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GOSFORD CITY COUNCIL

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**GREEN POINT CREEK, PEARL BEACH  
FLOODPLAIN MANAGEMENT PLAN**

November, 1992

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FLOODPLAIN MANAGEMENT PLAN**

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**Prepared By:**

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**GOSFORD CITY COUNCIL**  
**GREEN POINT CREEK, PEARL BEACH**  
**FLOODPLAIN MANAGEMENT PLAN**

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## **FOREWORD**

The New South Wales Government's flood policy is directed at providing solutions to existing flooding problems in developed areas as well as ensuring that new development is compatible with the flood hazard and that it does not create additional flooding problems in other areas.

Under the policy, the management of flood-prone land remains the responsibility of local government. The state government subsidizes flood mitigation works to alleviate existing problems, providing specialist technical advice to assist councils in the discharge of their floodplain management responsibilities.

The flood policy provides for technical and financial support by the government through the following four sequential stages:-

\* **Stage 1 - Flood study:**

Determines the nature and extent of the flood problem.

\* **Stage 2 - Floodplain management study:**

Evaluates management options for the floodplain in respect of both existing and proposed development.

\* **Stage 3 - Floodplain management plan:**

Involves formal adoption by council of a plan of management for the floodplain.

\* **Stage 4 - Implementation of the plan:**

Involves construction of flood mitigation works to protect existing development and includes use of local environmental plans to ensure new development is compatible with the flood hazard.

The Green Point Creek Floodplain Management Plan constitutes completion of the third stage of the management process for the Green Point Creek catchment and has been prepared for Gosford City Council to determine an appropriate floodplain management strategy.

Gosford City Council has adopted the one percent annual exceedence probability event (1% AEP) as the Designated or Standard flood for consideration of floodplain management options throughout the council area.

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Gosford City Council, in application of floodplain management plans in their administrative area identifies flood-labile land by hydraulic categories as "Floodway" or "Flood Storage".

The experience of the February 1990 flood indicates that the area inundated by that flood could be considered as a "floodway" in an hydraulic sense and, conversely, very little flood-labile land can be considered as "Flood Storage" or Flood Fringe".

Floodways are those areas where a significant volume of water flows during floods. They are often aligned with obvious naturally defined channels.

Floodways are areas which, even if only partially blocked, would cause a significant redistribution of flood flow, which may, in time, affect other areas. They are often, but not necessarily, the areas with deeper flow or areas where higher velocities occur.

Land use in floodways must be carefully controlled to ensure that the conveyance of the floodway is not reduced. Neither buildings nor hazardous uses or obstruction operations likely to impede floodwaters should be permitted in floodways. Only land use that is flood compatible or likely to enhance floodway capacity should be allowed.

The provision of floodways has added benefits as follows:

- floodways allow retention of the existing stream environment;
- when coupled with a freeboard allowance for buildings, they can accommodate floods larger than the designated flood; and
- a clearly visible floodway constantly provides flood awareness to the local community.

In the distant future, the floodway may provide the opportunity for improvement to the stream conveyance if it is necessary following ongoing development. However, once defined, the floodway should never be compromised. Small changes occurring progressively would, in time, cause a significant change to the flow capacity.

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## 1. INTRODUCTION

The Pearl Beach area is a residential zone of the Gosford City Council. It is located near Middle Head on Broken Bay, between Woy Woy and Patonga.

Green Point Creek is a major watercourse passing through the Pearl Beach area. A locality plan appears as Figure 1.

The impetus for the preparation of this report was a major flood that occurred in February 1990. Flooding has occurred regularly in Green Point Creek, though not to the magnitude experienced in February 1990.

A flood study of Green Point Creek was undertaken (Reference 1) and a preliminary flood management plan was prepared.

The preliminary management plan was exhibited publicly in April 1991 and public submissions were received. The public submissions, where appropriate, were incorporated into the study and this management plan.

The flood study indicated that:

- the February 1990 flood was the highest known flood on Green Point Creek;
- the February 1990 flood exceeded the accepted one percent annual exceedence probability flood (equivalent to once in 100 year flood) but was accepted as a suitable model for the once in 100 year flood;
- the February 1990 flood highlighted six principal issues relating to floodplain management in Green Point Creek; and
- the floodplain management issues could be addressed in a variety of ways. The optimum approach to each issue has been included in the Floodplain Management Plan.

