Short-term shell-sand dredging, Success Bank, Owen Anchorage

Cockburn Cement Limited

Report and recommendations
of the Environmental Protection Authority

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This report is to provide Environmental Protection Authority (EPA) advice to the Minister for the Environment on the proposal by Cockburn Cement Limited (CCL) to mine shell-sand from Success Bank as set out in CCL's Consultative Environmental Review (CER) January 1994.

The proposal is to mine 3.7 million tonnes of shell-sand from a 67ha area of Success Bank over the two year period 1994 - 96.

In the EPA's opinion, the following are the environmental factors relevant to the proposal:

(a) seagrass;
(b) Success Bank;
(c) beaches; and
(d) social surroundings.

The conditions and procedures, in the EPA's opinion, to which the proposal should be subject, if implemented are in summary:

(a) the proponent's commitments should be made enforceable;
(b) the proponent should be required to implement an Environmental Management plan; and
(c) the proponent should be required to implement an environmental management system.

The EPA submits the following recommendations:

Recommendation 1

That the Minister for the Environment note the relevant environmental factors and EPA objective, set for each factor (Section 3).

Recommendation 2

That subject to the satisfactory implementation of the EPA's recommended conditions and procedures (Section 4), including the proponent's environmental management commitments, the proposal can be managed to meet the EPA's objectives.

Recommendation 3

That the Minister for the Environment imposes the conditions and procedures set out in Section 4 of this report.

Recommendation 4

That the Minister for the Environment:

(a) notes that the EPA intends to develop a policy on seagrasses in the coastal waters adjacent to the Perth metropolitan area;

(b) notes that the scientific quest for more knowledge about all aspects of seagrass continues and that further research is needed to improve the understanding of the ecological functions of seagrass meadows, and evaluate means by which they might be artificially created or restored;

(c) notes that the EPA is of the view that the EMP prepared by the proponent (CCL, 1995), sets out an appropriate program of research, investigation and development; and

(d) **should advise the Minister for Resources Development that the dredging management plans required under the environmental conditions of the Cement Works (Cockburn Cement Limited) Agreement Act 1986 should address the environmental factors raised in this assessment.**

1. Introduction

This report is to provide Environmental Protection Authority (EPA) advice to the Minister for the Environment on the proposal by Cockburn Cement Limited (CCL) to mine shell-sand from Success Bank as set out in CCL's Consultative Environmental Review (CER), January, 1994 (CCL, 1994).

The proposal is to mine 3.7 million tonnes of unconsolidated shell-sand from a 67ha area of Success Bank over the two year period 1994-96. Further details are given in Section 2 of this report.

Section 3 discusses environmental factors relevant to the proposal.

Conditions and procedures to which the proposal should be subject if the Minister determines that it may be implemented are set out in Section 4. Section 5 presents the EPA's recommendations to the Minister.

Appendix 1 provides maps relating to the proposal. A list of people and organisations that made submissions is included in Appendix 2, and published information is listed in Appendix 3.

2. The proposal

The proposal is to mine 3.7 million tonnes of unconsolidated shell-sand from a 67ha area of Success Bank (Appendix 1: Figure 1) over the two year period: 1994-96.

The proposed mining area (Appendix 1: Figures 2 and 3) is along the western side of the developing "second" shipping channel where high grade shell-sand deposits have been defined. The mining will be carried out by a suction dredge and will result in cutting into the bank at the northern end (Appendix 1: Figure 2). The seafloor, currently at 3m to 5m depth, will be taken down to approximately 15m depth. Experience from previous dredging in bank materials indicates that cut faces will stabilise at repose angles of about 10 degrees.

3. Environmental factors

3.1 Relevant environmental factors

In the EPA's opinion, based on the submissions and material listed in Appendices 2 and 3, the following are the environmental factors relevant to the proposal:

(a) seagrass;

(b) Success Bank;

(c) beaches; and

(d) social surroundings.

