# CHAPTER IV

## MODE OF OCCURRENCE

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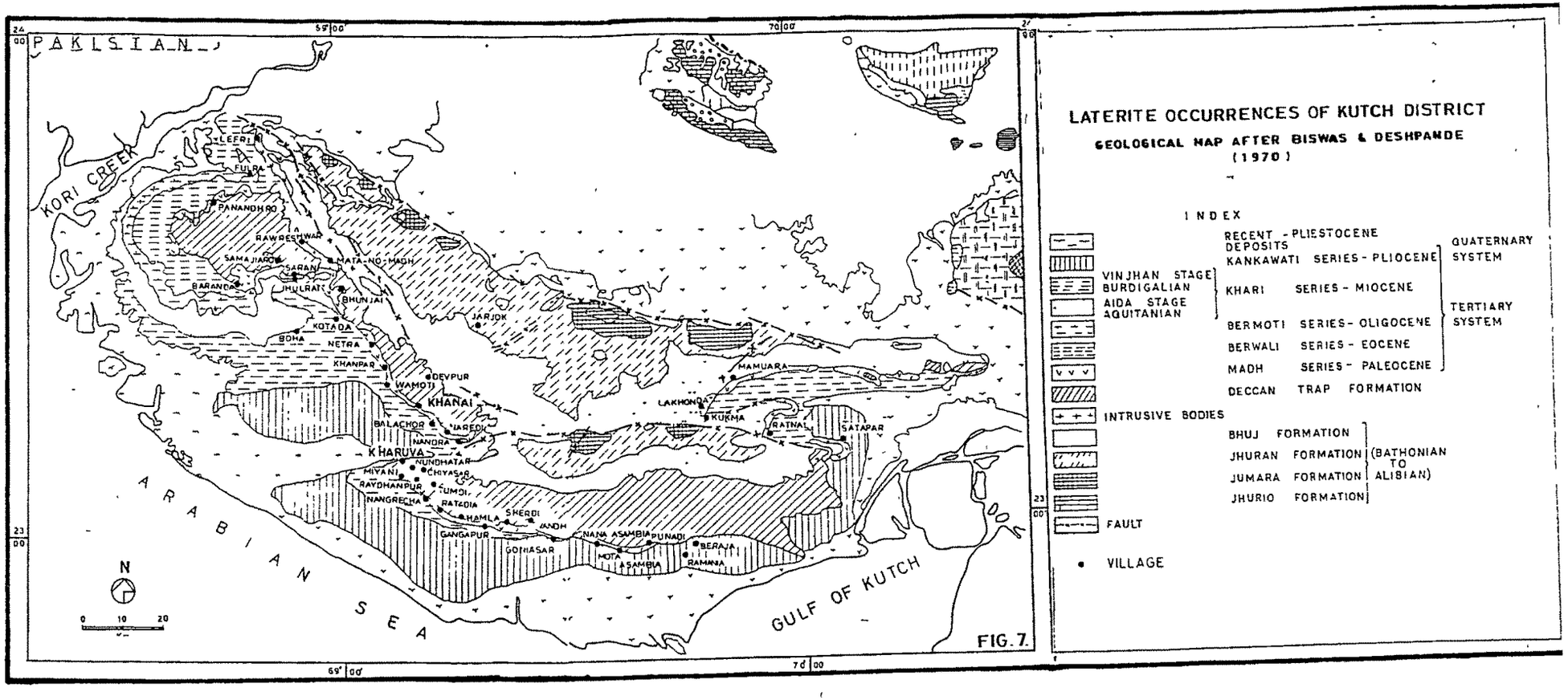
Laterites of Kutch are confined to a long, narrow (1-2km wide) and arcuate belt which extends from Anjar in the east to Panandhro in the northwest (Fig.7). This belt is 20-40 km inland from the coast, fringing the Lower Tertiary shoreline while remaining parallel to sub-parallel to the present coastline.

The laterite occurs in a single, gradational, residual, weathering profile of Palaeocene age ( Madh Series,Biswas,1971), developed over basalts of Cretaceous-Eocene age. This weathering profile consists of several members :-

| | |
|---|---|
| Soil | Top |
| Laterite/bauxite | |
| Kaolinite | |
| Bentonite | |
| Deccan Trap basalt | Bottom. |

All these constitute, what is popularly known as an alteration blanket, which occurs in the form of an elongate belt


PAKISTAN
KORI CREEK
LEFRI
FULRA
PANANDHRO
RAWRESHWAR
SAMAJIARO
SARAN
HATA-NO-MADH
BARANDA
JHULRAI
BHUNJAI
KOTADA
BOHA
NETRA
KHANPAR
DEVPUR
WAMOTI
KHANAI
BALACHOR
JAREDI
NANDRA
KHARUVA
NUNDHATAR
MIYANI
CHIYASAR
RAYDHANPUR
LUMDI
NANGRECHA
RATADIA
HAMLA
SHERDI
JADH
GANGAPUR
GOTHASAR
NANA ASAMBIA
PUNADI
MOTA ASAMBIA
BERAJA
RAMNA
JARJOK
HAMUARA
LAKHONDA
KURMA
RATNAL
SATAPAR
ARABIAN SEA
GULF OF KUTCH
N
0 10 20
69° 00'
70° 00'
23° 00'
24° 00'
FIG. 7.
LATERITE OCCURRENCES OF KUTCH DISTRICT
GEOLOGICAL MAP AFTER BISWAS & DESHPANDE
(1970)
INDEX
RECENT - PLIESTOCENE DEPOSITS
KANKAWATI SERIES - PLIOCENE
QUATERNARY SYSTEM
VINJHAN STAGE BURDIGALIAN
AIDA STAGE AQUITANIAN
KHARI SERIES - MIOCENE
BERMOTI SERIES - OLIGOCENE
BERWALI SERIES - EOCENE
MADH SERIES - PALEOCENE
TERTIARY SYSTEM
DECCAN TRAP FORMATION
INTRUSIVE BODIES
BHUJ FORMATION
JHURAN FORMATION
JUMARA FORMATION
JHURIO FORMATION
(BATHONIAN TO ALBIAN)
FAULT
VILLAGE

described. Extensive exposures of laterite are found in nearly all talukas of Kutch district with the exception of Rapar and Bhachau talukas where only minor occurrences are found. Each exposure was studied and the weathering profile, where available, described as per the norms of The Soil taxonomy of the U.S.Department of Agriculture (1965)..Sampling of the section was only carried out where complete weathering profiles were available. In this work, the laterite has been considered to be part of an altertion blanket, which was formed by insitu pedogenic processes. This process has led to a vertical division into three major soil horizons :-

| | |
|---|---|
| Horizon rich in oxides | $B_{ox}$ (Fe,Al) |
| Horizon rich in silicates (saprolite) | B |
| Horizon of fresh parent rock | C |

Normally, the soil sections are truncated. The A-horizon is always eroded. After The Soil Taxonomy of the U.S.Department of Agriculture (1965),this type of laterite belongs to the aquox sub-group in the group of oxisols which are soft during time of formation. During uplift above the groundwater level,the Fe-rich parts form hard ferricretes, where as the Al-rich parts become hard alucretes (Goudie,1973).

As the formation of this laterite belt is partly dependent upon the physiography and the parent rock geology, a brief account of these is included before the description of the individual laterite exposures.

**Physiography of the laterite bearing areas :-**

The topography of the area where laterite occurs in the Kutch

district is characterised by a series of low arcuate ridges, hillocks and isolated mounds ranging in altitude from 80-100 m above mean sea level. The area is dissected by a series of small nalas and streams mostly of the fold channel type. The terrain therefore is rugged and highly uneven. Towards the coast, the countryside is even or smooth, extensively cultivated, and merging with the coastal plains, while further inland, the terrain becomes very rugged, with long and high hill ranges, rising 150 - 300 m above mean sea level. This latter part forms the central high lands or main watershed of the peninsula.

All the major rivers and streams originate here and flow radially outwards. The Great and Little Ranns of Kutch and the expanse of mud and salt flats, border the district to the north and east. The Gulf of Kutch in the south, separates the Saurashtra peninsula from the rest of the district, while the waters of the Arabian sea form its western borders. The important rivers and streams flowing through the area are the Nag,Khari, Rukmavati, Kharod, Vengdi and Kankawati which drain into the Gulf of Kutch in the south through the bauxite areas of Mandvi and Abdasa talukas. The streams Naira, Miti, Khari, Barkhan and Rakhdi, flow westward, through the bauxite areas of Abdasa and Nakhatrana talukas into the Arabian sea to the west. The Kali river flowing north into the Kori creek is the only main stream which courses through the laterite areas of Lakhpat taluka. All these rivers are seasonal, with water flowing only during the monsoon period. Many artificial small lakes have been created on these rivers by costruction of small dams across their channels to preserve water for irrigation purposes. The low ridges and hillocks of the

laterite bearing areas have an east-west alignment in Mandvi taluka, and form a fairly continuous range from Miyani in the west (in Abdasa taluka) to Ramania in the east over a length of about 50 km. Thier northern margins rise sharply from the general ground level to a height of about 5 - 15 m forming steep escarpments.

In Nakhatrana, Abdasa and Lakhpat talukas, the trend of these ranges is roughly NW - SE over a length of about 80 km Here the escarpment slope generally faces west.

The ridges are long, narrow and form parallel ranges, separated by shallow valleys, which are generally cultivated. At some areas, as at Wandh, Naredi and Khanpur, the ridges are fairly broad and arcuate, forming numerous broad, roughly circluar valleys with several isolated mounds and hillocks. They present a panorama of vivid colours of red, pink,lavender,purple, yellow and white which contrast sharply with the drab greys and browns of the surrounding country.

**Structure of the laterite bearing areas :-**

The Trap basement, on which the laterite rests, has a highly eroded, uneven surface. Numerous basins, valley ridges, hills, etc. appear to have been carved on the Trap before the laterite was formed. The laterite follows the slopes of the Trap ridges and mounds. The Trap outcrops at a ground level of 50-60 m above mean sea level in the laterite terrain and are some 2-20 m below the laterite surface. Frequently conical hillocks and plateaus of Trap rise abruptly in the laterite area forming inliers. Parallel ridges of Trap covered by laterite with intervening

valleys filled by Tertiary sediments are common sometimes. The Trap slopes rise steeply from the laterite margins forming high peaks, as between Wandh and Goniasar, near Jarjok, Chiyasar and Nangrecha. In the southern parts of the district, Trap outcrops in the form of a long belt from Anjar in the east to Miyani in the west. In the eastern and central parts, up to Hamla, over a distance of about 75 km the Trap occupies the low lands between the 30 and 50 meter contours with low peaks rising occassionally above 80 to 100 m above sea level. Beyond Hamla to the west, there is a marked change from this, and the Trap in this sector forms high, broad plateaus dominating the area with peaks which rise 150 - 200 m above mean sea level. The width of this plateau is about 16 km between Kotada and Nangrecha and tapers sharply to the west before ending in a conical abutment against the Tertiary sediments just before Miyani. The southern flanks are steeply sloping with lower reaches overlapped by Tertiary sediments.

It appears as if this portion of Trap ridges had been thrown up during faulting. Along the northern margins of this plateau, the laterite and the Tertiary sediments show steep dips which become vertical between Chiyasar and Jarjok. Earlier workers have also denoted a long fault zone between Jarjok and Miyani. From Nangrecha in the south and around the tip of the ridge near Miyani upto Jarjok in the north, the ground is covered with Trap rubble. Boulders and pebbles of Trap generally with smooth, rounded or semi-rounded margins with soil embedding them, cover the laterite and other sediments. The rubble must have resulted due to the crushing and fracturing during faulting. This kind of Trap rubble cover over laterites is not observed in the eastern regions beyond Hamla, nor in the northern portions beyond Jarjok.

Evidences of other minor faulting in the laterite are observed at a few places both north and south of this Trap ridge at Jarjok, Chiyasar, Nangrecha and Hamla and as far east as Wandh. These are of the nature of slicken-slides and crushed zones in the laterite, perhaps connected with the major faulting mentioned before.

Further north, near Netra, another fault has been postulated by earlier workers resulting in the juxtaposition of laterite and older Jurassic formations. Beyond this to the NW, Trap forms a large inlier surrounded by Tertiary sediments between Baranda and Faulra.

While in the south, the Trap ridges penetrate far into the Tertiary zone upto Miyani, the Tertiary sediments form a complementary, deep in-road into Trap country between Naredi and Kotada as far east as Roha. The high hill just north of Roha is capped by Miocene sediments thus indicating a palaeo-gulf. Beyond Roha, to the NW,the alignment of Trap outcrops is NW-SW and it becomes narrower and more linear, with minor inundation of the Tertiary valleys. The laterite in the southern sector (Mandvi taluka) is broadest at Wandh which lies roughly in the centre of the belt. The overall width here is 2 km, gradually tapering out both to the east and the west with extremities being hardly 100 m wide. While at Wandh, the laterite forms broad arcuate ridges, from Nana Asambia to Tumdi in the east and from Gangapur to Nangrecha in the west. These ridges often show opposed dips indicating synclinal and anticlinal structures. The northern-most set of ridges along the main laterite/Trap contact show southerly dips. The ridges along the southern laterite/Tertiary contact

have the same attitude, while the ridges in between show dips opposed to those mentioned above. The valleys between these ridges are generally covered with alluvium and are cultivated. Many pits excavated on the margins near the laterite ridges show that these valleys are filled with Tertiary sediments. At Tumdi, Hamla and Ratadia, Trap outcrops in valleys while in a few cases, bentonite has also been observed.

Beyond Nangrecha, upto Miyani, the laterite zone becomes narrow and occupies the lower most slopes of the high Trap plateaus with southerly dips. Between Miyani and Jarjok, on the northern slopes of the same Trap plateau, the width of the laterite is only 50 m while the dip of the laterite in all parts is very low, viz. $5^0$ to $10^0$, steep dips to the north have been observed between Miyani and Chiyasar ($30-50^0$) and the laerite becomes vertical between Chiyasar and Jar jok. Beyond this point dips are again low as usual. the vertical attitude of laterite is not reported in any other part of the neighbourhood hence it must be the effect of structural distrbance (faulting)which must must have taken place after the deposition of Gaj beds, which are also affected similarly.

From Jarjok to southwest of Roha, (khirsota) the laterite forms a long ridge (100-200 m wide) with a southwest-northeast trend showing low dips to the north and northwest. Between khirsota and Nadra it veers sharply to the northwest for 2 km to the east of Naredi, ending in the Kankawati river. The dips are southerly or southeasterly. These two ridges, thus form a broad synclinal valley beteen Naredi and Kotada which is filled with Gaj sediments. From Naredi, the laterite ridge trends northwest upto

Mata-no-madh, in Lakhpat taluka, for a distance of 50 km.

At Wandh, in Mandvi taluka and also in Nakhatrana/Abdasa/ Lakhpat talukas, the laterite fringes around semicircular or oval inliers of Trap which form sharp depressions resembling small craters covered with lithomarge or soil.Occassionally,these Trap inliers form low conical hills or domes with the laterite bands occupying their lower most slopes. Isolated hillocks and mounds capped with a thin crust of laterite are common. The laterite topography in the southern sector is characterised by long narrow east-west trending parallel ridges. In the rest of the district, broad, arcuate ridges and isolated mounds are conspicuous.

The most striking feature is the escarpment slope along the contact with Trap, with the scarps varying in height from 1-20 m. The formations exposed, exhibit vivid colours, the red and pink of laterite contrasting with the white, grey and lavender of the clayey zones below. The crestal margins of these scarps are always in the form of a tenous, arcuate line with erosional breaks. They are very steep (freqently vertical) and rise sharply from the ground level. These scarps appear to have been formed by erosion, acting on the thin Tertiary cover deposited on the crests of the Trap ridges, hills and domes. The lithomarge and clayey zones, underlying laterite, being soft formations are more susceptible to weathering and were thus, scooped out to form caves with laterite roofs. These in time, collapsed under their own weight, causing erosion of the scarp margins with steeper slopes and increased height.

The dip slopes towards the Tertiary contact of these laterite

ridges have very low angles, generally $5^0 - 10^0$ and rarely $20^0$. Mninature scarps on the dip slopes are found along the bauxite and Tertiary contact lines at Wandh, Naredi and Nandra.

Tertiary sediments are also found capping the highest portion of laterite ridges at many places. This leads to the inference that after the formation of laterite, there was a period of erosion of the laterite, before subsidence, as depressions and basins scooped out in the laterite are seen to be filled by Tertiary sediments.

