	• Handling of excess earth material; • Noise generation • Increase in traffic volumes • Health & Safety risks	• *The padding and fill material will have to be brought in from some nearby places and have to laid over the site area;* • *Temporary storage sheds to be provided for construction material such as cement;* • *During padding and fill operations, it will also be ensured that alteration of the natural drainage at the micro watershed level around the site is kept to a minimum* • *The slope of land will be maintained during designing of the drains for the purpose of waste water handlings at site* • *Excavated soil to be used during site preparation;* • *Sediment interception barriers will be provided for run off occur during sitepreparation at those points, through which, run off is expected to flow into the garland drain* • *Provision and usage of adequate PPEs to workers as applicable and identified for the respective activity.*	• Vedanta Limited (Division: Cairn Oil & Gas)
4	Installation of camp site	• Structural Failure of crane • Crane overturning/ Collapse • Falling Objects	• *Surface conditions to be examined prior to movement of crane;* • *Provision and usage of adequate PPEs to workers as applicable and identified for the respective activity.*	• Vedanta Limited (Division: Cairn Oil & Gas) • Civil Contractors

Sl. No.	Activities	Potential Impacts	Management/Mitigation Measures	Responsibility
		• Health & Safety risks		
5	Transportation of Drilling Components and Rig	• Vehicular emissions • Damage to road conditions • Oil leaks	• *Only trained drivers with knowledge of on defensive driving to be involved in the movement of rigs.* • *All movement of major equipment shall be scheduled in the lee hours keeping consideration of the traffic movement in the connecting major arterial road.* • *Local administration and village administration as applicable to be informed during movement of rigs through village roads;*	• Vedanta Limited (Division: Cairn Oil & Gas)
6	Drilling and Well Testing	• Additional stress on the local water resources;	• *Water will be sourced locally approved sources, if not possible water will be taken from ground water with prior approval from CGWA.*	• Vedanta Limited (Division: Cairn Oil & Gas)
		• Potential for contamination due to handling, storage and transportation of wastes	• *Two separate Drill cutting disposal pits to be provided for WBM and SBM cuttings;* • *Drill waste pits to be provided with HDPE lining;* • *Used chemical barrels, used oil and other hazardous waste to be sent to SPCB authorized recyclers;* • *Vedanta Limited (Division: Cairn Oil & Gas)to also explore disposing drill cuttings containing for co-processing as alternate fuel and or raw material (AFR) in cement industry based on suitability and availability.*	• Vedanta Limited (Division: Cairn Oil & Gas) • Drilling contractor- HSE
		• Generation of noise	• *Equipment upkeep and regular maintenance to minimise noise generation from all rotary equipment;* • *PPE's such as ear plugs, muffs to be provided to workers at site;* • *Periodic maintenance of vehicles and machinery to be undertaken;* • *DG sets to be provided with acoustic enclosures as per requirements under CPCB guideline.*	• Vedanta Limited (Division: Cairn Oil & Gas)
		• Air emissions	• *Cold venting of gas not to be carried out.* • *Adequate stack heights to be provide for generators, adhering to the EPA standards for diesel generators;*	• Vedanta Limited (Division: Cairn Oil & Gas)
		• Improper sanitation	• *Proper sanitation facilities would be provided to workers* • *Safe drinking water would be provided at site*	• Vedanta Limited (Division: Cairn Oil & Gas)
		• Occupational Health & Safety Risks	• *Blowout preventers to be provided;* • *Flare pit to be placed at a safe distance from the well head and fuel storage areas;* • *Firefighting measures to be provided as may be required;*	• Vedanta Limited (Division: Cairn Oil & Gas)
7	Operation of Campsites	• Stress on water resources; • Potential	• *Safe drinking water would be provided at site* • *All waste to be collected in bins located near each set of porta cabins. Segregation of waste at the source of generation to be put in practice.*	• Vedanta Limited (Division: Cairn Oil & Gas)

Sl. No.	Activities	Potential Impacts	Management/Mitigation Measures	Responsibility
		contamination from generation of biomedical waste • Wastewater generation • Waste generation	• *All hazardous waste to be collected and stored on secure and paved area, and subsequently sent to authorised recyclers* • *Food waste to be stored in a closed container;* • *Mobile STP to be provided for campsites.* • *Waste generation to be separated and disposed of as per the regulatory requirements.*	
8	Operation of mud plant and warehouses	• Waste generation • Potential contamination due to mud preparation • Dust due to stacking of the materials • Emission due to the forklifts and crane usages	• *If area not paved, then periodic sprinkling shall be carried out* • *All diesel operated generators shall have acoustic enclosures and effective stack heights* • *Waste shall be effectively segregated at the source of generation and disposed as per the waste management plan* • *All the vehicles to be operated inside the mud plant and warehouse shall follow all the HSE requirements*	• Drilling Warehouse Manager • Drilling Logistics Manager
9	Decommissioning and Abandonment	• Demolition of drill cutting pits;	• *A site restoration approved plan shall be prepared with the detailed checklist;* • *All drill cuttings, spent mud, waste oil and other waste to be completely removed from the site and sent to designated disposal place prior to commencement of demolition work;* • *All concrete or steel installations will be removed to at least 1 m below ground level, so as to ensure that there will be no protruding surface structures. The casing wellhead and the top joint of the casings will be cut below the ground level and capped with a cement plug.* • *Prior to commencement of any demolition, a planned programme of site clearance will be formulated. All pits, cellars and holes will be removed and filled to ground level, any oil or otherwise contaminated soil will be removed and disposed to suitably.*	• Vedanta Limited (Division: Cairn Oil & Gas)

Source: ABC Techno Labs India Pvt. Ltd.

9.4 COST OF EMP

The tentative budget for implementation of the EMP including environmental monitoring would be 10 lakhs for each drilling location.

9.5 CORPORATE ENVIRONMENT RESPONSIBILITY

The company will comply with the 1st May 2018 OM w.r.t. CER and the cost will be assessed on actual project capex expenditure of that particular financial year.

CHAPTER 10: CONCLUSIONS & RECOMMENDATION

CB-ONHP-2017/10 Block is located inBanaskantha district of Gujarat and Jalore district in Rajasthan. It encloses an area of 2100Sq.Km in Banaskantha District of Gujarat and 666Sq. km in Jalore District of Rajasthan. The Vedanta Limited (Division: Cairn Oil & Gas) intends to carry out further Exploration and Appraisal Drilling activities in the Block, wherein 70drilling (exploratory and appraisal) wells are proposed to be drilled over 10-12 years. In case of successful discovery of crude oil, setting up of Early Production Units (EPUs)/Quick Production Units (QPUs) for produced well fluid processing and production of up to 28000 BOPD of crude oil and up to 4.2 MMSCFD of associated natural gas for captive power generation.

ToR has been approved by MoEF&CC dated on 26thApril, 2019 and MoEF&CC vide File No No.IA-J-11011/108/2019-IA-II(I).The baseline monitoring and all primary data collection was has been conducted for the summer season March 2019 to June 2019, as per the requirements of the ToR. This is the Draft EIA report has been prepared for conducting the public hearing.

The draft EIA report has assessed the overall significance of environmental impacts likely to arise from Drilling of proposed exploratory and appraisal wells. The overall impacts from the individual drilling sites have been assessed to be of moderate to minor in nature when appropriate mitigation measures to be implemented with proper planning and design.

To adequately address the impacts, mitigation measures and management plans suggested are as per the best practices followed in the Oil & Gas Industry. These plans include environmental management plan, monitoring plan, labour management plan, traffic management plan. Vedanta Limited (Division: Cairn Oil & Gas) shall put in place a robust mechanism with adequate resources to implement the suggested mitigation measures and management plans.

The measures will help to prevent any deterioration contamination of air, soil, groundwater and surface water quality beyond the prevailing status. Adequate safety measures would be adopted along with suitable emergency response and disaster management plan to safeguard against all man-made and natural disasters. Environmental monitoring of ambient air quality, noise levels, surface & groundwater etc. would be carried out at regular intervals to monitor and prevent any deterioration of baseline environmental quality due to the proposed project.

Compliance to all legal requirements and adherence to the suggested mitigation measures and plans will also enable Vedanta Limited (Division: Cairn Oil & Gas) in minimizing its impact on environmental and social parameter. This Report would be finalized after obtaining the comments and observations of public during the hearing to modify and strengthen any mitigation measures as required before same is submitted to MoEF&CC for obtaining Environmental Clearance (EC) of the project.

CHAPTER 11: DISCLOSURE OF CONSULTANT

This chapter describes about the environmental consultant engaged in preparation of EIA report for proposed Onshore Oil and Gas Exploration and Appraisal in the CB-ONHP-2017/10 block in Banskantha District, Gujarat and Jalore District, Rajasthanby Vedanta Limited (Division: Cairn Oil & Gas).

11.1 INTRODUCTION

ABC Techno Labs India Private Limited (formerly ABC Environ Solutions Pvt. Ltd.) is an ISO 9001, ISO 14001 & OHSAS 18001 Certified Company & leading Environmental Engineering & Consultancy Company constantly striving towards newer heights since its inception in 2006. Our Company is dedicated to providing strategic services in the areas of Environment, Infrastructure, Energy, Engineering and Multilab.

It is the first firm to be accredited by NABET (National Accreditation Board for Education and Training), Quality Council of India, as an EIA Consultant, approved for carrying out EIA studies and obtaining environmental clearance for various sectors such as Thermal Power Plants, Infrastructure, Industrial Estates/Complexes/Areas, Mining, Township & area development and Building construction projects etc. ABC Techno Labs is equipped with in-house, spacious laboratory, accredited by NABL (National Accreditation Board for Testing & Calibration Laboratories), Department of Science & Technology, Government of India.

Since establishment ABC Techno Labs focus on sustainable development of Industry and Environment based on sound engineering practices, innovation, quality, R&D and most important is satisfying customers need. The company has successfully completed more than 100 projects of a variety of industries, in the field of pollution control and environmental management solutions. The company is also dealing in the projects of waste minimization and cleaner production technology.

The team of technocrats and scientist are well experienced to deal with the design, Manufacture, Fabrication, Installation, commissioning of Effluent/ Wastewater treatment plants, Sewage Treatment plants, and Combined Treatment plants. The company is having well-experienced team of Scientists & Engineers who are looking after environmental projects & well-equipped analytical laboratory with a facility including analysis of physical, chemical and biological parameters as per the requirements of the State Pollution Control Board and our clients.

11.2 SERVICES OF ABC TECHNO LABS INDIA PRIVATE LIMITED

11.2.1 ENVIRONMENTAL SERVICES

- Environmental Impact Assessment (EIA)
- Environmental Management Plan (EMP)
- Social Impact Assessment (SIA)
- Environmental Baseline data collection for Air, Meteorology, Noise, Water, Soil, Ecology, Socio-Economic and Demography etc;
- Environmental Monitoring
- Socio-Economic Studies
- Resettlement & Rehabilitation Plan
- Ecological & Human Health Risk Assessment Studies
- Ecological Impact Assessment
- Environmental Management Framework
- Solid Waste Management
- Hazardous Waste Management
- Internship & Training

11.2.2 TURNKEY PROJECTS

- Water Treatment Plants
- Sewage Treatment Plant
- Recycling & Water Conservation Systems
- Zero Discharge System

11.2.3 OTHER SERVICES

- Operation & Maintenance of Water & Waste Water Plants
- Water & Waste Water Treatment Chemicals
- Pilot Plant studies
- Feasibility studies & preparation of budgetary estimates

11.2.4 LABORATORY SERVICES

- Chemical Testing
- Environmental Testing
- Microbiological Testing
- Food Testing
- Metallurgical Testing

11.3 SECTORS ACCREDITED BY NABET

Sl.No.	Sector No.	Name of sectors
1	1	Mining of Minerals including Opencast & Underground Mining
2	**2**	**Offshore & Onshore Oil and gas exploration, development & productions**
3	3	Irrigation Projects
4	4	Thermal Power Plant
5	7	Mineral Beneficiation including palletisation
6	8	Metallurgical Industries – (Ferrous only) Secondary

Sl.No.	Sector No.	Name of sectors
7	9	Cement Plants
8	10	Petroleum Refining Industry
9	15	Leather/Skin/hide processing industry
10	16	Chemical Fertilizers
11	17	Pesticides industry and pesticide specific intermediates
12	18	Petro-chemical Complexes (industries based on processing of petroleum fractions & natural gas and/or reforming to aromatics)
13	21	Synthetic organic chemicals industry (dyes & dye intermediates; bulk drugs and intermediated excluding drug formulations; synthetic rubbers; basic organic chemicals, other synthetic organic chemicals and chemical intermediates)
14	22	Distilleries
15	25	Sugar Industry
16	27	Oil & gas transportation pipe line (crude and refinery/ petrochemical products), passing through national parks / sanctuaries / coral reefs / ecologically sensitive areas including LNG Terminal
17	28	Isolated storage & handling of hazardous chemicals (As per threshold planning quantity indicated in column 3 of schedule 2 & 3 of MSIHC Rules 1989 amended 2000)
18	29	Airports
19	31	Industrial estates/ parks/ complexes/ areas, export processing Zones (EPZs), Special Economic Zones (SEZs), Biotech Parks, Leather Complexes
20	33	Ports, Harbours, Jetties, Marine terminals, break waters and dredging
21	34	Highways, Railways, Transport terminals, mass rapid transport system
22	36	Common Effluent Treatment Plants (CETPs)
23	37	Common Municipal Solid Waste Management Facility (CMSWMF)
24	38	Building and large Construction projects including shopping malls, multiplexes, commercial complexes, housing estates, hospitals, institutions
25	39	Townships and Area development projects

Source: ABC Techno Labs India Pvt. Ltd.

11.4 STUDY TEAM

ABC Techno Labs India Private Limited has carried out this Environmental Impact Assessment (EIA) study. The multidisciplinary team included expertise in Environmental Impact Assessment, Air & Water pollution & Control measures, Noise Control measures, Ecology & bio-diversity, Land use, Geology, Environmental Chemistry and Socio-Economic planner. The team members involved in EIA study area:

Sl. No.	Name	Role
1.	Mr. Abhik Saha	**EIA coordinator – Onshore Oil and gas exploration, development & productions** FAE – Air Pollution (AP) FAE – Ecology & Biodiversity (EB)

Sl. No.	Name	Role
		FAE – Water Pollution (WP) FAE – Solid & Hazardous Waste (SHW)
2.	Dr. R.K. Jayaseelan	FAE – Land use, Prevention & Control and Hydrogeology (Director –Technical)
3.	Mrs. K. Vijayalakshmi	FAE – Risk Assessment, Air Quality Modelling & Prediction
4.	Dr. Thillai Govindarajan	FAE – Geology
5.	Mr. R. Rajendran	FAE –Noise & Vibration
6.	Mr. Sushil Meshram	FAE – Socio-Economic Expert
7.	Mr. Sameer Deshpande	FAE- Soil Conservation (SC)
Team Members		
8.	S. Sravanakumar	FAA- Air Pollution, Water Pollution Prevention and Control
9.	Mr. Robson Chinnadurai	Senior Chemist
10.	Mr. M. Muruganantham	Junior Chemist
11.	Mr. Sathish	Field Technician

DISCLOSURE AS PER NABET /QCI

Details as per Schedule of EIA Notification 2006, as amended till date

Name of Publication	***Environmental Impact Assessment Report for proposed Onshore Oil and Gas Exploration and Appraisal in the CB-ONHP-2017/10 block in Banskantha District, Gujarat and Jalore District, Rajasthanby Vedanta Limited (Division: Cairn Oil & Gas)***
Schedule as per EIA notifocation 2006	***1 (b)***
Category	***A***
NABET Sector No.	***2 - Offshore & Onshore Oil and gas exploration, development & productions***

Declaration by experts contributing to the Environmental Impact Assessment Report for proposed Onshore Oil and Gas Exploration and Appraisal in the CB-ONHP-2017/10 block in Banskantha District, Gujarat and Jalore District, Rajasthan by Vedanta Limited (Division: Cairn Oil & Gas)

I, hereby, certify that I was a part of the EIA team in the following capacity that developed the above EIA/EMP.

EIA Coordinator

Name	:	**Mr. Abhik Saha**
Signature	:	Abhik Saha
Period of involvement	:	February 2019– Till date
Contact information	:	abc@abctechnolab.com

FUNCTIONAL AREA EXPERTS:

S. No.	Functional Areas	Name of the Expert/s	Involvement (Period)	Signature & Date
1.	WP	Mr. Abhik Saha	February 2019– Till date	Abhik Saha
2.	SHW		February 2019– Till date	
3.	EB		February 2019– Till date	
4.	AP	Dr. MuthiahMariappan	March 2019– Till date	
5.	AQ	Mrs. K. Vijayalakshmi	March 2019– Till date	
6.	NV		March 2019– Till date	

7.	RH		March 2019– Till date	
8.	HG	Dr. R.K. Jayaseelan	March 2019– Till date	
9.	LU		March 2019– Till date	
10.	GEO	Dr. Thillai Govindarajan	March 2019– Till date	
11.	SC	Mr. Sameer Despande	January 2018– Till date	
12.	SE	Mr. Sushil Meshram	March 2019– Till date	

Declaration by the head of the Accredited Consultant Organization

I, Mr. G. Murugesh, hereby confirm that the above mentioned experts prepared the EIA/EMP Report for the proposed Environmental Impact Assessment Report for proposed Onshore Oil and Gas Exploration and Appraisal in the CB-ONHP-2017/10 block in Banskantha District, Gujarat and Jalore District, Rajasthan by Vedanta Limited (Division: Cairn Oil & Gas). I also confirm that ABC Techno Labs India Pvt. Ltd. shall be fully accountable for any misleading information mentioned in this statement.

Signature :

Name : Mr. G. Murugesh
Designation : Chairman & Managing Director
Name of the EIA Consultant Organization: ABC Techno Labs India Private Limited
NABET Certificate No. & Issue Date: NABET/EIA/1619/RA0048 date 29th May 2017

ANNEXURE 1: REVENUE SHARING CONTRACT

REVENUE SHARING CONTRACT

BETWEEN

THE GOVERNMENT OF INDIA

AND

VEDANTA LIMITED

UNDER

HYDROCARBON EXPLORATION AND LICENSING POLICY

WITH RESPECT TO CONTRACT AREA IDENTIFIED

AS BLOCK

CB-ONHP-2017/10

K.K. Hoolani US(E-II), MoPNG

(PREMANAND MISHRA) Premanand Mishra Head Exploration-Onshore Vedanta Ltd.

Vasudev
VASUDEV BANSAL
DGH

TABLE OF CONTENTS

PM

APPENDICES

REVENUE SHARING CONTRACT
FOR ONLAND AREAS

This Contract made on this 1st October, Two thousand and Eighteen between: The President of India, acting through the Joint Secretary (E), Ministry of Petroleum and Natural Gas (hereinafter referred to as "the Government") of the FIRST PART;

AND

Vedanta Limited, a company incorporated under the laws of India (hereinafter referred to as **"Vedanta"** or **"Contractor"**) having its registered office at 1st Floor, C wing, Unit 103, Corporate Avenue Atul Projects, Chakala, Andheri (East) Mumbai, Mumbai City Maharashtra-400093 India which expression shall include its successors and such assigns as are permitted under Article 26 hereof, of the SECOND PART;

WITNESSETH:

WHEREAS

(1) The Oilfields (Regulation and Development) Act, 1948 (53 of 1948) (hereinafter referred to as "the Act") and the Petroleum and Natural Gas Rules, 1959, made there under (hereinafter referred to as "the Rules") make provisions, inter alia, for the regulation of Petroleum Operations and grant of Licenses and Leases for exploration, development and production of Petroleum in India;

(2) The Rules provide for the grant of Licenses and Leases in respect of land vested in a State Government by that State Government with the previous approval of the Central Government;

(3) Rule 5 of the Rules provides for an agreement between the Government and the Licensee or Lessee containing additional terms and conditions with respect to the License or Lease;

(4) The Government desires that all types of Petroleum resources which may exist in India, whether within territorial waters (ultra-deep, deep or shallow water), exclusive economic zone, the continental shelf of India, or Onland, be discovered and exploited in accordance with Good International Petroleum Industry Practices (GIPIP) with utmost expedition in the overall interests of India;

(5) The Government has formulated and approved a new exploration and licensing policy named 'Hydrocarbon Exploration and Licensing Policy' ("HELP") vide Resolution dated 30.03.2016, whereby it has been determined to provide a uniform license to enable E&P operators to explore and extract all hydrocarbon resources including conventional and unconventional oil and gas resources including CBM, Shale Gas/Oil, Tight Gas, Gas Hydrates and any other resource to be identified in future which fall within the definition of 'Petroleum" and "Natural Gas" under the Rules;

3

(6) The Government, pursuant to HELP, invited companies to submit competitive bids to obtain the right to undertake exploration, discovery and commercial production of Petroleum resources within India, which would also be governed by Applicable Laws governing Petroleum Operations within India formulated by the Government;

(7) **Vedanta** has committed that it has, or will acquire and make available, the necessary financial and technical resources and the technical and industrial competence and experience necessary for proper discharge and / or performance of all obligations required to be performed under this Contract in accordance with Good International Petroleum Industry Practices (GIPIP) and will provide guarantees as required in Article 27 for the due performance of its obligations hereunder; and

(8) As a result of discussions between representatives of the Government and **Vedanta** on the bid submitted by **Vedanta**, the Government has agreed to enter into this Contract with **Vedanta** with respect to the Contract Area identified as Block **CB-ONHP-2017/10** and detailed in Appendix A and Appendix B (hereinafter referred to as "the Block") on the terms and conditions herein set forth.

NOW, THEREFORE, in consideration of the premises and covenants and conditions herein contained, IT IS HERE BY AGREED between the Parties as follows

4

PM

IN WITNESS WHEREOF, the representatives of the Parties to this Contract being duly authorized have hereunto set their hands and have executed these presents this 1st October Two thousand and Eighteen.

Signed for and on behalf of the President of India

By: Amarnath

अमर नाथ / AMAR NATH
संयुक्त सचिव/Joint Secretary
पेट्रोलियम एवं प्राकृतिक गैस मंत्रालय
Ministry of Petroleum & Natural Gas
भारत सरकार/Govt. of India
नई दिल्ली/New Delhi

In presence of

संजय कुमार जैन / SANJAY KUMAR JAIN
निदेशक / Director
पेट्रोलियम एवं प्राकृतिक गैस मंत्रालय
Ministry of Petroleum & Natural Gas
भारत सरकार / Govt. of India
नई दिल्ली / New Delhi

Signed for and on behalf of Vedanta Limited

By:

In presence of

88

APPENDIX A
DESCRIPTION OF THE CONTRACT AREA

The area comprising approximately **2766 Sq. km.** onshore/offshore India identified as block **CB-ONHP-2017/10** described herein and shown on the map attached as Appendix B ("Map of the Contract Area"). Longitude and latitude measurements commence at points 1, 2, 3, ..., 22 are given below:

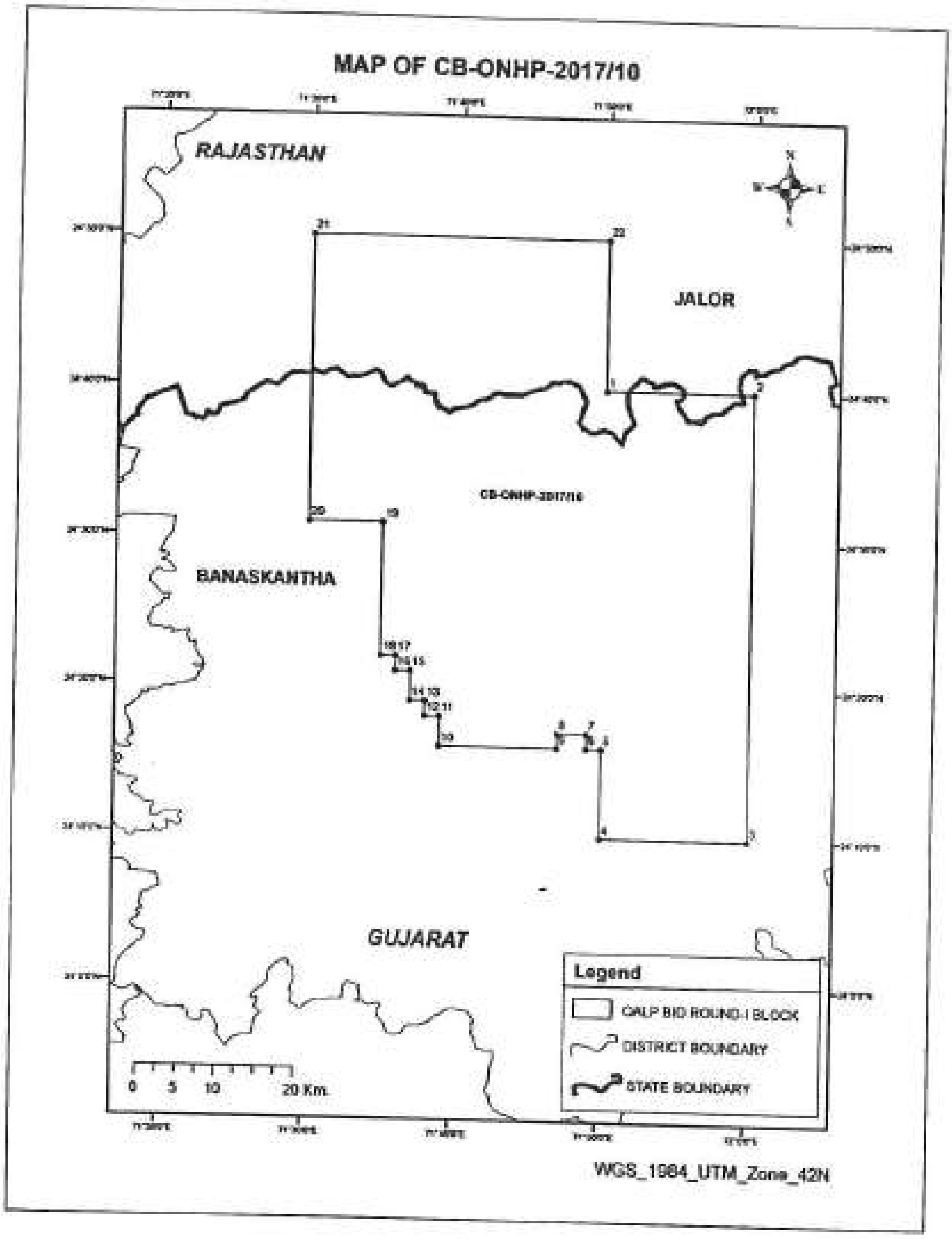
Points	Longitude	Latitude
1	71° 50'	24° 40'
2	72° 0'	24° 40'
3	72° 0'	24° 10'
4	71° 50'	24° 10'
5	71° 50'	24° 16'
6	71° 49'	24° 16'
7	71° 49'	24° 17'
8	71° 47'	24° 17'
9	71° 47'	24° 16'
10	71° 39'	24° 16'
11	71° 39'	24° 18'
12	71° 38'	24° 18'
13	71° 38'	24° 19'
14	71° 37'	24° 19'
15	71° 37'	24° 21'
16	71° 36'	24° 21'
17	71° 36'	24° 22'
18	71° 35'	24° 22'
19	71° 35'	24° 31'
20	71° 30'	24° 31'
21	71° 30'	24° 50'
22	71° 50'	24° 50'

89

PM

APPENDIX B

MAP OF THE CONTRACT AREA



90

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ANNEXURE 2: APPROVED TERMS OF REFERENCE (TOR)

No.IA-J-11011/108/2019-IA-II(I)
Goverment of India
Minister of Enviroment,Forest and Climate Change
Impact Assessment Division
***

Indira Paryavaran Bhavan,
Vayu Wing,3rd Floor,Aliganj,
Jor Bagh Road,New Delhi-110003
26 Apr 2019

To,

M/s M/s Vedanta Limited(Division Cairn Oil & Gas)
DLF Atria, Phase 2, Jacaranda Marg, DLF City,
Gurgaon-122002
Haryana

Tel.No.0124-4594176; Email:mayank.sharma@cairnindia.com

Sir/Madam,

This has reference to the proposal submitted in the Ministry of Environment, Forest and Climate Change to prescribe the Terms of Reference (TOR) for undertaking detailed EIA study for the purpose of obtaining Environmental Clearance in accordance with the provisions of the EIA Notification, 2006. For this purpose, the proponent had submitted online information in the prescribed format (Form-1) along with a Pre-feasibility Report. The details of the proposal are given below:

1. Proposal No.:	IA/GJ/IND2/100119/2019
2. Name of the Proposal:	Onshore Oil and Gas Exploration and Appraisal in CB-ONHP-2017/10 block in Banaskantha District of Gujarat and Jalore District of Rajasthan.
3. Category of the Proposal:	Industrial Projects - 2
4. Project/Activity applied for:	1(b) Offshore and onshore oil and gas exploration, development & production
5. Date of submission for TOR:	23 Mar 2019

1(b):STANDARD TERMS OF REFERENCE FOR CONDUCTING ENVIRONMENT IMPACT ASSESSMENT STUDY FOR OFFSHORE AND ONSHORE OIL AND GAS EXPLORATION, DEVELOPMENT AND PRODUCTION PROJECTS AND INFORMATION TO BE INCLUDED IN EIA/EMP REPORT

B. STANDARD TOR FOR ONSHORE OIL AND GAS EXPLORATION, DEVELOPMENT & PRODUCTION

1. Executive summary of a project.
2. Project description, project objectives and project benefits.
3. Cost of project and period of completion.
4. Site details within 1 km of the each proposed well, any habitation, any other installation/activity, flora and fauna, approachability to site, other activities including agriculture/land, satellite imagery for 10 km area. All the geological details shall be mentioned in the Topo sheet of 1:40000 scale, superimposing the well locations and other structures of the projects. Topography of the project site.
5. Details of sensitive areas such as National Park, Wildlife sanctuary and any other eco-sensitive area alongwith map indicating distance.
6. Approval for the forest land from the State/Central Govt. under Forest (Conservation) Act, 1980, if applicable.
7. Recommendation of SCZMA/CRZ clearance as per CRZ Notification dated 6th January, 2011 (if applicable).
8. Distance from nearby critically/severely polluted area as per Notification, if applicable. Status of moratorium imposed on the area.
9. Does proposal involve rehabilitation and resettlement? If yes, details thereof.
10. Environmental considerations in the selection of the drilling locations for which environmental clearance is being sought. Present any analysis suggested for minimizing the foot print giving details of drilling and development options considered.
11. Baseline data collection for air, water and soil for one season leaving the monsoon season in an area of 10 km radius with centre of Oil Field as its centre covering the area of all proposed drilling wells.
12. Climatology and Meteorology including wind speed, wind direction, temperature rainfall relative humidity etc.
13. Details of Ambient Air Quality monitoring at 8 locations for PM2.5, PM10, SO2, NOx, CO, VOCs, Methane and non-methane HC.
14. Soil sample analysis (physical and chemical properties) at the areas located at 5 locations.
15. Ground and surface water quality in the vicinity of the proposed wells site.

STANDARD TERMS OF REFERENCE (TOR) FOR EIA/EMP REPORT FOR PROJECTS/ ACTIVITIES REQUIRING ENVIRONMENT CLEARANCE

16. Measurement of Noise levels within 1 km radius of the proposed wells.
17. Vegetation and land use; flora/fauna in the block area with details of endangered species, if any.
18. Incremental GLC as a result of DG set operation, flaring etc.
19. Potential environmental impact envisaged during various stages of project activities such as site activation, development, operation/ maintenance and decommissioning.
20. Actual source of water and 'Permission' for the drawl of water from the Competent Authority. Detailed water balance, wastewater generation and discharge.
21. Noise abatement measures and measures to minimize disturbance due to light and visual intrusions.
22. Details on wastewater generation, treatment and utilization /discharge for produced water/ formation water, cooling waters, other wastewaters, etc. duringallprojectphases.
23. Details on solid waste management for drill cuttings, drilling mud and oil sludge, produced sand, radio activematerials, other hazardous materials, etc. including its disposal options during all project phases.
24. Disposal of spent oil and lube.
25. Storage of chemicals and diesel at site. Hazardous material usage, storage and accounting.
26. Commitment for the use of water based mud (WBM) only
27. Oil spill emergency plans for recovery/ reclamation.
28. H2S emissions control.
29. Produced oil/gas handling, processing and storage/transportation.
30. Details of control of air, water and noise pollution during production phase.
31. Measures to protect ground water and shallow aquifers from contamination.
32. Whether any burn pits being utilised for well test operations.
33. Risk assessment and disaster management plan for independent reviews of well designed construction etc. for prevention of blow out. Blowout preventer installation.
34. Environmental management plan.
35. Total capital and recurring cost for environmental control measures.
36. Emergency preparedness plan.
37. Decommissioning and restoration plans.
38. Documentary proof of membership of common disposal facilities, if any.
39. Details of environmental and safety related documentation within the company including documentation and proposed occupational health and safety Surveillance Safety Programme for all personnel at site. This shall also include monitoring programme for the environmental.
40. A copy of Corporate Environment Policy of the company as per the Ministry's O.M. No. J-11013/ 41/2006-IA.II(I) dated 26th April, 2011 available on the Ministry's website.
41. Any litigation pending against the project and or any direction/order passed by any court of law against the project. If so details thereof.

***

2

ANNEXURE 3: WELL WISE ENVIRONMENTAL SETTINGS

Well id	Village Name	Taluka/ Tehsil	District	State	Present Land use	Road Infrastructure	Forest/ Wildlife Santuary/ National Park	Nearest river/ Water bodies	Major human establishments etc	Industries etc
1	Navapura	Deodar	Banaskantha	Gujarat	Agricultural Fallow	Bhiladi-Gulab-Nava Nesada Road	Nil	Sujalam Sufalam Canal	Nil	Nil
2	Nesda nava	Deesa	Banaskantha	Gujarat	Agricultural Fallow	Bhiladi-Gulab-Nava Nesada Road and Approach Road	Nil	Nil	Nil	Nil
3	Dera	Deodar	Banaskantha	Gujarat	Agricultural Fallow	Approach Road near Dera village	Nil	Nil	Nil	Nil
4	Dharanva	Deesa	Banaskantha	Gujarat	Agricultural Fallow	Approach Road near Dharanva village	Nil	Nil	Nil	Nil
5	Sanav	Deodar	Banaskantha	Gujarat	Agricultural Fallow	Approach Road near Sanav village	Nil	Nil	Nil	Nil
6	Kuwana	Deodar	Banaskantha	Gujarat	Agricultural Fallow	State Highway-54 and Road connecting Jetda and Kuwana village	Nil	Nil	Kuwana 0.44km (NE)	Nil
7	Ganeshpura	Tharad	Banaskantha	Gujarat	Agricultural Fallow	State Highway-54, Gela-Lakhani Road and Lakhani-Jasara Road	Nil	Nil	Ganeshpura 0.70 km (NE)	Nil
8	Agthala	Deesa	Banaskantha	Gujarat	Agricultural Fallow	State Highway-54 and Appraoch Road	Nil	Nil	Agthala 0.65 km (NE)	Nil
9	Agthala	Deesa	Banaskantha	Gujarat	Open Jungle	Appraoch Roads	Nil	Nil	Nil	Nil
10	Malupur	Tharad	Banaskantha	Gujarat	Agricultural Fallow	Appraoch Road	Nil	Nil	Nil	Nil
11	Padadar	Tharad	Banaskantha	Gujarat	Agricultural Fallow	State Highway-54	Nil	Nil	Nil	Nil
12	Peparal	Tharad	Banaskantha	Gujarat	Agricultural Fallow	Appraoch Road near Peparal village	Nil	Nil	Nil	Nil
13	Gela	Tharad	Banaskantha	Gujarat	Agricultural Fallow	Appraoch Road near Gela village	Nil	Nil	Nil	Nil
14	Vasna	Deesa	Banaskantha	Gujarat	Agricultural Fallow	Appraoch Road near Vasna village	Nil	Nil	Nil	Nil
15	Chekra	Deesa	Banaskantha	Gujarat	Agricultural Fallow	Appraoch Road near chekra village	Nil	Nil	Nil	Nil
16	Chudmer	Tharad	Banaskantha	Gujarat	Agricultural Fallow	State Highway-128 and Appraoch Road near well	Nil	Narmada Main Canal	Chudmer 0.45km (NW)	Nil

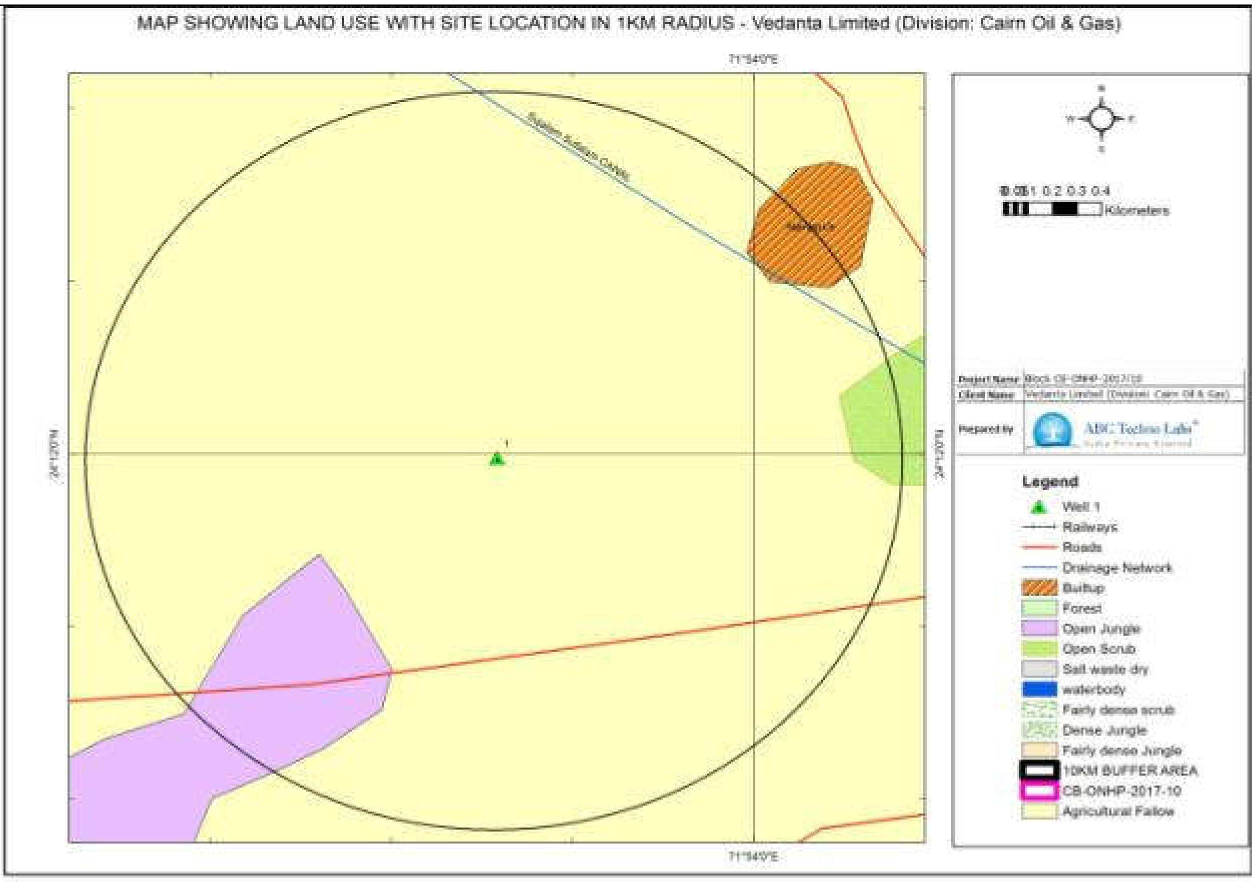
Well id	Village Name	Taluka/ Tehsil	District	State	Present Land use	Road Infrastructure	Forest/ Wildlife Santuary/ National Park	Nearest river/ Water bodies	Major human establishments etc	Industries etc
17	Budhanpur	Tharad	Banaskantha	Gujarat	Agricultural Fallow	NH-15 and SH-128	Nil	Nil	Nil	Nil
18	Kothigam	Tharad	Banaskantha	Gujarat	Agricultural Fallow	SH-128	Nil	Nil	Nil	Nil
19	Undrana	Tharad	Banaskantha	Gujarat	Agricultural Fallow	Undrana Road	Nil	Nil	Undera 0.78 km (N)	Nil
20	Bhimgadh	Tharad	Banaskantha	Gujarat	Agricultural Fallow	Road connecting Madal Taruwa Road	Nil	Nil	Nil	Nil
21	Detal Darbari	Tharad	Banaskantha	Gujarat	Agricultural Fallow	Detal Raod and Dodia Road	Nil	Nil	Nil	Nil
22	Bhakadiyal	Deesa	Banaskantha	Gujarat	Agricultural Fallow	Road connecting Ghana to Bhakadiyal village	Nil	Nil	Nil	Nil
23	Jamda	Tharad	Banaskantha	Gujarat	Agricultural Fallow	Nil	Bhachar Forest	Nil	Nil	Nil
24	Lunal	Tharad	Banaskantha	Gujarat	Agricultural Fallow	Road connecting Lunal to Dudhva	Nil	Nil	Nil	Nil
25	Vedala	Tharad	Banaskantha	Gujarat	Agricultural Fallow	NH-15 and SH-128	Nil	Nil	Vedala 0.5 km (SW)	Salt Waste dry
26	Khengarpura	Tharad	Banaskantha	Gujarat	Agricultural Fallow	Approach Roads near Khengarpura	Forest near Khengarpura	Nil	Nil	Nil
27	kochala	Tharad	Banaskantha	Gujarat	Agricultural Fallow	SH-128	Nil	Nil	Nil	Nil
28	Sidhotara	Tharad	Banaskantha	Gujarat	Agricultural Fallow	SH-128	Forest Near Sidhotara	Nil	Sidhotara 0.8 km (SW)	Nil
29	Yavarpura	Deesa	Banaskantha	Gujarat	Agricultural Fallow	SH-128 and Kheda Road	Forest Near Kheda	Nil	Nil	Nil
30	Bhadodra	Tharad	Banaskantha	Gujarat	Agricultural Fallow	Approach Road	Nil	Nil	Nil	Nil
31	Hathawada	Tharad	Banaskantha	Gujarat	Agricultural Fallow	Road connecting Bhapi to Bhapdi	Forest near Narmada Canal	Narmada Main Canal	Hathawada 0.7 km (NE)	Nil
32	Magrol	Tharad	Banaskantha	Gujarat	Fairly Dense Scrub	Mangrol Road	Nil	Nil	Nil	Nil
33	Changada	Tharad	Banaskantha	Gujarat	Agricultural Fallow	Road connecting Bhuriya to Kamali Village	Nil	Nil	Nil	Nil
34	Thara	Tharad	Banaskantha	Gujarat	Agricultural Fallow	Meghpura village Road	Nil	Nil	Nil	Nil
35	Kiyal	Tharad	Banaskantha	Gujarat	Open scrub	Kiya village Road	Forest Near Kiya village	Nil	Kiya village 0.2 km (W)	Nil
36	Ramuna	Dhanera	Banaskantha	Gujarat	Agricultural Fallow	Ramuna village Road	Nil	Rel Nadi	Nil	Nil
37	Jampur	Tharad	Banaskantha	Gujarat	Agricultural Fallow	Road coonecting to Jampur and Sanval village	Nil	Nil	Nil	Nil

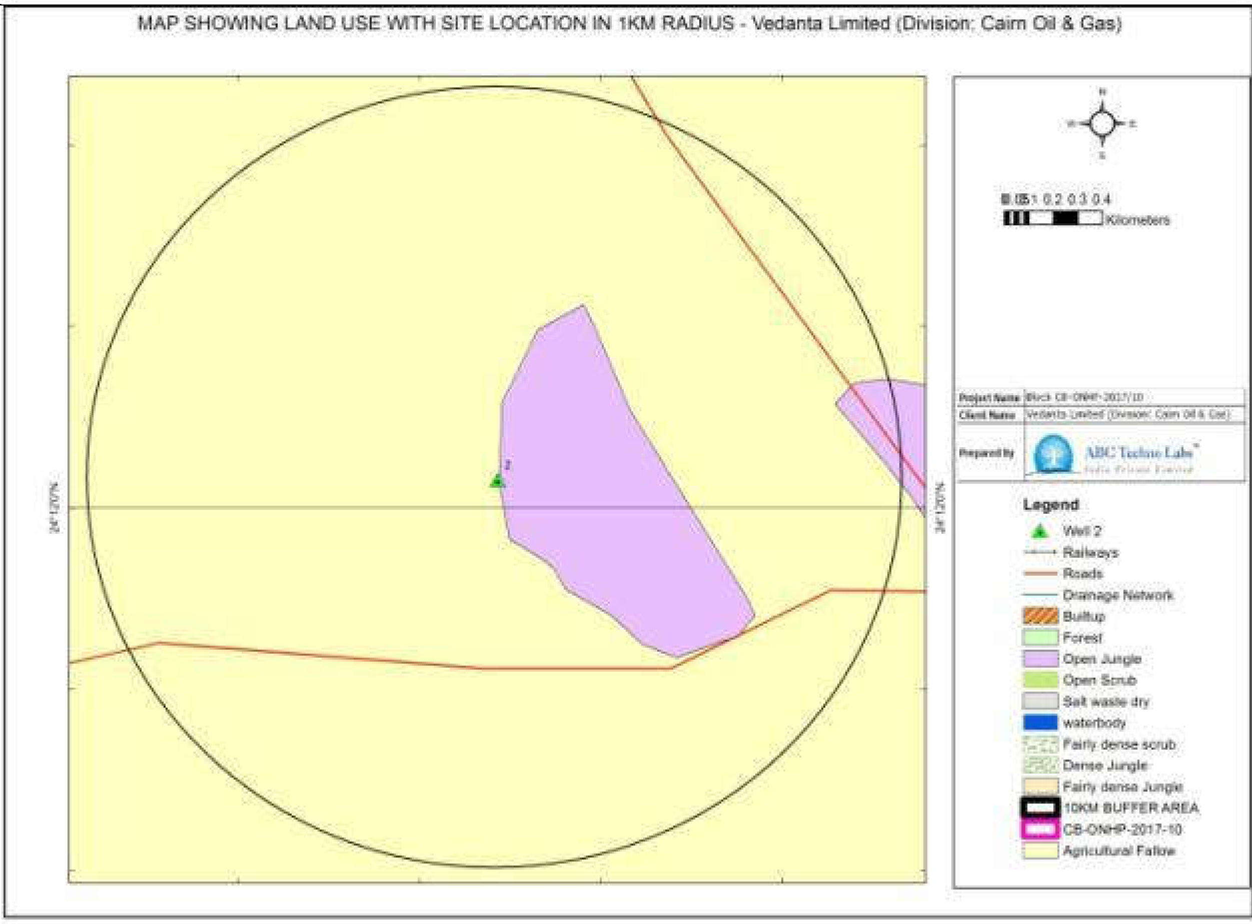
Well id	Village Name	Taluka/ Tehsil	District	State	Present Land use	Road Infrastructure	Forest/ Wildlife Santuary/ National Park	Nearest river/ Water bodies	Major human establishments etc	Industries etc
38	Rampura	Tharad	Banaskantha	Gujarat	Agricultural Fallow	Raod connecting to Rampura and Patiyara village	Forest Near Rampura	Nil	Rampura village 0.8 km (NE)	Nil
39	Karbun	Tharad	Banaskantha	Gujarat	Agricultural Fallow	Karbun village Road	Nil	Nil	Nil	Nil
40	Nana Mesara	Tharad	Banaskantha	Gujarat	Agricultural Fallow	NH-15	Nil	Nil	Nil	Nil
41	Jadara	Tharad	Banaskantha	Gujarat	Agricultural Fallow	Connecting Road Jadara to Dipada village	Nil	Nil	Nil	Nil
42	Morthal	Tharad	Banaskantha	Gujarat	Agricultural Fallow	Luvana Village Road	Nil	Nil	Nil	Nil
43	Bhajna	Dhanera	Banaskantha	Gujarat	Agricultural Fallow	Therevada Road	Nil	Nil	Nil	Nil
44	Vinchhivadi	Dhanera	Banaskantha	Gujarat	Agricultural Fallow	SH-129	Nil	Nil	Vinchhivadi 0.6 km (E)	Nil
45	Sherau	Tharad	Banaskantha	Gujarat	Agricultural Fallow	Connecting Road Sherau to Kumbardi village	Nil	Nil	Sherau 0.9 km (N)	Nil
46	Antrol	Tharad	Banaskantha	Gujarat	Agricultural Fallow	Antrol village Road	Nil	Nil	Nil	Nil
47	Naroli	Tharad	Banaskantha	Gujarat	Agricultural Fallow	Road connecting to Naroli to Raarka village	Nil	Nil	Naroli 0.9 km (W)	Nil
48	Vaghasan	Tharad	Banaskantha	Gujarat	Built up	Jhoss Baval Talab Vaghasan Road and Kod-Vaghasan Road	Nil	Nil	Vaghasan 0.3 km (SW)	Nil
49	Kharakhoda	Tharad	Banaskantha	Gujarat	Agricultural Fallow	NH-15 and Road connecting Miyal and Khara Khoda	Nil	Nil	Nil	Nil
50	Virol	Dhanera	Banaskantha	Gujarat	Agricultural Fallow	Vara Village Road	Nil	Nil	Nil	Nil
51	Nenava	Dhanera	Banaskantha	Gujarat	Agricultural Fallow	Connecing Road Nenava Village to Bhajna Road	Nil	Nil	Nenava Village 0.9km (NE)	Nil
52	Magarawa	Dhanera	Banaskantha	Gujarat	Agricultural Fallow	Nil	Nil	Nil	Nil	Nil
53	Kasavi	Tharad	Banaskantha	Gujarat	Agricultural Fallow	Nil	Nil	Nil	kasavi Village 0.98 km (SE)	Nil
54	Takhuva	Tharad	Banaskantha	Gujarat	Agricultural Fallow	Approach Road near Takhuva village	Nil	Nil	Jaisla Village 0.9 km (E)	Nil

Well id	Village Name	Taluka/ Tehsil	District	State	Present Land use	Road Infrastructure	Forest/ Wildlife Santuary/ National Park	Nearest river/ Water bodies	Major human establishments etc	Industries etc
55	Kailashnagar	Hindaun	Jalore	Rajasthan	Agricultural Fallow	Connecting Road Achalpur and Bapunagar	Open Forest Land Near Achalpur	Nil	Village Kailash Nagar (0.15 Km E) Bapu nagar(0.8Km N), Achalpur(1Km SW)	Nil
56	Lalpura	Sujangarh	Jalore	Rajasthan	Agricultural Fallow	Conncting Road to Khor- Lalpura-Dhurawa Villages	Open Jungle village Khor	Nil	Village Lalpura(0.8 Km NE) & Village Dhurawaa (1 Km N)	Nil
57	Gardali	Sanchore	Jalore	Rajasthan	Built up	SH 68 & Connecting Road to Gardali	Open Jungal Village Gardali and village Padeda ki Dhani	Nil	Gardali Village 0 Km	Nil
58	Paladar	Sanchore	Jalore	Rajasthan	Fairly dense Jungle	SH 168 A and Connecting Roads to Paladar Village	Nil	Nil	Paladar Village 0 Km	Nil
59	Sarawanaa	Sanchore	Jalore	Rajasthan	Agricultural Fallow	MDR 17 & Connecting Road to Sarawanaa Village	Nil	Nil	Sarawanaa Village (0.5 Km NE)	Nil
60	Amarpura	Sanchore	Jalore	Rajasthan	Agricultural Fallow	Approach Roads to Village Amarpura	Nil	Nil	Nil	Nil
61	Chhajara	Sanchore	Jalore	Rajasthan	Agricultural Fallow	Chhajara Village Connecting Roads	Nil	Nil	Chhajara Village (0.4 Km S)	Nil
62	Kilawa	Sanchore	Jalore	Rajasthan	Agricultural Fallow	Kilawa Village Connecting Roads	Nil	Nil	Kilawa Village (1 Km NW)	Nil
63	Itada	Sanchore	Jalore	Rajasthan	Agricultural Fallow	Sachore Town Approach Road	Nil	Nil	Sanchore Town (1Km NE), Makhupura Village (0.9 Km E)	Nil
64	Jajoosan	Sanchore	Jalore	Rajasthan	Agricultural Fallow	Hadetar- Barsam Village Road	Nil	Nil	Nil	Nil
65	Kesoori	Sanchore	Jalore	Rajasthan	Agricultural Fallow	Approach and Connecting road to Village Kesoori	Nil	Nil	Kesoori Village (0.5 Km, NE)	Nil
66	Janvi	Sanchore	Jalore	Rajasthan	Agricultural Fallow	Approach Road to Village Janvi	Nil	Nil	Nil	Nil
67	Vishnu nagar	Sanchore	Jalore	Rajasthan	Agricultural Fallow	Daadusan- Kacchela Road & approach Road Vishnu Nagar	Nil	Nil	Nil	Nil

Well id	Village Name	Taluka/ Tehsil	District	State	Present Land use	Road Infrastructure	Forest/ Wildlife Santuary/ National Park	Nearest river/ Water bodies	Major human establishments etc	Industries etc
68	Dadoosan	Sanchore	Jalore	Rajasthan	Agricultural Fallow	Daadusan- Palari Solankiyan Road	Nil	Nil	Nil	Nil
69	Siddheshwar	Sanchore	Jalore	Rajasthan	Agricultural Fallow	Sidheswar Village internal Roads	Nil	Nil	Sidheswar(0.2 Km South)	Nil
70	Phalna	Sanchore	Jalore	Rajasthan	Agricultural Fallow	B.Dhani Village road	Nil	Nil	Nil	Nil

Source: ABC Techno Labs India Pvt. Ltd.


MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Kilometers
Legend
Well 1
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow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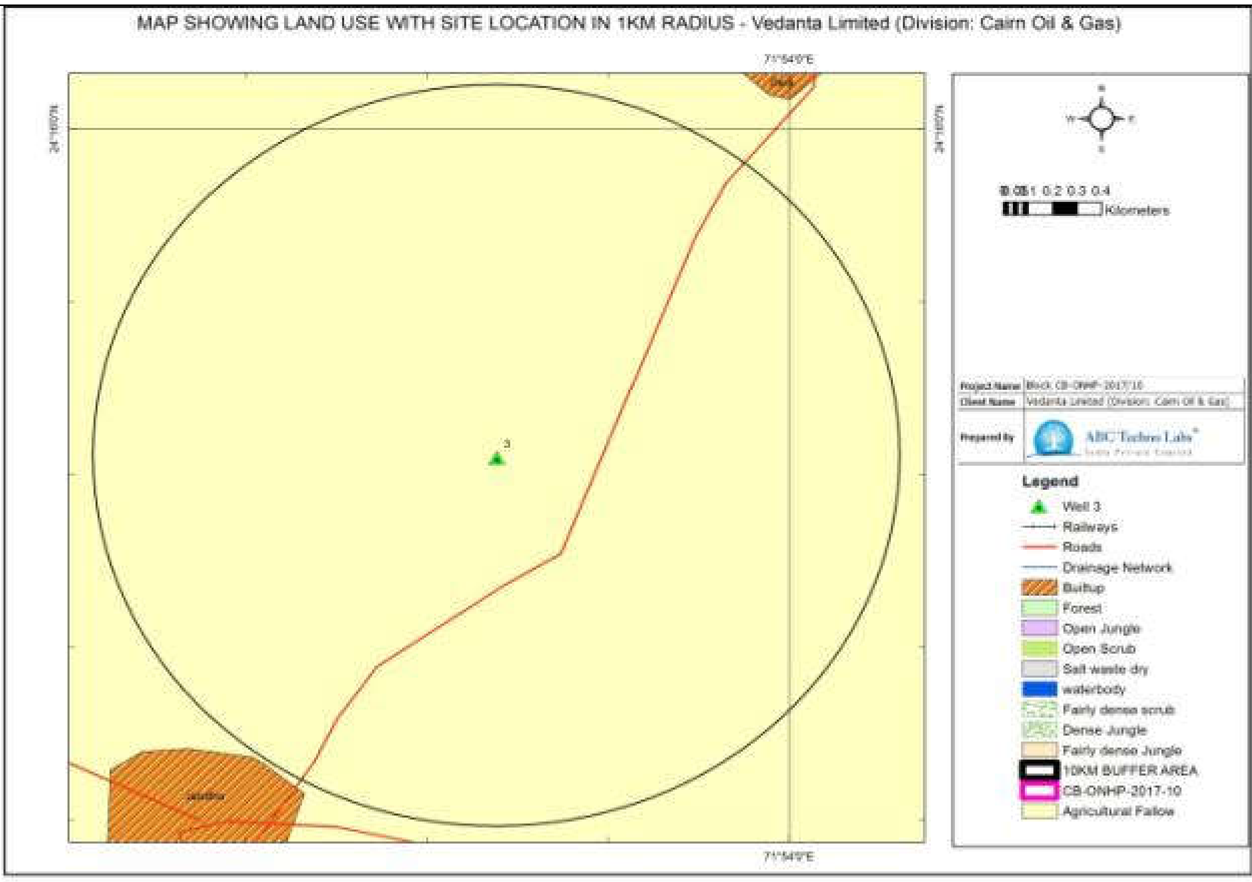
Kilometers
Legend
Well 2
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow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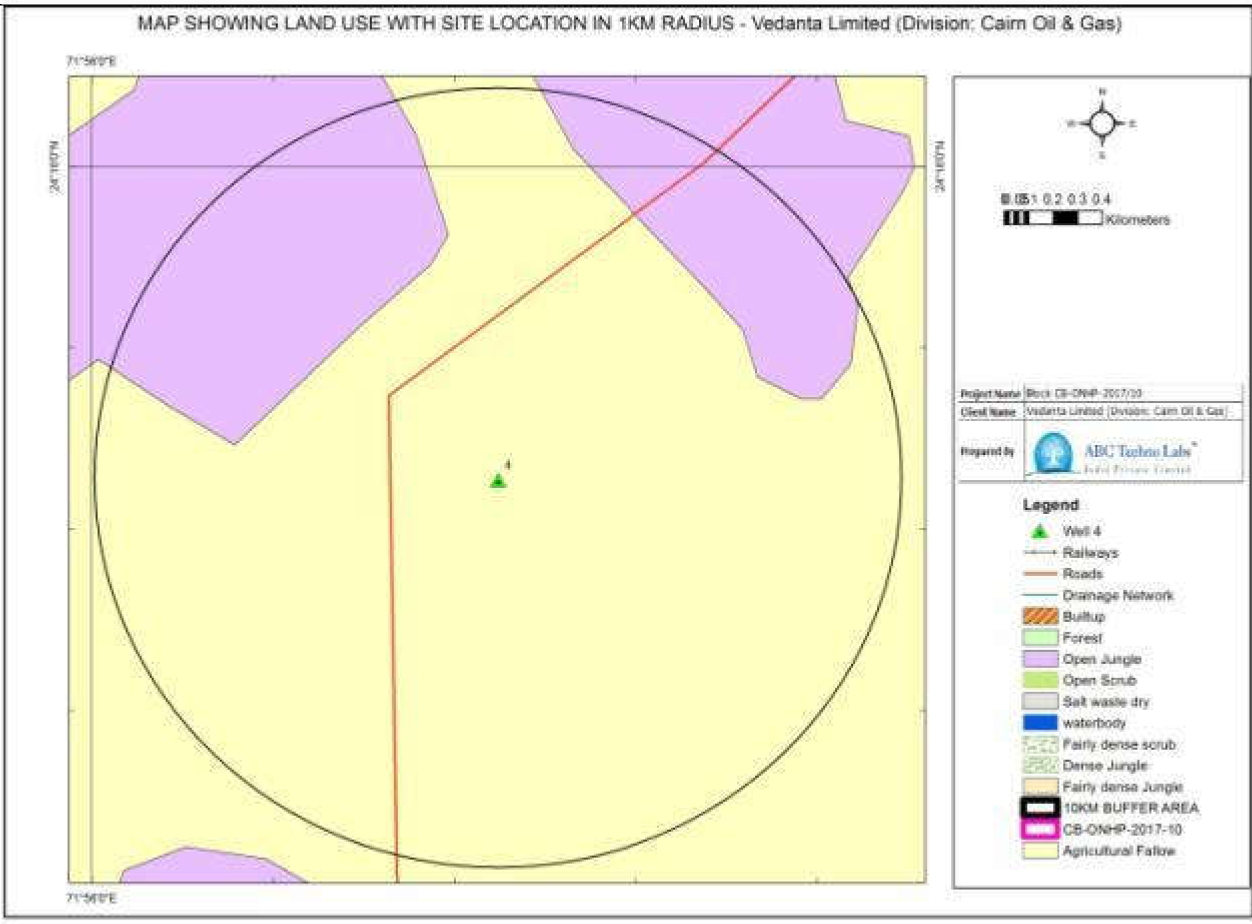
Kilometers
Legend
Well 3
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow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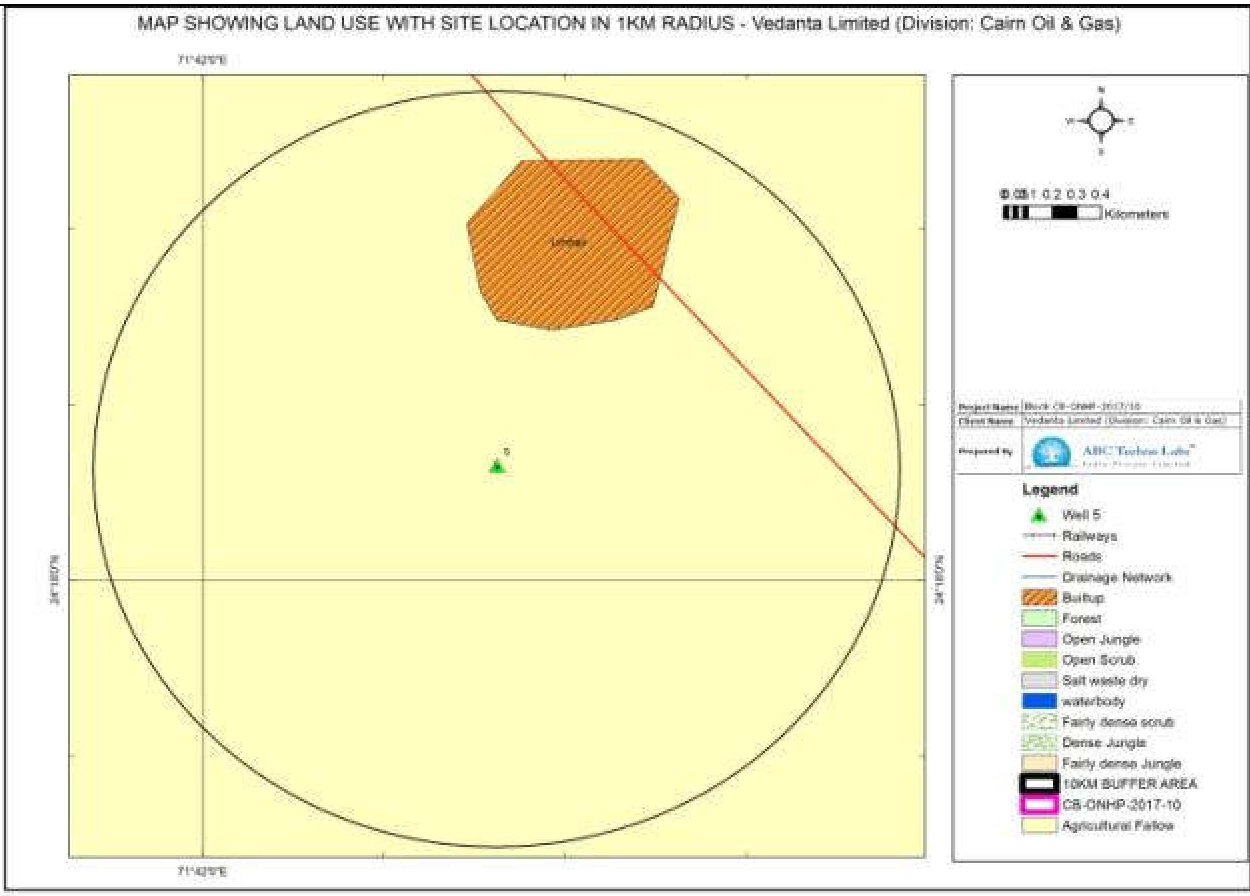
Kilometers
Legend
Well 4
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow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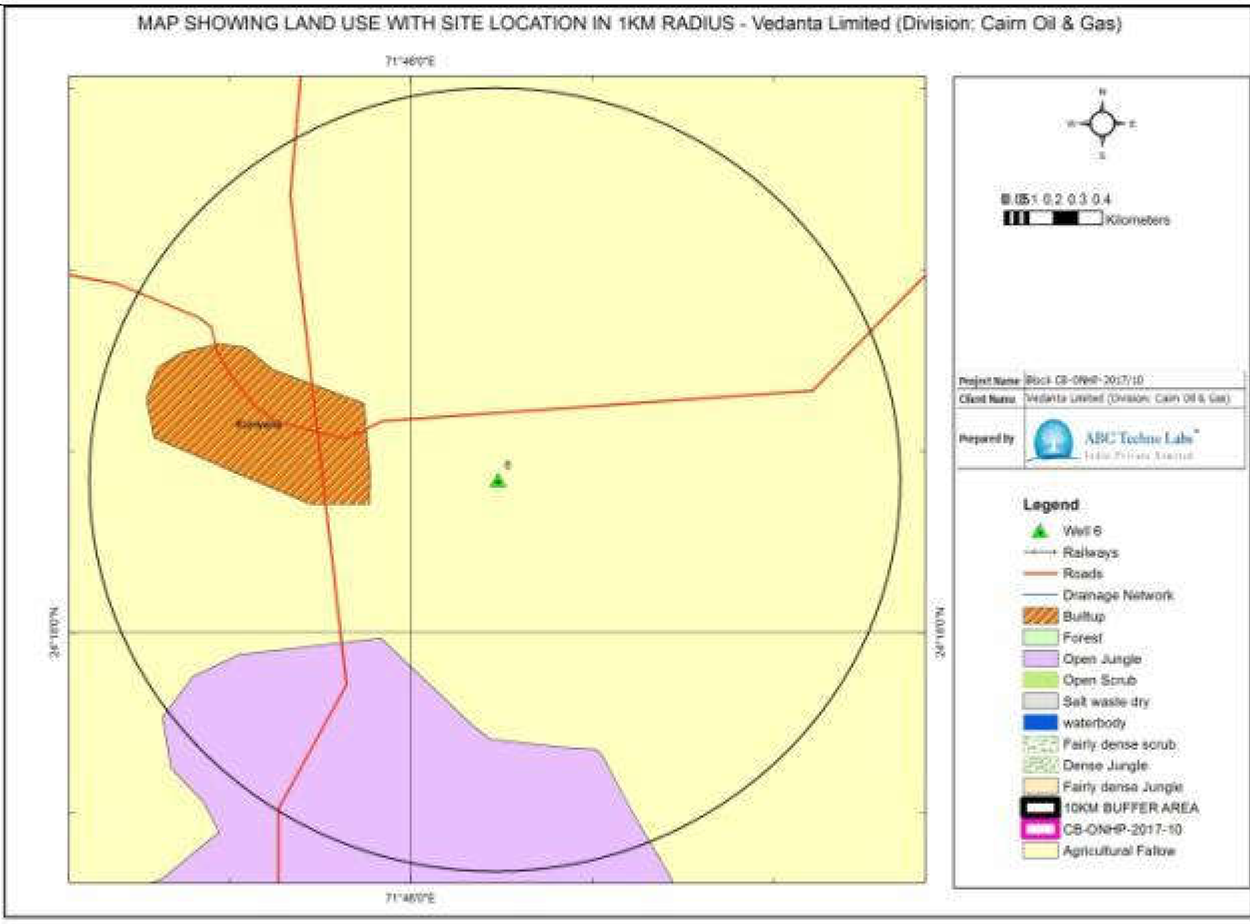
Kilometers
Legend
Well 5
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow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Kilometers
Legend
Well 6
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
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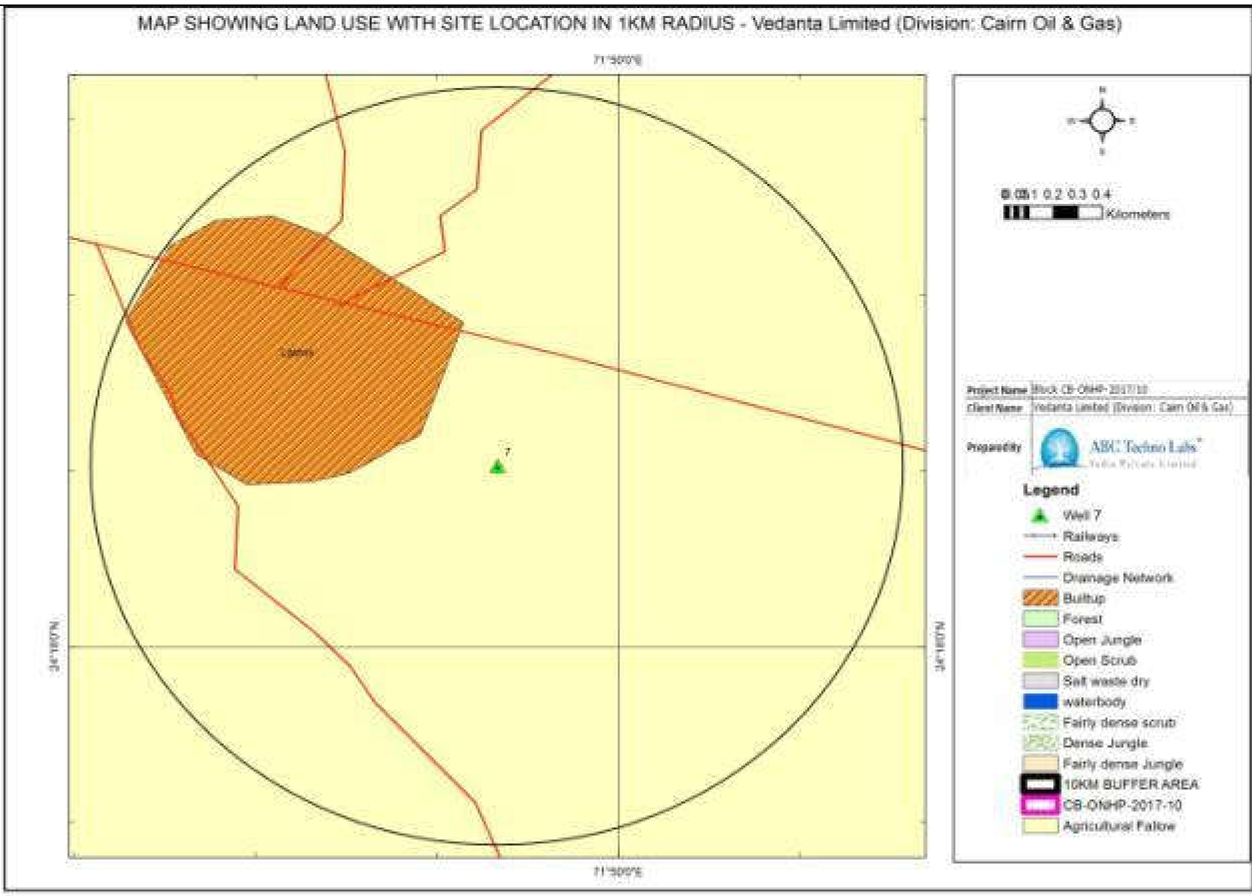
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow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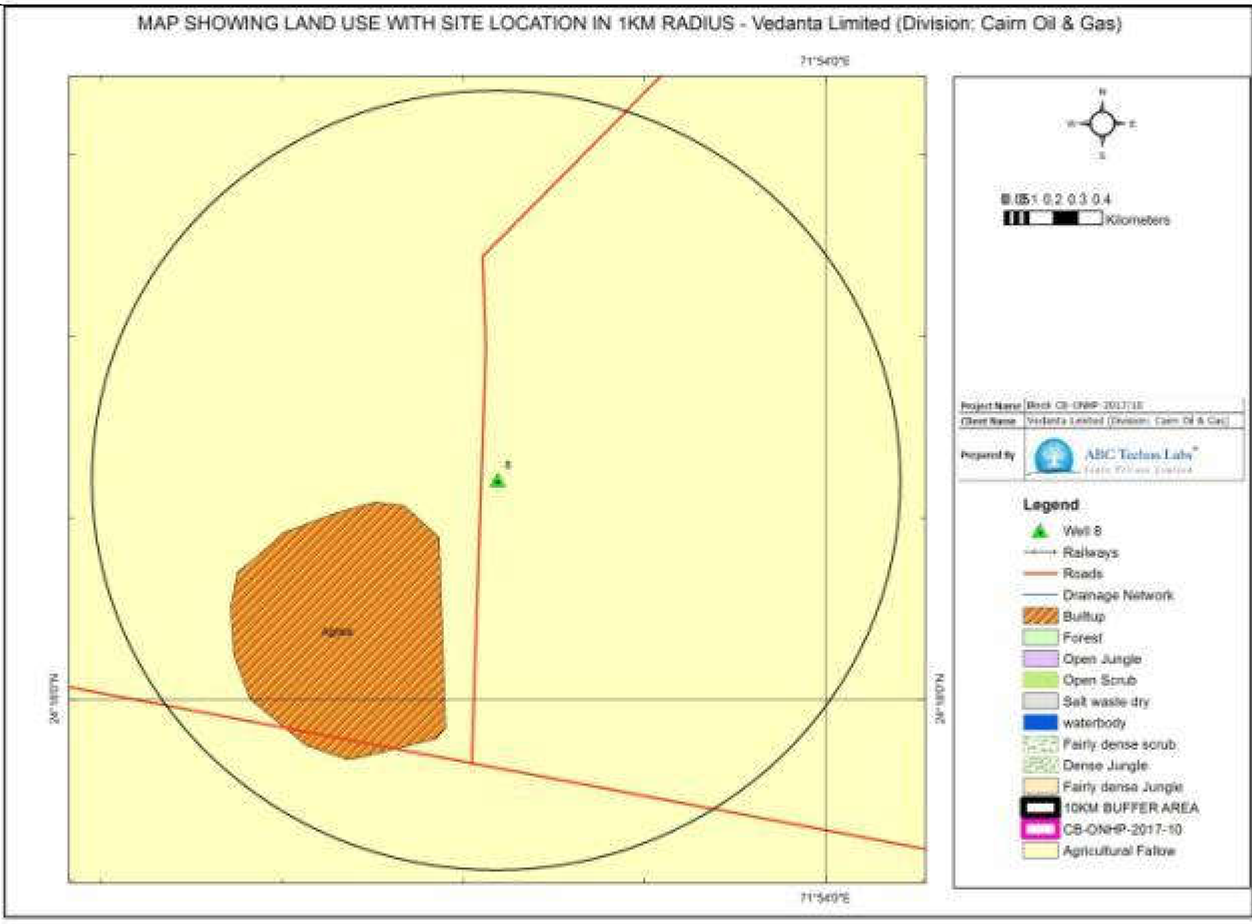
Kilometers
Project Name Block CB-ONHP-2017/10
Client Name Vedanta Limited (Division: Cairn Oil & Gas)
Prepared By
ABC Techno Labs
Legend
Well 7
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow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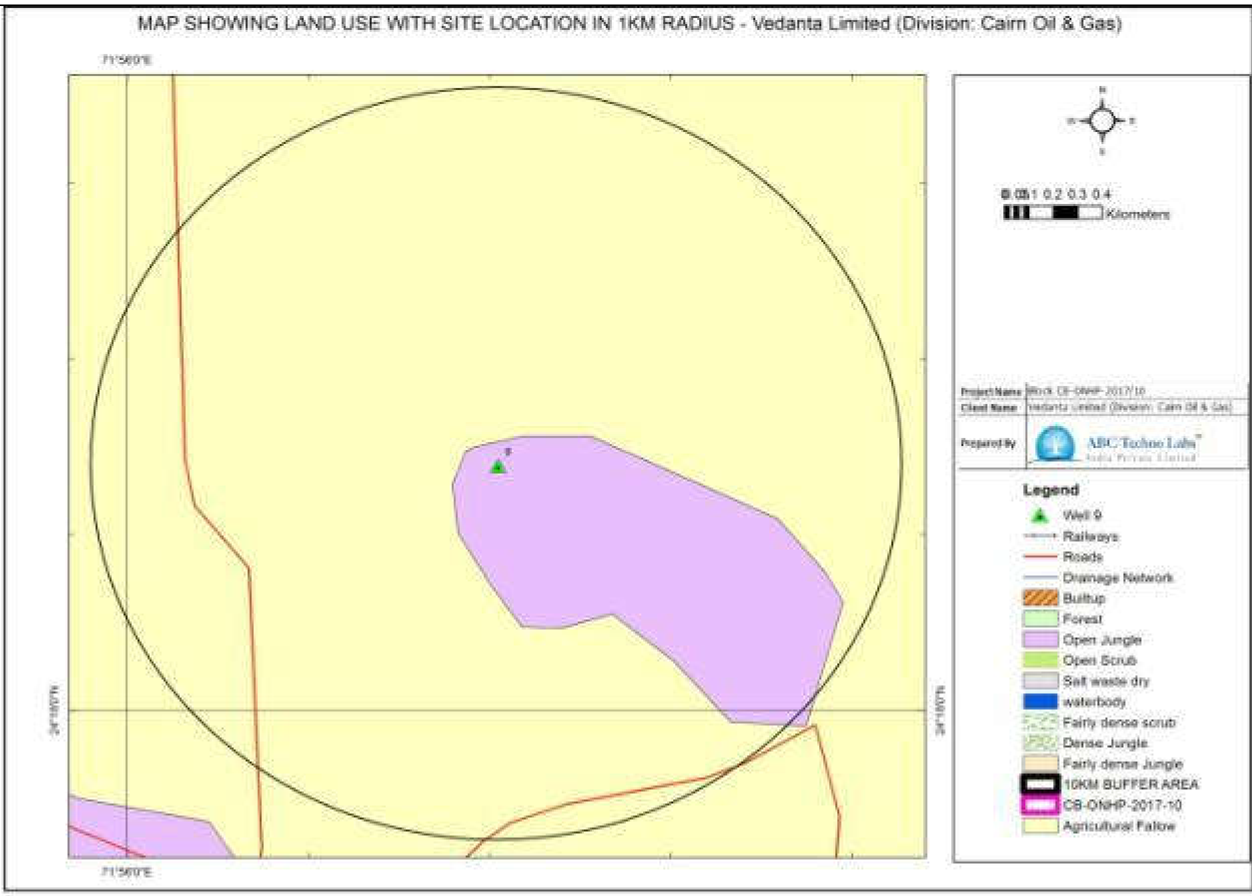
Kilometers
Project Name Block CB-ONHP-2017/10
Client Name Vedanta Limited (Division: Cairn Oil & Gas)
Prepared By
ABC Techno Labs
Legend
Well 8
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow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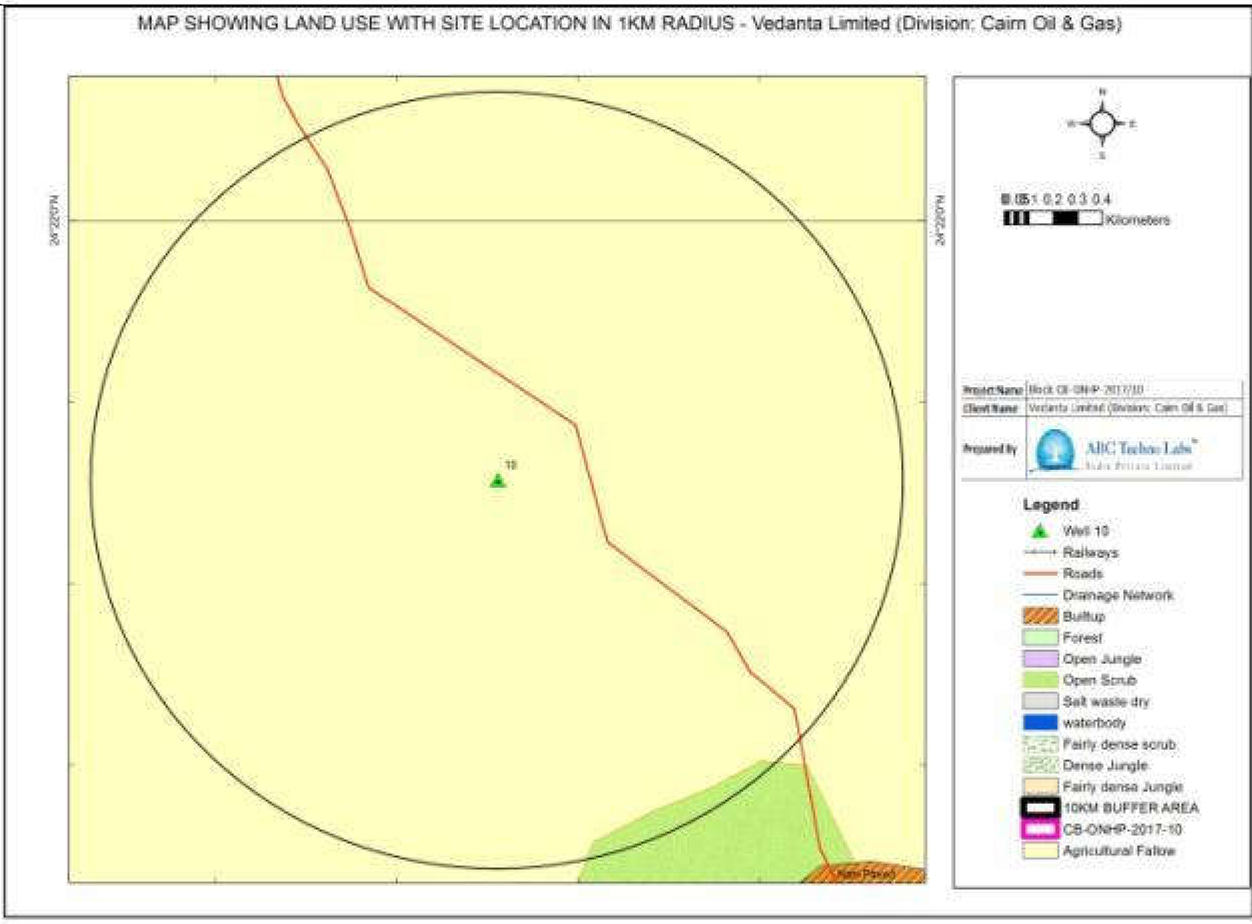
Kilometers
ABC Techno Labs
Legend
Well 9
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow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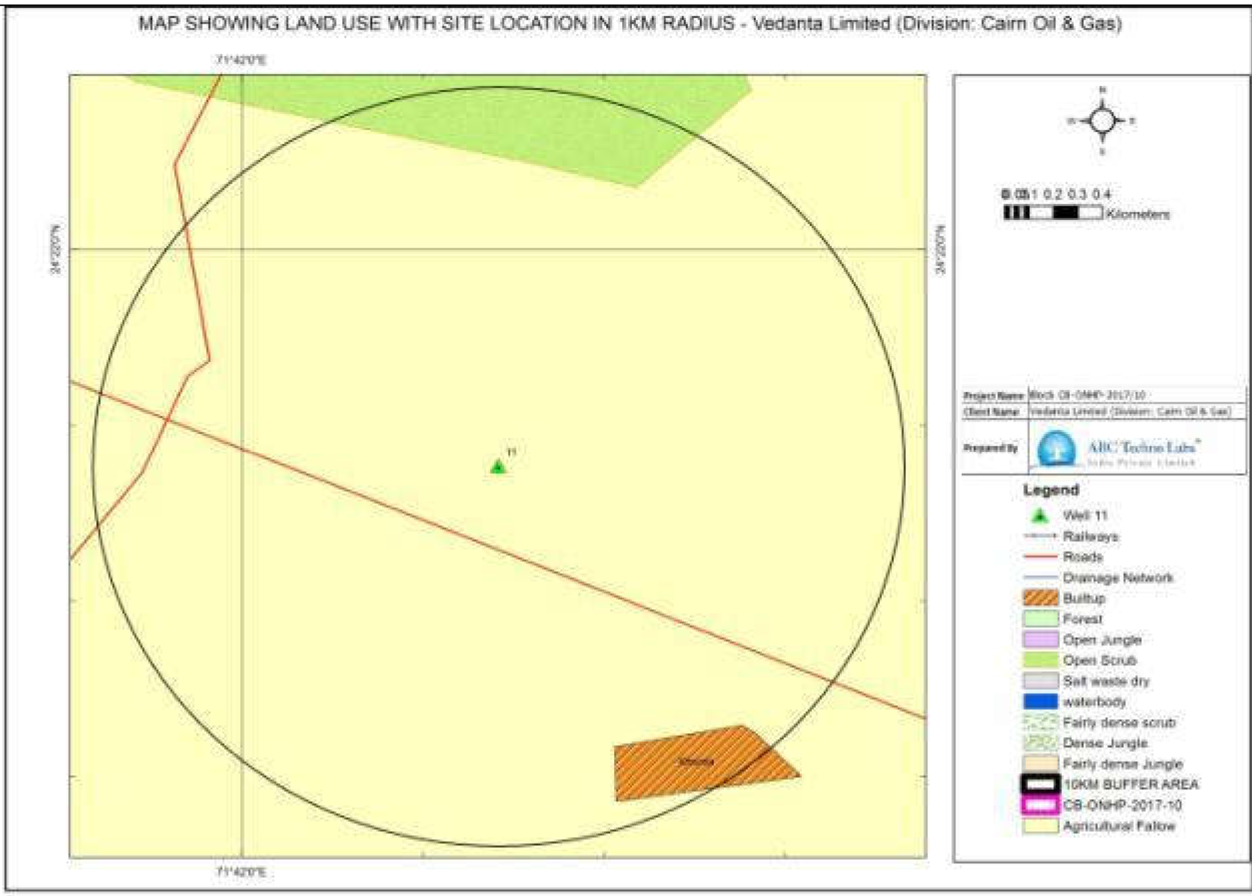
Kilometers
ABC Techno Labs
Legend
Well 10
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow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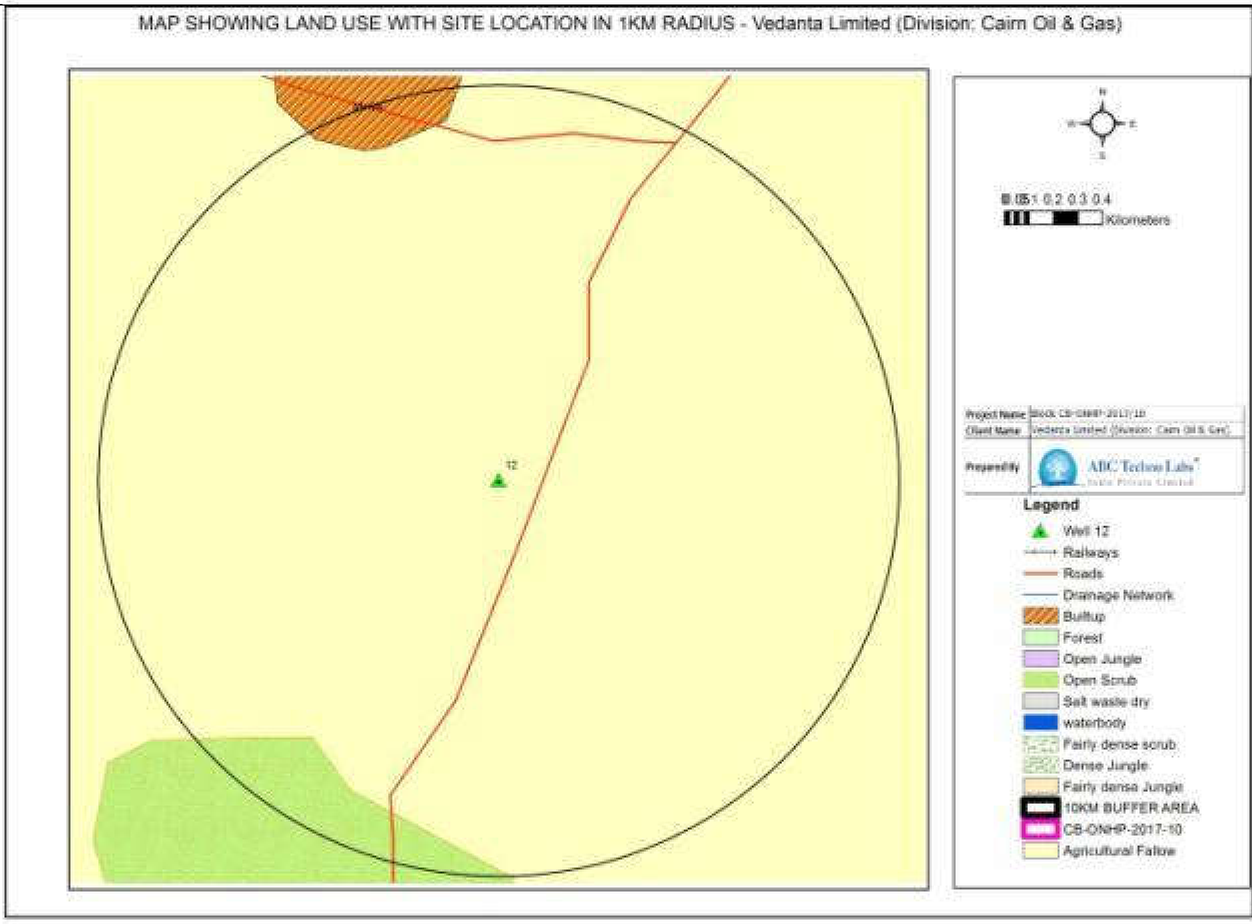
Kilometers
Legend
Well 11
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow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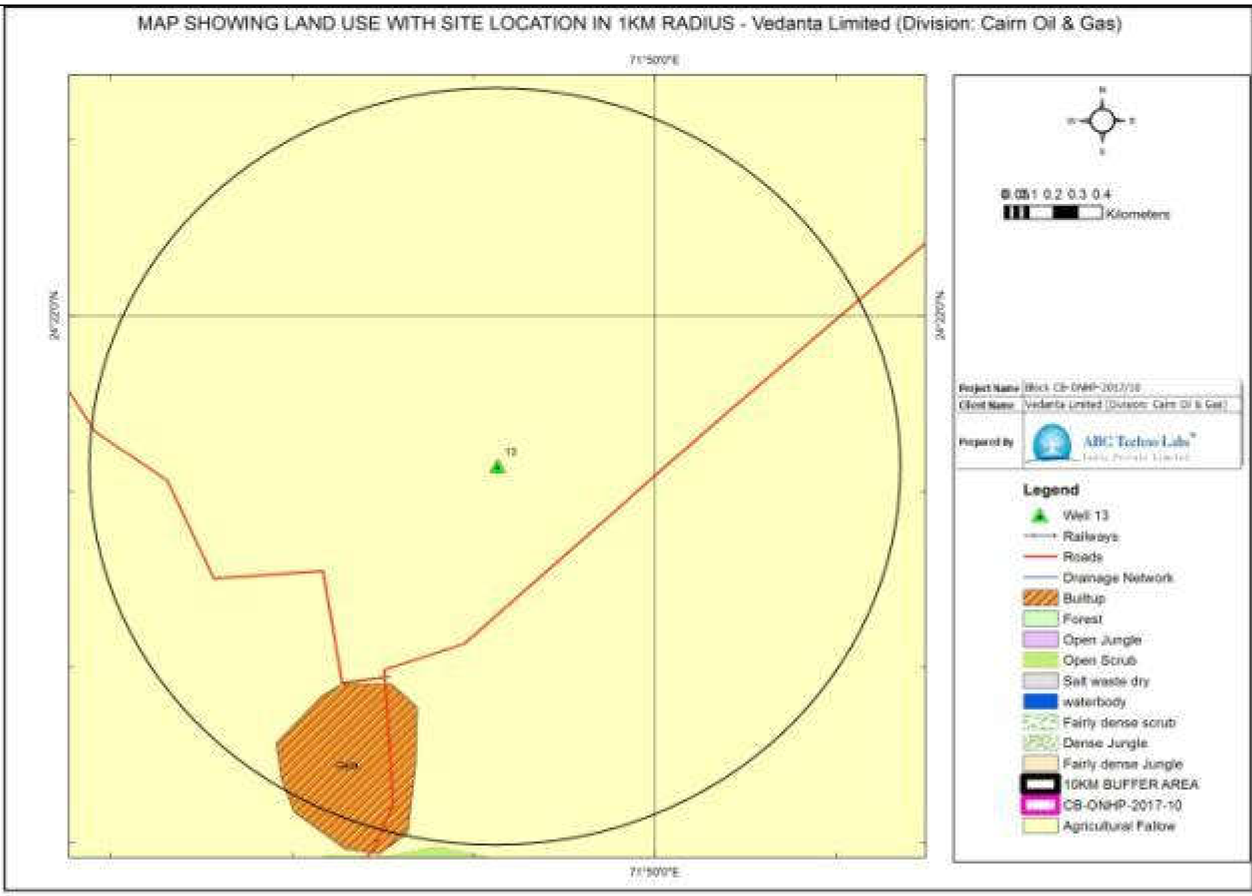
Kilometers
Legend
Well 12
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow



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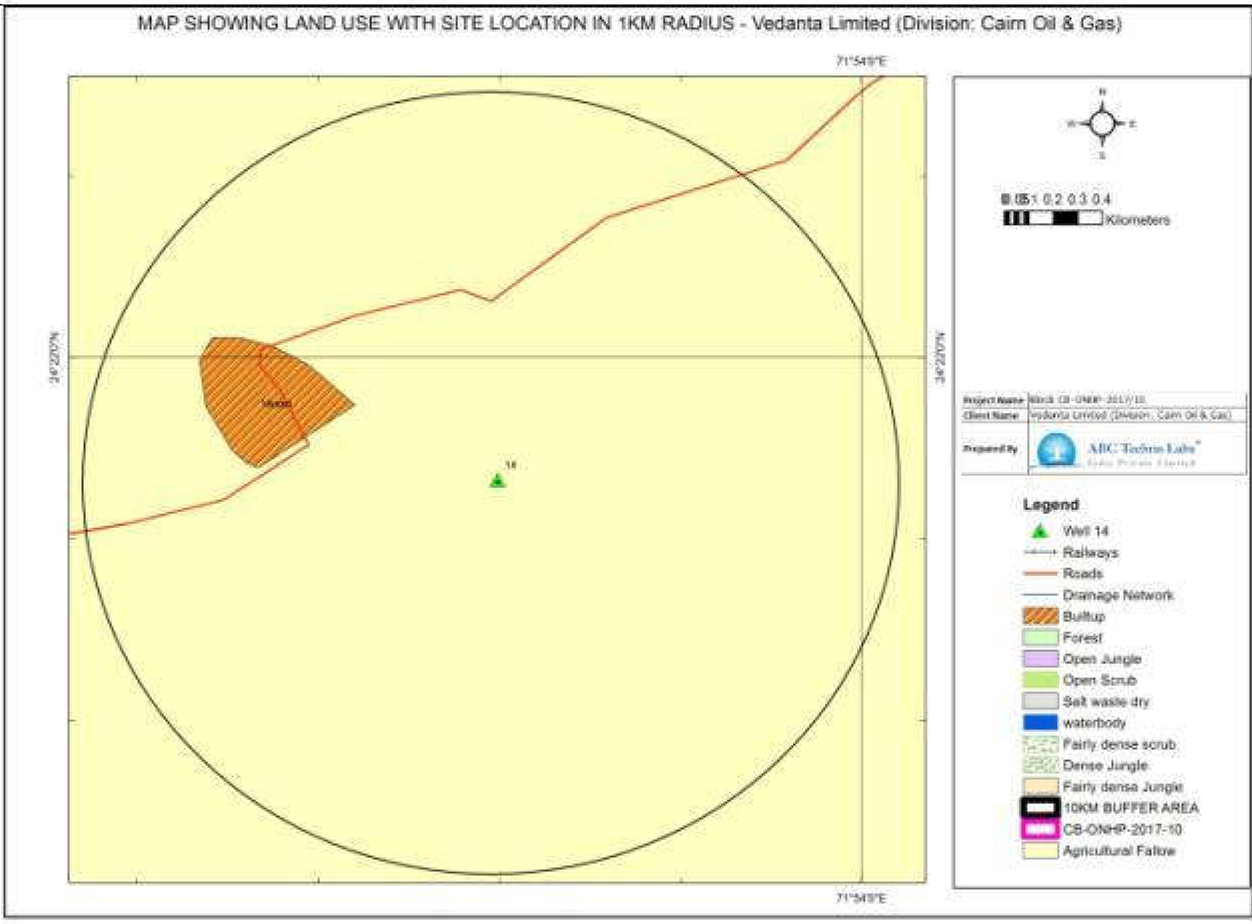
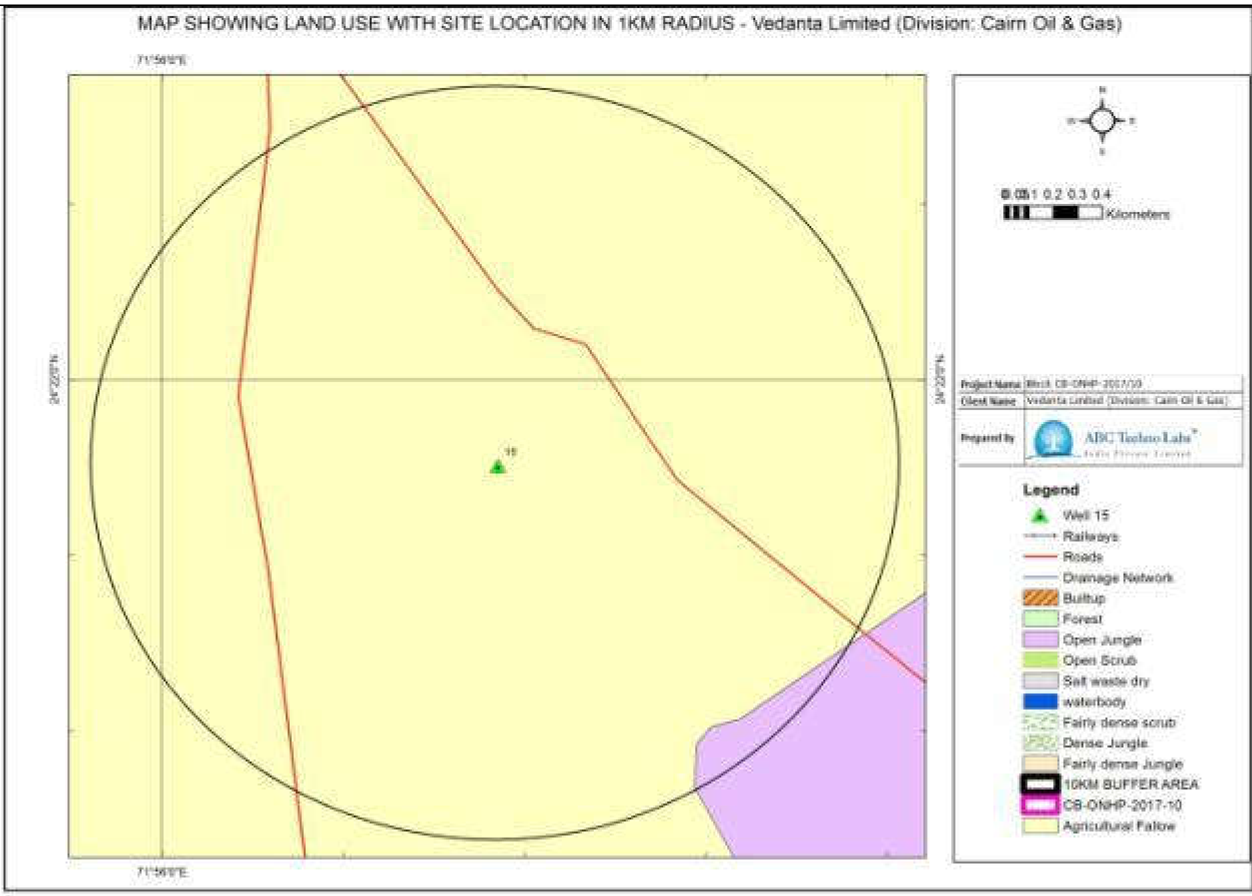
Kilometers
Legend
Well 13
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow



MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Kilometers
Legend
Well 14
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow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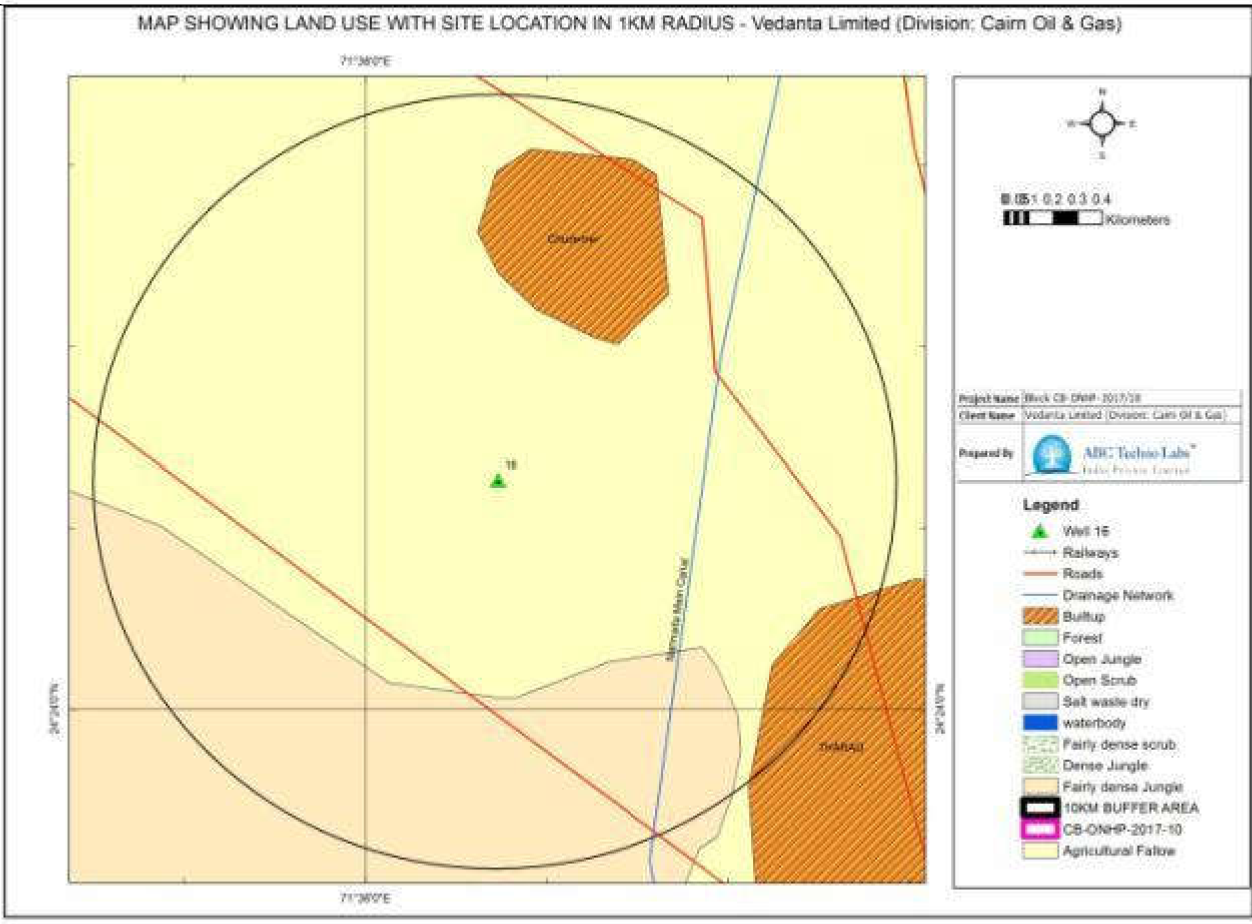
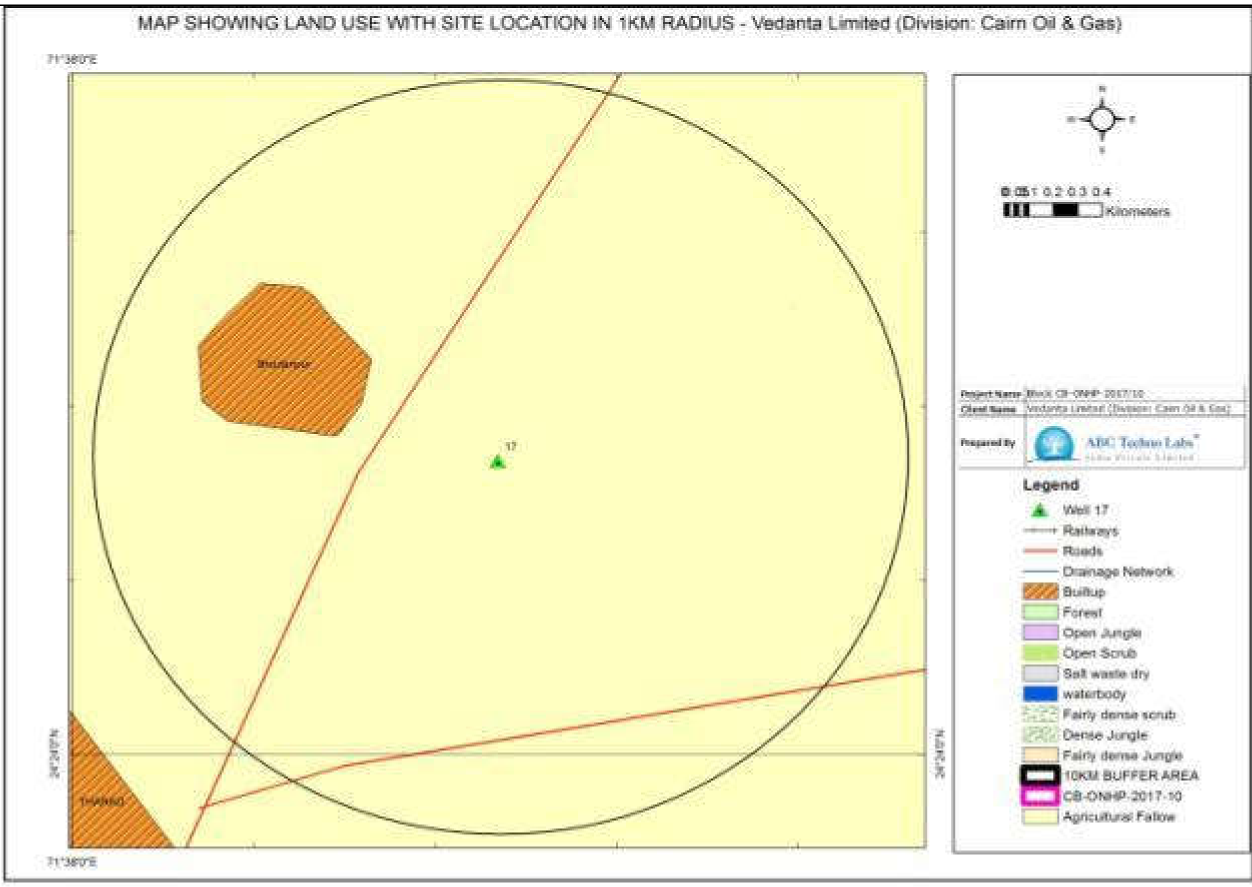
0 0.05 0.1 0.2 0.3 0.4
Kilometers
Project Name
Client Name
Prepared By
ABC Techno Labs
Legend
Well 15
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow


MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
0 0.05 0.1 0.2 0.3 0.4
Kilometers
Project Name
Client Name
Prepared By
ABC Techno Labs
Legend
Well 16
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow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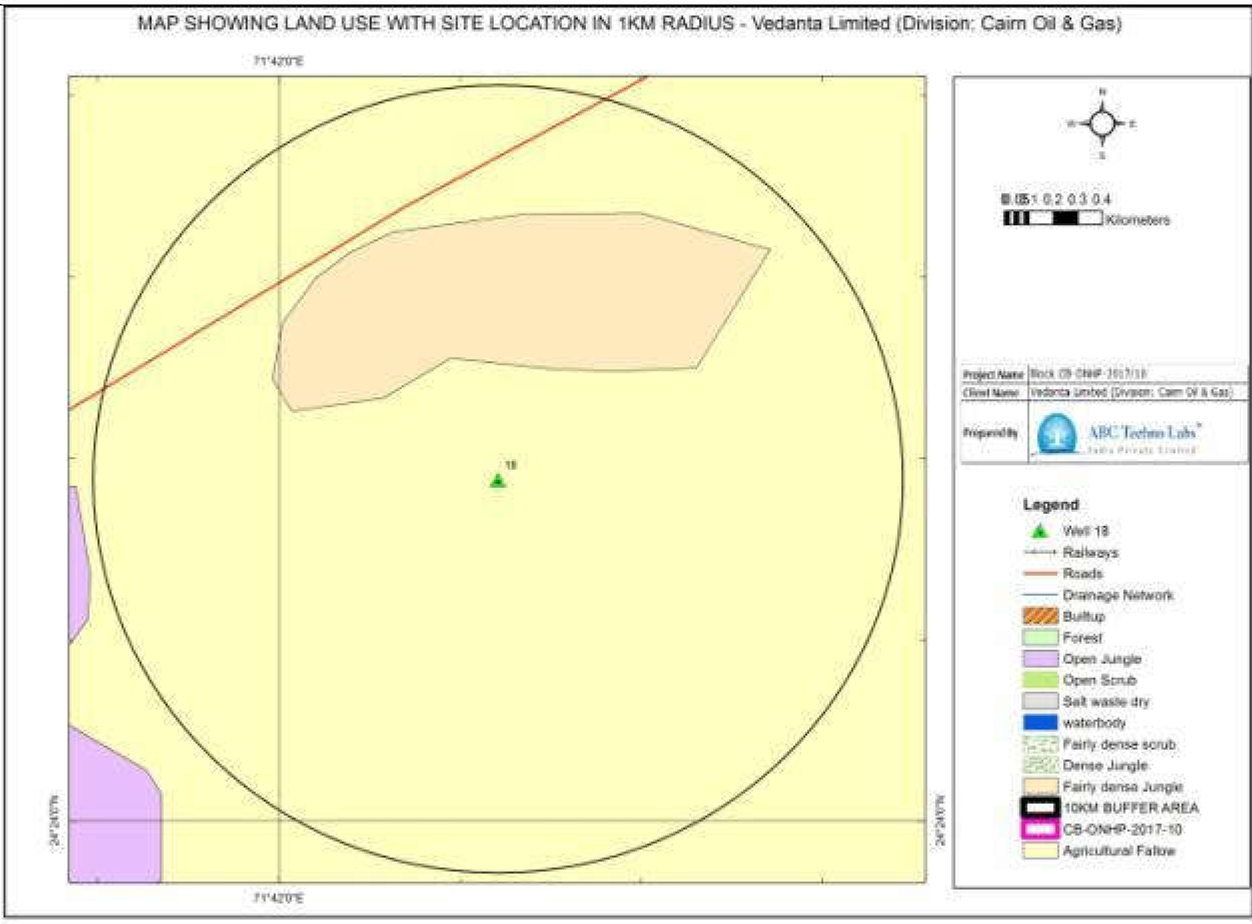
Kilometers
Legend
Well 17
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow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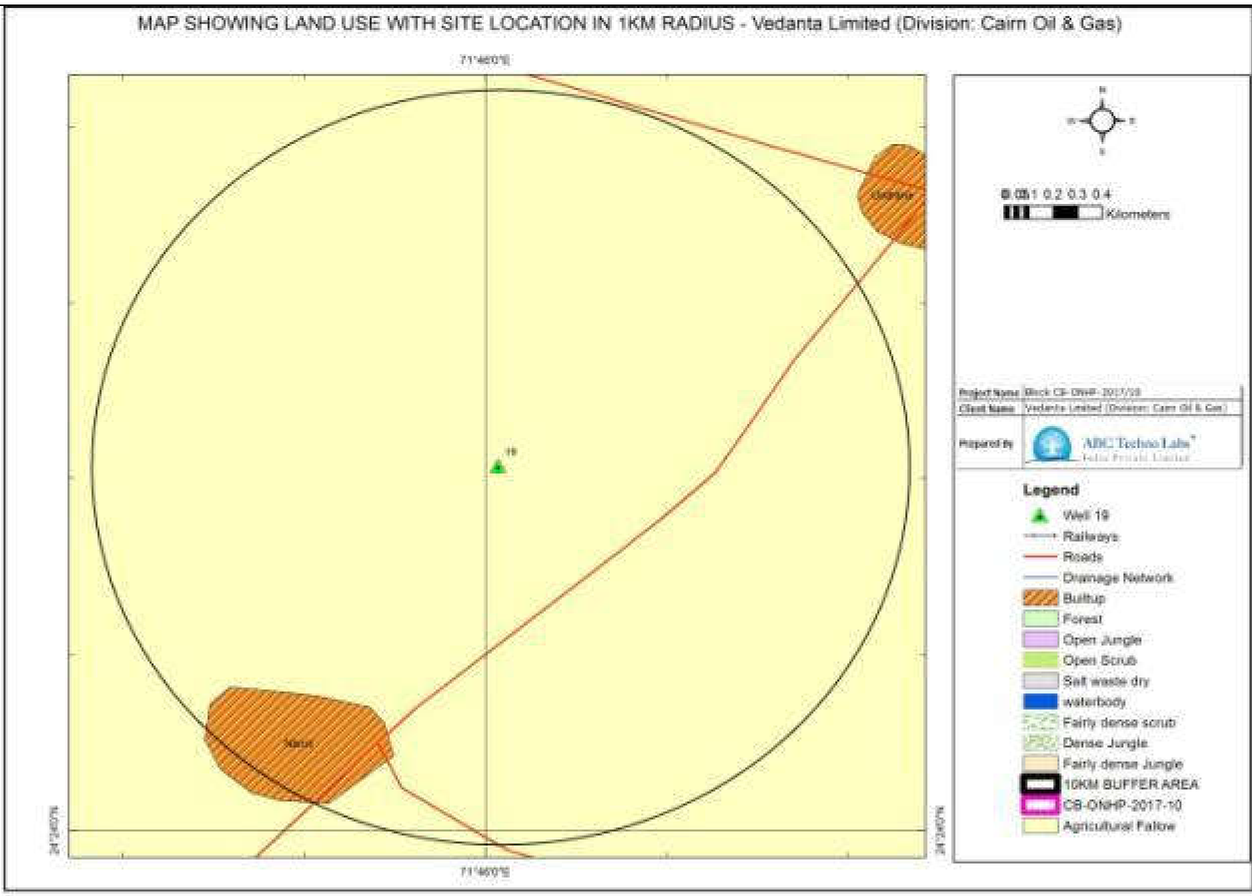
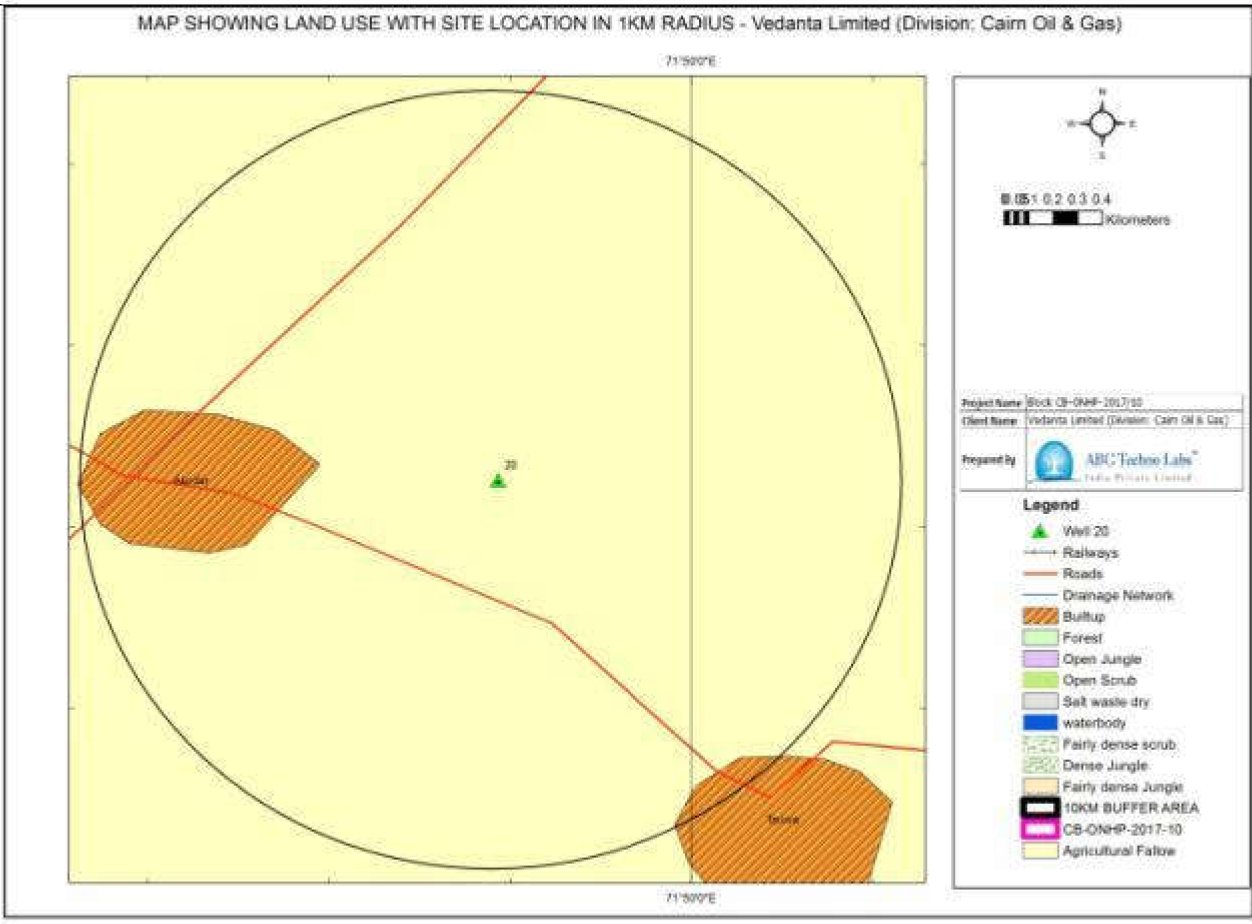
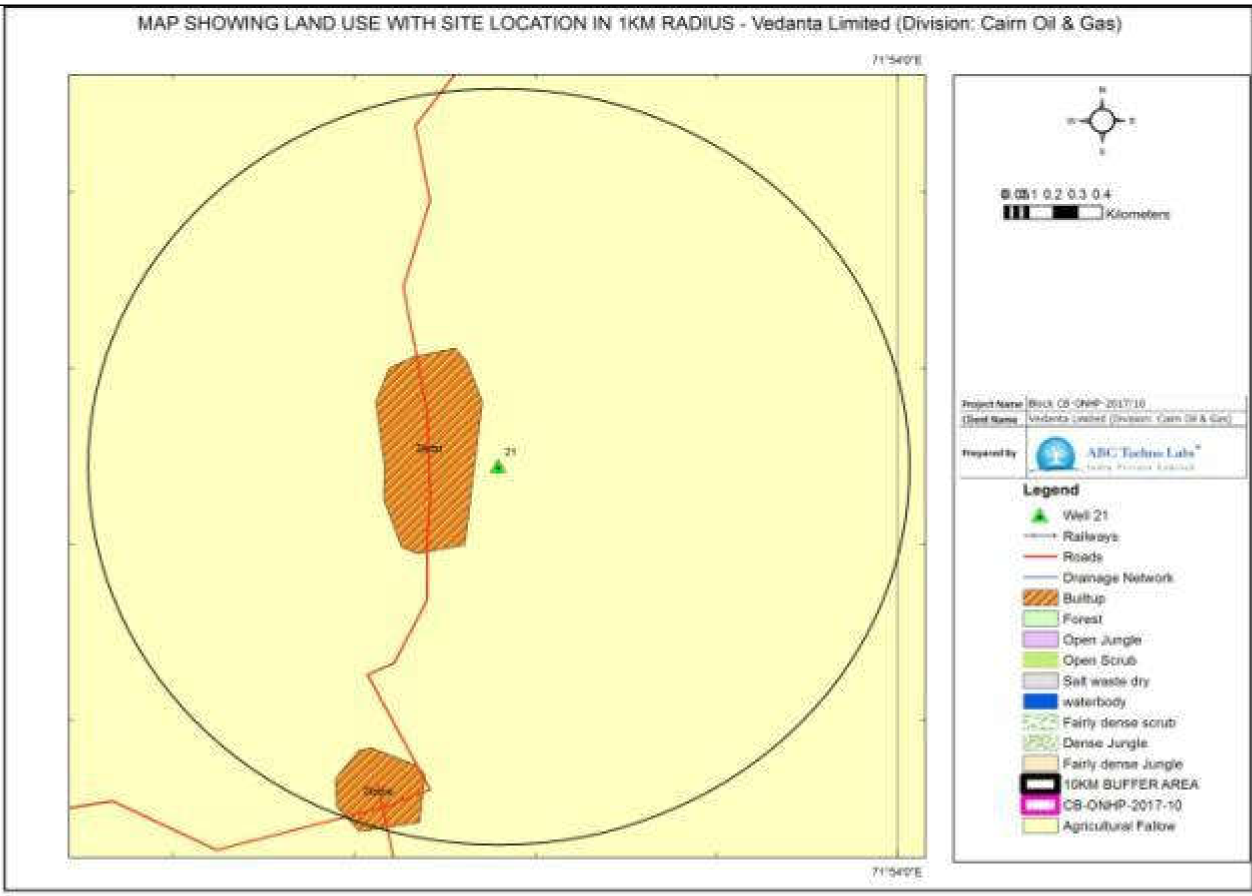
Kilometers
Legend
Well 18
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow



MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Kilometers
Legend
Well 19
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow



MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Kilometers
Legend
Well 20
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow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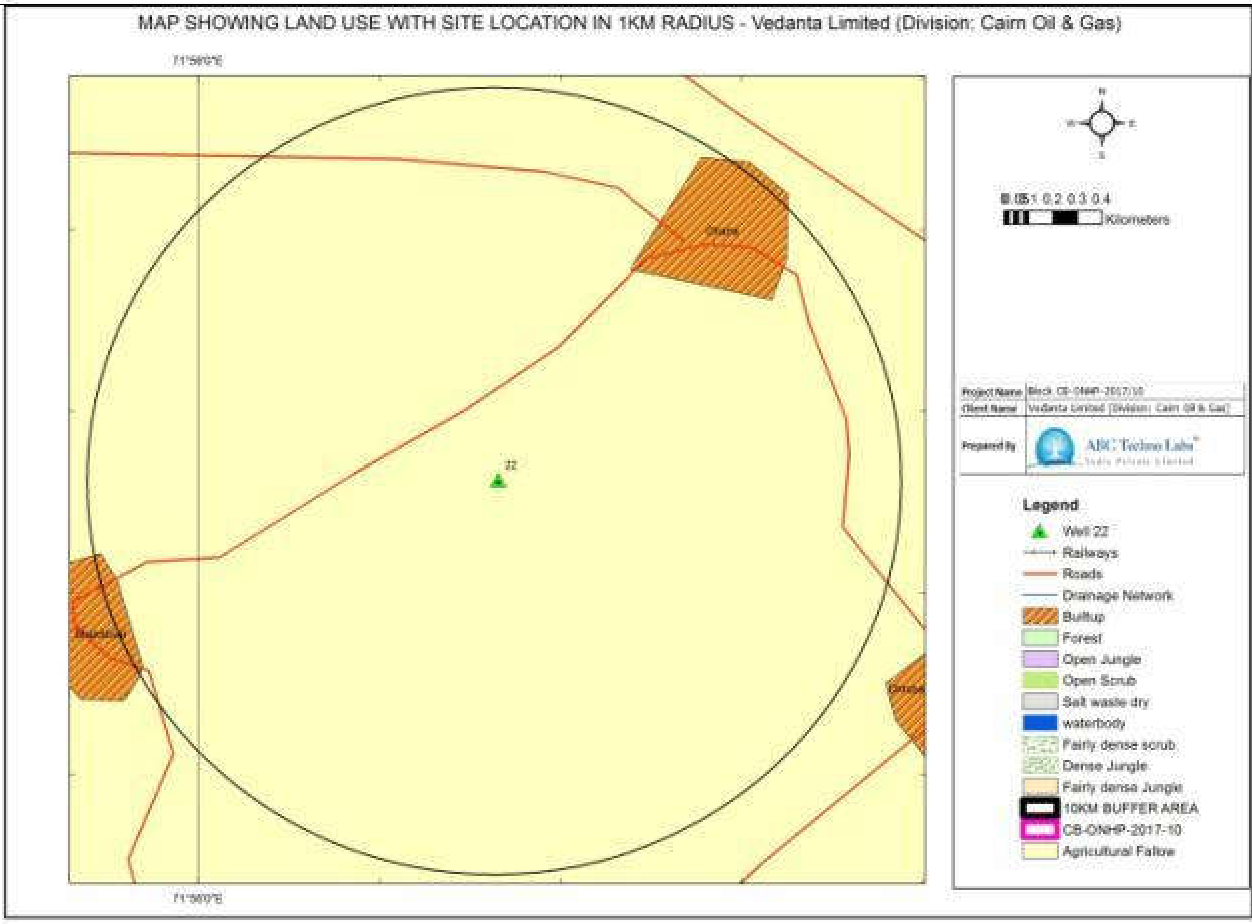
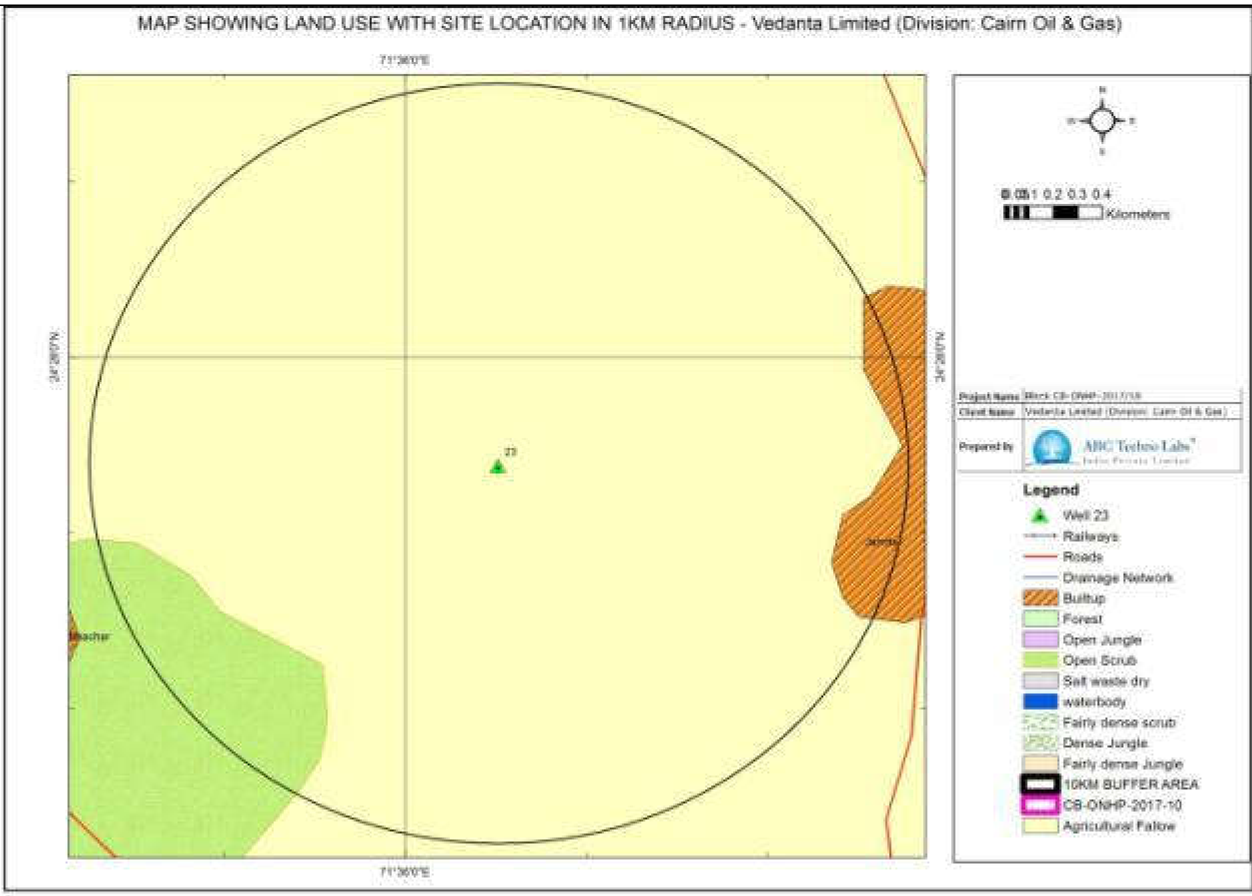
Kilometers
Legend
Well 21
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow


MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Kilometers
Legend
Well 22
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow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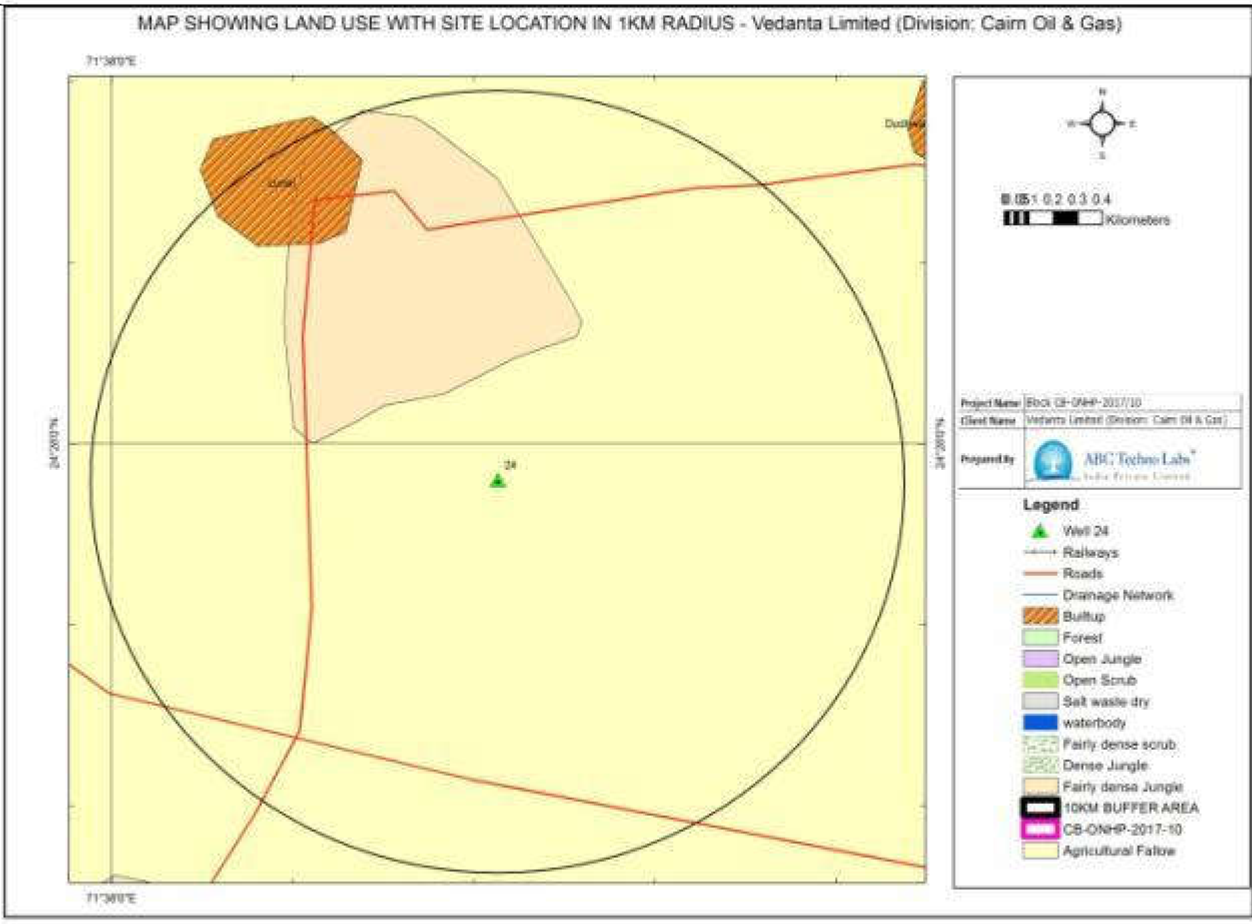
71°36'0"E
24°28'0"N
23
0 0.05 0.1 0.2 0.3 0.4
Kilometers
Legend
Well 23
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow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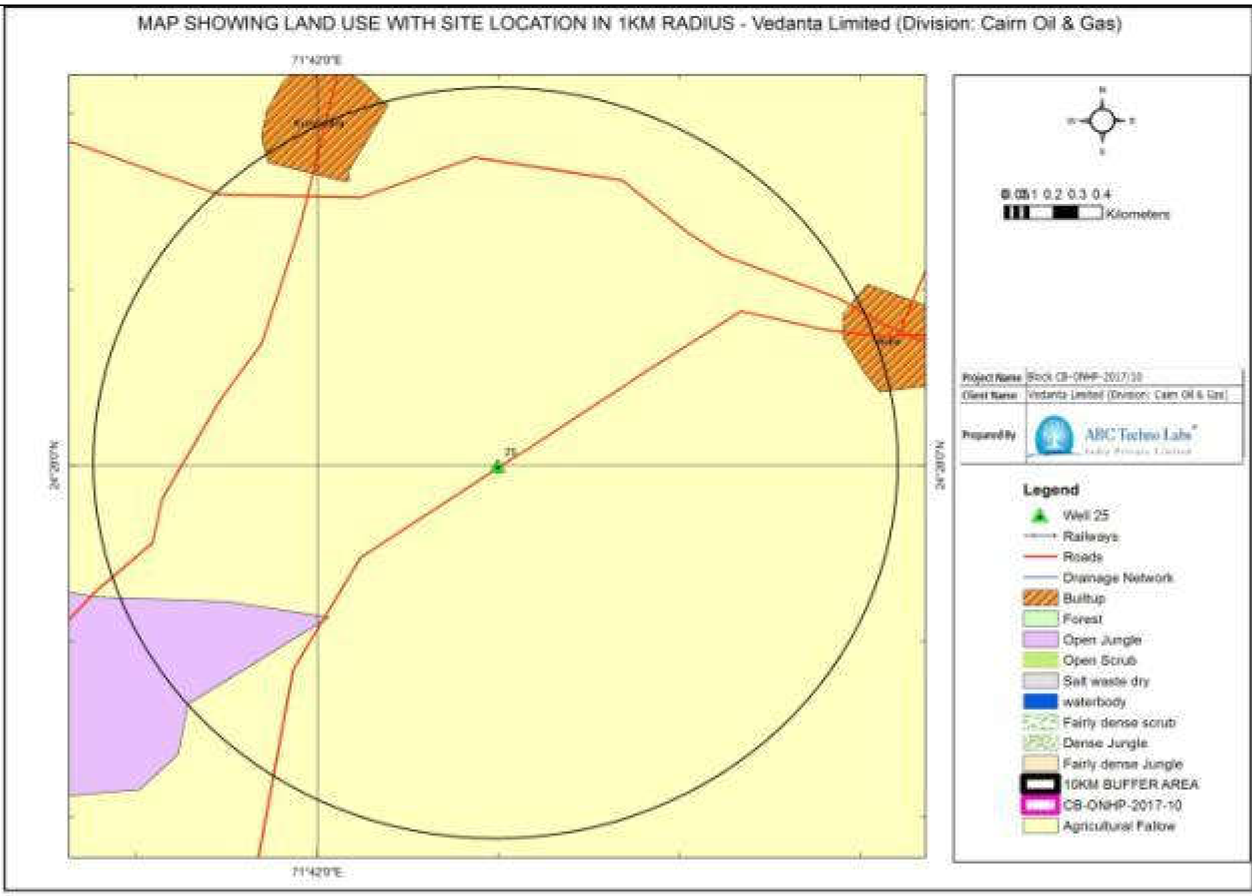
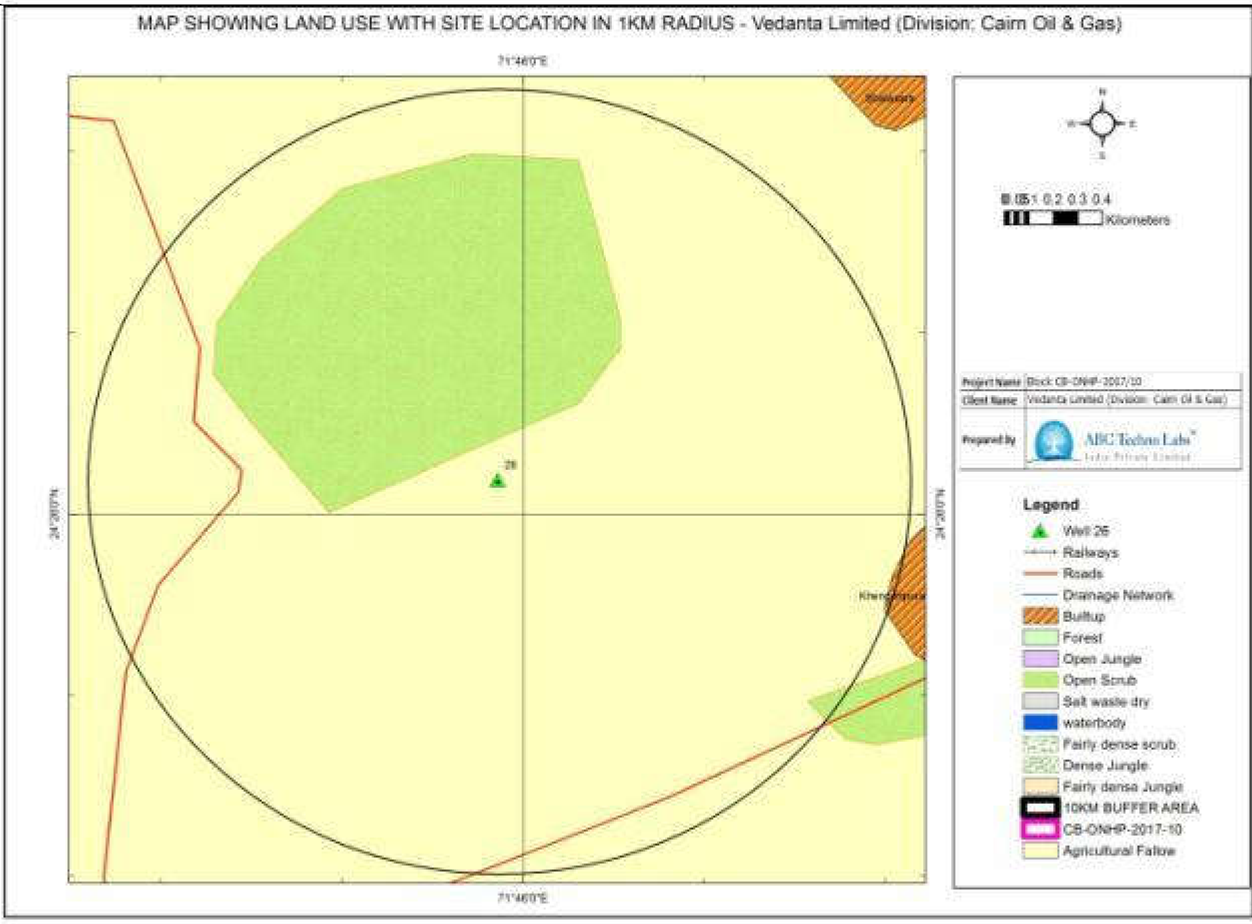
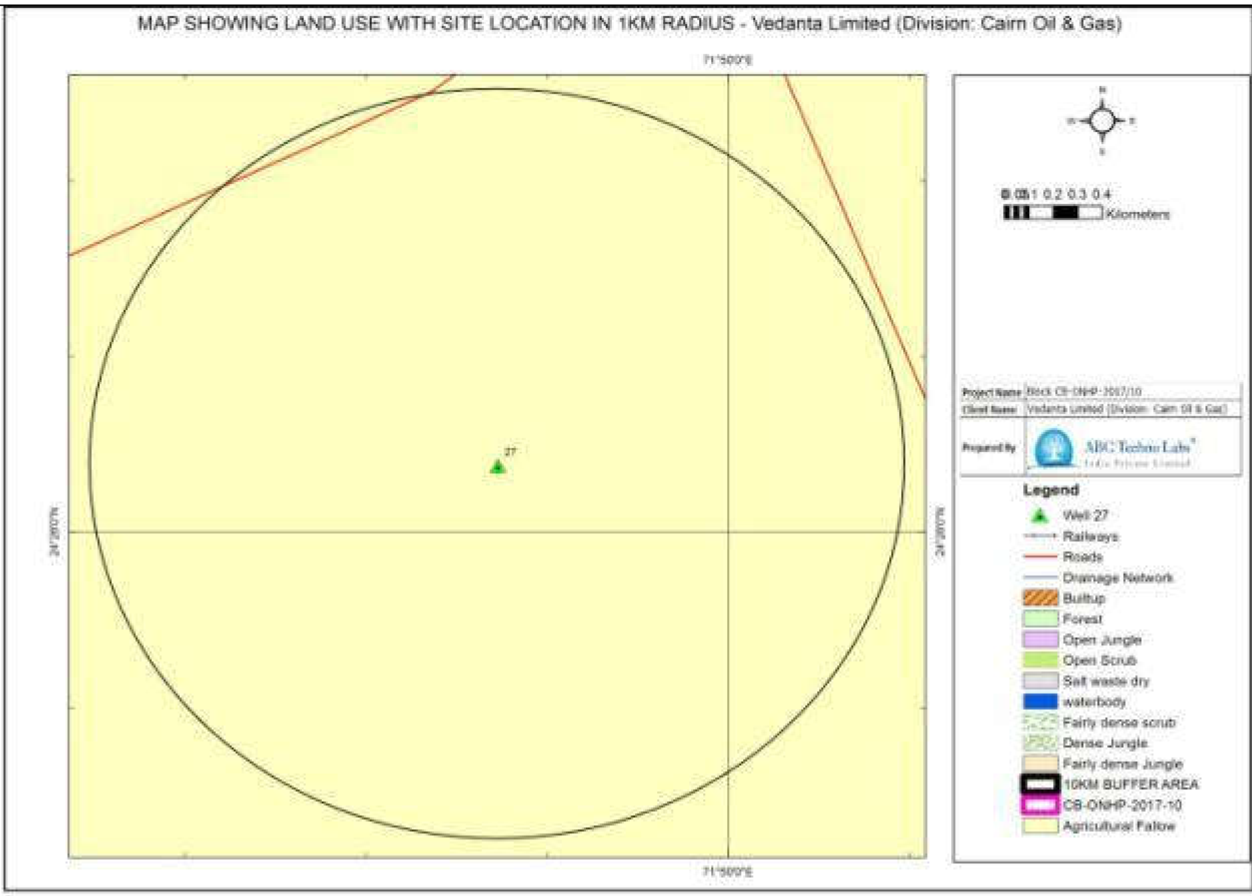
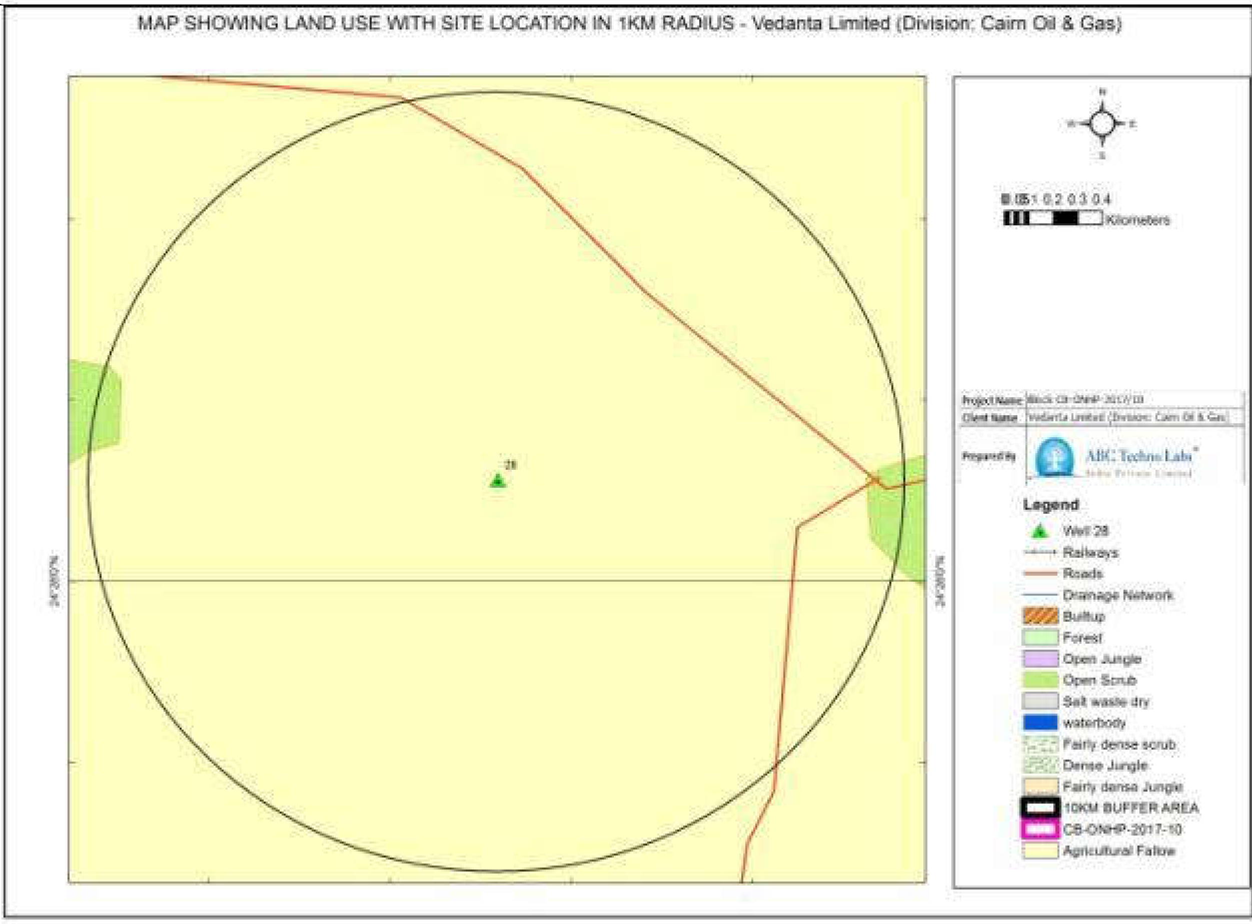
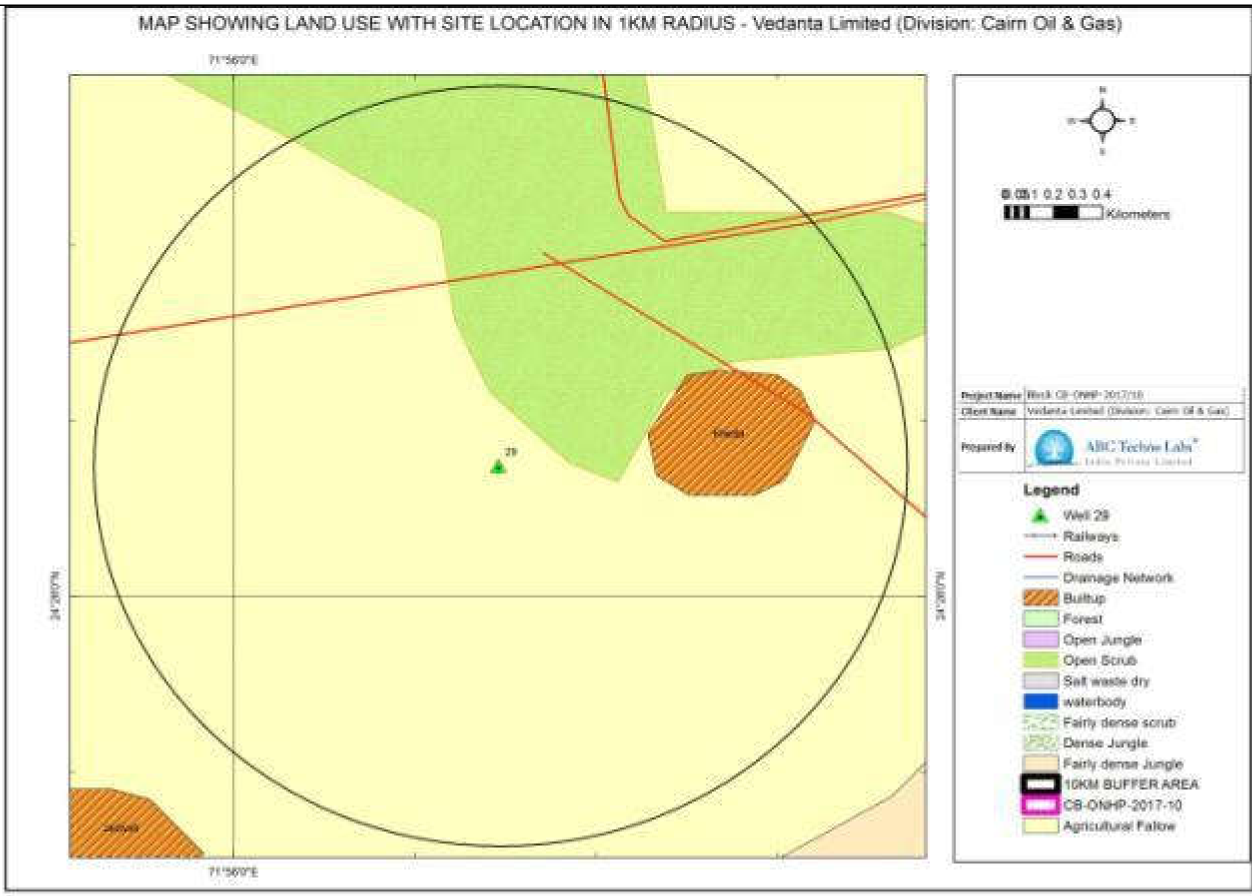
71°38'0"E
24°28'0"N
24
0 0.05 0.1 0.2 0.3 0.4
Kilometers
Legend
Well 24
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

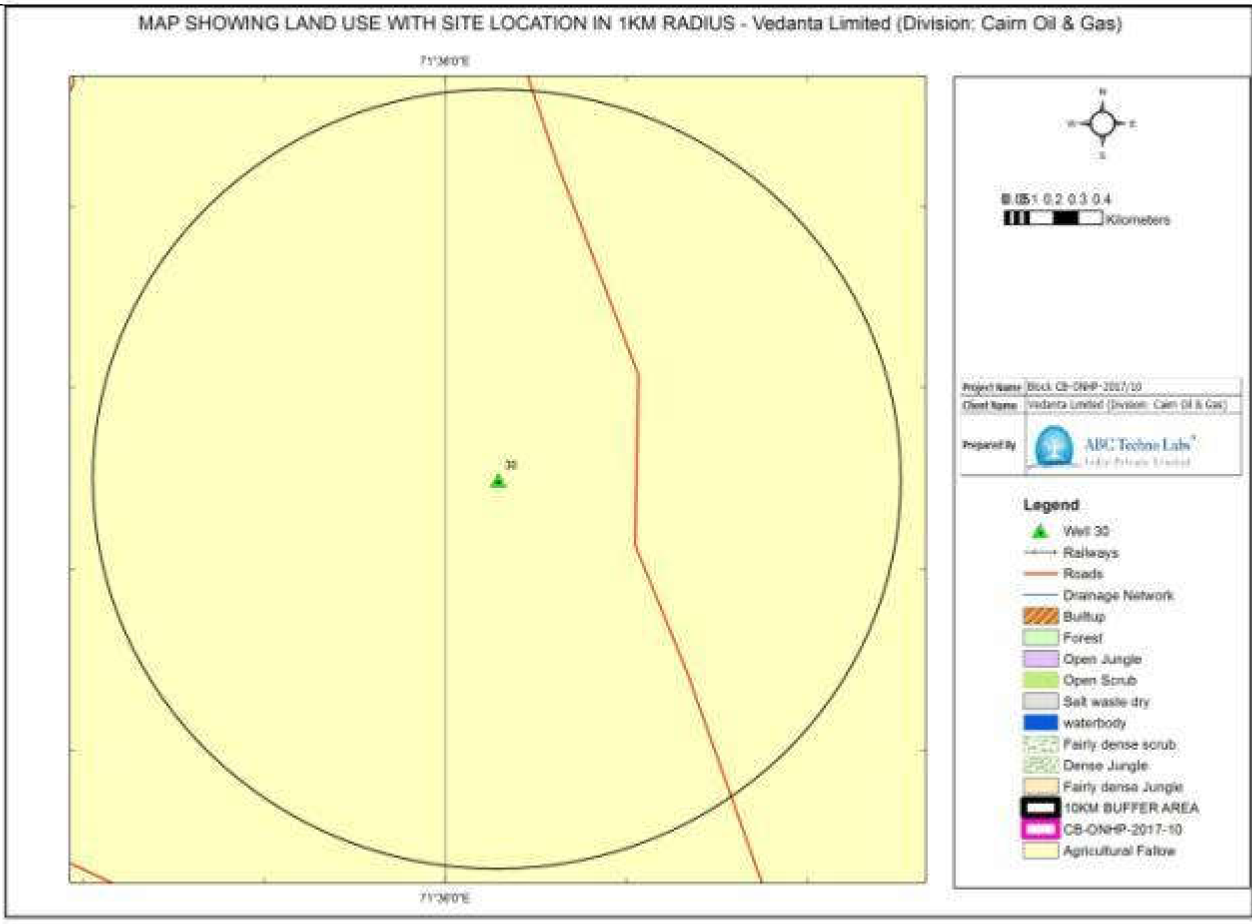

MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Kilometers
Legend
Well 25
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

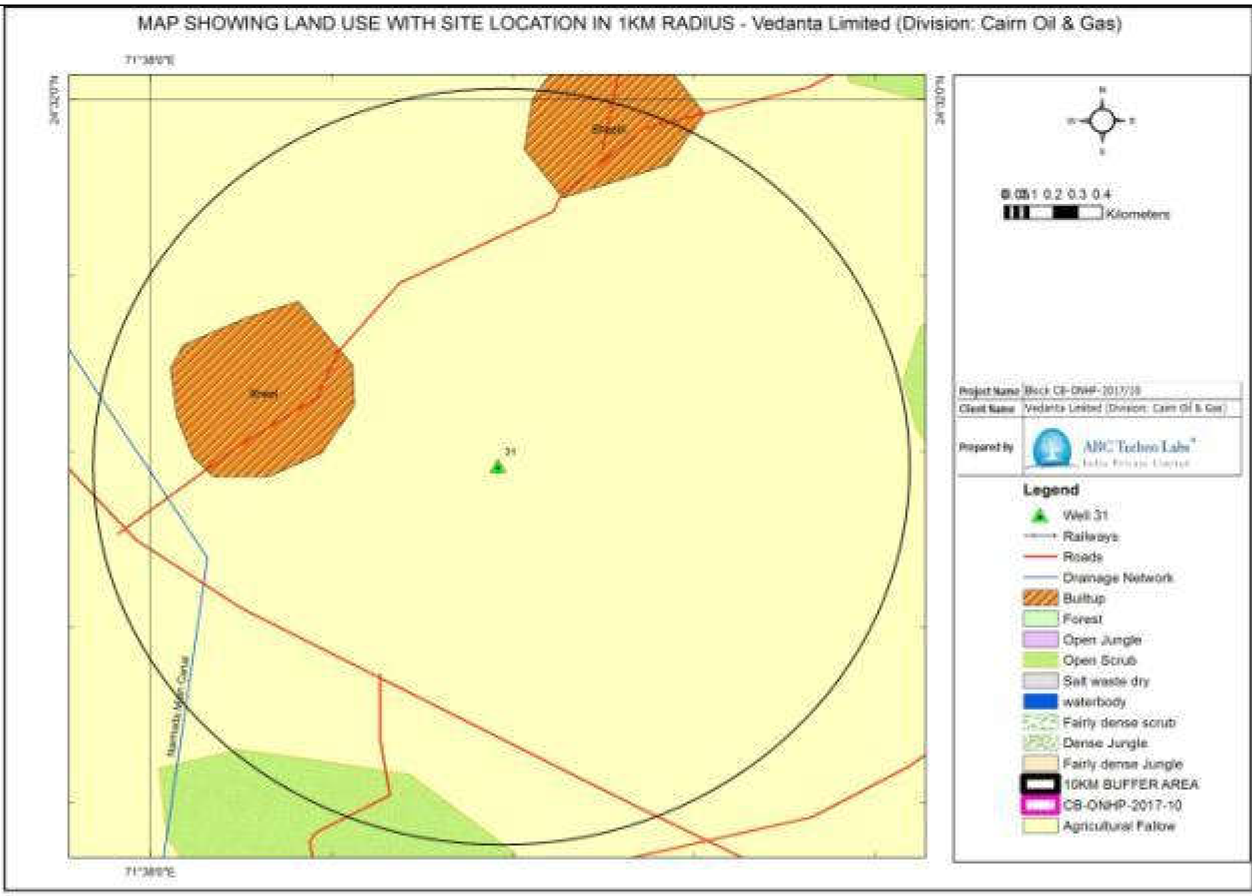

MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Kilometers
Legend
Well 26
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow


MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
71°50'0"E
27
Kilometers
Legend
Well 27
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

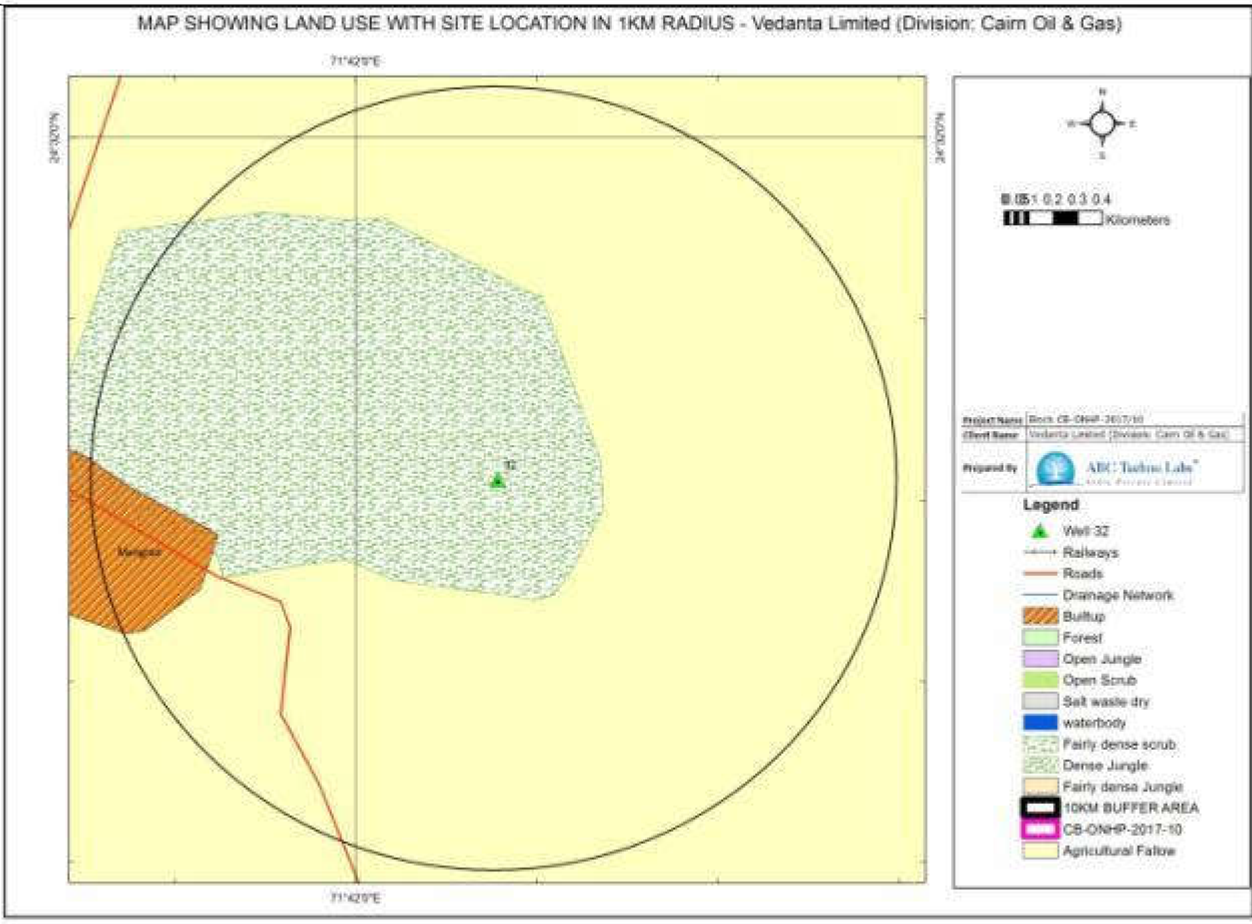

MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
28
Kilometers
Legend
Well 28
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow


MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
71°56'0"E
24°28'0"N
29
Kilometers
Legend
Well 29
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

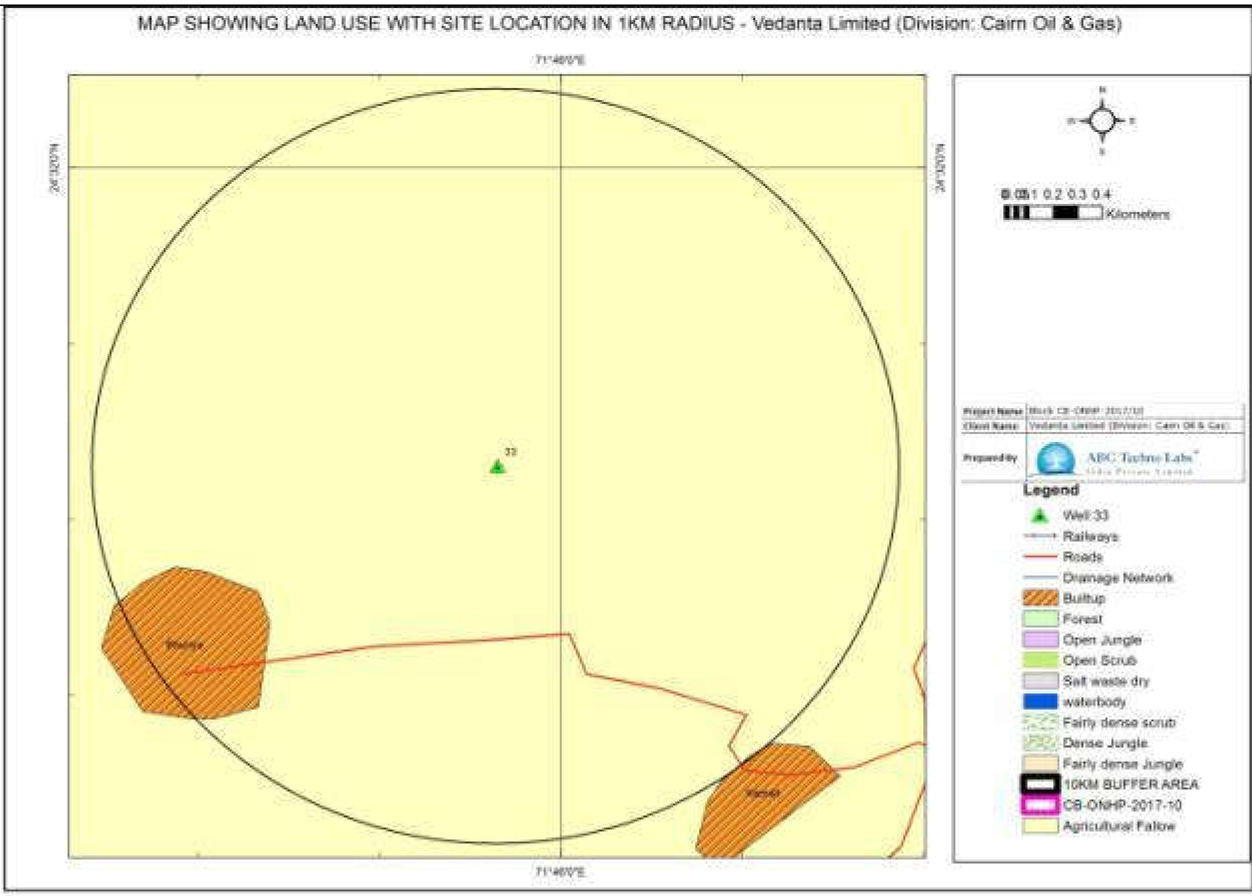

MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
71°36'0"E
30
Kilometers
Legend
Well 30
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

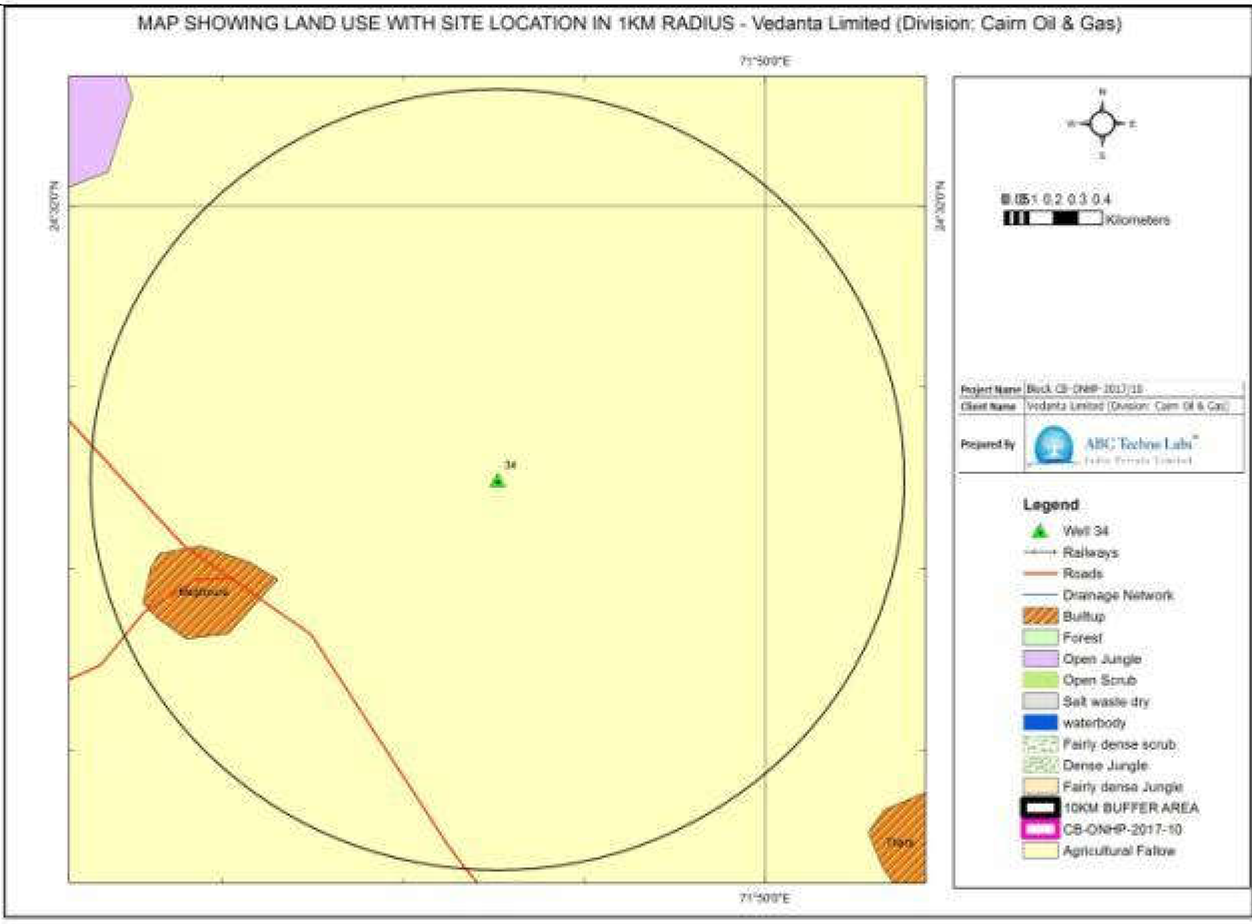


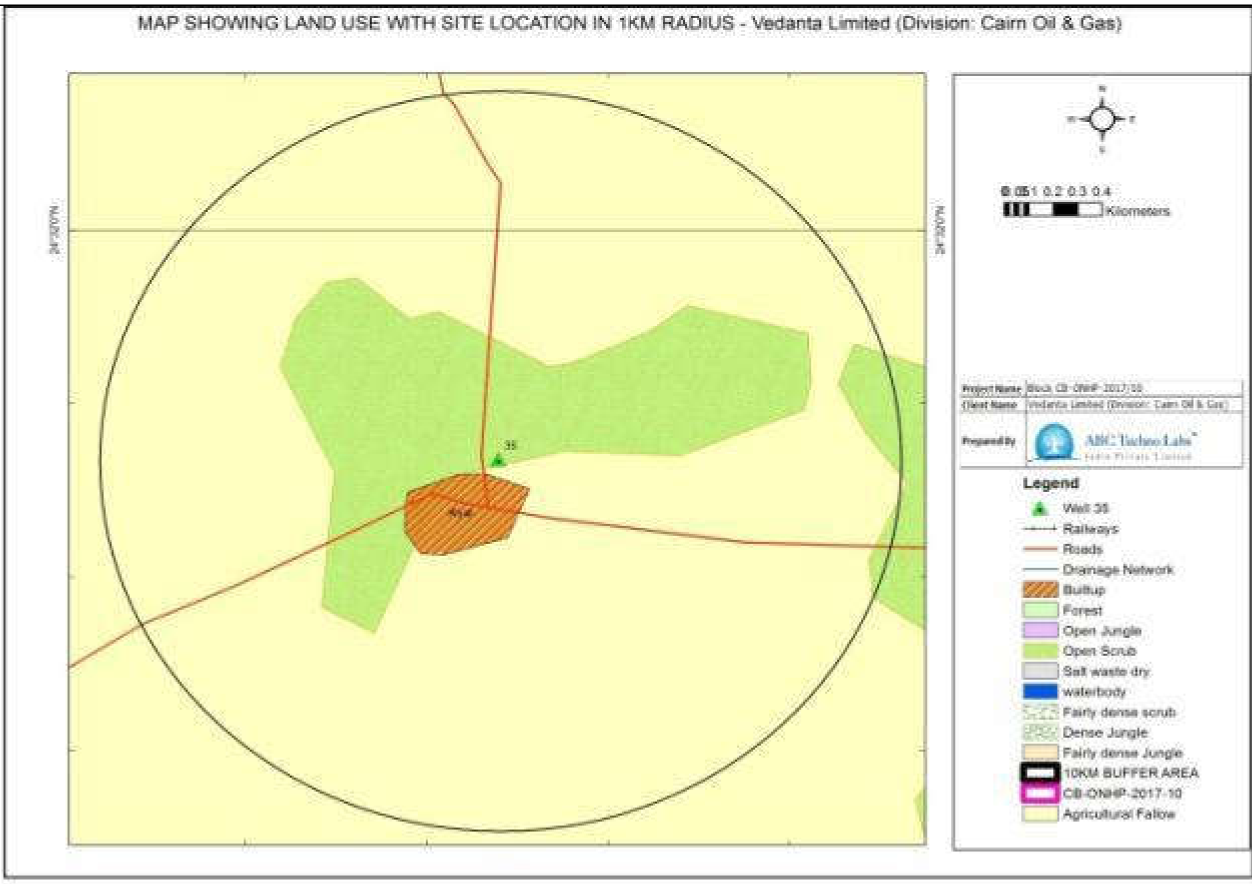
MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Kilometers
Legend
Well 31
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

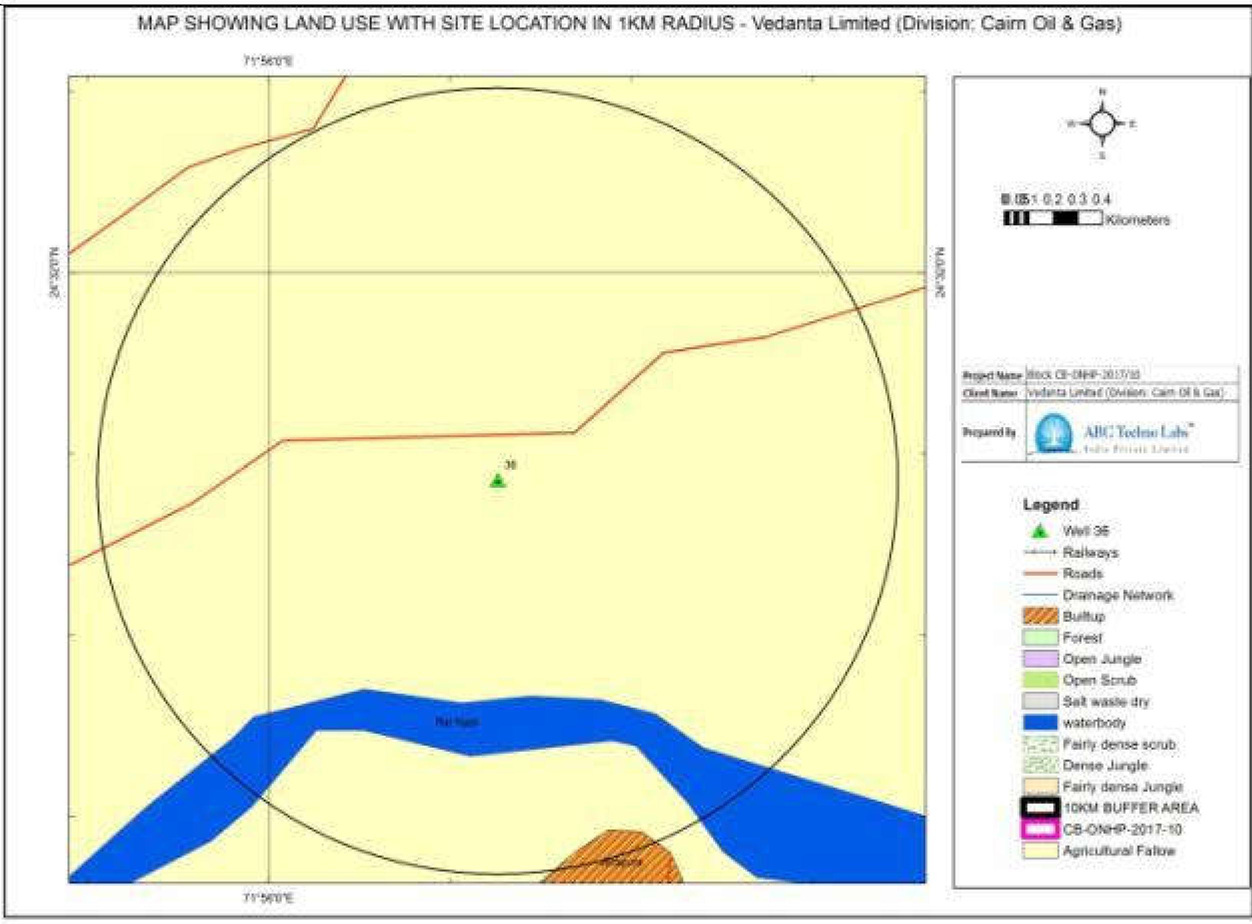


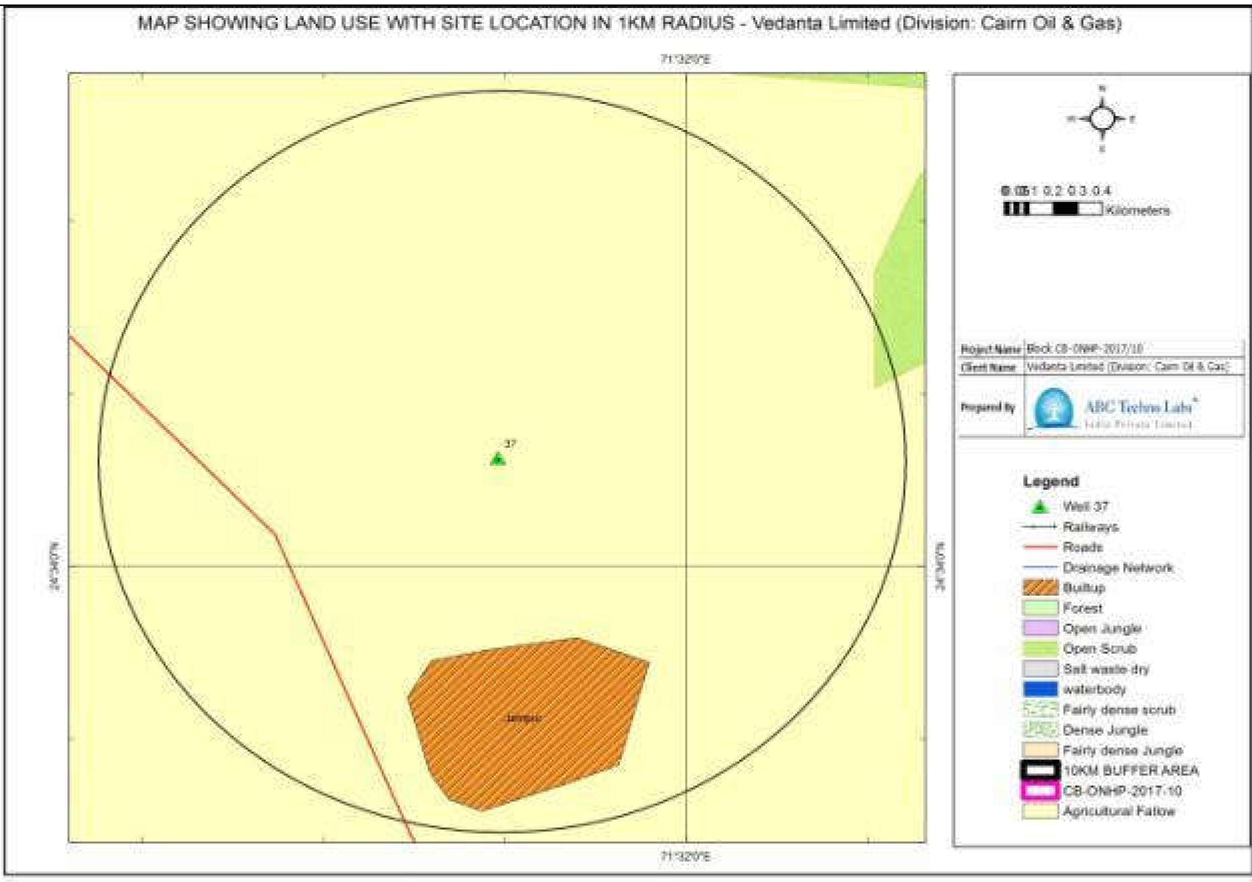
MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Kilometers
Legend
Well 32
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

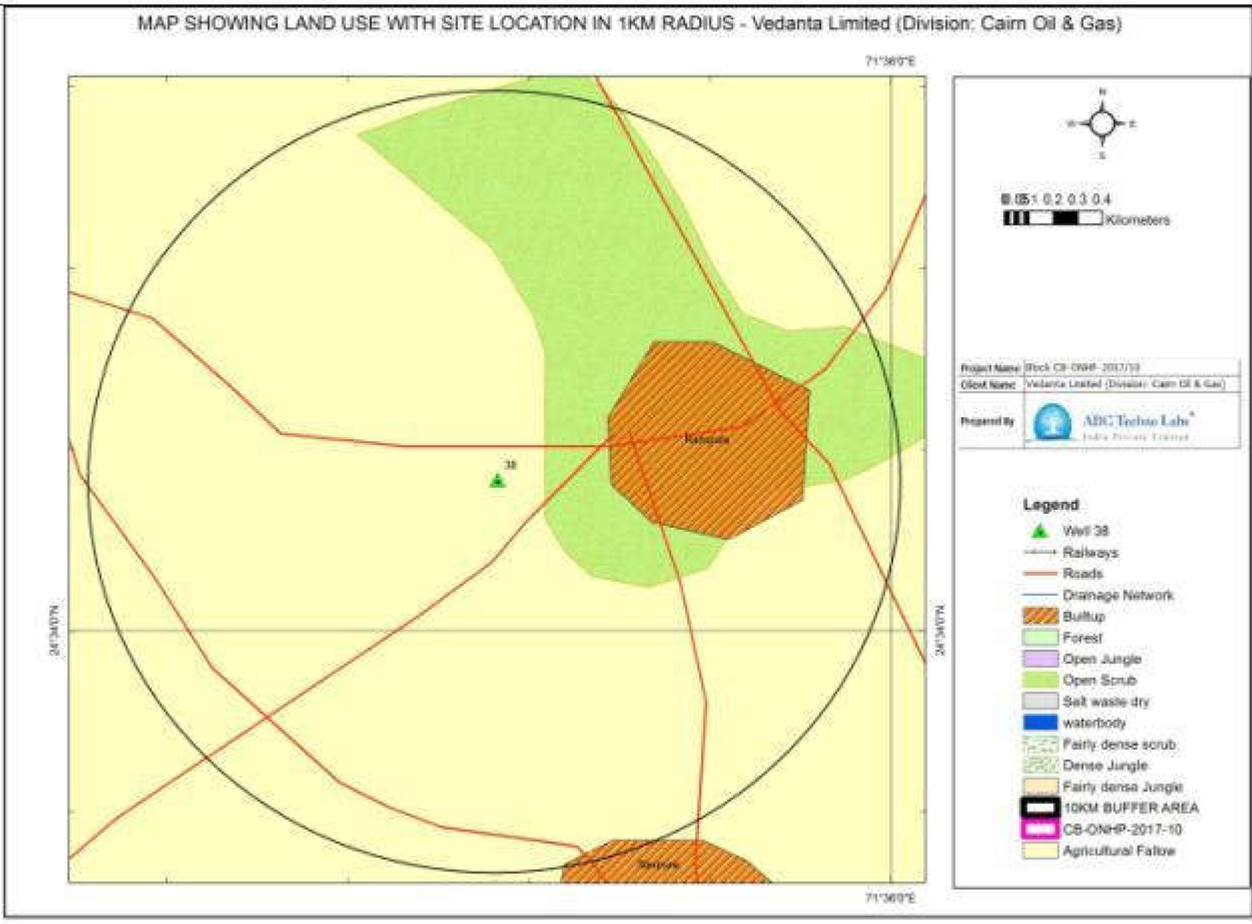

MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Kilometers
Legend
Well 33
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

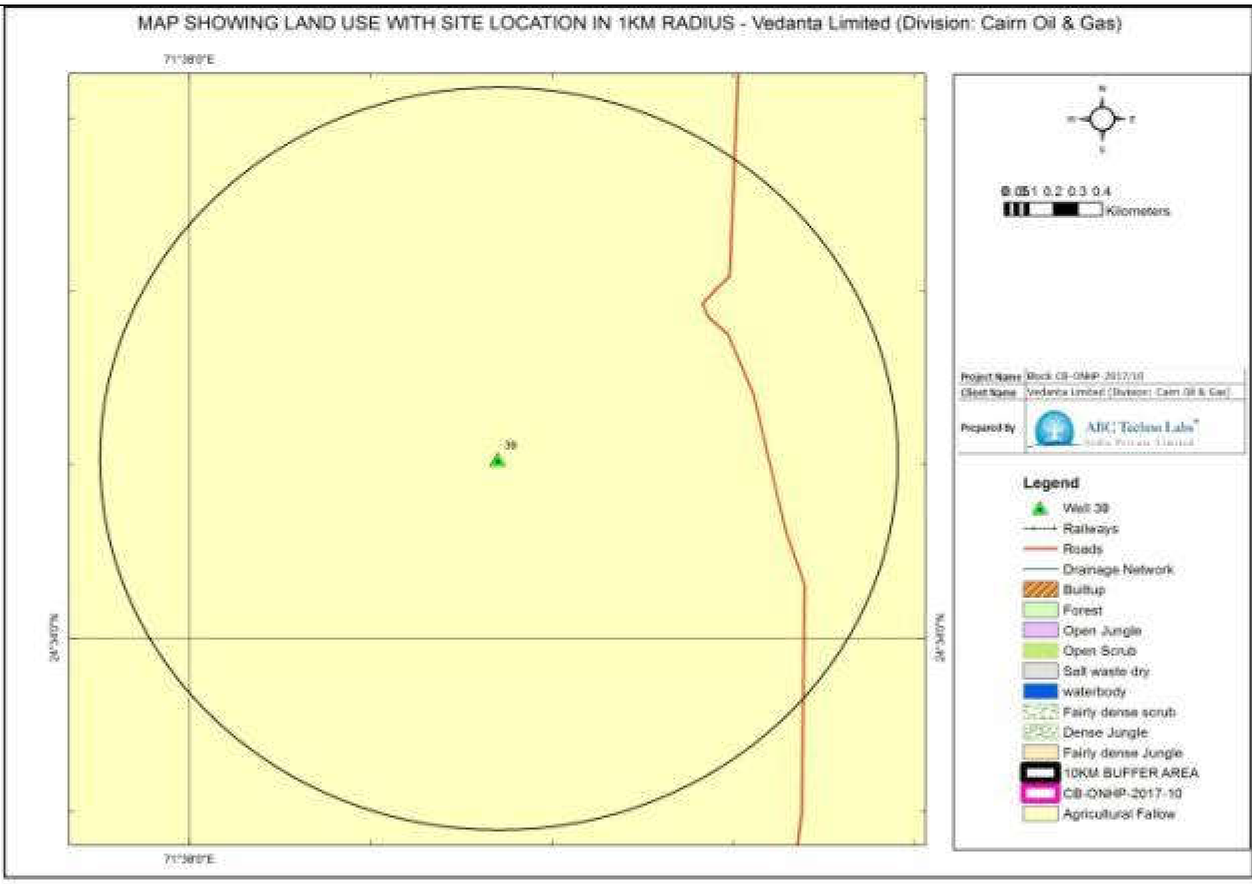

MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Kilometers
Legend
Well 34
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

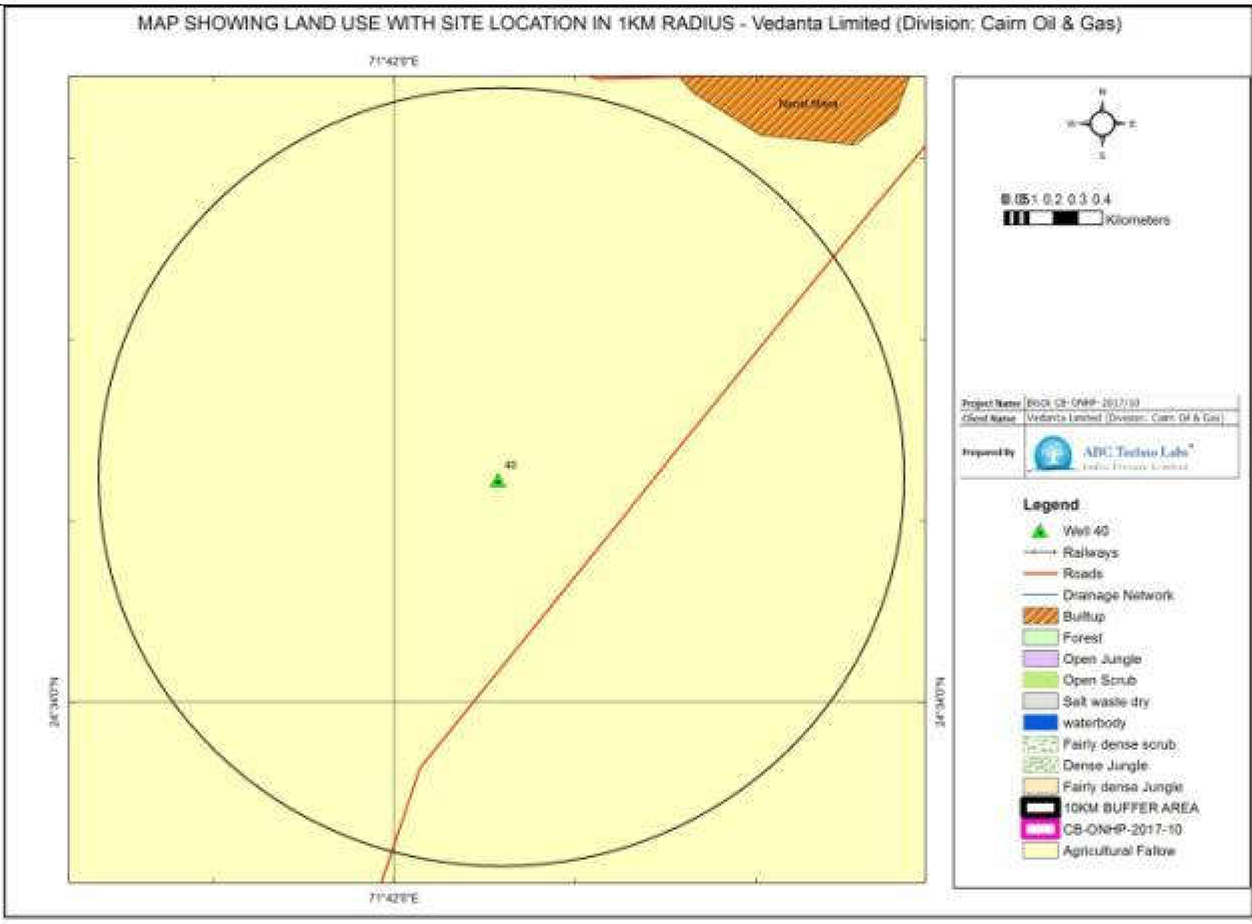

MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
0 0.05 0.1 0.2 0.3 0.4
Kilometers
Legend
Well 35
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

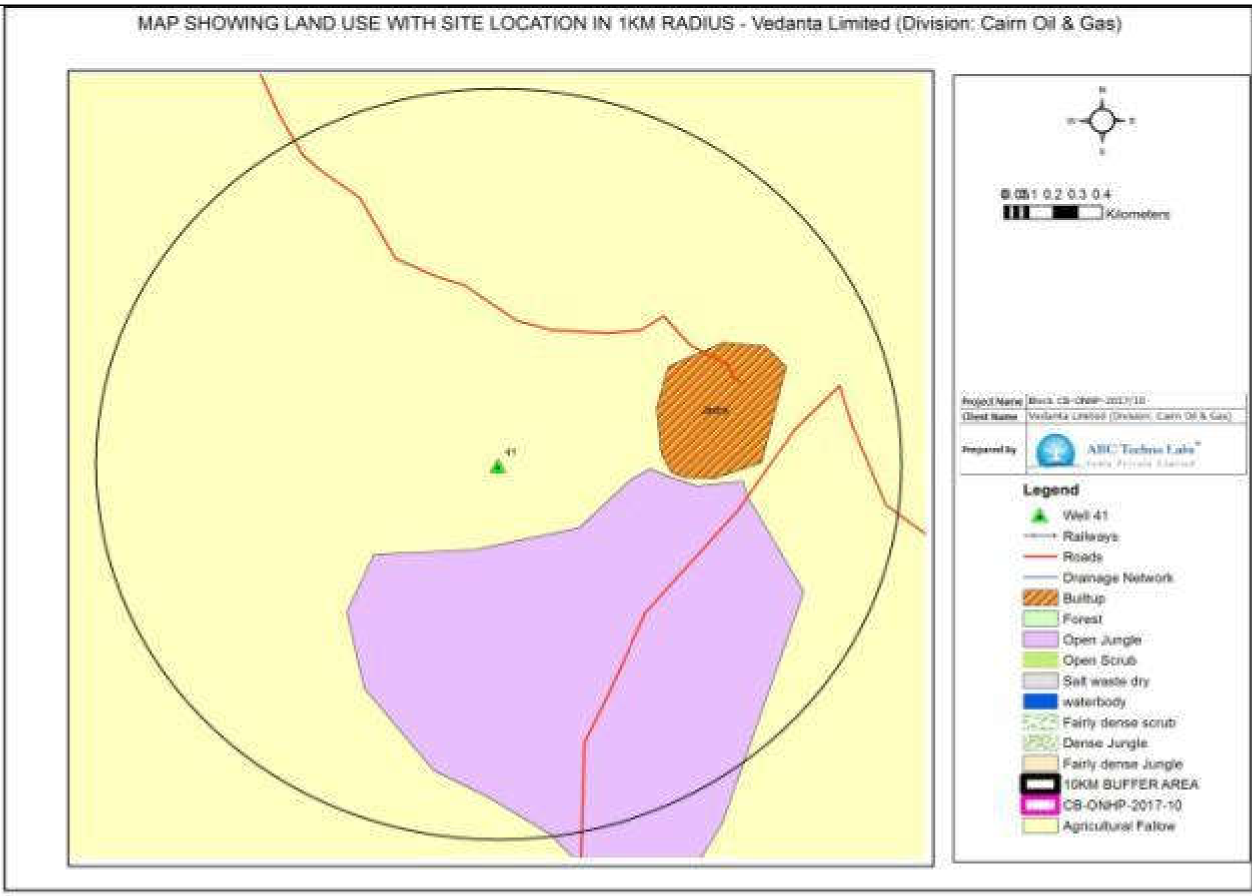

MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
71°56'0"E
0 0.05 0.1 0.2 0.3 0.4
Kilometers
Legend
Well 36
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