These relevant factors are discussed in the following Sections 3.2 to 3.5.

3.2 Seagrass

Aspects of seagrass

Seagrass meadows are a very important element of the environment as a habitat for a diversity of fauna and flora and for their role in maintaining the stability of marine beaches.

Seagrass meadows, composed mainly of species of the genera *Posidonia* and *Amphibolus,* characterise a vast, shallow neritic, temperate marine biome (large natural area) that extends

from Eucla on the south coast and along 700km of the west coast to the northern end of Shark Bay. There are about two million hectares of such seagrass meadows within the biome (SMEC, 1996).

The proposal area is contained within the biome.

The dominant species of seagrasses in the proposal area and immediate environs are of the genera *Posidonia* and *Amphibolus*. These grow in abundance on the bank top and upper slopes down to depths of about 9m; *Heterozostera*, *Halophila* and *Syringodium* species are subordinate components of the flora. The grasses grow mostly in extensive meadow-like stands and isolated clumps above shell-sand substrates. They have extensive rhizome/root meshes and stand up with variable relief to form canopies up to 0.5m high over the seafloor.

There is considerable variability in both growth patterns and density of seagrass in the proposal area and its immediate environs. The density ranges from sparse, with isolated plants in mobile sand, to very dense, with growths that blanket the substrate.

There is public concern about the loss of seagrass from the proposal area and immediate environs. CCL has developed a density classification scheme of four categories to facilitate documentation of seagrass in the proposal area and immediate environs: 0-25%, 25-50%, 50-75% and 75-100%, and for the purpose of this report these categories are called Classes 4, 3, 2 and 1 respectively.

This scheme has been used to develop the map shown in Figure 2 (Appendix 1), and is also the basis of the analysis in Table 1 below. The rest of Table 1 summarises the estimated seagrass cover density in 1996 for Success Bank and for the dredging area in nearby Owen Anchorage and Parmelia Bank.

The total area of seagrass meadow on Success and Parmelia Banks is about 2400ha of which about 1670ha is Class 1 (75-100% cover).

Research is being undertaken into seagrass regrowth and rehabilitation. This may have a positive effect on seagrass abundance in the future. At this time, however, there is considerable uncertainty about extents and rates of natural recolonisation, and the feasibility of rehabilitation through transplantation.

Assessment

As mentioned above, the biome is characterised by seagrass meadows composed mainly of species of the genera *Posidonia* and *Amphibolus* seagrasses. As a result, the area considered for assessment of this relevant environmental factor, seagrass, is the biome extending from Eucla to Shark Bay which contains two million hectares of seagrass meadows.

Table 1. Estimated seagrass cover based on CCL classification scheme (CCL, 1994) and mapping (CCL, 1996a).

Location	Seagrass cover (ha)				
	Class 1	Class 2	Class 3	Class 4	Total
	75-100% cover	50-75% cover	25-50% cover	<25% cover	
Success Bank (excluding dredging area)	806	132	223	44	1205
Owen Anchorage	176	25	20	0	221
Parmelia Bank	684	48	146	72	950
Totals	1668	205	393	159	2425
Dredging Area	2	0	4	43	49

The EPA's objective in regard to this environmental factor is "to maintain the abundance, species diversity and geographic distribution of seagrass".

In assessing the impact of the proposal on the abundance of seagrass, the seagrass loss which will result from this proposal must be considered in relation to the extent of seagrass within the biome. In comparative terms, losses from the proposed dredging area will be small. If the proposal was to proceed, abundant meadows of seagrass would still remain.

Whilst the proposal would lead to a small direct loss of seagrass, geographic distribution is unlikely to be affected by this proposal.

Seagrass diversity is unlikely to be affected by this proposal because there are no identified rare or endangered species of seagrass within the proposal area.

