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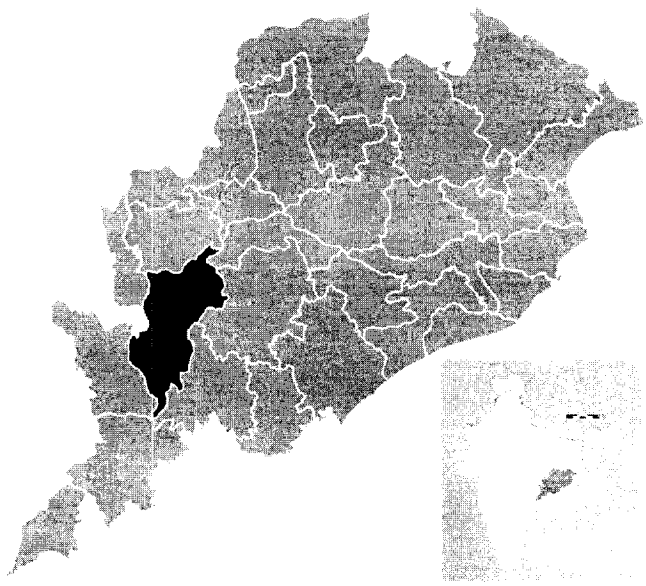
DISTRICT SURVEY REPORT (DSR) OF KALAHANDI DISTRICT, ODISHA ON MOORUM MINING

As per Notification No. S.O. 141(E), 15th January, 2016 & S.O. 3611(E), 25th July, 2018, New Delhi, Ministry Of Environment, Forest & Climate Change (MoEF & CC)



COLLECTORATE OF KALAHANDI, ODISHA
FEBRUARY – 2020

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LIST OF PLATES

A survey has been carried out by the ***District Level Environment Impact Assessment Authority (DEIAA), Kalahandi*** with the assistance of Geology Department or Irrigation Department or Forest Department or Public Works Department or Mining Department etc. in the district as per the *MoEF, New Delhi, notification S.O. 141(E) dated 15th January 2016* to prepare the District survey Report (DSR) of Kalahandi District (For Stone)in the year 2019.

Forwarded by:

i. Sub-Collector cum SDM, Bhawanipatna.

ii. Sub-Collector cum SDM, Dharmagarh.

iii. CDMO, Kalahandi.

iv. Deputy Director Geology, ZS Balangir

v. Deputy Director Agriculture, Kalahandi.

vi. Deputy Director Horticulture, Kalahandi.

vii. SDO Irrigation Division, Kalahandi, Bhawanipatna.

viii. ACF North & South Division, Kalahandi.

ix. Asst. Engineer (R & B), Kalahandi, Bhawanipatna.

x. RO State Pollution Control Board, Rayagada.

xi. Mining Officer, Kalahandi.

xii. Tahasildar of concern Tahasil.

0. PREFACE

The main objective of the preparation of District Survey Report(DSR) as per the notification issued by the *Ministry of Environment and Forest and Climate Change Notification No.S.O. 141(E) dated 15/01/2016&S.O.3611 (E) New Delhi dated 25/07/2018*is for identification of areas of aggradation or deposition & areas of erosion to ensure the mining potential of the District. District Survey Report of Stone mining has been prepared in accordance with *Clause-II of Appendix X* of the said notification.

01. INTRODUCTION.

The first gazetteer (15 August 1980) of Kalahandi District says that the district comprised of the ex-State Kalahandi minus Kashipur Police Station (the Zamizari of Khariar as Nuapada Sub-division, now Nuapada District). With the merger of princely States with province of Odisha 1948, the ex-State of Kalahandi together with ex-State Patna and Sonepur formed the District of Kalahandi with headquarters at Balangir. On 1st November 1949 Patna and Sonepur areas were separated to form District Balangir; Patna (later Bolangir) Sonepur (later Subarnapur district). And ex-State of Kalahandi, together with Nuapada sub-division which formed a part of Sambalpur district since 1st April 1936, was reconstituted a separate District Kalahandi with Headquarters at Bhawanipatna. As the area comprising Kashipur Police station posed administrative difficulties due to lack of direct communications with the district headquarters , it was separated from Kalahandi on 1st August 1962. Further Nuapada Subdivision was separated on 27 March 1993 from Kalahandi to form new District as Nuapada.

On the basis of Administration Kalahandi District has been divided into 2 Sub-Divisions named as Bhawanipatna & Dharmagarh. As Per the Blocks & Tahasils are concerned the District is divided into 13 Blocks & Tahasils namely Kalahandi, Kesinga, Karlamunda, M.Rampur, Narla, Th.Rampur, Lanjigarh belongs to Bhawanipatna Sub-Division and Jaipatna, Junagarh, Koksara, Golamunda, Kalampur and Dharmagarh belongs to Dharmagarh Sub-Division. There are 310 Gram Panchayat in the District.

Kalahandi situated at a distance about 400Km from the state capital & international airport Bhubaneswar and at a distance about 500 Km from the shore line of Bay of Bengal.

Highways like NH-26, SH-16, SH-06, SH-06A, SH44 etc. passes within the district.

02. OVERVIEW OF MINING ACTIVITY IN THE DISTRICT.

A great variety of major mineral potential like Bauxite, Graphite, Galena, Ruby & Iolite and Specified Minor Minerals like Quartz, Feldspar & Decorative Stone (Granite) are available in the district.

Bauxite occurs in Karlapat-Pollingpadar, Kutrumali-Tangridongar, Lanjigarh -Niyamgiri, Keluamali, Krishanmali.

Graphite occurs in Sargipada, Gaidar, Singjharan, Lamer&Badibahal.

Galena occurs in Sisakhal.

Precious Stone (Ruby) occurs in Jhillingdhar, Hinjlibahal, Kerumurda, Sirja, Tandla, Banjipadar, Sargiguda.

Semi-Precious Stone (Iolite) occurs in Dedar, Labanyasar, Bondoguda, Kutingpadar, Ghatpada, Rengali, Dharmagarh, Golamunda and Th.Rampur Tahasils.

Quartz and Quartzite occurs in Kalahandi, Kesinga, Jaipatna, Junagarh, Dharmagarh, M.Rampur, Narla, Koksara, Golamunda, Kalampur Tahasils.

