

# AN APPROACH TO DETERMINING WATER SURFACE ZONING SYSTEMS

## THE CASE OF THE KROMME RIVER ESTUARY

M.R. Sowman and R.F. Fuggle

*Environmental Evaluation Unit, University of Cape Town*

*The expansion of recreational boating in South Africa and the subsequent increased demand for water space has led to overcrowding and congestion on many estuaries, especially during peak holiday periods. In this paper, an approach to determine appropriate and acceptable water surface zoning systems to regulate recreational boating on the Kromme River estuary is described. Information on recreational boating patterns on the estuary, attitudes of recreation users towards current boating pressure and proposed regulatory measures was obtained from questionnaire surveys. This information provided the basis for devising zoning strategies for the Kromme River estuary. The advantages of employing this approach for planning and regulating recreational use of estuaries are outlined.*

*Die uitbreiding van rekreasiebootry in Suid-Afrika en die gevolglike toeneemende eise vir waterruimte, het gelei tot verdringing en opeenhoping in baie riviermondings, veral gedurende die spits vakansietye. In hierdie artikel word beskryf hoe geskikte en aanvaarbare watersoneeringsisteme vasgestel kan word ten einde rekreasiebootry in die Kromme Riviermondning te reguleer. Inligting oor die rekreasiebootrypatrone in die riviermondning, die houdings van ontspanningsgebruikers teenoor druk op die huidige bootgeriewe asook voorgestelde reguleringsmaatreëls is verkry uit vraelyste. Hierdie inligting was die basis vir die skep van soneringstrategieë vir die Kromme Riviermondning.*

*Die voordele verbonde aan hierdie benadering vir die beplanning en regulering van riviermondings vir rekreasiegebruik word uitgelig.*

### 1. INTRODUCTION

Several estuaries in South Africa provide ideal conditions for recreational boating activities because of their sheltered and productive waters and outstanding scenic qualities. Although there are no reliable statistics for actual numbers of recreational craft presently in use in South Africa, the increase in foreign exchange expenditure on imported recreational craft and accessories suggests that the recreational boating industry has expanded considerably in recent years (Johnson, 1984). The introduction and rapid growth of boardsailing alone has certainly increased the numbers of craft in use on South African waters. Statistics reveal that in 1980 there were 2 350 sailboards in use in South Africa (Brett and du Plessis, 1983), and that by 1985 this number had increased to approximately 29 000 (Pickstock, 1986).

The demand for water space for recreational boating which has accompanied the increase in number of recreational craft has resulted in overcrowding and congestion on many

South African estuaries, especially during peak holiday periods. In some cases overcrowding and overuse have resulted in conflict between different interest groups, and degradation of recreational resources. At water recreation sites where overcrowding is intense or congestion on the water surface constitutes a danger to recreationists, the relevant authorities may experience pressure to impose regulations to control recreational boating activities. The usual reasons for introducing regulatory measures are:

- (i) to ensure the safety of all users of the water body;
- (ii) to provide equitable opportunities for a number of different and even incompatible recreational activities; and
- (iii) to protect ecologically sensitive aquatic habitats (Brown et al., 1979).

The techniques employed for regulating and controlling recreational boating activities can be divided into five broad categories:

- (i) activity zoning – where different recreational activities are allocated to specific areas;
- (ii) time zoning – where different activities are scheduled for certain times of the day;
- (iii) protective space zoning – which requires that a protective barrier of space exist between incompatible recreational craft or activities;
- (iv) restrictions on boat speed and engine horsepower (no wake zones should be included in this category); and
- (v) limited density zoning – which restricts the number of recreationists or craft permitted at a recreation site at any one time (Wilson, 1964; Jaakson, 1971; Brown et al., 1979; Heatwole and West, 1982).

In the United States, the numbers participating in recreational boating have grown tremendously and managers of water recreation sites are increasingly employing these techniques to cope with boating pressure. Some of these regulatory measures have been intro-

duced on South African waters which are heavily utilised for recreation. For example, on several estuaries there are restrictions on boat speeds and engine horsepower, while on others, activities such as waterskiing are prohibited at certain times or allocated to a specific section of the estuary (Cape of Good Hope Proclamation 357 of 1972).

On the Knysna estuary protective space zoning has been introduced and powerboats are required to remain at a distance of 100 metres from where people are swimming, 15 metres from the edge of the water and 15 metres from any other vessel (Government Gazette, 13 December 1985, No 10036).

While water surface zoning is a positive means of reducing conflict on the water surface, it is the authors' view that zoning systems should not simply be imposed by decision-making authorities but should be developed through collaboration with recreation users of the area. In order to devise equitable water surface zoning systems for an estuary it is necessary to obtain information on:

- (i) recreational boating patterns on the water surface;
- (ii) prevailing attitudes of recreation users towards current boating pressure at recreation sites;
- (iii) regulatory measures to control boating activities that would be acceptable to the majority of users should they perceive the site as overcrowded.

