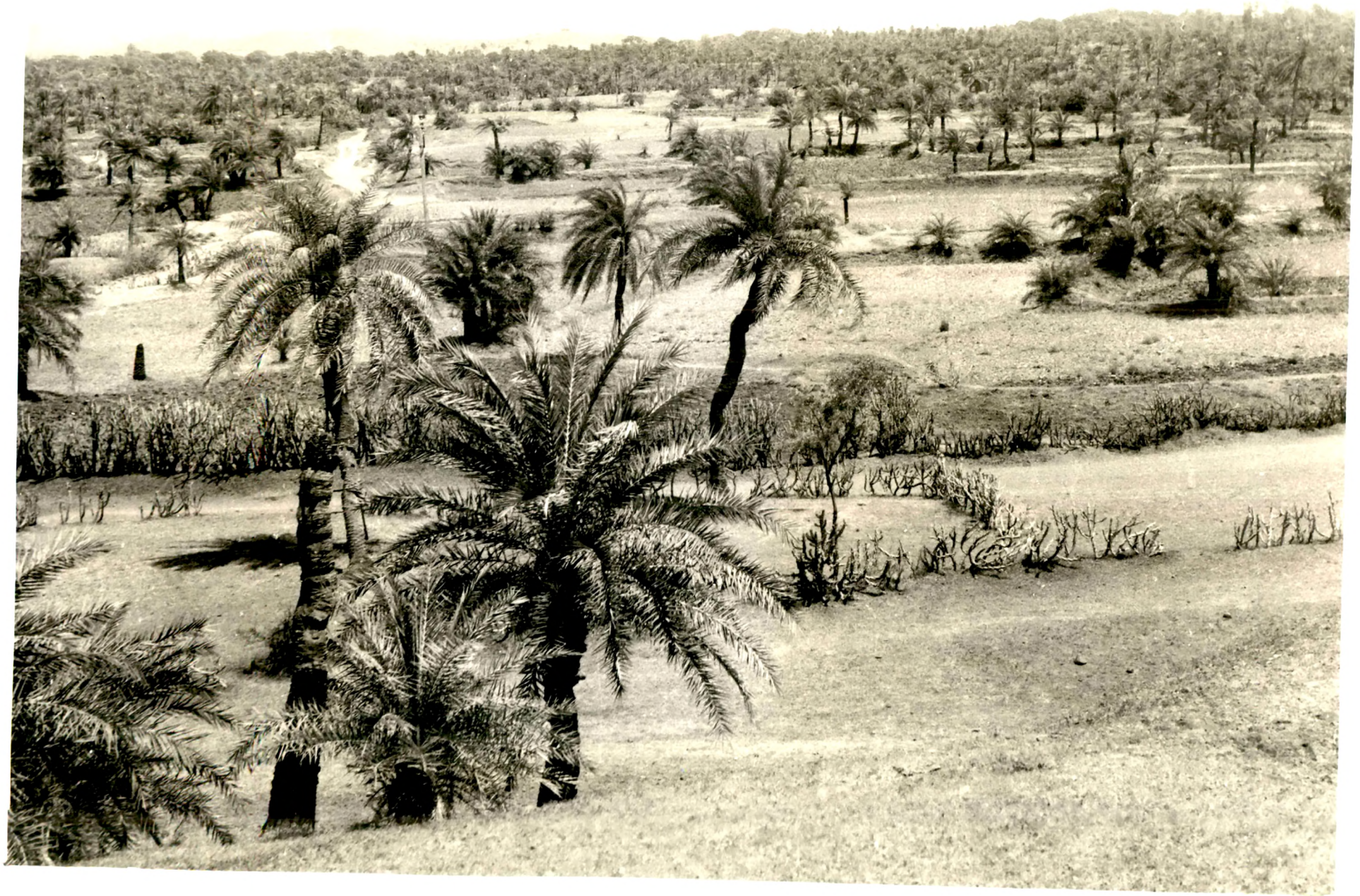
LANDSCAPE OF THE DEOKA COAST AT THE FOREGROUND

RAISED MUDFLAT



APPENDIX A

FACETS

FACET NO. A_1

CONVEX-TOPPED HILL

PATTERN A - DECCAN TRAP

FACET NO	: A_1
NAME	: Convex topped hill
LOCATION	: West of Bhilad
GEOREF	: 46/D15 and D11
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: June, 1982.

Morphology: This facet occupies the highest position in the surrounding landscape. It has a slope of about 20^{o}-25^{o}. The top of the hill is covered with a thin layer of partly weathered soil that supports grasses. The convex elongated form is due to sub-aerial denundation of the trap rock.

Surficial Deposit: The surface of the facet has a thin layer of residual soil cover. The depth of the soil varies from 2-20 cm with an underlying murrum layer of about 5-30 cm. The slopes of the hill give a concave surface. The foot of the hill is covered with a thick layer of colluvial deposit.

Water Regime: The facet remains wet during the rainy season and getsdried thereafter. The soil particles

hold some amount of water only for a short period; owing to low porocity and permeability the ground water condition is very poor.

Associated Features

Position in landscape: It occupies the highest position in the landscape.

Soil: A very thin layer of homogeneous residual black cotton soil of medium to fine grained texture.

Vegetation: Generally, only grasses grow on the hill tops, but at a few places, where depth of soil cover is more, xerophytic and occasional mesophytic plants grow.

Land Use: It is usually barren, but now trees are grown for forest development.

Genesis: The facet is formed by the denudation of Deccan Trap. The present topography is an erosional feature.

Airphoto Interpretation Aids

In the airphotos the facet appears oval or lensoid in shape. It is marked by a dark grey tone and is devoid of good external drainage. Some of the major hills show radial drainage pattern, where the channels are relatively shallow and narrow.

Comments and Reference

The facet is recognised in Toposheet Nos. 46/D14, 46/D15 and D11, 46/D16 and 47/A13. Its occurrence is rare and marks a typically higher elevation compared to the surrounding features.

FACET NO. A_2

CONICAL HILL

FACET NO	: A_2
NAME	: Conical hill
LOCATION	: West of Sarigam
GEOREF	: 46/D15 and D11
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: June, 1982.

Morphology: The facet occupies the highest position in the surrounding landscape. The slope is very steep and ranges from 30^{o}-80^{o}. It occurs at a height of about 170m above M.S.L. and is practically barren except covered with a few grasses.

Surficial Deposit: The surface has no soil cover except the lower flank and the foot of the hill where a layer of 2-20 cm is observed. At the foot weathered soil, tallus and screes form a heterogeneous deposit.

Water Regime: Since the facet is marked by a very steep slope with no soil cover, rain water is not retained and hence, it is dry throughout the year except at the foot.

Associated Features

Position in Landscape: It occupies the highest position in the surrounding landscape.

Soil: On the hill soil is absent since they are washed down as soon as they are formed. However, at the foot a heterogeneous deposit of soil and colluvium is always present. The soil is invariably black cotton type, which is a weathered product of trap rock.

Vegetation: Only grasses grow on the hill slope.

Land Use: The hill top is barren, but the hill slope and particularly the foot of the hill can be used for forest development and limited agriculture purposes.

Genesis: This facet is a denudational product of Deccan Trap and the present topography marks an erosional feature.

Airphoto Interpretation Aid

In the aerial photo the facet appears as conical in shape and is marked by light grey tone. It is devoid of good external drainage but deep V-shape valleys are very prominent. The drainage channels are relatively shallow and narrow and are controlled by structure as well as declivity.

Comments and References:

The facet is recognised in Toposheet Nos. 46/D15 and D11, 46/D16 and 47/A13; its occurrence is comparatively rare. Besides marking an higher elevation, it has a cone-shaped feature.

PLATE A_3

LINEAR RIDGE

FACET NO	: A_3
NAME	: Linear ridge
LOCATION	: North of Karajgam
GEOREF	: 46/D15 and D11
COMPILER	: Geology Department,
	M.S. University, Baroda.
DATE	: June, 1982.

Morphology: The facet occupies the highest position in the surrounding landscape. The slope is smooth and varies from 10-28°. The crestal part is more or less horizontal whereas the flanks have steep slope. The width of the facet is comparatively narrow, hence, it is linear. On the top, at some localities, grasses, shrubs and xerophytic woody plants are seen to grow but in general, this facet is barren.

Surficial Deposit: A very thin veneer of residual soil coversthe surface of the facet. Generally, the depth of the soil is very thin, about 2-20 cm but on the crest the thickness is comparatively more.

Water Regime: The facet remains wet only during rainy season. Owing to the lack of appreciable thickness of soil cover, no retention of rain water is

possible and hence, it remains dry for most of the time.

Associated Features

Position in Landscape: It occupies the highest position in the surrounding landscape.

Soil: A very thin veneer of black cotton soil covers the facet. The crest of the hill has a comparatively thick deposit of medium to fine grained homogeneous soil whereas at the foot the deposit is heterogenous and colluvial type.

Vegetation: Only grasses, herbs and shrubs grow on this facet. Occasional xerophytic plants are seen to dot the hill.

Land Use: Woody plants can grow well on the facet for timber, soil binding and environmental effects.

Genesis: This facet is formed by the subaerial erosion of trap rocks. The upper horizontal flow being more resistant, weather very slowly; the fractures and joints are the dominant factors that have controlled the denundation of the trap rocks.

Airphoto Interpretation Aid

The facet appears convex and linear on airphotos and is marked by dark grey tone. The surface

is barren with coarse external drainage. The hill-top is recognised by a darker tone as compared to the surrounding ground.

Comments and Reference:

The facet is present in the Toposheet Nos. 46/D15 and D11, 46/D16 and 47/A13. It comprises a barren and untrafficable terrain. It can be used for forest development.

PLATE A_4

HILL TOP (BARREN)

FACET NO	: A_4
NAME	: Hill top (barren)
LOCATION	: Northeast of Bhilad
GEOREF	: 46/D15 and D11
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: June, 1982.

Morphology: The facet occupies the highest position in the surrounding landscape. The height is 230m. The top is rough, convex upward and covered with weathered fragments of basaltic rocks. Soil cover is present only on small depressions.

Surficial Deposit: A thin cover of soil is found only in small depressions or on flat areas where the gravity flow is minimum. The soil grades into bedrock basalt with depth. The thickness of the soil varies from 2-20 cm. The completely decomposed material at the surface is separated from the basalt below by murrum showing intermediate stage of decomposition.

Water Regime: The facet remains dry throughout the year except during the rainy period. There is practically no water retension due to the impervious nature of the substratum.

Associated Features

Position of Landscape: It occupies the highest position.

Soil: It is a residual homogeneous soil that have not undergone transportation. It comprises silt, clay, and rock fragments. The soil is dark in colour and has comparatively finer texture.

Vegetation: It is barren with sporadic herbs, shrubs and grasses, all having xerophytic characteristics.

Land Use: Barren.

Genesis: The facet is a product of subaerial erosion of trap rock. The erosion of the rock is controlled by joints and horizontal flows.

Airphoto Interpretation Aids

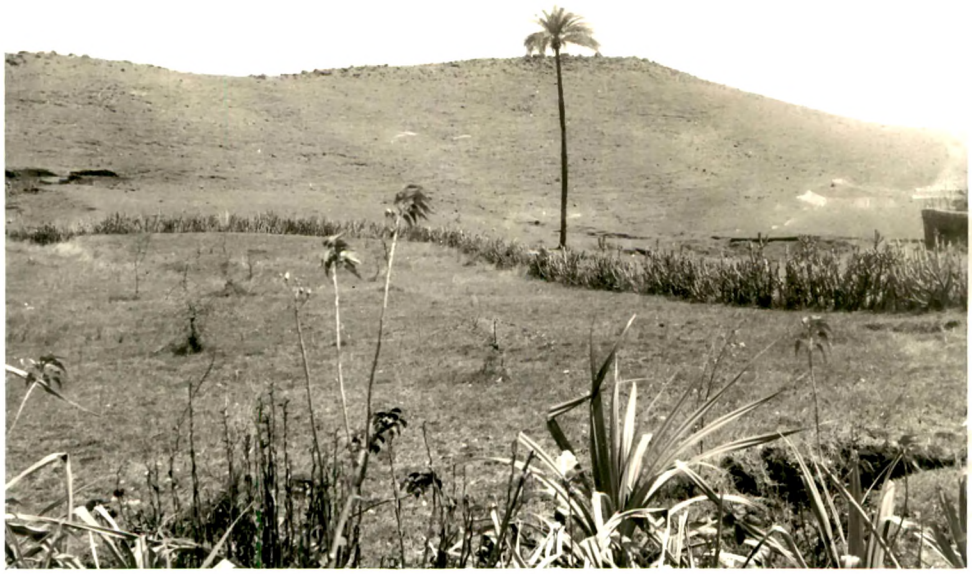
The facet is either convex or near horizontal, marked by a light grey tone. The surface is barren and at places prominent valleys are seen. The drainage is poor and the channels are shallow. The hill tops are recognised as a lighter tone as compared to the medium grey tone of the hill slopes that have some vegetation covers.