Feldspar occurs in Bhikajharan of Kalahandi Tahasil.

Decorative Stone (Granite) occurs in Lanjigarh & Kalahandi Tahasil.

(a)Major Mineral:-

In Kalahandi district, presently there are eight nos. of mining leases of semiprecious stone out of which only two nos. of mining leases are working i.e. Labanyasar Iolite Mines over an area of 2.505 hectares of Sri Debraj Meher & Bondoguda Iolite Mines over an area of 2.023 hectares of M/s Manikeswari Gems Pvt. Ltd.

(b) Specified Minor Minerals:-

(i)One Quarry lease for decorative stone (Granite) has been granted in favour of Sri Harendra Kumar Patnaik in village-Nuapada under Kalahandi Tahasil over an area of 8.575 hectares for decorative stone. Now the lease is non-working and the lessee has applied for Renewal of Mining Lease, which is under consideration of the Govt.

Besides this, three nos. of prospecting licenses for decorative stone (Granite) have been granted i.e. Karlasoda Decorative Stone (Granite) Quarry over an area of 13.464 hectares in village-Karlasoda under Kalahandi Tahasil in favour of Smt. P.Ramadevi, Chandanpur Decorative Stone (Granite) Quarry over an area of 3.602 hectares & Chandanpur Decorative Stone (Granite) Quarry over an area of 9.696 hectares in village-Chandanpur under Lanjigarh Tahasil in favour of Jay Minerals Prop. Ajay Agrawal.

(ii) There are six nos. of non-working Quartz mines in the district. Out of six, two mining leases had been granted in favour of Shreedhar Minerals, Proprietor Sri M.N. Pattjoshi at village Patharla over an area of 3.864 hectares under Kesinga Tahasil and at village Santemri over an area of 3.148 hectares under Jaipatna Tahasil.

Quartz Mines in village Sidingpadar over an area of 18.818 hectares under M-Rampur Tahasil has been granted in favour of Sri Samarendra Pratap Singh Deo. Quartz mines in village Beherakuni over an area of 3.318 hectares under Kalahandi Tahasil has been granted in favour of Sri S.K. Mund. Other two Quartz mines leases have been granted in favour of M/s Parvathi Impex , the leases are in village-Bhejiguda over an area of 22.048 hectares under Jaipatna Tahasil and at village-Karlaguda over an area of 7.292 hectares under Koksara Tahasil .

The above six Quartz Mining leases are under consideration for extension of Mining Lease by Government.

(iii)One Mining lease for Quartz and Feldspar has been granted in favour of M/s Shreedhar Minerals, Proprietor Sri M.N. Pattjoshi over an area of 5.147 hectares on Dt. 14.06.1982. Now the lease is non-working and the lessee has applied for Renewal of Mining Lease which is under consideration of Govt.

(iv) Three nos. of Prospecting Licenses (PL) have been granted for Quartz, one in favour of Sri Rabindra Kumar Lal at village-Dulkibandha under Jaipatna Tahasil over an area of 4.945 hectares and other two PLs have been granted in favour of M/s Shreedhar Minerals Proprietor Sri M.N. Patjoshi at village Khinbahali over an area of 2.428 hectares under Junagarh Tahasil and at village Bhalubutra over an area of 2.873 hectares under Jaipatna Tahasil.

(v) One Prospecting License has been granted for Quartz and Feldspar in favour of M/s Shreedhar Minerals Proprietor Sri M.N. Patjoshi at village Bhikajharan under Kalahandi Tahasil over an area of 12.638 hectares.

(b)Other than specified minor mineral:-

Other than specified minor minerals such as riverbed sand, ordinary stone (road metal) & Moorums are also available in the district. But

almost Moorum sairat sources are available in Gramya Jungle and Gochar kissam land.

03. GENERAL PROFILE OF THE DISTRICT.

Present Kalahandi District covering a geographical area of 7920 sq km lies in between 19.175489^0 to 20.454517^0 North Latitude and 82.617767^0 to 83.794874^0 East Longitude having a population of total population of1,576,869 as per the Census 2011. Out of which 787,101 are males while 789,768 are females. In 2011 there were total 401,251 families residing in Kalahandi district. The District occupies the South Western portion of Odisha, bordered to the North by the Balangir District and Nuapada District, to the South by the Nabarangpur District, Koraput District and Rayagada District, and to the East by the Rayagada, Kandhamal District and Boudh District.

The climate of the Kalahandi District is of extreme type. It is dry except during monsoon. The maximum temperature of the District is 45+ degree Celsius, whereas the minimum temperature recorded is 4^{0}Celsius. The District experiences the average annual rainfall as 1378.20 mm. The monsoon starts late in June and generally lasts up to September.

Kalahandi District is largely an agriculture based Economy. The District is rich with agriculture. Dharamgarh sub division was historical known for rice production in Odisha. Since 2000s the Indravati Water Project, second biggest in the state has changed the landscape of southern Kalahandi, leading to two crops in a year. Because of this, blocks like Kalampur, Junagarh, Jaipatna, Dharmagarh are the leading producer of paddy in district. Cotton is widely cultivated in areas of Kesinga, Bhawanipatna,Golamundablocks.

Forest based products like Mahua, Kendu-Leaf, Wood, Timber and Bamboos also contribute to local economy largely. Kalahandi District supply substantial raw materials to paper mills in neighbouring Rayagada District.

Kalahandi District celebrates many festivals round the year. ChhatraJatra in Bhawanipatna, Deepawali, Rathajatra, Shivaratri, Holi, Janmastami, Ramanabami are the famous festivals celebrated by local people with fun and fair. There are also some other local festivals like Khandabasa, Nuakhai, Amnuan, Kandulnuan, Seminuan, Dumernuan, Kalahandi Utsav, GhantaJatra that are celebrated in the District.

Many eminent personalities have taken birth on the soil of Kalahandi District. Rindo Majhi (freedom fighter in Odisha), Pratap Kesari Deo (former MP and ex- Maharaja of Kalahandi), Chakra Bisoi (freedom fighter), Ram Chandra Patra (bureaucrat, social worker, administrator), Natyarashmi Prafulla Ratha, Dayanidhi Nayak (former minister), Jayanta Kumar Behera (social activist and artist) and mountaineer Jogabyasa Bhoi (first from district to climb Mount Everest) are a few among them.

