Proposed short-term continuation of dredging of shell sand on Success Bank, Owen Anchorage; and proposed strategy to address the long-term environmental issues of shell sand dredging

Cockburn Cement Limited

Report and recommendations
of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 739
May 1994

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Summary and recommendations

Cockburn Cement Limited (the proponent) proposes to dredge 3.7 million tonnes of shell sand from 67ha of Success Bank over a two year period. The area would be dredged using existing plant and equipment. Of the 67ha that is proposed to be dredged, 17ha has substantial seagrass coverage.

Since 1972 Cockburn Cement Limited (CCL) has dredged shell sand to produce cement and lime product from Parmelia and Success Banks in accordance with a State Agreement Act. Most of the dredging has taken place along the alignment of a second shipping channel through Success and Parmelia Banks, running parallel to the existing Fremantle Port Authority Channel (Figure 1).

In 1992 CCL submitted a 10 year Dredging Management Programme (DMP) to the Government that was only partially approved because it included the loss of substantial ares of seagrass habitat from Success Bank. Accordingly, CCL undertook to develop a proposal addressing the environmental issues of concern.

The EPA received two proposals from CCL in December 1993 and set the level of assessment on the first at Consultative Environmental Review (CER), and the second Environmental Review and Management Programme (ERMP). In the first proposal CCL sought urgent access to shell sand resource for a period of two years to meet contract supply requirements (1994-1996). This short-term proposal identified an area on Success Bank (Figure 2) that was estimated to contain five million tonnes of shell sand of acceptable grade to CCL's present requirements. The second proposal related to CCL's long-term dredging operations which would, if implemented, lead to the loss of substantial areas of seagrass habitat from Success Bank.

The CER was released for a four week public review period which commenced on 19 January 1994 and ended on 16 February 1994. Thirty four submissions were received.

During the assessment, it was recognised by the Environmental Protection Authority (EPA), the proponent (CCL) and Department of Resource Development (DRD) that the two year access sought by CCL would not be sufficient time to address adequately the key issues associated with long term access to shell sand resource in Owen Anchorage. Consequently, CCL was asked to prepare a plan to ensure that substantial information would be available on seagrass rehabilitation, seagrass ecology and beneficiation of lower grade resource to allow a proper decision on long term access to be made following the preparation of an Environmental Review and Management Programme by CCL at that time. This plan (Appendix 1, Question 13 - Concept Plan) has been accepted by EPA subject to the recommendations in this Report.

EPA's Objective

The EPA considers the most important environmental issues of this proposal to be the potential impacts on seagrass habitat and stability of the submarine banks and shoreline of Owen Anchorage.

In 1991, EPA advised CCL in correspondence that: "Apart from the proposed dredging operations planned for 1991 and 1992 inclusive, any further dredging of Success Bank within the current lease area is not environmentally acceptable".

However, after receiving the proponent's CER and reviewing the performance of the environmental management of seagrass banks, and considering in more detail the requirements and obligations of the State Agreement Act, the EPA has decided to change its approach to resolving the conflict between the need for shell sand resource and protecting the environment.

The EPA has determined that its objective should be:

- **To minimise the further loss of seagrass in Owen Anchorage and its surrounds as a consequence of individual or cumulative impacts from development proposals.**

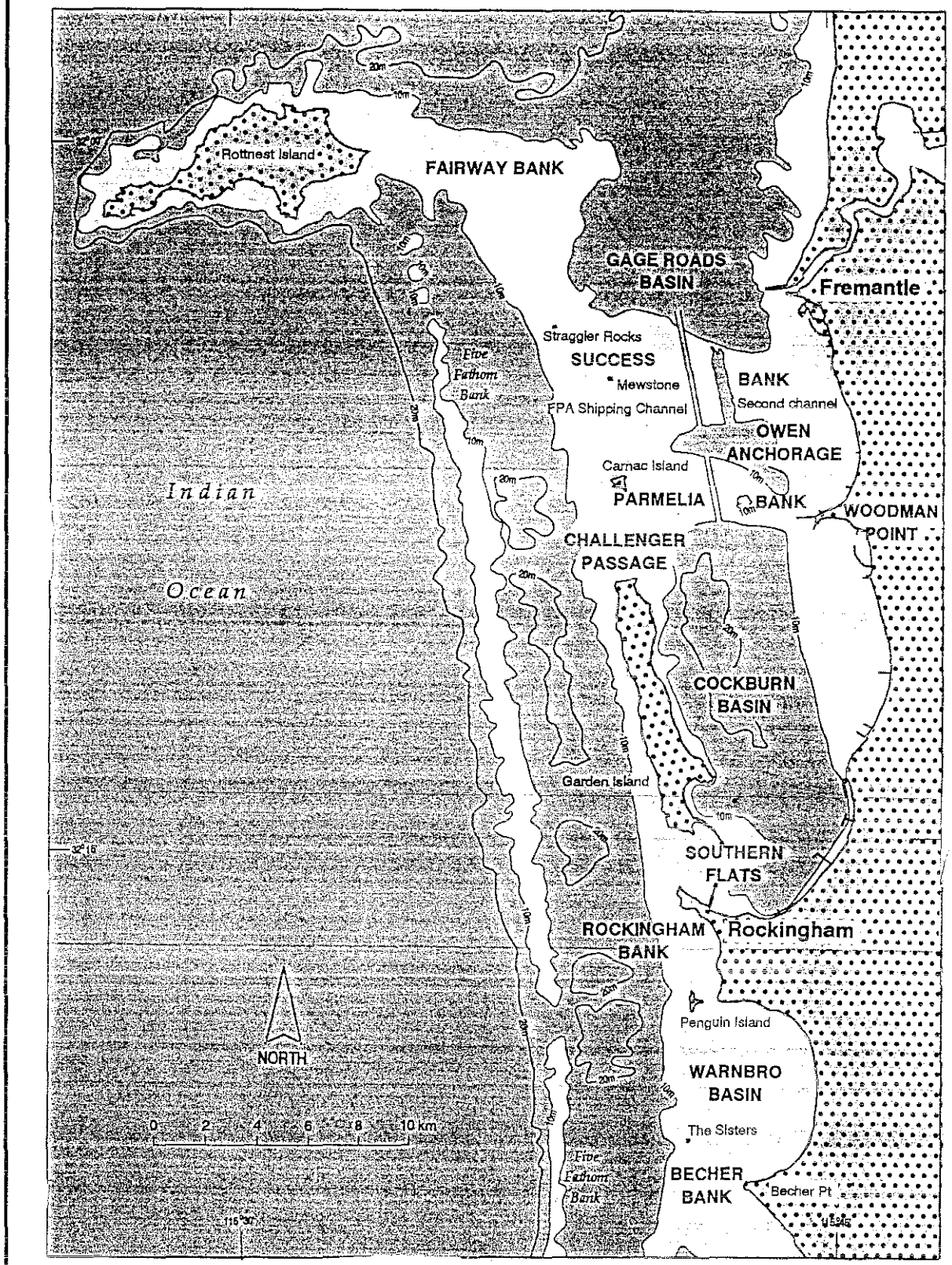


Figure 1. Location of Success Bank, Owen Anchorage (Courtesy of Figure 3 in proponent's CER)

As part of this objective EPA will prepare a position paper to examine the statewide distribution and values of seagrasses. This paper will provide a context for future development proposals needing to consider seagrass issues. The scope of this document is still to be determined but it will be completed by December 1995. Following completion of this paper, EPA will consider the development of an Environmental Protection Policy on seagrass.

With reference to the assessment of this proposal, the EPA recognises that to achieve its objective three matters must be afforded careful consideration:

- the optimum protection of seagrass habitat;
- the State's obligations under the State Agreement Act; and
- CCL's rights under the State Agreement Act.

The EPA's strategy to pursue its environmental objective in view of the above considerations requires that:

- EPA assesses CCL's short-term CER (1994 - 1996);
- EPA to develop a position paper on the distribution and values of seagrass in WA (This may lead to an Environmental Protection Policy;
- CCL to develop an Environmental Management Programme (EMP); and
- CCL to develop an ERMP based on results of the EMP.

Short-term access to shell sand resource

The EPA has assessed CCL's short-term CER and concludes that 50ha of the 67ha proposed for dredging of shell sand is environmentally acceptable due to its limited coverage of seagrasses (< 25% of seagrass cover). The remaining 17ha should not be dredged given that it is well covered with seagrasses. Upon advice from the Department of Environmental Protection, EPA accepted the 25% cut off figure as it represents a reasonable compromise between the optimum protection of seagrasses and CCL's Agreement Act with the State.

With respect to sediment stability, CCL has undertaken studies which indicate that its dredging activity will have minimal impact on the submarine banks and shoreline of Owen Anchorage. In reaching this conclusion, CCL utilised the findings of a report prepared for a substantially larger dredging proposal on Success Bank (Lawson and Treloar, 1987). This report indicated that the change of bottom topography due to dredging was unlikely to cause significant shoreline problems. CCL has also included commitments to continue its shoreline monitoring between Woodman Point and Catherine Point, and monitoring programme on slope stability in dredged areas.

Recommendation 1

The Environmental Protection Authority concludes that Cockburn Cement Limited's proposal to dredge shell sand from within the area identified in the Consultative Environmental Review is environmentally acceptable in those areas with limited seagrass cover (< 25% of seagrass cover).

This conclusion is based on considerations of the proponent's Consultative Environmental Review, submissions received from Government agencies and the public, the proponent's response to issues raised in submissions (Appendix 1) and the proponent's commitments (Appendix 3).

The Environmental Protection Authority determined the most important environmental issues requiring consideration to be:

- **the potential impacts on seagrass habitat; and**
- **stability of the submarine banks and shoreline of Owen Anchorage.**

The Authority considers that these issues have been addressed and that this short-term proposal could proceed subject to the recommendations in this Report.

Environmental Management Programme

The Environmental Management Programme (EMP) proposed in EPA's strategy will serve two purposes. First, it will describe in detail EPA's requirements for several studies of an EPA approved standard (to be carried out by EPA approved research organisations), allowing EPA to make recommendations on CCL long-term access to shell sand resource. Second, providing that the terms of the studies proposed are satisfactory to EPA, then approval of the EMP will also provide CCL access to suitable shell sand resource beyond 1996 for a period sufficient to conclude the studies, and for Government to decide on CCL's long-term access to shell sand resource.

The studies which should be included in the EMP are those proposed by CCL in its Concept Plan (seagrass rehabilitation and beneficiation of low grade resource), and studies on the ecological significance of seagrass in Owen Anchorage and its surrounds.