The floodplain management issues identified and addressed within the flood study were:

- \* Tourmaline Avenue culvert;
- \* Diamond Avenue road crossing;
- \* channel erosion along the creeks;
- \* low-set houses;
- \* maintenance of the outlet; and
- \* future activities on the flood-labile land.

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Gosford City Council has adopted the 1% AEP flood as the Designated flood for application of floodplain management plans in their administrative area.

The flood study for Green Point Creek indicated the February 1990 flood be accepted as a suitable model for the 1% AEP flood. Accordingly, it has been adopted as the model for the Designated flood for preparation and application of the Floodplain Management Plan.

The experience of the February 1990 flood along Green Point Creek indicated that the area inundated by that flood could be considered as a "floodway" in an hydraulic sense. Conversely, it is considered that very little of the area inundated by the February 1990 flood could be classed as "Flood Storage" or Flood Fringe".

Floodways are those areas where a significant volume of water flows during floods. They are often aligned with obvious naturally defined channels.

A concise description of the requirements for floodways is as follows:

- floodways are to be maintained in perpetuity for the passage of floodwaters;
- no landscape planting is to be undertaken where it would hinder the conveyance of water;
- no work that would impede the passage of floodwaters is permitted in a floodway;
- no buildings would be permitted to be constructed in the floodway;
- filling would be prohibited;
- fences likely to collect debris and/or impede floodwaters are not permitted;
- all land uses are to be flood compatible; and
- proposals to cross the floodway with major services would be permitted, subject to conditions.

Floodways would need to be crossed by major service installations of importance to the area. These should be permitted in the floodway provided they were investigated adequately and designed in a manner that did not significantly affect flood flow capacity or flood levels. They should also be designed so as to reduce damage potential to the services to the absolute minimum.

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The Floodplain Management Plan for Green Point Creek has been developed by consideration of the "Floodway" status of flood-labile land (as defined by the February 1990 flood as the Designated flood), the need to preserve floodways and the existing development in the area.

Whilst the area inundated by the February 1990 flood is considered as "floodway" in an hydraulic sense, it is appreciated that the existing dwellings do intrude into the floodway area and it is also reasonable to expect various landowners may wish to extend their dwellings in the future. The Floodplain Management Plan recognises such differences by creating separate areas identified as "floodway" and "flood-labile/developed".



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## 2. SPECIFIC COMPONENTS

The Floodplain Management Plan comprises of component areas which are outlined below. The plan is illustrated on Figure 2 with proposed works shown on Figure 3.

### A. *Tourmaline Avenue Floodway Area*

This area covers parts of the North Arm of Green Point Creek and downstream of Diamond Avenue.

Specific works/actions within this area are:-

#### A1. *Land Use Control*

The proposed land use controls to be applied are:

- the area inundated by the February 1990 flood be treated as "Floodway" with restrictive land use. The exception would be near Tourmaline Avenue where works are proposed to confine the 1990 flood equivalent within the channel;
- buildings adjacent to the floodway to have minimum floor levels set by the greater level value from either the February 1990 flood with adequate freeboard (0.5 metres) or at RL 4.55, the current minimum floor level set by Gosford Council to accommodate historically recorded storm surge and wave run-up on Pearl Beach;
- no further development including building activity and site improvement works such as filling and fence construction in floodway areas;
- general conditions for the floodway be applied in accordance with the general conditions in Section 1 above;
- re-vegetation of the floodplain areas within the floodway be promoted by a Council/community co-operative effort. Further research is required to identify appropriate plant variety to minimise the impact of re-vegetation on flooding; and
- no encroachment into the creek channels be permitted except by channel erosion control works to Council-approved and engineer-designed plans.

#### A2. *Channel Erosion Control*

Bank and bed protection works along parts of the North Arm and Green Point Creek are required to control channel erosion.