This approach was used in a study on recreational boating on the Kromme River estuary in the Eastern Cape region of South Africa. One aspect of the investigation was to develop appropriate and acceptable water surface zoning plans for the estuary so as to provide safe, equitable opportunities for all recreation users of the estuary during peak holiday seasons. This investigation, commissioned by the Humansdorp Divisional Council was undertaken by the Environmental Evaluation Unit of the University of Cape Town.

## 2. THE STUDY AREA

The Kromme River estuary, situated approximately 55 km to the west of Port Elizabeth (Fig. 1) provides excellent opportunities for a wide range of boating activities. The relatively sheltered estuarine waters and attractive natural environment have resulted in the development of several holiday cottages and retirement homes around the estuary. More recently a prestigious marina has been developed on the south bank of the Kromme River near the mouth (Fig. 1).

Since development is concentrated towards the mouth of the estuary, most aquatic recreation activities take place between the river mouth and the island where the Geelhoutboom River joins the estuary. The area of water suitable for recreational boating is approximately 125 hectares in extent, although varies between low and high tides.

In this paper, the St Francis Bay village, the Marina Glades development and the holiday cottages situated on the banks of the estuary between the

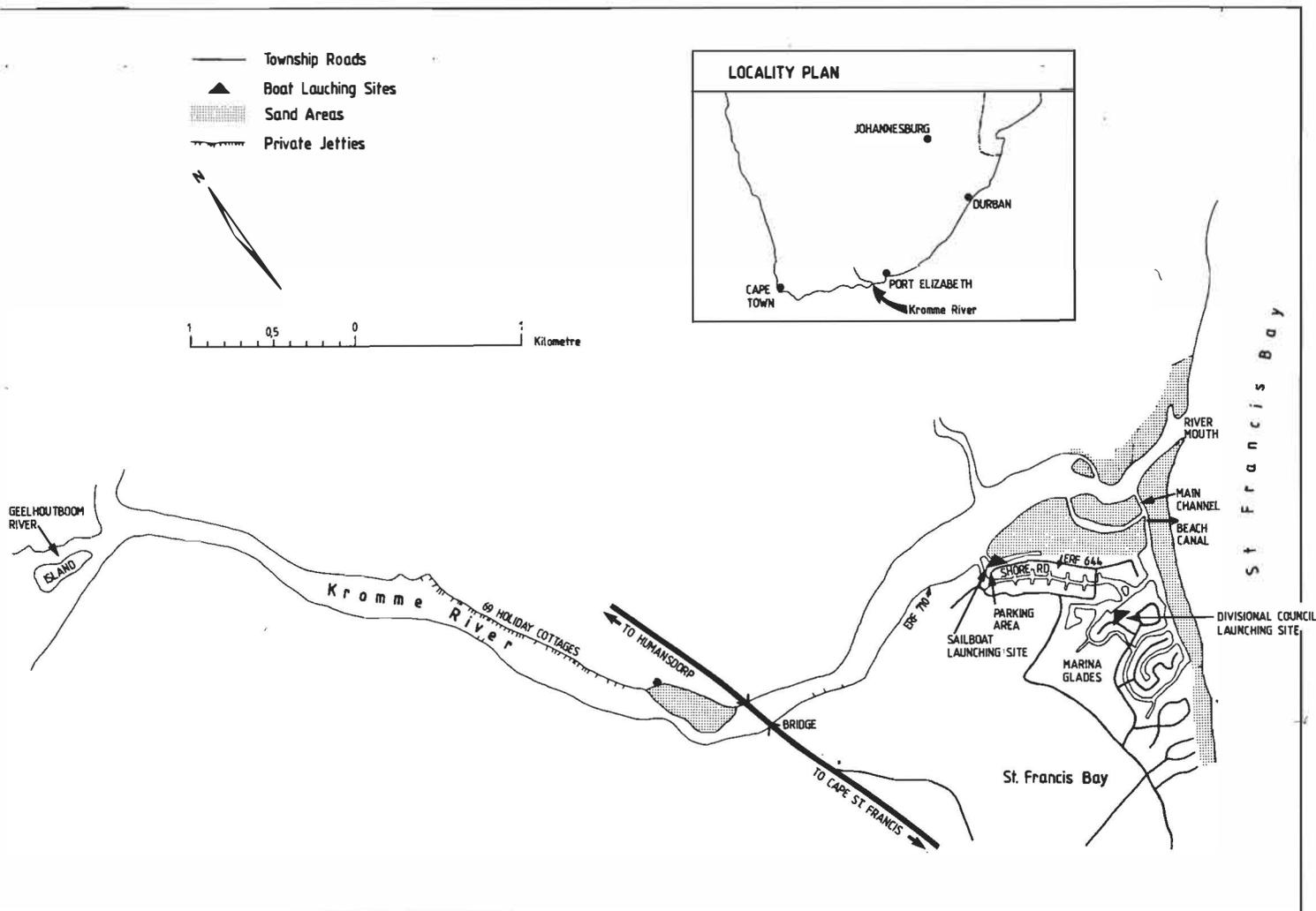
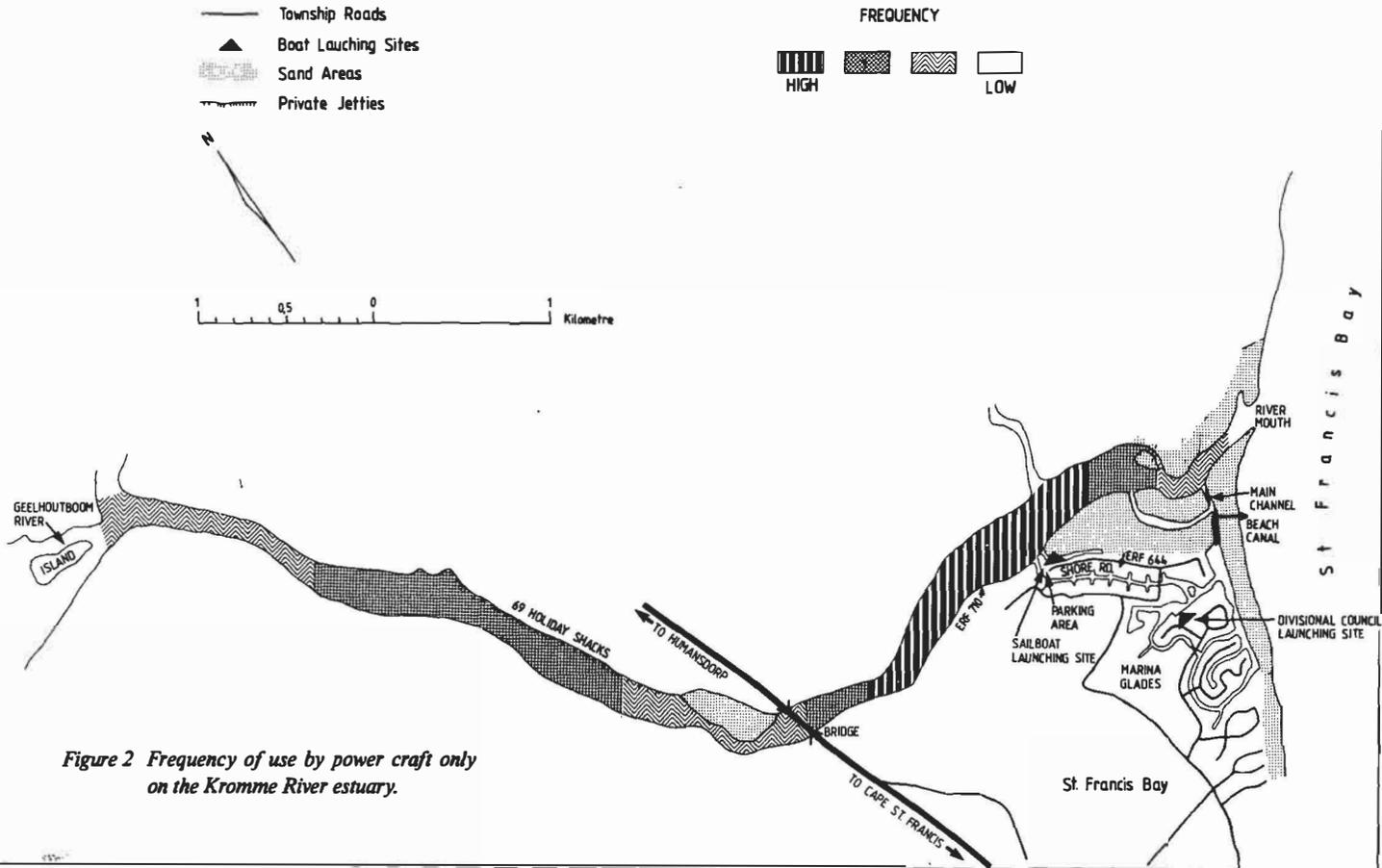
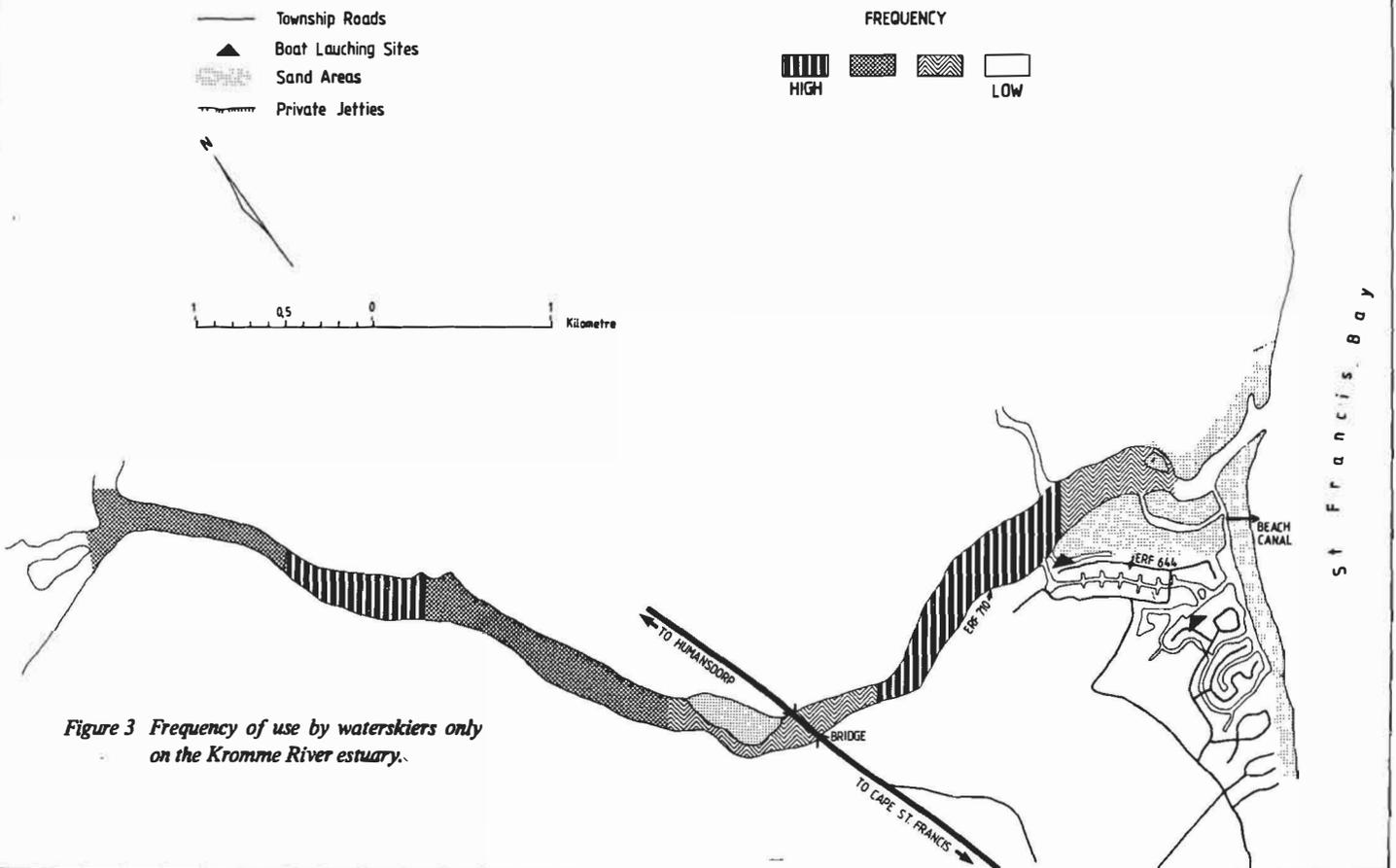