Having particular regard to:

(a) the representation of the seagrass habitat, diversity and distribution within the biome between Eucla and Shark Bay;

(b) the comparatively small area of seagrass meadow to be lost;

(c) the fact that the geographic distribution of the seagrass is unlikely to be affected; and

(d) the fact that no identified rare or endangered species of seagrass are present in the proposal area;

it is the EPA's opinion that the loss of seagrass within the proposed dredging area is unlikely to compromise the EPA's objective to maintain the abundance, species diversity and geographic distribution of seagrass.

Concerns were expressed in the public submissions on the loss of seagrass in the immediate environs of the proposal area.

The EPA does not share this concern. Of the 67ha of seabed proposed to be dredged, 49ha has some seagrass cover. From Table 1, the extent of the seagrass cover that will be lost from the proposed dredged area represents approximately 2% of the seagrass cover of Success and Parmelia Banks, and Owen Anchorage.

The proposed mining will destroy around 2ha of Class 1, dense seagrass meadow (Table 1) but for the most part the operation has been located in areas with sparse grass or mobile sandy substrates, devoid of grass.

It is the EPA's opinion that the relevant area for assessing the impact of the proposal on this environmental factor, seagrass, extends beyond Success and Parmelia Banks and Owen Anchorage. However, it is also the EPA's opinion that even if this was the relevant area for assessing the impact of the proposal, the proposal would still be unlikely to compromise the EPA's objective.

In addition, the proponent has committed to research into the feasibility of rehabilitating areas where seagrass has been lost. The EPA believes this research should continue.

3.3 Success Bank

Aspects of Success Bank

The bathymetry, sedimentology and geology of Success Bank has been documented in a number of publications, eg, Searle (1985), Searle and Semeniuk (1995).

Success Bank is a shallow sill that partitions the northern end of the Cockburn Sound Depression and thus closes the Owen Anchorage basin to the south (Appendix 1: Figure 3). The bank, which rises to a sill depth of about 5m from the adjacent seafloor at 15m to 20m depth, is a mound composed of calcareous sand ("shell-sand"). According to Searle (1985), the bank has grown across the Cockburn Depression in the past 2000 years as a result of accretion of calcareous sand eroded from the eolianite ridge to seaward (Garden Island Ridge) and of skeletal material from shelly benthos that inhabit seagrass meadows on the bank top and slopes.

The seagrass meadows are considered to have been important factors in promoting accretion by baffling, trapping and binding sediment delivered from the eolianite ridge. Spatially persistent zones of interaction between the various wave systems that traverse the area also have been influential in localising and shaping bank growth.

The shallow bank top is characterised by seagrass stands of variable density and areas of mobile sand. Dense growths stabilise the substrate while in areas with sparser seagrass cover there is enhanced sediment mobility which is reflected in transgressive sand sheets and various ripple bedforms.

The physical forces acting on Success Bank arise out of a complex interaction between winter storm waves, swell and currents and summer seabreeze wind waves as described by Searle (1985), and Rogers (1996). Rogers undertook directional wave measurements and spectral wave modelling.

The surface wind waves and swell and coastal circulation provide the energy to transport the sediment eastward along the axis of the banks.

Assessment

The area considered for assessment of this relevant environmental factor, Success Bank, is the bank itself. This is the area of a defined geomorphological unit where any possible change in the stability caused by the proposal may occur.

The EPA's objective in regard to this environmental factor is "to maintain the stability of Success Bank".

A concern was raised that the proposed dredging of Success Bank could cause changes to wave characteristics which in turn could impact on the stability of Success Bank.

The study by M P Rogers & Associates (1996) using wave measurement and spectral wave modelling indicates that the change of bathymetry is unlikely to have any significant effect on the wave climate over the bank and is unlikely to affect bank stability. The EPA accepts the validity of these results.

Having particular regard to the information from the wave measurements and spectral wave modelling studies, it is the EPA's opinion that stability of Success Bank is unlikely to be affected by the dredging.

3.4 Beaches

Aspects of the beaches

The information provided in 3.3 on the bathymetry and sedimentology of Success Bank is also relevant to this factor.