Recommendation 2

The Environmental Protection Authority recommends that Cockburn Cement Limited be required to prepare and subsequently implement a detailed Environmental Management Programme incorporating the following:

a) Studies into:

- **suitable shell sand resource on Success Bank for use by Cockburn Cement Limited beyond 1996 and up to completion of the research and development programmes required below, and a decision by Government on Cockburn Cement Limited's Environmental Review and Management Programme (see Recommendation 4). This study should further consider the effects of dredging on the wave climate of any proposed area; and**
- **alternative sources of resource; and**

b) Research and development programmes to EPA approved standards and by an approved research organisation(s) for :

- **the ecological significance of seagrasses in Owen Anchorage and its surrounds;**
- **seagrass rehabilitation; and**
- **beneficiation of low grade shell sand resource.**

The investigations required above should be completed within time frames determined by the Environmental Protection Authority in consultation with Cockburn Cement Limited.

The EPA considers the EMP should be submitted to the EPA within 6 months of any approval date for this proposal. The period of six months should be sufficient for CCL to prepare the EMP in close consultation with the EPA and other relevant parties. Subsequently, the EMP would be given a four week public review period.

Given the significance of the investigation required above, the EPA considers that full details of the investigations required in Recommendation 2 should be clearly identified.

Recommendation 3

The Environmental Protection Authority recommends that the detail of the above studies and research and programmes should include but not be limited to:

- **project description including objectives, milestones and preparation, implementation and completion time-frames;**
- **project manager and team selection criteria;**
- **quality assurance and quality control procedures;**

- **documentation of results; and**
- **budgets.**

Additionally, Cockburn Cement Limited should provide resources for independent expert reviews of the above investigations, their progress, and final results and conclusions if required by the Environmental Protection Authority.

The Environmental Management Programme should be available within 6 months of any approval of this proposal, and it is the Environmental Protection Authority's intention for the Environmental Management Programme to be the subject of a four week public review period.

The progress and performance of the above studies should be reported to the Environmental Protection Authority annually.

Environmental Review and Management Programme.

Following completion of the investigations required in Recommendation 2, the EPA would expect continued access to shell sand resource to be based on the results of CCL investigations and other information available at that time.

Accordingly, CCL should be required to prepare an Environmental Review and Management Programme (ERMP) regarding its proposed long-term shell sand dredging operations at this time. This would provide the Government with information from the investigations required in Recommendation 2, allowing it to make a decision on CCL's long-term access to shell sand resource. Development of an ERMP linked to the results of the research and development programmes is considered a more meaningful time-frame than the previously scheduled ERMP due before 1996. Two years would not provide sufficient time to undertake the research and development programmes required.

Recommendation 4

The Environmental Protection Authority recommends that following completion of the investigations required in Recommendation 2, Cockburn Cement Limited should prepare an Environmental Review and Management Programme. Cockburn Cement Limited's long-term access to shell sand resource should be based on the results of the required investigations and other information available at that time.

The State Agreement Act for CCL's operations in Owen Anchorage (administered by the Department of Resource Development) includes regular reporting requirements to the Minister for Resource Development. The EPA considers that it would be appropriate (if possible) to produce joint documents to meet the reporting requirements of both the Minister for Resource Development and the Minister for the Environment.

Based on its assessment of this proposal, and the recommendations above, the EPA has developed a list of 'Recommended Environmental Conditions' (see Section 6 of this Report) to the Minister for the Environment. The Authority considers that by setting these conditions on the development and operation of this proposal, the environment would be protected.

1. Introduction

Cockburn Cement Limited (the proponent) is the largest manufacturer of lime in Australia. Since 1972 Cockburn Cement Limited (CCL) has dredged shell sand from Parmelia and Success Banks in accordance with the Cement Works (Cockburn Cement Limited) Agreement (1972). This State Agreement Act provides access to the shell sand resources of Owen Anchorage up to the year 2011, with rights of extension to 2021. It should be noted that one of the State's obligations under the Act is to use every endeavour to find a reasonable alternate supply of shell sand to CCL's Coogee works should the Success or Parmelia Bank resource become unavailable. To date most of the dredging has taken place along the alignment of a second shipping channel through Success and Parmelia Banks, running parallel to the existing Fremantle Port Authority Channel (Figure 1).

Since 1986, at which time an amendment to the State Agreement Act was made to incorporate environmental provisions, CCL has been required to submit a shell sand Dredging and Management Programme (DMP). The DMP is submitted every two years and outlines in detail the subsequent two years dredging programme and plans for the following 8 years. The DMP is reviewed by a Dredging Management Programme Committee (DMP Committee) comprising representatives of Government and CCL. The Committee provides its advice to the Minister for Resource Development (who is responsible for the State Agreement Act) and the Minister then determines the acceptability or otherwise of the proponent's DMP.

DMPs for 1986, 1988 and 1990 were approved by the Minister for Resource Development. The 1990 approval required CCL to investigate alternatives to a proposed 30 year concept plan that foreshadowed the loss of substantial areas of seagrass habitat. The last DMP was received in December 1992. This DMP was only partially approved because it included the loss of substantial areas of seagrass habitat from Success Bank.

In order to resolve the environmental concerns of the 1992 DMP, CCL prepared two proposals for the EPA. Both proposals were referred to the EPA in December 1993 by the Minister for State Development through the Minister for the Environment.

The first proposal was prepared to obtain urgent approval to dredge shell sand so that CCL could meet its contract lime supply requirements. The EPA set the level of assessment on this short-term proposal at Consultative Environmental Review (CER).

In the second proposal CCL proposed to address the issue of long-term access and security to the shell sand on Success Bank. The level of assessment for that proposal was set at Environmental Review and Management Programme (ERMP) given that it included the potential loss of substantial areas of seagrass habitat.

The proponent's CER was released for a four week public review period which commenced on 19 January and closed on 16 February 1994. Thirty four submissions were received and a list of environmental issues raised in submissions was prepared by EPA and provided to CCL. CCL's response to these issues appears as Appendix 1.

2. Description of the proposal

The proposal is to dredge 3.7 million tonnes of shell sand from 67ha of Success Bank (estimated to contain five million tonnes of sand) over a two year period. The location of the short-term dredging area (Figure 2) was selected to minimise both seagrass loss, potential for bank destabilisation and modifications to wave dynamics. It has also been selected to provide access to resource near the southern part of the bank for use during winter. Winter storm swells make it difficult to operate on northern parts of the bank.

During the assessment of this proposal CCL provided information on how it proposed to manage the long-term issues of its shell sand dredging operations. The information provided by CCL included a Concept Plan and summary diagram (Appendix 1, Question 13).

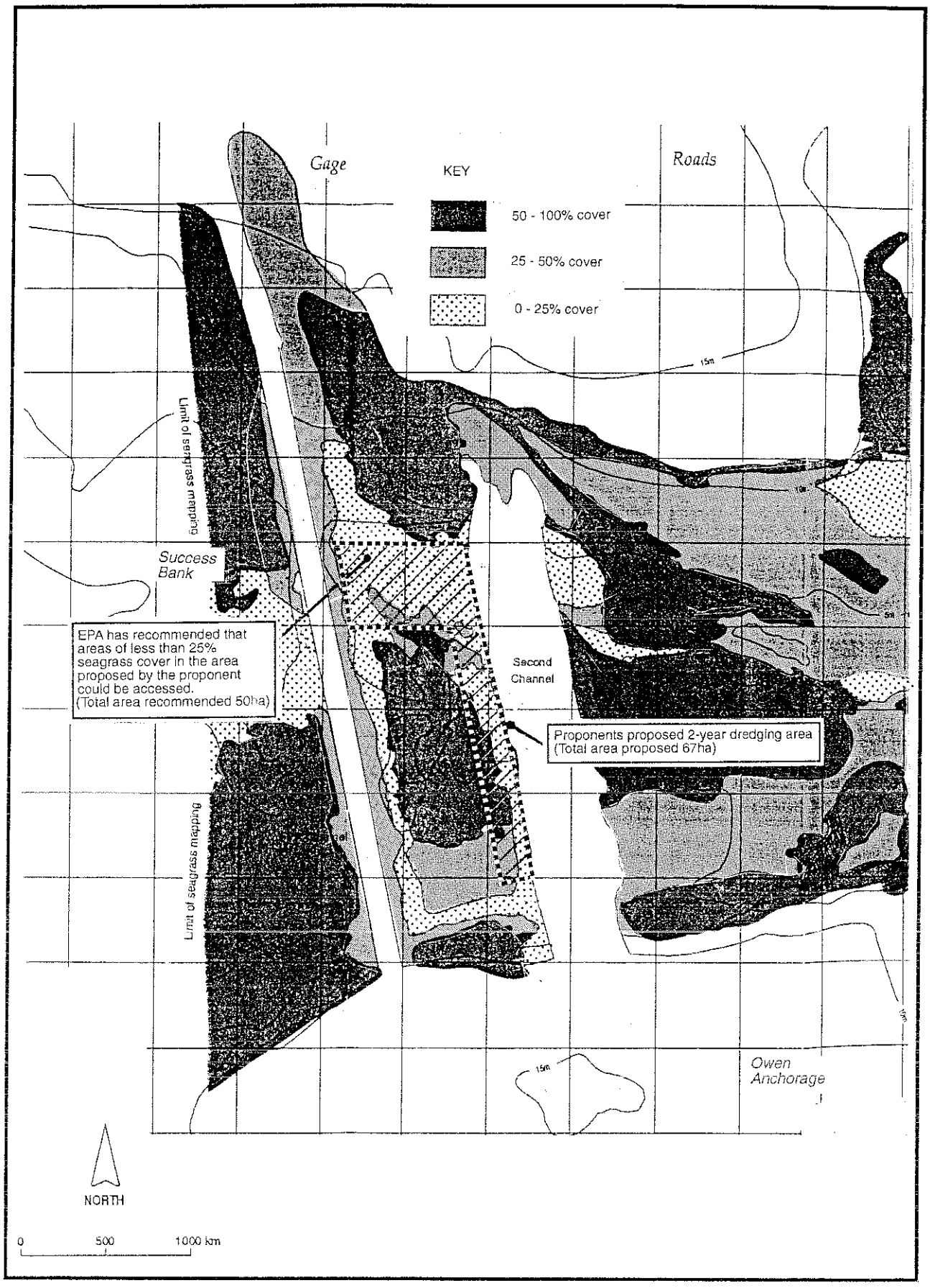


Figure 2. Seagrass density map and proponent's short-term proposed shellsand dredging area (modified from Figure 7 in proponent's CER).