Figure 1 Location of the Kromme River estuary.

FREQUENCY OF USE BY POWER CRAFT ONLY ON THE KROMME RIVER ESTUARY



FREQUENCY OF USE BY WATERSKIERS ONLY ON THE KROMME RIVER ESTUARY



### FREQUENCY OF USE BY POWER CRAFT AND SAILING CRAFT ON THE KROMME RIVER ESTUARY

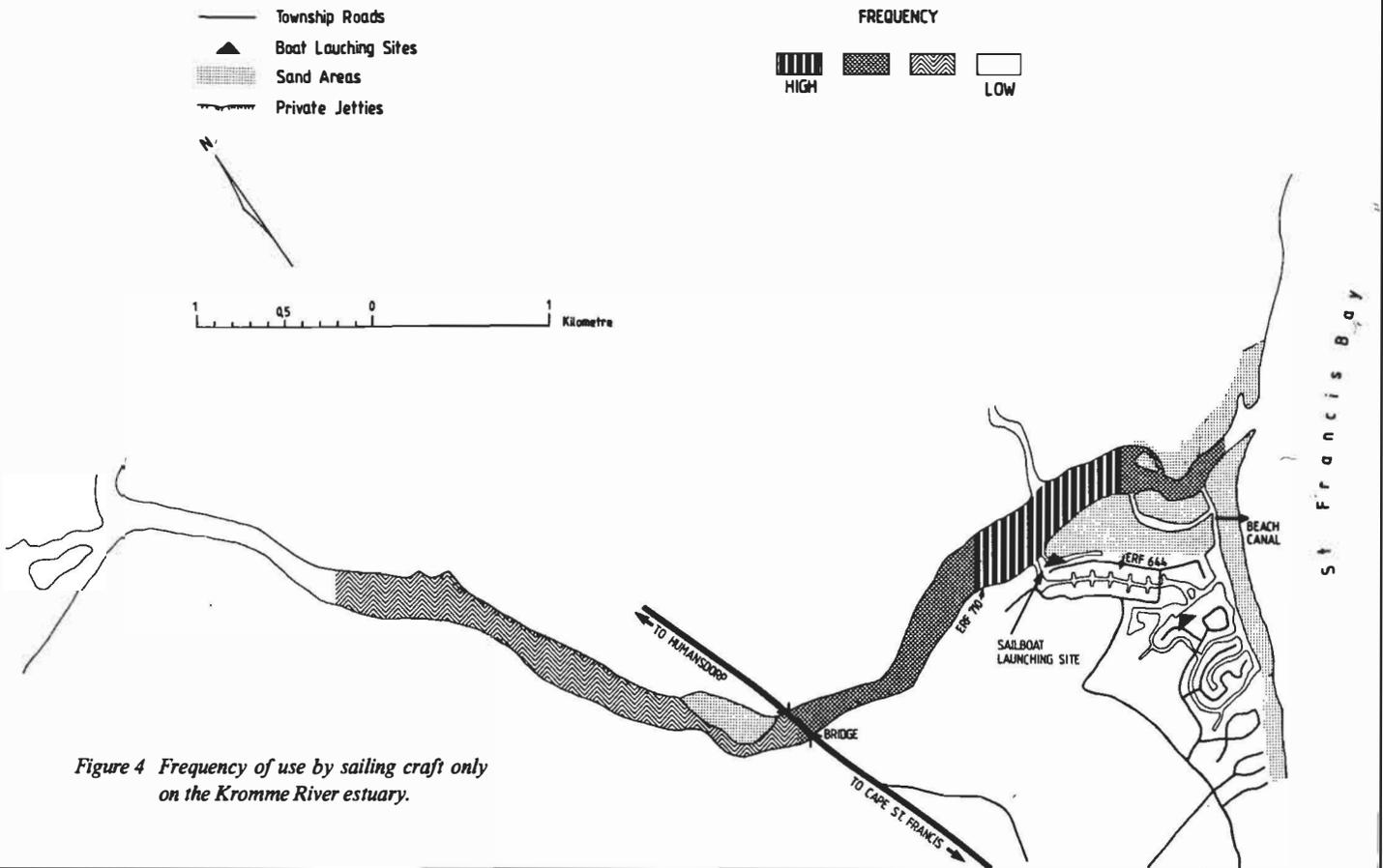


Figure 4 Frequency of use by sailing craft only on the Kromme River estuary.

