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Port Stephens Shire rural study

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PORT STEPHENS SHIRE RURAL STUDY



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PORT STEPHENS SHIRE RURAL STUDY

A REVIEW OF THE EXISTING COMPONENTS
OF THE RURAL AREAS OF THE SHIRE OF
PORT STEPHENS, AND RECOMMENDATIONS
FOR FUTURE ACTION IN RESPECT TO THESE
AREAS.

MARCH, 1983.

R. N. TAYLOR,
SHIRE PRESIDENT

EIS
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To achieve a rational use and reserve of land for future agricultural uses it is necessary to do two things;

- (a) Ensure that a sufficient area is zoned to permit current and future activities, and ensure that the zoning is sufficiently definitive enough to protect the land from competing uses and at the same time to have the zoning sufficiently flexible to allow innovation and change.
- (b) Convince the landowners within the rural area that the purpose of the zone and its land uses are in the community's interest.

Unfortunately whilst the first step can be implemented at an administrative level, experience has shown that rural landowners have on many occasions failed to appreciate the need and significance of the rural zones contribution to the community as a whole. No landowners in a residential, industrial or commercial area would seriously consider allowing the introduction of conflicting uses into their area, however, rural landowners do not seem as committed to preventing this happening. A case in point is the subdivision of rural land, whilst no landowner in a residential area would tolerate other owners continually subdividing their land below the minimum size; in rural areas this frequently happens, and it is an unfortunate fact that this action results in increased values for all, and threatens the whole fabric of the rural society. Rural land should be kept for rural activities.

This is reflected in Item 2 of the Schedule to the Minister for Planning and Environments Directions under Section 117 of the Environmental Planning and Assessment Act, {1979}. Policy Q and Strategy 51 of Regional Environmental Plan No. 1: Hunter Region, also reinforces the importance of agriculturally viable land and states that protection of prime, good or unique agricultural land can be achieved by preventing the subdivision of such land into allotments less than 40 hectares, other than where agricultural requirements justify the creation of smaller allotments. To satisfy the demand for rural/residential or hobby farm development Strategy 52 of the Hunter Regional Plan states that areas suitable for intensive agriculture and for subdivision into smaller rural residential areas {"hobby farms" etc} should be surveyed and identified and then zoned accordingly, with appropriate controls.

The foregoing may be considered a hard attitude to adopt, if it was not readily admitted that there is a need to create areas for rural/residential subdivision, and the aim of this report is to review this situation and recommend areas for such development. However, before any such areas are chosen they must be carefully scrutinised against a list of factors not the least of which is the need to preserve all viable rural land.

This Study, however, has a much wider purpose than rural subdivisions, and I commend it to you as a document which for the first time reviews the activities of the Port Stephens Shire, outside its towns.

It is hoped that the contents of this report will supply a new perspective on the Shire, and the recommendations will supply food for thought and discussion.

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Aims and Objectives of Study

Prior to reviewing the rural sectors of Port Stephens Shire, it is first necessary to establish parameters under which the review is to take place.

All investigations must set down Aims and Objectives to enable a series of satisfactory conclusions to be reached, and in this Study the following Aims and Objectives are espoused.

- * That ridgelines and visually significant areas be afforded protection by appropriate zonings to restrict inhospitable development.
- * That fresh water and estuarine areas be afforded protection to ensure that no deterioration takes place in the existing environment.
- * That industries associated with these estuarine areas be catered for in any review of the existing planning controls.
- * That due recognition be given to areas of existing and potential mineral resources.
- * That areas required for future urban expansion be protected from competing uses that may destroy the viability for that purpose.
- * That provision be made for variations in standards of lifestyles.
- * That areas with hydrological and erosion problems be identified and excluded from future development.
- * That areas experiencing slip or subsidence be identified and excluded from future development.
- * That any potential source of pollution that may exist or be the result of development, be investigated and evaluated against the need for the development.
- * That the need for waste disposal be assessed in respect to the rural areas of the Shire.
- * That the Tomago Sandbeds Water Supply Scheme be afforded protection.
- * That areas of potential bush fire hazard be identified.
- * That future subdivision potential of an area be assessed against its economic agriculture viability.
- * That any future subdivision proposals be assessed against the ability of Council to provide essential services to the community which would be housed within that subdivision.
- * That future development be assessed against the likelihood of weed infestation as a result of development taking place.
- * That the Tree Preservation Order of Council be reviewed in light of its ineffectiveness in rural areas.
- * That future development be assessed on its ability to protect against soil fertility depletion.
- * That an optimum population size and distribution be established for the rural areas of Port Stephens Shire.
- * That a set of performance standards be established for development within the rural areas of Port Stephens Shire.
- * That a Code be established to dictate standards of access to and within any proposed subdivision.
- * That standards be set in respect of the size, frontage and depth requirements in respect of rural allotments.
- * That action be taken to preserve resources within the Shire and to identify drought effect reduction measures.

- * That the potential for development of the Shire be assessed against recreation and leisure alternatives available.
- * That through this review identify favourable areas for future investigation for small rural residential allotments.
- * That areas of natural and man made constraints to future development be identified.
- * That provision be made for adequate social, community and recreation facilities to serve the existing and future urban and rural population of the Shire.
- * That provision of a land bank sufficient to meet the anticipated need in accordance with the expected growth so that there exists a reasonable balance between supply and demand be made.
- * That areas of potential rural/residential subdivision be located so that the maximum possible utilisation of existing investment in public utility services may be made.
- * That the preparation of Guidelines and Plan achieve a general improvement to the environment of the Shire to create an attractive rural character.
- * That provision for a diversification of the rural activities possible and give due recognition to rural activities other than those which are land based (that is; oyster farming, fishing, broiler sheds), be made.
- * That hobby farm areas should be located not more than 45 kilometres from the major commercial/industrial areas of Newcastle and Maitland.
- * That main and arterial roads within the Shire be protected by limitation of access.
- * That action be taken to ensure compatibility between the Tomago Aluminium Smelter and agricultural uses within its sphere of influence.
- * That any proposed areas for development be located in close proximity to existing local community facilities and services.
- * That existing rural activities which are currently economically viable be protected to ensure their continuance.
- * That performance standards be formulated in regards to design and aesthetics for rural buildings and subdivisions.

Delineation of Study Area

To appreciate the rural nature of much of the Port Stephens Shire, it is necessary to subdivide the area into precincts which group like activities together.

Only if this Study is viewed as a series of precincts, rather than individual urban areas and their surrounds, the true interaction of the locality with its surroundings is appreciated.

Port Stephens Shire covers an area of approximately 391 square miles /1013 square kilometres. It extends from the Paterson River in the west, Karuah and Nelson Bay to the north, the Hunter River and Fern Bay to the south and the Pacific ocean shoreline to the east.

Map 1 shows the extent of the Shire and its boundaries also reveal that the area falls naturally into precincts which can be easily identified. The adopted precincts which are indicated on Map 1 are based upon areas delineated by natural boundaries, roads and areas which are excluded from the study for reasons such as Commonwealth ownership, Water Board catchment, urban zonings or else are covered by other parallel studies (such as Medowie and Anna Bay).

Apart from physical barriers which inhibit urban growth, there are a number of Government restrictions which have a similar effect. These restrictions cover such elements as building in flood prone lands, access onto Main Roads, heritage and scenic preservation areas, easements for pipe and transmission lines, Noise Exposure Forecasts and a number of others.

History of Rural Land Use

The history of rural activity in the area is one of the longest associations of man and this country, as it was in the very early days of the colony that such activities commenced.

However, progress has meant that the relative importance of the traditional agricultural base is no longer evident.

Agricultural development on lands within the Shire began along the banks of the Hunter, Williams and Paterson Rivers in the early 1820's following the depletion of much of the cedar in the area. As the forest gave way beneath the axes and cross-cut saws the rich alluvial flats and low undulating country was revealed as prime agricultural land. Proximity to the urban settlements and navigatable waters made dairy farming and produce cultivation possible.

The land was granted by the Crown or taken up, in many cases by families who still hold it today. Names such as King, Windeyer, Tucker, and Dun are all synonymous with the farming of the area. Fragmentation of the initial large holdings was well under way prior to the turn of the century. Initially farming was almost entirely agricultural/cropping and vegetable crops, maize, lucerne and potatoes were all cultivated, as they still are today. Wheat, millet and sugarcane were also grown, however climate proved unfavourable and these crops lasted only a short time. As properties became smaller and the need to increase production became evident, specialisation of use became common.

It was not until the 1900's that the dairy industry became significant and the production of cream and butter saw the establishment of the Raymond Terrace Co-operative butter factory under the trade name of O.A.K. Dairy supplies were collected along the Williams, Hunter and Paterson Rivers, and on the lower reaches of the Williams, below Seaham, about thirty dairy farms were in production, at the time of the peak production, compared with the few remaining today.

The intervening years between settlement and the present day have seen many changes. Modern times and technology have replaced the family farming unit with mechanization and better job prospects outside the industry, higher living standards and aspirations have drawn many to the cities and towns.

Coinciding with the outflow of the traditional rural worker, has been the growth of the 'hobby farm' phenomena. This has led to the degeneration of the traditional rural activity, the increase in valuations of land and the reductions in the number of rural undertakings which are now economically viable.

The importance of rural industry has diminished over the years as modern commercial and industrial interests have developed. Today elements such as mining, tourism, ship-building and aluminium smelting take precedence over the traditional rural base and fulfil major roles in the economic and population development of the Shire.

The percentage of the Shire under cultivation, the proportion of the workforce engaged in rural work and the amount per capital of income generated in the rural section of the Shire have all decreased.

Changing times have ultimately seen a decline of agriculture until now almost the only economically viable properties are the few dairies and crop farmers located on the alluvial flood plain. Few large acreages remain and it is only the intensive farming - dairying, poultry, vegetable crops that remain economic. Virtually no land outside the flood plain has improved pastures and is used for grazing only, however even so only about 60% of the flood plain is now actually farmed.

Farming on the lands east of the Williams and Hunter Rivers was a relatively modern occurrence, and no major agricultural activity ever became sufficiently entrenched to a point where it was able to withstand the pressures of higher income uses. Its proximity to Newcastle, the R.A.A.F. Base, tourist attractions and industrial development at Tomago and Newcastle ensured that land prices soon outstripped the ability of the land production to pay its way. Single income farming activities east of the Williams River and inside the Study area has now ceased. The previously viable units are now either treated as subsidiary to external incomes or as purely hobby farms or quasi urban allotments.

The establishment of 'hobby farms' in an area can and does have a detrimental effect upon surrounding large properties.

- * An increasing number of buyers of rural small-holdings has the effect of forcing up land prices, making purchase of further land for farming uses impossible.
- * The cost of operating farms increases owing to the increase in the rates and land taxes which accompanies land price increases and whilst Council can and does give incentives by rate relief, it only serves to delay the inevitable.
- * Rural small holdings, with houses and lack of stock increase the fire danger, and the problems of weed, vermin and stock control which in turn lead to a further fall in agricultural production.

- * Many small holding owners are often absent and therefore could not effectively manage their property.

Basic Issues under Investigation

Accepting the proposition that agricultural land use is no longer the prime activity within the Shire, the review must be widened to encompass what are the real land uses, their importance, desirability and likely future.

Continuing development within the Shire, particularly residential, has seen a lot of the old rural areas change. The demand for rural homesites, hobby farms, and also rural retreats is very strong both from people living and working within the Shire area, as well as those willing to commute to Newcastle or Maitland.

The spread of this development up until now has been disjointed and generally uncoordinated. As a result Council is becoming more and more aware of problems which can and will arise unless developments are planned appropriately.

The important points which this Study will consider are:

1. Preservation of valuable agricultural lands. Farm land is one of our most precious resources and each year one sees more and more of it lost beneath the spread of urban and semi-urban development. Preservation of this diminishing resource is an important goal.
2. Protection of environmentally significant areas. The Shire is a host for a number of significant environmental areas of a wide variety of types. Water catchments such as the Tomago sandbeds, important bird and marine habitats such as Pipeclay Creek and Fullerton Cove, as well as valuable reserves of native flora and fauna in many areas. All of these points as well as such aspects as important scenic areas and areas of high visual quality, historic sites, aboriginal relics and also the foreshores, all these require protection in some form to ensure that they are not damaged or lost due to thoughtless or ignorant development of an area.

3. Safeguarding of valuable resources. As well as important farm lands other resources, such as freshwater river and stream catchments, mineral sands, hard rock, forestry, which are important for the future and must be preserved for the time when they will be needed.
4. Acknowledgement of natural hazards such as flood, fire, geological etc. With the large amount of flood prone land, forestry and other timbered areas and the often unpredictable Australian climate, natural hazards such as fire and flood are a fairly common occurrence. Common enough to require specific acknowledgement of the dangers they can pose in many areas, and implementation of the preventive measures.
5. Creation of specific areas to accommodate rural retreats, hobby farms and rural homesites. The location of areas especially suited to these various developments while still recognising the other points considered will enable such land uses to proceed to the benefit of both the inhabitants and the environment.

Ultimately of course policies will need to be formulated which will determine the future of these resources and guide development in rural areas. Areas deemed suitable both for development as well as for conservation will be located and appropriately zoned, providing an indication of how and where such rural development can take place.

Topography

Soils, slope, exposure and servicing have in the past determined land use, however with the shift away from reliance upon the land for income, elevation, view and accessibility have become the modern criteria for land use in the market place.

The topography of the Shire is shown on Map 2. This Map has been compiled from maps and information which have classified the landscape according to slope. Four categories have been determined for clarity of presentation.

Classifications:

A.	0	-	5%	-	Flat
B.	5	-	20%	-	Undulating
C.	20	-	30%	-	Hilly
D.	over		30%	-	Steep Terrain

The Map shows the steepest and hilliest areas are found in the north and north west of the Shire in the Dunns Creek and Seaham areas. Such areas are highly valued for their aesthetic qualities and prominence, due to the flatness of the surrounding landscape. The National Parks and Wildlife Service has recommended that areas shown on Map No. 3 be zoned Rural Environmental Protection 7(d) Scenic, with the intent of maintaining the natural appearance of these unique areas.

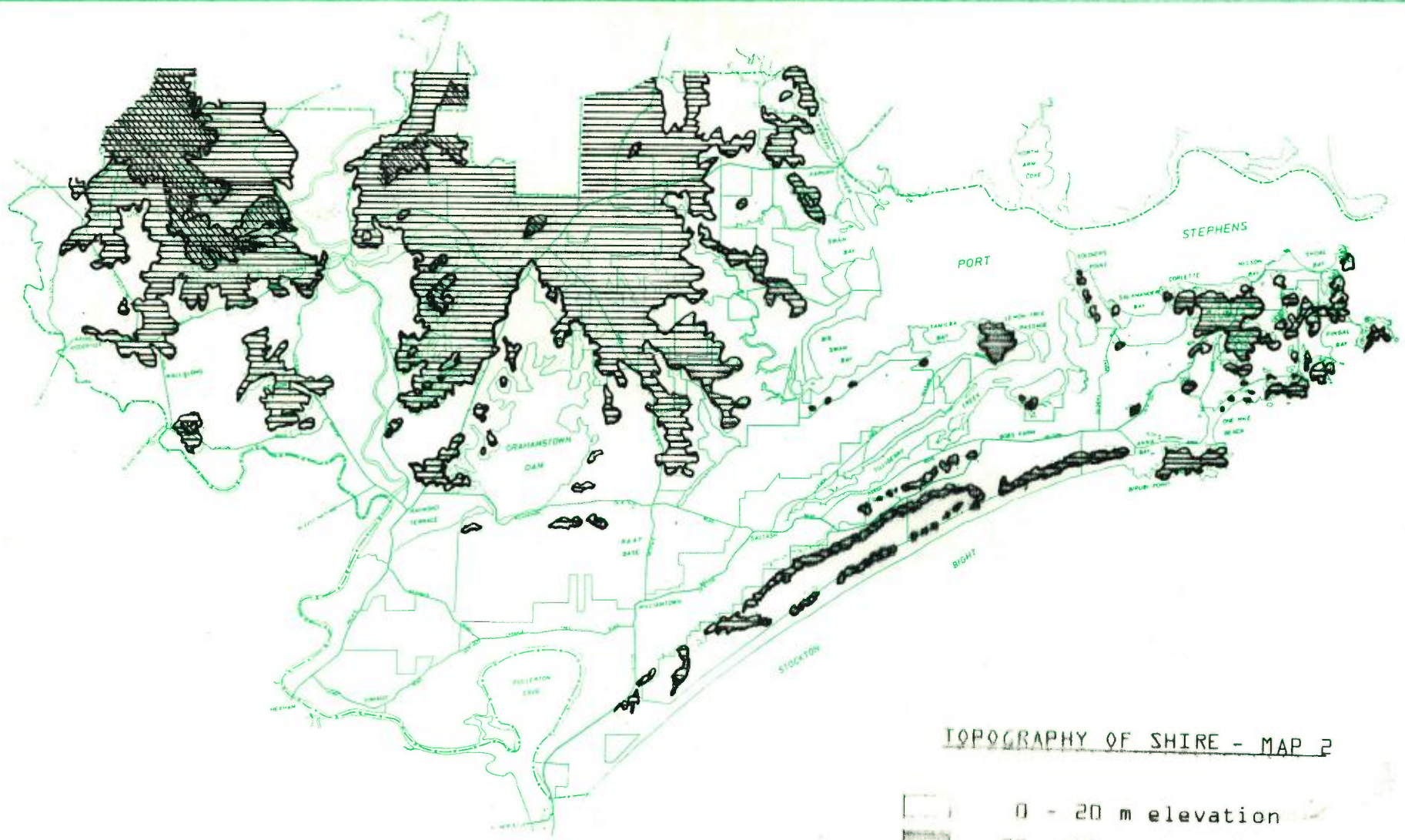
To achieve this, restrictions must be imposed upon development to ensure that only those developments sympathetic to the landscape proceed, and that these developments are strictly controlled to Council's satisfaction. In this regard, developments such as subdivisions, rural pursuits and dwellings will require guidance by Council as to limitations of subdivision, clearing and tree felling, even construction location and material.

In this way it is hoped to enable some development of such areas, but only where such development is deemed suitable, and where it is conducted in an appropriate manner.




The extreme north west is characterised by its rugged topography. Large areas are found here with slopes in excess of 30%, making them unsuitable for development. Buildings in such areas are usually only possible with engineering works, and similarly access can pose major problems. Clearing of these areas increases the already significant threat of sheet and gully erosion and tree felling is already causing such problems. A relatively small, but significant area is subject to mass movement and this and adjacent areas should remain untouched because of the obvious threat.

The erosion threat in this area is such that subdivision must be virtually excluded, due to the increased risk posed by clearing, road construction and dwelling construction, as well as habitation of these areas. Because of the sensitive nature of these areas, and the coinciding proposed 'Scenic Protection Zonings' no development (subdivision) in breach of current planning restrictions should proceed (unless in the opinion of Council and authorities such as National Parks and Wildlife Service, the Soil Conservation Service and the Department of Environment and Planning, that a subdivision or development would have no detrimental effect upon the area).

Another important area of undulating topography is the Newcastle Bight dunes which forms an often steep landform which is highly susceptible to erosion, particularly wind erosion. This area is considered of international importance for its scientific value which relates directly to landform, vegetation and Aboriginal relics. A portion of this dune system is already zoned for Foreshore Protection 7(f) and it is felt that the extension of this zoning to cover the remaining dune areas as delineated by the National Parks and Wildlife Service is warranted.




TOPOGRAPHY OF SHIRE - MAP 2

-  0 - 20 m elevation
-  20 - 100 m elevation
-  Over 100 m elevation



MAP 3
NATIONAL PARKS AND WILDLIFE
RECOMMENDATIONS

- 7e - Environmental Protection Historic Site
- 7g - Environmental Protection Scientific Site
-  Visually Significant Area

- 7a - Environmental Protection Wetlands
- 7b - Environmental Protection Estuarine Wetlands
- 7c - Environmental Protection Water Catchment
- 7d - Environmental Protection Scenic Protection
- 7f - Environmental Protection Foreshore Protection

ENVIRONMENTAL PLANNING & ASSESSMENT ACT 1979	
SHIRE OF PORT STEPHENS	
LOCAL ENVIRONMENTAL PLAN	
DATE:	
BY:	
FOR:	

The majority of remaining lands within the Shire are flat to gently undulating with scattered small hills. This is due to the extent of the floodplains found along the Paterson, Williams and Hunter Rivers which take up a large portion of the remaining land. Because of the flood threat these areas virtually exclude all development including subdivision.

Several cross-sections have been drawn to be viewed in conjunction with the topography map. (See Figures No. 1 and 2). These sections give a graphic representation of the topography of specific areas. These areas are Dunn's Creek to north of Seaham, from Hinton to Nelsons Plains, the Salt Ash and Newcastle Bight dune area, and at Anna Bay. It can be seen from the sections that the topography of the Dunn's Creek area is exceptionally steep and rugged compared to the relative flatness of the other sections, despite some isolated steep hills, example; Pig Island, Kanwary Hill. These flatter areas have few topographical constraints to development, but in the Dunns Creek area the steep topography would be the major limiting factor.

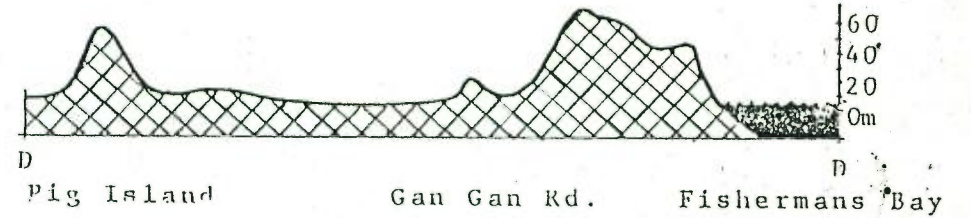
Essentially, only those areas outside the flood plain and with a slope less than thirty (30) per cent remain suitable for development. Such areas have no significant topographical constraints (however it should be noted that areas with a slope in excess of 20% also can pose construction problems). Areas identified as having Scenic Protection value should be zoned to exclude development detrimental to the landscape in both the physical and visual sense, and confining development to the remaining areas.

Topography

FIGURE 1 CROSS SECTIONS

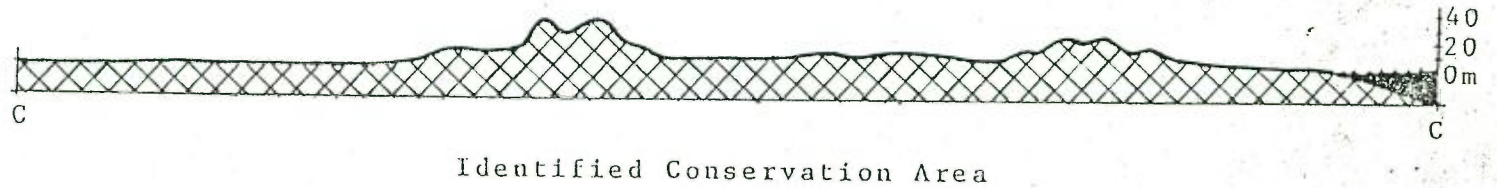
ANNA BAY AREA

SECTION DD



WILLIAMTOWN/SALT ASH AREA

SECTION CC

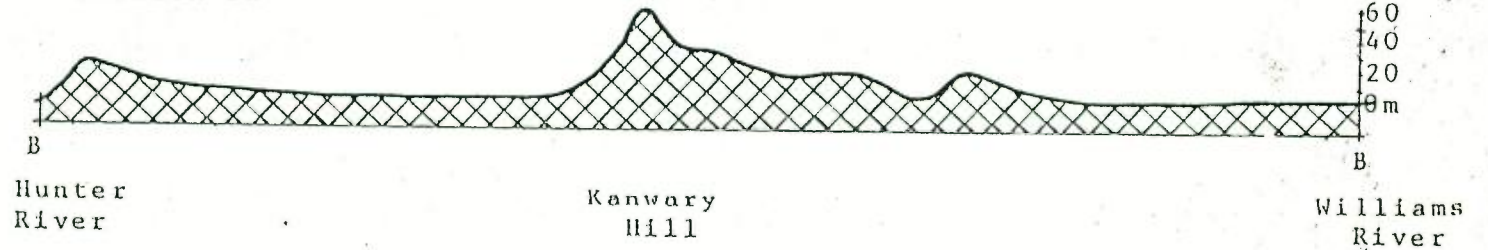


Topography

FIGURE 2 CROSS SECTIONS

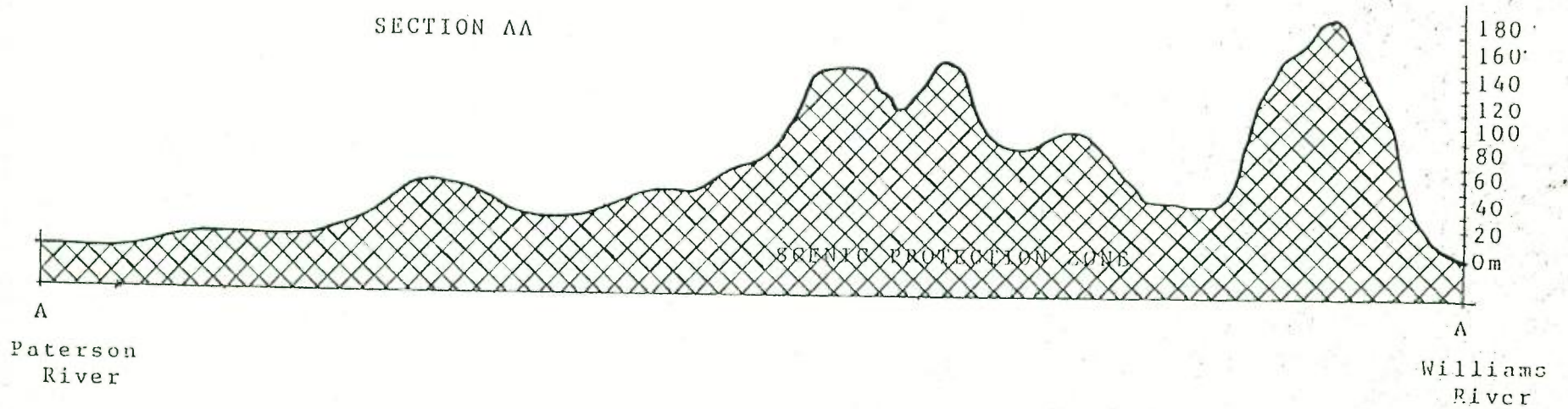
NELSONS PLAINS AREA

SECTION BB



DUNNS CREEK AREA

SECTION AA



Geology

The Geology of Port Stephens has had an evolutionary ² affect on current land uses

In early days the reliance on the alluvial flood plains of the Paterson, Williams and Hunter Rivers delineated development and land use.

Now the elevated flood free lands are eagerly sought for rural residential retreating, and the dunal systems form the backbone of the industrial, residential and water supply areas of the Shire.

The Shire is on the north east edge of the major tectonic unit known as the Sydney Basin. The rocks on the surface are mainly of the Permian age (280 to 230 million years ago) with Carboniferous rocks (340 to 280 million years ago) also outcropping. (See figure No.3). These consist of tuff, sandstone, conglomerate, shale, volcanic rocks and coal lenses and are generally massive. They are dominant in the north and west of the Shire, although alluvial flats occur in the Hunter, Paterson and Williams River Valleys.

The coastal strip which extends inland up to thirteen kilometres is underlain by unconsolidated sediments up to 120 metres thick. These have been accumulated by marine (oceanic), fluvial (river) and estuarine processes in recent geological time, i.e. the late Tertiary to Holocene (see figure No.3).

The coastal strip can be divided into three geomorphological units:-

- (1) The outer barrier immediately adjacent to the coastline, consisting of regular, low vegetated beach ridges, stabilised dunes and sand sheets and the existing beaches and unstable high dunes which extend along most of the coast.
- (2) High level windblown sands and dunes which have been trapped around bedrock in the Nelson Bay - Anna Bay area.
- (3) The inner barrier which extends from Tomago to Mallabula and comprises a series of partly eroded beach ridges, swales and modified dunes, all of which are vegetated and stabilised.

Geological Hazards

The main geological hazards in the study area are:-

- * Flooding and inundation which is covered elsewhere in the report.
- * Coastal erosion - Any interference with the natural form of the coastal zone, particularly its front face is certain to have major effects on erosion. Any proposals for sand mining must be carefully investigated and it is unlikely that they would not drastically alter the coastal dune system.
- * Surface Rock/Soil Conditions - The highest risk areas are underlain by alluvial and estuarine sediments and are generally within flood prone areas.
- * Groundwater Storage Areas - which are the Tomago Sandbeds under the control of the Hunter District Water Board outside the study area.

From the essentially limited soils information available for the area it is possible to differentiate the soil types into two main sections; Newcastle Bight Dunal Associations and the remaining areas (predominantly the western half of the Shire), which are associated with the alluvial flood plain and valley system of the Paterson, Williams and Hunter Rivers.