**TALUKA WISE DESCRIPTION OF THE INDIVIDUAL LATERITE EXPOSURES :**

**ANJAR TALUKA**

**1. Satapar :- (LST)**

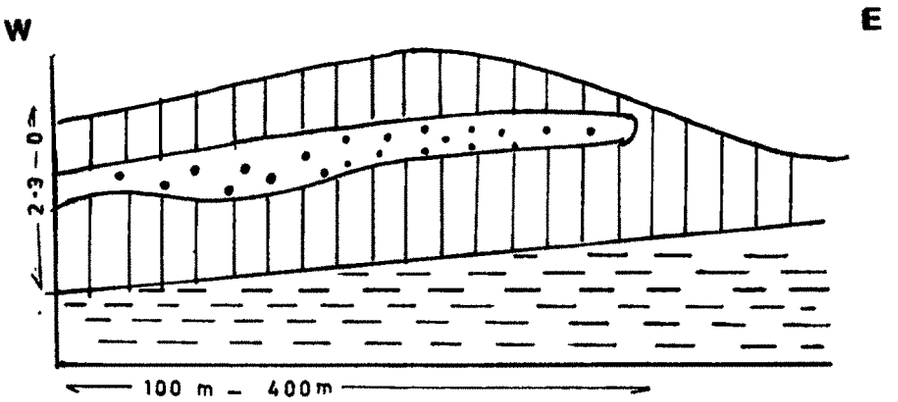
A small chain of hillocks situated at a distance of 2.5 km southwest of Satapar and 7km northeast of Anjar, show a good workable pocket of bauxite in the lateritic horizon. The area is situated at a distance of 900 m from the Anjar-Rapar road. The general trend of the ridge is WNW-ESE, with the escarpment towards the north and gentle slopes towards the south. The section is as follows (Fig 8):

| | | |
|---|---|---|
| Ferricrete | (laterite) | B (Fe,Al)ox |
| Alucrete | (bauxite ) | |
| Saprolite | | |

**2. Ratnal :- (LST)**

Laterite ridges having an east-west alignment are found at a distance of 1 km NW of Ratnal and about 1 km east of the Bhuj Anjar railway line. Impure bauxite is found in the laterite

SATAPAR ( Anjar Taluka )



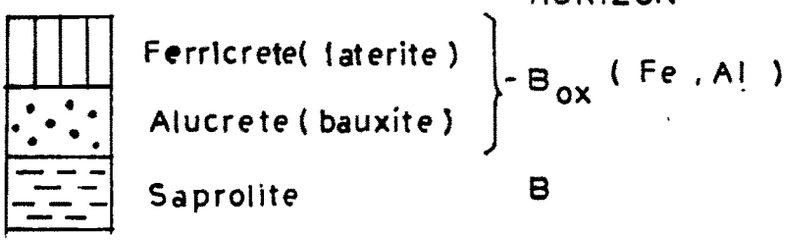
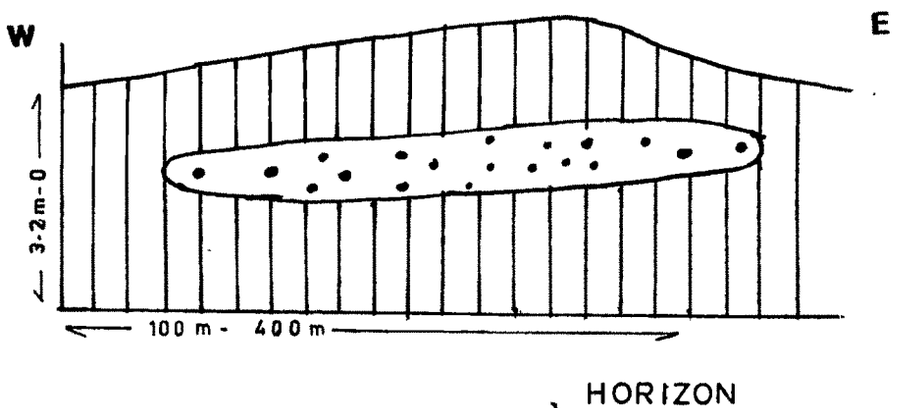




FIG. 8

RATNAL ( Anjar Taluka )



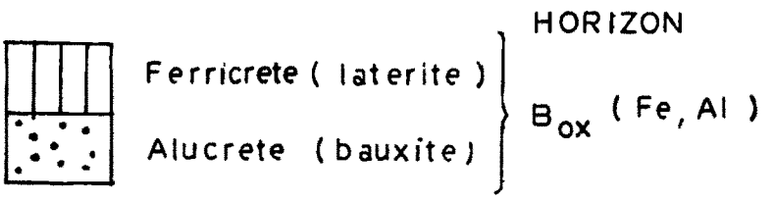




FIG. 9

horizon. Below this the sequence is not exposed. The section is as follows (Fig 9):

| | | |
|---|---|---|
| Ferricrete | (laterite) | B (Fe,Al) ox |
| Alucrete | (bauxite ) | |

**BHUJ TALUKA.**

**3. Kukma :- (LST)**

A small patch of impure bauxite is located 500 m northewst of kukma on the side of the road leading to Bhuj. Laterite is seen at a slightly higher elevation towards the northwest. The rest of the sequence remains unexposed (Fig. 10):

| | | |
|---|---|---|
| Ferricrete | (laterite) | B (Fe,Al) ox |
| Alucrete | (bauxite ) | |

**4. Lakhond :- (LST)**

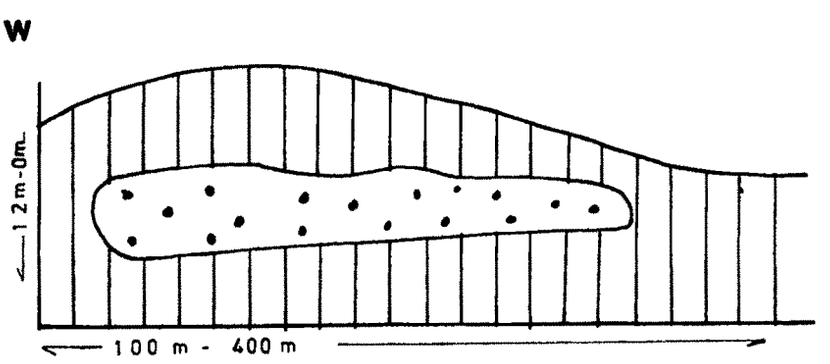
A small pocket of impure bauxite is noticed at a distance of 1.5 km SSW of the village. This pocket shows a steep scarp towards the north and gentle slopes towards the south. The escarpment section reveals the following sequence (Fig 11):

| | | |
|---|---|---|
| Alucrete | (bauxite) | B (Fe,Al) ox |
| Saprolite | | B |

**5. Mamuara :- (LST)**

A long narrow east-west trending belt of laterite running for a distance of 3 km near Mamuara, contains good horizons of

KUKUMA ( Bhuj Taluka )



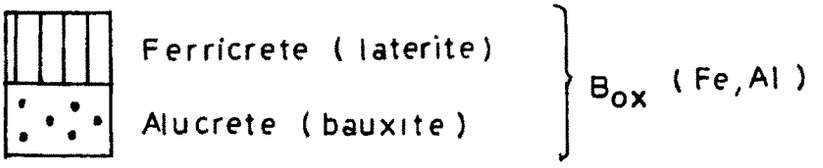
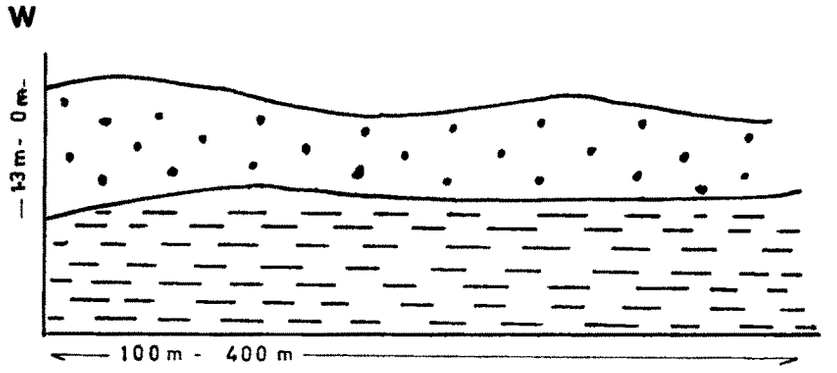




FIG 10

LAKHOND ( Bhuj Taluka )



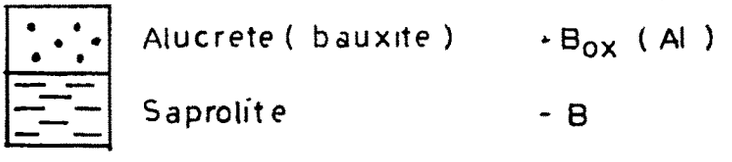




FIG. 11

impure bauxite.



The laterite ridges have escarpments towards the north and gentle slopes towards the south. The typical scarp section is (Fig 12):

| | | |
|---|---|---|
| Ferricrete | (laterite) | B (Fe,Al) ox |
| Alucrete | (bauxite) | |
| Saprolite | | B |

The laterite section rests on Bhuj sandstones directly without any overburden or Tertiary cover.

**MUNDRA TALUKA**

**6. Beraja :-**

A small patch of laterite is found to the north of the viilage (Fig 13)

**7. Ramania :-**

Scattered low lying laterite humps commence from the Nag river and continue for about 3 km toward the west (Fig 14)

**MANDVI TALUKA**

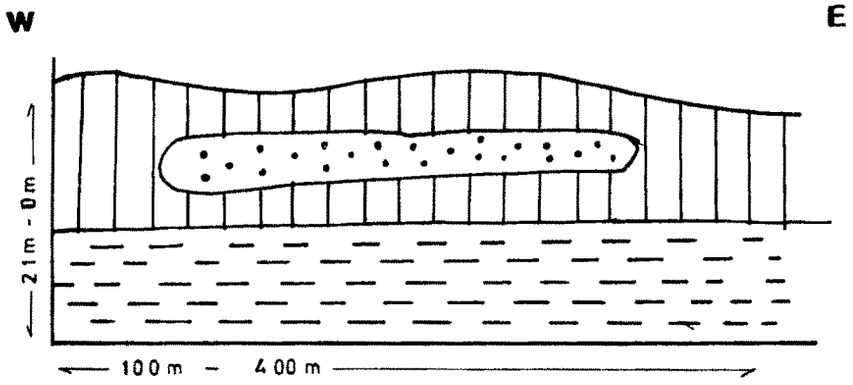
**8. Punadi :-**

A laterite ridge running in an east-west direction is found on the road to mandvi from Bhuj. Laterite and impure bauxite are found exposed here. The bauxite is massive, bouldery in nature and grey in colour (Fig 15)

**9. Mota Asambia and Nana Asambia :- (LST)**

This exposure is about 40 km from Bhuj and 25 km from Mandvi.

MAMUARA ( Bhuj Taluka )



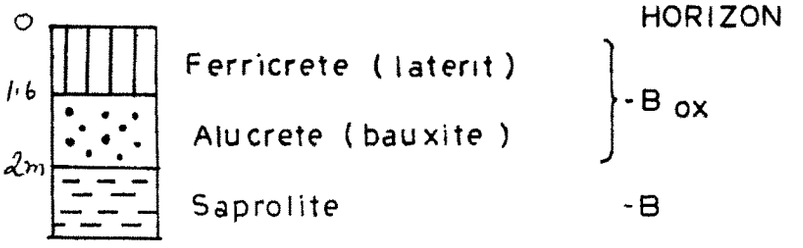
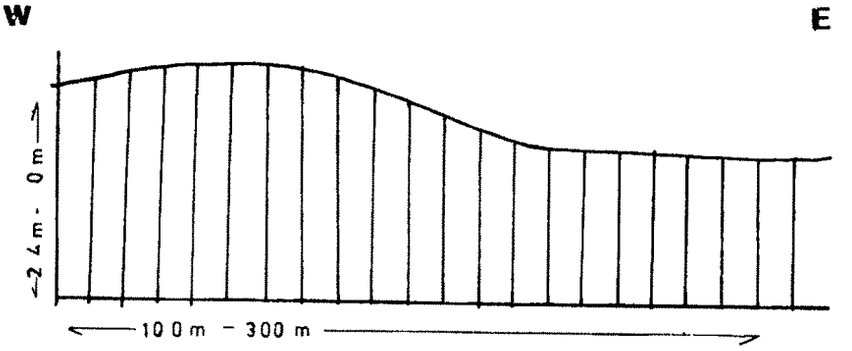




FIG.12

BERAJA ( Mundra Taluka )



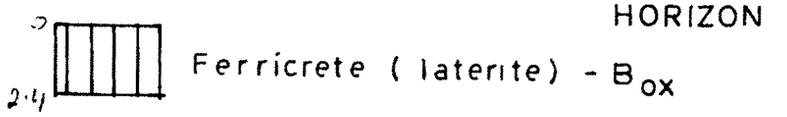




FIG.13.

RAMANIA ( Mundra Taluka )

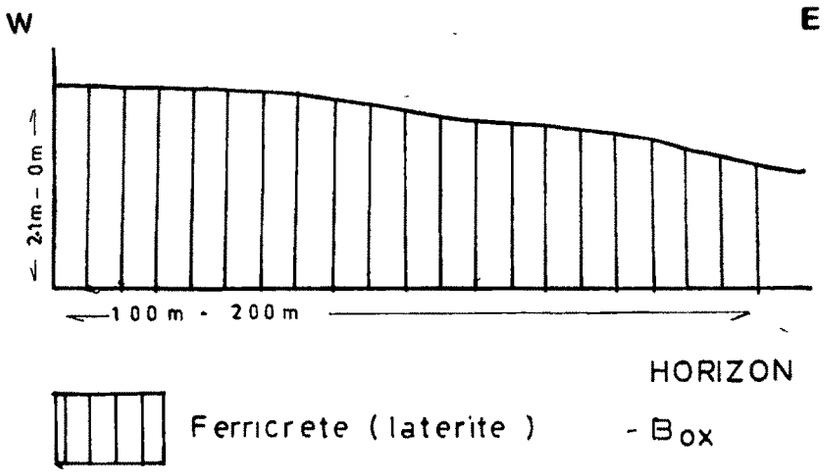



FIG 14

PUNADI ( Mandvi Taluka )

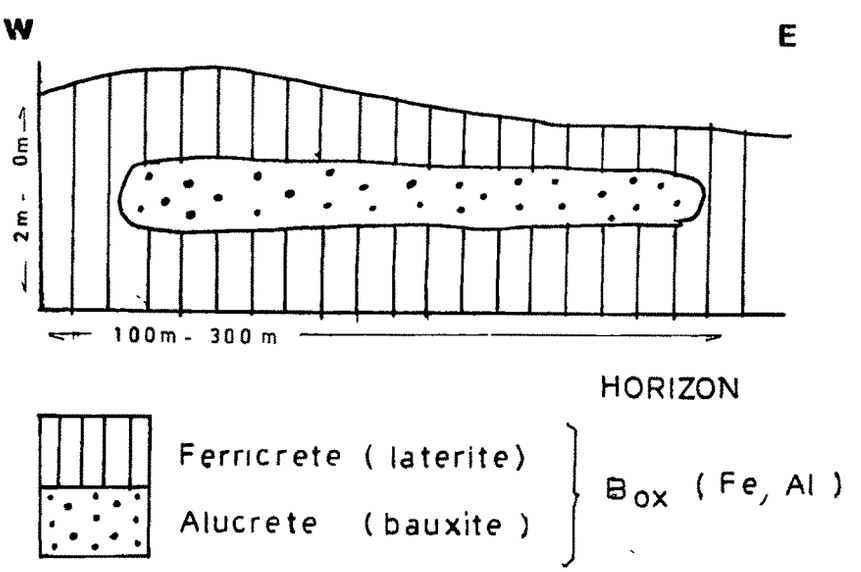



FIG.15.

The laterite is found occurring in the form of two sets of parallel ridges running in an east-west direction. The approximate distance between the ridges is 1 km. Fine grained basalt is found exposed on the northern slopes of the laterite ridges. Gaj limestones are found exposed in the intervening valley between the two laterite ridges. The northern scarps of the laterite ridges exhibit the following sequence (Fig 16):

| | | |
|---|---|---|
| Ferricrete | (laterite) | B (Fe,Al) ox |
| Alucrete | (bauxite ) | |
| Saprolite | | B |
| Altered basalt | | |
| Fresh basalt | | C |

The sequence represents a nearly ideal laterite succession ranging from fresh rock to the ultimate weathering product.

**10. Goniasar Mota and Goniasar Nana :- (HST)**

The laterite occurrence near these two villages is situated about 70 km due southeast of Bhuj and 20 km north of Mandvi. Small outcrops of laterite are seen on the banks of the Rukmavati river. Between these patches and the Mithai stream a concretionary limestone cover is seen in which a couple of small laterite inliers are exposed.