Comments and References:

The facet is present in the Toposheet Nos. 46/D14, 46/D15 and D11, 46/D16, 47/A13. It comprises a barren, inaccessible terrain and is very difficult to walk over it. The surface is rough and is marked by accumulation of weathered trap rocks and [illegible], therefore, of unstable nature. It can be, however, exploited for forestry.

FACET NO. A_5

HILL SLOPE (BARREN)



FACET NO : A_5

NAME : Hill slope (barren)

LOCATION : West of Bhilad

GEOREF : 46/D15 and D11.

COMPILER : Geology Department,
M.S. University, Baroda.

DATE : June, 1982.

Morphology: This facet occupies an intermediate position in the landscape. It comprises a smooth profile with a general slope of 30-60°. At places, its flanks form steep scarps. The height of the facet is 170m.

Surficial Deposits: The surface is covered with a thin veneer of soil which is underlain by a 10-30 cm of partly decomposed material that overlies trap rock. Newly formed decomposed materials are washed down and hence, no appreciable thickness of soil is encountered in this facet.

Water Regime: The facet remains dry throughout the year except during the monsoon. The low percolation rate of water into the trap substratum is responsible for its dry condition.

Associated Features

Position in Landscape: It occupies an intermediate position in a landscape, surrounded by hills and highlands.

Soil: Soil is partly transported and partly residual. It is black cotton soil of dark grey colour and medium to fine grained.

Vegetation: The facet is barren, except at few places where it is covered with grasses and bushes.

Land Use: It is barren and hence, the terrain is a wasteland; walking over it is difficult.

Genesis: The facet is formed by the erosion of the elevated portion of the trap hill by denudational agencies. The weathered debris get accumulated on the slope and at the foot.

Airphoto Interpretation Aid:

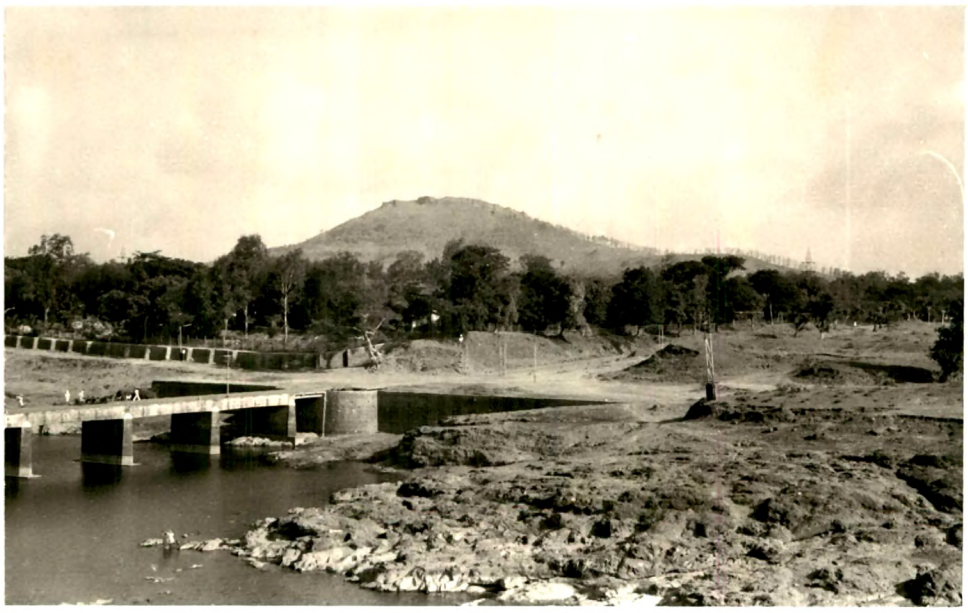
On the airphotos the facet is marked by a light grey tone on account of its barren nature. The slope is covered with rock debris and appears rather smooth.

Comments and Reference

The facet is present in the Toposheet Nos. 46/D15 and D11, 46/D16, 47/A13. It is barren and difficult to walk over it. Internal and external drainage are rather good.

PLATE A_6

HILL SLOPE (VEGETATED)



FACET NO	: A_6
NAME	: Hill slope (vegetated)
LOCATION	: Ashagarh
GEOREF	: 47/A13
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: June, 1982.

Morphology: The facet occupies an intermediate position in the surrounding landscape. It represents a rugged topography with slope ranging from 20-45^{o} though at places vertical cliffs are conspicuous. The height of the facet is 85m.

Surficial Deposits: The surface is covered with soil of 5-50 cm thick. However, below this depth is a 10-60 cm of partly decomposed murum that underlies the bed rock. The depth of the soil increases with decrease in slope, especially towards the lower flanks and foot.

Water Regime: The lower layer remains wet during the rainy season and because of a considerable depth of soil cover and luxuriant vegetation, water retention is comparatively higher.

Associated Features

Position in Landscape: It occupies an intermediate

position in the landscape, surrounded by hill tops and high grounds.

Vegetation: It is covered with a fairly dense thick jungle, abounding in babul, teak, nim etc. Grasses are seen to cover the facet.

Lane Use: The facet is ideal for plantation of trees for timber and furniture, that also helps for protection of the terrain against landslide.

Genesis: The facet is formed by erosion of the trap rock at the elevated position. The accumulation of debris from the top of the facet as well as residual soil in situ has given rise to this facet.

Airphoto Interpretation Aid:

It is marked by a dark grey tone due to the presence of vegetation. The surface is sloping and has a medium to fine drainage network.

Comments and Reference

The facet is present in Toposheet Nos.46/A14, 46/D15 and D11, 46/D16 and 47/A13. It is suitable for growing woody plants for furniture and timber. Being slopy and rugged it is not easily trackable.

FACET NO. A_7

VALLEYS

FACET NO : A_7

NAME : Valley

LOCATION : Manda

GEOREF : 46/D15 and D11

COMPILER : Geology Department,
M.S. University, Baroda.

DATE : June, 1982.

Morphology: This facet occupies an intermediate position in the landscape. It is marked by a V-shaped depression caused by the erosion of the trap rock by downflowing streams. It is a sloping surface with a steep slope ranging from 30^{o}-70^{o} and width varying from 300 to 600 m. The average height of the facet is 174 m.

Surficial Deposits: The surface is covered with a mixture of soil cover both residual and transported. The erosion of trap rock has given rise to an accumulation of talus and screes. The soil cover is usually washed down during torrential rainfall. However, on the lower reaches cobbles and boulders abound. At the foot talus cone of 1-5 m has been observed.

Water Regime: The surface remains wet throughout the year, except during drought. The percolation of water from the flanks of the valleys, gradually

accumulatestowards the channel so that a natural water course is maintained even after the rainy periods. However, at places the valley remains dry during summer.

Associated Features

Position in Landscape: It occupies an intermediate position in the surrounding landscape.

Soil: It is dark in colour, heterogenous, partly transported and partly residual. There is an abundance of coarse trap fragments, especially at the foot. The depth of soil is comparatively thin on the upper portion of the valley.

Vegetation: Growth of babul, cactus, grasses etc. is very common. At places where the subsoil remains wet, woody, mesophytic plants grow well.

Landuse: It is very ideal for the development of forests for timber logs and furniture woods. This facet is untrafficable.

Genesis: The valley is formed due to the downrushing of the stream waters, cutting prominent grooves along the hill slope. The slope is controlled by structure, rock resistance and erosive power of the streams.

Airphoto Interpretation Aid

The valley floor is covered with talus and screes, with a thin layer of soil that support vegetation. It is marked by a dark grey tone compared to a lighter one of the surrounding areas. It is V-shaped, sloping and is marked by good external and internal drainage.

Comments and Reference

The facet is present in Toposheet Nos.46/D14, 46/D15 and D11, 46/D16, 47/A13. It is covered with vegetation, mainly trees and bushes and hence, unmotorable. It is ideal for forest development.

FACET NO. A_8

GENTLE SLOPING PLAIN GROUND

FACET NO	: A_8
NAME	: Gentle sloping plain ground
LOCATION	: Bhilad
GEOREF	: 46/D15 and D11
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: June, 1982.

Morphology: This facet occupies the largest area of the pattern. It has a very gentle slope of 1 in 50 to 1 in 100 and comprises a rather coarse drainage texture marked by shallow streams. The soil is fine to medium grained with a large percent of silt and clay. The terrain is monotonous and the patches of grasses, herbs and shrubs grow all over.

Surficial Deposit: The soil is dark brown, fine grained and is transported. Its depth varies from 10-80 cm, It underlies a semi-weathered murum layer which is a residual deposit derived from the underlying trap rock. Towards the foot of the hill it is coarse, heterogenous with a mixture of coarse rock debris and clayey materials.

Water Regime: The facet remains wet during rainy season. Since the depth of the soil is appreciable

540

some percentage of water is held between the inter-granular spaces so that few centimetres below, it remains wet even after the monsoon period. However, during summer it gradually becomes dry.

Associated Features

Position in Landscape: It occupies the intermediate position in the surrounding landscape.

Soil: It is both residual and transported. The upper layer is medium to fine grained whereas the underlying murum layer is coarser.

Vegetation: Where the depth of the soil cover is appreciable and rainfall is good, the vegetation is luxuriant. Agricultural exploitation is being undertaken at many places. However, a major part of the pattern is still uncultivated and only grasses and shrubs grow at these places.

Landuse: It is used for cultivation of food crops and fruit trees as well as grasses for fodder.

Genesis: Formed by denudational agencies of trap rocks.

Airphoto Interpretation Aid

The facet shows light grey tone marking barren terrain and dark grey tone signifying vegetation patches. The drainage lines appear faint light grey. They show a parallely oriented rectangular pattern due to structural control and also dendritic pattern. The stream channels are narrow and shallow.

Comments and Reference

The facet is presented in the Toposheet Nos. 46/D14, 46/D15 and D11, 46/D16 and 47/A13. Being a plain ground, it is motorable during fair weather. The lands can be extensively exploited for agriculture purposes as well as for grazing cattle. Rivers follow straight courses but at some places they show meandering.

FACET NO. A_9

COLLUVIUM

FACET NO	: A_9
NAME	: Colluvium
LOCATION	: Udvada
GEOREF	: 46/D15 and D11.
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: June, 1982.

Morphology: This facet occupies an intermediate position in the landscape. It is a cone-shaped deposit lying at the foot of the hill and comprises heterogenous materials of different particle sizes. It has a maximum width of 100 m and depth of about 3-5 m.

Surficial Deposit: It consists of rock debris carried down hill due to gravity or rain water. It is a product of weathering aided by mass wasting. The deposit has a large percentage of coarse angular fragments below which lie the finer fractions. Where the river valley is mature this colluvial deposit interfingers with the alluvium.

Water Regime: Owing to high permeability there is no significant water retention and hence, after the rainy season the facet remains dry throughout the year.

Associated Features

Position in Landscape: It occupies an intermediate position in the surrounding landscape.

Soil: It is a transported deposit comprising a small percentage of fine powdery fraction and a 2-5 m of very coarse angular basaltic fragments. However, weathering of these coarse fragments have produced a thin layer of soil that supports grasses.

Vegetation: This facet is more or less barren with rare patches of grasses.

Landuse: Owing to the unstability, this facet is devoid of any significant vegetation and hence, is a waste land.

Genesis: It is a product of subaerial erosion of trap hills, aided by gravity and water action. The gravity sliding of the trap fragments often produce fine powdery fractions that abound this facet.

Airphoto Interpretation Aid

This facet appears as cone-shaped, sloping feature and is marked by a light grey tone. It is present at the foot of the hills, especially at the

valley floor. It shows no drainage network.

Comments and Reference

The facet is present in the Toposheet Nos. 46/D14, 46/D15 and D11, 46/D16, 47/A13. It is a wasteland and is difficult to walk over it.

FACET NO. A_{10}

RIVER BED (ROCKY)

FACET NO	: A_{10}
NAME	: River bed (rocky)
LOCATION	: North of Pardi
GEOREF	: 46/014
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: June, 1982.

Morphology: It occupies the lowest position in the pattern. The bed is rocky that has been planed down by the river water. At places, the more resistant ones stand as rocky islands. The rocky bed is near-horizontal except towards the banks where they slopestowards the channel. The highly jointed and fractured rocks are easily weathered away so that the river bed has a huge accumulation of cobble deposits.

Surficial Deposit: The bed is a trap rock that has been worn down to give a planar feature with some cobbles. However, during low tide a thin cover of mud is seen on these rocky surfaces.