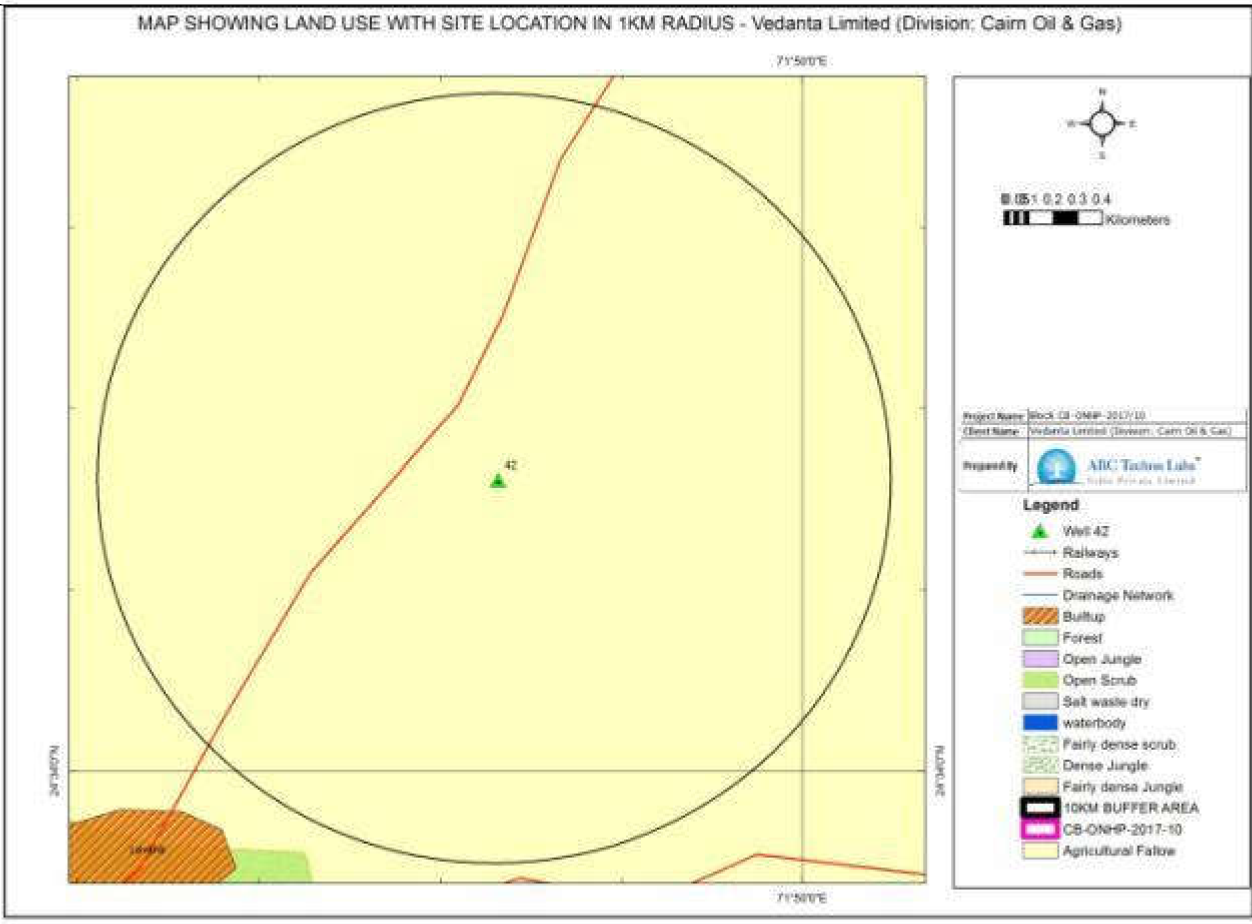

MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Kilometers
Legend
Well 37
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

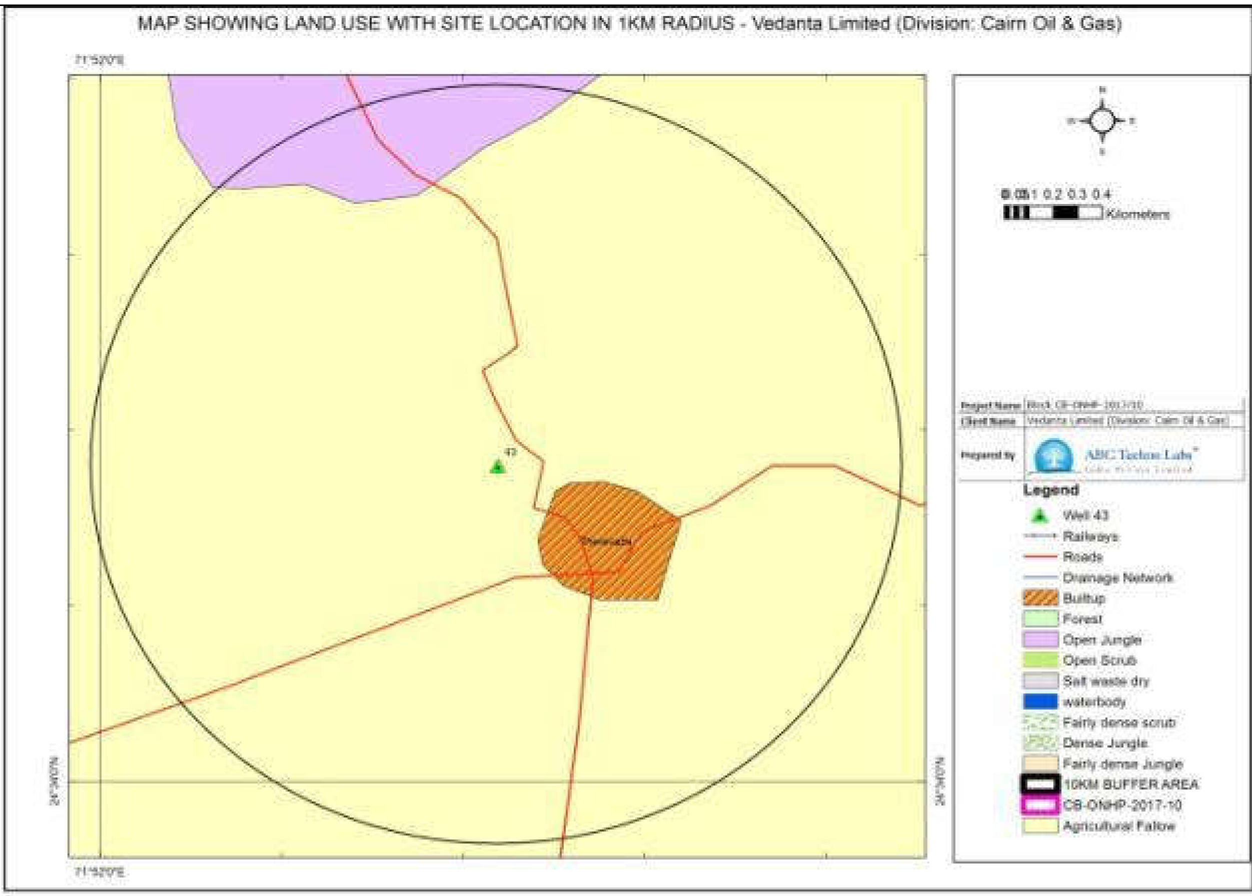

MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Kilometers
Legend
Well 38
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

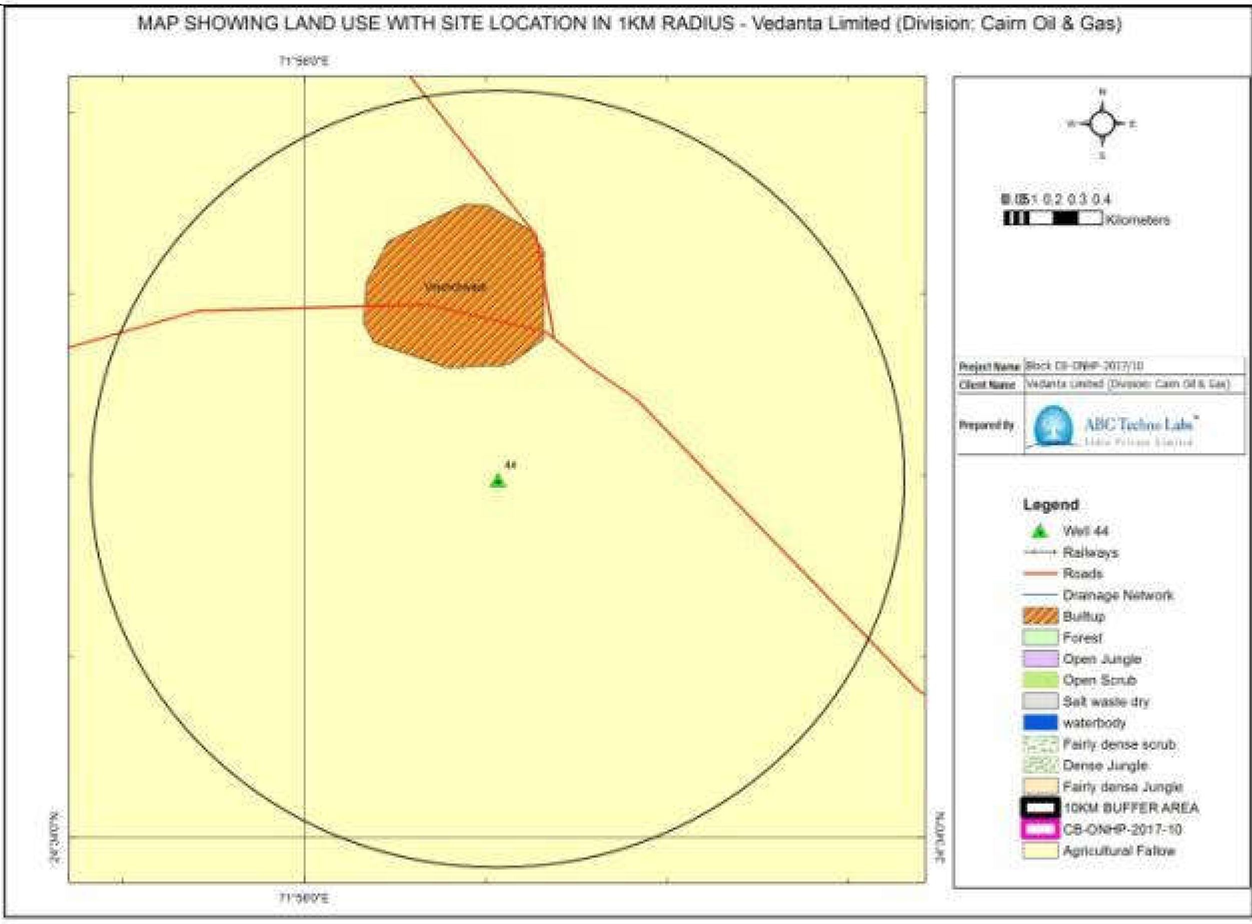

MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
39
Kilometers
Legend
Well 39
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow


MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
40
Kilometers
Legend
Well 40
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

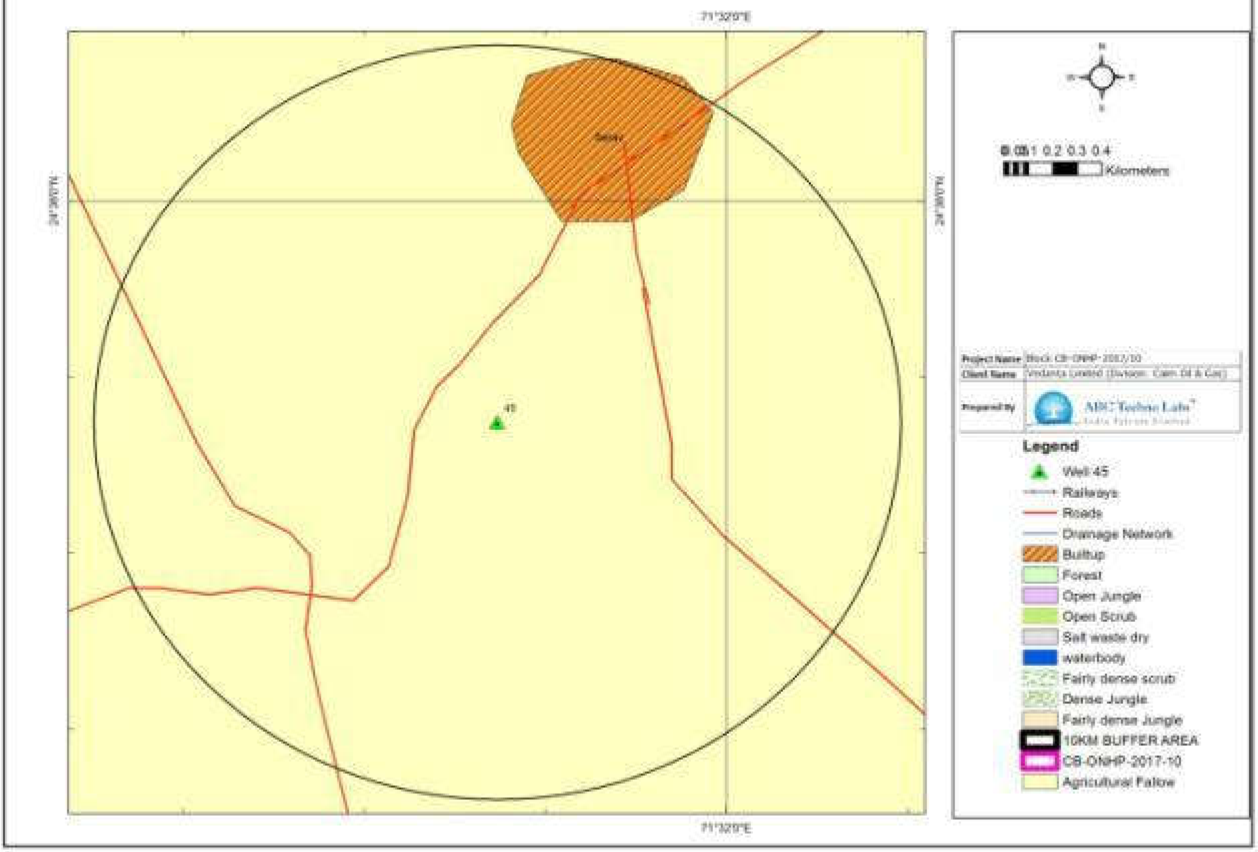

MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
41
Kilometers
Legend
Well 41
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow


MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
71°50'0"E
42
Kilometers
Legend
Well 42
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

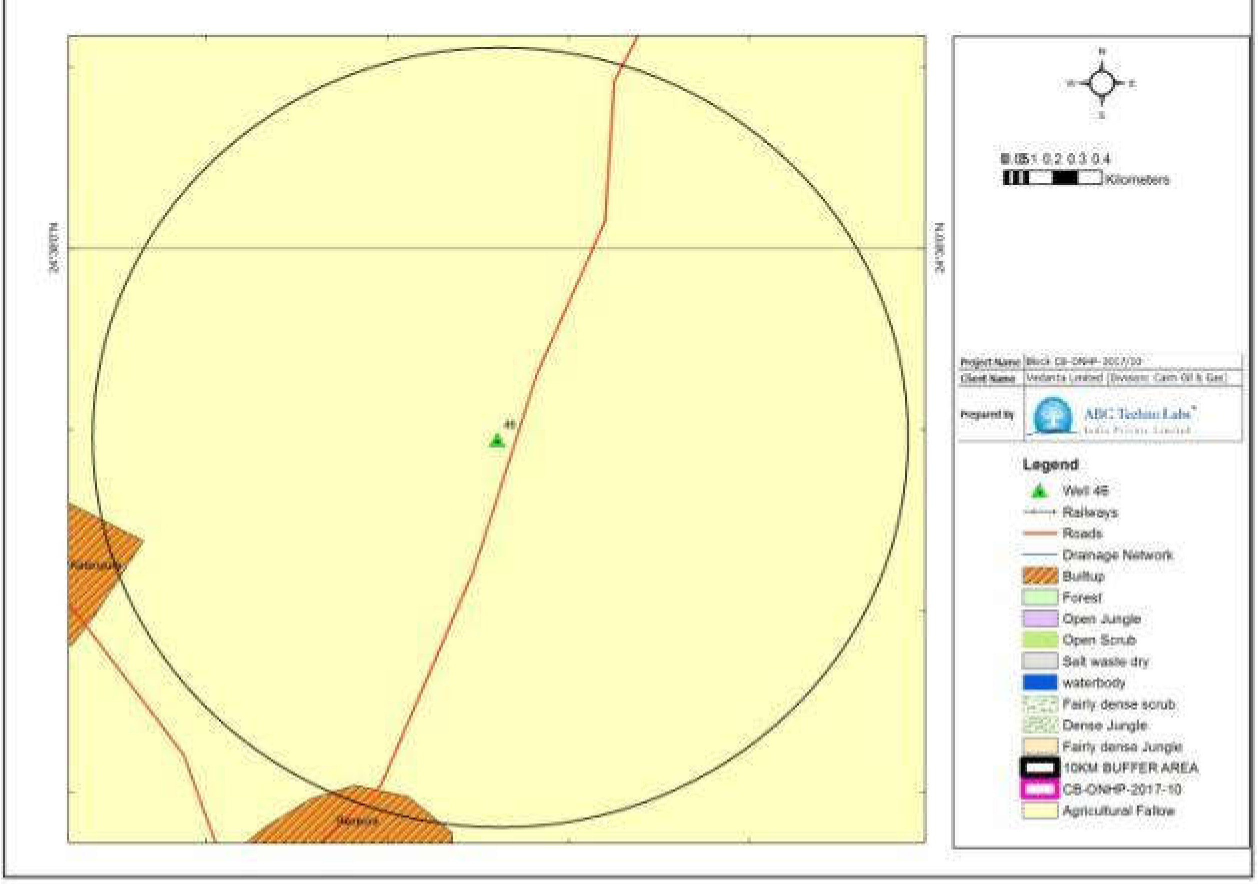

MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
43
Kilometers
Legend
Well 43
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

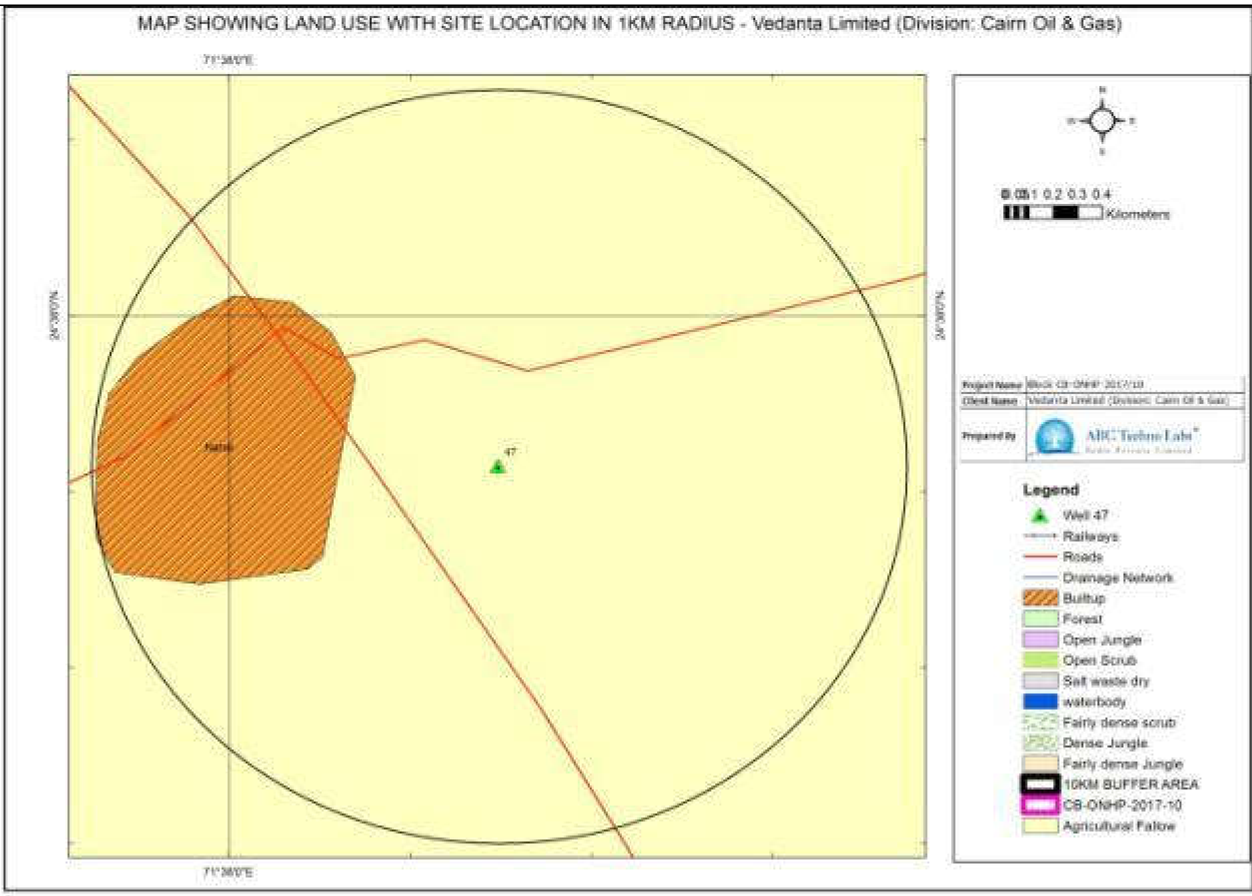

MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
44
Kilometers
Legend
Well 44
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

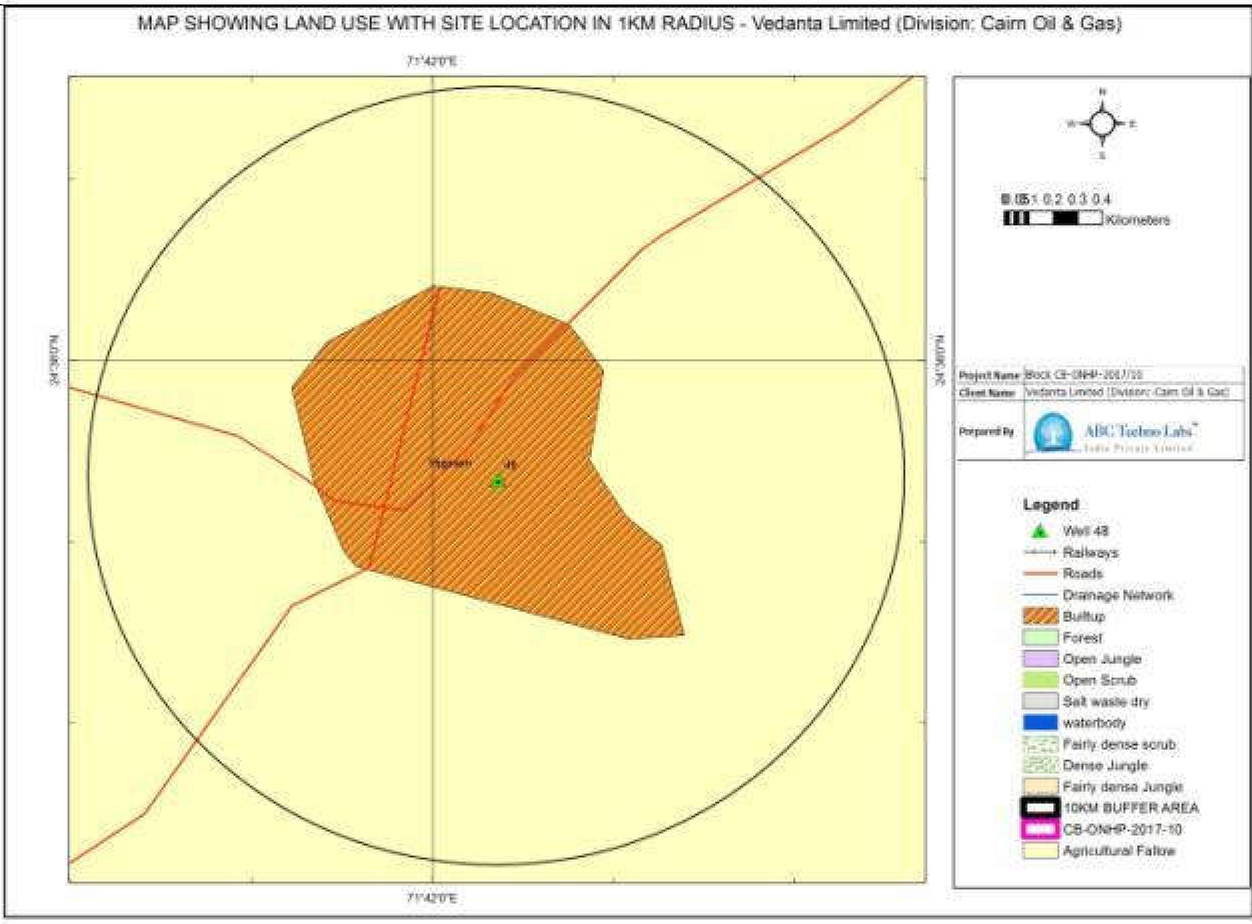
MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)

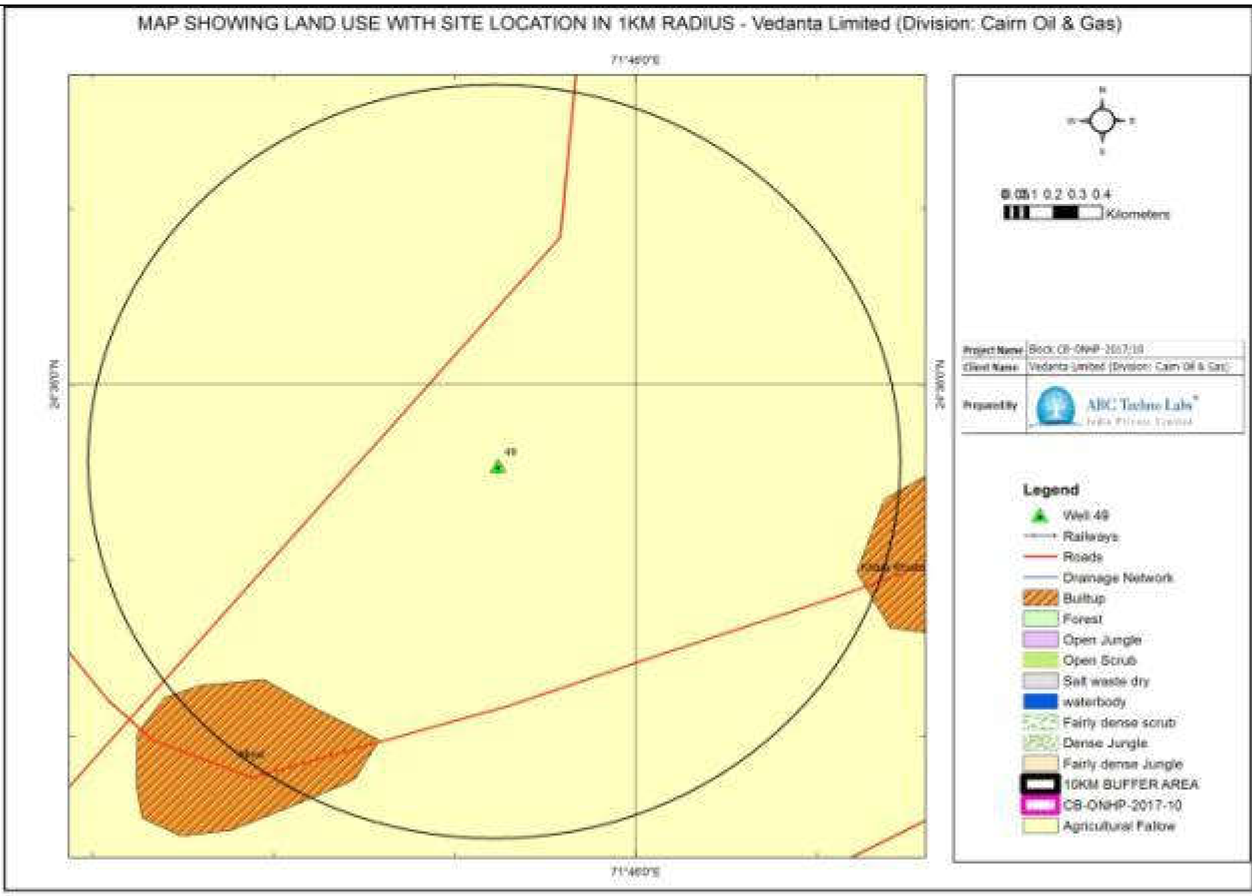


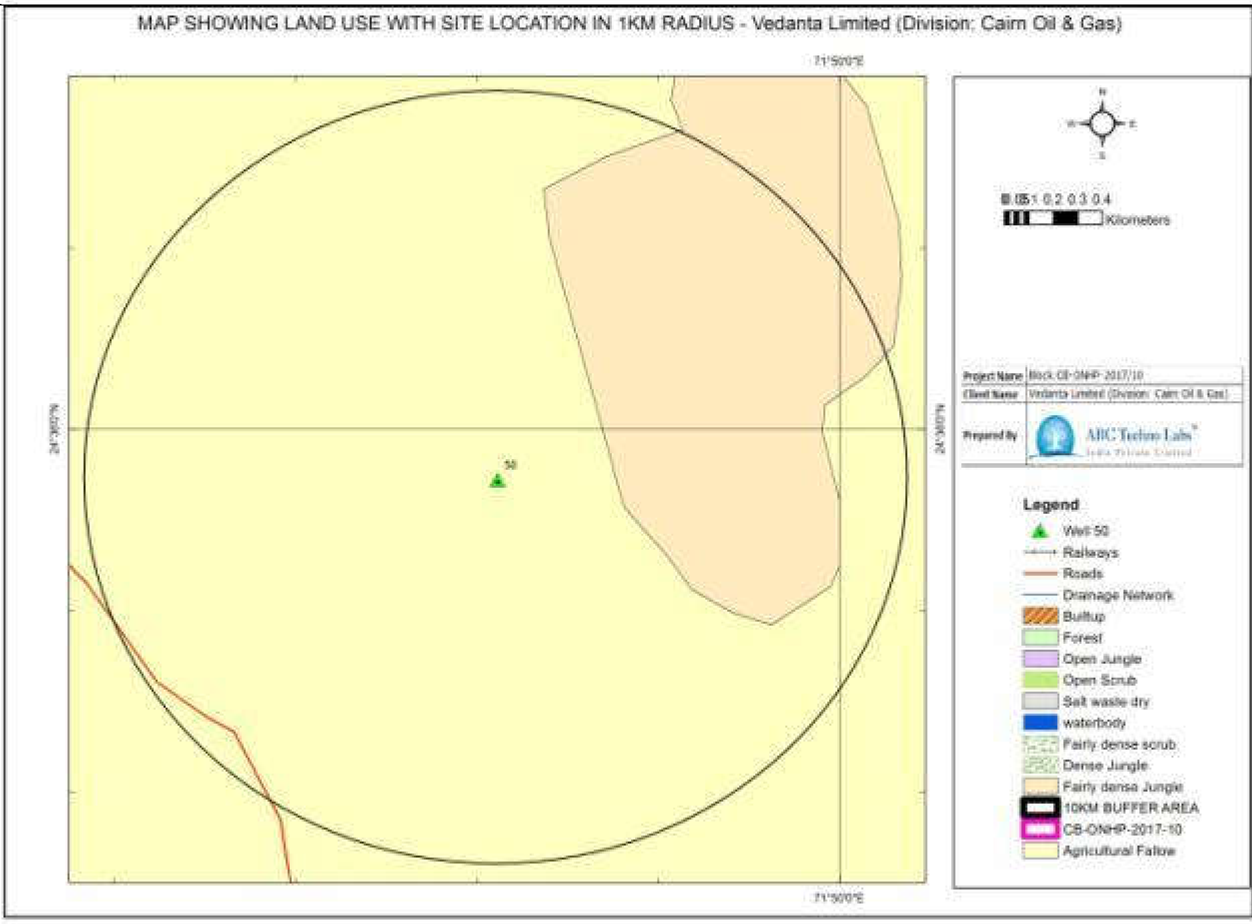
MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)



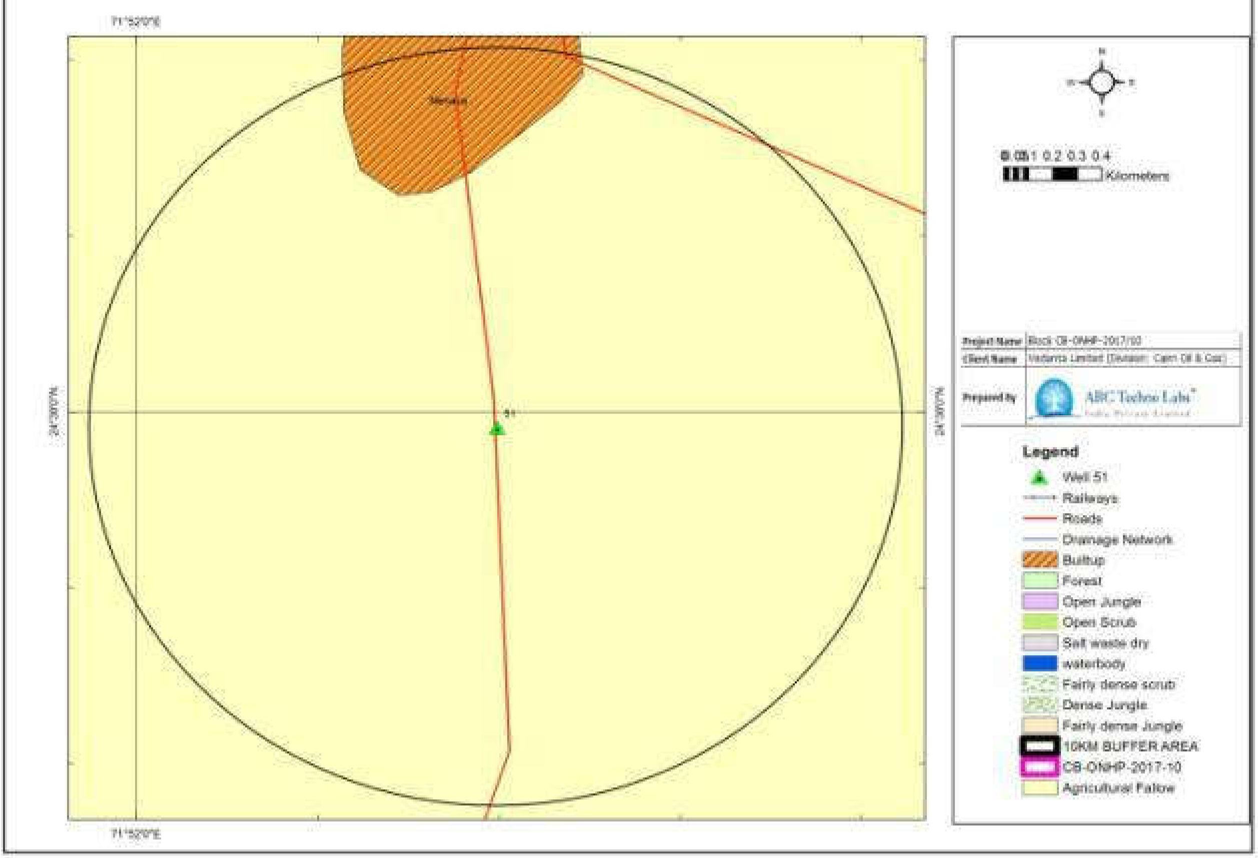

MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
47
Kilometers
Legend
Well 47
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow


MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
71°42'0"E
Kilometers
Legend
Well 48
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

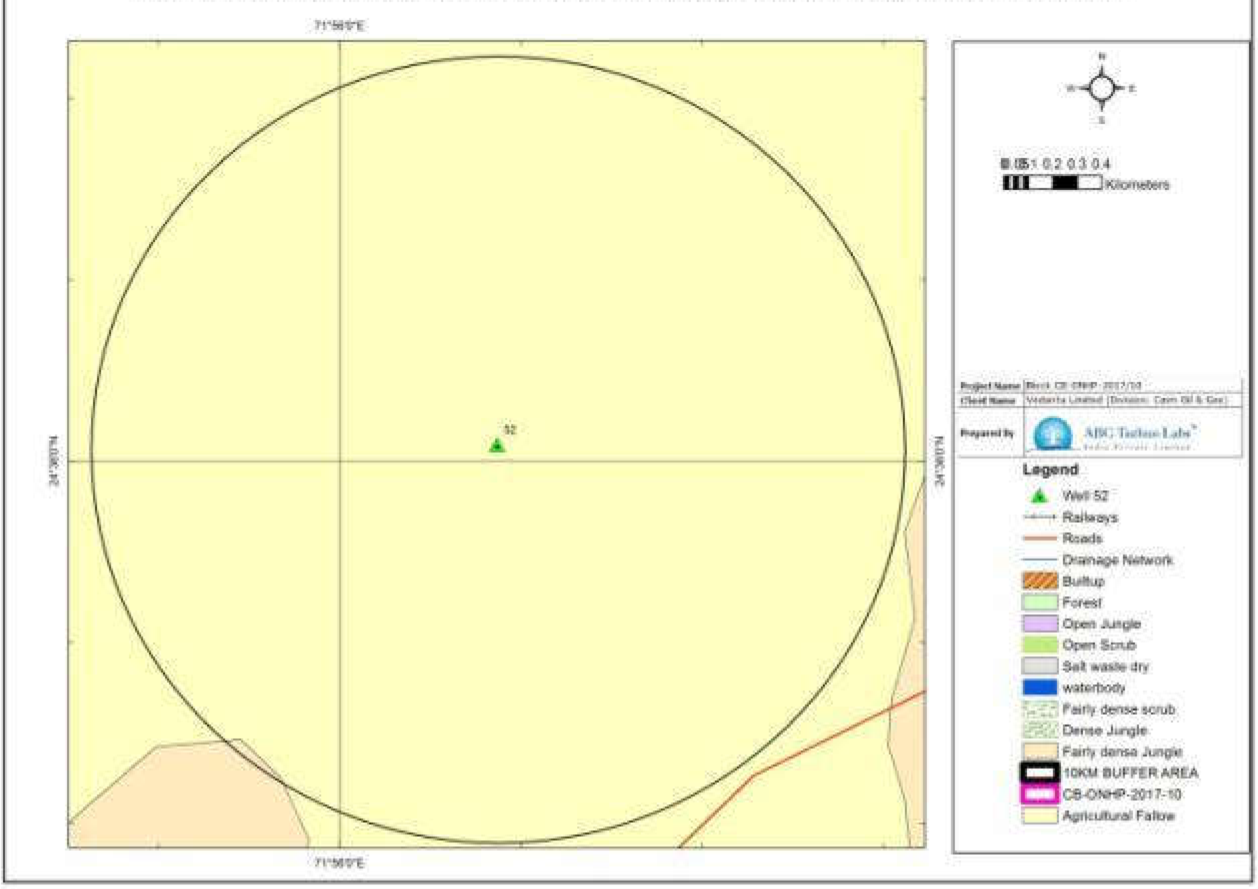

MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Legend
Well 49
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow
Kilometers

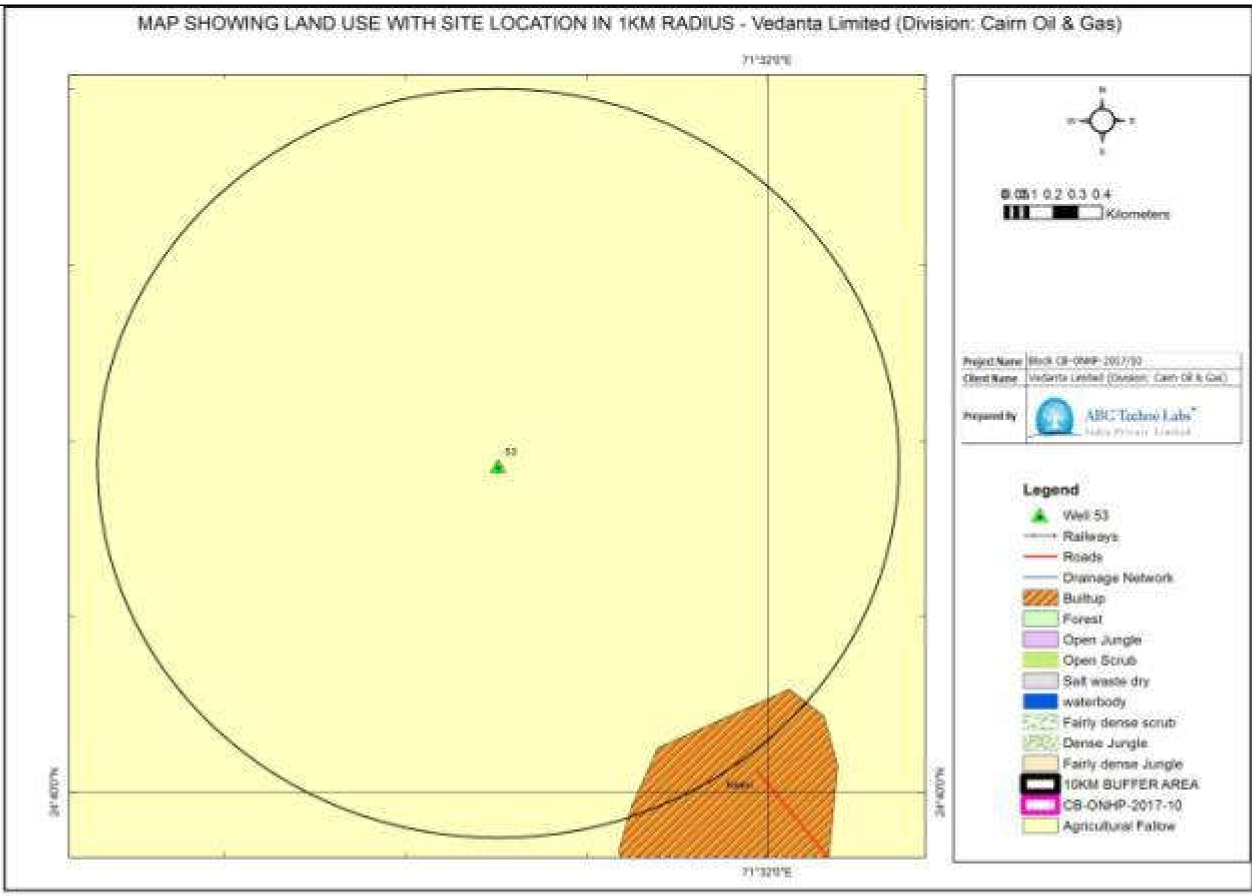

MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Legend
Well 50
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow
Kilometers

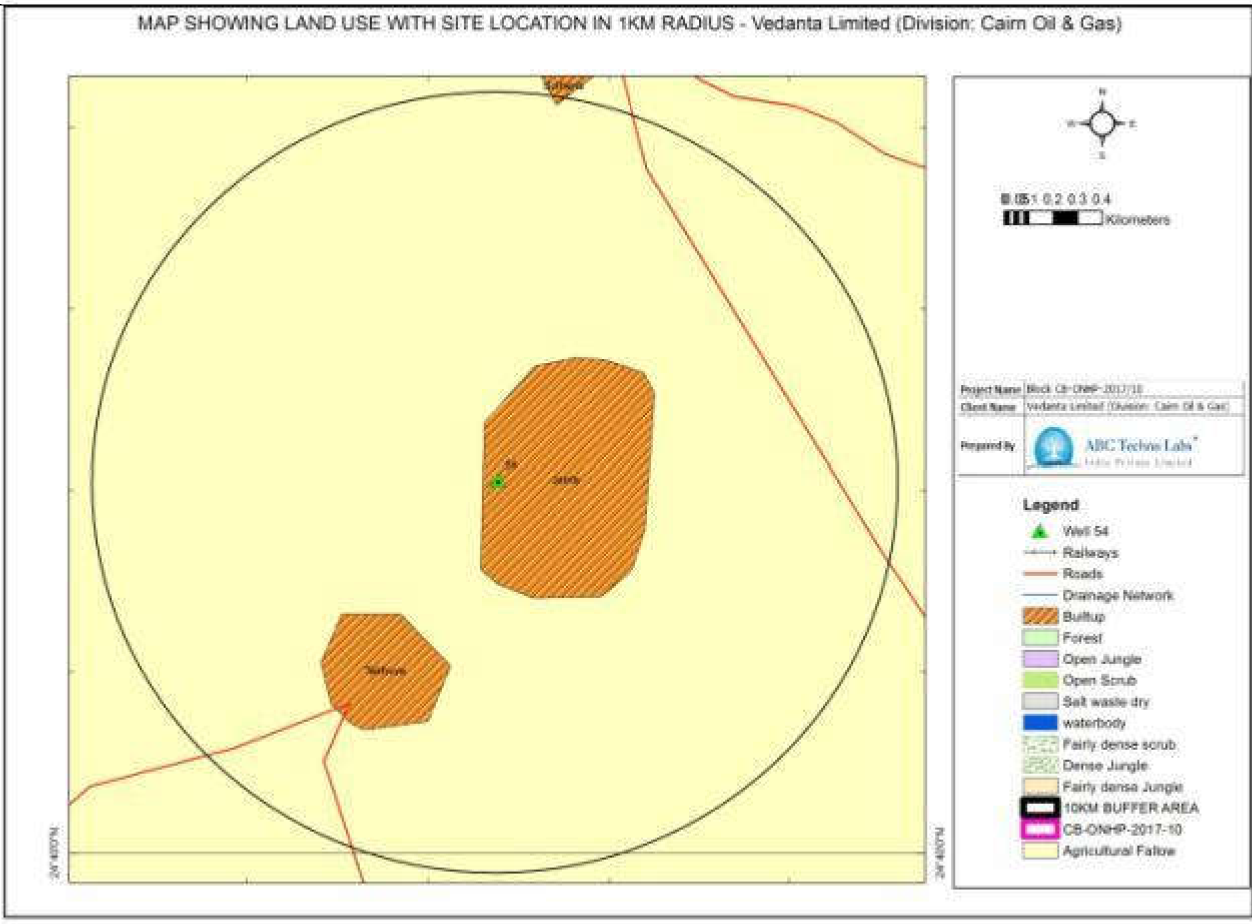
MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)

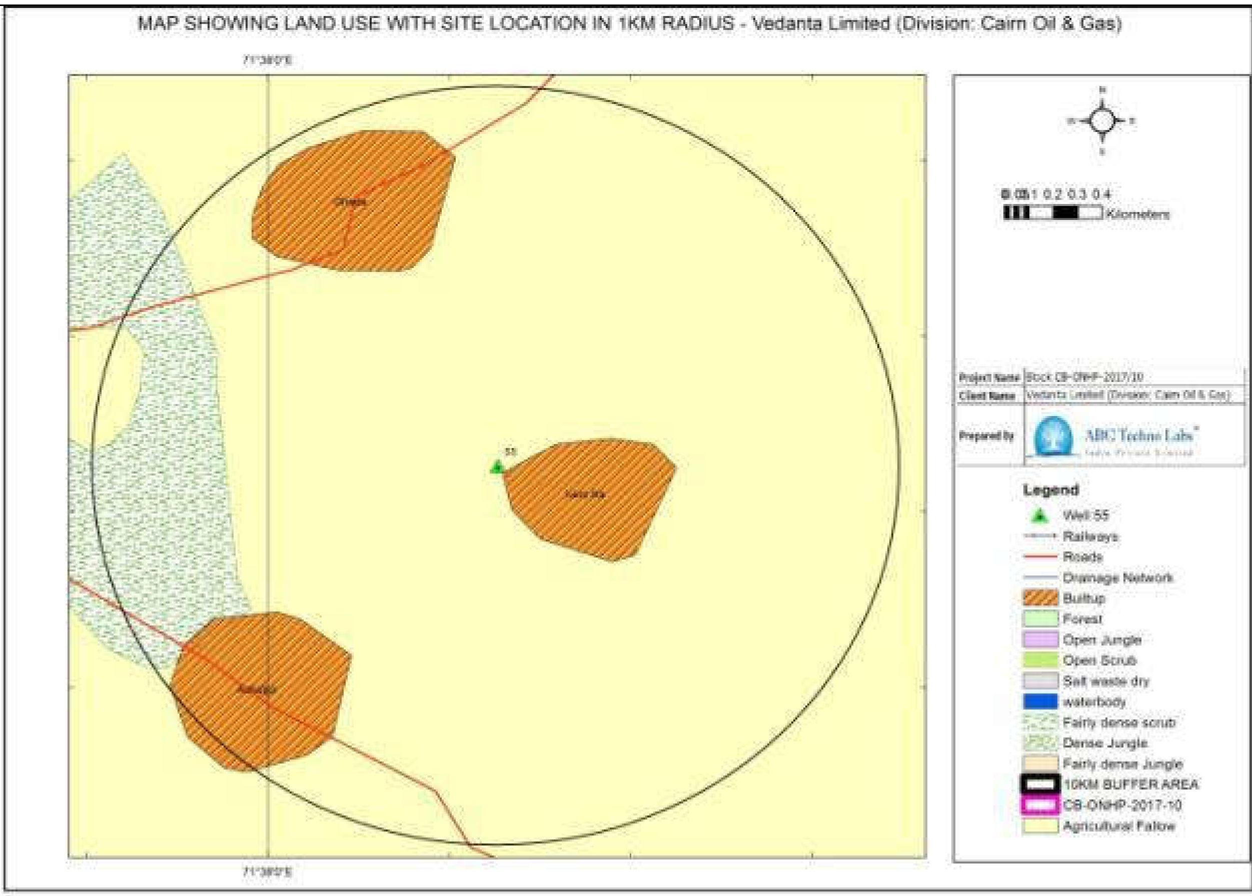


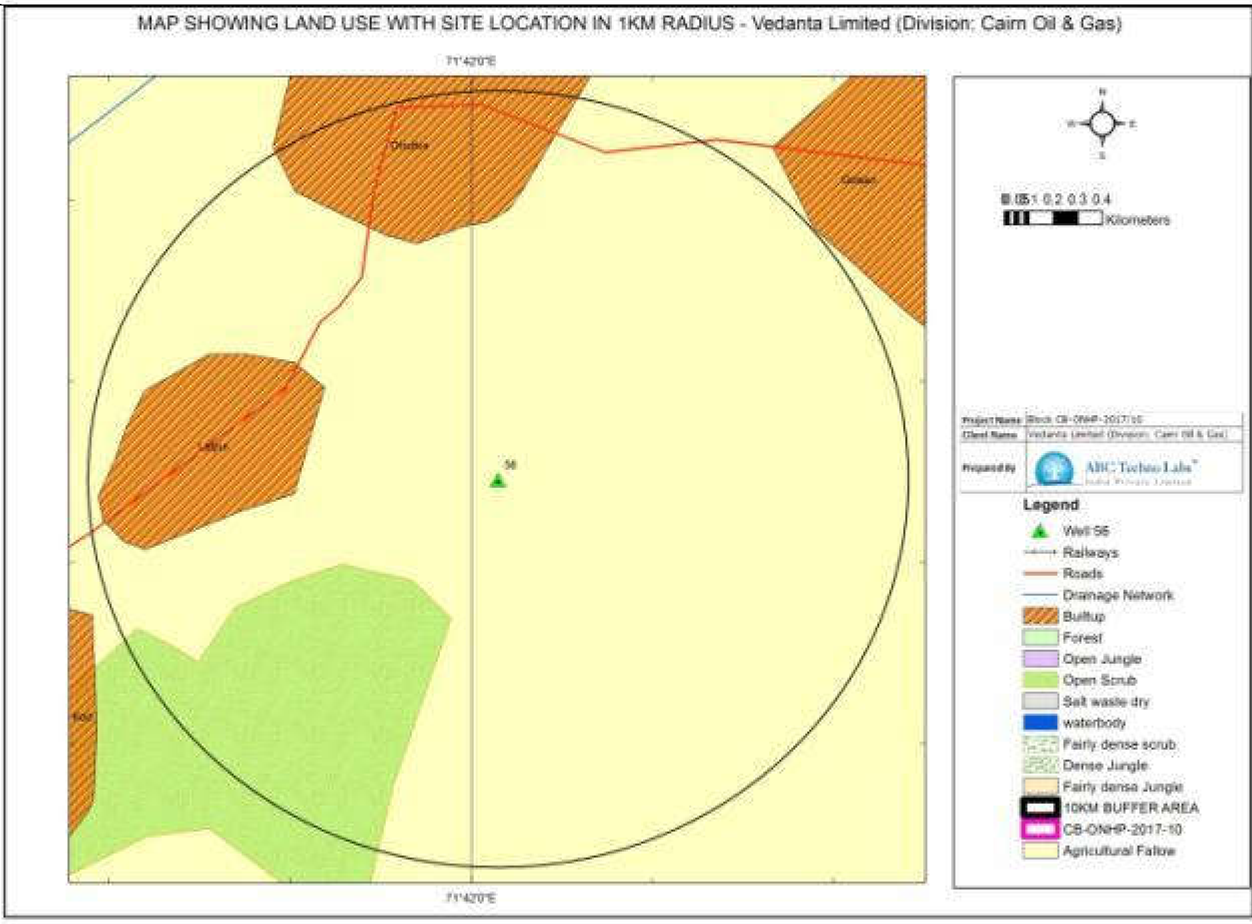
MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)

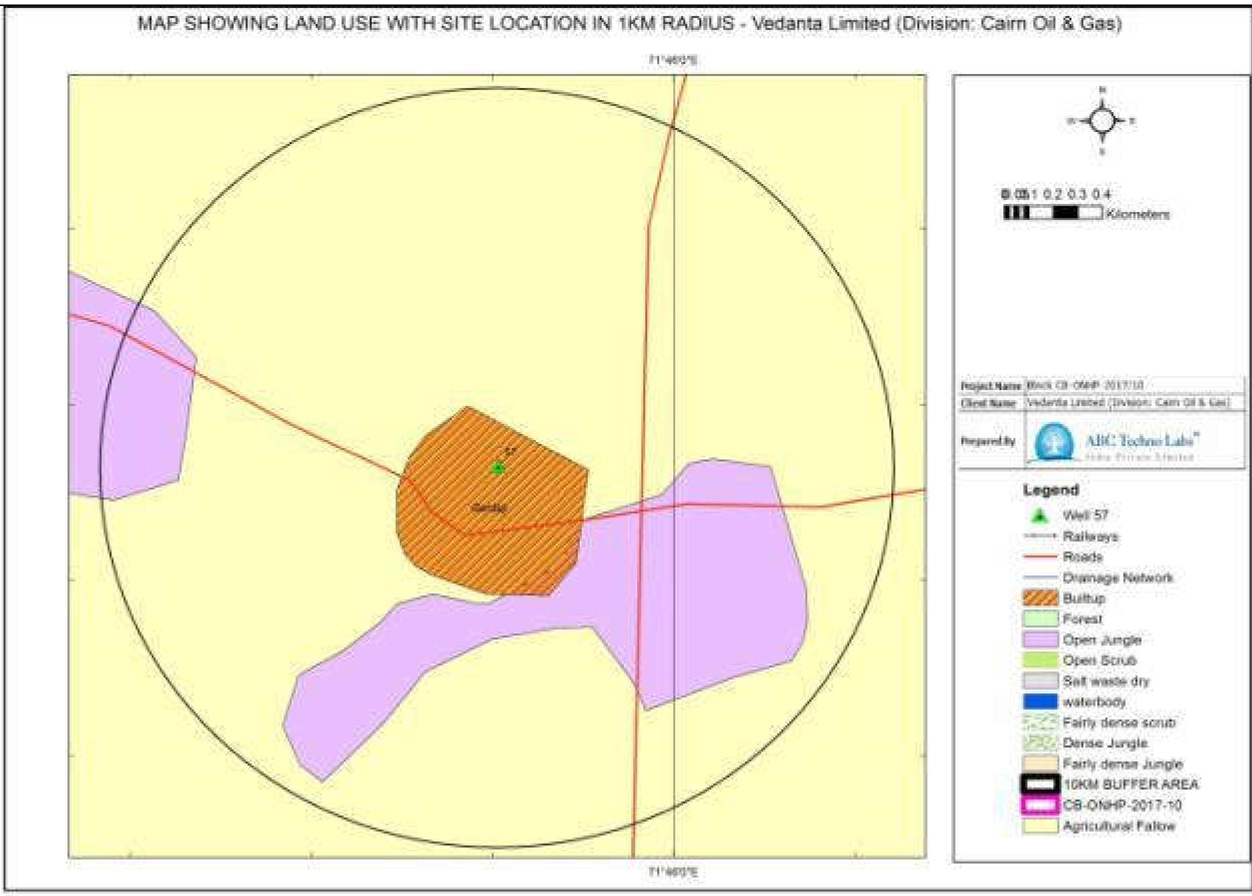



MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Kilometers
Legend
Well 53
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

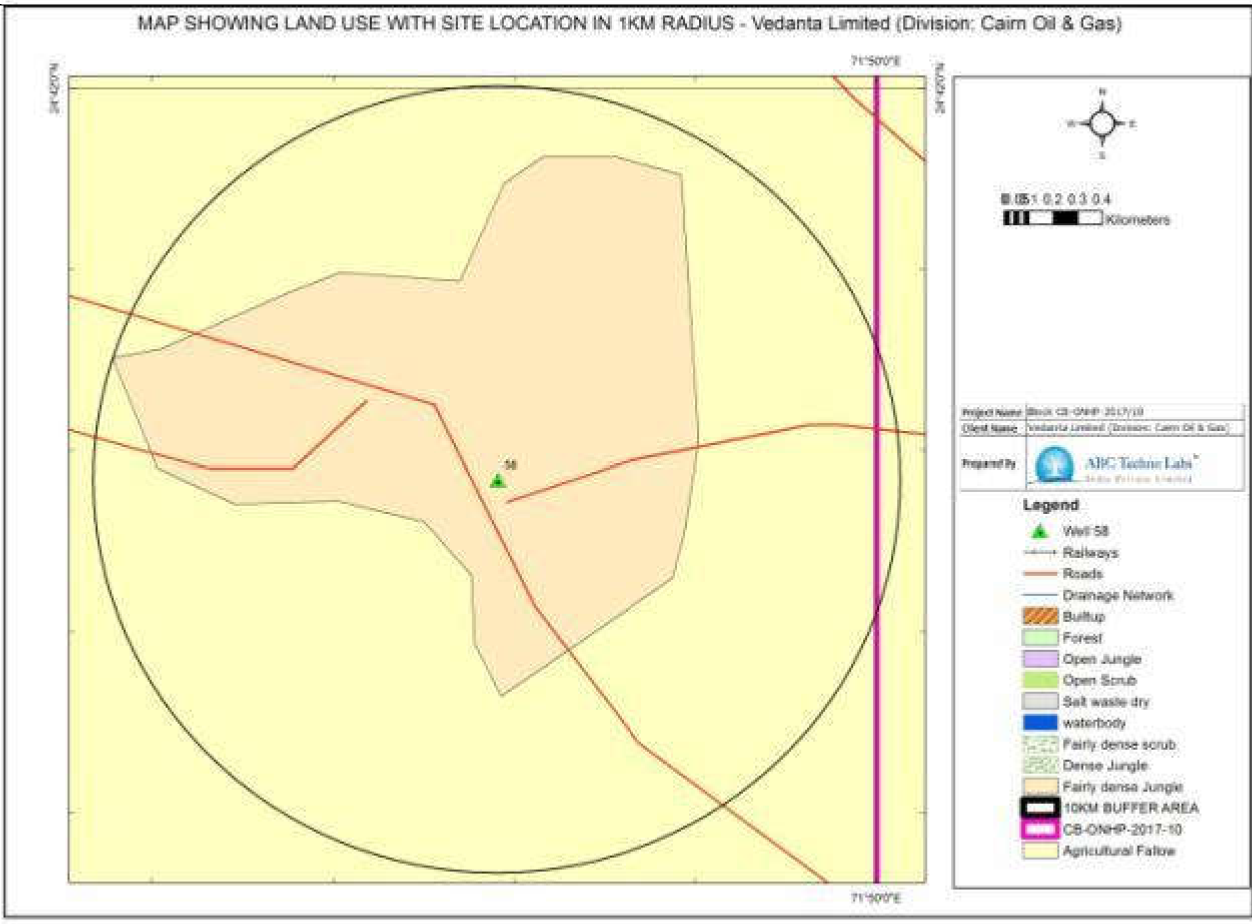

MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Kilometers
Legend
Well 54
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow


MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
55
Kilometers
Legend
Well 55
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

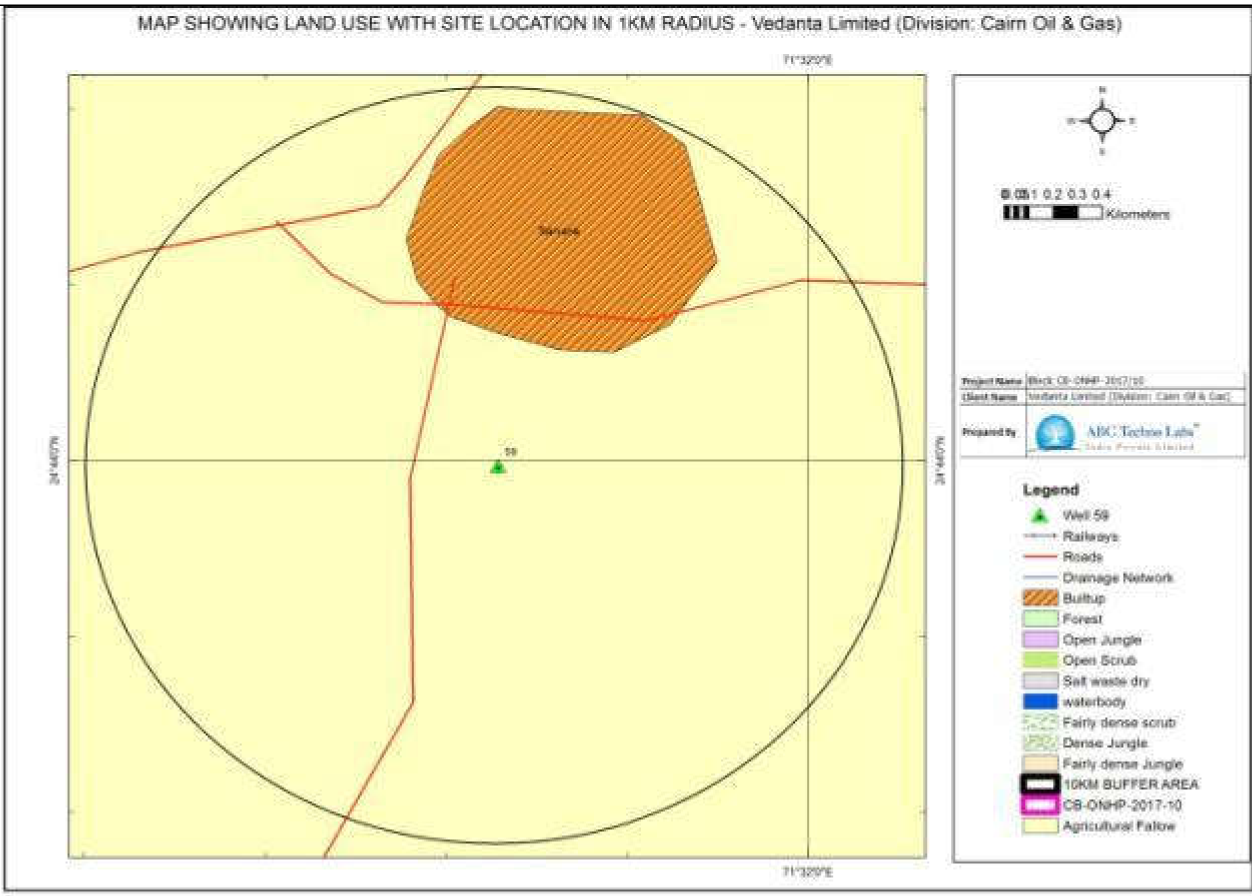

MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
56
Kilometers
Legend
Well 56
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow



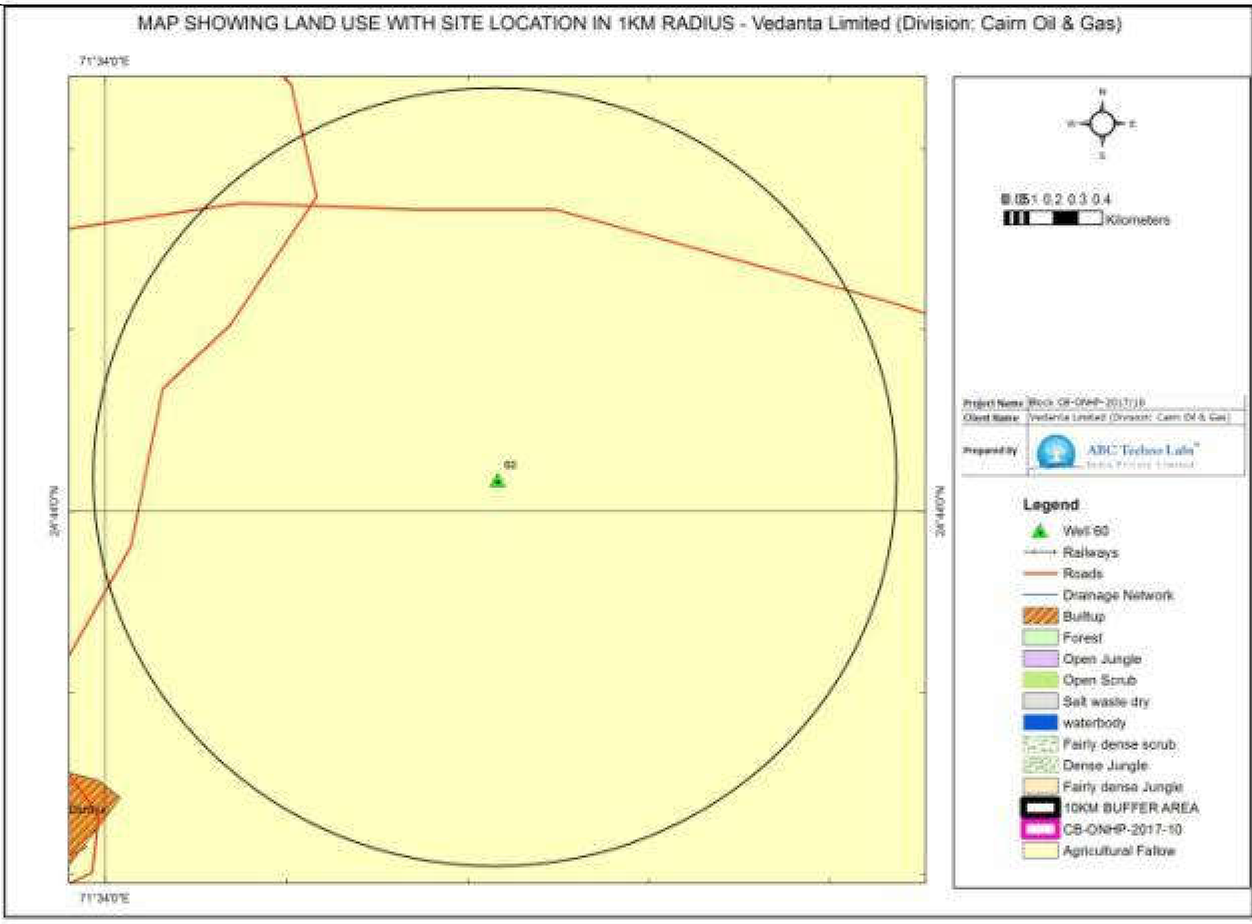
MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Kilometers
Legend
Well 57
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow



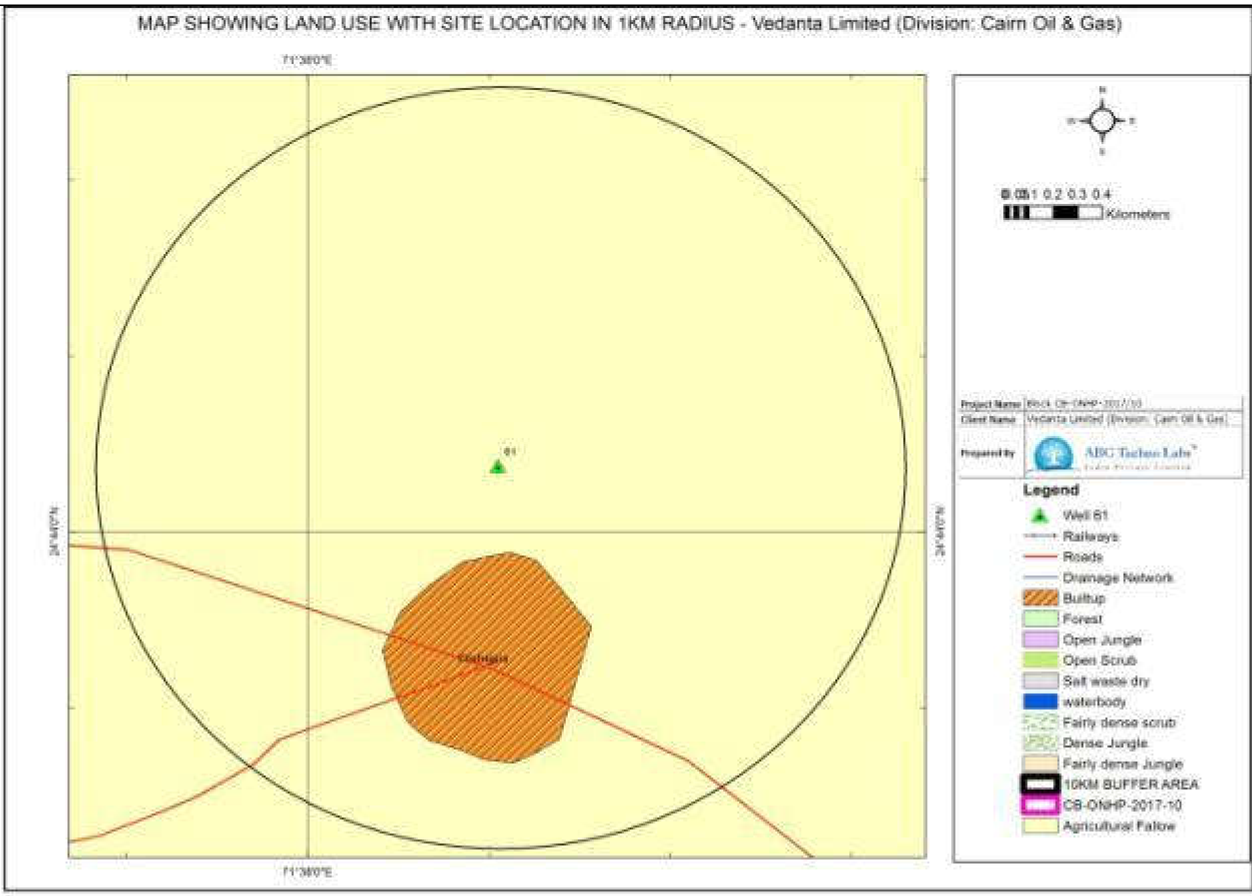
MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Kilometers
Legend
Well 58
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow



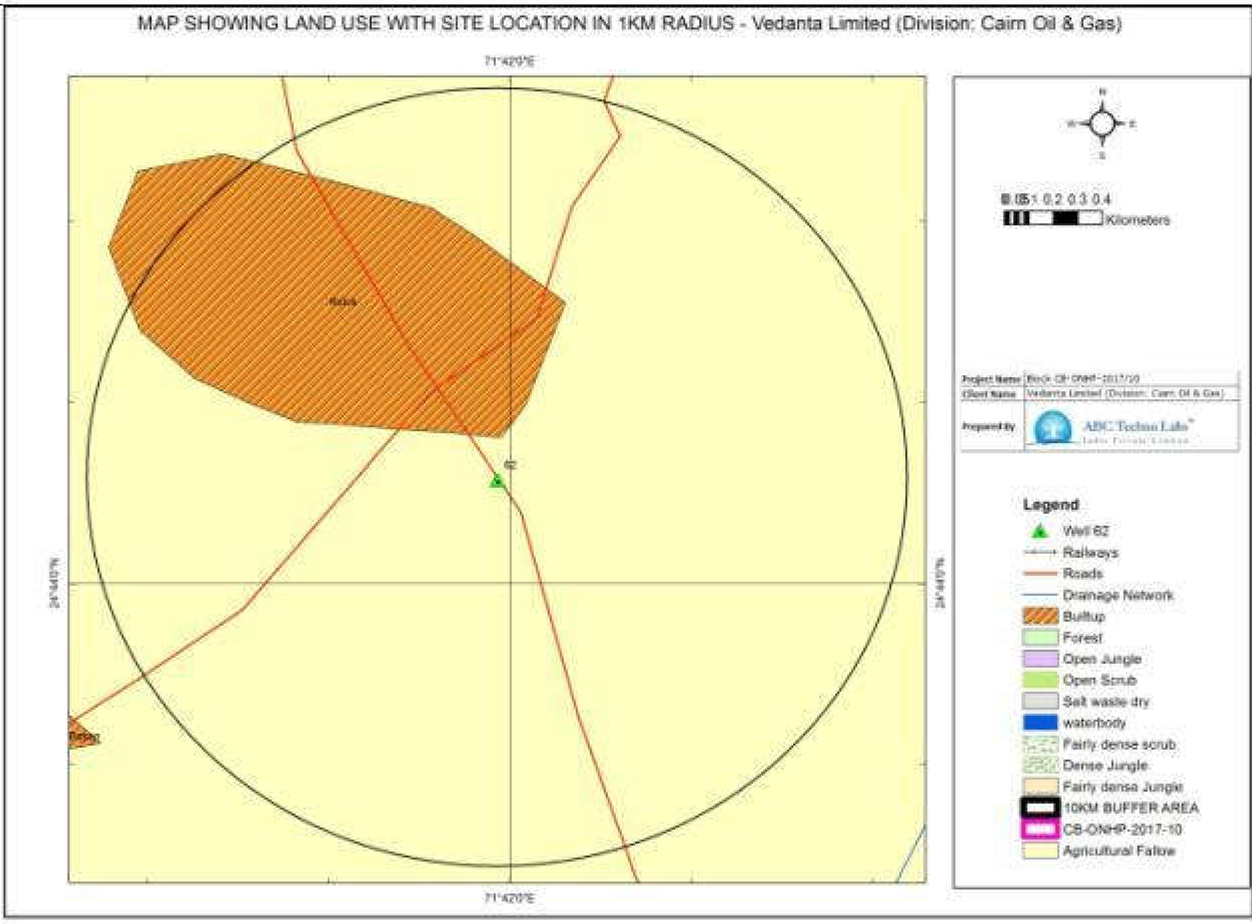
MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
59
Kilometers
Prepared By
ABC Techno Labs
Legend
Well 59
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow



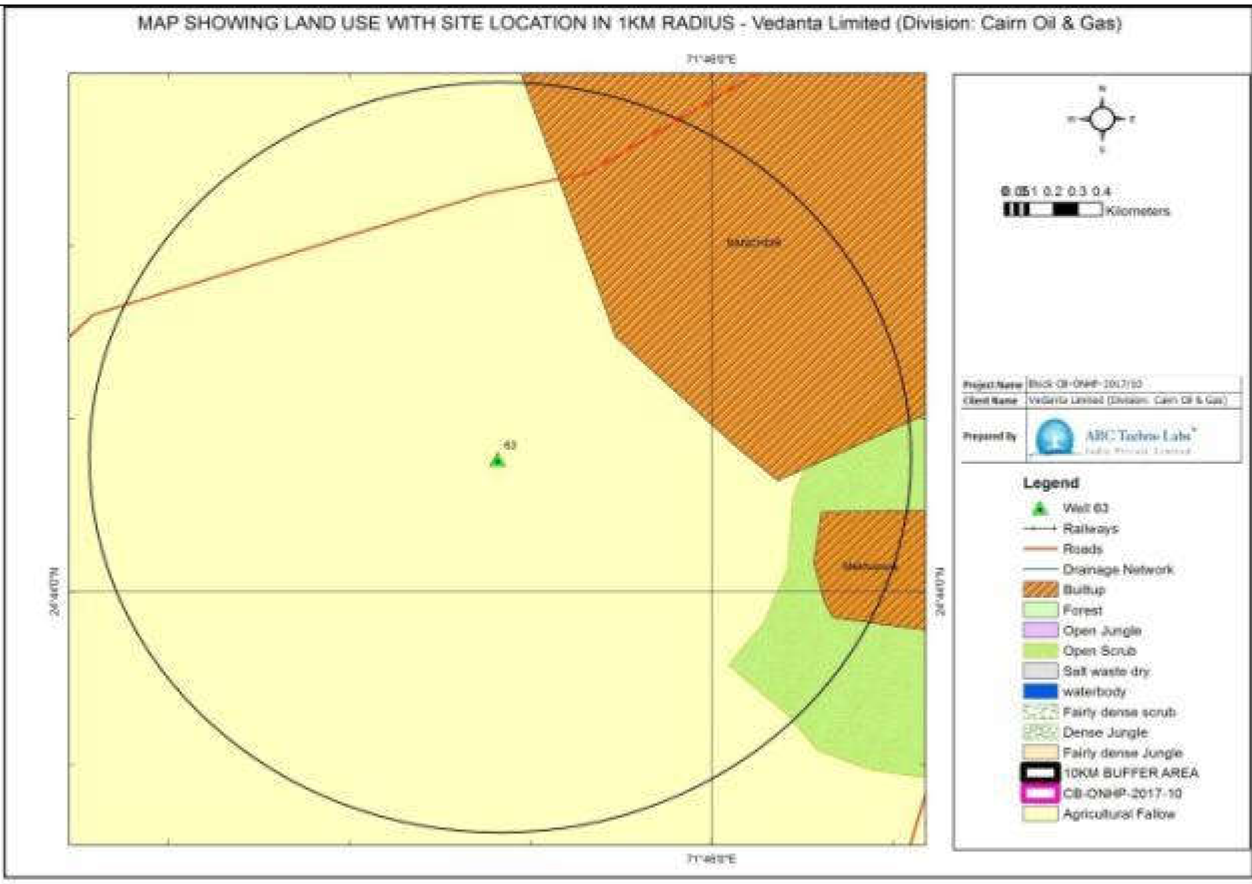
MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
60
Kilometers
ABC Techno Labs
Legend
Well 60
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

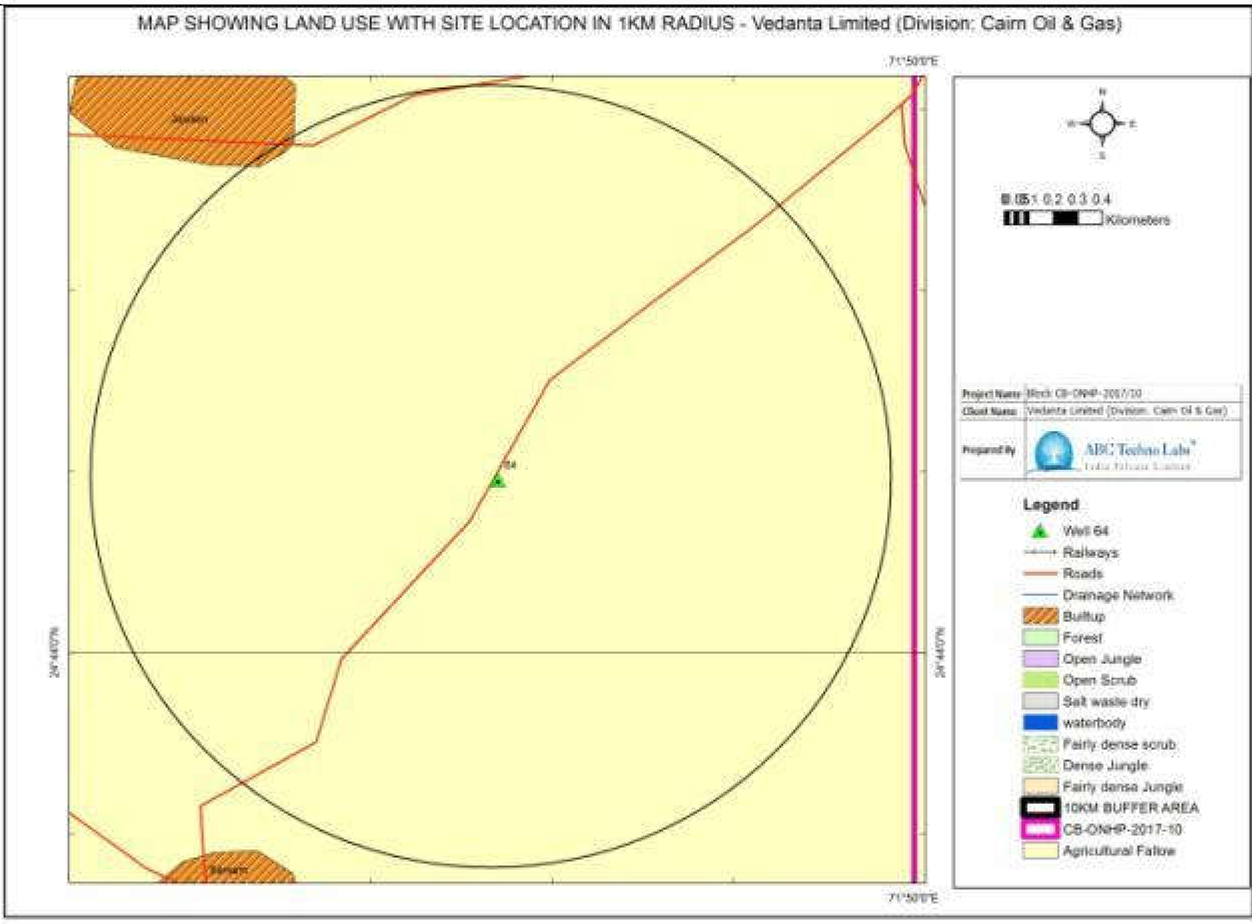


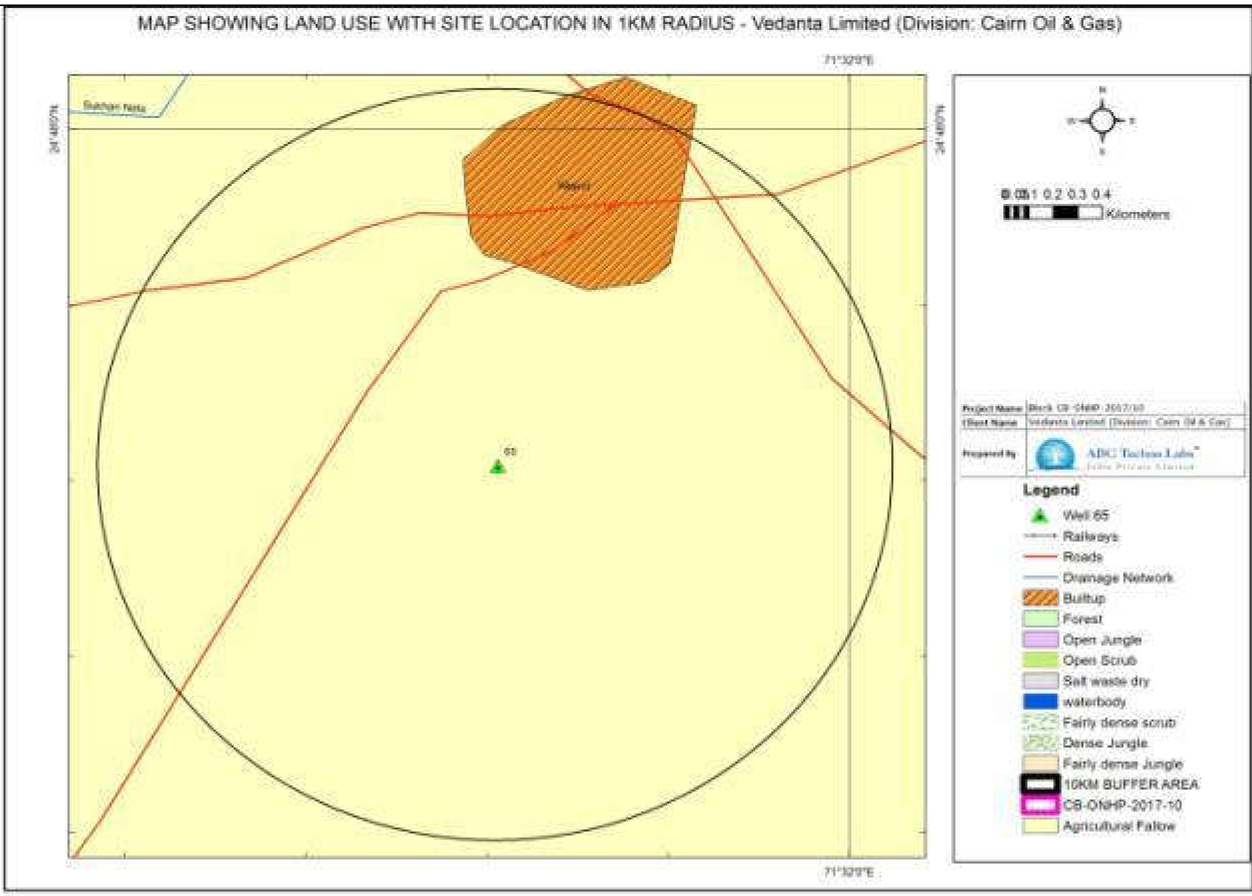
MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Kilometers
Legend
Well 61
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow



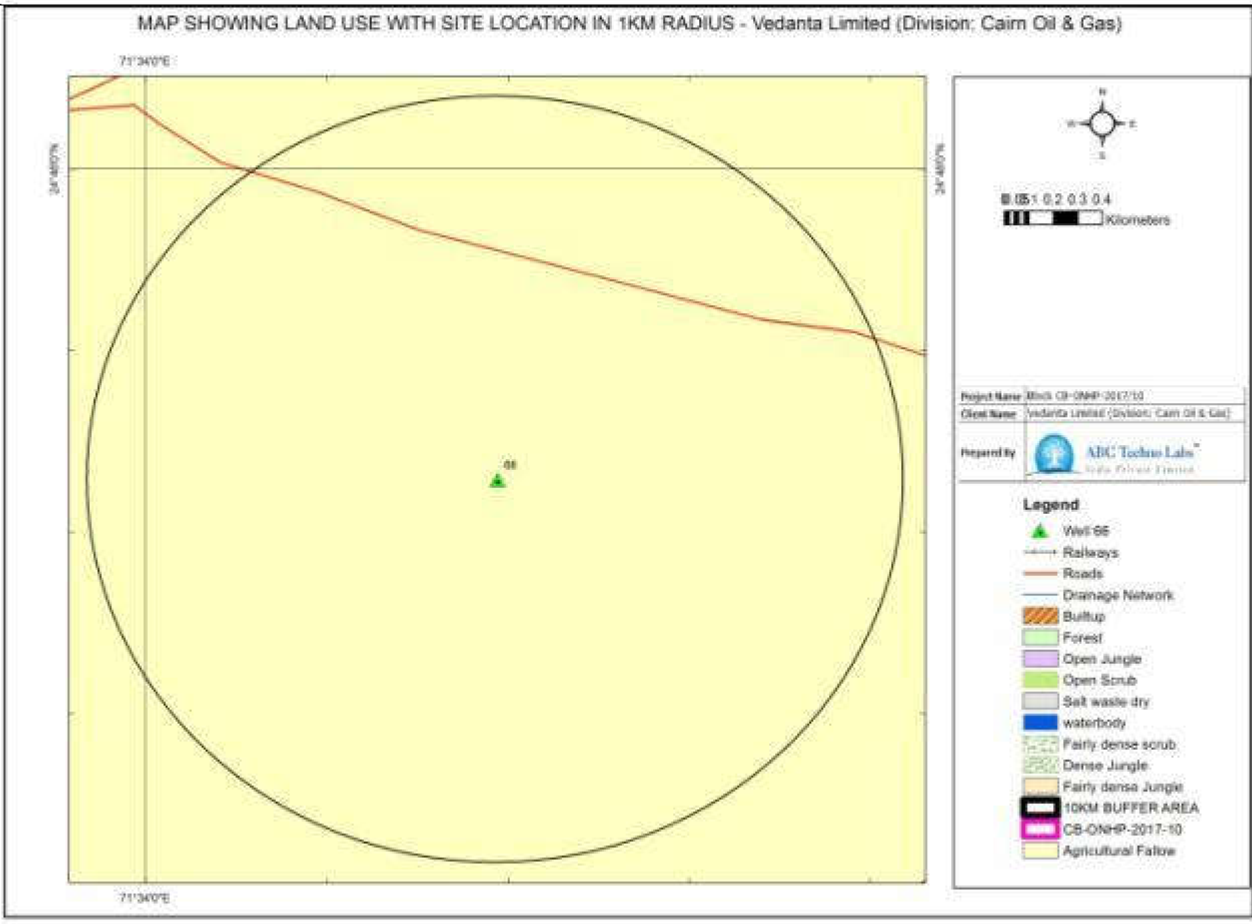
MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Kilometers
Legend
Well 62
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow


MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
0 0.05 0.1 0.2 0.3 0.4
Kilometers
Legend
Well 63
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

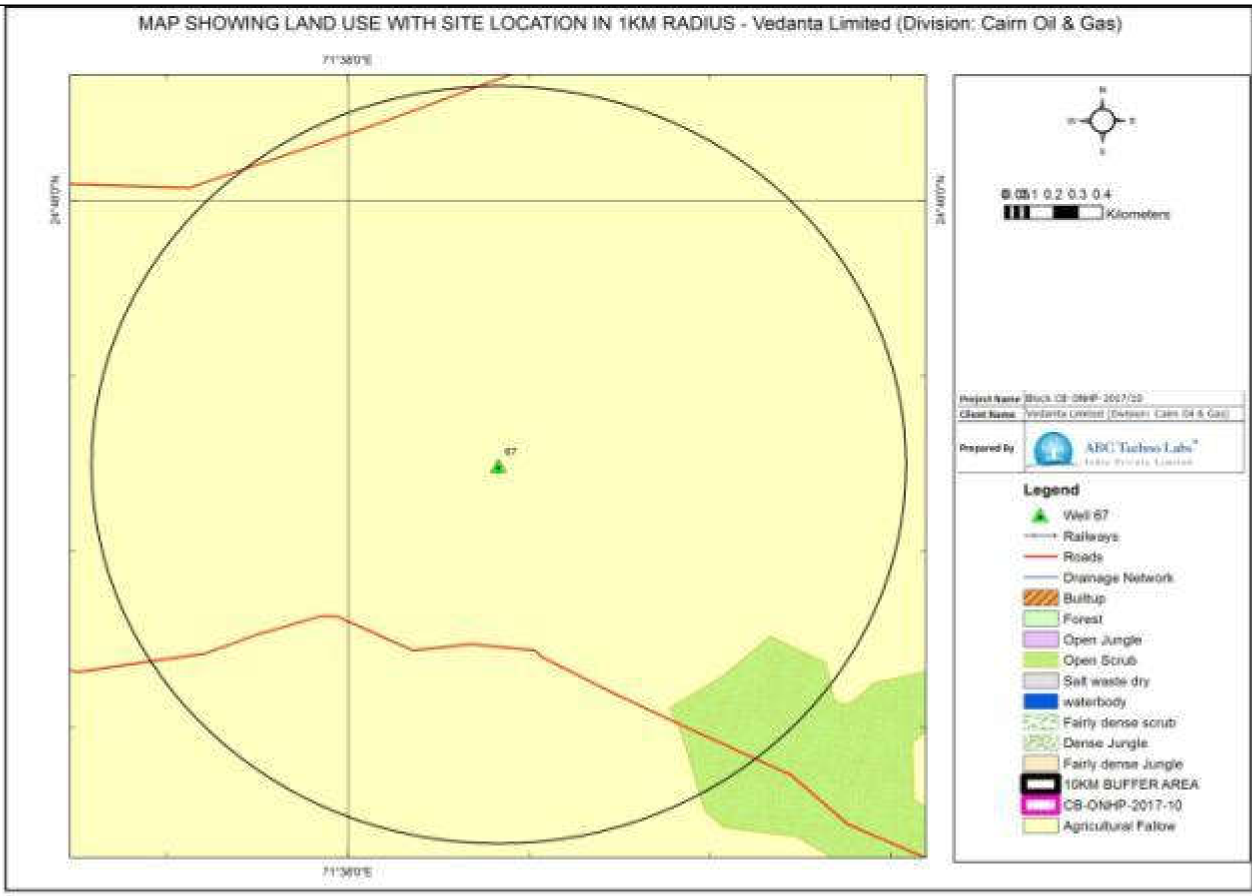

MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
0 0.05 0.1 0.2 0.3 0.4
Kilometers
Legend
Well 64
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

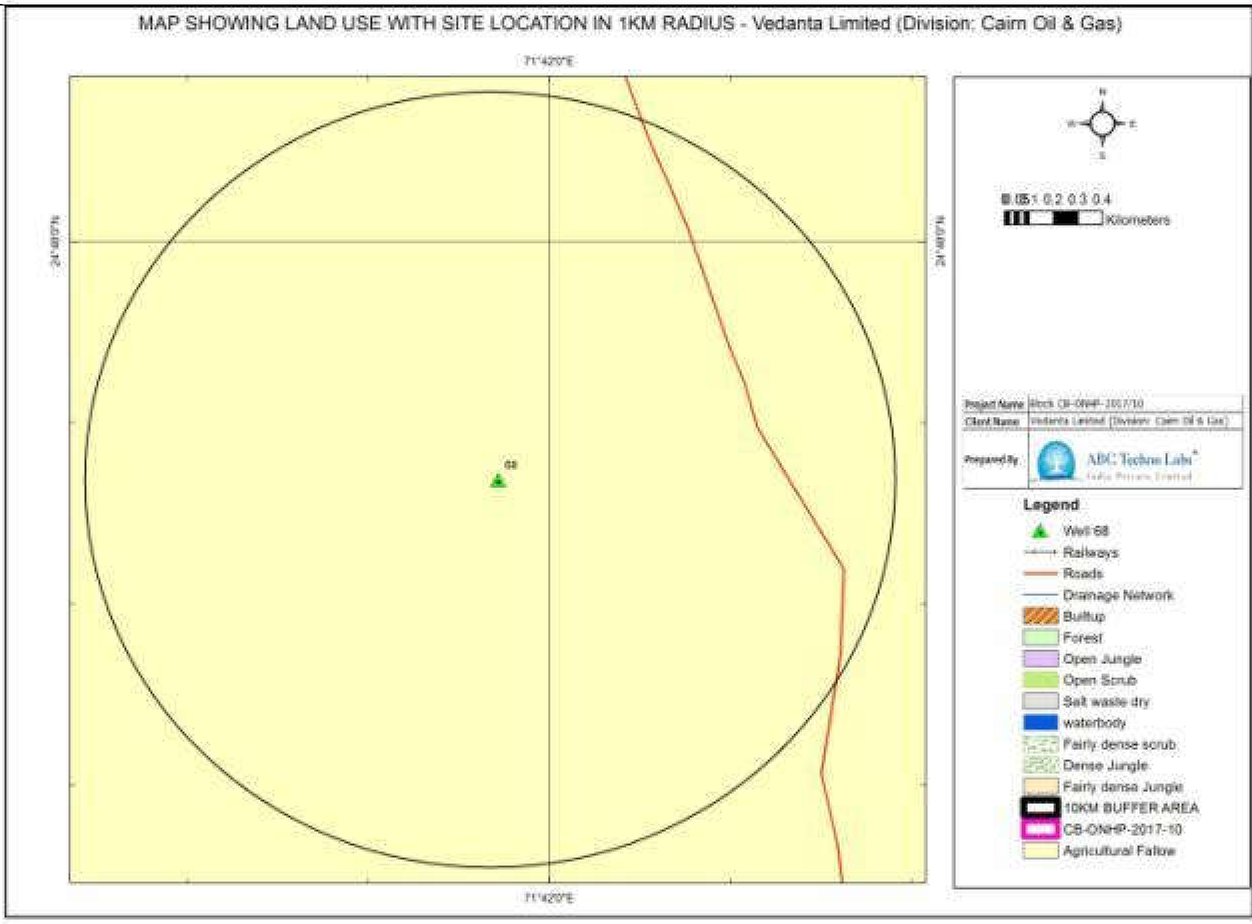


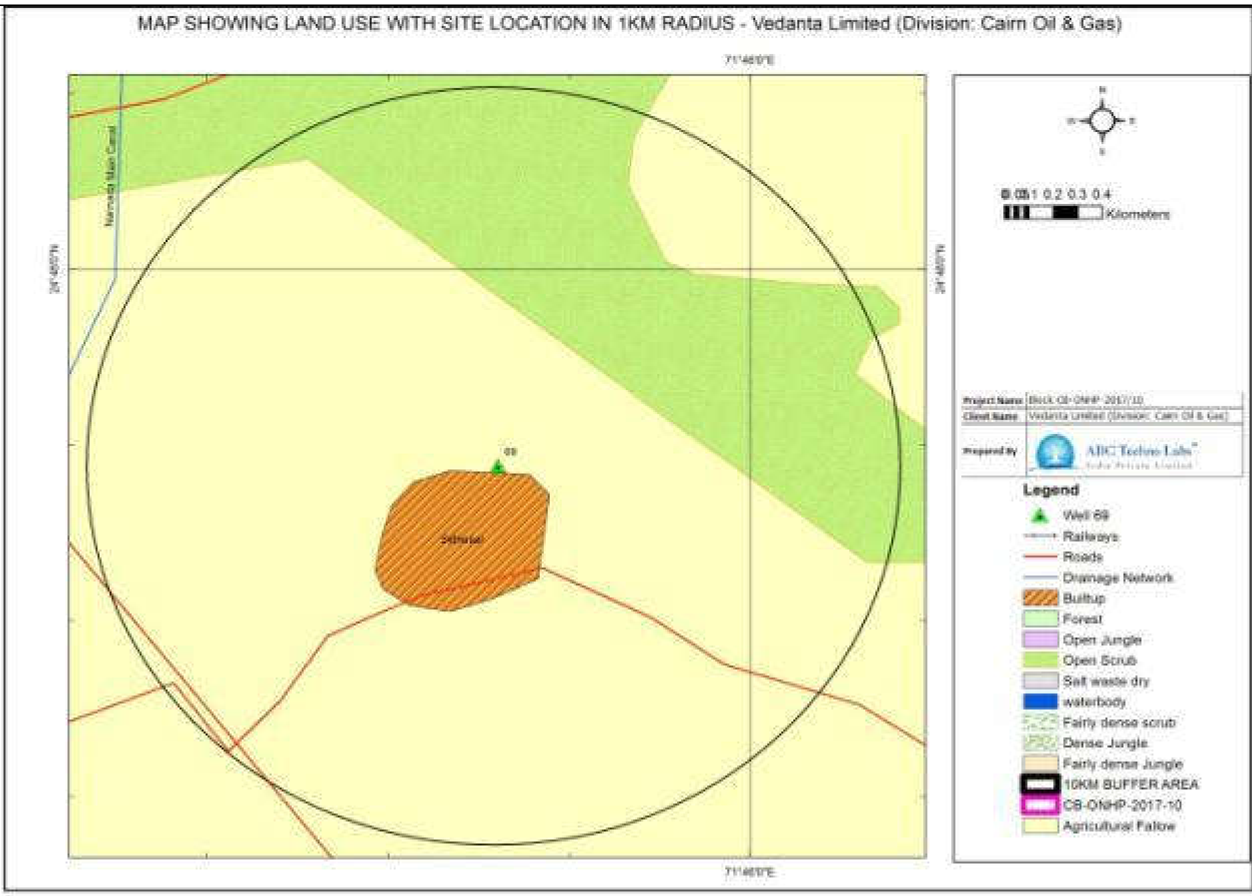
MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Kilometers
Legend
Well 65
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