### FREQUENCY OF USE BY SAILING CRAFT ONLY ON THE KROMME RIVER ESTUARY

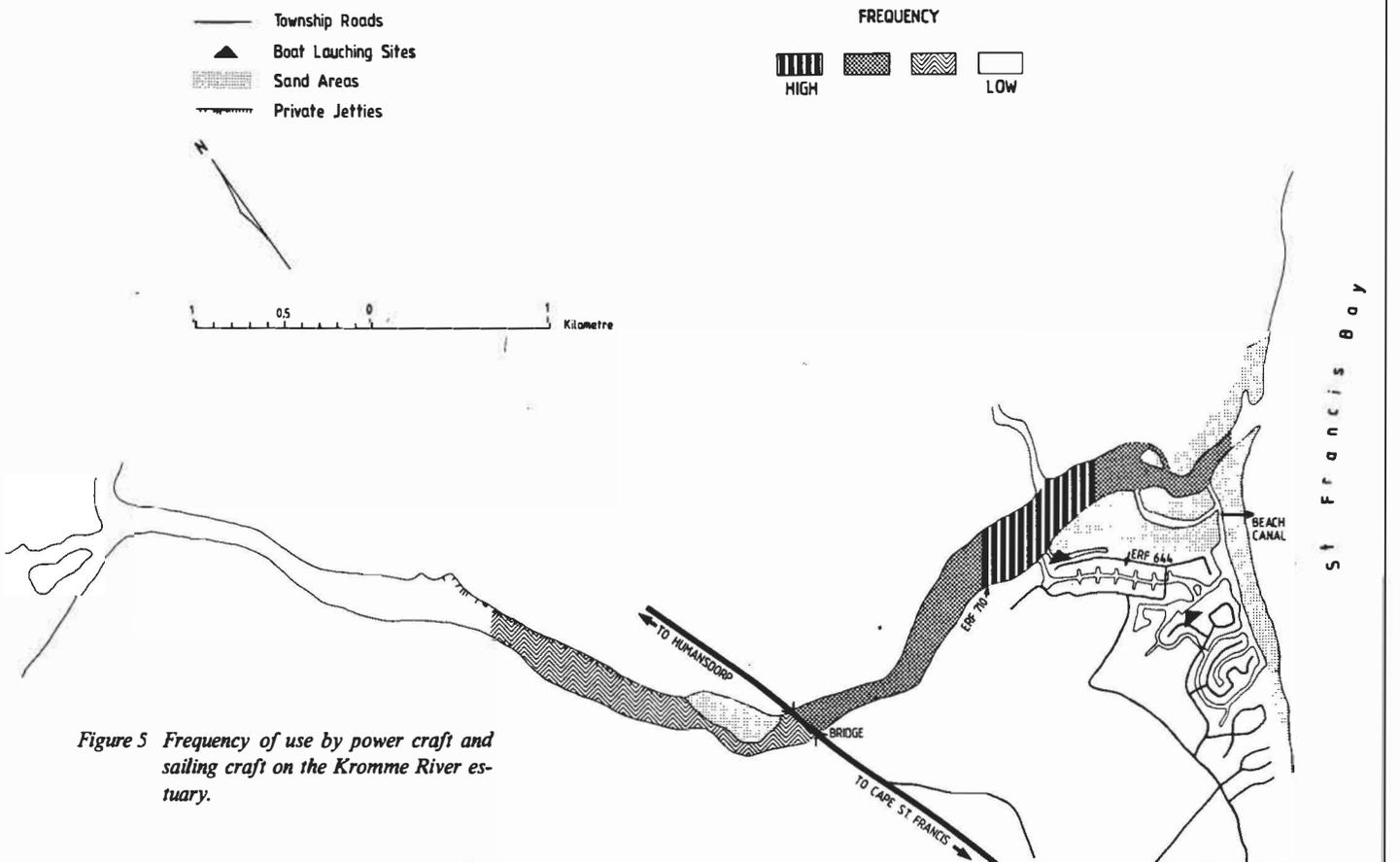


Figure 5 Frequency of use by power craft and sailing craft on the Kromme River estuary.

mouth and the Geelhoutboom River (Fig. 1) are collectively referred to as the St Francis/Kromme area.

### 3. METHODS OF DATA COLLECTION

Field investigations were undertaken during the Christmas/New Year peak summer holiday period from 28 December 1985 to 4 January 1986. This period was chosen so that a good indication of maximum recreational pressure could be obtained. Questionnaires were hand delivered to all households in the St Francis/Kromme area during this summer holiday period. Respondents were asked to return the completed questionnaire to the researcher by post in a stamped envelope provided. A total of 478 questionnaires were distributed and by 3 February 1986, 333 had been returned. This represents a response rate of 70% which is considered very good for a survey of this nature.

The purpose of the questionnaire survey was to obtain information on recreational boating patterns on the estuary, attitudes of recreationists to current boating pressure during peak holiday periods and measures to regulate boating activities that would be acceptable to users should overcrowding on the water surface become intense.

To acquire data on recreational boating patterns on the estuary, and identify areas most intensively used for various boating activities, questionnaire respondents were asked to identify on a 1:20 000 map of the Kromme River estuary the areas they used. Respondents were asked to indicate on the map where they launched their craft and mark with arrows the waters utilised most often for different boating activities.

Information obtained from individual responses to the questionnaire-maps was aggregated into 34, 200 m sections of the estuary by means of a transparent overlay on which the waters of the study area were partitioned into 34 vertical columns, 10 mm wide. Frequencies of use by: powerboats, which included powerboats used for fishing, waterskiing and cruising; sailing craft, which included sailboards, hobie cats and other sailing dinghies; waterskiers; and both powerboats and sailing craft were tabulated for each section of the estuary (Figs. 2 to 5).