Water Regime: The facet is flooded by river water for most of the time. During dry season few of

the rocky patches are seen to crop out of the surface but gets covered after a brief spell of rain.

Associated Features

Position in Landscape: It occupies the lowest position.

Soil: The terrain is rocky except a very thin cover of muddy deposit after the monsoon period.

Vegetation: Owing to the lack of soil cover and the ever flowing river water that inundates the river bed, there is absence of vegetation. Only a few grasses with fibrous root grow on the rocky crevices.

Landuse: This facet is a wasteland.

Genesis: The flowing water armed with sands and pebbles abrade the rocks to give a near horizontal surface. The joint system and fracture pattern also control the erosion. The facet is a cumulative product of corrosion, attrition and hydraulic action of river water.

Airphoto Interpretation Aid

In the airphotos the facet is marked by a light grey tone characteristics of trap rocks. The water bearing areas show a comparatively darker tone. The

rocky bed appears as patches and at most places is covered by the river water.

Comments and Reference:

The facet is present in Toposheet Nos.46/D14, 46/D15 and D11, 46/D16 and 47/A13. It is untrafficable except during dry season when walking on the trap substratum is feasible.

FACET NO. A_{11}

EROSIONAL PLANATION SURFACE

FACET NO	: A_{11}
NAME	: Erosional planation surface (Terrace)
LOCALITY	: North of Pardi
GEOREF	: 46/D14
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: June, 1982.

Morphology: The facet is an erosional feature carved by the action of river current. It is a plain ground exposed above the water during normal period and at places appearing as rocky islands in the river channel. It slopes towards the river channels and extends for 300-400m along the river banks.

Surficial Deposit: It comprises trap rock and has no surficial deposit except after flood when the river deposits a thin cover of clayey sediments. However, this clayey mud gets washed away during rainy season or during the subsequent flood.

Water Regime: The facet is occasionally flooded during rainy season. However, during summer it is exposed subaerially.

Associated Features

Position in Landscape: It occupies the lowest position in the landscape.

Soil: It is rocky without any soil deposit. A thin layer of mud is seen only after major flood.

Land Use: This terrain is a wasteland.

Genesis: The facet is a product of river action on trap rock. River water laden with detritus serves as tools for abrading the trap surface which gradually wear down giving rise to a near horizontal planation surface. The joint system and fracture pattern have also controlled its weathering and denudation.

Airphoto Interpretation Aid

In the airphotos this facet appears as a flat, horizontal feature marked by a light grey tone. It is easily recognised from the comparatively darker tone of the river water.

Comments and Reference

The facet is represented in Toposheet Nos.46/D14, 46/D15 and D11, 46/D16 and 47/A13. The surface is near horizontal, flat and more or less smooth. It is, however, untrafficable since it forms discontinuous patches. It marks an upper limit of river abrasion and at the banks it forms cliffs.

FACET NO. A_{12}

CHANNEL SHOAL

FACET NO : A_{12}

NAME : Channel Shoal

LOCALITY : North of Pardi

GEOREF : 46/D14

COMPILER : Geology Department,
M.S. University, Baroda.

DATE : July, 1982.

Morphology: This facet is a depositional feature lying in the channel bed and is usually exposed during dry periods when the level of water is considerably low. It is an essentially pebble and cobble deposit with some percentage of silt and clay, covering the coarser fragments. The shoal is generally linear in shape with few extending for 200-300m, though mostly they are less than 50m long. This deposit is usually unstable and shifts down stream during flood. It may also get washed away.

Surficial Deposit: The lower portion is coarse pebbly and cobbly, above which lie coarse sands. Finer sands and mud lie within the interstices of the coarser fragments or cover the whole deposit.

Water Regime: This facet is covered with water for most of the time except during dry period when the upper portions are exposed subaerially.

Associated Features

Position in Landscape: It occupies the lowest position in the landscape.

Soil: It is coarse to fine grained, heterogeneous and transported.

Land Use: This terrain is barren and is of practically no utility.

Vegetation: Vegetation is absent except isolated grasses at some localities.

Genesis: The eroded trap rocks from the hilly terrains are transported down stream by the rivers. When these rivers lose their transportation power, the coarser debris are deposited in the middle of the channel beds. Slow accretion enlarges the shoals so that in due course they grow in size. Finer sediments, especially silt and clay are deposited on them when the flood stage gradually slackens down.

Airphoto Interpretation Aid

In the airphotos the facet appears as tiny elongated bodies in the middle of the river channels. It is marked by a light grey tone surrounded by the darker tone of the river water. It is easier to recognise since it outcrops prominently above the stream water.

Comments and Reference:

This facet is present in toposheet Nos. 46/D14, 46/D15 and D11, 46/D16, 47/A13. It is untrafficable since it is surrounded by water for most of the time. This facet is unstable and goes on changing its position after each flood.

FACET NO. A_{13}

BED ROCK SOIL

FACET NO	: A_{13}
NAME	: Bed rock soil
LOCALITY	: Pardi
GEOREF	: 46/D14
COMPILER	: Geology Department,
	M.S. University, Baroda.
DATE	: July, 1982.

Morphology: It is a depositional feature lying at the top of rocky terrain. It is essentially a product of subaerial erosion and denudation and has not undergone any transportation. It is dark brown or reddish brown, comprising coarse trappean fragments with abundance of finer fractions. This deposit is very thin, usually less than 20 cm and are washed down hill by rain water.

Surficial Deposit: This deposit comprises coarse and fine disintegrated product of trap rocks and are generally very thin, less than 20 cm. However, at some places the thickness may be 40-50 cm. The upper portion is more or less decomposed, the intermediate one is semi-decomposed whereas the lower portion is trappean bed rock.

Water Regime: This facet is dry for most of the time except during rainy season when water is retained in the pore spaces of the soil.

Associated Features

Position in Landscape: This facet occupies the highest position in the surrounding area.

Soil: It is a residual soil, usually fine grained but a fair percentage of coarser debris is also common.

Vegetation: This facet supports only grasses, herbs and shrubs because of its low water retention capacity and thin soil cover.

Land Use: This terrain is barren and hence, a wasteland..

Genesis: Owing to physical and chemical agencies, the trappean rocks are attacked and are gradually weathered. This process is aided by the rain water that disintegrates the upper part of the bed rock and in due course a thin cover of soil is formed that may remain 'in situ' to give rise to the residual or sedentary soil. The upper cover is usually fine grained and is reddish or brownish in colour.

Airphoto Interpretation Aid

In the airphoto the facet is marked by a light grey tone and lies usually on the top of hills.

560

Comments and Reference

This facet is present in Toposheet Nos.46/D14, 46/D15 and D11, 46/D16, 47/A13. It is untrafficable. However, grasses and small plants could be grown to stabilize the area and to enhance its disintegration processes to form a thick layer of soil.

FACET NO. A_{14}

STONE QUARRY

562

FACET NO	: A_{14}
NAME	: Stone quarry
LOCALITY	: Pardi
GEOREF	: 46/D14
COMPILER	: Geology Department,
	M.S. University, Baroda.
DATE	: July, 1982.

Morphology: It is a man-made feature, where the trap materials are quarried for building as well as for road construction. The quarry depth varies from 2-20M or even more and laterally may extend for hundreds of metres. The quarries have been developed where the rocks are unweathered and located near main roads. After quarrying the grounds are planed down and only heaps of finer frequents and angular cobbles are observed.

Surficial Deposit: The surface is rocky, with angular rock fragments that lie scattered all around. Some of the fragments are as long as 2m. The finer fragments are formed due to pulverisation of the coarser ones during quarrying or due to disintegration.

Water Regime: The facet remains dry for most of the time except during rainy season, when rain water accumulates in small depressions.

Associated Features

Position in Landscape: This facet lies at a lower level, usually below the general ground level.

Soil: It is absent.

Vegetation: The facet is barren and supports no vegetation.

Land Use: The quarried materials are used for building and construction purposes.

Genesis: The feature is man made.

Airphoto Interpretation Aid

The facet is difficult to identify in airphotos due to its size. However, man made steep scarps with chunks of angular rock fragments are identified. It is marked by a light grey tone in contrast to the surrounding agricultural land which appears plain, smooth and dark grey in airphotos.

Comments and Reference

The facet is common in Toposheet Nos.46/D14, 46/D15 and D11, 46/D16 and 47/A13. Internal and external drainage are absent. It is marked by sharp cliffs, irregular depressions and smooth surrounding areas.

FACET NO. B_1

OLDER ALLUVIUM

PATTERN B - ALLUVIAL PLAIN

FACET NO	: B_1
NAME	: Older alluvium
LOCALITY	: Charwada (South of Tithal)
GEOREF	: 46/D14
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: It is a depositional feature of the late Pleistocene period, extending from the foot of the hills to the coastline. It has been deposited by the energetic Pleistocene rivers and comprises rock fragments, sands, silt, clay and some percentage of organic matter Calcareous nodules have also been observed at most of the places. The thickness of this alluvial deposit increases towards the coastal areas, especially in the northern part.

Surficial Deposit: The alluvium is essentially dark brown or black soil comprising fine grained sands, silt and clay. Towards Bulsar, especially near the coastline, the thickness is 8-10m, that decreases gradually towards Umbargaon.

Water Regime: The facet remains wet during rainy season but dries up during summer. However, owing to the high water retention in the pore spaces of the soil, it is saturated with water and the water table is encountered at 10-15m below the ground level.

Associated Features

Position in Landscape: This facet occupies a lower position in the surrounding landscape.

Soil: It comprises homogeneous, transported black cotton soil which is fine to medium textured, with a good percentage of sands, silt and clay.

Vegetation: This facet, being fertile, supports vegetation luxuriantly. Fruit trees, vegetables and grasses are readily grown.

Land Use: This facet is used for cultivation, as well as for cattle grazing.

Genesis: The eroded and weathered trap rocks by physical and chemical agencies were alluviated by the rivers and formed huge flood plains, that grew in size to form this older alluvial deposit, stretching from the foot of the hills to the coastal plain.

Airphoto Interpretation Aid

This facet is very extensive and in the airphotos it is readily marked by patches of light grey and dark grey tone. The dark grey tone signifies luxuriant vegetation and the light grey tone is due to the scantiness of vegetation. Drainage is very conspicuous and streams show some meandering.

Comments and Reference :

This facet is common in Toposheet Nos.46/D14, 46/D15 and D11, 46/D16 and 47/A13. This facet is flat, smooth and has good drainage and is fertile.

FACET NO. B_2

RELICT ALLUVIUM

569

FACET NO	: B_2
NAME	: Relict alluvium
LOCALITY	: Dandi
GEOREF	: 46/D14
COMPILER	: Geology Department, M.S.University, Baroda.
DATE	: July, 1982.

Morphology: It is a depositional feature, outcropping from the tidal flats. This feature is essentially a late Pleistocene deposit but has been isolated due to the rising Flandrian high strandline that eroded the low lying areas and where only parts of the older alluvium, that were lying at a higher altitude, were untouched. Its chemical composition is same as that of the older alluvium, comprising chiefly sands, silt, clay and organic matter. However, on the fringes calcareous nodules are abundant. The size of these features varies from tens of metres to few kilometres and has a thickness of 8-10m.

Surficial Deposit: It is a dark brown or black soil, comprising fine sands, silt and clay and has a thickness of about 10m, but at many places it is less.

Water Regime: The facet remains wet during rainy season but becomes dry during summer. At a depth of 10-12m water table is encountered but during high tide, especially after a good amount of water has been drawn out, salt water from the sea intrudes the freshwwater.

Associated Features

Position in Landscape: This facet lies at an higher elevation in the surrounding landscape.

Soil: It is a homogeneous, transported black cotton soil, derived by the weathering and disintegration of trap rocks. The soil is usually fine textured and has a thickness of about 10m..

Vegetation: Initially this facet was barren but now owing to greater demand for land at the coastal areas, fruit trees and vegetables are grown. At many places, orchards have come up.

Land Use: Besides gardening and cultivation this facet is also useful to tap fresh water for the fishing tribes who inhabit the coastal areas.

Genesis: During the warm period when the sea level was much lower, the major rivers were depositing huge flood plains at the coastal areas. With the onset

of Flandrian transgression, most of the alluvium were washed away, except few patches that were left as relict features, on account of their higher elevation.

Airphoto Interpretation Aid

This facet appears as small dots or linear shaped features, behind the coastal ridge or on tidal flats. It is marked by light medium tone. The darker tone is on account of its vegetation cover.

Comments and Reference

This facet is present in Toposheet Nos.46/D12, 46/D14, 46/D15 and D11, 46/D16, 47/A9 and 47/A13. It is a small elevated feature surrounded by a flat ground.