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Critical areas are identified as adjacent to or within:

- Lots 17 to 20, DP 246411 Tourmaline Avenue;
- Lots 457 and 458, DP 14592 Tourmaline Avenue; and

The works are intended to prevent:

- undermining of residences and improvements near Tourmaline Avenue culvert;
- erosion by flow exiting the Tourmaline Avenue culvert; and
- undercutting of Tourmaline Avenue and longer term undercutting of a downstream residence.

The estimated cost of these works is \$480 000. These works are envisaged as being financed by government and/or local owner funding.

Limited bed erosion control ("rock bars") is required as a temporary measure to prevent further bed erosion until full bank protection can be financed. The estimated cost of installation of "rock bars" is \$50 000. These works are envisaged as being financed by government and/or local owner funding.

Bank protection works will be required in other areas. These should be landowner funded.

### **A3. *Diamond Avenue Crossing***

Flood levels in the Diamond Avenue crossing are aggravated by construction and filling on the floodplain immediately downstream of Diamond Avenue.

It is proposed to:

- remove base slab from flood damaged Fire Station site;
- lower existing floodplain levels on No 1A Diamond Avenue by excavation after acquisition of a drainage easement; and
- replace an existing paling fence immediately downstream of No 1A Diamond Avenue with an open wire fence.

The estimated cost of these works is \$30 000.

The works will principally benefit No 1 and No 2 Diamond Avenue by providing freeboard to the February 1990 flood levels.

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Works are not proposed for protection of No 1A Diamond Avenue on the basis that the lowest floor level is set too low to practically achieve flood protection. Building use controls are proposed such that the lower floor level is only used for flood compatible uses and flood compatible decoration/furnishing is used at the lower floor level.

#### **A4. *Tourmaline Avenue***

The existing culvert at Tourmaline Avenue is under-sized.

It is proposed to replace the existing culvert with a larger twin cell box culvert incorporating a drop at the culvert inlet and an hydraulic energy dissipator within the culvert barrel.

The estimated cost of this work is \$445 000.

During the detail design process, it would be prudent to accurately cost a bridge and channel lining alternative to confirm the culvert option is the most cost-effective solution.

The works will reduce flood levels such that nine residences would be flood free in a February 1990 flood equivalent and an additional two residences will have freeboard above the 1990 flood equivalent compared to zero freeboard at present.

#### **B. *Crystal Avenue Floodway Area***

This area covers parts of the South Arm of Green Point Creek.

Specific actions within the area are:-

##### **B1. *Landuse Controls***

- the area inundated by the February 1990 flood be treated as "Floodway" with restrictive land use;
- no further development in the floodway areas in accordance with the general provisions in Section 1;
- retain the floodplain and creek channel in natural state;
- buildings adjacent to the floodway to have minimum floor levels set by the greater level value from either the February 1990 flood with adequate freeboard (0.5 metres) or RL 4.55 the current minimum floor level as set by Gosford City Council (Refer Section A1); and
- re-vegetation of the floodway be permitted if in accordance with provisions outlined in Section A1.

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**B2 Low-Set Houses**

Lot 574 (No 29) Crystal Avenue is low-set, being of slab-on-ground construction on the general floodplain level.

The appropriate option at this location is either voluntary acquisition or house raising. The final decision should be made after consultation with the owner and subject to issues such as cost and owners' expectations.

**B3. High-Set Houses**

The flood access to No 25 Crystal Avenue (Lot 576) is considered unsafe in a repeat of the February 1990 event.

It is proposed that re-development control be placed on the lot, after consultation with the owner, such that any new building will be located adjacent to high ground on Crystal Avenue.

**B4. Channel Erosion Control**

Bank and bed protection works along parts of the South Arm and Green Point Creek are required to control channel erosion as follows:

- no encroachment into the creek channels be permitted except by channel erosion control works to Council approved and engineer designed plans; and
- works to be financed by landowners.

**C. Tourmaline Avenue Culvert Area - Currently Flood-Liable**

This area is currently flood-labile in the Designated flood but will become flood-free after replacement of the Tourmaline Avenue culvert.

Specific works/action in the area are:-

**C1. Building Controls**

- buildings adjacent to the floodway to have minimum floor levels set by the February 1990 flood with adequate freeboard (0.5 metres); and
- relaxation of building controls after the replacement of Tourmaline Avenue culvert.

