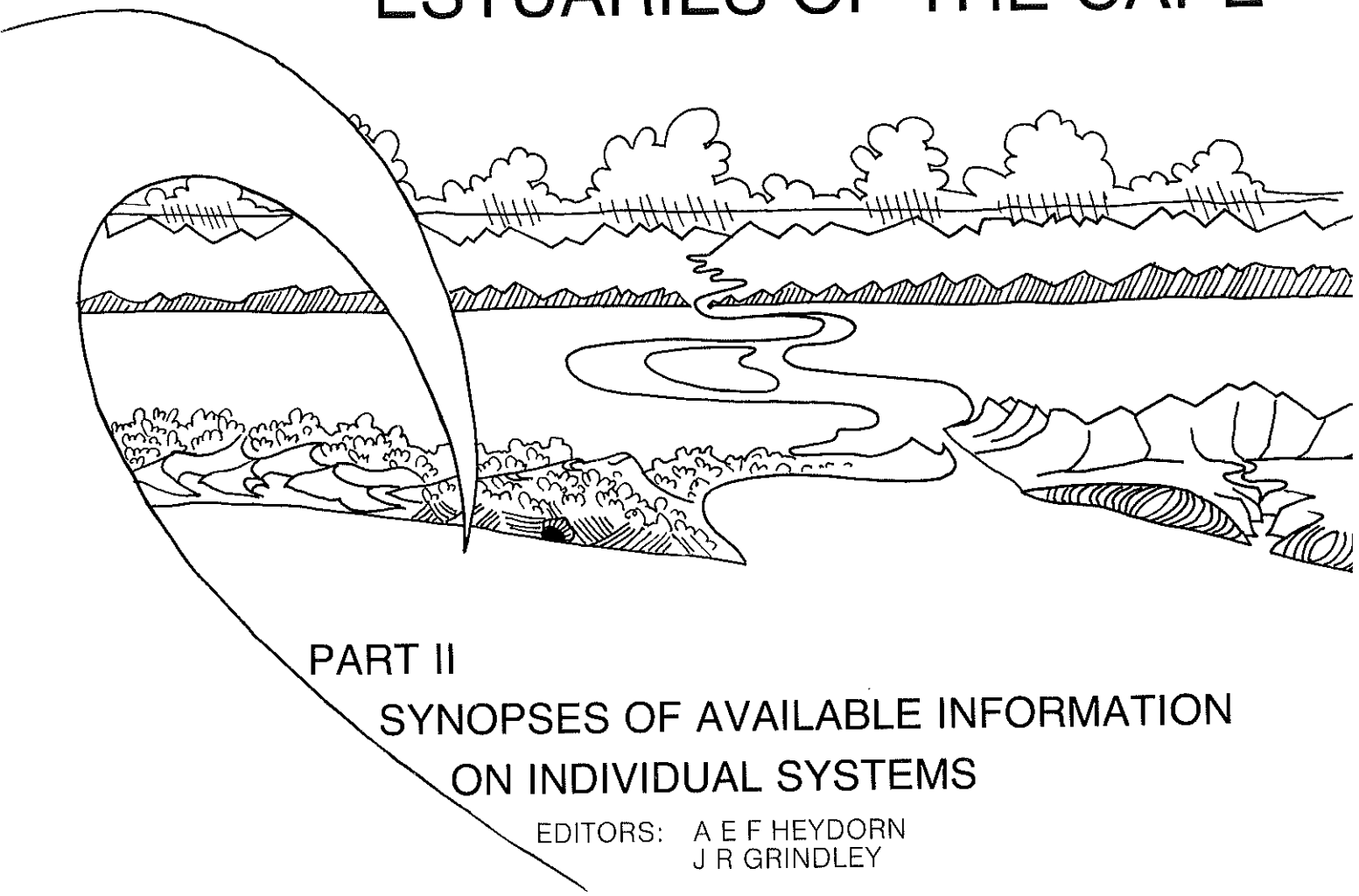
COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH
NATIONAL RESEARCH INSTITUTE FOR OCEANOLOGY
ESTUARINE AND COASTAL RESEARCH UNIT – ECRU

ESTUARIES OF THE CAPE



PART II
SYNOPSES OF AVAILABLE INFORMATION ON INDIVIDUAL SYSTEMS

EDITORS: A E F HEYDORN
J R GRINDLEY

REPORT NO. 9
UILKRAALS (CSW 17)

CSIR RESEARCH REPORT 408

Stellenbosch, South Africa
February 1982

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PART II: SYNOPSES OF AVAILABLE INFORMATION ON INDIVIDUAL SYSTEMS

REPORT NO. 9: UILKRAALS (CSW17)

(CSW17 — CSIR Estuary Index Number)

FRONTISPIECE: UILKRAALS ESTUARY — ALT. 500 m, ECRU 79-10-16

COMPILED BY: A E F HEYDORN AND
I B BICKERTON

ECRU Surveys : 7 DECEMBER 1979 & 12 MARCH 1981

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PREFACE

The Estuarine and Coastal Research Unit (ECRU) was established by the National Research Institute for Oceanology of the CSIR in 1979 with the following aims :

- to contribute information relevant to the development of a cohesive management policy for the South African coastline;
- to compile syntheses of all available knowledge on the 167 estuaries of the Cape between the Kei and the Orange rivers;
- to identify gaps in information and to stimulate research at Universities, Museums and other institutions to fill these.

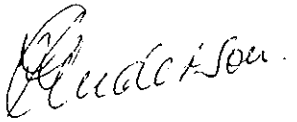
The Unit was established at the request of the Government, and the Department of Environmental Affairs contributes substantially to the running costs.

In 1980 the Unit published its first report under the title "The Estuaries of the Cape, Part I - Synopsis of the Cape Coast. Natural Features, Dynamics and Utilization" (by Heydorn and Tinley)*. As the name of the report implies, it is an overview of the Cape Coast dealing with aspects such as climate, geology, soils, catchments, run-off, vegetation, oceanography and of course, estuaries. At the specific request of the Government, the report includes preliminary management recommendations.

The present report is one of a series on Cape Estuaries being published under the general title "The Estuaries of the Cape, Part II." In these reports all available information on individual estuaries is summarized and presented in a format similar to that used in a report on Natal estuaries which was published by the Natal Town and Regional Planning Commission in 1978. It was found however, that much information is dated or inadequate and that the compilation of Part II reports is therefore not possible without brief prior surveys by the ECRU. These surveys are usually carried out in collaboration with the Botanical Research Institute and frequently with individual scientists who have special interest in the systems concerned. One of these is Prof J R Grindley of the University of Cape Town who is co-editor of the Part II series.

These surveys are however not adequate to provide complete understanding of the functioning of estuarine systems under the variable conditions prevalent along the South African coastline. The ECRU therefore liaises closely with Universities and other research institutes and encourages them to carry out longer-term research in selected estuarine systems. In this way a far greater range of expertise is involved in the programme and it is hoped that the needs of those responsible for coastal zone management at Local-, Provincial- and Central Government levels can be met within a reasonable period of time.

Finally, it has been attempted to write the Part II reports in language understandable to the layman. However it has been impossible to avoid technical terms altogether. A glossary explaining these is therefore included in each report.



F P Anderson
DIRECTOR

National Research Institute for Oceanology
CSIR

* CSIR Research Report 380

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UILKRAALS

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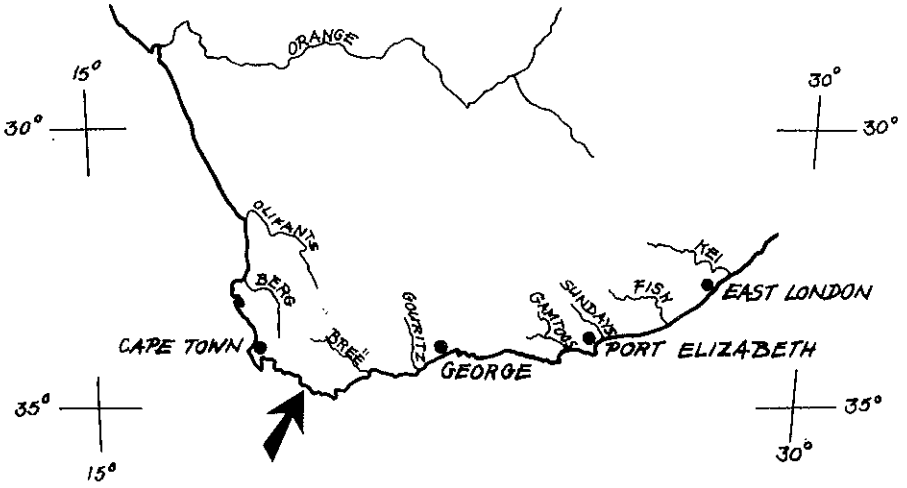
Uilkraals (1:50 000 Sheet 3419CB)
Uilekraal (1:250 000 Topographical Sheet 3319)
Uilenkraal (G F van Wyk 1955; Walsh 1968)
Uilskraal (Noble and Hemens 1978)

2. LOCATION

34^0 36' S 19^0 24' E



The mouth of the Uilkraals is situated approximately 60 km northwest of Cape Agulhas and 11 km east of Danger Point. It is the first river mouth to the east of Danger Point.

2.1 Accessibility

Accessible by 6 km of tarred road from the fishing harbour Gansbaai, which lies to the northwest of the Uilkraals mouth.

3. ABIOTIC CHARACTERISTICS

3.1 Catchment :

Area

391 km^2 (Midgley and Pitman 1969; Noble and Hemens 1978)
313 km^2 (Heydorn and Tinley 1980).

River length

About 30 km from the mouth to the junction of the major tributaries (Sondagskloof and Perdeberg rivers) in the upper catchment. The total river length from the mouth of the Uilkraals to the source of the Sondagskloof in the Elandsberge is approximately 46 km (1:250 000 Topographical Sheet 3319).

Tributaries

In the upper catchment : the Perdeberg and Sondagskloof rivers join about 30 km from the mouth to form the Uilkraals at an elevation of about 200 m. In the lower catchment : the Boesmans River joins the Uilkraals about 6 km from the mouth (1:250 000 Topographical Sheet 3319).

Mean annual run-off

65 x 10^6 m^3 (Midgley and Pitman 1969; Noble and Hemens 1978).

The Uilkraals and its catchment fall within the region of winter rainfall, with peaks in June and July. The mean annual rainfall for most of the Uilkraals catchment ranges between 500 and 600 mm (Heydorn and Tinley 1980, p 27). Midgley and Pitman (1969) give the mean annual precipitation for the catchment area as 606 mm.