The section along the mithai stream is as follows (Fig 17)

| | | |
|---|---|---|
| Ferricrete | (laterite) | B (Fe,Al) ox |
| Alucrete | (bauxite ) | |

MOTA ASAMBIA & NANA ASAMBIA ( Mandvi Taluka )

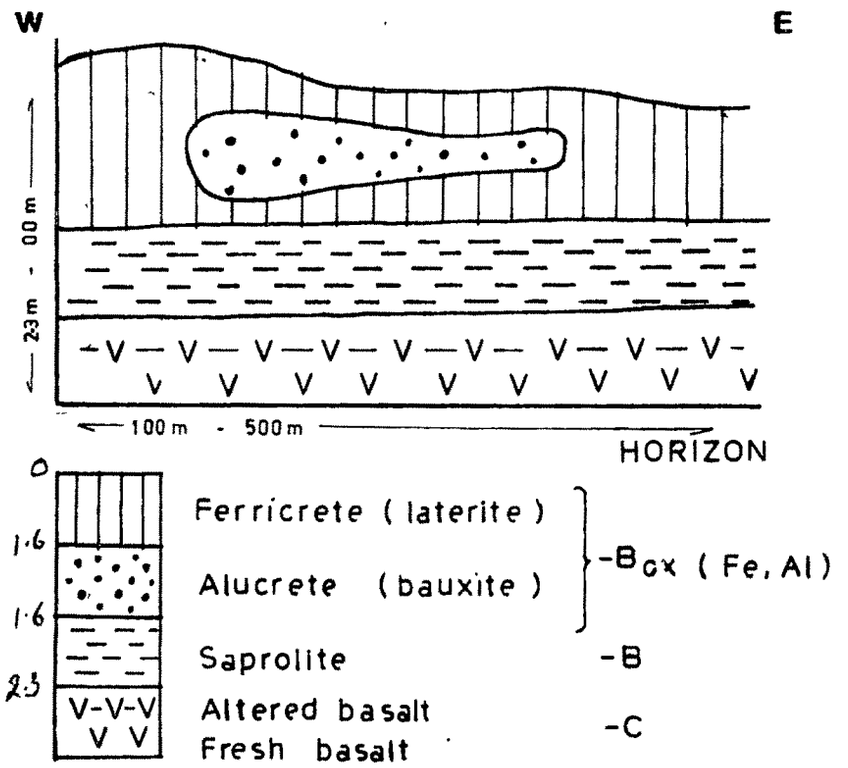



FIG. 16

GONIASAR MOTA ( Mandvi Taluka)

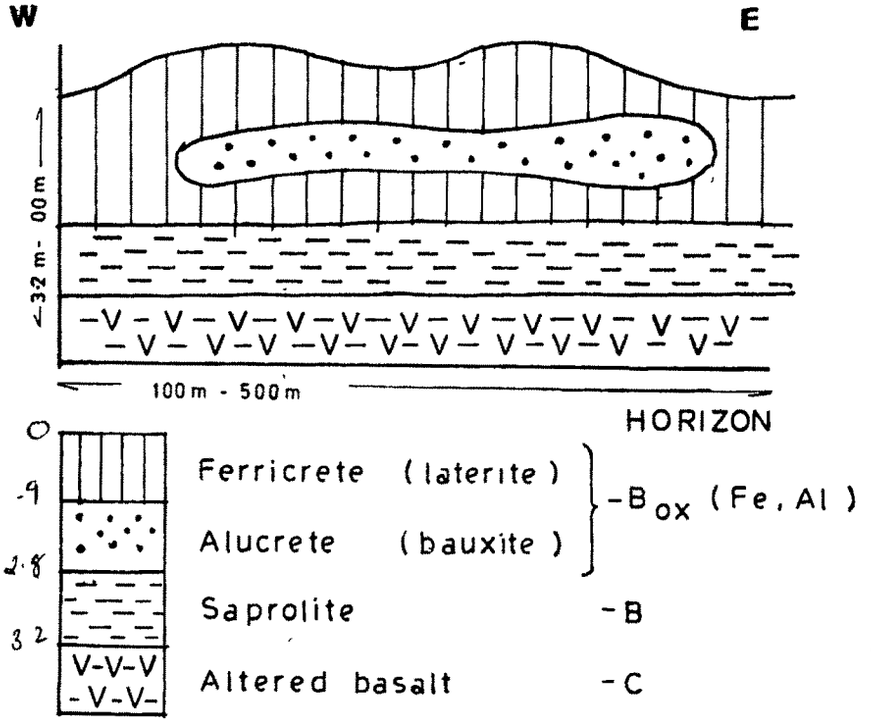



FIG. 17.

| | |
|---|---|
| Saprolite | B |
| Altered basalt | C |

The western portion of this pocket produces nodules of impure bauxite.

South of the above pocket, bentonite is quarried. A small patch of good bauxite is seen at the eastern end of a long narrow laterite ridge, trending east-west and fringing the Trap hill. The northern margins of this ridge represent a scarp dropping steeply to the basement, while Gaj formations overlap the southern margin.

The section of the hillock on the eastern flank is as follows (Fig 18)

| | | |
|---|---|---|
| Ferricrete | (laterite) | B $(Fe,Al)_{ox}$ |
| Alucrete | (bauxite) | |
| Saprolite | lithomarge<br>bentonite | |

West of the above pocket, the laterite widens out to a width of 400 m. The northern margins are lateritic while the central and southern parts are bauxitic in nature.

**11. Wandh :- (HST)**

This village is situated about 45 km from Bhuj and 30 km from Mandvi. The laterite exposures lie 2-3 km south, southwest and southeast of this village.

GONIASAR MOTA ( Mandvi Taluka )

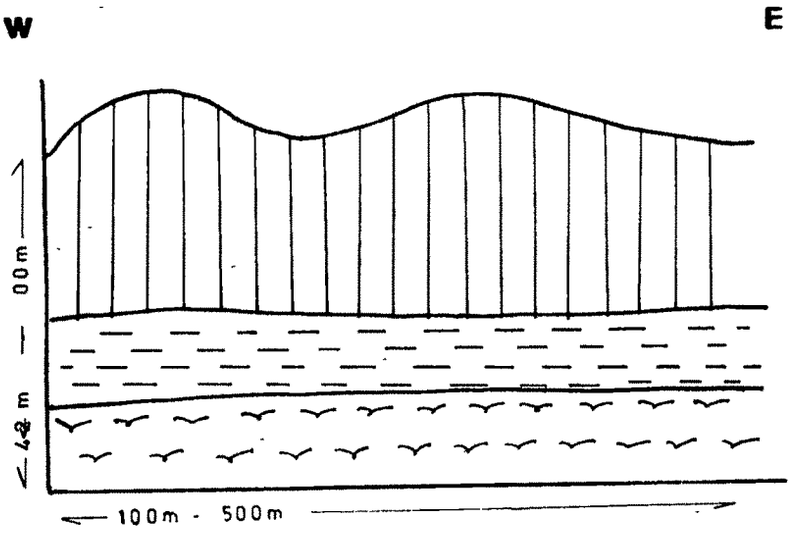



FIG. 18

WANDH ( Mandvi Taluka )

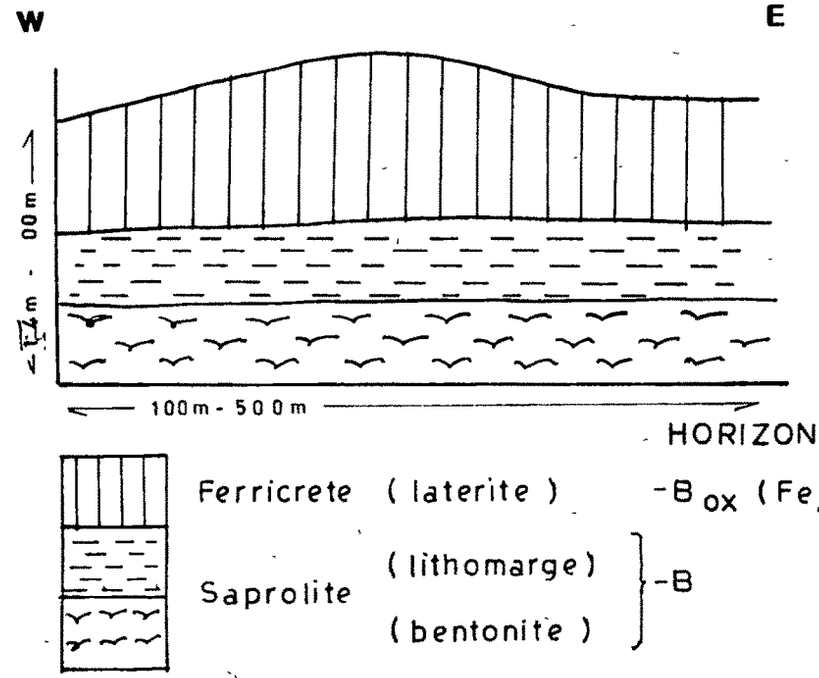



FIG. 19

Small patches of aluminous laterite are seen in the form of isolated outcrops in the saprolite which is exposed in the intervening valley between two laterite ridges.

Another patch south of the above one, has a ring of laterite forming the topographic high while bauxite is confined to a depression in the centre of it.

The above patches fringe around 3 inliers of Trap, situated south and southwest of the hillock, on which Jakh temple stands. 3 km west of Wandh village, bentonite is found occurring beneath a small mound of laterite. The surrounding area has a subnormal relief and the vegetation, as in the other areas, remains sparse. The soil is black and is highly cracked on the surface.

The boundary between the soil and the laterite is abrupt and irregular. The laterite below the boundary is reddish to purplish red, hard and concretionary.

Below the laterite comes the zone of white clay (lithomarge). The boundary separating the two is abrupt and irregular. The thickness of this zone varies greatly as there is a lot of pinching and swelling. the lithomarge is whithish to greyish-white with occassional tinges of red and pink.

---

The section here is as follows (Fig 19)

| | | |
|---|---|---|
| Ferricrete | (laterite) | B $(Fe,Al)_{ox}$ |
| Saprolite | white clay (lithomarge ) bentonite | B |

The bentonite underlies the lithomarge with a gradual and irregular boundary and exhibits various hues of colours like bottle green, dirty yellow and reddish brown. When freshly dug, it is in an extremely moist and plastic state.

In another pit of the same mine, which has been dug some 18 m away from the laterite hill, the section changes completely with the disappearance of the intermittent laterite and lithomarge. Instead, bentonite is found underlying a thin soil cover of about 1m with an abrupt and irregular boundary.

| | |
|---|---|
| Ferricrete | (laterite) $B_{ox}$ (Fe,Al) |
| Saprolite | (bentonite) |

12. **Sherdi :- (HST)**

A large bentonite mine is located 1.5 km east of Sherdi. The vegetation is sparse consisting mainly of shrubs and small bushes.

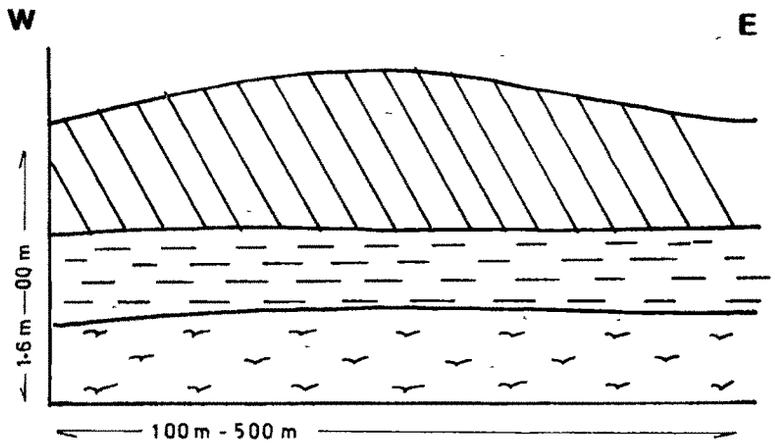
In this mine, there is no laterite capping, instead, there is a soil cover followed by lithomarge and bentonite. The succession in the mine section is as follows (Fig 20):

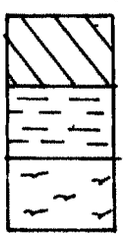
| | |
|---|---|
| Soil | A |
| Saprolite white clay (lithomarge)) bentonite | B |

The top of the soil is highly cracked.

The band of lithomarge varies in thicknes from north to south of the mine. It is whitish to greyish with occassional tinges of the pink. Amygdaloidal structure is slightly retained. Small blebs of reddish material is seen in the cavities which were

SHERDI ( Mandvi Taluka )



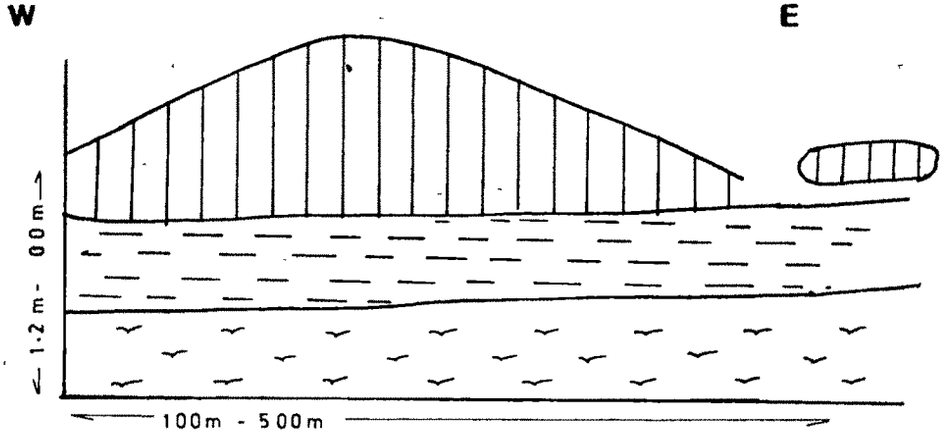



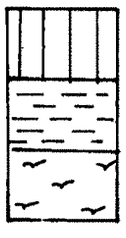
Soil — HORIZON -A

Saprolite ( lithomarge ) ( bentonite ) — -B

FIG. 20

SHERDI (Mandvi Taluka )



Ferricrete ( laterite ) — HORIZON -$B_{ox}$(Fe, Al )

Saprolite ( lithomarge) ( bentonite ) — -B

FIG. 21

originally supposed to be phenocrysts.

Another mine is located about 500 m southwest of the above site. The laterite capping on the eastern flank is in the form of a hillock. the lithological variation in the vertical section is as follows (Fig 21) :

| | | |
|---|---|---|
| Ferricrete | (laterite) | B (fe,Al) ox |
| Saprolite | white clay (lithomarge)) bentonite | B |

**13. Gangapur :-**

South of Gangapur, four humps of laterite are noticed. The laterite is very small in extent and with thin patches of aluminous laterite.

North of Gangapur area in the Rakhal, the laterite encrusting the long Trap ridges has small pockets of impure bauxite. The southern margins of these pockets show highly ferruginous formations of later age (Laki ?). Gaj sediments are encountered further south (Fig 22).

**14. Hamla :- (HST)**

About 3.5 km south of village Hamla, in the bend of Kharod river, a laterite section is seen which indicates a low dip of laterite towards the south. This evidence proves that the laterite may extend below the soil cover or Tertiary sediments towards the south.

There are three isolated parallel ridges of laterite running

GANGAPUR ( Mandvi Taluka )

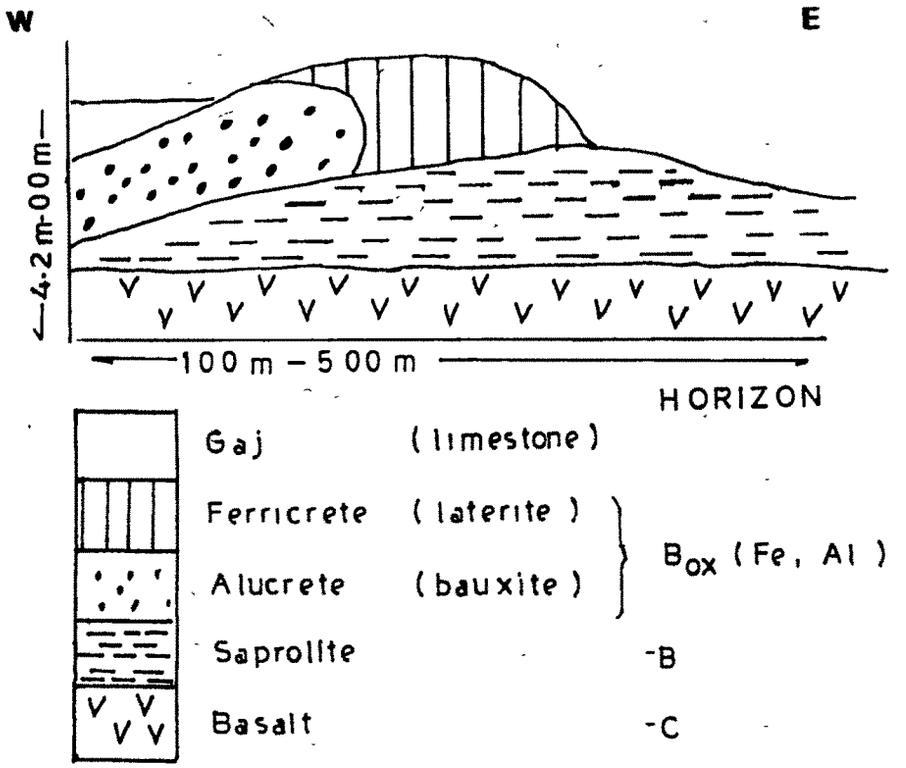



FIG 22

HAMLA ( Mandvi Taluka )

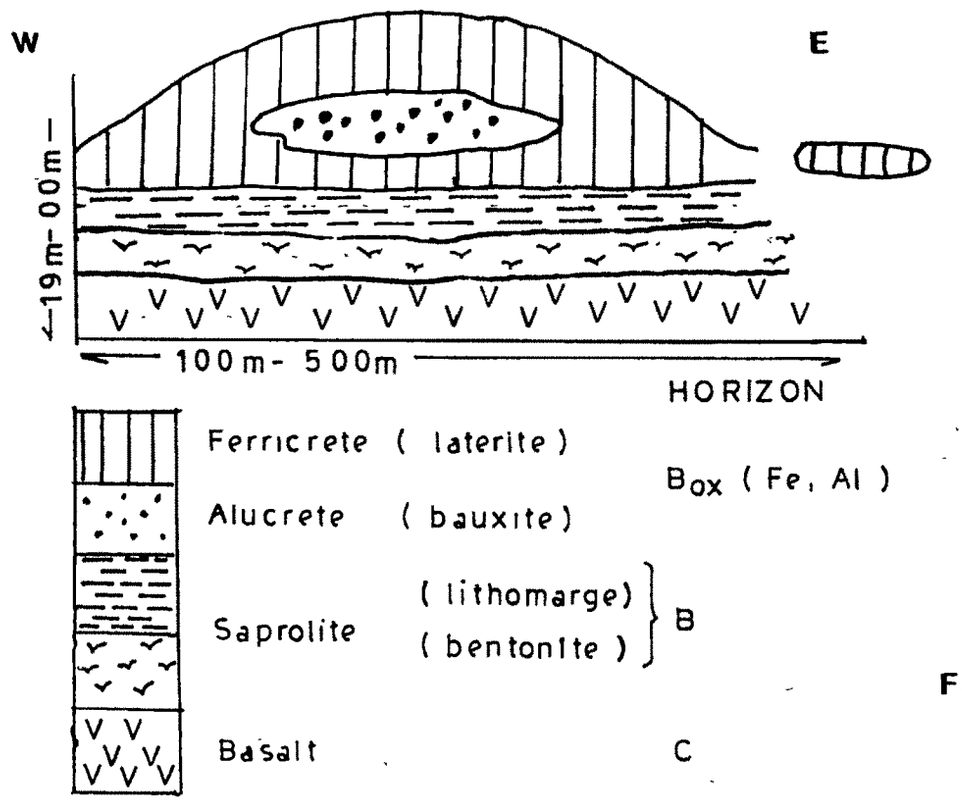



FIG 23

in an east-west direction. Tertiary sediments are seen in the intervening valleys between these parallel ridges. Some small patches of brecciated laterite are found in humps.