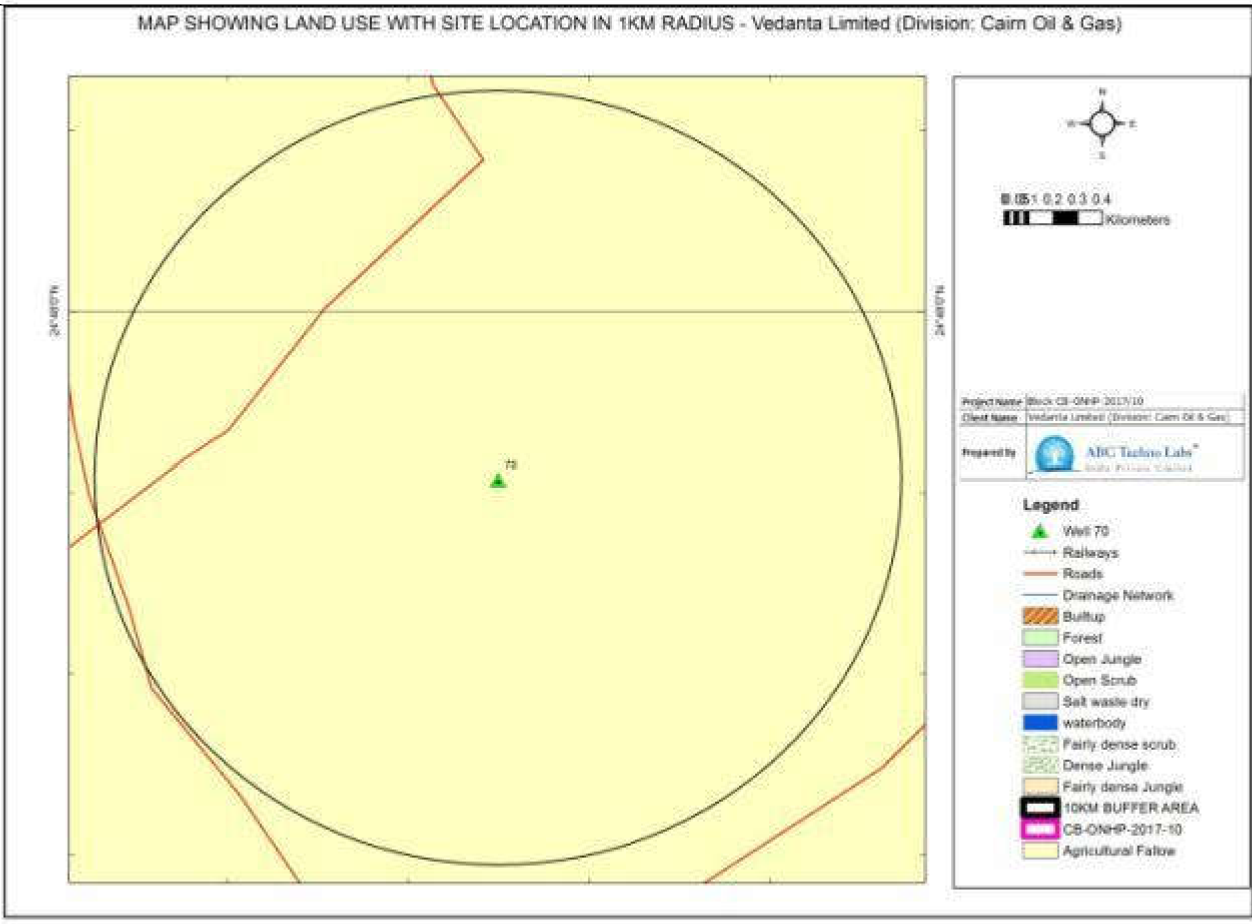


MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Kilometers
Legend
Well 66
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

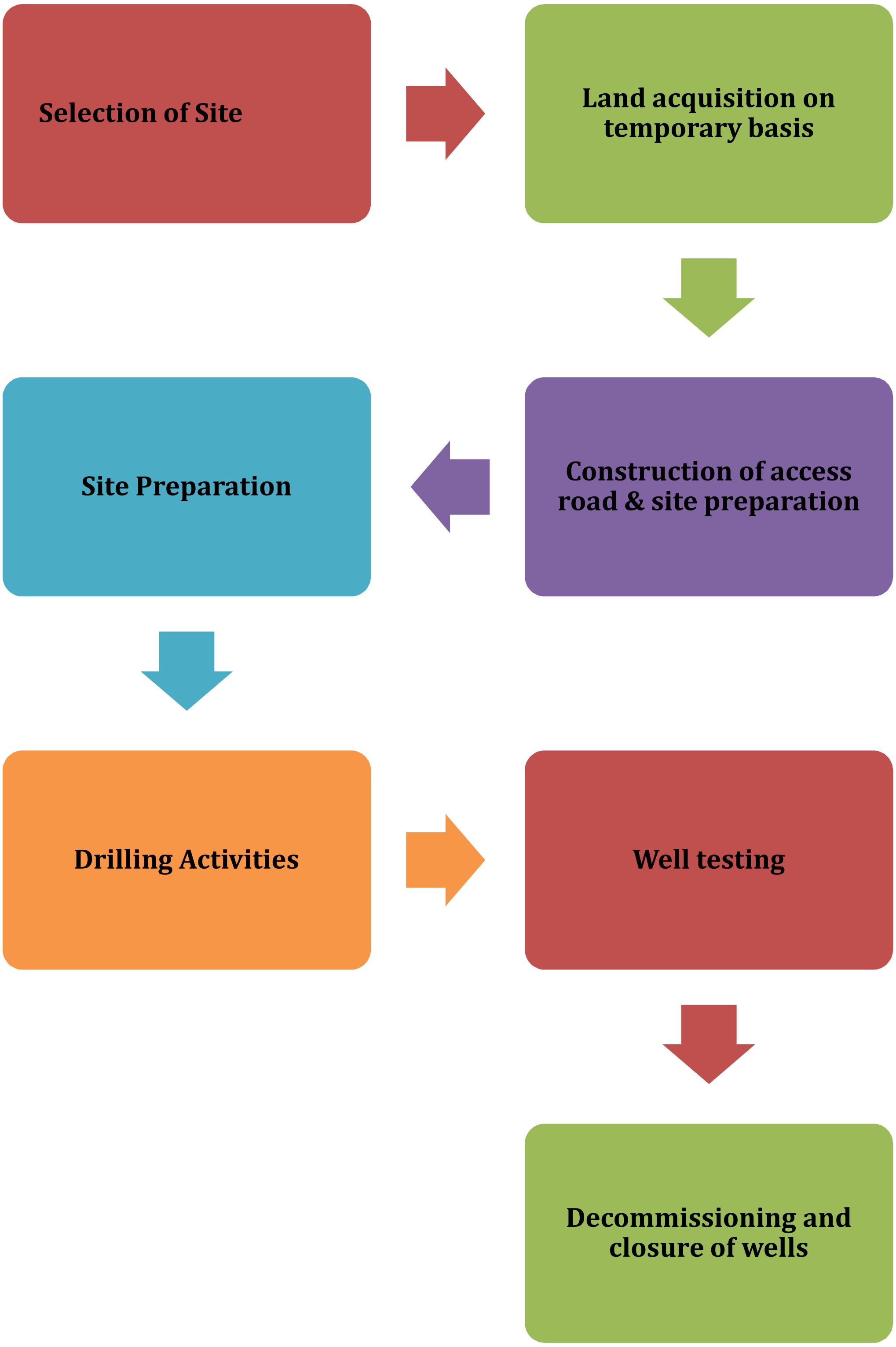

MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
71°38'0"E
24°48'0"N
67
N
W
E
S
0 0.05 0.1 0.2 0.3 0.4
Kilometers
Project Name
Client Name
Prepared By
ABC Techno Labs
Legend
Well 67
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow


MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
71°42'0"E
24°48'0"N
68
N
W
E
S
0 0.05 0.1 0.2 0.3 0.4
Kilometers
Project Name
Client Name
Prepared By
ABC Techno Labs
Legend
Well 68
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow


MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
Narmada Main Canal
Kilometers
Legend
Well 69
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow


MAP SHOWING LAND USE WITH SITE LOCATION IN 1KM RADIUS - Vedanta Limited (Division: Cairn Oil & Gas)
70
Kilometers
Legend
Well 70
Railways
Roads
Drainage Network
Builtup
Forest
Open Jungle
Open Scrub
Salt waste dry
waterbody
Fairly dense scrub
Dense Jungle
Fairly dense Jungle
10KM BUFFER AREA
CB-ONHP-2017-10
Agricultural Fallow

ANNEXURE 4: FLOW CHART SHOWING VARIOUS PHASES OF DRILLING ACTIVITIES



Source: Vedanta Limited (Division: Cairn Oil & Gas)

ANNEXURE 5: TYPICAL LIST OF CHEMICALS TO BE USED DURING DRILLING

CHEMICAL DETAIL

Chemicals	Functions
WBM Formulation	
Water /Base fluid	
Biopolymer	Viscosifier
Drispac/CMC	Fluid Loss Agent
Caustic Potash	Alkalinity Agent
Potassium Sulphate	Salinity
Torque Reducer/Blend of vegetable oil, Surfactant and Food Grade Paraffin Oil	Lubricant
Bentonite	Gelling agent
Gluteraldehyde	Biocide
Barite	Weighting Agent
SBM Formulation	
Synthetic Biodegradable Base Fluid	Base oil/Base Fluid
Polyamide, Petroleum Distillate, Dipropylene Glycol Methyl Ether	Emulsifier
Bentonite	Viscosifier
Gilsonite	Fluid Loss Agent
Sodium Formate	Brine Phase
Calcium Hydroxide	Alkalinity
Calcium Carbonate Graded	Bridging Agent
Barite	Weighting Agent

Source: Vedanta Limited (Division: Cairn Oil & Gas)

ANNEXURE 6: MICROMETEOROLOGICAL DATA

A. Banaskantha

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
18-Mar-19	1.00	24	21	4	22.5	0
18-Mar-19	2.00	24	21	4	22.5	0
18-Mar-19	3.00	24	21	4	22.5	0
18-Mar-19	4.00	22	23	4	45	0
18-Mar-19	5.00	22	23	4	45	0
18-Mar-19	6.00	22	23	4	45	0
18-Mar-19	7.00	23	24	4	67.5	0
18-Mar-19	8.00	23	24	4	67.5	0
18-Mar-19	9.00	23	24	4	67.5	0
18-Mar-19	10.00	28	29	4	67.5	0
18-Mar-19	11.00	28	29	4	67.5	0
18-Mar-19	12.00	28	29	4	67.5	0
18-Mar-19	13.00	33	22	3	45	0
18-Mar-19	14.00	33	22	3	45	0
18-Mar-19	15.00	33	22	3	45	0
18-Mar-19	16.00	35	21	3	112.5	0
18-Mar-19	17.00	35	21	3	112.5	0
18-Mar-19	18.00	35	21	3	112.5	0
18-Mar-19	19.00	33	23	4	225	0
18-Mar-19	20.00	33	23	4	225	0
18-Mar-19	21.00	33	23	4	225	0
18-Mar-19	22.00	31	22	3	22.5	0
18-Mar-19	23.00	31	22	3	22.5	0
18-Mar-19	0.00	31	22	3	22.5	0
19-Mar-19	1.00	27	20	7	22.5	0
19-Mar-19	2.00	27	20	7	22.5	0
19-Mar-19	3.00	27	20	7	22.5	0
19-Mar-19	4.00	24	25	7	315	0
19-Mar-19	5.00	24	25	7	315	0
19-Mar-19	6.00	24	25	7	315	0
19-Mar-19	7.00	24	27	8	315	0
19-Mar-19	8.00	24	27	8	315	0
19-Mar-19	9.00	24	27	8	315	0
19-Mar-19	10.00	28	21	10	315	0
19-Mar-19	11.00	28	21	10	315	0
19-Mar-19	12.00	28	21	10	315	0
19-Mar-19	13.00	33	25	15	292.5	0
19-Mar-19	14.00	33	25	15	292.5	0
19-Mar-19	15.00	33	25	15	292.5	0
19-Mar-19	16.00	34	24	19	270	0
19-Mar-19	17.00	34	24	19	270	0
19-Mar-19	18.00	34	24	19	270	0
19-Mar-19	19.00	32	27	18	247.5	0
19-Mar-19	20.00	32	27	18	247.5	0
19-Mar-19	21.00	32	27	18	247.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
19-Mar-19	22.00	28	24	9	247.5	0
19-Mar-19	23.00	28	24	9	247.5	0
19-Mar-19	0.00	28	24	9	247.5	0
20-Mar-19	1.00	24	38	9	270	0
20-Mar-19	2.00	24	38	9	270	0
20-Mar-19	3.00	24	38	9	270	0
20-Mar-19	4.00	23	62	7	292.5	0
20-Mar-19	5.00	23	62	7	292.5	0
20-Mar-19	6.00	23	62	7	292.5	0
20-Mar-19	7.00	23	67	5	315	0
20-Mar-19	8.00	23	67	5	315	0
20-Mar-19	9.00	23	67	5	315	0
20-Mar-19	10.00	26	53	12	315	0
20-Mar-19	11.00	26	53	12	315	0
20-Mar-19	12.00	26	53	12	315	0
20-Mar-19	13.00	31	29	16	292.5	0
20-Mar-19	14.00	31	29	16	292.5	0
20-Mar-19	15.00	31	29	16	292.5	0
20-Mar-19	16.00	33	29	19	270	0
20-Mar-19	17.00	33	29	19	270	0
20-Mar-19	18.00	33	29	19	270	0
20-Mar-19	19.00	31	29	17	270	0
20-Mar-19	20.00	31	29	17	270	0
20-Mar-19	21.00	31	29	17	270	0
20-Mar-19	22.00	28	24	6	270	0
20-Mar-19	23.00	28	24	6	270	0
20-Mar-19	0.00	28	24	6	270	0
21-Mar-19	1.00	24	29	1	292.5	0
21-Mar-19	2.00	24	29	1	292.5	0
21-Mar-19	3.00	24	29	1	292.5	0
21-Mar-19	4.00	22	48	2	315	0
21-Mar-19	5.00	22	48	2	315	0
21-Mar-19	6.00	22	48	2	315	0
21-Mar-19	7.00	23	64	1	337.5	0
21-Mar-19	8.00	23	64	1	337.5	0
21-Mar-19	9.00	23	64	1	337.5	0
21-Mar-19	10.00	27	50	2	337.5	0
21-Mar-19	11.00	27	50	2	337.5	0
21-Mar-19	12.00	27	50	2	337.5	0
21-Mar-19	13.00	32	28	2	337.5	0
21-Mar-19	14.00	32	28	2	337.5	0
21-Mar-19	15.00	32	28	2	337.5	0
21-Mar-19	16.00	34	28	2	315	0
21-Mar-19	17.00	34	28	2	315	0
21-Mar-19	18.00	34	28	2	315	0
21-Mar-19	19.00	33	25	3	292.5	0
21-Mar-19	20.00	33	26	3	292.5	0
21-Mar-19	21.00	33	26	3	292.5	0
21-Mar-19	22.00	31	32	3	292.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
21-Mar-19	23.00	31	32	3	292.5	0
21-Mar-19	0.00	31	32	3	292.5	0
22-Mar-19	1.00	27	37	3	315	0
22-Mar-19	2.00	27	37	3	315	0
22-Mar-19	3.00	27	37	3	315	0
22-Mar-19	4.00	23	34	3	247.5	0
22-Mar-19	5.00	23	34	3	247.5	0
22-Mar-19	6.00	23	34	3	247.5	0
22-Mar-19	7.00	24	25	3	45	0
22-Mar-19	8.00	24	25	3	45	0
22-Mar-19	9.00	24	25	3	45	0
22-Mar-19	10.00	29	21	4	22.5	0
22-Mar-19	11.00	29	21	4	22.5	0
22-Mar-19	12.00	29	21	4	22.5	0
22-Mar-19	13.00	34	23	5	22.5	0
22-Mar-19	14.00	34	23	5	22.5	0
22-Mar-19	15.00	34	23	5	22.5	0
22-Mar-19	16.00	35	22	5	22.5	0
22-Mar-19	17.00	35	22	5	22.5	0
22-Mar-19	18.00	35	22	5	22.5	0
22-Mar-19	19.00	33	24	5	22.5	0
22-Mar-19	20.00	33	24	5	22.5	0
22-Mar-19	21.00	33	24	5	22.5	0
22-Mar-19	22.00	30	24	4	22.5	0
22-Mar-19	23.00	30	24	4	22.5	0
22-Mar-19	0.00	30	24	4	22.5	0
23-Mar-19	1.00	26	24	4	45	0
23-Mar-19	2.00	26	24	4	45	0
23-Mar-19	3.00	26	25	4	45	0
23-Mar-19	4.00	25	25	3	45	0
23-Mar-19	5.00	25	25	3	45	0
23-Mar-19	6.00	25	25	3	45	0
23-Mar-19	7.00	25	25	2	67.5	0
23-Mar-19	8.00	25	25	2	67.5	0
23-Mar-19	9.00	25	25	2	67.5	0
23-Mar-19	10.00	30	22	2	112.5	0
23-Mar-19	11.00	30	22	2	112.5	0
23-Mar-19	12.00	30	22	2	112.5	0
23-Mar-19	13.00	35	20	2	180	0
23-Mar-19	14.00	35	20	2	180	0
23-Mar-19	15.00	35	20	2	180	0
23-Mar-19	16.00	38	20	2	247.5	0
23-Mar-19	17.00	38	20	2	247.5	0
23-Mar-19	18.00	38	20	2	247.5	0
23-Mar-19	19.00	35	20	4	292.5	0
23-Mar-19	20.00	35	20	4	292.5	0
23-Mar-19	21.00	35	20	4	292.5	0
23-Mar-19	22.00	33	21	4	292.5	0
23-Mar-19	23.00	33	21	4	292.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
23-Mar-19	0.00	33	21	4	292.5	0
24-Mar-19	1.00	30	25	2	315	0
24-Mar-19	2.00	30	25	2	315	0
24-Mar-19	3.00	30	25	2	315	0
24-Mar-19	4.00	26	29	2	337.5	0
24-Mar-19	5.00	26	29	2	337.5	0
24-Mar-19	6.00	26	29	2	337.5	0
24-Mar-19	7.00	27	29	1	247.5	0
24-Mar-19	8.00	27	29	1	247.5	0
24-Mar-19	9.00	27	29	1	247.5	0
24-Mar-19	10.00	31	28	1	135	0
24-Mar-19	11.00	31	28	1	135	0
24-Mar-19	12.00	31	28	1	135	0
24-Mar-19	13.00	35	25	3	337.5	0
24-Mar-19	14.00	35	25	3	337.5	0
24-Mar-19	15.00	35	25	3	337.5	0
24-Mar-19	16.00	37	26	4	315	0
24-Mar-19	17.00	37	28	4	315	0
24-Mar-19	18.00	37	28	4	315	0
24-Mar-19	19.00	35	27	4	292.5	0
24-Mar-19	20.00	35	27	4	292.5	0
24-Mar-19	21.00	35	27	4	292.5	0
24-Mar-19	22.00	32	22	3	292.5	0
24-Mar-19	23.00	32	22	3	292.5	0
24-Mar-19	0.00	32	22	3	292.5	0
25-Mar-19	1.00	29	28	4	225	0
25-Mar-19	2.00	29	28	4	225	0
25-Mar-19	3.00	29	28	4	225	0
25-Mar-19	4.00	25	36	3	22.5	0
25-Mar-19	5.00	25	36	3	22.5	0
25-Mar-19	6.00	25	36	3	22.5	0
25-Mar-19	7.00	26	35	3	22.5	0
25-Mar-19	8.00	26	35	3	22.5	0
25-Mar-19	9.00	26	35	3	22.5	0
25-Mar-19	10.00	31	27	4	112.5	0
25-Mar-19	11.00	31	27	4	112.5	0
25-Mar-19	12.00	31	27	4	112.5	0
25-Mar-19	13.00	35	29	5	315	0
25-Mar-19	14.00	35	29	5	315	0
25-Mar-19	15.00	35	29	5	315	0
25-Mar-19	16.00	36	26	6	315	0
25-Mar-19	17.00	36	26	6	315	0
25-Mar-19	18.00	36	26	6	315	0
25-Mar-19	19.00	35	28	5	315	0
25-Mar-19	20.00	35	28	5	315	0
25-Mar-19	21.00	35	28	5	315	0
25-Mar-19	22.00	32	23	3	315	0
25-Mar-19	23.00	32	23	3	315	0
25-Mar-19	0.00	32	23	3	315	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
26-Mar-19	1.00	28	27	3	247.5	0
26-Mar-19	2.00	28	27	3	247.5	0
26-Mar-19	3.00	28	27	3	247.5	0
26-Mar-19	4.00	25	33	4	22.5	0
26-Mar-19	5.00	25	33	4	22.5	0
26-Mar-19	6.00	25	33	4	22.5	0
26-Mar-19	7.00	25	33	3	45	0
26-Mar-19	8.00	25	33	3	45	0
26-Mar-19	9.00	25	33	3	45	0
26-Mar-19	10.00	30	23	3	45	0
26-Mar-19	11.00	30	23	3	45	0
26-Mar-19	12.00	30	23	3	45	0
26-Mar-19	13.00	35	24	3	22.5	0
26-Mar-19	14.00	35	24	3	22.5	0
26-Mar-19	15.00	35	24	3	22.5	0
26-Mar-19	16.00	36	20	4	0	0
26-Mar-19	17.00	36	20	4	0	0
26-Mar-19	18.00	36	20	4	0	0
26-Mar-19	19.00	35	20	5	112.5	0
26-Mar-19	20.00	35	20	5	112.5	0
26-Mar-19	21.00	35	20	5	112.5	0
26-Mar-19	22.00	32	24	4	247.5	0
26-Mar-19	23.00	32	24	4	247.5	0
26-Mar-19	0.00	32	24	4	247.5	0
27-Mar-19	1.00	28	24	4	22.5	0
27-Mar-19	2.00	28	24	4	22.5	0
27-Mar-19	3.00	28	24	4	22.5	0
27-Mar-19	4.00	26	24	3	45	0
27-Mar-19	5.00	26	25	3	45	0
27-Mar-19	6.00	26	25	3	45	0
27-Mar-19	7.00	27	25	2	67.5	0
27-Mar-19	8.00	27	25	2	67.5	0
27-Mar-19	9.00	27	25	2	67.5	0
27-Mar-19	10.00	32	24	1	90	0
27-Mar-19	11.00	32	24	1	90	0
27-Mar-19	12.00	32	24	1	90	0
27-Mar-19	13.00	38	20	2	67.5	0
27-Mar-19	14.00	38	20	2	67.5	0
27-Mar-19	15.00	38	20	2	67.5	0
27-Mar-19	16.00	39	20	3	112.5	0
27-Mar-19	17.00	39	20	3	112.5	0
27-Mar-19	18.00	39	20	3	112.5	0
27-Mar-19	19.00	38	23	3	337.5	0
27-Mar-19	20.00	38	23	3	337.5	0
27-Mar-19	21.00	38	23	3	337.5	0
27-Mar-19	22.00	36	21	3	315	0
27-Mar-19	23.00	36	21	3	315	0
27-Mar-19	0.00	36	21	3	315	0
28-Mar-19	1.00	31	29	3	315	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
28-Mar-19	2.00	31	29	3	315	0
28-Mar-19	3.00	31	29	3	315	0
28-Mar-19	4.00	27	30	3	337.5	0
28-Mar-19	5.00	27	30	3	337.5	0
28-Mar-19	6.00	27	30	3	337.5	0
28-Mar-19	7.00	28	25	2	247.5	0
28-Mar-19	8.00	28	25	2	247.5	0
28-Mar-19	9.00	28	25	2	247.5	0
28-Mar-19	10.00	34	27	2	90	0
28-Mar-19	11.00	34	27	2	90	0
28-Mar-19	12.00	34	27	2	90	0
28-Mar-19	13.00	40	22	2	247.5	0
28-Mar-19	14.00	40	21	2	247.5	0
28-Mar-19	15.00	40	22	2	247.5	0
28-Mar-19	16.00	40	21	4	270	0
28-Mar-19	17.00	40	22	4	270	0
28-Mar-19	18.00	40	21	4	270	0
28-Mar-19	19.00	38	22	5	270	0
28-Mar-19	20.00	38	24	5	270	0
28-Mar-19	21.00	38	24	5	270	0
28-Mar-19	22.00	35	20	3	292.5	0
28-Mar-19	23.00	35	20	3	292.5	0
28-Mar-19	0.00	35	20	3	292.5	0
29-Mar-19	1.00	31	27	3	292.5	0
29-Mar-19	2.00	31	27	3	292.5	0
29-Mar-19	3.00	31	27	3	292.5	0
29-Mar-19	4.00	27	41	2	202.5	0
29-Mar-19	5.00	27	41	2	202.5	0
29-Mar-19	6.00	27	41	2	202.5	0
29-Mar-19	7.00	28	41	1	22.5	0
29-Mar-19	8.00	28	41	1	22.5	0
29-Mar-19	9.00	28	41	1	22.5	0
29-Mar-19	10.00	34	27	1	90	0
29-Mar-19	11.00	34	27	1	90	0
29-Mar-19	12.00	34	27	1	90	0
29-Mar-19	13.00	41	24	2	225	0
29-Mar-19	14.00	41	24	2	225	0
29-Mar-19	15.00	41	24	2	225	0
29-Mar-19	16.00	41	24	5	247.5	0
29-Mar-19	17.00	41	24	5	247.5	0
29-Mar-19	18.00	41	24	5	247.5	0
29-Mar-19	19.00	39	26	5	270	0
29-Mar-19	20.00	39	26	5	270	0
29-Mar-19	21.00	39	26	5	270	0
29-Mar-19	22.00	37	25	3	292.5	0
29-Mar-19	23.00	37	25	3	292.5	0
29-Mar-19	0.00	37	25	3	292.5	0
30-Mar-19	1.00	32	31	3	270	0
30-Mar-19	2.00	32	31	3	270	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
30-Mar-19	3.00	32	31	3	270	0
30-Mar-19	4.00	27	41	3	292.5	0
30-Mar-19	5.00	27	41	3	292.5	0
30-Mar-19	6.00	27	41	3	292.5	0
30-Mar-19	7.00	28	39	2	292.5	0
30-Mar-19	8.00	28	39	2	292.5	0
30-Mar-19	9.00	28	39	2	292.5	0
30-Mar-19	10.00	33	24	3	292.5	0
30-Mar-19	11.00	33	24	3	292.5	0
30-Mar-19	12.00	33	24	3	292.5	0
30-Mar-19	13.00	39	22	4	292.5	0
30-Mar-19	14.00	39	22	4	292.5	0
30-Mar-19	15.00	39	22	4	292.5	0
30-Mar-19	16.00	40	20	5	270	0
30-Mar-19	17.00	40	20	5	270	0
30-Mar-19	18.00	40	20	5	270	0
30-Mar-19	19.00	38	20	5	270	0
30-Mar-19	20.00	38	20	5	270	0
30-Mar-19	21.00	38	20	5	270	0
30-Mar-19	22.00	34	22	3	247.5	0
30-Mar-19	23.00	34	22	3	247.5	0
31-Mar-19	0.00	34	22	3	247.5	0
31-Mar-19	1.00	30	27	3	270	0
31-Mar-19	2.00	30	27	3	270	0
31-Mar-19	3.00	30	27	3	270	0
31-Mar-19	4.00	26	40	2	225	0
31-Mar-19	5.00	26	40	2	225	0
31-Mar-19	6.00	26	40	2	225	0
31-Mar-19	7.00	28	41	1	135	0
31-Mar-19	8.00	28	41	1	135	0
31-Mar-19	9.00	28	41	1	135	0
31-Mar-19	10.00	34	28	1	90	0
31-Mar-19	11.00	34	28	1	90	0
31-Mar-19	12.00	34	28	1	90	0
31-Mar-19	13.00	40	23	2	135	0
31-Mar-19	14.00	40	23	2	135	0
31-Mar-19	15.00	40	23	2	135	0
31-Mar-19	16.00	41	20	3	337.5	0
31-Mar-19	17.00	41	20	3	337.5	0
31-Mar-19	18.00	41	22	3	337.5	0
31-Mar-19	19.00	39	20	4	315	0
31-Mar-19	20.00	39	20	4	315	0
31-Mar-19	21.00	39	20	4	315	0
31-Mar-19	22.00	37	22	3	292.5	0
31-Mar-19	23.00	37	20	3	292.5	0
1-Apr-19	1.00	32	27	2	292.5	0
1-Apr-19	2.00	32	23	2	292.5	0
1-Apr-19	3.00	32	25	2	292.5	0
1-Apr-19	4.00	27	35	2	202.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
1-Apr-19	5.00	27	35	2	202.5	0
1-Apr-19	6.00	27	35	2	202.5	0
1-Apr-19	7.00	29	35	2	67.5	0
1-Apr-19	8.00	29	35	2	67.5	0
1-Apr-19	9.00	29	35	2	67.5	0
1-Apr-19	10.00	34	31	2	202.5	0
1-Apr-19	11.00	34	31	2	202.5	0
1-Apr-19	12.00	34	31	2	202.5	0
1-Apr-19	13.00	40	31	2	315	0
1-Apr-19	14.00	40	31	2	315	0
1-Apr-19	15.00	40	31	2	315	0
1-Apr-19	16.00	40	28	4	337.5	0
1-Apr-19	17.00	40	28	4	337.5	0
1-Apr-19	18.00	40	28	4	337.5	0
1-Apr-19	19.00	38	28	4	337.5	0
1-Apr-19	20.00	38	29	4	337.5	0
1-Apr-19	21.00	38	29	4	337.5	0
1-Apr-19	22.00	35	29	3	337.5	0
1-Apr-19	23.00	35	31	3	337.5	0
1-Apr-19	0.00	35	31	3	337.5	0
2-Apr-19	1.00	31	31	3	315	0
2-Apr-19	2.00	31	31	3	315	0
2-Apr-19	3.00	31	32	3	315	0
2-Apr-19	4.00	27	34	4	337.5	0
2-Apr-19	5.00	27	34	4	337.5	0
2-Apr-19	6.00	27	34	4	337.5	0
2-Apr-19	7.00	28	32	3	292.5	0
2-Apr-19	8.00	28	32	3	292.5	0
2-Apr-19	9.00	28	32	3	292.5	0
2-Apr-19	10.00	34	29	2	225	0
2-Apr-19	11.00	34	29	2	225	0
2-Apr-19	12.00	34	31	2	225	0
2-Apr-19	13.00	39	31	3	292.5	0
2-Apr-19	14.00	39	31	3	292.5	0
2-Apr-19	15.00	39	28	3	292.5	0
2-Apr-19	16.00	41	28	4	292.5	0
2-Apr-19	17.00	41	28	4	292.5	0
2-Apr-19	18.00	41	28	4	292.5	0
2-Apr-19	19.00	39	29	4	270	0
2-Apr-19	20.00	39	29	4	270	0
2-Apr-19	21.00	39	29	4	270	0
2-Apr-19	22.00	37	31	4	270	0
2-Apr-19	23.00	37	31	4	270	0
2-Apr-19	0.00	37	31	4	270	0
3-Apr-19	1.00	32	31	3	292.5	0
3-Apr-19	2.00	32	32	3	292.5	0
3-Apr-19	3.00	32	34	3	292.5	0
3-Apr-19	4.00	27	40	2	337.5	0
3-Apr-19	5.00	27	40	2	337.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
3-Apr-19	6.00	27	40	2	337.5	0
3-Apr-19	7.00	29	42	1	337.5	0
3-Apr-19	8.00	29	42	1	337.5	0
3-Apr-19	9.00	29	42	1	337.5	0
3-Apr-19	10.00	34	23	2	292.5	0
3-Apr-19	11.00	34	23	2	292.5	0
3-Apr-19	12.00	34	23	2	292.5	0
3-Apr-19	13.00	39	31	4	270	0
3-Apr-19	14.00	39	31	4	270	0
3-Apr-19	15.00	39	31	4	270	0
3-Apr-19	16.00	41	28	5	270	0
3-Apr-19	17.00	41	28	5	270	0
3-Apr-19	18.00	41	28	5	270	0
3-Apr-19	19.00	39	28	5	270	0
3-Apr-19	20.00	39	29	5	270	0
3-Apr-19	21.00	39	29	5	270	0
3-Apr-19	22.00	37	29	3	247.5	0
3-Apr-19	23.00	37	31	3	247.5	0
4-Apr-19	0.00	37	31	3	247.5	0
4-Apr-19	1.00	33	31	3	292.5	0
4-Apr-19	2.00	33	31	3	292.5	0
4-Apr-19	3.00	33	32	3	292.5	0
4-Apr-19	4.00	27	34	2	270	0
4-Apr-19	5.00	27	39	2	270	0
4-Apr-19	6.00	27	39	2	270	0
4-Apr-19	7.00	28	39	1	225	0
4-Apr-19	8.00	28	39	1	225	0
4-Apr-19	9.00	28	39	1	225	0
4-Apr-19	10.00	35	31	2	315	0
4-Apr-19	11.00	35	31	2	315	0
4-Apr-19	12.00	35	31	2	315	0
4-Apr-19	13.00	40	28	3	292.5	0
4-Apr-19	14.00	40	28	3	292.5	0
4-Apr-19	15.00	40	28	3	292.5	0
4-Apr-19	16.00	41	28	4	270	0
4-Apr-19	17.00	41	29	4	270	0
4-Apr-19	18.00	41	29	4	270	0
4-Apr-19	19.00	40	29	5	270	0
4-Apr-19	20.00	40	31	5	270	0
4-Apr-19	21.00	40	31	5	270	0
4-Apr-19	22.00	38	31	4	270	0
4-Apr-19	23.00	38	31	4	270	0
4-Apr-19	0.00	38	32	4	270	0
5-Apr-19	1.00	33	34	3	270	0
5-Apr-19	2.00	33	23	3	270	0
5-Apr-19	3.00	33	23	3	270	0
5-Apr-19	4.00	28	41	2	270	0
5-Apr-19	5.00	28	41	2	270	0
5-Apr-19	6.00	28	41	2	270	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
5-Apr-19	7.00	28	48	1	247.5	0
5-Apr-19	8.00	28	48	1	247.5	0
5-Apr-19	9.00	28	48	1	247.5	0
5-Apr-19	10.00	33	34	3	247.5	0
5-Apr-19	11.00	33	34	3	247.5	0
5-Apr-19	12.00	33	34	3	247.5	0
5-Apr-19	13.00	39	31	4	247.5	0
5-Apr-19	14.00	39	31	4	247.5	0
5-Apr-19	15.00	39	31	4	247.5	0
5-Apr-19	16.00	41	28	6	225	0
5-Apr-19	17.00	41	28	6	225	0
5-Apr-19	18.00	41	28	6	225	0
5-Apr-19	19.00	38	28	5	247.5	0
5-Apr-19	20.00	38	29	5	247.5	0
5-Apr-19	21.00	38	29	5	247.5	0
5-Apr-19	22.00	36	29	3	270	0
5-Apr-19	23.00	36	31	3	270	0
5-Apr-19	0.00	36	31	3	270	0
6-Apr-19	1.00	32	31	3	270	0
6-Apr-19	2.00	32	31	3	270	0
6-Apr-19	3.00	32	32	3	270	0
6-Apr-19	4.00	27	34	2	247.5	0
6-Apr-19	5.00	27	53	2	247.5	0
6-Apr-19	6.00	27	53	2	247.5	0
6-Apr-19	7.00	27	52	2	247.5	0
6-Apr-19	8.00	27	52	2	247.5	0
6-Apr-19	9.00	27	52	2	247.5	0
6-Apr-19	10.00	31	36	3	225	0
6-Apr-19	11.00	31	36	3	225	0
6-Apr-19	12.00	31	36	3	225	0
6-Apr-19	13.00	37	22	4	247.5	0
6-Apr-19	14.00	37	22	4	247.5	0
6-Apr-19	15.00	37	22	4	247.5	0
6-Apr-19	16.00	40	25	5	247.5	0
6-Apr-19	17.00	40	25	5	247.5	0
6-Apr-19	18.00	40	25	5	247.5	0
6-Apr-19	19.00	38	29	5	247.5	0
6-Apr-19	20.00	38	31	5	247.5	0
6-Apr-19	21.00	38	28	5	247.5	0
6-Apr-19	22.00	36	28	4	247.5	0
6-Apr-19	23.00	36	28	4	247.5	0
6-Apr-19	0.00	36	28	4	247.5	0
7-Apr-19	1.00	30	29	4	247.5	0
7-Apr-19	2.00	30	29	4	247.5	0
7-Apr-19	3.00	30	29	4	247.5	0
7-Apr-19	4.00	28	31	3	270	0
7-Apr-19	5.00	28	31	3	270	0
7-Apr-19	6.00	28	31	3	270	0
7-Apr-19	7.00	28	31	3	270	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
7-Apr-19	8.00	28	32	3	270	0
7-Apr-19	9.00	28	34	3	270	0
7-Apr-19	10.00	34	36	3	247.5	0
7-Apr-19	11.00	34	36	3	247.5	0
7-Apr-19	12.00	34	36	3	247.5	0
7-Apr-19	13.00	40	33	5	270	0
7-Apr-19	14.00	40	28	5	270	0
7-Apr-19	15.00	40	28	5	270	0
7-Apr-19	16.00	42	28	6	270	0
7-Apr-19	17.00	42	28	6	270	0
7-Apr-19	18.00	42	29	6	270	0
7-Apr-19	19.00	40	29	5	270	0
7-Apr-19	20.00	40	29	5	270	0
7-Apr-19	21.00	40	31	5	270	0
7-Apr-19	22.00	35	31	3	247.5	0
7-Apr-19	23.00	35	31	3	247.5	0
7-Apr-19	0.00	35	31	3	247.5	0
8-Apr-19	1.00	31	32	3	247.5	0
8-Apr-19	2.00	31	34	3	247.5	0
8-Apr-19	3.00	31	38	3	247.5	0
8-Apr-19	4.00	30	44	3	292.5	0
8-Apr-19	5.00	30	44	3	292.5	0
8-Apr-19	6.00	30	44	3	292.5	0
8-Apr-19	7.00	29	44	3	292.5	0
8-Apr-19	8.00	29	44	3	292.5	0
8-Apr-19	9.00	29	44	3	292.5	0
8-Apr-19	10.00	34	30	3	247.5	0
8-Apr-19	11.00	34	30	3	247.5	0
8-Apr-19	12.00	34	30	3	247.5	0
8-Apr-19	13.00	40	33	5	270	0
8-Apr-19	14.00	40	28	5	270	0
8-Apr-19	15.00	40	28	5	270	0
8-Apr-19	16.00	41	28	6	270	0
8-Apr-19	17.00	41	28	6	270	0
8-Apr-19	18.00	41	29	6	270	0
8-Apr-19	19.00	40	29	5	292.5	0
8-Apr-19	20.00	40	29	5	292.5	0
8-Apr-19	21.00	40	31	5	292.5	0
8-Apr-19	22.00	37	31	3	270	0
8-Apr-19	23.00	37	31	3	270	0
8-Apr-19	0.00	37	28	3	270	0
9-Apr-19	1.00	33	28	3	247.5	0
9-Apr-19	2.00	33	28	3	247.5	0
9-Apr-19	3.00	33	28	3	247.5	0
9-Apr-19	4.00	28	28	3	292.5	0
9-Apr-19	5.00	28	29	3	292.5	0
9-Apr-19	6.00	28	29	3	292.5	0
9-Apr-19	7.00	27	29	3	292.5	0
9-Apr-19	8.00	27	31	3	292.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
9-Apr-19	9.00	27	31	3	292.5	0
9-Apr-19	10.00	32	31	4	270	0
9-Apr-19	11.00	32	37	4	270	0
9-Apr-19	12.00	32	37	4	270	0
9-Apr-19	13.00	39	31	5	270	0
9-Apr-19	14.00	39	31	5	270	0
9-Apr-19	15.00	39	28	5	270	0
9-Apr-19	16.00	41	28	6	270	0
9-Apr-19	17.00	41	28	6	270	0
9-Apr-19	18.00	41	28	6	270	0
9-Apr-19	19.00	38	28	6	292.5	0
9-Apr-19	20.00	38	29	6	292.5	0
9-Apr-19	21.00	38	29	6	292.5	0
9-Apr-19	22.00	34	29	4	292.5	0
9-Apr-19	23.00	34	31	4	292.5	0
9-Apr-19	0.00	34	31	4	292.5	0
10-Apr-19	1.00	30	31	4	270	0
10-Apr-19	2.00	30	28	4	270	0
10-Apr-19	3.00	30	28	4	270	0
10-Apr-19	4.00	27	28	3	292.5	0
10-Apr-19	5.00	27	28	3	292.5	0
10-Apr-19	6.00	27	28	3	292.5	0
10-Apr-19	7.00	28	29	3	292.5	0
10-Apr-19	8.00	28	29	3	292.5	0
10-Apr-19	9.00	28	29	3	292.5	0
10-Apr-19	10.00	33	31	3	292.5	0
10-Apr-19	11.00	33	38	3	292.5	0
10-Apr-19	12.00	33	38	3	292.5	0
10-Apr-19	13.00	39	35	4	270	0
10-Apr-19	14.00	39	31	4	270	0
10-Apr-19	15.00	39	28	4	270	0
10-Apr-19	16.00	41	28	5	270	0
10-Apr-19	17.00	41	28	5	270	0
10-Apr-19	18.00	41	28	5	270	0
10-Apr-19	19.00	39	28	6	292.5	0
10-Apr-19	20.00	39	29	6	292.5	0
10-Apr-19	21.00	39	29	6	292.5	0
10-Apr-19	22.00	35	29	4	292.5	0
10-Apr-19	23.00	35	31	4	292.5	0
10-Apr-19	0.00	35	35	4	292.5	0
11-Apr-19	1.00	31	31	3	292.5	0
11-Apr-19	2.00	31	28	3	292.5	0
11-Apr-19	3.00	31	28	3	292.5	0
11-Apr-19	4.00	29	28	4	292.5	0
11-Apr-19	5.00	29	28	4	292.5	0
11-Apr-19	6.00	29	28	4	292.5	0
11-Apr-19	7.00	29	29	3	315	0
11-Apr-19	8.00	29	29	3	315	0
11-Apr-19	9.00	29	29	3	315	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
11-Apr-19	10.00	34	31	4	292.5	0
11-Apr-19	11.00	34	34	4	292.5	0
11-Apr-19	12.00	34	34	4	292.5	0
11-Apr-19	13.00	40	35	5	292.5	0
11-Apr-19	14.00	40	31	5	292.5	0
11-Apr-19	15.00	40	28	5	292.5	0
11-Apr-19	16.00	42	28	5	270	0
11-Apr-19	17.00	42	28	5	270	0
11-Apr-19	18.00	42	28	5	270	0
11-Apr-19	19.00	40	28	5	292.5	0
11-Apr-19	20.00	40	29	5	292.5	0
11-Apr-19	21.00	40	29	5	292.5	0
11-Apr-19	22.00	36	29	4	315	0
11-Apr-19	23.00	36	31	4	315	0
12-Apr-19	0.00	36	31	4	315	0
12-Apr-19	1.00	32	31	3	292.5	0
12-Apr-19	2.00	32	28	3	292.5	0
12-Apr-19	3.00	32	28	3	292.5	0
12-Apr-19	4.00	29	28	4	292.5	0
12-Apr-19	5.00	29	29	4	292.5	0
12-Apr-19	6.00	29	29	4	292.5	0
12-Apr-19	7.00	29	29	4	315	0
12-Apr-19	8.00	29	43	4	315	0
12-Apr-19	9.00	29	43	4	315	0
12-Apr-19	10.00	35	30	4	315	0
12-Apr-19	11.00	35	30	4	315	0
12-Apr-19	12.00	35	30	4	315	0
12-Apr-19	13.00	40	28	4	270	0
12-Apr-19	14.00	40	28	4	270	0
12-Apr-19	15.00	40	28	4	270	0
12-Apr-19	16.00	42	29	5	247.5	0
12-Apr-19	17.00	42	29	5	247.5	0
12-Apr-19	18.00	42	29	5	247.5	0
12-Apr-19	19.00	40	29	5	292.5	0
12-Apr-19	20.00	40	29	5	292.5	0
12-Apr-19	21.00	40	29	5	292.5	0
12-Apr-19	22.00	36	29	4	315	0
12-Apr-19	23.00	36	29	4	315	0
12-Apr-19	0.00	36	29	4	315	0
13-Apr-19	1.00	33	24	3	315	0
13-Apr-19	2.00	33	24	3	315	0
13-Apr-19	3.00	33	24	3	315	0
13-Apr-19	4.00	28	35	4	315	0
13-Apr-19	5.00	28	35	4	315	0
13-Apr-19	6.00	28	35	4	315	0
13-Apr-19	7.00	28	45	4	315	0
13-Apr-19	8.00	28	45	4	315	0
13-Apr-19	9.00	28	45	4	315	0
13-Apr-19	10.00	34	32	4	315	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
13-Apr-19	11.00	34	32	4	315	0
13-Apr-19	12.00	34	32	4	315	0
13-Apr-19	13.00	40	31	4	292.5	0
13-Apr-19	14.00	40	28	4	292.5	0
13-Apr-19	15.00	40	28	4	292.5	0
13-Apr-19	16.00	42	28	5	247.5	0
13-Apr-19	17.00	42	28	5	247.5	0
13-Apr-19	18.00	42	28	5	247.5	0
13-Apr-19	19.00	40	29	5	270	0
13-Apr-19	20.00	40	29	5	270	0
13-Apr-19	21.00	40	29	5	270	0
13-Apr-19	22.00	36	31	3	270	0
13-Apr-19	23.00	36	31	3	270	0
13-Apr-19	0.00	36	31	3	270	0
14-Apr-19	1.00	32	28	2	315	0
14-Apr-19	2.00	32	28	2	315	0
14-Apr-19	3.00	32	28	2	315	0
14-Apr-19	4.00	29	28	3	315	0
14-Apr-19	5.00	29	28	3	315	0
14-Apr-19	6.00	29	28	3	315	0
14-Apr-19	7.00	29	28	3	315	0
14-Apr-19	8.00	29	29	3	315	0
14-Apr-19	9.00	29	29	3	315	0
14-Apr-19	10.00	35	29	3	292.5	0
14-Apr-19	11.00	35	31	3	292.5	0
14-Apr-19	12.00	35	31	3	292.5	0
14-Apr-19	13.00	41	31	4	270	0
14-Apr-19	14.00	41	31	4	270	0
14-Apr-19	15.00	41	31	4	270	0
14-Apr-19	16.00	42	31	5	270	0
14-Apr-19	17.00	42	28	5	270	0
14-Apr-19	18.00	42	28	5	270	0
14-Apr-19	19.00	40	28	6	292.5	0
14-Apr-19	20.00	40	28	6	292.5	0
14-Apr-19	21.00	40	28	6	292.5	0
14-Apr-19	22.00	36	28	4	315	0
14-Apr-19	23.00	36	28	4	315	0
14-Apr-19	0.00	36	28	4	315	0
15-Apr-19	1.00	32	28	10	292.5	0
15-Apr-19	2.00	32	30	10	292.5	0
15-Apr-19	3.00	32	30	10	292.5	0
15-Apr-19	4.00	29	33	9	292.5	0
15-Apr-19	5.00	29	33	9	292.5	0
15-Apr-19	6.00	29	33	9	292.5	0
15-Apr-19	7.00	29	31	11	292.5	0
15-Apr-19	8.00	29	31	11	292.5	0
15-Apr-19	9.00	29	31	11	292.5	0
15-Apr-19	10.00	33	29	13	270	0
15-Apr-19	11.00	33	29	13	270	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
15-Apr-19	12.00	33	31	13	270	0
15-Apr-19	13.00	38	31	18	270	0
15-Apr-19	14.00	38	31	18	270	0
15-Apr-19	15.00	38	31	18	270	0
15-Apr-19	16.00	38	31	20	270	0
15-Apr-19	17.00	38	31	20	270	0
15-Apr-19	18.00	38	28	20	270	0
15-Apr-19	19.00	35	28	18	247.5	0
15-Apr-19	20.00	35	28	18	247.5	0
15-Apr-19	21.00	35	28	18	247.5	0
15-Apr-19	22.00	32	28	19	315	0
15-Apr-19	23.00	32	29	19	315	0
15-Apr-19	0.00	32	29	19	315	0
16-Apr-19	1.00	29	34	13	247.5	0
16-Apr-19	2.00	29	34	13	247.5	0
16-Apr-19	3.00	29	34	13	247.5	0
16-Apr-19	4.00	28	38	5	135	0
16-Apr-19	5.00	28	38	5	135	0
16-Apr-19	6.00	28	38	5	135	0
16-Apr-19	7.00	27	44	6	315	0
16-Apr-19	8.00	27	44	6	315	0
16-Apr-19	9.00	27	44	6	315	0
16-Apr-19	10.00	29	46	15	270	0
16-Apr-19	11.00	29	46	15	270	0
16-Apr-19	12.00	29	46	15	270	0
16-Apr-19	13.00	33	35	21	247.5	0
16-Apr-19	14.00	33	35	21	247.5	0
16-Apr-19	15.00	33	35	21	247.5	0
16-Apr-19	16.00	33	34	26	247.5	0
16-Apr-19	17.00	33	34	26	247.5	0
16-Apr-19	18.00	33	34	26	247.5	0
16-Apr-19	19.00	30	40	23	270	0
16-Apr-19	20.00	30	40	23	270	0
16-Apr-19	21.00	30	40	23	270	0
16-Apr-19	22.00	27	44	17	270	0
16-Apr-19	23.00	27	44	17	270	0
16-Apr-19	0.00	27	44	17	270	0
17-Apr-19	1.00	25	48	13	270	0
17-Apr-19	2.00	25	48	13	270	0
17-Apr-19	3.00	25	48	13	270	0
17-Apr-19	4.00	24	54	12	270	0
17-Apr-19	5.00	24	54	12	270	0
17-Apr-19	6.00	24	54	12	270	0
17-Apr-19	7.00	24	59	13	270	0
17-Apr-19	8.00	24	59	13	270	0
17-Apr-19	9.00	24	59	13	270	0
17-Apr-19	10.00	28	43	17	247.5	0
17-Apr-19	11.00	28	43	17	247.5	0
17-Apr-19	12.00	28	43	17	247.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
17-Apr-19	13.00	32	23	18	247.5	0
17-Apr-19	14.00	32	23	18	247.5	0
17-Apr-19	15.00	32	23	18	247.5	0
17-Apr-19	16.00	33	31	21	270	0
17-Apr-19	17.00	33	31	21	270	0
17-Apr-19	18.00	33	29	21	270	0
17-Apr-19	19.00	31	29	18	270	0
17-Apr-19	20.00	31	31	18	270	0
17-Apr-19	21.00	31	31	18	270	0
17-Apr-19	22.00	28	31	8	270	0
17-Apr-19	23.00	28	31	8	270	0
17-Apr-19	0.00	28	31	8	270	0
18-Apr-19	1.00	27	31	5	292.5	0
18-Apr-19	2.00	27	33	5	292.5	0
18-Apr-19	3.00	27	39	5	292.5	0
18-Apr-19	4.00	25	48	6	292.5	0
18-Apr-19	5.00	25	48	6	292.5	0
18-Apr-19	6.00	25	48	6	292.5	0
18-Apr-19	7.00	26	52	4	202.5	0
18-Apr-19	8.00	26	52	4	202.5	0
18-Apr-19	9.00	26	52	4	202.5	0
18-Apr-19	10.00	30	30	10	135	0
18-Apr-19	11.00	30	30	10	135	0
18-Apr-19	12.00	30	30	10	135	0
18-Apr-19	13.00	34	29	15	270	0
18-Apr-19	14.00	34	29	15	270	0
18-Apr-19	15.00	34	31	15	270	0
18-Apr-19	16.00	35	31	19	270	0
18-Apr-19	17.00	35	31	19	270	0
18-Apr-19	18.00	35	31	19	270	0
18-Apr-19	19.00	34	31	17	247.5	0
18-Apr-19	20.00	34	31	17	247.5	0
18-Apr-19	21.00	34	31	17	247.5	0
18-Apr-19	22.00	31	31	12	247.5	0
18-Apr-19	23.00	31	23	12	247.5	0
18-Apr-19	0.00	31	23	12	247.5	0
19-Apr-19	1.00	28	26	10	22.5	0
19-Apr-19	2.00	28	26	10	22.5	0
19-Apr-19	3.00	28	26	10	22.5	0
19-Apr-19	4.00	28	29	6	45	0
19-Apr-19	5.00	28	29	6	45	0
19-Apr-19	6.00	28	29	6	45	0
19-Apr-19	7.00	28	31	5	67.5	0
19-Apr-19	8.00	28	31	5	67.5	0
19-Apr-19	9.00	28	31	5	67.5	0
19-Apr-19	10.00	32	25	11	157.5	0
19-Apr-19	11.00	32	25	11	157.5	0
19-Apr-19	12.00	32	25	11	157.5	0
19-Apr-19	13.00	35	30	14	270	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
19-Apr-19	14.00	35	29	14	270	0
19-Apr-19	15.00	35	29	14	270	0
19-Apr-19	16.00	36	31	15	247.5	0
19-Apr-19	17.00	36	31	15	247.5	0
19-Apr-19	18.00	36	31	15	247.5	0
19-Apr-19	19.00	35	31	14	0	0
19-Apr-19	20.00	35	31	14	0	0
19-Apr-19	21.00	35	31	14	0	0
19-Apr-19	22.00	30	30	9	22.5	0
19-Apr-19	23.00	30	30	9	22.5	0
19-Apr-19	0.00	30	30	9	22.5	0
20-Apr-19	1.00	28	25	7	112.5	0
20-Apr-19	2.00	28	25	7	112.5	0
20-Apr-19	3.00	28	25	7	112.5	0
20-Apr-19	4.00	27	37	9	315	0
20-Apr-19	5.00	27	37	9	315	0
20-Apr-19	6.00	27	37	9	315	0
20-Apr-19	7.00	29	40	6	315	0
20-Apr-19	8.00	29	40	6	315	0
20-Apr-19	9.00	29	40	6	315	0
20-Apr-19	10.00	33	27	7	270	0
20-Apr-19	11.00	33	27	7	270	0
20-Apr-19	12.00	33	27	7	270	0
20-Apr-19	13.00	37	31	9	270	0
20-Apr-19	14.00	37	31	9	270	0
20-Apr-19	15.00	37	31	9	270	0
20-Apr-19	16.00	38	36	14	270	0
20-Apr-19	17.00	38	36	14	270	0
20-Apr-19	18.00	38	36	14	270	0
20-Apr-19	19.00	37	28	18	270	0
20-Apr-19	20.00	37	28	18	270	0
20-Apr-19	21.00	37	28	18	270	0
20-Apr-19	22.00	34	32	14	270	0
20-Apr-19	23.00	34	32	14	270	0
20-Apr-19	0.00	34	32	14	270	0
21-Apr-19	1.00	31	29	9	292.5	0
21-Apr-19	2.00	31	29	9	292.5	0
21-Apr-19	3.00	31	29	9	292.5	0
21-Apr-19	4.00	27	30	8	202.5	0
21-Apr-19	5.00	27	30	8	202.5	0
21-Apr-19	6.00	27	30	8	202.5	0
21-Apr-19	7.00	28	26	8	112.5	0
21-Apr-19	8.00	28	31	8	112.5	0
21-Apr-19	9.00	28	31	8	112.5	0
21-Apr-19	10.00	33	31	11	315	0
21-Apr-19	11.00	33	36	11	315	0
21-Apr-19	12.00	33	36	11	315	0
21-Apr-19	13.00	38	36	11	292.5	0
21-Apr-19	14.00	38	28	11	292.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
21-Apr-19	15.00	38	28	11	292.5	0
21-Apr-19	16.00	40	28	11	270	0
21-Apr-19	17.00	40	32	11	270	0
21-Apr-19	18.00	40	32	11	270	0
21-Apr-19	19.00	38	32	17	270	0
21-Apr-19	20.00	38	29	17	270	0
21-Apr-19	21.00	38	29	17	270	0
21-Apr-19	22.00	36	29	14	270	0
21-Apr-19	23.00	36	30	14	270	0
21-Apr-19	0.00	36	30	14	270	0
22-Apr-19	1.00	31	30	11	292.5	0
22-Apr-19	2.00	31	26	11	292.5	0
22-Apr-19	3.00	31	40	11	292.5	0
22-Apr-19	4.00	27	59	8	315	0
22-Apr-19	5.00	27	59	8	315	0
22-Apr-19	6.00	27	59	8	315	0
22-Apr-19	7.00	29	52	6	337.5	0
22-Apr-19	8.00	29	52	6	337.5	0
22-Apr-19	9.00	29	52	6	337.5	0
22-Apr-19	10.00	34	26	9	315	0
22-Apr-19	11.00	34	26	9	315	0
22-Apr-19	12.00	34	26	9	315	0
22-Apr-19	13.00	40	31	8	292.5	0
22-Apr-19	14.00	40	31	8	292.5	0
22-Apr-19	15.00	40	31	8	292.5	0
22-Apr-19	16.00	43	36	3	292.5	0
22-Apr-19	17.00	43	36	3	292.5	0
22-Apr-19	18.00	43	36	3	292.5	0
22-Apr-19	19.00	42	28	10	270	0
22-Apr-19	20.00	42	28	10	270	0
22-Apr-19	21.00	42	28	10	270	0
22-Apr-19	22.00	38	32	15	270	0
22-Apr-19	23.00	38	32	15	270	0
22-Apr-19	0.00	38	32	15	270	0
23-Apr-19	1.00	34	29	10	292.5	0
23-Apr-19	2.00	34	29	10	292.5	0
23-Apr-19	3.00	34	29	10	292.5	0
23-Apr-19	4.00	28	30	10	292.5	0
23-Apr-19	5.00	28	30	10	292.5	0
23-Apr-19	6.00	28	30	10	292.5	0
23-Apr-19	7.00	29	26	7	292.5	0
23-Apr-19	8.00	29	56	7	292.5	0
23-Apr-19	9.00	29	56	7	292.5	0
23-Apr-19	10.00	34	34	11	270	0
23-Apr-19	11.00	34	34	11	270	0
23-Apr-19	12.00	34	34	11	270	0
23-Apr-19	13.00	40	34	14	247.5	0
23-Apr-19	14.00	40	34	14	247.5	0
23-Apr-19	15.00	40	31	14	247.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
23-Apr-19	16.00	42	31	18	225	0
23-Apr-19	17.00	42	31	18	225	0
23-Apr-19	18.00	42	36	18	225	0
23-Apr-19	19.00	40	36	21	247.5	0
23-Apr-19	20.00	40	36	21	247.5	0
23-Apr-19	21.00	40	28	21	247.5	0
23-Apr-19	22.00	37	28	13	292.5	0
23-Apr-19	23.00	37	28	13	292.5	0
23-Apr-19	0.00	37	32	13	292.5	0
24-Apr-19	1.00	33	32	10	315	0
24-Apr-19	2.00	33	32	10	315	0
24-Apr-19	3.00	33	42	10	315	0
24-Apr-19	4.00	28	49	8	292.5	0
24-Apr-19	5.00	28	55	8	292.5	0
24-Apr-19	6.00	28	55	8	292.5	0
24-Apr-19	7.00	29	56	8	292.5	0
24-Apr-19	8.00	29	56	8	292.5	0
24-Apr-19	9.00	29	56	8	292.5	0
24-Apr-19	10.00	33	35	12	292.5	0
24-Apr-19	11.00	33	35	12	292.5	0
24-Apr-19	12.00	33	35	12	292.5	0
24-Apr-19	13.00	39	28	15	270	0
24-Apr-19	14.00	39	28	15	270	0
24-Apr-19	15.00	39	28	15	270	0
24-Apr-19	16.00	41	26	19	270	0
24-Apr-19	17.00	41	25	19	270	0
24-Apr-19	18.00	41	25	19	270	0
24-Apr-19	19.00	39	25	18	270	0
24-Apr-19	20.00	39	35	18	270	0
24-Apr-19	21.00	39	28	18	270	0
24-Apr-19	22.00	35	28	12	292.5	0
24-Apr-19	23.00	35	28	12	292.5	0
24-Apr-19	0.00	35	26	12	292.5	0
25-Apr-19	1.00	30	25	15	292.5	0
25-Apr-19	2.00	30	25	15	292.5	0
25-Apr-19	3.00	30	25	15	292.5	0
25-Apr-19	4.00	27	25	13	292.5	0
25-Apr-19	5.00	27	25	13	292.5	0
25-Apr-19	6.00	27	32	13	292.5	0
25-Apr-19	7.00	27	32	10	292.5	0
25-Apr-19	8.00	27	32	10	292.5	0
25-Apr-19	9.00	27	42	10	292.5	0
25-Apr-19	10.00	33	49	13	292.5	0
25-Apr-19	11.00	33	55	13	292.5	0
25-Apr-19	12.00	33	55	13	292.5	0
25-Apr-19	13.00	40	56	19	270	0
25-Apr-19	14.00	40	56	19	270	0
25-Apr-19	15.00	40	56	19	270	0
25-Apr-19	16.00	41	31	23	270	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
25-Apr-19	17.00	41	31	23	270	0
25-Apr-19	18.00	41	31	23	270	0
25-Apr-19	19.00	39	36	19	270	0
25-Apr-19	20.00	39	36	19	270	0
25-Apr-19	21.00	39	36	19	270	0
25-Apr-19	22.00	36	28	9	247.5	0
25-Apr-19	23.00	36	28	9	247.5	0
25-Apr-19	0.00	36	28	9	247.5	0
26-Apr-19	1.00	32	32	9	270	0
26-Apr-19	2.00	32	32	9	270	0
26-Apr-19	3.00	32	32	9	270	0
26-Apr-19	4.00	29	29	9	270	0
26-Apr-19	5.00	29	29	9	270	0
26-Apr-19	6.00	29	29	9	270	0
26-Apr-19	7.00	29	30	9	270	0
26-Apr-19	8.00	29	30	9	270	0
26-Apr-19	9.00	29	30	9	270	0
26-Apr-19	10.00	34	26	12	270	0
26-Apr-19	11.00	34	36	12	270	0
26-Apr-19	12.00	34	36	12	270	0
26-Apr-19	13.00	40	31	15	292.5	0
26-Apr-19	14.00	40	31	15	292.5	0
26-Apr-19	15.00	40	31	15	292.5	0
26-Apr-19	16.00	42	36	16	292.5	0
26-Apr-19	17.00	42	36	16	292.5	0
26-Apr-19	18.00	42	36	16	292.5	0
26-Apr-19	19.00	41	28	15	292.5	0
26-Apr-19	20.00	41	28	15	292.5	0
26-Apr-19	21.00	41	28	15	292.5	0
26-Apr-19	22.00	38	32	13	270	0
26-Apr-19	23.00	38	32	13	270	0
26-Apr-19	0.00	38	32	13	270	0
27-Apr-19	1.00	34	29	13	292.5	0
27-Apr-19	2.00	34	29	13	292.5	0
27-Apr-19	3.00	34	29	13	292.5	0
27-Apr-19	4.00	30	30	12	292.5	0
27-Apr-19	5.00	30	30	12	292.5	0
27-Apr-19	6.00	30	30	12	292.5	0
27-Apr-19	7.00	31	30	11	315	0
27-Apr-19	8.00	31	30	11	315	0
27-Apr-19	9.00	31	30	11	315	0
27-Apr-19	10.00	37	30	13	315	0
27-Apr-19	11.00	37	30	13	315	0
27-Apr-19	12.00	37	36	13	315	0
27-Apr-19	13.00	42	36	19	315	0
27-Apr-19	14.00	42	28	19	315	0
27-Apr-19	15.00	42	28	19	315	0
27-Apr-19	16.00	43	28	21	292.5	0
27-Apr-19	17.00	43	32	21	292.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
27-Apr-19	18.00	43	32	21	292.5	0
27-Apr-19	19.00	41	32	20	270	0
27-Apr-19	20.00	41	29	20	270	0
27-Apr-19	21.00	41	29	20	270	0
27-Apr-19	22.00	37	29	15	270	0
27-Apr-19	23.00	37	30	15	270	0
27-Apr-19	0.00	37	30	15	270	0
28-Apr-19	1.00	32	30	11	270	0
28-Apr-19	2.00	32	26	11	270	0
28-Apr-19	3.00	32	30	11	270	0
28-Apr-19	4.00	29	28	9	292.5	0
28-Apr-19	5.00	29	28	9	292.5	0
28-Apr-19	6.00	29	28	9	292.5	0
28-Apr-19	7.00	30	29	9	315	0
28-Apr-19	8.00	30	30	9	315	0
28-Apr-19	9.00	30	30	9	315	0
28-Apr-19	10.00	36	30	12	315	0
28-Apr-19	11.00	36	26	12	315	0
28-Apr-19	12.00	36	30	12	315	0
28-Apr-19	13.00	41	28	19	292.5	0
28-Apr-19	14.00	41	28	19	292.5	0
28-Apr-19	15.00	41	28	19	292.5	0
28-Apr-19	16.00	42	28	22	270	0
28-Apr-19	17.00	42	28	22	270	0
28-Apr-19	18.00	42	28	22	270	0
28-Apr-19	19.00	40	30	18	270	0
28-Apr-19	20.00	40	30	18	270	0
28-Apr-19	21.00	40	30	18	270	0
28-Apr-19	22.00	38	26	10	247.5	0
28-Apr-19	23.00	38	30	10	247.5	0
28-Apr-19	0.00	38	28	10	247.5	0
29-Apr-19	1.00	34	28	9	247.5	0
29-Apr-19	2.00	34	28	9	247.5	0
29-Apr-19	3.00	34	41	9	247.5	0
29-Apr-19	4.00	28	41	8	247.5	0
29-Apr-19	5.00	28	41	8	247.5	0
29-Apr-19	6.00	28	42	8	247.5	0
29-Apr-19	7.00	29	42	7	247.5	0
29-Apr-19	8.00	29	42	7	247.5	0
29-Apr-19	9.00	29	40	7	247.5	0
29-Apr-19	10.00	34	32	12	247.5	0
29-Apr-19	11.00	34	32	12	247.5	0
29-Apr-19	12.00	34	32	12	247.5	0
29-Apr-19	13.00	40	26	19	247.5	0
29-Apr-19	14.00	40	30	19	247.5	0
29-Apr-19	15.00	40	28	19	247.5	0
29-Apr-19	16.00	41	28	24	247.5	0
29-Apr-19	17.00	41	28	24	247.5	0
29-Apr-19	18.00	41	28	24	247.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
29-Apr-19	19.00	39	28	21	247.5	0
29-Apr-19	20.00	39	28	21	247.5	0
29-Apr-19	21.00	39	30	21	247.5	0
29-Apr-19	22.00	37	30	13	247.5	0
29-Apr-19	23.00	37	30	13	247.5	0
29-Apr-19	0.00	37	30	13	247.5	0
30-Apr-19	1.00	33	30	14	247.5	0
30-Apr-19	2.00	33	37	14	247.5	0
30-Apr-19	3.00	33	37	14	247.5	0
30-Apr-19	4.00	28	47	10	247.5	0
30-Apr-19	5.00	28	47	10	247.5	0
30-Apr-19	6.00	28	47	10	247.5	0
30-Apr-19	7.00	28	49	11	225	0
30-Apr-19	8.00	28	49	11	225	0
30-Apr-19	9.00	28	49	11	225	0
30-Apr-19	10.00	33	32	18	247.5	0
30-Apr-19	11.00	33	32	18	247.5	0
30-Apr-19	12.00	33	32	18	247.5	0
30-Apr-19	13.00	40	32	24	247.5	0
30-Apr-19	14.00	40	32	24	247.5	0
30-Apr-19	15.00	40	32	24	247.5	0
30-Apr-19	16.00	41	29	27	247.5	0
30-Apr-19	17.00	41	29	27	247.5	0
30-Apr-19	18.00	41	29	27	247.5	0
30-Apr-19	19.00	39	24	19	247.5	0
30-Apr-19	20.00	39	23	19	247.5	0
30-Apr-19	21.00	39	23	19	247.5	0
30-Apr-19	22.00	36	23	10	247.5	0
30-Apr-19	23.00	36	22	10	247.5	0
30-Apr-19	0.00	36	22	10	247.5	0
1-May-19	1.00	32	28	12	225	0
1-May-19	2.00	32	28	12	225	0
1-May-19	3.00	32	38	12	225	0
1-May-19	4.00	28	38	11	202.5	0
1-May-19	5.00	28	38	11	202.5	0
1-May-19	6.00	28	42	11	202.5	0
1-May-19	7.00	28	42	13	225	0
1-May-19	8.00	28	42	13	225	0
1-May-19	9.00	28	36	13	225	0
1-May-19	10.00	33	36	19	247.5	0
1-May-19	11.00	33	62	19	247.5	0
1-May-19	12.00	33	62	19	247.5	0
1-May-19	13.00	39	62	18	270	0
1-May-19	14.00	39	43	18	270	0
1-May-19	15.00	39	39	18	270	0
1-May-19	16.00	40	39	15	270	0
1-May-19	17.00	40	39	15	270	0
1-May-19	18.00	40	32	15	270	0
1-May-19	19.00	39	32	14	247.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
1-May-19	20.00	39	32	14	247.5	0
1-May-19	21.00	39	34	14	247.5	0
1-May-19	22.00	37	34	12	247.5	0
1-May-19	23.00	37	34	12	247.5	0
1-May-19	0.00	37	32	12	247.5	0
2-May-19	1.00	32	32	9	225	0
2-May-19	2.00	32	32	9	225	0
2-May-19	3.00	32	33	9	225	0
2-May-19	4.00	29	33	8	247.5	0
2-May-19	5.00	29	33	8	247.5	0
2-May-19	6.00	29	36	8	247.5	0
2-May-19	7.00	29	36	8	247.5	0
2-May-19	8.00	29	36	8	247.5	0
2-May-19	9.00	29	32	8	247.5	0
2-May-19	10.00	33	32	12	247.5	0
2-May-19	11.00	33	34	12	247.5	0
2-May-19	12.00	33	34	12	247.5	0
2-May-19	13.00	39	34	14	247.5	0
2-May-19	14.00	39	34	14	247.5	0
2-May-19	15.00	39	34	14	247.5	0
2-May-19	16.00	41	29	14	247.5	0
2-May-19	17.00	41	29	14	247.5	0
2-May-19	18.00	41	29	14	247.5	0
2-May-19	19.00	40	29	15	247.5	0
2-May-19	20.00	40	29	15	247.5	0
2-May-19	21.00	40	29	15	247.5	0
2-May-19	22.00	37	29	13	270	0
2-May-19	23.00	37	29	13	270	0
2-May-19	0.00	37	29	13	270	0
3-May-19	1.00	33	32	10	270	0
3-May-19	2.00	33	34	10	270	0
3-May-19	3.00	33	33	10	270	0
3-May-19	4.00	28	33	10	247.5	0
3-May-19	5.00	28	33	10	247.5	0
3-May-19	6.00	28	36	10	247.5	0
3-May-19	7.00	28	36	10	247.5	0
3-May-19	8.00	28	36	10	247.5	0
3-May-19	9.00	28	28	10	247.5	0
3-May-19	10.00	33	28	12	270	0
3-May-19	11.00	33	28	12	270	0
3-May-19	12.00	33	28	12	270	0
3-May-19	13.00	39	28	11	292.5	0
3-May-19	14.00	39	28	11	292.5	0
3-May-19	15.00	39	26	11	292.5	0
3-May-19	16.00	42	26	10	292.5	0
3-May-19	17.00	42	26	10	292.5	0
3-May-19	18.00	42	26	10	292.5	0
3-May-19	19.00	40	26	16	270	0
3-May-19	20.00	40	28	16	270	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
3-May-19	21.00	40	28	16	270	0
3-May-19	22.00	38	31	15	247.5	0
3-May-19	23.00	38	31	15	247.5	0
3-May-19	0.00	38	41	15	247.5	0
4-May-19	1.00	34	41	10	270	0
4-May-19	2.00	34	41	10	270	0
4-May-19	3.00	34	50	10	270	0
4-May-19	4.00	30	50	13	292.5	0
4-May-19	5.00	30	50	13	292.5	0
4-May-19	6.00	30	53	13	292.5	0
4-May-19	7.00	29	53	11	247.5	0
4-May-19	8.00	29	53	11	247.5	0
4-May-19	9.00	29	39	11	247.5	0
4-May-19	10.00	33	39	9	247.5	0
4-May-19	11.00	33	39	9	247.5	0
4-May-19	12.00	33	24	9	247.5	0
4-May-19	13.00	39	24	10	270	0
4-May-19	14.00	39	24	10	270	0
4-May-19	15.00	39	26	10	270	0
4-May-19	16.00	41	26	12	292.5	0
4-May-19	17.00	41	26	12	292.5	0
4-May-19	18.00	41	23	12	292.5	0
4-May-19	19.00	40	23	14	270	0
4-May-19	20.00	40	23	14	270	0
4-May-19	21.00	40	46	14	270	0
4-May-19	22.00	38	46	13	247.5	0
4-May-19	23.00	38	46	13	247.5	0
4-May-19	0.00	38	52	13	247.5	0
5-May-19	1.00	35	52	10	247.5	0
5-May-19	2.00	35	52	10	247.5	0
5-May-19	3.00	35	50	10	247.5	0
5-May-19	4.00	29	50	6	202.5	0
5-May-19	5.00	29	50	6	202.5	0
5-May-19	6.00	29	55	6	202.5	0
5-May-19	7.00	28	55	9	225	0
5-May-19	8.00	28	55	9	225	0
5-May-19	9.00	28	41	9	225	0
5-May-19	10.00	33	41	14	247.5	0
5-May-19	11.00	33	41	14	247.5	0
5-May-19	12.00	33	22	14	247.5	0
5-May-19	13.00	39	22	15	270	0
5-May-19	14.00	39	22	15	270	0
5-May-19	15.00	39	22	15	270	0
5-May-19	16.00	41	22	14	270	0
5-May-19	17.00	41	22	14	270	0
5-May-19	18.00	41	21	14	270	0
5-May-19	19.00	40	21	16	270	0
5-May-19	20.00	40	21	16	270	0
5-May-19	21.00	40	23	16	270	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
5-May-19	22.00	37	23	15	270	0
5-May-19	23.00	37	23	15	270	0
5-May-19	0.00	37	45	15	270	0
6-May-19	1.00	33	45	13	270	0
6-May-19	2.00	33	45	13	270	0
6-May-19	3.00	33	52	13	270	0
6-May-19	4.00	27	52	9	270	0
6-May-19	5.00	27	52	9	270	0
6-May-19	6.00	27	54	9	270	0
6-May-19	7.00	29	54	6	270	0
6-May-19	8.00	29	54	6	270	0
6-May-19	9.00	29	35	6	270	0
6-May-19	10.00	34	35	12	270	0
6-May-19	11.00	34	35	12	270	0
6-May-19	12.00	34	26	12	270	0
6-May-19	13.00	40	26	19	270	0
6-May-19	14.00	40	26	19	270	0
6-May-19	15.00	40	22	19	270	0
6-May-19	16.00	41	22	22	247.5	0
6-May-19	17.00	41	22	22	247.5	0
6-May-19	18.00	41	22	22	247.5	0
6-May-19	19.00	39	21	20	247.5	0
6-May-19	20.00	39	21	20	247.5	0
6-May-19	21.00	39	21	20	247.5	0
6-May-19	22.00	37	23	13	247.5	0
6-May-19	23.00	37	23	13	247.5	0
6-May-19	0.00	37	22	13	247.5	0
7-May-19	1.00	33	22	14	270	0
7-May-19	2.00	33	22	14	270	0
7-May-19	3.00	33	32	14	270	0
7-May-19	4.00	28	32	9	247.5	0
7-May-19	5.00	28	32	9	247.5	0
7-May-19	6.00	28	38	9	247.5	0
7-May-19	7.00	29	38	8	270	0
7-May-19	8.00	29	38	8	270	0
7-May-19	9.00	29	23	8	270	0
7-May-19	10.00	34	23	15	270	0
7-May-19	11.00	34	23	15	270	0
7-May-19	12.00	34	23	15	270	0
7-May-19	13.00	40	23	23	247.5	0
7-May-19	14.00	40	23	23	247.5	0
7-May-19	15.00	40	21	23	247.5	0
7-May-19	16.00	40	21	26	247.5	0
7-May-19	17.00	40	21	26	247.5	0
7-May-19	18.00	40	21	26	247.5	0
7-May-19	19.00	38	21	21	270	0
7-May-19	20.00	38	21	21	270	0
7-May-19	21.00	38	22	21	270	0
7-May-19	22.00	35	22	16	270	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
7-May-19	23.00	35	22	16	270	0
7-May-19	0.00	35	22	16	270	0
8-May-19	1.00	31	22	13	270	0
8-May-19	2.00	31	26	13	270	0
8-May-19	3.00	31	27	13	270	0
8-May-19	4.00	27	27	9	270	0
8-May-19	5.00	27	27	9	270	0
8-May-19	6.00	27	37	9	270	0
8-May-19	7.00	27	37	11	247.5	0
8-May-19	8.00	27	37	11	247.5	0
8-May-19	9.00	27	32	11	247.5	0
8-May-19	10.00	32	32	21	247.5	0
8-May-19	11.00	32	32	21	247.5	0
8-May-19	12.00	32	34	21	247.5	0
8-May-19	13.00	38	34	26	247.5	0
8-May-19	14.00	38	34	26	247.5	0
8-May-19	15.00	38	34	26	247.5	0
8-May-19	16.00	39	34	27	270	0
8-May-19	17.00	39	32	27	270	0
8-May-19	18.00	39	27	27	270	0
8-May-19	19.00	37	27	21	270	0
8-May-19	20.00	37	27	21	270	0
8-May-19	21.00	37	31	21	270	0
8-May-19	22.00	34	31	14	270	0
8-May-19	23.00	34	31	14	270	0
8-May-19	0.00	34	43	14	270	0
9-May-19	1.00	31	43	14	270	0
9-May-19	2.00	31	43	14	270	0
9-May-19	3.00	31	45	14	270	0
9-May-19	4.00	26	45	10	247.5	0
9-May-19	5.00	26	45	10	247.5	0
9-May-19	6.00	26	54	10	247.5	0
9-May-19	7.00	27	54	12	247.5	0
9-May-19	8.00	27	54	12	247.5	0
9-May-19	9.00	27	38	12	247.5	0
9-May-19	10.00	32	38	19	247.5	0
9-May-19	11.00	32	38	19	247.5	0
9-May-19	12.00	32	39	19	247.5	0
9-May-19	13.00	37	39	24	247.5	0
9-May-19	14.00	37	39	24	247.5	0
9-May-19	15.00	37	35	24	247.5	0
9-May-19	16.00	38	35	24	247.5	0
9-May-19	17.00	38	35	24	247.5	0
9-May-19	18.00	38	33	24	247.5	0
9-May-19	19.00	36	33	19	270	0
9-May-19	20.00	36	33	19	270	0
9-May-19	21.00	36	35	19	270	0
9-May-19	22.00	34	35	14	292.5	0
9-May-19	23.00	34	35	14	292.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
9-May-19	0.00	34	44	14	292.5	0
10-May-19	1.00	30	44	13	270	0
10-May-19	2.00	30	44	13	270	0
10-May-19	3.00	30	49	13	270	0
10-May-19	4.00	27	49	10	247.5	0
10-May-19	5.00	27	49	10	247.5	0
10-May-19	6.00	27	55	10	247.5	0
10-May-19	7.00	27	55	10	247.5	0
10-May-19	8.00	27	55	10	247.5	0
10-May-19	9.00	27	41	10	247.5	0
10-May-19	10.00	31	41	31	247.5	0
10-May-19	11.00	31	41	31	247.5	0
10-May-19	12.00	31	23	31	247.5	0
10-May-19	13.00	36	23	36	247.5	0
10-May-19	14.00	36	23	36	247.5	0
10-May-19	15.00	36	23	36	247.5	0
10-May-19	16.00	37	22	37	247.5	0
10-May-19	17.00	37	22	37	247.5	0
10-May-19	18.00	37	22	37	247.5	0
10-May-19	19.00	34	22	34	270	0
10-May-19	20.00	34	22	34	270	0
10-May-19	21.00	34	35	34	270	0
10-May-19	22.00	31	35	31	270	0
10-May-19	23.00	31	35	31	270	0
10-May-19	0.00	31	48	31	270	0
11-May-19	1.00	29	48	15	270	0
11-May-19	2.00	29	48	15	270	0
11-May-19	3.00	29	64	15	270	0
11-May-19	4.00	27	64	13	247.5	0
11-May-19	5.00	27	64	13	247.5	0
11-May-19	6.00	27	69	13	247.5	0
11-May-19	7.00	27	69	10	225	0
11-May-19	8.00	27	69	10	225	0
11-May-19	9.00	27	53	10	225	0
11-May-19	10.00	32	53	18	225	0
11-May-19	11.00	32	53	18	225	0
11-May-19	12.00	32	27	18	225	0
11-May-19	13.00	37	27	22	247.5	0
11-May-19	14.00	37	27	22	247.5	0
11-May-19	15.00	37	29	22	247.5	0
11-May-19	16.00	39	29	22	247.5	0
11-May-19	17.00	39	29	22	247.5	0
11-May-19	18.00	39	29	22	247.5	0
11-May-19	19.00	38	31	17	270	0
11-May-19	20.00	38	31	17	270	0
11-May-19	21.00	38	32	17	270	0
11-May-19	22.00	35	32	13	270	0
11-May-19	23.00	35	32	13	270	0
11-May-19	0.00	35	47	13	270	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
12-May-19	1.00	31	47	14	270	0
12-May-19	2.00	31	47	14	270	0
12-May-19	3.00	31	63	14	270	0
12-May-19	4.00	29	63	9	247.5	0
12-May-19	5.00	29	63	9	247.5	0
12-May-19	6.00	29	65	9	247.5	0
12-May-19	7.00	29	65	6	225	0
12-May-19	8.00	29	65	6	225	0
12-May-19	9.00	29	46	6	225	0
12-May-19	10.00	33	46	13	225	0
12-May-19	11.00	33	46	13	225	0
12-May-19	12.00	33	23	13	225	0
12-May-19	13.00	38	23	18	247.5	0
12-May-19	14.00	38	23	18	247.5	0
12-May-19	15.00	38	26	18	247.5	0
12-May-19	16.00	40	26	21	270	0
12-May-19	17.00	40	26	21	270	0
12-May-19	18.00	40	28	21	270	0
12-May-19	19.00	39	28	18	270	0
12-May-19	20.00	39	28	18	270	0
12-May-19	21.00	39	26	18	270	0
12-May-19	22.00	37	26	12	270	0
12-May-19	23.00	37	26	12	270	0
12-May-19	0.00	37	39	12	270	0
13-May-19	1.00	33	39	15	270	0
13-May-19	2.00	33	39	15	270	0
13-May-19	3.00	33	55	15	270	0
13-May-19	4.00	28	55	11	270	0
13-May-19	5.00	28	55	11	270	0
13-May-19	6.00	28	60	11	270	0
13-May-19	7.00	28	60	8	247.5	0
13-May-19	8.00	28	60	8	247.5	0
13-May-19	9.00	28	43	8	247.5	0
13-May-19	10.00	32	43	14	247.5	0
13-May-19	11.00	32	43	14	247.5	0
13-May-19	12.00	32	21	14	247.5	0
13-May-19	13.00	38	21	19	247.5	0
13-May-19	14.00	38	21	19	247.5	0
13-May-19	15.00	38	23	19	247.5	0
13-May-19	16.00	40	23	23	247.5	0
13-May-19	17.00	40	23	23	247.5	0
13-May-19	18.00	40	26	23	247.5	0
13-May-19	19.00	38	26	20	270	0
13-May-19	20.00	38	26	20	270	0
13-May-19	21.00	38	26	20	270	0
13-May-19	22.00	36	26	14	270	0
13-May-19	23.00	36	26	14	270	0
13-May-19	0.00	36	41	14	270	0
14-May-19	1.00	33	41	14	270	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
14-May-19	2.00	33	41	14	270	0
14-May-19	3.00	33	55	14	270	0
14-May-19	4.00	28	55	10	270	0
14-May-19	5.00	28	55	10	270	0
14-May-19	6.00	28	57	10	270	0
14-May-19	7.00	28	57	10	247.5	0
14-May-19	8.00	28	57	10	247.5	0
14-May-19	9.00	28	38	10	247.5	0
14-May-19	10.00	33	38	18	225	0
14-May-19	11.00	33	38	18	225	0
14-May-19	12.00	33	30	18	225	0
14-May-19	13.00	39	30	25	247.5	0
14-May-19	14.00	39	30	25	247.5	0
14-May-19	15.00	39	28	25	247.5	0
14-May-19	16.00	40	28	27	247.5	0
14-May-19	17.00	40	28	27	247.5	0
14-May-19	18.00	40	28	27	247.5	0
14-May-19	19.00	39	28	23	247.5	0
14-May-19	20.00	39	28	23	247.5	0
14-May-19	21.00	39	27	23	247.5	0
14-May-19	22.00	37	27	16	270	0
14-May-19	23.00	37	27	16	270	0
14-May-19	0.00	37	41	16	270	0
15-May-19	1.00	33	41	14	270	0
15-May-19	2.00	33	41	14	270	0
15-May-19	3.00	33	59	14	270	0
15-May-19	4.00	28	59	11	270	0
15-May-19	5.00	28	59	11	270	0
15-May-19	6.00	28	63	11	270	0
15-May-19	7.00	28	63	8	247.5	0
15-May-19	8.00	28	63	8	247.5	0
15-May-19	9.00	28	43	8	247.5	0
15-May-19	10.00	32	43	12	225	0
15-May-19	11.00	32	43	12	225	0
15-May-19	12.00	32	23	12	225	0
15-May-19	13.00	38	23	20	225	0
15-May-19	14.00	38	23	20	225	0
15-May-19	15.00	38	28	20	225	0
15-May-19	16.00	39	28	23	247.5	0
15-May-19	17.00	39	28	23	247.5	0
15-May-19	18.00	39	28	23	247.5	0
15-May-19	19.00	37	28	19	247.5	0
15-May-19	20.00	37	30	19	247.5	0
15-May-19	21.00	37	33	19	247.5	0
15-May-19	22.00	33	33	14	270	0
15-May-19	23.00	33	33	14	270	0
15-May-19	0.00	33	49	14	270	0
16-May-19	1.00	30	49	18	270	0
16-May-19	2.00	30	49	18	270	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
16-May-19	3.00	30	63	18	270	0
16-May-19	4.00	28	63	14	270	0
16-May-19	5.00	28	63	14	270	0
16-May-19	6.00	28	67	14	270	0
16-May-19	7.00	27	67	10	270	0
16-May-19	8.00	27	67	10	270	0
16-May-19	9.00	27	49	10	270	0
16-May-19	10.00	31	49	13	270	0
16-May-19	11.00	31	49	13	270	0
16-May-19	12.00	31	28	13	270	0
16-May-19	13.00	36	28	17	247.5	0
16-May-19	14.00	36	28	17	247.5	0
16-May-19	15.00	36	28	17	247.5	0
16-May-19	16.00	38	28	21	247.5	0
16-May-19	17.00	38	26	21	247.5	0
16-May-19	18.00	38	22	21	247.5	0
16-May-19	19.00	36	22	18	270	0
16-May-19	20.00	36	22	18	270	0
16-May-19	21.00	36	31	18	270	0
16-May-19	22.00	32	31	13	270	0
16-May-19	23.00	32	31	13	270	0
16-May-19	0.00	32	44	13	270	0
17-May-19	1.00	30	44	16	270	0
17-May-19	2.00	30	44	16	270	0
17-May-19	3.00	30	58	16	270	0
17-May-19	4.00	28	58	12	270	0
17-May-19	5.00	28	58	12	270	0
17-May-19	6.00	28	63	12	270	0
17-May-19	7.00	28	63	11	270	0
17-May-19	8.00	28	63	11	270	0
17-May-19	9.00	28	46	11	270	0
17-May-19	10.00	32	46	19	247.5	0
17-May-19	11.00	32	46	19	247.5	0
17-May-19	12.00	32	27	19	247.5	0
17-May-19	13.00	37	27	27	247.5	0
17-May-19	14.00	37	27	27	247.5	0
17-May-19	15.00	37	29	27	247.5	0
17-May-19	16.00	38	28	33	270	0
17-May-19	17.00	38	28	33	270	0
17-May-19	18.00	38	31	33	270	0
17-May-19	19.00	35	31	28	270	0
17-May-19	20.00	35	31	28	270	0
17-May-19	21.00	35	32	28	270	0
17-May-19	22.00	32	32	20	270	0
17-May-19	23.00	32	32	20	270	0
17-May-19	0.00	32	49	20	270	0
18-May-19	1.00	30	49	23	270	0
18-May-19	2.00	30	49	23	270	0
18-May-19	3.00	30	60	23	270	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
18-May-19	4.00	28	60	18	270	0
18-May-19	5.00	28	60	18	270	0
18-May-19	6.00	28	60	18	270	0
18-May-19	7.00	28	60	14	270	0
18-May-19	8.00	28	60	14	270	0
18-May-19	9.00	28	42	14	270	0
18-May-19	10.00	32	42	15	247.5	0
18-May-19	11.00	32	42	15	247.5	0
18-May-19	12.00	32	31	15	247.5	0
18-May-19	13.00	37	31	23	270	0
18-May-19	14.00	37	31	23	270	0
18-May-19	15.00	37	36	23	270	0
18-May-19	16.00	38	36	27	270	0
18-May-19	17.00	38	30	27	270	0
18-May-19	18.00	38	26	27	270	0
18-May-19	19.00	36	26	22	270	0
18-May-19	20.00	36	26	22	270	0
18-May-19	21.00	36	28	22	270	0
18-May-19	22.00	32	28	13	270	0
18-May-19	23.00	32	28	13	270	0
18-May-19	0.00	32	36	13	270	0
19-May-19	1.00	30	36	14	270	0
19-May-19	2.00	30	36	14	270	0
19-May-19	3.00	30	48	14	270	0
19-May-19	4.00	28	48	14	270	0
19-May-19	5.00	28	48	14	270	0
19-May-19	6.00	28	55	14	270	0
19-May-19	7.00	28	55	12	270	0
19-May-19	8.00	28	55	12	270	0
19-May-19	9.00	28	42	12	270	0
19-May-19	10.00	33	42	15	270	0
19-May-19	11.00	33	42	15	270	0
19-May-19	12.00	33	23	15	270	0
19-May-19	13.00	38	23	18	270	0
19-May-19	14.00	38	23	18	270	0
19-May-19	15.00	38	23	18	270	0
19-May-19	16.00	40	23	21	270	0
19-May-19	17.00	40	23	21	270	0
19-May-19	18.00	40	26	21	270	0
19-May-19	19.00	38	28	18	270	0
19-May-19	20.00	38	28	18	270	0
19-May-19	21.00	38	28	18	270	0
19-May-19	22.00	36	32	13	270	0
19-May-19	23.00	36	32	13	270	0
19-May-19	0.00	36	40	13	270	0
20-May-19	1.00	33	40	16	270	0
20-May-19	2.00	33	42	16	270	0
20-May-19	3.00	33	51	16	270	0
20-May-19	4.00	28	51	12	292.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
20-May-19	5.00	28	51	12	292.5	0
20-May-19	6.00	28	61	12	292.5	0
20-May-19	7.00	28	61	8	292.5	0
20-May-19	8.00	28	61	8	292.5	0
20-May-19	9.00	28	43	8	292.5	0
20-May-19	10.00	33	43	12	270	0
20-May-19	11.00	33	43	12	270	0
20-May-19	12.00	33	31	12	270	0
20-May-19	13.00	38	31	17	270	0
20-May-19	14.00	38	31	17	270	0
20-May-19	15.00	38	36	17	270	0
20-May-19	16.00	40	36	20	270	0
20-May-19	17.00	40	36	20	270	0
20-May-19	18.00	40	39	20	270	0
20-May-19	19.00	38	39	18	270	0
20-May-19	20.00	38	39	18	270	0
20-May-19	21.00	38	35	18	270	0
20-May-19	22.00	34	35	10	270	0
20-May-19	23.00	34	35	10	270	0
20-May-19	0.00	34	35	10	270	0
21-May-19	1.00	31	35	11	270	0
21-May-19	2.00	31	35	11	270	0
21-May-19	3.00	31	40	11	270	0
21-May-19	4.00	30	40	12	270	0
21-May-19	5.00	30	40	12	270	0
21-May-19	6.00	30	46	12	270	0
21-May-19	7.00	30	46	12	270	0
21-May-19	8.00	30	46	12	270	0
21-May-19	9.00	30	35	12	270	0
21-May-19	10.00	34	35	14	247.5	0
21-May-19	11.00	34	35	14	247.5	0
21-May-19	12.00	34	29	14	247.5	0
21-May-19	13.00	39	29	18	247.5	0
21-May-19	14.00	39	29	18	247.5	0
21-May-19	15.00	39	25	18	247.5	0
21-May-19	16.00	40	25	22	270	0
21-May-19	17.00	40	25	22	270	0
21-May-19	18.00	40	28	22	270	0
21-May-19	19.00	38	28	18	270	0
21-May-19	20.00	38	28	18	270	0
21-May-19	21.00	38	23	18	270	0
21-May-19	22.00	34	23	14	270	0
21-May-19	23.00	34	23	14	270	0
21-May-19	0.00	34	31	14	270	0
22-May-19	1.00	31	31	16	270	0
22-May-19	2.00	31	31	16	270	0
22-May-19	3.00	31	42	16	270	0
22-May-19	4.00	29	42	15	270	0
22-May-19	5.00	29	42	15	270	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
22-May-19	6.00	29	47	15	270	0
22-May-19	7.00	30	47	13	270	0
22-May-19	8.00	30	47	13	270	0
22-May-19	9.00	30	39	13	270	0
22-May-19	10.00	34	39	15	247.5	0
22-May-19	11.00	34	39	15	247.5	0
22-May-19	12.00	34	22	15	247.5	0
22-May-19	13.00	39	22	17	247.5	0
22-May-19	14.00	39	22	17	247.5	0
22-May-19	15.00	39	26	17	247.5	0
22-May-19	16.00	41	27	20	247.5	0
22-May-19	17.00	41	27	20	247.5	0
22-May-19	18.00	41	27	20	247.5	0
22-May-19	19.00	39	28	18	270	0
22-May-19	20.00	39	28	18	270	0
22-May-19	21.00	39	31	18	270	0
22-May-19	22.00	37	31	14	270	0
22-May-19	23.00	37	31	14	270	0
22-May-19	0.00	37	40	14	270	0
23-May-19	1.00	34	40	16	247.5	0
23-May-19	2.00	34	40	16	247.5	0
23-May-19	3.00	34	46	16	247.5	0
23-May-19	4.00	31	46	13	247.5	0
23-May-19	5.00	31	46	13	247.5	0
23-May-19	6.00	31	45	13	247.5	0
23-May-19	7.00	31	45	13	247.5	0
23-May-19	8.00	31	45	13	247.5	0
23-May-19	9.00	31	32	13	247.5	0
23-May-19	10.00	35	32	19	270	0
23-May-19	11.00	35	32	19	270	0
23-May-19	12.00	35	30	19	270	0
23-May-19	13.00	40	30	25	270	0
23-May-19	14.00	40	30	25	270	0
23-May-19	15.00	40	27	25	270	0
23-May-19	16.00	40	27	27	270	0
23-May-19	17.00	40	27	27	270	0
23-May-19	18.00	40	21	27	270	0
23-May-19	19.00	38	21	23	270	0
23-May-19	20.00	38	21	23	270	0
23-May-19	21.00	38	27	23	270	0
23-May-19	22.00	34	27	16	270	0
23-May-19	23.00	34	27	16	270	0
23-May-19	0.00	34	33	16	270	0
24-May-19	1.00	31	33	16	270	0
24-May-19	2.00	31	33	16	270	0
24-May-19	3.00	31	42	16	270	0
24-May-19	4.00	29	42	14	270	0
24-May-19	5.00	29	42	14	270	0
24-May-19	6.00	29	46	14	270	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
24-May-19	7.00	29	46	13	247.5	0
24-May-19	8.00	29	46	13	247.5	0
24-May-19	9.00	29	33	13	247.5	0
24-May-19	10.00	34	33	20	247.5	0
24-May-19	11.00	34	33	20	247.5	0
24-May-19	12.00	34	29	20	247.5	0
24-May-19	13.00	39	29	24	270	0
24-May-19	14.00	39	29	24	270	0
24-May-19	15.00	39	27	24	270	0
24-May-19	16.00	40	27	23	270	0
24-May-19	17.00	40	27	23	270	0
24-May-19	18.00	40	27	23	270	0
24-May-19	19.00	38	24	18	270	0
24-May-19	20.00	38	24	18	270	0
24-May-19	21.00	38	24	18	270	0
24-May-19	22.00	34	26	13	270	0
24-May-19	23.00	34	26	13	270	0
24-May-19	0.00	34	34	13	270	0
25-May-19	1.00	31	34	14	270	0
25-May-19	2.00	31	34	14	270	0
25-May-19	3.00	31	44	14	270	0
25-May-19	4.00	30	44	11	270	0
25-May-19	5.00	30	44	11	270	0
25-May-19	6.00	30	45	11	270	0
25-May-19	7.00	30	45	9	270	0
25-May-19	8.00	30	45	9	270	0
25-May-19	9.00	30	35	9	270	0
25-May-19	10.00	34	35	11	270	0
25-May-19	11.00	34	35	11	270	0
25-May-19	12.00	34	22	11	270	0
25-May-19	13.00	39	22	12	270	0
25-May-19	14.00	39	22	12	270	0
25-May-19	15.00	39	23	12	270	0
25-May-19	16.00	42	24	15	270	0
25-May-19	17.00	42	24	15	270	0
25-May-19	18.00	42	24	15	270	0
25-May-19	19.00	40	24	19	270	0
25-May-19	20.00	40	24	19	270	0
25-May-19	21.00	40	26	19	270	0
25-May-19	22.00	36	26	16	247.5	0
25-May-19	23.00	36	26	16	247.5	0
25-May-19	0.00	36	33	16	247.5	0
26-May-19	1.00	33	33	13	270	0
26-May-19	2.00	33	33	13	270	0
26-May-19	3.00	33	41	13	270	0
26-May-19	4.00	31	41	14	270	0
26-May-19	5.00	31	41	14	270	0
26-May-19	6.00	31	43	14	270	0
26-May-19	7.00	31	43	9	270	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
26-May-19	8.00	31	43	9	270	0
26-May-19	9.00	31	32	9	270	0
26-May-19	10.00	35	32	15	247.5	0
26-May-19	11.00	35	32	15	247.5	0
26-May-19	12.00	35	26	15	247.5	0
26-May-19	13.00	40	26	20	270	0
26-May-19	14.00	40	26	20	270	0
26-May-19	15.00	40	23	20	270	0
26-May-19	16.00	42	23	21	270	0
26-May-19	17.00	42	23	21	270	0
26-May-19	18.00	42	24	21	270	0
26-May-19	19.00	40	24	18	270	0
26-May-19	20.00	40	24	18	270	0
26-May-19	21.00	40	22	18	270	0
26-May-19	22.00	37	22	11	247.5	0
26-May-19	23.00	37	22	11	247.5	0
26-May-19	0.00	37	33	11	247.5	0
27-May-19	1.00	33	33	12	270	0
27-May-19	2.00	33	33	12	270	0
27-May-19	3.00	33	42	12	270	0
27-May-19	4.00	30	42	11	270	0
27-May-19	5.00	30	42	11	270	0
27-May-19	6.00	30	50	11	270	0
27-May-19	7.00	30	50	8	270	0
27-May-19	8.00	30	50	8	270	0
27-May-19	9.00	30	38	8	270	0
27-May-19	10.00	34	38	12	247.5	0
27-May-19	11.00	34	38	12	247.5	0
27-May-19	12.00	34	38	12	247.5	0
27-May-19	13.00	40	28	15	247.5	0
27-May-19	14.00	40	28	15	247.5	0
27-May-19	15.00	40	28	15	247.5	0
27-May-19	16.00	42	26	19	270	0
27-May-19	17.00	42	26	19	270	0
27-May-19	18.00	42	26	19	270	0
27-May-19	19.00	41	24	19	270	0
27-May-19	20.00	41	24	19	270	0
27-May-19	21.00	41	24	19	270	0
27-May-19	22.00	38	26	14	270	0
27-May-19	23.00	38	26	14	270	0
27-May-19	0.00	38	32	14	270	0
28-May-19	1.00	34	32	17	270	0
28-May-19	2.00	34	32	17	270	0
28-May-19	3.00	34	44	17	270	0
28-May-19	4.00	30	44	16	270	0
28-May-19	5.00	30	44	16	270	0
28-May-19	6.00	30	46	16	270	0
28-May-19	7.00	30	46	13	270	0
28-May-19	8.00	30	46	13	270	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
28-May-19	9.00	30	33	13	270	0
28-May-19	10.00	34	33	15	270	0
28-May-19	11.00	34	33	15	270	0
28-May-19	12.00	34	24	15	270	0
28-May-19	13.00	40	24	20	270	0
28-May-19	14.00	40	24	20	270	0
28-May-19	15.00	40	26	20	270	0
28-May-19	16.00	42	26	22	270	0
28-May-19	17.00	42	32	22	270	0
28-May-19	18.00	42	24	22	270	0
28-May-19	19.00	40	24	19	270	0
28-May-19	20.00	40	24	19	270	0
28-May-19	21.00	40	26	19	270	0
28-May-19	22.00	37	26	15	247.5	0
28-May-19	23.00	37	32	15	247.5	0
28-May-19	0.00	37	31	15	247.5	0
29-May-19	1.00	33	31	19	270	0
29-May-19	2.00	33	31	19	270	0
29-May-19	3.00	33	42	19	270	0
29-May-19	4.00	30	42	15	270	0
29-May-19	5.00	30	42	15	270	0
29-May-19	6.00	30	46	15	270	0
29-May-19	7.00	30	46	11	270	0
29-May-19	8.00	30	46	11	270	0
29-May-19	9.00	30	35	11	270	0
29-May-19	10.00	35	35	15	270	0
29-May-19	11.00	35	35	15	270	0
29-May-19	12.00	35	30	15	270	0
29-May-19	13.00	41	30	18	270	0
29-May-19	14.00	41	28	18	270	0
29-May-19	15.00	41	26	18	270	0
29-May-19	16.00	43	26	18	270	0
29-May-19	17.00	43	32	18	270	0
29-May-19	18.00	43	33	18	270	0
29-May-19	19.00	41	33	18	270	0
29-May-19	20.00	41	33	18	270	0
29-May-19	21.00	41	33	18	270	0
29-May-19	22.00	38	28	16	270	0
29-May-19	23.00	38	28	16	270	0
29-May-19	0.00	38	29	16	270	0
30-May-19	1.00	34	29	14	270	0
30-May-19	2.00	34	29	14	270	0
30-May-19	3.00	34	38	14	270	0
30-May-19	4.00	30	38	10	270	0
30-May-19	5.00	30	38	10	270	0
30-May-19	6.00	30	42	10	270	0
30-May-19	7.00	30	42	10	247.5	0
30-May-19	8.00	30	42	10	247.5	0
30-May-19	9.00	30	33	10	247.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
30-May-19	10.00	35	33	14	247.5	0
30-May-19	11.00	35	33	14	247.5	0
30-May-19	12.00	35	28	14	247.5	0
30-May-19	13.00	41	28	18	247.5	0
30-May-19	14.00	41	29	18	247.5	0
30-May-19	15.00	41	29	18	247.5	0
30-May-19	16.00	42	32	20	247.5	0
30-May-19	17.00	42	32	20	247.5	0
30-May-19	18.00	42	32	20	247.5	0
30-May-19	19.00	41	32	18	270	0
30-May-19	20.00	41	32	18	270	0
30-May-19	21.00	41	32	18	270	0
30-May-19	22.00	37	32	12	270	0
30-May-19	23.00	37	36	12	270	0
30-May-19	0.00	37	38	12	270	0
31-May-19	1.00	34	38	11	270	0
31-May-19	2.00	34	38	11	270	0
31-May-19	3.00	34	50	11	270	0
31-May-19	4.00	32	50	8	270	0
31-May-19	5.00	32	50	8	270	0
31-May-19	6.00	32	54	8	270	0
31-May-19	7.00	31	54	9	225	0
31-May-19	8.00	31	54	9	225	0
31-May-19	9.00	31	37	9	225	0
31-May-19	10.00	35	37	14	225	0
31-May-19	11.00	35	37	14	225	0
31-May-19	12.00	35	29	14	225	0
31-May-19	13.00	41	29	18	225	0
31-May-19	14.00	41	29	18	225	0
31-May-19	15.00	41	29	18	225	0
31-May-19	16.00	43	29	19	247.5	0
31-May-19	17.00	43	24	19	247.5	0
31-May-19	18.00	43	24	19	247.5	0
31-May-19	19.00	42	24	16	270	0
31-May-19	20.00	42	24	16	270	0
31-May-19	21.00	42	44	16	270	0
31-May-19	22.00	38	44	12	270	0
31-May-19	23.00	38	44	12	270	0
31-May-19	0.00	38	51	12	270	0
1-Jun-19	1.00	35	51	12	270	0
1-Jun-19	2.00	35	51	12	270	0
1-Jun-19	3.00	35	50	12	270	0
1-Jun-19	4.00	32	50	11	270	0
1-Jun-19	5.00	32	50	11	270	0
1-Jun-19	6.00	32	51	11	270	0
1-Jun-19	7.00	32	51	13	247.5	0
1-Jun-19	8.00	32	51	13	247.5	0
1-Jun-19	9.00	32	37	13	247.5	0
1-Jun-19	10.00	35	37	17	225	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
1-Jun-19	11.00	35	37	17	225	0
1-Jun-19	12.00	35	22	17	225	0
1-Jun-19	13.00	41	22	21	247.5	0
1-Jun-19	14.00	41	22	21	247.5	0
1-Jun-19	15.00	41	26	21	247.5	0
1-Jun-19	16.00	43	26	22	270	0
1-Jun-19	17.00	43	26	22	270	0
1-Jun-19	18.00	43	26	22	270	0
1-Jun-19	19.00	42	30	19	270	0
1-Jun-19	20.00	42	30	19	270	0
1-Jun-19	21.00	42	42	19	270	0
1-Jun-19	22.00	40	42	12	270	0
2-Jun-19	1.00	40	42	12	270	0
2-Jun-19	2.00	40	63	12	270	0
2-Jun-19	3.00	35	63	12	247.5	0
2-Jun-19	4.00	35	63	12	247.5	0
2-Jun-19	5.00	35	61	12	247.5	0
2-Jun-19	6.00	31	61	10	225	0
2-Jun-19	7.00	31	61	10	225	0
2-Jun-19	8.00	31	56	10	225	0
2-Jun-19	9.00	31	56	12	247.5	0
2-Jun-19	10.00	31	56	12	247.5	0
2-Jun-19	11.00	31	41	12	247.5	0
2-Jun-19	12.00	35	41	17	247.5	0
2-Jun-19	13.00	35	41	17	247.5	0
2-Jun-19	14.00	35	22	17	247.5	0
2-Jun-19	15.00	42	22	21	270	0
2-Jun-19	16.00	42	22	21	270	0
2-Jun-19	17.00	42	24	21	270	0
2-Jun-19	18.00	44	24	22	270	0
2-Jun-19	19.00	44	24	22	270	0
2-Jun-19	20.00	44	23	22	270	0
2-Jun-19	21.00	42	23	20	270	0
2-Jun-19	22.00	42	23	20	270	0
3-Jun-19	1.00	42	26	20	270	0
3-Jun-19	2.00	38	26	17	247.5	0
3-Jun-19	3.00	38	26	17	247.5	0
3-Jun-19	4.00	38	50	17	247.5	0
3-Jun-19	5.00	34	50	20	270	0
3-Jun-19	6.00	34	50	20	270	0
3-Jun-19	7.00	34	58	20	270	0
3-Jun-19	8.00	31	58	16	270	0
3-Jun-19	9.00	31	58	16	270	0
3-Jun-19	10.00	31	60	16	270	0
3-Jun-19	11.00	31	60	12	247.5	0
3-Jun-19	12.00	31	60	12	247.5	0
3-Jun-19	13.00	31	43	12	247.5	0
3-Jun-19	14.00	35	43	18	247.5	0
3-Jun-19	15.00	35	43	18	247.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
3-Jun-19	16.00	35	22	18	247.5	0
3-Jun-19	17.00	42	22	23	270	0
3-Jun-19	18.00	42	22	23	270	0
3-Jun-19	19.00	42	23	23	270	0
3-Jun-19	20.00	44	23	24	270	0
3-Jun-19	21.00	44	23	24	270	0
3-Jun-19	22.00	44	23	24	270	0
4-Jun-19	1.00	42	24	21	270	0
4-Jun-19	2.00	42	24	21	270	0
4-Jun-19	3.00	42	26	21	270	0
4-Jun-19	4.00	40	26	16	247.5	0
4-Jun-19	5.00	40	26	16	247.5	0
4-Jun-19	6.00	40	43	16	247.5	0
4-Jun-19	7.00	35	43	18	270	0
4-Jun-19	8.00	35	43	18	270	0
4-Jun-19	9.00	35	52	18	270	0
4-Jun-19	10.00	30	52	14	270	0
4-Jun-19	11.00	30	52	14	270	0
4-Jun-19	12.00	30	57	14	270	0
4-Jun-19	13.00	31	57	13	270	0
4-Jun-19	14.00	31	57	13	270	0
4-Jun-19	15.00	31	42	13	270	0
4-Jun-19	16.00	35	42	18	247.5	0
4-Jun-19	17.00	35	42	18	247.5	0
4-Jun-19	18.00	35	22	18	247.5	0
4-Jun-19	19.00	41	22	24	270	0
4-Jun-19	20.00	41	22	24	270	0
4-Jun-19	21.00	41	25	24	270	0
4-Jun-19	22.00	42	26	27	270	0
5-Jun-19	1.00	42	26	27	270	0
5-Jun-19	2.00	42	26	27	270	0
5-Jun-19	3.00	39	26	23	270	0
5-Jun-19	4.00	39	26	23	270	0
5-Jun-19	5.00	39	25	23	270	0
5-Jun-19	6.00	35	25	17	270	0
5-Jun-19	7.00	35	25	17	270	0
5-Jun-19	8.00	35	38	17	270	0
5-Jun-19	9.00	32	38	14	270	0
5-Jun-19	10.00	32	38	14	270	0
5-Jun-19	11.00	32	52	14	270	0
5-Jun-19	12.00	30	52	12	270	0
5-Jun-19	13.00	30	52	12	270	0
5-Jun-19	14.00	30	56	12	270	0
5-Jun-19	15.00	30	56	12	270	0
5-Jun-19	16.00	30	56	12	270	0
5-Jun-19	17.00	30	39	12	270	0
5-Jun-19	18.00	34	39	18	270	0
5-Jun-19	19.00	34	39	18	270	0
5-Jun-19	20.00	34	45	18	270	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
5-Jun-19	21.00	40	32	22	270	0
5-Jun-19	22.00	40	32	22	270	0
6-Jun-19	1.00	34	31	9	247.5	0
6-Jun-19	2.00	28	47	8	247.5	0
6-Jun-19	3.00	28	47	8	247.5	0
6-Jun-19	4.00	28	47	8	247.5	0
6-Jun-19	5.00	29	51	7	247.5	0
6-Jun-19	6.00	29	51	7	247.5	0
6-Jun-19	7.00	29	51	7	247.5	0
6-Jun-19	8.00	34	32	12	247.5	0
6-Jun-19	9.00	34	32	12	247.5	0
6-Jun-19	10.00	34	32	12	247.5	0
6-Jun-19	11.00	40	14	19	247.5	0
6-Jun-19	12.00	40	14	19	247.5	0
6-Jun-19	13.00	40	14	19	247.5	0
6-Jun-19	14.00	41	11	24	247.5	0
6-Jun-19	15.00	41	11	24	247.5	0
6-Jun-19	16.00	41	11	24	247.5	0
6-Jun-19	17.00	39	14	21	247.5	0
6-Jun-19	18.00	39	14	21	247.5	0
6-Jun-19	19.00	39	14	21	247.5	0
6-Jun-19	20.00	37	24	13	247.5	0
6-Jun-19	21.00	37	24	13	247.5	0
6-Jun-19	22.00	37	24	13	247.5	0
7-Jun-19	1.00	33	37	14	247.5	0
7-Jun-19	2.00	33	37	14	247.5	0
7-Jun-19	3.00	33	37	14	247.5	0
7-Jun-19	4.00	28	47	10	247.5	0
7-Jun-19	5.00	28	47	10	247.5	0
7-Jun-19	6.00	28	47	10	247.5	0
7-Jun-19	7.00	28	49	11	225	0
7-Jun-19	8.00	28	49	11	225	0
7-Jun-19	9.00	28	49	11	225	0
7-Jun-19	10.00	33	32	18	247.5	0
7-Jun-19	11.00	33	32	18	247.5	0
7-Jun-19	12.00	33	32	18	247.5	0
7-Jun-19	13.00	40	12	24	247.5	0
7-Jun-19	14.00	40	12	24	247.5	0
7-Jun-19	15.00	40	12	24	247.5	0
7-Jun-19	16.00	41	9	27	247.5	0
7-Jun-19	17.00	41	9	27	247.5	0
7-Jun-19	18.00	41	9	27	247.5	0
7-Jun-19	19.00	39	13	19	247.5	0
7-Jun-19	20.00	39	13	19	247.5	0
7-Jun-19	21.00	39	13	19	247.5	0
7-Jun-19	22.00	36	22	10	247.5	0
8-Jun-19	1.00	36	22	10	247.5	0
8-Jun-19	2.00	36	22	10	247.5	0
8-Jun-19	3.00	40	15	19	270	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
8-Jun-19	4.00	40	15	19	270	0
8-Jun-19	5.00	40	15	19	270	0
8-Jun-19	6.00	41	13	23	270	0
8-Jun-19	7.00	41	13	23	270	0
8-Jun-19	8.00	41	13	23	270	0
8-Jun-19	9.00	39	19	19	270	0
8-Jun-19	10.00	39	19	19	270	0
8-Jun-19	11.00	39	19	19	270	0
8-Jun-19	12.00	36	30	9	247.5	0
8-Jun-19	13.00	36	30	9	247.5	0
8-Jun-19	14.00	36	30	9	247.5	0
8-Jun-19	15.00	32	38	9	270	0
8-Jun-19	16.00	32	38	9	270	0
8-Jun-19	17.00	32	38	9	270	0
8-Jun-19	18.00	29	49	9	270	0
8-Jun-19	19.00	29	49	9	270	0
8-Jun-19	20.00	29	49	9	270	0
8-Jun-19	21.00	29	51	9	270	0
8-Jun-19	22.00	29	51	9	270	0
9-Jun-19	1.00	29	51	9	270	0
9-Jun-19	2.00	34	36	12	270	0
9-Jun-19	3.00	34	36	12	270	0
9-Jun-19	4.00	34	36	12	270	0
9-Jun-19	5.00	40	18	15	292.5	0
9-Jun-19	6.00	40	18	15	292.5	0
9-Jun-19	7.00	40	18	15	292.5	0
9-Jun-19	8.00	42	12	16	292.5	0
9-Jun-19	9.00	42	12	16	292.5	0
9-Jun-19	10.00	42	12	16	292.5	0
9-Jun-19	11.00	41	13	15	292.5	0
9-Jun-19	12.00	41	13	15	292.5	0
9-Jun-19	13.00	41	13	15	292.5	0
9-Jun-19	14.00	38	22	13	270	0
9-Jun-19	15.00	38	22	13	270	0
9-Jun-19	16.00	38	22	13	270	0
9-Jun-19	17.00	34	30	13	292.5	0
9-Jun-19	18.00	34	30	13	292.5	0
9-Jun-19	19.00	34	30	13	292.5	0
9-Jun-19	20.00	30	27	12	292.5	0
9-Jun-19	21.00	30	27	12	292.5	0
9-Jun-19	22.00	30	27	12	292.5	0
10-Jun-19	1.00	31	20	11	315	0
10-Jun-19	2.00	31	20	11	315	0
10-Jun-19	3.00	31	20	11	315	0
10-Jun-19	4.00	37	14	13	315	0
10-Jun-19	5.00	37	14	13	315	0
10-Jun-19	6.00	37	14	13	315	0
10-Jun-19	7.00	42	8	19	315	0
10-Jun-19	8.00	42	8	19	315	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
10-Jun-19	9.00	42	8	19	315	0
10-Jun-19	10.00	43	7	21	292.5	0
10-Jun-19	11.00	43	7	21	292.5	0
10-Jun-19	12.00	43	7	21	292.5	0
10-Jun-19	13.00	41	10	20	270	0
10-Jun-19	14.00	41	10	20	270	0
10-Jun-19	15.00	41	10	20	270	0
10-Jun-19	16.00	37	20	15	270	0
10-Jun-19	17.00	37	20	15	270	0
10-Jun-19	18.00	37	20	15	270	0
10-Jun-19	19.00	32	30	11	270	0
10-Jun-19	20.00	32	30	11	270	0
10-Jun-19	21.00	32	30	11	270	0
10-Jun-19	22.00	29	28	9	292.5	0
11-Jun-19	1.00	29	28	9	292.5	0
11-Jun-19	2.00	29	28	9	292.5	0
11-Jun-19	3.00	30	20	9	315	0
11-Jun-19	4.00	30	20	9	315	0
11-Jun-19	5.00	30	20	9	315	0
11-Jun-19	6.00	36	16	12	315	0
11-Jun-19	7.00	36	16	12	315	0
11-Jun-19	8.00	36	16	12	315	0
11-Jun-19	9.00	41	10	19	292.5	0
11-Jun-19	10.00	41	10	19	292.5	0
11-Jun-19	11.00	41	10	19	292.5	0
11-Jun-19	12.00	42	8	22	270	0
11-Jun-19	13.00	42	8	22	270	0
11-Jun-19	14.00	42	8	22	270	0
11-Jun-19	15.00	40	11	18	270	0
11-Jun-19	16.00	40	11	18	270	0
11-Jun-19	17.00	40	11	18	270	0
11-Jun-19	18.00	38	18	10	247.5	0
11-Jun-19	19.00	38	18	10	247.5	0
11-Jun-19	20.00	38	18	10	247.5	0
11-Jun-19	21.00	34	31	9	247.5	0
11-Jun-19	22.00	34	31	9	247.5	0
12-Jun-19	1.00	34	31	9	247.5	0
12-Jun-19	2.00	28	47	8	247.5	0
12-Jun-19	3.00	28	47	8	247.5	0
12-Jun-19	4.00	28	47	8	247.5	0
12-Jun-19	5.00	29	51	7	247.5	0
12-Jun-19	6.00	29	51	7	247.5	0
12-Jun-19	7.00	29	51	7	247.5	0
12-Jun-19	8.00	34	32	12	247.5	0
12-Jun-19	9.00	34	32	12	247.5	0
12-Jun-19	10.00	34	32	12	247.5	0
12-Jun-19	11.00	40	14	19	247.5	0
12-Jun-19	12.00	40	14	19	247.5	0
12-Jun-19	13.00	40	14	19	247.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
12-Jun-19	14.00	41	11	24	247.5	0
12-Jun-19	15.00	41	11	24	247.5	0
12-Jun-19	16.00	41	11	24	247.5	0
12-Jun-19	17.00	39	14	21	247.5	0
12-Jun-19	18.00	39	14	21	247.5	0
12-Jun-19	19.00	39	14	21	247.5	0
12-Jun-19	20.00	37	24	13	247.5	0
12-Jun-19	21.00	37	24	13	247.5	0
12-Jun-19	22.00	37	24	13	247.5	0
13-Jun-19	1.00	33	37	14	247.5	0
13-Jun-19	2.00	33	37	14	247.5	0
13-Jun-19	3.00	33	37	14	247.5	0
13-Jun-19	4.00	28	47	10	247.5	0
13-Jun-19	5.00	28	47	10	247.5	0
13-Jun-19	6.00	28	47	10	247.5	0
13-Jun-19	7.00	28	49	11	225	0
13-Jun-19	8.00	28	49	11	225	0
13-Jun-19	9.00	28	49	11	225	0
13-Jun-19	10.00	33	32	18	247.5	0
13-Jun-19	11.00	33	32	18	247.5	0
13-Jun-19	12.00	33	32	18	247.5	0
13-Jun-19	13.00	40	12	24	247.5	0
13-Jun-19	14.00	40	12	24	247.5	0
13-Jun-19	15.00	40	12	24	247.5	0
13-Jun-19	16.00	41	9	27	247.5	0
13-Jun-19	17.00	41	9	27	247.5	0
13-Jun-19	18.00	41	9	27	247.5	0
13-Jun-19	19.00	39	13	19	247.5	0
13-Jun-19	20.00	39	13	19	247.5	0
13-Jun-19	21.00	39	13	19	247.5	0
13-Jun-19	22.00	36	22	10	247.5	0
14-Jun-19	1.00	36	22	10	247.5	0
14-Jun-19	2.00	36	22	10	247.5	0
14-Jun-19	3.00	33	35	10	315	0
14-Jun-19	4.00	33	35	10	315	0
14-Jun-19	5.00	33	35	10	315	0
14-Jun-19	6.00	28	55	8	292.5	0
14-Jun-19	7.00	28	55	8	292.5	0
14-Jun-19	8.00	28	55	8	292.5	0
14-Jun-19	9.00	29	56	8	292.5	0
14-Jun-19	10.00	29	56	8	292.5	0
14-Jun-19	11.00	29	56	8	292.5	0
14-Jun-19	12.00	33	35	12	292.5	0
14-Jun-19	13.00	33	35	12	292.5	0
14-Jun-19	14.00	33	35	12	292.5	0
14-Jun-19	15.00	39	18	15	270	0
14-Jun-19	16.00	39	18	15	270	0
14-Jun-19	17.00	39	18	15	270	0
14-Jun-19	18.00	41	13	19	270	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
14-Jun-19	19.00	41	13	19	270	0
14-Jun-19	20.00	41	13	19	270	0
14-Jun-19	21.00	39	15	18	270	0
14-Jun-19	22.00	39	15	18	270	0
15-Jun-19	1.00	39	15	18	270	0
15-Jun-19	2.00	35	23	12	292.5	0
15-Jun-19	3.00	35	23	12	292.5	0
15-Jun-19	4.00	35	23	12	292.5	0
15-Jun-19	5.00	30	38	15	292.5	0
15-Jun-19	6.00	30	38	15	292.5	0
15-Jun-19	7.00	30	38	15	292.5	0
15-Jun-19	8.00	27	56	13	292.5	0
15-Jun-19	9.00	27	56	13	292.5	0
15-Jun-19	10.00	27	56	13	292.5	0
15-Jun-19	11.00	27	56	10	292.5	0
15-Jun-19	12.00	27	56	10	292.5	0
15-Jun-19	13.00	27	56	10	292.5	0
15-Jun-19	14.00	33	30	13	292.5	0
15-Jun-19	15.00	33	30	13	292.5	0
15-Jun-19	16.00	33	30	13	292.5	0
15-Jun-19	17.00	40	15	19	270	0
15-Jun-19	18.00	40	15	19	270	0
15-Jun-19	19.00	40	15	19	270	0
15-Jun-19	20.00	41	13	23	270	0
15-Jun-19	21.00	41	13	23	270	0
15-Jun-19	22.00	41	13	23	270	0