The district Kalahandi is situated at the south western part of Odisha constituting part of Western Ghat Mobile Belt normally a rugged hilly terrain. The district covers a number of new series Topo Sheets i.e. *F44W16, E44E9, E44E10, E44E11, E44E13, E44E14, E44E15, E44E16, F44X3, F44X4, F44X7,F44X8, F44X11, F44X12, F44X16, E44F1, E44F2, E44F3, E44F5 & E44F6.*

Kalahandi district is physiologically a complex terrain having numerous numbers of hills, moulds, plane lands, river beds, agricultural lands, forest growth areas etc. In the southern most part of the district there is Indravati Reservoir catchment area which is also shared byNawarangpur district. Adjacent to reservoir catchment area hilly terrain present which have an elevation range from mean sea level about 700m to 1000m. Hills and mounts are more common in the south to Bhawanipatna where as in the north part is the less hills compared to southern part possesses an elevation range between 250m to 800m from MSL. As the district is a part of Eastern Ghat Mobile Belt so the rock

types are mostly homogeneous in nature, so the drainage pattern developed in the region is dendritic pattern. The main drainage trend flows from the south-west to north-east direction within the district. There are several seasonal nala / dry nala & a few perineal natural drainage exists within the district. Main river that touches the district is *Tel River*, in addition to that a few other small rivers present within the district namely *Hati Nadi, Udanti Nadi, Sagada Nadi, Kamal Nadi, Ret Nadi, Uttei Nadi*etc etc.

The main township that is developed in the district is Bhawanipatna also is the district head quarter, which is present in the central part of the district and connect to all parts of the district through road ways.

There are a number of reserve forests present within the district a few major RF are namely *Benakhamar RF, Udaygiri RF, Singari RF, Gopalpur RF, Indravati RF, Phatadhara RF, Machul RF, Hatisal RF, Kiding RF, Bazargarh RF, Benagurha RF, Urladani RF, Taprang RF, Telan RF, Satami RF, Sulia Block A RF*ect. In addition to the reserve forests there is a wild life sanctuary present in the district namely *Karlapat Wild life sanctuary.*

04. GEOLOGY OF THE DISTRICT.

Kalahandi District is part of Eastern Ghat Super Group, the Eastern Ghats are a discontinuous range of mountains along India's eastern coast. The Eastern Ghats run from the northern Odisha through Andhra Pradesh to Tamil Nadu in the south passing some parts of Karnataka and in the Wayanad district of Kerala. They are eroded and cut through by four major rivers of peninsular India, viz. Godavari, Mahanadi, Krishna, and Kaveri.

The mountain ranges run parallel to the Bay of Bengal. The Deccan Plateau lies to the west of the range, between the Eastern Ghats and Western Ghats. The coastal plains, including the Coromandel Coast region, lie between the Eastern Ghats and the Bay of Bengal. The Eastern Ghats are not as high as the Western Ghats. The Eastern Ghats are older than the Western Ghats, and have a complex geologic

history related to the assembly and breakup of the ancient supercontinent of Rodinia and the assembly of the Gondwana supercontinent.

The Eastern Ghats on the east coast of India is a largely granulite terrain but also exposes granites, migmatites, anorthosites and alkaline rocks. This granulite belt has had a prolonged history of mountain building from late Archaean to late Proterozoic. During this long period the Eastern Ghats mobile belt witnessed repeated folding and possibly polycyclic metamorphism. Some recent findings suggest breaks between orogenic cycles and a proterozoic reworking of Archaean granulites. Extreme-temperature crustal metamorphism under fluid-absent conditions and crustal anataxis in huge thickness of pelitic to psammiticprotoliths producing leptynites are some of the important results of recent investigations of the Eastern Ghats mobile belt. Different generation of charnockites are present in the Eastern Ghats belt, but charnockitisation of granitic gneisses is yet to be documented. Some apparently nascent growths, the patchy charnockites in the Chilka area are shown to be relict of older charnockitic rocks that suffered granulite-facies metamorphism and attendant migmatisation.

Event Stratigraphy of the Eastern Ghat Mobile Belt is as follows;

Age(Ma)	Event
550-650	Exhumation & Stabilisation(Pan-African)
800-850	Emplacement of Anorthosite Massifs, Some Alkaline Rocks(?)
	Younger Granitoids are charnokites
950-1100	Main Eastern Ghat Orogeny(=Grenville)
	Khondalite Group: Garnet-Sillimanite- Graphite Gneiss(Khondalite)with minor cordierite-Saphrine-Spinel Gneiss(Mg-Al)
	Calc- Silicate rocks & rare Marbles
	Quartzite(Garnet ±Sillimanite)
~1500	Emplacement of Alkaline rocks along with the rift Margin
	Evolution of platform(Purana) basins like Cuddahpah,Chhatishgarh, Indravati etc.
1800-1600	Evolution of Nellore-Khemmam schist belt in Dharwar Craton
2600-2800	Charnokite& Gneisses of the basement(WCZ).

05. DRAINAGE AND IRRIGATION PATTERN.

Kalahandi district is a physically hilly terrain having majorly dendritic drainage pattern, there is only one main river named *Tel River* flows in the district in the northern part of district, in addition to that several immature rivers namely *HatiNadi, UdantiNadi, SagadaNadi, KamalNadi, Ret Nadi, UtteiNadi*etc. Originate & flows in the district also few of them act as the tributary to Tel River. The distance of the sources from the river origin is geologically very short, hence this can be concluded that the rate of deposition of sand in Tel River is moderate, while in Rest Rivers within the district the rate of deposit is slow.