The bentonite mine is located 1 km south of Hamla and is situated under a small laterite hillock. The surrounding countryside has a subnormal relief with small hillocks of laterite dotting the landscape. The bentonite is mined from two pits, one is in the east and the other in the west. The eastern pit shows the following section (Fig 23):

| | | |
|---|---|---|
| Ferricrete | (laterite) | B (Fe,Al) ox |
| Saprolite | white clay (lithomare)) bentonite | B |

In the western pit, there is no laterite capping or lithomarge but only a thin cover of 1m thick black soil. The surface is marked with huge cracks. The boundary between the soil and the underlying bentonite is abrupt and irregular. The bentonite texturally and structurally resembles the bentonite found in the eastern pit.

There is another mine 2 km southeast of Hamla on the southern part of a laterite hill. The lithological variation in the mine is :

| | | |
|---|---|---|
| Ferricrete | (laterite) | B (Fe,Al) ox |
| Alucrete | (bauxite) | |
| Saprolite | (white clay (lithomarge)) (bentonite) | B |

Trap basalt C

The soil is reddish-black in colour and its surface is marked with cracks. The boundary separating the soil and the underlying laterite is abrupt and irregular. The laterite belt is reddish and concretionary in nature and has a varying thickness.

Towards the south, after a distance of only 20-30 m, lithomarge is absent and bentonite is found underlying a thin soil cover. The black soil has its surface marked with cracks. The boundary separating the soil and the underlying bentonite is abrupt and irregular.

Another mine is located some 1.5 km south of Hamla. Bentonite occurs in the centre of a circle of small laterite hillocks.

The quarry has been dug on the southern base of a laterite hillock. The lithological variation in the mine section is as follows :

| | | |
|---|---|---|
| Ferricrete | (laterite) | B (Fe, Al) ox |
| Saprolite | white clay (lithomarge) | |
| | bentonite | B |

**15. Nana Ratadia and Mota Ratadia :- (HST)**

A laterite belt running NNW-SSE is situated 1.5 km southwest of the village. Bauxite is found in pockets. One of the major pockets is situated 1.5 km southwest of the village. The laterite outcrops in the form of narrow, low lying mounds, about 3.5 m in height. This laterite belt is bordered by the Deccan Trap towards the north and Gaj limestone towards the south. Small

intervening patches of ferruginous clays, bentonite and lithomarge are also noticed. Generally escarpments are seen toward the north and gentle slopes of $2^{0}$ - $4^{0}$ towards the south (Fig 24 )

**16. Tumdi (HST) :-**

The laterite belt near Tumdi has got quite a few deposits of impure bauxite which are situated south, southeast and southwest of the village, on the banks of the river Khari.

The surrounding country side has a subnormal relief with small hillocks pock-marking the area occassionally. The vegetation is sparse and consists mainly of bushes and dry gress.

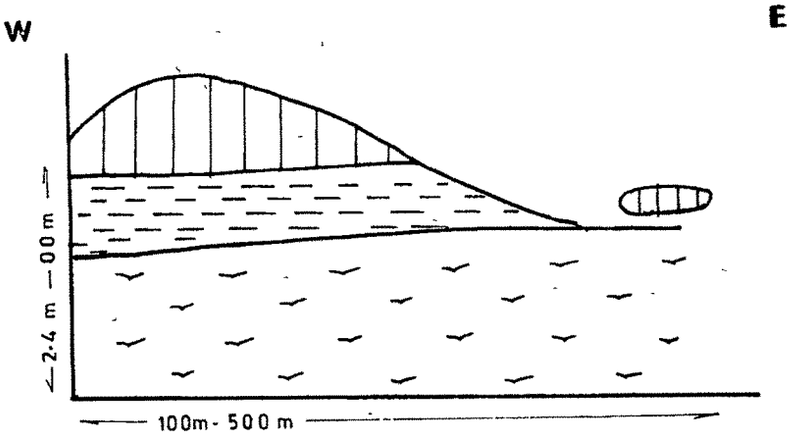
The lithological variation in the mine section is as follows (Fig 25):

| | | |
|---|---|---|
| Soil | | A |
| Ferricrete | (laterite) | B (Fe,Al) ox |
| Saprolite | (white clay (lithomare)) (bentonite) | B |

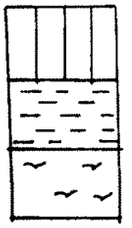
**17. Nangrecha (HST) :-**

The laterite belt of village Ratadia Nana extends in a NNW direction upto village Nangrecha. The laterite ridges are bounded by Deccan Trap to the north and gaj limestone to the south. The laterite occurs in the form of a thin,hard crust, overlying brick red and ferruginous clays. Generally it has gentle slopes of $2^{o}$ - $3^{o}$ towards the south with scarps to the north. Within this belt,

RATADIA ( Mandvi Taluka )




HORIZON



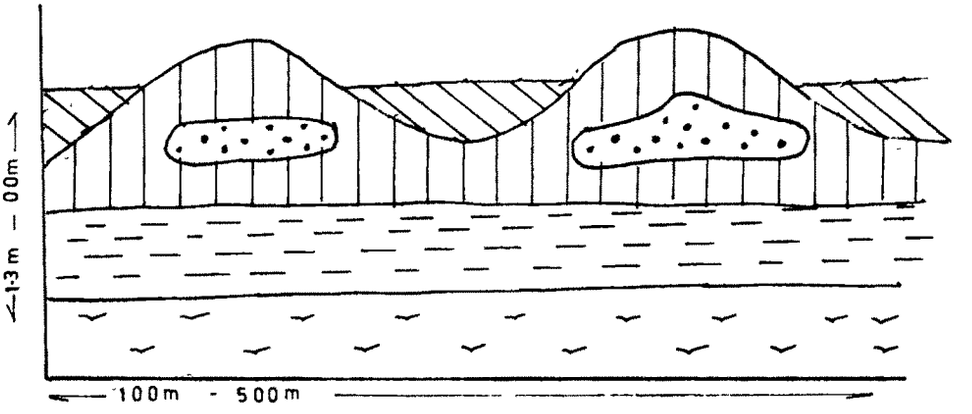
Ferricrete ( laterite ) -$B_{ox}$(Fe , Al )

Saprolite ( lithomarge ) -B

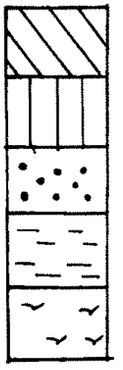
( bentonite ) -B

FIG. 24

TUMDI ( Mandvi Taluka )




HORIZON



Soil -A

Ferricrete ( laterite ) -$B_{ox}$(Fe, Al )

Alucrete ( bauxite ) -$B_{ox}$(Fe, Al )

Saprolite ( lithomarge ) -B

( bentonite ) -B

FIG 25

pockets of good grade bauxite intermixed with laterite are noticed. The aluminous laterite deposits are located at a distance of 1.3 km east of the village. 2 km east of Nangrecha, the bentonite mine shows the following section (Fig 26)

| | | |
|---|---|---|
| Soil | | A |
| Saprolite | (reddish clay)<br>(bentonite) | B |

The laterite capping and lithomarge is typically absent and replaced by a small band of reddish clay and soil.

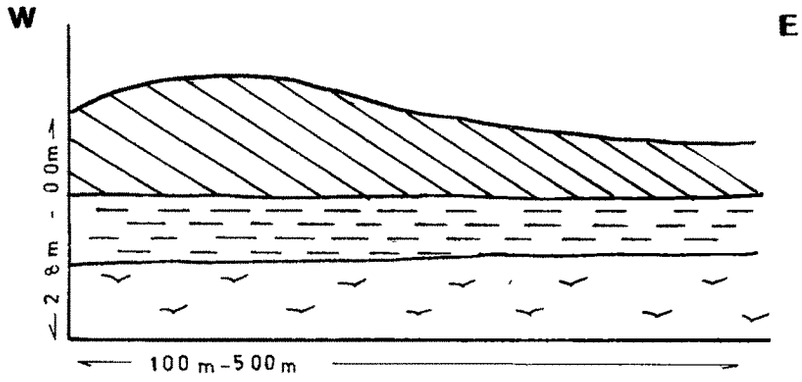
The surface of the black soil cover is marked with cracks.

**ABDASA TALUKA**

18. Nandra :-(LST)

This village is situated 50 km from Bhuj on the Naliya road. The laterite patch is situated about 1 km south of the village. Impure bauxite caps a low arcuate ridge with a highly ferruginous rim to the east which forms sharp scarp margin. The low ground beyound the scarp is covered with clay and Trap, affording a full and excellent section. To the west and south, Tertiary sediments overlap the bauxite patch. The ferruginous rim is seen to continue southeastwards and joins up with the Roha patch. Towards the west, the laterite ridge continues with sinuous scarp margins upto the Naredi laterite patch. Traps are exposed beyound the scarp margins to the north, while Gaj sediments overlap to the south. The section is as follows (Fig 27)

NANGRECHA ( Mandvi Taluka )



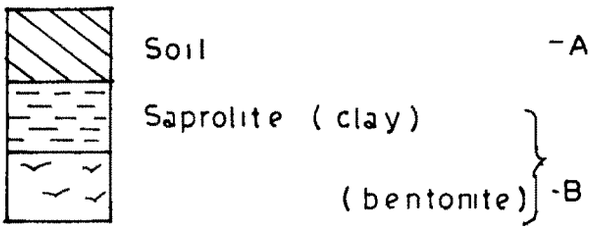
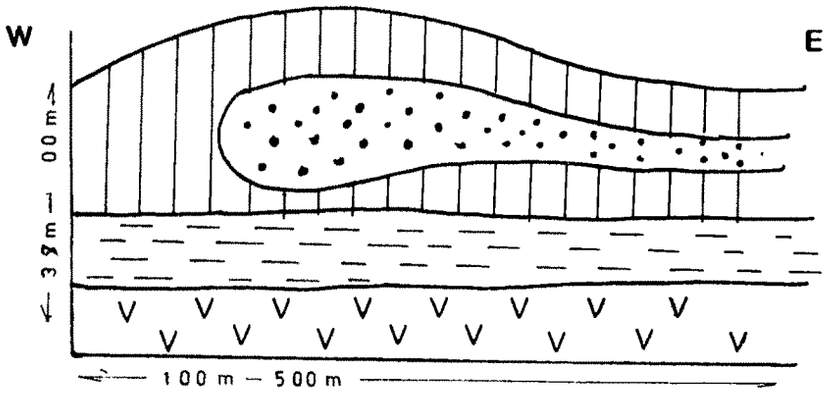




FIG 26

NANDRA ( Abdasa Taluka )



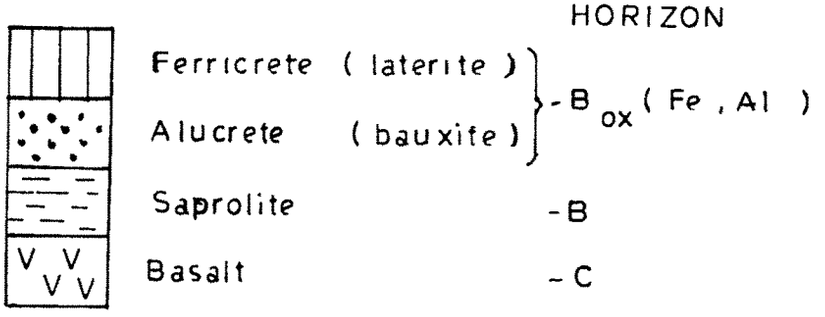




FIG 27

| | | |
|---|---|---|
| Ferricrete | (laterite) | B (Fe,Al) ox |
| Alucrete | (bauxite) | |
| Saprolite | (clays) | B |
| Deccan Trap | | |

**19. Naredi (LST):-**

The different pockets of laterite are located 53 - 55 km from Bhuj and 61 - 63 km from Mandvi via Kotada and sisagraph.

The main laterite patches are situated 2 km NNE of Naredi in the northeast.

The village of Naredi stands on Gaj limestone and is situated on the northern banks of the river Kankawati. 2 - 3 km from the village in the northeastern sector, an extensive formation of laterite is observed covering a low lying plateau with gentle slopes to the south (covered by Gaj beds) and scarps to the north.

The laterite exposure in the NNE corner is in the form of a ridge, overlying lithomarge without any appreciable bauxite formation. The southern limits of this patch reveals a concretionary, ferruginous formation mixed with clays, probably of Laki age. Within the bauxite pocket, a few small patches of ferruginous, concretionary Laki formation are seen in the form of slightly elevated mounds in the southern portion and they show a thin sparse covering of Gaj limestone, lying on the top, presumably the eroded remnants of the original Gaj cover here. A small patch of bauxite underlian by clay is seen separated from

the above pocket by an erosional break. Just northeast of this patch, separated from it by a nala, a full section from highly altered Traps at the bottom to the hard crust of bouldery bauxite at the top is seen, showing the intervening saprolite consisting of clays.

In the southeast of the above plateau, a full section, from the hard bouldery bauxite zone at the top, to the Trap below, is seen along the northern scarp margins of the pocket. Reddish and whitish saprolitic clay bands overlie the Trap below, succeeded above by the bauxite clayey zone, which in turn passes into the hard bouldery bauxite zone. The section is exposed over a length of 215 m along the river and is limited by the Gaj beds overlying the Trap to the east and abruplty changes to ferruginous laterite to the west. Further west, Gaj beds are again seen covering the river banks.

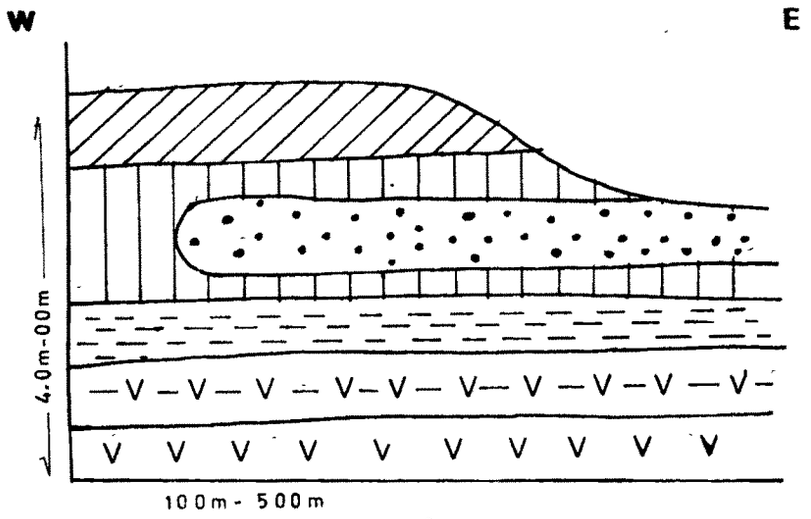
The generalised profile of 30 pit sections around Naredi is as follows (Fig 28)

| | | |
|---|---|---|
| Soil cover | | A |
| Ferricrete | (laterite) | B (Fe,Al) ox |
| Alucrete | (bauxite) | |
| Saprolite | (clays) | B |
| Trap basalt | (altered) (fresh) | C |

**20. Raydhanpur :-**

1 km east of the village, a fairly extensive patch of

NAREDI ( Abdasa Taluka )



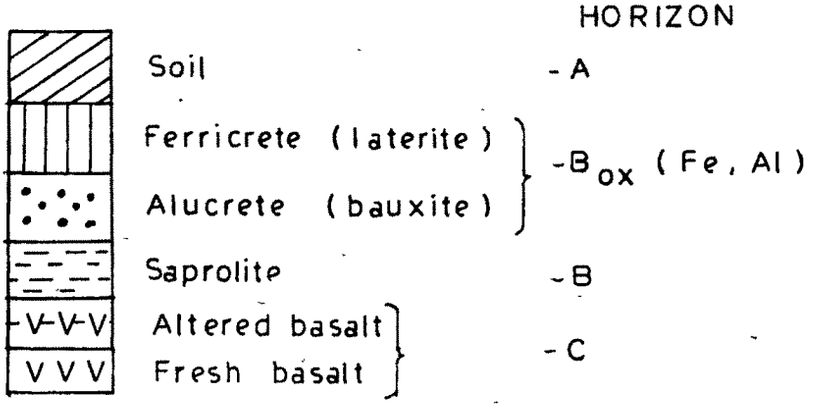




FIG. 28.