Newcastle Bight Dunai Associations:

The area covered by these associations is extensive (see Map 4) stretching from Tomago and Fern Bay in the south to Karuah and the Port in the north. These sand based soils have only been studied in part, however, it would seem feasible to assume that the four types listed below would be representative of the major area of sand based soils.

Sand soils in the area are of two main types:- alluvium (or water deposited) sands and aeolian (or wind blown deposited) sands.

Alluvium Soils: Water deposition can take two forms, either marine sea deposition or fluvial-
river deposition, the latter forming the more significant deposits.

Hexham* - areas of dark heavy and sometimes peaty acid swamp soils and meadow soils in low lying areas. Humus-iron podzol soils occur in inland dunes. Along the coast yellowish/white single grained sands and dunal soil systems.

Aeolian Soils:

Duck Hole* - a landform of dunes and undulating sand plains consisting of predominantly single grained sands of both aeolian regosols and some humus-iron podzols. An inherent feature of these soils is their unstable nature once disturbed, as evidenced by the extensive blowouts along the Stockton Bight and the mobile dunes found in the area.

A number of minor soil types occur throughout this area however they occur generally as scattered pockets and small areas.

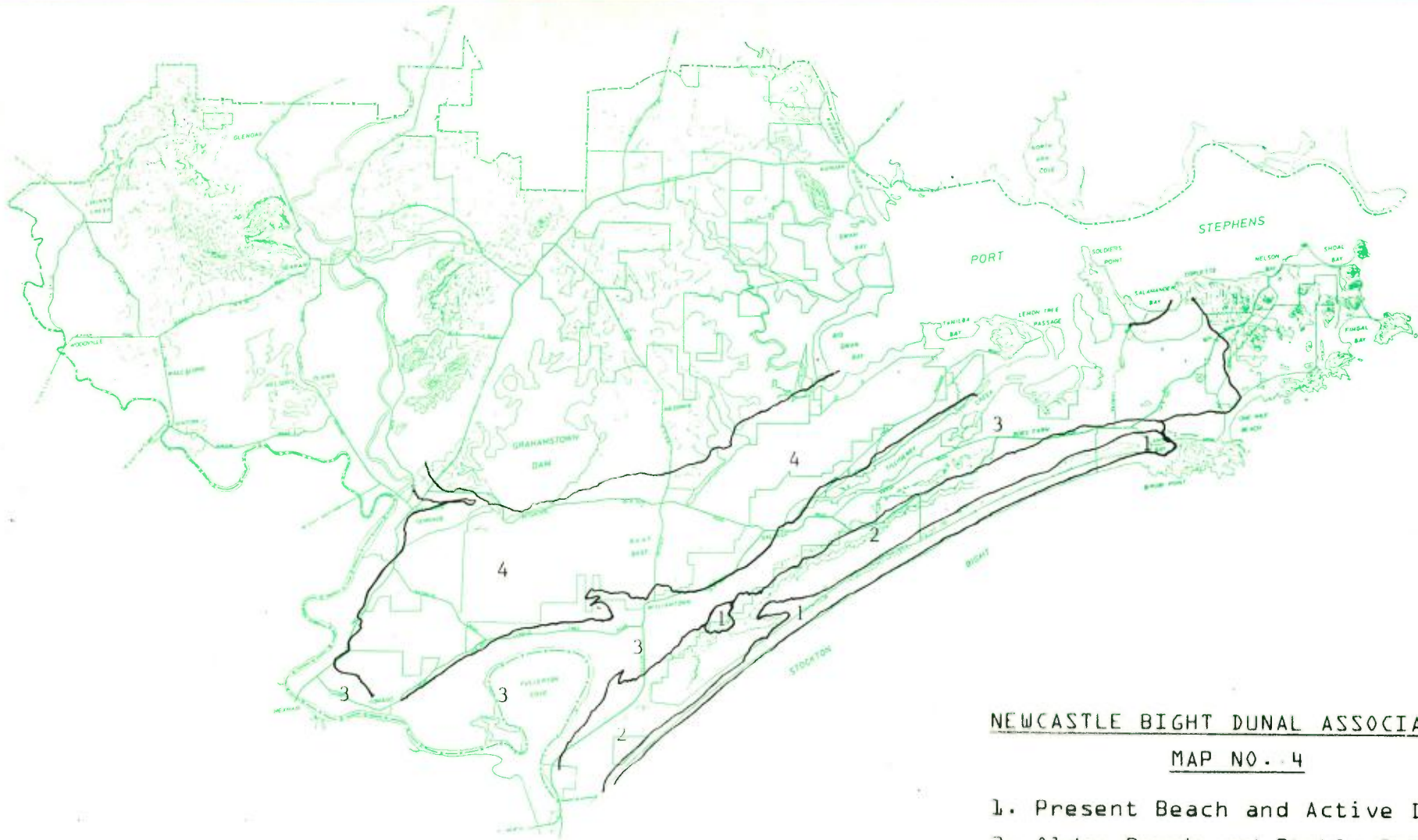
Lavas, Glacial beds, basic intrusive* - some shallow podzolic soils, however a predominance of skeletal soils combined with rock outcrops, shallow cracking clays and solonetzic soils.

Shale, sandstone, conglomerate* - a variety of soil types including cracking clays and degraded black earths, shallow earths and skeletal soils interspaced amongst a preponderance of podzolic and solonetzic soils.

Hunter fluvial* - alluvial terraces featuring a wide range of soils including cracking clays, dark coloured chernozenic, solonetzic and podzolic soils and regosols. These floodplain soils form the basis of most viable agricultural pursuits in the area. Rich, deep alluvial soils adjacent to the rivers (their origin) provide perfect conditions for cultivation and grazing and are naturally used intensively.

Avicennia* - waterlogged saline heavy brown clays which take the form of tidal mud flats (generally mangrove areas).

Nesta* - permanently wet or moist black peaty meadow soils of recent marine days.



NEWCASTLE BIGHT DUNAL ASSOCIATION

MAP NO. 4

1. Present Beach and Active Dunes
2. Older Beach and Stable Dunes
3. Estuarine and Alluvial Sediments
4. Stable Sand Sheets and Beach Ridge.

Non Dunal Soils:

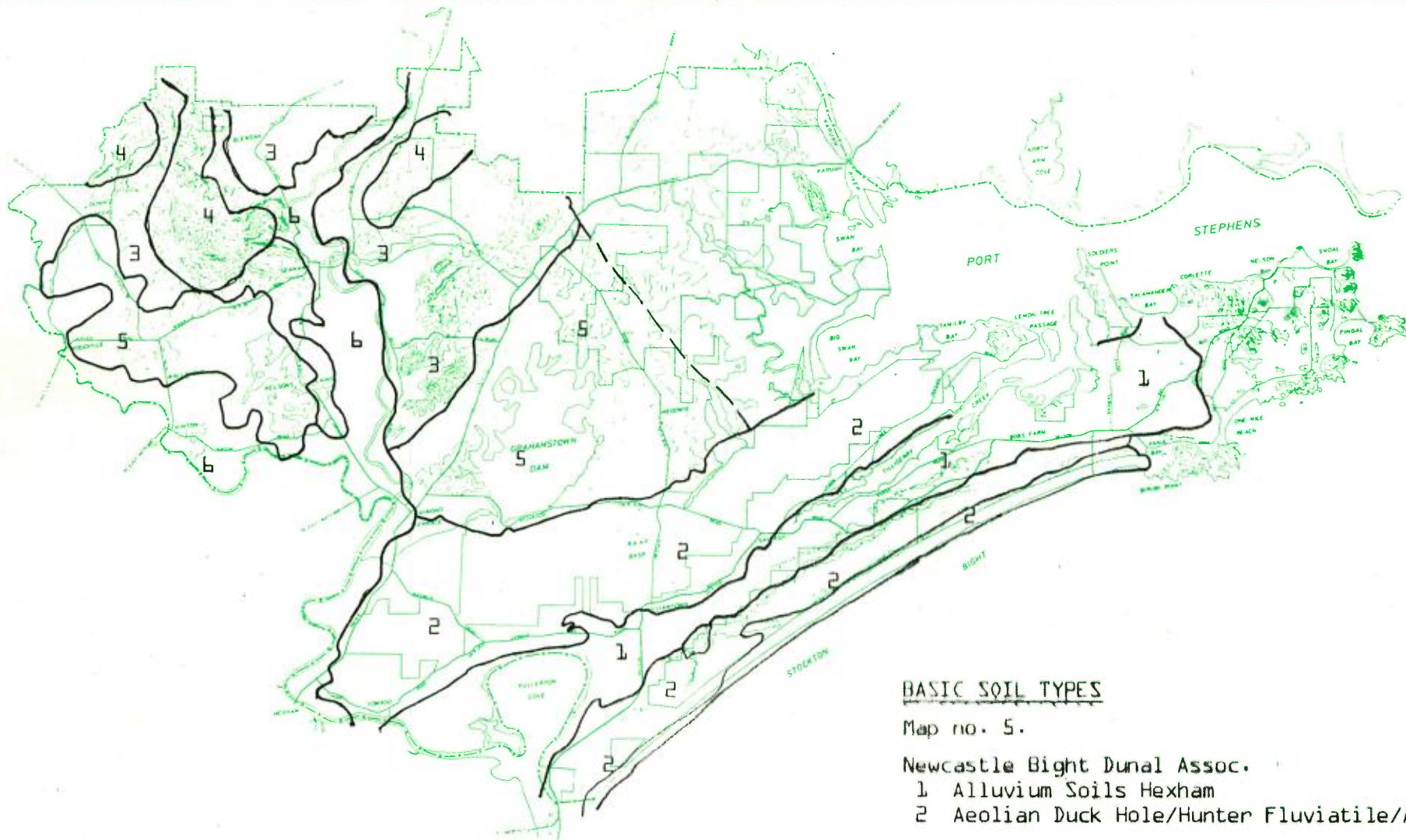
Soil type in the western half of the Shire area consists of both igneous and sedimentary based soils in various combinations. There are four basic soil types, their extent is shown on Map No.5.

Mudstone, chert, ^ftuff* - predominantly brown podzolic soils ranging from shallow depths on steeper gradients to mostly deep deposits in undulating/level areas. Hilly and rugged areas feature reduced depth and developing brown earths and skeletal soils.

Lavas, Glacial beds, basic intrusive*- some shallow podzolic soils, however a predominance of skeletal soils combined with rock outcrops, shallow cracking clays and salinized soils.

Shale, sandstone, conglomerate*- a variety of soil types including cracking clays and degraded black earths, shallow earths and skeletal soils interspaced amongst a predominance of podzolic and solonchalic soils.

Hunter fluviatile*- alluvial terraces featuring a wide range of soils including cracking clays, dark coloured chernozemic, solonchalic and podzolic soils and regosols. These floodplains soils form the basis of most viable agricultural pursuits in the area. Rich deep alluvial soils adjacent to the rivers (their origin) provide perfect conditions for cultivation and grazing and are naturally used intensively.



BASIC SOIL TYPES

Map no. 5.

Newcastle Bight Dunal Assoc.

- 1 Alluvium Soils Hexham
- 2 Aeolian Duck Hole/Hunter Fluvialite/Avicennia/ Nosta.

Non Dunal Assoc.

- 3 Mudstone, chert, tuft
- 4 Lavas, glacial beds, basic intrusives
- 5 Shale, sandstone, conglomerate
- 6 Hunter Fluvialite

Vegetation

The vegetation of the area is a varied one ranging from foreshore and dunal heath and mangrove forests through to small scattered areas of subtropical rainforest which feature remnant specimens of *Toona australis* - the Red Cedar.

This wide variation is directly linked to the geology and landform of the area as it is the extreme variation in these factors which causes such a variation in the vegetation.

Vegetation cover throughout the Shire reflects the spread of agriculture along the Valley seeking the richer soils along the Valley floor and gentler slopes. All native vegetation has been removed from such areas leaving only a remnant. Native forest still remains in some areas - outside those areas controlled by the Forestry Commission - where steeper slopes and ridges provide little use for agriculture. This is evident particularly in the Dunns Creek area where steep slopes and extensive forests combine to form one of the most attractive rural areas. Much of the estuarine and coastal heath vegetation remains, basically due to the poor suitability of those areas for agriculture.

Within the Study area there are a wide variety of vegetation formations. The major plant communities have been mapped and noted below:-

1. Eucalypt Tall Mixed Woodland

This is one of the more extensive communities in the Study area typically made up of gums and stringybarks to approximately fifteen (15) metres in height or greater. The upper stratum is typically made up of a predominance of spotted gum (*Eucalyptus maculata*) and narrow leaved ironbark (*Eucalyptus crebra*). This varies according to aspect and location with a variety of similar species both alternating and co-existing.

Substratum varies according to density and species type. Much of the area has been cleared to native grasses and in some cases native/improved pasture.

In those areas retaining a native understorey, vegetation is basically a sclerophyllous shrub stratum.

Trees:

<i>Angophora costata</i>	rusty gum
<i>Eucalyptus crebra</i>	narrow leaved ironbark
" <i>maculata</i>	spotted gum
" <i>oblonga</i>	narrow leaved stringybark
" <i>punctata</i>	grey gum
" <i>resinifera</i>	red mahogany
" <i>siderophloia</i>	northern grey ironbark
" <i>unbra</i>	barstard mahogany

Shrubs:

<i>Acacia falcata</i>
<i>Banksia collina</i>
" <i>integrifolia</i>
<i>Breynia oblongifolia</i>
<i>Casuarina torulosa</i>
<i>Glochidion ferinandi</i>
<i>Hakea sericea</i>
<i>Leptospermum</i> spp.
<i>Melaleuca styphelioides</i>
<i>Persoonia pinifolia</i>

Groundcover:

<i>Briza maxima</i>
<i>Impurata cylindrica</i>
<i>Lomandra longifolia</i>
<i>Themeda australis</i>

Small areas of wet sclerophyll forest are found within the hilly areas to the west of the Shire along sheltered gullies and watercourses. Species found within these wet sclerophyll areas in as much as the dominant tree species differ in some locations. In much of the Seaham to Dunns Creek area, *Eucalyptus maculata* - spotted gum - forms the dominant element. However in some locations *Eucalyptus grandis* - flooded gum - and *Eucalyptus saligna* - Sydney blue gum - are the dominant species.

2. Eucalyptus Dry Sclerophyll Forest

Another co-dominant community, which is found in the Seaham and Grahamstown areas. Tree height is approximately fifteen (15) metres with a thin interlacing canopy. Species dominance varies and is based upon one or a combination of the following species.

Trees:

<i>Angophora costata</i>	rusty gum
<i>Eucalyptus acmenoides</i>	white mahogany
" <i>agglomerata</i>	blue-leaved stringybark
" <i>capitellata</i>	brown stringybark
" <i>gummifera</i>	red bloodwood
" <i>haemastoma</i>	scribbly gum
" <i>maculata</i>	spotted gum
" <i>punctata</i>	grey gum
" <i>resinifera</i>	red mahogany

There is generally a stronger development of heath understorey plants in this forest type with a strong shrub stratum evident.

Shrubs:

Acacia floribunda
 " *suaveolens*
Actinotus helianthi
Banksia serratifolia
Comesperma ericinum
Eriostemon australis
Haemodorum corymbosum

Isopogen anemorifolius
Lambertia formosa
Macrozamia communis
Melichnus urceolatus
Persoonia levis
Pimelea linifolia
Ricinocarpus pinifolius

Groundcover:

Cheilanthes tenuifolia
Imperata cylindrica
Lomandra longifolia
Pteridium esculentum
Themeda australis

The upperstratum can feature a variety of other occasional tree species, such as *Eucalyptus pilularis* - blackbutt - and *Eucalyptus oblonga* - narrow leafed stringybark - which contributes to the variety to be

found within this community. While the shrub layer and groundcovers are quite diverse, they are characteristically similar.

3. Eucalyptus Savannah Woodland

This is a common community through much of the south west of the Shire area. Features of the community are a reduced tree height to approximately ten (10) metres and reduced tree cover. Substratum is predominantly cleared to a grassy open floor of most semi-improved and improved pastures.

In this area species are generally an extension of the Eucalypt Tall Mixed Woodlands. However, due to extensive clearing for grazing and agriculture little of this community remains undisturbed becoming only scattered small stands.

Dominant Species:

Eucalyptus crebra	narrow leafed ironbark
" oblonga	narrow leafed stringybark
" maculata	spotted gum
" melliodora	yellow box

and to a lesser extent:

Eucalyptus albens	white box
" blakelyi	Blakley's red gum
" molluccana	coastal gry box
" tereticornus	forest red gum

4. Fen (Swamp) Vegetation

Found predominantly along the Williams River and the Hunter, but also on the Tomago Sand Beds and much of the Tomaree Peninsula, this community varies significantly according to its physical location.

In the west along the Williams-Hunter Rivers the land has been cleared and drained to utilise the rich soils beneath. Such areas are now generally intensively farmed and grazed and only remnant specimens of the major species remain in inaccessible locations.

Major Plant Species:

Casuarina spp.
Leptospermum spp.
Melaleuca spp.

Sedges and ferns are still found beneath remnant tree stands and along actual river banks, but even here competition from introduced pasture species is reducing these significantly.

In the east of the Shire where this vegetation is found overlying old sand dune systems, it has been relatively undisturbed because most of this area is utilised for water catchment under the control of the Hunter District Water Board, and because of this such areas also fall outside the extent of the Rural Land Use Study.

Forestry

The Forestry Commission can foresee no significant increase in State Forest. Most Crown land of interest has already been dedicated as State Forest, and acquisition of private land for State Forest is unlikely in this area.

Most forests in the area have been managed for a long period, mainly for production of mining timber. It is expected this use will continue and these forests will be maintained more or less in their present condition. Harvesting of timber will remain periodical as stands grow to a suitable size, and is typically a thinning only, and clearfelling is not practised.

There are no proposals for the establishment of exotic pine plantations in the general area.

Hydrology

Within Port Stephens Shire, rainfall has a beneficial effect on the pastoral and agricultural interests as well as the storage levels of the Hunter District Water Boards supply sources.

However the potentially disastrous effects of flooding and drought are causes for concern, and whilst the effects of flooding can be ameliorated nothing can offset the effects of drought.

Drainage Pattern

The Shire is situated in the lower reaches of two important river basins. These basins, the Hunter and the Karuah, affect the western and eastern halves of the Shire respectively. (See Map 6).

The Hunter River Basin: The Hunter together with its major tributaries, the Paterson and Williams, forms the major agricultural water resource in the area. Although the majority of this water source is subject to salinity due to tidal influence, it forms the supply for extensive crop and pasture irrigation in the area.

The only major river in the Shire receiving non-tidal waters, is the Williams above Seaham Weir. While water quality tests are not taken within the Shire, a station at Glen Martin indicates that the waters of the Williams at that point are suitable for domestic stock and most agricultural uses.

The tidal limits of rivers within the Port Stephens Shire are:-

- Hunter River - Oakhampton (upstream of Maitland)
- Paterson River - Gostwyck (upstream of Paterson)
- Williams River - Seaham Weir
- Karuah River - Allworth,

Rainfall

The period from December to April tends to be relatively wet, while June to September is relatively dry. Heavy rains may occur at any time of the year, but are more likely in the warmer months.

Dry spells lasting six months or more occasionally occur throughout the region.

AVERAGE MONTHLY RAINFALL (mm)
(1969 to 1979)

	J	F	M	A	M	J	J	A	S	O	N	D	Total
Total (mm)	134.4	110.4	143.8	90.1	116.1	137.3	27.9	48.7	62.9	93.2	98.2	93.1	1156.1
Days	10.6	10.4	13.6	9.09	10.1	12.1	6	6.9	9.9	11.7	11.5	8.4	120

Annual rainfall averages for centres in the area are as follows:-

- Maitland - 888 mm
- Paterson - 909 mm
- Dungog - 994 mm
- Tomago - 1120 mm
- Newcastle - 1300 mm

Flooding

Floods are unpredictable in size and occurrence, and experience has shown conclusively that it is not possible to completely control floods in the Hunter Valley, only to mitigate or lessen their effects.

The concept of flood mitigation is to confine the smaller floods to the river and thus avoid damage.



