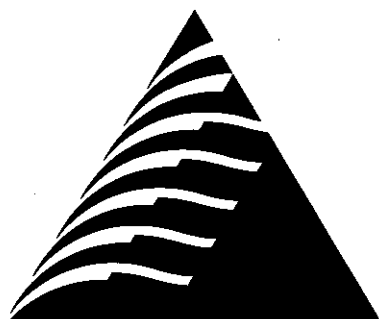




ANNEX

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**Coastal Hazards
and
Dune Stability**



AUSTRALIAN WATER
AND COASTAL STUDIES

FERN BAY DUNE STABILISATION

POSITION PAPER

REPORT 93/36

SEPTEMBER 1993

**AUSTRALIAN WATER AND
COASTAL STUDIES PTY LTD**

FERN BAY DUNE STABILISATION

POSITION PAPER

REPORT 93/36

SEPTEMBER 1993

Prepared by:

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Foreword

This position paper was prepared for Landcom and Howship Holdings Pty Ltd and relates to a proposal to rezone land at Fern Bay for residential development. The paper presents a program for stabilising the mobile dune field on the site in a manner which provides protection to, and is co-ordinated with, progressive development of the site.

The work was undertaken by the joint consultants Geomarine Pty Ltd and Australian Water and Coastal Studies Pty Ltd (AWACS), acting on behalf of the clients.

Information published in this report is available for general release only by permission of the clients.

Acknowledgements

During the course of the study consultations were held with a number of people whose assistance is gratefully acknowledged. In particular, thanks are extended to:

- Mr Peter Dwyer and Mr Jeff Hunt - Department of Conservation and Land Management, Newcastle.
- Mr Stephen Leathley - Port Stephens Shire Council
- Lieutenant Colonel Bob Senior - Australian Defence Force Academy
- Ms Patricia Michell - LANDCOM
- Mr Terence Baird - Howship Holdings Pty Ltd
- Mr Tony Tribe - Giles Tribe Architects Pty Ltd

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1 Introduction

1.1 Background

This position paper has been prepared on behalf of **LANDCOM** and **Howship Holdings** and relates to a proposal for rezoning of three parcels of land at Fern Bay within Port Stephens Shire at the southern end of Stockton Bight.

The brief provided by the client and modified through subsequent discussions and meetings required that this report should advise:

- the minimum stabilisation works required to protect the proposed development on the **Howship Holding Land**, **Department of Housing Land** and the adjacent **Crown Land**;
- latest starting date for stabilisation works in terms of the rate of release of land proposed;
- progression of stabilisation in distance and time with respect to development; and
- principles governing the progression of development.

The stabilisation works are considered and costed individually for the **Howship/Department of Housing land** and for the adjacent **Crown Land**.

In considering the rezoning of this land to residential, Port Stephens Council is cognisant of the hazard to the back beach area from aeolian sand drift. This problem is immediate to a portion of the land proposed for re-zoning and will continue to threaten additional land if not addressed.

These issues were raised by Port Stephens Council in a letter dated 3rd March 1993. In conclusion Council requested, among other things, that prior to determining the rezoning application

"iii) Council has information on how the dune stabilisation works are proposed to be funded and what the program of works will be;

iv) Council is satisfied that there is a commitment to finish the dune stabilisation and that it won't inherit a liability;"

This report, in part, addresses these requirements.

The stabilisation works proposed within this report represent the minimum work required to allow the development of the allotments to proceed on the basis that the aeolian hazard will be removed prior to any new development being at threat. We do not recommend that development proceed within the designated 100 year hazard zone until such time as it has been verified that this hazard has been effectively removed.

Included is the staging of the development in broad terms such that the stabilisation can be completed prior to assessing whether development may proceed within the 100 year hazard area.

1.2 Data Source

The extent and nature of the sand drift problem has been clearly defined in a series of reports prepared by the **Public Works Department (1977)**, the **N.S.W. Soil Conservation Service (1985)** and **Australian Water And Coastal Studies (AWACS, 1992a)**. These previous studies define the rates of transgression of the aeolian dunes and the magnitude of other coastal hazards. They have been used as the basis for developing the stabilisation works now proposed in this report. Additional field data collection has not been undertaken.