RAYDHANPAR ( Abdasa Taluka )

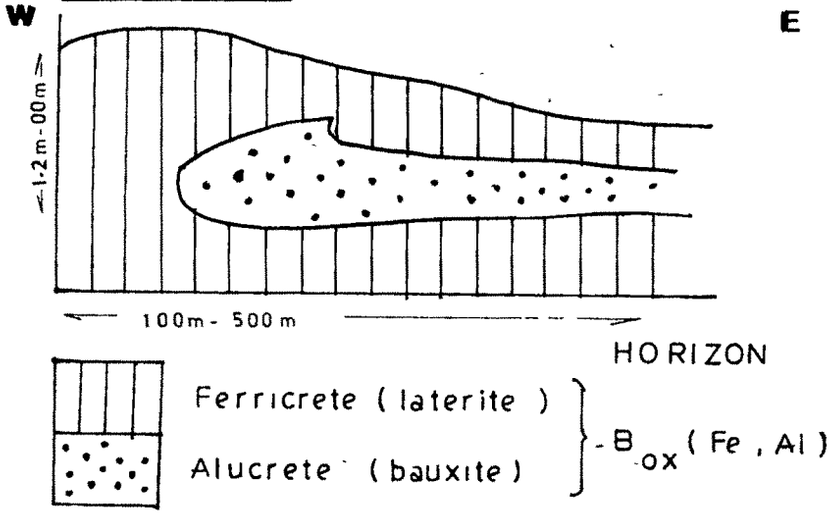






FIG. 29.

laterite with minor occurrences of bauxite are seen. The section here is as follows (Fig 29)

| | |
|---|---|
| Ferricrete | B (Fe,Al) ox |
| Alucrete | (bauxite) |

**21. Miyani :-**

A fairly large and good bauxite pocket surrounded by Gaj formation to the north and Trap towards the south is seen located on either side of the village well (Fig 30)

**22. Chiyasar :-**

This village is situated about 10 km west of Jarjok/Kotada village.

A very narrow, long laterite band forming a connecting bridge between the laterite of Miyani/Nundatar village to the west and Kotada/Jarjok to the east is observed here. The laterite shows steep ($45^{0}$ -$65^{0}$) northerly dips and is vertical at many places. Earlier workers have postulated a long east-west trending fault which is not observed anywhere in the neighbourhood, except west of Jarjok.

The laterite rests on the lower reaches of a long Trap ridge with steep slopes. The width is 20 - 50 m and Gaj beds form the northern boundary. Adjacent to Trap the laterite is highly ferruginous while towards the Gaj contact, it is bauxitic in nature. Although the outcrop is broken at places by soil, clay or milliolitic limestone, it is continuous for over 3.5 km.

Further west, between Chiyasar and Nundatar/Wandh, only small patches of laterite and bauxite are observed on the slopes of the

MIYANI ( Abdasa Taluka )

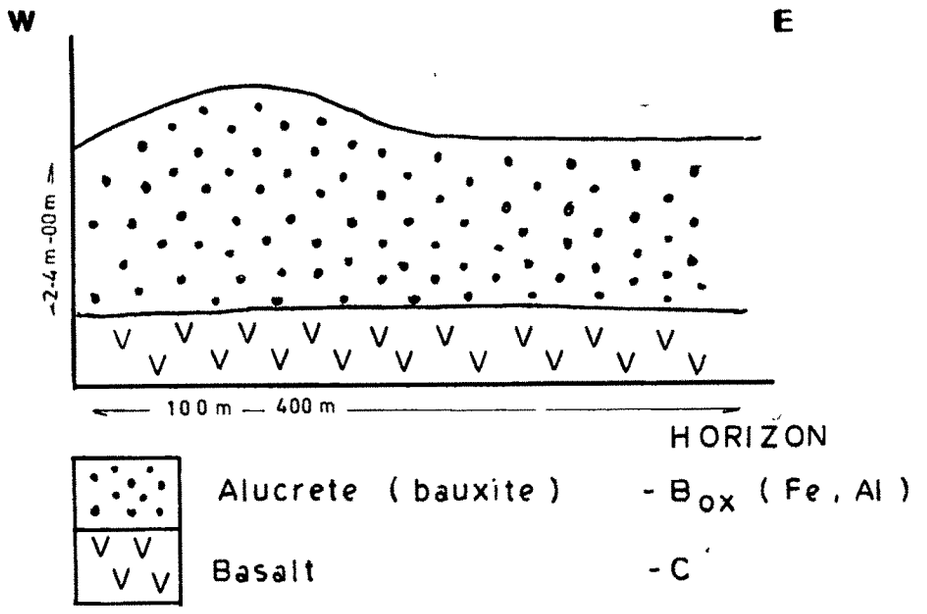



FIG. 30

CHIYASAR ( Abdasa Taluka )

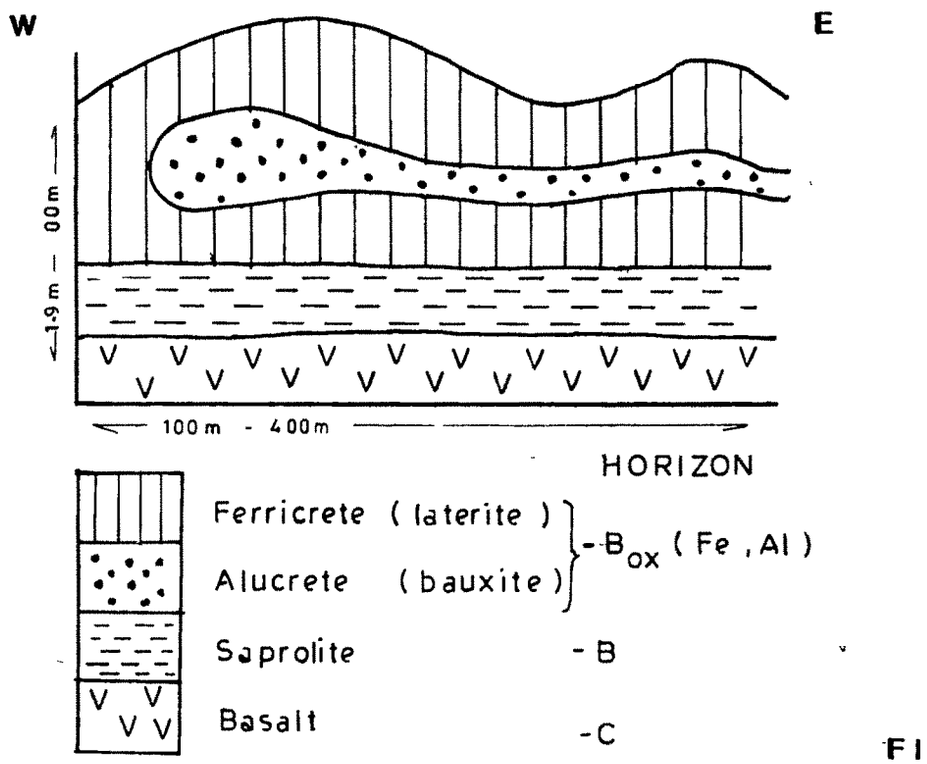



FIG 31

Gaj covered hill range extending between these villages. Here again, they show very steep northerly dips.

The generalised laterite section here is as (Fig 31)

| | | |
|---|---|---|
| Ferricrete | (laterite ) | B (Fe,A1) ox |
| Alucrete | (bauxite ) | |
| Saprolite | (clays) | B |
| Trap basalt | | C |

**23. Kharuva :-**

About 1.6 km southwest of village Kharuva, one small bauxite patch striking northwest-southeast is noticed in the laterite. The section here is as follows (Fig 32)

| | | |
|---|---|---|
| Ferricrete | (laterite) | B (Fe,A1) ox |
| Alucrete | (bauxite) | |

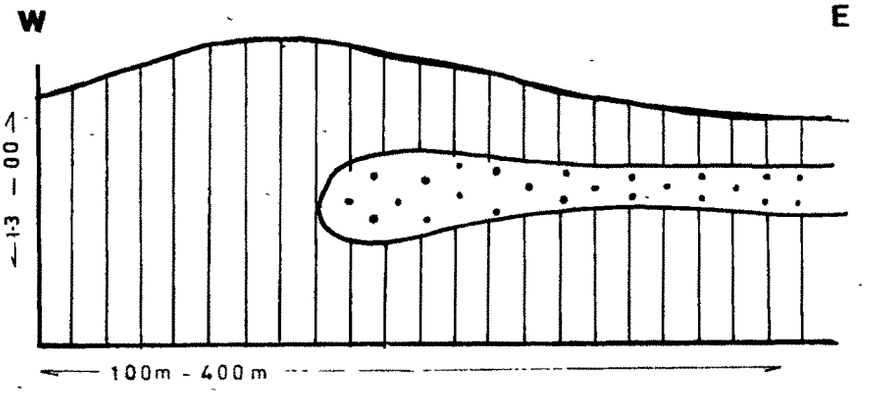
**24. Nundatar :- (LST)**

About 1.5 km south of wandh/Nundatar villages, a hill composed of laterite is seen on the southern banks of Kankawati river. The laterite dips between $5^0 - 10^0$ to the east , with Traps exposed along the western margin beyond the scarp. The laterite shows pockets of bauxite irregularly distributed in it.

The section here is as follows (Fig 33)

| | | |
|---|---|---|
| Ferricrete | (laterite) | B (Fe,A1) ox |
| Alucrete | (bauxite ) | |

KHARUVA ( Abdasa Taluka )

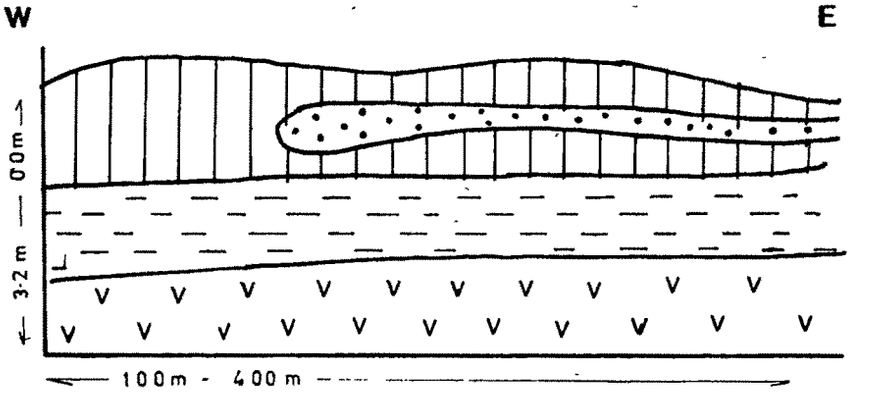



HORIZON

Ferricrete ( laterite )
Alucrete ( bauxite ) } Box ( Fe, Al )

FIG. 32.

NUNDATAR ( Abdasa Taluka )




HORIZON

Ferricrete ( laterite )
Alucrete ( bauxite ) } Box ( Fe, Al )
Saprolite ( clay ) — B
Basalt — C

FIG. 33

| | | |
|---|---|---|
| Saprolite | (clay) | B |
| Trap basalt | | C |

**25. Balachor :-(LST)**

The deposits here are situated west and northwest of the village. The deposits are 58 - 60 km away from Bhuj and 70 km from mandvi via naredi, Kotada and Sisagarh village.

The village stands on a ridge covered by Gaj sediments and on the eastern slopes of this ridge a number of small outcrops of bauxite are seen. Traps are exposed on the lower most level and in the valley to the east.

The section here is as follows (Fig 34)

| | | |
|---|---|---|
| Ferricrete | (laterite) | B (Fe,Al) ox. |
| Alucrete | (bauxite) | |
| Trap basalt | | C |

**26. Wamoti (Moti) :-(LST)**

There is a discontinuous chain of hillocks trending northwest-southeast covered by laterite situated at a distance of 3 km from the village. Here laterite caps the Deccan Trap which occupy an extensve area. The laterite contains scattered pockets of impure bauxite, which are found occupying the southern slopes of the ridge in the form of isolated mounds. A plateau covered by laterite is noticed at a distance of about 3 km southeast of the village. The laterite is brecciated and dark brown in colour. It

BALACHOR ( Abdasa Taluka )

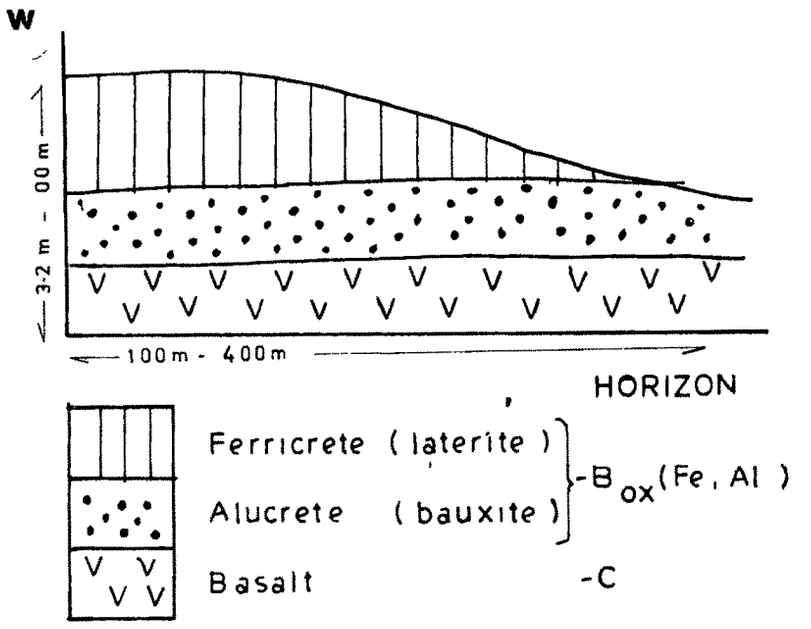



FIG 34

WAMOTI ( Abdasa Taluka)

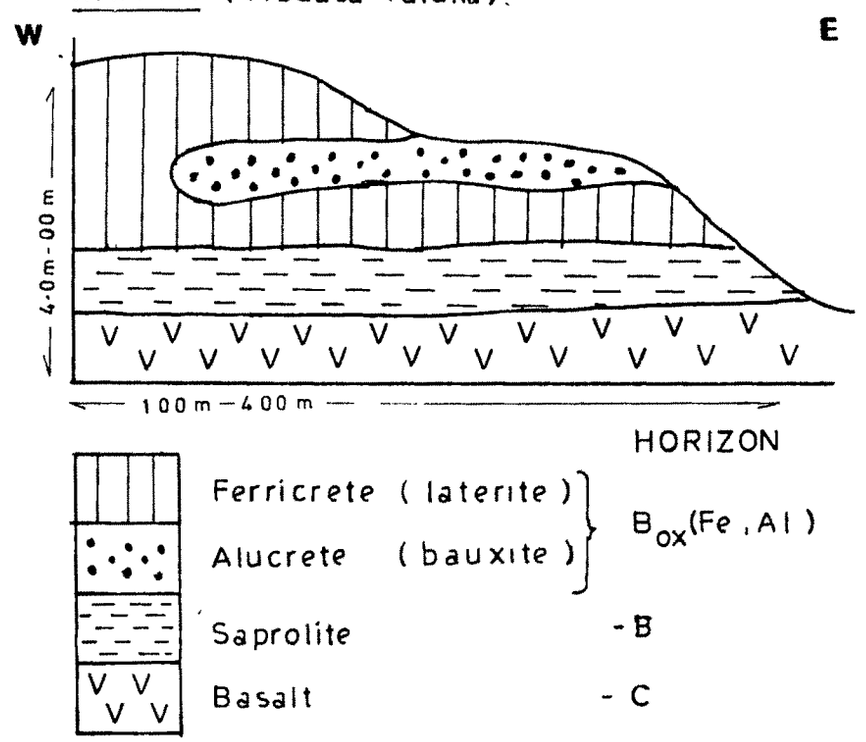



FIG 35

is hard, compact and massive. A section in the valley shows white clay at the base and laterite at the top.

2 km southwest of the village, laterite forms an arcuate ridge fringing a central Trap dome. Along the Trap and Tertiary contacts there is an enrichment of iron while the central portion shows good bauxite deposits.

The generalised section here is (Fig 35)

| | | |
|---|---|---|
| Ferricrete | (laterite) | B (Fe,Al) ox |
| Alucrete | (bauxite) | |
| Saprolite | (clay) | B |
| Trap basalt | | C |

**27. Wamoti (Nani): -(LST)**

A narrow chain of laterite hillocks trending NNW-SSE is noticed at a distance of 1 km southwest of the village. The laterite is brecciated with scattered horizons of bauxite on the southern and eastern slopes of the hillocks. Exposures of Gaj beds are observed on the western and southern margins of the laterites.