Additional river source details are given in the following table

Sl no.	Name of river	Area (sq. km drained)	% area drained in the District
01	Tel River	2850	60%
02	Hati River	735	100%
03	Udanti River	1800	100%
04	Sagada River	360	100%
05	Kamal River	350	100%
06	Ret River	810	100%
07	Uttei River	420	100%

06. LAND UTILISATION PATTERN IN THE DISTRICT: FOREST, AGRICULTURAL, HORTICULTURAL, MINING ETC.

General land information of Kalahandi district is as follows;

Sl. No					High	Med.	Low	
1	Geographical area			Ha.				792000
2	Cultivable area			Ha.	237856	85279	67865	391000
3	Forest area			Ha.				314000
4	Misc. Tree & Grooves			Ha.				8000
5	Permanent Pasture			Ha.				23000
6	Culturable Waste			Ha.				21000
7	Land put to non aggriculture. Use			Ha.				35000
8	Net shown area		Kharif-2018	Ha.				383721
9	Gross crop area		2018-19	Ha.				600030
10	Cropping intensity		2018-19	Ha.				156%
11	Irrigated area		Kharif-2018	Ha.				143688
12			Rabi 2018-19	Ha.				84721
13	Cultivated area		For 2019	Ha.	217139	90962	75620	383721
14	Paddy area		For 2019	Ha.	46976	79261	75620	201857

15	Non paddy area		For 2019	Ha.	170163	11701	0	181865
16	DAO Circle			Nos.				4
17	AAO Circle			Nos.				26
18	AC/VAW Circle			Nos.				310

Forest:

Forest land use as per the concern authority is as follows;

Abstract of area statement of Kalahandi North Division

SL. NO	Legal status of the forest Blocks	Name of the Range										Total	
		Bhawanipatna		**M.Rampur**		**Narla**		**Kesinga**		**Kegaon**			
		No. of Blocks	Area in Ha.	No. of Blocks	Area in Ha.	No.of Blocks	Area in Ha.	No.of Blocks	Area in Ha.	No.of Blocks	Area in Ha.	No.of Blocks	Area in Ha.
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Reserve Forest	12	15653.00	11	21475.00	7	15141.00	3	9824.00	10	20521.00	43	82614.00
2	P.F.	-	-	-	-	-	-	-	-	-	-	-	-
3	PRF notified u/s-4	1	6720.20	11	15174.98	6	4469.44	-	-	-	-	18	26364.62
4	PRF not notified u/s-4	2	9255.70	9	2551.08	5	4787.93	6	727.14	16	1285.75	38	18607.60
5	Village Forest	14	89.524	3	12.638	-	-	12	77.76	1	20.00	30	199.65
6	Non Forest land mutated in favour of FD	1	436.00	-	-	-	-	-	-	-	-	1	436.00
Total =		**30**	**32154.42**	**34**	**39213.43**	**18**	**24398.37**	**21**	**10628.90**	**27**	**21826.75**	**130**	**128221.87**

Abstract of area statement of Kalahandi South Division

SL. NO	Legal status of the forest Blocks	Name of the Range														Total	
		Biswanathpur		**Dharmagarh**		**Jaipatna**		**Junagarh**		**Th.Rampur North**		**Th.Rampur South**		**Karlapat**			
		No. of Blocks	Area in Ha.	No. of Blocks	Area in Ha.	No. of Blocks	Area in Ha.	No. of Blocks	Area in Ha.	No. of Blocks	Area in Ha.	No. of Blocks	Area in Ha.	No. of Blocks	Area in Ha.	No. of Blocks	Area in Ha.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
1	Reserve Forest	16	17139.00	5	13083.00	8	2992.00	7	5239.00	9	717.00	4	6086.00	-	-	49	45256.00
2	P.F.	1	17.483	-	-	-	-	-	-	-	-	-	-	-	-	1	17.483
3	PRF notified u/s-4	9	11349.02	-	-	-	-	2	327.10	7	9288.59	3	756.19	1	462.00	22	22182.90
4	PRF not notified u/s-4	10	1480.32	-	-	-	-	6	3453.02	1	346.00	-	-	1	760.17	18	6039.51
5	Village Forest	-	-	1	20.00	-	-	-	-	3	20.00	6	60.00	-	-	10	100.00
6	Non Forest land mutated in favour of FD	2	43.261	-	-	1	25.40	-	-	1	22.416	5	322.953	-	-	9	414.03
Total =		**38**	**30029.08**	**6**	**13103.00**	**9**	**3017.40**	**15**	**9019.21**	**21**	**10394.01**	**18**	**7225.14**	**2**	**1222.17**	**109**	**74009.92**

Agriculture:

Please refer general information table above.

Horticulture:

A detail of the land use given by concern authority is as follows;

Sl. No	Crop	Area (in Hects)
1	Fruits	17944.00
2	Plantation Crops	2100.00
3	Spices	5389.00
4	Vegetables	23300.00
5	Flowers	269.00
Total =		49002.00

Mining:

The total area considered for mining activity for all minerals shall be the mining area within the district.

07. SURFACE WATER AND GROUND WATER SCENARIO OF THE DISTRICT.

Please refer Plate-V for details.

08. RAINFALL OF THE DISTRICT AND CLIMATIC CONDITION.

The climate of the Kalahandi District is of extreme type. It is dry except during monsoon. The maximum temperature of the District is 45+ degree Celsius, whereas the minimum temperature recorded as 4^{0}Celsius. The District experiences the average annual rainfall as 1664.633 mm. The monsoon starts late in June and generally lasts up to September.

MONTH WISE RAINFALL DATA OF KALAHANDI DISTRICT

Year	2017	2018	2019
MONTH	AVERAGE RAINFALL in mm	AVERAGE RAINFALL in mm	AVERAGE RAINFALL in mm
January	0	0	1.82
February	0	0	6.2
March	15.52	0	8.63
April	2.46	14.52	10.54
May	16.5	40.12	23.48
June	209.64	106.44	156.98
July	511.85	652.15	454.07
August	342.65	815.76	657.01
September	208.94	231.42	253.3
October	116.66	59.88	--
November	1.16	0	--
December	0	76.18	--
Total	**1425.38**	**1996.47**	**1572.05**

09. DETAILS OF THE MINING LEASES IN THE DISTRICT

No Quarry Lease has been granted for Moorum.

10. DETAILS OF ROYALTY OR REVENUE RECEIVED.

Nil.

11. DETAILS OF PRODUCTION OF MOORUM.

Nil.

12. MINERAL MAP OF THE DISTRICT.

Please refer Plate-V.

13. LIST OF LETTER OF INTENT (LOI) HOLDERS IN THE DISTRICT.

Nil

14. TOTAL MINERAL RESERVE AVAILABLE IN THE DISTRICT.

Reserve & Resource potential Evaluation;

As per UNFC (*United Nations Framework Classification*) of potentials of minerals, A '***Mineral Reserve***' is the economically mineable part of a Measured and/or Indicated Mineral Resource. It includes diluting materials and allowances for losses which may occur when the material is mined. Appropriate assessments, which may include feasibility studies, have been carried out, and include consideration of, and modification by, realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction is justified.