FACET NO. B_3

RECENT FLOODPLAIN

FACET NO	: B_3
NAME	: Recent flood plain
LOCALITY	: Bulsar
GEOREF	: 46/D14
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: It is a flood plain deposit of late Holocene to Recent, marking the lower terraces of the major rivers. It is usually broad but at many places. it is linear and elongated and usually occupies a lower position. The deposit comprises mainly fine sands, silt and clay with subordinate percentages of organic matter.

Surficial Deposit: The facet is essentially a dark, fine grained alluvial deposit, with a thickness of 1-3m.

Water Regime: This facet remains more or less wet during the whole year on account of the river water flowing through it. However, during drought it may get dried up.

Associated Features

Position in Landscape: This facet occupies a lower

level, usually near the low water line of the river water.

Soil: It is a homogeneous, transported, fine grained alluvial soil of recent origin, deposited during flood periods.

Vegetation: It is extremely fertile and has been exploited for agriculture as well as for orchards.

Land Use: This facet is used primarily for cultivation because of its fertility.

General: During flood period, when the rivers are in spate, large amount of debris are carried towards the coastline. When the carrying capacity of these rivers slackens, the finer sediments are deposited on the banks or on the low-lying areas near the banks. These sediments, with slow accumulations, grow in size to give a recent flood plain deposit, and usually comprise fine sands, silt and clay.

Airphoto Interpretation Aid

This facet appears as linear, elongated horizontal feature, bounded by the river bluffs and sometimes extending beyond the river banks to low lying areas. It is marked by dark grey tone due to abundant vegetation.

Comments and Reference

This facet is present in Toposheet Nos.46/D14, 46/D15 and D11, 46/D16 and 47/A13. It is characterised by smooth, horizontal surface, marking the areas flooded by rivers.

FACET NO. B_4

ALLUVIAL TERRACES

FACET NO	: B_4
NAME	: Alluvial terraces
LOCALITY	: Pardi (Railway station)
GEOREF	: 46/D14
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: They are depositional features, characteristic of the major rivers. The upper terrace height varies from 5-8m whereas the lower terrace is usually 2-3m high. They comprise gravel, coarse sands, silt and clay. They sometimes show alternation of coarse and find sands due to climatic variations. The upper terrace indicatesan older flood plain whereas the lower one is a recent deposit.

Surficial Deposit: The sediments of the terraces are coarse, pebbly and sandy. The pebbles are rounded and either spherical or platy. However, the lower terrace is composed of a good percentage of fine sands, silt and clay.

Water Regime: It remains wet during flood period or rainy season, but the lower terrace remains wet throughout the year.

Associated Features

Position in Landscape: This facet lies at a low level.

Soil: It is homogeneous, transported, dark coloured black cotton soil, comprising sands, silt and clay.

Vegetation: The terraces are more or less barren except at some places where agriculture is being attempted.

Land Use: This facet is barren but the recent flood plains are supporting vegetation luxuriantly.

Genesis: The alluvial terrace points to succesive climate variations. The flood plains that were formed during the late Pleistocene period were cut when the rivers became energetic and formed the first terrace. The second flood plains formed in the recent periods were also entrenched by the rivers due to upset of equilibrium triggered by another changes in climate.

Airphoto Interpretation Aid

This facet is linear, elongated, horizontal running parallel to the river courses. It is represented by two features, one lying 5-8m above the water line and otherlying at the low water line. It is marked by light to medium grey tone representing upper and lower terraces.

Comments and Reference

This facet is present in Toposheet Nos. 46/D14, 46/D15 and D11, 46/D16 and 47/A13. It is bounded by river channel on one side and river bluff on the other.

FACET NO. B_5

RIVER BLUFF

FACET NO	: B_5
NAME	: River bluff
LOCALITY	: Daman
GEOREF	: 46/D15 and D11.
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: It is an erosional feature, carved by the down flowing stream during flood. The headward erosion of the valley floor has given rise to a cliffy feature having a height of about 5m but at the coast-line a cliff height of about 10m at the river banks marks this feature.

Water Regime: Since the lower part of the bluff lies at the low water level, it remains more or less wet but the upper portion is saturated with water only during rainy period.

Associated Features

Position in Landscape: This facet lies at a lower to intermediate position.

Soil: There is no deposit of soil.

Vegetation: Owing to its instability this feature does not support any vegetation.

Land Use: This facet is barren and has practically no utility in whatever form.

Genesis: It points to climatic variations when the level of river water rose and started downcutting the valleys. This phenomena could be related to the regression of the sea level when the valley floor stood at a relatively higher level in comparison to the sea level. At the coastal areas vertical down-cutting of 8-10m is conspicuous.

Airphoto Interpretation Aid

In airphoto this facet is marked by a vertical feature with cliff and bounded by river channel on one side and alluvial plain on the other.

Comments and Reference

This facet is present in Toposheet Nos.46/D14, 46/D15 and D11, 46/D16 and 47/A13. It is untrakable and untrafficable.

FACET NO. B_6

MEANDERING CHANNEL

FACET NO : B_6

NAME : Meandering channels

LOCALITY : Pardi (Railway Station)

GEOREF : 46/D14

COMPILER : Geology Department,
M.S. University, Baroda.

Morphology: On the alluvial plain, where gradient is comparatively low, the channels gradually adjust their slope to effectively carry their load, but generally meander when the slope exceeds that required to transport the sediments. The meandering belt of channels has bankful channel width atleast ten times if not more. The meandering channels usually carry finer sediments such as silt and clay. During flood period the meandering belt shifts, lengthens or narrows. These channels are seasonal and during summer most of them get dried up.

Surficial Deposit: The facet comprises fine sands, silt and clay brought in suspension during flood and deposited when the water turbulence slackens.

Water Regime: The facet remains more or less wet except during prolonged period of dry spell.

Associated Features

Position in Landscape: This facet lies at the lowest level in the landscape.

Soil: The bank of the channels is composed of silt and clay with some organic matter. The soil is homogeneous and transported.

Vegetation: Vegetation is practically absent, except on the banks where only patches of grasses are seen growing.

Land Use: The channels can support vegetation on their banks if flooding is prevented.

Genesis: Erosion of the flood plain has given rise to this facet. The meandering habit is due to a very gentle slope where the streams lengthen their courses to maintain a gradient required to carry the sediments.

Airphoto Interpretation Aid

In airphotos they appear as medium to dark grey lines showing a smooth meandering pattern. The vegetation on the banks is marked by a dark discontinuous grey tone.

Comments and Reference

This facet is present in Toposheet Nos.46/D14, 46/D15 and D11, 46/D16 and 47/A13. The channels are seasonal except the major ones. On the banks vegetation can grow well especially paddy field if floods can be controlled.

FACET NO. B_7

POINT BAR

FACET NO	: B_7
NAME	: Point bars
LOCALITY	: Lavachha (Dadra and Nagar Haveli)
GEOREF	: 46/D15 and D11
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: They are cresentic or lensoid shaped features, developed on the inner side of the meander loops and are formed by slow accretion of river materials accompanying migration of the meander. They are welded to the banks but sometimes have narrow troughs that are filled with fine sediments. Their sizes vary from 50m to 300m. In vertical section the lowermost portion comprises coarse sands and gravels whereas the upper portion consists of medium to fine sands and clay.

Surficial Deposit: They comprise coarse to medium sands with a fairly large percentage of mud in the form of mud drape.

Water Regime: This facet remains wet for the greater part of the year; the lower portion lying at the low water level remains wet permanently but the upper part that is exposed subaerially gets dried up during

summer.

Associated Features

Position in Landscape: This facet occupies a lower position in the neighbouring landscape.

Soil: The soil is transported fine to coarse textured, comprising a good percentage of mud, especially on the upper portion.

Vegetation: It is practically barren.

Land Use: This facet is of no utility.

Genesis: The helical flow of water that converges on the outside of meander bend erodes the banks whereas on the inner side, the rotary movement of water which is upward, deposits the sediments to form point bars.

Airphoto Interpretation Aid

In airphoto the facet appears as small lensoid or crescent-shaped deposit lying at the inner side of the meander loop. It is marked by a light grey tone.

Comments and Reference

This facet is present in Toposheet Nos.46/D14, 46/D15 and D11 and 46/D16. The point bar is typical of a graded river and the extent of this feature indicates load carrying capacity of the rivers and sediment supply.

FACET NO. B_8

POND

591

FACET NO	: B_8
NAME	: Ponds
LOCALITY	: Udvada
GEOREF	: 46/D15 and D11
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: The ponds are stagnant water accumulations situated at a low altitude. They are generally circular or oval in shape and extend for a length of 200-800m or even more. Most of them are permanent water bodies derived their water from the atmosphere or from hilly areas.

Surficial Deposit: There is an absence of any surficial deposit.

Water Regime: This facet remains wet throughout the year.

Associated Features

Position in Landscape: This facet occupies the lowest position in the landscape.

Soil: There is no soil cover.

Vegetation: It is absent.

Land Use: This facet is useful for irrigation as well as for drinking purposes.

Genesis: During heavy rainfall the low lying areas are covered with pools of water. If the depressions are large a good amount of water is collected in them. They become permanent water bodies if there is a constant supply of water, especially during rainy period.

Airphoto Interpretation Aid

This facet appears as circular or near circular feature marked by a dark grey tone. The periphery of the facet supports trees and in the surrounding areas vegetation is luxuriant.

Comments and Reference

This facet is present in the Toposheet Nos.46/D14, 46/D15 and D11, 46/D16 and 47/A13. It is very useful for irrigation as well as for domestic purposes.

FACET NO. C_1

FORESHORE MUDFLAT

PATTERN C - MUDDY SHORE

FACET NO	: C_1
NAME	: Foreshore mudflat
LOCALITY	: Bordi
GEOREF	: 46/D12
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: It is an extensive, near horizontal mud deposit found in the intertidal zone. The finer mud sediments are derived from the inland areas by rivers, creeks and tidal inlets. This mudflat comprises fine sands, silt, clay and a fair percentage of organic matter. It extends for about 500m seawards and laterally it covers the foreshore for more than one kilometre. It is usually barren but sometimes supports mangroves. Since the sediment supply is more and the wave action is negligible, this deposit is more or less stable and stands out as permanent features.

Surficial Deposit: This facet comprises mud which is dark grey, fine grained. It is sticky and plastic and can be rolled into small threads of 1mm diameter

and 2-3 cm length. The thickness of mud cover varies from 10cm to 80cm or even more, near the creeks.

Water Regime: This facet is exposed to seawater and remains inundated by tide water throughout the year. External and internal drainage is good.

Associated Features

Position in Landscape: It occupies a rather low position in the surrounding landscape.

Soil: It is transported, homogeneous, dark grey, fine grained, with some percentage of sands.

Vegetation: It is barren except patchy growth of mangroves.

Land Use: It is a wasteland.

Genesis: This facet is formed by the deposition of the fine clayey sediments drained into the sea by rivers, creeks and tidal inlets and redeposited on the foreshore by waves.

Airphoto Interpretation Aids

This facet is marked by a dark grey tone adjacent to the waterline. It is dissected by creeks and inlets.

Comments and Reference

This facet is present in Toposheet Nos. 46/D14, 46/D15 and D11, 46/D12. The surface is smooth, muddy and extremely difficult to walk over it.

FACET NO. C_2

ESTUARINE MUDFLAT

FACET NO	: C_2
NAME	: Estuarine mudflat
LOCATION	: Umarsadi Machiwada
GEOREF	: 46/D14
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: This facet occupies a lower position in the landscape, slightly higher than the low waterline and extends along the banks of the rivers, especially at their mouths. It comprises mud deposit of thickness ranging from few centimetres to two metres. The mud deposit is seen to abut against the alluvial mounds at the banks. The mud surface is not smooth. It has micro-undulations, especially ripple marks. Owing to its constantly being under water, no vegetation is supported.

Surficial Deposit: The facet comprises fine grained soil with a thickness of about 50-200 cm. It is sticky and plastic and is derived from the inland as well as from the seas.

Water Regime: This facet remains wet throughout the year. During high tide it is inundated by sea water and gets uncovered during low tide.

Associated Features

Position in Landscape: It occupies a low position in the landscape.

Soil: The soil is transported dark grey, fine grained and homogeneous.

Vegetation: Vegetation is absent except occasional patches of mangroves.

Land Use: Since it is inundated constantly and having a high selinity, it is a wasteland.

Genesis: During high tide seawater ingresses inland through the river mouths and impinges on the banks, thus depositing finer sediments that are in suspension. Sediments derived from inland areas and those from the offshore are trapped in the estuary and gradually deposited on the banks when the tide recedes.

Airphoto Interpretation Aids

This facet is recognised by a dark grey tone adjacent to the river channels and gives a smooth, horizontal flat surface, devoid of any significant vegetation.