B. Jalore

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
18-Mar-19	1.00	25	34	13	45	0
18-Mar-19	2.00	22	45	10	45	0
18-Mar-19	3.00	23	47	13	45	0
18-Mar-19	4.00	21	45	15	45	0
18-Mar-19	5.00	20	50	16	67.5	0
18-Mar-19	6.00	23	50	13	90	0
18-Mar-19	7.00	25	45	12	90	0
18-Mar-19	8.00	27	40	10	90	0
18-Mar-19	9.00	26	38	14	112.5	0
18-Mar-19	10.00	28	35	18	90	0
18-Mar-19	11.00	28	30	8	90	0
18-Mar-19	12.00	30	32	11	67.5	0
18-Mar-19	13.00	34	28	5	67.5	0
18-Mar-19	14.00	36	27	9	67.5	0
18-Mar-19	15.00	32	25	7	135	0
18-Mar-19	16.00	30	25	5	135	0
18-Mar-19	17.00	30	25	3	135	0
18-Mar-19	18.00	31	25	15	247.5	0
18-Mar-19	19.00	30	28	13	247.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
18-Mar-19	20.00	27	30	18	247.5	0
18-Mar-19	21.00	28	31	22	45	0
18-Mar-19	22.00	26	34	19	45	0
18-Mar-19	23.00	24	35	15	45	0
18-Mar-19	0.00	27	34	12	45	0
19-Mar-19	1.00	25	37	12	90	0
19-Mar-19	2.00	20	42	5	90	0
19-Mar-19	3.00	24	44	6	135	0
19-Mar-19	4.00	21	48	5	135	0
19-Mar-19	5.00	26	50	4	135	0
19-Mar-19	6.00	25	52	6	180	0
19-Mar-19	7.00	28	50	5	180	0
19-Mar-19	8.00	27	48	8	180	0
19-Mar-19	9.00	29	50	6	202.5	0
19-Mar-19	10.00	26	45	4	202.5	0
19-Mar-19	11.00	30	44	8	202.5	0
19-Mar-19	12.00	32	34	15	225	0
19-Mar-19	13.00	35	30	18	225	0
19-Mar-19	14.00	38	28	12	225	0
19-Mar-19	15.00	34	25	23	225	0
19-Mar-19	16.00	30	22	20	225	0
19-Mar-19	17.00	32	24	14	225	0
19-Mar-19	18.00	33	26	24	225	0
19-Mar-19	19.00	31	29	21	225	0
19-Mar-19	20.00	27	30	20	225	0
19-Mar-19	21.00	29	31	21	225	0
19-Mar-19	22.00	27	32	19	225	0
19-Mar-19	23.00	23	33	20	225	0
19-Mar-19	0.00	27	35	19	225	0
20-Mar-19	1.00	26	35	18	225	0
20-Mar-19	2.00	20	38	10	225	0
20-Mar-19	3.00	24	39	13	247.5	0
20-Mar-19	4.00	26	40	12	247.5	0
20-Mar-19	5.00	22	40	16	247.5	0
20-Mar-19	6.00	23	41	14	270	0
20-Mar-19	7.00	25	42	17	270	0
20-Mar-19	8.00	24	35	12	270	0
20-Mar-19	9.00	26	37	17	270	0
20-Mar-19	10.00	28	34	13	270	0
20-Mar-19	11.00	27	30	14	270	0
20-Mar-19	12.00	30	26	18	247.5	0
20-Mar-19	13.00	36	22	12	247.5	0
20-Mar-19	14.00	31	19	15	247.5	0
20-Mar-19	15.00	33	17	18	247.5	0
20-Mar-19	16.00	32	15	12	247.5	0
20-Mar-19	17.00	30	17	8	247.5	0
20-Mar-19	18.00	31	17	12	247.5	0
20-Mar-19	19.00	29	19	8	247.5	0
20-Mar-19	20.00	27	20	10	247.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
20-Mar-19	21.00	28	20	8	247.5	0
20-Mar-19	22.00	26	20	5	247.5	0
20-Mar-19	23.00	24	19	3	247.5	0
20-Mar-19	0.00	26	20	6	247.5	0
21-Mar-19	1.00	25	21	8	247.5	0
21-Mar-19	2.00	23	20	5	247.5	0
21-Mar-19	3.00	25	23	7	225	0
21-Mar-19	4.00	23	25	4	225	0
21-Mar-19	5.00	27	27	12	225	0
21-Mar-19	6.00	24	27	15	67.5	0
21-Mar-19	7.00	26	25	13	67.5	0
21-Mar-19	8.00	28	26	10	67.5	0
21-Mar-19	9.00	27	28	17	67.5	0
21-Mar-19	10.00	29	25	15	67.5	0
21-Mar-19	11.00	30	24	12	67.5	0
21-Mar-19	12.00	31	25	17	67.5	0
21-Mar-19	13.00	38	22	16	67.5	0
21-Mar-19	14.00	34	22	8	67.5	0
21-Mar-19	15.00	33	20	11	45	0
21-Mar-19	16.00	35	19	12	45	0
21-Mar-19	17.00	31	20	8	45	0
21-Mar-19	18.00	32	18	9	45	0
21-Mar-19	19.00	30	20	6	45	0
21-Mar-19	20.00	27	21	8	45	0
21-Mar-19	21.00	29	22	12	22.5	0
21-Mar-19	22.00	30	20	15	22.5	0
21-Mar-19	23.00	26	25	10	22.5	0
21-Mar-19	0.00	24	29	19	22.5	0
22-Mar-19	1.00	26	28	19	45	0
22-Mar-19	2.00	22	35	12	45	0
22-Mar-19	3.00	24	39	17	22.5	0
22-Mar-19	4.00	21	40	15	22.5	0
22-Mar-19	5.00	23	42	12	22.5	0
22-Mar-19	6.00	24	42	16	22.5	0
22-Mar-19	7.00	26	39	10	22.5	0
22-Mar-19	8.00	24	35	15	22.5	0
22-Mar-19	9.00	27	33	19	22.5	0
22-Mar-19	10.00	30	30	16	22.5	0
22-Mar-19	11.00	34	28	14	22.5	0
22-Mar-19	12.00	32	22	16	22.5	0
22-Mar-19	13.00	35	20	12	22.5	0
22-Mar-19	14.00	37	18	10	360	0
22-Mar-19	15.00	33	17	14	22.5	0
22-Mar-19	16.00	30	17	8	0	0
22-Mar-19	17.00	28	16	9	0	0
22-Mar-19	18.00	32	17	12	22.5	0
22-Mar-19	19.00	29	20	10	0	0
22-Mar-19	20.00	27	21	14	0	0
22-Mar-19	21.00	29	23	11	45	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
22-Mar-19	22.00	24	25	9	45	0
22-Mar-19	23.00	27	29	8	45	0
22-Mar-19	0.00	25	30	6	45	0
23-Mar-19	1.00	27	31	14	67.5	0
23-Mar-19	2.00	23	30	11	90	0
23-Mar-19	3.00	25	34	14	90	0
23-Mar-19	4.00	23	35	16	90	0
23-Mar-19	5.00	26	36	12	90	0
23-Mar-19	6.00	25	38	13	112.5	0
23-Mar-19	7.00	27	38	10	90	0
23-Mar-19	8.00	28	40	9	90	0
23-Mar-19	9.00	28	40	13	112.5	0
23-Mar-19	10.00	30	38	12	90	0
23-Mar-19	11.00	34	37	10	90	0
23-Mar-19	12.00	33	26	12	180	0
23-Mar-19	13.00	42	23	9	180	0
23-Mar-19	14.00	38	20	6	180	0
23-Mar-19	15.00	35	17	10	225	0
23-Mar-19	16.00	32	16	10	225	0
23-Mar-19	17.00	31	17	15	225	0
23-Mar-19	18.00	34	17	9	202.5	0
23-Mar-19	19.00	33	24	5	202.5	0
23-Mar-19	20.00	30	27	3	202.5	0
23-Mar-19	21.00	31	25	10	180	0
23-Mar-19	22.00	30	30	8	180	0
23-Mar-19	23.00	33	34	15	180	0
23-Mar-19	0.00	31	35	10	180	0
24-Mar-19	1.00	29	36	13	247.5	0
24-Mar-19	2.00	29	38	16	247.5	0
24-Mar-19	3.00	27	40	10	247.5	0
24-Mar-19	4.00	24	42	8	247.5	0
24-Mar-19	5.00	22	43	9	247.5	0
24-Mar-19	6.00	26	43	6	225	0
24-Mar-19	7.00	22	41	8	225	0
24-Mar-19	8.00	27	40	11	225	0
24-Mar-19	9.00	29	38	9	247.5	0
24-Mar-19	10.00	32	35	14	247.5	0
24-Mar-19	11.00	35	32	10	247.5	0
24-Mar-19	12.00	34	27	13	270	0
24-Mar-19	13.00	41	24	18	270	0
24-Mar-19	14.00	39	25	20	270	0
24-Mar-19	15.00	36	22	22	315	0
24-Mar-19	16.00	34	22	15	315	0
24-Mar-19	17.00	31	21	19	315	0
24-Mar-19	18.00	33	22	24	337.5	0
24-Mar-19	19.00	30	24	22	337.5	0
24-Mar-19	20.00	32	25	17	337.5	0
24-Mar-19	21.00	29	25	18	247.5	0
24-Mar-19	22.00	28	27	15	247.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
24-Mar-19	23.00	26	28	14	247.5	0
24-Mar-19	0.00	25	28	12	247.5	0
25-Mar-19	1.00	27	28	7	22.5	0
25-Mar-19	2.00	24	30	8	22.5	0
25-Mar-19	3.00	26	31	3	90	0
25-Mar-19	4.00	24	30	5	90	0
25-Mar-19	5.00	28	31	2	90	0
25-Mar-19	6.00	26	32	4	90	0
25-Mar-19	7.00	29	30	8	90	0
25-Mar-19	8.00	28	28	6	90	0
25-Mar-19	9.00	28	27	10	0	0
25-Mar-19	10.00	31	25	7	0	0
25-Mar-19	11.00	30	23	5	0	0
25-Mar-19	12.00	32	19	14	112.5	0
25-Mar-19	13.00	42	18	10	112.5	0
25-Mar-19	14.00	38	18	12	112.5	0
25-Mar-19	15.00	34	18	20	315	0
25-Mar-19	16.00	35	19	18	315	0
25-Mar-19	17.00	31	19	17	315	0
25-Mar-19	18.00	33	19	22	337.5	0
25-Mar-19	19.00	30	22	18	360	0
25-Mar-19	20.00	27	21	15	360	0
25-Mar-19	21.00	29	23	18	360	0
25-Mar-19	22.00	25	25	15	360	0
25-Mar-19	23.00	29	27	12	360	0
25-Mar-19	0.00	25	28	10	225	0
26-Mar-19	1.00	27	29	15	247.2	0
26-Mar-19	2.00	23	35	13	225	0
26-Mar-19	3.00	25	38	14	22.5	0
26-Mar-19	4.00	26	40	10	22.5	0
26-Mar-19	5.00	22	42	13	22.5	0
26-Mar-19	6.00	25	45	12	67.5	0
26-Mar-19	7.00	27	43	15	45	0
26-Mar-19	8.00	24	40	9	90	0
26-Mar-19	9.00	28	41	10	90	0
26-Mar-19	10.00	31	38	10	90	0
26-Mar-19	11.00	30	32	6	90	0
26-Mar-19	12.00	32	20	11	45	0
26-Mar-19	13.00	42	18	8	45	0
26-Mar-19	14.00	37	16	5	45	0
26-Mar-19	15.00	34	15	11	22.5	0
26-Mar-19	16.00	30	13	8	22.5	0
26-Mar-19	17.00	32	18	5	22.5	0
26-Mar-19	18.00	34	14	7	22.5	0
26-Mar-19	19.00	32	15	6	22.5	0
26-Mar-19	20.00	28	17	5	22.5	0
26-Mar-19	21.00	31	18	4	45	0
26-Mar-19	22.00	30	20	5	45	0
26-Mar-19	23.00	25	22	8	45	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
26-Mar-19	0.00	29	25	6	45	0
27-Mar-19	1.00	29	24	5	45	0
27-Mar-19	2.00	24	28	5	45	0
27-Mar-19	3.00	27	31	8	67.5	0
27-Mar-19	4.00	25	32	10	67.5	0
27-Mar-19	5.00	21	35	15	67.5	0
27-Mar-19	6.00	27	33	10	90	0
27-Mar-19	7.00	30	30	16	90	0
27-Mar-19	8.00	25	28	14	90	0
27-Mar-19	9.00	31	28	10	112.5	0
27-Mar-19	10.00	28	25	8	112.5	0
27-Mar-19	11.00	30	22	5	112.5	0
27-Mar-19	12.00	36	19	6	202.5	0
27-Mar-19	13.00	40	17	4	202.5	0
27-Mar-19	14.00	41	15	6	202.5	0
27-Mar-19	15.00	38	15	4	292.5	0
27-Mar-19	16.00	35	15	3	292.5	0
27-Mar-19	17.00	32	14	2	292.5	0
27-Mar-19	18.00	37	15	5	247.5	0
27-Mar-19	19.00	31	16	7	247.5	0
27-Mar-19	20.00	30	15	8	247.5	0
27-Mar-19	21.00	34	17	9	157.5	0
27-Mar-19	22.00	28	20	12	157.5	0
27-Mar-19	23.00	25	20	15	157.5	0
27-Mar-19	0.00	21	20	10	157.5	0
28-Mar-19	1.00	32	20	13	202.5	0
28-Mar-19	2.00	30	23	10	202.5	0
28-Mar-19	3.00	29	25	13	225	0
28-Mar-19	4.00	27	28	15	225	0
28-Mar-19	5.00	24	25	17	225	0
28-Mar-19	6.00	29	28	10	225	0
28-Mar-19	7.00	31	26	8	225	0
28-Mar-19	8.00	30	25	5	225	0
28-Mar-19	9.00	33	28	11	202.5	0
28-Mar-19	10.00	36	24	9	202.5	0
28-Mar-19	11.00	34	22	12	202.5	0
28-Mar-19	12.00	38	24	14	225	0
28-Mar-19	13.00	41	22	13	225	0
28-Mar-19	14.00	35	23	18	225	0
28-Mar-19	15.00	40	21	16	247.5	0
28-Mar-19	16.00	37	20	13	247.5	0
28-Mar-19	17.00	36	22	10	247.5	0
28-Mar-19	18.00	39	22	14	247.5	0
28-Mar-19	19.00	34	24	16	247.5	0
28-Mar-19	20.00	38	26	12	247.5	0
28-Mar-19	21.00	36	27	13	225	0
28-Mar-19	22.00	32	29	10	225	0
28-Mar-19	23.00	25	30	9	225	0
28-Mar-19	0.00	31	31	12	225	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
29-Mar-19	1.00	33	31	15	247.5	0
29-Mar-19	2.00	32	35	10	247.5	0
29-Mar-19	3.00	29	39	12	247.5	0
29-Mar-19	4.00	25	38	5	247.5	0
29-Mar-19	5.00	30	39	8	247.5	0
29-Mar-19	6.00	28	39	8	225	0
29-Mar-19	7.00	31	35	5	225	0
29-Mar-19	8.00	29	30	7	225	0
29-Mar-19	9.00	32	25	9	202.5	0
29-Mar-19	10.00	30	22	12	202.5	0
29-Mar-19	11.00	35	20	16	202.5	0
29-Mar-19	12.00	38	20	14	202.5	0
29-Mar-19	13.00	43	18	18	202.5	0
29-Mar-19	14.00	42	17	9	202.5	0
29-Mar-19	15.00	41	17	10	225	0
29-Mar-19	16.00	38	16	8	225	0
29-Mar-19	17.00	40	16	5	225	0
29-Mar-19	18.00	39	17	17	225	0
29-Mar-19	19.00	35	18	13	225	0
29-Mar-19	20.00	32	19	19	225	0
29-Mar-19	21.00	35	19	27	225	0
29-Mar-19	22.00	31	20	24	225	0
29-Mar-19	23.00	25	20	22	225	0
29-Mar-19	0.00	29	21	20	225	0
30-Mar-19	1.00	32	23	17	225	0
30-Mar-19	2.00	30	25	14	225	0
30-Mar-19	3.00	30	27	15	225	0
30-Mar-19	4.00	28	29	13	225	0
30-Mar-19	5.00	26	33	16	225	0
30-Mar-19	6.00	29	35	12	247.5	0
30-Mar-19	7.00	24	37	10	247.5	0
30-Mar-19	8.00	30	36	8	247.5	0
30-Mar-19	9.00	33	39	11	247.5	0
30-Mar-19	10.00	35	30	5	247.5	0
30-Mar-19	11.00	36	36	10	247.5	0
30-Mar-19	12.00	38	22	13	247.5	0
30-Mar-19	13.00	40	20	12	247.5	0
30-Mar-19	14.00	39	15	8	247.5	0
30-Mar-19	15.00	41	15	15	247.5	0
30-Mar-19	16.00	38	14	12	247.5	0
30-Mar-19	17.00	35	15	16	247.5	0
30-Mar-19	18.00	40	15	14	292.5	0
30-Mar-19	19.00	36	17	18	292.5	0
30-Mar-19	20.00	32	19	9	292.5	0
30-Mar-19	21.00	37	19	10	337.5	0
30-Mar-19	22.00	36	20	8	337.5	0
30-Mar-19	23.00	32	22	6	337.5	0
31-Mar-19	0.00	30	21	4	337.5	0
31-Mar-19	1.00	33	22	9	247.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
31-Mar-19	2.00	28	23	8	247.5	0
31-Mar-19	3.00	30	25	9	22.5	0
31-Mar-19	4.00	27	25	5	22.5	0
31-Mar-19	5.00	24	27	10	22.5	0
31-Mar-19	6.00	29	27	15	45	0
31-Mar-19	7.00	32	24	17	45	0
31-Mar-19	8.00	30	20	15	45	0
31-Mar-19	9.00	33	23	17	90	0
31-Mar-19	10.00	35	20	12	90	0
31-Mar-19	11.00	34	19	10	90	0
31-Mar-19	12.00	37	17	11	67.5	0
31-Mar-19	13.00	41	15	8	67.5	0
31-Mar-19	14.00	40	12	12	67.5	0
31-Mar-19	15.00	39	14	9	112.5	0
31-Mar-19	16.00	40	13	7	112.5	0
31-Mar-19	17.00	36	12	5	112.5	0
31-Mar-19	18.00	37	15	10	337.5	0
31-Mar-19	19.00	33	14	6	337.5	0
31-Mar-19	20.00	37	17	10	337.5	0
31-Mar-19	21.00	34	17	13	247.5	0
31-Mar-19	22.00	30	18	12	247.5	0
31-Mar-19	23.00	29	15	8	247.5	
31-Mar-19	0.00	27	19	9	247.5	0
1-Apr-19	1.00	31	19	13	22.5	0
1-Apr-19	2.00	31	22	13	22.5	0
1-Apr-19	3.00	29	23	9	45	0
1-Apr-19	4.00	29	25	9	45	0
1-Apr-19	5.00	29	24	9	45	0
1-Apr-19	6.00	29	26	8	90	0
1-Apr-19	7.00	29	23	8	90	0
1-Apr-19	8.00	29	20	8	90	0
1-Apr-19	9.00	34	22	6	157.5	0
1-Apr-19	10.00	34	20	6	157.5	0
1-Apr-19	11.00	34	18	6	157.5	0
1-Apr-19	12.00	38	15	9	315	0
1-Apr-19	13.00	38	13	9	315	0
1-Apr-19	14.00	38	15	9	315	0
1-Apr-19	15.00	39	13	15	315	0
1-Apr-19	16.00	39	14	15	315	0
1-Apr-19	17.00	39	16	15	315	0
1-Apr-19	18.00	38	15	14	315	0
1-Apr-19	19.00	38	17	14	315	0
1-Apr-19	20.00	38	19	14	315	0
1-Apr-19	21.00	34	20	11	337.5	0
1-Apr-19	22.00	34	22	11	337.5	0
1-Apr-19	23.00	34	24	11	337.5	0
1-Apr-19	0.00	34	22	11	337.5	0
2-Apr-19	1.00	32	24	6	315	0
2-Apr-19	2.00	32	24	6	315	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
2-Apr-19	3.00	31	26	3	247.5	0
2-Apr-19	4.00	31	25	3	247.5	0
2-Apr-19	5.00	31	24	3	247.5	0
2-Apr-19	6.00	30	26	5	247.5	0
2-Apr-19	7.00	30	23	5	247.5	0
2-Apr-19	8.00	30	20	5	247.5	0
2-Apr-19	9.00	35	21	5	270	0
2-Apr-19	10.00	35	18	5	270	0
2-Apr-19	11.00	35	19	5	270	0
2-Apr-19	12.00	40	16	5	270	0
2-Apr-19	13.00	40	14	5	270	0
2-Apr-19	14.00	40	11	5	270	0
2-Apr-19	15.00	40	13	8	292.5	0
2-Apr-19	16.00	40	15	8	292.5	0
2-Apr-19	17.00	40	15	8	292.5	0
2-Apr-19	18.00	39	17	8	315	0
2-Apr-19	19.00	39	19	8	315	0
2-Apr-19	20.00	39	24	8	315	0
2-Apr-19	21.00	35	26	9	292.5	0
2-Apr-19	22.00	35	28	9	292.5	0
2-Apr-19	23.00	35	29	9	292.5	0
2-Apr-19	0.00	35	29	9	292.5	0
3-Apr-19	1.00	32	28	14	247.5	0
3-Apr-19	2.00	32	25	14	247.5	0
3-Apr-19	3.00	30	26	14	270	0
3-Apr-19	4.00	30	23	14	270	0
3-Apr-19	5.00	30	22	14	270	0
3-Apr-19	6.00	29	23	11	247.5	0
3-Apr-19	7.00	29	20	11	247.5	0
3-Apr-19	8.00	29	18	11	247.5	0
3-Apr-19	9.00	33	18	13	225	0
3-Apr-19	10.00	33	15	13	225	0
3-Apr-19	11.00	33	13	13	225	0
3-Apr-19	12.00	39	14	11	247.5	0
3-Apr-19	13.00	39	12	11	247.5	0
3-Apr-19	14.00	39	13	11	247.5	0
3-Apr-19	15.00	42	12	8	270	0
3-Apr-19	16.00	42	14	8	270	0
3-Apr-19	17.00	42	14	8	270	0
3-Apr-19	18.00	41	14	6	247.5	0
3-Apr-19	19.00	41	16	6	247.5	0
3-Apr-19	20.00	41	18	6	247.5	0
3-Apr-19	21.00	38	21	13	225	0
3-Apr-19	22.00	38	25	13	225	0
3-Apr-19	23.00	38	28	13	225	0
4-Apr-19	0.00	38	30	13	225	0
4-Apr-19	1.00	34	30	21	225	0
4-Apr-19	2.00	34	35	0	225	0
4-Apr-19	3.00	31	36	16	247.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
4-Apr-19	4.00	31	39	16	247.5	0
4-Apr-19	5.00	31	40	16	247.5	0
4-Apr-19	6.00	31	41	10	247.5	0
4-Apr-19	7.00	31	38	10	247.5	0
4-Apr-19	8.00	31	35	10	247.5	0
4-Apr-19	9.00	35	33	8	247.5	0
4-Apr-19	10.00	35	30	8	247.5	0
4-Apr-19	11.00	35	25	8	247.5	0
4-Apr-19	12.00	40	19	11	247.5	0
4-Apr-19	13.00	40	17	11	247.5	0
4-Apr-19	14.00	40	15	11	247.5	0
4-Apr-19	15.00	42	12	11	247.5	0
4-Apr-19	16.00	42	13	11	247.5	0
4-Apr-19	17.00	42	14	11	247.5	0
4-Apr-19	18.00	40	16	12	225	0
4-Apr-19	19.00	40	18	12	225	0
4-Apr-19	20.00	40	17	12	225	0
4-Apr-19	21.00	37	20	17	225	0
4-Apr-19	22.00	37	24	17	225	0
4-Apr-19	23.00	37	25	17	225	0
4-Apr-19	0.00	37	27	17	225	0
5-Apr-19	1.00	34	28	20	247.5	0
5-Apr-19	2.00	34	30	20	247.5	0
5-Apr-19	3.00	32	32	18	247.5	0
5-Apr-19	4.00	32	30	18	247.5	0
5-Apr-19	5.00	32	32	18	247.5	0
5-Apr-19	6.00	31	33	15	247.5	0
5-Apr-19	7.00	31	32	15	247.5	0
5-Apr-19	8.00	31	30	15	247.5	0
5-Apr-19	9.00	35	31	17	202.5	0
5-Apr-19	10.00	35	28	17	202.5	0
5-Apr-19	11.00	35	25	17	202.5	0
5-Apr-19	12.00	40	18	20	225	0
5-Apr-19	13.00	40	17	20	225	0
5-Apr-19	14.00	40	15	20	225	0
5-Apr-19	15.00	42	14	22	225	0
5-Apr-19	16.00	42	14	22	225	0
5-Apr-19	17.00	42	13	22	225	0
5-Apr-19	18.00	40	14	25	225	0
5-Apr-19	19.00	40	15	25	225	0
5-Apr-19	20.00	40	18	25	225	0
5-Apr-19	21.00	37	17	26	225	0
5-Apr-19	22.00	37	15	26	225	0
5-Apr-19	23.00	37	18	26	225	0
5-Apr-19	0.00	37	19	26	225	0
6-Apr-19	1.00	33	19	21	225	0
6-Apr-19	2.00	33	20	21	225	0
6-Apr-19	3.00	29	21	18	225	0
6-Apr-19	4.00	29	22	18	225	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
6-Apr-19	5.00	29	22	18	225	0
6-Apr-19	6.00	28	23	19	202.5	0
6-Apr-19	7.00	28	21	19	202.5	0
6-Apr-19	8.00	28	20	19	202.5	0
6-Apr-19	9.00	32	19	20	225	0
6-Apr-19	10.00	32	17	20	225	0
6-Apr-19	11.00	32	16	20	225	0
6-Apr-19	12.00	38	14	18	225	0
6-Apr-19	13.00	38	12	18	225	0
6-Apr-19	14.00	38	14	18	225	0
6-Apr-19	15.00	41	13	16	247.5	0
6-Apr-19	16.00	41	13	16	247.5	0
6-Apr-19	17.00	41	15	16	247.5	0
6-Apr-19	18.00	40	14	18	225	0
6-Apr-19	19.00	40	15	18	225	0
6-Apr-19	20.00	40	17	18	225	0
6-Apr-19	21.00	36	17	25	225	0
6-Apr-19	22.00	36	15	25	225	0
6-Apr-19	23.00	36	20	25	225	0
6-Apr-19	0.00	36	18	25	225	0
7-Apr-19	1.00	33	18	24	225	0
7-Apr-19	2.00	33	18	24	225	0
7-Apr-19	3.00	30	20	21	202.5	0
7-Apr-19	4.00	30	17	21	202.5	0
7-Apr-19	5.00	30	16	21	202.5	0
7-Apr-19	6.00	29	19	18	202.5	0
7-Apr-19	7.00	29	18	18	202.5	0
7-Apr-19	8.00	29	14	18	202.5	0
7-Apr-19	9.00	32	15	17	202.5	0
7-Apr-19	10.00	32	13	17	202.5	0
7-Apr-19	11.00	32	10	17	202.5	0
7-Apr-19	12.00	38	11	15	202.5	0
7-Apr-19	13.00	38	10	15	202.5	0
7-Apr-19	14.00	38	8	15	202.5	0
7-Apr-19	15.00	40	11	14	225	0
7-Apr-19	16.00	40	15	14	225	0
7-Apr-19	17.00	40	12	14	225	0
7-Apr-19	18.00	40	13	18	225	0
7-Apr-19	19.00	40	14	18	225	0
7-Apr-19	20.00	40	18	18	225	0
7-Apr-19	21.00	36	16	24	202.5	0
7-Apr-19	22.00	36	15	24	202.5	0
7-Apr-19	23.00	36	14	24	202.5	0
7-Apr-19	0.00	36	18	24	202.5	0
8-Apr-19	1.00	33	19	23	225	0
8-Apr-19	2.00	33	22	23	225	0
8-Apr-19	3.00	31	24	19	225	0
8-Apr-19	4.00	31	27	19	225	0
8-Apr-19	5.00	31	25	19	225	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
8-Apr-19	6.00	30	29	18	225	0
8-Apr-19	7.00	30	26	18	225	0
8-Apr-19	8.00	30	25	18	225	0
8-Apr-19	9.00	33	24	19	225	0
8-Apr-19	10.00	33	20	19	225	0
8-Apr-19	11.00	33	18	19	225	0
8-Apr-19	12.00	38	16	18	225	0
8-Apr-19	13.00	38	15	18	225	0
8-Apr-19	14.00	38	16	18	225	0
8-Apr-19	15.00	41	16	17	225	0
8-Apr-19	16.00	41	17	17	225	0
8-Apr-19	17.00	41	20	17	225	0
8-Apr-19	18.00	40	22	24	225	0
8-Apr-19	19.00	40	25	24	225	0
8-Apr-19	20.00	40	27	24	225	0
8-Apr-19	21.00	36	29	31	225	0
8-Apr-19	22.00	36	32	31	225	0
8-Apr-19	23.00	36	33	31	225	0
8-Apr-19	0.00	36	35	31	225	0
9-Apr-19	1.00	32	34	22	225	0
9-Apr-19	2.00	32	36	22	225	0
9-Apr-19	3.00	30	38	19	225	0
9-Apr-19	4.00	30	35	19	225	0
9-Apr-19	5.00	30	37	19	225	0
9-Apr-19	6.00	29	36	18	225	0
9-Apr-19	7.00	29	34	18	225	0
9-Apr-19	8.00	29	32	18	225	0
9-Apr-19	9.00	32	26	19	225	0
9-Apr-19	10.00	32	25	19	225	0
9-Apr-19	11.00	32	22	19	225	0
9-Apr-19	12.00	38	20	19	225	0
9-Apr-19	13.00	38	18	19	225	0
9-Apr-19	14.00	38	16	19	225	0
9-Apr-19	15.00	41	17	21	225	0
9-Apr-19	16.00	41	18	21	225	0
9-Apr-19	17.00	41	17	21	225	0
9-Apr-19	18.00	39	19	26	225	0
9-Apr-19	19.00	39	23	26	225	0
9-Apr-19	20.00	39	24	26	225	0
9-Apr-19	21.00	35	26	30	202.5	0
9-Apr-19	22.00	35	28	30	202.5	0
9-Apr-19	23.00	35	28	30	202.5	0
9-Apr-19	0.00	35	29	30	202.5	0
10-Apr-19	1.00	32	30	24	225	0
10-Apr-19	2.00	32	31	24	225	0
10-Apr-19	3.00	30	33	19	225	0
10-Apr-19	4.00	30	30	19	225	0
10-Apr-19	5.00	30	31	19	225	0
10-Apr-19	6.00	30	33	18	225	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
10-Apr-19	7.00	30	30	18	225	0
10-Apr-19	8.00	30	28	18	225	0
10-Apr-19	9.00	34	26	19	225	0
10-Apr-19	10.00	34	23	19	225	0
10-Apr-19	11.00	34	22	19	225	0
10-Apr-19	12.00	39	16	16	247.5	0
10-Apr-19	13.00	39	15	16	247.5	0
10-Apr-19	14.00	39	13	16	247.5	0
10-Apr-19	15.00	41	11	14	247.5	0
10-Apr-19	16.00	41	10	14	247.5	0
10-Apr-19	17.00	41	11	14	247.5	0
10-Apr-19	18.00	40	11	17	225	0
10-Apr-19	19.00	40	13	17	225	0
10-Apr-19	20.00	40	11	17	225	0
10-Apr-19	21.00	37	14	21	225	0
10-Apr-19	22.00	37	15	21	225	0
10-Apr-19	23.00	37	17	21	225	0
10-Apr-19	0.00	37	16	21	225	0
11-Apr-19	1.00	34	15	20	225	0
11-Apr-19	2.00	34	14	20	225	0
11-Apr-19	3.00	32	15	16	247.5	0
11-Apr-19	4.00	32	15	16	247.5	0
11-Apr-19	5.00	32	17	16	247.5	0
11-Apr-19	6.00	32	15	14	247.5	0
11-Apr-19	7.00	32	13	14	247.5	0
11-Apr-19	8.00	32	11	14	247.5	0
11-Apr-19	9.00	36	12	18	270	0
11-Apr-19	10.00	36	10	18	270	0
11-Apr-19	11.00	36	10	18	270	0
11-Apr-19	12.00	40	10	24	270	0
11-Apr-19	13.00	40	12	24	270	0
11-Apr-19	14.00	40	12	24	270	0
11-Apr-19	15.00	41	11	24	247.5	0
11-Apr-19	16.00	41	12	24	247.5	0
11-Apr-19	17.00	41	10	24	247.5	0
11-Apr-19	18.00	40	13	22	247.5	0
11-Apr-19	19.00	40	12	22	247.5	0
11-Apr-19	20.00	40	13	22	247.5	0
11-Apr-19	21.00	36	15	22	225	0
11-Apr-19	22.00	36	14	22	225	0
11-Apr-19	23.00	36	12	22	225	0
12-Apr-19	0.00	36	18	22	225	0
12-Apr-19	1.00	33	18	24	225	0
12-Apr-19	2.00	33	19	24	225	0
12-Apr-19	3.00	31	22	19	247.5	0
12-Apr-19	4.00	31	20	19	247.5	0
12-Apr-19	5.00	31	22	19	247.5	0
12-Apr-19	6.00	34	19	12	247.5	0
12-Apr-19	7.00	34	15	12	247.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
12-Apr-19	8.00	34	12	12	247.5	0
12-Apr-19	9.00	34	14	4	202.5	0
12-Apr-19	10.00	34	13	4	202.5	0
12-Apr-19	11.00	34	10	4	202.5	0
12-Apr-19	12.00	39	10	5	157.5	0
12-Apr-19	13.00	39	8	5	157.5	0
12-Apr-19	14.00	39	8	5	157.5	0
12-Apr-19	15.00	41	9	10	225	0
12-Apr-19	16.00	41	9	10	225	0
12-Apr-19	17.00	41	8	10	225	0
12-Apr-19	18.00	40	9	18	225	0
12-Apr-19	19.00	40	10	18	225	0
12-Apr-19	20.00	40	11	18	225	0
12-Apr-19	21.00	36	13	26	225	0
12-Apr-19	22.00	36	15	26	225	0
12-Apr-19	23.00	36	17	26	225	0
12-Apr-19	0.00	36	18	26	225	0
13-Apr-19	1.00	33	18	20	247.5	0
13-Apr-19	2.00	33	22	20	247.5	0
13-Apr-19	3.00	31	25	15	225	0
13-Apr-19	4.00	31	28	15	225	0
13-Apr-19	5.00	31	30	15	225	0
13-Apr-19	6.00	31	31	14	202.5	0
13-Apr-19	7.00	31	28	14	202.5	0
13-Apr-19	8.00	31	25	14	202.5	0
13-Apr-19	9.00	34	25	14	180	0
13-Apr-19	10.00	34	20	14	180	0
13-Apr-19	11.00	34	18	14	180	0
13-Apr-19	12.00	38	14	14	202.5	0
13-Apr-19	13.00	38	12	14	202.5	0
13-Apr-19	14.00	38	10	14	202.5	0
13-Apr-19	15.00	40	10	16	225	0
13-Apr-19	16.00	40	10	16	225	0
13-Apr-19	17.00	40	11	16	225	0
13-Apr-19	18.00	39	11	21	225	0
13-Apr-19	19.00	39	14	21	225	0
13-Apr-19	20.00	39	14	21	225	0
13-Apr-19	21.00	36	15	26	225	0
13-Apr-19	22.00	36	18	26	225	0
13-Apr-19	23.00	36	19	26	225	0
13-Apr-19	0.00	36	20	26	225	0
14-Apr-19	1.00	33	19	20	225	0
14-Apr-19	2.00	33	22	20	225	0
14-Apr-19	3.00	31	23	14	225	0
14-Apr-19	4.00	31	20	14	225	0
14-Apr-19	5.00	31	19	14	225	0
14-Apr-19	6.00	31	21	10	202.5	0
14-Apr-19	7.00	31	19	10	202.5	0
14-Apr-19	8.00	31	17	10	202.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
14-Apr-19	9.00	35	16	4	135	0
14-Apr-19	10.00	35	14	4	135	0
14-Apr-19	11.00	35	12	4	135	0
14-Apr-19	12.00	39	11	4	135	0
14-Apr-19	13.00	39	10	4	135	0
14-Apr-19	14.00	39	10	4	135	0
14-Apr-19	15.00	40	8	4	180	0
14-Apr-19	16.00	40	8	4	180	0
14-Apr-19	17.00	40	9	4	180	0
14-Apr-19	18.00	39	8	5	180	0
14-Apr-19	19.00	39	10	5	180	0
14-Apr-19	20.00	39	11	5	180	0
14-Apr-19	21.00	36	12	14	157.5	0
14-Apr-19	22.00	36	14	14	157.5	0
14-Apr-19	23.00	36	15	14	157.5	0
14-Apr-19	0.00	36	16	14	157.5	0
15-Apr-19	1.00	34	16	17	202.5	0
15-Apr-19	2.00	34	15	17	202.5	0
15-Apr-19	3.00	33	14	15	247.5	0
15-Apr-19	4.00	33	14	15	247.5	0
15-Apr-19	5.00	33	15	15	247.5	0
15-Apr-19	6.00	32	14	13	225	0
15-Apr-19	7.00	32	17	13	225	0
15-Apr-19	8.00	32	17	13	225	0
15-Apr-19	9.00	35	18	8	180	0
15-Apr-19	10.00	35	15	8	180	0
15-Apr-19	11.00	35	13	8	180	0
15-Apr-19	12.00	39	12	19	225	0
15-Apr-19	13.00	39	10	19	225	0
15-Apr-19	14.00	39	8	19	225	0
15-Apr-19	15.00	39	8	26	247.5	0
15-Apr-19	16.00	39	7	26	247.5	0
15-Apr-19	17.00	39	6	26	247.5	0
15-Apr-19	18.00	36	8	30	270	0
15-Apr-19	19.00	36	8	30	270	0
15-Apr-19	20.00	36	12	30	270	0
15-Apr-19	21.00	32	10	36	292.5	0
15-Apr-19	22.00	32	15	36	292.5	0
15-Apr-19	23.00	32	18	36	292.5	0
15-Apr-19	0.00	32	22	36	292.5	0
16-Apr-19	1.00	29	33	17	292.5	0
16-Apr-19	2.00	29	33	17	292.5	0
16-Apr-19	3.00	28	37	15	247.5	0
16-Apr-19	4.00	28	37	15	247.5	0
16-Apr-19	5.00	28	37	15	247.5	0
16-Apr-19	6.00	26	41	21	270	0
16-Apr-19	7.00	26	41	21	270	0
16-Apr-19	8.00	26	41	21	270	0
16-Apr-19	9.00	28	35	18	247.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
16-Apr-19	10.00	28	35	18	247.5	0
16-Apr-19	11.00	28	35	18	247.5	0
16-Apr-19	12.00	31	32	23	225	0
16-Apr-19	13.00	31	32	23	225	0
16-Apr-19	14.00	31	32	23	225	0
16-Apr-19	15.00	32	24	36	225	0
16-Apr-19	16.00	32	24	36	225	0
16-Apr-19	17.00	32	24	36	225	0
16-Apr-19	18.00	32	21	38	225	0
16-Apr-19	19.00	32	21	38	225	0
16-Apr-19	20.00	32	21	38	225	0
16-Apr-19	21.00	30	24	20	247.5	0
16-Apr-19	22.00	30	24	20	247.5	0
16-Apr-19	23.00	30	24	20	247.5	0
16-Apr-19	0.00	30	24	20	247.5	0
17-Apr-19	1.00	29	26	14	247.5	0
17-Apr-19	2.00	29	26	14	247.5	0
17-Apr-19	3.00	27	30	15	270	0
17-Apr-19	4.00	27	30	15	270	0
17-Apr-19	5.00	27	30	15	270	0
17-Apr-19	6.00	36	32	15	247.5	0
17-Apr-19	7.00	36	32	15	247.5	0
17-Apr-19	8.00	36	32	15	247.5	0
17-Apr-19	9.00	28	28	18	225	0
17-Apr-19	10.00	28	28	18	225	0
17-Apr-19	11.00	28	28	18	225	0
17-Apr-19	12.00	31	22	15	247.5	0
17-Apr-19	13.00	31	22	15	247.5	0
17-Apr-19	14.00	31	22	15	247.5	0
17-Apr-19	15.00	32	19	12	247.5	0
17-Apr-19	16.00	32	19	12	247.5	0
17-Apr-19	17.00	32	19	12	247.5	0
17-Apr-19	18.00	32	19	10	247.5	0
17-Apr-19	19.00	32	19	10	247.5	0
17-Apr-19	20.00	32	19	10	247.5	0
17-Apr-19	21.00	30	26	13	225	0
17-Apr-19	22.00	30	26	13	225	0
17-Apr-19	23.00	30	26	13	225	0
17-Apr-19	0.00	30	26	13	225	0
18-Apr-19	1.00	28	36	17	225	0
18-Apr-19	2.00	28	36	17	225	0
18-Apr-19	3.00	27	43	9	180	0
18-Apr-19	4.00	27	43	9	180	0
18-Apr-19	5.00	27	43	9	180	0
18-Apr-19	6.00	27	43	6	67.5	0
18-Apr-19	7.00	27	43	6	67.5	0
18-Apr-19	8.00	27	43	6	67.5	0
18-Apr-19	9.00	28	34	13	22.5	0
18-Apr-19	10.00	28	34	13	22.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
18-Apr-19	11.00	28	34	13	22.5	0
18-Apr-19	12.00	32	23	16	0	0
18-Apr-19	13.00	32	23	16	0	0
18-Apr-19	14.00	32	23	16	0	0
18-Apr-19	15.00	33	19	17	112.5	0
18-Apr-19	16.00	33	19	17	112.5	0
18-Apr-19	17.00	33	19	17	112.5	0
18-Apr-19	18.00	33	19	17	0	0
18-Apr-19	19.00	33	19	17	0	0
18-Apr-19	20.00	33	19	17	0	0
18-Apr-19	21.00	31	23	13	247.5	0
18-Apr-19	22.00	31	23	13	247.5	0
18-Apr-19	23.00	31	23	13	247.5	0
18-Apr-19	0.00	31	23	13	247.5	0
19-Apr-19	1.00	29	26	11	22.5	0
19-Apr-19	2.00	29	26	11	22.5	0
19-Apr-19	3.00	28	30	9	45	0
19-Apr-19	4.00	28	30	9	45	0
19-Apr-19	5.00	28	30	9	45	0
19-Apr-19	6.00	28	33	9	67.5	0
19-Apr-19	7.00	28	33	9	67.5	0
19-Apr-19	8.00	28	33	9	67.5	0
19-Apr-19	9.00	30	30	10	157.5	0
19-Apr-19	10.00	30	30	10	157.5	0
19-Apr-19	11.00	30	30	10	157.5	0
19-Apr-19	12.00	33	22	10	337.5	0
19-Apr-19	13.00	33	22	10	337.5	0
19-Apr-19	14.00	33	22	10	337.5	0
19-Apr-19	15.00	35	16	11	337.5	0
19-Apr-19	16.00	35	16	11	337.5	0
19-Apr-19	17.00	35	16	11	337.5	0
19-Apr-19	18.00	35	15	10	225	0
19-Apr-19	19.00	35	15	10	225	0
19-Apr-19	20.00	35	15	10	225	0
19-Apr-19	21.00	33	18	8	22.5	0
19-Apr-19	22.00	33	18	8	22.5	0
19-Apr-19	23.00	33	18	8	22.5	0
19-Apr-19	0.00	33	18	8	22.5	0
20-Apr-19	1.00	31	21	8	67.5	0
20-Apr-19	2.00	31	21	8	67.5	0
20-Apr-19	3.00	29	25	9	112.5	0
20-Apr-19	4.00	29	25	9	112.5	0
20-Apr-19	5.00	29	25	9	112.5	0
20-Apr-19	6.00	30	26	7	157.5	0
20-Apr-19	7.00	30	26	7	157.5	0
20-Apr-19	8.00	30	26	7	157.5	0
20-Apr-19	9.00	33	23	6	247.5	0
20-Apr-19	10.00	33	23	6	247.5	0
20-Apr-19	11.00	33	23	6	247.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
20-Apr-19	12.00	36	17	8	247.5	0
20-Apr-19	13.00	36	17	8	247.5	0
20-Apr-19	14.00	36	17	8	247.5	0
20-Apr-19	15.00	38	13	7	247.5	0
20-Apr-19	16.00	38	13	7	247.5	0
20-Apr-19	17.00	38	13	7	247.5	0
20-Apr-19	18.00	37	13	6	225	0
20-Apr-19	19.00	37	13	6	225	0
20-Apr-19	20.00	37	13	6	225	0
20-Apr-19	21.00	35	16	12	225	0
20-Apr-19	22.00	35	16	12	225	0
20-Apr-19	23.00	35	16	12	225	0
20-Apr-19	0.00	35	16	12	225	0
21-Apr-19	1.00	32	21	22	247.5	0
21-Apr-19	2.00	32	21	22	247.5	0
21-Apr-19	3.00	30	29	16	247.5	0
21-Apr-19	4.00	30	29	16	247.5	0
21-Apr-19	5.00	30	29	16	247.5	0
21-Apr-19	6.00	29	29	13	247.5	0
21-Apr-19	7.00	29	29	13	247.5	0
21-Apr-19	8.00	29	29	13	247.5	0
21-Apr-19	9.00	33	21	14	247.5	0
21-Apr-19	10.00	33	21	14	247.5	0
21-Apr-19	11.00	33	21	14	247.5	0
21-Apr-19	12.00	38	14	15	225	0
21-Apr-19	13.00	38	14	15	225	0
21-Apr-19	14.00	38	14	15	225	0
21-Apr-19	15.00	40	12	10	225	0
21-Apr-19	16.00	40	12	10	225	0
21-Apr-19	17.00	40	12	10	225	0
21-Apr-19	18.00	39	11	8	202.5	0
21-Apr-19	19.00	39	11	8	202.5	0
21-Apr-19	20.00	39	11	8	202.5	0
21-Apr-19	21.00	36	15	13	225	0
21-Apr-19	22.00	36	15	13	225	0
21-Apr-19	23.00	36	15	13	225	0
21-Apr-19	0.00	36	15	13	225	0
22-Apr-19	1.00	33	25	21	247.5	0
22-Apr-19	2.00	33	25	21	247.5	0
22-Apr-19	3.00	31	37	17	270	0
22-Apr-19	4.00	31	37	17	270	0
22-Apr-19	5.00	31	37	17	270	0
22-Apr-19	6.00	30	35	12	247.5	0
22-Apr-19	7.00	30	35	12	247.5	0
22-Apr-19	8.00	30	35	12	247.5	0
22-Apr-19	9.00	34	25	10	225	0
22-Apr-19	10.00	34	25	10	225	0
22-Apr-19	11.00	34	25	10	225	0
22-Apr-19	12.00	39	15	8	247.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
22-Apr-19	13.00	39	15	8	247.5	0
22-Apr-19	14.00	39	15	8	247.5	0
22-Apr-19	15.00	43	10	4	225	0
22-Apr-19	16.00	43	10	4	225	0
22-Apr-19	17.00	43	10	4	225	0
22-Apr-19	18.00	42	10	5	180	0
22-Apr-19	19.00	42	10	5	180	0
22-Apr-19	20.00	42	10	5	180	0
22-Apr-19	21.00	38	12	12	202.5	0
22-Apr-19	22.00	38	12	12	202.5	0
22-Apr-19	23.00	38	12	12	202.5	0
22-Apr-19	0.00	38	12	12	202.5	0
23-Apr-19	1.00	35	16	19	247.5	0
23-Apr-19	2.00	35	16	19	247.5	0
23-Apr-19	3.00	32	23	17	270	0
23-Apr-19	4.00	32	23	17	270	0
23-Apr-19	5.00	32	23	17	270	0
23-Apr-19	6.00	32	30	14	247.5	0
23-Apr-19	7.00	32	30	14	247.5	0
23-Apr-19	8.00	32	30	14	247.5	0
23-Apr-19	9.00	35	26	16	247.5	0
23-Apr-19	10.00	35	26	16	247.5	0
23-Apr-19	11.00	35	26	16	247.5	0
23-Apr-19	12.00	40	15	17	247.5	0
23-Apr-19	13.00	40	15	17	247.5	0
23-Apr-19	14.00	40	15	17	247.5	0
23-Apr-19	15.00	42	10	17	225	0
23-Apr-19	16.00	42	10	17	225	0
23-Apr-19	17.00	42	10	17	225	0
23-Apr-19	18.00	41	10	22	225	0
23-Apr-19	19.00	41	10	22	225	0
23-Apr-19	20.00	41	10	22	225	0
23-Apr-19	21.00	37	10	27	247.5	0
23-Apr-19	22.00	37	10	27	247.5	0
23-Apr-19	23.00	37	10	27	247.5	0
23-Apr-19	0.00	37	10	27	247.5	0
24-Apr-19	1.00	34	18	22	247.5	0
24-Apr-19	2.00	34	18	22	247.5	0
24-Apr-19	3.00	31	33	18	247.5	0
24-Apr-19	4.00	31	33	18	247.5	0
24-Apr-19	5.00	31	33	18	247.5	0
24-Apr-19	6.00	31	36	13	247.5	0
24-Apr-19	7.00	31	36	13	247.5	0
24-Apr-19	8.00	31	36	13	247.5	0
24-Apr-19	9.00	35	22	13	225	0
24-Apr-19	10.00	35	22	13	225	0
24-Apr-19	11.00	35	22	13	225	0
24-Apr-19	12.00	40	13	18	225	0
24-Apr-19	13.00	40	13	0	225	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
24-Apr-19	14.00	40	13	0	225	0
24-Apr-19	15.00	42	9	25	225	0
24-Apr-19	16.00	42	9	25	225	0
24-Apr-19	17.00	42	9	25	225	0
24-Apr-19	18.00	40	10	28	225	0
24-Apr-19	19.00	40	10	28	225	0
24-Apr-19	20.00	40	10	28	225	0
24-Apr-19	21.00	36	14	27	225	0
24-Apr-19	22.00	36	14	27	225	0
24-Apr-19	23.00	36	14	27	225	0
24-Apr-19	0.00	36	14	27	225	0
25-Apr-19	1.00	33	22	23	225	0
25-Apr-19	2.00	33	22	23	225	0
25-Apr-19	3.00	31	37	20	225	0
25-Apr-19	4.00	31	37	20	225	0
25-Apr-19	5.00	31	37	20	225	0
25-Apr-19	6.00	30	40	17	225	0
25-Apr-19	7.00	30	40	17	225	0
25-Apr-19	8.00	30	40	17	225	0
25-Apr-19	9.00	33	26	16	225	0
25-Apr-19	10.00	33	26	16	225	0
25-Apr-19	11.00	33	26	16	225	0
25-Apr-19	12.00	39	18	19	247.5	0
25-Apr-19	13.00	39	18	19	247.5	0
25-Apr-19	14.00	39	18	19	247.5	0
25-Apr-19	15.00	41	15	21	247.5	0
25-Apr-19	16.00	41	15	21	247.5	0
25-Apr-19	17.00	41	15	21	247.5	0
25-Apr-19	18.00	40	16	19	247.5	0
25-Apr-19	19.00	40	16	19	247.5	0
25-Apr-19	20.00	40	16	19	247.5	0
25-Apr-19	21.00	37	22	19	225	0
25-Apr-19	22.00	37	22	19	225	0
25-Apr-19	23.00	37	22	19	225	0
25-Apr-19	0.00	37	22	19	225	0
26-Apr-19	1.00	34	28	21	202.5	0
26-Apr-19	2.00	34	28	21	202.5	0
26-Apr-19	3.00	33	31	14	202.5	0
26-Apr-19	4.00	33	31	14	202.5	0
26-Apr-19	5.00	33	31	14	202.5	0
26-Apr-19	6.00	32	32	14	202.5	0
26-Apr-19	7.00	32	32	14	202.5	0
26-Apr-19	8.00	32	32	14	202.5	0
26-Apr-19	9.00	35	31	16	225	0
26-Apr-19	10.00	35	31	16	225	0
26-Apr-19	11.00	35	31	16	225	0
26-Apr-19	12.00	40	18	13	225	0
26-Apr-19	13.00	40	18	13	225	0
26-Apr-19	14.00	40	18	13	225	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
26-Apr-19	15.00	42	12	14	247.5	0
26-Apr-19	16.00	42	12	14	247.5	0
26-Apr-19	17.00	42	12	14	247.5	0
26-Apr-19	18.00	41	9	16	270	0
26-Apr-19	19.00	41	9	16	270	0
26-Apr-19	20.00	41	9	16	270	0
26-Apr-19	21.00	38	10	14	292.5	0
26-Apr-19	22.00	38	10	14	292.5	0
26-Apr-19	23.00	38	10	14	292.5	0
26-Apr-19	0.00	38	10	14	292.5	0
27-Apr-19	1.00	36	11	11	292.5	0
27-Apr-19	2.00	36	11	11	292.5	0
27-Apr-19	3.00	34	12	8	292.5	0
27-Apr-19	4.00	34	12	8	292.5	0
27-Apr-19	5.00	34	12	8	292.5	0
27-Apr-19	6.00	33	10	13	270	0
27-Apr-19	7.00	33	10	13	270	0
27-Apr-19	8.00	33	10	13	270	0
27-Apr-19	9.00	37	7	10	270	0
27-Apr-19	10.00	37	7	10	270	0
27-Apr-19	11.00	37	7	10	270	0
27-Apr-19	12.00	41	6	10	270	0
27-Apr-19	13.00	41	6	10	270	0
27-Apr-19	14.00	41	6	10	270	0
27-Apr-19	15.00	42	6	13	247.5	0
27-Apr-19	16.00	42	6	13	247.5	0
27-Apr-19	17.00	42	6	13	247.5	0
27-Apr-19	18.00	41	6	15	247.5	0
27-Apr-19	19.00	41	6	15	247.5	0
27-Apr-19	20.00	41	6	15	247.5	0
27-Apr-19	21.00	38	5	14	270	0
27-Apr-19	22.00	38	5	14	270	0
27-Apr-19	23.00	38	5	14	270	0
27-Apr-19	0.00	38	5	14	270	0
28-Apr-19	1.00	35	7	11	247.5	0
28-Apr-19	2.00	35	7	11	247.5	0
28-Apr-19	3.00	32	10	12	247.5	0
28-Apr-19	4.00	32	10	12	247.5	0
28-Apr-19	5.00	32	10	12	247.5	0
28-Apr-19	6.00	32	11	12	270	0
28-Apr-19	7.00	32	11	12	270	0
28-Apr-19	8.00	32	11	12	270	0
28-Apr-19	9.00	37	9	16	247.5	0
28-Apr-19	10.00	37	9	17	247.5	0
28-Apr-19	11.00	37	9	18	247.5	0
28-Apr-19	12.00	41	7	17	225	0
28-Apr-19	13.00	41	7	17	225	0
28-Apr-19	14.00	41	7	17	225	0
28-Apr-19	15.00	42	6	15	247.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
28-Apr-19	16.00	42	6	15	247.5	0
28-Apr-19	17.00	42	6	15	247.5	0
28-Apr-19	18.00	41	7	13	247.5	0
28-Apr-19	19.00	41	7	13	247.5	0
28-Apr-19	20.00	41	7	13	247.5	0
28-Apr-19	21.00	37	10	10	247.5	0
28-Apr-19	22.00	37	10	10	247.5	0
28-Apr-19	23.00	37	10	10	247.5	0
28-Apr-19	0.00	37	10	10	247.5	0
29-Apr-19	1.00	34	15	13	202.5	0
29-Apr-19	2.00	34	15	13	202.5	0
29-Apr-19	3.00	31	24	15	202.5	0
29-Apr-19	4.00	31	24	15	202.5	0
29-Apr-19	5.00	31	24	15	202.5	0
29-Apr-19	6.00	31	25	15	202.5	0
29-Apr-19	7.00	31	25	15	202.5	0
29-Apr-19	8.00	31	25	15	202.5	0
29-Apr-19	9.00	35	18	16	225	0
29-Apr-19	10.00	35	18	16	225	0
29-Apr-19	11.00	35	18	16	225	0
29-Apr-19	12.00	40	12	19	225	0
29-Apr-19	13.00	40	12	19	225	0
29-Apr-19	14.00	40	12	19	225	0
29-Apr-19	15.00	42	9	22	225	0
29-Apr-19	16.00	42	9	22	225	0
29-Apr-19	17.00	42	9	22	225	0
29-Apr-19	18.00	41	10	25	225	0
29-Apr-19	19.00	41	10	25	225	0
29-Apr-19	20.00	41	10	25	225	0
29-Apr-19	21.00	36	18	27	202.5	0
29-Apr-19	22.00	36	18	27	202.5	0
29-Apr-19	23.00	36	18	27	202.5	0
29-Apr-19	0.00	36	18	27	202.5	0
30-Apr-19	1.00	34	23	24	225	0
30-Apr-19	2.00	34	23	24	225	0
30-Apr-19	3.00	32	20	20	247.5	0
30-Apr-19	4.00	32	20	20	247.5	0
30-Apr-19	5.00	32	20	20	247.5	0
30-Apr-19	6.00	31	27	19	225	0
30-Apr-19	7.00	31	27	19	225	0
30-Apr-19	8.00	31	27	19	225	0
30-Apr-19	9.00	34	28	27	225	0
30-Apr-19	10.00	34	28	27	225	0
30-Apr-19	11.00	34	28	27	225	0
30-Apr-19	12.00	39	15	28	225	0
30-Apr-19	13.00	39	15	28	225	0
30-Apr-19	14.00	39	15	28	225	0
30-Apr-19	15.00	41	9	28	225	0
30-Apr-19	16.00	41	9	28	225	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
30-Apr-19	17.00	41	9	28	225	0
30-Apr-19	18.00	40	11	27	225	0
30-Apr-19	19.00	40	11	27	225	0
30-Apr-19	20.00	40	11	27	225	0
30-Apr-19	21.00	36	17	30	202.5	0
30-Apr-19	22.00	36	17	30	202.5	0
30-Apr-19	23.00	36	17	30	202.5	0
30-Apr-19	0.00	36	17	30	202.5	0
1-May-19	1.00	33	27	25.2	225	0
1-May-19	2.00	33	27	25.2	225	0
1-May-19	3.00	33	27	25.2	225	0
1-May-19	4.00	30	36	18	225	0
1-May-19	5.00	30	36	18	225	0
1-May-19	6.00	30	36	18	225	0
1-May-19	7.00	30	35	18	225	0
1-May-19	8.00	30	35	18	225	0
1-May-19	9.00	30	35	18	225	0
1-May-19	10.00	35	17	18	247.5	0
1-May-19	11.00	35	17	18	247.5	0
1-May-19	12.00	35	17	18	247.5	0
1-May-19	13.00	40	9	14.4	270	0
1-May-19	14.00	40	9	14.4	270	0
1-May-19	15.00	40	9	14.4	270	0
1-May-19	16.00	41	6	14.4	270	0
1-May-19	17.00	41	6	14.4	270	0
1-May-19	18.00	41	6	14.4	270	0
1-May-19	19.00	40	6	14.4	270	0
1-May-19	20.00	40	6	14.4	270	0
1-May-19	21.00	40	6	14.4	270	0
1-May-19	22.00	37	9	14.4	247.5	0
1-May-19	23.00	37	9	14.4	247.5	0
1-May-19	0.00	37	9	14.4	247.5	0
2-May-19	1.00	34	12	21.6	225	0
2-May-19	2.00	34	12	21.6	225	0
2-May-19	3.00	34	12	21.6	225	0
2-May-19	4.00	32	13	18	247.5	0
2-May-19	5.00	32	13	18	247.5	0
2-May-19	6.00	32	13	18	247.5	0
2-May-19	7.00	31	14	14.4	247.5	0
2-May-19	8.00	31	14	14.4	247.5	0
2-May-19	9.00	31	14	14.4	247.5	0
2-May-19	10.00	35	13	14.4	225	0
2-May-19	11.00	35	13	14.4	225	0
2-May-19	12.00	35	13	14.4	225	0
2-May-19	13.00	39	9	10.8	270	0
2-May-19	14.00	39	9	10.8	270	0
2-May-19	15.00	39	9	10.8	270	0
2-May-19	16.00	41	6	7.2	292.5	0
2-May-19	17.00	41	6	7.2	292.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
2-May-19	18.00	41	6	7.2	292.5	0
2-May-19	19.00	41	6	7.2	315	0
2-May-19	20.00	41	6	7.2	315	0
2-May-19	21.00	41	6	7.2	315	0
2-May-19	22.00	38	8	7.2	292.5	0
2-May-19	23.00	38	8	7.2	292.5	0
2-May-19	0.00	38	8	7.2	292.5	0
3-May-19	1.00	35	10	10.8	270	0
3-May-19	2.00	35	10	10.8	270	0
3-May-19	3.00	35	10	10.8	270	0
3-May-19	4.00	32	10	14.4	337.5	0
3-May-19	5.00	32	10	14.4	337.5	0
3-May-19	6.00	32	10	14.4	337.5	0
3-May-19	7.00	33	8	14.4	247.5	0
3-May-19	8.00	33	8	14.4	247.5	0
3-May-19	9.00	33	8	14.4	247.5	0
3-May-19	10.00	36	8	7.2	45	0
3-May-19	11.00	36	8	7.2	45	0
3-May-19	12.00	36	8	7.2	45	0
3-May-19	13.00	40	7	10.8	135	0
3-May-19	14.00	40	7	10.8	135	0
3-May-19	15.00	40	7	10.8	135	0
3-May-19	16.00	41	6	7.2	337.5	0
3-May-19	17.00	41	6	7.2	337.5	0
3-May-19	18.00	41	6	7.2	337.5	0
3-May-19	19.00	40	6	10.8	337.5	0
3-May-19	20.00	40	6	10.8	337.5	0
3-May-19	21.00	40	6	10.8	337.5	0
3-May-19	22.00	37	6	14.4	225	0
3-May-19	23.00	37	6	14.4	225	0
3-May-19	0.00	37	6	14.4	225	0
4-May-19	1.00	35	6	14.4	135	0
4-May-19	2.00	35	6	14.4	135	0
4-May-19	3.00	35	6	14.4	135	0
4-May-19	4.00	33	7	7.2	337.5	0
4-May-19	5.00	33	7	7.2	337.5	0
4-May-19	6.00	33	7	7.2	337.5	0
4-May-19	7.00	32	10	7.2	225	0
4-May-19	8.00	32	10	7.2	225	0
4-May-19	9.00	32	10	7.2	225	0
4-May-19	10.00	36	14	7.2	135	0
4-May-19	11.00	36	14	7.2	135	0
4-May-19	12.00	36	14	7.2	135	0
4-May-19	13.00	41	10	3.6	292.5	0
4-May-19	14.00	41	10	3.6	292.5	0
4-May-19	15.00	41	10	3.6	292.5	0
4-May-19	16.00	42	7	3.6	315	0
4-May-19	17.00	42	7	3.6	315	0
4-May-19	18.00	42	7	3.6	315	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
4-May-19	19.00	40	8	10.8	225	0
4-May-19	20.00	40	8	10.8	225	0
4-May-19	21.00	40	8	10.8	225	0
4-May-19	22.00	38	12	10.8	22.5	0
4-May-19	23.00	38	12	10.8	22.5	0
4-May-19	0.00	38	12	10.8	22.5	0
5-May-19	1.00	36	13	7.2	112.5	0
5-May-19	2.00	36	13	7.2	112.5	0
5-May-19	3.00	36	13	7.2	112.5	0
5-May-19	4.00	33	13	14.4	270	0
5-May-19	5.00	33	13	14.4	270	0
5-May-19	6.00	33	13	14.4	270	0
5-May-19	7.00	32	20	18	247.5	0
5-May-19	8.00	32	20	18	247.5	0
5-May-19	9.00	32	20	18	247.5	0
5-May-19	10.00	34	27	18	202.5	0
5-May-19	11.00	34	27	18	202.5	0
5-May-19	12.00	34	27	18	202.5	0
5-May-19	13.00	40	13	10.8	247.5	0
5-May-19	14.00	40	13	10.8	247.5	0
5-May-19	15.00	40	13	10.8	247.5	0
5-May-19	16.00	42	6	7.2	270	0
5-May-19	17.00	42	6	7.2	270	0
5-May-19	18.00	42	6	7.2	270	0
5-May-19	19.00	41	6	7.2	270	0
5-May-19	20.00	41	6	7.2	270	0
5-May-19	21.00	41	6	7.2	270	0
5-May-19	22.00	38	8	10.8	247.5	0
5-May-19	23.00	38	8	10.8	247.5	0
5-May-19	0.00	38	8	10.8	247.5	0
6-May-19	1.00	34	13	21.6	225	0
6-May-19	2.00	34	13	21.6	225	0
6-May-19	3.00	34	13	21.6	225	0
6-May-19	4.00	33	19	21.6	270	0
6-May-19	5.00	33	19	21.6	270	0
6-May-19	6.00	33	19	21.6	270	0
6-May-19	7.00	32	21	18	247.5	0
6-May-19	8.00	32	21	18	247.5	0
6-May-19	9.00	32	21	18	247.5	0
6-May-19	10.00	36	16	18	225	0
6-May-19	11.00	36	16	18	225	0
6-May-19	12.00	36	16	18	225	0
6-May-19	13.00	41	7	25.2	247.5	0
6-May-19	14.00	41	7	25.2	247.5	0
6-May-19	15.00	41	7	25.2	247.5	0
6-May-19	16.00	43	5	25.2	225	0
6-May-19	17.00	43	5	25.2	225	0
6-May-19	18.00	43	5	25.2	225	0
6-May-19	19.00	41	7	32.4	225	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
6-May-19	20.00	41	7	32.4	225	0
6-May-19	21.00	41	7	32.4	225	0
6-May-19	22.00	37	11	36	225	0
6-May-19	23.00	37	11	36	225	0
6-May-19	0.00	37	11	36	225	0
7-May-19	1.00	34	16	28.8	225	0
7-May-19	2.00	34	16	28.8	225	0
7-May-19	3.00	34	16	28.8	225	0
7-May-19	4.00	31	24	21.6	247.5	0
7-May-19	5.00	31	24	21.6	247.5	0
7-May-19	6.00	31	24	21.6	247.5	0
7-May-19	7.00	31	27	21.6	247.5	0
7-May-19	8.00	31	27	21.6	247.5	0
7-May-19	9.00	31	27	21.6	247.5	0
7-May-19	10.00	35	21	25.2	225	0
7-May-19	11.00	35	21	25.2	225	0
7-May-19	12.00	35	21	25.2	225	0
7-May-19	13.00	41	9	32.4	225	0
7-May-19	14.00	41	9	32.4	225	0
7-May-19	15.00	41	9	32.4	225	0
7-May-19	16.00	42	8	28.8	225	0
7-May-19	17.00	42	8	28.8	225	0
7-May-19	18.00	42	8	28.8	225	0
7-May-19	19.00	40	10	32.4	225	0
7-May-19	20.00	40	10	32.4	225	0
7-May-19	21.00	40	10	32.4	225	0
7-May-19	22.00	36	17	36	225	0
7-May-19	23.00	36	17	36	225	0
7-May-19	0.00	36	17	36	225	0
8-May-19	1.00	32	29	32.4	225	0
8-May-19	2.00	32	29	32.4	225	0
8-May-19	3.00	32	29	32.4	225	0
8-May-19	4.00	30	39	25.2	225	0
8-May-19	5.00	30	39	25.2	225	0
8-May-19	6.00	30	39	25.2	225	0
8-May-19	7.00	29	42	21.6	225	0
8-May-19	8.00	29	42	21.6	225	0
8-May-19	9.00	29	42	21.6	225	0
8-May-19	10.00	33	35	28.8	225	0
8-May-19	11.00	33	35	28.8	225	0
8-May-19	12.00	33	35	28.8	225	0
8-May-19	13.00	39	17	28.8	225	0
8-May-19	14.00	39	17	28.8	225	0
8-May-19	15.00	39	17	28.8	225	0
8-May-19	16.00	41	12	28.8	225	0
8-May-19	17.00	41	12	28.8	225	0
8-May-19	18.00	41	12	28.8	225	0
8-May-19	19.00	39	14	32.4	225	0
8-May-19	20.00	39	14	32.4	225	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
8-May-19	21.00	39	14	32.4	225	0
8-May-19	22.00	35	19	36	225	0
8-May-19	23.00	35	19	36	225	0
8-May-19	0.00	35	19	36	225	0
9-May-19	1.00	32	25	32.4	247.5	0
9-May-19	2.00	32	25	32.4	247.5	0
9-May-19	3.00	32	25	32.4	247.5	0
9-May-19	4.00	30	32	25.2	247.5	0
9-May-19	5.00	30	32	25.2	247.5	0
9-May-19	6.00	30	32	25.2	247.5	0
9-May-19	7.00	29	35	25.2	225	0
9-May-19	8.00	29	35	25.2	225	0
9-May-19	9.00	29	35	25.2	225	0
9-May-19	10.00	32	28	36	225	0
9-May-19	11.00	32	28	36	225	0
9-May-19	12.00	32	28	36	225	0
9-May-19	13.00	38	14	36	225	0
9-May-19	14.00	38	14	36	225	0
9-May-19	15.00	38	14	36	225	0
9-May-19	16.00	39	14	32.4	225	0
9-May-19	17.00	39	14	32.4	225	0
9-May-19	18.00	39	14	32.4	225	0
9-May-19	19.00	37	17	32.4	225	0
9-May-19	20.00	37	17	32.4	225	0
9-May-19	21.00	37	17	32.4	225	0
9-May-19	22.00	34	23	32.4	225	0
9-May-19	23.00	34	23	32.4	225	0
9-May-19	0.00	34	23	32.4	225	0
10-May-19	1.00	31	33	28.8	225	0
10-May-19	2.00	31	33	28.8	225	0
10-May-19	3.00	31	33	28.8	225	0
10-May-19	4.00	28	47	25.2	225	0
10-May-19	5.00	28	47	25.2	225	0
10-May-19	6.00	28	47	25.2	225	0
10-May-19	7.00	27	55	25.2	225	0
10-May-19	8.00	27	55	25.2	225	0
10-May-19	9.00	27	55	25.2	225	0
10-May-19	10.00	31	45	28.8	225	0
10-May-19	11.00	31	45	28.8	225	0
10-May-19	12.00	31	45	28.8	225	0
10-May-19	13.00	36	30	28.8	225	0
10-May-19	14.00	36	30	28.8	225	0
10-May-19	15.00	36	30	28.8	225	0
10-May-19	16.00	38	25	21.6	225	0
10-May-19	17.00	38	25	21.6	225	0
10-May-19	18.00	38	25	21.6	225	0
10-May-19	19.00	37	29	25.2	202.5	0
10-May-19	20.00	37	29	25.2	202.5	0
10-May-19	21.00	37	29	25.2	202.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
10-May-19	22.00	33	45	36	202.5	0
10-May-19	23.00	33	45	36	202.5	0
10-May-19	0.00	33	45	36	202.5	0
11-May-19	1.00	31	55	32.4	225	0
11-May-19	2.00	31	55	32.4	225	0
11-May-19	3.00	31	55	32.4	225	0
11-May-19	4.00	29	66	32.4	225	0
11-May-19	5.00	29	66	32.4	225	0
11-May-19	6.00	29	66	32.4	225	0
11-May-19	7.00	28	68	25.2	225	0
11-May-19	8.00	28	68	25.2	225	0
11-May-19	9.00	28	68	25.2	225	0
11-May-19	10.00	32	53	28.8	225	0
11-May-19	11.00	32	53	28.8	225	0
11-May-19	12.00	32	53	28.8	225	0
11-May-19	13.00	38	31	28.8	225	0
11-May-19	14.00	38	31	28.8	225	0
11-May-19	15.00	38	31	28.8	225	0
11-May-19	16.00	40	22	25.2	225	0
11-May-19	17.00	40	22	25.2	225	0
11-May-19	18.00	40	22	25.2	225	0
11-May-19	19.00	39	24	28.8	202.5	0
11-May-19	20.00	39	24	28.8	202.5	0
11-May-19	21.00	39	24	28.8	202.5	0
11-May-19	22.00	36	32	36	225	0
11-May-19	23.00	36	32	36	225	0
11-May-19	0.00	36	32	36	225	0
12-May-19	1.00	33	44	32.4	225	0
12-May-19	2.00	33	44	32.4	225	0
12-May-19	3.00	33	44	32.4	225	0
12-May-19	4.00	31	54	25.2	225	0
12-May-19	5.00	31	54	25.2	225	0
12-May-19	6.00	31	54	25.2	225	0
12-May-19	7.00	30	55	21.6	202.5	0
12-May-19	8.00	30	55	21.6	202.5	0
12-May-19	9.00	30	55	21.6	202.5	0
12-May-19	10.00	34	39	25.2	225	0
12-May-19	11.00	34	39	25.2	225	0
12-May-19	12.00	34	39	25.2	225	0
12-May-19	13.00	39	23	25.2	225	0
12-May-19	14.00	39	23	25.2	225	0
12-May-19	15.00	39	23	25.2	225	0
12-May-19	16.00	41	16	21.6	225	0
12-May-19	17.00	41	16	21.6	225	0
12-May-19	18.00	41	16	21.6	225	0
12-May-19	19.00	40	17	21.6	225	0
12-May-19	20.00	40	17	21.6	225	0
12-May-19	21.00	40	17	21.6	225	0
12-May-19	22.00	37	21	28.8	202.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
12-May-19	23.00	37	21	28.8	202.5	0
12-May-19	0.00	37	21	28.8	202.5	0
13-May-19	1.00	35	30	25.2	225	0
13-May-19	2.00	35	30	25.2	225	0
13-May-19	3.00	35	30	25.2	225	0
13-May-19	4.00	32	41	21.6	225	0
13-May-19	5.00	32	41	21.6	225	0
13-May-19	6.00	32	41	21.6	225	0
13-May-19	7.00	31	48	21.6	225	0
13-May-19	8.00	31	48	21.6	225	0
13-May-19	9.00	31	48	21.6	225	0
13-May-19	10.00	34	45	21.6	225	0
13-May-19	11.00	34	45	21.6	225	0
13-May-19	12.00	34	45	21.6	225	0
13-May-19	13.00	38	29	18	225	0
13-May-19	14.00	38	29	18	225	0
13-May-19	15.00	38	29	18	225	0
13-May-19	16.00	40	20	18	247.5	0
13-May-19	17.00	40	20	18	247.5	0
13-May-19	18.00	40	20	18	247.5	0
13-May-19	19.00	40	19	25.2	225	0
13-May-19	20.00	40	19	25.2	225	0
13-May-19	21.00	40	19	25.2	225	0
13-May-19	22.00	37	24	32.4	225	0
13-May-19	23.00	37	24	32.4	225	0
13-May-19	0.00	37	24	32.4	225	0
14-May-19	1.00	34	30	32.4	225	0
14-May-19	2.00	34	30	32.4	225	0
14-May-19	3.00	34	30	32.4	225	0
14-May-19	4.00	32	34	25.2	225	0
14-May-19	5.00	32	34	25.2	225	0
14-May-19	6.00	32	34	25.2	225	0
14-May-19	7.00	30	43	21.6	202.5	0
14-May-19	8.00	30	43	21.6	202.5	0
14-May-19	9.00	30	43	21.6	202.5	0
14-May-19	10.00	32	44	18	202.5	0
14-May-19	11.00	32	44	18	202.5	0
14-May-19	12.00	32	44	18	202.5	0
14-May-19	13.00	37	28	21.6	225	0
14-May-19	14.00	37	28	21.6	225	0
14-May-19	15.00	37	28	21.6	225	0
14-May-19	16.00	41	20	25.2	225	0
14-May-19	17.00	41	20	25.2	225	0
14-May-19	18.00	41	20	25.2	225	0
14-May-19	19.00	40	20	28.8	225	0
14-May-19	20.00	40	20	28.8	225	0
14-May-19	21.00	40	20	28.8	225	0
14-May-19	22.00	36	25	32.4	225	0
14-May-19	23.00	36	25	32.4	225	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
14-May-19	0.00	36	25	32.4	225	0
15-May-19	1.00	33	37	32.4	225	0
15-May-19	2.00	33	37	32.4	225	0
15-May-19	3.00	33	37	32.4	225	0
15-May-19	4.00	31	50	25.2	225	0
15-May-19	5.00	31	50	25.2	225	0
15-May-19	6.00	31	50	25.2	225	0
15-May-19	7.00	30	53	21.6	225	0
15-May-19	8.00	30	53	21.6	225	0
15-May-19	9.00	30	53	21.6	225	0
15-May-19	10.00	33	40	21.6	202.5	0
15-May-19	11.00	33	40	21.6	202.5	0
15-May-19	12.00	33	40	21.6	202.5	0
15-May-19	13.00	38	24	25.2	202.5	0
15-May-19	14.00	38	24	25.2	202.5	0
15-May-19	15.00	38	24	25.2	202.5	0
15-May-19	16.00	39	20	28.8	225	0
15-May-19	17.00	39	20	28.8	225	0
15-May-19	18.00	39	20	28.8	225	0
15-May-19	19.00	38	23	28.8	225	0
15-May-19	20.00	38	23	28.8	225	0
15-May-19	21.00	38	23	28.8	225	0
15-May-19	22.00	36	28	32.4	225	0
15-May-19	23.00	36	28	32.4	225	0
15-May-19	0.00	36	28	32.4	225	0
16-May-19	1.00	34	37	28.8	225	0
16-May-19	2.00	34	37	28.8	225	0
16-May-19	3.00	34	37	28.8	225	0
16-May-19	4.00	31	45	21.6	247.5	0
16-May-19	5.00	31	45	21.6	247.5	0
16-May-19	6.00	31	45	21.6	247.5	0
16-May-19	7.00	31	48	18	225	0
16-May-19	8.00	31	48	18	225	0
16-May-19	9.00	31	48	18	225	0
16-May-19	10.00	33	44	18	225	0
16-May-19	11.00	33	44	18	225	0
16-May-19	12.00	33	44	18	225	0
16-May-19	13.00	37	30	21.6	225	0
16-May-19	14.00	37	30	21.6	225	0
16-May-19	15.00	37	30	21.6	225	0
16-May-19	16.00	39	19	25.2	225	0
16-May-19	17.00	39	19	25.2	225	0
16-May-19	18.00	39	19	25.2	225	0
16-May-19	19.00	38	21	28.8	225	0
16-May-19	20.00	38	21	28.8	225	0
16-May-19	21.00	38	21	28.8	225	0
16-May-19	22.00	35	27	28.8	225	0
16-May-19	23.00	35	27	28.8	225	0
16-May-19	0.00	35	27	28.8	225	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
17-May-19	1.00	34	34	25.2	247.5	0
17-May-19	2.00	34	34	25.2	247.5	0
17-May-19	3.00	34	34	25.2	247.5	0
17-May-19	4.00	32	42	21.6	W	0
17-May-19	5.00	32	42	21.6	W	0
17-May-19	6.00	32	42	21.6	W	0
17-May-19	7.00	31	46	18	225	0
17-May-19	8.00	31	46	18	225	0
17-May-19	9.00	31	46	18	225	0
17-May-19	10.00	32	45	28.8	202.5	0
17-May-19	11.00	32	45	28.8	202.5	0
17-May-19	12.00	32	45	28.8	202.5	0
17-May-19	13.00	37	28	28.8	225	0
17-May-19	14.00	37	28	28.8	225	0
17-May-19	15.00	37	28	28.8	225	0
17-May-19	16.00	38	23	32.4	247.5	0
17-May-19	17.00	38	23	32.4	247.5	0
17-May-19	18.00	38	23	32.4	247.5	0
17-May-19	19.00	36	26	32.4	270	0
17-May-19	20.00	36	26	32.4	270	0
17-May-19	21.00	36	26	32.4	270	0
17-May-19	22.00	34	31	25.2	292.5	0
17-May-19	23.00	34	31	25.2	292.5	0
17-May-19	0.00	34	31	25.2	292.5	0
18-May-19	1.00	31	37	18	292.5	0
18-May-19	2.00	31	37	18	292.5	0
18-May-19	3.00	31	37	18	292.5	0
18-May-19	4.00	30	37	14.4	292.5	0
18-May-19	5.00	30	37	14.4	292.5	0
18-May-19	6.00	30	37	14.4	292.5	0
18-May-19	7.00	30	39	7.2	270	0
18-May-19	8.00	30	39	7.2	270	0
18-May-19	9.00	30	39	7.2	270	0
18-May-19	10.00	33	37	14.4	225	0
18-May-19	11.00	33	37	14.4	225	0
18-May-19	12.00	33	37	14.4	225	0
18-May-19	13.00	37	29	14.4	225	0
18-May-19	14.00	37	29	14.4	225	0
18-May-19	15.00	37	29	14.4	225	0
18-May-19	16.00	38	23	14.4	247.5	0
18-May-19	17.00	38	23	14.4	247.5	0
18-May-19	18.00	38	23	14.4	247.5	0
18-May-19	19.00	38	21	10.8	247.5	0
18-May-19	20.00	38	21	10.8	247.5	0
18-May-19	21.00	38	21	10.8	247.5	0
18-May-19	22.00	37	25	14.4	225	0
18-May-19	23.00	37	25	14.4	225	0
18-May-19	0.00	37	25	14.4	225	0
19-May-19	1.00	35	34	25.2	225	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
19-May-19	2.00	35	34	25.2	225	0
19-May-19	3.00	35	34	25.2	225	0
19-May-19	4.00	33	40	21.6	247.5	0
19-May-19	5.00	33	40	21.6	247.5	0
19-May-19	6.00	33	40	21.6	247.5	0
19-May-19	7.00	32	46	18	247.5	0
19-May-19	8.00	32	46	18	247.5	0
19-May-19	9.00	32	46	18	247.5	0
19-May-19	10.00	35	36	14.4	225	0
19-May-19	11.00	35	36	14.4	225	0
19-May-19	12.00	35	36	14.4	225	0
19-May-19	13.00	38	25	18	225	0
19-May-19	14.00	38	25	18	225	0
19-May-19	15.00	38	25	18	225	0
19-May-19	16.00	38	18	18	225	0
19-May-19	17.00	38	18	18	225	0
19-May-19	18.00	38	18	18	225	0
19-May-19	19.00	40	16	14.4	247.5	0
19-May-19	20.00	40	16	14.4	247.5	0
19-May-19	21.00	40	16	14.4	247.5	0
19-May-19	22.00	38	20	21.6	225	0
19-May-19	23.00	38	20	21.6	225	0
19-May-19	0.00	38	20	21.6	225	0
20-May-19	1.00	35	30	28.8	247.5	0
20-May-19	2.00	35	30	28.8	247.5	0
20-May-19	3.00	35	30	28.8	247.5	0
20-May-19	4.00	33	46	21.6	247.5	0
20-May-19	5.00	33	46	21.6	247.5	0
20-May-19	6.00	33	46	21.6	247.5	0
20-May-19	7.00	32	50	18	247.5	0
20-May-19	8.00	32	50	18	247.5	0
20-May-19	9.00	32	50	18	247.5	0
20-May-19	10.00	34	40	14.4	225	0
20-May-19	11.00	34	40	14.4	225	0
20-May-19	12.00	34	40	14.4	225	0
20-May-19	13.00	38	26	18	225	0
20-May-19	14.00	38	26	18	225	0
20-May-19	15.00	38	26	18	225	0
20-May-19	16.00	40	19	18	247.5	0
20-May-19	17.00	40	19	18	247.5	0
20-May-19	18.00	40	19	18	247.5	0
20-May-19	19.00	40	18	18	225	0
20-May-19	20.00	40	18	18	225	0
20-May-19	21.00	40	18	18	225	0
20-May-19	22.00	37	25	21.6	225	0
20-May-19	23.00	37	25	21.6	225	0
20-May-19	0.00	37	25	21.6	225	0
21-May-19	1.00	35	36	28.8	225	0
21-May-19	2.00	35	36	28.8	225	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
21-May-19	3.00	35	36	28.8	225	0
21-May-19	4.00	34	35	21.6	225	0
21-May-19	5.00	34	35	21.6	225	0
21-May-19	6.00	34	35	21.6	225	0
21-May-19	7.00	33	35	18	225	0
21-May-19	8.00	33	35	18	225	0
21-May-19	9.00	33	35	18	225	0
21-May-19	10.00	36	32	14.4	36	0
21-May-19	11.00	36	32	14.4	36	0
21-May-19	12.00	36	32	14.4	36	0
21-May-19	13.00	39	24	14.4	225	0
21-May-19	14.00	39	24	14.4	225	0
21-May-19	15.00	39	24	14.4	225	0
21-May-19	16.00	41	19	14.4	247.5	0
21-May-19	17.00	41	19	14.4	247.5	0
21-May-19	18.00	41	19	14.4	247.5	0
21-May-19	19.00	40	19	14.4	247.5	0
21-May-19	20.00	40	19	14.4	247.5	0
21-May-19	21.00	40	19	14.4	247.5	0
21-May-19	22.00	39	23	14.4	247.5	0
21-May-19	23.00	39	23	14.4	247.5	0
21-May-19	0.00	39	23	14.4	247.5	0
22-May-19	1.00	36	29	25.2	202.5	0
22-May-19	2.00	36	29	25.2	202.5	0
22-May-19	3.00	36	29	25.2	202.5	0
22-May-19	4.00	35	34	21.6	225	0
22-May-19	5.00	35	34	21.6	225	0
22-May-19	6.00	35	34	21.6	225	0
22-May-19	7.00	34	38	18	225	0
22-May-19	8.00	34	38	18	225	0
22-May-19	9.00	34	38	18	225	0
22-May-19	10.00	37	31	14.4	225	0
22-May-19	11.00	37	31	14.4	225	0
22-May-19	12.00	37	31	14.4	225	0
22-May-19	13.00	40	24	18	225	0
22-May-19	14.00	40	24	18	225	0
22-May-19	15.00	40	24	18	225	0
22-May-19	16.00	42	19	18	247.5	0
22-May-19	17.00	42	19	18	247.5	0
22-May-19	18.00	42	19	18	247.5	0
22-May-19	19.00	41	19	18	247.5	0
22-May-19	20.00	41	19	18	247.5	0
22-May-19	21.00	41	19	18	247.5	0
22-May-19	22.00	39	26	28.8	225	0
22-May-19	23.00	39	26	28.8	225	0
22-May-19	0.00	39	26	28.8	225	0
23-May-19	1.00	37	32	36	225	0
23-May-19	2.00	37	32	36	225	0
23-May-19	3.00	37	32	36	225	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
23-May-19	4.00	35	28	28.8	247.5	0
23-May-19	5.00	35	28	28.8	247.5	0
23-May-19	6.00	35	28	28.8	247.5	0
23-May-19	7.00	34	31	18	247.5	0
23-May-19	8.00	34	31	18	247.5	0
23-May-19	9.00	34	31	18	247.5	0
23-May-19	10.00	36	27	18	225	0
23-May-19	11.00	36	27	18	225	0
23-May-19	12.00	36	27	18	225	0
23-May-19	13.00	40	19	25.2	225	0
23-May-19	14.00	40	19	25.2	225	0
23-May-19	15.00	40	19	25.2	225	0
23-May-19	16.00	42	16	28.8	247.5	0
23-May-19	17.00	42	16	28.8	247.5	0
23-May-19	18.00	42	16	28.8	247.5	0
23-May-19	19.00	41	18	32.4	225	0
23-May-19	20.00	41	18	32.4	225	0
23-May-19	21.00	41	18	32.4	225	0
23-May-19	22.00	38	23	32.4	225	0
23-May-19	23.00	38	23	32.4	225	0
23-May-19	0.00	38	23	32.4	225	0
24-May-19	1.00	35	30	32.4	225	0
24-May-19	2.00	35	30	32.4	225	0
24-May-19	3.00	35	30	32.4	225	0
24-May-19	4.00	33	36	25.2	247.5	0
24-May-19	5.00	33	36	25.2	247.5	0
24-May-19	6.00	33	36	25.2	247.5	0
24-May-19	7.00	32	39	25.2	225	0
24-May-19	8.00	32	39	25.2	225	0
24-May-19	9.00	32	39	25.2	225	0
24-May-19	10.00	35	35	21.6	225	0
24-May-19	11.00	35	35	21.6	225	0
24-May-19	12.00	35	35	21.6	225	0
24-May-19	13.00	39	25	18	247.5	0
24-May-19	14.00	39	25	18	247.5	0
24-May-19	15.00	39	25	18	247.5	0
24-May-19	16.00	41	20	14.4	247.5	0
24-May-19	17.00	41	20	14.4	247.5	0
24-May-19	18.00	41	20	14.4	247.5	0
24-May-19	19.00	40	18	14.4	315	0
24-May-19	20.00	40	18	14.4	315	0
24-May-19	21.00	40	18	14.4	315	0
24-May-19	22.00	39	20	10.8	292.5	0
24-May-19	23.00	39	20	10.8	292.5	0
24-May-19	0.00	39	20	10.8	292.5	0
25-May-19	1.00	37	26	18	202.5	0
25-May-19	2.00	37	26	18	202.5	0
25-May-19	3.00	37	26	18	202.5	0
25-May-19	4.00	36	33	25.2	247.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
25-May-19	5.00	36	33	25.2	247.5	0
25-May-19	6.00	36	33	25.2	247.5	0
25-May-19	7.00	35	32	18	225	0
25-May-19	8.00	35	32	18	225	0
25-May-19	9.00	35	32	18	225	0
25-May-19	10.00	37	23	7.2	202.5	0
25-May-19	11.00	37	23	7.2	202.5	0
25-May-19	12.00	37	23	7.2	202.5	0
25-May-19	13.00	40	17	10.8	225	0
25-May-19	14.00	40	17	10.8	225	0
25-May-19	15.00	40	17	10.8	225	0
25-May-19	16.00	42	13	10.8	247.5	0
25-May-19	17.00	42	13	10.8	247.5	0
25-May-19	18.00	42	13	10.8	247.5	0
25-May-19	19.00	41	13	10.8	247.5	0
25-May-19	20.00	41	13	10.8	247.5	0
25-May-19	21.00	41	13	10.8	247.5	0
25-May-19	22.00	39	17	14.4	225	0
25-May-19	23.00	39	17	14.4	225	0
25-May-19	0.00	39	17	14.4	225	0
26-May-19	1.00	36	23	28.8	247.5	0
26-May-19	2.00	36	23	28.8	247.5	0
26-May-19	3.00	36	23	28.8	247.5	0
26-May-19	4.00	35	24	18	247.5	0
26-May-19	5.00	35	24	18	247.5	0
26-May-19	6.00	35	24	18	247.5	0
26-May-19	7.00	34	27	14.4	225	0
26-May-19	8.00	34	27	14.4	225	0
26-May-19	9.00	34	27	14.4	225	0
26-May-19	10.00	37	20	18	225	0
26-May-19	11.00	37	20	18	225	0
26-May-19	12.00	37	20	18	225	0
26-May-19	13.00	42	9	21.6	247.5	0
26-May-19	14.00	42	9	21.6	247.5	0
26-May-19	15.00	42	9	21.6	247.5	0
26-May-19	16.00	43	6	21.6	247.5	0
26-May-19	17.00	43	6	21.6	247.5	0
26-May-19	18.00	43	6	21.6	247.5	0
26-May-19	19.00	42	7	18	247.5	0
26-May-19	20.00	42	7	18	247.5	0
26-May-19	21.00	42	7	18	247.5	0
26-May-19	22.00	39	12	21.6	225	0
26-May-19	23.00	39	12	21.6	225	0
26-May-19	0.00	39	12	21.6	225	0
27-May-19	1.00	36	22	28.8	225	0
27-May-19	2.00	36	22	28.8	225	0
27-May-19	3.00	36	22	28.8	225	0
27-May-19	4.00	33	36	18	225	0
27-May-19	5.00	33	36	18	225	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
27-May-19	6.00	33	36	18	225	0
27-May-19	7.00	32	42	14.4	225	0
27-May-19	8.00	32	42	14.4	225	0
27-May-19	9.00	32	42	14.4	225	0
27-May-19	10.00	36	32	14.4	225	0
27-May-19	11.00	36	32	14.4	225	0
27-May-19	12.00	36	32	14.4	225	0
27-May-19	13.00	41	19	14.4	225	0
27-May-19	14.00	41	19	14.4	225	0
27-May-19	15.00	41	19	14.4	225	0
27-May-19	16.00	43	11	10.8	225	0
27-May-19	17.00	43	11	10.8	225	0
27-May-19	18.00	43	11	10.8	225	0
27-May-19	19.00	42	10	10.8	225	0
27-May-19	20.00	42	10	10.8	225	0
27-May-19	21.00	42	10	10.8	225	0
27-May-19	22.00	39	16	14.4	202.5	0
27-May-19	23.00	39	16	14.4	202.5	0
27-May-19	0.00	39	16	14.4	202.5	0
28-May-19	1.00	36	30	25.2	225	0
28-May-19	2.00	36	30	25.2	225	0
28-May-19	3.00	36	30	25.2	225	0
28-May-19	4.00	34	41	25.2	247.5	0
28-May-19	5.00	34	41	25.2	247.5	0
28-May-19	6.00	34	41	25.2	247.5	0
28-May-19	7.00	33	44	21.6	225	0
28-May-19	8.00	33	44	21.6	225	0
28-May-19	9.00	33	44	21.6	225	0
28-May-19	10.00	35	37	18	202.5	0
28-May-19	11.00	35	37	18	202.5	0
28-May-19	12.00	35	37	18	202.5	0
28-May-19	13.00	40	21	14.4	225	0
28-May-19	14.00	40	21	14.4	225	0
28-May-19	15.00	40	21	14.4	225	0
28-May-19	16.00	42	13	10.8	225	0
28-May-19	17.00	42	13	10.8	225	0
28-May-19	18.00	42	13	10.8	225	0
28-May-19	19.00	42	11	10.8	225	0
28-May-19	20.00	42	11	10.8	225	0
28-May-19	21.00	42	11	10.8	225	0
28-May-19	22.00	39	19	14.4	225	0
28-May-19	23.00	39	19	14.4	225	0
28-May-19	0.00	39	19	14.4	225	0
29-May-19	1.00	36	32	25.2	225	0
29-May-19	2.00	36	32	25.2	225	0
29-May-19	3.00	36	32	25.2	225	0
29-May-19	4.00	35	31	21.6	225	0
29-May-19	5.00	35	31	21.6	225	0
29-May-19	6.00	35	31	21.6	225	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
29-May-19	7.00	34	32	18	225	0
29-May-19	8.00	34	32	18	225	0
29-May-19	9.00	34	32	18	225	0
29-May-19	10.00	37	26	18	225	0
29-May-19	11.00	37	26	18	225	0
29-May-19	12.00	37	26	18	225	0
29-May-19	13.00	42	15	18	225	0
29-May-19	14.00	42	15	18	225	0
29-May-19	15.00	42	15	18	225	0
29-May-19	16.00	45	10	18	225	0
29-May-19	17.00	45	10	18	225	0
29-May-19	18.00	45	10	18	225	0
29-May-19	19.00	44	9	18	202.5	0
29-May-19	20.00	44	9	18	202.5	0
29-May-19	21.00	44	9	18	202.5	0
29-May-19	22.00	40	16	21.6	225	0
29-May-19	23.00	40	16	21.6	225	0
29-May-19	0.00	40	16	21.6	225	0
30-May-19	1.00	37	27	25.2	225	0
30-May-19	2.00	37	27	25.2	225	0
30-May-19	3.00	37	27	25.2	225	0
30-May-19	4.00	35	30	21.6	225	0
30-May-19	5.00	35	30	21.6	225	0
30-May-19	6.00	35	30	21.6	225	0
30-May-19	7.00	34	37	18	225	0
30-May-19	8.00	34	37	18	225	0
30-May-19	9.00	34	37	18	225	0
30-May-19	10.00	36	37	21.6	225	0
30-May-19	11.00	36	37	21.6	225	0
30-May-19	12.00	36	37	21.6	225	0
30-May-19	13.00	42	20	21.6	225	0
30-May-19	14.00	42	20	21.6	225	0
30-May-19	15.00	42	20	21.6	225	0
30-May-19	16.00	44	14	18	202.5	0
30-May-19	17.00	44	14	18	202.5	0
30-May-19	18.00	44	14	18	202.5	0
30-May-19	19.00	43	13	21.6	202.5	0
30-May-19	20.00	43	13	21.6	202.5	0
30-May-19	21.00	43	13	21.6	202.5	0
30-May-19	22.00	39	19	25.2	225	0
30-May-19	23.00	39	19	25.2	225	0
30-May-19	0.00	39	19	25.2	225	0
31-May-19	1.00	36	31	21.6	225	0
31-May-19	2.00	36	31	21.6	225	0
31-May-19	3.00	36	31	21.6	225	0
31-May-19	4.00	34	44	21.6	202.5	0
31-May-19	5.00	34	44	21.6	202.5	0
31-May-19	6.00	34	44	21.6	202.5	0
31-May-19	7.00	33	49	21.6	202.5	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
31-May-19	8.00	33	49	21.6	202.5	0
31-May-19	9.00	33	49	21.6	202.5	0
31-May-19	10.00	36	40	25.2	202.5	0
31-May-19	11.00	36	40	25.2	202.5	0
31-May-19	12.00	36	40	25.2	202.5	0
31-May-19	13.00	42	23	21.6	225	0
31-May-19	14.00	42	23	21.6	225	0
31-May-19	15.00	42	23	21.6	225	0
31-May-19	16.00	44	14	14.4	225	0
31-May-19	17.00	44	14	14.4	225	0
31-May-19	18.00	44	14	14.4	225	0
31-May-19	19.00	44	13	10.8	225	0
31-May-19	20.00	44	13	10.8	225	0
31-May-19	21.00	44	13	10.8	225	0
31-May-19	22.00	41	18	21.6	225	0
31-May-19	23.00	41	18	21.6	225	0
31-May-19	0.00	41	18	21.6	225	0
1-Jun-19	1.00	22	31	7	67.5	0
1-Jun-19	2.00	20	30	5	67.5	0
1-Jun-19	3.00	21	34	12	90	0
1-Jun-19	4.00	20	35	12	90	0
1-Jun-19	5.00	17	36	15	90	0
1-Jun-19	6.00	19	38	13	90	0
1-Jun-19	7.00	15	38	12	90	0
1-Jun-19	8.00	18	40	10	112.5	0
1-Jun-19	9.00	21	40	9	112.5	0
1-Jun-19	10.00	25	38	8	135	0
1-Jun-19	11.00	28	37	5	135	0
1-Jun-19	12.00	27	26	9	135	0
1-Jun-19	13.00	25	23	7	135	0
1-Jun-19	14.00	29	20	6	135	0
1-Jun-19	15.00	29	17	9	135	0
1-Jun-19	16.00	27	16	5	180	0
1-Jun-19	17.00	30	17	2	180	0
1-Jun-19	18.00	28	17	7	180	0
1-Jun-19	19.00	27	24	6	225	0
1-Jun-19	20.00	24	27	2	225	0
1-Jun-19	21.00	26	25	5	225	0
1-Jun-19	22.00	23	30	8	202.5	0
2-Jun-19	1.00	25	34	6	225	0
2-Jun-19	2.00	24	35	12	112.5	0
2-Jun-19	3.00	24	36	14	135	0
2-Jun-19	4.00	21	38	15	135	0
2-Jun-19	5.00	22	40	24	247.5	0
2-Jun-19	6.00	18	42	20	225	0
2-Jun-19	7.00	20	43	12	225	0
2-Jun-19	8.00	21	43	23	45	0
2-Jun-19	9.00	24	41	26	67.5	0
2-Jun-19	10.00	22	40	31	45	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
2-Jun-19	11.00	23	38	20	112.5	0
2-Jun-19	12.00	25	35	15	135	0
2-Jun-19	13.00	24	32	20	135	0
2-Jun-19	14.00	26	27	24	135	0
2-Jun-19	15.00	27	24	15	157.5	0
2-Jun-19	16.00	29	25	12	157.5	0
2-Jun-19	17.00	30	22	19	157.5	0
2-Jun-19	18.00	28	22	17	180	0
2-Jun-19	19.00	27	21	16	180	0
2-Jun-19	20.00	31	22	18	225	0
2-Jun-19	21.00	30	24	16	202.5	0
2-Jun-19	22.00	25	25	17	180	0
3-Jun-19	1.00	27	25	18	270	0
3-Jun-19	2.00	26	27	13	225	0
3-Jun-19	3.00	24	28	10	202.5	0
3-Jun-19	4.00	23	28	8	315	0
3-Jun-19	5.00	24	28	11	315	0
3-Jun-19	6.00	20	30	9	337.5	0
3-Jun-19	7.00	22	31	4	292.5	0
3-Jun-19	8.00	20	30	7	315	0
3-Jun-19	9.00	19	31	8	22.5	0
3-Jun-19	10.00	21	32	5	270	0
3-Jun-19	11.00	23	30	4	225	0
3-Jun-19	12.00	20	28	8	202.5	0
3-Jun-19	13.00	22	27	12	337.5	0
3-Jun-19	14.00	24	25	10	315	0
3-Jun-19	15.00	26	23	12	337.5	0
3-Jun-19	16.00	26	19	14	315	0
3-Jun-19	17.00	28	18	13	315	0
3-Jun-19	18.00	26	18	12	315	0
3-Jun-19	19.00	28	18	15	292.5	0
3-Jun-19	20.00	24	19	10	315	0
3-Jun-19	21.00	23	19	9	337.5	0
3-Jun-19	22.00	27	19	14	315	0
4-Jun-19	1.00	25	22	12	225	0
4-Jun-19	2.00	20	21	10	225	0
4-Jun-19	3.00	21	23	14	225	0
4-Jun-19	4.00	15	25	13	180	0
4-Jun-19	5.00	19	27	10	180	0
4-Jun-19	6.00	18	28	9	180	0
4-Jun-19	7.00	22	29	14	360	0
4-Jun-19	8.00	20	35	12	22.5	0
4-Jun-19	9.00	20	38	12	22.5	0
4-Jun-19	10.00	18	40	23	22.5	0
4-Jun-19	11.00	20	42	13	135	0
4-Jun-19	12.00	19	45	13	135	0
4-Jun-19	13.00	20	43	12	112.5	0
4-Jun-19	14.00	19	40	10	112.5	0
4-Jun-19	15.00	21	41	13	360	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
4-Jun-19	16.00	23	38	10	337.5	0
4-Jun-19	17.00	24	32	13	315	0
4-Jun-19	18.00	25	20	12	337.5	0
4-Jun-19	19.00	28	18	10	337.5	0
4-Jun-19	20.00	26	16	12	292.5	0
4-Jun-19	21.00	27	15	15	337.5	0
4-Jun-19	22.00	25	13	10	337.5	0
5-Jun-19	1.00	24	18	14	315	0
5-Jun-19	2.00	26	14	17	337.5	0
5-Jun-19	3.00	24	15	13	315	0
5-Jun-19	4.00	20	17	15	315	0
5-Jun-19	5.00	23	18	15	337.5	0
5-Jun-19	6.00	22	20	16	315	0
5-Jun-19	7.00	18	22	10	315	0
5-Jun-19	8.00	16	25	5	315	0
5-Jun-19	9.00	21	24	14	225	0
5-Jun-19	10.00	22	28	6	202.5	0
5-Jun-19	11.00	19	31	12	22.5	0
5-Jun-19	12.00	25	32	14	45	0
5-Jun-19	13.00	23	35	8	67.5	0
5-Jun-19	14.00	19	33	10	45	0
5-Jun-19	15.00	21	30	5	67.5	0
5-Jun-19	16.00	20	28	8	67.5	0
5-Jun-19	17.00	22	28	7	67.5	0
5-Jun-19	18.00	24	25	4	45	0
5-Jun-19	19.00	26	22	2	45	0
5-Jun-19	20.00	26	19	5	157.5	0
5-Jun-19	21.00	25	17	3	135	0
5-Jun-19	22.00	28	15	6	135	0
6-Jun-19	1.00	27	15	6	337.5	0
6-Jun-19	2.00	24	15	7	315	0
6-Jun-19	3.00	26	14	8	225	0
6-Jun-19	4.00	27	15	7	247.5	0
6-Jun-19	5.00	25	16	9	180	0
6-Jun-19	6.00	27	15	4	180	0
6-Jun-19	7.00	24	17	7	45	0
6-Jun-19	8.00	20	20	6	0	0
6-Jun-19	9.00	22	20	2	0	0
6-Jun-19	10.00	21	20	5	0	0
6-Jun-19	11.00	23	20	8	67.5	0
6-Jun-19	12.00	24	23	5	112.5	0
6-Jun-19	13.00	21	25	8	112.5	0
6-Jun-19	14.00	19	28	4	315	0
6-Jun-19	15.00	20	25	3	315	0
6-Jun-19	16.00	21	28	5	157.5	0
6-Jun-19	17.00	20	26	6	180	0
6-Jun-19	18.00	18	25	8	180	0
6-Jun-19	19.00	24	28	7	157.5	0
6-Jun-19	20.00	22	24	6	90	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
6-Jun-19	21.00	25	22	5	90	0
6-Jun-19	22.00	28	24	7	247.5	0
7-Jun-19	1.00	30	22	3	225	0
7-Jun-19	2.00	33	23	6	315	0
7-Jun-19	3.00	30	21	6	315	0
7-Jun-19	4.00	28	20	8	292.5	0
7-Jun-19	5.00	29	22	6	360	0
7-Jun-19	6.00	29	22	6	270	0
7-Jun-19	7.00	27	24	8	360	0
7-Jun-19	8.00	25	26	5	360	0
7-Jun-19	9.00	26	27	9	112.5	0
7-Jun-19	10.00	21	29	13	135	0
7-Jun-19	11.00	22	30	14	135	0
7-Jun-19	12.00	20	31	16	135	0
7-Jun-19	13.00	24	31	10	157.5	0
7-Jun-19	14.00	19	35	15	225	0
7-Jun-19	15.00	22	39	10	225	0
7-Jun-19	16.00	20	38	8	225	0
7-Jun-19	17.00	18	39	4	225	0
7-Jun-19	18.00	21	39	9	225	0
7-Jun-19	19.00	22	35	6	202.5	0
7-Jun-19	20.00	23	30	6	202.5	0
7-Jun-19	21.00	24	25	9	202.5	0
7-Jun-19	22.00	25	22	8	202.5	0
8-Jun-19	1.00	28	20	5	202.5	0
8-Jun-19	2.00	28	20	8	202.5	0
8-Jun-19	3.00	29	18	9	202.5	0
8-Jun-19	4.00	27	17	5	202.5	0
8-Jun-19	5.00	30	17	8	202.5	0
8-Jun-19	6.00	25	16	5	180	0
8-Jun-19	7.00	27	16	7	180	0
8-Jun-19	8.00	29	17	9	180	0
8-Jun-19	9.00	28	18	11	180	0
8-Jun-19	10.00	25	19	10	180	0
8-Jun-19	11.00	26	19	12	180	0
8-Jun-19	12.00	22	20	15	180	0
8-Jun-19	13.00	21	20	12	180	0
8-Jun-19	14.00	20	21	13	180	0
8-Jun-19	15.00	24	23	13	247.5	0
8-Jun-19	16.00	20	25	9	180	0
8-Jun-19	17.00	23	27	11	247.5	0
8-Jun-19	18.00	20	29	6	225	0
8-Jun-19	19.00	18	33	8	225	0
8-Jun-19	20.00	22	35	12	247.5	0
8-Jun-19	21.00	20	37	10	225	0
8-Jun-19	22.00	24	36	15	225	0
9-Jun-19	1.00	25	39	14	247.5	0
9-Jun-19	2.00	27	30	12	270	0
9-Jun-19	3.00	28	36	13	270	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
9-Jun-19	4.00	29	22	19	247.5	0
9-Jun-19	5.00	30	20	15	270	0
9-Jun-19	6.00	30	15	13	270	0
9-Jun-19	7.00	31	15	21	247.5	0
9-Jun-19	8.00	28	14	20	247.5	0
9-Jun-19	9.00	25	15	15	292.5	0
9-Jun-19	10.00	30	15	18	292.5	0
9-Jun-19	11.00	33	17	16	315	0
9-Jun-19	12.00	35	19	14	315	0
9-Jun-19	13.00	26	19	18	202.5	0
9-Jun-19	14.00	24	20	12	225	0
9-Jun-19	15.00	22	22	20	180	0
9-Jun-19	16.00	25	21	21	180	0
9-Jun-19	17.00	23	17	24	22.5	0
9-Jun-19	18.00	24	19	20	45	0
9-Jun-19	19.00	21	18	17	22.5	0
9-Jun-19	20.00	18	15	14	45	0
9-Jun-19	21.00	19	20	12	0	0
9-Jun-19	22.00	21	23	15	22.5	0
10-Jun-19	1.00	20	12	18	0	0
10-Jun-19	2.00	18	15	12	0	0
10-Jun-19	3.00	23	23	18	22.5	0
10-Jun-19	4.00	22	14	20	0	0
10-Jun-19	5.00	25	10	12	0	0
10-Jun-19	6.00	27	14	19	22.5	0
10-Jun-19	7.00	30	15	15	0	0
10-Jun-19	8.00	32	18	16	0	0
10-Jun-19	9.00	28	11	18	0	0
10-Jun-19	10.00	25	14	17	0	0
10-Jun-19	11.00	28	10	12	0	0
10-Jun-19	12.00	27	13	16	112.5	0
10-Jun-19	13.00	21	20	14	135	0
10-Jun-19	14.00	23	25	12	270	0
10-Jun-19	15.00	25	16	14	247.5	0
10-Jun-19	16.00	23	25	10	270	0
10-Jun-19	17.00	25	20	13	270	0
10-Jun-19	18.00	21	29	16	45	0
10-Jun-19	19.00	23	19	15	22.5	0
10-Jun-19	20.00	20	26	20	0	0
10-Jun-19	21.00	22	29	14	45	0
10-Jun-19	22.00	20	24	13	45	0
11-Jun-19	1.00	19	30	15	67.5	0
11-Jun-19	2.00	21	35	16	67.5	0
11-Jun-19	3.00	23	37	18	90	0
11-Jun-19	4.00	22	39	15	90	0
11-Jun-19	5.00	24	31	19	90	0
11-Jun-19	6.00	26	25	20	90	0
11-Jun-19	7.00	28	21	15	90	0
11-Jun-19	8.00	28	25	14	90	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
11-Jun-19	9.00	30	20	10	90	0
11-Jun-19	10.00	31	24	5	90	0
11-Jun-19	11.00	30	19	7	112.5	0
11-Jun-19	12.00	28	15	9	135	0
11-Jun-19	13.00	29	20	10	135	0
11-Jun-19	14.00	29	18	9	112.5	0
11-Jun-19	15.00	27	12	12	135	0
11-Jun-19	16.00	25	15	10	135	0
11-Jun-19	17.00	26	18	10	112.5	0
11-Jun-19	18.00	24	25	8	135	0
11-Jun-19	19.00	21	30	6	225	0
11-Jun-19	20.00	20	31	5	225	0
11-Jun-19	21.00	24	35	11	225	0
11-Jun-19	22.00	20	38	8	270	0
12-Jun-19	1.00	22	39	13	270	0
12-Jun-19	2.00	16	40	10	270	0
12-Jun-19	3.00	18	40	12	270	0
12-Jun-19	4.00	22	41	14	270	0
12-Jun-19	5.00	24	42	12	270	0
12-Jun-19	6.00	22	35	10	270	0
12-Jun-19	7.00	24	37	16	247.5	0
12-Jun-19	8.00	26	34	12	270	0
12-Jun-19	9.00	27	30	16	270	0
12-Jun-19	10.00	28	26	19	247.5	0
12-Jun-19	11.00	31	22	18	270	0
12-Jun-19	12.00	30	19	12	270	0
12-Jun-19	13.00	29	17	21	247.5	0
12-Jun-19	14.00	24	15	20	270	0
12-Jun-19	15.00	21	17	19	270	0
12-Jun-19	16.00	28	17	17	270	0
12-Jun-19	17.00	27	19	19	270	0
12-Jun-19	18.00	25	20	23	270	0
12-Jun-19	19.00	25	20	11	270	0
12-Jun-19	20.00	23	20	10	270	0
12-Jun-19	21.00	21	19	13	270	0
12-Jun-19	22.00	20	20	10	270	0
13-Jun-19	1.00	22	21	8	225	0
13-Jun-19	2.00	19	20	5	270	0
13-Jun-19	3.00	20	23	6	180	0
13-Jun-19	4.00	18	25	4	270	0
13-Jun-19	5.00	21	27	2	270	0
13-Jun-19	6.00	20	27	8	67.5	0
13-Jun-19	7.00	23	25	10	45	0
13-Jun-19	8.00	22	26	12	45	0
13-Jun-19	9.00	24	28	15	67.5	0
13-Jun-19	10.00	21	25	10	45	0
13-Jun-19	11.00	24	24	9	45	0
13-Jun-19	12.00	27	25	12	45	0
13-Jun-19	13.00	32	22	8	45	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
13-Jun-19	14.00	30	22	5	135	0
13-Jun-19	15.00	28	20	10	135	0
13-Jun-19	16.00	29	19	5	135	0
13-Jun-19	17.00	27	20	7	360	0
13-Jun-19	18.00	28	18	10	360	0
13-Jun-19	19.00	26	20	8	360	0
13-Jun-19	20.00	24	21	5	360	0
13-Jun-19	21.00	25	22	13	360	0
13-Jun-19	22.00	23	20	11	360	0
14-Jun-19	1.00	21	25	9	360	0
14-Jun-19	2.00	25	29	12	270	0
14-Jun-19	3.00	24	28	15	247.5	0
14-Jun-19	4.00	22	35	12	225	0
14-Jun-19	5.00	23	39	16	45	0
14-Jun-19	6.00	19	40	13	45	0
14-Jun-19	7.00	20	42	10	45	0
14-Jun-19	8.00	22	42	15	67.5	0
14-Jun-19	9.00	21	39	13	90	0
14-Jun-19	10.00	20	35	11	90	0
14-Jun-19	11.00	23	33	15	90	0
14-Jun-19	12.00	24	30	13	90	0
14-Jun-19	13.00	26	28	14	157.5	0
14-Jun-19	14.00	26	22	15	135	0
14-Jun-19	15.00	30	20	12	135	0
14-Jun-19	16.00	29	18	8	157.5	0
14-Jun-19	17.00	28	17	10	157.5	0
14-Jun-19	18.00	24	17	7	135	0
14-Jun-19	19.00	26	16	9	135	0
14-Jun-19	20.00	27	17	13	157.5	0
14-Jun-19	21.00	25	20	10	180	0
14-Jun-19	22.00	24	21	11	180	0
15-Jun-19	1.00	25	23	15	157.5	0
15-Jun-19	2.00	23	25	11	180	0
15-Jun-19	3.00	24	29	8	180	0
15-Jun-19	4.00	20	30	7	180	0
15-Jun-19	5.00	23	40	10	202.5	0
15-Jun-19	6.00	20	42	5	180	0
15-Jun-19	7.00	21	42	8	202.5	0
15-Jun-19	8.00	19	39	4	180	0
15-Jun-19	9.00	17	35	5	135	0
15-Jun-19	10.00	21	33	7	112.5	0
15-Jun-19	11.00	20	30	5	135	0
15-Jun-19	12.00	24	28	11	180	0
15-Jun-19	13.00	25	22	13	360	0
15-Jun-19	14.00	23	20	10	360	0
15-Jun-19	15.00	26	18	15	135	0
15-Jun-19	16.00	28	17	18	112.5	0
15-Jun-19	17.00	32	17	15	135	0
15-Jun-19	18.00	28	16	10	360	0