3. Public submissions

Thirty four Submissions were received on the CER. A list of organisations and individuals who made submissions is provided in this Report (Appendix 2).

The principal issues raised in the submissions related to:

- loss of seagrass habitat;
- the significant historical loss of seagrass habitat;
- the rehabilitation of seagrass habitat;
- a need for more information on the areas of seagrass that could be lost if the proposed ERMP were approved;
- CCL's past environmental practice with reference to seagrass losses;
- CCL's need for high quality shell sand;
- potential effects on wave energy and the erosion of shorelines in Owen Anchorage;
- completion of the second channel through both Success and Parmelia Banks;
- the need to include targets for assessment and review of proposed monitoring programmes;
- shell sand beneficiation research;
- the dependencies of the renewable resources in Cockburn Sound (fish and mollusc species) on the seagrass habitats of Success Bank; and
- the significance of reported recolonisation of flora and fauna in previously dredged areas.

A list of issues raised and the proponent's response to these issues are included in Appendix 1.

4. EPA's evaluation and findings

The EPA considers the most important environmental issues of the short-term dredging of shell sand in Owen Anchorage to be:

- the potential impacts on seagrass habitat ; and
- stability of the submarine banks and shoreline of Owen Anchorage.

Recognition of the multiple beneficial uses of Owen Anchorage and its surrounds was also considered. Some of these beneficial uses include direct contact recreation, fishing, scientific and educational studies, and shipping.

In its guidelines the EPA's objective was that CCL demonstrate that shell sand could be dredged from Owen Anchorage without jeopardising the ecological value of seagrasses or causing significant adverse changes to wave energy in Owen Anchorage. The direct loss of seagrass habitat was to be avoided.

The EPA considers that the seagrass habitat of Owen Anchorage and its surrounds should be protected because of their ecological importance as a habitat and nursery for marine life (eg. Bell and Pollard, 1989). Additionally, they protect and stabilise sediments from erosion, baffle wave energy, help maintain water clarity and prevent erosion of shorelines (eg. Searle and Logan, 1978).

In the absence of any formal policy on seagrass protection the EPA (1991) advised CCL that "Apart from the proposed dredging operations planned for 1991 and 1992 inclusive, any further dredging of Success Bank within the current lease area is not environmentally acceptable". This advice formed part of EPA's response to CCL's draft Dredging Management Plan for dredging between 1991 - 2000.

However, after receiving the CER (1994) and reviewing the performance of the environmental management of seagrass banks, and considering in more detail the requirements and obligations

of the State Agreement Act, the EPA has decided to change its approach to resolving the conflict between the need for shell sand resource and protecting the environment. It became apparent in EPA's consideration of the CER and proposed Concept Plan that factors such as the employment of CCL's workforce, commitments to large contracts to supply lime to major WA industries and the State's obligations to find a reasonable alternate supply of shellsand to CCL's Coogee works should Success or Parmelia Bank resource become unavailable, were important considerations.

Taking into consideration the above factors EPA has determined that its objective should be:

- **To minimise the further loss of seagrass in Owen Anchorage and its surrounds as a consequence of individual or cumulative impacts from development proposals.**

Additionally, given a lack of information on the value of seagrass in Western Australia, EPA will prepare a position paper to examine the statewide distribution and values of seagrasses. This paper will provide a context for future development proposals needing to consider seagrass issues. The scope of this document is still to be determined but it will be completed by December 1995. Following completion of this paper, EPA will consider the development of an Environmental Protection Policy on seagrass.

With reference to the assessment of this proposal, the EPA recognises that to achieve its objective three matters must be afforded careful consideration:

- the maximum protection of seagrass habitat;
- the State's obligations under the State Agreement Act; and
- CCL's rights under the State Agreement Act.

EPA's strategy to pursue its objective in view of the above considerations requires that:

- EPA assesses CCL's short-term CER (1994 - 1996);
- EPA to develop a position paper on the distribution and values of seagrass in WA (This may lead to an Environmental Protection Policy);
- CCL to develop an Environmental Management Programme; and
- CCL to develop an ERMP based on the results of the EMP.

4.1 CCL's short-term access to shell sand resource

Issue 1- potential loss of seagrass habitat

The majority (50ha) of shell sand resource in the 67ha of acceptable grade resource for CCL's present requirements has limited coverage of seagrasses (<25% of seagrass cover). However, there could be some direct loss (17ha) of areas with a more substantial coverage of seagrasses if the proposal were implemented as proposed (Figure 2).

Proponent's response:

CCL has indicated in Section 5.2.2 of the CER that it will undertake to test and develop techniques to help mitigate the effects of dredging the seagrasses in the proposed dredge area. The proposed activities include investigating new dredging techniques, the rehabilitation of seagrass habitat, the beneficiation of low grade shell sand and ways in which dredged areas might be enhanced for recreational purposes (eg artificial reefs).

EPA's assessment:

EPA has assessed CCL's short-term CER and concludes that 50ha of the 67ha proposed for dredging is environmentally acceptable due to its limited coverage of seagrasses (< 25% of seagrass cover). The remaining 17ha should not be dredged given that it is well covered with seagrasses. Upon advice from the Department of Environmental Protection, EPA accepted the 25% figure as it represents a reasonable compromise between the optimum protection of seagrasses and CCL's Agreement Act with the State.

Recommendation 1

The Environmental Protection Authority concludes that Cockburn Cement Limited's proposal to dredge shell sand from within the area identified in the Consultative Environmental Review is environmentally acceptable in those areas with limited seagrass cover (< 25% of seagrass cover).

This conclusion is based on considerations of the proponent's Consultative Environmental Review, submissions received from Government agencies and the public, the proponent's response to issues raised in submissions (Appendix 1) and the proponent's commitments (Appendix 3).

The Environmental Protection Authority determined the most important environmental issues requiring consideration to be:

- **the potential impacts on seagrass habitat; and**
- **stability of the submarine banks and shoreline of Owen Anchorage.**

The Authority considers that these issues have been addressed and that this short-term proposal could proceed subject to the recommendations in this Report.

During the assessment of this proposal the Department of Fisheries made a submission advising that CCL should undertake studies to identify "the importance of seagrass habitat and particular seagrass species to the local marine environment, including fish species". The results of the study should assist in the assessment of future potential losses of seagrass habitat. Additionally, as CCL has explained in its response to issues raised in submissions, when compared to the physical characteristics of seagrasses, their ecological role is much less well described. Accordingly, this information should be investigated. Cockburn Cement Limited should undertake a research and development programme into the ecological significance of seagrasses in Owen Anchorage and its surrounds. EPA has made a recommendation on this issue in Section 4.2, Recommendation 2.

Issue 2 - sediment stability

The proposed dredge area constitutes 67 ha of submarine banks. Dredging will continue to approximately the same depth as the Second Channel in Success Bank (12-13 metres) and will comprise a relatively steep slope habitat and undulating basin floor. EPA's concern was to know what effects the altered bank would have on wave characteristics and the stability of the submarine banks and shoreline of Owen Anchorage.

Proponent's response:

The modified shape and depth of the banks has the potential to effect the wave climate of the area, which may have a consequential effect on both bank and coastal stability and on shipping and navigation uses of affected waters.

The proponent has considered these issues in Section 4.2 of the CER. Findings of work carried out to date show that dredged slopes older than 10 years have appeared to stabilise and that neither wave climate or navigation is expected to be effected in the Fremantle Port Authority Channel. Additionally, in the small boats harbours south of Fremantle numerical modelling of the changes to the wave climate show that the proposal is expected to have negligible impact on navigation or breakwater stability at the small boat harbours.

In so far as potential effects on coastal stability is concerned, CCL drew its conclusions from a report prepared for a large scale dredging proposal on Success Bank (Lawson and Treloar, 1987). This report indicated that the change of bottom topography due to dredging was unlikely to cause significant shoreline problems. Given that this CER does not represent a large scale operation in comparison to the original report, the effects are considered to be negligible. CCL has also committed to shoreline monitoring between Woodman Point and Catherine Point and monitoring of slope stability (Appendix 3).

EPA's assessment:

EPA considers the proponent's response to be reasonable. No other environmental concerns were raised regarding sediment stability. However, in order to minimise potential impacts on the existing shipping channel, the Fremantle Port Authority has suggested a 200 metre distance may be more appropriate than the 100m (minimum) distance proposed by CCL where the proposed dredge area and shipping channel are at their closest points. The EPA considers that this issue should be dealt with by CCL and the Fremantle Port Authority.

4.2 CCL's Concept Plan on the long-term environmental issues of shell sand dredging

During the assessment of the CER, it was recognised by the Environmental Protection Authority (EPA), the proponent (CCL) and Department of Resource Development (DRD) that the two year access sought by CCL would not be sufficient time to address adequately the key issues associated with long term access to shell sand resource in Owen Anchorage. Consequently, CCL was asked to prepare a plan to ensure that substantial information would be available on seagrass rehabilitation, seagrass ecology and beneficiation of lower grade resource to allow a proper decision on long term access to be made following the preparation of an Environmental Review and Management Programme by CCL at that time. CCL provided a plan for EPA's consideration in its response to issues raised in submissions (Appendix 1, Question 13 - Concept Plan).

EPA considers the key aspects of CCL's Concept Plan to be:

1. CCL's commitment to a comprehensive research and development programme on seagrass rehabilitation;
2. CCL's commitment to a comprehensive research and development programme on the beneficiation of low grade resource;
3. CCL's need for access to sufficient high grade shell sand resource in order to provide time to complete the studies proposed in 1 and 2 above (7 years has been indicated);
4. CCL's commitment to cease dredging activities through seagrass habitat on Success Bank at the end of the studies proposed in 1 and 2 above. Future access to shell sand resource on Success Bank would be determined based on the results of the studies; and
5. CCL's need for further access to shell sand resource during the implementation of alternative processing technologies (eg beneficiation of low grade resource or alternative land based supplies) (an additional 3 years has been indicated).

CCL's Concept Plan has been accepted by EPA subject to the recommendations in this Report.

EPA's assessment:

EPA considers the research and development programmes proposed by CCL (see points 1 & 2 in key aspects of CCL's Concept Plan above) to be critical issues of any long-term plans for future shell sand access in Owen Anchorage. Accordingly, CCL should be required to undertake significant and substantial research and developments programmes into these issues. The research and development programmes, their results and conclusions should be developed to an EPA approved standard and be carried out by an approved research organisation. Seagrass rehabilitation may show that a stable seagrass habitat can be returned to Owen Anchorage and Cockburn Sound. Beneficiation of low grade shell sand would allow other areas of lower grade shell sand to be used without the loss of substantial areas of seagrass which are associated with high grade shell sand. EPA considers that early success in the development of a suitable beneficiation process may reduce pressures to dredge shell sand on Success Bank.