HYDROLOGY - MAP 6

- Division between Catchments
- Existing Service Lines
- Potential Service
- ~~~~~ Catchment Areas
- Chichester Pipeline

When this is no longer possible, in the case of larger floods, the aim is to gradually allow the flood waters to spill into the natural flood basins along the river. As the river rises still further, excess water is led through defined floodways to encourage free flowing and rejoins the river further downstream.

The Hunter, and its tributaries the Paterson and Williams have long been prone to extensive flooding. Flood records date back to 1820, but during the last 50 years the Valley has experienced some seventeen serious floods. Serious flooding in the 1940's and 50's prompted government action to review the flood situation. Following the 1955 flood the State Government authorised the Hunter Valley Flood Mitigation Act 1956, which allowed the co-ordinated construction of flood mitigation works over the whole Valley.

A combination of methods and structures such as levees, drains, floodways, spillways, control banks, etc., are used to reduce damage from flood waters and to restore land to production by draining water back to the river as quickly as possible.

With the completion of major flood mitigation works in the Lower Hunter the emphasis of the programme has turned to flood plain management, controlling development on the flood plain. Use of flood prone land for housing, commerce and industry in the past has resulted in heavy losses and great hardship in times of flood. The State Government has since adopted a policy of discouraging urban development in flood prone areas. The aim of this policy is to reduce

flood losses and the resultant high cost to the community and to avoid unnecessary hardship to people who might otherwise settle in unsafe areas. New development will be directed to flood free land, or where a flood plain location can not be avoided, proper flood proofing will be incorporated in the developments design.

Groundwater

Groundwater is stored beneath the land surface in the open spaces between individual grains in unconsolidated fluviatile deposits. It may also occur in joints, faults and fractures in otherwise impermeable rock.

Hard rocks of Carboniferous and Permian Age occupy the northwestern part of the Shire. They consist of tuff, sandstone, conglomerate, shale, volcanic rocks and coal lenses. Bores in topographically favourable sites may yield a useful stock supply of groundwater generally at depths of less than thirty (30) metres but relatively few bores have been constructed. The quality of water from the carboniferous hard rock aquifers is usually good.

Alluvial deposits occur as river flats along the Hunter, Paterson and Williams Rivers and as aeolian and beach sands from east of Raymond Terrace to the coast and extending from Tomago to Port Stephens. Alluvial river flats could be expected to yield useful stock supplies from wells, with possibly an occasional yield sufficient for limited irrigation.

Between Raymond Terrace and Hexham the alluvial plain is underlain by black sand and mud of estuarine origin. There is a variation in water quality both laterally and with depth and large supplies of good quality.

The best sources of groundwater within the area are the large sand deposits east of Raymond Terrace to the coast. The Hunter District Water Board extracts large quantities of high quality groundwater from two areas, those being the Tomago Sand Beds, north and north east of Raymond Terrace, and the beds near Nelson Bay and Anna Bay, on the south side of Port Stephens.

Groundwater is replenished directly or indirectly by infiltration of water from the surface. If chemical or organic pollutants enter the water before it infiltrates then there is a likelihood of those pollutants reaching the water storage. It is therefore important to guard against pollution of groundwater reserves.

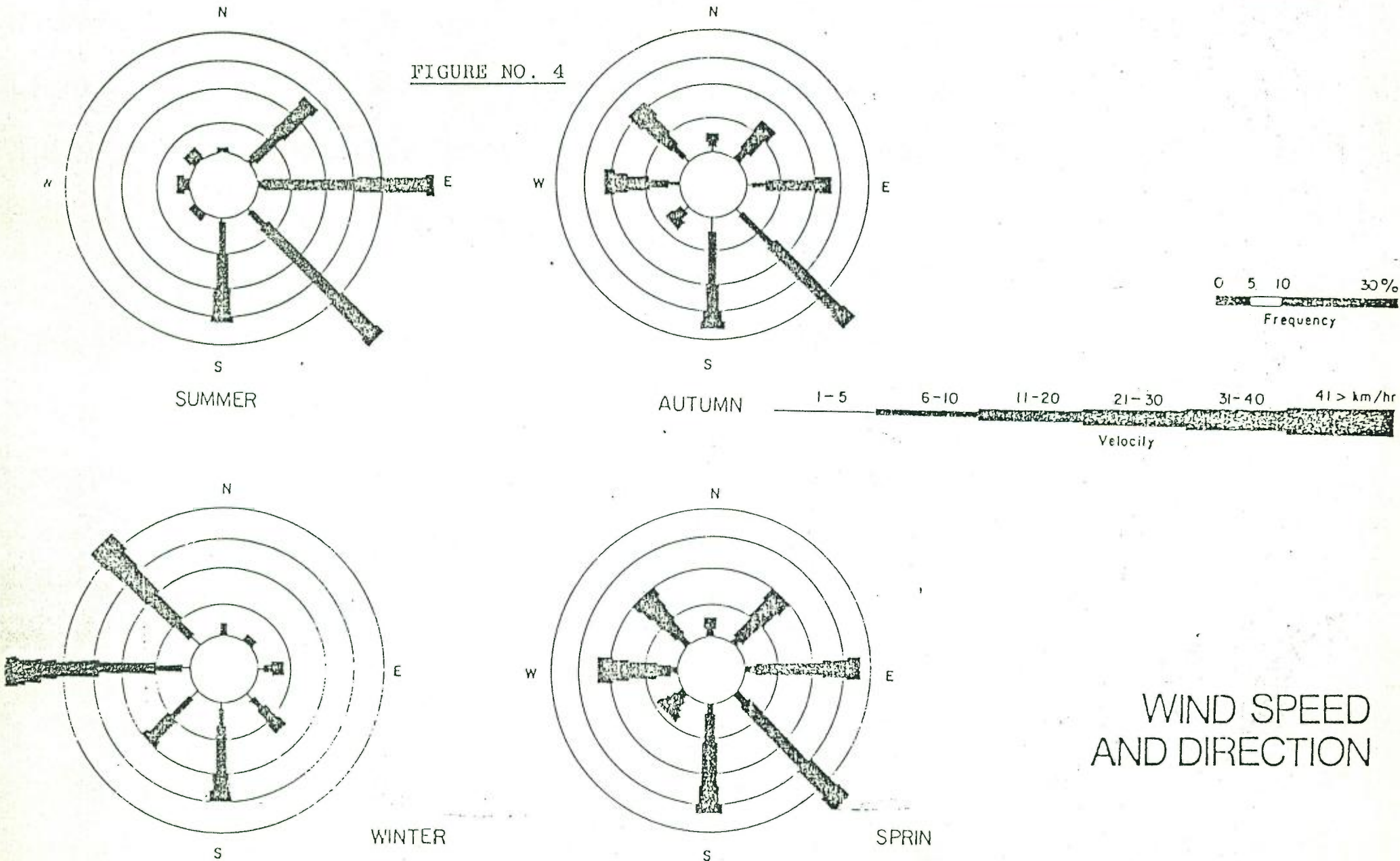
Climatology

Many activities within the Shire are governed by the effects of wind speed and direction, rainfall, temperature and humidity.

The desirable location for a subdivision, an industrial establishment, specialised agricultural activity must of necessity take into account the climatology of the area.

The attached diagrams reflect information which has been made available from the Meteorological Section of the R.A.A.F. Base, Williamstown, as in relation to Port Stephens Shire. Information for individual areas within the Shire is not available, however because of the basic uniform topography of the Shire, little variation occurs from the data displayed within the rural areas. This is not to say that there is no information available concerning rainfall distribution in the Tomaree Peninsula area which greatly exceeds that of other areas, however, for the purpose of this report that information is irrelevant as this Study does not extend to making recommendations with respect to the rural lands on the Tomaree Peninsula.

FIGURE NO. 4



WIND SPEED AND DIRECTION

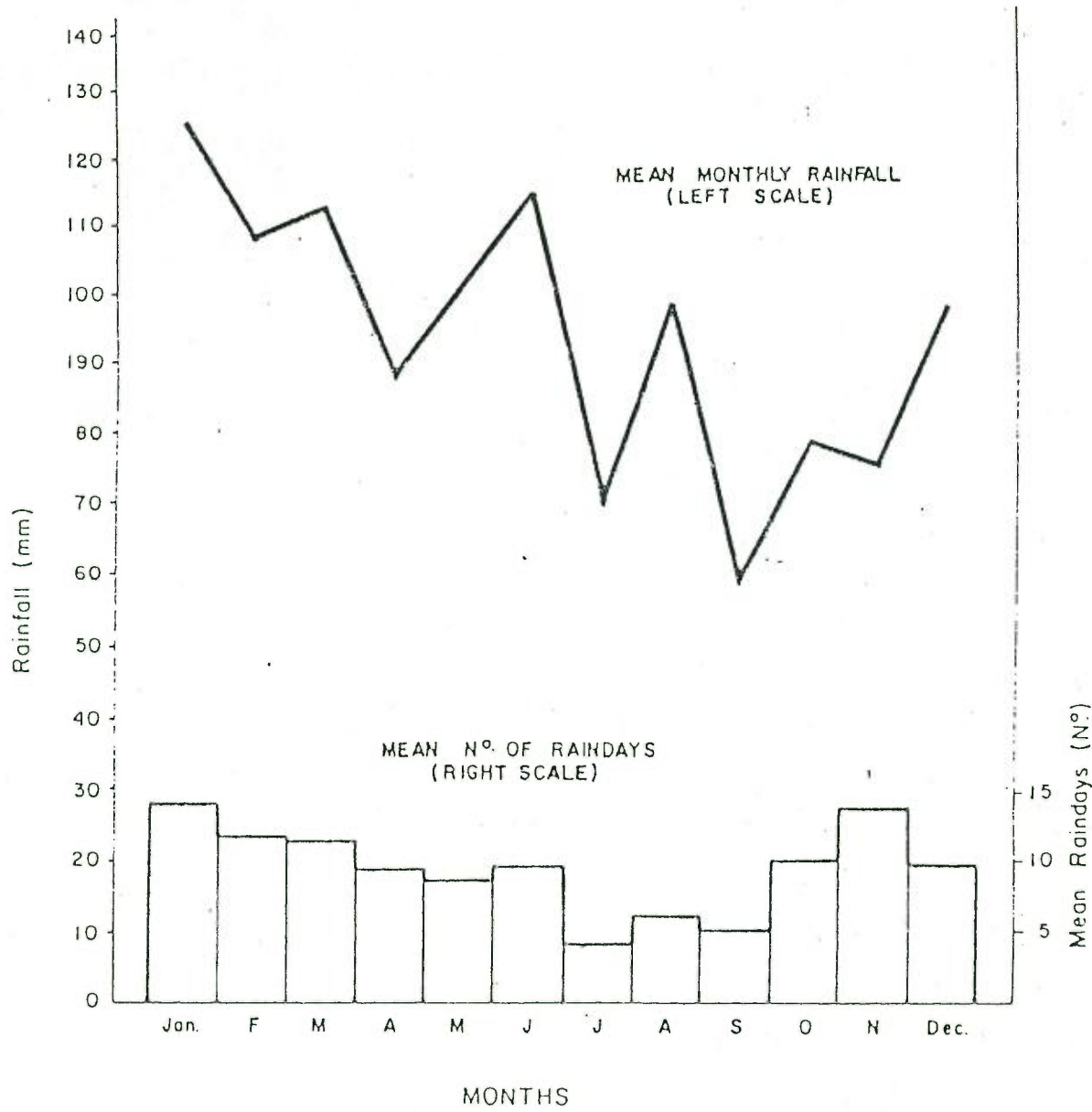
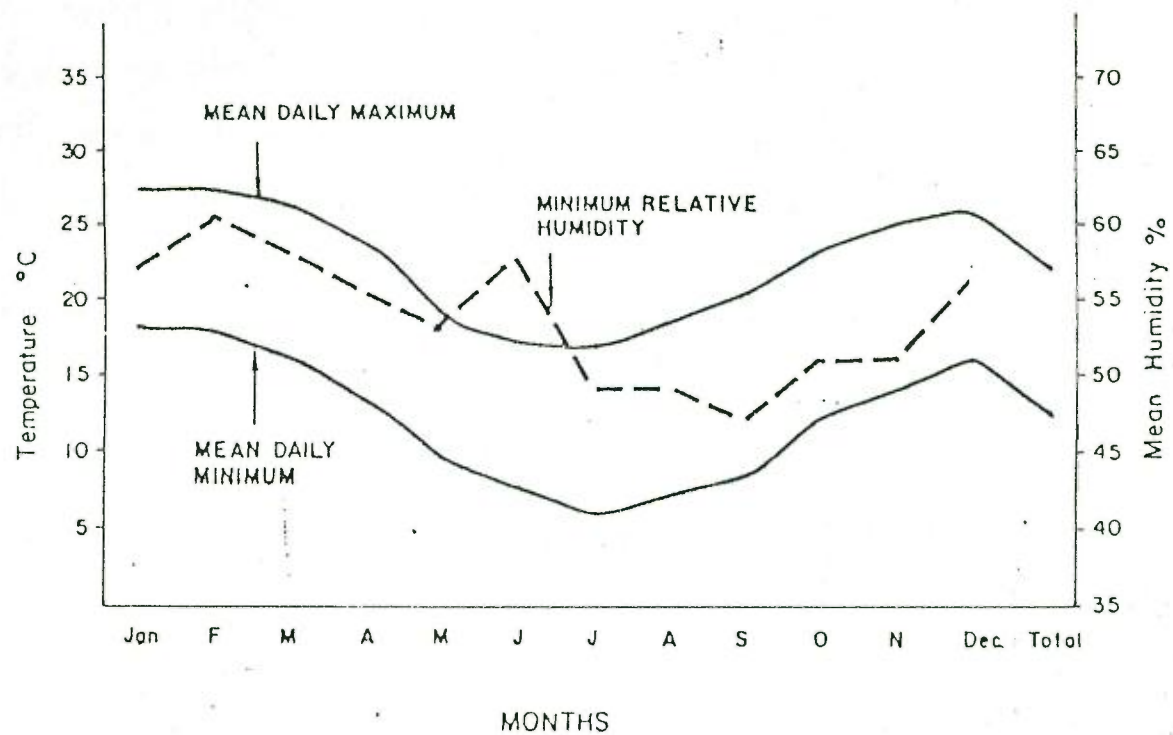


FIGURE NO. 5

RAINFALL

FIGURE NO. 6



TEMPERATURE & HUMIDITY

Tomago Sandbeds Water Supply System

The supply of potable water to the residents and industry of the Lower Hunter Valley is directly related to the fortunes of the hydrology and climatology of the Port Stephens Shire.

As the underground water held in the Tomago Sandbeds is of such critical importance to not only the agricultural activities east of the Hunter River, but also to the Newcastle urban area, the system is analysed in detail.

Agricultural uses in the area survive in a symbiotic relationship with the groundwater, since not only does agricultural activities in the area depend for their existence on a ready, reliable supply of water, but the land use must act to protect the quality and quantity of supply.

The Hunter District Water Board states that evaporation from the sandbeds is relatively low because of the extensive tree cover in the area.

The sand sheets and dunes that form part of a large underground water aquifer extending from Tomago in the southwest to Tanilba Bay in the northeast is known as the Tomago Sandbeds.

The sandbeds extend to an average depth of 18 m below the surface and are relatively unconsolidated and continuous over the entire area. The fine grained sand forms a fairly uniform aquifer in which the water table varies from 1.5 m to 5 m below the surface.

Interbedded with the sands are clays, gravels and shell horizons, as well as peats, lignites and other carbonaceous material. Ascending the sequence, the deposits consist of coarse gravels, estuarine clays and sands, beach and dune sands, and in some places flood-deposited loams. Griffin (1964) found that the clay horizons, which are originally thought to have formed an impervious seal at the base of the sequence (Corlette, 1944), were not continuous over the entire area, but formed lenticular masses which vary considerably in thickness and extent. Bedrock occurs below the estuarine clays at depths between 20 m and 30 m.

The exact limits of the groundwater aquifer have not been precisely defined, but the proclaimed boundary of the Tomago Sandbeds Water Supply Catchment is considered the approximate limits of the groundwater aquifer suitable for water supply. This boundary encompasses an area of 106 km².

The Hunter District Water Board has developed the sandbeds as a major source of domestic water for Newcastle. Within the Tomago Sandbeds Water Supply Catchment, approximately 91 km² are utilised for water supply.

In 1977-78, a total of 13,577 Ml of water were delivered to the Newcastle area from the Tomago Sandbeds, representing 16 per cent of total domestic water requirements.

The quantity of water stored in the sandbeds is variable and generally related to rainfall patterns, recharge and use. Over a ten month period (15th September, 1976 to 13th July, 1977), the quantity of water stored in the sandbeds averaged 42,828 Ml. The lowest amount stored being 33,102 Ml in the summer months (February) and the highest in winter (June) when 47,722 Ml was stored.

Within the Tomago Sandbeds there are 20 primary pumping stations which supply water to a central treatment plant at Tomago, where the water is treated, and pumped to reservoirs for distribution.

The Tomago Sandbeds are not utilised as a year-round water source. Most stations are operated only during the summer months (October to March) when the demand is greatest. The number of stations delivering water to the central treatment plant at any one time is dependent on demand, water quality and the storage situation with regard to other sources and supply.

The operations over any one year at any particular pumping station follow no particular pattern, none operate continuously, but water may be pumped for periods of several weeks at a time. Usually stations with consistently low iron contents are used more frequently, but when water demand is high, stations are 'mixed' in an attempt to obtain the lowest possible iron content.

Apart from changes in the Grahamstown area, flow directions remain relatively constant over the area, although actual water levels may change. The original pumping stations first brought into service in 1939 use a shallow-well suction-lift system for drawing water from a depth of 12 m.

The more recent pumping stations use deep bore pumps which draw water from a depth of 20 m below the surface. The stations have a maximum capacity of 5.2 ml/d and consists of eight bores installed 220 m apart in a straight line. This line is orientated north-south to parallel the water table contours and to intercept groundwater which flows naturally from the sandbeds to the Hunter River to the northwest.

That water draw ranges in quantity from high to moderately high iron content and water pumped from the sandbeds is treated at the Hunter District Water Board's plant at Tomago.

After aeration in spray basins, to remove hydrogen sulphide, to lower carbon dioxide and to increase oxygen content, the water gravitates to treatment plants. Treatment processes include dosing with lime, alum and chorine. After flocculation and sedimentation processes, the water is filtered through rapid sand filters and then passed to a 9.1 Ml capacity clear water reservoir for delivery to service reservoirs and pumping stations.

The Hunter District Water Board is examining means of augmenting the Newcastle - Lake Macquarie domestic water supplies. Growth in the region over the decade has placed a strain on existing water sources and the Board is concerned that suitable sources are available to meet future demand.

Within the Tomago Sandbeds, investigations are being carried out to upgrade and increase the capacity of existing pumping stations, and feasibility studies are being conducted to determine the capacity for these stations to supply water on a year-round basis.

Investigations are also being carried out to determine the feasibility of placing additional stations within the sandbeds to augment existing supplies.

The water stored in the sandbeds is derived entirely from rainfall by direct absorption through the pervious surface of the sand. The quantity that passes into storage is that portion of the rainfall which is not lost by evaporation, plant transpiration, underground flow and runoff.

Over most of the sandbeds the groundwater table is found within 1.5 m to 5 m of the surface, the water being stored in the interstices of the sand. The permeability and storage capacity of the sandbeds are related to soil type, particle size distribution, density of the soil, and the presence of impervious layers in the aquifer formation.

Permeability testing has been carried out by Gerard and Herzog (1971) at eight sites within the area mined by Rutile and Zircon Mines (Newcastle) Limited. Tests were carried out during pumping prior to, during, and after mining, but only the results of tests carried out prior to mining are indicative of the permeability of sand on the site. Their results showed that the average permeability of the sandbeds is .025 cm/s or 20 m/d.

Groundwater contours determined by the Hunter District Water Board are shown on Map No. 7, and indicate a natural hydraulic gradient towards the Hunter River, the Pacific Ocean and Port Stephens.

The Hunter District Water Board has installed lysimeters to measure the amount of rainfall reaching the water table. In general, approximately 20 to 25 per cent of the rainfall reaches the water table, and hence less than 25 per cent of the average annual rainfall is available for pumping. A safe yield of 625 kl/d.km² has been adopted by the Hunter District Water Board.

The Hunter District Water Board (1957) has conducted experiments which show that the incidence and character of rainfall is of importance in determining the amount of rainfall that will percolate into the sand.

McGrath (1967) found that figures such as 30 per cent of rainfall thought to be available for pumping were not applicable to actual rainstorms, since the infiltration for short periods depended very much on antecedent conditions.

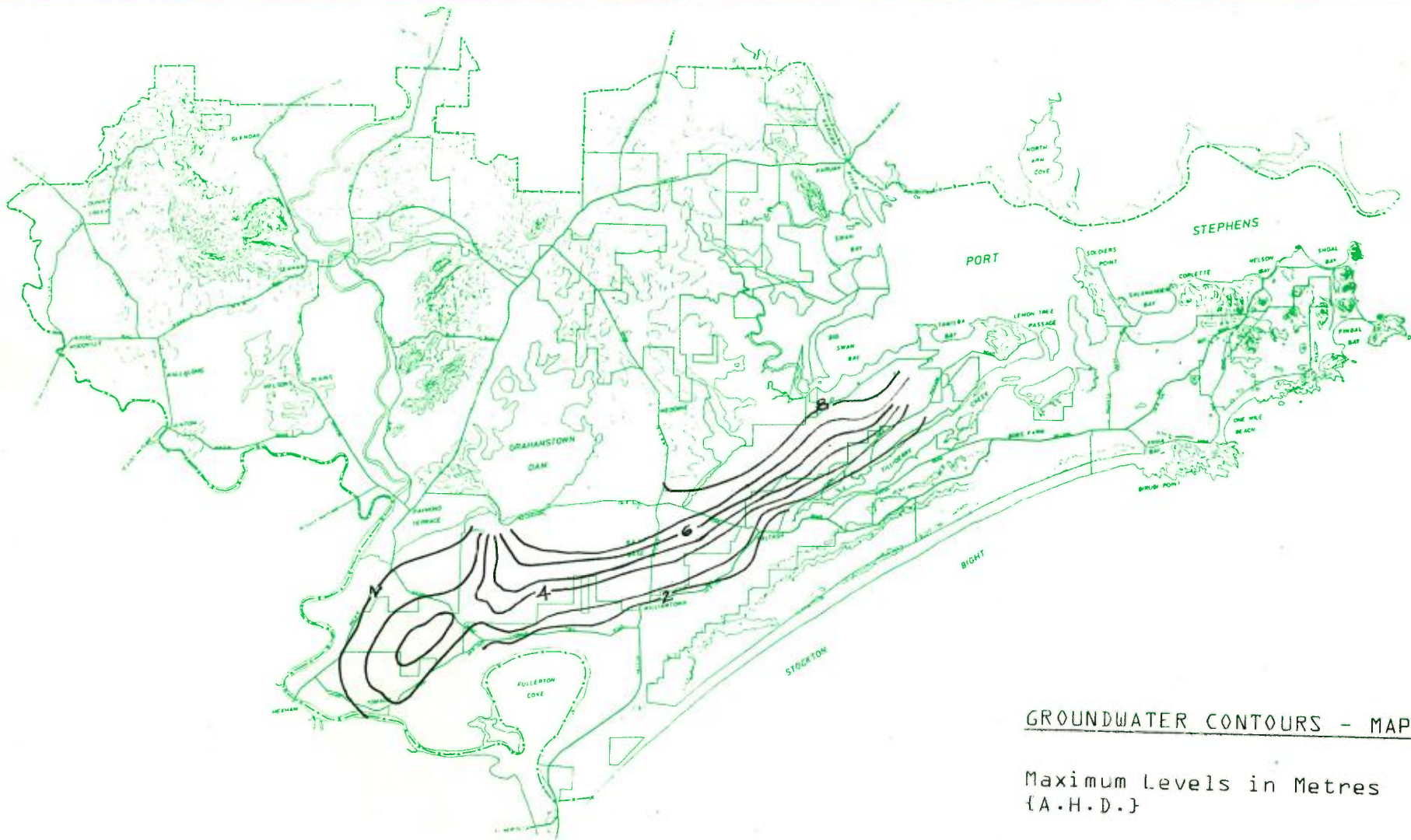
After a fairly dry period, good rains may have little or no effect on the water level, since they contribute to wetting the dry surface sands. Heavy concentrated rains make the greatest contribution to storage. Thus, although the Tomago Sandbeds have an annual average rainfall of 1156 mm per annum, it is not this yearly rainfall total that is critical for storage, but rather the individual weather sequences.

The Hunter District Water Board (1957) and McGrath (1967) consider that evaporation and transpiration, where evaporation covers direct water loss from the water table as well as from the land surface, account for a large amount of the water lost from the Tomago Sandbeds.

Experiments carried out by the Board have determined that 1.2 m of sand cover is sufficient to prevent evaporation from the water table and consequently, water losses overall from storage by evaporation are probably not great, except after periods of heavy rain when many low-lying areas would have less than 1.2 m of sand above the water table.

The Hunter District Water Board has been monitoring the quality of water in the Tomago Sandbeds on a regular basis since 1930. Early analysis showed that the water was of very variable quality. Some samples were clear while in others, colour was up to 200 parts on the platinum-cobalt scale. A few showed considerable turbidity and chemical analysis and water 'softness' were widely variable. Iron content was frequently high (up to 6 mg/l), free oxygen was found to be practically absent and carbon dioxide was high, averaging about 100 mg/l with occasional samples up to 240 mg/l. pH was found to vary from 5.0 to 6.5 being usually around 5.5, and free hydrogen sulphide was present in nearly all samples ranging from 0.5 to 1.0 mg/l.

It was found that after pumping commenced, the iron content increased to an average maximum of 4.4 mg/l in 1949 (Hunter District Water Board, 1957). Since this time, the iron content has decreased to a level suitable for treatment. Apart from the iron content, it has been found that there has been little variation in the quality of the water of the sandbeds since pumping commenced. Those inspection points that yielded good water initially have continued to do so, while the unsatisfactory points likewise, have shown little tendency to change in spite of the large quantity of water pumped from the sandbeds.



GROUNDWATER CONTOURS - MAP 7

Maximum Levels in Metres
{A.H.D.}

<p>Scale: 1:50,000</p> <p>Map No: 57A</p> <p>Shire of Port Stephens</p> <p>Local Environmental Plan</p>	<p>ENVIRONMENTAL PLANNING & ASSESSMENT ACT, 1973</p> <p>SHIRE OF PORT STEPHENS</p> <p>LOCAL ENVIRONMENTAL PLAN</p>	<p>DEPARTMENT OF REGIONAL DEVELOPMENT AND LOCAL GOVERNMENT</p> <p>1988</p>
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Recommendations
with regard to
Tomago Sandbeds

1. That all lands within the Catchment Area be subjected to restrictions as to land use which will ensure the protection of the supply.
2. That the restrictions listed in the Hunter District Water Board's Catchment Area By Laws be included in any future rezoning proposals for lands affected by such By Laws.
3. That the Tree Preservation Order currently applying to Residential Areas of the Shire be extended to cover areas affected by the Hunter District Water Board's Catchment Area By Laws in respect of the Tomago Sandbeds.
4. That future subdivisions (other than 40 hectare subdivisions) not be permitted within the area defined by the Hunter District Water Board's Catchment By Laws.

Groundwater Licenses and Use

Other than the production bores in the Tomago Sandbeds operated by the Hunter District Water Board, there are four irrigation or industrial bores located within the Shire, however none of the bores are located within the study parameters.

There are also a number of licensed bores of sufficient yield for stock and domestic water supplies in use at various locations.

Surface Water Licenses and Use

As at the 31st August, 1982, the Water Resources Commission had issued eighteen (18) licenses in the Shire for the private diversion of non-tidal streams, mainly for irrigation purposes. An area of 234.5 hectares has been authorised for irrigation.

Swamps and Wetlands

"Almost all the local wetlands are quite close to the larger concentrations of population in the Region, as most people live and work in the lower Hunter or along the coastal strip between Port Stephens and Lake Macquarie. Despite their proximity, wetlands are certainly not everyone's 'cup of tea' and they are generally little known, seldom visited and frequently maligned. All too often, wetlands or swamplands are regarded as being synonymous with wastelands and therefore to be 'reclaimed' whenever possible...However, there are considerable benefits which both estuarine and freshwater ecosystems can provide for mankind."

David Waterhouse, 1981 - Wetlands of Australia's Hunter Region.

Wetlands can be defined as areas of swamp, shallow water or waterlogged land. The water cover may be permanent or temporary. Estuaries are tidal wetlands, usually the tidal portions of the river mouths, bays and lagoons. The estuary includes the tidal water body, the floor of the estuary and the intertidal area.

Freshwater wetlands are important feeding, nesting and resting sites for many birds both indigenous and migratory. Birds commonly occurring in wetlands include white and grey ibis, heron, egrets, cormorants and ducks. Major game duck species depend upon coastal refuges when inland wetlands dry up. Of the many species of wading birds which depend upon the New South Wales estuarine system, twenty-six are long distance migrators.

It has further been demonstrated that 70% of fish caught off the New South Wales coast are estuarine dependent for at least part of their life-cycle. The prawn and oyster industries are also heavily dependent upon estuarine resources.

The protection of wetlands depends upon three major points:-

- * Careful control of development in the catchment-control of urban runoff and clearing.
- * Control of discharges, stormwater drainage and septic tank effluent.

- * Foreshore protection against such development as clearing of foreshore vegetation resulting in bank erosion and loss of productive vegetation, works within the waterway changing flow characteristics, reclamation, dredging and draining.

Activities such as these either destroy or significantly reduce the viability of such areas. Consequently the following works should not be allowed to occur in wetlands;-

- * filling;
- * draining;
- * mining;
- * dredging;
- * reclamation;
- * waste disposal.

Agricultural Activities

Diverse agricultural activities have always been evident within Port Stephens Shire. However, in recent years, the intensive agricultural uses such as Broiler Industry, Oyster Farming and commercial market gardening have come into prominence.

This movement reflects the movement of land values and the market place fluctuation, and from information available it would appear that this movement away from low density use of agricultural land will accelerate.

Agricultural activities account for 21,268 hectares of a total rural area of 73,606 hectares within the Shire of Port Stephens.

Land related activities currently being undertaken in the rurally zoned land of the Shire are:-

- (a) Cropping and Market Gardening;
- (b) Livestock Production;
- (c) Oyster Farming;
- (d) Mineral Sandmining;
- (e) Extractive Resource Mining;
- (f) Timber Getting.

On current figures the livestock count within the Shire is as set out in Figure No. 7.

However, the actual area of land intensively farmed or by improved pastures is grossly less. Intensive rural industry can be allocated into three distinct groupings:-

- (a) Cropping and Market Gardening;
 - (b) Oyster Farming;
 - (c) Battering Poultry and the Broiler Industry.
- (A) Cropping and Market Gardening;

Commercial cropping is confined to the flood plains of the Lower Williams, Hunter and Paterson Rivers. Improved pastures and on farm consumption crops are grown on the remainder of the flood plains of the Shire.

Market gardening falls into five distinct areas and types within the Shire.

1. The flood plain vegetable crops of the Woodville area;
2. The "salad vegetable" crops of the Bobs Farm/Anna Bay area;
3. The stone fruit farms of Medowie;
4. The cut flower industry of Bobs Farm; and
5. The nurseries of the Tomago/Salt Ash area.

Soil, climate and rainfall of each of these areas uniquely suits the activity and there are no current or proposed uses which are incompatible with the continuation of the viability of these industries, save the Medowie area which is the subject of a separate report. The areas of operation are shown on the land use Map 8.

(B) Oyster Farming

Because of the complexity of the oyster industry and its dependence upon the land and water conditions, and the drastic effect changes to the environment can have, a detailed report is made on the growth of oysters and their environment later in this report.

(C) Battering Poultry and Broiler Industry

Whilst the dairy industry has traditionally been the largest income earner and employer of farm labour in the rural sector of the Shire, it has been overtaken in the last decade by the broiler poultry and beef cattle industries. The intensification of land usage, and the associated increases in land values which accompany the broiler industry has ensured that the dairy industry will never again return to its previous position of importance.



MAP 8

AGRICULTURAL LANDUSE

- Dairying
- Poultry Farming
- /// Flower Growing
- ✳ Market Gardening
- ☞ Oyster Farming
- ☞ Cultivation

ENVIRONMENTAL PLANNING & ASSESSMENT ACT 1979		STATEMENT OF RELATIONSHIP WITH OTHER PLANS
SHIRE OF PORT STEPHENS LOCAL ENVIRONMENTAL PLAN	DATE OF PREPARATION DATE OF REVIEW DATE OF AMENDMENT DATE OF AMENDMENT DATE OF AMENDMENT	

The dairy industry as it now exists, only accounts for 18.1% of agricultural production in the region, a drop of 30% in the last two decades. However, despite the drop in its relative importance to the agricultural sector, an increase in productivity has resulted from on farm improvements, and a general increase in the size of holdings.

Steggles Pty. Ltd., have at Woodville their hatching plants and farms and account for the major proportion of the poultry livestock within the Shire.

Battering and Broiler Industries because of the size of the buildings needed, the number of birds housed and the need to dispose of large quantities of waste, a situation arises which makes the co-existence of rural residential and the industry incompatible. Council has currently a code, for the siting of Broiler Sheds which is as follows:-

CODE FOR THE ERECTION OF POULTRY BROILER SHEDS

Council at its meeting held on the 22nd May, 1979, resolved that the following conditions be adopted in relation to Poultry Broiler Sheds:-

1. No shed shall be erected upon a site which has a land area of less than 10 hectares, (24.71 acres)
2. No shed shall be erected within 20 metres of any side or rear boundary of an allotment.
3. No shed shall be located so that it is within 500 metres of any dwelling erected upon an adjoining allotment.
4. The building line to a road or public place for a Poultry Broiler Shed shall be 100 metres.
5. Where sheds and or storage areas are visible from a road or public place they shall be adequately screened.

6. As the court has held that Broiler Sheds do not come within the definition of "agricultural buildings" Councils normal development fees shall apply to any application to erect such a building.
7. Council reserves the right to require an Environmental Statement for any application that may arise in an environmentally sensitive area or an unusually significant area.

FIGURE NO. 7 - LAND USE ON THE LOWER HUNTER FLOOD PLAINS

Item	Unit	1967-68	1973-74	1977-78*
Sown Pasture	ha	**	4 104	3 517
Native pasture	ha	**	7 611	6 850
Lucerne	ha	1 329	1 444	431
Maize	ha	333	177	206
Potato	ha	927	744	577
Cabbage	ha	85	173	125
Cauliflower	ha	96	192	128
Lettuce	ha	14	45	94
Watermelon	ha	6	52	38
Pumpkin	ha	81	199	164
Area vegetables for human consumption	ha	1 307	1 427	1 217
Area vegetables double cropped	ha	**	268	249
Dairy cattle	No.	11 510	14 123	8 756

* 1977-78 statistics do not include holdings with gross return less than \$1 500, hence not all production areas tallied.

** Not available.

FIGURE NO. 7 CON.

LIVESTOCK NUMBERS IN PORT STEPHENS SHIRE

AUSTRALIAN BUREAU OF STATISTICS AGRICULTURAL CENSUS, MARCH 31, 1981

	No. of Stock	No. of farms with stated Stock
<u>CATTLE</u>		
Dairy bulls (1 yr & over)	58	31
Dairy bull calves	15	10
Dairy cows (in milk & dry)	2,891	42
Dairy heifers (1 yr & over)	698	38
Dairy heifer calves	512	38
House cows & heifers	68	28
Dairy cattle (excluding house cows)	4,174	47
Dairy cattle (including bulls)	4,242	70
Beef bulls (1 yr & over)	140	75
Beef bull calves	71	15
Cows & heifers 1 to 2 yrs old	1,071	54
Cows & heifers (over 2 yrs)	2,904	83
Heifer calves (under 1 yr)	847	75
Other calves (under 1 yr)	1,108	72
Other calves (1 yr & over)	1,090	48
Meat cattle (including bulls)	7,231	118
<u>CATTLE</u>	<u>total Cattle & Calves</u>	<u>152</u>
	11,473	
<u>PIGS</u>		
Boars	17	13
Breeding Sows & Gilts	134	14
Other Pigs	875	14
<u>Total Pigs</u>	<u>1,026</u>	<u>16</u>
<u>GOATS</u>	<u>Total Goats</u>	<u>5</u>
	185	
<u>HORSES</u>	<u>Total Horses</u>	<u>11</u>
	88	

POULTRY Total Poultry (includes Chickens 1,556,390 and Turkeys) 28

OYSTERS Total Oysters (Bags) 24,057 1,040

Total Number of Farm Enterprises Reported in Census for Port Stephens Shire = 233

Total Area of Farm Enterprises Reported in Census for Port Stephens Shire = 21,268 hectares.

Recommendations

- (1) That areas currently being used for dairying be protected from competing land uses.
- (2) That dairying be encouraged in areas capable of being irrigated.
- (3) That areas above the 1 in 100 year flood area adjacent to existing dairying activities be protected for use in times of flooding.
- (4) That dairying be concentrated into existing areas and the dispersal of the industry be discouraged.
- (5) That extension of the existing broiler activity within the Shire be not encouraged.
- (6) That existing Broiler farms be permitted to expand areas of operation where they comply with Council's current code of development.
- (7) That grazing be excluded from areas which are prone to erosion and excessive slope.
- (8) That clearing of lands in areas having a slope greater than 30 per cent for use for grazing be not permitted.

Oyster Farming

A long term profitable and intensive agricultural use within the Shire is Oyster Farming.

Oyster Farming more than any other agricultural use relies upon not only weather but also estuarine and the land conditions for survival.

The average person knows little of this industry, and for this purpose a detailed explanation follows, so that rational conclusions can be drawn.

Port Stephens Shire is the greatest producer of plate oysters and bottle grade oysters in the State based on 1981/82 figures.

Production figures for 1981/82 were:- 20,944 bags of plate oysters and 3,113 bags of bottle grade oysters, a total of 24,057 bags derived from 440 oyster leases covering approximately 119.8 kilometres of foreshore and a further 600 leases covering 1290 hectares of estuarine waterways.

To enable the true impact of this rural industry upon potential future land uses within the Shire, it is first necessary to review the oyster production process, its potential threats from the environment and its likely future needs.

Oyster farming consists of two phases, spat collection and growing.

Spat Collection

In the natural state, the oyster larvae settle onto rocks shells, jetty pilings, mangrove roots and other such surfaces in the environment. The oyster farmer provides artificial material (culch) for the spat to attach to. Various culch materials have been used in New South Wales, including mangrove sticks, asbestos sheets (both of these with and without a thin veneer of cement), rock slabs, tiles, strips of cabbage tree etc. The only pre-requisite is that the material must be firm and clean, ie. free of marine growth or silt, and cheap and easy to handle. The most widespread material used to-day is the sawn hardwood stick, which has virtually replaced the use of other culch materials in most areas. The sticks most commonly used are one inch square and six feet long and are made from any of the New South Wales hardwoods.