Assessment

The area considered for assessment of this relevant environmental factor, beaches, is the beaches between Fremantle and Woodman Point. This is the area where any possible change in the wave climate caused by the proposal could have an effect.

The EPA's objective in regard to this relevant factor is "to maintain the stability of beaches".

Proposed dredging will change the bathymetry which could in turn affect the magnitude and direction of the incoming wind waves and swell. A concern was raised that such changes could impact on sand transport and beach stability between Fremantle and Woodman Point.

With respect to beach stability, CCL has dredged shell-sand from the Success and Parmelia Banks since 1972 and has carried out shoreline monitoring for much of this time. The monitoring has shown seasonal variations but no long term effects in beach stability have been detected. Further, wave measurements and spectral wave modelling studies by Lawson and Treloar (1987) and M P Rogers and Associates (1996), which include the effects on wave climate caused by the change in bathymetry due to dredging, indicate that the proposed dredging

is unlikely to cause significant change to the beaches. In addition, CCL has committed to continue the beach monitoring between Woodman Point and Catherine Point.

Having particular regard to the history of the effects of dredging on Success Bank and information from the wave measurement and spectral wave modelling studies, it is the EPA's opinion that beach stability is unlikely to be affected by the dredging.

3.5 Social surroundings

Aspects of social surroundings

The waters over Success Bank and the beaches immediately adjacent, are used for a number of social activities, including swimming and fishing.

Concern was raised in public submissions in relation to the possible effects of the proposal on these activities.

Assessment

The area considered for assessment of this relevant environmental factor, social surroundings, is the water over Success Bank and the beaches between Fremantle and Woodmans Point. This is the area where any possible swimming and fishing could be effected by the proposal.

The EPA's objective in regard to this environmental factor in relation to this proposal is "to maintain the quality of the area in relation to specific social activities, being swimming and fishing".

CCL has been dredging on Success Bank for many years. The dredging is carried out several kilometres offshore. The EPA is not aware of any information to indicate that the dredging operations have materially affected use of the area for swimming.

The Fisheries Department submission indicated that the loss of the seagrass is unlikely to have a discernible effect upon commercial and recreational fishing in the area, particularly as the bulk of seagrass to be removed from areas of low density (0 - 25% cover) seagrass cover. The EPA accepts the truth of this submission.

Having particular regard to the fact that these social activities have coexisted with dredging in the proposal area and immediate environs for many years, and to the advice from the Fisheries Department, it is the EPA's opinion that this proposal is unlikely to further materially affect the use of the area for swimming or fishing.

In recognition of the possible effects on fishing, CCL has made a commitment to further investigate seagrass as a habitat for fauna and flora, including fish species.

4. Conditions and procedures

In the EPA's opinion, the proposal should be subject to the following conditions and procedures if implemented:

4.1 Proponents commitments.

The proponent's commitments set out in the CER (CCL, 1994), and summarised in Table 2, should be made enforceable conditions .

4.2 Environmental Management Plan

(i) The proponent should be required to implement the plan of research, investigation and technical development detailed in the EMP published in February 1995 (CCL, 1995) as modified by the Supplement prepared by the proponent and reported in EPA Bulletin 803.

(ii) The proponent should be required to report on progress and performance of the EMP annually to the EPA.

(iii) The proponent should be required to provide resources for independent expert reviews of the findings and conclusions of the research, investigation and technical development to the satisfaction of the EPA.

4.3 Environmental Management System

The proponent should be required to prepare and implement an environmental management plan and environmental management procedures in order to implement the proposals and manage the relevant environmental factors to ensure the EPA's objectives (Section 3) are met. The plan should adopt quality assurance principles (such as those adopted in Australian Standards ISO 9000 series) and environmental management principles (such as those adopted in the voluntary Australian Standards ISO 14000 [draft] series), with appropriate monitoring and auditing to ensure compliance with this condition.