Comments and Reference

This facet is present in Toposheet Nos.46/D14, 46/D15 and D11, 46/D16, 47/A9 and 47/A13. It is untrafficable and difficult to walk over it except during hightide when boat can ply over. It has good drainage. This facet is a wasteland.

FACET NO. C_3

RAISED MUDFLAT

FACET NO	: C_3
NAME	: Raised mudflat
LOCALITY	: Umbargaon
GEOREF	: 46/D16
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: It is an extensive, near horizontal mud deposit, more or less stabilized and unaffected by the present day tides. This deposit was formed at a higher strandline when the sea had transgressed inland. It comprises predominantly silt and clay and a very small percentage of sands. Organic matter is, however, observed in the form of plant roots, leaves and stem, and shell fragments etc. This facet is found abutting against the alluvium or trappean hills and extends for hundreds of metres.

Surficial Deposit: The facet comprises mud deposit; the mud is dark grey, fine grained, sticky and plastic. However, a small percentage of sands have also been observed. The depth of the mud varies from half metre to about 3 metres, or even more.

Water Regime: Since this facet is not exposed to sea water, it receives water only from the atmosphere but remains wet for most of the time since it has

a good water retention capacity.

Associated Features

Position in Landscape: It occupies the highest position in the surrounding landscape.

Soil: The soil is transport one, dark grey, fine grained, homogeneous and muddy.

Vegetation: The facet readily supports grasses and halophytic plants but where the salts have been leached out, woody plants as well as few mesophytic trees grow well.

Land Use: After the salts have been leached this facet can be exploited for agriculture purposes.

Genesis: During the higher strandline, lagoonal areas were formed behind the ridge complex. Fine sands, silt and clay derived from the marine environment and also from inland areas were deposited to form a near horizontal deposit. When the sea regressed this mud-flat was left at an higher elevation, unaffected by the present day high tides.

Airphoto Interpretation Aids

This facet is recognised as a mudflat deposit raised above the ground and marked by medium to dark

grey tone with significant vegetation cover. It is bounded by alluvial plain and trap rocks on one side and by present day mudflat on the other.

Comments and Reference

This facet is present in Toposheet Nos.46/D14, 46/D15 and D11, 46/D16 and 47/A9 and 47/A13. This facet supports vegetation after its reclamation. It is untrafficable.

FACET NO. C_4

MUDFLATS WITH MUDCRACKS

FACET NO	: C_4
NAME	: Mudflat with mud cracks
LOCATION	: Bhagal
GEOREF	: 46/D14
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: This facet occupies an intermediate position in the landscape and lies behind the ridge at a slightly elevated areas, on the mudflat. The mud deposit has developed irregular cracks on the surface whose width varies from 2-5cm and extend downwards, to a depth of 10-20cm. The blocks enclosing the cracks are triangular to polygonal with areas varying from 200-400 sq.cm. In transverse section these cracks give a V-shaped profile. Owing to extreme dessication the polygons are broken into pieces.

Surficial Deposits: The facet comprises fine mud deposits of 50-150 cm thick. Sometimes during storms fine sands, rock fragments and organic matter like plant roots, leaves etc. are invariably incorporated.

Water Regime: This facet gets flooded during high tide or during stormy weather and hence, remains wet.

However, the upper part gets dried up soon. It is devoid of external and internal drainage. Perched water at places are present below the surface.

Associated Features

Position in Landscape: It occupies an intermediate position in the landscape.

Soil: It is transported, homogeneous, fine grained and dark grey.

Vegetation: Vegetation is very sparse, only salt resistant grasses and occasional xerophytic shrubs grow due to high salinity.

Land Use: It is a waste land.

Genesis: The finer suspensates are deposited in this environment, derived from the inland as well as marine areas. During a spell of dry condition, the mud deposit starts shrinking due to the evaporation of water and hence, develop prominent cracks.

Airphoto Interpretation Aid

The facet is marked by medium tone. The shape is either circular to linear, surrounded by coastal ridge, alluvium and creeks. The surface appears smooth in the

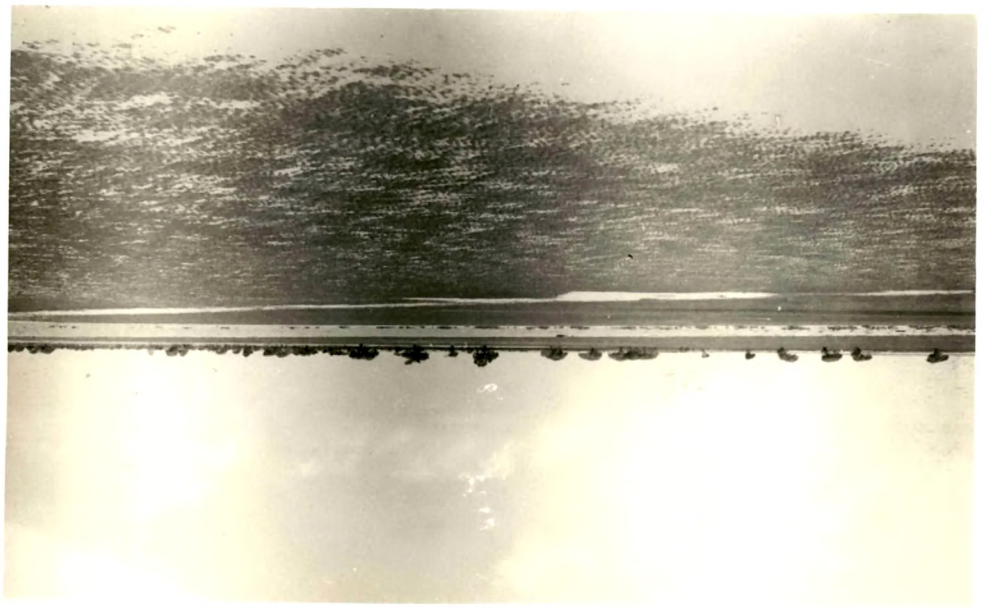
airphotos. Drainage is poor.

Comments and Reference

This facet is present in Toposheet Nos.46/D14, 46/D15 and D11, 46/D16 and 47/A9 and 47/A13. During dry period it is trackable.

FACET NO. C_5

MUDFLAT WITH RIPPLE MARKS



610

FACET NO	: C_5
NAME	: Mudflat with ripple marks
LOCALITY	: Daman
GEOREF	: 46/D15 and D11
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: The facet occupies an intermediate position in the landscape. It is influenced by tidal current and its surface is characterised by asymmetrical transverse ripple marks. These ripple marks have steep lee side and a gentle stoss side. The crests are undulatory and the troughs are filled with coarse sands or coarse organic matter. The amplitude of the ripple marks varies from $\frac{1}{2}$ cm to 5 cm and the wavelength from 2 cm to 15 cm.

Surficial Deposits: The facet comprises fine mud deposits, with thickness ranging from 10 cm to 50 cm or at places even more. It is composed of silt and clay and a small percentage of sands and organic matter.

Water Regime: The facet remains saturated with water throughout the year, as it is under the influence of tides. Since the sediments are fine grained it has

a high retention capacity. Drainage channels are scarce.

Associated Features

Position in Landscape: It occupies an intermediate position in the landscape.

Soil: The soil is dark brown, fine grained, transported and homogeneous.

Vegetation: It is sporadically vegetated, with sparse growth of grasses, shrubs and mangroves.

Land Use: It is a wasteland since it is affected by high tide.

Genesis: Sediments carried from the marine and inland souces are deposited in the lagoon to form mudflats. The receeding tides give rise to undulatory ripple marks.

Airphoto Interpretation Aid

The airphotos show a flat, smooth surface marked by dark grey tone. However, owing to their small size, the ripple marks are not identified.

Comments and Reference

The facet is present in Toposheet Nos.46/D14, 46/D15 and D11, 46/D16 and 47/A13. The surface being muddy, it is difficult to walk over it.

FACET NO. C_6

MUDFLAT WITH MANGROVES

613

FACET NO	: C_6
NAME	: Mudflat with mangroves
LOCALITY	: Bordi
GEOREF	: 46/D12
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: This facet occupies the lowest position in the landscape and lies in the intertidal zone, at the low waterline. This mudflat is fine grained, dark brown and comprises mangrove plants few of which are 2-3m high and have stunted growth. These plants have their roots penetrated deep into the mud and are consequently stabilized. At this place, the mangrove plants do not have any pneumatophores. The extent of the plant growth is more than $\frac{1}{2}$ km but laterally this patch is very narrow, about 200m. The plants are not covered completely during high tide.

Surficial Deposit: This facet comprises fine mud deposits, 50-100 cm thick, dark brown, with abundant organic matter.

Water Regime: It is invariably saturated with sea water since even during low tide it is partially covered with water. It also receives fresh water from

the atmosphere as well as from the rivers to support the mangrove plants.

Associated Features

Position in Landscape: It occupies the lowest position in the landscape.

Soil: It is transported, fine grained, dark grey, homogeneous, comprising silt and clay with some organic matter.

Vegetation: This environment readily supports mangrove plants owing to its low energy and abundant mud supply.

Land Use: It is a wasteland.

Genesis: The fine sediments derived from the inland and marine areas are invaded by mangrove plants. Owing to high mud supply and low wave energy the plants grow readily.

Airphoto Interpretation Aid

This facet is marked by a smooth dark grey tone, predominantly due to mangrove plants. It is more or less flat and bounded by backshore on one side and waterline on the other.

Comments and Reference

This facet is present in Toposheet Nos.46/D12, 46/D15 and D11, 46/D16 and 47/A9. It is untrafficable except on foot and is a wasteland. These mangrove plants by entrapping silt and clay, gradually raise the ground above the high tide.

FACET NO. C_7

TIDAL CREEK

FACET NO	: C_7
NAME	: Tidal creeks
LOCALITY	: Daman
GEOREF	: 46/D15 and D11
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: They are broad tidal passes through which marine water ingresses inland. The mouth is about 300-500m wide and showsa meandering habit. The depth varies from 10m to 30m at the coastline but it decreases inland. During high tide silt and clay are deposited on the banks giving rise to estuarine mudflats. During flood stage silt and clay are transported near the bottom in the creeks and are deposited in the inland areas, especially in the lagoons whereas during low tide or ebb, part of the sediments are retransported to the sea.

Surficial Deposit: On the banks fine sediments, mostly silt and clay are deposited. The thickness ranges from one metre to three metres. Besides fine sediments, some coarser fractions are also transported from the inland areas, especially during flood.

Water Regime: This facet remains saturated with water throughout the year.

Associated Features

Position in Landscape: It occupies the lowest position in the landscape.

Soil: On the banks as well as at the bottom the soil is fine textured, dark grey, homogeneous, transported and comprising silt and clay.

Vegetation: Vegetation is very sparse except few patches of holophytic grasses and mangrove plants.

Land Use: It is a wasteland except for navigation.

Genesis: The low gradient of the coastal areas are affected by high tide. The rising tide water ingresses the marine water inland. It also indicates a submergent coastline.

Airphoto Interpretation Aid

This facet is marked in the airphotos as branching lines landwards. The tone is dark grey in a light background. The channels are smooth and the surface is well drained. The banks are muddy and lack substantial vegetation.

Comments and Reference

This facet is present in the Toposheet Nos. 46/D14, 46/D15 and D11, 46/D16, 47/A9 and 47/A13. The banks being muddy, it is difficult to walk over them but during high tide it is navigable. It serves as a means of transport.

FACET NO. C_8

TIDAL INLET

620

FACET NO : C_8

NAME : Tidal inlets

LOCALITY : Charwada (South of Tithal)

GEOREF : 46/D14

COMPILER : Geology Department,
M.S. University, Baroda.

DATE : July, 1982.

Morphology: They are tidal passes through which sea water ingresses landwards. These inlets have comparatively broader throats near the shoreline which taper landwards. The inlets show a sinuous pattern near the coastline, the sinuosity being due to high sedimentation of the inlet neck. The widths of the inlets vary from 5m to 30m, and at places even more. The depth ranges from 1m to 5m. Inlets are influenced by waves, high tide and onshore wind. Landward sediment transport is dominant. In wave dominated inlets medium to coarse sediments is predominant at the throat and finer sediments abound towards the tidal prism whereas in tide dominated inlets the sediments are fine in size.

Surficial Deposit: The sediments are light brown at the throat but dark brown in the tidal prism. The thickness of the deposit varies from 50 cm to 150 cm.

Water Regime: The inlets remain dry during low tide especially in tide dominated inlets but in the others they are inundated and hence, saturated with water. There is a good external and internal drainage.

Associated Features

Position in Landscape: It occupies the lowest position in the landscape.

Soil: It is homogeneous, fine to medium grained, transported, the sediments are derived through the mouth from the marine environments and some fractions also come from the alluvial areas.