3.2 Flow :

No recorded data.

Flood history and level fluctuations

According to Mr Terblanche, the caravan park supervisor at Uilkraals mouth, the river is known to be subject to floods which can be of considerable magnitude. According to him, damage as a result of flooding has occurred in the caravan park (Fig. 1) and river levels can therefore apparently rise by 1 to 2 m. More accurate flood level figures are not available.

3.3 Obstructions :

(a) In the catchment

There is no dam in the catchment at present but consideration is being given to the construction of a dam about 10 km upstream to provide water for the village Franskraal (Mr J W Lampbrechts, Secretary, Caledon Divisional Council, pers. comm.).

(b) Near the mouth (See Fig. 1)

A bridge approximately 220 m long spans the river approximately 800 m from its mouth. A causeway approximately 120 m in length supports the eastern road access to the bridge while the remaining 100 m is spanned and supported by concrete pylons (Figs. 1 and 2 and Plate III). This bridge which replaced a wooden footbridge, was constructed by the Cape Provincial Administration (Caledon Divisional Council) and was

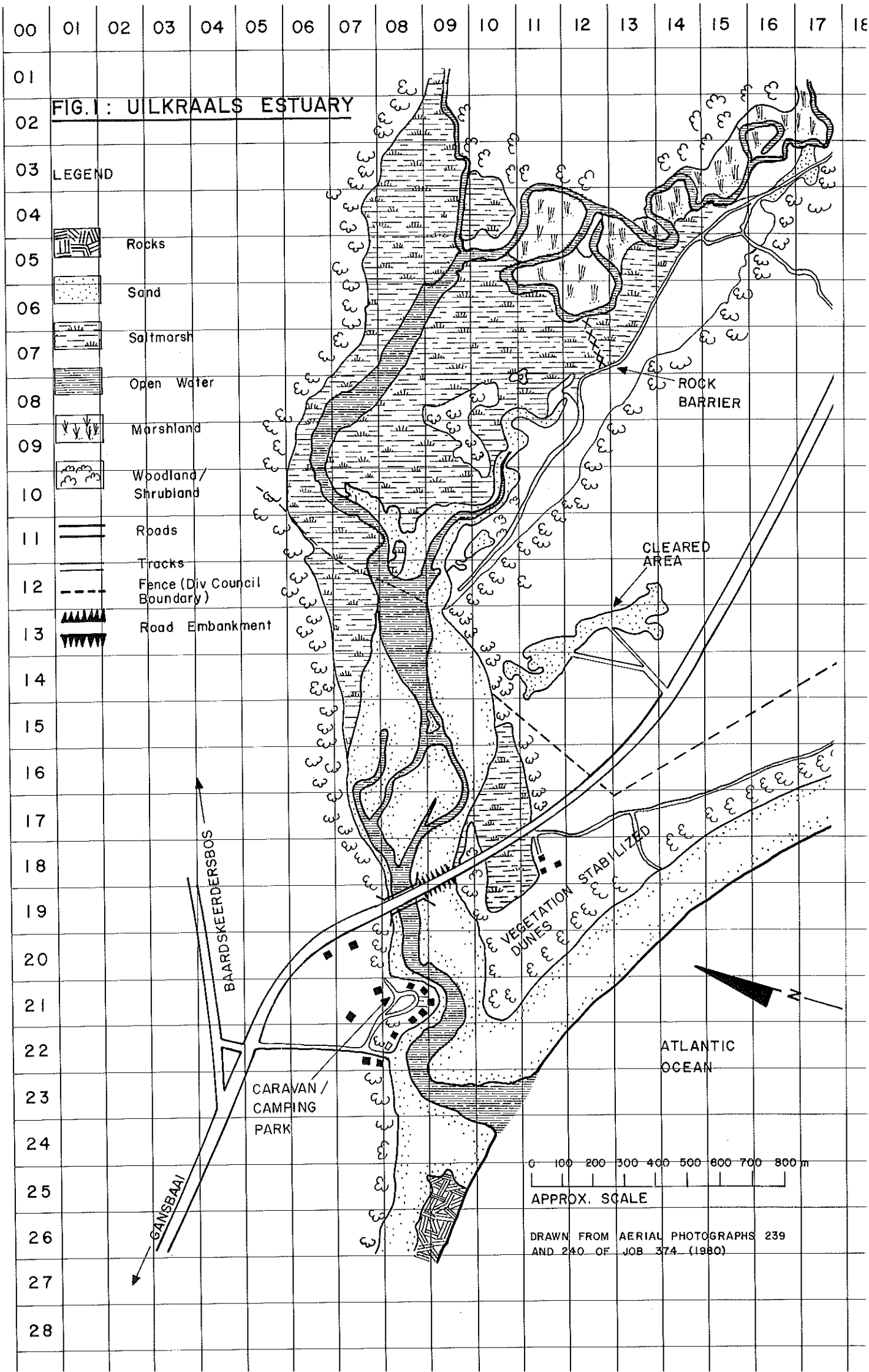


FIG. 1 : ULKRAALS ESTUARY
LEGEND
Rocks
Sand
Saltmarsh
Open Water
Marshland
Woodland / Shrubland
Roads
Tracks
Fence (Div Council Boundary)
Road Embankment
ROCK BARRIER
CLEARED AREA
VEGETATION STABILIZED DUNES
BAARDSKEERDERSBOS
GANSBAAI
CARAVAN / CAMPING PARK
ATLANTIC OCEAN
N
0 100 200 300 400 500 600 700 800 m
APPROX. SCALE
DRAWN FROM AERIAL PHOTOGRAPHS 239 AND 240 OF JOB 374 (1980)

completed in 1973. Judging from the comparison of a sketch made by Mr G F van Wyk in November 1955 with Aerial Photography Job No. 326 of 1979, the effect of the bridge has been to concentrate river and tidal flows against the western bank (Plate III). In 1978 a rubble and rock embankment (Fig. 2b) about 150 m long was built, protruding from the western dune on which holiday bungalows are situated. The purpose of this embankment was to force the river mouth eastwards, i.e. away from the beach in front of the bungalows and caravan park where it entered the sea at times. Within a few months of its construction, the embankment was badly eroded by wave and tidal action and partly covered with sand. Further, a shallow, stagnant pool of water and a series of sand dunes had formed on the beach in front of the bungalows (Frontispiece).

To rectify this situation, the Caledon Divisional Council removed the western embankment in 1980 and constructed a new embankment (Fig. 2c). This was to force the river mouth westwards to its original position. At the time of writing the mouth had returned to its westerly position after the eastern embankment had also been removed (Fig. 1).

About 3 km from the mouth a 200 m long artificial rock barrier about 0,5 m high, running in a north-east/south-west direction, bisects the southern part of the floodplain (Fig. 1). This barrier is possibly an attempt to prevent saltwater penetration of the floodplain grazing lands to the east of it.

3.4 Siltation

Siltation of the river mouth due to erosion in the catchment is minimal. However, at the time of the ECRU survey in December, 1979, there was evidence of shifting sandbanks in the riverbed in the area within about 1,5 km of the mouth, particularly in the vicinity of the causeway for the road bridge.

3.5 Landownership / use :

(a) Catchment

Agriculture consisting of cultivated lands and grazing of both cattle and sheep.

(b) Around the estuary (See Fig. 1)

A caravan and camping park with a few holiday bungalows and approximately 1 000 sites, owned by the Caledon Divisional Council, is situated on the west bank at the mouth of the estuary. Furthermore, the estuary is used extensively by holiday-makers residing at Franskraal, the holiday resort 2 km to the west of the estuary. According to the C P A Cape Coastal Survey, Report No. 2 of 1973, Franskraal was established in 1945 with

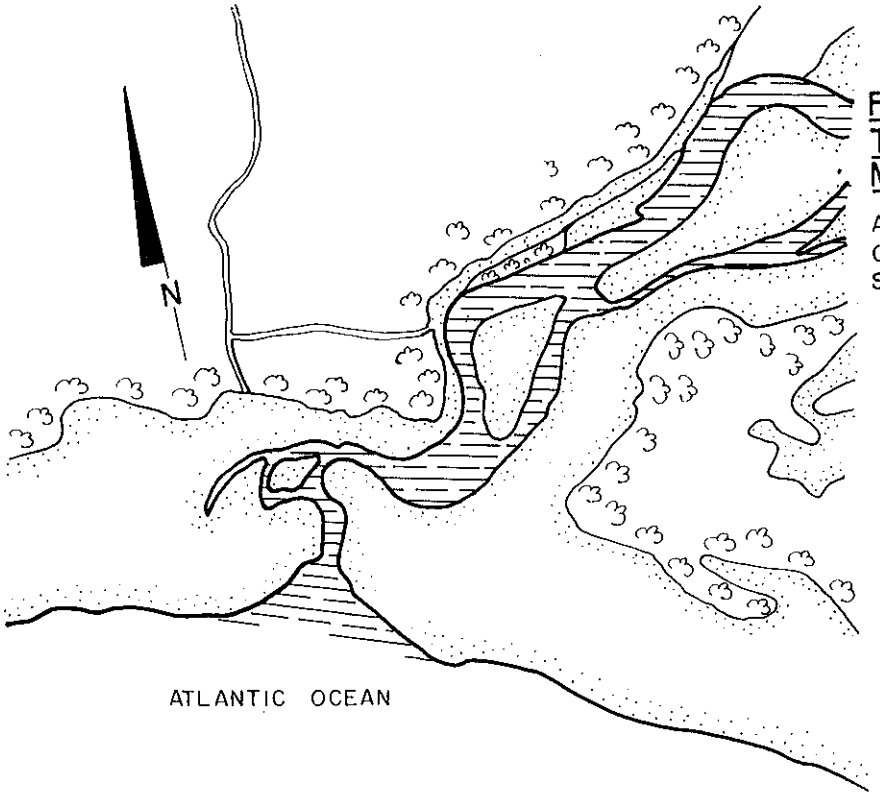
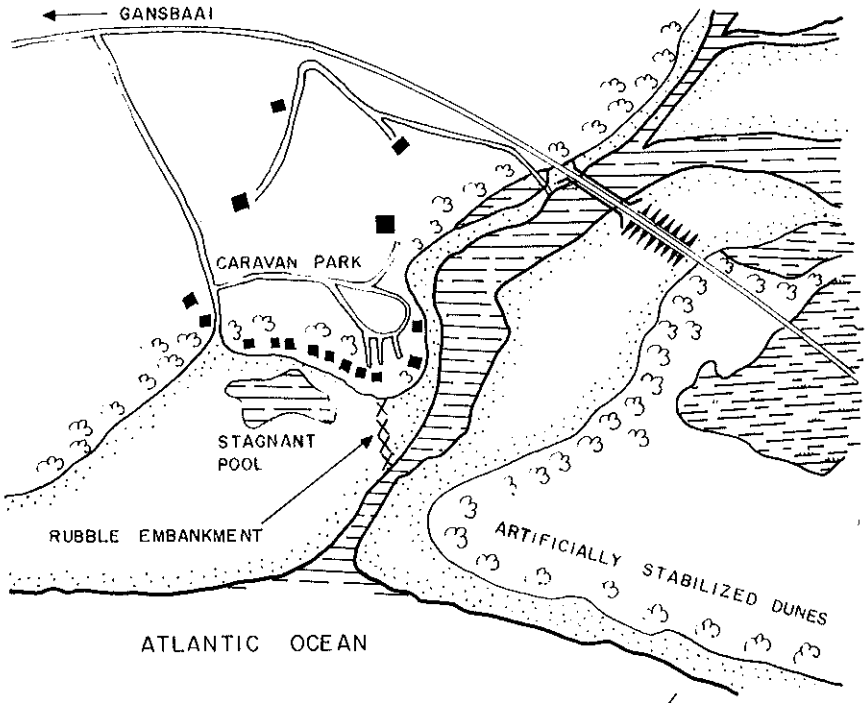