5. Recommendations

The EPA submits the following recommendations:

Recommendation 1

That the Minister for the Environment note the relevant environmental factors and EPA objective, set for each factor (Section 3).

Recommendation 2

That subject to the satisfactory implementation of the EPA's recommended conditions and procedures (Section 4), including the proponent's environmental management commitments, the proposal can be managed to meet the EPA's objectives.

Recommendation 3

That the Minister for the Environment imposes the conditions and procedures set out in Section 4 of this report.

Recommendation 4

That the Minister for the Environment:

(a) notes that the EPA intends to develop a policy on seagrasses in the coastal waters adjacent to the Perth metropolitan area;

(b) notes that the scientific quest for more knowledge about all aspects of seagrass continues and that further research is needed to improve the understanding of the ecological functions of seagrass meadows, and evaluate means by which they might be artificially created or restored;

(c) notes that the EPA is of the view that the EMP prepared by the proponent (CCL, 1995), sets out an appropriate program of research, investigation and development; and

(d) should advise the Minister for Resources Development that the dredging management plans required under the environmental conditions of the Cement Works (Cockburn Cement Limited) Agreement Act 1986 should address the environmental factors raised in this assessment.

relevant environmental factor	environmental objective	the proposal	proponent's commitments	EPA opinion
seagrass	to maintain the abundance, species diversity and geographic distribution of seagrass	Of the 67ha of seabed to be dredged 49ha has some level of sea grass cover. Mining will destroy around 2ha of Class 1 (dense seagrass meadow) cover. Most of the rest is Class 4 (sparse grass or mobile sandy substrates, devoid of grass) cover.	to research into the feasibility of rehabilitating areas where seagrass has been lost	The loss of seagrass within the proposed dredging area is unlikely to compromise the EPA's objective to maintain abundance, species diversity and geographic distribution of seagrass.
Success Bank	to maintain the stability of Success Bank	A 67ha area of Success Bank will be cut into at the northern end with seafloor depth changing from 3m– 5m in depth to approximately 15m in depth		Success Bank stability is unlikely to be affected by the proposed dredging.
beaches	to maintain the stability of beaches	No direct impact	to continue the shoreline monitoring	Beach stability is unlikely to be affected by the proposed dredging.
social surroundings - swimming and fishing	to maintain the quality of the area in relation to specific social activities, being, swimming and fishing	Negligible direct impact	to investigate seagrass as a habitat for fauna and flora, including fish species	The proposal is unlikely to further materially affect use of the area for swimming or fishing

Table 2. Summary of relevant environmental factors, objectives, proponent's commitments and EPA's opinion

Appendix 2

Public Submissions and Proponent's Response

List of organisations and individuals who made submissions

Organisations:

- City of Cockburn
- Confederation of Affiliated Residents and Ratepayers Association of WA.
- Conservation Council of WA
- Coogee Beach Progress Association
- CSIRO, Division of Fisheries
- Department of Minerals and Energy
- Department of Resources Development
- Fisheries Department of WA
- Fremantle Port Authority
- Gypsum Industries of Australia and Aglime of Australia
- Meridian Environmental
- Perth Game Fishing Club
- Precious Metals Australia Limited
- The Greens WA
- Town of Kwinana
- WA Fishing Industry Council (Inc.)
- WA Recreational Sportfishing Council
- Waterbird Conservation Group
- Western Angler
- Western Australian Naturalists' Club
- Wetlands Conservation Society

Individuals

- Ms K Bakitch
- Ms D Carr
- Mr P Corser
- Ms J Dellow
- S Edwards
- Astrid Herlihy
- Ms M Jenkins
- Mr O Johnston
- Ms N Lapthorne
- Mrs J Payne
- Mrs E Quinn
- A & H Reddyhough
- Dr P Woods