The EPA recognises that the research and development programmes are unlikely to be completed for several years. Given this situation, and that CCL only has recommended approval to shell sand resource for two years (nominally 1994 to 1996), EPA has considered CCL's access to suitable shell sand resource beyond 1996 (see point 3 in key aspects of CCL's Concept Plan above). EPA concludes that CCL should investigate suitable shell sand resource on Success Bank for use by CCL beyond 1996 (for an 'interim period') up to completion of the research and development programmes proposed above, and a decision by Government on CCL's ERMP (Recommendation 4). Alternative resource to that available on Success Bank should also be investigated. The evaluation of area(s) to meet this 'interim period' should ensure that the loss of seagrass is minimised. Additionally, EPA will require that a 'state of the art' study of the interim period dredging activity on the wave climate is undertaken to ensure unacceptable environmental impacts are prevented.

So that the studies and research and development programmes required above are properly co-ordinated and adequately designed, an EMP should be developed. The detail and difficulty of the research and development programmes required above should not be underestimated. The programmes would need to be of a very high scientific standard given that the techniques are not proven.

The EPA considers that CCL should develop an EMP to assist in the design and co-ordination of the investigations required above.

Recommendation 2

The Environmental Protection Authority recommends that Cockburn Cement Limited be required to prepare and subsequently implement a detailed Environmental Management Programme incorporating the following:

a) Studies into:

- **suitable shell sand resource on Success Bank for use by Cockburn Cement Limited beyond 1996 and up to completion of the research and development programmes required below, and a decision by Government on Cockburn Cement Limited's Environmental Review and Management Programme (see Recommendation 4). This study should further consider the effects of dredging on the wave climate of any proposed area; and**
- **alternative sources of resource; and**

b) Research and development programmes to EPA approved standards and by an approved research organisation(s) for:

- **the ecological significance of seagrasses in Owen Anchorage and its surrounds;**
- **seagrass rehabilitation; and**
- **beneficiation of low grade shell sand resource.**

The investigations required above should be completed within time frames determined by the Environmental Protection Authority in consultation with Cockburn Cement Limited.

The EMP should be submitted to the EPA within 6 months of approval of this CER. The period of six months should be sufficient for CCL to prepare the EMP in close consultation with the EPA and other relevant parties. Subsequently, the EMP would be given a four week public review period.

Given the significance of the investigations to be undertaken. The EMP should also include full details of the investigations such as project description, quality control and assurance (including agreed performance indicators), budgets and reporting procedures. Additionally, CCL should

be required to provide resources for independent expert reviews of the above investigations, their progress, and final results and conclusions if required by the Environmental Protection Authority.

Recommendation 3

The Environmental Protection Authority recommends that the detail of the above studies and research and programmes should include but not be limited to:

- **project description including objectives, milestones and preparation, implementation and completion time-frames;**
- **project manager and team selection criteria;**
- **quality assurance and quality control procedures;**
- **documentation of results; and**
- **budgets.**

Additionally, Cockburn Cement Limited should provide resources for independent expert reviews of the above investigations, their progress, and final results and conclusions if required by the Environmental Protection Authority.

The Environmental Management Programme should be available within 6 months of any approval of this proposal, and it is the Environmental Protection Authority's intention for the Environmental Management Programme to be the subject of a four week public review period.

The progress and performance of the above studies should be reported to the Environmental Protection Authority annually.

Following completion of the above investigations, EPA would expect continued access to shell sand resource to be based on the results of CCL investigations and other information available at that time. Accordingly, CCL should be required to prepare an ERMP regarding its proposed long-term shell sand dredging operations at this time. This would provide the Government with information from the investigations, allowing it to make a decision on CCL's long-term access to shell sand resource.

Development of an ERMP linked to the results of the research and development programmes is considered a more appropriate time-frame than the previously scheduled ERMP due before 1996. Two years would not provide sufficient time to undertake the research and development programmes required.

Recommendation 4

The Environmental Protection Authority recommends that following completion of the investigations required in Recommendation 2, Cockburn Cement Limited should prepare an Environmental Review and Management Programme. Cockburn Cement Limited's long-term access to shell sand resource should be based on the results of the required investigations and other information available at that time.

5. Conclusion

The EPA has assessed CCL short-term proposal for urgent access to shell sand resource described in its Consultative Environmental Review, January 1994. EPA has concluded that 50ha of the 67ha proposed by CCL for dredging is environmentally acceptable due to its limited coverage of seagrasses.

During the assessment of the short-term proposal, CCL was requested to brief EPA on its long-term strategy to secure access to shell sand resource on Success Bank. This information has allowed EPA to assess a number of environmental issues pertaining to development, by CCL, of an ERMP. The ERMP would be expected to address CCL's long-term strategy to secure access to shell sand resource in Owen Anchorage.

Based on CCL's strategy for long-term access to shell sand resource, EPA has recommended to Government its own strategy which is aimed at an orderly process to meet EPA's long-term objective of optimising seagrass protection in Owen Anchorage and its surrounds. At the same time EPA has allowed for CCL's continued operations under its Agreement Act with the State.

6. Recommended environmental conditions

The Authority considers that it could be necessary or desirable to make minor and non-substantial changes to the designs and specifications of the proposal which were examined as part of the Environmental Protection Authority's assessment. Accordingly, the Environmental Protection Authority considers that subsequent statutory approvals for this proposal could make provision for such changes, where it can be shown that the changes are not likely to have a significant effect on the environment.

Furthermore, the Authority believes that any approval for the proposal based on this assessment should be limited to five years. Accordingly, if the proposal has not been substantially commenced within five years of the date of this report, then such approval should lapse. After that time, further consideration of the proposal should only occur following a new referral to the Environmental Protection Authority.

Based on its assessment of this proposal and recommendations in this report, the Environmental Protection Authority considers that the following Recommended Environmental Conditions are appropriate:

1. Proponent Commitments

The proponent has made a number of environmental management commitments in order to protect the environment.

1-1 In implementing the proposal, the proponent shall fulfil the commitments made in the Consultative Environmental Review and in response to issues raised in submissions, provided that the commitments are not inconsistent with the conditions or procedures contained in this statement (These commitments are included in Appendix 3 of this Report).

2. Implementation

Changes to the proposal which are not substantial may be carried out with the approval of the Minister for the Environment.

2-1 Subject to these conditions, the manner of detailed implementation of the proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the Environmental Protection Authority with the proposal. Where, in the course of that detailed implementation, the proponent seeks to change those designs, specifications, plans or other technical material in any way that the Minister for the Environment determines on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

3 Proponent

These conditions legally apply to the nominated proponent.

3-1 No transfer of ownership, control or management of the project which would give rise to a need for the replacement of the proponent shall take place until the Minister for the Environment has advised the proponent that approval has been given for the nomination of a replacement proponent. Any request for the exercise of that power of the Minister shall be accompanied by a copy of this statement endorsed with an undertaking by the

proposed replacement proponent to carry out the project in accordance with the conditions and procedures set out in the statement.

4. Short-term shell sand Access

4-1 The proponent shall only dredge shell sand in areas with limited coverage of seagrasses (< 25% of seagrass cover).

5. Environmental Management Programme

5-1 Within six months of the formal authority issued to the decision-making authorities under Section 45(7) of the Environmental Protection Act 1986, the proponent shall prepare a detailed Environmental Management Programme incorporating the following:

1. Studies into -

a) suitable shell sand resource on Success Bank for use by the proponent beyond 1996 and up to completion of the research and development programmes required below, and a decision by Government on the Environmental Review and Management Programme required in Condition 5-8. This study shall further consider the effects of dredging on the wave climate of any proposed area; and

b) alternative sources of resource.

2. Research and development programmes of an EPA approved standard to be carried out by EPA approved research organisation(s) for -

a) the ecological significance of seagrasses in Owen Anchorage and its surrounds;

b) seagrass rehabilitation; and

c) beneficiation of low grade shell sand resource.

5-2 The proponent shall complete the investigations required by Condition 5-1 within time-frames determined by the Environmental Protection Authority following consultation with the proponent.

5-3 The proponent shall provide, to the Environmental Protection Authority, adequate details of the investigations required by Condition 5-1, including but not limited to the following:

- project description including objectives, milestones and preparation, implementation and completion time-frames;
- project manager and team selection criteria;
- quality assurance and quality control procedures;
- documentation of results; and
- budgets.

5-4 The proponent shall subject the Environmental Management Programme required by Condition 5-1 to a four week public review period.

5-5 The proponent shall implement the Environmental Management Programme required by Condition 5-1 subsequent to meeting the requirements of Condition 5-3.

5-6 The proponent shall report on the progress and performance of the Environmental Management Programme required by Condition 5-1 annually to the Environmental Protection Authority.

5-7 The proponent shall provide resources for independent expert reviews of the above investigations, their progress, and final results and conclusions if required by the Environmental Protection Authority.

5-8 Following completion of the studies required by Condition 5-1 the proponent shall prepare a Environmental Review and Management Programme for long-term access to the shell sand resource in Owen Anchorage or other suitable alternative resource(s). The Environmental Review and Management Programme should be based upon the

results of the studies required by Condition 5-1 and other information available at that time.

6 Time Limit on Approval

The environmental approval for the proposal is limited.

6-1 If the proponent has not substantially commenced the project within five years of the date of this statement, then the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for the Environment shall determine any question as to whether the project has been substantially commenced. Any application to extend the period of five years referred to in this condition shall be made before the expiration of that period, to the Minister for the Environment by way of a request for a change in the condition under Section 46 of the Environmental Protection Act. (On expiration of the five year period, further consideration of the proposal can only occur following a new referral to the Environmental Protection Authority.)

7 Compliance Auditing

In order to ensure that environmental conditions and commitments are met, an audit system is required.

7-1 The proponent shall prepare periodic "Progress and Compliance Reports", to help verify the environmental performance of this project, in consultation with the Environmental Protection Authority.

Procedure

The Environmental Protection Authority is responsible for verifying compliance with the conditions contained in this statement, with the exception of conditions stating that the proponent shall meet the requirements of either the Minister for the Environment or any other government agency.

If the Environmental Protection Authority, other government agency or proponent is in dispute concerning compliance with the conditions contained in this statement, that dispute will be determined by the Minister for the Environment.

