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IMPACT ON LAND DUE TO EXPLORATORY WELL DRILLING FOR HYDROCARBON: CASE STUDY

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ABSTRACT

Oil and hydrocarbon is an important contributor for the country development. However, exploratory drilling of oil deteriorates affect the environment by polluting air, water and soil. It also affects the surrounding agricultural land that limits the production of crops. One exploratory well is to be drilled at Mahuar, Tehsil Mau, district Mau in Uttar Pradesh. However, the environmental impact of this exploratory drill is a major concerning issue. It has some negative effects on surrounding human and biological society. The people of this area are sufferer in terms of air, water and land pollutions as well as health problem. The main focal point of this study was to collect information on land and problems associated with exploratory drilling using structured survey, field observation. The collected data were justified with existing information.

Key words: Land, Oils, Hydrocarbons

INTRODUCTION

The impact of any major developmental project on land environment generally depends on the type/category of proposed development. For example, the grass root/green field development requires land acquisition/procurement, site grading/ construction and operation. In such cases the impacts on land environment would be in the form of temporary or permanent change in land use pattern as well as direct and indirect impacts on surrounding land use due to pollution discharge in the form of flue gases, fugitive emission, liquid effluents etc. apart from the above, the importance of impacts on land environment also depend on several factors like the project location, land use/land cover in surrounding area, ecological or otherwise sensitivity of the surrounding region.

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Baseline Status: Eight locations within the study area were identified for collection of soil samples. Standard methods (soil Chemical Analysis by M.L.Jackson) have been followed for the analysis of soil samples. The project under study is related to exploratory drilling (ONGC) for oil and gas, accordingly for assessment of impact on land environment is carried out pertinent to study, the current land use/land cover of identified project site as well as surrounding area and the resulting changes in land use pattern and the corresponding impacts and also the pollution impact during normal operation of the proposed project. The baseline (pre-project) status of land environment has been assessed through reconnaissance in project area, characteristics of soils through field studies, study of land use pattern through Satellite imagery and census records to project region.

The size of the frequency shift and its duration depends on the load characteristics and the response of the generation control system to load changes. Frequency variations that go outside of accepted limits for normal steady state operation of the power system can be caused by faults on the bulk power r transmission system, a large block of load being disconnected, or a large source of generation going offline.

Reconnaissance: Soil samples were collected from the study area within 10 km radial distance. The study area is covered with clay and sandy loam in texture. These land within the study area is agricultural land is being used to produce Wheat, Maize, Jaon, Arhar, Moong, Udad, Gram, Peas, Masoor, Sugar Cane, Spices, Potato, Onion, Ground Nut, Seasum seeds (Til), Mustard, Alsi, Soyabean, Sunflower etc. The site of the selected area for drilling purpose is an non-agricultural land. The study area does not have any Forest area.

Soil type : Soil of Ramganjmandi is characterized by two types of soil. The southern part is subjugated to moderately deep, well drained fine soils on gently sloping plains with clayey surface, slightly eroded, coupled with shallow, well drained, clayey soil, and the northern part is characterized by the rock outcrops associated with shallow, loamy skeletal, well drained, soils on very gently sloping foot slopes, cruelly eroded.

Natural Vegetation: The type of Trees, Shrubs and Herbs are observed in the study area. The sensitivity of plants and animal species to changes occurring in their ecosystem can therefore be used for monitoring the biological environment for environmental impact assessment.

Geology of the Study Area: The area under context covers 8354 sq.km. The exploration acreage possesses Vindhhayan sediments of Proterozoic age. Vindhyan basin is as such a large Proterozoic basin in Peninsular India. It extends from Chittaurgarh in the west to Sasaram in the east and from Dholpur in the north to Khandwa in the south, covering the states of Uttar Pradesh, Madhya Pradesh, Uttar Pradesh and Bihar. Towards north-west it is bounded by the Delhi-Aravalli-Orrogenic belt and to the south-southwest by Son-Narmada Lineament. The Bundelkhand massif occupies the central portion of the Basin. Gangetic alluvial plains occur to north. The Bundelkhand massif broadly divides the basin into two geographical domains: Son Valley and the Western Kalisindh valley. The block GV-ONN-2004/1 lies in the Kalisindh Valley Sector.

Climate: The climate is tropical type. The season's area is well defined during mid of February to March end and October – January are pleasant. April to August is very hot months and mid August to September, this area experience large rain. The minimum temperature is generally observed in the study area is 2.0 deg.C and maximum temperature is 46.9ºC. The average relative humidity is 54 %. The Annual rainfall in Mau (2004) was 77.23 cm. The actual annual rainfall at Mau tehsil as Office of Collect orate , Mau is 91.10 cm.