Vegetation: It is unvegetated, except few patches of grasses and isolated shrubs.

Land Use: Since it is inundated daily, it is a wasteland.

Genesis: During high tide, the sea water ingresses landward through narrow depressions, sometimes eroding the barrier ridge. The daily ebb and flood carve out passes, eroding the floor of the channels and maintain permanent passages that develop into tidal inlet. These inlets started their developed during the Flandrian

transgression when the high strandline eroded the barrier complex but now they are in constant adjustment with nearshore sedimentation processes and sediment supply.

Airphoto Interpretation Aid

This facet is recognised as a linear, sinuous narrow water passage cutting the coastal ridge and flowing landwards. It is marked by a medium grey tone with the absence of vegetation.

Comments and Reference

This facet is present in Toposheet Nos.46/D12, 46/D14, 46/D15 and D11, 46/D16, 47/A9, 47/A13. During low tide, it is accessible to pedestrians whereas during high tide, only small boats can ply over. It has good drainage.

FACET NO. C_9

TIDAL CHANNEL

625

FACET NO	: C_9
NAME	: Tidal channels
LOCALITY	: Umarsadi (Machiwada)
GEOREF	: 46/D14
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: These are small tidal passes that originate from creeks and cut the tidal flats. They serve as passages for ingress of estuarine water to the tidal flats during flood stage and as well as during ebb when the water flows back to the estuary. They show meandering as well as braiding patterns. The channel width varies from 1m to 10m, depth $\frac{1}{2}$m to 5m. The sediments are predominantly fine grained, muddy, with some percentages of organic matter.

Surficial Deposit: The facet has a thick cover of fine mud deposit on the channel bed as well as on the banks. The mud is derived from the landward as well as seaward areas. The thickness varies from 20 cm to 150 cm.

Water Regime: This facet is covered with water throughout the year.

Associated Features

Position in Landscape: It occupies the lowest position in the surrounding landscape.

Soil: It is dark brown, homogeneous, transported, fine grained, mostly clayey with some organic matter.

Vegetation: Except few patches of grasses on the banks, no other vegetation is supported.

Land Use: It is a wasteland.

Genesis: With the onset of the Flandrian transgression the estuarine rivers extended their courses in the tidal flats forming these small tidal channels.

Airphoto Interpretation Aid

This facet is observed in the airphotos as branching, meandering tidal channels, criss-crossing the mudflat. Braiding of these channels have also been observed. It is marked by a medium to dark grey tone cutting a smooth, near horizontal mudflat.

Comments and Reference

This facet is present in the Toposheet Nos.46/D12, 46/D14, 46/D15 and D11, 46/D16, 47/A9 and 47/A13. It is not trackable due to mud deposits. During high tide boats can ply over it. This facet is a wasteland.

FACET NO. D_1

LOWER FORESHORE

PATTERN D - SANDY SHORE

FACET NO	: D_1
NAME	: Lower Foreshore
LOCALITY	: Nargol
GEOREF	: 46/D12
COMPILER	: Geology Department,
	M.S. University, Baroda.
DATE	: July, 1982.

Morphology: It is the lower part of the foreshore that is sandwiched between low waterline and upper foreshore. It extends for 50-100 m seawards but at places the width is much more. It has a gentle slope of 2-3^{o} and comprises mostly fine sands, silt and clay with some percentages of shell fragments. At places coarse sands, pebbles and cobbles have been encountered. The surface is more or less smooth, plain, structureless except minor ripple marks and bioglyphs.

Surficial Deposit: The facet comprises fine sands, silt and clay derived from the inland areas as well as from offshore zone.

Water Regime: This facet remains permanently wet since it is covered by high tide and during low tide water oozes down from the upper foreshore. Owing

to higher permeability and porosity the water retention capacity is not more.

Associated Features

Position in Landscape: It occupies the lowest position in the landscape.

Soil: It is very thin, usually fine grained, transported and heterogeneous.

Vegetation: This facet is devoid of any significant vegetation except at some places where algal mat and seweeds grow. Few patches of mangrove plants are not uncommon.

Land Use: This facet is a wasteland. At one place artificial walls have been constructed by fisherman for laying nets. It is untrafficable except during high tide when boats can ply over it.

Airphoto Interpretation Aid

It is recognised as thin, linear strip running along the low waterline and is marked by a light grey tone.

Comments and Reference

This facet is present in Toposheet Nos.46/D12, 46/D14, 46/D15 and D11, 47/A9, 47/A13. It is rather difficult to walk over it since the water table lies at its surface, it is always wet. Usually it comprises finer sediments than the upper foreshore.

FACET NO. D_2

UPPER FORESHORE

631

FACET NO	: D_2
NAME	: Upper foreshore
LOCALITY	: Udwada
GEOREF	: 46/D15 and D11
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: This facet lies between the lower foreshore and the backshore. It extends for 30-60m, of course with some variations. The slope is usually steeper, ranging from 10-25^{o} for beaches comprising coarser sediments whereas for those composing of finer sediments the slope is less than 5^{o}. The upper foreshore sediments are usually coarse grained, rounded, comprising shell fragments, rock fragments and quartz grains. Sometimes shingles are strewn on the surface. The surface is more or less smooth but a motley of sedimentary structures such as beach cusps, rill marks, swash marks, ripple marks etc. are impressed upon it.

Surficial Deposit: This facet comprises winnowed sands mostly medium to coarse grained.

Water Regime: This facet remains covered with sea water only during high tide. Owing to high porosity and permeability, sea water sinks down so that the upper surface of this facet remains dry for some time.

Associated Features

Position in Landscape: It occupies a lower position in the surrounding landscapes.

Soil: Soil cover is absent.

Vegetation: Vegetation is almost lacking except occasional mangrove plants and algal mats.

Land Use: It is a wasteland.

Genesis: The sediments drained by the rivers are transported by longshore and onshore currents. The swash and backwash winnow the sands and transport the finer fractions seaward leaving a residual lag deposits.

Airphoto Interpretation Aids

In airphotos, this feature appears as a narrow stretch running along the high waterline. The surface appears smooth except where trap rock crops out. It is barren and hence, is marked by a light grey tone.

Comments and Reference

This facet is observed in Toposheet Nos.46/D14, 46/D15 and D11, 46/D12, 47/A9 and 47/A13. This facet is untrafficable except on foot during low tide.

FACET NO. D_3

BACKSHORE

FACET NO	: D_3
NAME	: Backshore
LOCALITY	: South of Tithal
GEOREF	: 46/D14
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: This facet extends landward from the sloping foreshore to the point of development of vegetation or change in physiography. Sometimes it is marked by a near horizontal feature comprising coarse sediments. The backshore extends for about 10-40m with a slope of about $10-25^{o}$ and comprises pebbles and coarse sands. The size of the sediments decreases at the lower limit of the backshore. It is formed by breaking waves laden with coarse debris.

Surficial Deposit: This facet comprises coarse sands and shingles with a small percentage of fines. Shell fragments are also abundant in certain localities.

Water Regime: Since this facet lies above the high waterline it becomes wet only during rainy season or during stormy conditions. Owing to high porosity and permeability, the facet becomes dry after a short spell of dry weather.

Associated Features

Position in Landscape: It occupies an intermediate position in the surrounding landscape.

Soil: It is absent.

Land Use: It is wasteland, except for sand quarry.

Genesis: When the waves laden with a mixed assemblage of sediments, break on the upper foreshore, the coarser fractions are stranded on the upper part whereas the finer fractions are carried down by the backwash. In due course, a feature comprising coarse sediments and lying above the high waterline is formed.

Airphoto Interpretation Aid

This facet appears as a narrow, linear stretch lying parallel to the coastal ridge and sloping seaward. It is marked by a light grey tone.

Comments and Reference

This facet is present in Toposheet Nos.46/D14, 46/D12, 46/D15 and D11 and 47/A9. It is untrafficable except on foot. It is unstable since it is readily attacked by waves during spring tide.

FACET NO. D_4

COASTAL RIDGE

FACET NO : D_4

NAME : Coastal ridge

LOCALITY : Deheri

GEOREF :: 46/D12

COMPILER : Geology Department,
M.S. University, Baroda.

DATE : July, 1982.

Morphology: It is a depositional feature occupying the highest position and runs parallel to the shoreline. It has a width of about 100m and the height ranges from 5-8m. It comprises pebbles, coarse sands and some percentages of silt. The sands are composed of rock fragments, quartz grains and shell fragments. Lying above it are dunal deposits with varying shapes and sizes. This ridge is a product of the rising sea during the Holocene period. At many places this feature is being eroded during high tide.

Surficial Deposit: It has no surficial deposit, except transported eolian sands.

Water Regime: This facet remains wet only during rainy season or during stormy weather when high tide lashes against the ridge. For the rest of the year, it remains dry. However, subsurface sweet water is

encountered at a depth of 8-10m.

Associated Features

Position in Landscape: It occupies the highest position in the surrounding landscape.

Soil: It is absent.

Vegetation: Though this facet is dry, fruit trees, are readily grown on it. At many places casuarina plants are grown for its stabilisation.

Land Use: It is used for orchard development and as potential source for drinking water as well as holiday resort.

Genesis: It was formed by the reworking of the fluvial sediments dumped at the coastline. Spilling breakers, with long periods, deposited coarse sediments at the coastline. In due course a linear sandy ridge developed that grew further by the filtrate eolian sands deposited on it from the beach.

Airphoto Interpretation Aid

This facet appears as a linear feature running along the coastline. It is marked by a light grey tone, especially where vegetation is sparse and bounded by the sea on one side and tidal flat or

640

alluvium on the other.

Comments and Reference

This facet is present in Toposheet Nos.46/D14, 46/D15 and D11, 46/D12 and 47/A9. It is an elevated linear features, dissected by rivers tidal inlets and creeks. At most of the places it is being eroded by waves.

FACET NO. D_5

WAVE ERODED RIDGE

FACET NO	: D_5
NAME	: Coastal ridge (eroded)
LOCALITY	: Charwada
GEOREF	: 46/D14
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: This facet represents an erosional feature at the shoreline, having a width of about 100m, and a height range of 5-8m. It comprises pebbles, coarse sands and some shell fragments. This facet is being eroded by plunging waves, especially during storms. Prominent scarps of 1-4m have been formed. The eroded materials are planed down on the backshore giving it a steeper slope.

Surficial Deposit: No surficial deposit is present.

Water Regime: The facet remains wet during rainy season or during storm. At a depth of 8-10m sweet water is encountered. However, with excess of overdraught, the water level goes down and at times becomes saline.

Associated Features

Position in Landscape: It occupies the highest position in the landscape.

Soil: It is absent.

Vegetation: On the ridge various types of plants are seen to grow. Fruit trees have been cultivated at some spots. Casuarina plants and grasses are being grown for its stabilization.

Land Use: Besides agricultural purposes, this facet serves as potential source for drinking water as well as holiday resort.

Genesis: This facet was formed during the higher strandline, by spilling breakers having long period. At present, destructive waves are gradually undermining this feature to give rise to an erosional feature with prominent cliffs.

Airphoto Interpretation Aid

This facet appears as a linear feature, running all along the coastline. The cliffy nature is marked by a straight, raised topography. In airphotos, it is recognised by a light grey tone, bounded by sea and tidal flat and at places being dissected by rivers, creeks and tidal inlets.

Comments and Reference

This facet is recognised in Toposheet Nos. 46/D14, 46/D15 and D11, 46/D12 and 47/A9. This facet is trackable but not trafficable. The erosion of the ridge has given rise to a straight coastline.

FACET NO. D_6

COASTAL DUNE (BARREN)

FACET NO : D_6

NAME : Coastal dune (barren)

LOCALITY : Tithal

GEOREF : 46/D14

COMPILER : Geology Department,
M.S. University, Baroda.

DATE : July, 1982.

Morphology: It is a depositional feature, capping the barrier ridge and having diverse shapes and sizes. Usually, it is either longitudinal, transverse or parabolic and extends for about 50-100m with a height of 2-5m. It comprises medium to fine sands, rounded to subrounded. The sands comprise quartz grains, rock fragments and shell fragments. This facet is devoid of any significant vegetation and hence, is barren.

Surficial Deposit: It comprises fine grained eolian deposits with some percentages of silt and clay.

Water Regime: This facet, owing to high porosity and permeability, does not hold water. It remains wet only for a short duration during the rainy season.

Associated Features

Position in Landscape: It occupies the highest position in the landscape.

Soil: Significant soil cover is absent, except some fine dust over the sands.

Vegetation: It is barren.

Land Use: This facet is a wasteland except for sand quarry.

Genesis: During strong onshore wind fine sands are winnowed and carried on the coastal ridge to form dunal hills.