7. Reference

Bell J D and Pollard D A (1989). Ecology of fish assemblages and fisheries associated with seagrasses. In: 'Seagrasses: A Treatise on Seagrass with Special Reference to the Australian Region'. (Eds A W D Larkum, A J McComb and S A Shepherd), (Elsevier, Amsterdam) pp 565-609.

Environmental Protection Authority (1991). Cockburn Cement Limited operations in Owen Anchorage. Correspondence from Environmental Protection Authority to Cockburn Cement Limited, 11 February 1991.

Lawson & Treloar J (1987). Cockburn Cement Limited, Dredging Management Plan, Cockburn Sound - Wave Climate changes. Report 1189 prepared for Maunsell & Partners Pty Ltd.

Searle J D and Logan B W (1978). A report on sedimentation in Geographe Bay. Report to the Public Works Department, Western Australia. Department of Geology, The University of Western Australia.

Appendix 1

Proponents responses to issues raised in submissions and long-term Concept Plan

1. *Is it responsible for the proponent to be contemplating further reduction of seagrass meadows given that so much has already been lost from the area?*

The proponent is currently operating legally and responsibly within the terms and conditions of an Agreement Act with the State of Western Australia. Under the terms of this Agreement, the State is responsible for finding an alternative resource in the event that the present resource becomes unavailable. No suitable alternative resource is available for the period of this proposal. Hence the Company has no option but to contemplate further reduction of seagrass meadows other than to cease dredging. However, such an action would have severe repercussions on the State's economy, building industry and metals refining industry.

Since none of the seagrasses to be removed are either rare or endangered, and since the small area affected (some 17 ha) is such a small proportion of that type of habitat available in the metropolitan area (even allowing for the loss of seagrass in Cockburn Sound) the Company is quite confident that its proposal is socially responsible.

2. *Is there any clear evidence that* Posidonia *seagrass meadows can be regrown or is the issue being clouded by the fact that* Halophila *and* Heterozostera *(which are not the dominant genera of seagrasses in Owen Anchorage) seagrasses have been shown to regenerate?*

Whilst there is no clear evidence that meadows of *Posidonia* have regrown in disturbed areas, there is evidence accumulating which suggests this might be possible. The evidence includes:

- observations by LeProvost Dames & Moore (LDM) (October 1993) of *Posidonia australis* fringes 1 - 2 m wide growing over old *Posidonia sinuosa* root mat exposed in mooring scars occurring in 2 - 3 m of water in Thompsons Bay, Rottnest. The patches were growing laterally by rhizome extension;

- observations by LDM (April 1993) of *Posidonia australis* runners growing down the slope of the dredged hole in Parmelia Bank and of an apparent increase in density of grass growing on the slope. It is intended to quantify these observations during the 1994 survey;

- observations by LDM (1993) and Murdoch University (1992-93) researchers, Dr Eric Paling and post-graduate students, of growth of individual plants and runners of *Posidonia sinuosa, Amphibolis griffithii* and *P coriacea* within extensive meadows of *Heterozostera*, growing on the slope of the FPA Channel at 11 - 14m depth;

- successful germination of collected seeds and survival of the seedlings over an extended period (Kirkman); and

- successful transplantation and survival of small blocks of seagrass cut from seagrass meadows (Kirkman, Paling).

It still remains to be demonstrated that transplants will continue to grow and to expand laterally, and for successful techniques to be developed to carry out replanting on a large scale. These are issues which are currently being investigated.

Given that complex multi-species rehabilitation programmes once thought to be impossible are now successfully undertaken in terrestrial and wetland habitats and that there have been recent positive results in seagrass rehabilitation studies in the USA, there seems to be no reason why the regeneration of the floristically much simpler seagrass assemblages should not ultimately also be successful given proper commitment to researching methods and conducting trials on the most promising techniques. It must be recognised, however, that this will take time since there have essentially been no comprehensive replanting programmes undertaken on the coast.

3. *Can the proponent explain the ecological and physical differences of the* Posidonia, Amphibolis, Halophila *and* Heterozostera *seagrasses and why one genus may not provide the same ecological integrity than the others? Which is the predominant seagrass in Owen Anchorage?*

The physical characteristics of the various species of seagrass growing on Success Bank are well described in the scientific literature and naturalists' handbooks. The ecological differences between the species are much less well described. At a superficial level all seagrass species have a number of common characteristics. They all:

- photosynthesise, converting carbon dioxide into sugars;
- provide food and shelter for a variety of marine organisms;
- baffle water movement; and
- bind the superficial sediments.

The extent to which each species carries out these functions will depend on its physical characteristics in the case of physical functions such as sediment binding and baffling of water movement, and a complex web of physical and biological interactions in the case of biological functions. It is this latter area where least is known about the ecological role of the seagrasses.

Owen Anchorage does not have a single, predominant seagrass species, rather the visually dominant species changes in response to the differing habitat conditions encountered. Thus *P australis* and *P sinuosa* tend to be common on the eastern portions of Parmelia Bank; *P sinuosa* is common on the southern and central portions of Success Bank; *P coriacea* on the central part of Success Bank and the western portions of both banks, while *A griffithii* is common on the northern side of Success Bank.

The most widely distributed species in Owen Anchorage may be *Heterozostera* and *Halophila*, the two genera which occur on most parts of the banks and depressions, either alone or as an understorey to the larger species. These species are also the most prolific colonisers of the dredged areas.

Neither the most abundant nor most productive of the eight or more species present has been determined.

The ecological function of each species is different but not necessarily of greater or lesser importance than for any other.

4. *What is the relative significance of the 0-25% against say the 25-50% seagrass density values from an ecological viewpoint? From the data available, how easily can seagrass density maps be made using other criteria (eg 0-10%, 10-20%, etc)?*

The seagrass density (percentage cover) figure provides an estimate of the seagrass standing crop expressed as a percentage of the area of the seafloor covered by seagrass. Thus the 25 to 50% category will have a greater coverage than the 0 to 25% category. These categories (or for that matter any other categorisation which might be adopted) cannot be used as indicators of the ecological value of one area as opposed to another, or of the productivity of those areas.

These categories were never intended to be used as a measure of relative ecological significance, which is not known. Rather, they were used to show the differences in seagrass cover which occur on the Bank, and also that Cockburn has located its proposed dredging area in a zone of primarily low density seagrass, considered a key issue by the EPA.

The seagrass density figure presented in the CER shows relative seagrass density on various parts of Success Bank based on interpretation of the differing phototones which can be mapped from high quality water penetrating aerial photography and confirmed by ground truthing. Early work on seagrass mapping from aerial photography was generally limited to only two categories, ie presence or absence. Improvement in photographic techniques and position fixing accuracy has allowed the interpretation to be extended to the limits presented in the CER with a high degree of correlation to ground truthing results.

However, each increase in the number of classes differentiated increases the error factor inherent in the mapping and greatly increases the number of site observations required for accurate ground truthing.

5. *Given the significant historical loss of seagrass meadows in the area and their ecological significance, shouldn't they be protected in a similar manner to wetlands on land?*

Seagrasses are protected in a number of marine parks and reserves, eg Marmion Marine Park, Shoalwater Islands Marine Park and Rottnest Island, and in the World Heritage Area of Shark Bay. In addition, as Crown Lands, seagrass areas are generally protected unless specific approval is given for their disturbance, as under Cockburn's Agreement Act.

Historically the major losses of seagrasses in Western Australian waters have occurred as a result of pollutant discharges and associated eutrophication problems, eg Cockburn Sound and Albany Harbour. By comparison, the remaining losses have been small and confined to specific development requirements, resulting from navigational requirements and also from Cockburn's operations under an Agreement Act. The estimated loss from Cockburn Sound is some 3100 ha. The loss from the FPA Shipping Channel (Parmelia and Success Banks) is 242 ha of bank habitat and losses from Cockburn's operations on both Success and Parmelia Banks is estimated at 210 ha of bank habitat (1993 assessment); recent research shows that natural regrowth of seagrasses has occurred in parts of dredged areas. Additional small losses have occurred in the immediate vicinity of marinas, breakwaters, jetties and moorings in the region.

In habitats adjacent to the metropolitan shoreline (Becher Point to Ocean Reef), from an estimated 13,000 ha of seagrass present prior to the industrialisation of Cockburn Sound, some 10,000 ha or 75% now remains. In comparison, estimates of remnant terrestrial habitats in the Perth Metropolitan Region suggest that less than 25% of wetlands and less than 10% of banksia woodland areas remain, while occurrences of tuart woodland and coastal Callitris woodlands are rare and the remnants mostly highly modified.

As none of the seagrass species recorded to-date on Success Bank is known to be confined to the Metropolitan region, unlike the situation with some rare terrestrial species which are known to be confined to the Metropolitan area, the need for the total protection of all the remaining seagrass has not been demonstrated.

6. *Shouldn't the proponent prove that* Posidonia *seagrasses can be restored in areas already dredged before proceeding with more dredging?*

The Company has at all times operated within the terms of its Agreement Act with the State. In 1986, this Act was amended to include environmental conditions to be monitored via the establishment of a Dredging and Management Programme and Committee. To-date, four DMP reports have been submitted. Whilst the Company has been directed (in late 1990) to investigate alternative sources of high quality sands, it has never been directed to rehabilitate dredged areas, largely because it was thought to be impossible and unnecessary in the floor of a channel which eventually will be used for navigation by shipping into Cockburn Sound.

It is only as a result of the Company's recent initiative in funding private research into seagrass restoration that findings are emerging which indicate that it may be possible to in fact restore *Posidonia* and *Amphibolis* seagrasses into dredged areas. However, proving that restoration on a large scale can be accomplished will take several years during which time the Company has contractual obligations to meet, which it entered into on the strength of its Agreement Act with the State. The consequences of stopping dredging until seagrass restoration is proven (refer Question 1) are substantial and not considered socially responsible.

Furthermore, the Company has committed (see Section 7 CER) to continue research into restoring seagrasses to previously dredged areas. This research is currently being conducted by Murdoch University biologists.

7. *Currently, the proponent accesses the shellsand at minimal cost, it pays no royalties to the State and no rehabilitation has been undertaken although operations have been in place for more than 20 years. In this situation it would seem appropriate for the proponent to ensure that the highest level of environmental protection is provided. Does the proponent consider its proposal meets such a standard in this proposal?*

The original Agreement with the State was initiated in 1971 before the pollution problems and the consequent loss of seagrass in Cockburn Sound were known.