The mineability (Economic Viability) is demonstrated in consecutive Feasibility Assessment stages which may be, in order of increasing detail, Prefeasibility Study and Feasibility Study/Mining Report. A Probable Mineral Reserve may derive from a Prefeasibility study and a Proved Mineral Reserve from a Feasibility Study or mining activity documentation. Hence for the Reserve Potential estimation of the Kalahandi district, the approved Mining Plans of each existing Quarry has been referred as it provides a details of the Mineable & Geological Reserve potentials of the Quarry lease.

Similarly, as per UNFC (*United Nations Framework Classification*) of potentials of minerals A '***Mineral Resource***" is a concentration or occurrence of material of intrinsic economic interest in or on the Earth's crust in such form, quality and quantity that these are reasonable

prospects for eventual economic extraction. The location, quantity, grade, geological characteristics and continuity of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge.

The resource figures are quoted as being of intrinsic economic interest, depending on the results of a Prefeasibility Study and feasibility Study. Generally, only in-situ resource figures are reported at this stage of geological assessment. Mineral Resources are subdivided, in order of increasing geological confidence, into inferred, indicated and measured categories. Portions of a deposit that do not have reasonable prospects for eventual economic extraction must not be included in a Mineral Resource.

For assessment of potential resources of *new sairat sources of Moorum*, a joint field survey has been done and sources has been identified. At this stage of survey, a detail study of each source is not feasible, hence the area of proposed quarry lease has been multiplied with the average height of the respective source to obtain the tentative Geological resources whereas for Mineable resources has been considered about 60% of geological Resources.

Potential Resources of *New Sairat Sources for Moorum*

Sl No.	Name of Tahasil	Name of Proposed source with area in Acre. (Location in Latitude & Longitude)	Proposed source area in (Hectares)	Tentative Geological Resource of Proposed Source in m^3	Tentative Mineable Resource of Proposed Source i.e. 60% of geological Resources in m^3
1	Dharamgarh	Ainlajore Moorum, Khata No.394, Plot No. 519, 1.00 Ac Lat. - 19° 48' 12.12" N Long.-82° 45' 30.97" E	0.404	16188	9713
2	Kesinga	Amtha Moorum, Khata No.427, Plot No. 2620, 12.77 Ac Lat. - 20° 04' 44.44" N Long.-83° 09' 20.97" E	5.167	98847	59308
TOTAL				**115035**	**69021**

The total Tentative Geological & Mineable sand potential of the district shall be the proposed Resource calculated in the above tables, the potentials are as follows;

Category	Tentative Geological Potential in m^3	Tentative Mineable Potential in m^3
Proposed sources	**115035**	**69021**

15. QUALITY/GRADE OF MINERAL AVAILABLE IN THE DISTRICT.

Moorum of the district is suitable for filling purposes of road.

16. USE OF MINERAL.

Moorum of the district is used mainly in the road construction purpose apart from some domestic constructions.

17. DEMAND AND SUPPLY OF THE MINERAL IN THE LAST THREE YEARS.

There is need for Moorum in various infrastructure development project of Govt. Normally Moorum is being used for back filling & approach road levelling etc. So, to fulfil the demand few moorum quarries are proposed.

18. MINING LEASES MARKED ON THE MAP OF THE DISTRICT.

Please refer Plate-VI

19. DETAILS OF THE AREA OF WHERE THERE IS A CLUSTER OF MINING LEASES VIZ. NUMBER OF MINING LEASES, LOCATION (LATITUDE AND LONGITUDE).
Nil

20. DETAILS OF ECO-SENSITIVE AREA, IF ANY, IN THE DISTRICT.

The Karlapat sanctuary over a notified area 147.66 sq.km is located in Kalahandi South Division which is 12km from Bhawanipatna in Kalahandi district covering a dense patch of lush green dry deciduous forest. A beautiful waterfall, 'Phurlijharan' has been developed as a picnic spot for the local visitors and draws large number of visitors from far off places in and around Kalahandi District. Karlapat Wildlife Sanctuary is home to a plethora wildlife animals and birds. The

sanctuary is rich in wildlife such as leopard, gaur, sambar, nilgai, barking deer, mouse deer, soft claws ottawa, a wide variety of birds and reptiles.

21. IMPACT ON THE ENVIRONMENT (AIR, WATER, NOISE, SOIL, FLORA & FAUNA, LAND USE, AGRICULTURE, FOREST ETC.) DUE TO MINING ACTIVITY.

Mining is the extraction of minerals and other geological materials of economic value from deposits on the Earth. Mining adversely affects the environment by inducing loss of biodiversity, soil erosion, and contamination of surface water, groundwater, and soil. Mining can also trigger the formation of sinkholes. The leakage of chemicals from mining sites can also have detrimental effects on the health of the population living at or around the mining site.

As mentioned above, mining activities can harm the environment in several ways.

Impacts on Air

Air quality is adversely affected by mining operations. Unrefined materials are released when mineral deposits are exposed on the surface through mining. Wind erosion and nearby vehicular traffic cause such materials to become airborne. Lead, arsenic, cadmium, and other toxic elements are often present in such particles. These pollutants can damage the health of people living near the mining site. Diseases of the respiratory system and allergies can be triggered by the inhalation of such airborne particles.

Impacts on Water

Mining also causes water pollution which includes metal contamination, increased sediment levels in streams, and acid mine drainage. Pollutants released from processing plants, tailing ponds, underground mines, waste-disposal areas, active or abandoned

surface or haulage roads, etc., act as the top sources of water pollution. Sediments released through soil erosion cause siltation or the smothering of stream beds. It adversely impacts irrigation, swimming, fishing, domestic water supply, and other activities dependent on such water bodies.

High concentrations of toxic chemicals in water bodies pose a survival threat to aquatic flora and fauna and terrestrial species dependent on them for food. The acidic water released from metal mines or coal mines also drains into surface water or seeps below ground to acidify groundwater. The loss of normal pH of water can have disastrous effects on life sustained by such water.

Noise impacts

Noise pollution mainly due to operation of machineries, occasional plying of machineries and drilling & blasting. These actives will create noise pollution in the surrounding area that affects the life of the nearby habitats.