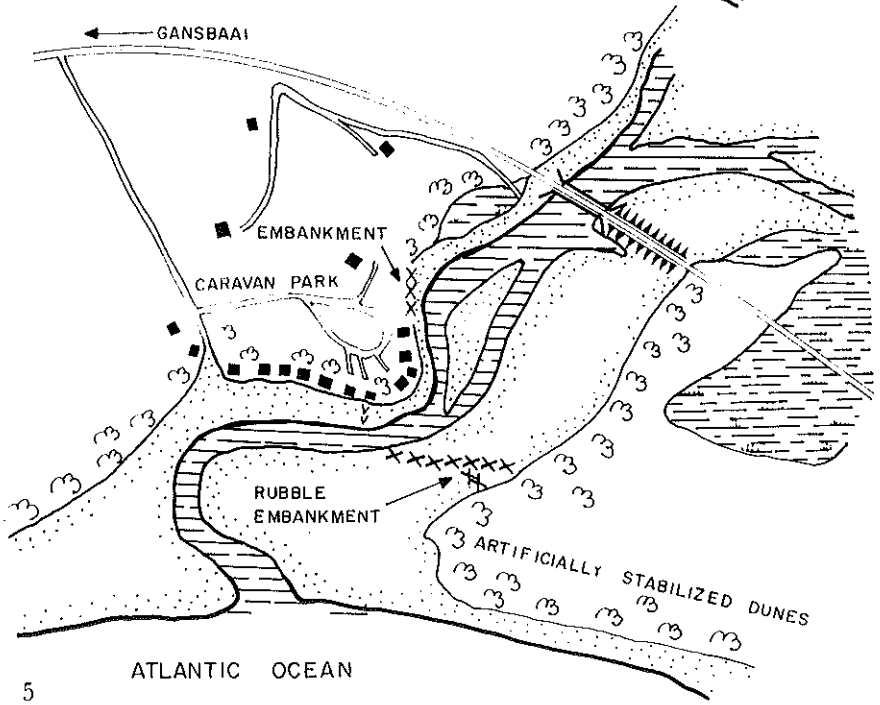
FIG. 2: CHANGES IN CONFIGURATION OF UILKRAALS ESTUARY MOUTH.

ALL MAPS DRAWN TO AN APPROX. SCALE OF 1:10 000 USING A BAUSCH AND LOMB STEREO ZOOM TRANSFERSCOPE.

(a) 1938 COMPILED FROM AERIAL PHOTOGRAPHS (TRIG. SURVEY) TAKEN IN 1938, JOB NO. 130 AT AN APPROX. SCALE OF 1:25 000.



(b) 1979 COMPILED FROM AERIAL PHOTOGRAPHS (UNIV. OF NATAL, SURVEY DEPT.) TAKEN IN 1979, JOB NO. 326 AT AN APPROX. SCALE OF 1:10 000 THE RUBBLE EMBANKMENT FORCING THE MOUTH TO THE EAST IS SHOWN



(c) 1980 COMPILED FROM AERIAL PHOTOGRAPHS (UNIV. OF NATAL, SURVEY DEPT.) TAKEN IN 1980, JOB NO. 374 AT AN APPROX. SCALE OF 1:20 000 AND FIELD SKETCHES MADE BY ECRU PERSONNEL. THE RUBBLE EMBANKMENT ON THE EAST BANK FORCING THE MOUTH BACK TO ITS ORIGINAL POSITION IS SHOWN. THE REMAINS OF THE ORIGINAL EMBANKMENT ON THE WEST BANK AND A LOW (0,5m) EMBANKMENT PROTECTING THE CARAVAN PARK FROM FLOOD DAMAGE ARE ALSO SHOWN.

1 088 erven. By 1972 only 15% of them had been developed. There is, however, an influx of about 1 600 persons into Franskraal during peak holiday periods.

To the east of the mouth lies State Forest Land indicated on the 1:50 000 Sheet 3419CB as The Duinefontein Sands Forestry Reserve.

Upstream of the road bridge an extensive part of the floodplain is used for grazing by cattle.

3.6 Local authority :

The lower reaches of the estuary (from the mouth to the fence running in a north/south direction across the estuary 1 km upstream of the bridge) and its surrounding areas are controlled by the Caledon Divisional Council. The catchment and upper reaches of the estuary above the fence are controlled by the Bredasdorp/Swellendam Divisional Council.

3.7 Estuary uses :

Fishing, bait gathering, swimming, i.e. general recreational activities.

3.8 Morphometry of the estuary :

(See Fig. 1)

Area

The area of the estuary up to approximately the confluence of the Uilkraals and Boesmans Rivers (See Fig. 3), as measured from Aerial Photography Job No. 374 of 1980, is approximately 260 ha.

Shape

The river enters the sea via a meandering channel (Fig. 1 and Frontispiece) across the floodplain, which opens onto sand flats. The lower reaches of these sand flats (Plate II) are traversed by the road bridge. The river flows through several channels across the sandflats upstream of the bridge. The mouth was formerly mobile and, in the past (Fig. 2a), could enter the sea at any point between the eastern dune spit and the western part of the beach opposite the caravan park. However, it has now been partially fixed by a combination of factors, namely: the causeway of the road bridge; the stabilization of the eastern dune spit by the Dept. of Forestry; (Fig. 1) and the stabilization of the western dune spit on which the bungalows stand.

Walsh 1968 states: "The Uilenkraal flows in a superficial channel bordered by sandbanks near the sea where it broadens

to about 200 yards. The full breadth of the sandy river is filled only at high tides and then only to a depth of about 8 feet in mid-channel, so that the river, which does not close its mouth throughout the year, has no real lagoon". Walsh goes on to say that the position of the mouth does not change, but this is questionable in view of its dynamic nature.

Bathymetry

The upper reaches of the Uilkraals Estuary consist of a channel 1-2 m deep and about 15 m wide, meandering across a floodplain and opening onto wide tidal sandflats which are inundated or exposed depending on the state of the tide. There is a shallow braided channel, about 0,3 m deep at low tide, running across the sandflats. This channel is diverted against the western bank at the road bridge and is about 1 m deep under the bridge at low tide. Downstream of the bridge the depth in the channel varies from about 0,5 m to 1 m at low tide.

During the ECRU survey on 7 December 1979 when the mouth opened on the eastern side of the beach, the depth in mid-channel on the outgoing tide was 1 m. During a visit by ECRU personnel on 12 March 1981, when the mouth had returned to the western side of the beach, the depth at low tide was again approximately 1 m and the width about 20 m.

A diagram of the estuary, drawn by Mr G F van Wyk in November 1955, shows the mouth as being approximately 25 m wide and 2 m deep at low tide. Walsh (1968) states that at high tide, the river in mid-channel is 2,5 m deep.

It must be borne in mind that the above depths can vary over a period of time due to changes in water flow patterns and the mobile nature of the sediments.

3.9 Geomorphology :

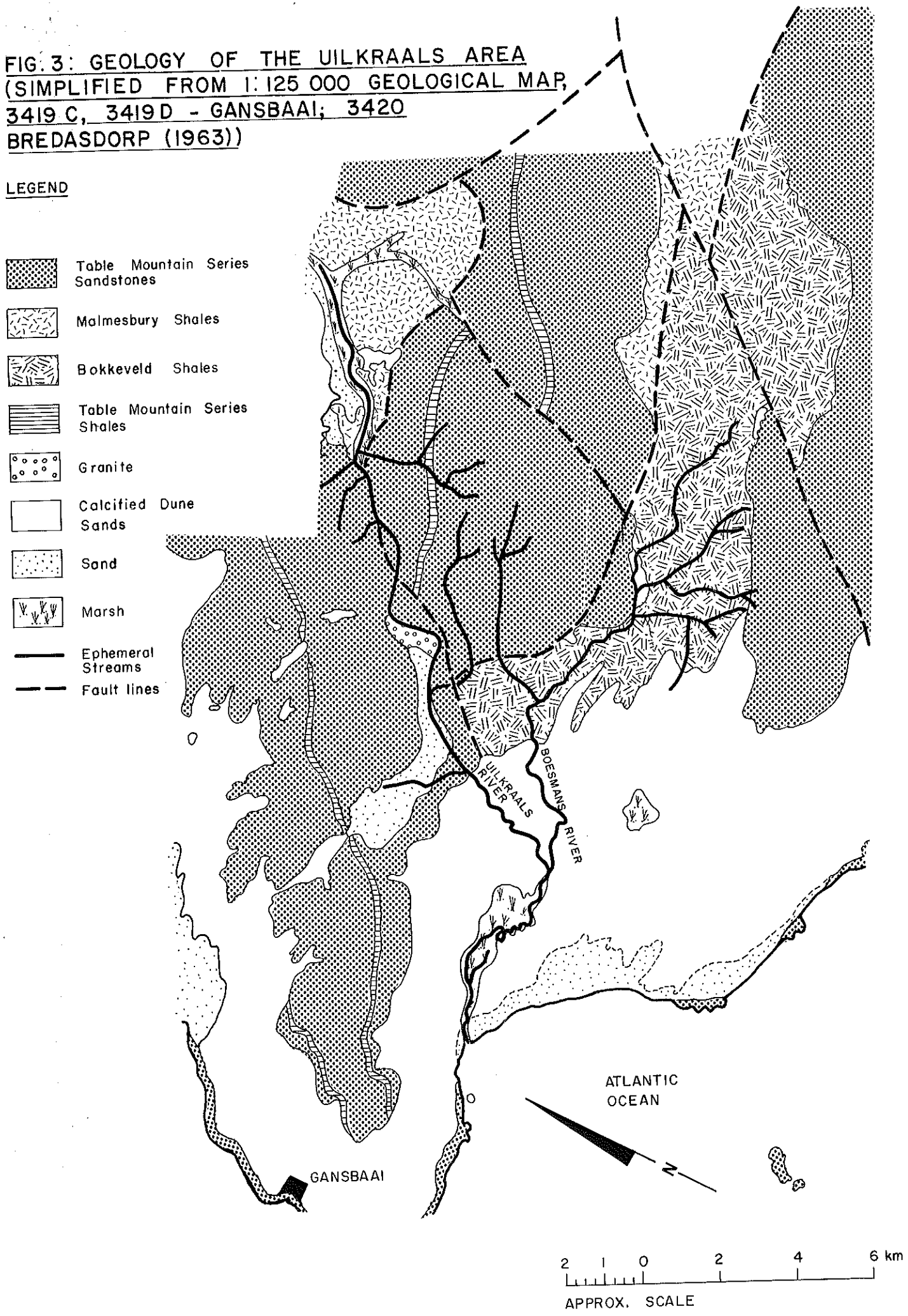
Geology (See Fig. 3)