The laterite section is as below (Fig 36 )

| | | |
|---|---|---|
| Ferricrete | (laterite) | B (Fe,Al) ox |
| Alucrete | (bauxite) | |

**28. Khappar :-**

There is a chain of low lying flat-topped hillocks situated

WAMOTI (Abdasa Taluka)

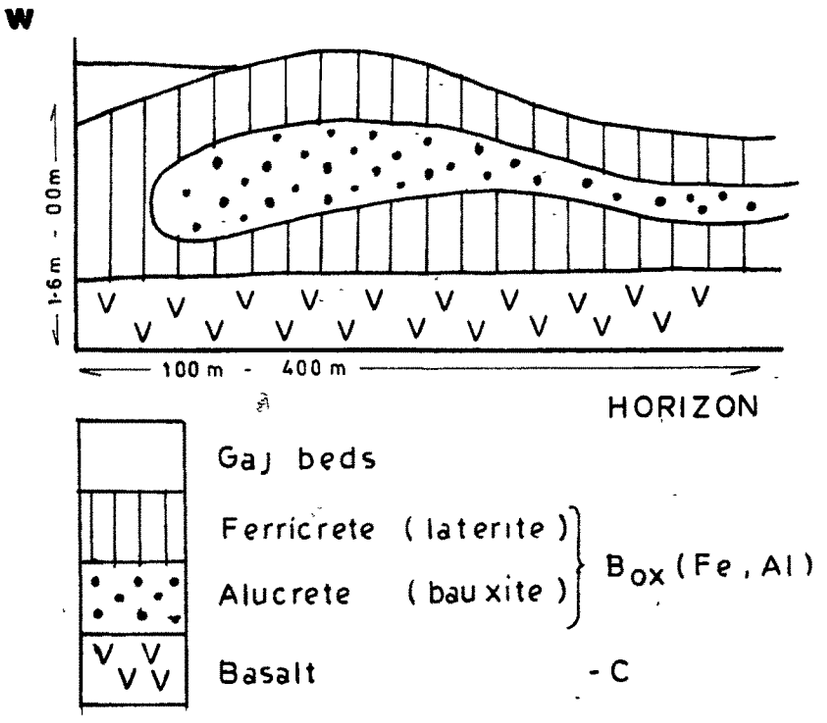



FIG 36

KHAPPAR (Abdasa Taluka)

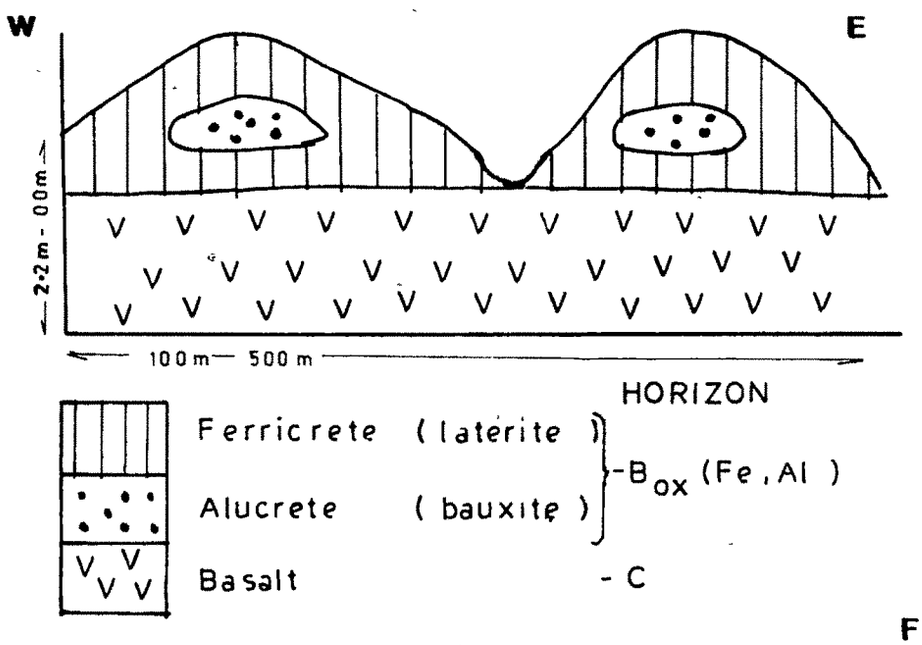



FIG 37

about 1 km SSW of the village. Most of the hillocks consist of laterite resting on Trap, which in turn are covered by Gaj beds. Scattered bauxite occurrences are also noticed.

The sequence here is (Fig.37):

| | | |
|---|---|---|
| Ferricrete | (laterite) | B (Fe,Al) ox |
| Alucrete | (bauxite) | |

**29. Netra :-**

An exposure of laterite t rending NW-SE runs for a distance of about 3 km southwest of the village. The laterite rests upon Trap with a cover of Gaj beds towards the south. This is the major exposure of laterite around this village. Minor occurrences of bauxite in the form of small humps and laterite are seen west and south of Netramata temple. The generalised laterite sequence is as follows (Fig 38) :

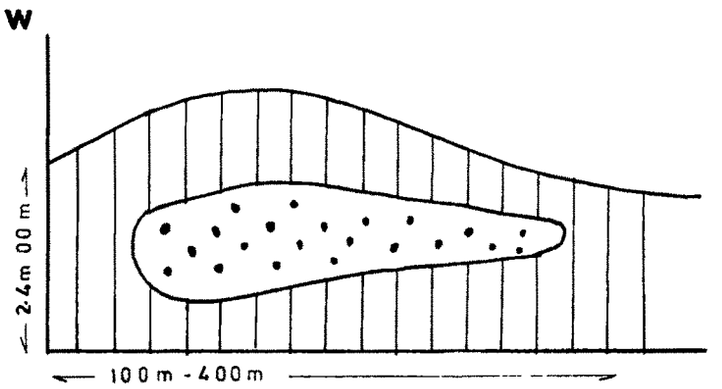
| | | |
|---|---|---|
| Ferricrete | (laterite) | B (Fe,Al) ox |
| Alucrete | (bauxite) | |

**30. Boha :-(LST)**

About 0.5 km east of Boha, a nala reveals a thin crust of bauxite overlying saprolite. The ground around this nala is covered with soil and Trap rubble. Another bauxite exposure is noticed 0.5 km away from the previous one. It lies below an overburden of Gaj shales.

Another bauxite exposure is located 1 km west of the village on the western banks of the river Sai. This extends over a length of 300 m in a north-south direction. The bauxite horizon overlies a

NETRA ( Abdasa Taluka )



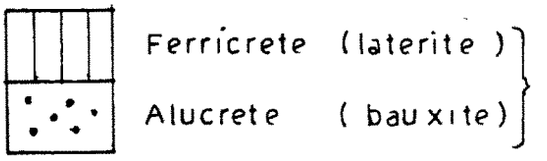
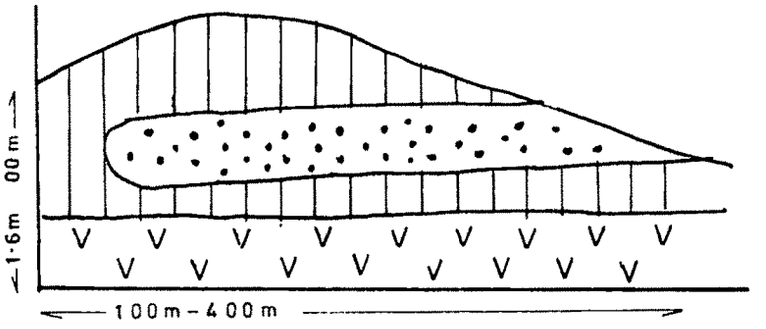




FIG 38

BOHA ( Abdasa Taluka )



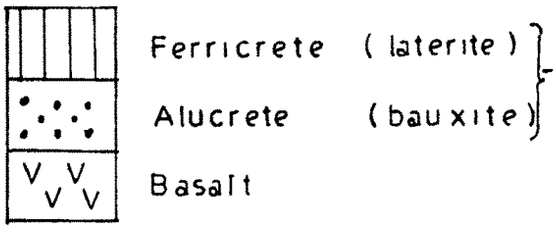




FIG. 39

zone of saprolite.

The sequence here is as follows (Fig 39) :

| | | |
|---|---|---|
| Alucrete | (bauxite) | B ox (Fe,Al) |
| Saprolite | (clay) | B |
| Trab basalt | | C |

**NAKHATRANA TALUKA**

**31. Roha :-**

A highly clayey laterite outcrops on the southern and northern flanks of a long ridge, situated just north of the village. This is capped by Tertiary sediments (limestone) (Fig 40)

**32. Rasalia :-(LST)**

A narrow belt of laterite is situated at a distance of 3 km south of the village. There are extensive exposures of Traps and sandstones near the village. Laterite rests direrctly on the Trap and is in turn covered by Gaj beds towards the west. Scattered pockets of bauxite are noticed on the southern slopes of the laterite ridge.

The section is (Fig 41)

| | | |
|---|---|---|
| Ferricrete | (laterite) | |
| Alucrete | (bauxite) | B ox (Fe,Al) |
| Trap basalt | | C |

ROHA ( Nakhatrana Taluka )

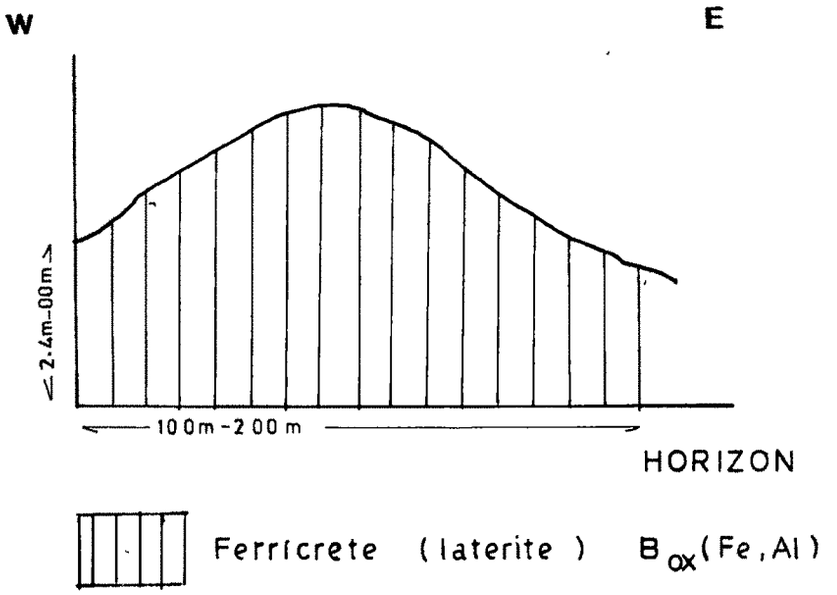



FIG. 40

RASALIA (Nakhatrana Taluka )

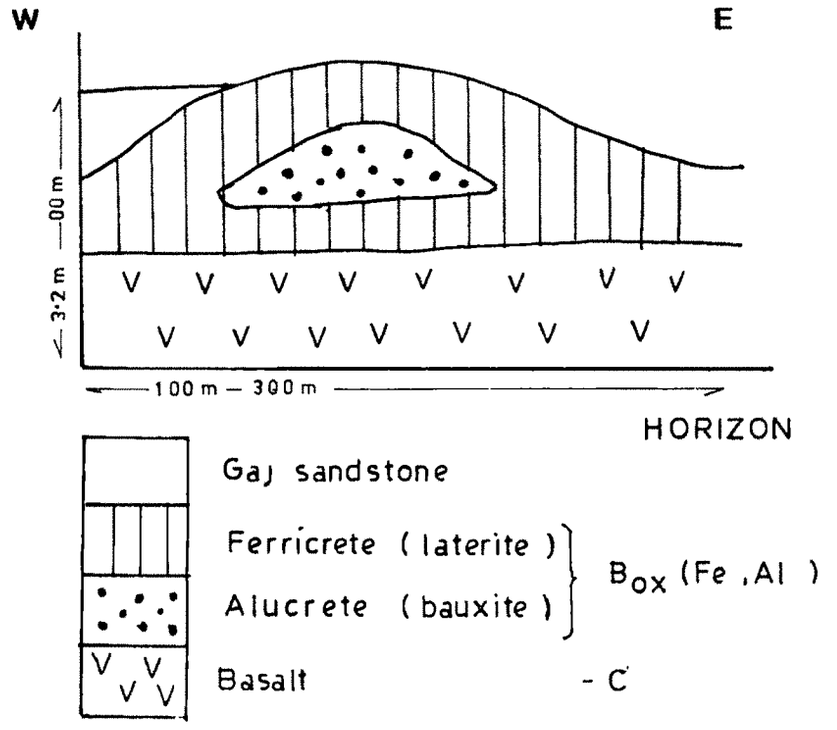



FIG 41

**33. Kotada :-(LST)**

These deposits are situated 53 km from Bhuj via the village of Roha and Kotada. It is 53 km via Devpar and Sisagadh from Mandvi.

Kotada village stands on Trap patches of Jurassic sandstones and milliolite limestone are also seen. Northwest of the village, Traps are also exposed. A narrow ridge trending NNE-SSW beyond this river constitutes the laterite area. About 500 m from the top of the ridge to the west, Gaj limestones are encountered. Further east, the laterite forms a long ridge upto Roha village. Small patches of bauxite are seen in this stretch of laterite. Towards the eastern end, the laterite narrows down.

The section is as follows (Fig 42):

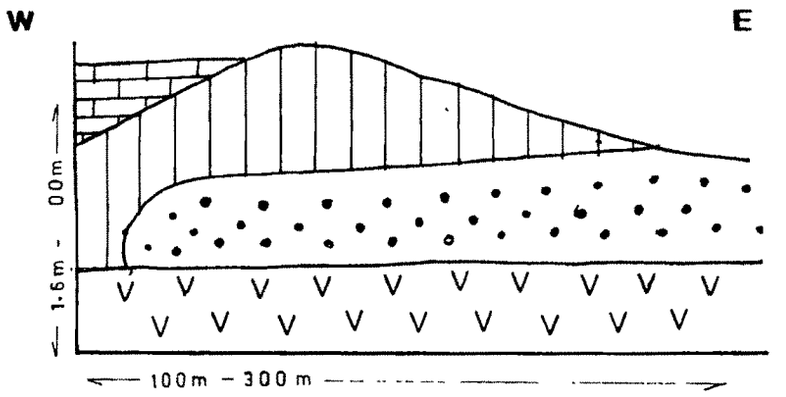
| | | |
|---|---|---|
| Ferricrete | (laterite) | B (Fe,Al) ox |
| Alucrete | (bauxite) | |
| Trap basalt | | C |

**34. Jarjok :-**

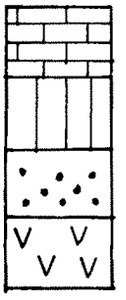
The narrow belt of laterite described in Chiyasar area, continues eastwards towards Jarjok and connects up with the laterite patch of Kotada village.

The laterite has narrow, small bauxite patches at places and shows steep dips to the northwest and at a few places are vertical. Traps are encountered south of the laterite with Gaj beds to the north. Towards the Trap contact, ferruginous clays are seen adjacent to which, an earthy, clayey bauxitic horizon is

KOTADA (Nakhatrana Taluka)




HORIZON



Milliolite limestone

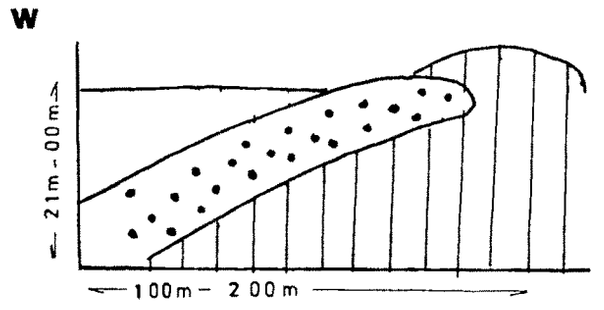
Ferricrete (laterite) } $B_{ox}$ (Fe, Al)

Alucrete (bauxite) }

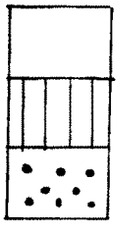
Basalt

FIG. 42

JARJOK (Nakhatrana Taluka)




HORIZON



Gaj Sandstone

Ferricrete (laterite) } $B_{ox}$ (Fe, Al)

Alucrete (bauxite) }

FIG 43

observed. A small, but good bauxite patch is observed at the eastern end where laterite is exposed on the western bank of the stream just west of Jarjok village. From this point the trend of the laterite becomes northerly and is exposed as discontinuous patch upto the laterite patch described under Kotada village (Fig 43)

**35. Deban :-(LST)**

A small belt of laterite trending NW-SE, is situated at a distance of about 1 km from the village. It has a brecciated texture. Exposures of Traps are noticed at a distance of about 700 m southwest of the village.

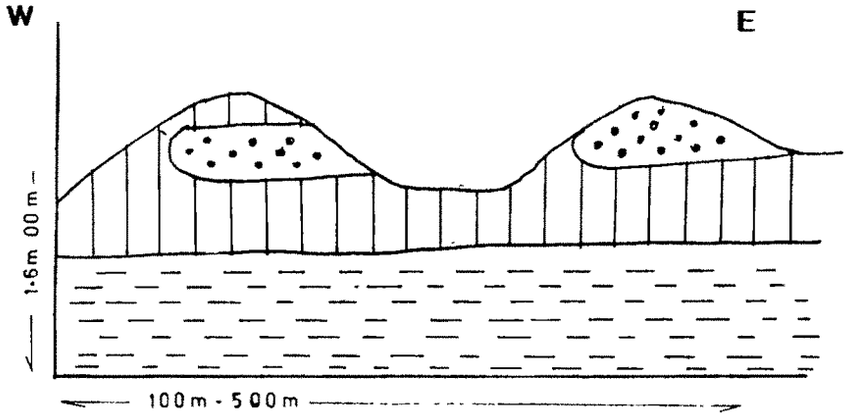
There are two small humps of bauxite situated at a distance of2.5 km southwest of the village and west of the cart track leading to Khanai. At a distance of 1.5km northwest of Deban and on the bank of a small nala, the following sequence is exposed (Fig.44):

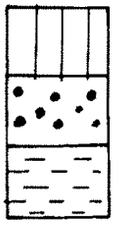
| | | |
|---|---|---|
| Ferricrete | (laterite) | Box (Fe,Al) |
| Alucrete | (bauxite) | |
| Saprolite | (clay) | B |

**36. Khanai :-**

The laterite deposits found here are located at a distance of 1.5 km southwest of the village. These laterite pockets are quite extensive with a length of about 2 km and a width of 0.9 km (Fig.45).