Date	Time	Temp	Humidity	Windspeed (KMPH)	Wind direction	Rainfall
15-Jun-19	19.00	29	17	17	360	0
15-Jun-19	20.00	27	20	15	360	0
15-Jun-19	21.00	25	21	12	360	0
15-Jun-19	22.00	28	23	19	337.5	0

Source: ABC Techno Labs India Pvt. Ltd.

ANNEXURE 7: NATIONAL AMBIENT AIR QUALITY STANDARDS

National Ambient Air Quality Standards

The national ambient air quality standards are given in Table 3.9. Monitored values for study have been compared with the National Ambient Air Quality Standards.

Table A1: National Ambient Air Quality Standards

Sl.No.	Pollutants	Time weighted average	Concentration in ambient air		
			Industrial, Residential, Rural & Other Areas Areas	Ecologically Sensitive Area (notified by Central Government)	Methods of Measurement
1	Sulphur Dioxide (SO_2), µg/m^3	Annual*	50	20	- Improved West & Gaeke
		24 hours**	80	80	- Ultraviolet fluorescence
2	Nitrogen Dioxides (NO_2), µg/m^3	Annual*	40	30	- Modified Jacob & Hochheiser (Na-Arsenite)
		24 hours**	80	80	- Chemiluminescence
3	Particulate Matter (size less than 10 µm) or PM10 µg/m^3	Annual*	60	60	- Gravimetric
					- TOEM
		24 hours**	100	100	- Beta attenuation
4	Particulate Matter (size less than 2.5 µm) or PM2.5 µg/m$_3$	Annual*	40	40	- Gravimetric
					- TOEM
		24 hours**	60	60	- Beta attenuation
5	Ozone (O_3) µg/m^3	8 hours**	100	100	- UV photometric
					- Chemiluminescence
		1 hour**	180	180	- Chemical method
6	Lead (Pb) µg/m^3	Annual*	0.5	0.5	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper
		24 hours**	1	1	- ED-XRF using Teflon filter
7	Carbon Monoxide (CO) mg/m^3	8 hours**	2	2	- Non Dispersive Infra Red (NDIR) Spectroscopy
		1 hour**	4	4	
8	Ammonia (NH_3) µg/m^3	Annual*	100	100	- Chemiluminescence
		24 hours**	400	400	- Indophenol blue method

Note:*Annual arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.*

*** 24 hourly /8 hourly values should be met 98% of the time in a year. However 2% of the time, it may exceed but not on two consecutive days.*

ANNEXURE 8: AMBIENT AIR QUALITY MONITORING DATA

AAQ 1- Hadecha

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
18.03.2019	46.3	23.6	5.3	12.5	0.17	<5.0	5.8	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
19.03.2.09	52.3	26.7	6.5	19.6	0.27	<5.0	6.8	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
29.03.2019	45.6	17.6	7.4	16.1	0.15	<5.0	7.1	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
30.03.2019	57.8	18.9	8.9	16.7	0.24	<5.0	8.8	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
01.04.2019	51.7	21.5	9.6	17.5	0.18	<5.0	5.6	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
02.04.2019	45.8	19.3	7.1	18.5	0.23	<5.0	6.9	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
12.04.2019	52.8	20.6	5.3	19.6	0.14	<5.0	7.6	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
13.04.2019	49.9	18.7	9.7	18.7	0.28	<5.0	8.7	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
15.04.2019	56.9	17.5	8.4	15.6	0.16	<5.0	5.6	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
16.04.2019	49.7	20.3	5.3	19.6	0.22	<5.0	6.7	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
26.04.2019	52.5	18.6	7.7	16.7	0.14	<5.0	8.5	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
27.04.2019	44.8	23.5	8.5	19.3	0.25	<5.0	9.6	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
29.04.2019	51.7	26.3	7.4	18.6	0.15	<5.0	5.7	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
30.04.2019	48.9	25.6	6.3	19.6	0.18	<5.0	8.9	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
10.05.2019	56.8	17.9	9.9	16.3	0.21	<5.0	9.7	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
11.05.2019	50.4	22.4	8.4	17.8	0.19	<5.0	8.7	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
13.05.2019	52.8	25.7	7.8	19.6	0.13	<5.0	9.2	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
14.05.2019	58.9	24.6	8.9	14.8	0.27	<5.0	6.7	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
24.05.2019	57.4	18.9	5.6	16.2	0.16	<5.0	5.7	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
25.05.2019	43.9	22.6	7.1	13.9	0.25	<5.0	6.9	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
27.05.2019	53.8	19.8	8.8	12.8	0.27	<5.0	7.6	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
28.05.2019	49.7	26.4	7.5	14.6	0.17	<5.0	5.9	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
07.06.2019	55.4	22.8	8.7	15.8	0.28	<5.0	8.9	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
08.06.2019	58.9	26.8	9.6	18.9	0.17	<5.0	9.6	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
10.06.2019	42.7	21.4	6.8	19.7	0.15	<5.0	8.7	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
11.06.2019	50.9	23.4	6.4	15.9	0.27	<5.0	8.8	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
MIN Value	***42.7***	***17.5***	***5.3***	***12.5***	***0.1***	***BDL(<5)***	***5.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
MAX Value	*58.9*	*26.8*	*9.9*	*19.7*	*0.3*	*BDL(<5)*	*9.7*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*	*BDL(<1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*
Average	*51.5*	*22.0*	*7.7*	*17.1*	*0.2*	*BDL(<5)*	*7.6*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*	*BDL(<1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*
P98	*58.9*	*26.8*	*9.8*	*19.7*	*0.3*	*BDL(<5)*	*9.7*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*	*BDL(<1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*
CPCB Limits	*100*	*60*	*80*	*80*	*2*	*400*	*100*	*1*	*5*	*1*	*6*	*20*	*NS*	*NS*	*NS*

N.B: BDL-Below Detection Level

AAQ 2- Mendhala

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
18.03.2019	55.6	21.8	6.7	15.6	0.22	<5.0	5.7	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
19.03.2.09	45.6	17.8	9.4	17.1	0.17	<5.0	6.8	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
29.03.2019	40.2	25.7	7.9	12.5	0.16	<5.0	9.5	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
30.03.2019	59.1	18.9	8.8	13.9	0.23	<5.0	8.7	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
01.04.2019	58.7	17.9	6.8	17.9	0.26	<5.0	6.7	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
02.04.2019	42.6	19.8	7.1	16.9	0.17	<5.0	9.5	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
12.04.2019	50.7	22.9	8.9	15.7	0.27	<5.0	8.8	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
13.04.2019	56.2	23.1	9.6	19.3	0.18	<5.0	5.8	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
15.04.2019	57.8	26.7	7.8	13.7	0.22	<5.0	9.8	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
16.04.2019	48.2	19.6	9.2	15.6	0.17	<5.0	8.7	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
26.04.2019	52.5	21.3	8.8	12.6	0.18	<5.0	6.8	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
27.04.2019	57.8	17.8	8.1	14.8	0.22	<5.0	9.9	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
29.04.2019	49.5	26.8	6.9	17.8	0.19	<5.0	5.8	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
30.04.2019	53.4	18.9	5.9	17.3	0.27	<5.0	7.8	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
10.05.2019	49.6	26.8	6.2	13.7	0.18	<5.0	8.6	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
11.05.2019	58.6	19.9	9.6	19.4	0.24	<5.0	6.7	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
13.05.2019	59.4	21.3	8.7	16.8	0.29	<5.0	9.4	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
14.05.2019	45.6	23.8	6.9	17.8	0.18	<5.0	8.9	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
24.05.2019	44.6	17.9	8.3	14.8	0.28	<5.0	7.5	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
25.05.2019	57.8	24.7	7.8	15.7	0.17	<5.0	9.2	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
27.05.2019	44.7	25.3	8.8	16.7	0.26	<5.0	5.9	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
28.05.2019	56.7	26.9	9.2	14.7	0.17	<5.0	6.6	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
07.06.2019	58.9	25.2	8.9	19.3	0.19	<5.0	7.8	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
08.06.2019	44.8	22.5	7.7	17.5	0.27	<5.0	9.2	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
10.06.2019	56.8	17.8	6.8	15.7	0.19	<5.0	8.8	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
11.06.2019	58.5	20.7	9.7	16.8	0.25	<5.0	5.3	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
MIN Value	***40.2***	***17.8***	***5.9***	***12.5***	***0.2***	***BDL(<5)***	***5.3***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***59.4***	***26.9***	***9.7***	***19.4***	***0.29***	***BDL(<5)***	***9.9***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***52.5***	***22.0***	***8.1***	***16.1***	***0.21***	***BDL(<5)***	***7.9***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***59.3***	***26.9***	***9.7***	***19.4***	***0.29***	***BDL(<5)***	***9.9***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
CPCB Limits	***100***	***60***	***80***	***80***	***2***	***400***	***100***	***1***	***5***	***1***	***6***	***20***	***NS***	***NS***	***NS***

N.B: BDL-Below Detection Level

AAQ 3- Taanpi

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
20.03.2019	49.8	17.8	7.8	12.8	0.23	<5.0	7.8	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
21.03.2019	45.7	18.9	6.9	19.6	0.17	<5.0	6.8	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
27.03.2019	53.9	22.6	8.4	17.6	0.27	<5.0	5.4	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
28.03.2019	58.9	19.8	9.3	18.9	0.13	<5.0	7.3	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
05.04.2019	45.8	25.8	6.8	16.8	0.15	<5.0	6.6	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
06.04.2019	56.8	22.8	8.7	15.3	0.22	<5.0	8.8	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
08.04.2019	51.7	17.8	7.9	19.7	0.16	<5.0	9.3	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
09.04.2019	57.7	24.9	5.4	16.3	0.25	<5.0	6.1	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
19.04.2019	46.9	25.1	8.3	15.8	0.17	<5.0	7.8	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
20.04.2019	53.9	22.8	7.9	19.6	0.15	<5.0	9.4	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
22.04.2019	43.7	17.9	9.7	13.3	0.19	<5.0	7.2	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
23.04.2019	52.8	25.9	6.9	14.6	0.18	<5.0	9.4	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
03.05.2019	53.7	23.7	5.9	18.6	0.23	<5.0	8.2	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
04.05.2019	51.7	22.9	8.7	19.3	0.15	<5.0	9.1	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
06.05.2019	43.7	18.9	7.3	16.3	0.26	<5.0	6.5	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
07.05.2019	50.8	25.8	5.8	17.7	0.15	<5.0	7.9	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
17.05.2019	54.8	23.9	7.8	19.6	0.27	<5.0	8.4	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
18.05.2019	44.6	19.8	8.9	18.9	0.24	<5.0	8.6	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
20.05.2019	56.8	20.7	7.9	16.7	0.22	<5.0	5.8	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
21.05.2019	48.9	26.5	9.5	19.8	0.18	<5.0	7.9	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
31.05.2019	56.8	22.7	6.9	13.6	0.22	<5.0	6.8	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
01.06.2019	59.8	17.9	5.8	18.7	0.19	<5.0	5.3	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
03.06.209	49.7	18.9	7.7	14.5	0.15	<5.0	6.7	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
04.06.2019	56.7	23.7	5.2	16.7	0.17	<5.0	5.8	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
13.06.2019	49.8	20.6	9.3	17.5	0.26	<5.0	7.5	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
14.06.2019	54.9	21.9	5.6	18.5	0.23	<5.0	8.2	<0.1	<0.1	<0.1	<1.0	<1.0	<0.1	<0.1	BDL(<1)
MIN Value	***43.7***	***17.8***	***5.2***	***12.8***	***0.1***	***BDL(<5)***	***5.3***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***59.8***	***26.5***	***9.7***	***19.8***	***0.3***	***BDL(<5)***	***9.4***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***51.9***	***21.9***	***7.6***	***17.2***	***0.2***	***BDL(<5)***	***7.5***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***59.4***	***26.2***	***9.6***	***19.8***	***0.3***	***BDL(<5)***	***9.4***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
CPCB Limits	***100***	***60***	***80***	***80***	***2***	***400***	***100***	***1***	***5***	***1***	***6***	***20***	***NS***	***NS***	***NS***

N.B: BDL-Below Detection Level

AAQ4-Khimana

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
20.03.2019	56.8	22.6	6.2	12.8	0.23	BDL(<5)	6.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
21.03.2019	44.7	18.9	5.9	19.6	0.15	BDL(<5)	8.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
27.03.2019	58.9	22.2	7.8	17.9	0.22	BDL(<5)	7.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
28.03.2019	44.7	19.8	6	16.8	0.18	BDL(<5)	8.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
05.04.2019	58.9	23.2	8.6	13.8	0.22	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.04.2019	44	25.9	6	15.7	0.19	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.04.2019	56.8	22.3	7.8	18.9	0.25	BDL(<5)	6.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
09.04.2019	54.8	26.9	6.3	16.6	0.22	BDL(<5)	7.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
19.04.2019	46.6	25.8	8.8	13.6	0.28	BDL(<5)	5.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
20.04.2019	45.8	18.7	5.9	18.6	0.24	BDL(<5)	9.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
22.04.2019	50.8	25.8	9.8	12.4	0.16	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.04.2019	51.7	19.8	6.1	17.5	0.23	BDL(<5)	6.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
03.05.2019	54.9	26.3	9.6	19.6	0.17	BDL(<5)	8.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.05.2019	48.9	17.9	8.4	15.6	0.22	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.05.2019	48.5	24.6	6.5	16.8	0.27	BDL(<5)	7.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
07.05.2019	52.7	19.8	7.7	19.8	0.28	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
17.05.2019	49	24.9	6.4	14.9	0.22	BDL(<5)	8.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
18.05.2019	57.9	18.8	8.7	15.7	0.17	BDL(<5)	6.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
20.05.2019	48.4	26.5	7.2	16.5	0.16	BDL(<5)	5.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
21.05.2019	54.8	20.9	6.3	14.6	0.21	BDL(<5)	7.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
31.05.2019	49.5	17.9	8.9	17.7	0.19	BDL(<5)	8.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.06.2019	59.7	24.5	7.7	18.5	0.24	BDL(<5)	9.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.06.209	48.9	23.8	5.7	16.8	0.18	BDL(<5)	7.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.06.2019	51.1	26.8	6.5	15.8	0.28	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.06.2019	57.9	21.3	6.9	19.3	0.24	BDL(<5)	5.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
14.06.2019	48.2	19.8	7.9	17.8	0.18	BDL(<5)	7.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	***44.0***	***17.9***	***5.7***	***12.4***	***0.2***	***BDL(<5)***	***5.2***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***59.7***	***26.9***	***9.8***	***19.8***	***0.3***	***BDL(<5)***	***9.8***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***51.7***	***22.5***	***7.3***	***16.7***	***0.2***	***BDL(<5)***	***7.9***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***59.3***	***26.9***	***9.7***	***19.7***	***0.3***	***BDL(<5)***	***9.8***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
CPCB Limits	***100***	***60***	***80***	***80***	***2***	***400***	***100***	***1***	***5***	***1***	***6***	***20***	***NS***	***NS***	***NS***

N.B: BDL-Below Detection Level

AAQ5-Lakhapura

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
18.03.2019	51.5	18.3	7.6	12.3	0.15	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
19.03.2.09	45.3	22.3	5.6	19.6	0.27	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.03.2019	54.1	20.1	7.1	17.3	0.16	BDL(<5)	9.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.03.2019	42.3	18.5	8.3	18.6	0.28	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.04.2019	54.6	25.3	7.3	14.6	0.22	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
02.04.2019	49.3	19.3	5.6	19.7	0.23	BDL(<5)	6.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
12.04.2019	54.1	20.3	7.6	16.7	0.18	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
13.04.2019	45.6	17.8	8.3	19.3	0.21	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
15.04.2019	53.8	26.3	5.5	18.9	0.17	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
16.04.2019	52.3	25.3	9.2	14.1	0.23	BDL(<5)	9.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
26.04.2019	57.6	22.3	8.3	15.3	0.18	BDL(<5)	7.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
27.04.2019	51.9	18.2	7.6	19.6	0.26	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.04.2019	58.6	24.3	5.5	18.3	0.23	BDL(<5)	9.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.04.2019	52.3	17.6	6.3	15.3	0.29	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
10.05.2019	45.6	22.3	9.5	16.3	0.15	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.05.2019	55.7	21.3	7.3	19.6	0.22	BDL(<5)	7.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.05.2019	47.6	20.3	9.7	14.1	0.18	BDL(<5)	9.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
14.05.2019	53.6	24.8	8.3	18.3	0.19	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
24.05.2019	52.3	23.6	7.1	17.6	0.25	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.05.2019	41.3	17.9	6.3	18.3	0.27	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
27.05.2019	50.3	25.3	5.6	19.5	0.18	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
28.05.2019	44.6	19.6	7.4	16.3	0.17	BDL(<5)	5.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
07.06.2019	52.5	18.2	8.2	17.8	0.24	BDL(<5)	8.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.06.2019	51.3	26.8	7.6	19.6	0.23	BDL(<5)	6.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
10.06.2019	55.6	20.3	8.3	15.3	0.16	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.06.2019	44.3	26.4	7.2	12.3	0.29	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	***41.3***	***17.6***	***5.5***	***12.3***	***0.2***	***BDL(<5)***	***5.3***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***58.6***	***26.8***	***9.7***	***19.7***	***0.3***	***BDL(<5)***	***9.7***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***50.7***	***21.6***	***7.4***	***17.1***	***0.2***	***BDL(<5)***	***7.5***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***58.1***	***26.6***	***9.6***	***19.7***	***0.3***	***BDL(<5)***	***9.5***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
CPCB Limits	100	60	80	80	2	400	100	1	5	1	6	20	NS	NS	NS

N.B: BDL-Below Detection Level

AAQ6-Achalpur

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
18.03.2019	41.3	18.6	5.7	13.2	0.21	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
19.03.2.09	52.3	19.6	7.5	15.3	0.26	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.03.2019	44.1	22.2	8.3	18.3	0.18	BDL(<5)	8.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.03.2019	55.6	25.3	6.8	19.6	0.16	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.04.2019	53.6	22.3	5.8	15.3	0.17	BDL(<5)	7.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
02.04.2019	44	19.3	8.6	12.5	0.25	BDL(<5)	5.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
12.04.2019	54.3	22.3	7.7	17.6	0.18	BDL(<5)	8.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.04.2019	45.3	18.3	6.3	19.3	0.28	BDL(<5)	9.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
15.04.2019	58.6	25.3	8.6	18.3	0.15	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
16.04.2019	50.2	26.3	5.9	17.6	0.16	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
26.04.2019	56.3	17.9	8.2	19.5	0.22	BDL(<5)	6.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
27.04.2019	51.3	24.3	9.6	13.2	0.23	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.04.2019	57.6	19.6	8.7	15.6	0.24	BDL(<5)	8.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.04.2019	47.9	22.3	5.3	18.5	0.16	BDL(<5)	6.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
10.05.2019	54.6	17.6	9.2	17.6	0.17	BDL(<5)	7.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.05.2019	59.6	22.3	7.2	18.5	0.27	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.05.2019	50.3	21.4	6.4	13.6	0.23	BDL(<5)	6.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
14.05.2019	46.3	18.5	7.9	16.3	0.21	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
24.05.2019	52.3	24.3	5.5	12.5	0.19	BDL(<5)	6.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.05.2019	59.6	25.4	8.6	18.6	0.21	BDL(<5)	7.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
27.05.2019	49.5	26.8	7.6	19.8	0.17	BDL(<5)	8.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
28.05.2019	58.6	21.4	8.5	13.6	0.26	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
07.06.2019	56.3	24.5	9.3	15.4	0.24	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.06.2019	51.1	22.3	6.8	14.9	0.18	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
10.06.2019	45.3	18.7	8.6	18.7	0.22	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.06.2019	59.3	26.4	9.4	19.3	0.26	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	***41.3***	***17.6***	***5.3***	***12.5***	***0.2***	***BDL(<5)***	***5.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***59.6***	***26.8***	***9.6***	***19.8***	***0.3***	***BDL(<5)***	***9.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***52.1***	***22.0***	***7.6***	***16.6***	***0.2***	***BDL(<5)***	***7.7***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***59.6***	***26.6***	***9.5***	***19.7***	***0.3***	***BDL(<5)***	***9.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
CPCB Limits	*100*	*60*	*80*	*80*	*2*	*400*	*100*	*1*	*5*	*1*	*6*	*20*	*NS*	*NS*	*NS*

N.B: BDL-Below Detection Level

AAQ7-Sarawanaa

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
20.03.2019	51.3	17.9	7.6	13.6	0.16	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
21.03.2019	48.8	18.3	6.9	19.6	0.21	BDL(<5)	6.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
27.03.2019	56.3	20.5	5.3	18.6	0.26	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
28.03.2019	42.3	19.6	6.6	19.6	0.18	BDL(<5)	9.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
05.04.2019	59.6	26.3	8.6	17.3	0.26	BDL(<5)	6.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.04.2019	52.3	18.9	9.6	14.3	0.16	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.04.2019	42.4	25.3	6.3	19.6	0.18	BDL(<5)	8.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
09.04.2019	48.6	21.3	8.6	12.3	0.19	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
19.04.2019	53.9	18.6	6.3	19.6	0.23	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
20.04.2019	54.3	20.3	7.6	18.3	0.22	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
22.04.2019	40.6	19.6	8.6	19.6	0.26	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.04.2019	48.9	25.3	7.3	13.6	0.17	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.05.2019	55.6	21.3	6.1	18.3	0.18	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.05.2019	45.6	26.3	9.6	17.3	0.23	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.05.2019	51.6	20.3	7.2	19.3	0.25	BDL(<5)	5.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
07.05.2019	42.3	24.6	8.6	17.3	0.19	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
17.05.2019	58.6	18.6	6.3	15.3	0.28	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
18.05.2019	53.6	20.3	8.6	14.3	0.16	BDL(<5)	9.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
20.05.2019	48.6	17.6	7.9	12.9	0.15	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
21.05.2019	59.6	24.3	6.3	18.5	0.28	BDL(<5)	7.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
31.05.2019	52.3	19.3	5.8	19.6	0.26	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.06.2019	42.3	24.7	8.6	13.2	0.16	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.06.209	58.6	22.3	9.3	15.3	0.27	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.06.2019	46.3	24.1	6.9	12.4	0.26	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.06.2019	53.6	26.3	8.3	17.6	0.21	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
14.06.2019	42.3	18.6	9.3	19.3	0.18	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	*40.6*	*17.6*	*5.3*	*12.3*	*0.2*	*BDL(<5)*	*5.1*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*	*BDL(<1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*
MAX Value	*59.6*	*26.3*	*9.6*	*19.6*	*0.3*	*BDL(<5)*	*9.8*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*	*BDL(<1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*
Average	*50.4*	*21.6*	*7.6*	*16.8*	*0.2*	*BDL(<5)*	*7.5*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*	*BDL(<1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*
P98	*59.6*	*26.3*	*9.6*	*19.6*	*0.3*	*BDL(<5)*	*9.7*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*	*BDL(<1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*
CPCB Limits	*100*	*60*	*80*	*80*	*2*	*400*	*100*	*1*	*5*	*1*	*6*	*20*	*NS*	*NS*	*NS*

N.B: BDL-Below Detection Level

AAQ8-Tharad

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
20.03.2019	53.6	17.3	8.6	19.6	0.22	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
21.03.2019	46.3	22.3	6.5	13.5	0.26	BDL(<5)	6.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
27.03.2019	53.3	19.6	7.6	12.3	0.16	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
28.03.2019	55.6	18.6	8.0	14.2	0.24	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
05.04.2019	46.3	21.5	9.3	15.6	0.26	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.04.2019	52.3	19.6	5.6	18.6	0.23	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.04.2019	43.6	22.6	9.3	19.6	0.18	BDL(<5)	5.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
09.04.2019	59.3	23.6	7.1	12.3	0.16	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
19.04.2019	53.6	25.3	8.6	13.5	0.26	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
20.04.2019	56.3	18.7	9.6	14.5	0.23	BDL(<5)	8.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
22.04.2019	49.3	19.6	5.6	15.6	0.17	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.04.2019	57.6	17.6	8.3	17.6	0.21	BDL(<5)	7.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.05.2019	48.6	25.6	7.6	19.3	0.26	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.05.2019	52.3	22.3	5.6	18.6	0.21	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.05.2019	42.3	24.3	9.3	19.6	0.26	BDL(<5)	7.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
07.05.2019	55.3	26.5	8.9	15.7	0.21	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
17.05.2019	56.3	18.6	7.8	13.6	0.18	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
18.05.2019	46.3	23.6	8.4	12.4	0.26	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
20.05.2019	50.3	24.3	6.4	19.6	0.16	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
21.05.2019	51.2	19.7	8.6	18.2	0.28	BDL(<5)	8.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
31.05.2019	55.3	22.1	7.7	19.3	0.22	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.06.2019	44.3	24.6	9.3	12.3	0.16	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.06.209	52.3	25.3	8.6	14.3	0.26	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.06.2019	60.1	19.6	7.9	19.3	0.16	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.06.2019	49.3	23.9	5.6	17.2	0.15	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
14.06.2019	55.3	24.3	6.3	12.8	0.25	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	***42.3***	***17.3***	***5.6***	***12.3***	***0.2***	***BDL(<5)***	***5.3***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***60.1***	***26.5***	***9.6***	***19.6***	***0.3***	***BDL(<5)***	***9.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***51.8***	***22.0***	***7.8***	***16.1***	***0.2***	***BDL(<5)***	***7.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***59.7***	***26.1***	***9.5***	***19.6***	***0.3***	***BDL(<5)***	***9.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
CPCB Limits	***100***	***60***	***80***	***80***	***2***	***400***	***100***	***1***	***5***	***1***	***6***	***20***	***NS***	***NS***	***NS***

N.B: BDL-Below Detection Level

AAQ8-Tharad

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
20.03.2019	53.6	17.3	8.6	19.6	0.22	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
21.03.2019	46.3	22.3	6.5	13.5	0.26	BDL(<5)	6.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
27.03.2019	53.3	19.6	7.6	12.3	0.16	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
28.03.2019	55.6	18.6	8.0	14.2	0.24	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
05.04.2019	46.3	21.5	9.3	15.6	0.26	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.04.2019	52.3	19.6	5.6	18.6	0.23	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.04.2019	43.6	22.6	9.3	19.6	0.18	BDL(<5)	5.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
09.04.2019	59.3	23.6	7.1	12.3	0.16	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
19.04.2019	53.6	25.3	8.6	13.5	0.26	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
20.04.2019	56.3	18.7	9.6	14.5	0.23	BDL(<5)	8.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
22.04.2019	49.3	19.6	5.6	15.6	0.17	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.04.2019	57.6	17.6	8.3	17.6	0.21	BDL(<5)	7.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.05.2019	48.6	25.6	7.6	19.3	0.26	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.05.2019	52.3	22.3	5.6	18.6	0.21	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.05.2019	42.3	24.3	9.3	19.6	0.26	BDL(<5)	7.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
07.05.2019	55.3	26.5	8.9	15.7	0.21	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
17.05.2019	56.3	18.6	7.8	13.6	0.18	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
18.05.2019	46.3	23.6	8.4	12.4	0.26	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
20.05.2019	50.3	24.3	6.4	19.6	0.16	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
21.05.2019	51.2	19.7	8.6	18.2	0.28	BDL(<5)	8.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
31.05.2019	55.3	22.1	7.7	19.3	0.22	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.06.2019	44.3	24.6	9.3	12.3	0.16	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.06.209	52.3	25.3	8.6	14.3	0.26	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.06.2019	60.1	19.6	7.9	19.3	0.16	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.06.2019	49.3	23.9	5.6	17.2	0.15	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
14.06.2019	55.3	24.3	6.3	12.8	0.25	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	***42.3***	***17.3***	***5.6***	***12.3***	***0.2***	***BDL(<5)***	***5.3***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***60.1***	***26.5***	***9.6***	***19.6***	***0.3***	***BDL(<5)***	***9.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***51.8***	***22.0***	***7.8***	***16.1***	***0.2***	***BDL(<5)***	***7.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***59.7***	***26.1***	***9.5***	***19.6***	***0.3***	***BDL(<5)***	***9.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
CPCB Limits	***100***	***60***	***80***	***80***	***2***	***400***	***100***	***1***	***5***	***1***	***6***	***20***	***NS***	***NS***	***NS***

N.B: BDL-Below Detection Level

AAQ9- Magarawa

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
22.03.2019	49.6	22.3	8.3	13.8	0.16	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.03.2019	55.6	21.2	6.5	19.8	0.28	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.03.2019	43.2	25.3	9.4	25.3	0.17	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
26.03.2019	56.3	18.3	8.6	18.7	0.24	BDL(<5)	7.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.04.2019	42.3	21.3	6.3	15.7	0.16	BDL(<5)	8.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.04.2019	56.3	17.6	5.3	19.6	0.18	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
10.04.2019	55.9	23.5	8.6	14.2	0.29	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.04.2019	42.5	17.2	7.6	19.8	0.25	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
17.04.2019	53.2	19.6	9.6	16.5	0.18	BDL(<5)	8.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
18.04.2019	53.6	25.3	8.7	14.5	0.29	BDL(<5)	9.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
24.04.2019	45.3	17.3	6.3	17.5	0.19	BDL(<5)	7.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.04.2019	52.3	18.3	8.6	19.6	0.17	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.05.2019	56.3	26.4	7.3	12.7	0.3	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
02.05.2019	45.3	21.3	9.3	14.3	0.19	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.05.2019	58	26.3	7.6	13.7	0.26	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
09.05.2019	46.3	22.3	8.6	15.7	0.17	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
15.05.2019	58.4	24.3	5.6	16.8	0.29	BDL(<5)	7.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
16.05.2019	55.3	24.6	8.6	18.6	0.26	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
22.05.2019	44.3	17.6	9.3	19.8	0.18	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.05.2019	52.3	26.8	8.4	16.8	0.28	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.05.2019	46.3	24.6	6.6	17.8	0.27	BDL(<5)	6.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.05.2019	58.6	21.3	7.8	18.6	0.23	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
05.06.2019	53.2	24.3	6.5	19.8	0.18	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.06.2019	45.3	25.6	6.8	14.5	0.16	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
12.06.2019	56.3	18.6	7.8	12.1	0.24	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.06.2019	59.6	21.3	9.8	18.7	0.29	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	***42.3***	***17.2***	***5.3***	***12.1***	***0.16***	***BDL(<5)***	***5.3***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***59.6***	***26.8***	***9.8***	***25.3***	***0.30***	***BDL(<5)***	***9.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***51.6***	***22.0***	***7.8***	***17.1***	***0.23***	***BDL(<5)***	***8.0***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***59.1***	***26.6***	***9.7***	***22.6***	***0.30***	***BDL(<5)***	***9.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
CPCB Limits	***100***	***60***	***80***	***80***	***2***	***400***	***100***	***1***	***5***	***1***	***6***	***20***	***NS***	***NS***	***NS***

N.B: BDL-Below Detection Level

AAQ10- Dhanera

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
22.03.2019	59.3	22.3	7.3	13.2	0.26	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.03.2019	56.3	17.6	5.3	19.8	0.24	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.03.2019	48.6	18.6	6.3	15.6	0.19	BDL(<5)	7.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
26.03.2019	45.3	20.3	8.6	16.2	0.26	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
03.04.2019	51.3	19.6	7.6	17.8	0.24	BDL(<5)	7.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.04.2019	56.3	25.3	6.6	19.6	0.15	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
10.04.2019	44.3	21.3	9.3	18	0.16	BDL(<5)	8.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.04.2019	51.1	18.6	8.5	13.2	0.28	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
17.04.2019	46.3	19.3	6.3	18.6	0.26	BDL(<5)	6.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
18.04.2019	56.3	25.3	8.6	15.8	0.17	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
24.04.2019	50.9	22.3	9.3	19.5	0.26	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.04.2019	58.6	18.6	8.1	16.7	0.24	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.05.2019	46.3	23.6	7.6	18.6	0.25	BDL(<5)	8.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
02.05.2019	47.6	19.6	5.9	17.6	0.19	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.05.2019	59.3	18.6	8.3	14.8	0.15	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
09.05.2019	56.3	21.8	9.6	19.6	0.22	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
15.05.2019	57.6	26.3	5.9	14.3	0.27	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
16.05.2019	42.3	18.6	7.9	18.6	0.16	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
22.05.2019	40.3	26.8	8.6	14.2	0.15	BDL(<5)	9.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.05.2019	59.6	21.3	9.3	19.8	0.16	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.05.2019	55.3	19.6	6.3	12.3	0.26	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.05.2019	57.8	24.3	7.6	14.6	0.24	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
05.06.2019	48.6	26.3	5.9	19.7	0.25	BDL(<5)	7.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.06.2019	53.5	22.3	8.6	16.8	0.18	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
12.06.2019	49.6	18.6	9.3	17.6	0.19	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.06.2019	52.3	19.9	7.2	19.6	0.16	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	***40.3***	***17.6***	***5.3***	***12.3***	***0.2***	***BDL(<5)***	***5.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***59.6***	***26.8***	***9.6***	***19.8***	***0.3***	***BDL(<5)***	***9.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***52.0***	***21.4***	***7.7***	***17.0***	***0.2***	***BDL(<5)***	***8.1***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***59.5***	***26.6***	***9.5***	***19.8***	***0.3***	***BDL(<5)***	***9.5***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
CPCB Limits	***100***	***60***	***80***	***80***	***2***	***400***	***100***	***1***	***5***	***1***	***6***	***20***	***NS***	***NS***	***NS***

N.B: BDL-Below Detection Level

AAQ11- Ganata

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
22.03.2019	49.2	18.6	5.6	19.6	0.23	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.03.2019	53.6	23.5	6.1	13.2	0.16	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.03.2019	48.6	19.8	7.6	15.6	0.15	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
26.03.2019	56.8	26.5	9.6	16.2	0.19	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.04.2019	58.6	23.3	8.6	17.8	0.23	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.04.2019	43.5	18	7.6	15.3	0.25	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
10.04.2019	58.6	19.6	5.6	16.9	0.27	BDL(<5)	8.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.04.2019	59.3	24.7	6.3	17.5	0.29	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
17.04.2019	52.3	25.5	9.3	19.6	0.16	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
18.04.2019	46.8	26.3	8.5	16.8	0.15	BDL(<5)	7.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
24.04.2019	50.9	17.6	7.6	14.3	0.17	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.04.2019	56.4	19.2	5.6	15.4	0.26	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.05.2019	48.1	23.6	9.3	17.4	0.28	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
02.05.2019	43.5	26.3	6.5	18.6	0.19	BDL(<5)	9.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.05.2019	51.2	19.6	8.3	13.4	0.23	BDL(<5)	6.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
09.05.2019	59.6	22.6	9.3	14.6	0.27	BDL(<5)	7.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
15.05.2019	58.7	24.3	8.9	15.4	0.21	BDL(<5)	8.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
16.05.2019	46.7	26.3	7.6	19.6	0.18	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
22.05.2019	58.3	18.6	8.5	18.9	0.26	BDL(<5)	8.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.05.2019	49.8	19.6	9.6	17.5	0.15	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.05.2019	52.8	20.3	6.3	13.2	0.18	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.05.2019	48.5	18.7	7.8	19.6	0.24	BDL(<5)	8.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
05.06.2019	56.9	24.1	6.3	15.6	0.19	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.06.2019	48.4	24.3	8.6	19.6	0.23	BDL(<5)	8.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
12.06.2019	58.6	21.3	9.3	16.3	0.28	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.06.2019	57.6	26.8	8.6	17.5	0.21	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	***43.5***	***17.6***	***5.6***	***13.2***	***0.2***	***BDL(<5)***	***5.3***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***59.6***	***26.8***	***9.6***	***19.6***	***0.3***	***BDL(<5)***	***9.7***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***52.8***	***22.3***	***7.8***	***16.7***	***0.2***	***BDL(<5)***	***7.9***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***59.5***	***26.7***	***9.6***	***19.6***	***0.3***	***BDL(<5)***	***9.7***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
CPCB Limits	*100*	*60*	*80*	*80*	*2*	*400*	*100*	*1*	*5*	*1*	*6*	*20*	*NS*	*NS*	*NS*

N.B: BDL-Below Detection Level

AAQ12- Sanadhar

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
18.03.2019	53.6	21.3	9.2	12.3	0.18	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
19.03.2.09	46.3	17.5	8.3	16.3	0.26	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.03.2019	56.8	25.3	7.3	13.2	0.27	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.03.2019	57.6	21.3	5.3	18.6	0.21	BDL(<5)	7.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.04.2019	55.9	18.5	6.5	17.9	0.19	BDL(<5)	5.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
02.04.2019	46.3	26.5	7.9	19.3	0.26	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
12.04.2019	51.2	18.6	8.6	14.3	0.24	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.04.2019	53.6	19.6	9.3	19.6	0.25	BDL(<5)	9.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
15.04.2019	40.5	22.3	5.6	17.3	0.19	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
16.04.2019	56.3	17.9	7.9	18.3	0.23	BDL(<5)	8.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
26.04.2019	58.6	18.9	8.8	19.6	0.16	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
27.04.2019	49.3	19.6	9.3	15.3	0.22	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.04.2019	45.3	20.3	8.3	18.3	0.19	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.04.2019	57.6	17.6	7.3	15.1	0.28	BDL(<5)	8.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
10.05.2019	55.3	21.3	5.6	18.3	0.24	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.05.2019	46.9	22.3	9.6	19.3	0.16	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.05.2019	56.3	24.3	8.9	12.3	0.23	BDL(<5)	9.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
14.05.2019	58.6	26.3	7.6	15.3	0.27	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
24.05.2019	49.6	21.3	5.6	19.3	0.23	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.05.2019	53.2	19.6	8.4	17.3	0.26	BDL(<5)	7.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
27.05.2019	58.6	24.6	6	19.3	0.18	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
28.05.2019	49.6	18.6	9.6	18.6	0.25	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
07.06.2019	56.3	20.3	5.6	13.6	0.19	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.06.2019	51.3	19.4	7.6	19.1	0.23	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
10.06.2019	48.6	26.9	6.3	15.8	0.27	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.06.2019	59.3	24.3	9.1	18.6	0.29	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	***40.5***	***17.5***	***5.3***	***12.3***	***0.2***	***BDL(<5)***	***5.3***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***59.3***	***26.9***	***9.6***	***19.6***	***0.3***	***BDL(<5)***	***9.7***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***52.8***	***21.3***	***7.7***	***17.0***	***0.2***	***BDL(<5)***	***7.7***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***59.0***	***26.7***	***9.6***	***19.6***	***0.3***	***BDL(<5)***	***9.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
CPCB Limits	***100***	***60***	***80***	***80***	***2***	***400***	***100***	***1***	***5***	***1***	***6***	***20***	***NS***	***NS***	***NS***

N.B: BDL-Below Detection Level

AAQ13- Nana Kapra

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
18.03.2019	48.6	19.6	7.4	14.3	0.25	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
19.03.2.09	55.3	20.2	5.6	15.5	0.16	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.03.2019	53.7	18.6	7.9	16.6	0.18	BDL(<5)	6.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.03.2019	46.3	20.9	6.5	17.9	0.23	BDL(<5)	9.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.04.2019	58.5	19.6	7.1	19.5	0.18	BDL(<5)	8.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
02.04.2019	43.5	22.4	8.6	18.5	0.22	BDL(<5)	7.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
12.04.2019	50.6	17.6	7.4	16.3	0.21	BDL(<5)	8.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.04.2019	40.3	24.1	9.6	18.5	0.26	BDL(<5)	5.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
15.04.2019	59.6	19.8	6.9	17.6	0.28	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
16.04.2019	56.3	23.6	8.6	18.9	0.16	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
26.04.2019	48.6	17.3	6.9	19.3	0.15	BDL(<5)	8.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
27.04.2019	47.1	21.4	9.3	13.2	0.19	BDL(<5)	8.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.04.2019	56.3	19.7	6.9	17.9	0.28	BDL(<5)	9.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.04.2019	50.7	25.7	8.2	14.2	0.24	BDL(<5)	7.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
10.05.2019	46.3	17.3	7	15.6	0.26	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.05.2019	56.3	20.4	5.3	17.6	0.19	BDL(<5)	6.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.05.2019	49.6	19.6	6.8	19.6	0.24	BDL(<5)	8.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
14.05.2019	56.3	20.8	8.6	18.6	0.18	BDL(<5)	9.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
24.05.2019	51.2	22.5	7.8	13.2	0.28	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.05.2019	53.2	18.9	9.3	19.2	0.23	BDL(<5)	5.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
27.05.2019	57.9	21.3	6.4	14.7	0.24	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
28.05.2019	41.3	17.6	7.6	15	0.22	BDL(<5)	9.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
07.06.2019	52.3	24.1	8.6	19.1	0.21	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.06.2019	48.3	20.7	6.2	15.6	0.18	BDL(<5)	8.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
10.06.2019	51.3	17.5	7.6	13.5	0.19	BDL(<5)	5.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.06.2019	59.6	24.6	5.9	18.9	0.26	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	***40.3***	***17.3***	***5.3***	***13.2***	***BDL(<0.1)***	***BDL(<5)***	***5.4***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***59.6***	***25.7***	***9.6***	***19.6***	***BDL(<0.1)***	***BDL(<5)***	***9.9***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***51.5***	***20.6***	***7.5***	***16.9***	***BDL(<0.1)***	***BDL(<5)***	***7.8***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***59.6***	***25.2***	***9.5***	***19.6***	***BDL(<0.1)***	***BDL(<5)***	***9.9***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
CPCB Limits	***100***	***60***	***80***	***80***	***2***	***400***	***100***	***1***	***5***	***1***	***6***	***20***	***NS***	***NS***	***NS***

N.B: BDL-Below Detection Level

AAQ14- Duchakwada

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
18.03.2019	56.3	18.6	5.3	12.3	0.15	BDL(<5)	5.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
19.03.2.09	44.25	22.3	7.8	16.2	0.28	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.03.2019	56.8	26.7	6.5	18.6	0.16	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.03.2019	46.9	22.3	9.3	19.6	0.28	BDL(<5)	5.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.04.2019	49.3	18.6	8.3	14.7	0.22	BDL(<5)	9.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
02.04.2019	59.3	26.3	6.1	12.5	0.28	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
12.04.2019	56.3	21.3	7.9	17.5	0.24	BDL(<5)	6.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.04.2019	47	18.6	6.4	18.6	0.26	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
15.04.2019	55.7	19.3	8.6	15.3	0.24	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
16.04.2019	48.6	25.85717967	6.1	12.6	0.27	BDL(<5)	6.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
26.04.2019	58.1	25.7	9.6	13.7	0.16	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
27.04.2019	57.5	19.7	8.6	15.6	0.24	BDL(<5)	5.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.04.2019	46.3	26.71703838	5.3	19.6	0.21	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.04.2019	55.3	18.6	7.6	14.7	0.19	BDL(<5)	5.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
10.05.2019	52.3	24.99732096	9.3	19.3	0.27	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.05.2019	54.6	22.3	8.5	14.8	0.29	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.05.2019	51.4	18.5	7.3	17.6	0.18	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
14.05.2019	53.6	19.8	9.3	14.8	0.25	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
24.05.2019	48.6	26.4	8.3	16.3	0.21	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.05.2019	51.3	18.4	7.3	18.9	0.24	BDL(<5)	6.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
27.05.2019	48.3	17.8	8.6	14.3	0.22	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
28.05.2019	54.2	24.6	7.3	15.6	0.23	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
07.06.2019	56.3	22.7	8.3	18.3	0.28	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.06.2019	48.6	25.8	6.6	19.6	0.18	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
10.06.2019	53.6	19.6	5.2	12.3	0.15	BDL(<5)	6.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.06.2019	59.3	24.3	9.3	17.3	0.27	BDL(<5)	9.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	***44.3***	***17.8***	***5.2***	***12.3***	***0.2***	***BDL(<5)***	***5.3***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***59.3***	***26.7***	***9.6***	***19.6***	***0.3***	***BDL(<5)***	***9.3***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***52.7***	***22.1***	***7.6***	***16.2***	***0.2***	***BDL(<5)***	***7.4***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***59.3***	***26.7***	***9.5***	***19.6***	***0.3***	***BDL(<5)***	***9.3***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
CPCB Limits	***100***	***60***	***80***	***80***	***2***	***400***	***100***	***1***	***5***	***1***	***6***	***20***	***NS***	***NS***	***NS***

N.B: BDL-Below Detection Level

AAQ15- Pechhdal

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
20.03.2019	46.3	25.3	6.8	15.3	0.24	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
21.03.2019	52.3	17.8	7.6	14.8	0.16	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
27.03.2019	56.8	18.6	8.4	12.6	0.18	BDL(<5)	8.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
28.03.2019	49.3	26.3	9.7	14.3	0.19	BDL(<5)	9.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
05.04.2019	53.2	22.5	9.1	16.5	0.25	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.04.2019	58.6	23.6	5.6	18.6	0.18	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.04.2019	44.3	18.6	9.3	15.7	0.16	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
09.04.2019	56.4	19	7.4	16.3	0.14	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
19.04.2019	58.3	25.3	8.6	15.7	0.24	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
20.04.2019	57.8	20.4	6.3	12.8	0.25	BDL(<5)	6.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
22.04.2019	44.5	26.5	9.7	14.5	0.18	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.04.2019	59.3	18.5	8.6	12.4	0.15	BDL(<5)	5.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.05.2019	56.3	16.8	9.2	13.6	0.29	BDL(<5)	8.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.05.2019	58.7	24.69	8.7	19.7	0.28	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.05.2019	54.2	22.5	9.2	18.6	0.23	BDL(<5)	6.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
07.05.2019	55.1	23.6	8.6	14.5	0.16	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
17.05.2019	48.3	18.5	7.6	18.6	0.24	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
18.05.2019	49.2	16.7	9.5	17.8	0.26	BDL(<5)	7.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
20.05.2019	56.3	19.6	7.3	19.3	0.18	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
21.05.2019	58.6	26.7	9.1	19.7	0.26	BDL(<5)	8.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
31.05.2019	60.1	23.6	5.6	13.5	0.18	BDL(<5)	6.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.06.2019	56.3	18.7	6.4	18.7	0.21	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.06.209	46.3	24.3	9.6	14.3	0.15	BDL(<5)	8.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.06.2019	52.3	19.3	7.8	16.9	0.22	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.06.2019	46.5	24.6	9.1	13.2	0.15	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
14.06.2019	58.3	18.6	8.6	19.1	0.25	BDL(<5)	6.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	***44.3***	***16.7***	***5.6***	***12.4***	***0.1***	***BDL(<5)***	***5.3***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***60.1***	***26.7***	***9.7***	***19.7***	***0.3***	***BDL(<5)***	***9.3***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***53.6***	***21.6***	***8.2***	***16.0***	***0.2***	***BDL(<5)***	***7.5***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***59.7***	***26.6***	***9.7***	***19.7***	***0.3***	***BDL(<5)***	***9.3***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
CPCB Limits	***100***	***60***	***80***	***80***	***2***	***400***	***100***	***1***	***5***	***1***	***6***	***20***	***NS***	***NS***	***NS***

N.B: BDL-Below Detection Level

AAQ16- Akoli

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
20.03.2019	45.2	18.6	5.6	13.2	0.19	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
21.03.2019	56.3	22.6	6.9	18.3	0.15	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
27.03.2019	47.2	25.3	8.3	19.6	0.18	BDL(<5)	8.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
28.03.2019	53.2	26.7	9.6	17.5	0.25	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
05.04.2019	45.2	17.5	6.7	15.3	0.22	BDL(<5)	9.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.04.2019	56.3	26.9	7.3	12.3	0.18	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.04.2019	48.5	19.6	8.3	19.6	0.26	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
09.04.2019	51.3	21.3	5.3	13.2	0.28	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
19.04.2019	59.9	18.9	9.6	16.2	0.24	BDL(<5)	6.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
20.04.2019	46.3	23.6	6.3	19.2	0.17	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
22.04.2019	59.8	20.7	7.6	17.8	0.26	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.04.2019	49.6	19.6	5.9	19.6	0.15	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.05.2019	58.5	24.6	8.1	18.1	0.24	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.05.2019	53.6	18.6	9.9	15.3	0.26	BDL(<5)	9.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.05.2019	49.5	25.7	6.2	14.9	0.27	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
07.05.2019	58.3	19.9	8.5	18.3	0.16	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
17.05.2019	59.6	24.4	8.2	19.8	0.15	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
18.05.2019	49.5	19.6	5.6	19.3	0.25	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
20.05.2019	56.3	26.9	7.3	18.6	0.18	BDL(<5)	9.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
21.05.2019	49.8	17.8	7.2	16.9	0.23	BDL(<5)	9.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
31.05.2019	56.3	23.6	9.3	12.3	0.18	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.06.2019	55.6	26.5	8.6	18.2	0.19	BDL(<5)	8.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.06.209	59.3	25.3	9.6	16.3	0.27	BDL(<5)	6.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.06.2019	57.9	17.8	6.3	19.6	0.21	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.06.2019	45.7	26.7	7.3	15.2	0.28	BDL(<5)	9.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
14.06.2019	55.2	17.3	6.3	19.3	0.19	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	***45.2***	***17.3***	***5.3***	***12.3***	***0.2***	***BDL(<5)***	***5.3***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***59.9***	***26.9***	***9.9***	***19.8***	***0.3***	***BDL(<5)***	***9.8***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***53.2***	***22.2***	***7.5***	***17.1***	***0.2***	***BDL(<5)***	***7.5***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***59.9***	***26.9***	***9.8***	***19.7***	***0.3***	***BDL(<5)***	***9.8***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
CPCB Limits	*100*	*60*	*80*	*80*	*2*	*400*	*100*	*1*	*5*	*1*	*6*	*20*	*NS*	*NS*	*NS*

N.B: BDL-Below Detection Level

AAQ17- Chitalwana

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
22.03.2019	48.3	17.9	6.9	19.3	0.15	BDL(<5)	9.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.03.2019	55.3	22.3	7.6	13.6	0.23	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.03.2019	48.3	19.3	8.9	15.6	0.16	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
26.03.2019	56.3	17.3	9.3	17.6	0.19	BDL(<5)	5.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.04.2019	49.6	26.8	5.6	12.6	0.24	BDL(<5)	8.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.04.2019	59.8	19.3	8.8	18.3	0.25	BDL(<5)	7.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
10.04.2019	52.3	25.3	7.3	14.3	0.18	BDL(<5)	6.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.04.2019	44.3	21.3	5.3	18.6	0.26	BDL(<5)	8.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
17.04.2019	50.6	18.3	6.9	17.9	0.23	BDL(<5)	8.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
18.04.2019	46.3	19.3	9.3	12.6	0.24	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
24.04.2019	58.3	23.2	6.4	19.6	0.18	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.04.2019	51.3	17.6	8.3	13.2	0.24	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.05.2019	59.3	18.3	7.6	18.6	0.16	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
02.05.2019	49.5	26.5	9.9	19.3	0.19	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.05.2019	57.3	25.3	6.3	17.6	0.24	BDL(<5)	8.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
09.05.2019	42.3	19.6	8.5	12.6	0.18	BDL(<5)	9.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
15.05.2019	59.6	25.8	7.9	19.3	0.26	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
16.05.2019	53.6	18.3	5.9	14.2	0.13	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
22.05.2019	51.3	21.3	6.3	19.3	0.18	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.05.2019	49.3	23.6	8.6	18.3	0.23	BDL(<5)	6.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.05.2019	45.3	22.3	9.3	18.6	0.26	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.05.2019	52.3	18.9	8.9	16.3	0.15	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
05.06.2019	50.3	23.6	7.6	18.3	0.19	BDL(<5)	6.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.06.2019	49.3	18.7	6.2	19.3	0.24	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
12.06.2019	58.6	25.1	8.3	19.8	0.26	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.06.2019	53.6	21.3	7.8	15.3	0.24	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	*42.3*	*17.3*	*5.3*	*12.6*	*0.1*	*BDL(<5)*	*5.3*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*	*BDL(<1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*
MAX Value	*59.8*	*26.8*	*9.9*	*19.8*	*0.3*	*BDL(<5)*	*9.9*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*	*BDL(<1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*
Average	*52.0*	*21.4*	*7.7*	*16.9*	*0.2*	*BDL(<5)*	*7.5*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*	*BDL(<1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*
P98	*59.7*	*26.7*	*9.6*	*19.7*	*0.3*	*BDL(<5)*	*9.9*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*	*BDL(<1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*
CPCB Limits	*100*	*60*	*80*	*80*	*2*	*400*	*100*	*1*	*5*	*1*	*6*	*20*	*NS*	*NS*	*NS*