The individual sticks are nailed together to form a frame. The frame typically consists of about eight or nine sticks nailed parallel to one another, about four inches apart by means of two cross pieces.

The frames are usually dipped into hot tar before use. The tar performs four functions:-

- (1) it provides a clean surface for the settlement of the spat;
- (2) it makes the subsequent removal of the oysters from the sticks much easier;
- (3) it preserves the timber from attack by marine borers;
- (4) it destroys marine growth that has previously formed on old sticks being reused.

The stick frames are tied into bundles or 'crates' which consist of a stack of four to six frames, and placed onto racks in the spat collection areas. The height of the rails above the bottom is positioned so that the crates lie in the optimum depth for spat settlement. This height is usually judged by observing the distribution of the spat on natural surfaces around the adjacent shoreline.

The crates are placed in areas of the bays and estuaries where spat settlement is known to be heaviest. These areas are usually downstream in more marine conditions. The culch material is usually set out one or two weeks prior to the expected spawning time. Material set out too early becomes fouled with marine growth and barnacles which prevent the subsequent attachment of oyster spat.

The crates are put out in December and spatfall generally occurs in the period January to April. The spat are left to establish until the crates are removed to 'maturing' areas later in the year. The removal can take place at any time within a span of several months, according to individual farmers' schedules and judgement. However, early spring is the most usual time. Thus oyster culture activity is quite variable from July to December, and can be expected to be minimised in November.

When the crates are removed to the maturing areas, they are 'depoted'. In this process, the crates of frames are unfastened and reconstructed and the frames in effect reversed so that all of the spat now face inwards towards the centre of the newly formed crate. The reasons for depoting are twofold;-

- (1) it protects the small vulnerable spat from fish predators;
- (2) it prevents the sticks from receiving a second spatfall, which they may do if left in the original spat collecting areas.

The maturing areas do not normally receive spatfalls. It is important that all oysters on the sticks are of the same age and hence size, to eliminate costly handling and sorting before marketing.

Growing

When the oysters are about 15 months old, the crates and frames are dismantled and the sticks laid out singly on racks in the growing areas. The waters are usually more turbid and contain more organic food materials for the oyster. Such areas are usually located on the mud-flats adjacent to mangrove thickets.

The rack system of stick cultivation has proved to be the most economically successful of all the methods employed in New South Wales. Using this method, vast areas of previously unproductive mud flats have been developed to produce yields of quick growing oysters. The heights of the racks are set to obtain maximum growth rates on the stick.

When the oysters have reached a marketable size, they are knocked from the sticks and 'culled' or sorted.

The small non-marketable oysters are either bottled, or when possible placed onto wire-bottomed shallow trays and replaced for a further period in the growing areas. This 'tray culture' is only possible in sheltered areas, and farmers often have to construct fences around their leases to eliminate wave action and fish predators. Tray oysters are recognised as having the best shape and quality for the market. Tray culture allows easy culling, and trays are easily handled or moved.

Biological Factors Affecting Oyster Culture

These may be classified under three headings; predators, disease and winter mortality.

(a) Predators and Pests

Representatives of nearly every group of marine animals either predate upon *C. commercialis* or otherwise form a pest to the oyster culture industry. Those species causing the most problems to the oyster industry are as follows:

Fish - Several species of fish predate upon oysters, especially the spat. Bream and toadfish consume considerable numbers of young oysters in the spat collection areas. Mullet and other plankton feeders consume considerable numbers of oyster larvae before they settle. Rays cause damage to culture trays in some areas while consuming the oysters on them.

Molluscs - Several species of Gastropod molluscs attack oysters by drilling holes through their shell through which they secrete venoms and digestive juices. These pests are probably the most damaging of all those found on the oyster leases. The most troublesome species in New South Wales are tingle whelk, or common borer, *Bedevelia hanleyi* (formerly *Symene hanleyi*), the mulberry whelk, *Morula marginalba*, and the hairy whelk, *Monoplex australasiae*.

Mussels, mainly *Mytilus* sp. and *Brachyodontes hirsutus*, although not actively predated upon the oyster, compete with the spat for space on the culch material and also make culling more difficult.

Worms - *Polydora ciliata* (O. Polychaeta) is a serious pest in the New South Wales oyster industry. These worms have a free swimming larva which enters the oyster and proceeds to lay down a mud burrow between the shell and mantle. The oyster in turn secretes a protective shell layer over the worm and thus forms a mud 'blister' on the inside shell surface. Although this pest does not actually kill the oyster, it does make the oyster unattractive to the consumers. *P. ciliata* only becomes a serious problem where the culch material is placed too close to the bottom.

Protozoa - Protozoa are microscopic single celled animals. Some species, when consumed in large quantities by oysters, can discolour the flesh and although this is not harmful to the oyster or humans, it renders the oyster unattractive. Outbreaks of 'blooms' of such organisms are however infrequent and the oyster soon 'recovers' after a few days in normal seawater.

Crabs - Mangrove crabs, *Scylla serrata* are capable of crushing oyster shells, and are a minor pest in some culture areas, especially where the culch material is placed near to the bottom. They also cause problems by burrowing around the rack support posts causing them to collapse.

Algae - Some species of algae are pests of oyster beds. The 'ballon weed', *Colpomenia sinuosa* attaches itself to oysters when young. This then forms air filled, bladder like growths, which may float off, carrying the attached oyster with it. Other filamentous algae or 'slime', of which there are many different species, are a serious pest in the spat collecting areas, where they settle onto the culch material and prevent the settlement of spat.

(b) Disease

Oysters are known to be susceptible to various types of diseases, but none of these appear to be harmful to man. As yet, little is known about these diseases. 'Winter mortality' is a major disease affecting oyster production in New South Wales.

(c) Winter Mortality

In particularly bad years, this disease is capable of destroying up to 80% of the oyster crops in some growing areas (Malcolm 1971). Although the cause of this mortality is unknown, it is suspected of being a micro-organism. Much research is at present being carried out on the subject by the New South Wales State Fisheries Department.

The disease reaches its peak at the end of winter, or early spring hence the name. The cause of the mortality is obscure, but it is related to the salinity change that takes place in the growing areas after winter flooding. The disease does not occur in all rivers and estuaries and does not occur in all years. There is no known remedy for the disease, the only alternative is to remove the oyster to disease free areas during the outbreak periods.

Environmental Factors Affecting Oyster Culture

(a) Turbidity and Silting

An increase in the suspended particulate matter in the water as a result of dredging activities or the clearing of shoreline vegetation for housing or agriculture purposes, can affect the oyster culture industry in two ways.

In extreme cases, the oyster gills become choked with sediment and the oysters die. Alternatively, in less severe cases, the oyster terminates feeding activity for prolonged periods with a corresponding reduction in growth rates.

In spat collecting areas, heavy silt deposits on the culch material can prevent the settlement of spat. The development plan provides for the minimisation of silt runoff into the Bay during all stages of construction and occupation of the site.

(b) Flooding and Salinity Change

Winter flooding and the associated drop in salinity can cause mortality if the low salinity conditions persist for prolonged periods. The oysters can tolerate submersion in low salinity water for several days by simply closing their shells and suspending feeding activities. This conditions is in fact probably advantageous as the oyster drills and some of the other predators can not tolerate such conditions, and are killed. However, if the condition persists for longer periods oyster mortality does occur.

(c) Temperature

The combination of high summer temperatures and prolonged exposure periods during Spring tides can lead to heavy mortality. Some oyster farmers have overcome the problem by covering the oyster trays with hessian material and installing sprinkling systems over the leases.

(d) Wave Action.

In open or exposed culture areas or areas subjected to boating activities, the resultant wave action may wash oysters off open trays. To overcome this, some farmers construct fences or breakwaters around their leases and cover their trays. Once washed from the trays, the oysters are prone to attack by oyster drills, starfish, crabs, etc., or are smothered by silt. No adverse effects are anticipated from any wave action created by boats in the vicinity of spat collection leases, where the oysters are grown on sticks and trays are not used.

(e) Pollution

Pollution is probably the most imminent problem facing the New South Wales oyster industry. Pollution may take several forms;

- oil pollution
- chemical pollution
- sewage
- heavy metal pollution.

The effects of pollution on oysters are difficult to predict. The immobility of the oyster makes it necessary for it to accept whatever pollutants reach it. On the other hand, its ability to close its shell makes it possible for the oyster to exclude the external environment for relatively long periods.

Oil Pollution - All crude oils and oil fractions are toxic to oysters. The position of the cultivated oysters at the mid-tide level exposes them not only to the effects of the soluble fractions of oils, but also to the insoluble, floating oils. Also, because most oyster leases are located within estuaries, oil spills at any one location are rapidly transported along the length of the rivers by the tides and currents. Many of the solvent dispersant chemicals used today to combat oil spills are themselves equally as toxic as the oil they disperse. It has been demonstrated that oysters can accumulate some of the carcinogenic hydrocarbons present in petroleum products in their fatty tissues, at levels which are potentially harmful to man.

To date, no serious oil spills have affected the New South Wales oyster industry, although minor 'spills' are becoming more prevalent with the recent upsurge of marinas along the coast.

Chemical Pollution - Many industrial complexes discharge their wastes into streams and waterways, along the New South Wales coastline. Some of these wastes are extremely toxic, e.g. cyanides, aromatic hydrocarbons while others such as phosphates, nitrates can indirectly pollute waters by reducing the oxygen content of the water below levels which can support life. Such conditions in turn become conducive to the multiplication of sulphur reducing bacteria which in turn introduce toxic hydrogen sulphide into the water.

In most of the oyster culture areas in New South Wales industrial pollution is not yet a cause for concern. However, with the increase in industrial and urban development along New South Wales estuaries, the problem is becoming more serious.

Heavy Metal Pollution - Besides chemical pollutants, many industries release high concentrations of heavy metals such as Cu, Pb, Fe, Co, Cr, Zn, Mn, Cd, and Hg into coastal streams. Oysters are capable of removing these elements from the surrounding water and concentrating them in their tissues. While the oyster themselves are not harmed by the metals, consumption of the oysters by human can lead to serious illness.

Sewage - Oysters have no diseases of their own they can transmit to man. However, they have often been the agents by which diseases such as typhoid fever and infectious hepatitis have been transmitted. Since the oyster is a filter feeding organism, it can filter the minute bacteria and viruses from the seawater and concentrate them. Both harmful and harmless species are collected in this manner. Such bacteria are able to survive long periods in the oyster, even after the oysters have been taken ashore, processed and even frozen.

Such contamination usually originates from the discharge of raw, untreated sewage into oyster culture areas. However, pollution of this type can also result from the runoff water from urbanised and agricultural areas adjacent to culture areas. The contamination source in these cases may be domestic or wild animals.

With the advent of total purification of oysters by May, 1983, many, if not all, these problems will be overcome.

Oyster Culture in Port Stephens and Salamander Bay

Oyster culture in Port Stephens includes both spat collection and growing.

Spat collected in Port Stephens are not only grown to marketable size within Port Stephens, but are transported to other growing areas throughout New South Wales. In fact, the majority of the spat collected in Port Stephens are grown outside the area.

Oyster growing or fattening is restricted solely to the stick method using sawn hardwood sticks. In fact, the stick method of culture was introduced into the New South Wales oyster industry at Port Stephens in the 1930's initially using mangrove sticks (Croft 1967).

The small oysters that are separated during the culling process are sold to farmers in other growing areas of New South Wales for tray culture.

Oyster growing is carried out along most of the mud flats areas around Port Stephens and the creeks and rivers entering it. All of the growing areas are upstream in the lower salinity waters, usually in association with mangroves. There are approximately 1,040 oyster leases in Port Stephens.

Spat collection is confined to two distinct areas of Port Stephens, one around the area of Pindimar on the northern side of the Port and the other in Salamander Bay on the southern shore. Both of these areas are downstream from the growing areas.

There are a total of 76 oyster lease areas (for spat collection) within Salamander Bay, extending from Corlette Point to Wanda Head or Round Head. These cover a total area of about 25 hectares.

The production of oysters from Port Stephens in recent years has been:-

Year	Production (Bags)
1969	26,162
1972	35,838
1982	24,057

The figures do not really represent the total contribution of the Port Stephens area to the New South Wales oyster industry. Although the area produces marketable oysters, it also supplies spat to farmers in most of the other growing areas of the State. Nearly all of the spat for the Georges River oyster production comes from Port Stephens. Port Stephens spat is also supplied to the growers in the Macleay River, Hastings River, Clarence River, Hawkesbury River, Clyde River, Shoalhaven River and Merimbula. This spat includes both that produced from the two spat collection areas, Salamander Bay and the Pindimar area, and that produced from the cullings of the stick cultured oysters.

Depuration

Seawater always contains a certain amount of marine bacteria which are a normal part of the bacterial fauna found in oysters. However, sewerage outlets add bacteria originating in the digestive tracts of man and animals. Most of these species are normally harmless to man, however others are extremely dangerous. These include the Salmonellae, which include the organism causing typhoid fever, the Shigella, which causes dysentery, and certain species of Clostridia, which can produce exotoxins pathogenic to man. Several of these latter species have been found in shellfish. At the present time, the only well documented virus infection associated with shellfish is hepatitis, but this was associated with the consumption of grossly polluted shellfish

These harmful pathogenic species are relatively rare and are consequently difficult to detect, so bacteriologists use the commoner harmless types such as Escherichia coli and the coliform group as indicator species to predict their presence. The presence of abnormally high concentrations of these latter species indicates the possibility of the presence of the dangerous species.

Both the oysters themselves and the waters in which they are growing are examined regularly in certain parts of the world for E. coli and coliform bacteria. Some countries have defined 'safe' levels, and oysters containing levels above this may not be harvested for human consumption.

In New South Wales samples of oysters are examined regularly by the Health Department for E. coli and coliform bacteria. The maximum permitted faecal coliform count in New South Wales is 230 per 100 mls of tissue and body water combined.

Fortunately, contaminated oysters may be 'purified' by placing them for a few days in 'clean' water. This process is called 'depuration'. A process that will be fully implemented in Port Stephens by May, 1983.

In summary then, it is evident that any interference to the oyster culture industry in Salamander Bay would have widespread repercussions throughout the entire New South Wales oyster industry. It would not be simply a few oyster farmers residing in Salamander Bay who would be affected. This point has been borne in mind and considered carefully during development planning.

Special Features of the Port Stephens Area Responsible for its Success as a Spat Collection Area.

Oyster spat collection areas may be found near the mouths of most of the oyster cultivation estuaries along the New South Wales coast from Queensland to Victoria. However, the spat production from the other areas combined is far less than that from the Port Stephens area. The reasons for the success of spat collection in Port Stephens is twofold:-

(1) Spatfall is reliable. In most of the other spat collection areas the timing and density of spat settlement is quite variable between years. In some years, there may be no spatfall at all. In Port Stephens, the spatfall has always been reliable.

(2) The density of spatfall is ideal. As a generalisation, it can be stated that the density of spatfall decreases along the New South Wales coast from North to South. In the Northern areas, spatfall is usually too heavy, necessitating a lot of culling and handling before the sticks are placed in the growing areas. If this is not carried out, the rate of growth is slow and the oysters become misshapen. In the Southern areas, the opposite occurs, spatfall is usually too light to be of any use to the farmer. The spatfall in the Port Stephens area is of the ideal density, requiring little or no culling before being transported to the growing areas.

The Port Stephens area is relatively free of any type of pollution and until now there has been little housing development along the shoreline adjacent to the lease areas. It is impossible to place an objective value upon this factor, but it would also undoubtedly contribute somewhat to its success.

The environmental and hydrological conditions which are responsible for the success of the Salamander Bay and Pindimar areas as spat settlement areas are unknown, although obviously it would be complex interactions of tides, currents, temperature, salinity and food supply.

Oyster Farming Recommendations

1. That no development be permitted to take place which will accelerate or change the existing composition and quality of "run off" into areas identified by the Fisheries Departments Map, and that those estuarine wetlands and their catchment areas be delineated and protected by an appropriate zoning.
2. That the Australian Oyster Farmers and Producers Association be requested to review the present total dependency of the industry on the catching of spat in Salamander Bay in view of the advances made by the Fisheries Research Station, Wallis Island, into the breeding and catching of spat.
3. That the Australian Oyster Farmers and Producers Association be requested to place a submission to Council in respect to housing and industrial land needs of the industry.

Wetlands of Port Stephens Shire

Whilst the wetlands of the Shire have been dealt with in the section relating to Heritage, because of the importance of these areas to the water based rural activities of the Shire Map No. 9 depicts the estuarine wetlands associated with the Port. For a detailed analysis of these areas the readers attention is directed to the publication "Wetlands of Australia's Hunter Region" by David Waterhouse.



ESTUARINE WETLANDS OF PORT
STEPHENS SHIRE - MAP NO. 9

ENVIRONMENTAL PLANNING & ASSESSMENT ACT, 1979 SHIRE OF PORT STEPHENS LOCAL ENVIRONMENTAL PLAN	STATE OF NEW SOUTH WALES DEPARTMENT OF LANDS AND SURVEY 1981
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Statistics

Port Stephens Shire is experiencing the pressures of rapid growth and change.

To fully appreciate these changes it is necessary to tabulate the Census data, not only into areas, but also compare it to previous Census collections.

A true indication of the amount of activity and growth in the Shire of Port Stephens can be seen when the growth of the area in terms of building stock is compared to the surrounding Lower Hunter Local Government Areas.

Within the rural zones of Port Stephens Shire since 1974, substantial subdivisional activity has taken place, notwithstanding the fact that in May, 1974, the 40 hectare minimum area allotment was introduced.

Whilst the 40 hectare allotment was to have been the minimum sized allotment in the rural zones of the Shire, the wording of Clause 19 of the Interim Development Order No. 23 was such that rural subdivisions of less than 40 hectares could continue under certain circumstances. Whilst it would appear that the intention of Clause 19 was such that the larger land owner would not be disadvantaged by the jump from 0.8 hectare minimum area to that of 40 hectare minimum area, the result has been a continual eroding of the size of rural holdings.

This has resulted in:-

- (i) Fragmentation of rural holdings;
- (ii) Threats to the viability of rural holdings;
- (iii) Uncoordinated development;
- (iv) Eroding of or lack of services in areas;
- (v) Creation of traffic problems on Main and Arterial Roads;
- (vi) Increasing demands to 'loosen up' the existing standards;
- (vii) Increasing mobility of the residents of the rural areas;
- (viii) A dramatic change in land uses.

Figure No. 8 depicts the subdivisional activity throughout the rural areas of the Shire since the introduction of the Interim Development Order No. 23 on the 17th May, 1974.

Figure No. 9 reviews building activity in Port Stephens Shire against adjoining areas.

A review of the 1981 Census against the rural subdivisional activity since 1976 illustrates the dynamic change that has taken place in the rural sectors of the Shire (Figure No. 10)

FIGURE NO. 8

SUBDIVISION APPLICATIONS	1980		1981		1982	
	No. of Appli.	No. of Lots	No. of Appli.	No. of Lots	No. of Appli.	No. of Lots
Bobs Farm	3	7	2	4	1	3
Dunns Creek	2	6	1	3	1	8
Fullerton Cove	1	2	2	5	2	4
Hinton	1	2	2	4	2	4
Nelsons Plains	3	4				
Salt Ash	2	5	5	29	1	2
Seaham	4	26	10	70	5	15
Swan Bay	1	2	2	8		
Wallalong	2	4	3	11	2	7
Williamstown	1	2	4	7	4	9
Woodville			4	10	1	2

TOTAL RURAL SUBDIVISIONS

Year	No. of Applications	No. of Lots Proposed	Linen Plans Signed	No. of Lots Created
1972	19	330	17	325
1973	62	728	39	344
1974	40	400	26	174
1975	25	86	15	28
1976	38	124	25	74
1977	30	122	16	43
1978	36	99	28	101
1979	37	205	23	74
1980	28	99	20	98
1981	59	373	31	173
1982	19	54	22	60

FIGURE NO. 9 - Building Activity Within the Hunter Valley

LOCAL GOVERNMENT AREA	(EXPRESSED IN \$MILLIONS)			
	JUNE 1978- JUNE 1979	JUNE 1979- JUNE 1980	JUNE 1980- JUNE 1981	JUNE 1981- JUNE 1982
Newcastle	11.4	19.2	32.2	22.3
Lake Macquarie	46.0	62.6	80.8	65.9
Maitland	8.3	13.1	16.5	18.9
Cessnock	5.2	9.0	16.0	19.7
Port Stephens	18.7	30.8	43.7	43.0
Singleton	4.3	7.0	13.7	14.8
Dungog	0.9	1.3	2.5	3.6
Muswellbrook	1.2	4.1	6.8	11.7
Gloucester	0.7	1.4	0.9	1.6

(Source: Hunter Valley Research Foundation)

FIGURE NO. 10

BUILDING APPLICATIONS - DWELLINGS	1981	1980	1979	1978	1977
Twelve Mile Creek	1	1	1	1	1
Seaham	19	19	16	6	14
East Seaham	4				
Swan Bay	1	3	3	8	3
Wallalong	7	7	8	4	5
Woodville	3	5	3	4	4
Glen Oak	3	2	3		1
Dunns Creek	9	9	4		8
Butterwick	1	2			
Nelsons Plains	7	5	2	3	5
Hinton	3	3	3		3
Eagleton	7	1			
Tomago	3	2	2	4	1
Williamstown	8	8	8	9	5
Fullerton Cove	6	5	2		
Bobs Farm	8	7	4	1	3
Salt Ash	20	35	24	22	22
	<u>110</u>	<u>114</u>	<u>83</u>	<u>62</u>	<u>75</u>

On the following pages a review is made of the 1981 Census as compared to the two previous Census. From this it will be ascertained that substantial growth has taken place in the Shire as a whole but more particularly in areas which have traditionally been considered rural.

Figure No. 11 shows population growths in the various areas and the percentage change. Figure No. 12 shows the overall change in dwelling stock within the various areas and the percentage increase.

Figure 13 shows the likely total population as of June, 1981, if all dwellings were occupied at that time. Figure No. 14 demonstrates the mobility of the rural workforce and the relatively low percentage of residence within the area commonly known as rural which are engaged in rural occupations.

Figure No. 15, Age Pyramids, show the structure of selected rural areas against developing urban areas within the Shire.

FIGURE NO. 11 - Population Growths

LOCATION	POPULATION 1971	POPULATION 1976	% CHANGE	POPULATION 1981	% CHANGE
Nelson Bay, Shoal Bay and Fingal Bay	3,323	4,332	+30%	5,685	+31.2%
Soldiers Point, Salamander Bay and Corlette	984	1,506	+53%	2,246	+49.2%
Lemon Tree Passage, Mallabula and Tanilba Bay	686	1,328	+93.6%	2,877	+116.6%
Karuah and Swan Bay	733	816	+11.3%	960	+17.6%

FIGURE NO. 11 CON.

LOCATION	POPULATION 1971	POPULATION 1976	% CHANGE	POPULATION 1981	% CHANGE
Hinton	189	242	+28%	207	-14.5%
Medowie	567	840	+48.1%	2,049	+143.9%
Anna Bay, Bobs Farm Area	1,166	1,233	+5.7%	1,995	+61.8%
Raymond Terrace, Tomago and Surrounds	6,800	8,070	+18.7%	9,255	+14.7%
Seaham, Nelsons Plains, Dunns Creek and Woodville	1,037	1,037	0	1,290	+24.4%
Fern Bay, Fullerton Cove and Williamtown	727	645	-11.3%	1,032	+60%
R.A.A.F. Base, Williamtown	1,522	886	-41.8%	699	-21.1%
TOTALS	17,734	20,935	+18.1%	28,295	+35.1%

FIGURE NO. 12 - Dwelling Stock

LOCATION	DWELLINGS 1971 Occ/Unoc	DWELLINGS 1976 Occ/Unoc	PERCENTAGES % +/- Occ/Unoc	DWELLINGS 1981 Occ/Unoc	PERCENTAGES % +/- Occ/Unoc	RATIO OCC.
Nelson Bay, Shoal Bay & Fingal Bay	1,101/ 657	1,522/1,105	+ 38.2/+ 68	2,043/1,236	+ 34 /+ 11.8	2.78
Soldiers Point/Corlette	355/ 357	540/ 389	+ 52.1/+ 9.0	781/ 476	+ 44.6/+ 22.3	2.87
Lemon Tree Passage/Tanilba Bay	220/ 150	452/ 152	+ 98.2/+ 1.3	973/ 309	+115.2/+103.3	2.95
Karuah/Swan Bay	191/ 56	228/ 52	+ 19.4/- 7.1	280/ 58	+ 22.8/+ 11.5	3.42
Hinton	53/ 3	69/ 4	+ 30.2/+ 33.3	57/ 6	- 17.4/+ 50.0	3.63
Medowie	154/ 18	233/ 16	+ 51.3/- 11.1	619/ 47	+165.7/+193/7	3.31
Anna Bay	340/ 123	300/ 170	+ 11.8/+ 38.2	611/ 227	+103.6/+ 33.5	3.26
Raymond Terrace, Tomago & Surrounds	1,669/ 64	2,044/ 98	+ 22.2/+ 53.0	2,495/ 180	+ 22.1/+ 83.4	3.70
Seaham/Nelsons Plains/Dunns Creek	255/ 23	285/ 31	+ 11.8/+ 34.8,	351/ 36	+ 23.2/+ 16.1	3.67
Fern Bay/Williamtown	206/ 15	485/ 9	- 10.2/- 40.0	236/ 18	+ 27.6/+100.0	4.37
R.A.A.F. Base, Williamtown	143/ 6	142/ 8	- 0.7/+ 33.3	79/ 15	- 46.7/+ 87.0	8.84
Totals	4,695/1,472	6,080/2,034		8,525/2,608		3.33

FIGURE NO. 13 - Maximum Occupation

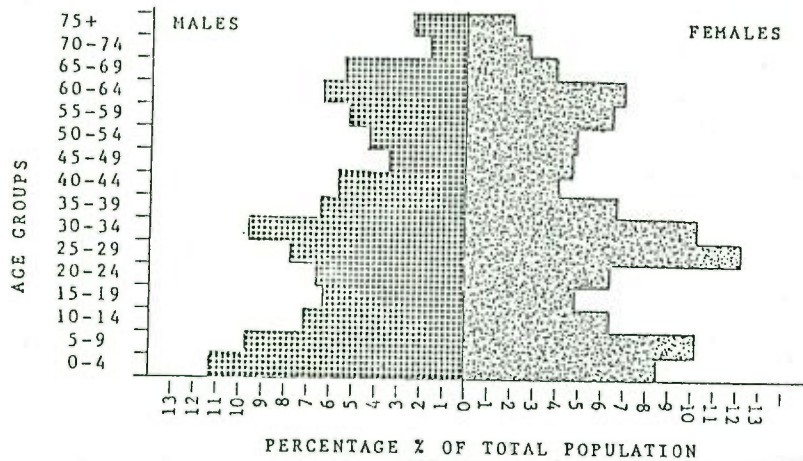
LOCATION	NO. OCC.	NO. UNOC.	AVERAGE OCCUPANCY (%)	ADDITIONAL POPULATION IF DWELLINGS OCCUPIED AT OCCUPANCY AVERAGE	TOTAL POSSIBLE OCCUPATION AS AT JUNE, 1981
Nelson Bay, Shoal Bay and Fingal Bay	2,043	1,236	2.78	3,436	9,121
Soldiers Point, Salamander Bay and Corlette	781	476	2.87	1,366	3,612
Lemon Tree Passage, Nallabula and Tanilba Bay	973	309	2.95	912	3,789
Karuah and Swan Bay	280	58	3.42	198	1,158
Hinton	57	6	3.63	22	229
Nedowie	619	47	3.31	158	2,206
Anna Bay/Bobs Farm	611	227	3.26	740	2,735
Raymond Terrace, Tomago and Surrounds	2,495	180	3.70	666	9,921
Seaham, Nelsons Plains, Dunns Creeek/Woodville	351	36	3.67	130	1,420
Fern Bay, Fullerton Cove and Williamtown	236	18	4.37	79	1,111

FIGURE NO. 14 - Rural Workforce

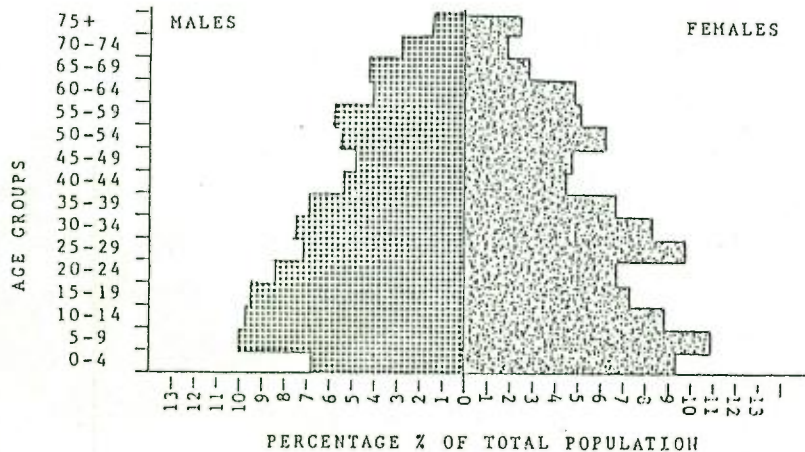
Census District	Location	Population		Area	% of Workforce Engaged in Agriculture	% in Residence 1976	% in Residence for at least one year