An important consideration in the original Agreement between the State and the Company was that dredging would take place in a manner mutually acceptable to the Company and the Fremantle Port Authority. As a result, very substantial progress has been made towards completion of a second shipping channel through Success and Parmelia Banks, at no cost to the Authority, and the "no royalty" provision must be viewed in this context.

No rehabilitation has been undertaken because it was both not required by Government nor was it considered to be possible by the scientific community. It is only as a result of the Company's initiative in conducting research that the possibility of rehabilitation is now being considered seriously.

The Company was only advised in late 1990 to find alternatives to dredging in seagrass meadows on Success Bank and, since then, has expended considerable sums of money investigating alternative options, only to find that no viable alternatives exist in the short term.

Given the above background, the Company considers that the dredging programme proposed in the CER meets the highest level of protection that can be afforded to seagrasses while still being able to access the 67 ha required for the two year period. Recognising the concerns with seagrass loss in the State, the Company has proposed that it dredge selectively in either bare sand or low density seagrass areas rather than higher density meadows over the next two years in order to minimise the losses of seagrass in the area in which the required grades can be won.

Overall, Cockburn Cement's Environmental Policy (CER, p.31) is to establish and achieve practicable environmental performance standards that are acceptable to the community as a whole.

8. *Is the proponent satisfied that its pre-mining fields surveys provide an accurate reflection of the available resource? If problems have been experienced in the past with this issue (as identified in the CER) what has been done to improve the situation?*

The pre-dredging field surveys for the area identified in the CER accurately reflect the available resource.

Up to 1986 the total resource available had been identified by a 200 hole drilling programme. Since that time, a further programme of 187 holes down to -15 metres has been completed. This enabled a new estimate of total available shellsand resource for Parmelia and Success Bank to be completed in 1990. As a result, the resource is now better defined, but it is still possible that some previously unrecognised low grade areas will be encountered as dredging proceeds.

9. *Can the proponent more clearly explain its need for high quality shellsand (eg 92%) and why the substantial volumes of shellsand of apparently slightly lower quality (eg 89%) are not acceptable? Is the required quality of shellsand a contractual obligation or is it an industrial process limitation issue?*

The ideal material for producing quicklime contains 98% (or above) calcium carbonate. High grade limestones meeting this requirement exist in some parts of the world. There are no such materials within 500 kilometres of Perth, and transporting them from other locations would render the lime making process uneconomic.

The requirement for 92% quality shellsand enables the specifications and requirements of quicklime users to be met, albeit with a quicklime that is of low "available lime" grade by world standards. The use of 89% quality shellsand, for example, would result in quicklime of below 70% "available lime" which would not meet users' specifications, would cause significant process problems and cost increases for the users and would not be acceptable to them. Therefore the required quality of shellsand is both a contractual obligation and an industrial process limitation issue.

10. *If this proposal is approved will the change in depth of Success Bank result in effects on the wave height or in-shore ecosystems?*

No. The larger scale studies referred to in Section 4.2.2 concluded that effects of dredging a much larger area than that proposed in the CER would have negligible effect on wave height. As a result, no adverse effects on near shore ecosystems are anticipated.

11. *Is it fair to say that the limitations to dredging other areas for shellsand relate significantly to investment (new dredge and equipment) and technology (development of beneficiation) limitations? Given the time the proponent has had to consider these issues, why is it only now that the issues are being addressed?*

Under the terms of the 1971 Agreement Act which gave the Company dredging rights "within that part of the sandbanks as lie within a radius of five (5) miles from a point marked 'R' located on the eastern shore of Owen Anchorage". The Company has invested in both floating and shore based plant designed specifically to extract shellsand within this area.

The Company, as outlined in Section 1.3.2 of the CER, addressed and endeavoured to resolve its ongoing requirements by further exploration and developing new technology without success and at considerable cost. The last 10 year plan approved by the Minister was DMP2, covering the period 1989 to 1998. It was not until late 1990, when DMP3 was submitted, that the Company was requested to consider alternative resources and methods, and this process is still being pursued.

12. *Does the proponent consider the historical seagrass losses and the potential losses associated with its proposal to be environmentally significant when considered separately and together?*

The perceptions on whether losses of part or all of an ecosystem are environmentally significant are highly subjective and therefore it is difficult to respond objectively about whether losses of one part or another of the system is significant. Moreover, there are no criteria yet developed for Western Australia seagrass systems on which their environmental significance can be meaningfully assessed. Development of such criteria, without a considerable and long term research effort, are reliant on available data and the perceptions and intuition of those making the assessment.

The estimated seagrass loss from Cockburn Sound is some 3100 ha. The loss from the FPA Shipping Channel (Parmelia and Success Banks) is 242 ha of bank habitat and losses from Cockburn's operations on both Success and Parmelia Banks is estimated at 210 ha of bank habitat (1993 assessment). In habitats adjacent to the metropolitan shoreline (Becher Point to Ocean Reef), from an estimated 13,000 ha of seagrass present prior to the industrialisation of Cockburn Sound, some 10,000 ha or 75% now remains. There is no evidence that the beneficial uses of the dredged area, the entire study area (i.e. Success and Parmelia Banks and Owen Anchorage) or the adjacent beaches and man-made structures have been adversely affected by Cockburn's dredging operation.

Looking to the proposal, with the mitigation approaches that are planned (Section 5.2.2 of CER), further seagrass losses arising from dredging during the 1994-1996 period will be minimised. Further progress is anticipated both in understanding the dynamics of natural regrowth and developing

restoration/transplantation techniques for seagrass. The Company believes that the areas proposed for dredging in the CER, that is removal of 67 ha of low density seagrass or bare sand, viewed against the considerably greater area of higher density seagrass meadows present in the metropolitan area is, intuitively, unlikely to represent a regionally significant loss to the community and unlikely to lead to loss of the seagrass gene stock of the regional seagrass ecosystem.

13. *What areas have been proposed for the proponent's long term dredging proposal? If the area involves additional losses of seagrass meadows has the proponent committed to using this resource only if it proves that the regeneration of* Posidonia *and* Amphibolis *seagrass meadows is possible?*

In discussion with the EPA and DRD, following the proponents CER submission and in response to the questions raised on the submission, the longer term issues were seen to limit the full consideration of shellsand resource access. On this basis, the proponent has developed, in conjunction with DRD, a concept plan. This concept plan will, when expanded to form an implementation plan, effectively allow the EPA to consider all issues related to both short and long term access to shellsand. The basis of the concept plan is shown in Attachment I and is based on a commitment by the proponent for ongoing research and development in four strategic areas. The implementation plan would include specific target dates, resource commitments by the proponent, and performance criteria. See also CER 5.2.2 (i), (ii), (ii) and (iv).

The strategic areas of the concept plan are:

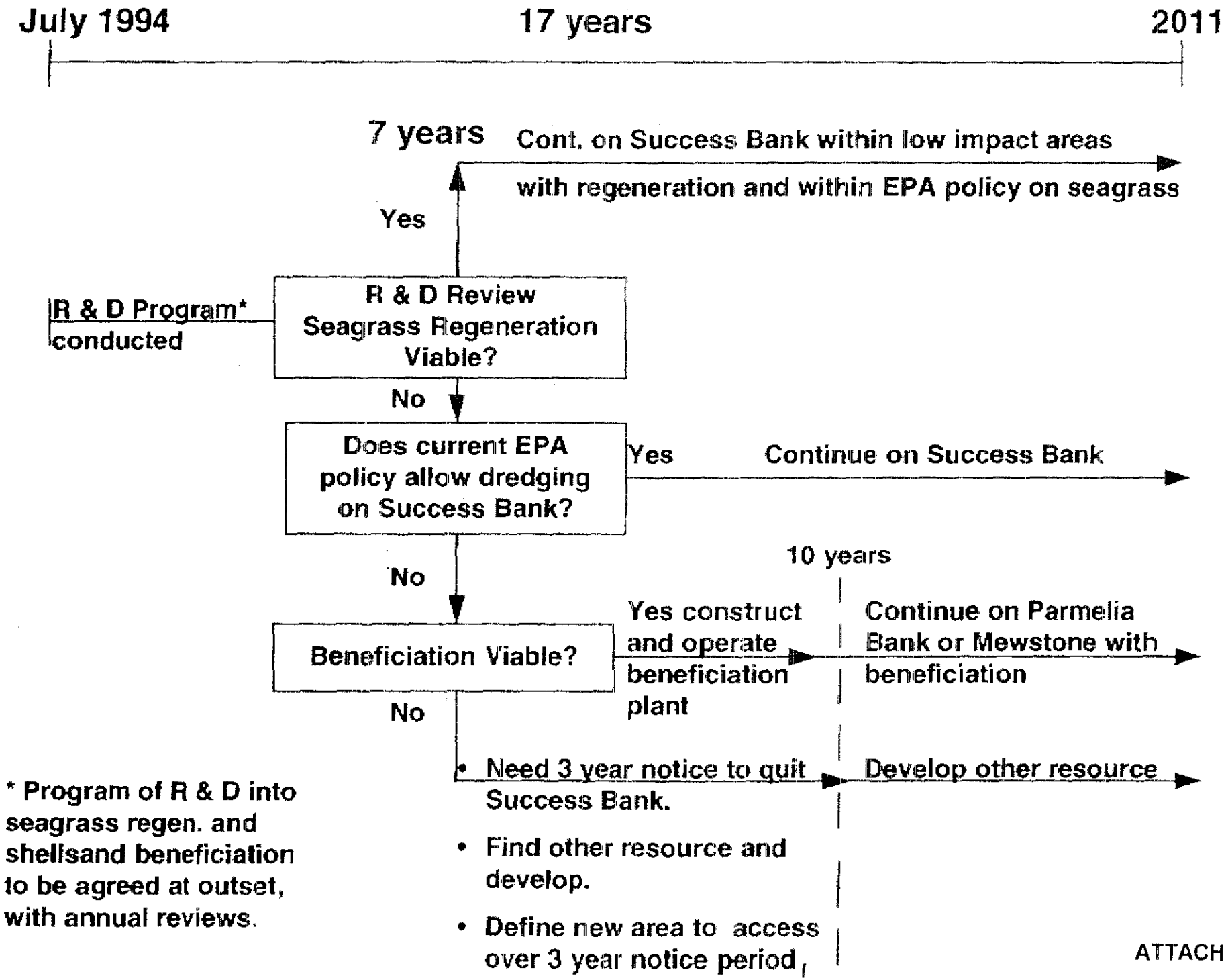
1. Seagrass restoration
2. Habitat enhancement
3. Beneficiation
4. Modification of wave characteristics

Seagrass Restoration

The research and development on seagrass restoration will focus on three distinct areas:

1. The development and implementation of techniques for the removal and transplanting of large clumps of seagrasses. The programme will incorporate a sophisticated eco-system management programme to evaluate plant chemical analysis, soil and seabed composition, water quality, light attenuation, wind/currents/tides, weather and other scientific requirements.