1.3 Basis for Costing

The method of undertaking the stabilisation work and the approximate costings of the works required are presented in detailed reports by **AWACS (1992b)** and by the **Department of Conservation and Land Management (CaLM, 1993)**.

The precise method of stabilisation will be determined through the preparation of a detailed specification for the work and the letting of a tender at the appropriate time. This stabilisation will likely include the types of techniques proposed by CaLM but may also accommodate the construction of necessary infrastructure into the hind dune stabilisation works.

The costs adopted in this assessment are based on the stabilisation costs as advised to **Port Stephens Council** by CaLM. It is noted that these costs are towards the upper range for stabilisation works of this type and are above those suggested by AWACS in their Beach Plan of Management (AWACS, 1992b). They have been used on the basis that CaLM is the expert advisor to State (and Local) Government on dune stabilisation matters and is best placed to assess costs. The final cost will be determined at the time the work is let to tender, based on detailed specification.

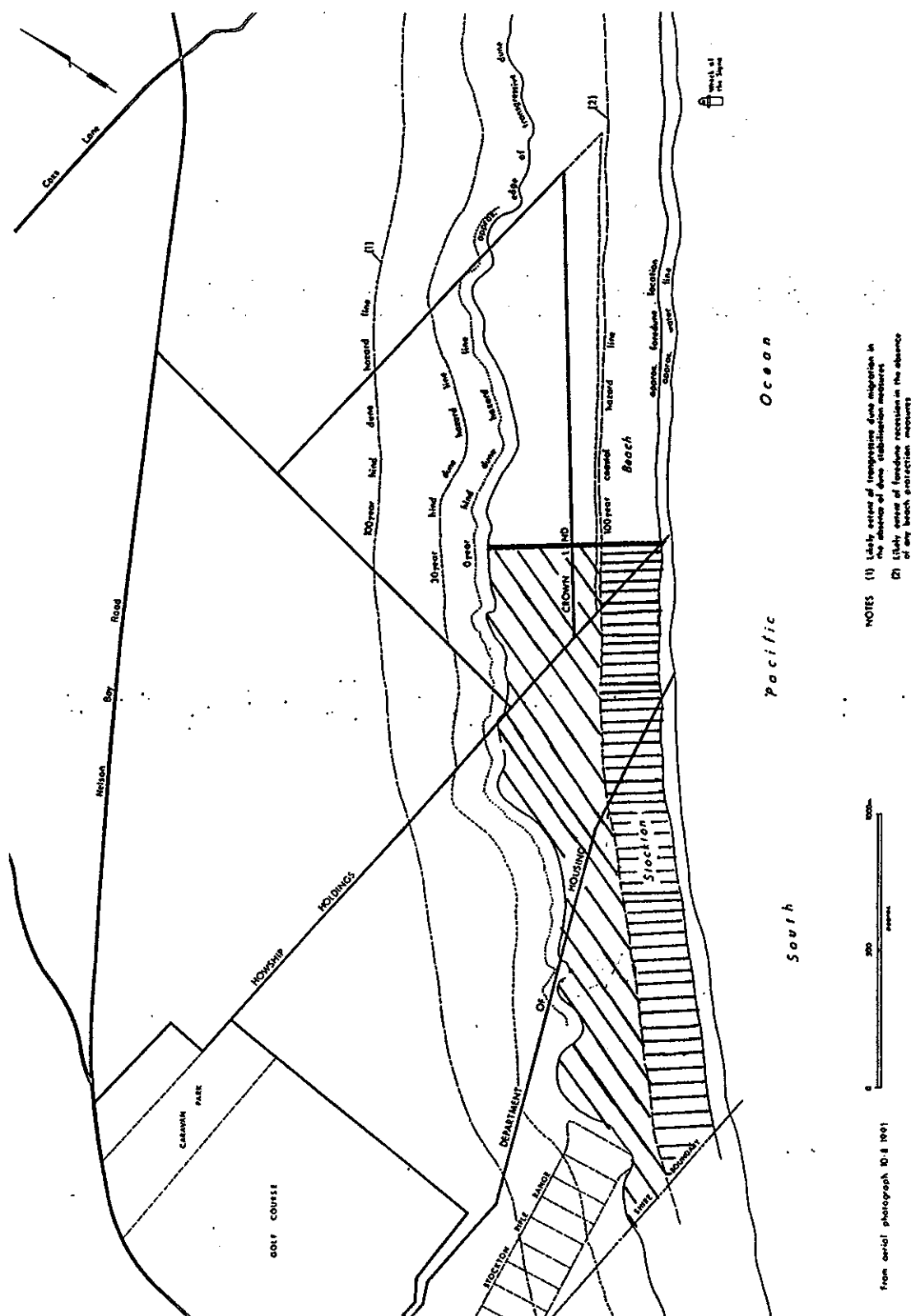
2 Stabilisation Requirements

2.1 Department of Housing and Howship Holdings

The proposal is for the rezoning of the properties owned by **Howship Holdings**, the **Department of Housing** and the adjacent **Crown Lands** which are controlled by **CaLM** as shown on **Figure 2.1**. The defined extent of the 100 year aeolian hazard zone as defined by **AWACS 1992b** is shown also.

To allow the safe development of the land of **Howship Holdings** and the **Department of Housing** (but omitting the **Crown Lands**), the minimum areas of dune stabilisation works required are presented in **Figure 2.1** with a representative cross-sectional schematisation in **Figure 2.2**. These areas are considered to be the minimum requirements to allow consideration of the progression of any development seaward beyond the 100 year hind dune hazard line (**Figure 2.1**).

Verbal advice from the Department of Conservation and Land Management (**CaLM**; Peter Dwyer and, indirectly, Jeff Hunt through Peter Dwyer) supports the view that to protect the subject lands it is not essential to stabilise the land south of the shire boundary within the Newcastle City area. Apart from a requirement to stabilise a relatively small area on the steep side slope leading up to the crest of the large transgressive dune straddling the boundary between the local government areas, much of the dune extending to the south in this area is relatively low and does not present a threat of destabilising the larger hind dunes within the rifle range holdings or those on the subject properties.



**Figure 2.1 Site Plan of Required Dune
Stabilisation Works to Protect
Howship Holdings and Department of
Housing Allotments**