The frequency of different activities for each section was then assigned to one of four categories on a high-to-low continuum. The four categories of frequency were subjectively determined based on the range of values obtained. This approach was adopted since the numbers of respondents who provided cartographic data for the four maps varied, depending on whether respondents used their craft for the activity concerned. Thus the high-to-low categories indicated on the maps are qualitative rather than quantitative and the same categories on different maps are not strictly comparable.

A similar approach was used in a study of boating patterns on the waters surrounding Long Island. These waters are heavily utilised by both recreational craft and commercial vessels and water surface zoning was considered an appropriate means of mitigating conflict between these two groups. Because of the extensive area of water under investigation, map-questionnaires proved the most effective method of acquiring the information needed to formulate zoning strategies for Long Island waters (Heatwole and West, 1982).

### 4. RESULTS

The aggregated information on frequencies of use by different craft obtained from analysis of questionnaire maps (Figs. 2 to 5) shows that:

- (i) The area of water between the road bridge and the river mouth is utilised fairly heavily by all recreational craft. Frequency of use, except by waterskiers, diminishes with increased distance from the river mouth. This observation was expected since residential development is concentrated below the road bridge towards the mouth.
- (ii) Sailing craft intensively utilise the waters adjacent to the slipway situated on Shore Road (Fig. 4). This slipway provides the only public launching site for sailboats along the estuary. The adjacent shoreline is also suitable for launching sailboards and is the most popular boardsailing site on the estuary. Confirmation of this was provided by daily observations.
- (iii) Although a section of the estuary's lower reaches is intensively utilised by waterskiers, high-to-medium frequencies prevail on most of the water above the road bridge

(Fig. 3). This suggests that as powerboats are able to travel rapidly, waterskiers are prepared to travel some distance to find suitable conditions for their sport.

- (iv) The area of most intense use by both powerboats and sailing craft lies between Erf 710 and Erf 644 and is where potential conflicts between powerboats and sailing craft may occur (Fig. 5). Since powerboats generally travel parallel to the shore and most sailing craft progress at right angles to the shore risk of collision or conflict is heightened in this area.

Analysis of other questions provided information on attitudes towards levels of crowding tolerated at access sites and on the water surface, as well as measures that would be acceptable to recreationists for regulating boating activities to prevent overcrowding on the estuary.

The responses to the question as to whether the existing boat launching facilities and car and boat trailer parks along the Kromme River estuary could support more people during peak holiday periods, gave an indication of people's perception of the facilities capacity along the estuary. Of the questionnaire respondents, 73% felt that the existing facilities could not support more people during peak holiday periods. This response indicates that the current levels of crowding experienced at the Shore Road launching and parking site (Fig. 1) are already unacceptable to the majority of respondents.

In another question people were asked whether they considered the area of surface water on the Kromme River estuary to be crowded by recreational craft during peak holiday periods: 75% replied 'Yes', 17% answered 'No', and 8% did not answer this question. Of the 17% that answered 'No', 26 respondents (ie. 7%) felt that the estuary could accommodate 10% more craft while 20 respondents (ie. 6%) suggested that 25% more craft could utilise the estuary during peak periods.

This response suggests that for the majority of people who utilise the estuary for recreational boating, the resource is crowded. Thus increased levels of use by recreational craft on the estuary, would certainly be unacceptable to most current users.

Those people who felt that the water surface was crowded during peak periods were asked to respond to the following question:

In your opinion, what would be the most effective way of preventing congestion on the Kromme River estuary? (Please tick ( ) all options that are acceptable to you)

	Number of respondents
Activity zoning (different activities allocated to specific parts of the estuary)	158
Time zoning (different activities allowed on the estuary at certain times of the day)	27
Restrictions on boat speed and engine horsepower in crowded areas	110
Registration and strict control of sailing and power craft	191
Limiting the number of powerboats allowed on the estuary per household	114
Restricting development in the area	164
Any other comments _____	

The responses to this question suggest that the majority of people participating in recreational boating are in favour of some form of regulation to control crowding and congestion on the estuary. However, analysis of this question revealed that time zoning was not considered an appropriate means of regulating boating activities. The option to limit the number of powerboats allowed on the estuary per household which was supported by 114 respondents is already enforced in the St Francis Bay local area (PN 698/1980). In terms of this by-law only one powerboat (whether commercial or non-commercial) may be registered per non-riparian developed property in St Francis Bay and two boats (either one commercial and one non-commercial or two non-commercial) per riparian developed property in St Francis Bay. Only registered boats are permitted to launch from the Divisional Council launching site (Fig. 1) and utilise the canal waters to gain access to the estuary.

The main comment made by respondents was that boat handling by children under 16 years of age was often reckless and endangered other water sport enthusiasts. To ensure the responsible and safe use of powerboats respondents felt that a law enforcement officer should patrol the waterways during peak periods of recreational activity.