		M	F				
081401	Dunns Creek	183	173	3,691	22	34	97.2
081402	Woodville	177	182	2,879	27.8	41.7	99.4
081403	Nelsons Plains	288	287	6,713	29.4	45.7	99.1
081405	East Seaham	240	220	10,917	13.7	48.3	98
081406	Swan Bay/Karuah	110	106	8,141	36.1	47.6	95
081411	Salt Ash	322	286	3,861	4.7	33.9	97.5
081509	Fullerton Cove	668	579	10,927	5.8	40.3	92.3
081602	Williamtown	268	235	4,792	6.5	28.5	91.8
081603	Bobs Farm	283	271	6,201	10.1	50.9	97.8

FIGURE NO. 15 - Age Pyramids

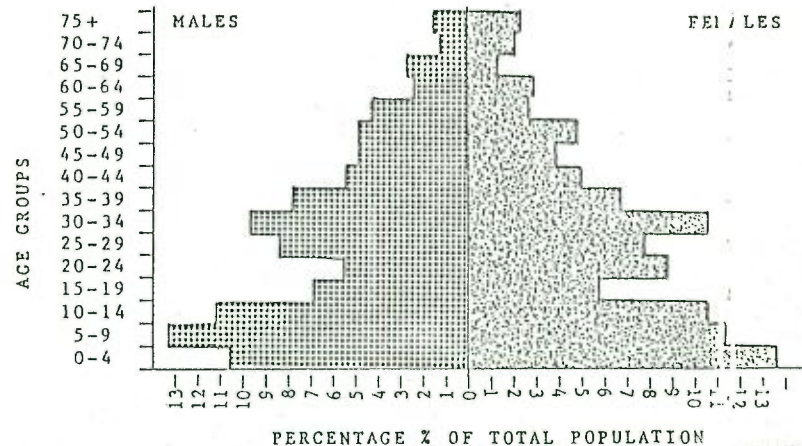
TANILBA, MALLABULA, LEMON TREE PASSAGE AND SALT ASH



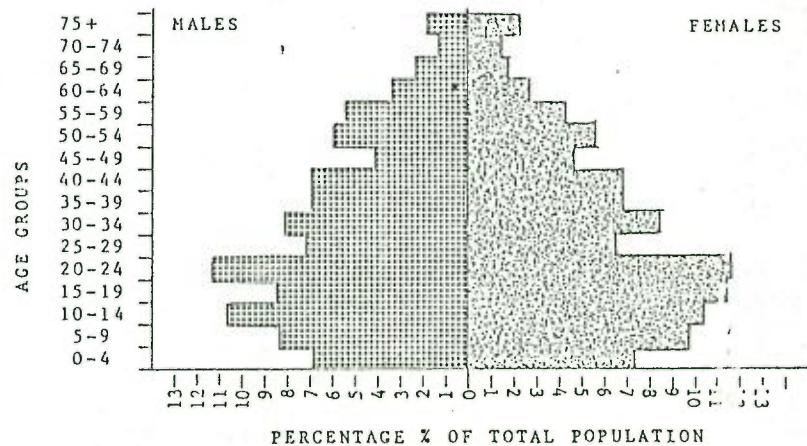
ANNA BAY & SURROUNDS



SEAHAM & SURROUNDS



FERN BAY AND WILLIAMTOWN AREAS



Excluded Areas

The true extent of activity in the rural areas of the Shire tends to be seen as a series of competing uses which are alien in their association with traditional rural uses.

Activities such as Defence, protection of water supply sources, scientific and historically significant areas, wetlands, and areas of high Bushfire Index must be protected, and to achieve this protection it is often necessary to prohibit and restrict uses which would be incompatible with the predominant use.

The Shire of Port Stephens has a policy of rural rebates for those land holders within its areas which continue to conduct rural activities upon their land.

Any land holder whose property exceeds 8,000 square metres in area and is engaged in a rural activity is entitled to receive a rebate on his rates. The current rebate is 50%.

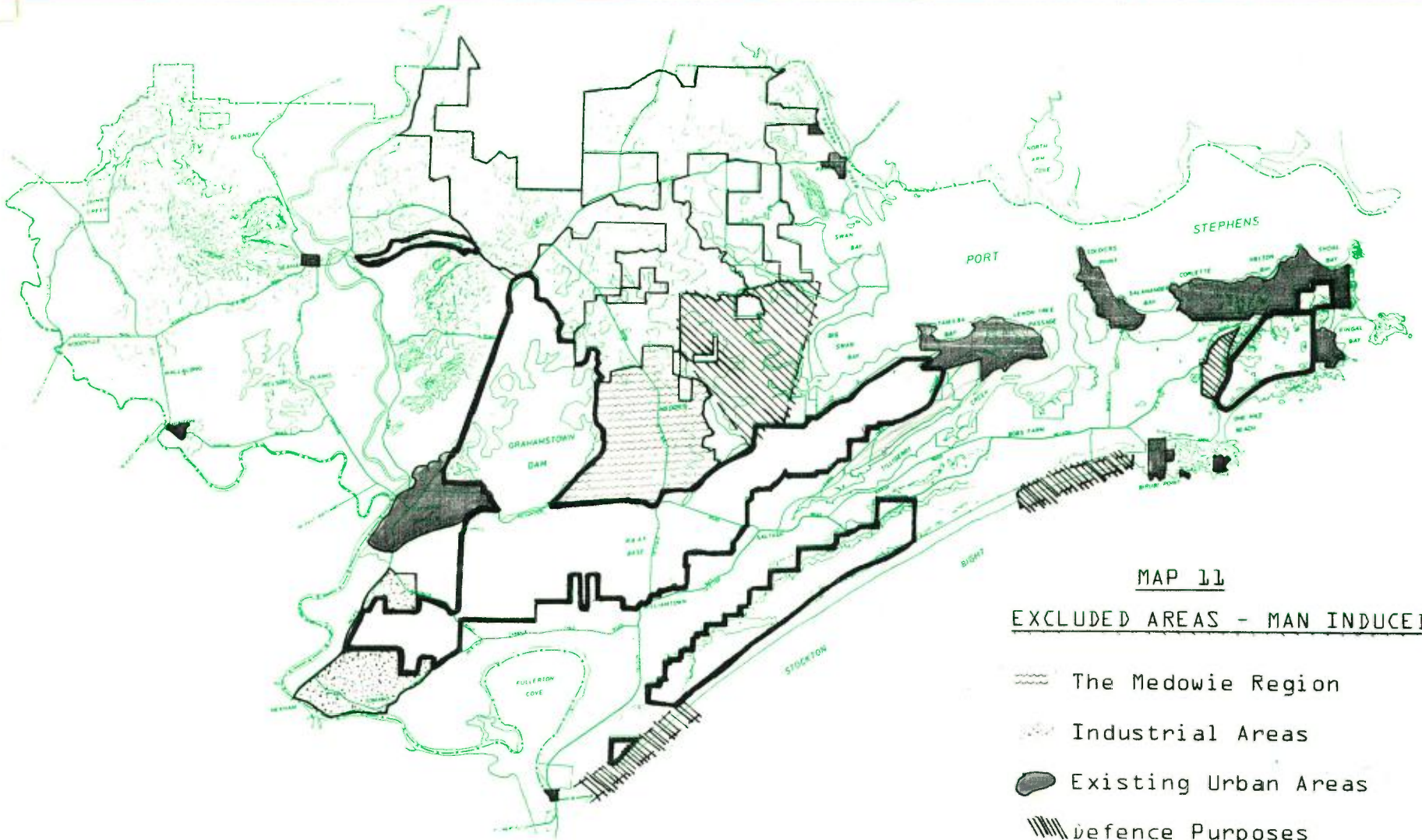
To fully appreciate the rural capabilities of the Shire, against the competing uses that may affect the land, it is proposed to now differentiate those areas which have inherent restrictions to any future development, and then concentrate only upon those areas which appear to have opportunities for various alternative types of development.

To this end the following categories of areas have been excluded from this Study:-

- (a) Existing urban areas;
- (b) The Medowie Region - the subject of a separate Environmental Study;
- (c) Industrial areas;
- (d) All lands currently zoned Flood Plain or else within the 1:100 year flood level of the Hunter, Paterson or Williams Rivers;
- (e) All public lands:- Crown, Hunter District Water Board, Forestry, National Parks and Wildlife, Defence and Public Reserves;
- (f) Noise Exposure Forecast areas;
- (g) Scenic protection areas;
- (h) Mining lease areas;
- (i) Areas having a slope greater than 30%;
- (j) Areas having a high bush fire index;
- (k) Wetlands defined by the National Parks and Wildlife and Fisheries Departments;
- (l) Areas of Historical or Scientific importance.

The forgoing are depicted on Map Nos. 10, 11 and 12.

Whilst the abovementioned areas have been excluded from further detailed discussions in this report, a brief explanation of the reasons for the exclusions and the affects that these exclusions have upon the remaining areas of the Shire is necessary to fully comprehend the interaction within the Shires rural areas.



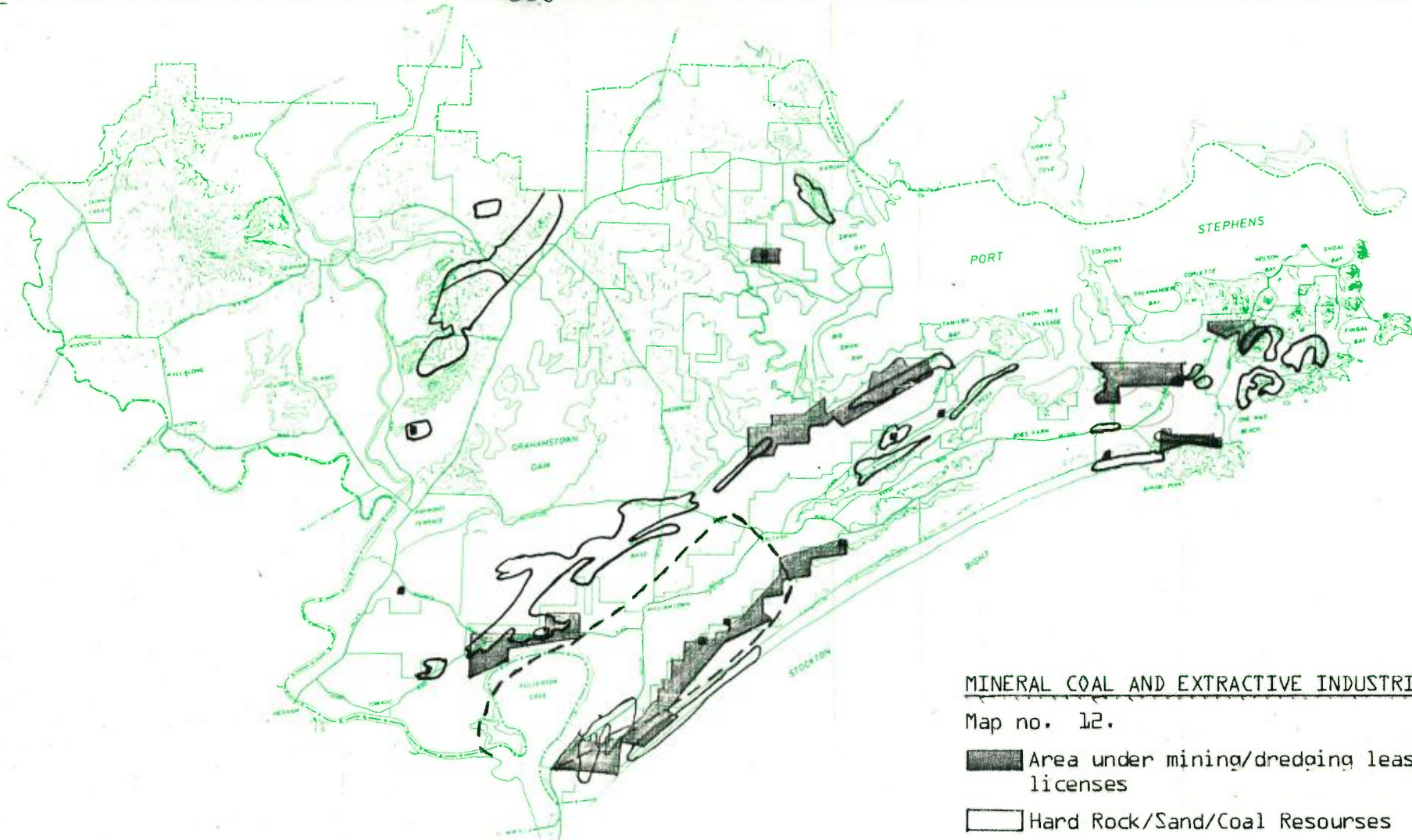
MAP 11

EXCLUDED AREAS - MAN INDUCED

-  The Medowie Region
-  Industrial Areas
-  Existing Urban Areas
-  Defence Purposes
-  H.D.W.B. lands
-  Forestry Areas




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MINERAL COAL AND EXTRACTIVE INDUSTRIES.

Map no. 12.

-  Area under mining/dredging leases/prospecting licenses
-  Hard Rock/Sand/Coal Resources
-  Existing Extraction Sites

Existing Urban areas

Raymond Terrace throughout its long association with the rural activities of the Shire, has always acted as the sub regional service and commercial centre, a role which has grown over the years, until it now is a major commercial node for the area.

With the expansion of Raymond Terrace and the other smaller towns into their peripheral rural lands existing agricultural viability has been threatened.

Raymond Terrace is the only urban area within the Shire which is of sufficient size, and located in a position where it can exert an influence on the surrounding rural communities. From Raymond Terrace, the physical and social infrastructure of the Shire radiates, and whilst community facilities are currently lacking in the town, steps are now being undertaken to rectify this situation. The commercial activities of the town are at such a level that they exert an influence not only over the Shires communities, but also over the surrounding local Government areas whose population is not orientated towards Maitland. Any development undertaken in the western sector of the Shire must be reviewed in the light of Raymond Terrace's ability to service and provide for the needs of the intending residents as the towns of Hinton Morpeth, Paterson and Seaham will never achieve sufficient size to provide the infrastructure needed to support substantial hinterland development. Development and review of the rural areas in the eastern sector of the Shire is less defined as the communities have allegiance to other areas as well as Raymond Terrace.

There exists a need to review the ability of existing urban areas to provide accommodation for those engaged in rural pursuits, as opposed to those who just wish to live in the rural environment. At present each urban area of the Shire has sufficient undeveloped urban land available to meet the medium to long term needs in this regard, and consequently this Study confines itself to reviewing the impact of residential intrusion into rurally zoned lands within the Shire and does not attempt to review the adequacy of existing residentially zoned areas provided for urban growth adjacent to existing towns.

Medowie Region

Medowie is the first definable area in the Lower Hunter which has experienced the rural residential phenomena and much can be learnt from that experience.

The Environmental Study and the Draft Local Environmental Plan for the area defined as the Medowie Region should be consulted in conjunction with this report for a detailed analysis of the area and Council's adopted strategy for the area. The external ramifications of this strategy are:-

- (i) An increase in traffic movements on Main Roads 518/517;
- (ii) The establishment of a residential community in Medowie sufficient in size to support the economic, social and community needs of the Region;
- (iii) Act as a damper on the pressure for small rural allotments in the immediate vicinity of the Region.

Industrial Areas

With the industrial growth within the Shire, particularly at Tomago, far reaching ramifications will result not only to the existing populations, employment opportunities, but also to traditional farming techniques and crops.

Whilst the industrial areas of the Shire, located at Tomago, Heatherbrae and on the Tomaree Peninsula, have no empathy with nor exert an influence over the land uses of the rural areas of the Shire, the potential land uses in areas within the 0.5 ug/m^3 isopleth of the Fallout Schedule of the Tomago Aluminium Smelter may be subject to restrictions as to future land uses. In this regard the following is quoted from the "Environmental Impact Statement for an Aluminium Smelter at Tomago" prepared by James B. Croft and Associates:-

"On the basis of the safeguards proposed in the preceding pages of this section, the Company believes that it can operate the proposed smelter with minimum impact on the surrounding areas. However, the possibility is recognised that certain combinations of operational and meteorological conditions could lead to the potential for effects beyond the boundaries of the site. The Company also accepts that there is a basic incompatibility between heavy industry, such as the smelter and residential development.

It is the intention of the Company to set aside a reserve area around the plant which will be free of buildings and equipment. In this area, tree planting will be enhanced or initiated and only such uses as parking or employee recreation areas will be permitted. Because of constraints on orientation and siting of major components of plant, some additional properties will be purchased in order to complete this zone of passive use.

The land, at present the subject of discussions by the Company, falls into two categories. The first is the non-industrial land uses within the existing industrial zone where average ground level concentrations of fluorides may exceed 1 ug/m^3 , based upon the results of the dispersion model described in Section 7. Although there will be no harmful effect on humans in this zone, vegetables, crops, various fruit trees and sensitive native vegetation may be affected. Grazing animals are likely to be affected through the consumption of vegetation with high fluoride levels.

The second category involves areas where the average ground level fluoride concentrations are predicted to be in the range of 1.0 to 0.3 ug/m^3 . Again, although there will be no harmful impact on residents, sensitive vegetation and grazing animals may be affected.

The Company will discuss the possibility of purchasing properties from persons owning land in these two categories should they be concerned and express an interest in selling.

Some sensitive species of garden vegetables, fruit trees and flowers may be affected in areas subject to ground fluoride concentrations down to about 0.1 ug/m^3 . The Company will discuss any possible problems with concerned residents on a case by case basis.

The programme of consultations and negotiations with property owners around the smelter will continue into the operating stages and will be varied according to experience and the results of the monitoring programme. The Company has as its objective, the development of a buffer area containing safe uses around the smelter but is anxious not to disturb land owners when no risk of significant impact exists.

The area to the immediate north of the plant is within the Tomago Sandbeds Water Supply Catchment. Part of this area will be owned by the Company and the remainder by the Hunter District Water Board which controls all development in the sandbeds area. The Company is supporting research and investigations on the potential effects of fluorides on the sandbeds and will maintain close liaison with the Board in the assessment of the impact of the smelter in practice. "

The Company has approached Council to act in association with Maitland City Council, Newcastle City Council and the Council of Greater Cessnock, to prepare a Draft Local Environmental Plan to delineate land uses within the sphere of influence of the site. At this juncture no final resolution has been presented to Council for action.

As a condition of the Development Consent granted in respect to the Smelter, the following condition was imposed;

"39. Establish an information and advice service for landholders within 4 km of the proposed development to advise them of any precautions necessary to preserve the health of their plants and stock, together with an educational programme to keep landowners informed of likely problems in growing and using sensitive crops, or grazing susceptible animals.

In addition the Company has responsibilities to negotiate for all land which is currently in agriculture use within the defined buffer zone of the Smelter and in this regard the Company has supplied the following letter:-

TO WHOM IT MAY CONCERN

Following the completion of environmental approval procedures which included a Commission of Inquiry, the Minister for Environment and Planning, the Honourable Mr Eric Bedford issued an Instrument of Approval for the development of an aluminium smelter on the former Courtaulds' site at Tomago.

As a condition of consent the Minister required Tomago Aluminium Company Pty Limited to seek to negotiate with the owners of certain properties within a defined buffer zone around the smelter regarding possible acquisition of their property. The Minister also laid down procedures and principles to be followed in the event of disputes over the acquisition of properties within the buffer zone or outside the buffer zone. The procedures and principles are summarised in Attachment 1 to this letter.

In purchasing a property within the prescribed buffer zone or within 4 kilometres of the site, it is recommended that you consider the implications of the smelter development, the buffer zone and the acquisition procedures. Should you wish to discuss the matter further you should contact one of the following:

Tomago Aluminium Company Pty Limited
 Mr R L Muller (02) 221 2333
 Mr G Taylor (049) 648 411

Port Stephens Shire Council
 Town Planning Department (049) 873 122

Department of Environment and Planning, Newcastle
 Mr K Short (049) 23818

Following the approval for the Tomago project, Tomago Aluminium Company Pty Limited is seeking to acquire properties for the purpose of establishing a buffer area around the proposed smelter within the boundaries shown on the map attached, prior to the date of commencement of operation of the smelter, except for:

Land zoned "General Industrial" under Interim Development Order No. 23, Shire of Port Stephens, gazetted on 10/5/1974, unless the lands are subject to non-conforming uses, such as farming and dwelling-houses;

Lands zoned "Special Uses"; and

Lands already acquired by the developer or associated companies.

The lands to be acquired do not include the Caravan Park situated on the southern side of Tomago Road.

The Minister for Planning and Environment has stated that insofar as the acquisition of properties within the Buffer Zone is concerned, in the event of the company being unable to reach agreement with an owner, upon the request of either party he will refer the matter to a Commissioner of Inquiry whom he will appoint. Upon receiving the report of the Commissioner he will determine whether the property shall, in the circumstances of the case, be excised from the "buffer zone".

If this process does not result in the property being excised from the "buffer zone" then we expect the Minister to ask that the procedure set down in Condition 38 of the Instrument of Approval be followed.

Condition 38 which deals with requests for acquisition or claims for compensation outside the buffer zone but within 4 kilometres of the site is as follows:

The applicant will "Expeditionously seek to reach agreement, in the event of claims for compensation or requests for acquisition of property being received by the developer from land owners or occupiers of land (claimants) situated outside the buffer area but within 4 km of the site, claiming that their property is affected by emissions from the proposed development. If agreement cannot be reached, the claim or request shall be referred to a panel by the Department. The Panel shall consist of:

- (a) a nominee of the Law Society of New South Wales;
- (b) the Director of the Department of Environment & Planning or nominee; and
- (c) the President of the Australian Council of Valuers, or nominee.

The panel shall determine:

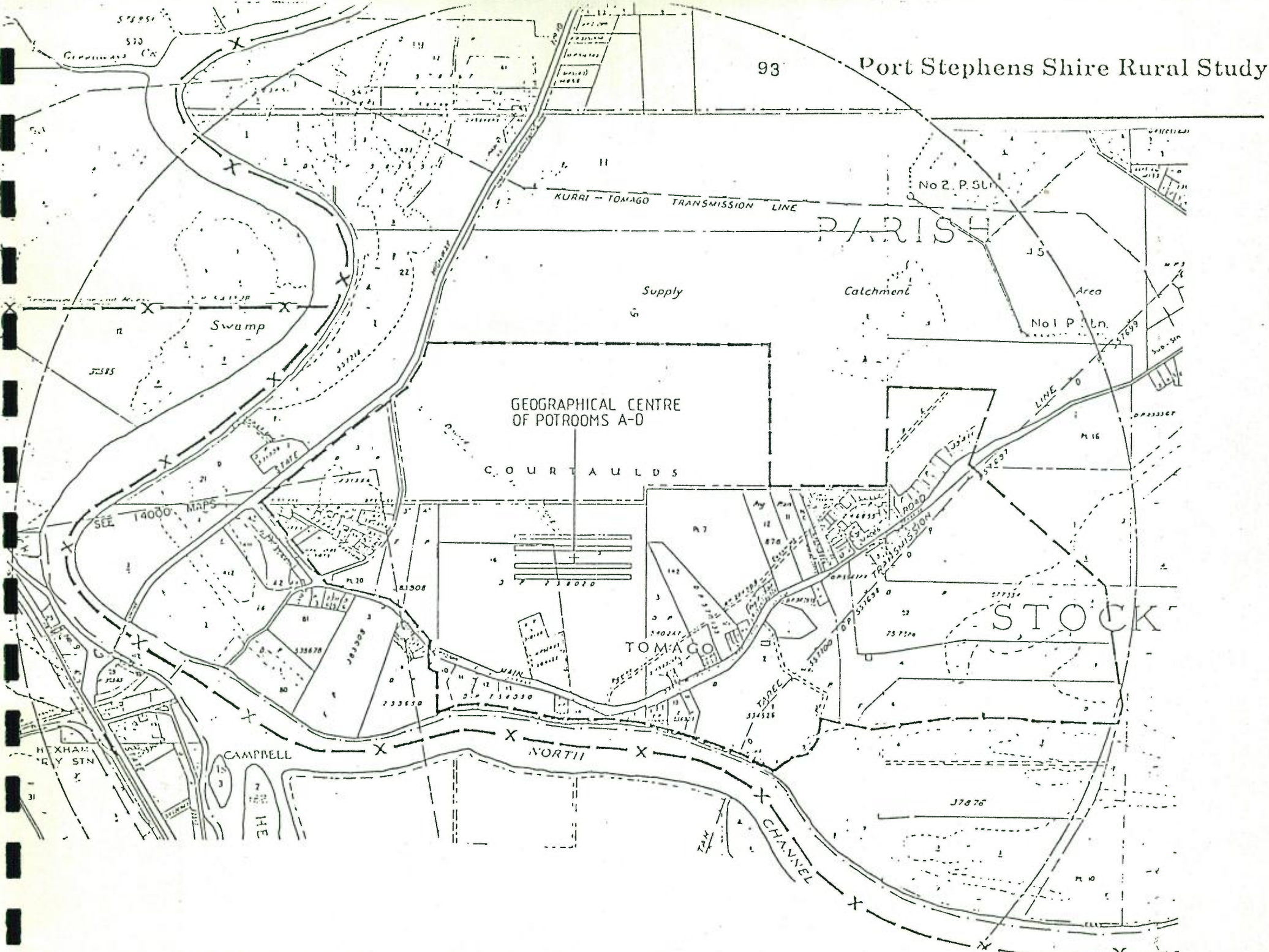
- (d) whether the claimant has a claim resulting from emissions from the proposed development;
- (e) if so, whether the claim can be settled by payment of compensation without acquisition of the claimant's property;
- (f) if so, the amount of such compensation;
- (g) the costs, if any, to be awarded to the claimant in respect of expenses for legal advice and representation and expert witnesses.

In determining the acquisition price referred to above, the panel shall have regard to:

- (h) the market value of the claimant's land immediately prior to the date of development approval, having regard to the existing use of the land;
- (i) the length of time which has elapsed since the granting of development approval; and
- (j) the cost to the claimant of disturbance and relocation if the claimant elects to relocate his existing activity, PROVIDED THAT for the purpose of assessing this cost, the claimant will be deemed to be relocating within the sub-region known as the Lower Hunter.

The decision of the panel shall be binding on the applicant.

The applicant will meet the costs of providing the panel and any costs associated therewith."



PARISH

Supply

Catchment

Area

GEOGRAPHICAL CENTRE OF POTROOMS A-D

COURTAULDS

TOMAGO

STOCK

Swamp

NORTII

CHANNEL

SEE 14000 MAPS

CAMPBELL

No 2 P. Stn.

No 1 P. Ln.

H. XHAN RY STN

THE

37876

PL 10

PL 7

PL 16

233850

334526

75750

758070

338878

383308

340247

09351628

27734

570

570

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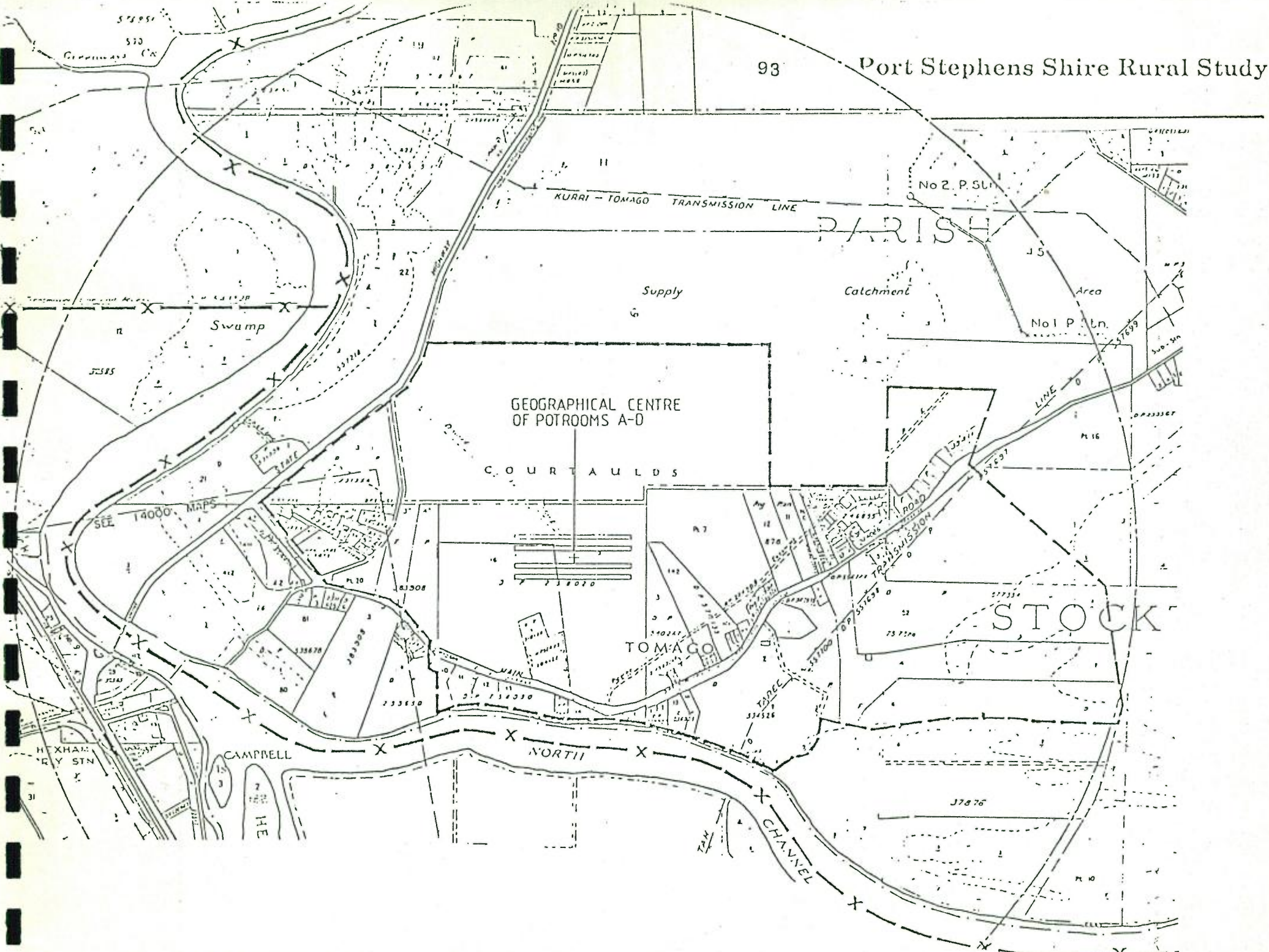
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(1) Flood Plains: Under the current provisions of the Interim Development Order No. 23 all lands known to have been affected by the flood waters of the 1955 flood have been included in the zoning Non Urban 1(c) - Flood Plain.

Since the inception of the Order in May, 1974, the Department of Public Works have undertaken extensive mapping works aimed at accurately identifying all areas affected by flood waters. The maps now being published will act as the criteria for future zoning delineations within the Shire. The accurate plotting has enabled the distinguishing of flood ways from flood proned land, and in accordance with State Government Policy as enunciated in the Department of Environment and Planning Circular No. 31, Council has sought to actively restrict development in these areas. The areas affected by flooding as shown on Map No. 13. (See Appendix No. 2).

As part of the strategy emanating from this report will be recommendations on further restrictions as to development within the flood zones; differentiation between the types of flood activity upon land; the creation of a list of essential/legitimate uses that may be permitted within flood zones; and, a review of adjoining areas with non agricultural uses and their future growth potential in view of their access and servicing in times of flood.

As a result of Flood Mitigation works undertaken on the River Systems within the Shire since 1955, the following areas now are protected by a system of levy banks which have varying design frequencies for flooding. The following information is obtained from the New South Wales Coastal Rivers Flood Planning Management Studies - Hunter Valley, prepared by Sinclair, Knight and Partners Pty. Ltd.

Areas Flooded After the Flood Mitigation Works:

Group 1: Design Flood Frequency: 2 to 4 years.

Swan Reach
Wallalong - Green Wattle
Dunns Creek
Webbers Creek.

Group 2: Design Flood Frequency: 4 to 8 years.

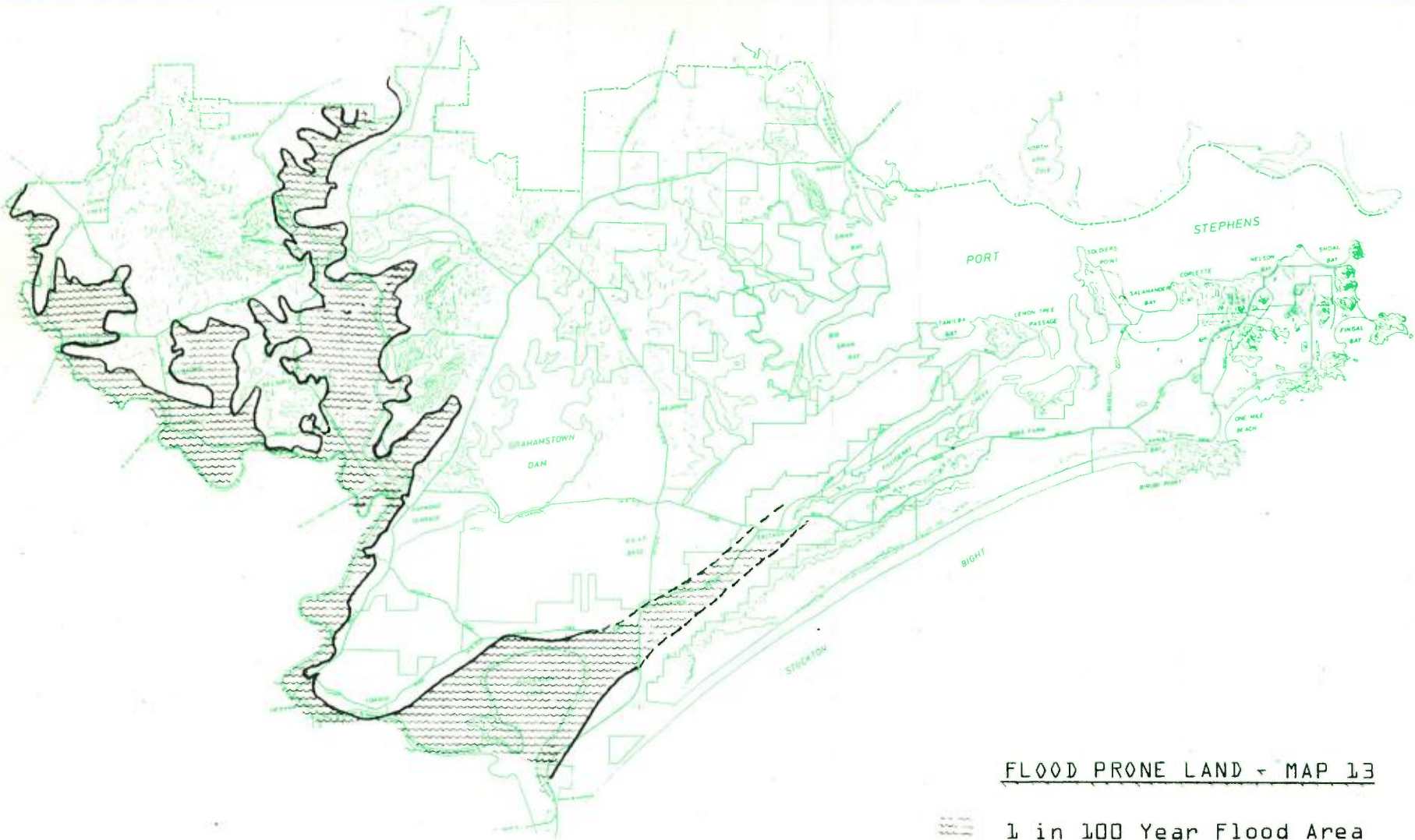
Eskdale Swamp
Mosman Swamp
Nelsons Plains
Irrawang:
Tomago - Fullerton Cove

Group 3: Design Flood Frequency: 8 to 25 years.

Raymond Terrace.

The report qualifies the foregoing by stating it is difficult to define the frequency of flooding agricultural lands in the Lower Hunter with any greater degree of precision. Two constraints are involved. First, each flood follows a different pattern due to differing flows in the Hunter, Paterson and Williams Rivers. Secondly, rivers and their catchments are changing in nature, so that flood frequency relationships also vary over time.

The following graph illustrates the flood height recurrence interval for Raymond Terrace.



FLOOD PRONE LAND - MAP 13

1 in 100 Year Flood Area

SCALE	1:50,000	SHIRE OF PORT STEPHENS
DATE	1978	
PROJECT NO.	1000	
PROJECT NAME	LOCAL ENVIRONMENTAL PLAN	
PROJECT LOCATION	SHIRE OF PORT STEPHENS	
PROJECT STATUS	FINAL	
PROJECT OWNER	SHIRE OF PORT STEPHENS	
PROJECT CONTACT		
PROJECT REFERENCE		
PROJECT DESCRIPTION		
PROJECT OBJECTIVES		
PROJECT BENEFITS		
PROJECT RISKS		
PROJECT IMPACTS		
PROJECT MONITORING		
PROJECT EVALUATION		
PROJECT REVIEW		
PROJECT CLOSURE		

ENVIRONMENTAL PLANNING & ASSESSMENT ACT, 1979

SHIRE OF PORT STEPHENS

LOCAL ENVIRONMENTAL PLAN

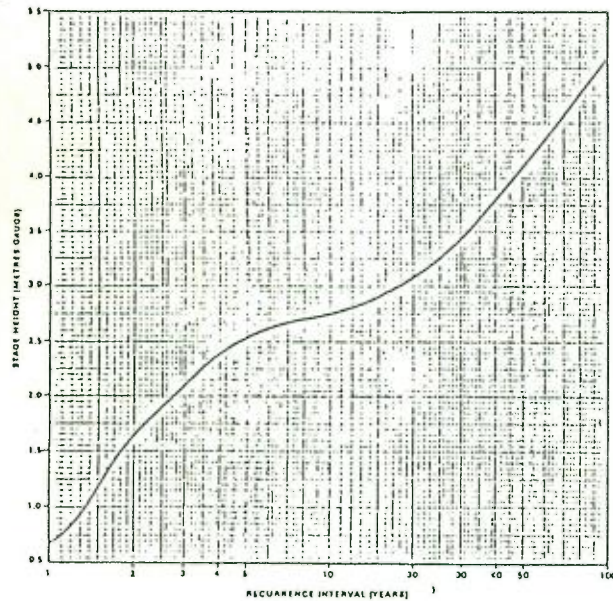


FIGURE NO. 16

SOURCE OF DATA: PUBLIC WORKS DEPARTMENT

NOTE: LENGTH OF RECORD 1920 - 1979
GAUGE ZERO - 1.02m AHD

RAYMOND TERRACE STAGE HEIGHT
RECURRENCE INTERVAL
HUNTER RIVER
FLOOD PLAIN MANAGEMENT STUDY

- (1) On land subject to flooding within the range 1 in 20 and 1 in 100 year flood, that Development Applications will be considered and determined subject to appropriate conditions being carried out in respect to:-
 - (i) the level of the surface of the lowest floor of the building;
 - (ii) preventing the retention of floodwaters or flood debris beneath the building;
 - (iii) the carrying out of flood proofing works to the building;
 - (iv) preventing the concentration of floodwater around the building;
 - (v) providing for the diversion of floodwater around the building;
 - (vi) preventing damage to the building as a result of the site being flooded; and
 - (vii) access, safety and services to the building should the site be flooded.

- (2) That lands located in a flood area of less than 1 in 20 years - floodways, no development should be permitted.

Crown Land

The Crown remains the major landholder within the Shire, although much of the land is devoted to specific purposes, such as forestry and water supply, however, large tracts remain as vacant land, and land held by specific authorities which is surplus to their requirements. The proposed State Environmental Planning Policy in respect to surplus Crown land will have important repercussions on the future land uses of rural Port Stephens.

Whilst the New South Wales Department of Agriculture was unable to supply details of cropping and grazing figures for the Port Stephens Shire area, Figures No.7 - charts reveal firstly, the change in agricultural uses in the Lower Hunter area in general in flood plain areas, and the second chart reveals the current level of Shire stock that exists within the Shire. From this may be gained the relative proportion of agricultural activity that takes place in the Shire as a part of the Lower Hunter area.

Vacant Crown Land

The Department of Lands holds substantive areas of vacant crown land within the Shire. These areas exist in the eastern sector of the Shire and do not contribute towards the agricultural base. The land holdings are predominately on the Tomaree Peninsula and apart from some parcels earmarked as potential residential areas the lands in the main will fall within the proposed Tomaree National Park or additional areas for Water Supply catchment.

The lands do not have a history of agricultural activity and have been identified by the Soil Conservation Service as in the main being unsuitable for either urban or rural development. For a full resume of all crown land within the Shire of Port Stephens, it is necessary to consult the Lands Assessment and Disposition Prices - For Crown Lands in New South Wales, a Land Resource Inventory, prepared by the Department of Environment and Planning and in conjunction with the Department of Local Government.

Hunter District Water Board Land

The Hunter District Water Board is the single largest user of land in Port Stephens Shire.

The need to protect the Boards sources of Water Supply is of paramount importance in any planning strategies.

The Hunter District Water Board is the major land user within the Shire of Port Stephens, and the extent of the Board's holdings is shown on Map No. 14. Currently the Board does not permit dual usage of its lands, however, following a successful operation in which Mineral Sands were removed from the Tomago Sandbed area by Rutile and Zircon Mines, further relaxation of this stance is expected. Because of its extensive holdings and its location within the Shire, it is necessary to review the activity of the Board's operations and to integrate its needs into any study and recommendations that may rise out of such a study. The Hunter District Water Board's reply to a requested input into this study stated:-

"The Board's comments on the provision of water supply and sewerage facilities to the proposed development are -

Water: Plans attached show:-

- (1) Catchment areas and land owned or controlled by the Board within the Shire.
- (2) Coastal water reserves and proposed reserves under the control of the Board between Stockton and Anna Bay not yet exploited by the Board.
All the above areas must be strictly protected from pollution to preserve the safety of the water supply.
- (3) Present areas supplied with water, and major watermains.

Rural areas adjacent to areas presently supplied, or adjacent to major watermains, could generally be considered suitable for rural home sites, provided excess capacity existed, and the elevation was suitable. If there is not sufficient excess capacity, the cost to amplify the system may, in many cases, be prohibitive.

Because water from Chichester is untreated and sometimes has to be interrupted because of water quality problems, all new subdivisions connected to the Chichester main are required to provide a reservoir to hold at least two full days supply.

No new dams are currently proposed within the Shire, but extensions to the water reserves west of the Anna Bay water reserves, and north of the Stockton water reserves (the latter shown on plan attached) are under investigation or proposed.

Sewerage:

It is not the Board's policy to provide sewerage facilities to blocks which are zoned for rural use."

The Board's areas of activity are directed into six main spheres:-

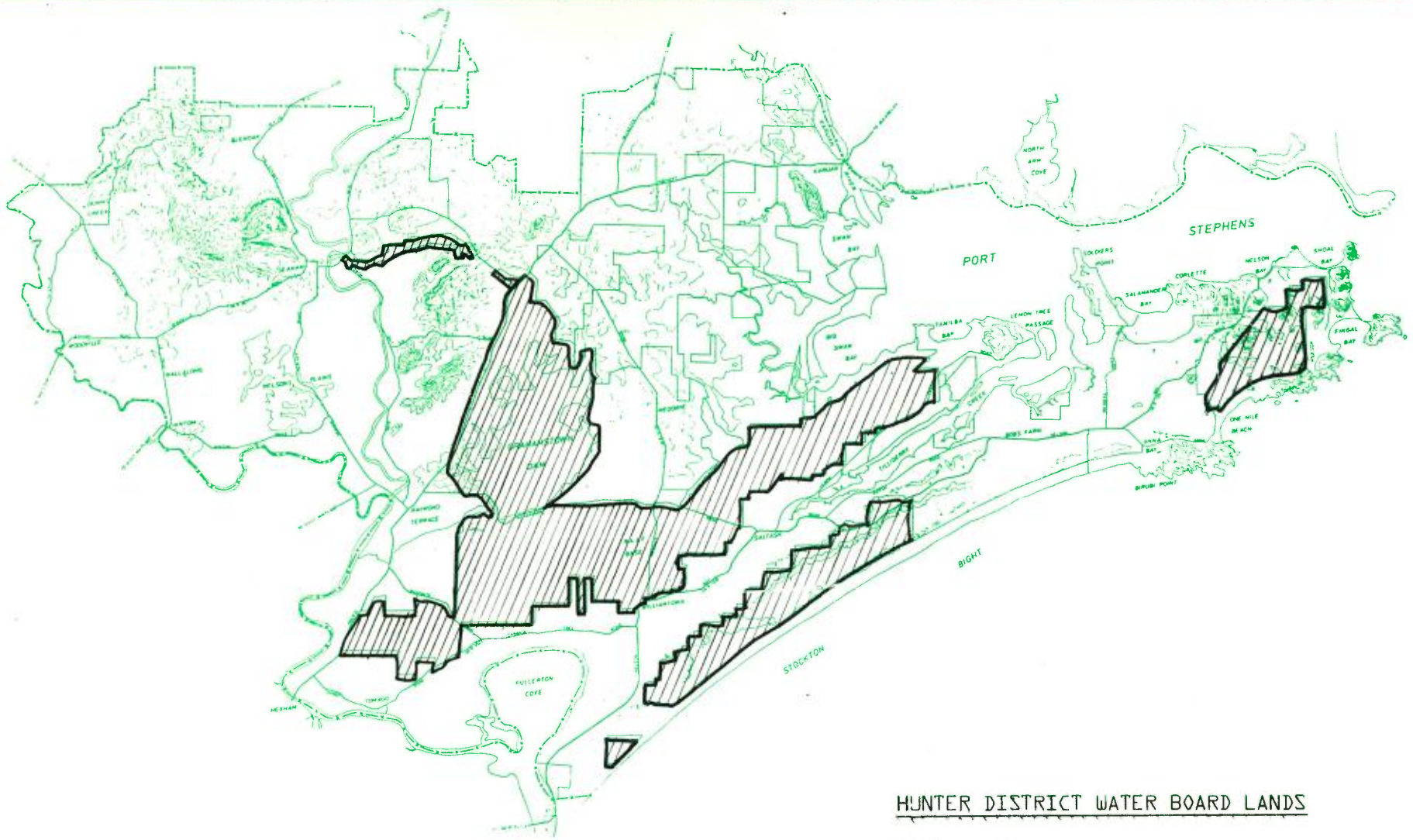
- (i) Tomago Sandbeds Water Supply;
- (ii) Grahamstown Dam and Seaham Weir;
- (iii) Lemon Tree Passage/Karuah Water Supply;
- (iv) The Tomaree Peninsula Water Supply;
- (v) The proposed Stockton Bight Water Reserves;
- (vi) The Chichester Pipeline.

The Tomago Water Supply falls into two major components, namely the;-

- (i) Underground Water System
- (ii) The Treatment Plant at Tomago which treats both the water drawn from the Sandbeds, as well as the water collected within the Grahamstown Storage area, and then disperses the water into the reticulation systems. The Grahamstown Storage area forms an integral part of the Sandbeds supply as it was originally designed to help replenish the sandbeds and not solely as a storage dam.

Grahamstown Storage Area/Seaham Weir

The scheme consists of a weir across the Williams River at Seaham which feeds water via an open channel and pipe to the storage



HUNTER DISTRICT WATER BOARD LANDS

MAP no. 14.

 Lands owned or controlled by the H.D.W.B.

<p>ENVIRONMENTAL PLANNING & ASSESSMENT ACT, 1979</p> <p>SHIRE OF PORT STEPHENS</p> <p>LOCAL ENVIRONMENTAL PLAN</p>	<p>STATEMENT OF RELATIONSHIP WITH OTHER PLANS</p> <p>1. This plan is consistent with the following plans:</p> <p>2. This plan is complementary to the following plans:</p> <p>3. This plan is in conflict with the following plans:</p>
--	---

area of 25.36 km² at Grahamstown. The dam was conceived as an augmentation to the existing Tomago Sandbed supply, and was created over an area of Wetlands known as the Campvale and Ferodale Swamps.

The storage area exerts an influence over planning decisions for the Shire in three ways:-

- (i) The Catchment area restrictions applied by the Board and the associated limitations to land uses in the area.
- (ii) The blocking off of the natural drainage course for a large area of the Shire and the subsequent need to carefully monitor run off.
- (iii) The improvements in salinity levels in the Williams River above the Seaham Weir, and therefore better potential for irrigation and agricultural uses.

The Grahamstown water source is a fully treated supply and as such the Hunter District Water Board are now reviewing potential uses that the storage area and its surrounds can be put to. This change in attitude by the Board will affect land uses in the immediate vicinity of the area and will have ramifications over the whole Catchment area in general. The Board proposes to publish a prospectus early in 1983, detailing future uses.

Lemon Tree Passage/Karuah Water Supply

As the source of this water supply is located within the Tomago Sandbeds area it has previously been discussed, however, the significance of this supply is that it enables a large area between the two localities to be supplied with a reticulated service. The potential area capable of being serviced is shown on Map No. 15.

Tomaree Peninsula Supply

The water supply for the resort towns of the Shire is drawn from a separate source to the rest of the Shire, and whilst the protection of the source is of paramount importance, if the recommendations of the section dealing with the proposed National Park and Anna Bay Study are implemented this will become a reality.

Stockton Bight Potential Source

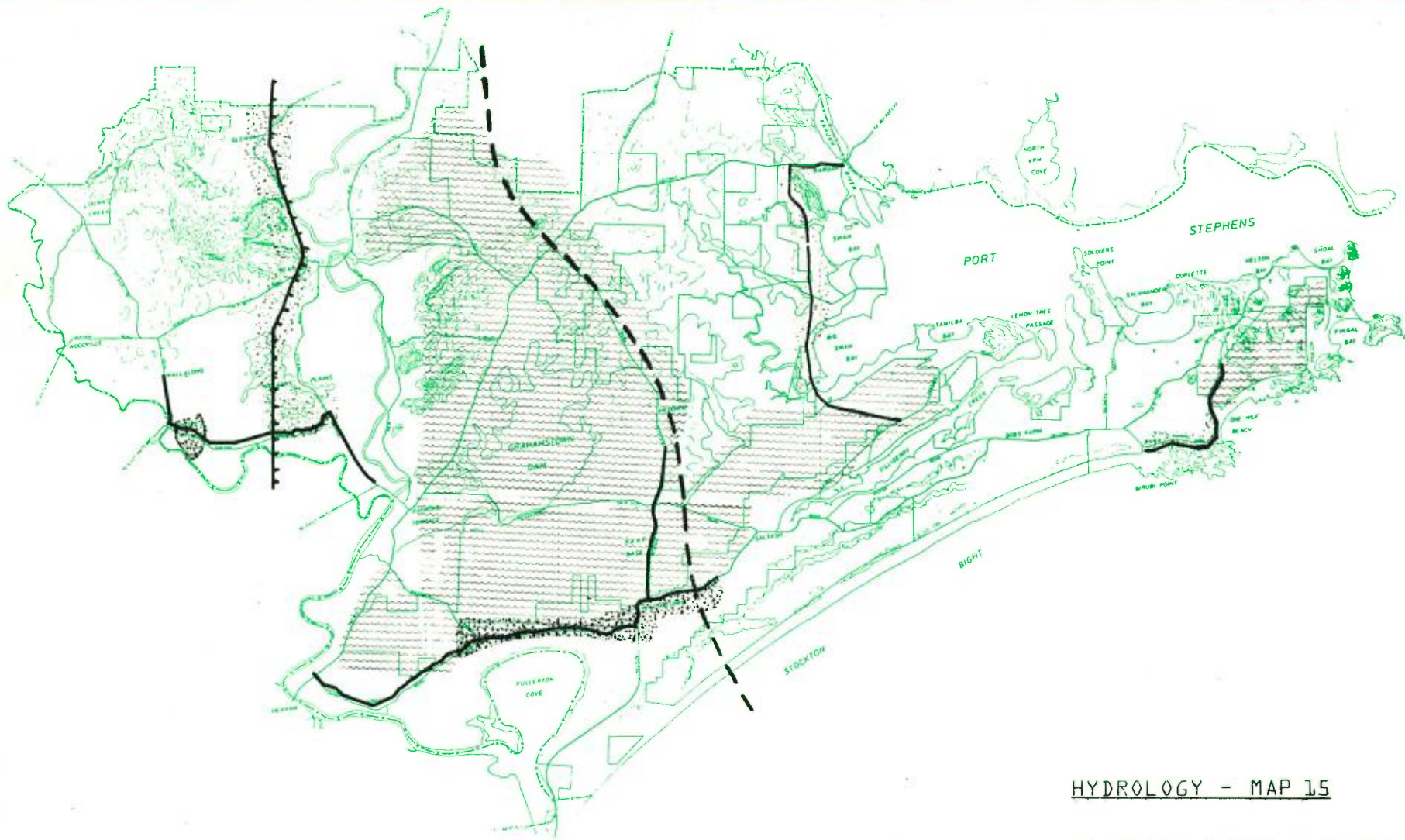
Whilst this source of water is, as yet, an untapped supply, the potential for a reliable supply is great.

The Inner Barrier (Tomago Sandbeds) is separate from the coast by a more recent Outer Barrier and by estuarine swamps and flats, and it is in this area that a supply of similar standard to Tomago is being investigated.

Also under investigation in this area is the potential for a new deep water Port for Newcastle, and a study by the Department of Environment and Planning into the landscape and recreational potential of the area.

Chichester Pipeline

The significance of this line passing through the rural western sector of the Shire can be seen on Map No. 15 by the areas capable of being serviced with a water supply.



HYDROLOGY - MAP 15

- Division between Catchments
- Existing Service Lines
- Potential Service
- ~~~~~ Catchment Areas
- +—— Chichester Pipeline