About 70 percent of the annual rainfall is received during July to September, about 20% percent from October to March and 10% from April to June. The climatological data is givem in **Table (A)**

Table (A): Climatological data of Mau

(Source : IMD Mau)

Year	Max. Temp Deg. C	Min Temp Deg. C	Mean Temp Deg. C	Mean Relaive Humidity (%)
2000	43.6	3.2	26.5	51
2002	46.0	2.0	25.9	54
2003	46.9	7.1	27.9	45
2004	45.7	7.5	27.9	44
2005	45.6	8.5	27.2	43

Cropping Pattern: The major crops of the study area is wheat, spices, seasum seeds, mustard and soyabeen. The majority of the area is covered with the soyabeen, wheat, Jawar, Maize, Mustard, Udad crops, the various crops which are cultivated in this area are given **Table (B)**.

Table (B): Areawise Main Crops (2005-2006)

Crops	Area (Hectare)
Jawar	5301
Wheat	5207
Maize	5570
Jaon	3
Arhar	31
Moong	86
Udad	8120
Gram	1477
Peas	1
Masoor	5
Sugar Cane	-
Spices	8177
Potato	7
Onion	6
Ground Nut	59
Seasum seeds (Til)	153
Mustard	6245
Alsi	135
Soyabean	16275

Land Use Pattern:

Table (C) : Land Use Statistics of Suket # 1 with respect to Crops

Category	Area (Sq. Km)
Kharif Only	63.79
Rabi Only	23.59
Zaid Only	0.07
Double / Triple Crop	48.07
Current Fallow	59.34
Deciduous Forest	16.52

Shrub/ Scrub	10.37
Other Wastelands	85.47
Scrub Land	3.44
Waterbodies	3.42

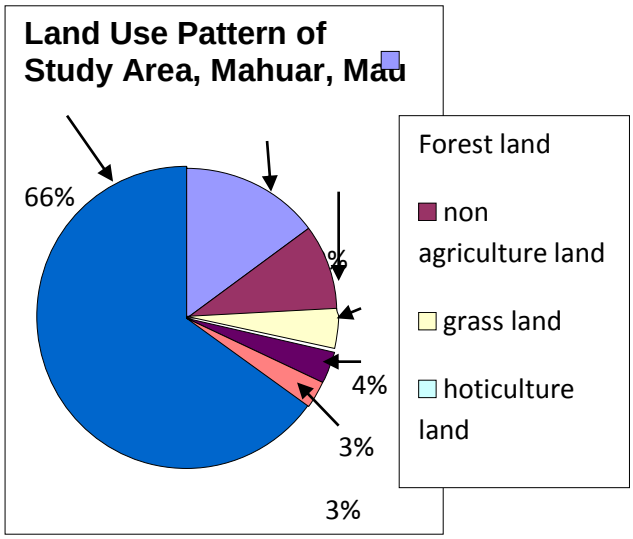
Table (D): Land use pattern of Tehsil Ramganjmandi (Reference year 2006-2007)

Land use pattern Land

Land use pattern	Land area (%)
Total actual area covered under mines (Limestone building and Cement grade)	2866.84 hect (03.61)
Total area under forest	63219.50 hect (79.81)
Total Agricultural land	6723.00 hect (08.48)
Other Land use	6400.00 hect (08.07)
Total Geographical area	**79210.00 hect (100% approx.)**

The wasteland is 85.47 sq. kms. The maximum covered area is for the Khariff, which is around 63.79 sq.km. The double and triple crop covered the 48.07 sq.km. The land use also covers the deciduous forest of the covered area upto 16.52 sq.kms

The pie chart of land use pattern details are given in the Satellite Imagery of the study area is presented in **Figure (1) below**



The sources of Irrigation and Irrigational area (Hectares) in tehsil Mau are given below in **Table (E)**

Table (E): Sources of Irrigation & Irrigational area (Hectare)

Sources	Area (Ha)	Numbers
Wells	18263	5965
Tubewells	0	5
Ponds	0	3
Canal	0	-
Others	556	-
Total Irrigated Land	**18819**	-

Baseline Data: Eight (08) villages were identified for existing soil quality assessment. The location and names of sites/villages of the study areas are given in **Table (F)**. The sampling locations are shown in **Figure – (2).**.