Airphoto Interpretation Aid

This feature is recognised on the airphotos as small sandy hills dotting the coastal ridge. It is marked by a light grey tone, almost white, overlying the ridge.

Comments and Reference

This facet is present in the Toposheet Nos.46/D14, 46/D15 and D11, 46/D12 and 47/A9. It is a hummocky eolian deposit marked by a gentle slope towards the windward side and a comparatively steeper one towards the leeward side. It is mostly devoid of any significant vegetation. It is untrafficable and very difficult to walk over it.

FACET NO. D_7

COASTAL DUNE (STABILISED)

FACET NO : D_7

NAME : Coastal dune (stabilized)

LOCALITY : Tithal

GEOREF : 46/D14

COMPILER : Geology Department,
M.S. University, Baroda.

DATE : July, 1982.

Morphology: This facet represents a depositional feature of sands, transported by eolian agency and deposited on the coastal ridge in the form of longitudinal, transverse or parabolic dune hills. The sands are fine to medium grained, rounded and comprise quartz grains, and rock fragments and shell fragments. The width of the eolian deposit varies from 50-100m, though few as large as 150m have been encountered. The surface is not smooth; it is marked by eolian ripple marks. Sometimes, vegetation covers the whole surface.

Surficial Deposit: It comprises a very thin cover of dust brought from the beach or from the inland areas by onshore and offshore winds, respectively.

Water Regime: Except rainy season, this facet remains dry throughout the year. Owing to high porosity and permeability, water retention is insignificant.

650

Associated Features

Position in Landscape: It occupies the highest position in the landscape.

Soil: Soil cover is absent.

Vegetation: It supports casuarine plants, grasses and creepers, that have helped in its stability.

Land Use: Except for sand quarry it is of practically no use.

Genesis: It is a wind borne deposit. The sediments transported from the beach by onshore winds are deposited in front of any artificial barrier. With the successive abstraction of the finer sediments from the beach, and their deposition on the ridge, dune hills of considerable areal extent are developed.

Airphoto Interpretation Aid

In the airphotos, this facet is marked by a light grey tone, depending on the density of vegetation cover.

Comments and References

This facet is present in the Toposheet Nos. 46/D14, 46/D15, and D11, 46/D12 and 47/A9. It is a hummocky feature having a comparatively gentle windward side and a steep leeward side. It is covered with vegetation and hence, is stabilised.

FACET NO. D_8

INNER DUNE (PRESENT DAY)

FACET NO	: D_8
NAME	: Inner dune (present day)
LOCALITY	: Umarsadi (Machiwada)
GEOREF	: 46/D14
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: This facet represents an eolian deposit, hummocky in shape, extending for 75-80m in breadth and rising above the ridge with height between 5 and 8m. It is an essentially present day dune hill, lying behind the ridge and abutting against the alluvium. It comprises medium to fine, well rounded quartz sands, with a fair percentage of rock fragments and shell fragments. The dune surface is marked by eolian ripple marks. The sediments of the dune are derived from the beach and ridge by the onshore winds that winnow away the finer fractions and deposited them behind the ridge.

Surficial Deposit: The surface is covered with fine sands, silt and clay, entrained by wind and deposited over the sandy hills.

Water Regime: Except rainy period, this facet

remains dry for the rest of the year. Owing to high porosity and permeability, no subsurface water is encountered in it.

Associated Features

Position in Landscape: It occupies the highest position in the surrounding landscape.

Soil: It is absent.

Vegetation: Except isolated xerophytic herbs and grasses, this facet is unvegetated.

Land Use: It is a wasteland, except for sand quarry.

Genesis: Strong onshore winds winnow the beach and ridge materials and deposit the finer sediments behind the ridge, especially at the foot of the alluvial hills or at any barrier that serves as nucleus for the growth of these sandy hills.

Airphoto Interpretation Aid

This feature is difficult to recognise in the airphotos due to its size. With the help of magnifying lens small dots are observed behind the ridge. They can be identified as small elevated sandy hills, marked by light grey tone.

Comments and Reference

This facet is present in Toposheet Nos.46/D14, 46/D15 and D11 and 46/D12. Since this facet is unstabilised, its landward migration is commonly observed. It is untrafficable and extremely difficult to walk over it.

FACET NO. D_9

BEACH WITH CURRENT RIPPLE MARKS

FACET NO	: D_9
NAME	: Beach with ripple marks
LOCALITY	: Nargol
GEOREF	: 46/D12
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: It is a sandy deposit lying between high and low tide, extending for about 75-100m in width and having a general slope of 5-10° seawards. It comprises mostly quartz grains and shell fragments, with some rock fragments. The beach surface is marked by undulatory ripple marks having wave lengths of 4-5 cm and amplitudes 1-2 cm. The ripple marks have a gentle stoss side and a steep lee side. Sometimes, coarse sands, shell fragments and wood particles are seen to rest on the trough areas.

Surficial Deposit: Fine grained sands, silt and clay, transported by wave currents overlie this facet. These sediments are derived from the inland areas as well as from the offshore ones.

Water Regime: This facet remains covered during high tide while during low tide it remains humid.

Associated Features

Position in Landscape: This facet occupies the lowest position in the landscape.

Soil: The soil is transported, homogeneous, dark grey and fine grained, comprising mostly fine sands, silt and clay.

Vegetation: It is barren, except sporadic growth of seaweeds, algal mats and mangrove plants.

Land Use: It is a wasteland.

Genesis: Sediments transported from the inland areas by the rivers are reworked by waves to give rise to a sandy deposit. The receeding tides give rise to undulatory current ripple marks on the loose sandy surface.

Airphoto Interpretation Aid

In the airphotos this facet appears as a narrow linear feature running parallel to the coastal ridge. It is recognised by its light to medium grey tone. The surface is smooth and the ripple marks, owing to their miniature size, cannot be recognised.

Comments and Reference

This facet is common in the Toposheet Nos. 46/D14, 46/D15 and D11, 46/D12 and 47/A9. The shape of the ripple marks indicate a comparatively low velocity environment; the fine sediments dampen the wave velocity. Biogenic structures are also commonly observed, indicating a good habitat for the marine faunas especially, the arthropods and cephalopods.

FACET NO. D_{10}

BEACH WITH SWASH MARKS

661

FACET NO	: D_{10}
NAME	: Beach with swash marks
LOCALITY	: Daman
GEOREF	: 46/D15
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: This facet is a sandy deposit lying between high and low waterline and stretching for about 100-200m in width with a slope of 10-15°. It comprises coarse and fine sands and silt; pebbles and cobbles are observed at the low waterline. The sands are composed predominantly of rock fragments with minor percentages of quartz grains and shell fragments. On the beach surface hydrodynamically lighter materials such as wood particles, shell fragments, mica flakes, sea weeds etc. are deposited as tiny ridges, irregular in shapes; the spacing between two successive swash marks indicate, the magnitude of the fall of tide.

Surficial Deposit: Fine sands, silt and clay are deposited on surface by swash waves and tidal currents.

Water Regime: This facet remains wet during high tide and also during rainy period. Only the upper one centimetre cover gets dried up during low tide, especially in summer. With the rising tide it soon becomes wet.

Associated Features

Position in Landscape: This facet occupies the lowest position in the surrounding landscape.

Soil: It is absent.

Vegetation: Except seaweeds and algal mats at one or two places, this facet is devoid of any vegetation.

Land Use: It is a wasteland.

Genesis: The fluvial sediments are reworked by longshore currents and deposited at the intertidal zone. Sediments transported from the offshore areas are redistributed in this zone by swash and backwash to give rise to a beach deposit. Hydrodynamically lighter materials, such as wood particles, light minerals, shell fragments, sea weeds etc. are carried by the swash and deposited on the beach surface to give a wavy structure indicative of the

retreat of tide.

Airphoto Interpretation Aid

This facet appears as linear feature running parallel to the coastal ridge. In the airphotos it is distinguished by a smooth surface lying between the high and low tide and marked by medium to dark grey tone.

Comments and Reference

This facet is present in the Toposheet Nos. 46/D14, 46/D15 and D11, 46/D12 and 47/A9. The distance between two successive swash marks is more on a steep beach.

FACET NO. D_{11}

BEACH WITH RILL MARKS

FACET NO	: D_{11}
NAME	: Beach with rill marks
LOCALITY	: Umbargaon
GEOREF	: 46/D12
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: The facet lies between the low and high water line, having a width of about 200-250m and with a slope of about 3-5°. The sediments comprise fine grained quartz and shell fragments. The upper cover of about 15-20 cm is muddy on which rill marks are developed. These sedimentary structures are formed on the middle foreshore and show braided and meandering patterns. The length of the rill marks varies from few centimetres to about two metres, and the width of the main trunk ranges from 1 cm for minor rills to 15 cm for major ones.

Surficial Deposit: The facet comprises fine sands, silt and clay, transported from the inland areas by rivers and plastered on the beach by swash action.

Water Regime: This facet is inundated during high tide but retains some water in the interstices of the sand grains and is seen to be moist throughout the day.

Associated Features

Position in Landscape: It occupies the lowest position in the landscape.

Soil: The soil is fine grained, dark brown, homogeneous, transported, and has a thickness of 5-20 cm.

Land Use: It is a wasteland.

Genesis: Sediments derived from the inland as well as offshore areas are transported at the foreshore by longshore and onshore currents. The swash waves deposit these sediments on the intertidal areas. The finer sediments are plastered on the foreshore and rilled by the down flowing water that had sunk in the upper foreshore.

Airphoto Interpretation Aid

This facet is identified in the airphotos as a linear, narrow coastal stretch having a smooth surface. It is marked by medium to grey tone.

Comments and Reference

This facet is present in the Toposheet Nos. 46/D14, 46/D15 and D11, 46/D12 and 47/A9. The rill marks indicate a thick cover of muddy layer on the beach. Their slope and size depend upon grain size, slope, width of the beach as well as depth of water table.

FACET NO. D_{12}

BEACH WITH BIOGLYPHS

FACET NO	: D_{12}
NAME	: Beach with bioglyphs
LOCALITY	: Nargol
GEOREF	: 46/D12
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: It is a sandy deposit lying in the intertidal zone and comprising medium to fine sands, silt and clay. Owing to low gradient, less than 5^{o}, the width extends for atleast 200m. Its surface is riddled by track and trails of marine organisms. Crab burrows, their feacal pellets and tracks of gastropods and worms are abundant. The deposit, being fine grained and muddy, provides an ideal site for these marine faunas to thrive.

Surficial Deposit: The upper few centimetre layer is composed of fine sands, silt and clay that have been transported in suspension by the waves. Below, the sediments become coarser, shell fragments and quartz grains are abundant.

Water Regime: This facet is inundated daily by the rising tides and hence, is always wet. High water

retention of the fine sediments makes this facet permanently moist.

Associated Features

Position in Landscape: It occupies the lowest position in the landscape.

Soil: It comprises a very thin cover of dark brown, fine grained, homogeneous, transported soil.

Vegetation: This facet is barren except sporadic growth of patches of grasses, sea weeds and mangroves at some places.

Land Use: It is a wasteland.

Genesis: The finer sediments transported from inland as well offshore areas have been distributed on the intertidal zone.

Airphoto Interpretation Aid

This facet runs parallel to the coastline. The position of high tide and the breaking of waves are easily recognised. It is marked by a light grey tone in the airphotos.

Comments and References

This facet is present in the Toposheet Nos.46/D14, 46/D15 and D11, 46/D12 and 47/A9. Owing to high organic content of this facet, marine benthic faunas thrive well in this zone.

FACET NO. D_{13}

RIVER MOUTH BARS

FACET NO	: D_{13}
NAME	: River mouth bar
LOCALITY	: Umbargaon
GEOREF	: 46/D12
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: It is a depositional feature, developed at the mouth of the rivers, and extends seaward for about one kilometre, having a width of about 500-600m and a height of 5m. It comprises pebbles, cobbles, coarse sands and clayey materials. It has a steep concave face towards the river mouth and a gentle convex face seawards. During high tide the bar is submerged except a small portion of its upper part which is covered temporarily by the swashing waves. The fringes of the bar sometimes show cusp structure and on the crest asymmetrical ripple marks are commonly observed.

Surficial Deposit: This feature is covered with coarse sands, silt and clay, brought from the inland areas by the rivers.

Water Regime: This facet is inundated during high tide and is left exposed subaerially during low tide.

Associated Features

Position in Landscape: It occupies the lowest position in the landscape.

Soil: It is medium to coarse in size, dark brown and transported.

Vegetation: This facet is devoid of any vegetation.

Land Use: It is a wasteland, except for laying nets for fishing.

Genesis: The rivers laden with sediments on entering the sea lose their transportation power and dump the load at their mouths. When the supply of fluvial material is more than the fanning away by longshore current, bars are developed. The finer sediments, which are in suspension, are deposited on them during the receeding tide.