The following description is based on information obtained from the 1:125 000 Geological Map 3419C, 3419D Gansbaai and 3420C Bredasdorp and the 1:1 000 000 Geological Map of South Africa.

The sources of the river system lie in the Koueberg and Perdeberg Mountains which are characterized by Table Mountain Group sandstones, quartzites, shale layers and conglomerates. Lower down near Papiesvlei in the river valley, rocks of the Malmesbury Formation outcrop. These consist of sheared shale and fine-grained greywacke[1].

[1] *greywacke : strongly cemented, fine to coarse sandstones containing angular particles which are mainly rock-fragments.*

FIG. 3: GEOLOGY OF THE UILKRAALS AREA (SIMPLIFIED FROM 1:125 000 GEOLOGICAL MAP, 3419 C, 3419 D - GANSBAAI; 3420 BREDASDORP (1963))



From here, the river follows a fault[2] line running in a south-westerly direction. An outcrop of pre-Cape granite is found about 12 km upstream of the river mouth on the northern side of the fault. This fault probably stretches into the sea but is not traceable, as calcified[3] dune sands (Bredasdorp Beds) blanket the area from the mouth to about 9 km upstream of the mouth. The calcified dune sands contain limestone of marine origin (Du Toit 1966) which may influence the pH of the water.

The Boesmans River, a tributary of the Uilkraals flowing in from the east, passes through a large area of Bokkeveld Shales. This outcrop is separated from the Table Mountain Group lying to the north, by the above-mentioned fault.

To the west of the Uilkraals mouth, sandstones, quartzites and shales of the Table Mountain Group, outcrop in the form of the Franskraal Mountains set back from the shoreline and also the rocks on the shoreline.

To the south-east of the mouth a belt of shifting dune sands is found along the adjacent coastline.

Nature of bottom materials

From the mouth to just upstream of the bridge, the sediments are dark grey in colour and covered by a clean sandy layer consisting predominantly of quartz and shell fragments indicating marine origin. Deeper down the sediments are black, indicating anoxic conditions. Prawn holes are very common and these probably assist with sediment turnover and oxygenation of lower levels. Further upstream of the bridge the river flows over sandflats.

The shallow edges of the channel meandering across the floodplain in the upper reaches of the estuary, consisted of a thin layer of fine-grained sand overlying mud in March 1981.

Generally there is little evidence of siltation from soil erosion in the catchment.

Sandbar characteristics

When the mouth was fixed (See Section 3.3(b)) on the eastern side of the beach by the gravel and rock embankment in 1978, the beach which was formerly flooded at high tide became prone to aeolian dune formation. In December 1979, these young dunes were 0,5-1,5 m high and of serious concern to the Caledon Divisional Council (Mr J W Lampbrechts pers. comm.).

[2] *fault : a surface of fracture or rupture of strata, involving permanent dislocation and displacement within the earth's crust as a result of the accumulation of strain.*

[3] *calcified : hardened by the deposit of lime or calcium salts.*

Now that the mouth has returned to its position on the western side of the beach, the sandbar has a relatively flat profile and is subject to overwashing during high tides.

Configuration of adjacent shore

The mouth of the Uilkraals opens into the bay to the east of Danger Point (1:50 000 Sheet 3419CB). East of the mouth the shoreline consists of sandy beaches backed by vegetation-stabilized dunes showing signs of wave erosion where they have been fixed closer to the sea than their natural margin (compare Figs. 2a & 2b). West of the mouth, the rocky shoreline is composed of Table Mountain Group sandstones.

3.10 Oceanography

Major currents

According to Harris (1978) the major currents, up to 12 km away from the shore, run approximately parallel to the coast and are both west- and east-going. There is a clear seasonal difference, west-going currents prevailing in summer, whilst in the winter months the percentage of east-going currents is greater. However, there is a high frequency of slack periods, especially during winter when it can be as high as 40%.

Upwelling of denser colder water on this section of coast occurs when south-easterly winds blow (Heydorn and Tinley 1980) predominantly in the summer months.

Waves

The prevailing swells are generated in the South Atlantic and approach the coast predominantly from a south-westerly direction (Ocean Wave Research Report No. 1, 1968). From aerial photography of the coast it appears that these swells are deflected to a certain extent by the rocky shoreline and promontories running to the south-west of the mouth of the Uilkraals. Because of this, the approach of the swells becomes parallel with the shoreline.

Swell height as measured at Gansbaai to the south of Walker Bay, is approximately 2 m for 50% of the time and the wave period between 11,5 and 12,5 seconds (J Rossouw pers. comm.).

Surf zone currents

There is a predominantly wave-generated longshore drift which is probably reversible.

Tides

Tidal levels in 1981 for Hermanus (26 km north-west of the Uilkraals mouth) as referred to chart datum were as follows :

MLWS	MHWS
0,37	1,81

This gives a tidal range of 1,44 m (South African Tide Tables 1981).

3.11 Physico-chemical characteristics :

The only physico-chemical data available are those collected on 7 December 1979 during the ECRU survey and during a visit to the Uilkraals on 12 March 1981 by ECRU personnel. These data are presented in Tables 1 and 2 respectively.

The data indicate tidal interchange up to approximately 3 km upstream of the mouth. During March 1981, saline water of 8 to 9 parts per thousand had been trapped in the blind ending channel (Grid Refs. 0611 and 0713) joining the main channel approximately 3 km upstream of the mouth (Fig. 1). It appears that saline water had penetrated at least to this junction before the February 1981 floods. These floods probably flushed the main channel, thereby trapping the saline water in the blind side channel.

In March 1981 a low pH (6,0 - 7,0) and transparent brown water were recorded in the upper reaches of the floodplain (Grid Refs. 0515, 0614 and 0713) and in the meandering channel. This is typical of water drained from catchments dominated by Table Mountain Group sandstones and is probably due to humic acids leached out of the decaying vegetation (King et al 1979).

In Table 1, the high oxygen levels of 9,8 milligrams per litre (38 percent oversaturated) and 10,8 milligrams per litre (52 percent oversaturated) measured in open water at Grid Refs. 2209 and 2008 respectively, probably indicate high phytoplankton concentrations. The close proximity of the alga (Enteromorpha) probably caused the high oxygen level of 13,0 milligrams per litre (83 percent oversaturated) at Grid Ref. 2008.

Nutrients

No information available.

3.12 Pollution

Sewage, oil, metals, pesticides, herbicides and other forms of pollution.

No information available.

3.13 Public health aspects :

Bacteriology

No information available.

Others

No information available.

TABLE 1 : Physico-chemical data collected during the ECRU survey in December 1979.
See Fig. 1 for grid references

Date	79-12-07	79-12-07	79-12-07	79-12-07
Time	11h30	11h00	10h45	10h00
State of mouth	Open on eastern side of beach			
State of tide	Low at 11h26	Low at 11h26	Outgoing	Outgoing
ECRU Grid Ref.	2410	2209	2008	1408
Position of sampling site	At mouth	400 m from mouth	600 m from mouth	1500 m from mouth
Depth (m) at sampling site	1,0	0,5-1,0	0,5-1,0	0,5-1,0
* Width (m)	25	80	70	250
Diss. O_2 (mg/ℓ) measured with O_2/Temp. meter	No data	9,8	Open water 10,8 Near algae 13,0	No data
Salinity (‰)	35,5	30,0	29,0	20,0
Surface temp. (°C)	No data	24,5	25,5	No data

* Estuary/River width at sampling site.

TABLE 2 : Physico-chemical data collected during a visit to the Uilkraals by ECRU personnel in March 1981. See Fig 1 for grid references.

Date	12 MARCH 1981							
Time	12h00	13h00	13h30	14h30	14h45	15h35	16h00	19h30
State of mouth	Open on western side of beach							
State of tide	Outgoing	Outgoing	Low at 14h06	Low at 14h06	Low at 14h06	Incoming	Incoming	Incoming but water still flowing out
ECRU Grid Ref.	0515	0614	0713	0611	0610	1209	1308	2008
Position of sampling site	3,5 km from mouth	3 km from mouth	Blind channel 2,8 km from mouth	Blind channel 2,5 km from mouth	Main channel 2,5 km from mouth	Tidal flats 2 km from mouth	Open sand flats 1,8 km from mouth	At bridge
Depth (m) at sampling site	1-2	1-2	1-2	No data	1,7	Variable 0,1-0,2	0,2	0,2 m on east side 1 m on west side
* Width (m)	15	15	15	15	20	Open floodplain	Open sandflats	80
Salinity (^{o}/oo)	0	0	8	9	No data	20-25	24	26
pH	6	6,5	6,5-7,0	No data	No data	No data	No data	No data
Water colour	Transparent brown	Transparent brown	No data	No data	No data	Transparent	Transparent	Transparent
Substrate	Fine-grained sand overlying mud	Fine sand overlying mud	No data	No data	Mud overlain by sand at edges of channel	Fine to medium sand	Fine to medium sand	Fine to medium sand

* Estuary/River width at sampling site.