Table F: Land Use Pattern of Study Area, Mahuar, Tehsil Mau

Land Use	Area (Ha)
Forest Land (Janglaat)	13744
Non Agriculture Land	8459
Grass Land	3756
Hoticulture Land	62
Waste Land	3138
Fallow Land	2812
Total Cultivated Land	59240
Total	**91211**

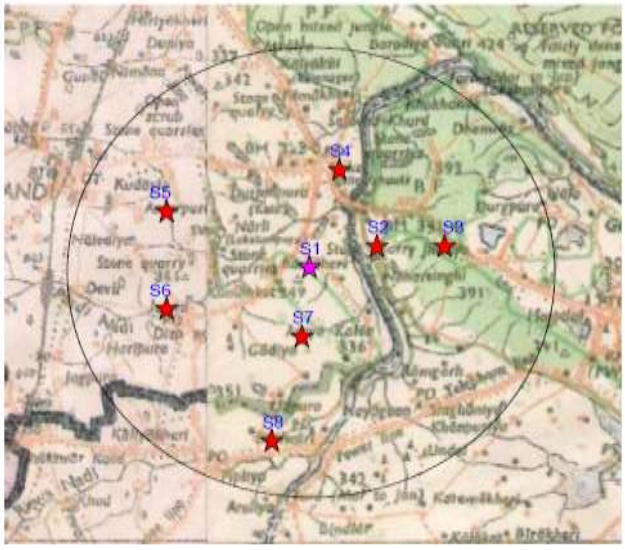


Fig. 2 Sampling Location for Land Environment

The sampling locations for soil sampling are given below in **Table (G)**

Table (G): Soil Sampling Locations

Site Name	Name of Village / Location
S1	Mahuar
S2	Zulmi
S3	Arniya Kalan
S4	Bhilwari
S5	Jhirniya
S6	Devrighata
S7	Suket
S8	Amarpura

Representative soil samples from depth (0-15 cm) were collected from these sites/villages area for estimation of the physicochemical characteristics of soil. Air-dried and Sieved samples have been used for determination of physical properties of soil. Standard methods were followed for the analysis of soil samples.

The International Pipette Method (Black, 1964) was adopted for determination of particle size analysis. The textural diagram was generated using "SEE soil Class 2.0 version based on United States Department of Agriculture (USDA) classification of soils. Physical parameters such as bulk density, porosity and water holding capacity were determined by following KR Box Method .

The analysis results are given **Table** (H)

Table (H): Soil Sample from: Mahuar (S1), Zulmi(S2), Arniya Kalan(S3), Bhilwari(S4), Jhirniya(S5), Devrighata(S6), Suket(S7), Amarpura(S8)

Parameter	Unit	Obtained Value (s1)	Obtained Value (s2)	Obtained Value (s3)	Obtained Value (s4)	Obtained Value (s5)	Obtained Value (s6)	Obtained Value (s7)	Obtained Value (s8)
Arsenic (as As)	µg/gm	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium (as Cd)	µg/gm	ND	ND	ND	ND	ND	ND	ND	ND
Chromium Total (as Cr)	µg/gm	24.35	31.04	22.31	22.64	32.98	22.75	25.04	28.24
Conductivity	µmhos/cm	731.0	170.0	362.0	200.0	278.0	261.0	375.0	282.0
Copper (as Cu)	µg/gm	33.69	46.21	21.76	16.05	22.02	15.21	32.15	17.98
Iron (as Fe)	µg/gm	10191.06	20790.42	921.79	10136.19	12799.12	7263.12	8181.65	9313.23
Lead (as Pb)	µg/gm	21.96	13.18	11.14	16.02	19.16	22.74	20.12	18.50
Magnesium (as Mg)	µg/gm	6050.0	6418.0	6124.0	5168.0	6122.0	5288.0	6018.0	5270.0
Mercury (as Hg)	µg/gm	ND	ND	ND	ND	ND	ND	ND	ND
Nickel (as Ni)	µg/gm	33.74	43.12	22.70	22.28	35.62	24.43	26.37	31.42
pH	-	7.2	7.7	7.5	7.7	7.7	7.7	7.7	7.6
Phosphorus (as P)	µg/gm	969.0	649.0	424.0	298.0	443.0	532.5	1014.5	672.5
Potassium (as K)	µg/gm	2195.32	749.49	1450.58	890.54	1065.32	702.5	2295.35	776.47
Total Nitrogen (as N)	%	0.119	0.025	0.026	0.021	0.035	0.016	0.018	0.014
Zinc (as Zn)	µg/gm	62.04	32.47	23.84	22.35	31.14	18.86	47.05	23.41

ND – Not Detectable

CONCLUSION

The proposed drilling activity will lead to temporary and minor soil erosion and loss of agricultural land.

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