Appendix 3

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Appendix 1

Figures

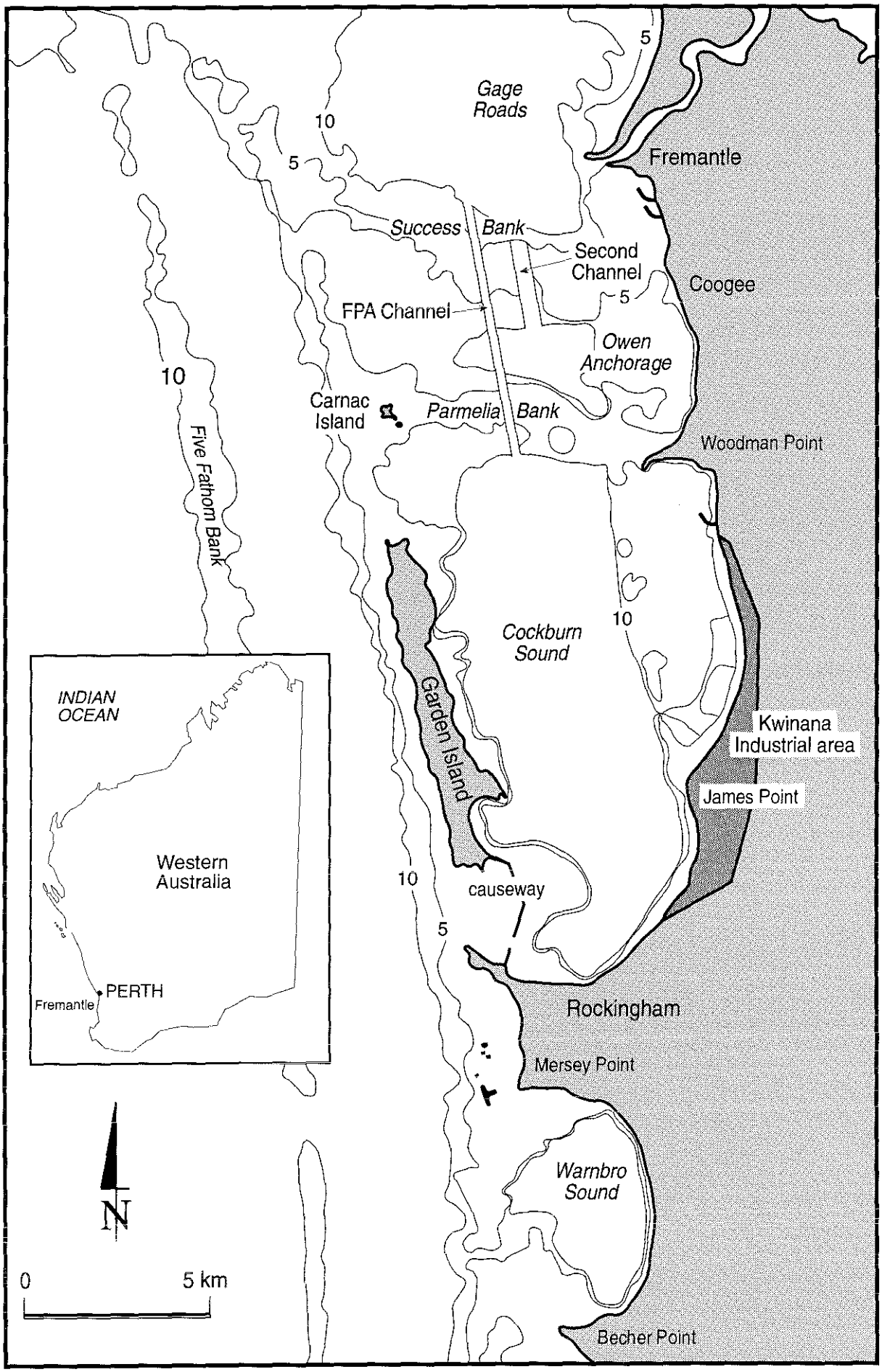