Impact on Soil

Soil disruptions can contribute to the deterioration of the area's flora and fauna. There is also a huge possibility that many of the surface features that were present before mining activities cannot be replaced after the process has ended. The removal of soil layers and deep underground digging can destabilize the ground which threatens the future of roads and buildings in the area.

Impacts on Flora & Fauna

Often, the worst effects of mining activities are observed after the mining process has ceased. The destruction or drastic modification of the pre-mined landscape can have a catastrophic impact on the biodiversity of that area. Mining leads to a massive habitat loss for a diversity of flora and fauna ranging from soil microorganisms to large mammals. Endemic species are most severely affected since even the slightest disruptions in their habitat can result in extinction or put them

at high risk of being wiped out. Toxins released through mining can wipe out entire populations of sensitive species.

22. REMEDIAL MEASURES TO MITIGATE THE IMPACT OF MINING ON THE ENVIRONMENT.

The major potential environmental impacts associated with mining and associated mineral processing operations are related to erosion-prone landscapes, soil and water quality, and air quality. These potential impacts are recognized and addressed in current mining operations as well as in some former mining operations by reclaiming areas of physical disturbance to prevent erosion, stabilizing soils containing metals or chemicals to prevent unwanted metal releases into the environment, preventing and/or treating water contamination, and controlling air emissions.

Mine closure and a number of activities to mitigate the impacts of mining are an integral part of all mine planning and mineral development from the discovery phase through to closure:

Reclamation
Soil treatment
Water treatment
Preventing acid rock drainage
Controlling gas emissions

Air

Mitigation measures suggested for air pollution controls are to be based on the baseline ambient air quality of the project/cluster area and would include measures such as:

- Dust generation shall be reduced by using sharp teeth of shovels.
- Wet drilling shall be carried out to contain the dust particles.
- Controlled blasting techniques shall be adopted.

- Water sprinkling on haul roads, service roads and overburden dumps will help in reducing considerable dust pollution.
- Proper and regular maintenance of mining equipment's have to be undertaken.
- Transport of materials in trucks are to be covered with tarpaulin.
- The mine pit water can be utilized for dust suppression in and around mine area.
- Information on wind diction and meteorology are to be considered during planning, so that pollutants, which cannot be fully suppressed by engineering techniques, will be prevented from reaching the nearby agricultural land, if any.
- Comprehensive greenbelt around overburden dumps and periphery of the mining projects/clusters has to be carried out to reduce to fugitive dust transmission from the project area in order to create clean & healthy environment.

Water

- Construction of garland drains and settling tanks to divert surface run –off of the mining area to the natural drainage.
- Construction of checks dams/ gully plugs at strategic places to arrest silt wash off from broken up area.
- Retaining walls with weep hole are to be constructed around the mine boundaries to arrest silt wash off.
- The mined out pits shall be converted in to the water reservoir at the end of mine life. This will help in recharging ground water table by acting as a water harvesting structure.
- Periodic analysis of mine pit water and ground water quality in nearby villages are to be undertaken.
- Domestic sewage from site office & urinals/latrines provided within ML/QL areas is to be discharged in septic tank followed by soak pits.

Noise

- Periodic maintenance of machineries, equipments shall be ensured to keep the noise generated within acceptable limit.
- Development of thick green belt around mining/cluster area, haul roads to reduce the noise.
- Provision of earplugs to workers exposed to high noise generating activities like blasting, excavtion site etc. Worker and operators at work sites will be provided with earmuffs.
- Conducting periodical medical checkup of all workers for any noise related health problems.
- Proper training to personnel to create awareness about adverse noise related effects.
- Periodic noise monitoring at locations within the mining area and nearby habitations to assess efficacy of adopted control measures.
- During blasting optimum spacing, burden and charging of holes will be made under the supervision of competent qualified mines foreman, mate etc.

Biological Environment

- Development of green belt/gap filling saplings in the safety barrier left around the quarry area/ cluster area.
- Carrying out thick greenbelt with local flora species predominantly with long canopy laves on the inactive mined out upper benches.
- Development of dense poly culture plantation using local floral species in the mining areas at conceptual stage if the mine is not continued much below the general ground level.
- Adoption of suitable air pollution control measures as suggested above.
- Transport of materials in trucks covered with tarpaulin.

23. RECLAMATION OF MINED OUT AREA (BEST PRACTICE ALREADY IMPLEMENTED IN THE DISTRICT, REQUIREMENT AS PER RULES AND REGULATION, PROPOSED RECLAMATION PLAN).

Not applicable as there is no recorded Moorum quarries in the district. Now few new Moorum quarries have been proposed.

24. RISK ASSESSMENT & DISASTER MANAGEMENT PLAN.

Moorum quarry mining shall be operated manually. Bench height may be 02 to 04 mtrs. There is hardly any risky operation.

25. DETAILS OF THE OCCUPATIONAL HEALTH ISSUES IN THE DISTRICT. (LAST FIVE-YEAR DATA OF NUMBER OF PATIENTS OF SILICOSIS & TUBERCULOSIS IS ALSO NEEDS TO BE SUBMITTED).

As per the data provided by CDMO, Kalahandi *Tuberculosis* patients cases of last 5 years is as follows;

Sl No	Year	TB Cases
01	2014	1633
02	2015	1703
03	2016	1629
04	2017	1411
05	2018	1427
06	2019	1224 till 14.10.19

No case of Silicosis recorded in the district.

26. PLANTATION AND GREEN BELT DEVELOPMENT IN RESPECT OF LEASES ALREADY GRANTED IN THE DISTRICT.

As the Moorum quarry lease within the district are non-forest lands rather revenue lands. As per the guidelines prescribed by OMMCR-2016 a safety zone of 7.5m has been considered for all quarry leases all along the inside of boundary line. Plantation proposal has been usually stated in the approved Mining Plans for all quarry leases. Saplings of local plants has been proposed to be planted in the safety zone area of quarries.

27. ANY OTHER INFORMATION.

Kalahandi district has a glorious rich cultural past, rich in agriculture. It is at the northern marginal area of Eastern Ghat Province having potential of several valuable minerals like Bauxite, gem stones, dimension stones, ordinary stones, sand and Moorum etc. Systematic & scientific application of technologies in all fields will definitely enhance the livelihood of the common man of the area and the district can contribute a major part in thriving of the state as well as the nation.