ENVIRONMENTAL PLANNING & ASSESSMENT ACT, 1979 SHIRE OF PORT STEPHENS LOCAL ENVIRONMENTAL PLAN	
DATE: 1988 SCALE: 1:50,000 SHEET NO: 100A	PROJECT NO: 100A DRAWN BY: [Name] CHECKED BY: [Name]

Defence

The Defence establishment at Williamstown and its associated ranges and dropping areas has been in existence for many years, and predates most urban, rural and hobby farm development east of the Williams River. The future economic wellbeing of the Shire will rest to a large degree in recognition of this fact and protecting the operations of the Department from conflicting uses.

Defence activities within the Shire affect land usage in the following ways:-

- (i) R.A.A.F. Base, Williamtown;
- (ii) Noise Exposure Forecasts;
- (iii) Air gunnery and artillery ranges;
- (iv) Parachute dropping areas.

The need to protect the Base and its approaches from competing uses, has and will continue to be pre-eminent in any planning decisions for the Williamtown area.

The expansion of R.A.A.F. Williamtown to cater for the FA18 has been approved and the impact of this upgrading has been dealt with in detail in the review of Environmental Factors prepared by Gutteridge, Maskins and Davies.

The Noise Exposure Forecasts associated with the Base are shown on Map No. 16 .