DEBAN ( Nakhatrana Taluka )

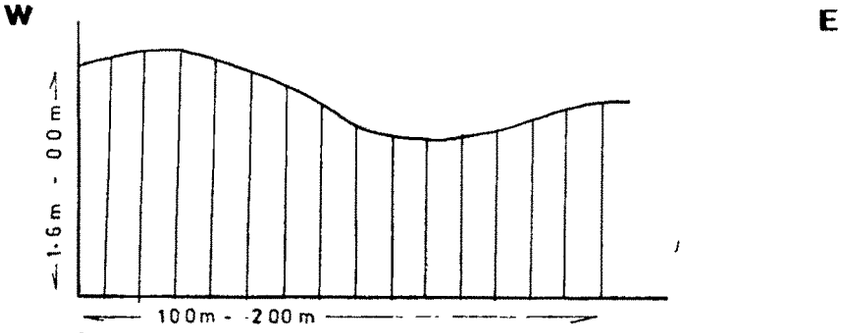


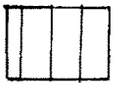



| | HORIZON |
|---|---|
| Ferricrete ( laterite ) | $-B_{ox}$ (Fe , Al ) |
| Alucrete ( bauxite ) | |
| Saprolite | -B |

FIG 44

KHANAI ( Nakhatrana Taluka )



| | HORIZON |
|---|---|
| Ferricrete ( laterite ) | $B_{ox}$ (Fe, Al ) |

FIG 45

LAKHPAT TALUKA

37 Jhulrai :-(HST)

Jhulrai is 3 km from Saran on the Madh-Baranda road. An acurate laterite ridge is observed about 1 km north of the village. A part of the ridge running NNW consists of hard, massive yellowish-grey, ferruginous laterite, overlying white, pink and ash-grey bands of saprolitic clays. In a bentonite quarry near the village, the following sequence is observed (Fig.46) :

| | | |
|---|---|---|
| Ferricrete | (laterite) | Box (Fe.Al) |
| Alucrete | (bauxide) | |
| Saprolite | (bentonite) | B |

38. Saran :-(HST)

This village is situated on the Madh-Baranda road about 5km southwest of Samajirao village.

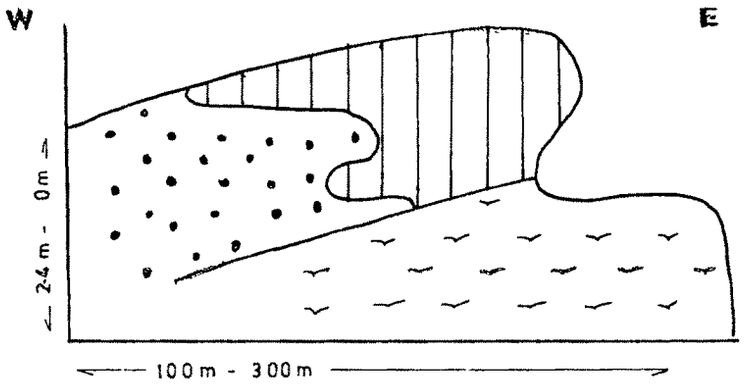
A long narrow chain of laterite humps is found occurring to the northwest, north and east of Saran. A bentonite quarry showed the following sequence (Fig.47):

| | | |
|---|---|---|
| Ferricrete | (laterite) | B (Fe,Al) ox |
| Alcurete | (bauxite) | |
| Saprolite | (bentonite) | B |

39 Samajirao Moti :-

Samajirao Moti is 4 km from Rawreshwar due SSW on the road leading to Baranda.

JHULRAI ( Lakhpat Taluka)



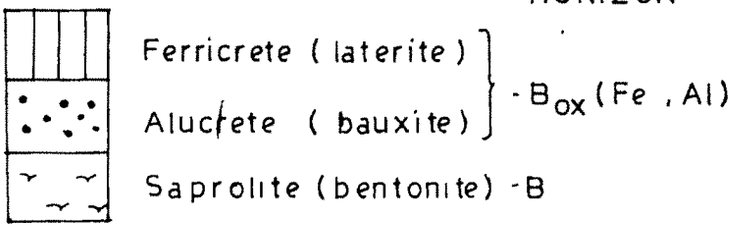
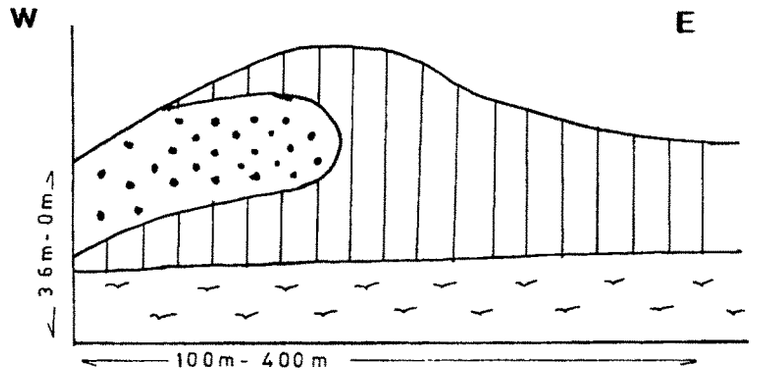




FIG. 46

SARAN ( Lakhpat Taluka )



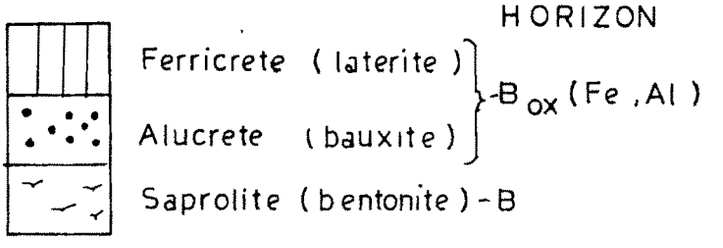




FIG 47.

An east-west laterite ridge is noticed between the villages Samajirao and Marchabani and seen extending for about 6 km with an average width of 1.5 km (Fig.48).

**40. Rato Talav :-(HST)**

The laterite/bauxite patch of Rato Talav is situated just north of the 33 milestone on the Bhuj-Naliya road.

These patches are situated 53 km from Bhuj and 64 km from Mandvi via Naredi, Kotada and Sisagarh villages.

The area comprises of low mounds and ridges covered either by bouldary bauxite or laterite and separated from one another by low-lying portions of saprolitic clays.

The laterite patch is bounded by Traps to the east and north and by Gaj beds to the west and south. The generalised section is as follows (Flg.49):

| | | | |
|---|---|---|---|
| Ferricrete | (laterite) | B ox | (Fe,Al) |
| Alucrete | (bauxite) | | |
| Saprolite | (bentonite) | B | |
| Trap basalt | | C | |

**41. Mata-no-Madh :-(HST)**

Mata-no-Madh is situated 100 km from Bhuj on the road to Lakhpat. About 3.5 km SSW of Madh temple and near Denma village, two small patches of bauxite are seen. The material is hard and massive. The west and southwest boundaries of the above pockets

SAMAJIRAO MOTI ( Lakhpat Taluka )

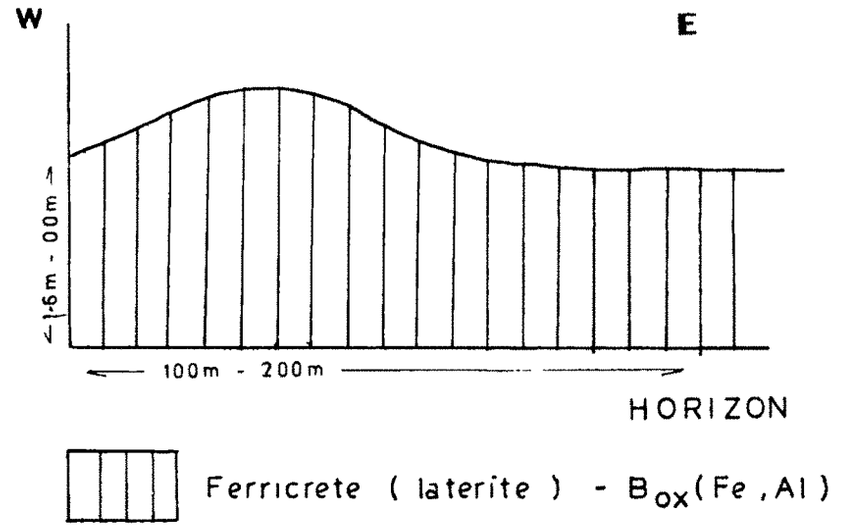



FIG 48

RATO TALAV ( Lakhpat Taluka )

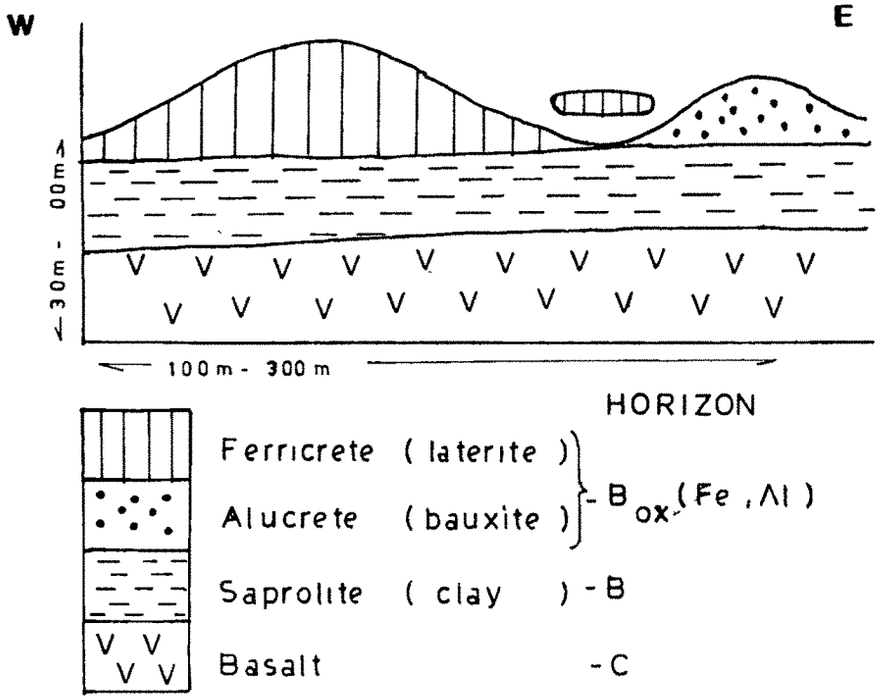



FIG 49

are marked by the Laki formation consiating of gypseous and bituminous shales.

On the Madh-Kotra road, a low lying ridge consisting of laterite running in an east-west direction is found. (Fig. 50,51).

| | | |
|---|---|---|
| Gypseous & bituminous shales – | | |
| Ferricrete | (laterite) | B (Fe.Al) ox |
| Alcurete | (bauxite) | |
| Saprolite | (clay) (bentonite) | B |

**42. Rawreshwar :-**

It is about 15 km from Madh on the Baranda fair weather road. A laterite ridge is found running northeast of Saran and southwest of Rawreshwar. About 2.5 km SSW of the village, 3 small pockets of fawn grey bauxite are encontered (Fig.52).

**43. Panandro :-**

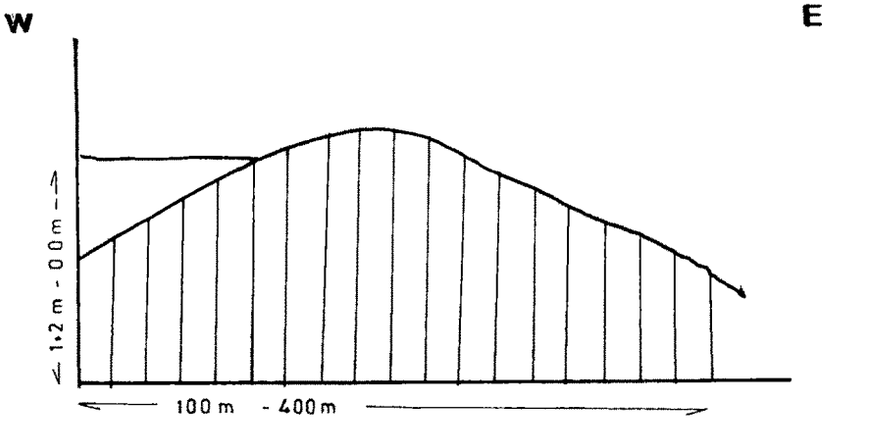
It is situated 15 km west of Gadhuli on the Lakhpat-Gadhuli district road.

Laterite/bauxite is found to occur near Babia hill situated at a distance of 3 km to the NNE of the village (Fig. 53).

**44 Fulra :-**

This village is situated about 12 km west of Gadhuli on the Bhuj-Lakhpat road. In the laterite belt, at a distance fo 1.6 km southwest of the village Fulra, 3 pockets of bauxite are noticed.

MATA-NO-MADH ( Lakhpat Taluka )

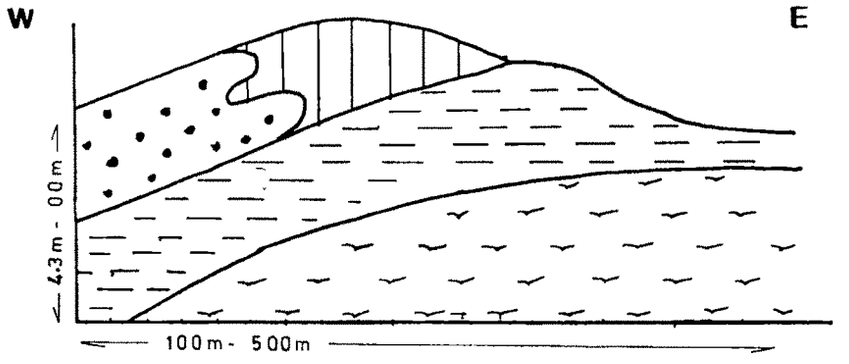



HORIZON

Gypseous & bituminous shales

Ferricrete ( laterite ) - $B_{ox}$ ( Fe, Al )

FIG 50




HORIZON

Ferricrete ( laterite )
Alucrete ( bauxite )
} - $B_{ox}$ ( Fe, Al )

Saprolite ( Clay / bentonite ) } - B

FIG. 51.

RAWRESHWAR ( Lakhpat Taluka )

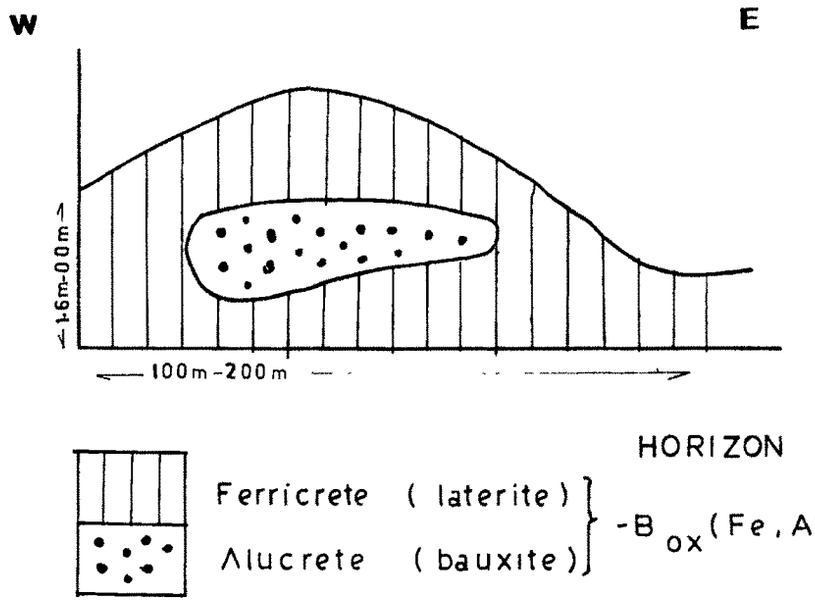



FIG. 52.

PANANDRO ( Lakhpat Taluka )

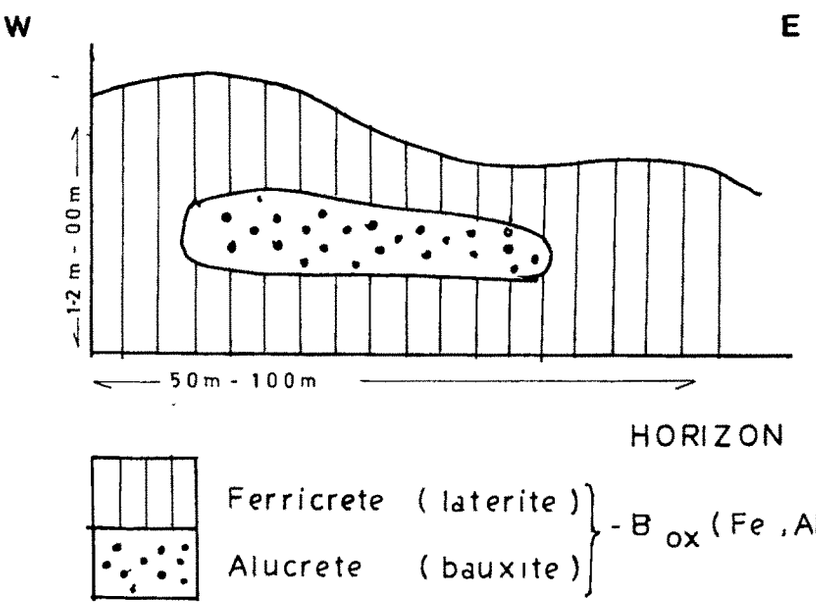



FIG 53.