4 BIOTIC CHARACTERISTICS

Only a minimal amount of previous information on the plant and animal life of the Uilkraals Estuary could be found. The observations below made by the ECRU during its brief survey and subsequent visit are superficial, but nevertheless give an indication of the range of animal and plant life which occurs at the Uilkraals.

4.1 Flora :

Phytoplankton/diatoms

No sampling for phytoplankton took place during the ECRU surveys. It seems likely that marine phytoplankton is carried into the estuary with incoming tides. The development of phytoplankton blooms within the estuary seems unlikely because of strong tidal flow.

Aquatic vegetation

(a) Estuary

At the time of the ECRU survey the filamentous algae Enteromorpha and Cladophora were present in the estuary.

In March 1981 at the time of a visit by ECRU personnel, beds of Ulva were present under the road bridge. Stands of the aquatic grass Ruppia spiralis occurred in the main channel (Grid Ref. 0515) through the floodplain in the upper reaches of the estuary.

(b) Adjacent shoreline

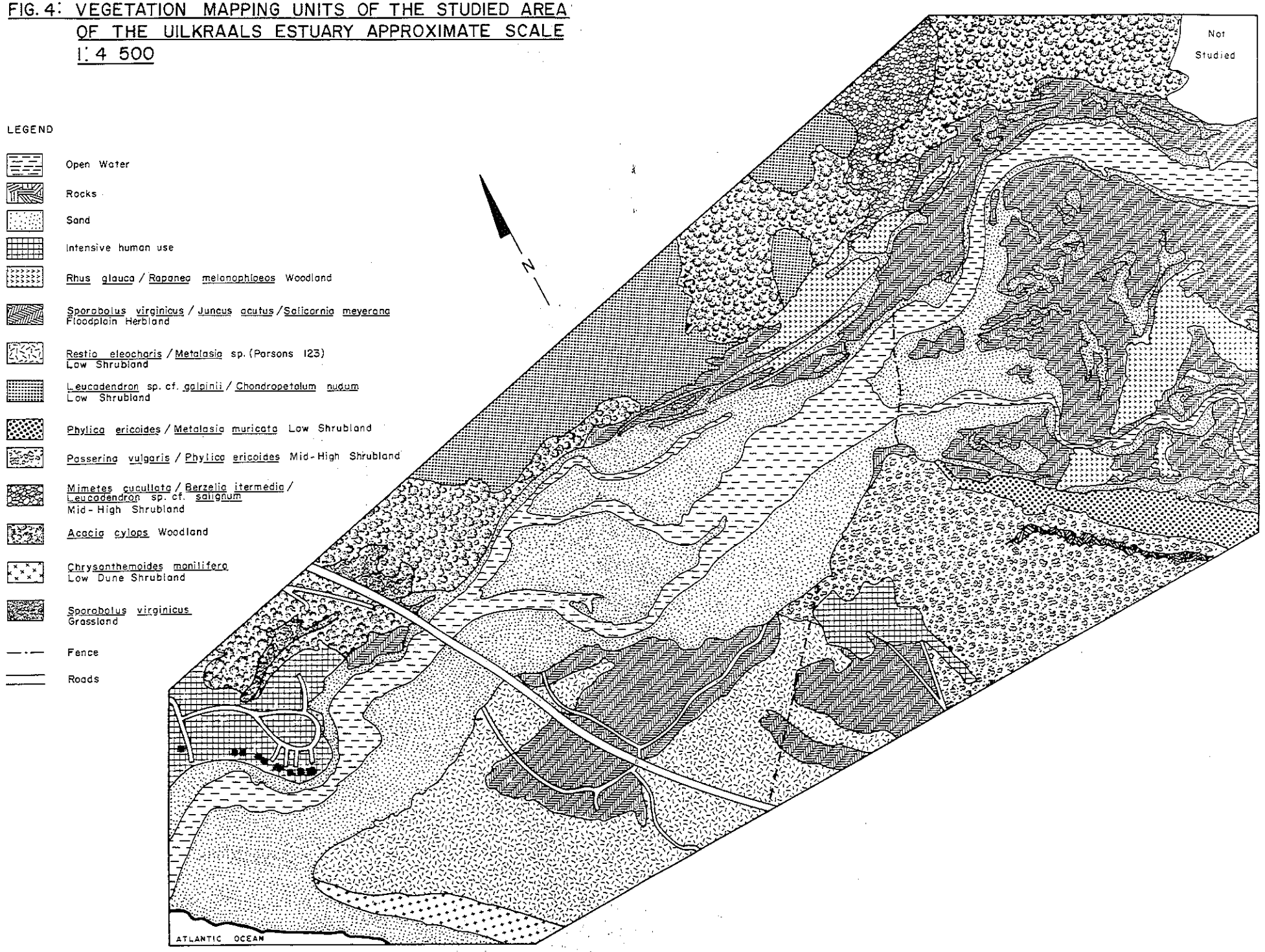
Kelp, Ecklonia maxima, is abundant in the nearshore region along the shoreline adjacent to the Uilkraals mouth.

Semi-aquatic vegetation

The following semi-aquatic species were recorded in and around the estuary during the ECRU survey :

Plantago carnosa
Salicornia meyerana
Triglochin bulbosum
Scirpus littoralis
Sebaea minutiflora
Sebaea albens
Juncus spp.
Crassula glomerata
Spergularia marginata
Cotula eckloniana
Chenolea diffusa
Samolus deis
Limonium scabrum

FIG. 4: VEGETATION MAPPING UNITS OF THE STUDIED AREA OF THE UILKRAALS ESTUARY APPROXIMATE SCALE 1: 4 500



Terrestrial vegetation

(This section is contributed by Miss R. Parsons of the Botanical Research Institute).

This region falls into Acock's Veld Type 47, Coastal Macchia. This is a complex and interesting veld type occurring on sand and limestone in the west and southern coastal belts. It can be considered to be a transitional scrub type with both a fynbos element and a more tropical element occurring (Acocks 1975).

Ten main plant communities (mapping units) were identified and their spatial distribution is shown in Fig. 4. The structure, species composition and area of each community can be seen in Appendix 1. The Sporobolus virginicus Grassland has the highest cover (95 percent) and the Chrysanthemoides monilifera Low Dune Shrubland and the Restio eleocharis/Metalasia sp. (Parsons 123)[1] have the lowest with a total cover of 45 percent. The height of the communities ranges from 3,0 m of the Rhus glauca (taaibos)/Rapanea melanophloeos (boekenhout) Woodland and the Acacia cyclops (rooikrans) Woodland to the 0,15 m of the Sporobolus virginicus Grassland. The Mimetes cucullata/Berzelia intermedia/Leucadendron sp. cf. salignum Mid-high Shrubland has the highest species diversity with 15 species recorded, while the Acacia cyclops Woodland has the lowest with only 3 spp. recorded.

The plant communities can be consolidated into five plant formations viz. low shrubland (0,25-1,0 m), mid-high shrubland (1-2 m), woodland, herbland and grassland. Of these the low shrubland covers the most extensive area (39 ha of the 205 ha studied). This is followed by the herbland (37 ha), the woodland (32 ha), the mid-high shrubland (19 ha) and grassland (1,3 ha). The open sand (including the beach) covers a large area of 46 ha of the total study area of 205 ha.

The Sporobolus virginicus/Juncus acutus/Salicornia meyerana Floodplain Herbland consists of a mosaic of vegetation with different species dominant in patches. These patches were too small to be mapped individually. The patchiness of the vegetation is probably a result of different salinities, periods of inundation, etc. The floodplain is used for grazing and both cattle and horses were seen on it. Typical saltmarsh species (e.g. Salicornia meyerana) occur on the floodplain.

There are fairly large patches of fynbos in the study area. The communities which can be considered as fynbos are the Phylica ericoides/Metalasia muricata (blombos) Low Shrubland, Passerina vulgaris (gonna)/Phylica ericoides Mid-high Shrubland, Mimetes cucullata/Berzelia intermedia/Leucadendron sp. cf. salignum Mid-high Shrubland and the Leucadendron sp. cf. galpinii/Chondropetalum nudum Low Shrubland. These communitites cover a total area of 56 ha, i.e. 27,3 percent of the study area.

[1] *Parsons species numbers e.g. Parsons 123 refer to specimens unidentified by the B R I at the time of writing.*

Alien vegetation is replacing the natural vegetation over fairly large areas. The chief invader is rooikrans (Acacia cyclops). The alien vegetation is especially evident along roads and where the vegetation has been disturbed. The pressures of clearing, trampling and grazing of the vegetation alters the plant succession and opens up the vegetation which allows the intrusion of plant invaders. There are already A.cyclops seedlings in the remaining fynbos. If some method of containing and controlling the spread of the alien vegetation is not introduced the displacement of the natural vegetation will continue.

4.2 Fauna :

Note : As mentioned at the beginning of Section 4, only cursory observations were possible during the ECRU surveys and the lists below should not be interpreted as being representative of all animals in the habitats mentioned.

Zooplankton

No data.

Fauna on hard substrates, soft substrates and on vegetation

(a) on hard substrates

The limpet, Siphonaria oculus was observed on semi-submerged rocks at the bridge.

(b) on soft substrates

According to G F van Wyk, there was a good population of bloodworms (Arenicola loveni), sandprawns (Callianassa kraussi) and mudprawns (Upogebia africana) both upstream and downstream of the foot bridge (close to the present road bridge) when he visited Uilkraals on 12 November 1955. Mr C Gaigher (CPA Nature and Environmental Conservation Memorandum, 78-07-11) has reported that the bloodworm has disappeared subsequent to construction of the road bridge in 1973, probably as a result of reduced water exchange and the effects of freshwater flooding caused by the bridge. When the ECRU visited the Uilkraals on 7 December 1979, there was no evidence of bloodworm. Both C.kraussi and U.africana were present upstream and downstream of the new road bridge but C.kraussi was more abundant and had a wider distribution, with the occurrence of U.africana ending abruptly about 100 m upstream of the bridge.

In March 1981, C.kraussi occurred in abundance from the mouth up into the main channel across the floodplain (Grid Ref. 0515) where conditions were fresh (Table 2). Very few U.africana burrows were noted but several fresh moults were found indicating the presence of these prawns.

At the time of the ECRU survey in December 1979 the crown crab Hymenosoma orbiculare and the hermit crab Diogenes brevirostris were found to be abundant in the vicinity of the bridge. Another crab, Cyclograpsus punctatus, occurred in smaller numbers in the same area. Sampling (using a 'D' net) just above the bridge in March 1981 revealed the presence of large numbers of the above species as well as the shrimp Palaemon pacificus.

(c) on vegetation

No data.