Airphoto Interpretation Aid

This facet appears as an oblong narrow feature at the mouth of the rivers. It is marked by a medium grey tone with a surrounding darker one that characterises the sea. Distributary channels are seen at the bar fringes.

Comments and Reference

This facet is present in theToposheet Nos. 46/D14, 46/D15 and D11 and 46/D12. During low tide this facet is trackable with some difficulty. Owing to the unconsolidated nature of the sediment, it is untrafficable by any sort of vehicles. Now-a-days fishermen lay nets to entrap fishes during high tide.

FACET NO. D_{14}

PALAEOBARS

FACET NO	: D_{14}
NAME	: Palaeobar
LOCALITY	: Umbargaon
GEOREF	: 46/D16
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: This depositional feature, related to a higher strandline, is developed in the inland areas. It extends for 80-100m and has a height of 3-4m above the ground level. It comprises pebbles, coarse and fine sands with a good percentage of shell fragments. The pebbles are basaltic, 5-50 mm diameter and are mostly rounded. On the top a small cover of eolian deposit has been observed. This feature is stabilized by grasses and few woody plants.

Surficial Deposit: It comprises fine sands, mostly quartz grains and shell fragments, deposited by eolian agencies.

Water Regime: This facet remains wet only during rainy season whereas during the rest of the year it remains dry.

Associated Features

Position in Landscape: It occupies the highest position in the surrounding landscape.

Soil: The upper cover of this facet comprises fine grained, homogeneous transported soil.

Vegetation: Since this facet remains dry for the most part of the year, only grasses and weeds grow on it.

Land Use: It is barren except used as burial ground.

Genesis: During the high strandline the spilling waves laden with coarse sediments broke at this junction, depositing the load. In course of time, a bar was formed that grew in size. With the retreat of the sea the bar was left exposed subaerially. Fine sediments from the dune ridge were lifted by onshore wind and deposited on it.

Airphoto Interpretation Aid

This facet, owing to its small extent, is marked as a tiny linear sandy hill in the inland area and recognised by a light grey tone in the airphotos.

Comments and Reference

This facet is present only in Toposheet Nos. 46/D16. It lies exposed inland and is surrounded by tidal mudflat. It points to a higher strandline of the Holocene period. It is an incipient ridge, identical to those found at the coastline but with the only difference in size.

FACET NO. D_{15}

LITTORAL CONCRETE (BEACH ROCK)

FACET NO : D_{15}

NAME : Beach rock

LOCALITY : Umbargaon

GEOREF : 46/D16

COMPILER : Geology Department,
M.S. University, Baroda.

DATE : July, 1982.

Morphology: This feature is a marine deposit related to a higher strandline, lying 4-5m above the H.W.L. It is a gritty deposit composing of pebbles, sands and shell fragments cemented together by calcium carbonate. The pebbles are rounded, some of them are near spherical and are of basaltic nature. The rock is friable as cementation is not complete. It also shows crossstratification.

Surficial Deposit: This facet is covered with fine sands, silt and clay, brought by eolian agency.

Water Regime: This facet receives rain only during monsoon and remains dry for the rest of the year.

Associated Features

Position in Landscape: It occupies the highest position in the surrounding landscape.

Soil: A thin cover of transported soil, derived from the surrounding alluvial plains by eolian agency, is deposited on this feature. The grain size is fine, homogeneous and light brown to dark brown.

Vegetation: Only xerophytic plants and grasses are seen growing on this facet due to dry climatic condition.

Land Use: It is a wasteland.

Genesis: The higher strandline is characterised by beach deposit in the inland area. This feature is exposed subaerially due to the regression of the sea and hence, is a palaeobeach. Cementation is due to the interaction of fresh and sea water that precipitated. calcium carbonate which cemented the beach sands.

Airphoto Interpretation Aid

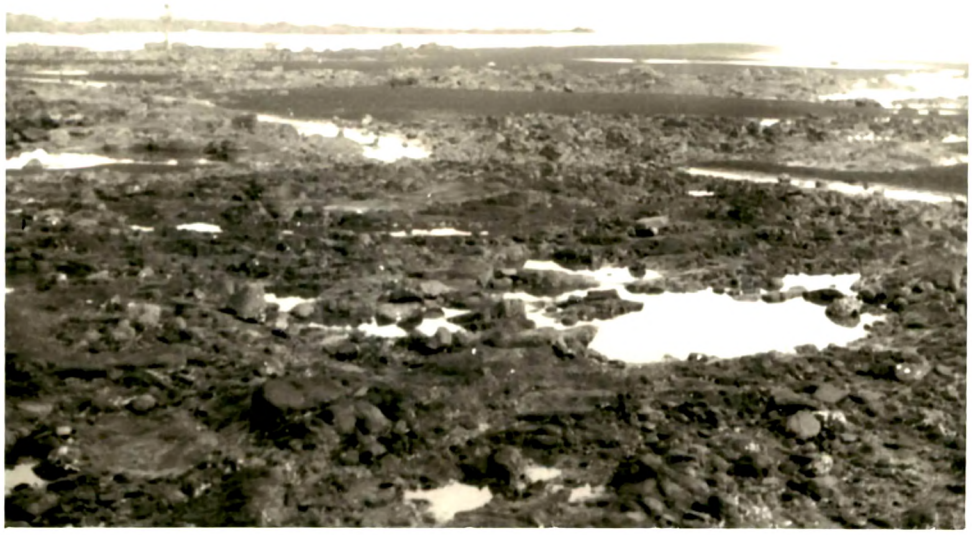
This facet is marked by a light grey tone on account of its barren nature. In airphoto this feature cannot be identified due to its size.

Comments and Reference

This facet is recognised in the Toposheet Nos. 46/D16. It represents a higher strandline during the Holocene period as evidenced by the nature of the sediments and its composition.

FACET NO.E_1

ROCKY BEACH



PATTERN E - ROCKY SHORE

FACET NO	: E_1
NAME	: Rocky beach
LOCALITY	: Phansa
GEOREF	: 46/D15 and D11
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: This facet occupies the lowest position in the landscape. It comprises highly jointed trappean rocks, dipping seawards. The surface is abraded by waves armed with small rock fragments. The weathering and denudation of the trap rock have given rise to cobbles and pebbles that are mostly angular. Small ditches of 20 cm to 5 m are common on the trappean surface. Sometimes, sands, silt and clay are deposited in the ditches. This facet is visible only during low tide and is seen to extend even further west.

Surficial Deposit: No significant surficial deposit is encountered in this facet. Only a very thin veneer of fine sands, silt and clay are seen to cover the trappean surface, especially in small depressions.

Water Regime: This facet gets inundated during high tide and during low tide water is retained in small depressions, joints and creeks.

Associated Features

Position in Landscape: It occupies the lowest position in the landscape.

Soil: Soil cover is absent.

Vegetation: This facet is more or less barren except isolated mangroves plants.

Land Use: It is a wasteland.

Genesis: The facet is formed by the erosion of the trap rock by waves. The joint pattern serves as easy site for the combing down of the rock fragments. Sea waves, due to hydraulic action pick up the finer particles and lash against the trap rock, abrading the surface and reducing it to low waterline level.

Airphoto Interpretation Aid

The facet is marked by medium grey tone. The landward extent is marked by light grey tone indicating coastal ridge and towards the seaward side the tone is dark grey characteristic of sea water.

Comments and Reference:

This facet is present in the Toposheet Nos. 46/D15 and D11, 46/D12 and 47/A9. During low tide the facet is untrakable due to slimy and muddy rock surface.

FACET NO. E_2

ROCKY BEACH WITH MANGROVE PLANTS

FACET NO : E_2

NAME : Rocky foreshore with mangrove plants.

LOCALITY : Phansa

GEOREF : 46/D15 and D11

COMPILER : Geology Department,
M.S. University, Baroda.

DATE : July, 1982.

Morphology: This facet occupies the lowest position in the surrounding landscape. It is made up of trappean bed rock that has been abraded by corrasion and attrition, aided by the hydraulic action of waves that readily pick up finer rock fragments to dash against the trappean rock. This trappean surface is not smooth; it is marked by small depressions that have formed ditches in which finer sediments and sea water are trapped during the receeding tides. Asymmetrical current ripple marks are very common on the thin mud deposits. Owing to a significant supply of mud and a relatively calm environment, mangrove plants are seem to grow in the joints and crevices.

Surficial Deposit: It comprises a very thin veneer of sands, silt and clay. The thickness is less than 5 cm at most of the places except in small

depressions.

Water Regime: This facet is covered during high tide but during low tide water is retained only in small depressions and crevices.

Associated Features

Position in Landscape: This facet occupies the lowest position in the landscape.

Soil: It has a very thin cover of fine grain, homogeneous, transported soil.

Vegetation: Isolated mangrove plants are seen to grow in the rock crevices where a thin cover of mud is accumulated. The plants are nearly covered during high tide, except the top portion.

Genesis: The trap surface is planed down to a horizontal level by wave action.

Airphoto Interpretation Aid

In the airphotos this facet is characterised by a medium to grey tone. It is marked by near horizontal planar surface with occasional pools of water.

690

Comments and Reference

This facet is present in Toposheet Nos. 46/D16 and 47/A9. It represents an erosional feature. Significant supply of mud and calm environment are typical characteristics of this facet.

FACET NO. E_3

COBBLE AND PEBBLE BEACH

FACET NO : E_3

NAME : Cobble and pebble beach

LOCALITY : Udwada

GEOREF : 46/D15 and D11.

COMPILER : Geology Department,
M.S. University, Baroda.

Morphology: It is a depositional feature occupying the lowest position in the surrounding landscape and having a width of 300m or even more. The sediments are very coarse, pebbly and cobbly. The rock fragments are basaltic and are near spherical, oblong or platy; most of them are rounded. The size of the pebbles varies from 1 cm to 3 cm and the cobbles attain size as large as 25 cm. Some of the cobbles show percussion marks. Oyster shells have clung on them. The pebbles and cobbles are derived from the inland areas by rivers and reworked by waves. However, some fractions are of marine origin.

Surficial Deposit: It comprises coarse sands and pebbles.

Water Regime: During high tide the sediments are covered with water whereas during low tide it is exposed subaerially, However, it remains moist throughout the day.

Associated Features

Position in Landscape: It occupies the lowest position in the landscape.

Soil: It is absent.

Vegetation: Except a few seaweeds and sporadic algal mats, this facet is devoid of any significant vegetation.

Land Use: It is a wasteland.

Genesis: During the low strandline the major rivers were transporting coarse sediments into the sea. With the rising sea level the mouths of the rivers were chocked up so that the pebbles and cobbles were dumped near the coastline, with very little reworking.

Airphoto Interpretation Aid

In the airphotos this facet is marked by a medium grey tone. The cobble deposit is not recognised because of its small extent but the transition from light to dark tone is conspicuous.

Comments and Reference

This facet is present in Toposheet Nos. 46/D14, 46/D15 and D11 and 46/D16. This facet is not trackable during low tide. It represents a fluctuation of sea level.

FACET NO. E_4

ROCKY HEADLAND

FACET NO	: E_4
NAME	: Rocky headland
LOCALITY	: Deoka
GEOREF	: 46/D15 and D11
COMPILER	: Geology Department, M.S. University, Baroda.
DATE	: July, 1982.

Morphology: The feature is an erosional one, effected by wave and tide action on the trap rocks that protrude seawards to form headland. This headland is exposed during low tide, but during high tide only that portion situated above the high waterline, especially on the backshore, is visible. Seawards, it extends for many kilometres. The surface is not smooth, but infested with small depressions on account of the uneven weathering of trap rock. It is covered with a very thin layer of mud, especially at small depressions. Pebbles and cobbles eroded by waves lie mostly at its flanks.

Surficial Deposit: Except coarse sands, mud and small patches of pebbles, no significant surficial deposit is encountered.

Water Regime: This facet is inundated during high tide but remains wet even during low tide. However, those portions that lie above the high water remain dry.

Associated Features

Position in Landscape: It occupies intermediate to highest position in the landscape.

Soil: At a few places a very thin cover of fine grained, transported, homogeneous soil is present.

Vegetation: This facet is barren. Occasional mangrove plants grow in the crevices.

Land Use: It is a wasteland.

Genesis: The exposed trap rocks are attacked by waves and gradually worn down to a horizontal flat surface at the high waterline. Erosion of this facet is mostly controlled by jointing.

Airphoto Interpretation Aid

This facet is marked by a light to medium grey tone on account of its barren nature. Seawards it is covered with water and hence, is distinguished by a dark grey tone.

Comments and Reference

This facet is present in Toposheet Nos. 46/D15 and D11, 46/D12 and 47/A9. During low tide, it is trackable, however, vehicles cannot ply over it.