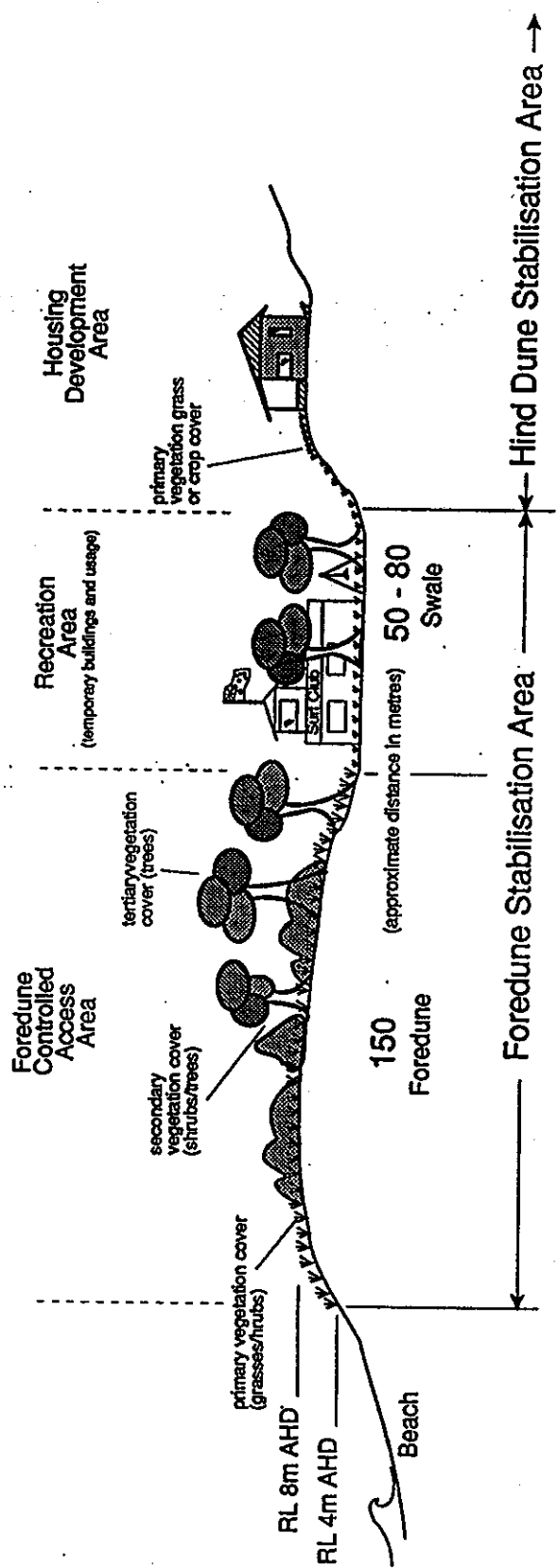


Figure 2.2 Schematic Cross-Section of Dune Stabilisation Works

2.2 Crown Lands

The **Crown Land** could be stabilised concurrent with the release and development of the areas outside the 100 year zone in the adjacent areas of the **Department of Lands and Howship Holdings**.

This could be undertaken either progressively or concurrently to provide the stabilisation of the foredune and hind dunes across the **Department of Defence, Department of Housing and Crown Land** holdings north from the **Port Stephens and Newcastle Council** boundary.

The additional stabilisation works required to protect the **Crown Land** are shown in **Figure 2.3**. These have been adapted from the required works as developed by **AWACS (1992b)** and **CaLM (1993)**.