The bauxite layer is found under a nominal soil cover and overlying saprolitic clays (Flg.54).

45 Lefri :-

This village is linked with the Bhuj/Lakhpat road at Mata-no-Madh by a 8 km long fair weather road.

Bauxite humps are situated 5 km due southwest of the village. This patch runs in an east-west direction (Flg. 55).

**Salient fields characters of laterite occurrences in Kutch**

As stated earlier, laterite exposures are found in all talukas of Kutch district, except Bhachau and Rapar talukas.The salient field characters are given below :

1) The laterite occurrences are confined to a narrow, elongate Palaeocene belt, a few hundred meters 1-2 kilometers wide, hundreds of kilometers long, running parallel to the Lower Tertiary shore line. This belt is sandwiched between the Cretaceous-Eocene Deccan Trap basalts and the subsequent Tertiary sequence.

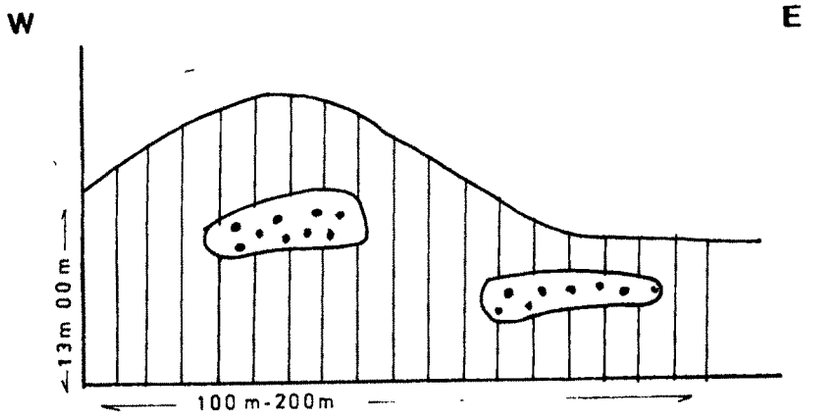
2) This belt is characterized by low-lying, elongated laterite ridges (Plate 1, 1a), separated by broad, intermittent valleys, which are generally 10-15 m deep. Deeply incised valleys are absent.

3) The generalized section in the laterite area is as follows:

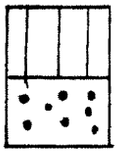
Horizon rich in Oxides B (Fe,Al) ox

Horizon rich in Silicates (Saprolite) B

FULRA ( Lakhpat Taluka)



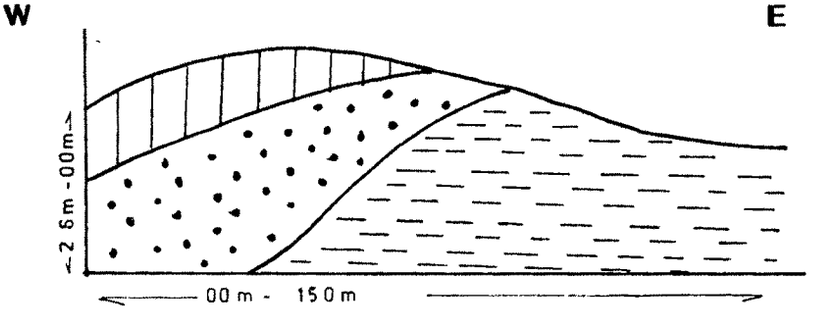

HORIZON



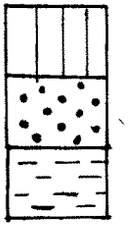
Ferricrete ( laterite )
Alucrete (bauxite ) } -B ox (Fe , Al )

FIG 54

LEFRI ( Lakhpat Taluka )




HORIZON



Ferricrete ( laterite )
Alucrete ( bauxite ) } - B ox (Fe , Al )
Saprolite ( clay ) -B

FIG 55

Plate 1 : Panoramic view of the laterite country from the top of Roha Hill.

Plate 1a : Characteristic low-lying, elongated, flat-topped ridges of laterite.

Within this major section there are two types of sub-sections present, viz...

a) The High Silica type (HST) (Fig. 57), and

b) The Low Silica type (LST) (Fig. 56).

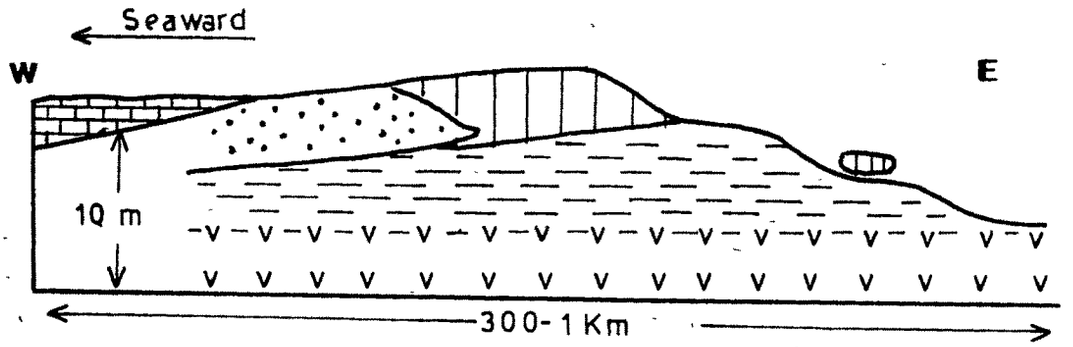
| HST (Plate 2) | | | LST (Plate 3) |
|---|---|---|---|
| Laterite/bauxite | - B | (Fe,Al) | -Laterite/bauxite |
| Kaolinite Saprolite | - B | | -Kaolinite |
| Bentomte Deccan Trap basalt | - C | | -Deccan Trap basalt . |

4) Both the above mentioned sequences are continuous, gradational and residual in nature with no signs of sedimentary reworking.

5) This laterite sequence constitutes what is popularly known as an alteration blamket. Normally the soil sections are truncated with the a horizon eroded.

6) The HST type of sequence is generally located along the Trap/laterite contact, while the LST type occurs towards the Tertiary contact.

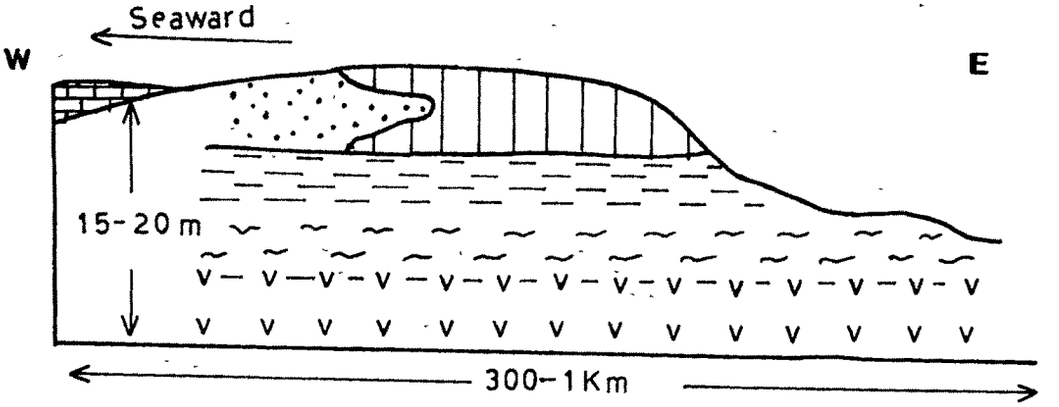
7) The lower most zone in both the HST and LST sequences is composed of Deccan Trap basalt. Exposures of this are limited in the laterite bearing areas. Either they are confined to the lowest zones of the lateritic profile, viz., in the pit and mine sections or on the surface at some places, eg., Mata-on-madh. (Plate 4). Typical spheroidal texture is exhibited (Plate 4a). At Mata-no-Madh, the complete section is surficially exposed (Plate 4b).




Low silica Type section ( LST ) with kaolinitic saprolite in Kutch

FIG.56

| | | |
|---|---|---|
| | Nummulitic limestone ( Mid-up Eocene) | |
| | Laki formation ( Lower - Eocene ) | |
| | ferricrete = Laterite | Box ( Fe , Al ) |
| | alucrete = bauxite | |
| | Kaolitnite LST SAPROLITE | B |
| | bentonite HST | |
| V-V-V V-V-V | altered TRAP BASALT | C |
| V V V V V V | fresh | |




High silica Type section (HST) with bentontic and kaolintic saprolite in Kutch

FIG.57

Plate 2 : Typical HST type of section showing laterite, bauxite, kaolinite, bentonite and Deccan Trap besalt in one gradational section.

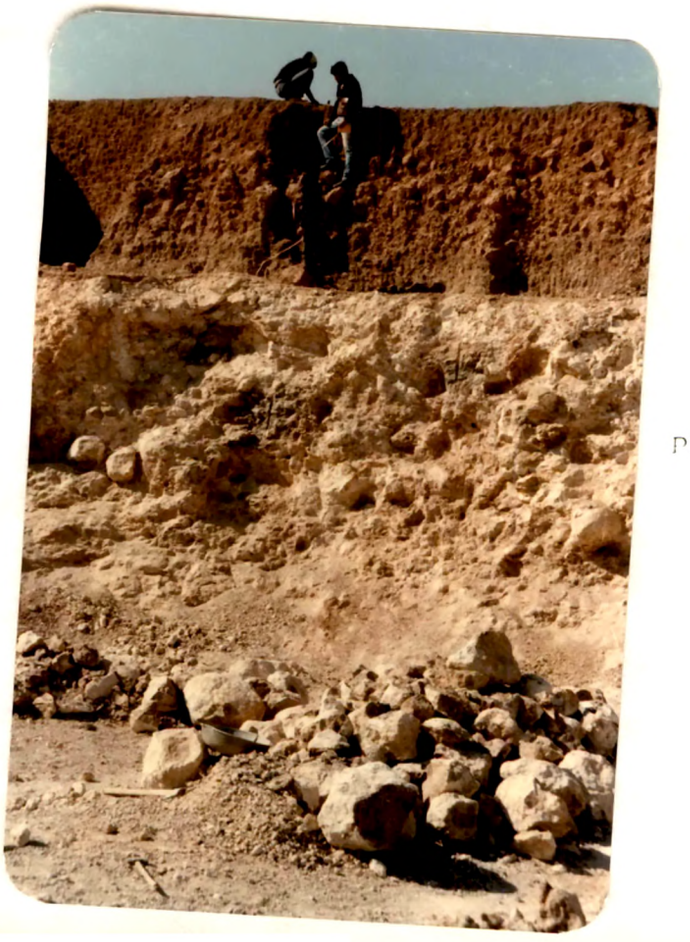


Plate 2a : Close up of the above section.

Plate 3 : Typical LST type of section depicting laterite/ bauxite underlain by only kaolinite.

Plate 4 : Exposure of basalt found at the base of the laterite prodile at Mata-no-Madh.

Plate 4a : Typical spheroidal weathering exhibited by the Deccan Trap basalt.

Plate 4b : The complete laterite sequence exposed at Mata-no-Madh. Mata-no-Madh is the type area of the 'Madh series of Biswas.

8) The saprolite (zone B), consist of two layers, as stated above. In the HST type of section, the bottom-most layer is composed of wet, sticky bentonite. The colour of the bentonite varies from bottle green, lavender, buff, light red to dark red. This zone usually retains the original structure and texture of the underlying basalt. Relict amygdaloidal texture (Plate 5) and exfoliation structure (Plates 6,7) are common. The exfoliation structure is of two types, viz., (a) where the core of the exfoliated basalt and the outer rims are completely bentonitized (Plate 8) and, (b) the inner core is of hard basalt while the rims are bentonitized (Plate 9,9a). The relict textures present in the bentonite zone, are indicative that thi zone was the first alteration product in the weathering of the underlying Deccan Trap basalts.

The bentonite layer is nearly always traversed by numerous thin veins and encrustations of calcite and gypsum (Plate 10).

9) The kaolinite layer (Plate 11), in the HST as well as the LST sections is usually buff to grey coloured with occassional patches and spots of bright red colour. The boundary separating the kaolinite and the underlying bentonite (in the case of HST section), and basalt (in the case of LST section), is gradual with tongues of each member penetrating into one another. This transition,though gradual is quite well defined. The relict textures of the underlying basalt which are so well preserved in bentonite are either missing or ill-preserved in the kaolinite layer. The calcite and gypsum veins and enctrustation so common in the bentonite zone, are either absent or present in negligible quantities.

Plate 5 : Relict amygdaloidal texture which is so commonly preserved in the bentonite layer of the laterite section.

Plate 6 : Relict exfoliation structures which are well preserved in the bentonite layer of the laterite section.

Plate 7 : Relict exfoliation structures wh ich are well preserved in the bentonite layer of the laterite section.

Plate 8 : Relict exfoliation structure in bentonite with the core and outer rims completely bentonitised.

Plate 9 : Relict exfoliation structure in bentonite with an inner core of basalt and the outer rims completely bentonitised.

Plate 9a : Relict exfoliation structure in bentonite with an inner core of basalt and the outer rims completely bentonitised.

Plate 10 : The bentonite layer is nearly always traversed by numerous thin veins and encrustations of calcite and gypsum.

Plate 11 : The kaolinite layer in the HST as well as the LST sections is usually buff to grey coloured with occassional patches and spots of bright red Colour.

The boundary separating the kaolinite and the overlying laterite is also gradual but quite well defined (Plate 12,12a,12b).

10) Reddish to purplish red, hard (Plate 13), concretionary or angular blocky (Plate 13a) or blackish laterite (Plate 13b)overlies the kaolinite with a gradual boundary.

11) The laterite contains large reserves of economically workable bauxite. These deposits are located on the Tertiary contact of the laterite belt.

12) Further, the laterite profile, viz., the saprolite zone is a good source of high grade bentonite clay. The occurrences are near the Deccan trap basalt/laterite contact. In fact, Kutch district is one of the largest producers of bentonite in India.

13) From the above two points, it is very clear that bauxite and bentonite cannot occur together. They are found occurring on opposite ends of the nearly 2 km wide laterite belt. Lateritization usually produces high grade bauxite deposits, but the occurrence of large reserves of bentonite as a part of the lateritic profile makes this quite unique in itself.

14) The intermittent low grounds between the hillocks of laterite are usually covered with boulders and debris of laterite (Plate 14,14a). Rounded bits and pieces of various forms of crypto-crystalline silica are also found in the reddish soil.

Fig-51 shows the distribution pattern of the LST and HST sections in Kutch. It is obvious from this map that there are two patches of HST pockets (i.e. in Mandvi taluka and a part of Lakhpat

Plate 12 : The gradual but well defined boundary between laterite and kaolinite.

Plate 12a : The gradual but well defined boundary between laterite and kaolinite.

Plate 12b : The gradual but well defined boundary between laterite and kaolinite.

Plate 13 : Reddish to purplish red, hard and concretionary laterite.

Plate 13a : Reddish, angular, blocky laterite.

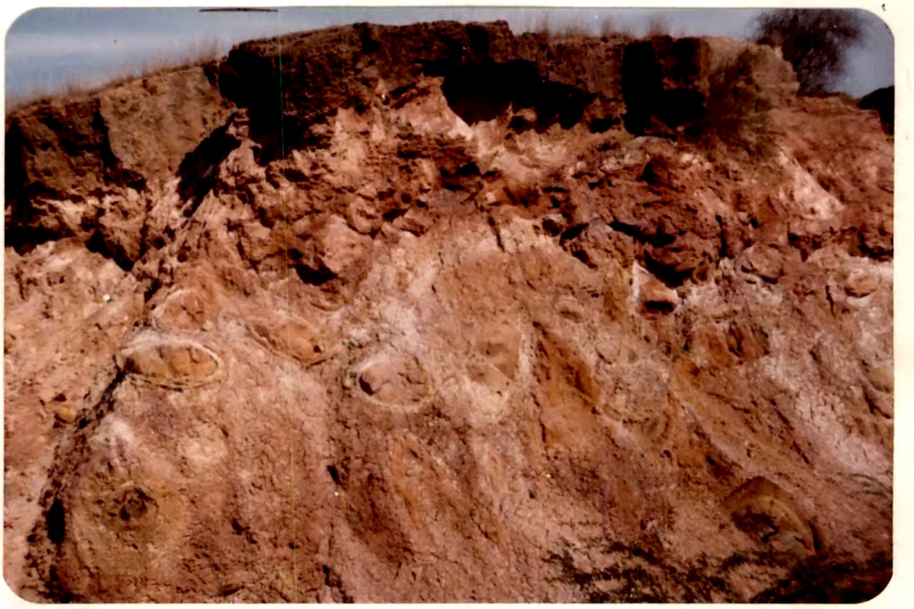


Plate 13b : Blackish laterite overlying the kaolinite zone.

Plate 14 : Debris of laterite found in the intermittent valleys between the ridges of laterite.

Plate 14a : Debris of laterite found in the intermittrnt valleys between the ridges of laterite.

taluka), whereas a majority of the remaining sections are of the LST type. Further, in Mandvi taluka there is the occurrence of both HST and LST sections, but while the HST sections occur on the laterite/trap contact, the LST sections are found on the Tertiary/laterite contact.