2. The proponent's current research and development programme, carried out in conjunction with Murdoch University to gain further understanding of the dynamics of seagrass regrowth, restoration and transplanting techniques, both offshore and in controlled laboratory



ATTACHMENT I

situations, will continue for a further 5 years period, or until such time as sufficient data has been collected to obtain a level of confidence of success.

3. The continued investigation into improved dredging techniques to minimise the loss of seagrass, and carry out further investigation of leaving undulated seafloor to provide seagrass recolonisation.

Habitat enhancement

The proponent proposes to carry out a staged 5 year programme to investigate the feasibility of establishing a number of artificial reefs within the dredged areas. The purpose of the reefs will be to increase the complexity and diversity of habitat available in the region and thereby producing localised increase in bio-productivity of the dredged sites.

Beneficiation

The potential benefits to the proponent and to the environment of being able to beneficiate low grade shellsand make it worthwhile to investigate this technique further. The proponent therefore proposes to continue its inhouse investigation into technical and economical feasibility of this technique. It has established a pilot plant at its works and, over the next 2 years, will continue to develop techniques, which will determine a sufficient level of confidence as to whether the project is viable in a large scale commercial type of operation. Significant time and capital expenditure will be needed to determine the technical and economical viability of this process.

Modification of wave characteristics

In order to determine the potential for wave climate changes, as a result of changes in bank bathymetry resulting from our dredging operation and its possible effects on coastal stability and shipping, the proponent intends to model the effects of dredging and wave attenuation, and any possible effects of wave climate on the FPA channel shellsand banks, seagrass habitat and coastline within Owen Anchorage.

The results of this overall concept plan will give a higher degree of confidence for the proponent's future ongoing dredging operation, and the longer term goals and environmental issues required for management of the area.

14. *In the event that this proposal is approved, has the proponent committed to compensate professional and recreational fishermen for any losses that might be experienced?*

No. The proponent does not commit to compensate professional and recreational fishermen for any losses that might be experienced.

There is no evidence to support the inference that local seagrass is a breeding habitat for commercial and recreational fish species and according to a recent article in Western Fisheries, Summer 1993, most scientists agree that very few organisms depend on seagrass as a direct food source.

Furthermore, it is unlikely that any changes in commercial and recreational fish stocks can be attributed to the proposal.

There have been a number of human impacts on the area previously (see for example the CER, page 20, last paragraph). Furthermore it may be arguable that any reduction in catch is due to over-fishing or new methods of fishing used by recreational and commercial fishermen themselves.

It is inevitable that when a particular area is subject to a number of beneficial uses that those uses will impact on each other. Multiple beneficial use in an area is a question of mutual accommodation and policy and should not give rise to questions of compensation.

The concept of compensation for a reduction in catch for fishermen appears to us to constitute an incentive for non-productivity.

In the above circumstances the compensation issue is inappropriate and the proponent would not be committed to compensation to professional and recreational fishermen.

However, the proponent has committed to investigating the feasibility of establishing replacement habitat and rehabilitating dredged areas.

15. *Is it likely that disturbance of the seafloor will release nutrients which may in turn have a detrimental impact on the marine ecosystem?*

It is anticipated that the dredging process will result in the release of some nutrient, however, the quantities are believed to be small and the nutrient quickly assimilated by the surrounding ecosystem. Observations on dredged areas of Owen Anchorage, including dredging by Cockburn, intensive maintenance dredging by the FPA and disturbance of sediments by the passage of ships through the FPA Channel, have shown no detrimental impact on the ecosystem, using as indicators of nutrient enrichment enhanced epiphyte growth and seagrass dieback around the fringes of dredged areas.

The periodic discharge of nutrient rich water from the Swan River into adjacent coastal waters including Owen Anchorage is considered a far larger source of nutrients than that generated by the sediment disturbances described above.

16. *Is it fair to say that access to the shellsand on a royalty free basis (provided by the State Agreement Act) makes it impossible for alternative shellsand proposals to compete even though they might otherwise be profitable?*

The "no royalty" basis of the Agreement, while of financial significance for the Company's dredging operation, must be viewed in the context explained under Question 7. However, it is not true to say that the absence of a royalty makes the present operation more profitable (or financially attractive) than an alternative shellsand proposal with a royalty payable at levels applicable to comparable materials.

None of the alternatives described in Section 2 of the CER would be more financially attractive than the present operation, even if they were all available on a "no royalty" basis. In most cases there are also technical problems, as detailed in the CER, which make the alternatives non-viable.

17. *From a socially responsible perspective is it not reasonable for the proponent to approach the seagrass meadows issue on a more cautious manner? This might involve substantial investment in research and new equipment but the alternative (ie loss of seagrass meadows) is surely a higher price to pay.*

The issue of social responsibility has been dealt with in answers to Questions 1 and 6, and the reader is referred to those answers.

The proponent is adopting a cautious approach in proposing to dredge primarily in areas of low seagrass density.

Cockburn is continuing its research programme into trial planting of different seedlings, replanting of clumps up to 300mm and developing an underwater machine to allow replanting of clumps up to 1 square metre.

At Cockburn's Woodman Point washing plant, seagrass is being grown in tanks to study regrowth patterns and seedling raising using recirculated water taken directly from Owen Anchorage.

These research projects are undertaken in parallel with private environmental specialists and PhD students from Murdoch University's Environmental Science faculty, directed by Dr Eric Paling and Professor Arthur McComb.

Scientific evidence compiled by Cockburn has shown that natural regrowth of seagrasses has occurred in parts of dredged areas as little as 18 months ago.

As in other aspects of its management, Cockburn Cement adopts a socially responsible perspective in managing its environmental impacts and particularly in the long-term planning of its dredging operations. In relation to dredging in the Owen Anchorage area, a range of philosophies is possible, the two extremes of the range being an absolute conservationist approach (ie zero environmental impact) and an absolute short-term economic gain approach (ie zero attention to environmental impact). Neither extreme is necessary in this situation and neither is acceptable.

In view of the minimal impact that has resulted from the last 22 years of its dredging operation (see also answer to question 5) and the rate of increase of understanding of this aspect of the environment (assisted in no small measure by Cockburn's own research), the proposal is socially responsible and low in environmental risk.

18. *Can the proponent explain the apparent inconsistency where 3.7 million tonnes is required for the two year period (Section 1.4 CER) and in Section 1.2.1 of the CER the figures suggest closer to 3.5 million tonnes per year is currently being dredged?*

Section 1.2.1 of the CER correctly states the specification capabilities of the dredge, not allowing for relocation, maintenance and weather downtime: using the figures in the CER, the dredge has a hypothetical capacity of 800 tonnes x 12 hours x 365 days or 3,504,000 tonnes a year. However, the actual dredging output is limited by the filling and travelling time of the three barges from the dredge to the washing plant and return. Depending on the area of operation there is a waiting time before the next barge load is filled. Current market requirements for the next two years require the dredge to provide 3.7 million tonnes for the two year period; this covers current forecasts of demand plus a contingency factor to allow for unanticipated increases in demand.

19. *Does the proponent's proposal meet the requirements of Ecologically Sustainable Development?*

Ecologically sustainable development means using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained and the total quality of life, now and in the future, can be increased (Commonwealth of Australia, June 1990).

The federal government considers the five key elements of ecologically sustainable development to be:

- integrating economic and environmental goals in policies and activities;
- ensuring that environmental assets are appropriately valued;
- providing for equity within and between generations;
- dealing cautiously with risk and irreversibility; and
- recognising the global dimension.

Giver the above definitions, Cockburn believes that its proposal to dredge 67 ha of Success Bank, of which 50 ha is relatively bare sand, does not conflict with ecological sustainable criteria.

The Company's activities provide an important source of materials to the State and the Company also provides employment to a large number of Western Australians. At the same time, its dredging operations are tightly regulated through its own environmental policies, through its environmental commitments within the Agreement Act and through scrutiny of its Dredging and Management Plans by Government, thus integrating economic and environmental goals in a fashion that is acceptable to the Government of the day.

The value of the seagrass asset, and the recognition of the increasing global interest in seagrass conservation, has been clearly demonstrated through the work undertaken as part of the Company's environmental programmes and through its own voluntary research programmes initiated collaboratively with seagrass scientist in this State.

Within the operational constraints identified in the CER, the Company has attempted to deal cautiously with the risks of seagrass loss by targeting the lowest density or least vegetated sections of the seafloor over the two year period requested and thus avoiding removal of the more extensive meadows of higher density on the Bank.

It is considered extremely unlikely that the seagrass loss resulting from the proposal will adversely affect marine ecological processes within the metropolitan region, considering the area to be affected (see answer to question 5, above). Furthermore, there is no indication that seagrass losses to date have had more than localised effect, nor is there any indication that the community has suffered a loss in beneficial use as a result.

Rather, the community's quality of life (standard of living) has benefited from the economic activity and employment generated by Cockburn, and export income generated by industries which maintain their place in the market through access to the lime produced by Cockburn.

20. *Does the proponent plan to complete the second shipping channel through both Success and Parmelia Banks?*

This question is covered in Sections 2.1 and 2.5 of the CER.

The channel in Success Bank will be completed on or before September 1994 apart from the remaining material in the northernmost section which is too low in quality to be suitable for Cockburn's manufacturing process and will be left in situ.

The Company does not intend to complete the channel through Parmelia Bank in the foreseeable future, again because the material is not suited to its manufacturing process.

21. *The proponent's commitments appear to be lacking. Any commitment to undertake investigations and continue monitoring must also include a similar assurance that action will be taken to implement the findings. Additionally the investigations and monitoring cannot continue forever. Does the proponent agree?*

The cost of monitoring and research ensures that Cockburn will not pursue these activities beyond that which is necessary to assess the impact of their operations and to determine the viability of rehabilitation techniques. However, such investigations to be effective have to be carried out for sufficient time to develop an understanding of the time scales involved in the processes being monitored.

It is in Cockburn's interest to implement research findings which assist in minimising its impact on the environment such that the community considers it desirable to allow continued access to the resource. However, no company can responsibly commit itself to implement research findings without knowledge of what those findings may be, or how they might affect the future operations and viability of the Company.