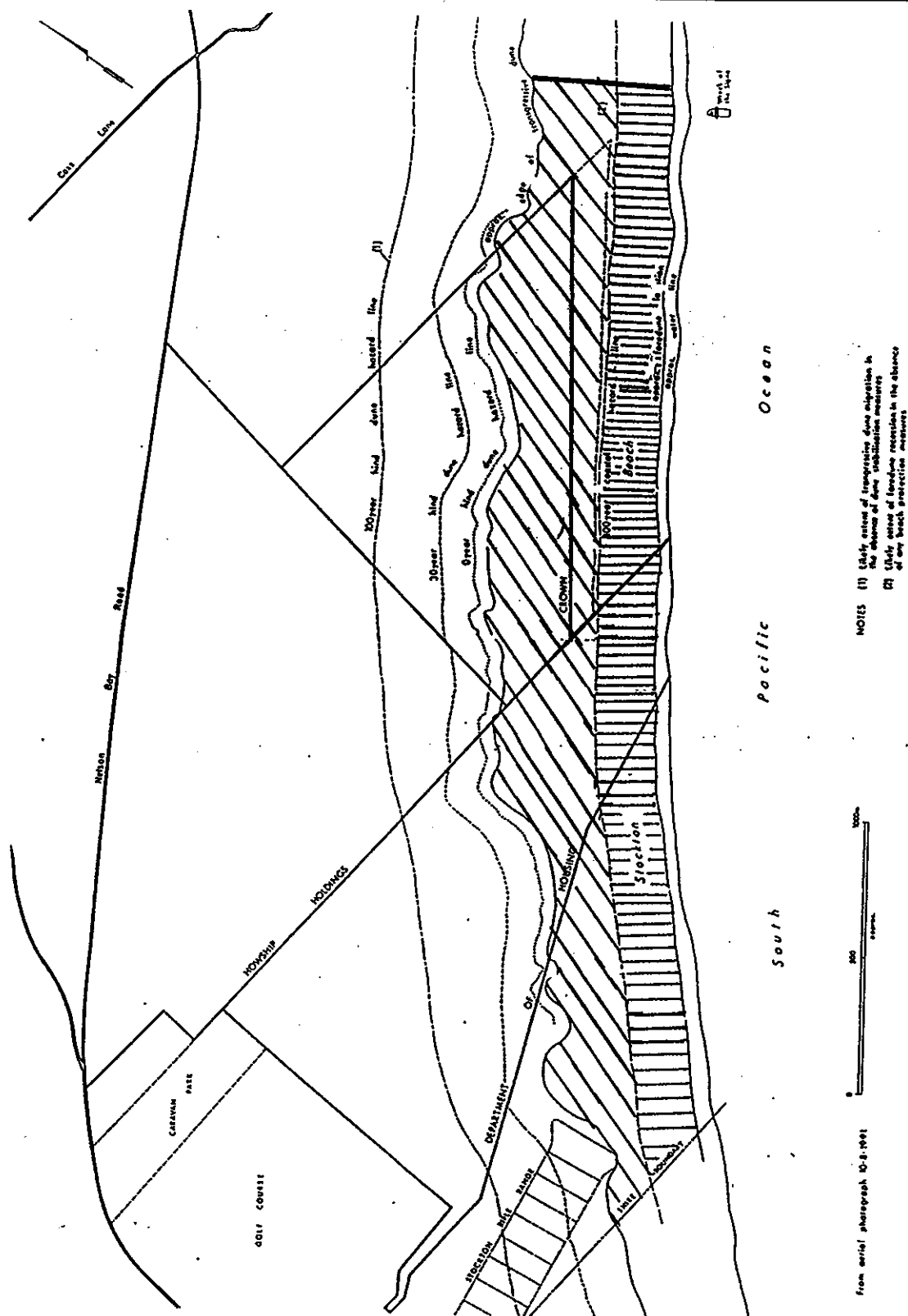


Figure 2.3 Site Plan of Required Dune Stabilisation Works to Protect Howship Holdings, Department of Housing and Crown Land Allotments

3 Programme of Works

3.1 Dune Stabilisation

The extent of works required for the necessary dune stabilisation has been prepared based on the advice of CaLM (1993) in their report *Position Paper Dune Stabilisation Proposals Fern Bay Residential Development* (Figure 2.1).

3.2 Projected Programme for Development

It is anticipated that development would proceed at a rate of some 170-300 lots per year. A schematic diagram showing, in broad terms, the principles of a possible staging for the progression of development proposed is depicted in Figure 3.1.

3.3 Timing Requirements

Dune stabilisation works would need to be established and consolidated prior to any residential development encroaching within the 100 year hazard line.

In the following some timing requirements required for stabilisation works to commence are considered to ensure the orderly progression of development.

There are approximately 2,160 lots available for development outside the 100 year hazard line within the properties of the Department of Housing and Howship Holdings.