N.B: BDL-Below Detection Level

AAQ18- Sanchore

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
22.03.2019	55.3	25.3	8.3	13.6	0.18	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.03.2019	45.6	19.8	6.6	15.6	0.26	BDL(<5)	7.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.03.2019	52.6	24.3	7.5	18.5	0.18	BDL(<5)	8.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
26.03.2019	58.9	26.7	7.9	19.5	0.22	BDL(<5)	9.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.04.2019	56.8	22.3	9.9	16.5	0.19	BDL(<5)	6.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.04.2019	45.6	19.5	9.6	17.6	0.21	BDL(<5)	7.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
10.04.2019	44.8	23.4	5.8	16.5	0.18	BDL(<5)	8.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.04.2019	49.5	20.3	5.9	19.8	0.23	BDL(<5)	7.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
17.04.2019	58.6	26.9	6.3	17.8	0.16	BDL(<5)	8.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
18.04.2019	59.8	17.9	6.8	16.9	0.26	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
24.04.2019	46.3	24.3	9.7	18.5	0.13	BDL(<5)	7.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.04.2019	56.3	26.8	8.6	15.3	0.18	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.05.2019	55.3	23.5	9.4	19.5	0.21	BDL(<5)	5.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
02.05.2019	49.6	18.6	6.3	17.8	0.22	BDL(<5)	7.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.05.2019	47.8	17.6	8.3	12.8	0.19	BDL(<5)	5.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
09.05.2019	52.3	22.3	8.3	18.5	0.18	BDL(<5)	7.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
15.05.2019	59.6	19.6	9.5	19.5	0.21	BDL(<5)	8.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
16.05.2019	44.8	22.3	9.5	17.5	0.18	BDL(<5)	9.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
22.05.2019	46.5	23.6	5.6	18.5	0.21	BDL(<5)	6.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.05.2019	56.3	24.3	6.1	19.6	0.17	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.05.2019	53.6	18.3	7.7	13.6	0.25	BDL(<5)	8.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.05.2019	60.5	24.8	5.8	18.5	0.15	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
05.06.2019	59.3	19.6	9.6	18.9	0.21	BDL(<5)	8.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.06.2019	43.2	23.5	6.6	13.6	0.19	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
12.06.2019	55.6	22.3	8.3	17.5	0.2	BDL(<5)	7.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.06.2019	49.6	19.6	9.7	19.7	0.2	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	***43.2***	***17.6***	***5.6***	***12.8***	***0.1***	***BDL(<5)***	***5.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***60.5***	***26.9***	***9.9***	***19.8***	***0.3***	***BDL(<5)***	***9.8***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***52.5***	***22.2***	***7.8***	***17.4***	***0.2***	***BDL(<5)***	***8.0***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***60.2***	***26.9***	***9.8***	***19.8***	***0.3***	***BDL(<5)***	***9.8***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
CPCB Limits	***100***	***60***	***80***	***80***	***2***	***400***	***100***	***1***	***5***	***1***	***6***	***20***	***NS***	***NS***	***NS***

N.B: BDL-Below Detection Level

AAQ19- Lachhiwar

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
22.03.2019	52.6	16.5	5.6	16.6	0.15	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.03.2019	56.1	18.5	6.9	12.4	0.13	BDL(<5)	8.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.03.2019	59.8	19.6	9.9	13.8	0.24	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
26.03.2019	57.4	25.6	5.6	19.5	0.2	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.04.2019	47.8	19.6	7.4	16.4	0.27	BDL(<5)	7.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.04.2019	57.3	23.6	9.8	18.5	0.19	BDL(<5)	8.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
10.04.2019	49.3	26.5	9.9	17.9	0.29	BDL(<5)	6.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.04.2019	58.6	19.5	8.5	19.9	0.16	BDL(<5)	9.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
17.04.2019	55.3	17.6	7.5	12.6	0.27	BDL(<5)	7.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
18.04.2019	42.3	18.6	6.7	15.6	0.26	BDL(<5)	6.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
24.04.2019	48.5	20.3	5.4	13.8	0.21	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.04.2019	46.5	21.9	9.1	19.4	0.29	BDL(<5)	7.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
01.05.2019	49.9	23.4	7.3	17.8	0.18	BDL(<5)	8.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
02.05.2019	52.6	20.9	6.3	19.9	0.29	BDL(<5)	5.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.05.2019	55.7	18.5	5.9	18.5	0.27	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
09.05.2019	59.6	19.5	8.5	16.3	0.16	BDL(<5)	8.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
15.05.2019	58.5	23.2	9.3	17.5	0.19	BDL(<5)	9.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
16.05.2019	44.8	25.3	8.2	18.4	0.23	BDL(<5)	6.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
22.05.2019	48.9	19.8	8.3	19.4	0.19	BDL(<5)	9.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.05.2019	52.6	18.3	7.3	13.5	0.16	BDL(<5)	8.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.05.2019	51.3	18.6	8.6	12.7	0.26	BDL(<5)	6.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.05.2019	49.5	21.2	9.1	16.5	0.19	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
05.06.2019	59.3	17.6	5.6	15.8	0.28	BDL(<5)	8.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.06.2019	52.3	22.3	7.9	19.9	0.16	BDL(<5)	9.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
12.06.2019	55.3	22.3	9.1	16.7	0.24	BDL(<5)	8.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.06.2019	53.6	25.3	8.7	18.5	0.21	BDL(<5)	7.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	***42.3***	***16.5***	***5.4***	***12.4***	***0.1***	***BDL(<5)***	***5.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***59.8***	***26.5***	***9.9***	***19.9***	***0.3***	***BDL(<5)***	***9.8***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***52.9***	***20.9***	***7.8***	***16.8***	***0.2***	***BDL(<5)***	***7.9***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***59.7***	***26.1***	***9.9***	***19.9***	***0.3***	***BDL(<5)***	***9.8***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
CPCB Limits	***100***	***60***	***80***	***80***	***2***	***400***	***100***	***1***	***5***	***1***	***6***	***20***	***NS***	***NS***	***NS***

N.B: BDL-Below Detection Level

AAQ20- Hathawada

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
18.03.2019	54.32	22.3	8.5	16.5	0.16	BDL(<5)	5.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
19.03.2.09	54.9	19.3	7.3	19.4	0.21	BDL(<5)	6.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.03.2019	59.6	17.3	6.3	12.7	0.15	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.03.2019	49.6	18.6	8.2	14.5	0.28	BDL(<5)	6.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.04.2019	59.8	26.5	9.1	15.6	0.24	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
02.04.2019	47.8	18.6	7.3	17.8	0.19	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
12.04.2019	54.8	23.6	5.6	19.5	0.23	BDL(<5)	9.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.04.2019	59.7	19.5	7.6	16.3	0.16	BDL(<5)	7.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
15.04.2019	48.5	26.3	9.1	12.4	0.27	BDL(<5)	6.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
16.04.2019	58.9	25.8	6.3	14.6	0.19	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
26.04.2019	47.8	22.6	9.1	15.6	0.28	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
27.04.2019	58.9	20.9	9.3	18.6	0.18	BDL(<5)	8.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.04.2019	47.8	22.6	7.3	17.3	0.24	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.04.2019	55.9	26.5	6.3	14.3	0.22	BDL(<5)	6.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
10.05.2019	56.8	24.8	5.3	17.5	0.18	BDL(<5)	9.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.05.2019	48.8	18.5	7.2	19.3	0.15	BDL(<5)	8.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.05.2019	47.9	20.3	8.6	15.3	0.28	BDL(<5)	6.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
14.05.2019	49.2	19.3	7.9	16.3	0.16	BDL(<5)	7.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
24.05.2019	50.6	21.3	8.1	12.8	0.26	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.05.2019	59.9	18.3	6.3	13.2	0.2	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
27.05.2019	58.6	25.6	9.1	16.3	0.28	BDL(<5)	6.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
28.05.2019	49.3	17.3	9.7	15.6	0.25	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
07.06.2019	58.6	26.3	6.3	17.3	0.17	BDL(<5)	8.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.06.2019	56.3	18.3	9.3	12.3	0.24	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
10.06.2019	54.2	22.3	9.1	18.6	0.18	BDL(<5)	8.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.06.2019	49.6	19.6	8.6	17.3	0.27	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	***47.8***	***17.3***	***5.3***	***12.3***	***0.2***	***BDL(<5)***	***5.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***59.9***	***26.5***	***9.7***	***19.5***	***0.3***	***BDL(<5)***	***9.8***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***53.8***	***21.6***	***7.8***	***16.0***	***0.2***	***BDL(<5)***	***7.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***59.9***	***26.5***	***9.5***	***19.5***	***0.3***	***BDL(<5)***	***9.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
CPCB Limits	***100***	***60***	***80***	***80***	***2***	***400***	***100***	***1***	***5***	***1***	***6***	***20***	***NS***	***NS***	***NS***

N.B: BDL-Below Detection Level

AAQ21- Vaghasan

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
20.03.2019	53.9	17.8	9.1	19.2	0.16	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
21.03.2019	41.8	16.9	5.3	16.3	0.19	BDL(<5)	5.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
27.03.2019	51.3	23.5	6.9	15.9	0.26	BDL(<5)	7.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
28.03.2019	48.6	22.9	8.8	12.6	0.18	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
05.04.2019	57.3	19.7	7.3	13.2	0.23	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.04.2019	51.3	16.8	5.1	14.8	0.19	BDL(<5)	8.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.04.2019	45.7	24.6	6.2	16.9	0.21	BDL(<5)	7.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
09.04.2019	58.3	18.3	7.8	19.2	0.18	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
19.04.2019	45.1	20.9	8.5	15.7	0.23	BDL(<5)	9.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
20.04.2019	43.2	16.7	6.3	18.6	0.15	BDL(<5)	5.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
22.04.2019	59.6	20.7	5.1	17.5	0.22	BDL(<5)	8.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.04.2019	41.2	23.8	7.9	19.6	0.19	BDL(<5)	9.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.05.2019	56.3	19.3	8.7	13.3	0.17	BDL(<5)	6.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.05.2019	46.8	21.9	9.1	16.8	0.26	BDL(<5)	8.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.05.2019	53.2	18.6	6.6	18.2	0.22	BDL(<5)	9.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
07.05.2019	41.5	24.1	7.8	15.6	0.17	BDL(<5)	7.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
17.05.2019	58.3	17.9	8.3	17.3	0.2	BDL(<5)	6.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
18.05.2019	49.9	24.1	6.9	12.6	0.18	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
20.05.2019	58.6	16.3	5.8	13.5	0.21	BDL(<5)	9.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
21.05.2019	49.6	21.9	6.3	18.3	0.27	BDL(<5)	6.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
31.05.2019	54.2	22.5	7.2	16.3	0.23	BDL(<5)	9.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.06.2019	46.7	26.3	8.9	17.3	0.19	BDL(<5)	8.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.06.209	58.9	17.3	9.1	12.6	0.15	BDL(<5)	9.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.06.2019	49.3	22.7	7.6	18.6	0.28	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.06.2019	55.6	25.6	5.2	15.3	0.27	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
14.06.2019	48.9	18.9	8.7	18.3	0.29	BDL(<5)	9.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	***41.2***	***16.3***	***5.1***	***12.6***	***0.2***	***BDL(<5)***	***5.3***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***59.6***	***26.3***	***9.1***	***19.6***	***0.3***	***BDL(<5)***	***9.9***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***51.0***	***20.8***	***7.3***	***16.3***	***0.2***	***BDL(<5)***	***8.0***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***59.3***	***26.0***	***9.1***	***19.4***	***0.3***	***BDL(<5)***	***9.8***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
CPCB Limits	*100*	*60*	*80*	*80*	*2*	*400*	*100*	*1*	*5*	*1*	*6*	*20*	*NS*	*NS*	*NS*

N.B: BDL-Below Detection Level

AAQ22- Bhildi

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
20.03.2019	49.3	21.9	7.3	12.9	0.15	BDL(<5)	6.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
21.03.2019	56.5	17.3	6.8	19.4	0.24	BDL(<5)	9.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
27.03.2019	42.8	18.6	9.2	13.1	0.18	BDL(<5)	8.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
28.03.2019	56.2	22.4	8.6	14.8	0.25	BDL(<5)	7.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
05.04.2019	48.6	18.9	9.5	19.6	0.19	BDL(<5)	6.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.04.2019	59.1	25.6	6.3	15.7	0.27	BDL(<5)	5.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.04.2019	47.5	19.7	5.8	16.5	0.16	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
09.04.2019	53.6	24.3	7.3	19.4	0.24	BDL(<5)	6.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
19.04.2019	42.1	19.1	9.6	17.3	0.18	BDL(<5)	9.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
20.04.2019	58.6	24.6	5.7	13.7	0.28	BDL(<5)	6.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
22.04.2019	49.5	26.1	6.3	18.4	0.26	BDL(<5)	7.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.04.2019	56.9	18.6	7.4	19.3	0.17	BDL(<5)	5.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.05.2019	55.6	20.8	8.6	13.2	0.24	BDL(<5)	8.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.05.2019	49.3	19.3	5.2	14.8	0.14	BDL(<5)	9.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.05.2019	58.2	26.4	7.5	19.7	0.28	BDL(<5)	5.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
07.05.2019	48.1	17.8	9.6	15.1	0.18	BDL(<5)	6.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
17.05.2019	51.3	26.3	8.9	14.3	0.23	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
18.05.2019	57.6	24.1	9.5	16.9	0.16	BDL(<5)	8.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
20.05.2019	48.1	17.9	6.7	17.3	0.26	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
21.05.2019	58.3	24.3	9.3	19.1	0.17	BDL(<5)	6.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
31.05.2019	44.9	18.6	7.8	16.8	0.29	BDL(<5)	5.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.06.2019	58.7	25.7	8.4	17.3	0.15	BDL(<5)	8.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.06.209	46.3	19.5	9.1	14.9	0.29	BDL(<5)	9.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.06.2019	58.2	26.8	7.5	17.9	0.14	BDL(<5)	8.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
13.06.2019	47.6	19.3	8.1	12.6	0.28	BDL(<5)	7.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
14.06.2019	59.1	20.9	9.2	13.2	0.24	BDL(<5)	8.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	*42.1*	*17.3*	*5.2*	*12.6*	*0.1*	*BDL(<5)*	*5.1*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*	*BDL(<1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*
MAX Value	*59.1*	*26.8*	*9.6*	*19.7*	*0.3*	*BDL(<5)*	*9.9*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*	*BDL(<1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*
Average	*52.4*	*21.7*	*7.9*	*16.3*	*0.2*	*BDL(<5)*	*7.7*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*	*BDL(<1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*
P98	*59.1*	*26.6*	*9.6*	*19.7*	*0.3*	*BDL(<5)*	*9.9*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*	*BDL(<1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*
CPCB Limits	*100*	*60*	*80*	*80*	*2*	*400*	*100*	*1*	*5*	*1*	*6*	*20*	*NS*	*NS*	*NS*

N.B: BDL-Below Detection Level

AAQ23- Manpura Dhunsol

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
22.03.2019	56.3	26.3	6.9	13.5	0.25	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.03.2019	44.2	19.3	8.9	19.3	0.19	BDL(<5)	5.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.03.2019	56.1	20.3	7.3	18.6	0.24	BDL(<5)	6.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
26.03.2019	45.2	23.6	8.6	16.3	0.18	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.04.2019	58.9	17.1	6.9	13.5	0.26	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.04.2019	46.8	24.3	8.1	19.3	0.24	BDL(<5)	5.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
10.04.2019	50.6	18.2	5.8	12.8	0.26	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.04.2019	42.1	26.7	9.9	14.6	0.18	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
17.04.2019	56.8	19.4	6.2	13.7	0.28	BDL(<5)	8.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
18.04.2019	48.3	24.3	8.3	15.3	0.29	BDL(<5)	9.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
24.04.2019	55.5	18.7	5.9	18.4	0.26	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.04.2019	41.2	25.8	7.4	16.7	0.16	BDL(<5)	5.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.05.2019	57.4	18.3	5.6	19.5	0.22	BDL(<5)	9.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
02.05.2019	45.3	17.1	9.2	14.2	0.19	BDL(<5)	6.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.05.2019	59.5	20.8	8.3	16.7	0.25	BDL(<5)	8.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
09.05.2019	58.1	18.9	7.2	12.6	0.16	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
15.05.2019	42.8	24.5	5.3	14.3	0.26	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
16.05.2019	53.7	22.3	6.5	17.4	0.16	BDL(<5)	7.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
22.05.2019	57.2	19.8	8.6	18.2	0.29	BDL(<5)	8.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.05.2019	45.2	24.3	9.1	19.5	0.17	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.05.2019	58.3	18.5	7.3	14.5	0.23	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.05.2019	40.8	26.3	8.5	19.3	0.28	BDL(<5)	6.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
05.06.2019	59.3	16.8	9.3	17.6	0.24	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.06.2019	49.7	22.7	7.4	15.7	0.28	BDL(<5)	8.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
12.06.2019	58.2	19.3	6.2	19.6	0.24	BDL(<5)	6.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.06.2019	47.1	21.3	7.3	18.4	0.2	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	***40.8***	***16.8***	***5.3***	***12.6***	***0.2***	***BDL(<5)***	***5.2***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***59.5***	***26.7***	***9.9***	***19.6***	***0.3***	***BDL(<5)***	***9.8***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***51.3***	***21.3***	***7.5***	***16.5***	***0.2***	***BDL(<5)***	***7.8***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***59.4***	***26.5***	***9.6***	***19.6***	***0.3***	***BDL(<5)***	***9.7***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
CPCB Limits	***100***	***60***	***80***	***80***	***2***	***400***	***100***	***1***	***5***	***1***	***6***	***20***	***NS***	***NS***	***NS***

N.B: BDL-Below Detection Level

AAQ24- Arnay

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
22.03.2019	56.9	19.8	5.6	16.5	0.16	BDL(<5)	5.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.03.2019	42.8	23.5	6.2	18.5	0.25	BDL(<5)	8.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.03.2019	54.2	18.6	8.3	13.5	0.18	BDL(<5)	6.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
26.03.2019	49.8	26.8	9.5	19.3	0.26	BDL(<5)	9.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.04.2019	42.2	17.6	7.5	12.7	0.17	BDL(<5)	5.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.04.2019	58.1	23.5	8.3	17.6	0.21	BDL(<5)	8.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
10.04.2019	50.9	19.8	9.6	18.3	0.19	BDL(<5)	9.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.04.2019	52.4	25.7	8.5	19.6	0.21	BDL(<5)	5.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
17.04.2019	44.6	18.6	7.3	15.8	0.27	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
18.04.2019	41.2	26.4	5.6	17.3	0.18	BDL(<5)	8.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
24.04.2019	53.5	18.6	7.8	16.7	0.21	BDL(<5)	6.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
25.04.2019	46.5	23.9	8.2	19.8	0.26	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.05.2019	51.2	17.4	9.4	17.5	0.15	BDL(<5)	8.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
02.05.2019	48.5	20.5	7.1	16.3	0.19	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.05.2019	59.6	18.6	8.6	19.1	0.21	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
09.05.2019	54.2	26.1	9.5	16.8	0.24	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
15.05.2019	56.3	17.5	7.2	13.1	0.22	BDL(<5)	6.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
16.05.2019	48.2	24.7	6.5	12.7	0.29	BDL(<5)	8.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
22.05.2019	52.3	18.7	8.6	19.8	0.18	BDL(<5)	5.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.05.2019	58.6	24.5	5.8	18.7	0.16	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.05.2019	41.2	19.6	9.2	16.2	0.29	BDL(<5)	6.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.05.2019	59.8	24.5	7.4	12.8	0.18	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
05.06.2019	50.1	26.9	5.9	19.7	0.22	BDL(<5)	8.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.06.2019	46.5	17.8	8.7	14.2	0.17	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
12.06.2019	57.3	26.3	6.1	19.7	0.26	BDL(<5)	8.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.06.2019	59.8	18.5	7.5	13.9	0.29	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	***41.2***	***17.4***	***5.6***	***12.7***	***0.2***	***BDL(<5)***	***5.2***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***59.8***	***26.9***	***9.6***	***19.8***	***0.3***	***BDL(<5)***	***9.8***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***51.4***	***21.7***	***7.7***	***16.8***	***0.2***	***BDL(<5)***	***7.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***59.8***	***26.9***	***9.6***	***19.8***	***0.3***	***BDL(<5)***	***9.8***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
CPCB Limits	***100***	***60***	***80***	***80***	***2***	***400***	***100***	***1***	***5***	***1***	***6***	***20***	***NS***	***NS***	***NS***

N.B: BDL-Below Detection Level

AAQ25- Ajavaadaa

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
22.03.2019	45.6	17.6	5.6	13.5	0.18	BDL(<5)	5.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.03.2019	52.3	18.5	9.8	16.8	0.26	BDL(<5)	6.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.03.2019	45.6	19.6	5.6	13.5	0.16	BDL(<5)	8.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
26.03.2019	52.3	22.5	9.5	18.8	0.25	BDL(<5)	9.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.04.2019	45.8	24.3	7.5	15.2	0.15	BDL(<5)	5.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
04.04.2019	52.9	18.3	8.3	16.3	0.28	BDL(<5)	7.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
10.04.2019	59.9	24.3	6.5	19.2	0.26	BDL(<5)	9.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.04.2019	47.5	19.6	8.5	17.5	0.24	BDL(<5)	7.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
17.04.2019	49.9	26.3	5.6	13.8	0.21	BDL(<5)	8.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
18.04.2019	53.8	17.6	8.4	18.9	0.19	BDL(<5)	9.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
24.04.2019	48.5	25.6	6.5	16.3	0.24	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.04.2019	42.8	19.6	9.2	12.4	0.17	BDL(<5)	6.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.05.2019	58.7	24.5	7.6	19.8	0.29	BDL(<5)	9.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
02.05.2019	42.5	22.3	7.1	18.6	0.23	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.05.2019	59.6	18.6	8.6	16.4	0.15	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
09.05.2019	45.1	22.3	6.8	18.1	0.24	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
15.05.2019	56.3	19.6	7.2	15.6	0.15	BDL(<5)	7.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
16.05.2019	48.7	26.8	6.5	12.7	0.29	BDL(<5)	8.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
22.05.2019	56.5	18.6	8.6	19.8	0.23	BDL(<5)	6.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.05.2019	49.5	24.5	5.6	17.2	0.19	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.05.2019	42.8	23.2	9.8	15.8	0.22	BDL(<5)	9.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.05.2019	59.8	18.6	8.6	12.6	0.29	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
05.06.2019	50.1	25.6	5.9	19.7	0.28	BDL(<5)	9.1	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.06.2019	46.5	21.3	8.7	13.5	0.27	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
12.06.2019	57.3	18.6	6.2	16.4	0.21	BDL(<5)	8.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.06.2019	48.5	26.1	8.9	19.1	0.3	BDL(<5)	7.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	***42.5***	***17.6***	***5.6***	***12.4***	***0.2***	***BDL(<5)***	***5.3***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***59.9***	***26.8***	***9.8***	***19.8***	***0.3***	***BDL(<5)***	***9.9***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***50.7***	***21.7***	***7.6***	***16.4***	***0.2***	***BDL(<5)***	***7.9***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***59.9***	***26.6***	***9.8***	***19.8***	***0.3***	***BDL(<5)***	***9.7***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
CPCB Limits	***100***	***60***	***80***	***80***	***2***	***400***	***100***	***1***	***5***	***1***	***6***	***20***	***NS***	***NS***	***NS***

N.B: BDL-Below Detection Level

AAQ26- Daiyap

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
22.03.2019	55.3	13.6	5.6	16.5	0.21	BDL(<5)	5.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.03.2019	54.8	18.5	6.2	15.6	0.24	BDL(<5)	6.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.03.2019	45.7	17.6	8.3	13.5	0.16	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
26.03.2019	44.9	22.5	9.5	12.8	0.28	BDL(<5)	9.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.04.2019	53.6	26.8	7.5	15.1	0.19	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.04.2019	52.4	22.3	8.3	19.9	0.28	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
10.04.2019	51.2	24.3	9.6	18.3	0.24	BDL(<5)	5.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.04.2019	53.8	18.5	8.5	17.5	0.25	BDL(<5)	5.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
17.04.2019	46.5	20.1	7.3	19.1	0.26	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
18.04.2019	41.2	21.3	5.6	16.8	0.25	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
24.04.2019	43.5	26.3	6.5	15.3	0.19	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.04.2019	46.5	18.5	8.2	19.7	0.26	BDL(<5)	8.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.05.2019	45.1	24.5	9.4	19.8	0.15	BDL(<5)	9.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
02.05.2019	58.6	26.8	7.1	17.5	0.28	BDL(<5)	6.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.05.2019	55.6	23.6	8.6	18.7	0.16	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
09.05.2019	51.3	26.1	9.5	16.8	0.24	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
15.05.2019	52.3	22.3	7.2	15.2	0.17	BDL(<5)	7.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
16.05.2019	49.3	19.38	6.5	12.7	0.29	BDL(<5)	8.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
22.05.2019	52.3	26.5	8.6	19.8	0.18	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.05.2019	48.3	21.3	7.5	17.1	0.23	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.05.2019	48.6	23.2	9.8	15.8	0.22	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.05.2019	52.3	15.9	7.4	13.1	0.16	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
05.06.2019	49.3	26.9	5.9	18.6	0.29	BDL(<5)	7.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.06.2019	46.5	22.9	8.7	13.5	0.15	BDL(<5)	8.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
12.06.2019	57.3	26.8	8.7	18.7	0.25	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.06.2019	54.3	21.3	7.5	19.1	0.26	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	***41.2***	***13.6***	***5.6***	***12.7***	***0.2***	***BDL(<5)***	***5.3***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***58.6***	***26.9***	***9.8***	***19.9***	***0.3***	***BDL(<5)***	***9.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***50.4***	***22.2***	***7.8***	***16.8***	***0.2***	***BDL(<5)***	***7.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***58.0***	***26.9***	***9.7***	***19.9***	***0.3***	***BDL(<5)***	***9.6***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
CPCB Limits	*100*	*60*	*80*	*80*	*2*	*400*	*100*	*1*	*5*	*1*	*6*	*20*	*NS*	*NS*	*NS*

N.B: BDL-Below Detection Level

AAQ27- Surachand

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
22.03.2019	45.8	18.5	6.5	12.6	0.18	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.03.2019	54.6	19.5	9.8	14.2	0.24	BDL(<5)	8.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.03.2019	48.9	17.5	8.4	13.5	0.26	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
26.03.2019	56.8	26.5	7.5	16.3	0.25	BDL(<5)	8.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.04.2019	48.5	26.8	7.5	17.3	0.18	BDL(<5)	9.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.04.2019	49.5	26.8	9.8	19.8	0.28	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
10.04.2019	52.6	24.3	9.6	16.3	0.28	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.04.2019	50.4	25.4	6.8	12.6	0.26	BDL(<5)	7.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
17.04.2019	53.6	19.3	7.4	18.6	0.22	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
18.04.2019	41.2	23.5	5.6	19.6	0.18	BDL(<5)	8.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
24.04.2019	43.5	18.5	6.5	15.8	0.17	BDL(<5)	9.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.04.2019	52.6	19.3	9.7	12.3	0.25	BDL(<5)	8.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.05.2019	58.9	23.6	5.6	19.8	0.15	BDL(<5)	8.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
02.05.2019	58.6	26.6	7.1	16.2	0.26	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.05.2019	57.4	19.6	8.7	18.7	0.22	BDL(<5)	8.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
09.05.2019	48.6	26.1	5.9	17.6	0.24	BDL(<5)	9.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
15.05.2019	56.3	22.3	8.4	19.6	0.18	BDL(<5)	9.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
16.05.2019	56.9	21.3	5.9	12.7	0.2	BDL(<5)	8.2	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
22.05.2019	53.6	26.5	9.9	18.6	0.18	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.05.2019	58.8	21.9	7.5	19.8	0.16	BDL(<5)	8.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.05.2019	59.6	19.6	6.8	14.3	0.22	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.05.2019	59.8	24.5	7.4	16.8	0.16	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
05.06.2019	54.2	22.6	7.5	18.6	0.19	BDL(<5)	8.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.06.2019	56.3	23.6	8.7	13.5	0.15	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
12.06.2019	46.9	18.6	5.6	17.3	0.18	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.06.2019	48.3	17.3	7.5	18.3	0.26	BDL(<5)	8.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	*41.2*	*17.3*	*5.6*	*12.3*	*0.2*	*BDL(<5)*	*5.3*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*	*BDL(<1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*
MAX Value	*59.8*	*26.8*	*9.9*	*19.8*	*0.3*	*BDL(<5)*	*9.9*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*	*BDL(<1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*
Average	*52.8*	*22.3*	*7.6*	*16.6*	*0.2*	*BDL(<5)*	*8.7*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*	*BDL(<1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*
P98	*59.7*	*26.8*	*9.9*	*19.8*	*0.3*	*BDL(<5)*	*9.9*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*	*BDL(<1)*	*BDL(<0.1)*	*BDL(<0.1)*	*BDL(<1)*
CPCB Limits	*100*	*60*	*80*	*80*	*2*	*400*	*100*	*1*	*5*	*1*	*6*	*20*	*NS*	*NS*	*NS*

N.B: BDL-Below Detection Level

AAQ28- Vav

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
22.03.2019	45.9	18.3	5.6	13.2	0.19	BDL(<5)	8.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.03.2019	58.6	19.3	6.5	16.3	0.23	BDL(<5)	9.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.03.2019	59.4	22.3	9.8	14.3	0.16	BDL(<5)	7.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
26.03.2019	59.6	19.3	7.5	12.8	0.24	BDL(<5)	8.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
03.04.2019	46.9	18.3	7.5	18.3	0.25	BDL(<5)	8.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
04.04.2019	44.5	21.3	8.6	19.8	0.19	BDL(<5)	9.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
10.04.2019	49.8	19.3	9.4	14.2	0.29	BDL(<5)	6.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
11.04.2019	58.6	18.5	8.5	13.2	0.23	BDL(<5)	5.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
17.04.2019	57.9	17.3	7.3	16.3	0.28	BDL(<5)	6.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
18.04.2019	41.2	21.5	6.5	19.3	0.27	BDL(<5)	9.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
24.04.2019	48.1	19.3	7.4	15.8	0.19	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
25.04.2019	46.5	24.3	8.7	14.3	0.23	BDL(<5)	7.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
01.05.2019	50.8	21.8	9.4	12.6	0.29	BDL(<5)	5.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
02.05.2019	58.6	26.9	6.8	19.6	0.25	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
08.05.2019	59.6	18.6	9.7	14.3	0.26	BDL(<5)	8.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
09.05.2019	57.6	26.1	9.5	13.2	0.19	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
15.05.2019	56.3	19.5	5.8	15.6	0.24	BDL(<5)	9.7	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
16.05.2019	57.5	19.4	9.4	15.3	0.19	BDL(<5)	7.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)

Date of Monitoring	PM10 µg/m3	PM2.5 µg/m3	SO2 µg/m3	NO2 µg/m3	CO mg/m3	NH3 µg/m3	O3 µg/m3	Lead µg/m3	Benzene µg/m3	BaP µg/m3	As ng/m3	Ni ng/m3	Methane HC µg/m3	Non Methane HC µg/m3	Total VOC's µg/m3
22.05.2019	40.9	22.5	7.6	12.7	0.26	BDL(<5)	7.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
23.05.2019	57.9	26.5	7.5	19.8	0.16	BDL(<5)	8.4	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
29.05.2019	56.9	18.2	8.6	18.3	0.19	BDL(<5)	5.3	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
30.05.2019	47.8	24.5	7.4	14.3	0.28	BDL(<5)	5.9	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
05.06.2019	48.5	26.9	9.8	19.7	0.26	BDL(<5)	8.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
06.06.2019	48.9	18.5	8.7	16.3	0.15	BDL(<5)	6.8	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
12.06.2019	57.3	26.8	8.7	19.8	0.21	BDL(<5)	9.6	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
13.06.2019	59.8	24.8	8.5	12.3	0.19	BDL(<5)	8.5	BDL(<0.1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)	BDL(<1)	BDL(<0.1)	BDL(<0.1)	BDL(<1)
MIN Value	***40.9***	***17.3***	***5.6***	***12.3***	***0.2***	***BDL(<5)***	***5.3***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
MAX Value	***59.8***	***26.9***	***9.8***	***19.8***	***0.3***	***BDL(<5)***	***9.8***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
Average	***52.9***	***21.5***	***8.1***	***15.8***	***0.2***	***BDL(<5)***	***7.8***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
P98	***59.7***	***26.9***	***9.8***	***19.8***	***0.3***	***BDL(<5)***	***9.8***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***	***BDL(<1)***	***BDL(<0.1)***	***BDL(<0.1)***	***BDL(<1)***
CPCB Limits	***100***	***60***	***80***	***80***	***2***	***400***	***100***	***1***	***5***	***1***	***6***	***20***	***NS***	***NS***	***NS***

N.B: BDL-Below Detection Level

ANNEXURE 9: TRAFFIC STUDY RESULTS

Time	NH 15 (Banaskantha), Gujarat (Weekdays)							
	Cycles	Two Wheelers	Auto Rickshows	Cars/ Vans	LCV	Trucks/ Bus	Multiaxle	Cart
6:00 AM	4	15	10	18	22	107	22	6
7:00 AM	4	24	14	22	34	93	43	4
8:00 AM	5	53	43	23	41	70	40	4
9:00 AM	14	66	58	27	52	44	79	2
10:00 AM	11	57	56	31	59	87	22	0
11:00 AM	4	44	65	35	61	80	36	0
12:00 PM	6	40	70	40	59	93	40	2
1:00 PM	7	46	59	41	63	80	47	6
2:00 PM	6	44	67	36	47	40	43	0
3:00 PM	5	42	61	36	49	70	32	0
4:00 PM	14	33	58	33	43	80	40	0
5:00 PM	11	46	65	32	52	83	61	2
6:00 PM	6	55	67	36	56	97	32	2
7:00 PM	7	58	58	40	70	123	47	0
8:00 PM	7	76	56	37	63	107	58	0
9:00 PM	5	66	52	30	72	120	36	4
10:00 PM	3	62	43	32	63	107	47	0
11:00 PM	2	28	40	29	52	133	43	0
12:00 AM	1	17	12	27	45	100	40	2
1:00 AM	1	12	23	25	36	73	77	0
2:00 AM	1	11	20	34	20	33	59	0
3:00 AM	1	8	8	31	23	57	68	2
4:00 AM	1	7	9	28	22	83	45	0
5:00 AM	2	9	11	23	41	57	51	0
Total	**130**	**919**	**1022**	**743**	**1147**	**2015**	**1105**	**36**

Time	NH 15 (Banaskantha), Gujarat (Weekend)							
	Cycles	Two Wheelers	Auto Rickshows	Cars/ Vans	LCV	Trucks/ Bus	Multiaxle	Cart
6:00 AM	6	17	11	18	24	118	24	4
7:00 AM	4	27	16	22	38	104	48	2
8:00 AM	5	54	48	23	46	78	44	4
9:00 AM	15	66	64	33	58	48	88	2
10:00 AM	11	55	62	31	66	96	24	0
11:00 AM	8	49	72	39	60	89	40	0
12:00 PM	6	45	78	36	66	93	44	2
1:00 PM	7	43	66	41	78	89	52	4
2:00 PM	8	49	74	36	52	42	48	0
3:00 PM	7	42	68	38	54	78	36	0
4:00 PM	15	37	64	39	54	89	44	0

Time	NH 15 (Banaskantha), Gujarat (Weekend)							
	Cycles	Two Wheelers	Auto Rickshows	Cars/ Vans	LCV	Trucks/ Bus	Multiaxle	Cart
5:00 PM	9	51	72	33	58	93	68	2
6:00 PM	9	62	78	40	62	107	44	0
7:00 PM	6	65	60	44	78	137	56	0
8:00 PM	7	78	58	41	70	118	60	0
9:00 PM	4	78	30	33	80	133	36	4
10:00 PM	4	70	26	35	70	118	44	0
11:00 PM	5	33	40	32	58	148	40	0
12:00 AM	2	20	12	30	50	111	40	2
1:00 AM	1	13	13	28	40	81	65	0
2:00 AM	1	9	20	38	22	18	75	0
3:00 AM	0	9	11	34	26	63	60	2
4:00 AM	2	5	11	31	24	93	36	0
5:00 AM	0	10	24	26	46	63	56	0
Total	**143**	**988**	**1078**	**801**	**1280**	**2206**	**1172**	**28**

Time	SH-11 (Jalore), Rajasthan (Weekdays)							
	Cycles	Two Wheelers	Auto Rickshows	Cars/ Vans	LCV	Trucks/ Bus	Multiaxle	Cart
6:00 AM	4	17	11	20	24	118	24	6
7:00 AM	5	27	16	24	38	104	48	4
8:00 AM	6	58	48	26	46	78	44	4
9:00 AM	16	74	64	30	58	48	88	2
10:00 AM	12	63	62	34	66	96	24	0
11:00 AM	5	49	72	39	68	89	40	0
12:00 PM	7	45	78	44	66	104	44	2
1:00 PM	8	51	66	45	70	89	52	6
2:00 PM	7	49	74	40	52	44	48	0
3:00 PM	6	47	68	40	54	78	36	0
4:00 PM	16	37	64	37	48	89	44	0
5:00 PM	13	51	72	35	58	93	68	2
6:00 PM	7	62	74	40	62	107	36	2
7:00 PM	8	65	64	44	78	137	52	0
8:00 PM	8	84	62	41	70	118	64	0
9:00 PM	5	73	58	33	80	133	40	4
10:00 PM	4	69	48	35	70	118	52	0
11:00 PM	2	31	44	32	58	148	48	0
12:00 AM	1	18	13	30	50	111	44	2
1:00 AM	1	13	26	28	40	81	85	0
2:00 AM	1	12	22	38	22	18	65	0
3:00 AM	1	9	8	34	26	63	75	2
4:00 AM	2	8	10	31	24	93	50	0

Time	SH-11 (Jalore), Rajasthan (Weekdays)							
	Cycles	Two Wheelers	Auto Rickshows	Cars/ Vans	LCV	Trucks/ Bus	Multiaxle	Cart
5:00 AM	2	10	12	26	46	63	56	0
Total	**145**	**1021**	**1136**	**826**	**1274**	**2219**	**1227**	**36**

Time	SH-11 (Jalore), Rajasthan (Weekend)							
	Cycles	Two Wheelers	Auto Rickshows	Cars/ Vans	LCV	Trucks/ Bus	Multiaxle	Cart
6:00 AM	4	17	11	20	24	118	24	6
7:00 AM	5	27	16	22	38	104	48	4
8:00 AM	6	58	48	26	46	78	44	4
9:00 AM	5	66	64	30	58	48	60	2
10:00 AM	6	62	62	34	60	96	24	0
11:00 AM	5	49	64	39	64	89	36	0
12:00 PM	5	45	74	39	66	104	44	2
1:00 PM	6	51	66	33	62	89	60	6
2:00 PM	7	49	64	32	52	44	48	0
3:00 PM	6	47	68	35	54	78	40	0
4:00 PM	11	37	64	37	48	89	44	0
5:00 PM	7	51	66	35	60	46	68	2
6:00 PM	4	62	70	40	62	96	36	2
7:00 PM	8	65	64	44	70	122	52	0
8:00 PM	8	78	62	41	70	118	64	0
9:00 PM	5	73	52	33	66	133	40	4
10:00 PM	4	69	48	35	70	118	52	0
11:00 PM	2	31	36	32	58	155	48	0
12:00 AM	1	18	13	30	50	111	44	2
1:00 AM	1	13	26	28	40	81	85	0
2:00 AM	1	12	22	35	22	20	65	0
3:00 AM	1	9	8	34	26	63	75	2
4:00 AM	2	8	10	31	24	93	50	0
5:00 AM	2	10	12	26	46	63	56	0
Total	**111**	**1006**	**1090**	**791**	**1236**	**2156**	**1207**	**36**

Time	SH-54 (Banaskantha), Gujarat (Weekdays)							
	Cycles	Two Wheelers	Auto Rickshows	Cars/ Vans	LCV	Trucks/ Bus	Multiaxle	Cart
6:00 AM	2	9	5	10	12	60	12	2
7:00 AM	2	14	8	12	19	52	24	4
8:00 AM	3	30	24	13	23	39	22	0
9:00 AM	3	23	39	22	33	52	22	0
10:00 AM	6	32	31	17	33	49	12	0
11:00 AM	2	25	36	20	34	45	20	0

Time	SH-54 (Banaskantha), Gujarat (Weekdays)							
	Cycles	Two Wheelers	Auto Rickshows	Cars/ Vans	LCV	Trucks/ Bus	Multiaxle	Cart
12:00 PM	8	37	32	15	29	25	32	2
1:00 PM	4	26	33	23	35	45	22	2
2:00 PM	4	25	37	20	26	22	24	0
3:00 PM	3	24	34	20	27	39	18	2
4:00 PM	8	19	32	19	24	45	22	0
5:00 PM	6	26	36	18	29	47	27	2
6:00 PM	4	31	37	20	31	54	18	2
7:00 PM	4	33	32	22	39	69	24	0
8:00 PM	4	43	31	21	35	60	24	0
9:00 PM	3	37	29	17	41	67	20	0
10:00 PM	2	35	24	18	35	60	26	0
11:00 PM	1	16	22	16	29	75	24	0
12:00 AM	1	9	7	15	25	56	22	2
1:00 AM	0	6	13	14	20	41	37	0
2:00 AM	0	6	11	19	11	9	33	0
3:00 AM	0	4	4	17	13	32	38	2
4:00 AM	1	4	5	16	12	47	25	0
5:00 AM	1	5	6	13	23	32	29	0
Total	**73**	**517**	**575**	**418**	**645**	**1123**	**581**	**20**

Time	SH-54 (Banaskantha), Gujarat (Weekend)							
	Cycles	Two Wheelers	Auto Rickshows	Cars/ Vans	LCV	Trucks/ Bus	Multiaxle	Cart
6:00 AM	2	9	5	10	12	60	12	6
7:00 AM	2	14	8	12	19	52	24	4
8:00 AM	3	28	24	13	23	39	22	4
9:00 AM	3	23	39	22	33	52	22	2
10:00 AM	4	32	31	17	33	49	12	0
11:00 AM	2	25	36	20	34	45	20	0
12:00 PM	7	34	32	15	29	25	32	2
1:00 PM	3	26	33	21	35	45	22	6
2:00 PM	4	25	37	16	26	22	24	0
3:00 PM	3	24	34	15	27	39	18	0
4:00 PM	8	19	32	19	24	45	22	0
5:00 PM	6	26	36	15	29	47	27	2
6:00 PM	4	31	37	19	31	54	18	2
7:00 PM	4	31	32	22	39	69	24	0
8:00 PM	4	43	31	21	35	60	24	0
9:00 PM	3	34	29	17	38	67	20	4
10:00 PM	2	33	24	18	35	60	26	0
11:00 PM	1	16	22	16	29	75	24	0

Time	SH-54 (Banaskantha), Gujarat (Weekend)							
	Cycles	Two Wheelers	Auto Rickshows	Cars/ Vans	LCV	Trucks/ Bus	Multiaxle	Cart
12:00 AM	1	9	7	15	25	56	22	2
1:00 AM	0	6	13	12	20	41	37	0
2:00 AM	0	6	11	19	11	9	33	2
3:00 AM	0	4	4	17	13	32	38	2
4:00 AM	1	4	5	16	12	47	25	0
5:00 AM	1	5	6	13	23	32	29	0
Total	**68**	**505**	**575**	**401**	**642**	**1123**	**581**	**38**

Time	SH-128 (Banaskantha), Gujarat (Weekdays)							
	Cycles	Two Wheelers	Auto Rickshows	Cars/ Vans	LCV	Trucks/ Bus	Multiaxle	Cart
6:00 AM	3	13	8	15	18	89	18	6
7:00 AM	4	20	12	18	29	78	36	4
8:00 AM	5	44	36	20	35	58	33	4
9:00 AM	12	55	48	23	44	36	48	2
10:00 AM	9	47	47	26	50	72	18	0
11:00 AM	4	37	54	29	51	67	30	0
12:00 PM	5	34	59	33	50	78	33	2
1:00 PM	6	38	50	34	53	67	32	6
2:00 PM	5	37	56	30	39	33	36	0
3:00 PM	5	35	51	30	41	58	27	0
4:00 PM	12	28	48	28	36	67	33	0
5:00 PM	9	38	54	26	44	69	40	2
6:00 PM	5	46	56	30	47	80	27	2
7:00 PM	6	49	48	33	59	103	36	0
8:00 PM	6	63	47	31	53	89	36	0
9:00 PM	4	55	44	25	60	100	30	4
10:00 PM	3	52	36	26	53	89	39	0
11:00 PM	2	23	33	24	44	111	36	0
12:00 AM	1	14	10	23	38	83	33	2
1:00 AM	1	10	20	21	30	61	55	0
2:00 AM	1	9	17	29	17	13	49	0
3:00 AM	1	7	6	26	20	47	56	2
4:00 AM	1	6	7	23	18	69	38	0
5:00 AM	2	7	9	20	35	47	42	0
Total	**109**	**766**	**852**	**620**	**956**	**1664**	**861**	**36**

Time	SH-128 (Banaskantha), Gujarat (Weekend)							
	Cycles	Two Wheelers	Auto Rickshows	Cars/ Vans	LCV	Trucks/ Bus	Multiaxle	Cart
6:00 AM	3	13	8	15	18	89	18	6

Time	SH-128 (Banaskantha), Gujarat (Weekend)							
	Cycles	Two Wheelers	Auto Rickshows	Cars/ Vans	LCV	Trucks/ Bus	Multiaxle	Cart
7:00 AM	4	20	12	18	29	78	36	4
8:00 AM	5	42	36	20	35	58	33	4
9:00 AM	10	52	44	23	44	36	48	2
10:00 AM	9	44	47	26	48	72	18	0
11:00 AM	4	34	46	29	51	67	30	0
12:00 PM	4	31	54	33	50	78	33	2
1:00 PM	6	30	44	34	50	67	32	6
2:00 PM	5	28	52	30	39	56	36	0
3:00 PM	5	31	51	31	41	58	27	0
4:00 PM	9	26	48	28	36	67	33	0
5:00 PM	9	38	46	26	44	69	40	2
6:00 PM	6	46	48	29	38	80	27	2
7:00 PM	6	49	46	30	50	103	36	0
8:00 PM	6	58	47	31	53	89	36	0
9:00 PM	4	53	44	24	56	100	30	4
10:00 PM	3	52	36	23	53	89	39	0
11:00 PM	2	23	33	22	44	111	36	0
12:00 AM	1	14	10	21	38	83	33	2
1:00 AM	1	10	20	21	30	61	55	0
2:00 AM	1	9	17	29	17	13	49	0
3:00 AM	1	7	6	26	20	47	56	2
4:00 AM	1	6	7	23	18	56	38	0
5:00 AM	2	7	9	20	35	41	42	0
Total	**103**	**723**	**809**	**609**	**931**	**1666**	**861**	**36**

ANNEXURE 10: DEMOGRAPHIC PROFILE OF THE STUDY AREA

Distribution of population in the Study area of CB-ONHP-2017/10 block

Sl. No	Name	Household	Total Population	Demographic Structure							
				Total Male	Total Female	SC	SC Male	Female SC	ST	ST Male	ST Female
					Tharad, BK						
1.	Kasavi	252	1599	858	741	273	147	126	0	0	0
2.	Takhuva	93	583	294	289	44	19	25	70	40	30
3.	Kharakhoda	305	1914	1018	896	263	146	117	7	3	4
4.	Vaghasan	543	3543	1858	1685	397	201	196	5	4	1
5.	Naroli	671	4377	2384	1993	610	332	278	348	189	159
6.	Antrol	349	2234	1165	1069	239	123	116	0	0	0
7.	Sherau	369	2076	1086	990	208	109	99	2	0	2
8.	Karbun	612	3706	1985	1721	376	202	174	193	102	91
9.	Nana Mesara	208	1330	693	637	177	94	83	58	30	28
10.	Jadara	251	1614	836	778	82	42	40	185	98	87
11.	Morthal	939	5922	3029	2893	329	171	158	20	8	12
12.	Rampura	378	2470	1270	1200	213	115	98	0	0	0
13.	Jampur	254	1417	719	698	207	100	107	0	0	0
14.	Ganeshpura	334	1869	970	899	314	163	151	0	0	0
15.	Bhadodar	281	1633	818	815	205	112	93	0	0	0
16.	Hathawada	166	889	487	402	160	86	74	0	0	0
17.	Mangrol	401	2324	1210	1114	295	155	140	202	108	94
18.	Changada	546	3428	1767	1661	419	212	207	1	0	1
19.	Thara	471	3113	1611	1502	503	254	249	125	68	57
20.	Kiyal	323	2193	1100	1093	63	31	32	0	0	0
21.	Kochala	261	1724	904	820	104	52	52	0	0	0
22.	Jamda	490	2709	1420	1289	518	267	251	0	0	0
23.	Lunal	265	1643	839	804	399	196	203	24	11	13
24.	Vedala	270	1725	880	845	119	67	52	115	54	61

Sl. No	Name	Household	Total Population	Demographic Structure								
				Total Male	Total Female	SC	SC Male	Female SC	ST	ST Male	ST Female
25.	Khengarpura	343	2158	1073	1085	251	133	118	0	0	0
26.	Sidhotara	386	2351	1197	1154	91	53	38	1	1	0
27.	Undrana	456	2917	1493	1424	310	142	168	0	0	0
28.	Chudmer	443	2641	1346	1295	1637	834	803	0	0	0
29.	Budhanpur	332	1848	952	896	539	284	255	38	19	19
30.	Kothigam	244	1436	736	700	330	176	154	0	0	0
31.	Bhimgadh	145	994	518	476	76	43	33	0	0	0
32.	DetalDarbari	275	1645	851	794	247	124	123	0	0	0
33.	Malupur	632	3487	1763	1724	630	328	302	130	67	63
34.	Padadar	174	1050	525	525	93	49	44	4	1	3
35.	Gela	541	3786	1947	1839	508	263	245	0	0	0
36.	Peparal	337	2209	1153	1056	296	162	134	265	142	123
Total		**13340**	**82557**	**42755**	**39802**	**11525**	**5987**	**5538**	**1793**	**945**	**848**
Dhanera, BK											
37.	Nenava	932	5773	3019	2754	1026	527	499	359	180	179
38.	Magarawa	493	3254	1668	1586	263	136	127	669	334	335
39.	Bhajna	596	3802	2002	1800	110	59	51	30	17	13
40.	Vinchhivadi	407	2537	1316	1221	295	151	144	284	156	128
41.	Ramuna	311	2301	1201	1100	259	132	127	323	160	163
42.	Virol	232	1564	765	799	306	130	176	0	0	0
Total		**2971**	**19231**	**9971**	**9260**	**2259**	**1135**	**1124**	**1665**	**847**	**818**
Deesa, BK											
43.	Bhakadiyal	384	2456	1285	1171	140	67	73	0	0	0
44.	Vasna (Kuda)	367	2278	1208	1070	234	129	105	6	3	3
45.	Chekra	426	2243	1190	1053	183	94	89	215	114	101
46.	Yavarpura	387	2367	1218	1149	121	62	59	4	3	1
47.	Agthala	917	5225	2752	2473	306	154	152	5	3	2
48.	Dharanva	132	813	417	396	47	23	24	0	0	0

Sl. No	Name	Household	Total Population	Demographic Structure							
				Total Male	Total Female	SC	SC Male	Female SC	ST	ST Male	ST Female
49.	Nesda Nava	620	3709	1884	1825	550	278	272	41	24	17
Total		**3233**	**19091**	**9954**	**9137**	**1581**	**807**	**774**	**271**	**147**	**124**
Deodar, BK											
50.	Kuwana	368	2356	1208	1148	141	73	68	215	116	99
51.	Sanav	376	2408	1280	1128	117	58	59	0	0	0
52.	Dera	332	1920	1014	906	76	39	37	0	0	0
53.	Navapura	279	1622	857	765	75	41	34	238	117	121
Total		**1355**	**8306**	**4359**	**3947**	**409**	**211**	**198**	**453**	**233**	**220**
Sanchor, Jalore											
54.	Itada	267	1540	813	727	157	91	66	12	5	7
55.	Bagsari	197	1098	578	520	514	281	233	0	0	0
56.	Kesoori	491	3038	1597	1441	814	436	378	0	0	0
57.	Amarpura	246	1308	647	661	456	218	238	0	0	0
58.	Chhajara	280	1693	911	782	280	145	135	243	133	110
59.	Vishnu Nagar	250	1366	700	666	98	49	49	0	0	0
60.	Siddheshwar	289	1821	918	903	143	69	74	90	42	48
61.	Kilawa	305	1864	967	897	349	187	162	3	2	1
62.	Gardali	155	869	435	434	120	59	61	78	39	39
63.	Jajoosan	221	1482	753	729	492	253	239	234	116	118
64.	Phalna	155	961	528	433	20	10	10	122	68	54
65.	Paladar	524	3525	1829	1696	619	312	307	419	219	200
Total		**3380**	**20565**	**10676**	**9889**	**4062**	**2110**	**1952**	**1201**	**624**	**577**
Sujangarh, Churu											
66.	Lalpura	145	821	430	391	187	93	94	0	0	0
Hindaun, Karauli											
67.	Kailash Nagar	288	1663	913	750	593	349	244	0	0	0
Grand Total		**24712**	**152234**	**79058**	**73176**	**20616**	**10692**	**9924**	**5383**	**2796**	**2587**

Source: Census 2011

Distribution of Literacy rate & Working population in the study area of CB-ONHP-2017/10 Block

Sl. No	Name	Total Population	Literacy Rate						Employment Pattern							
			Total Literate	Male-Literate	Female-Literate	Total Illiterate	Male Illiterate	Female Illiterate	Total Worker	Main Worker	Main Cultivator	Main Agriculture	Main Household	Main other Worker	Marginal Worker	Non Worker
Tharad, BK																
1.	Kasavi	1599	868	566	302	731	292	439	911	232	44	7	120	403	508	688
2.	Takhuva	583	326	215	111	257	79	178	167	114	15	1	34	164	3	416
3.	Kharakhoda	1914	987	656	331	927	362	565	1016	273	34	9	36	352	664	898
4.	Vaghasan	3543	1608	1064	544	1935	794	1141	1483	647	95	6	40	788	695	2060
5.	Naroli	4377	2409	1611	798	1968	773	1195	1902	1251	286	22	189	1748	154	2475
6.	Antrol	2234	1175	785	390	1059	380	679	759	391	110	8	56	565	194	1475
7.	Sherau	2076	1111	728	383	965	358	607	760	460	56	5	132	653	107	1316
8.	Karbun	3706	2373	1385	988	1333	600	733	1556	782	92	19	90	983	573	2150
9.	Nana Mesara	1330	730	461	269	600	232	368	512	342	13	0	41	396	116	818
10.	Jadara	1614	818	538	280	796	298	498	675	289	77	26	183	575	100	939
11.	Morthal	5922	2689	1741	948	3233	1288	1945	2856	1169	368	4	826	2367	489	3066
12.	Rampura	2470	1307	890	417	1163	380	783	1242	423	134	27	63	647	595	1228
13.	Jampur	1417	1004	537	467	413	182	231	742	305	72	0	21	398	344	675
14.	Ganeshpura	1869	897	621	276	972	349	623	600	379	109	7	53	548	52	1269
15.	Bhadodar	1633	992	612	380	641	206	435	828	580	160	4	79	823	5	805
16.	Hathawada	889	586	375	211	303	112	191	447	149	245	1	46	441	6	442
17.	Mangrol	2324	1254	815	439	1070	395	675	817	372	160	19	151	702	115	1507
18.	Changada	3428	1740	1118	622	1688	649	1039	1780	452	184	5	199	840	940	1648
19.	Thara	3113	1510	965	545	1603	646	957	1600	543	85	16	357	1001	599	1513
20.	Kiyal	2193	818	544	274	1375	556	819	982	780	67	1	50	898	84	1211
21.	Kochala	1724	736	517	219	988	387	601	934	498	51	0	249	798	136	790
22.	Jamda	2709	1395	912	483	1314	508	806	1237	627	127	0	463	1217	20	1472
23.	Lunal	1643	845	563	282	798	276	522	793	284	42	11	44	381	412	850
24.	Vedala	1725	871	560	311	854	320	534	957	452	225	0	111	788	169	768
25.	Khengarpura	2158	917	600	317	1241	473	768	1177	307	197	0	18	522	655	981
26.	Sidhotara	2351	884	610	274	1467	587	880	803	484	264	0	40	788	15	1548
27.	Undrana	2917	1011	692	319	1906	801	1105	1541	1101	180	0	177	1458	83	1376
28.	Chudmer	2641	1120	739	381	1521	607	914	759	620	105	2	24	751	8	1882
29.	Budhanpu	1848	953	649	304	895	303	592	1065	539	267	0	161	967	98	783

Sl. No	Name	Total Population	Literacy Rate						Employment Pattern							
			Total Literate	Male-Literate	Female-Literate	Total Illiterate	Male Illiterate	Female Illiterate	Total Worker	Main Worker	Main Cultivator	Main Agriculture	Main Household	Main other Worker	Marginal Worker	Non Worker
	r															
30.	Kothigam	1436	795	499	296	641	237	404	624	204	79	5	31	319	305	812
31.	Bhimgadh	994	571	351	220	423	167	256	547	160	36	110	166	472	75	447
32.	DetalDarbari	1645	413	274	139	1232	577	655	930	269	27	0	5	301	629	715
33.	Malupur	3487	1715	1116	599	1772	647	1125	1656	759	500	0	209	1468	188	1831
34.	Padadar	1050	488	340	148	562	185	377	271	184	64	4	15	267	4	779
35.	Gela	3786	1994	1258	736	1792	689	1103	1681	1266	204	15	174	1659	22	2105
36.	Peparal	2209	1081	695	386	1128	458	670	1092	367	134	6	305	812	280	1117
Total		**82557**	**40991**	**26602**	**14389**	**41566**	**16153**	**25413**	**37702**	**18054**	**4908**	**340**	**4958**	**28260**	**9442**	**44855**
Dhanera, BK																
37.	Nenava	5773	2688	1777	911	3085	1242	1843	1872	1005	325	4	319	1653	219	3901
38.	Magarawa	3254	1462	939	523	1792	729	1063	759	536	143	0	46	725	34	2495
39.	Bhajna	3802	1465	989	476	2337	1013	1324	1926	957	90	5	547	1599	327	1876
40.	Vinchhivadi	2537	1076	691	385	1461	625	836	1273	408	109	0	79	596	677	1264
41.	Ramuna	2301	1142	729	413	1159	472	687	821	410	119	0	276	805	16	1480
42.	Virol	1564	732	465	267	832	300	532	714	537	71	21	82	711	3	850
Total		**19231**	**8565**	**5590**	**2975**	**10666**	**4381**	**6285**	**7365**	**3853**	**857**	**30**	**1349**	**6089**	**1276**	**11866**
Deesa, BK																
43.	Bhakadiyal	2456	1036	683	353	1420	602	818	1321	587	21	0	29	637	684	1135
44.	Vasna (Kuda)	2278	971	633	338	1307	575	732	1171	407	116	1	526	1050	121	1107
45.	Chekra	2243	979	636	343	1264	554	710	1295	448	250	18	450	1166	129	948
46.	Yavarpura	2367	1401	876	525	966	342	624	806	461	38	4	83	586	220	1561
47.	Agthala	5225	2312	1494	818	2913	1258	1655	2281	993	427	186	459	2065	216	2944
48.	Dharanva	813	518	288	230	295	129	166	223	138	54	0	10	202	21	590
49.	Nesda Nava	3709	1720	1043	677	1989	841	1148	1686	587	452	7	392	1438	248	2023
Total		**19091**	**8937**	**5653**	**3284**	**10154**	**4301**	**5853**	**8783**	**3621**	**1358**	**216**	**1949**	**7144**	**1639**	**10308**
Deodar, BK																
50.	Kuwana	2356	1154	745	409	1202	463	739	695	389	128	3	22	542	153	1661
51.	Sanav	2408	943	657	286	1465	623	842	1235	585	42	0	48	675	560	1173
52.	Dera	1920	961	628	333	959	386	573	903	351	218	5	260	834	69	1017
53.	Navapura	1622	847	550	297	775	307	468	895	277	176	6	436	895	0	727
Total		**8306**	**3905**	**2580**	**1325**	**4401**	**1779**	**2622**	**3728**	**1602**	**564**	**14**	**766**	**2946**	**782**	**4578**

Sl. No	Name	Total Population	Literacy Rate						Employment Pattern							
			Total Literate	Male-Literate	Female-Literate	Total Illiterate	Male Illiterate	Female Illiterate	Total Worker	Main Worker	Main Cultivator	Main Agriculture	Main Household	Main other Worker	Marginal Worker	Non Worker
Sanchor , Jalore																
54.	Itada	1540	831	544	287	709	269	440	1027	371	12	0	332	715	312	513
55.	Bagsari	1098	521	357	164	577	221	356	642	275	0	6	31	312	330	456
56.	Kesoori	3038	1131	803	328	1907	794	1113	1584	721	208	20	47	996	588	1454
57.	Amarpura	1308	645	404	241	663	243	420	769	288	216	4	78	586	183	539
58.	Chhajara	1693	719	530	189	974	381	593	892	395	217	6	81	699	193	801
59.	Vishnu Nagar	1366	820	523	297	546	177	369	726	457	2	0	60	519	207	640
60.	Siddheshwar	1821	891	552	339	930	366	564	835	274	40	0	315	629	206	986
61.	Kilawa	1864	810	541	269	1054	426	628	975	313	63	2	134	512	463	889
62.	Gardali	869	296	206	90	573	229	344	503	129	44	0	26	199	304	366
63.	Jajoosan	1482	723	468	255	759	285	474	818	542	131	1	48	722	96	664
64.	Phalna	961	461	322	139	500	206	294	507	203	8	4	77	292	215	454
65.	Paladar	3525	1460	1007	453	2065	822	1243	2064	1399	320	12	97	1828	236	1461
Total		**20565**	**9308**	**6257**	**3051**	**11257**	**4419**	**6838**	**11342**	**5367**	**1261**	**55**	**1326**	**8009**	**3333**	**9223**
Sujangarh,Churu																
66.	Lalpura	821	433	275	158	388	155	233	460	146	0	0	36	182	278	361
Hindaun, Karauli																
67.	Kailash Nagar	1663	969	655	314	694	258	436	463	19	51	12	291	373	90	1200
Grand total		**152234**	**73108**	**47612**	**25496**	**79126**	**31446**	**47680**	**69843**	**32662**	**8999**	**667**	**10675**	**24743**	**16840**	**82391**

Source: Census 2011

Distribution of Infrastructure Profile in the study area

Banaskantha

Sl. No .	Name of CD block	Total number of inhabited villages in the C. D. block	Total population of C.D. block	Villages having educational institutions							
				Pre-primary school	Primary school	Secondary school	Senior secondary school (SS)	Degree college of arts sceince& commerce	Vocational training school /ITI	Others (specify)	No educational facility
1	Vav	120	246156	0	120	18	9	0	1	1	0
2	Tharad	134	299335	0	134	22	5	1	0	0	0
3	Dhanera	77	201163	0	77	21	9	0	0	0	0
4	Dantiwada	57	115221	0	55	7	2	0	2	0	2
5	Amirgadh	69	132354	0	69	4	2	1	1	0	0
6	Danta	182	207086	0	177	13	4	1	2	0	5
7	Vadgam	109	231947	2	109	22	10	0	1	0	0
8	Palanpur	115	278542	0	114	24	7	0	3	0	1
9	Deesa	148	471969	0	148	26	10	0	1	0	0
10	Deodar	70	163007	1	70	14	5	1	1	0	0
11	Bhabhar	51	101258	1	51	5	2	0	0	0	0
12	Kankrej	101	257553	1	98	22	5	0	1	0	3
	Total	**1233**	**2705591**	**5**	**1222**	**198**	**70**	**4**	**13**	**1**	**11**

Source: Census 2011

Distribution of Health Infrastructure in the study area

Sl.No.	Name of CD block	Villages having Medical institutions								
		Community health centre	Primary health centre	Primary health sub centre	Veterinary hospital	Mobile health clinic	Medical practioner (with MBBS Degree)	Medical practioner (with other degree)	Medicine shop	No medical facility
1	Vav	2	6	47	4	0	4	5	8	70
2	Tharad	3	9	52	5	6	0	1	10	79
3	Dhanera	0	5	21	5	0	2	4	8	52
4	Dantiwada	1	3	3	1	0	3	9	11	36

Sl.No.	Name of CD block	Villages having Medical institutions								
		Community health centre	Primary health centre	Primary health sub centre	Veterinary hospital	Mobile health clinic	Medical practioner (with MBBS Degree)	Medical practioner (with other degree)	Medicine shop	No medical facility
5	Amirgadh	1	5	23	5	3	0	0	6	44
6	Danta	1	8	36	9	1	2	1	6	76
7	Vadgam	3	5	34	5	1	3	8	23	68
8	Palanpur	1	7	42	4	2	0	0	18	70
9	Deesa	2	13	54	8	2	4	3	23	87
10	Deodar	0	5	17	1	0	1	0	7	52
11	Bhabhar	0	2	12	1	0	0	0	0	38
12	Kankrej	1	8	30	5	1	4	4	10	66
	Total	**15**	**76**	**371**	**53**	**16**	**23**	**35**	**130**	**738**

Source: Census 2011

Distribution of Infrastructure Profile in the study area
Jalore, Rajasthan

Sl.No.	Name of CD block	Total number of inhabited villages in the C. D. block	Total population of C.D. block	Villages having educational institutions					
				Pre-primary school	Primary school	Middle school	Secondary school	Senior secondary school (SS)	No educational facility
1	Sayla	79	263393	55	75	72	44	20	4
2	Ahore	111	189189	64	93	76	47	15	18
3	Jalor	68	157217	43	60	57	32	9	8
4	Bhinmal	88	248753	65	84	80	46	16	4
5	Jaswantpura	74	157009	49	70	54	32	9	4
6	Chitalwana	151	210636	66	128	86	38	15	23
7	Sanchore	125	243947	70	120	93	48	8	5
8	Raniwara	95	206831	55	89	71	37	12	6
	Total	**791**	**1676975**	**467**	**719**	**589**	**324**	**104**	**72**

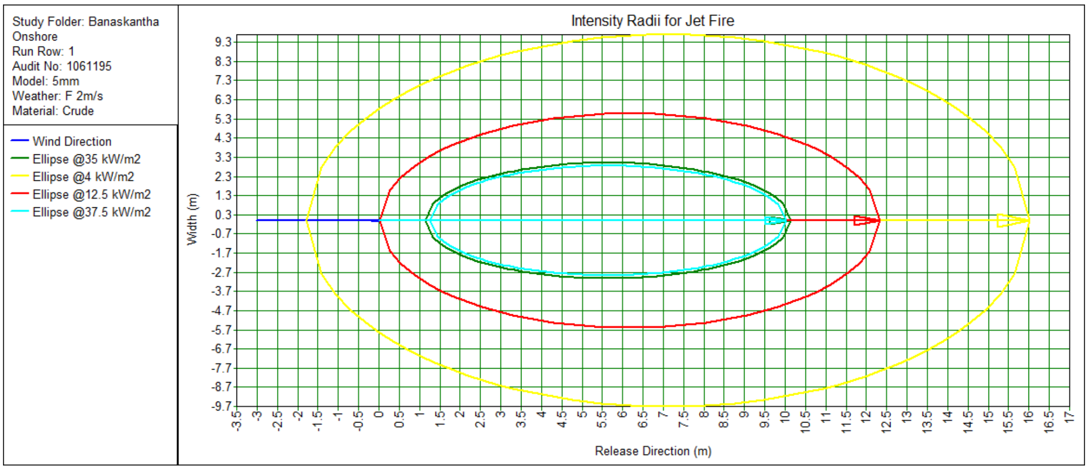
Source: Census 2011

Distribution of Health Infrastructure in the study area Jalore, Rajasthan

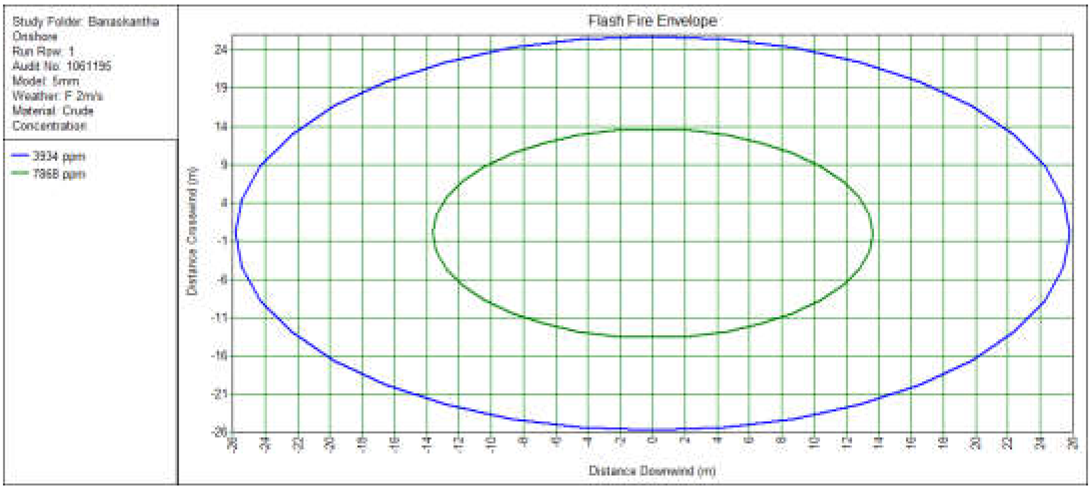
Sl.No.	Name of CD block	Villages having Medical institutions					Villages having Medical institutions (contd.) ...							
		Community health centre	Primary health centre	Primary health sub centre	Maternity and child welfare centre	T.B. clinic	Hospital-alternative medicine	Dispensary	Veterinary hospital	Family welfare centre	Medical practioner (with MBBS Degree)	Medical practioner (with other degree)	Medicine shop	No medical facility
1	Sayla	3	12	66	40	0	33	13	13	18	16	6	43	9
2	Ahore	0	10	80	26	0	19	11	7	11	10	0	28	29
3	Jalor	1	9	55	22	1	15	7	4	6	9	3	27	10
4	Bhinmal	2	7	74	48	2	32	9	9	15	8	5	50	11
5	Jaswantpura	4	8	50	26	1	17	7	6	8	8	1	35	22
6	Chitalwana	2	13	88	24	0	13	4	5	3	9	1	31	60
7	Sanchore	1	10	58	38	1	23	1	6	4	8	0	47	53
8	Raniwara	2	8	57	31	1	22	3	10	7	11	2	34	33
	Total	**15**	**77**	**528**	**255**	**6**	**174**	**55**	**60**	**72**	**79**	**18**	**295**	**227**

Source: Census 2011

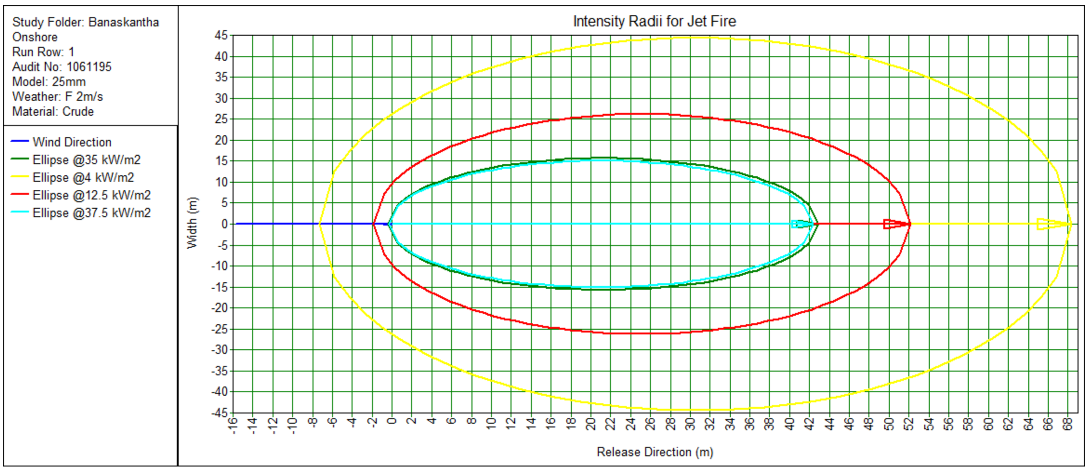
ANNEXURE 11: CONSEQINCE CONTOURS – BANASKANTHA



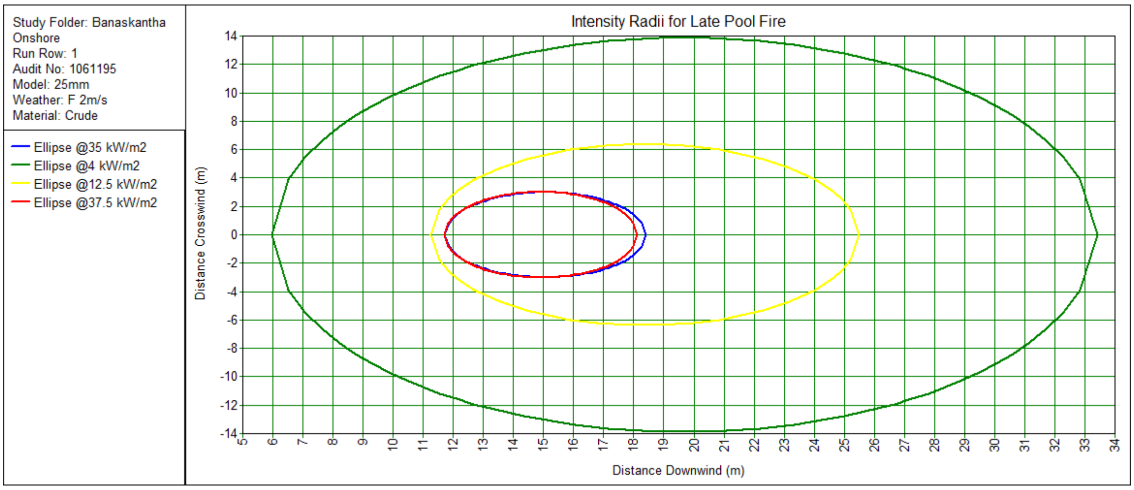
INTENSITY JET FIRE RADII DUE TO 5MM LEAK OF CRUDE IN IS 01



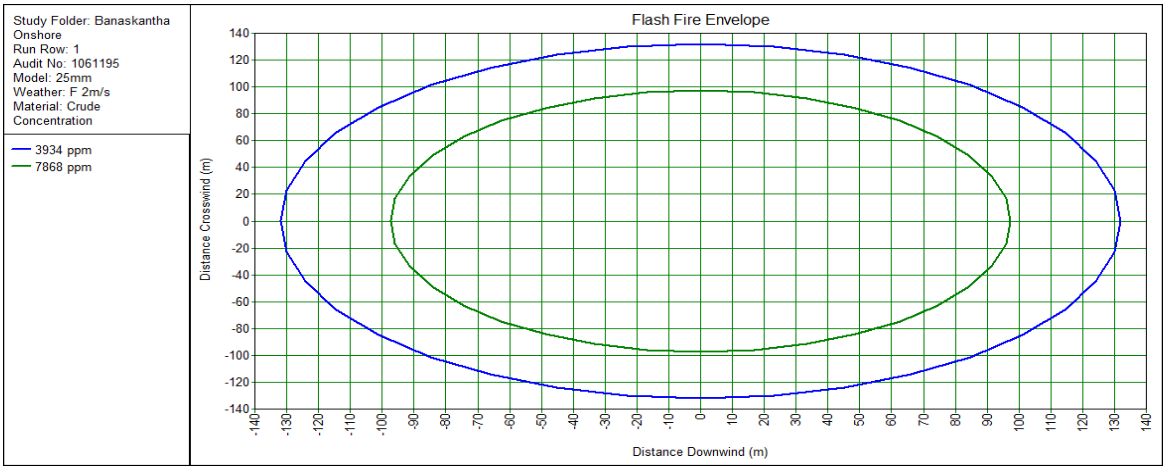
FLASH FIRE ENVELOPE DUE TO 5MM LEAK OF CRUDECONCENTRATION IN IS 01



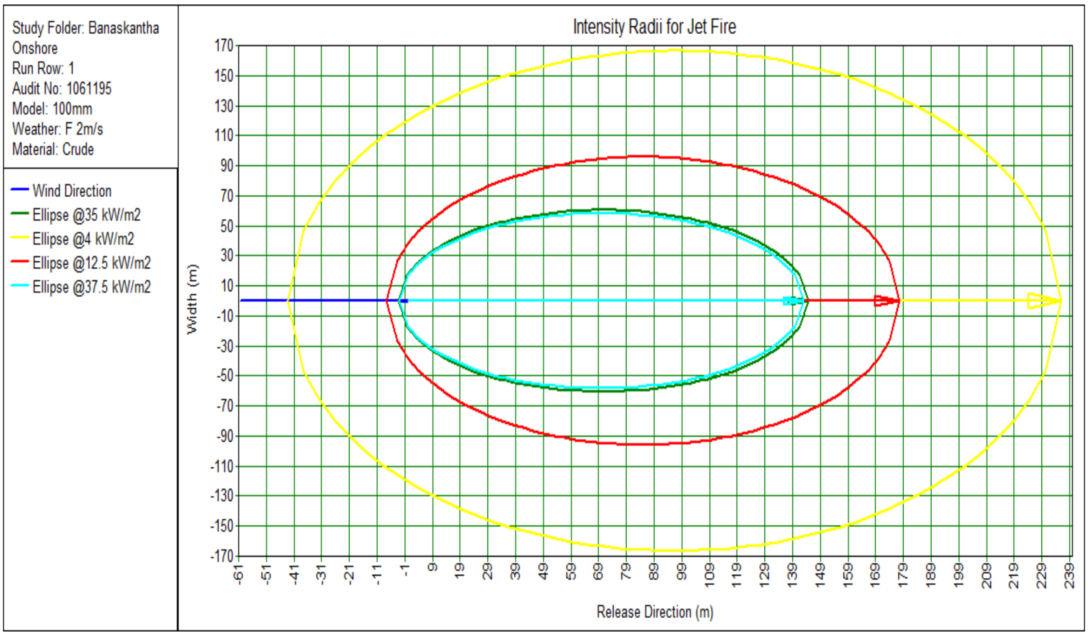
INTENSITY JET FIRE RADII DUE TO 25MM LEAK OF CRUDE IN IS 01



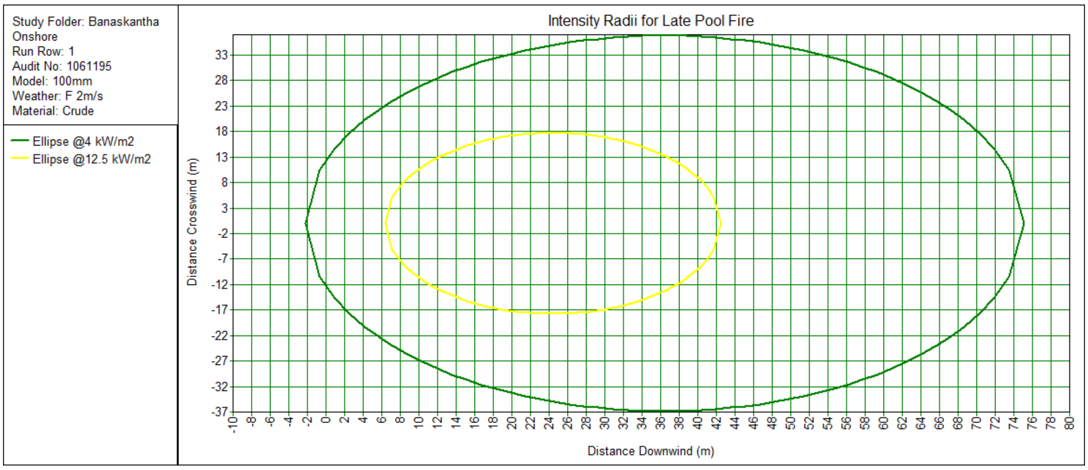
INTENSITY RADII FOR LATE POOL FIRE DUE TO 25MM LEAK OF CRUDE IN IS 01



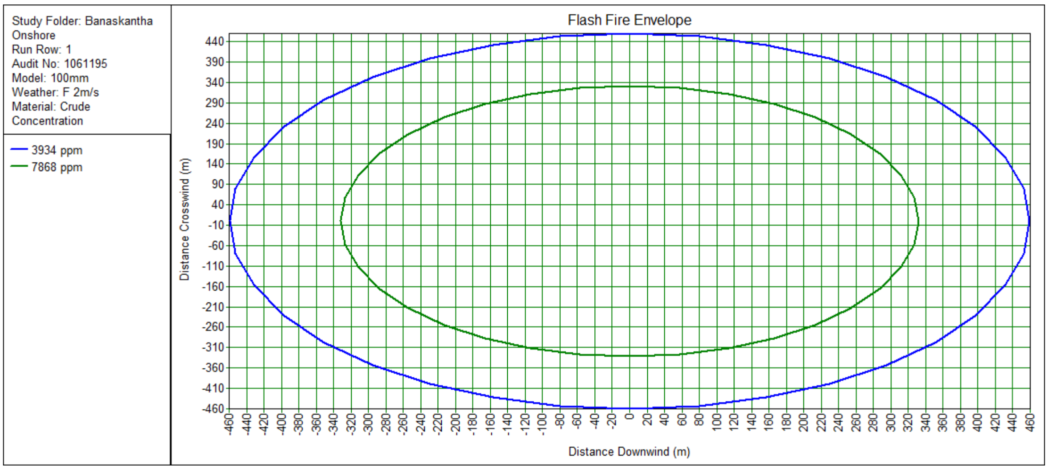
FLASH FIRE ENVELOPE DUE TO 25MM LEAK OF CRUDE CONCENTRATIONIN IS 01



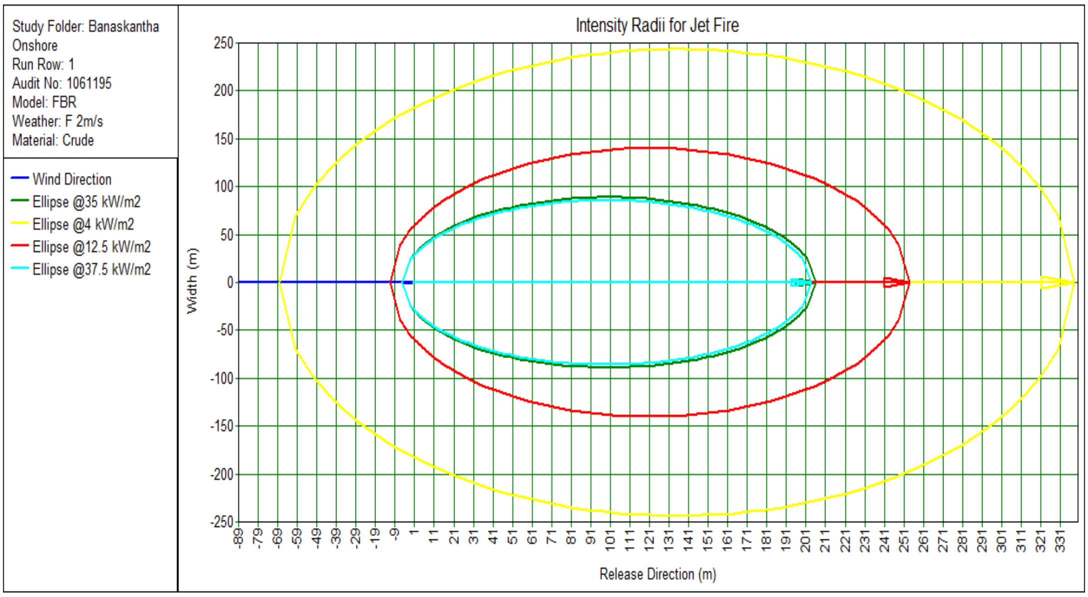
INTENSITY RADII FOR JET FIRE DUE TO 100 MM LEAK OF CRUDE IN IS 01



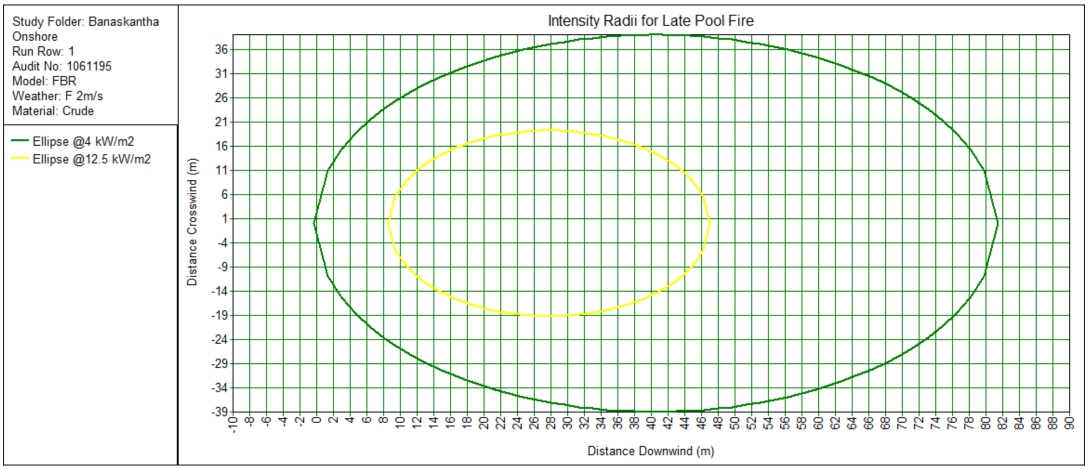
INTENSITY RADII FOR LATE POOL FIRE DUE TO 100 MM LEAK OF CRUDE IN IS 01



INTENSITY RADII FORFLASH FIRE DUE TO 100 MM LEAK OF CRUDE CONCENTRATION IN IS 01



INTENSITY RADII FOR JET FIRE DUE TO FBR OF CRUDE IN IS 01



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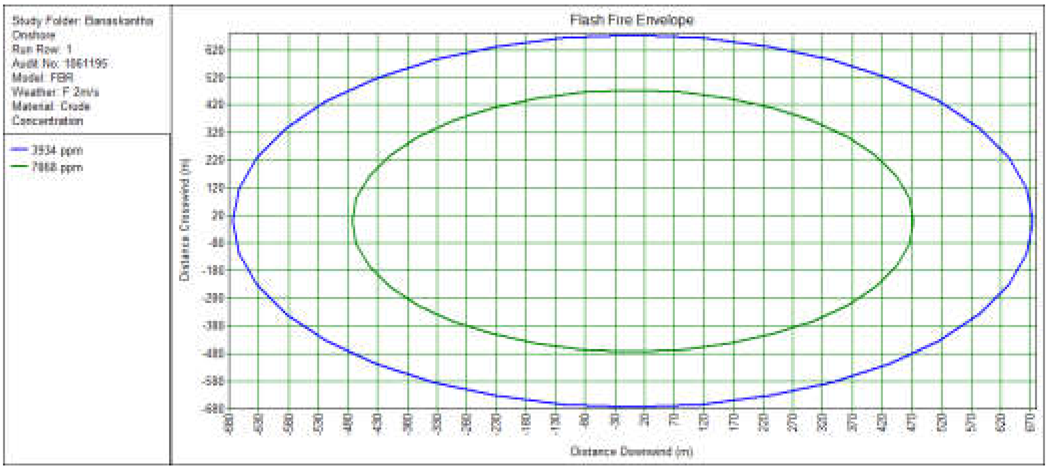

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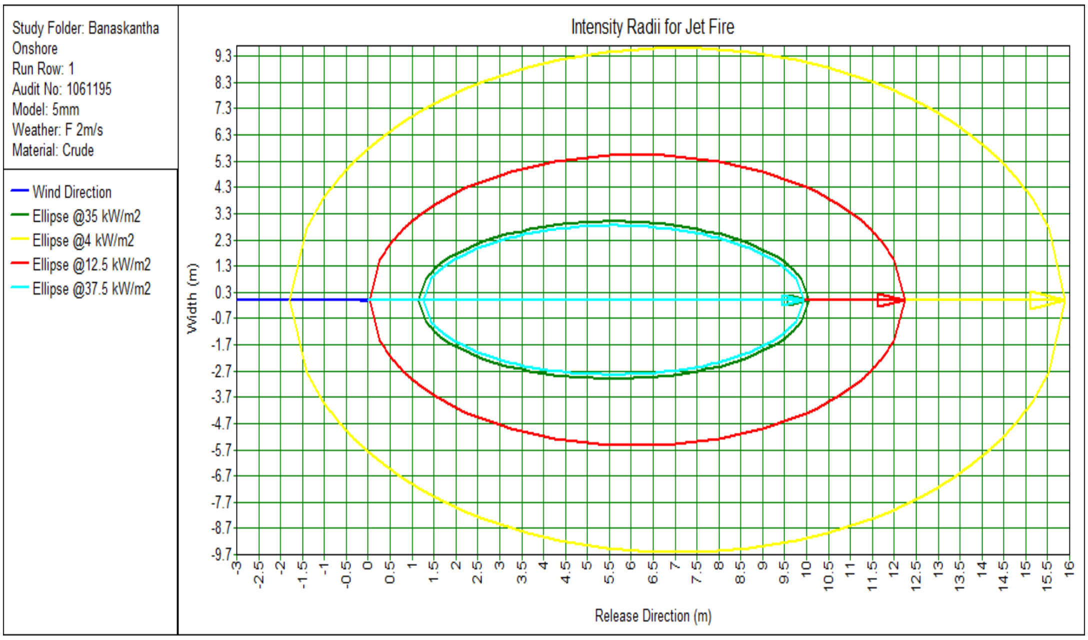
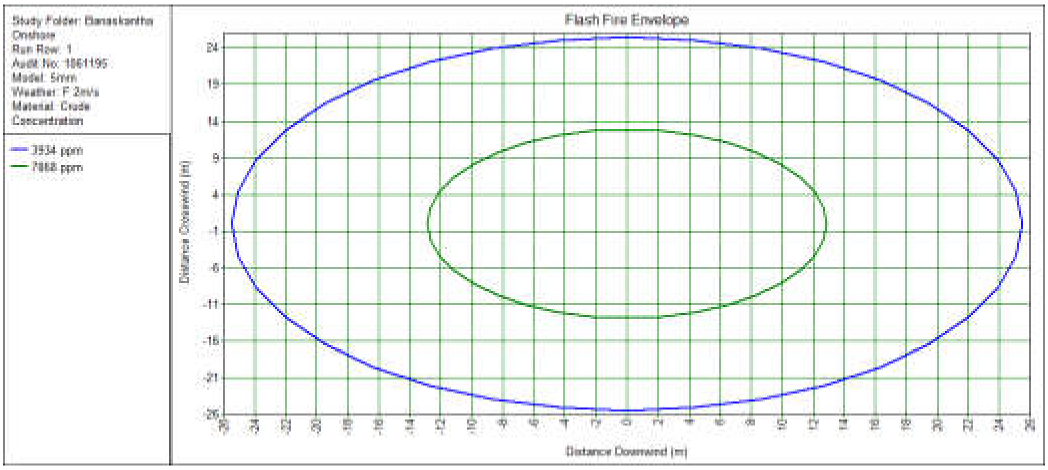
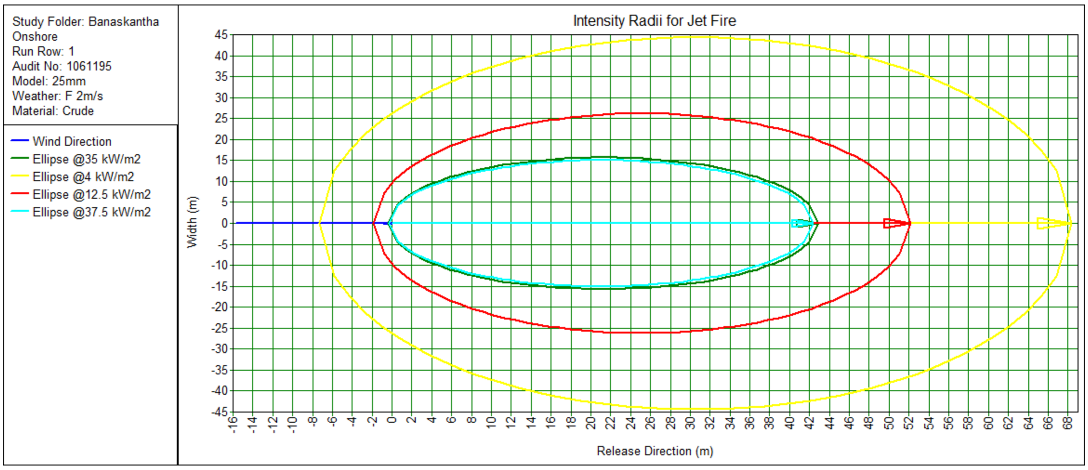


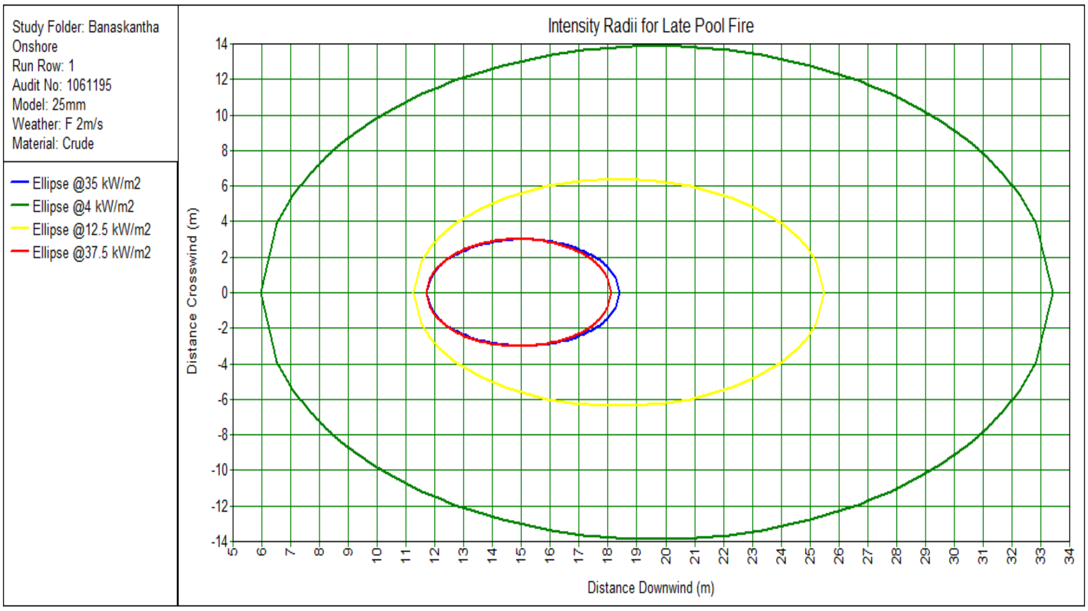
INTENSITY RADII FOR JET FIRE DUE TO 5 MM LEAK OF CRUDE IN IS 02



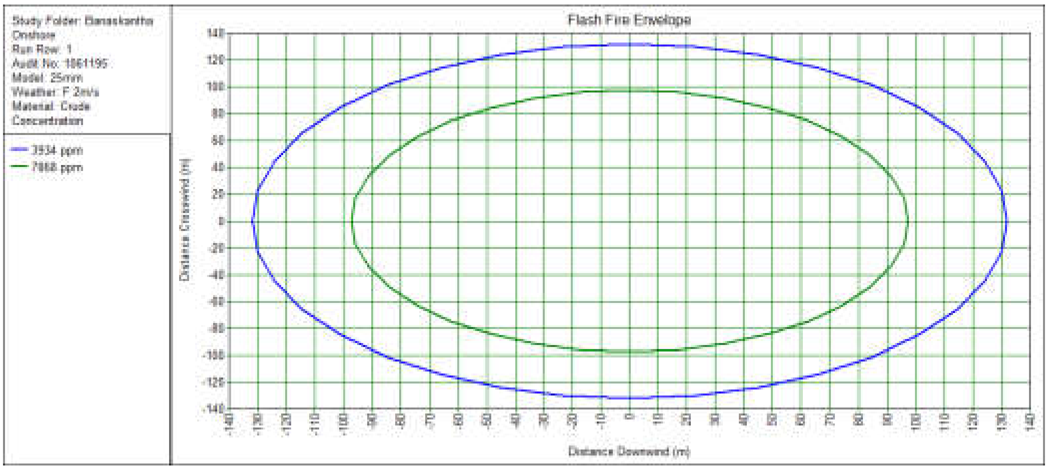
FLASH FIRE ENVELOPE DUE TO 5 MM LEAK OF CRUDE IN IS 02



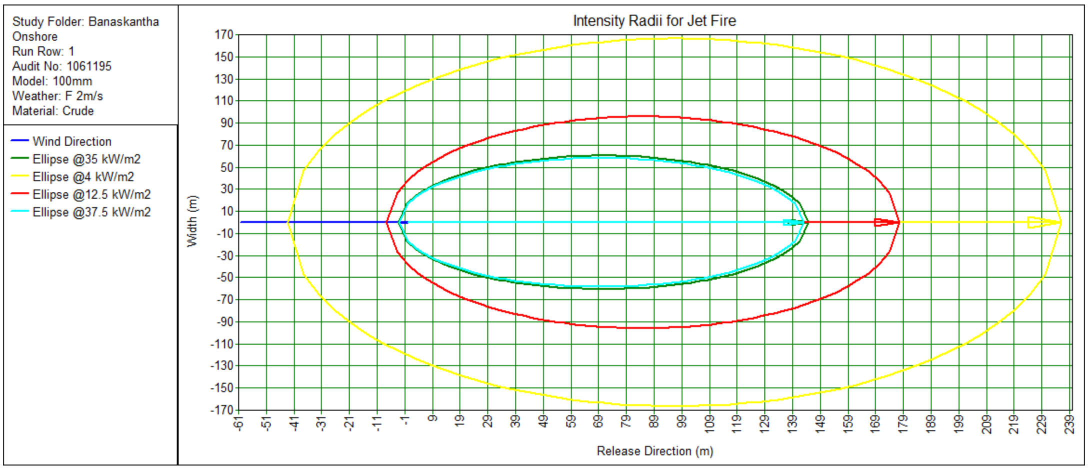
INTENSITY RADII FOR JET FIRE DUE TO 25 MM LEAK OF CRUDE IN IS 02