Insects

No data.

Other invertebrates

No data.

Fish

G F van Wyk recorded the occurrence of White Steenbras (Lithognathus lithognathus), Mullet (Family : Mugilidae) and the Bareheaded Goby (Gobius nudiceps) during his visit in November 1955. The ECRU did not sample for fish specifically in December 1979 or March 1981, but observed juvenile Mullet in abundance upstream and downstream of the bridge on both occasions. White Steenbras (Lithognathus lithognathus) and the Knysna Sandgoby (Psammagobius knysnaensis) were observed but in smaller numbers.

Reptiles and Amphibians

No specimens were collected or recorded during the ECRU surveys. However, according to A L de Villiers (pers. comm.), the following species have been recorded from the area covered by the 1:50 000 Topocadastral Sheet 3419CB Gansbaai in which the Uilkraals estuary is centrally situated.

Snakes

Black House Snake (Lamprophis inornatus) (Fitzsimons 1962)

Frogs

Sand Toad (Bufo angusticeps)	(CPA	Dept.	of	Nat.	&	Env.	Cons.	Records)
Clicking Stream Frog (Rana grayii)	"	"	"	"	"	"	"
Common Caco (Cacosternum boettgeri)	"	"	"	"	"	"	"
Rattling Kassina (Kassina wealii)	"	"	"	"	"	"	"
Cape Sand Frog (Tomopterna delalandii)	"	"	"	"	"	"	"

The Uilkraals falls within the limited range of the rare and endangered Micro Frog (Microbatrachella capensis), there being records from Kleinmond and Hermanus Lagoon to the west and Pearly Beach to the east (A L de Villiers pers. comm.).

Birds

The following birds have been recorded at the Uilkraals. The sources of the data and dates of the counts are indicated.

Roberts No.	Species	Number seen			
		Summers et al 76-01-17	ECRU 79-12-07	J.Cooper (in litt.), 81-01-07	ECRU* 81-03-12
47	White-breasted Cormorant	Not counted	3		
48	Cape Cormorant	" "	1		
50	Reed Cormorant	" "	4	3	
54	Grey Heron	" "	1	8	1
58	Great White Heron	" "			1
59	Little Egret	" "	5	4	3
61	Cattle Egret	" "	4		5
79	Black Stork	" "		1	
87	Egyptian Goose	" "		2	2
149	Fish Eagle	" "	1		
167	African Marsh Harrier	" "		1	
231	Black Oyster-catcher		1		
232	Turnstone		4		
233	Ringed Plover	26	1	13	
235	White-fronted Sandplover	58	14	15	2
237	Kittlitz's Sandplover			3	
238	Three-banded Sandplover		2		
241	Grey Plover	38	40	67	
245	Blacksmith Plover		10		
251	Curlew Sandpiper	440	480	534	100
253	Little Stint	90	6	143	
255	Sanderling	45		3	
258	Common Sandpiper		2	4	
263	Greenshank	22		30	8
266	Bar-tailed Godwit	1			
267	Curlew	1	2	3	
268	Whimbrel	53	22	65	1
287	S.Black-backed Gull	Not counted	236	77	300
289	Silver Gull	Not counted	34	92	14
290	Caspian Tern	" "	1		
291	Common Tern	" "		4720	8
296	Sandwich Tern	" "	5000	581	
298	Swift Tern	" "		376	
394	Pied Kingfisher	" "	1	6	5
493	European Swallow	" "	4		
495	White-throated Swallow	" "			1
509	African Sand Martin	" "	3		
686	Cape Wagtail	" "		4	

*The bird recordings made by the ECRU on 12 March 1981 do not reflect a full birdcount and originate from casual observations, made during the botanical survey of the estuary.

Mammals

The following mammals have been recorded by Stuart et al (1980) for the area covered by the 1:50 000 Topocadastral Sheet 3419CB.

Horse-shoe Bat	(Rhinolophus capensis)
Cape Fur Seal	(Arctocephalus pusillus)
Southern Elephant Seal	(Mirounga leonina)
Cape Greater Gerbil	(Tatera afra)
Cape Dune Molerat	(Bathyergus suillus)
Water Mongoose	(Atilax paludinosus)
Cape Wild Cat	(Felis libyca)
Caracal	(Felis caracal)

5 SYNTHESIS

The state of knowledge of the Uilkraals is poor considering the easy accessibility to this estuary and its degree of utilization for recreational purposes.

The Uilkraals has a relatively small Table Mountain Sandstone dominated catchment of 313 km^2 which receives most of its annual rainfall (500-600 mm) in the winter months (Heydorn and Tinley 1980). The river therefore flows strongly in winter with run-off declining in summer. The ecological viability of the estuary depends primarily on tidal flushing. The Uilkraals is biologically productive because of its extensive low-lying floodplain and good tidal water exchange. An indication of its importance as a wetland habitat may be gauged from the fact that 33 estuarine-associated bird species have been recorded there. Data presented by Siegfried (1981) in comparing the relative utilization of west and south coast estuaries in the Cape by migratory and resident wader species, suggest that the Uilkraals is of particular importance to migratory waders utilizing the estuary in the summer months. Furthermore, the Uilkraals is scenically very attractive and has great recreational potential as is evidenced by the popular caravan/camping park on the western side of the mouth.

However, severe problems have been experienced near the mouth which can be attributed to the following factors :

(a) Sand has accumulated on the eastern side of the estuary both seawards and landwards of the road embankment, probably because the embankment interferes with the flushing action of floodwaters (see Fig. 2(a) - (c) and Figs. 5 and 6). According to Messrs. Lampbrechts and Terblanche of the Caledon Divisional Council, waterflow has been concentrated against the western bank of the estuary since the bridge was completed in 1973. This has increased the vulnerability of the Uilkraals Caravan Park to flooding and has given rise to severe concern about erosion of the sand promontory carrying the holiday bungalows. It was this concern which prompted the Caledon Divisional Council to construct the rubble embankments depicted in Figs. 2(b) and (c) and described in section 3.3(b). The dynamics of the mouth have been furthermore modified by the fixing of the sandspit on the eastern side of the mouth by dune reclamation with alien vegetation (compare Figs. 2(a) and (b)), which appears to have limited the degree to which the mouth can meander towards the east. The unexpected problems

FIG. 5 : Uilkraals Estuary in 1955. The photograph was taken from the present site of the holiday bungalows on the western dune promontory, looking upstream.
(Photo : G F van Wyk 55-11-12)

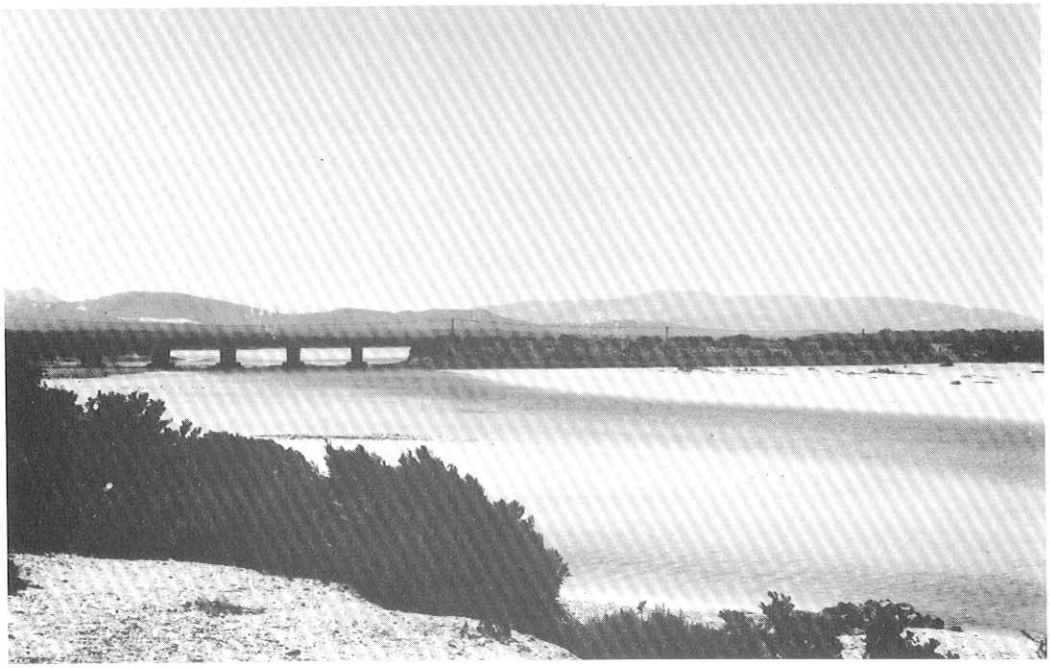


FIG. 6: Uilkraals Estuary in 1980. The photograph was taken from almost the same position as that in Fig. 5. The impact of the road bridge embankment on the estuary can be seen on comparison of Fig. 5 with Fig. 6.
(ECRU 80-03-23)

created by dune formation on the beach opposite the caravan park and the stagnant water pool on the beach immediately below the bank, must be attributed to the joint effects of these various forms of human interference.

(b) Ecologically, the road embankment is also undesirable, because it restricts tidal water exchange with the saltmarsh regions upstream of the bridge (compare Figs. 2(a) and (b)). It is notable that since the construction of the road bridge, the bloodworm (Arenicola loveni) has disappeared from the estuary upstream of the bridge and that mudprawns (Upogebia africana) have become scarce (C M Gaigher, CPA Nature and Environmental Conservation Memorandum 78-07-11). These changes were also evident during the ECRU surveys and are considered to be indicative of biological impoverishment as a result of the embankment.

The above-mentioned problems exemplify the need for very careful evaluation of any action which can modify the dynamics of, and biological processes in estuaries, before artificial manipulation is undertaken or development takes place. Not only does loss of aesthetic and recreational appeal have economic consequences because fewer people are attracted to degraded environments, but actions such as the construction and subsequent removal of embankments are a waste of effort and public money.

Thus the Uilkraals estuary provides an excellent example of the need for communication between all concerned in the utilization and management of the region - the Divisional Council, the Provincial Roads and Nature Conservation Departments, and the Department of Forestry. Perhaps what is needed most of all is one body to whom all plans must be submitted, before development takes place.

6 ACKNOWLEDGEMENTS

The collection of field data for this report was essentially a team effort and the assistance of the other members of the ECRU survey team is acknowledged. Mr B D Coward assisted with the compilation of the geological information, Mr J Cooper of the Percy Fitzpatrick Institute kindly supplied unpublished bird census data and Mr A L de Villiers of the CPA Department of Nature and Environmental Conservation compiled the list of reptiles and amphibians from his Department's records.