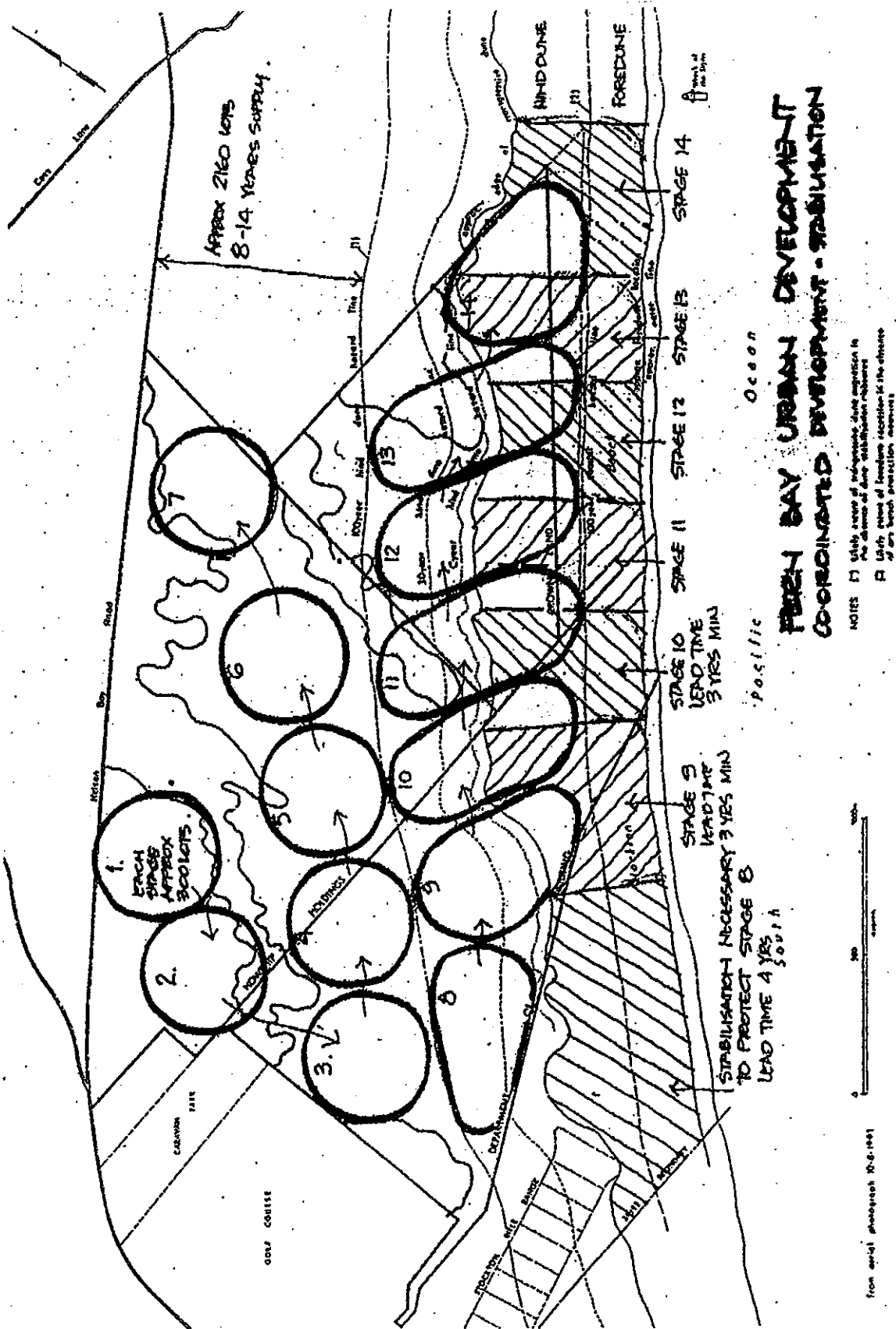


Figure 3.1 Schematic Diagram Indicating Progression of the Development

| Time for development to reach *100 year hazard line*:

- 8 to 14 years

| Time required to stabilise the dune field to allow development of Stage 8 allotments (**Figure 2.1**):

- 4 years (2 years + 2 years to verify effectiveness and to ensure success)



Therefore, to allow orderly progression of development into Lot 8 stabilisation works would need to start:

- › **by the commencement of the 5th year at an optimistic rate of development; or**
- › **by the commencement of the 11 year at a pessimistic rate of development.**

4 Estimated Costs

4.1 Basis of Estimate

The cost of the dune stabilisation works has been estimated on the basis of unit rates advised by CaLM (1993). While these rates are toward the higher end of rates normally quoted for this sort of work, they do provide a realistic upper estimate on which Port Stephens Council could rely, ensuring that adequate funds could be secured for the works. The high cost estimates used reflect the opportunity to develop new techniques for stabilising large scale areas. However, it is likely that actual costs would be below those used for this estimate. In any event, should the works be economically viable even by allowing for what may appear to be high estimates in the costs of stabilisation works, then this would give added confidence in the assessment of the overall viability of the proposal and land re-zoning.

4.2 Costings

4.2.1 Department of Housing and Howship Holdings

Based on the programme of stabilisation developed from the original advice provided by CaLM, costs for the works were computed on present worth and based on 1993 prices.

In summary:



Cost of Stabilisation works to protect Department of Lands and Howship Holdings allotments is estimated at \$6.0M + \$0.4M maintenance per annum.

As the vegetation consolidates the maintenance costs can be expected to reduce in time. However, such discounting for maintenance has not been included in this assessment.

4.2.2 Department of Housing, Howship Holdings and Crown Land



The total cost of stabilisation works to protect Department of Housing, Howship Holdings and Crown Land allotments is estimated at \$12.5M + \$0.9M per annum after 7 years

4.2.3 Incremental Costings for Works on Crown Land

On the basis that estimates for the cost of stabilisation works to protect Department of Housing, and Howship Holdings allotments only after 7 years is \$7.2M + \$0.4M per annum (higher estimate based on no reduction in maintenance costs with time):



The incremental cost to incorporate Crown Land allotments is \$5.2M + \$0.4M per annum

5 Principles Governing Progression of Development

The primary considerations in determining the staging of the development are:

1. No development should take place within the 100 year hazard zone until such time as both the foredune and the hind dune stabilisation works are completed and verified to be effective to protect that development.