INTENSITY RADII FOR LATE POOLFIRE DUE TO 25 MM LEAK OF CRUDE IN IS 02



FLASH FIRE ENVELOPE DUE TO 25 MM LEAK OF CRUDE CONCENTRATION IN IS 02



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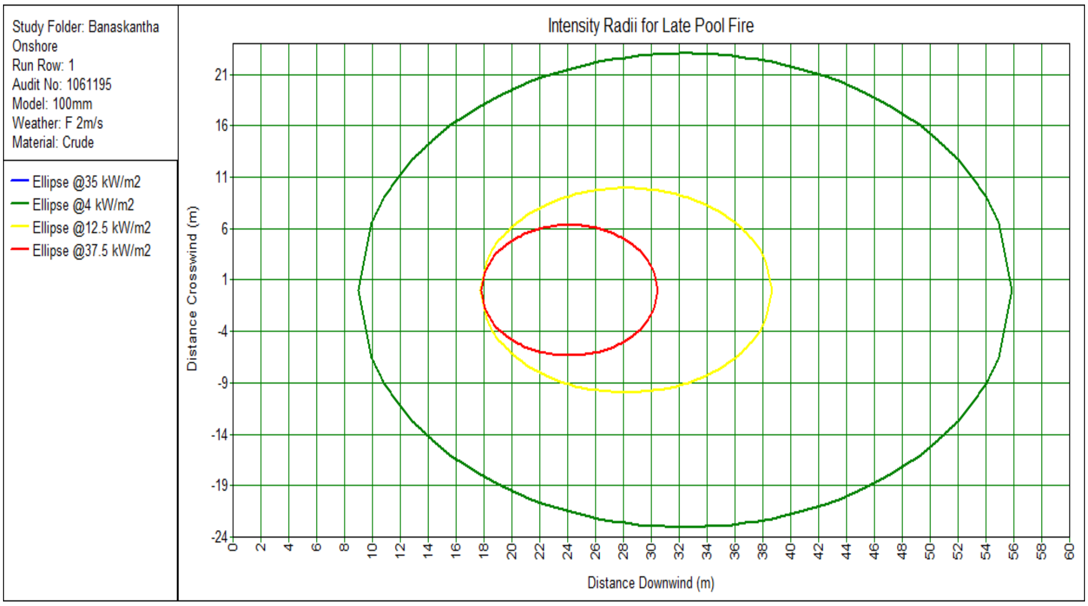

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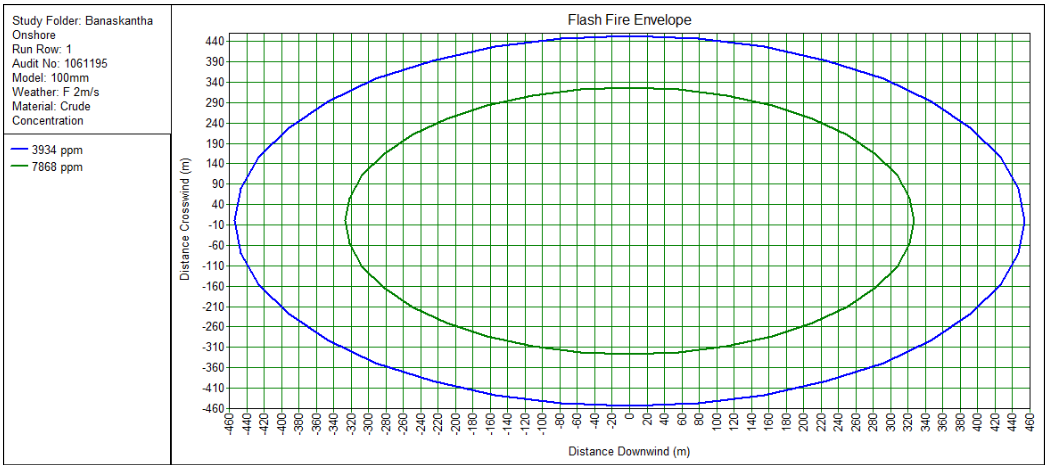

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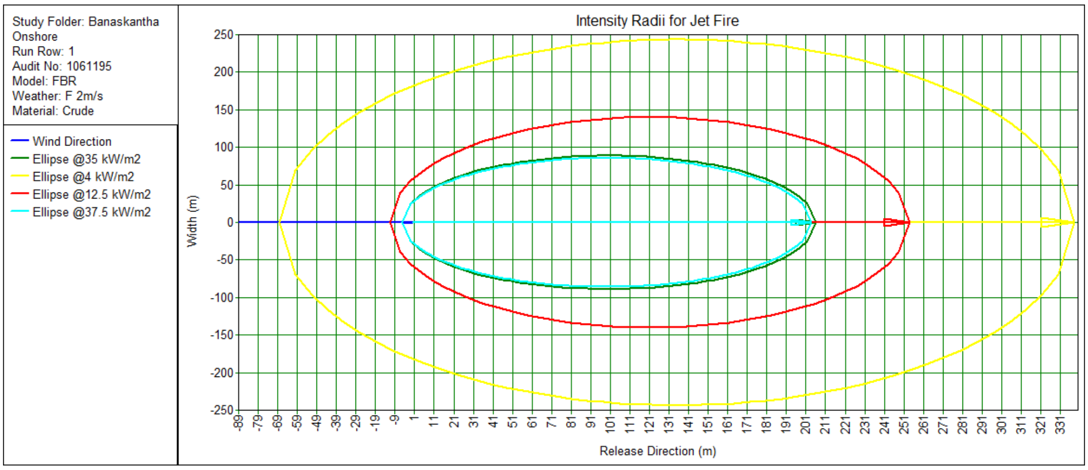

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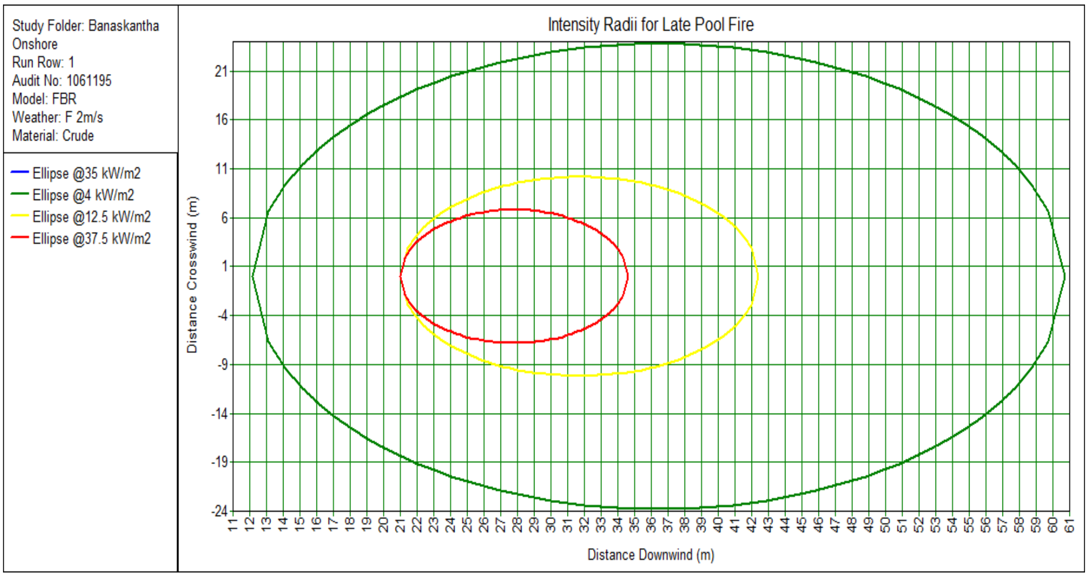

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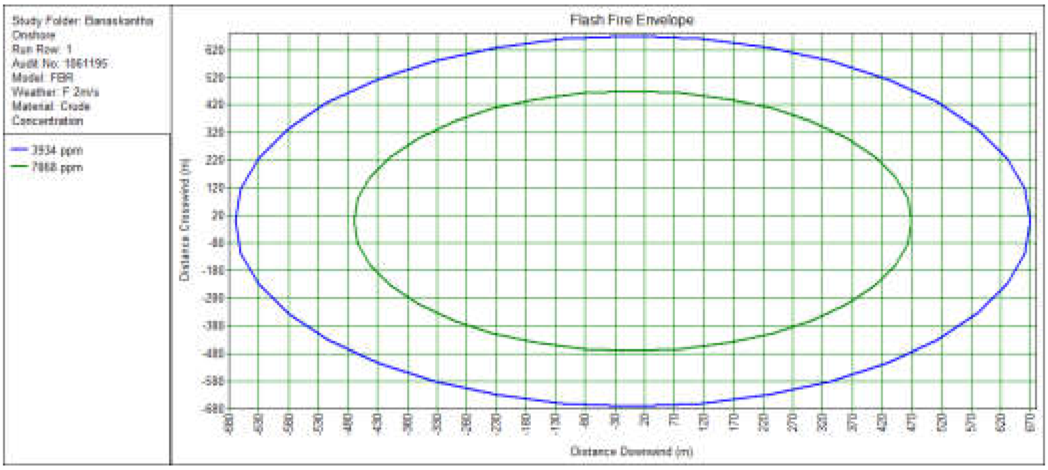

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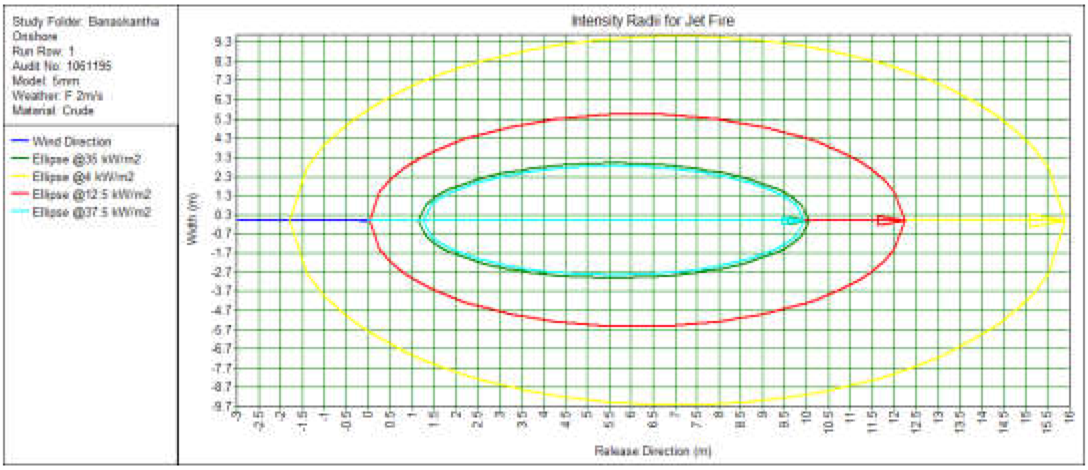

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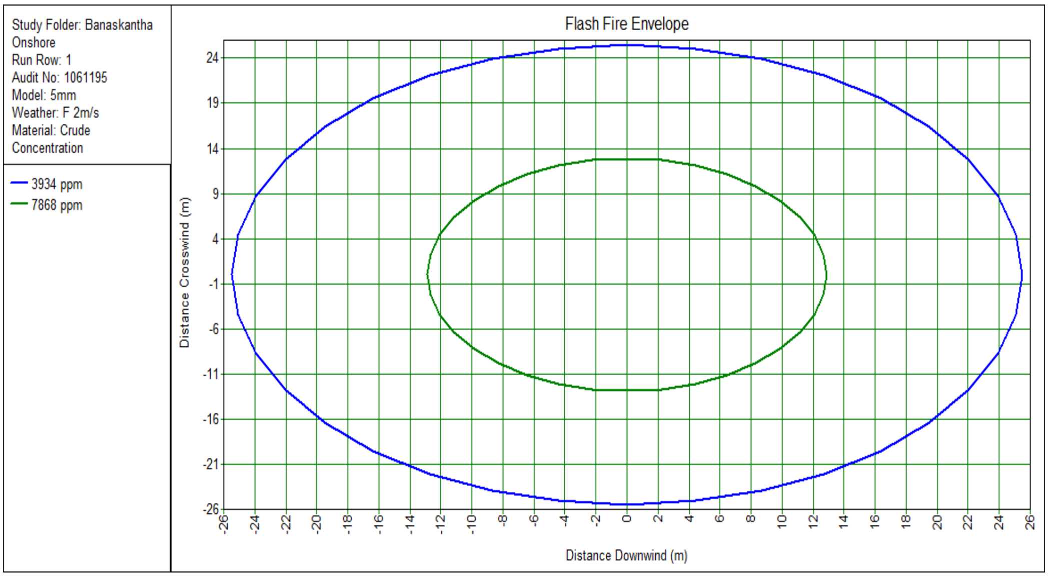

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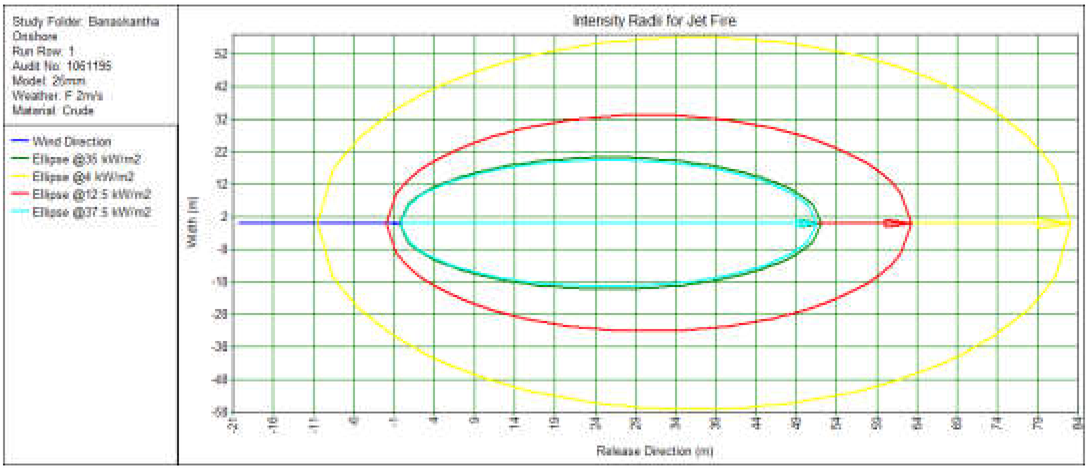

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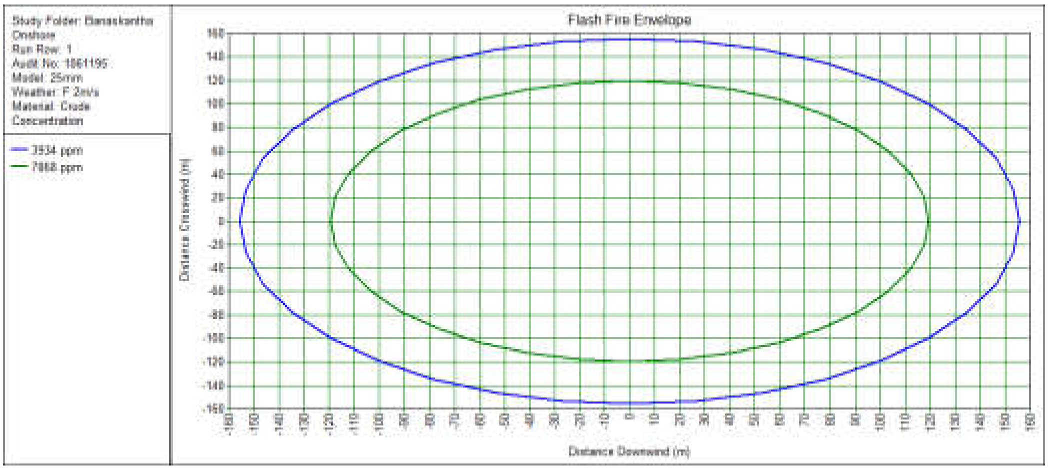

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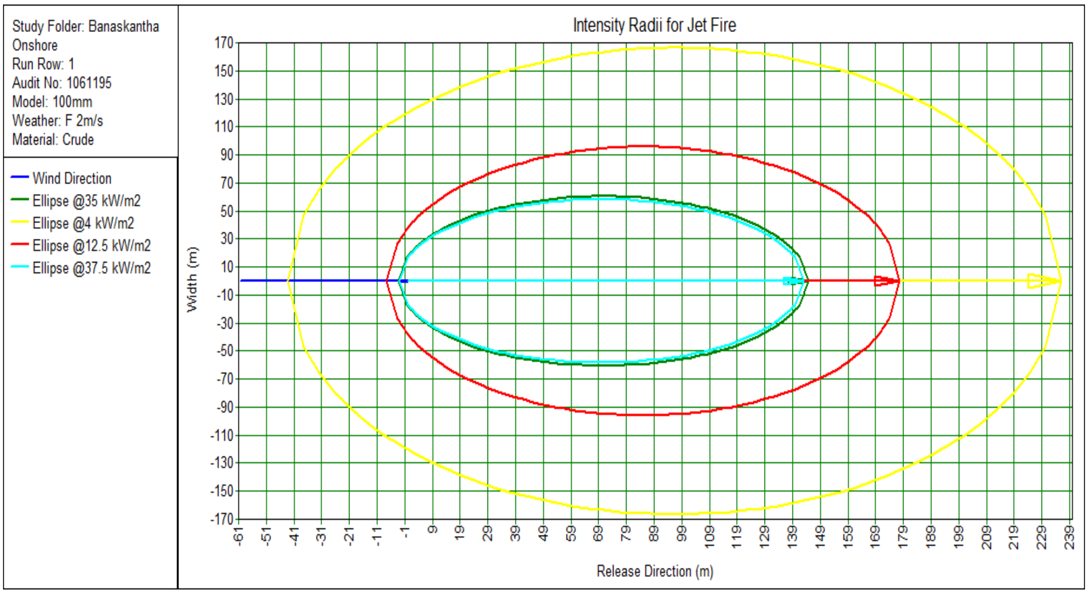

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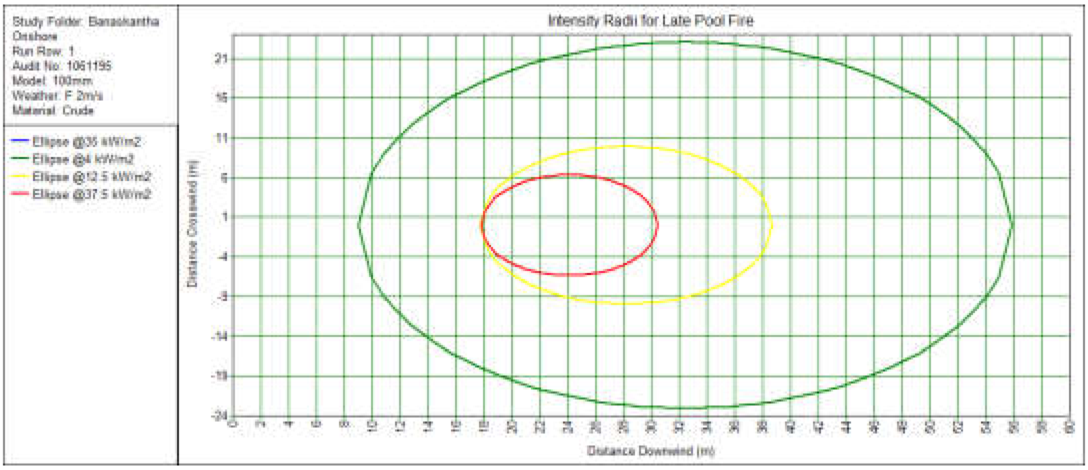

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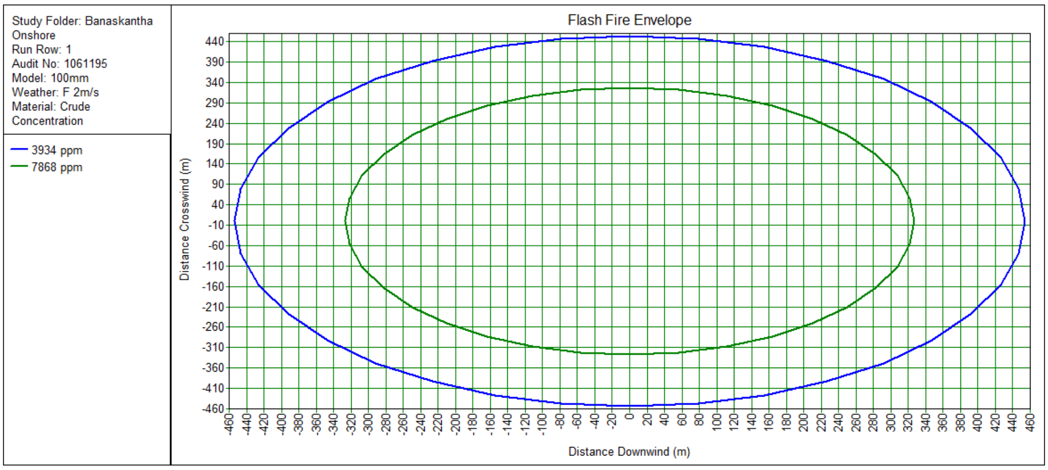

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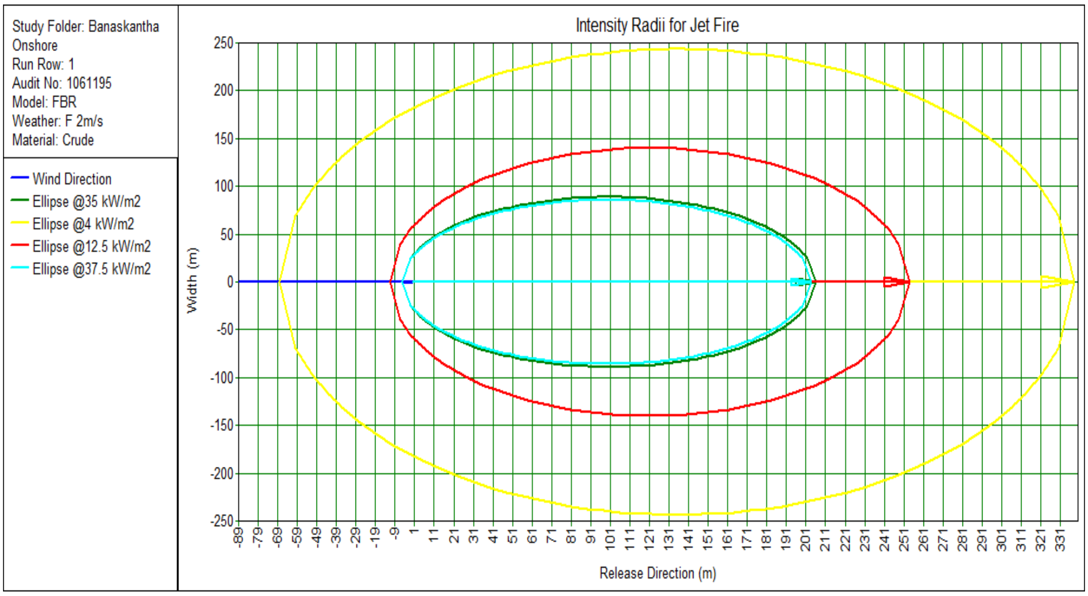

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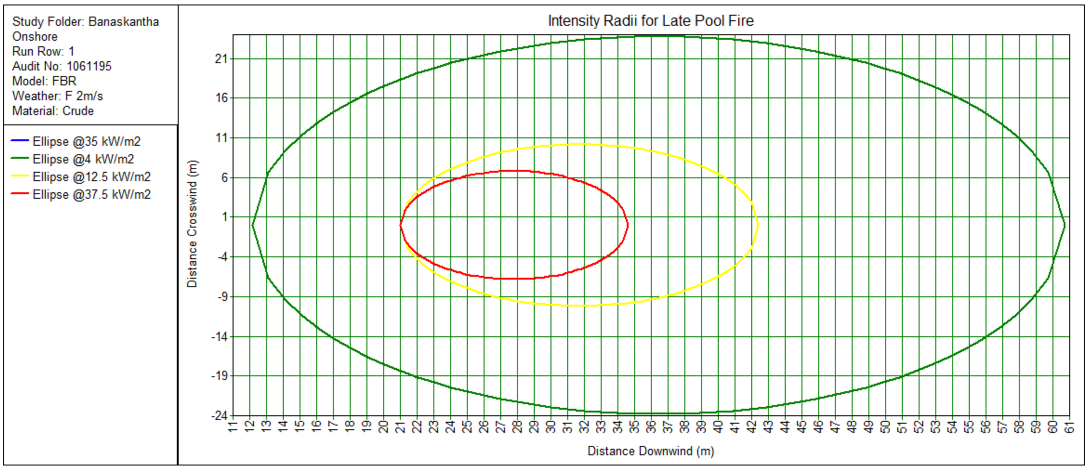

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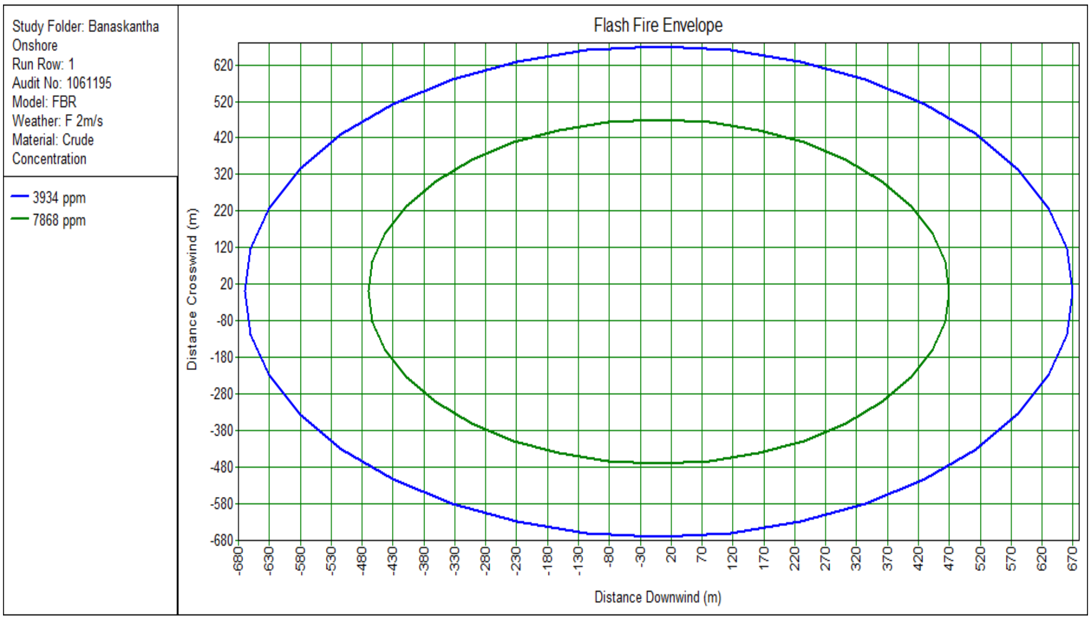

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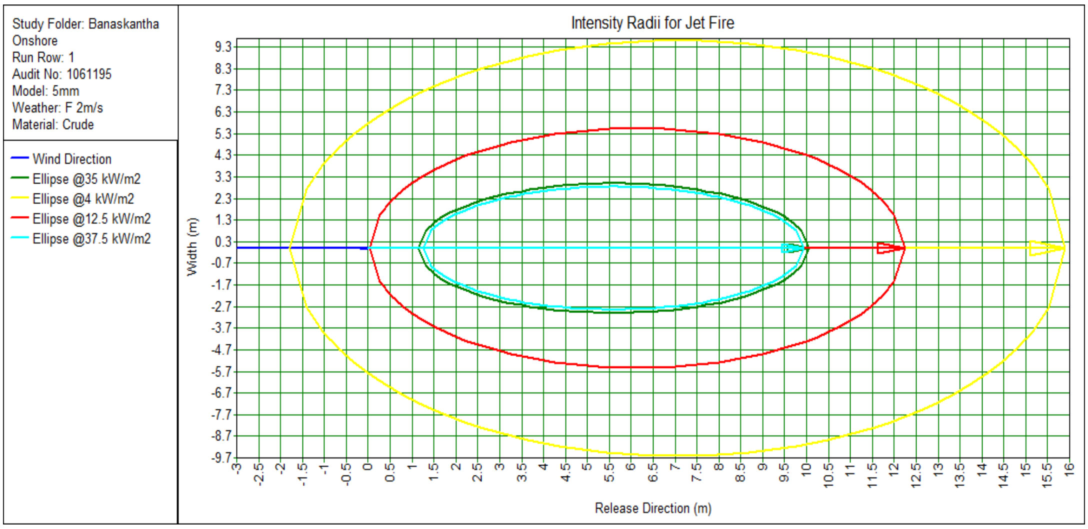
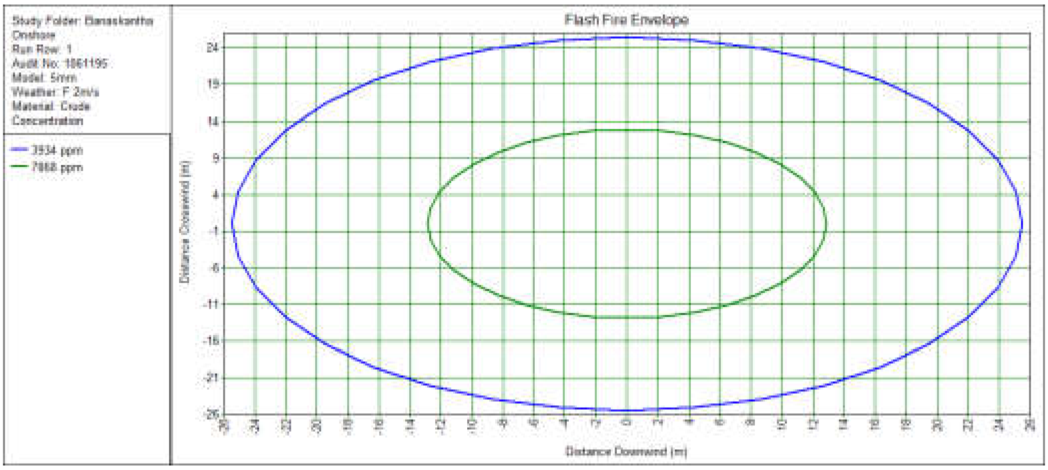


INTENSITY RADII FOR JET FIRE DUE TO 5 MM LEAK OF CRUDE IN IS 04



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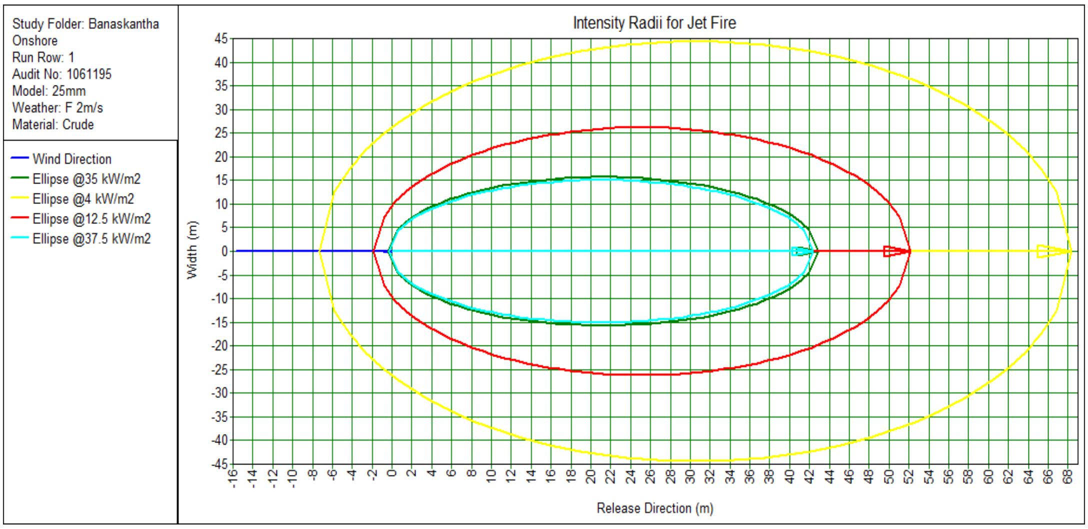
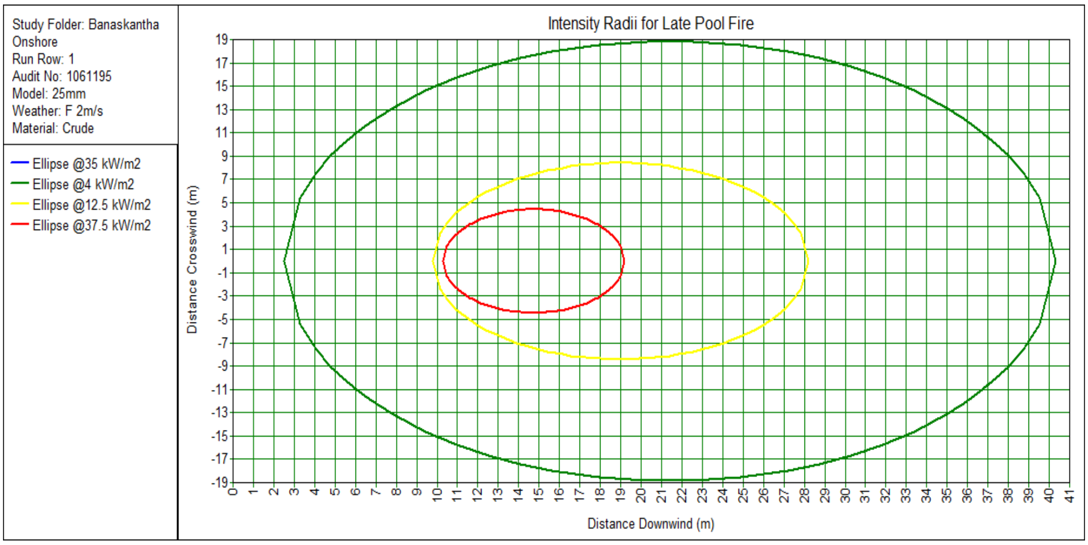


INTENSITY RADII FOR JET FIRE DUE TO 25 MM LEAK OF CRUDE IN IS 04



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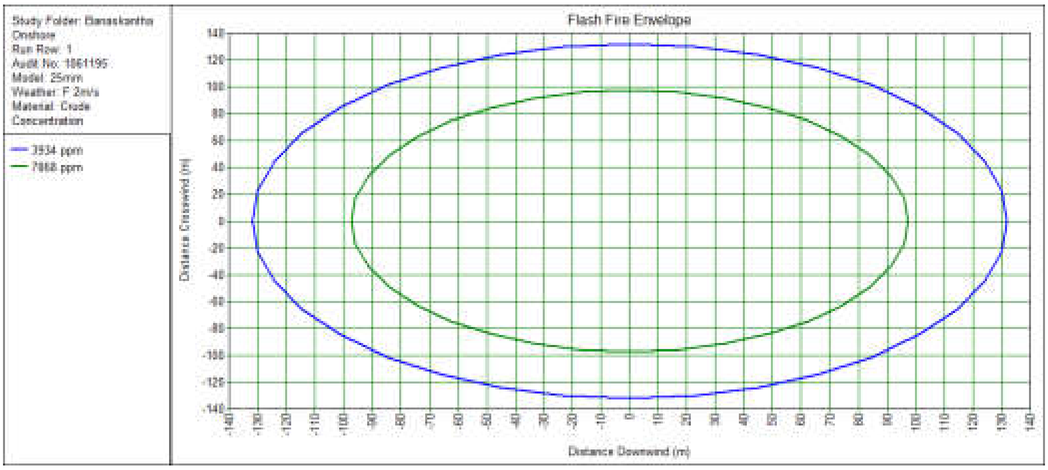

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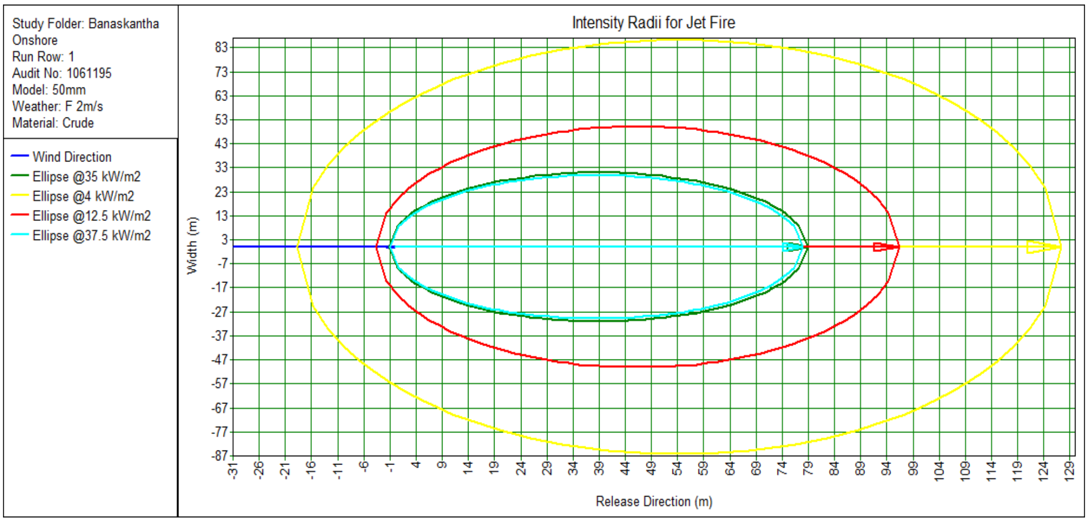

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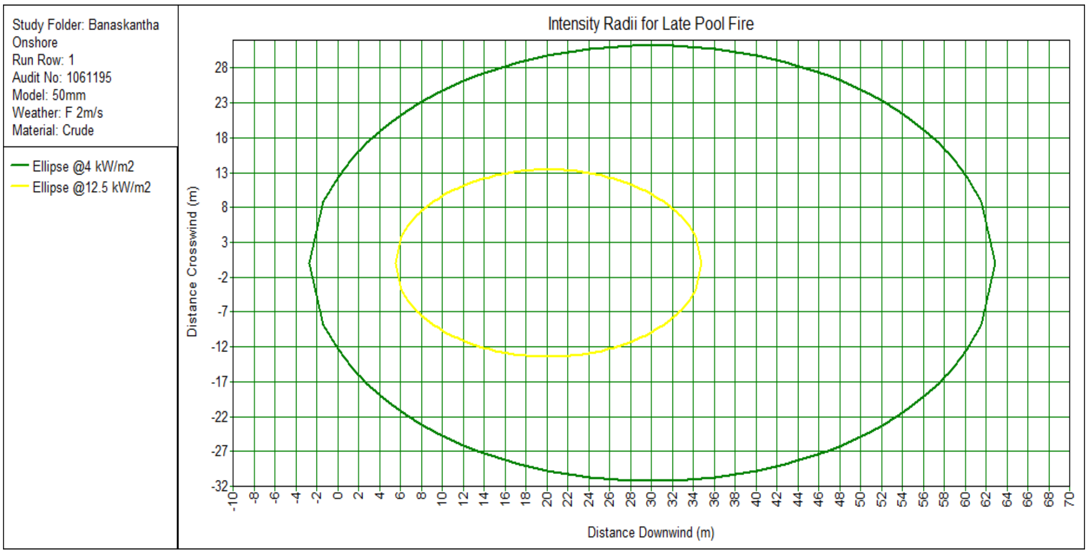

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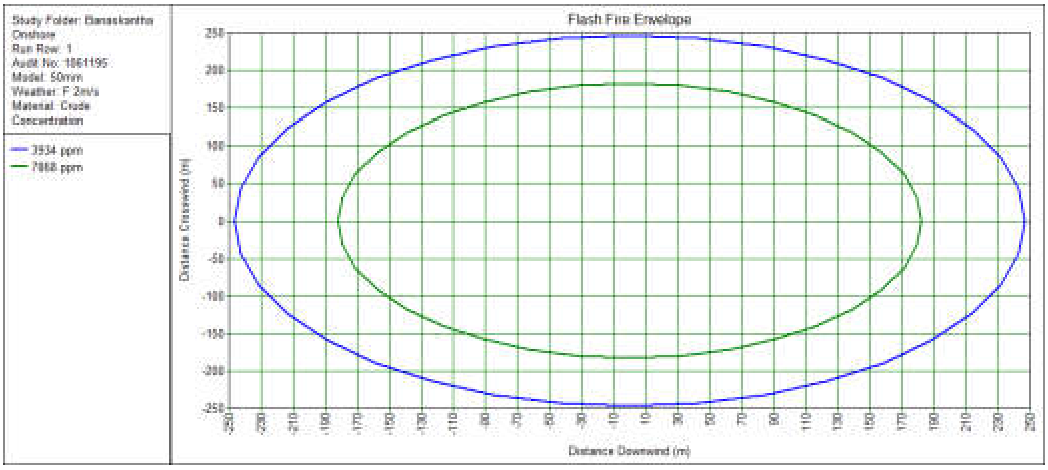

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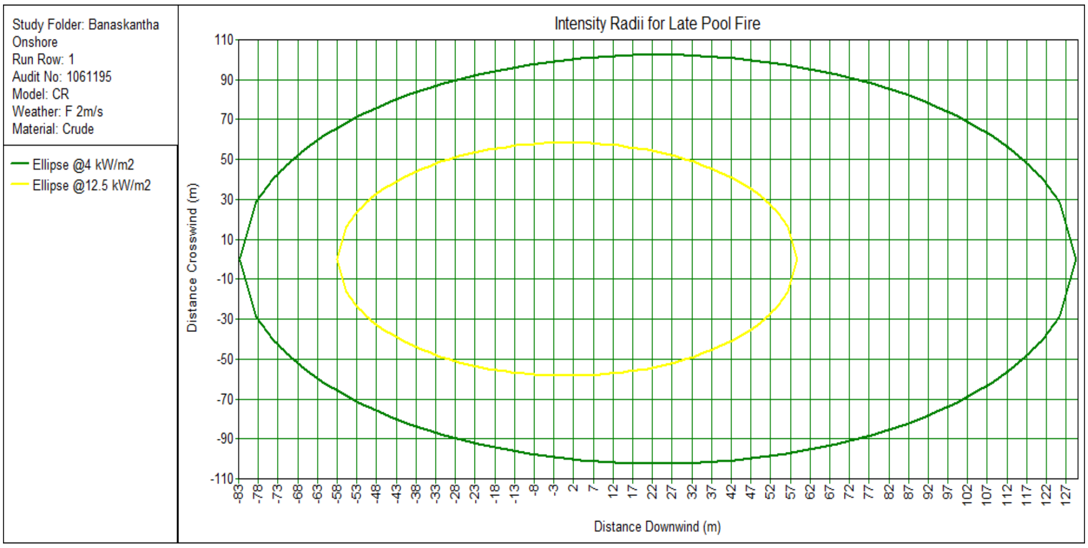

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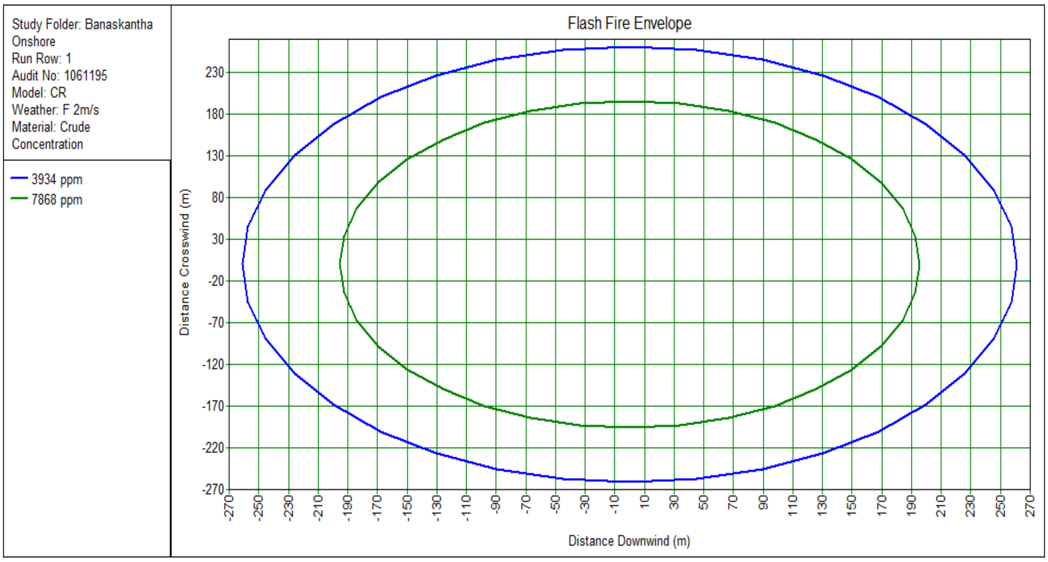

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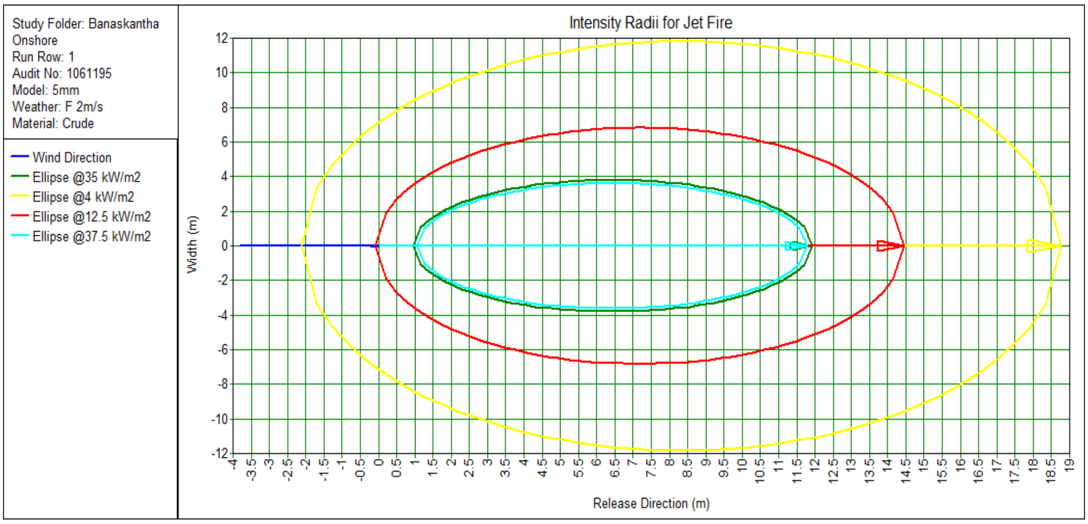

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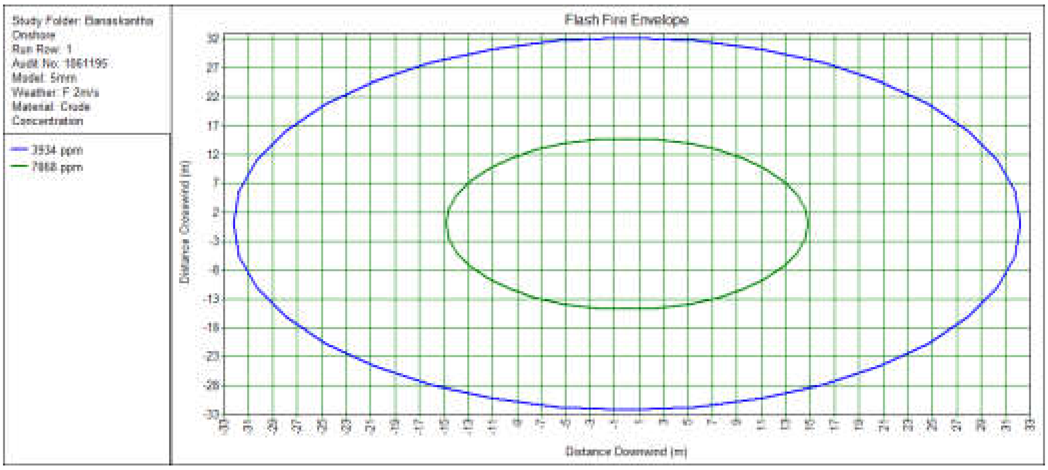

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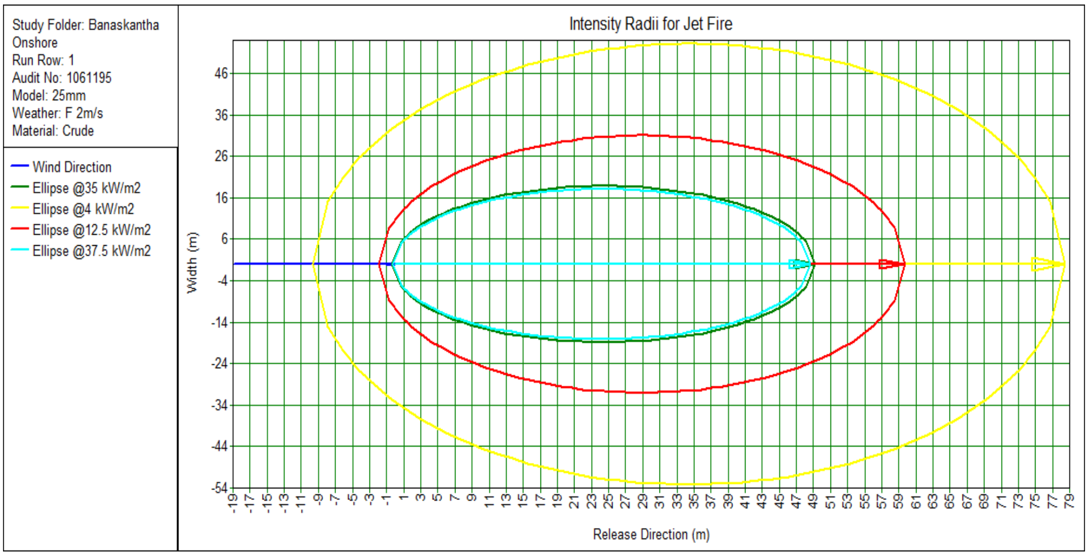
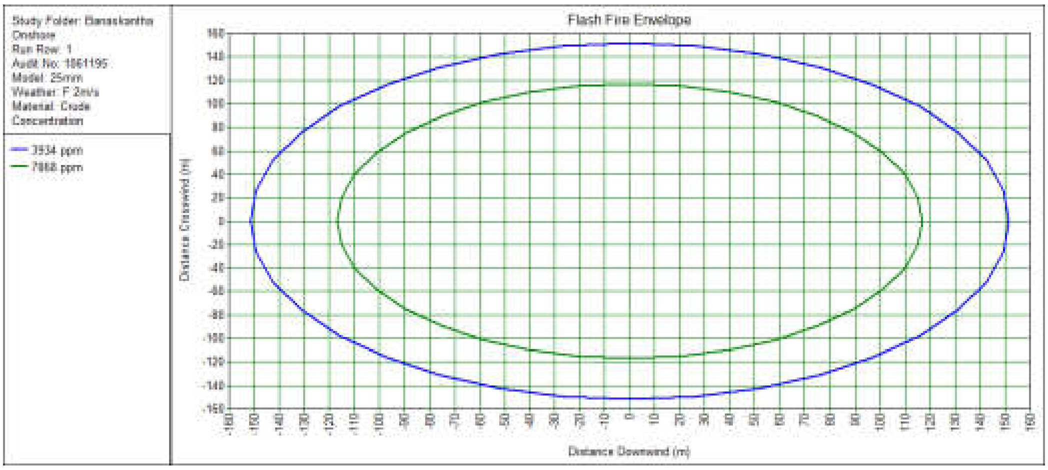


INTENSITY RADII FOR JET FIRE DUE TO 25 MM LEAK OF CRUDE IN IS 05



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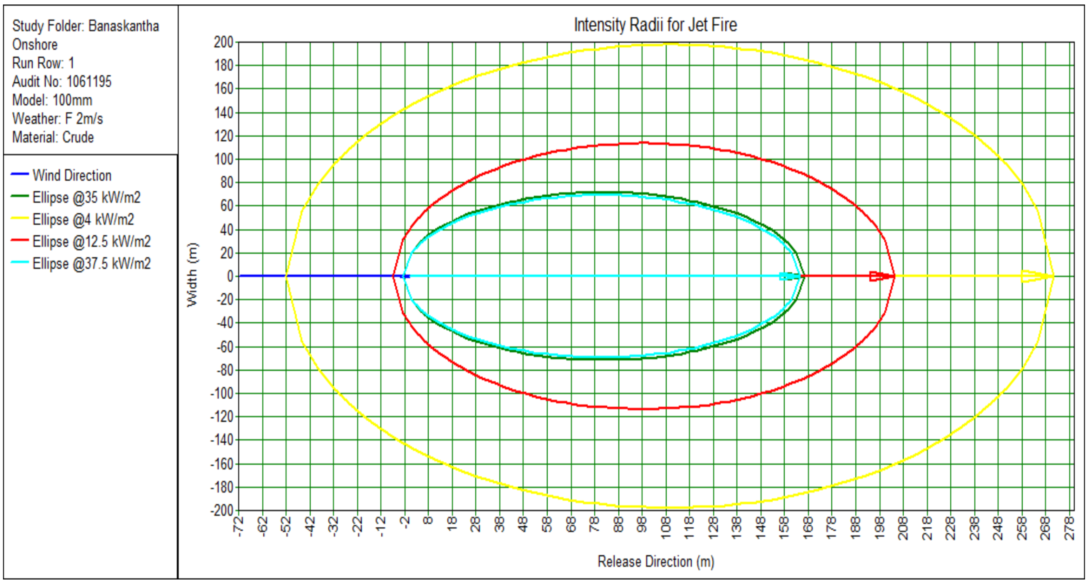

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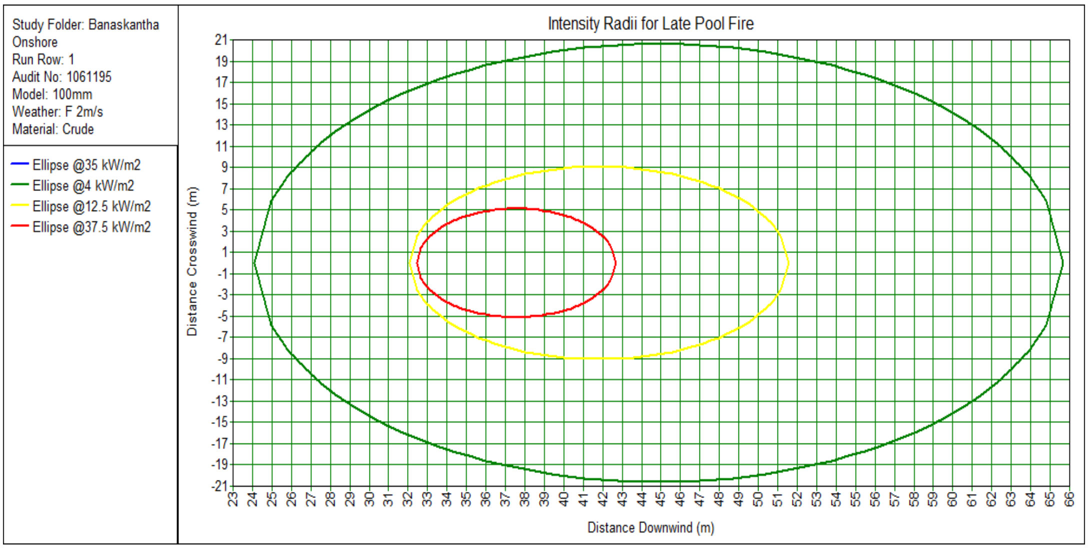
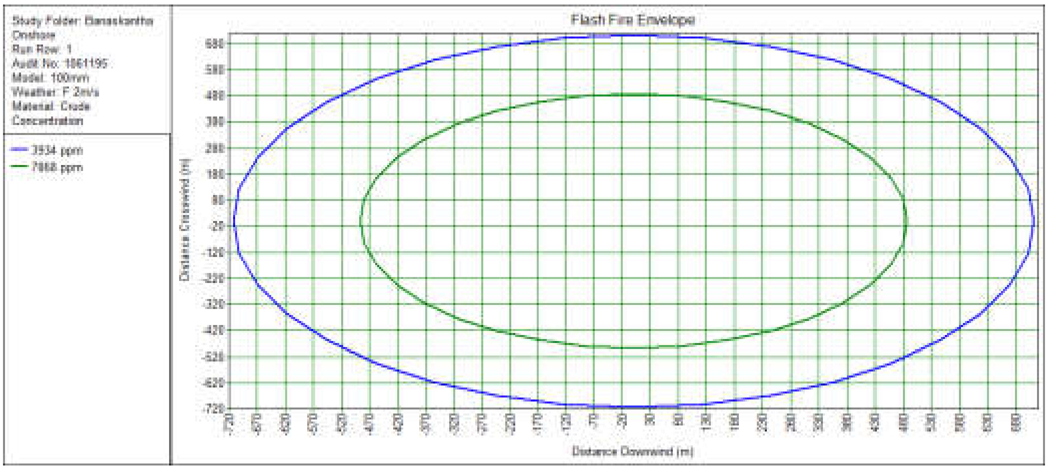


INTENSITY RADII FOR LATE POOL FIREDUE TO 100 MM LEAK OF CRUDE IN IS 05



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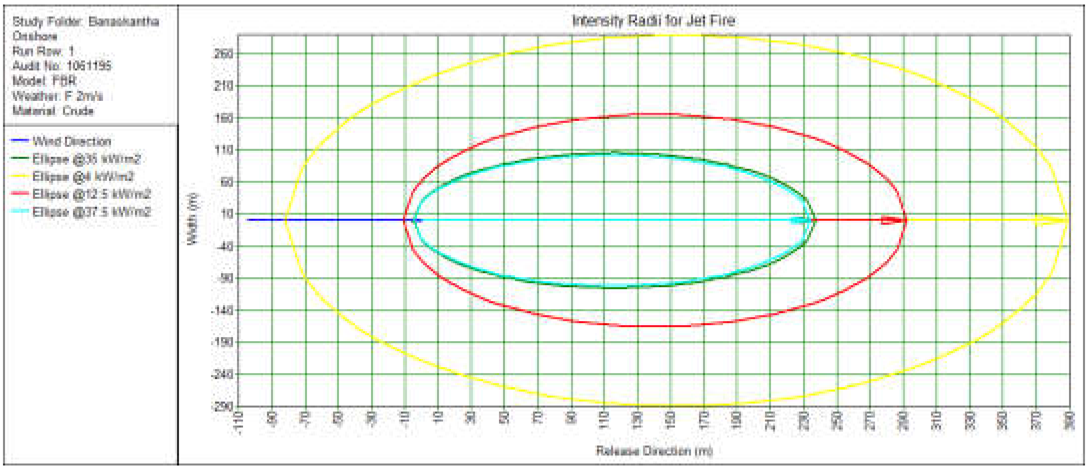

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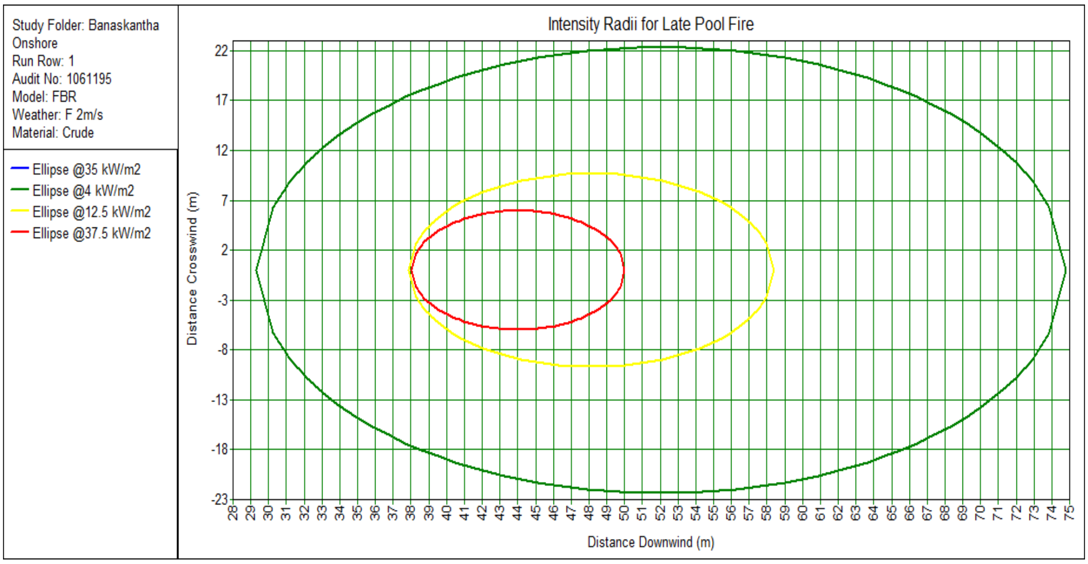

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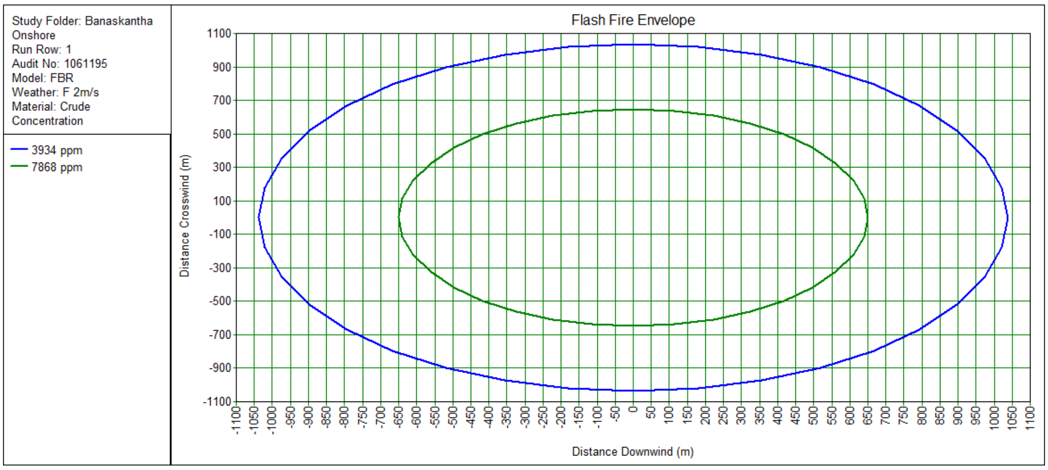
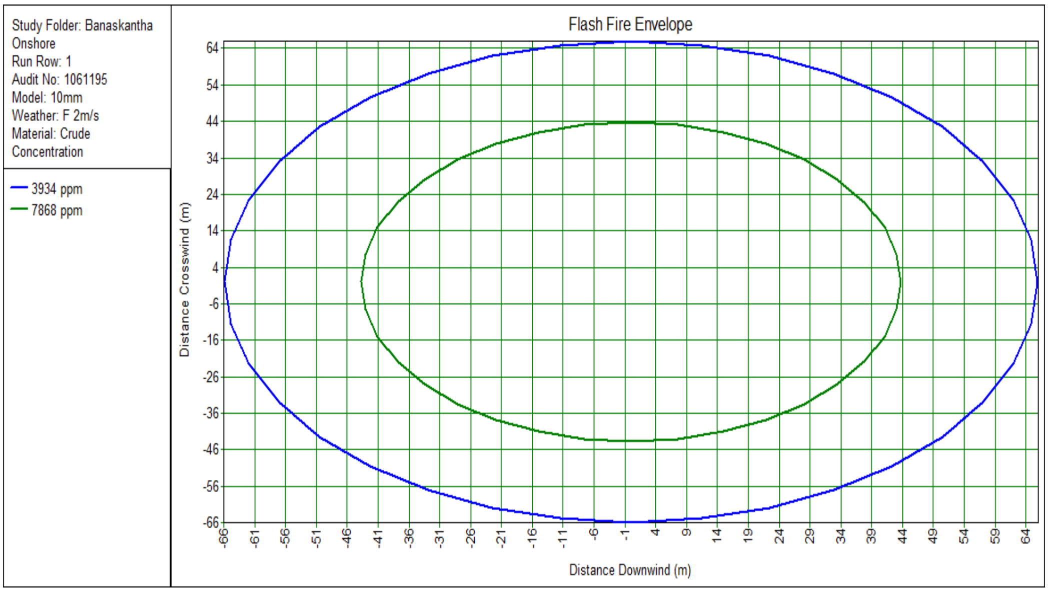
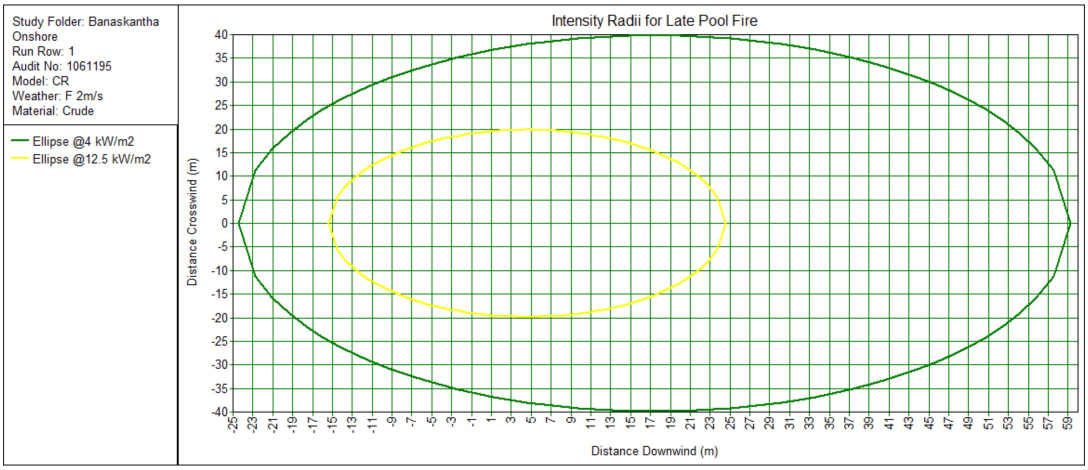


FLASH FIRE ENVELOPE DUE TO FBR OF CRUDE CONCENTRATION IN IS 05

INTENSITY RADII FOR JET FIRE DUE TO 10 MM LEAK OF CRUDE IN IS 06



FLASH FIRE ENVELOPE DUE TO 10 MM LEAK OF CRUDE CONCENTRATION IN IS 06



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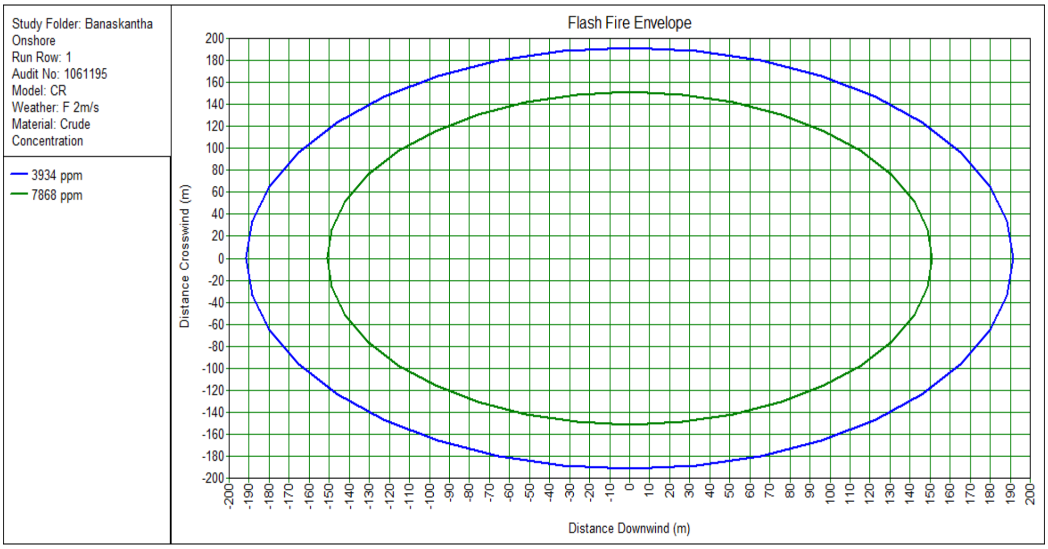

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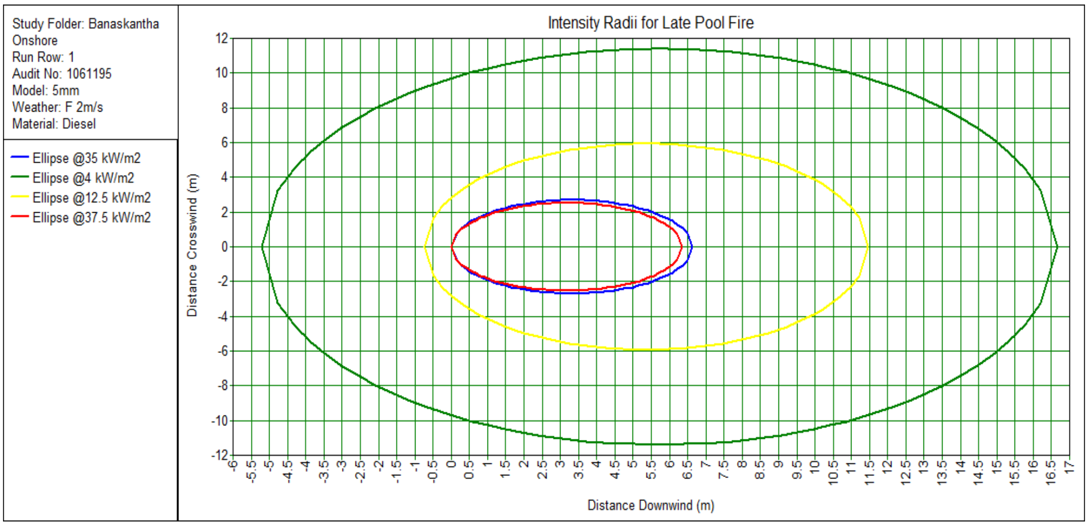

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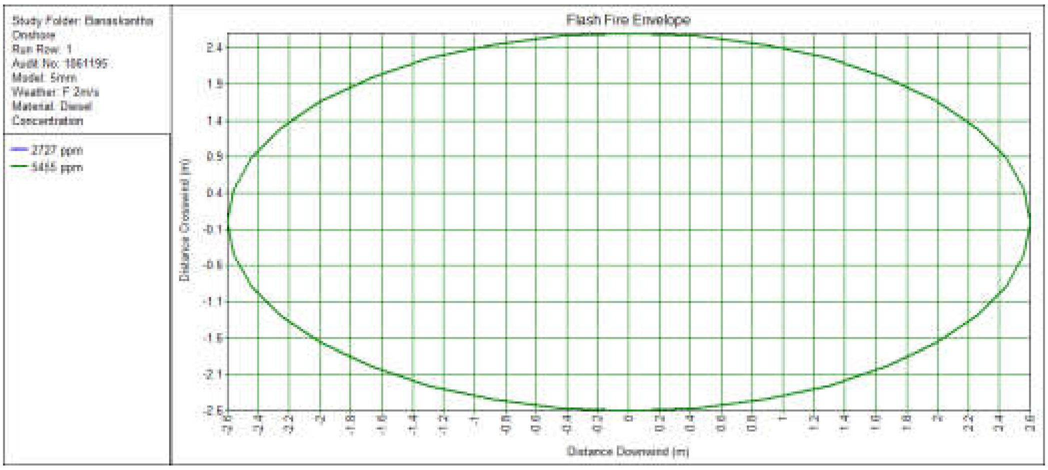
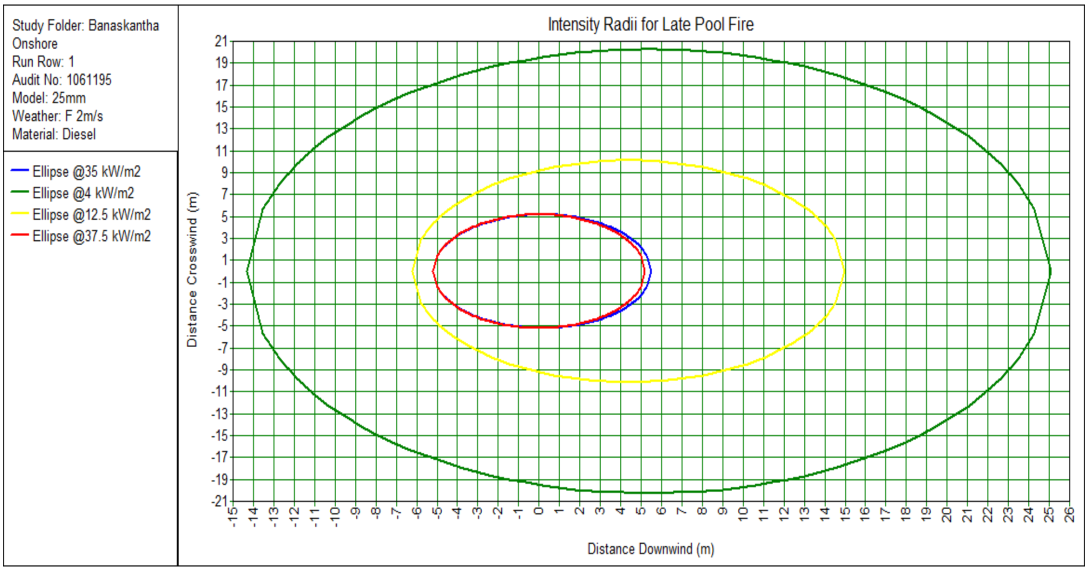


FLASH FIRE ENVELOPE DUE TO 5MM LEAK OF DIESEL CONCENTRATION IN IS 07



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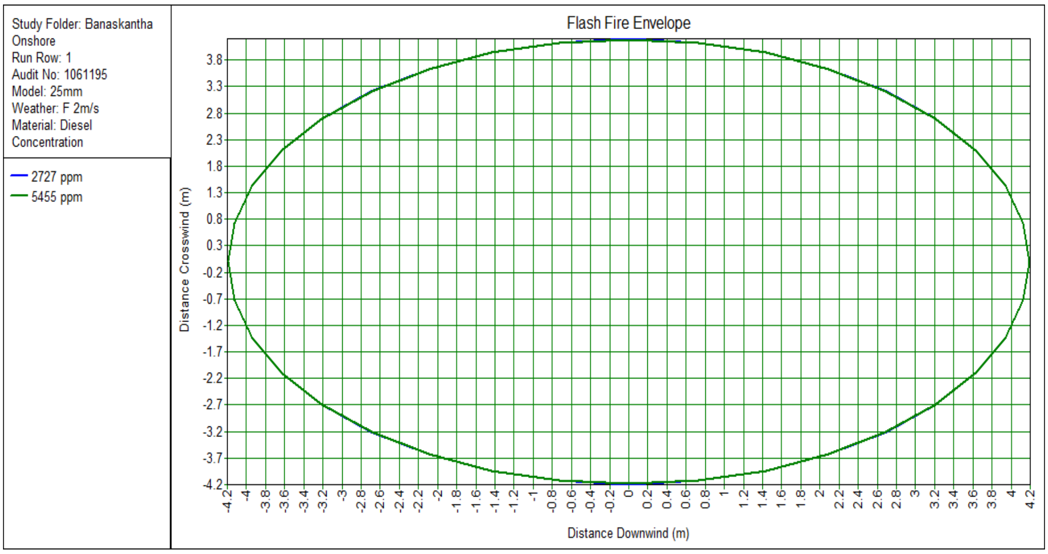
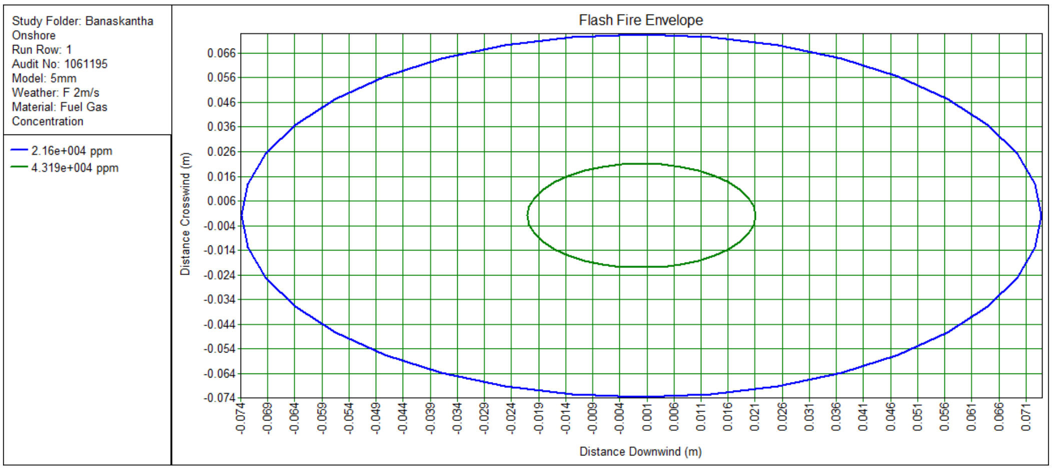
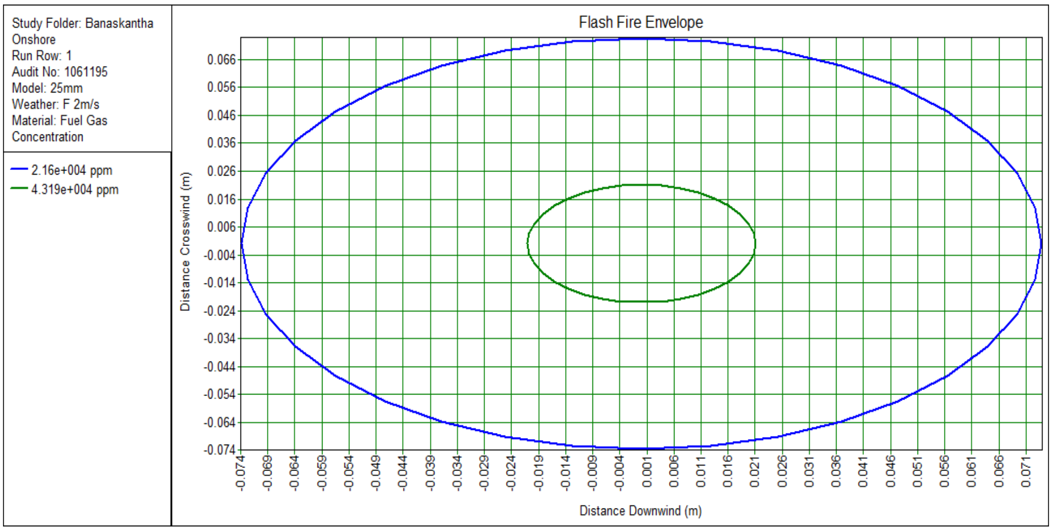


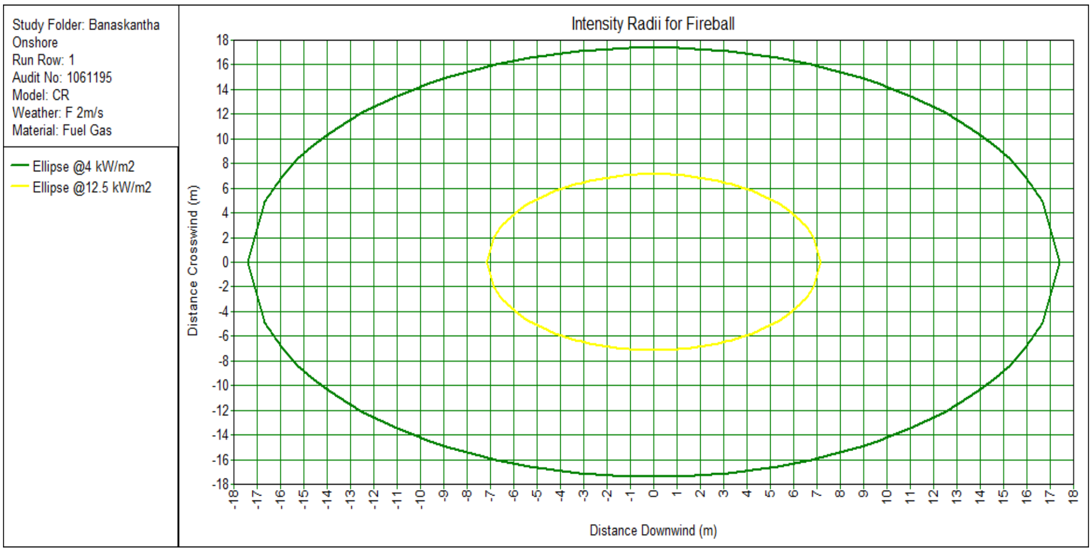
FLASH FIRE ENVELOPE DUE TO 25MM LEAK OF DIESEL CONCENTRATION IN IS 07



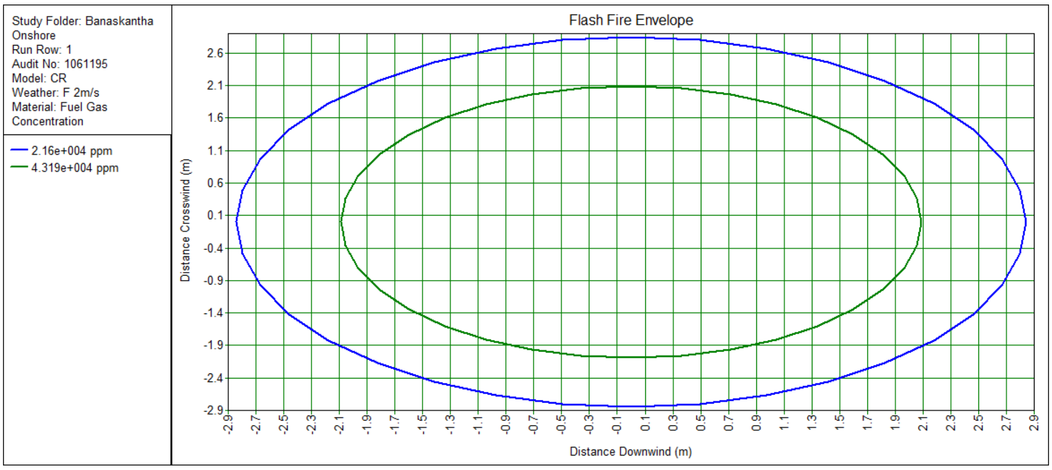
FLASH FIRE ENVELOPE DUE TO 5 MM LEAK OF FUEL GAS CONCENTRATION IN IS 08



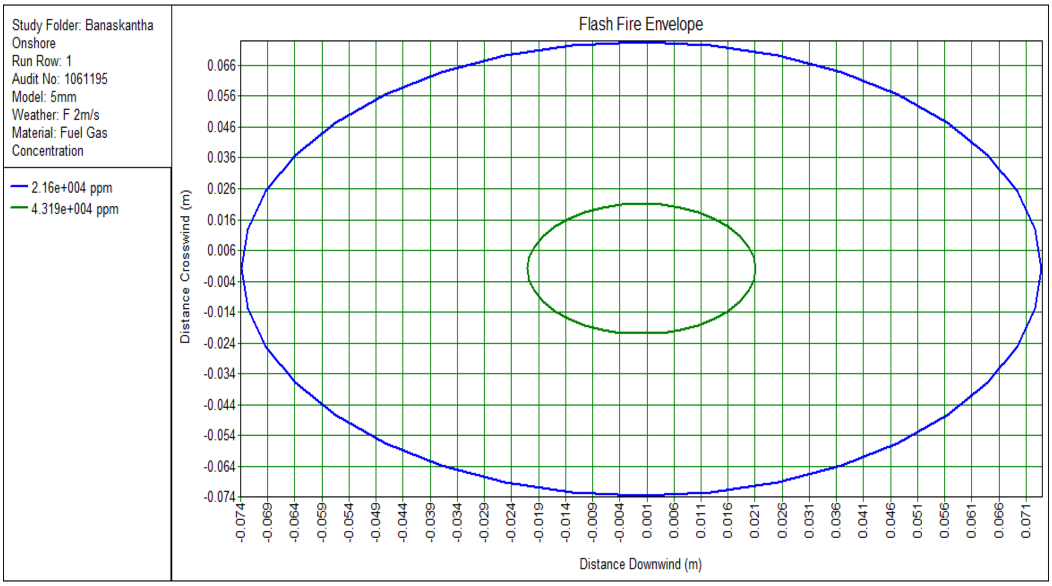
FLASH FIRE ENVELOPE DUE TO 25 MM LEAK OF FUEL GAS CONCENTRATION IN IS 08



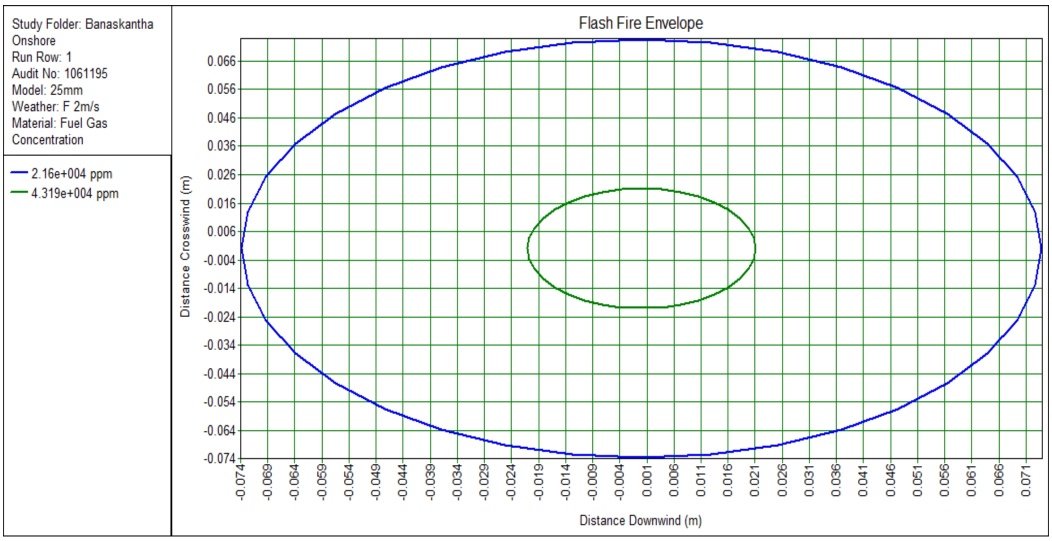
INTENSITY RADII FOR FIRE BALL DUE TO CROF FUEL GAS.



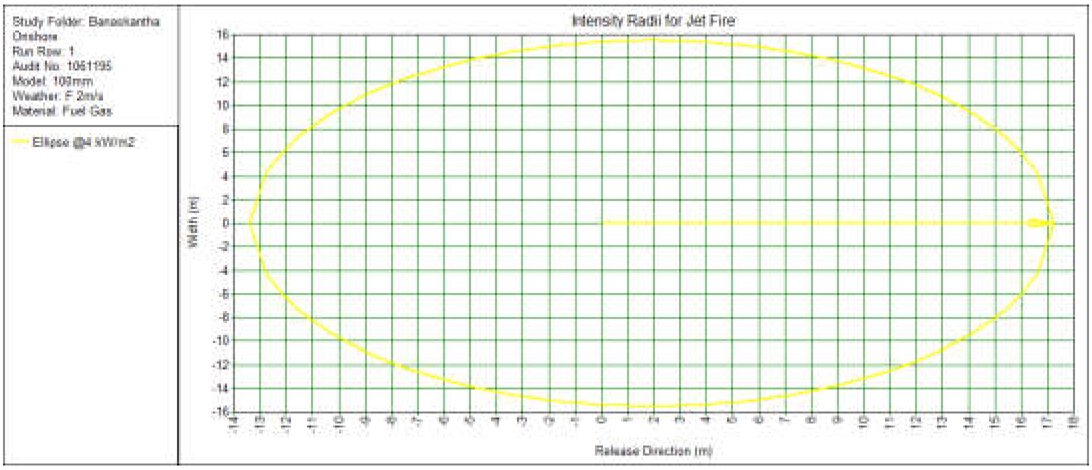
FLASH FIRE ENVELOPE DUE TOCR OF FUEL GAS CONCENTRATION



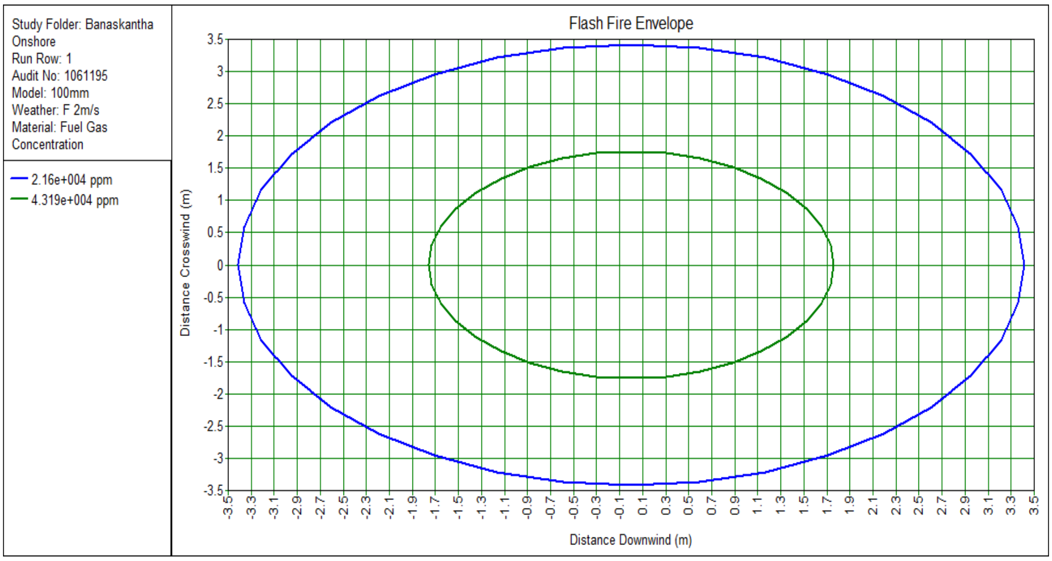
FLASH FIRE ENVELOPE DUE TO 5 MM LEAK OFFUEL GAS CONCENTRATION IN IS 09



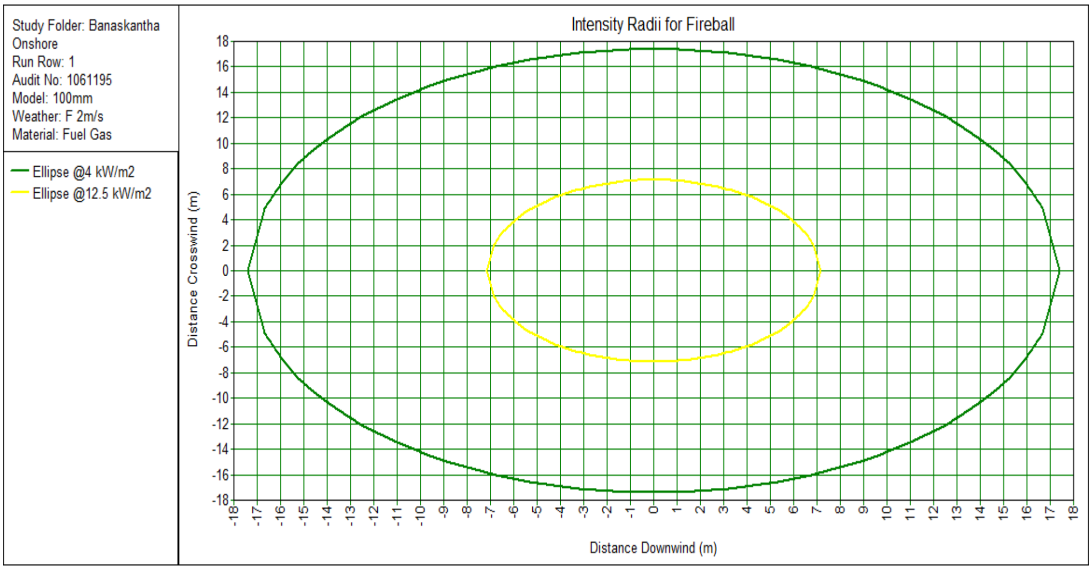
FLASH FIRE ENVELOPE DUE TO 25 MM LEAK OFFUEL GAS CONCENTRATION IN IS 09.



INTENSITY RADII FOR JET FIRE DUE TO 100 MM LEAK OFFUEL GAS IN IS 09.



FLASH FIRE ENVELOPE DUE TO 100MM LEAK OFFUEL GAS CONCENTRATION IN IS 09.



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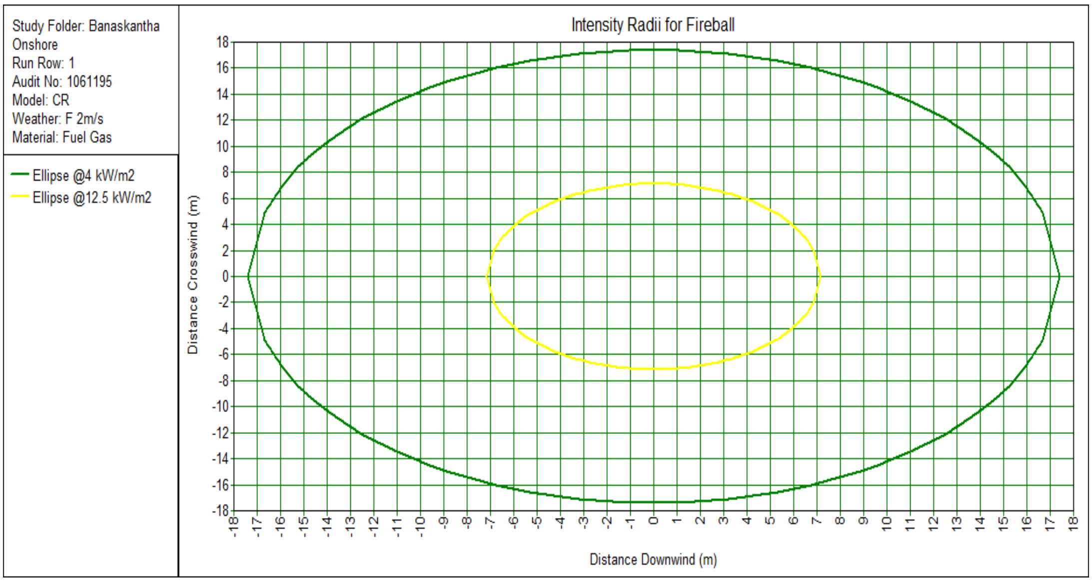

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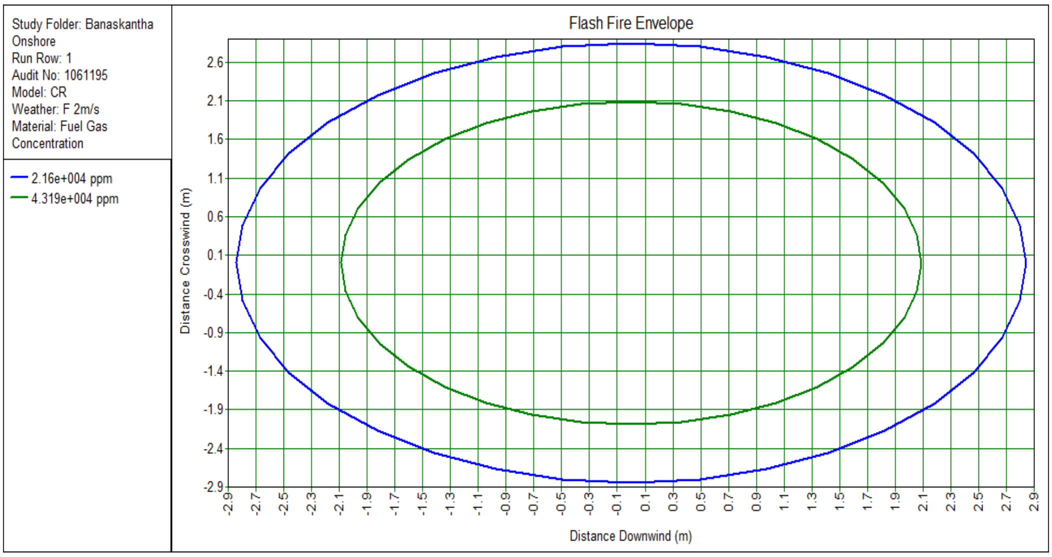

FLASH FIRE ENVELOPE DUE TO CR OFFUEL GAS CONCENTRATION.

ANNEXURE 12: NABL CERTIFICATE OF ABC TECHNO LABS INDIA PVT. LTD.

National Accreditation Board for Testing and Calibration Laboratories

(A Constituent Board of Quality Council of India)

NABL

QCI

CERTIFICATE OF ACCREDITATION

ABC TECHNO LABS INDIA PRIVATE LIMITED

has been assessed and accredited in accordance with the standard

ISO/IEC 17025:2005

"General Requirements for the Competence of Testing & Calibration Laboratories"

for its facilities at

ABC Tower, No:400, 13th Street, SIDCO Industrial Estate, North Phase, Ambattur, Chennai, Tamil Nadu

in the field of

TESTING

Certificate Number TC-5770

Issue Date 29/11/2017 **Valid Until** 28/11/2019

This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the relevant requirements of NABL.

(To see the scope of accreditation of this laboratory, you may also visit NABL website www.nabl-india.org)

Signed for and on behalf of NABL

N. Venkateswaran
Program Director

8907697010003000583

Anil Relia
Chief Executive Officer