The co-operation of Messrs. Lampbrechts and Terblanche of the Caledon Divisional Council is acknowledged with gratitude.

The survey was carried out at the request and with the financial support of the Department of Environmental Affairs (previously Department of Water Affairs, Forestry and Environmental Conservation). The encouragement of this Department, the Cape Estuaries Steering Committee and the S A National Committee for Oceanographic Research is gratefully acknowledged.

7. GLOSSARY OF TERMS USED IN PART II REPORTS

abiotic: non-living (characteristics).
aeolian (deposits): materials transported and laid down on the earth's surface by wind.
alien: plants or animals introduced from one environment to another, where they had not occurred previously.
alluvium: unconsolidated fragmental material laid down by a river or stream as a cone or fan, in its bed, on its floodplain and in lakes or estuaries, usually comprised of silt, sand or gravel.
anaerobic: lacking or devoid of oxygen.
anoxic: the condition of not having enough oxygen.
aquatic: growing or living in or upon water.
arcuate: curved symmetrically like a bow.
barchanoid (dune): crescent-shaped and moving forward continually, the horns of the crescent pointing downwind.
bathymetry: measurement of depth of a water body.
benthic: bottom-living.
berm: a natural or artificially constructed narrow terrace, shelf or ledge of sediment.
bimodal: having two peaks.
biogenic: originating from living organisms.
biomass: a quantitative estimation of the total weight of living material found in a particular area or volume.
biome: major ecological regions (life zones) identified by the type of vegetation in a landscape.
biotic: living (characteristics).
breaching: making a gap or breaking through (a sandbar).
calcareous: containing an appreciable proportion of calcium carbonate.
calcrete: a sedimentary deposit derived from coarse fragments of other rocks cemented by calcium carbonate.
Chart Datum: This is the datum of soundings on the latest edition of the largest scale navigational chart of the area. It is -0,900 m relative to land levelling datum which is commonly called Mean Sea Level by most land surveyors.
coliforms: members of a particularly large, widespread group of bacteria normally present in the gastro-intestinal tract.
community: a well defined assemblage of plants and/or animals clearly distinguishable from other such assemblages.
conglomerate: a rock composed of rounded, waterworn pebbles 'cemented' in a matrix of calcium carbonate, silica or iron oxide.
cusp: a sand spit or beach ridge usually at right angles to the beach formed by sets of constructive waves.
"D" net: a small net attached to a "D" shaped frame riding on skids and pulled along the bottom of the estuary, used for sampling animals on or near the bottom.
detritus: organic debris from decomposing plants and animals.
diatoms: a class of algae with distinct pigments and siliceous cell walls. They are important components of phytoplankton.
dynamic: relating to ongoing and natural change.
ecology: the study of the structure and functions of ecosystems, particularly the dynamic co-evolutionary relationships of organisms, communities and habitats.
ecosystem: an interacting and interdependent natural system of organisms, biotic communities and their habitats.
eddies: a movement of a fluid substance, particularly air or water, within a larger body of that substance.
endemic: confined to and evolved under the unique conditions of a particular region or site and found nowhere else in the world.
enon: most striking formation in the Cape. Crammed with pebbles and boulders, phenomenally embedded and massive, yellow or brilliantly red in colour, producing remarkable hills. Curiously carved into crags and hollows.

epifauna: animal life found on the surface of any substrate such as plants, rocks or even other animals.

epiphyte: a plant living on the surface of another plant without deriving water or nourishment from it.

episodic: sporadic and tending to be extreme.

estuary: a partially enclosed coastal body of water which is either permanently or periodically open to the sea and within which there is a measurable variation of salinity due to the mixture of sea water with fresh water derived from land drainage (Day 1981).

eutrophication: the process by which a body of water is greatly enriched by the natural or artificial addition of nutrients. This may result in both beneficial (increased productivity) and adverse effects (smothering by dominant plant types).

flocculation (as used in these reports): the settlement or coagulation of river borne silt particles when they come in contact with sea water.

fluvial (deposits): originating from rivers.

food web: a chain of organisms through which energy is transferred. Each "link" in a chain feeds on and obtains energy from the preceding one.

fynbos: literally fine-leaved heath-shrub. Heathlands of the south and south-western Cape of Africa.

geomorphology: the study of land form or topography.

gill net: a vertically placed net left in the water into which fish swim and become enmeshed, usually behind the gills.

habitat: area or natural environment in which the requirements of a specific animal or plant are met.

halophytes: plants which can tolerate salty conditions.

HAT (Highest Astronomical Tide) and LAT (Lowest Astronomical Tide): HAT and LAT are the highest and lowest levels respectively, which can be predicted to occur under average meteorological conditions and under any combination of astronomical conditions; these levels will not be reached every year. HAT and LAT are not the extreme levels which can be reached, as storm surges may cause considerably higher and lower levels to occur (South African Tide Tables 1980).

hummock (dune): a low rounded hillock or mound of sand.

hydrography: the description, surveying and charting of oceans, seas and coastlines together with the study of water masses (flow, floods, tides etc.).

hydrology: the study of water, including its physical characteristics, distribution and movement.

indigenous: belonging to the locality; not imported.

intertidal: generally the area which is inundated during high tides and exposed during low tides.

isohyets: lines on maps connecting points having equal amounts of rainfall.

isotherms: lines on maps joining places having the same temperature at a particular instant, or having the same average, extremes or ranges of temperature over a certain period.

lagoon: an expanse of sheltered, tranquil water. (Thus Langebaan lagoon is a sheltered arm of the sea with a normal marine salinity; Knysna lagoon is an expanded part of a normal estuary and Hermanus lagoon is a temporarily closed estuary (Day 1981)).

limpid: clear or transparent.

littoral: applied generally to the seashore. Used more specifically it is the zone between high- and low-water marks.

longshore drift: a drift of material along a beach as a result of waves breaking at an angle.

macrophyte: any large plant as opposed to small ones. Aquatic macrophytes may float at the surface or be submerged and/or rooted on the bottom.

marls: crumbly mixture of clay, sand and limestone, usually with shell fragments.

matrix: medium in which a structure is embedded.

meiofauna: microscopic or semi-microscopic animals that inhabit sediments but live quite independently of the macrofauna, or benthos.

metamorphic: changes brought about in rocks within the earth's crust by the agencies of heat, pressure and chemically active substances.

MHWS (Mean High Water Springs) and MLWS (Mean Low Water Springs): the height of MHWS is the average, throughout a year when the average maximum declination of the moon is 23°, of the height of two successive high waters during those periods of 24 hours (approximately once a fortnight) when the range of the tide is greatest. The height of MLWS is the average height obtained by the two successive low waters during the same periods (South African Tide Tables 1980).

morphometry: physical dimensions such as shape, depth, width, length etc.

osmoregulation: the regulation in animals of the osmotic pressure in the body by controlling the amount of water and/or salts in the body.

pathogenic: disease producing.

photosynthesis: the synthesis of carbohydrates in green plants from carbon dioxide and water, using sunlight energy.

phytoplankton: plant components of plankton.

piscivorous: fish eating.

plankton: microscopic animals and plants which float or drift passively in the water.

quartzite: rock composed almost entirely of quartz recemented by silicon. Quartzite is hard, resistant and impermeable.

riparian: adjacent to or living on the banks of rivers, streams or lakes.

rip current: the return flow of water which has been piled up on the shore by waves, especially when they break obliquely across a longshore current.

salinity: the proportion of salts in pure water, in parts per thousand by mass. The mean figure for the sea is 34,5 parts per thousand, written 34,5°/₀₀.

secchi disc: a simple instrument used to measure the transparency of water.

sheet flow: water flowing in thin continuous sheets rather than concentrated into individual channels.

slipface: the sheltered leeward side of a sand-dune, steeper than the windward side.

teleost: modern day bony fishes (as distinct from cartilaginous fishes).

trophic level: a division of a food chain defined by the method of obtaining food either as primary producers, or as primary, secondary or tertiary consumers.

trough: a crescent shaped section of beach between two cusps.

wetlands: areas that are inundated or saturated by surface or ground water frequently enough to support vegetation adapted to life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.

zooplankton: animal components of plankton.

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APPENDIX I: Species composition and physical features of the vegetation mapping units of the studied area the Uilkraals estuary (See Fig. 4).

CHRYSANTHEMOIDES MONILIFERA - Low Dune Shrubland	
Total cover (%)	45
Height (m)	0-1,0
Area (ha)	2
% of Studied area	1,0
No. of species	10

Agropyron distichum (+), Arctotheca populifolia (+), Chrysanthemoides monilifera (1), Chrysocoma coma aurea (+), Ehrharta villosa (r), Helichrysum crispum (+), Senecio elegans (+), Senecio maritimus (+), Tetragonia decumbens (+), Thesidium fragile (+).

PHYLICA ERICOIDES/METALASIA MURICATA - Low Shrubland	
	45
	0-0,8
	3,3
	1,6
	12

Acacia cyclops (+), Asparagus sp. (+), Cassine peragua (+), Metalasia muricata (1), Muraltia satureioides (+), Nylandtia spinosa (1), Passerina glomerata (1), Phylica ericoides (1), Polygala myrtifolia (+), Protea sp. (+), Psoralea fruticans (+), Rhus glauca (+).

SPOROBOLUS VIRGINICUS - Grassland	
Total cover (%)	95
Height (m)	0-0,15
Area (ha)	1,3
% of Studied area	0,6
No. of species	4

Acacia cyclops (+), Juncus acutus (+), Pteronia uncinata (+), Sporobolus virginicus (5).

ACACIA CYCLOPS - Woodland	
	80
	0-3,0
	26
	12,7
	3

Acacia cyclops (5), Erica quadrangularis (+), Phylica ericoides (+).

RHUS GLAUCA/RAPANEA MELANOPHLOEOS - Woodland	
Total cover (%)	55
Height (m)	0-3,0
Area (ha)	6,4
% of Studied area	3,1
No. of species	9

Asparagus sp. (+), Cassine peragua (+), Colpoon compressum (+), Haemanthus rotundifolius (+), Linocieva faveolata (+), Maytenus oleoides (1), Polygata myrtifolia (1), Rapanea melanophloeos (1), Rhus glauca (1).

LEUCADENDRON sp. cf. GALPINII/ CHONDROPETALUM NUDUM - Low Shrubland	
	60
	0-1,0
	11
	5,4
	9

Carpobrotus edulis (+), Chondropetalum nudum (+), Erica mammosa (+), Erica pulchella (+), Leucadendron linifolium (+), Leucadendron sp. cf. galpinii (1), Lobelia coronopifolia (+), Passerina vulgaris (+), Phylica ericoides (+).