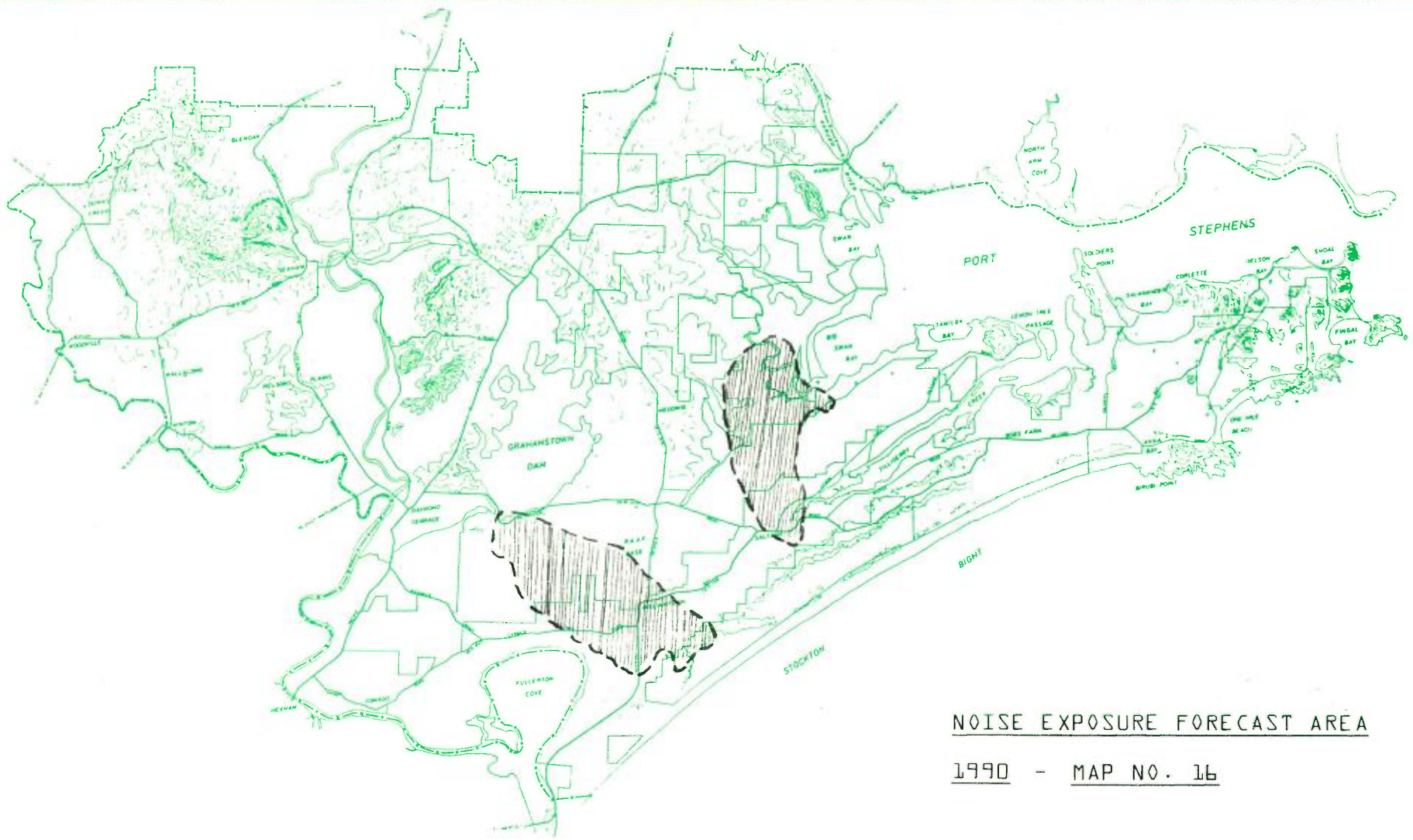
The following table defines the limitation of development that results from this Noise Exposure Forecasting.

ZONE (NEF RANGE)	A (LESS THAN 30 NEF)	B (30-40- NEF)	C (ABOVE 40 NEF)
LAND USE COMPATIBILITY			
Residential	Yes	Note(2)	No
Hotel, Motel, Offices, Public Buildings	Yes	Yes (Note(3))	No
Schools, Hospitals, Churches, Indoor Theatres, Auditoriums	Yes (Note(3))	No	No

Commercial, Industrial	Yes	Yes	Note(3)
Outdoor Amphitheatres, Theatres	Yes Note(1) & (3)	No	No
Outdoor Recreational (Non-Spectator)	Yes	Yes	Yes

NOTE:

- (1) A detailed noise analysis should be undertaken by qualified personnel for all indoor or outdoor music auditoriums and all outdoor theatres.
- (2) Case history experience indicates that individuals in private residences may complain, perhaps vigorously. Concerted group action is possible. New single-dwelling construction should generally be avoided. For apartment construction Note (3) applies.
- (3) An analysis of building noise reduction requirements should be made and needed noise control features should be included in the design.



NOISE EXPOSURE FORECAST AREA

1990 - MAP NO. 16

<p>ENVIRONMENTAL PLANNING & ASSESSMENT ACT, 1979</p> <p>SHIRE OF PORT STEPHENS</p> <p>LOCAL ENVIRONMENTAL PLAN</p>	<p>STATEMENT OF RELATIONSHIP WITH OTHER PLANS</p> <p>1. LOCAL GOVERNMENT ACT, 1979</p> <p>2. LOCAL GOVERNMENT (GENERAL) ACT, 1979</p> <p>3. LOCAL GOVERNMENT (MISCELLANEOUS) ACT, 1979</p> <p>4. LOCAL GOVERNMENT (MISCELLANEOUS) ACT, 1980</p> <p>5. LOCAL GOVERNMENT (MISCELLANEOUS) ACT, 1981</p> <p>6. LOCAL GOVERNMENT (MISCELLANEOUS) ACT, 1982</p> <p>7. LOCAL GOVERNMENT (MISCELLANEOUS) ACT, 1983</p> <p>8. LOCAL GOVERNMENT (MISCELLANEOUS) ACT, 1984</p> <p>9. LOCAL GOVERNMENT (MISCELLANEOUS) ACT, 1985</p> <p>10. LOCAL GOVERNMENT (MISCELLANEOUS) ACT, 1986</p> <p>11. LOCAL GOVERNMENT (MISCELLANEOUS) ACT, 1987</p> <p>12. LOCAL GOVERNMENT (MISCELLANEOUS) ACT, 1988</p> <p>13. LOCAL GOVERNMENT (MISCELLANEOUS) ACT, 1989</p> <p>14. LOCAL GOVERNMENT (MISCELLANEOUS) ACT, 1990</p>
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There are three areas within the Shire which are affected by either current or abandoned air gunnery, artillery and bombing ranges.

(1) The current Salt Ash Air Range

This area is affected in two ways; firstly, by the Noise Exposure Forecast, and its associated recommended restrictions on future development, and secondly, by the 'overshoot' area which affects private as well as government lands to the north of the target area. The area affected is also shown on Map No. 17. All areas affected by this 'overshoot', should be withdrawn from the current rural zoning and placed in a Special Use Zone and acquired by the Department.

(ii) The Stockton Bight Bombing Range

This area emanates from wartime gunnery practise range from Fern Bay north. Whilst the range has been abandoned for a number of years, the necessary clearings can not be obtained to permit any development of the lands affected, consequently, the lands shown on Map No. 17 must of necessity remain sterile as far as development is concerned.

(iii) The Morna Point Air-Gunnery Range

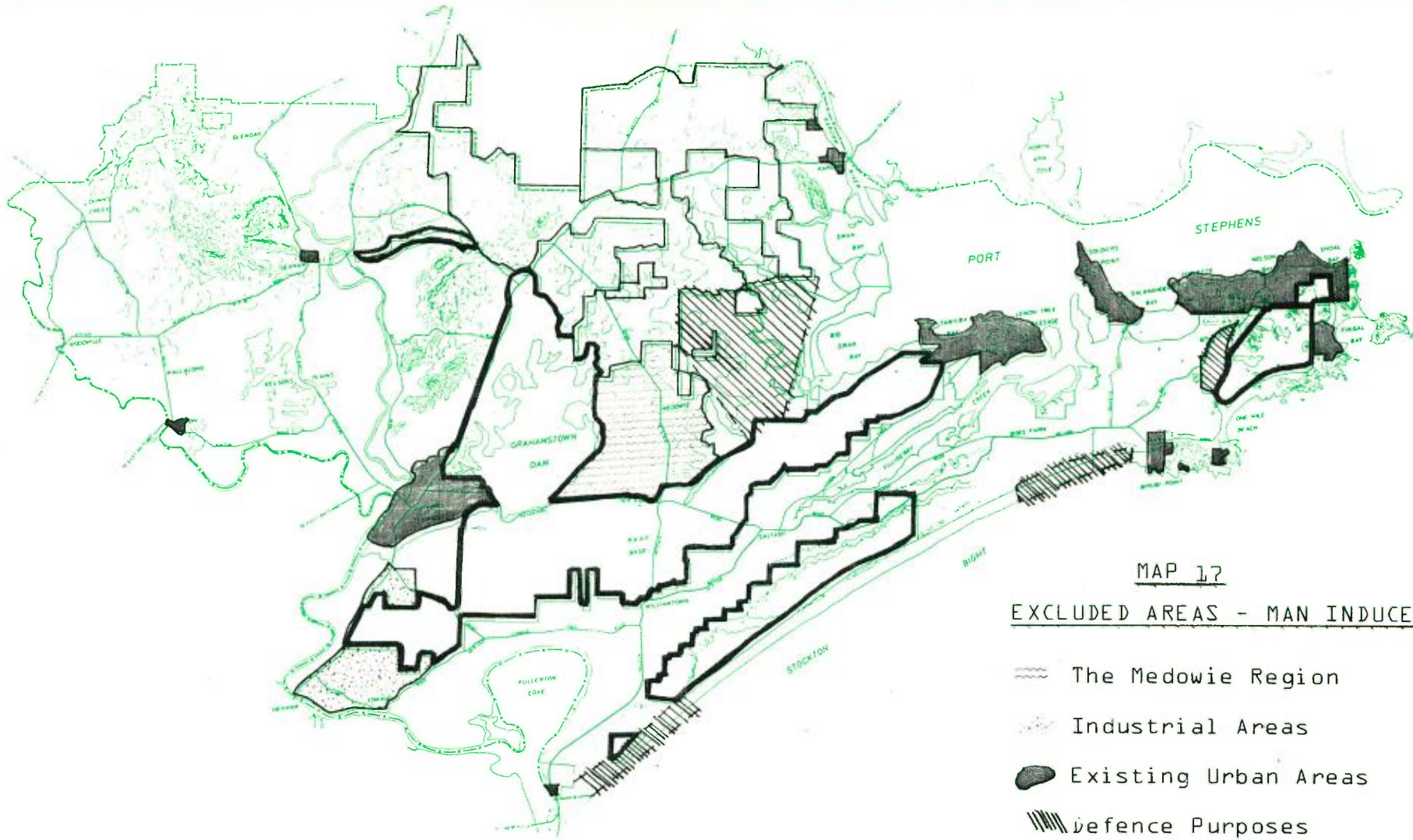
This range whilst no longer in use, has never been cleared of unexploded shells and remains a potential hazard to all who use the northern end of Stockton Bight for recreational activities.

The area consists of moving sand dunes and because of the shifting nature of the sand it does not appear possible to ever effectively clear the area.

The area affected by the Morna Point Air Gunnery range is shown on Map No. 17.

Recommendations

- (1) That the areas of artillery bombing ranges and over shoot areas be defined by zoning and where not held in public ownership that the Department be required to acquire the lands.
- (2) That the Department of Defence be required to accurately define any properties that may be effected by noise in association with the operation of the Williamtown Air Force Base and that where properties become effected by the introduction of new aircraft that a suitable system for determining compensation be established.



MAP 17

EXCLUDED AREAS - MAN INDUCED

-  The Medowie Region
-  Industrial Areas
-  Existing Urban Areas
-  Defence Purposes
-  H.D.W.B. lands
-  Forestry Areas

Mineral and Extractive Resources

Port Stephens Shire is rich in mineral and extractive resources and the protection of these sources against competing development is essential.

Various resources that are currently being extracted and/or with potential for future extraction are discussed below. If all areas with potential resources were to be zoned for future extraction there would be little land left within the Shire for other purposes. Because extraction is heavily dependent on market demand it is difficult to forecast when mining is likely or if it will take place at all. There is also a lack of information on the extent of resources and if they are economically viable. The usual comment is that this "requires further investigation". For these reasons it is difficult to make provision for future extraction. Where possible resources should not be sterilised by urban development, but for most mining it will be necessary to consider individual applications as they arise.

Hard Rock Resources: Hard rock extractive resources have potential for either "crushed and broken stone" or "natural material". Crushed stone can be used for concrete and bitumen aggregates, railway ballast, fine aggregate, road building material and for decorative stone. Natural material can be used for road building, land fill and reclamation.

Apart from the quarry at Raymond Terrace, almost the entire rock production in Port Stephens has been used for road construction. Currently, available resources are limited to a small number of quarries. Matson* has said that Port Stephens has sufficient resources of hard rock to satisfy local needs until 1995. This was based on output from three quarries at Raymond Terrace, Lemon Tree Passage and Soldiers Point and a few other smaller quarries operating intermittently. With the closure of the Soldiers Point quarry, the time when resources will be exhausted is significantly reduced. However, it is possible that this quarry will be re-opened in the near future. It is therefore difficult to determine at what time existing supplies will be exhausted, especially when considered with other variables such as population growth, building activity and road construction which are major determinants of demand.

In any event there are no definite long term supplies of hard rock resources in Port Stephens. No suitable sites have been thoroughly investigated and delineated to replace existing quarries when they are eventually closed, whenever that may be.

*C.R. Matson: The Hard Rock Extractive Resources of the Port Stephens Area, Geological Survey Report (Unpublished Report) 1975.

However, the Department of Mineral Resources has advised that there is an abundance of potential sources of hard rock aggregate in the Shire, and also outside the boundaries of the Shire, but close by. Therefore, it is unnecessary to identify specific sites for future extraction, providing all potential areas are not precluded from extraction.

It is nevertheless important that existing quarries are allowed to continue operating so that all potential resources are won and utilised. Once a quarry has commenced it should continue to operate until it is no longer economically viable so as to minimise the need to open new quarries. No matter what protective measures are undertaken quarries have a significant effect on the environment and new ones should only be opened where it is absolutely essential.

Sand Resources: Port Stephens Shire has extensive sand deposits, and sand is currently being extracted in several areas (See Map 18). Sand resources are suitable for use in foundries, glass making, filling and heavy mineral extraction. The major deposits occur at Anna Bay, Tanilba Bay, within the Tomago Sand Beds, and in the Newcastle Bight dunes (see Map No.18).

However, most of the deposits currently being extracted or with potential for extraction lie outside the study area. In the Anna Bay area there are extensive deposits of heavy mineral sand and also an important source of foundry sand. Subject to

further investigation and advice, those deposits that are economically viable, and which during mining would have minimal environmental impact, could be zoned for future extraction to provide for the needs of Newcastle, Sydney and Wollongong.

Near Tanilba Bay there are very large deposits of sand suitable for glass making, and sand is currently being extracted from here. These deposits are of Statewide significance, and it is estimated that deposits can satisfy the demand for colourless glass making sand for the next thirty years. However, these deposits are also outside the study area as they are on Crown Land. In any event they are already within a silica sand protection zone which will prevent alienation of this valuable resource.

There are also major deposits in the Tomago Sandbeds which are under the control of the Hunter District Water Board. The Newcastle Bight Dunes form part of the same dune system and have important deposits of heavy mineral sand and construction sand which lie partly within the Study area. Extraction is currently taking place in the Willamtown area, and zoning for mining could be made in those areas which have a low environmental impact.

In general, although Port Stephens Shire has extensive and important sand deposits, most of these are outside the Study area and therefore have not been discussed in detail.

Unprocessed Material: conglomerate for use as roadbase, soil and loam are extracted from scattered sites by the Council and private operators. The location of these sites is determined by siting as close as possible to where it is to be used, to minimise transport costs. Deposits are widespread and it is difficult to determine where they are likely to be required a long way ahead. Therefore, it is not possible to pinpoint future extraction sites, and as the need arises sites will have to be looked at individually. The only guideline is that sites are generally close to urban area.

Peat: A number of wetland areas have potential for peat extraction. However, there is often a conflict on interests with the need to protect these ecologically valuable areas. Fortunately, only Campvale Swamp is likely to attract commercial interest, because of its known deposits of peat. It is considered that wetland areas should be zoned environmental protection rather than for extraction, because of their undoubted value as a habitat for flora and fauna, and in biological production. Peat resources are relatively plentiful and it is therefore unnecessary to allow mining in Eskdale, McClements or Campvale Swamps, where resources may exist.

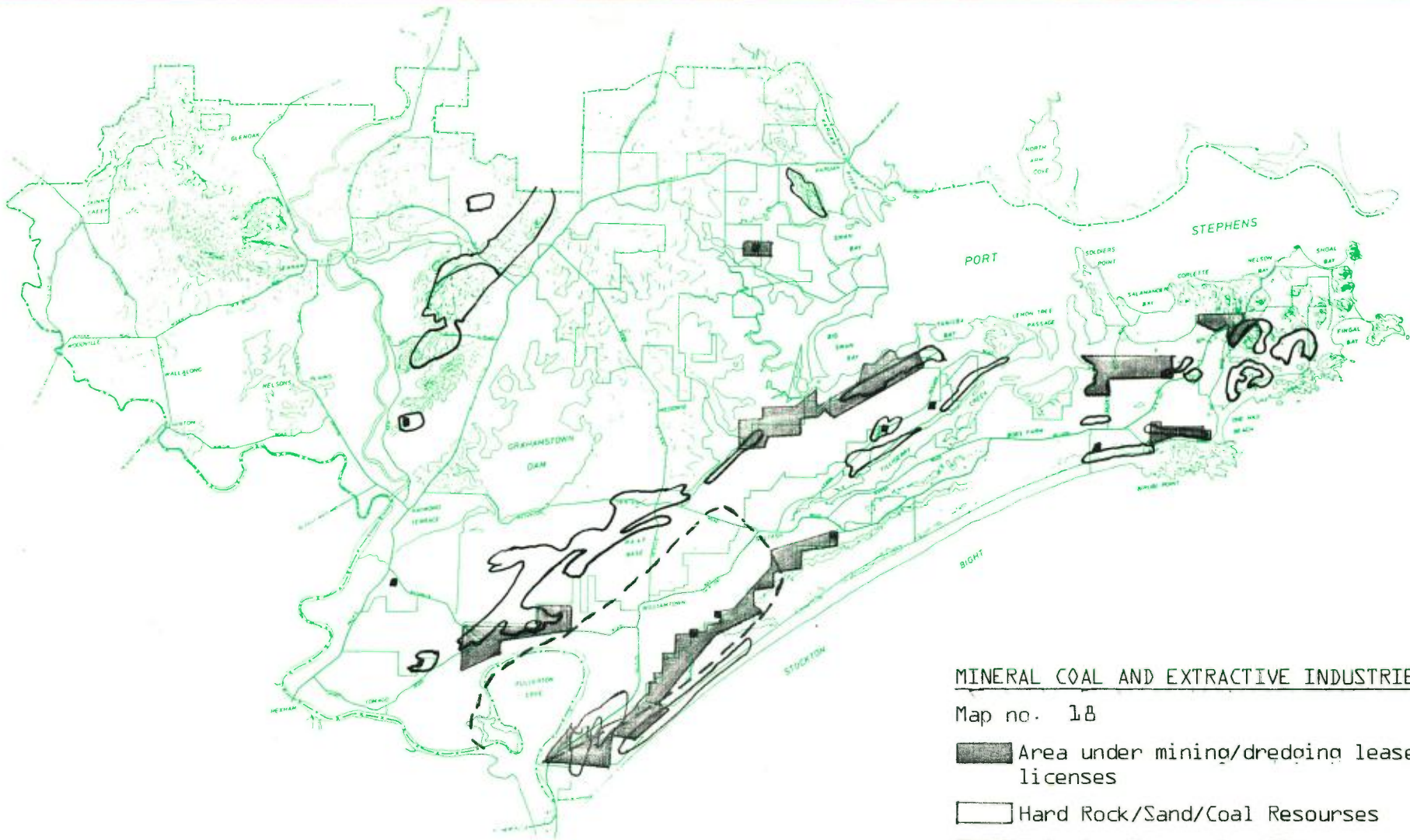
Coal: Significant seams of coal occur in the Fullerton Cove-Williamtown area and the Department of Mineral Resources has advised that these seams may be economically viable (See Map 18). However, no extraction is foreseen in the near future. If coal mining was to take place it would be by underground methods only, although provision would need to be made for surface works. Therefore it is not necessary to make special allowances for coal mining at this time.

Kaolin: A relatively small area at Swan Bay is currently being exploited for Kaolin, a fine white clay used in the refractory industries. It is partly within forestry land and partly within the 1(a) zone (See Map No.18). Other deposits exist outside the area currently under mining leases, but their potential for extraction is unknown. The area currently under lease in the 1(a) zone could be zoned for extraction while the surrounding area should remain as it is. It is unlikely there will be development pressures in this area.

Metals: The Department of Mineral Resources has advised that there are no significant deposits of metallic minerals in the Shire and there is little likelihood of any being found.

- (1) That all areas of hard rock aggregate which has been determined suitable for processing be protected from future competing uses.
- (2) That the silica sand resources of the Tanilba Peninsula remain protected.
- (3) That existing extractive industries associated with foundry and building sands be permitted to continue and that no future approvals be granted unless and until the existing pits can be proved to be no longer economically viable. *cannot supply demand.*
- (4) That the kaolin and clay resources identified by the Department of Mineral and Resources be protected from competing uses.

7.
change wording



MINERAL COAL AND EXTRACTIVE INDUSTRIES.

Map no. 18

- Area under mining/dredging leases/prospecting licenses
- Hard Rock/Sand/Coal Resources
- Existing Extraction Sites

Areas of Natural,
Ecological,
Historical and
Archaeological
Value

The National Parks and Wildlife Service, having been requested to input into this Study, have submitted that the areas designated in Map 19 be protected from competing zonings and thus be allowed to remain in their natural state for future generations.

The Service defines its responsibilities as follows:-

- * the investigation of land for national parks and nature reserves, so that a complete range of the State's natural environments are conserved;
- * acquisition and preservation of historic sites, buildings, objects, monuments and sites of national historic significance;
- * investigation of land for state recreation areas;
- * preservation and protection of Aboriginal sites and objects of significance;
- * management of these resources so they can be enjoyed by present generations and successfully preserved for future generations;
- * development of facilities for visitor use without impairing the other values of the areas;
- * protection, management and research into native wildlife throughout the State;
- * promotion of awareness, understanding and appreciation of wildlife, national parks and all aspects of conservation.

The Service sees the Port Stephens Shire as containing areas with considerable importance for wildlife conservation and the conservation of natural environments for recreation in a regional, and in one case, international context. The Service further believes that the Shire contains a significant number of Aboriginal relics and doubtless there are many more yet to be discovered and recorded.

One of the reasons Port Stephens Shire still contains a good deal of natural vegetation is that much of the Shire is composed of low-lying swampy ground or sand dune sequences derived from recent (Pleistocene) geomorphological events. These events include the recent progression and recession of the sea and the associated aeolian (wind) deposits of sand over the Shire. Therefore, much of the Shire was not suitable for agriculture or other rural pursuits even though the area was settled over 130 years ago and various attempts at agriculture were made.

The National Parks and Wildlife Service is of the opinion that as much as possible of the remaining natural land in the Port Stephens Shire should be given positive protection from ad hoc development.


At present the National Parks and Wildlife Act, 1974, is responsible for the management of three small nature reserves within the Shire, they are:-

- * Moffats Swamp Nature Reserve.
- * Senham Swamp Nature Reserve.
- * Snapper Island Nature Reserve.



MAP 19

NATIONAL PARKS AND WILDLIFE
RECOMMENDATIONS

- 7h - Environmental Protection Historic Site
- 7j - Environmental Protection Scientific Site
-  Visually Significant Area

- 7a - Environmental Protection Wetlands
- 7b - Environmental Protection Estuarine Wetlands
- 7c - Environmental Protection Water Catchment
- 7d - Environmental Protection Scenic Protection
- 7e - Environmental Protection Water Catchment
- 7f - Environmental Protection Foreshore Protection

ENVIRONMENTAL PLANNING & ASSESSMENT ACT, 1979 SHIRE OF PORT STEPHENS LOCAL ENVIRONMENTAL PLAN		DATE OF PREPARATION DATE OF REVIEW DATE OF AMENDMENT
PREPARED BY CHECKED BY APPROVED BY	DATE DATE DATE	DATE DATE DATE

(1) Moffats Swamp Nature Reserve

Moffats Swamp Nature Reserve is 151 hectares in area and was reserved in June, 1977.

The nature reserve and proposed extensions have a number of significant conservation values;

- (a) The organic mud on the bed of the swamp has possible palynological values;
- (b) This habitat has elements of both coastal bogs - overlying clay and seasonal fresh swamps. No swamps in any other park or reserve on the Lower North Coast and Central Coast appear comparable to Moffats Swamp;
- (c) The geomorphology of the area is considered rare and justifies dedication as a nature reserve;
- (d) The paperbark forests are important as a food source for mammals and birds;
- (e) The forest groves around the swamp have considerable aesthetic appeal; and
- (f) The *Ghania* clumps which are a feature of the undergrowth are an important food plant for a number of butterfly species.

The Service considers that there is a strong argument for the introduction of a Rural 7(j) - Scientific zoning over the extended area of the Moffats Swamp Nature Reserve as shown on Map 19 .

(2) Seaham Swamp Nature Reserve

The reserve contains two main important conservation and educational features;-

- (a) A seasonal fresh swamp which provides a valuable breeding and feeding ground for a number of common and uncommon species of waterbirds. The less common species include Japanese snipe and nankeen night heron.
- (b) A historical quarry site of geological importance. This quarry allows interpretation of outcrops at varied sediments deposited in the Upper Carboniferous Age during a glacial period. One of Australia's most famous early geologists, Professor Edgeworth David, was associated with the recognition of the area. The quarry is now considered among the geological fraternity as a site of international significance because of the glacial depositional sequence preserved there.

The Education Department carries out field studies of both of these features of the reserve.

The Service hopes in the near future to extend this Reserve and requests that a Rural 7(a) - Wetlands zoning be implemented over the area shown on Map 19 .

3. Snapper Island Nature Reserve

Whilst it is preserved because of its outstanding rainforest remnant it does not have a bearing upon this Study, however, because of its unique importance to the natural environment it should be protected by a suitable zoning at the time of review of the rural zones within the Shire.

Areas of Identified Conservation Value

The Service has identified six areas of conservation value within the Shire, and they are:-

- (i) Proposed Tomaree National Park;
- (ii) Proposed Irrawang Historic Site;
- (iii) Worimi (Pipeclay Creek) Study Area;
- (iv) Kooragang Island-Fullerton Cove Study Area;
- (v) Newcastle Bight;
- (vi) Non-estuarine Wetlands; Pressey (1981).

1. Proposed Tomaree National Park

The Port Stephens Shire Council has already resolved to support the establishment of this National Park and has taken steps via its Anna Bay Strategy Plan Report to reserve the lands necessary from competing zonings.

2. Proposed Irrawang Historic Site

Whilst Council agrees that this site is in need of protective management, it is located upon land held by the Hunter District Water Board and therefore it is beyond the scope of this study to recommend any immediate action in respect to the area.

3. Worimi (Pipeclay Creek) Study Area

The Worimi study area is located at the western end of Port Stephens near Karuah. The area under study consists of about 1750 hectares and is mainly composed of estuarine wetlands and includes a very large and important mangrove community.

The area is rich in aquatic fauna - vertebrates and invertebrates and is important for the fishing industry of the Port Stephens area because of the scientifically acknowledged complex food chains and breeding and feeding grounds associated with mangrove communities.

The tenure of the land varies, but includes Crown and freehold lands. Most of the freehold lands are below the 1 in 100 year flood level. However such future developments as canal-subdivision, drainage etc., could possibly occur in the area. Any developments such as these could severely damage the natural values of the area. The Service considers that these lands should be given protective zoning 7(b) Estuarine Wetlands by Council to ensure their future survival.

4. Kooragang Island-Fullerton Cove Study Area

Kooragang Island and Fullerton Cove are located in the lower Hunter, near the river's mouth at Stockton. Fullerton Cove is located in the Shire, while Kooragang Island is in Newcastle City.

The conservation value of this wetland complex lies in the fact that it constitutes one of the few remaining large areas of estuarine wetland in New South Wales. The proposed nature reserve contains a variety of coastal wetland communities and supports large numbers of species and individuals of waterbirds including migratory waders. The high conservation value of the area was recognised in the 1973 Coffey Report on the Inquiry into Pollution from Kooragang Island.

The northern part of Kooragang Island, Fullerton Cove and adjacent areas, and the area to the north of Stockton Bridge on the eastern side of the Hunter River comprise the areas necessary to fulfil all the habitat requirements of the migratory waders.

Kooragang Island and Fullerton Cove constitute a considerable area of remaining wader habitat in New South Wales and their preservation is necessary for the survival of the migratory waders.

In 1981 there was a joint Ministerial announcement (Minister for Public Works and Minister for Planning and Environment) of the intention to establish a nature reserve incorporating part of Kooragang Island and part of Fullerton Cove including the bed of Fullerton Cove estuary.

The Service soon proposes to reserve the Crown land segment of the Kooragang Island-Fullerton Cove area as nature reserve. However, it should be recognised that a large and important area of wetland habitat lies on adjoining freehold lands. The Service may in the future purchase some of these lands as additions to the nature reserve. This will be subject to funding and the attitudes of the owners of the land to selling to the Service.

The Service would strongly recommend that 7(b) Estuarine Wetland zoning with appropriate protective conditions be applied to the area of wetland shown on Map 19.

5. Newcastle Bight

The "Bight" is a large tract of coastal land consisting of both forested and unforested sand dunes, swales and strand lines. A number of swamp forests and hind dune scrub occur throughout the system. A dominant feature of the area is a massive unstable sand blow occupying the length of the "Bight".

The geomorphology of the area has been studied in detail by Professor B. G. Thom (Professor Geography, University of New South Wales). Professor Thom considers this area to have international significance as a sand dune system and as a record of recent history of environmental change.

The area is presently under threat because of:-

- (a) frequent fires which apparently result in poor regeneration of the natural vegetation in the area. This may indirectly lead to further sand blowouts in the dune system because of the removal of the vegetation cover;
- (b) uncontrolled 4WD access with resulting tracks, erosion etc.;
- (c) proposed residential subdivisions in the area;

The Service considers that this area warrants a protection zoning to help conserve its natural values. An appropriate zoning would be 7(f) Foreshore protection as shown on Map 19.