Figure 1. Location Plan - Owen Anchorage, Success Bank, Parmelia Bank

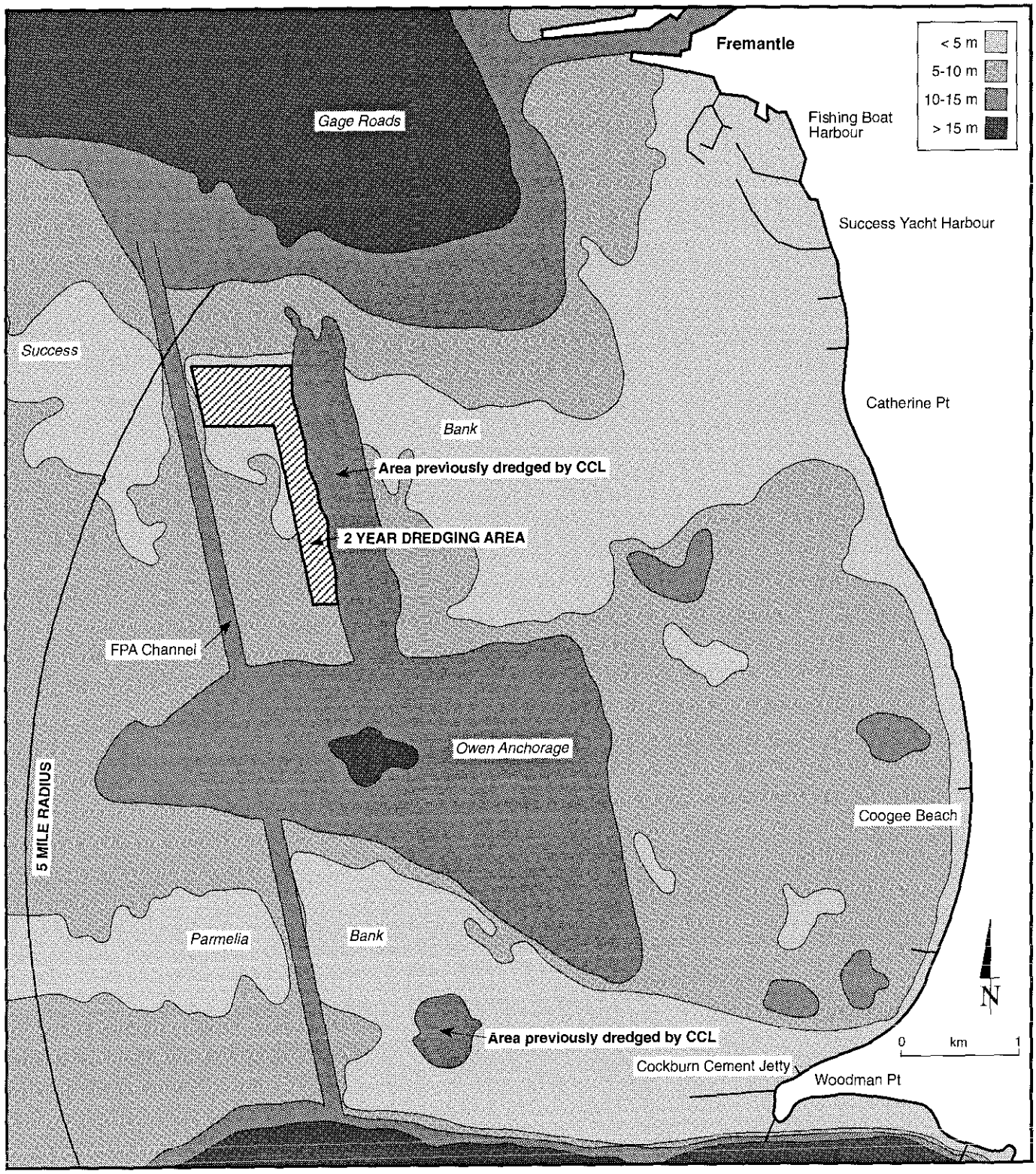

Figure 3. Proposed two year dredging programme.