PASSERINA VULGARIS/PHYLICA ERICOIDES
Mid-high Shrubland

Total cover (%)	60
Height (m)	0-1,75
Area (ha)	15
% of Studied area	7,3
No. of species	14

Aspalathus spinescens var. spinescens (+), Asparagus sp. (+), Chironia baccifera (+), Chondropetalum nudum (+), Colpoon compressum (+), Erica pulchella (+), Muraltia satureioides (+), Nylandtia spinosa (+), Passerina vulgaris (1), Phylica ericoides (1), Polygala myrtifolia (+), Rapanea melanophloeos (+), Rhus glauca (+), Staberoha cernua (+).

RESTIO ELEOCHARIS/METALASIA sp.
(Parsons 123) Low Shrubland

	45
	0-0,5
	22
	10,7
	14

Acacia cyclops (+), Chironia baccifera (+), Limonium sp. (Parsons 120) (1), Metalasia muricata (1), Metalasia sp. (Parsons 123) (1), Muraltia satureioides (+), Nylandtia spinosa (+), Passerina glomerata (+), Psoralea fruticans (+), Pterocelastrus tricuspidatus (+), Pteronia uncinata (+), Phylica ericoides (1), Restio eleocharis (1), Selago sp. (Parsons 122) (+).

MIMETES CUCULLATA/BERZELIA INTERMEDIA/LEUCADENDRON sp. cf. SALIGNUM
Mid-high Shrubland

Total cover (%)	70
Height (m)	0-1,2
Area (ha)	3,8
% of Studied area	1,9
No. of species	15

Aspalathus spinescens var. spinescens (+), Athanasia dentata (+), Berzelia intermedia (1) Carpobrotus edulis (+), Chironia baccifera (+), Chondropetalum nudum (+), Erica corifolia (+), Erica mammosa (+), Erica pulchella (+), Erica quadrangularis (1), Leucadendron sp. cf. salignum (1), Leucospermum prostratum (+), Mimetes cucullata (1), Staberoha cornua (+), Stoebe capitata (+).

SPOROBOLUS VIRGINICUS/JUNCUS ACUTUS/SALICORNIA MEYERANA
Floodplain Herbland

Total cover (%)	55-85
Height (m)	0-0,75
Area (ha)	37,7
% of Studied area	18,4
No. of species	11

Chenolea diffusa (+), Falkia repens (1), Juncus acutus (r-4), Limonium linifolium var. maritinum (+), Plantago carnosa (+), Pteronia uncinata (+-1), Salicornia meyerana (r-4), Samolus porosus (r-2), Scirpus littoralis (1), Sporobolus virginicus (1-5), Thesium frisea (+).

	OPEN WATER	BEACH and SAND
Area (ha)	21	46
% of Studied area	10,2	22,4

	ROCKS	ROADS
Area (ha)	0,17	3,4
% of Studied area	0,1	1,7

	INTENSIVE HUMAN USE
Area (ha)	6
% of Studied area	2,9

TOTAL AREA STUDIED 205 ha

Note : The symbols in brackets following each species name represent Braun-Blanquet Cover Classes as follows :

r - *1/few individuals, cover less than 0,1% of area*
\+ - *occasional plants, cover less than 1% of area*
1 - *abundant, cover 1-5% of area*
2 - *any number, cover 6-25% of area*
3 - *any number, cover 26-50% of area*
4 - *any number, cover 51-75% of area*
5 - *any number, cover 76-100% of area.*

ESTUARY / RIVERMOUTH / LAGOON	YEAR (DATE OF INFORMATION)	ABIOTIC																				BIOTIC										
		Physiography		Physics			Geomorphology			Chemistry					Bacteriology	Other						Flora			Fauna								Food Webs
		Catchment characteristics	Morphology	Hydrology	Density variations	Circulation & mixing	Geology	Paleoenvironment	Sediment transport & deposition	General chemistry	Eutrophication	Metal residues	Pesticide residues			Management	Aquaculture	Modelling	Conservation	Utilization	Historical	Halophytes	Phytoplankton	Terrestrial	Zooplankton	Other invertebrates	Insects	Fauna on hard substrates	Fauna on soft substrates	Fish	Reptiles & Amphibians	Birds	Mammals	
Sources of Information		Summary of available information																														
Acocks	1975																						*									
Cape Provincial Administration	1973																			*												
Du Toit	1966						*																									
Fitzsimons	1962																													*		
Harris	1978			*		*																										
Heydorn and Tinley	1980	*		*		*																										
King et al	1979									*																						
Noble and Hemens	1978	*		*																												
Ocean Wave Research Report No. 1	1968			*																												
Roberts	1978																													*		
Siegfried	1962																											*				
Siegfried	1981																													*		
South African Tide Tables	1981			*																												
Stuart et al	1980																														*	
Summers et al	1976																													*		
Van Wyk	1955		*	*					*												*						*	*	*			
Walsh	1968		*																													
C. Gaigher (CPA Nat. & Env. Cons. Memo)	1978																											*				

ESTUARY / RIVERMOUTH / LAGOON	YEAR (DATE OF INFORMATION)	ABIOTIC																			BIOTIC												
		Physiography		Physics			Geomorphology			Chemistry					Bacteriology	Other					Flora			Fauna										
		Catchment characteristics	Morphology	Hydrology	Density variations	Circulation & mixing	Geology	Paleoenvironment	Sediment transport & deposition	General chemistry	Eutrophication	Metal residues	Pesticide residues			Management	Aquaculture	Modelling	Conservation	Utilization	Historical	Halophytes	Phytoplankton	Terrestrial	Zooplankton	Other invertebrates	Insects	Fauna on hard substrates	Fauna on soft substrates	Fish	Reptiles & Amphibians	Birds	Mammals	Food Webs
Sources of Information		Summary of available information																															
J.W. Lampbrechts (pers. comm.)	1980	*							*							*				*													
J. Rossouw (pers. comm.)	1981			*		*																											
Mr Terblanche (pers. comm.)	1981		*	*												*																	
ECRU survey (December)	1979		*	*		*	*		*	*						*				*		*					*	*	*		*		
ECRU visit (March)	1981		*	*		*			*	*										*		*					*	*	*		*		
MAPS																																	
S.A. 1:50 000 Sheet 3419 CB	1969	*	*				*																										
S.A. 1:250 000 Topo. Sheet 3319	1975	*																															
S.A. 1:125 000 Geol. Map 3419C, 3419D, 3420C	1963						*																										
S.A. 1:1 000 000 Geological Map	1970						*																										
AERIAL PHOTOGRAPHY																																	
Trig. Survey																																	
Job No. 130/38	1938		*	*		*	*		*																								
Job No. 461	1961		*	*		*	*		*																								
Job No. 719	1973		*	*		*	*		*																								
Univ. of Natal Land Surv. Dept.																																	

APPENDIX II : (Continued)

			Summary of available information																						
BIOTIC	Fauna	Food Webs																							
		Mammals																							
		Birds																							
		Reptiles & Amphibians																							
		Fish																							
		Fauna on soft substrates																							
		Fauna on hard substrates																							
		Insects																							
		Other invertebrates																							
		Zooplankton																							
	Flora	Terrestrial																							
		Phytoplankton																							
		Halophytes																							
ABIOTIC	Other	Historical																							
		Utilization																							
		Conservation																							
		Modelling																							
		Aquaculture																							
		Management																							
	Bacteriology																								
	Chemistry	Pesticide residues																							
		Metal residues																							
		Eutrophication																							
		General chemistry																							
	Geomorphology	Sediment transport & deposition		*	*	*																			
		Paleoenviroment																							
		Geology		*	*	*																			
	Physics	Circulation & mixing		*	*	*																			
		Density variations																							
		Hydrology		*	*	*																			
	Physiography	Morphology		*	*	*																			
		Catchment characteristics																							
YEAR (DATE OF INFORMATION)				1979	1980	1980																			
ESTUARY / RIVERMOUTH / LAGOON			Sources of information	Job No. 326	Job No. 349	Job No. 374																			

NOTES:

PLATES I, II AND III OVERLEAF

PLATE I :

Meandering channel across Uilkraals floodplain approximately 3,3 km from the mouth.

(ECRU 81-03-12)

PLATE II :

Open sandflats upstream of the road bridge across the Uilkraals. The photograph was taken from the western side of the bridge.

(ECRU 81-03-12)

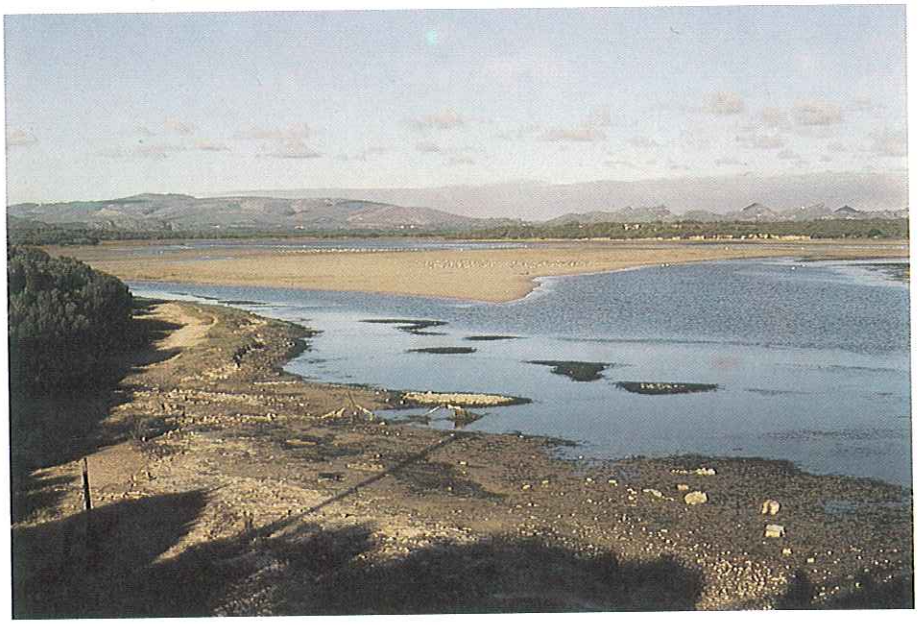

PLATE III :

Western bank of the Uilkraals from the base of the bridge pylons looking downstream. The orientation of the bridge pylons such that exit flow from the bridge, is directed towards the dune promontory and holiday developments in the background, can be seen.

(ECRU 80-07-16)