* SEE M48-127

6. Non Estuarine Wetlands of the Shire

In 1982 R. Pressey was contracted by the National Parks and Wildlife Service to carry out a survey of the coastal flood plains and identify areas of importance for conservation for wetland flora and fauna. The areas identified by Pressey as worthy of being rezoned to Rural 7(a) Wetlands are shown on Map No.20.

Areas of Potential Conservation Value

The Service has identified four areas within the Shire of Port Stephens as having a potential conservation value;

- (i) Tilligerry Creek-Lemon Tree Passage Area
- (ii) The Tomago Sand Beds
- (iii) Uffington, Wallaroo and Karuah State Forests
- (iv) Other lands containing natural habitat values scenic and recreational resources in the Shire.

Whilst the first three mentioned areas have been excluded from this Study because of their ownership or consideration under other reports, the fourth category needs comment, and may be subdivided as follows:-

- (a) The Dunns Creek and Chambers Creek catchments. This area is also the subject of comments by the New South Wales Soil Conservation Service and the New South Wales Department of Agriculture.

- (b) Carmichaels Creek and Deadmans Creek area.
- (c) Kings Hill, Seaham Hill and land west of Nine Mile Creek: This range of natural land presents a scenic backdrop to a large section of the Shire.
- (d) Pig Island, Murrumburrimbah Swamp, Pennington Island: These areas of mainly low-lying land are located between Anna Bay and Tilligerry Creek. The wetland component of these areas may be important to waterbirds.

The Map No.21 summarises the submission by the National Parks and Wildlife Service and shows the zonings as appropriate to meet conservation requirements.

Scenic

This visual quality of much of the Study area hinges upon a number of locations, basically prominent landforms, which retain their undisturbed natural appearance. These include lands of various tenure with native vegetation and wildlife habitat values, and it has been suggested by the National Parks and Wildlife Service that a zoning of 'scenic protection' be implemented in these areas to preserve these environments by:-

- (i) minimising subdivision size;
- (ii) helping protect the scenic and wildlife values of the area.

The areas considered significant as conservation sites are:-



WETLANDS AND VISUAL RIVER CATCHMENT AREAS: MAP 20


-  Bolwarra Flats Visual Catchment Area
-  Non Estuarine Wetlands

<p>SCALE: 1:50,000</p> <p>DATE: 1993</p> <p>PROJECT: LOCAL ENVIRONMENTAL PLAN</p> <p>PREPARED BY: [Name]</p> <p>APPROVED BY: [Name]</p> <p>DATE: [Date]</p>	<p>ENVIRONMENTAL PLANNING & ASSESSMENT ACT, 1973</p> <p>SHIRE OF PORT STEPHENS</p> <p>LOCAL ENVIRONMENTAL PLAN</p>	<p>STATEMENT OF RELATIONSHIP WITH OTHER PLANS</p> <p>[Blank space for text]</p>
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MAP 21

NATIONAL PARKS AND WILDLIFE
RECOMMENDATIONS

- 7h - Environmental Protection Historic Site
- 7j - Environmental Protection Scientific Site
-  Visually Significant Area

- 7a - Environmental Protection Wetlands
- 7b - Environmental Protection Estuarine Wetlands
- 7c - Environmental Protection Water Catchment
- 7d - Environmental Protection Scenic Protection
- 7f - Environmental Protection Foreshore Protection

ENVIRONMENTAL PLANNING & ASSESSMENT ACT, 1973 SHIRE OF PORT STEPHENS LOCAL ENVIRONMENTAL PLAN	
DATE: 1973-1974 SCALE: 1:50,000 DRAWN BY: [Name] CHECKED BY: [Name]	APPROVED BY: [Name] DATE: [Date]

- (a) The Dunns Creek and Chambers Creek catchments.

Dunns Creek catchment area forms the backdrop of the Shire to the north where its timber clad slopes rise to heights of 900 feet above sea level. Steep slopes, inaccessibility and construction problems have until now kept all but isolated developments on the foothills around Dunns Creek and Forest Roads.

The Bolwarra Flats

A significant portion of the Bolwarra Flats landscape falls within the Shire area, and forms a major part of the agricultural lands of the Study area.

The terrain of the floodplain and wetlands is flat, adjoined by undulating terrain on the uplands. The National Trust state in their submission that: "This area of rich river flats presents a beautiful mosaic of varied market gardens and fodder crops, when viewed from the adjoining low hills. Dotted with traditional timber farm buildings the area has a visual character unusual in the Australian environment".

In the publication "Hunter 2000" by the National Trust, the area defined as the Bolwarra Flats was first singled out as worthy of preservation. Since that time the New South Wales Department of Environment and Planning have extended the initial review of the area and offered policies for preservation and protection. The area of the Flats is shown on Map 20.

The Department in their publication "Lower Hunter Landscape Protection and Improvement Study" say of the relation to that portion of the Bolwarra Flats Unit within Port Stephens Shire:-

- (1) The geology of the unit is predominantly alluvium overlaying permian deposits in the south and the north. Permian deposits comprise conglomerate, sandstone, mudstone, siltstone, shale, tuft, tillitic and coal. The alluvium deposits form prime crop lands.
- (2) The unit has largely been cleared of indigenous vegetation. Extensive wetlands exist at Irrawang Swamps on the Williams River. Isolated stands of dry sclerophyll forest remain on poorer quality upland grazing land. Eucalypt tall mixed woodland cover the hills between the Pacific Highway and Williams River.
- (3) The terrain of the flood plain and wetlands is flat adjoined by undulating terrain on the uplands. The Kings Hill formation, east of the Williams River, is rolling and hilly terrain.
- (4) All of the unit is within a lowland landscape. Land with foreground views of major water bodies (Hunter, Paterson and Williams Rivers) is of a distinctive variety class as also the wooded hilly terrain of Kings Hill.
- (5) The National Trust state in their submission that "this area of rich river flats presents a beautiful mosaic of varied market gardens and fodder crops, when viewed from the adjoining low hills. Dotted with traditional timber farm buildings the area has a visual character unusual in the Australian environment".

- (6) Of particular interest are the historic villages of Morpeth and Hinton, on prominent land in the middle of the unit. Other settlements sited above and overlooking the flood plain are Wallalong and Woodville.
- (7) The unit boundaries are determined by: natural features, Main Roads 104, 301, 601, New Line Road, local roads, property boundaries, the Main Northern Railway and the edge of existing urban development.
- (8) In the Shire of Port Stephens flood plains are zoned Non Urban 1(c) which permits agriculture and flood mitigation works. Extractive industry, mines, quarries, pig keeping, stock sales yards and utility installations are permissible with Council consent. A 40 hectare minimum subdivision lot area applies in this zone. In addition there are 100 foot wide open space reservations along one side of the Hunter and Williams Rivers near Raymond Terrace.
- (9) Hinton and Abbotsford have extensive 2(e) Village Zones which allow for a significant change to the character of these settlements.
- (10) There is pressure for urban development on all flood free lands. This pressure may be greatest where development is an extension of existing urban areas.
- (11) This recommendation applies to all of the Hunter Paterson and Williams River visual corridors including areas with fore to middle ground views of these rivers. Flood control embankments restrict views of the rivers from adjoining lands. Extensive modification of the banks and riverside vegetation has taken place for bank stabilisation and flood control purposes.
- (12) The presence of trees on the river banks enhances the visual quality of the river environment. Indigenous trees are preferable to exotic tree species. It is recommended that all existing stands of native trees on river banks be preserved and indigenous tree species be specified for new riverside plantations. The hill west of New Line Road is also recommended for preservation due to its prominence and proximity to the road.
- (13) Sub units include: grazing land adjacent to prime alluvial soil, prominent areas, and significant stands of trees. Much of the land is of minimal visual variety, being relatively flat and treeless. However, the proximity of this land to more attractive areas, and its open character makes it unsuited to extensive urban development. Land adjacent to prime alluvial soil forms an integral part of farming operations on the river flats. It should be given the same protection as the river flats. This land often forms the foreground to views from public roads of the river flats.
- (14) Many sub-units contain poultry sheds which are often prominent in views from public roads. The establishment of indigenous tree and shrub plantations could screen and reduce the impact of these buildings. Future construction of poultry sheds in these sub-units should be subject to Council development approval. In approving future applications Council should consider the visual impact of the proposal and ensure that adequate measures have been taken to reduce any visual impact on public views of the proposals.

- (15) Irrawang Swamp as well as two smaller wetlands are included in this recommendation for priority wetland protection. All trees in these wetlands should be preserved as they are important elements in this flat landscape. No further modification of these wetlands should be permitted which will adversely affect their natural qualities.
- (16) All of the soil within these sub-units is prime alluvium which should be protected for commercial agriculture enterprise. Roadside and riverbank tree planting could improve the visual attractiveness of the sub units.

Recommendations

- (1) That the areas defined by the National Parks and Wildlife be zoned in accordance with Map No. 21.
- (2) That the wetlands of the Shire as defined by the Fisheries Department be suitably zoned.
- (3) That the scenic preservation areas defined on Map No. 21, be protected from inhospitable development.
- (4) That the historical and archaeological sites mentioned in this section be suitably zoned to prevent competing uses.

Agricultural Capabilities

For rural activities to be successful a combination of factors must be present and the right portents must exist, as well as having the right climate, market, infrastructure, elevation and slope, the soil capability must also be conducive to the type of agriculture proposed.

And where these ingredients exist stringent steps must be takne to ensure that they are not alienated from agricultural use.

The Minister for Agriculture has adopted a firm policy aimed at preventing the alienation of prime agricultural land from commercial production. As prime agricultural land is a limited resource it is important that as much as possible be preserved in its viable state. Fragmentation of agricultural land has occurred throughout much of the Shire and is most noticeable through the Nelsons Plains area between Raymond Terrace and Seaham, and through to Clarencetown. Other areas of major 'disturbance' are the Williamtown and Salt Ash area, Nelson Bay Road (Main Road No. 108), the Seaham to Clarencetown area on both sides of the Williams River, and the Dunn's Creek area.

Both the Soil Conservation Service and the Department of Agriculture have assessed the capability of rural land within the Shire for agricultural use. The results of these assessments vary due to the basic difference between these two Departments opinions upon the use of land.

The assessments of these two Departments have provided a simplified mapping of three categories which correspond to the usually more detailed classifications adopted.

Soil Conservation Service Capability Classifications:-
(Refer to Map No.22).

Class 1:

This class comprises the better areas of agricultural land within the Shire, land which can be regularly cultivated, has a low erosion hazard and is generally fertile. It therefore represents

land which should be retained for long term agricultural production, and not subdivided into small uneconomic units for semi-rural non-agricultural land use purposes.

Class 2:

Land in this class is not considered suitable for regular cultivation, and its optimum rural use is for livestock grazing.

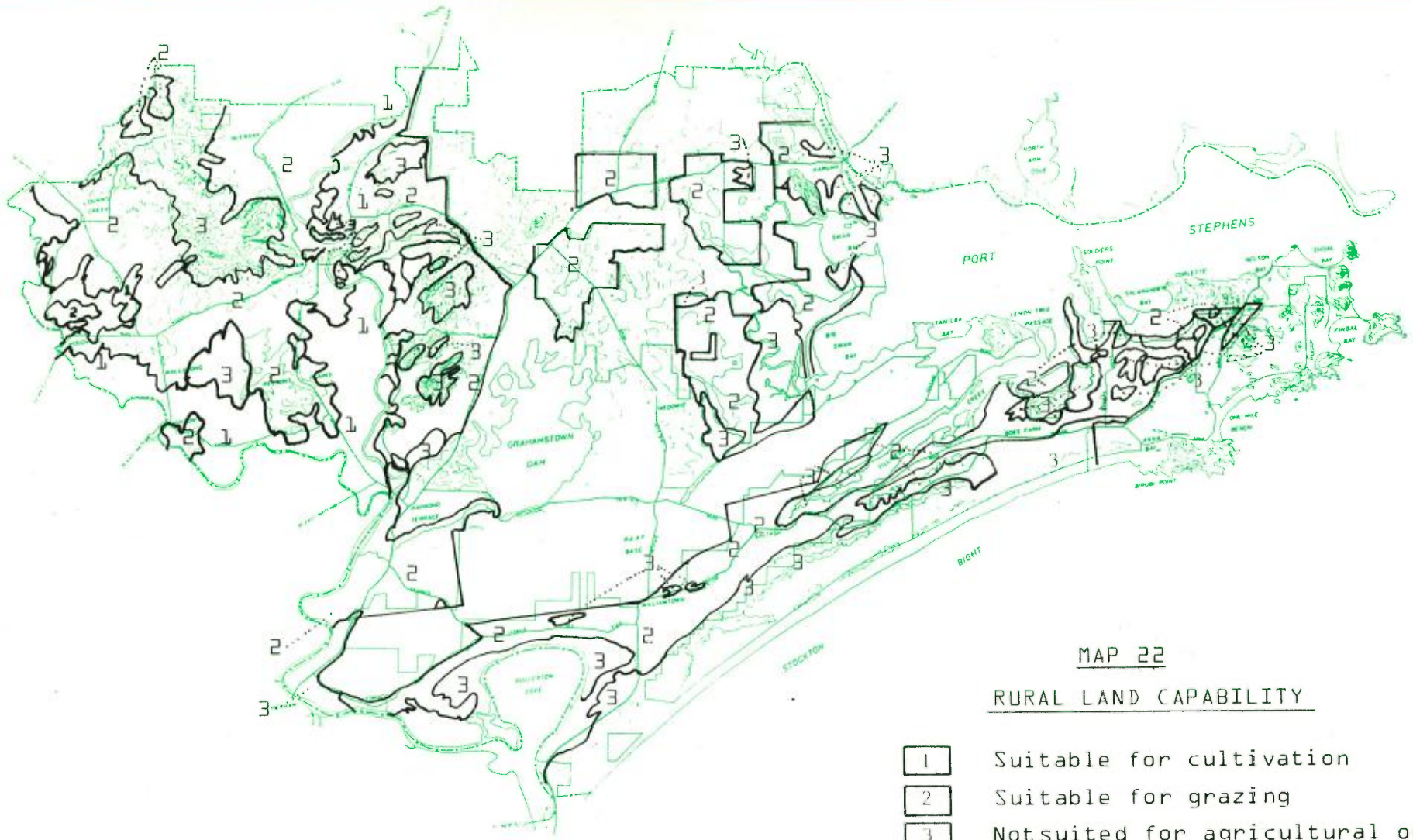
The class therefore comprises, in general terms, the land within the Shire with the least limitations for hobby farm and semi-rural land uses. The viability of grazing livestock within this class varies markedly however considerable areas are considered good quality grazing land and therefore should be preserved to ensure continued, and viable pastoral production.

Class 3:

This class represents land within the Shire which is generally unsuitable for agricultural or pastoral use, and is best left undisturbed.

This land comprises the major swamps, waterbodies, mangrove areas, all steep land over a thirty (30) per cent slope gradient, areas of 'protected land' (as defined under Section 21 of the Soil Conservation Act, 1938) as well as slope gradients above ten(10) percent located on the erosion-prone earthy sands and podzols in the south-eastern portion of the Shire.

These areas therefore have very limited potential for semi-rural land uses, although some portions of this class could be added to areas of adjoining Class



MAP 22

RURAL LAND CAPABILITY

- 1 Suitable for cultivation
- 2 Suitable for grazing
- 3 Not suited for agricultural or pastoral production
- Excluded areas

2 land to form large semi-rural holdings. Restrictions on clearing and permissible land uses within Class 3 land would be essential in the event of such an undertaking.

Department of Agriculture Land Capability Classification:-

Class 1:

Land capable of regular cultivation for cropping or intensive horticulture. It has a very good capability for agriculture. It includes irrigated areas with high production.

- * Lands are either level or very gently sloping.
- * Soils are deep, well to imperfectly drained, and have good water holding capacity.
- * Soils can be maintained in good tilth and productivity.
- * Erosion damage is nil to slight and potential for future damage is low.
- * Productivity is high to moderately high for a wide range of adapted field crops.
- * The soils have a moderate to high capability to withstand frequent cultivation and artificial irrigation without serious damage.
- * Any adverse soil physical and chemical restraints are capable of economic amelioration.
- * Economic losses caused by floods are low in the long term.
- * Lands are not likely to accumulate excessive salt or develop prolonged high water tables following irrigation.

- * Lands are not exposed to recurrent extremes of climate to an extent that productivity is seriously affected.
- * Intensive production has been facilitated by existing local or regional infrastructure (such as drainage scheme, irrigation networks or levee banks), except for those parts which have suffered damage beyond economic amelioration.

Class 2

Land suitable for cultivation for cropping, but not suited to continuous cropping or intensive horticulture. It has good capability for agriculture, but where constraints limit the cropping phase to a rotation with improved pastures and thus reduce the overall level of production.

- * Land may be level to moderately steep.
- * Soils are deep to moderately deep, well drained and have good available water capacity.
- * Climatic and environmental conditions are particularly favourable for sensitive crops whose cultivation would be seriously impaired in adjacent areas with less favourable characteristics.
- * Erosion damage or hazard is low to moderate; soil conservation measures may be required.
- * Soils have a moderate to high capacity to withstand frequent cultivation and artificial irrigation without serious damage, except for those on steeper lands which have a low capability and require conservation work.

- * Soils can be maintained in good tilth and productivity.
- * For a wide range of field crops, adapted to the region, their productivity is high to moderately high.
- * Any adverse soil physical and chemical restraints are capable of economic amelioration.
- * Economic losses caused by floods are low in the long term.
- * These are lands where existing local or regional infrastructure (such as drainage schemes, irrigation networks or levee banks) has been provided for intensive production - except for those parts which have suffered damage beyond economic amelioration.
- * Lands are not likely to accumulate excessive salt or develop prolonged high water tables following irrigation.

Class 3

Land suitable for grazing - well suited to pasture improvement and can be cultivated for an occasional cash crop or forage crop in conjunction with pasture management. The overall level of production is moderate as a result of high environmental costs which limit the frequency of ground disturbance. Has a moderate capability for agriculture. Pasture land capable of sustained high levels of production, although conservation measures may be required.

- * Lands have either many moderate or few severe limitations of those listed under Class 5, restricting the extent of arable agriculture.

- * Sustained high to moderately high levels of productivity of pastures adapted to the region are easily maintained.
- * Lands may be very gently to steeply sloping.
- * Soils may be deep or shallow, well drained to poorly drained.
- * Erosion damage is nil to moderately severe but conservation works are feasible.
- * Under artificial irrigation, level lands are incapable of sustained high levels of production because of unsuitable soil-physical properties incapable of economic amelioration.

Class 4

Land suitable for grazing and not suitable for cultivation. Agriculture is based on native pastures or improved pastures relying on minimum tillage techniques. The overall level of production is low. Environmental constraints make arable agriculture uneconomic.

- * Lands are hilly or rolling with steep or moderately steep slopes.
- * The degree of stoniness or rockiness is slight to severe but not extreme.
- * Erosion damage or hazard is moderate to severe and control works are necessary; severely eroded areas are only capable of economic restoration by the establishment of permanent pasture.

- * Soil physical handicaps are sufficiently severe to prevent cultivation but will allow some pasture growth providing year round feed for a low stocking rate.
- * While extremes of salinity, salt hazard, toxicity, deficiency, acidity or alkalinity may be present they are not so severe as to prevent plant growth but instead may combine to depress yields seriously and place severe restrictions on the range of suitable pasture species.
- * Where land is subject to periodic inundation and high water tables, these conditions are generally of short duration.
- * Where permanent high water tables exist, the land can be drained sufficiently to permit some pasture growth.
- * The density of bush or scrub may be low to high, but not extremely high.
- * Where the population of feral and noxious animals is high it does not impose a severe limitation to grazing.
- * Where the density of weeds is high, successful eradication is only possible by a continuing program.

Class 5

Land suited for only rough grazing or land not suited to agriculture. Agricultural production is very low or zero. Severe or absolute constraints to production are imposed by environmental factors.

- * Extremes of -
 - slope;
 - stoniness or rockiness;
 - erosion hazard or damage by wind or water;
 - soil physical handicaps;
 - salinity or salt hazard;
 - surface water or flooding;
 - toxicity or deficiency;
 - acidity or alkalinity;
 - high watertables incapable of economic drainage; or bush or scrub uneconomic to clear.
- * Large populations of feral animals inhabit the area.
- * High densities of weeds and timber regrowth which are uneconomic to eradicate;
- * These are timbered or previously timbered upland areas where clearing has led or may lead to excessive movement of salt into the groundwater.

Recommendation

- (1) That the system and classification adopted by the Soil Conservation Service and shown on the Agricultural Capability map be adopted by Council as its criteria for judging competing land uses and requests for rezonings.

Bushfire Hazard Analysis

One of the most avoidable natural hazards is that of bushfires. For whilst the starting of a fire is accidental or unable to be prevented, the loss of resources, equipment and lives can be guarded against by correctly taking into account the potential of an area in respect to bushfires.

The fire hazard of an area can pose a major constraint to development particularly urban and rural residential. Because of the danger that a bushfire can pose both to property and life, it is important that any potential development in such areas be considered in light of two major themes.

On the one hand there are planning measures which, in dealing with landuse options, can choose to exclude development from areas with significant fire hazard, or they can ensure that a development should be designed so as to minimise its vulnerability to fire.

On the other hand there is the gamut of protective measures, both preventative and reactive, for which the various 'free' fighting organisations are responsible, and which in many cases adequately safeguard areas of development.

It is essential to know the bushfire hazard rating of an area to determine the degree of development constraint. The rating is a calculation based upon three core factors; fuel, terrain and fire season, which relate respectively to vegetation type, slope and climate.

Using this calculation system the general rating of areas of the Shire has been determined and is shown on Map No. 23.

For those areas found to have a high or medium hazard rating there are essentially two options.

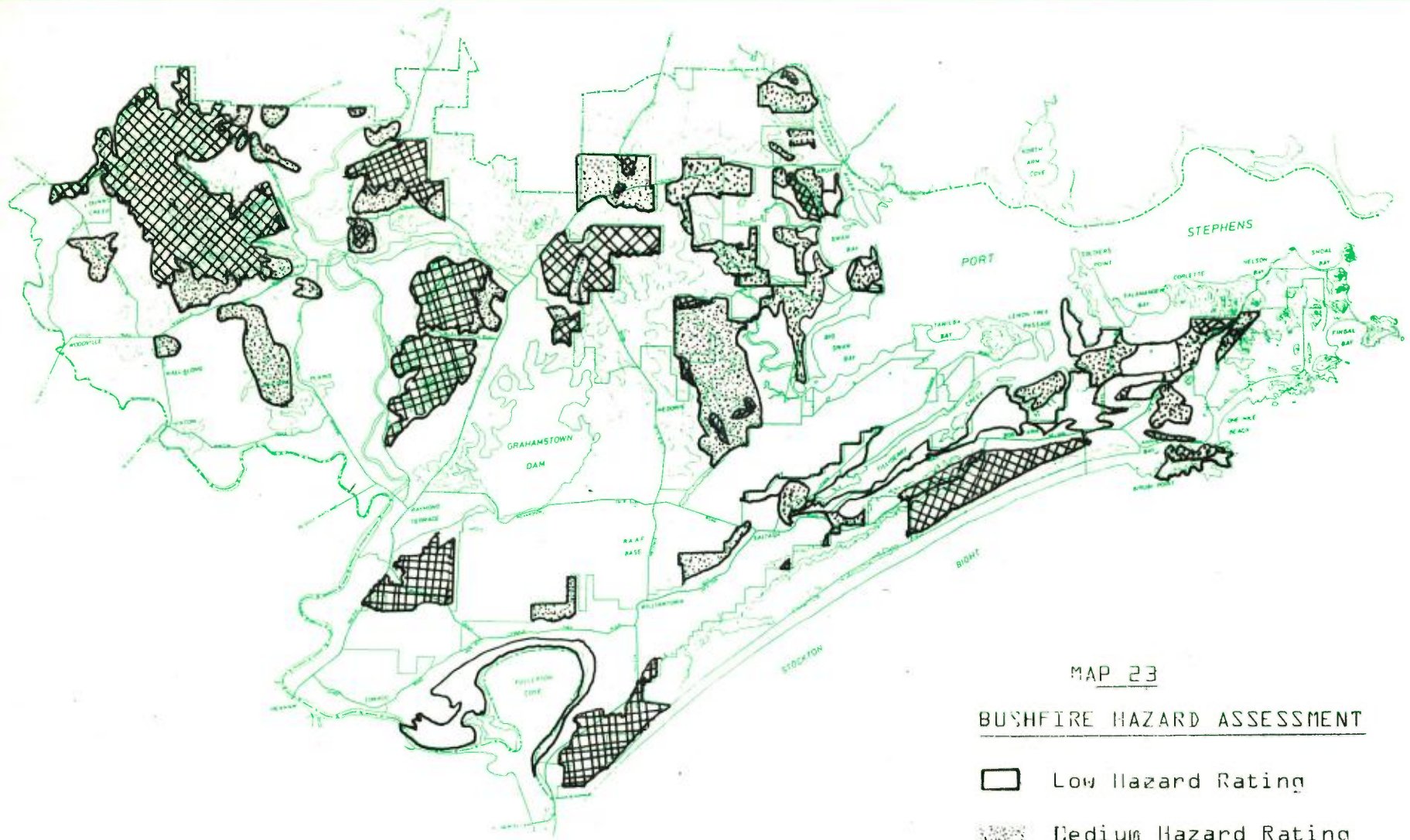
- (i) The first, and obvious solution is the exclusion of development, a viable option if there are alternative sites available to meet development demand, or if the cost of fire risk-reduction

works would incur too high a cost to the community in terms of either direct financial cost or environmental costs associated with impact upon scenic or ecological qualities.

- (ii) The alternative is to develop the area in such a way as to protect it from fire. This object can be achieved through the use of perimeter reserves or roads which can provide a reasonably effective fire break between developments and the surrounding bushland. The use of perimeter reserves/roads however has inherent disadvantages such as its adverse effect upon the natural environment. Examples of its use in north-west areas of Sydney have shown that perimeter roads cause far greater disturbance than 'spine roads' (with allotments backing onto bushland) due to destruction of vegetation, increased erosion and the need for increased roadwork construction.

The co-ordinating committee of the Bushfire Council has adopted a policy providing for perimeter roads where housing subdivisions encroach onto unimproved bushland with such roads to be located immediately between the building blocks and surrounding bushland.

The principle of this is two-fold, firstly, it provides a fire break for developments adjacent to fire prone areas, and secondly it provides ready ingress/egress to a fire if it occurs in such areas. In this way it fulfils both a preventative, and reactive role to the fire threat. This alone though is no solution to the possible dangers of bushfires, water supply, brigade availability and fire trails are essential elements in the control of bushfires.



MAP 23

BUSHFIRE HAZARD ASSESSMENT

- Low Hazard Rating
- Medium Hazard Rating
- High Hazard Rating

Bushfires pose a major threat to life and property in both urban and rural areas. Therefore the danger from bushfires must be an important consideration when evaluating any form of more intensive development than presently exists. A bushfire hazard map has been prepared which has classified areas according to the danger that occurs when a bushfire takes place. This map does not attempt to show the likelihood of fires occurring, although this is taken into account in preparing the map. What it does show is the relative danger when bushfires do occur.

The method of compiling the map has been taken from the Rural Land Evaluation Manual, and involves a number of steps to categorise areas according to high, medium or low fire hazard. The first step is to place the Shire into the appropriate State Fire Zone, which is the Eastern Zone. The next phase involves mapping vegetation cover of the Shire and classifying it into different types. The various types are given a ranking according to their bushfire fuel production. A similar process also takes place for a terrain rating and fire season frequency rating. Modifying factors of fire history, density of settlement, access and availability of fire fighting services are also evaluated before calculating the final fire hazard rating. As stated above this rating is not of the likely occurrence of frequency of bushfires, but of the danger to life and property in areas where bushfires may occur, that is any area with some vegetation cover.

Areas with a low hazard rating are not considered to be significantly dangerous and a low fire hazard by itself should not preclude development. For areas with a high or medium rating it is recommended that any further development be excluded. (This is a viable option where alternative sites are available, which is the case for most of the Shire). In any event, it will generally be found that areas with a high rating will be unsuitable for most development, although there may be subdivision pressure.

It is possible to develop in some cases by the provision of risk-reducing works that make development less vulnerable to fire. However, such works should never involve unnecessary or unacceptable costs to the community in terms of direct financial costs or adverse environmental impact.

Recommendations

- (1) That the areas defined as having a high Bushfire Hazard Index be excluded from any development proposal.
- (2) That Council include in any Certificate issued under Section 149 of the Environmental Planning and Assessment Act a rating in accordance with the Bushfire Hazard Index.
- (3) That the Bushfire Hazard Index be reviewed on an annual basis against the actual occurrence of bushfires within the Shire and if necessary the maps updated to reflect current activities.

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Port Stephens Shire rural study