INDEX MAP

PLATE-I

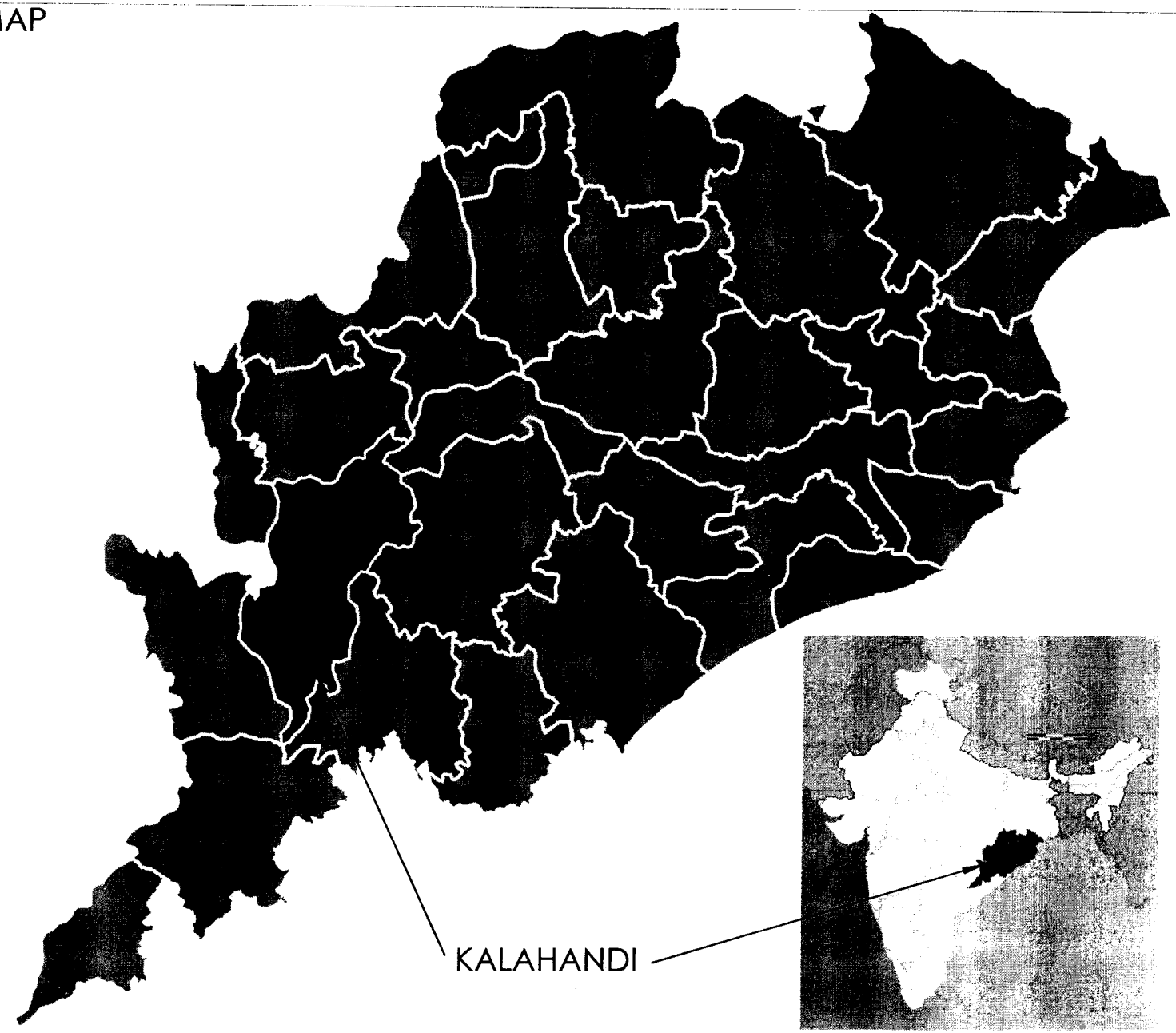

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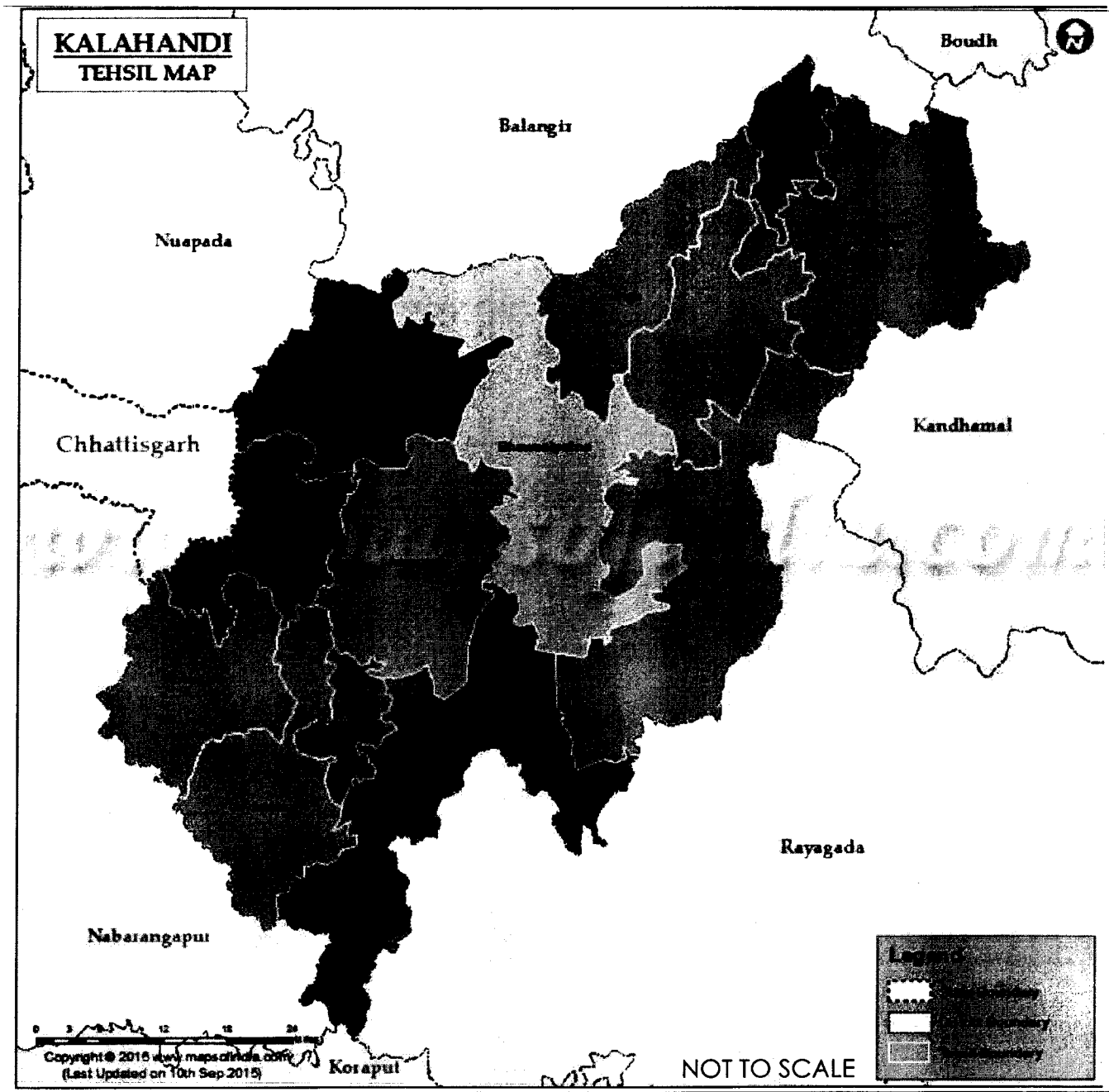
PLATE-II