Generally in N.S.W., in existing developed areas development is excluded from those areas which are considered at risk from a coastal hazard within a 50 year period and development is generally excluded in undeveloped areas considered at risk within a 100 year period. Further, the N.S.W. Coast Government Policy gives a clear signal that development will be prohibited, *inter alia*, on frontal dunes (variously defined in government documents but all definitions including unconsolidated bare sand areas adjacent to the beachfront as are the subject dunes in this proposal). Once the dune stabilisation works are completed successfully, the 100 year hazard line may be redefined and consideration may be given to allow further development within what is, at present, a coastal hazard zone. This requirement would allow Port Stephens Shire Council to exercise a duty of care in approving development.

2. Stabilisation does not need to be completed prior to development.

While in the longer term stabilisation work must be undertaken and completed to secure developed land outside the *100 year hazard line*, development could commence outside the 100 year hazard zone prior to stabilisation works being undertaken.

However, approval for residential development within the *100 year hazard line* would require successful dune stabilisation for protection from the aeolian hazard for those works.

3. A two year verification period following the completion of stabilisation works should be allowed for assessing the success or otherwise of the works.

Advice from CaLM indicated that a proving period of some 2 years following completion of stages of works would be required before it could be established that those works were successful.

4. Generally, the stabilisation should proceed from south to north and from front to back on the dune system.

This principal is based on that of stabilising the *up-wind* areas first.

5. Earthworks and contouring should be planned and undertaken so as to not threaten the stability of completed stabilisation works.

Contouring and earthworks of the destabilised dunes should be undertaken far enough in advance of the sections undergoing stabilisation such that those sections would not be destabilised by the earthworks.

6. The method and cost for stabilisation will be determined by detailed specification and tender at the appropriate time.

The costing of the stabilisation works adopted in this advice is based on that given by CaLM as the State Government's expert in land stabilisation and advisor to Port Stephens Council. It is likely that Council would seek and rely on advice from CaLM on any proposal and costings proffered by the developer. The real cost will be determined when tenders are let and the work is completed successfully.

There is little value in specifying details of the method of stabilisation at this time. There is the possibility, however, that some development infrastructure may be incorporated with the stabilisation works or used as a means of stabilisation. This would need to be considered when detailed stabilisation plans are prepared.

6 Summary, Conclusions and Recommendations

In the foregoing a proposal to make land available for residential development at Fern Bay has been refined in terms of principles of progression of development and estimates of costs on the basis of previous advices provided by AWACS and CaLM. In carrying out this refinement a number of conclusions were reached and recommendations were made; the principal conclusions and recommendations are summarised below.



It is not necessary to stabilise the frontal dunes within the Newcastle City area in order to protect the Department of Housing, Howship Holdings or Crown Lands sites.



A programme of progressive development and stabilisation has been developed to ensure that adequate protection of development can be provided as it proceeds.



Some principles Governing the Progression of the Development have been outlined:

Development could be undertaken on the **Department of Housing and Howship Holdings** lands prior to the commencement of dune stabilisation works and the works could be programmed in such a way that stabilisation was achieved progressively to best suit the progression of the development.

No residential development should take place within the *100 year hazard line* until such time as the required stabilisation works are completed and verified to be effective for the area of development proposed.



Costs for stabilisation of the dunal areas to protect the Department of Housing and Howship Holdings lands are estimated at \$6.0M capital cost + \$0.4M maintenance per annum.

The incremental cost of dune stabilisation required for developing the Crown Land is \$5.2M capital cost + \$0.4M maintenance per annum.

The maintenance costs would reduce substantially as the vegetation consolidates with time and as the stabilised areas are developed. However, such discounting of costs has not been included in this assessment.



The N.S.W. Coast Government Policy gives a clear signal that development will be prohibited, *inter alia*, on frontal dunes. The responsibility for the co-ordinated and consistent implementation of this policy rests with the Coastal Committee of NSW which provides a mechanism for the review and development of the policy.

7 References

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