## 5. DISCUSSION AND CONCLUSIONS

From the results of this investigation we have been able to:

- (i) identify the activity patterns of recreational craft using the Kromme River estuary;
- (ii) identify areas of intense use as well as areas where incompatible recreational activities are taking place on the water surface;
- (iii) ascertain that the majority of users of the estuary consider the ancillary shore facilities for recreational craft and the water surface to be crowded during peak holiday periods;
- (iv) determine that the introduction of measures to regulate boating activities to reduce congestion on the water surface would be supported by the majority of users of the estuary; and
- (v) ascertain what regulatory measures would be favourably supported by most people using the Kromme River estuary for recreational boating.

This information provided a useful guide for devising a plan for zoning and regulating current and future recreational boating on the Kromme River estuary. Based on the results of this study we consequently recommended that:

- New developments in the St Francis/Kromme area which will result in an increase in the number of boats using the estuary should not be permitted unless careful measures are introduced to regulate the numbers and activities of boats using the estuary during peak holiday periods.
- Waterskiing should be restricted to the water area above the road bridge, upstream of the 69 holiday cottages situated on the northern bank of the river.

- No powerboating activities should be permitted on the estuary between Erf 710 and Erf 644 and powerboats should only utilise this stretch of water to gain access to the estuary from the waterways, from one section of the river to another, and must not travel at a speed in excess of 10 km/h in this restricted area.
- Buoys should be placed in the estuary to demarcate the area where powerboating activities are prohibited.
- The slipway situated in front of the St Francis village which provides direct access to the sea should be upgraded and made safe for launching and landing powerboats. This would reduce the amount of sea-going powerboat traffic on the estuary.
- Additional public access to the estuary should be provided for boardsailors. An access site upstream from the Shore Road launching site would be preferable because of sand banks situated towards the mouth.
- Expansion of parking facilities along Shore Road should be made if additional access sites for boardsailors are not provided. Parking bays should be demarcated on the seaward side of Shore Road.
- The provisions of by-law PN 698/1980, relating to registration of boats in the St Francis Bay local area should be extended to all house owners along the banks of the Kromme River estuary.
- During peak holiday periods a law enforcement officer should be present in the St Francis/Kromme area to ensure the implementation of the provisions of by-law PN698/1980 relating to boating activities on the estuary.

In conclusion, the advantages of employing this approach for planning and regulating recreational use of estuaries are outlined. Firstly, this approach provides factual and detailed information on recreational activity patterns on the water surface. Such information cannot be obtained from aerial surveys and satellite images. Secondly, it takes cognisance of the opinions of users of the recreation resource and incorporates

their views in the planning and management of the resource. Thirdly, it is relatively inexpensive to employ, does not require intensive manpower or specialised training and skills to conduct the surveys and analyse the results. Fourthly, the questionnaire surveys are an acceptable method of acquiring this information as indicated from the high response obtained from the Kromme River estuary study. Finally, this approach is not limited to estuaries but can also be applied to other water systems (dams, vleis, lagoons and coastal waters) utilised for recreational boating.

#### REFERENCES:

- BRETT, K.B. and F. du Plessis, 1983. A survey of consumer perceptions of a sailboard market in South Africa. *Technical Report*, Graduate School of Business, UCT.
- BROWN, T.L., E.J. Finegan and M.P. Voiland, 1979. Current Use of Water Surface Zoning for Recreation. *Water Resources Bulletin*, 15 (2): 337 - 344.
- CAPE OF GOOD HOPE PROCLAMATION 357 of 1972. Proclamation for the control of inland water.
- GOVERNMENT GAZETTE, 13 December 1985, No 10036, Regulations in terms of Section 23(1) of the Lake Areas Development Act, 1975 (Act 39 of 1975), p. 31.
- HEATWOLE, C.A. and N.C. West, 1982. Recreational-Boating Patterns and Water-Surface Zoning. *The Geographical Review*, 72(3): 304 - 314.
- JAAKSON, R. 1971. Zoning to Regulate On-Water Recreation. *Land Economics*, 47: 382 - 388.
- JOHNSON, G. 1984. Chairman, Boating Industry Association of South Africa, Personal Communication.
- PICKSTOCK, R. 1986. Vice Chairman, Western Province Boardsailing Club, Personal Communication.
- PN 698/1980. Humansdorp Divisional Council: By-law relating to the control and use of the waterways and their banks in the local area of St Francis Bay, Cape Provincial Gazette, No 4121, 5 September 1980.
- WILSON, G. 1964. *Lake Zoning for Recreation*. American Institute of Park Executives, Inc., Wheeling, West Virginia.

#### ACKNOWLEDGEMENT

The authors wish to thank the Human Science Research Council for the financial support given to the research on which the article reports.