Cockburn is already implementing the preliminary findings of slope stability studies in the development of its dredging plans, and proposes to undertake full scale seagrass transplantation/rehabilitation work, depending on the success of field trials.

22. *To what extent is the problem of resource availability an issue of capital expenditure (ie the purchase of a new dredge capable of accessing deeper water, etc).*

Within the two year period of the proposal, capital expenditure is not a constraint in selecting suitable resource areas. This is because appropriate plant could not be brought into operation by 1996.

In considering alternatives to the proposal (Section 2 of CER) capital expenditure would become a significant issue in the case of any need for beneficiation and the winning and processing of the alternative resources available on Mewstone and Parmelia Bank; however it is not the capital expenditure issue in the first instance that eliminates these alternatives from being feasible for the 1994-1996 period.

23. *Has the proponent investigated the issue of shellsand beneficiation overseas and what are the findings?*

The Company has carried out and is continuing its research worldwide with various companies including those from overseas and the position is as stated in Section 2.6 of the CER.

24. *Has the proponent considered the dependencies of the renewable resources in Cockburn Sound (fish and mollusc species) on the seagrass habitats of Success Bank?*

The proponent has considered in general terms the effect of removal of seagrass habitat on renewable resources but has been unable to find applicable data on areas affected by loss of seagrass and consequently has adopted the precautionary strategy of minimising the area of seagrass affected until the results of studies on the productivity of other habitats in Owen Anchorage are completed.

Should the renewable resources of Cockburn Sound prior to industrialisation have been dependent on seagrasses, then the loss of seagrass could have been expected to have a very marked affect on Cockburn Sound productivity. Such an effect, if it does exist, has never been documented.

The Cockburn Sound Environmental Study 1976-1979 (DCE, 1979) found that the Sound yielded large (760 live weight tonnes professional and 330 tonnes recreational) catches of both scale fish and crustaceans following the loss of seagrass in that area, however, as no similar study had been conducted prior to the loss of the seagrass, productivity comparisons could not be drawn. That study also concluded 'that the species which were found to frequent the seagrass habitat were of limited direct benefit to commercial and recreational fishing interests'.

Similarly there is no pre-dredging baseline for Success Bank (the first stage of shipping channel construction having taken place in 1919) and it is unlikely that it would be possible to separate in the short term the effects of losses of small areas of seagrass from natural variations and other human impact, including fishing pressure, on Success Bank overall. However, the effects of shipping channel dredging are not known to have had any impact on the renewable resources of Owen Anchorage.

25. *The significance of the reported recolonisation of previously dredged areas with flora and fauna needs to be determined with information on:*

- *the extent of the recolonisation and time-scale for recovery;*
- *the nature of the assemblages recolonising the dredged areas (species composition, densities, distribution and productivity); and*
- *the extent to which these recolonised assemblages provide the same support for the renewable resource previously supported by the habitats removed in the dredging process.*

Has the proponent already considered these issues (which is not evident in the CER) or are they asking for access to seagrass meadows based on a commitment to investigate them?

The proponent has considered these issues in its Dredging and Management Programme, Numbers 3 and 4, and as a result conducted the preliminary studies in 1993 which resulted in the findings of regrowth of a wide range of seagrass species on dredged slopes, as well as the recolonisation of dredged basins by a range of biota. The proponent is asking for access to areas of

Success Bank containing limited seagrass meadows to enable it to continue its investigations into quantifying the characteristics of recolonised dredged habitats.

26. *What is the relevance of a statement that says only 4% of the available seagrass habitat of Success Bank will be lost if the CER is approved? Surely, the significance of this percentage loss cannot be determined in the absence of a detailed understanding of the habitat values which apply to the 17 ha of seagrass to be removed.*

The quotation of the figures of 4% of the Success Bank seagrass habitat and 1% of Metropolitan seagrass habitat allows the reader to put into perspective the loss of the 67 ha of bank habitat arising from this proposal. The figure is a factual statement, on available data, of the proportion of the bank affected by the proposal, nothing more.

In this estimate no attempt has been made to assign a habitat value to the area affected because it is not definable. Rather, a conservative approach has been adopted whereby the whole of the area contained within the 67 ha has been assumed to be of equal value to any other area of seagrass on Success Bank, even though most (50 ha) of the proposed dredge area contains little or no seagrass.

The figure of 17 ha, which represents the area of higher density seagrass present within the 67 ha proposed for dredging, is approximately 1% of the area of Success Bank habitat which has been shown to support some level of seagrass growth.

27. *Australia is party to the Rio Declaration (UNCED 1992) which, inter alia, endorses the precautionary principle as guide to environmentally relevant actions. How does this proposal comply with that principle?*

Principle 15 of the Rio Declaration (the Precautionary Principle) provides:

> 'In order to protect the environment, the precautionary approach shall be widely applied by States accordingly to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effect measures to prevent environmental degradation.'

We believe that the proposal as outlined in the CER does not run counter to the precautionary principle as a guide to environmental actions since:

- the Declaration applies to threats of serious or irreversible damage, which is not the case here, since the area affected is small at the regional scale and the damage is not likely to be irreversible, with

seagrass colonisation having been demonstrated in previously dredged locations in the vicinity of the proposal;

- the Company is proposing a number of measures aimed at mitigating the effects of dredging;

- the proposal deliberately targets bare sand or low density seagrass habitat to minimise seagrass losses and to reduce the effects of any losses on the ecosystem.

28. *The proponent plans to deploy beacons for accurate dredge control. Would it not be better to fix the beacons in position (possibly as piles) which are visible from the air? This modification would allow accurate aerial photography to monitor impacts on seagrass meadows and the dredge operations.*

Because Owen Anchorage and adjacent Success and Parmelia Banks are used for a range of activities by others, (See Section 3.4 CER), it is normal practice to place visual marker buoys to delineate the area to be dredged. The location and placement is fixed using a Satellite Global Positioning System (GPS) which is accurate to within 10 metres and is monitored by the Fremantle Port Authority who also carry out the surveys of the seabed dredged.

Aerial photographic technology today is such that accurate pinpointing of dredged areas and the seabeds can be achieved without having to install permanent beacons.

29. *What evaluation/performance criteria does the proponent consider to be appropriate with regard to its commitments to investigate shellsand beneficiation and seagrass restoration issues? What is the anticipated time frame to obtain useful results from these investigations?*

The evaluation/performance criteria considered appropriate for investigating shellsand beneficiation are:

- that a technically feasible and cost effective method be developed on a large commercial scale for beneficiation of low grade shellsand and disposal/alternative use of significant quantities of waste silica sand.

The proponent is continuing both laboratory and pilot scale trials on the beneficiation of shellsand in order to prove scale and commercial viability. Over $1 million has been expended to date.

Beneficiation may be technically feasible in the long term but not within the two year period covered by the CER.

The evaluation/performance criteria considered appropriate for seagrass restoration are:

- that a practical and cost effective technique for removal of all seagrass ahead of dredging and replanting in suitable locations can be established and that the transplanted seagrass can be shown to survive with at least a density that will ensure re-colonisation to its previous density over a realistic period;

- that a method can be developed to plant artificially cultured seedlings or runners which will show a rate of growth and expansion such that the area of seagrass lost will be replaced within a realistic period, acceptable to the authorities and the company; and

- the above can be implemented economically.

Since recent experimentation by a number of workers has shown that it is possible to transplant seagrass and for it to survive to-date for periods of two years or more, in some cases without any demonstrable expansion, it is concluded that transplant trial results showing both survival and expansion of transplants could not be conclusively demonstrated in a period of less than five years.

30. *To what degree is the proponent suggesting that artificial reefs will replace the functions of seagrass meadows?*

The concept of placing artificial reefs in Owen Anchorage was suggested as a means of providing an additional fishing resource, primarily for recreational fishermen. It is not suggested that such reefs would replace the ecological function of the seagrass meadows. Artificial reefs develop their own biological communities based on macro algae as the principal primary producers and generally support different species of invertebrates and fish, to those occurring in seagrass meadows.

PWT/MEB
11th April 1994

Appendix 2

List of organisations and individuals who made submissions

- Western Australian Naturalists' Club
- City of Cockburn
- Department of Minerals and Energy
- Department of Resources Development
- Coogee Beach Progress Association
- Western Angler
- Town of Kwinana
- W.A. Recreational Sportfishing Council
- W.A. Fishing Industry Council (Inc.)
- Conservation Council of WA
- Fremantle Port Authority
- Fisheries Department of WA
- CSIRO, Division of Fisheries
- Waterbird Conservation Group
- Gypsum Industries of Australia and Aglime of Australia
- Confederation of Affiliated Residents and Ratepayers Association of W.A.
- Precious Metals Australia Limited
- The Greens W.A.
- Perth Game Fishing Club
- Meridian Environmental
- Wetlands Conservation Society
- Ms M Jenkins
- Ms K Bakitch
- Ms N Lapthorne
- Dr P Woods
- Astrid Herlihy
- A & H Reddyhough
- Mrs J Payne
- Mr P Corser
- Ms J Dellow
- Mrs E Quinn
- Mr O Johnston
- Ms D Carr
- S Edwards

Appendix 3

Proponent's list of environmental management commitments

COMMITMENTS

Cockburn Cement Limited confirms that it has no option but to dredge on Success Bank, and that it will dredge only within the agreed boundaries of the short-term dredging strategy over the two year period of the CER.

Furthermore, the Company reaffirms its commitment to its Environmental Policy, to the preparation of an ERMP for its long-term dredging strategy, and the associated Environmental Investigation Programme outlined below:

- continue existing DMP study commitments;
- test and develop mitigation techniques for the long-term dredging strategy;
- minimise the effects of the short-term dredging strategy.

DMP Commitments include:

- shoreline monitoring between Woodman Point and Catherine Point;
- monitoring of stability and seagrass dynamics of dredged slopes;
- detailed seagrass mapping of Success Bank resources;
- characterisation and quantification of the biotic component of dredged habitats;
- photographic monitoring of the study area.

Mitigation Techniques include:

- investigations by Murdoch University into means of restoring seagrass to dredged areas;
- investigations into improved dredging techniques to minimise seagrass loss;
- investigations into techniques for bulk transport of seagrasses;
- investigations of beneficiation of lower grade sands to enable dredging in alternative areas;
- investigations into enhancement of dredged areas for recreational use by establishing artificial reefs.

Dredging Management will include:

- accurately marking the boundaries of the dredging area;
- dredging the boundaries to maximise the rate of slope stabilisation;
- monitoring of slope stability and compliance with dredging area boundary proposed.