KALAHANDI
TEHSIL MAP
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Balangir
Nuapada
Chhattisgarh
Kandhamal
Rayagada
Nabarangapur
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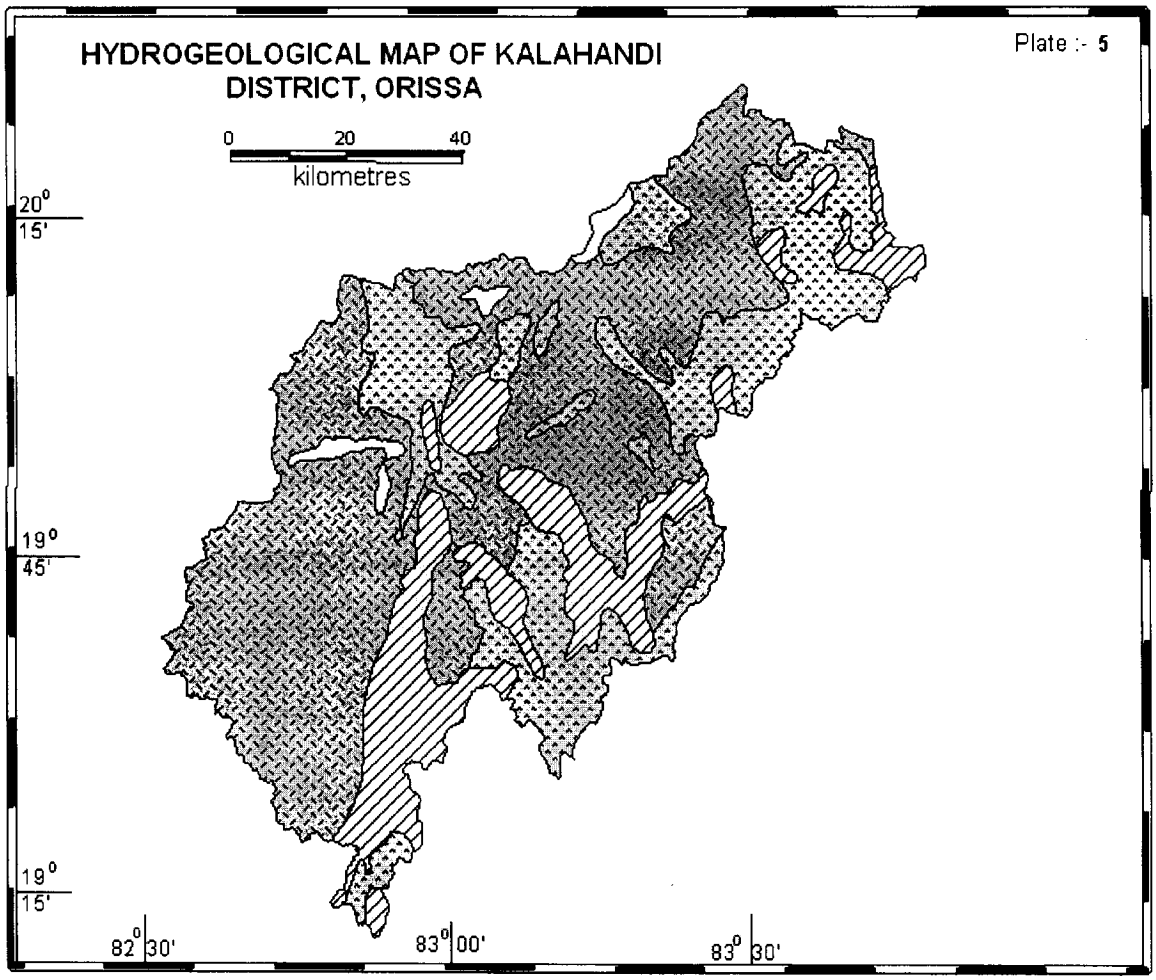

LEGEND

	AGE GROUP	LITHOLOGY	HYDROGEOLOGICAL CONDITIONS POROUS FORMATIONS	GROUND WATER POTENTIAL
UNCONSOLIDATED FORMATIONS	QUATERNARY	RECENT ALLUVIUM, LATERITES & LATERITIC GRAVELS	THIN DISCONTINUOUS PATCHES FORMING SHALLOW AQUIFERS	LIMITED TO MODERATE YIELD PROSPECTS BELOW 20m³/Hr.
CONSOLIDATED FORMATIONS	ARCHEAN	GRANITE & ITS VARIANTS CHARNOCKITES KHONDALITES	FISSURED FORMATION GROUND WATER RESTRICTED TO RESIDUUM AND FRACTURE ZONE HAVING SECONDARY POROSITY	LIMITED TO MODERATE YIELD PROSPECTS BELOW 30 m³/ Hr.