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**D. *Tourmaline Avenue Flood-Liable Developed Area***

This area covers parts of the North Arm of Green Point Creek with the following specific works:-

**D1. *Building Controls***

- buildings adjacent to the floodway to have minimum floor levels set by the February 1990 flood with adequate freeboard (0.5 metres);
- no building structures to be less than 300 millimetres above the 1990 flood level, with the exception of support piers. Support piers are to present a minimum obstruction to floodwaters;
- fences on the floodplain to be of flood compatible variety such that their construction does not impede flood flows or debris;
- access bridges and roadways to be set nominally at existing floodplain levels such that the creek channel is not constricted; and
- the maximum water level increases in the February 1990 flood equivalent caused by individual access bridges to be set at 0.1 metres.

**D2. *Channel Erosion Control***

Bank and bed protection works along parts of the North Arm and Green Point Creek are required to control channel erosion as follows:-

- no encroachment into the creek channels be permitted except by channel erosion control works to Council approved and engineer designed plans; and
- works to be financed by landowners.

**E. *Diamond - Tourmaline Avenue Flood-Liable Developed Area***

This area covers parts of the North Arm of Green Point Creek with the following specific works:-

**E1. *Building Controls***

- buildings adjacent to the flood-liable area to have minimum floor levels set by the greater level value from either the February 1990 flood with adequate freeboard (0.5 metres) or at RL 4.55 the current minimum floor level set by Gosford Council to accommodate historically recorded storm surge and wave run-up on Pearl Beach;

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- no building structures to be less than 300 millimetres above the 1990 flood level, with the exception of support piers. Support piers are to present a minimum obstruction to floodwaters; and
  - fences on the floodplain to be of flood compatible variety such that their construction does not impede flood flows or debris.

### ***E2. Channel Erosion Control***

Bank and bed protection along parts of the North Arm and Green Point Creek are required to control channel erosion as follows:-

- no encroachment into the creek channels be permitted except by channel erosion control works to Council approved and engineer designed plans; and
- works to be financed by landowners.

### ***F. Miscellaneous Activities Within Flood-Liable Areas***

The Floodplain Management Study, community responses to the public exhibition of the Draft Floodplain Management Plan and community consultation have indicated several activities should be undertaken in joint Council/community on-going actions as part of the Management Plan.

The activities envisaged are:

- development of a suitable landscaping plan for re-vegetation of the flood-liable areas;
- development of fencing and landscaping guidelines for the flood-liable areas; and
- development of maintenance guidelines for Green Point Creek to enhance its general amenity (including water quality).

Further research is required into suitable plant species having characteristics to ensure their success in the Pearl Beach soils and climate whilst having minimal impact on flooding when such events occur.

Each of the above items affects individual landowners differently and, hence, a consultative approach between Gosford Council (and its officers) community groups and individual landowners is an appropriate mechanism to achieve the objectives of re-vegetation of the creek; adoption of appropriate fencing guidelines and enhancement of the amenity of Green Point Creek.

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### 3. PRIORITY OF WORKS

The preliminary floodplain management plan outlined in the previous section covers a variety of works. The costs of these works is seen as being met by either a combination of government funding with some local landowner funding or the total cost being met by local landowners.

A priority of works is set out in Table 1 below based on the consultant's interpretation of the nature of continuing damage and the risks of future damage leading to an assessment of the urgency of completing various works.

**TABLE 1**

Priority of Works

PRIORITY	WORKS	COST	B/C	BASIS OF RANKING
1	Channel protection Lots 17 to 20, DP 246411.	\$310 000	N/A	Continued erosion threatens property improvements.
2	Channel protection Lots 457, 458, DP 14592.	\$170 000	N/A	Continued erosion threatens residences. Erosion not as severe as Priority 1 works
3	Voluntary acquisition Lot 574 (No 29) Crystal Av. (buy and and demolish building, re-sell land).	\$100 000 Depends on neg.	0.18	House set too low. Continued damage will occur for even small floods. Cost depends on negotiation.
4	Construct "rock bars" as limited protection.	\$ 50 000	N/A	Temporary works to reduce future cutting of the bed to lower levels and thereby inducing extra bank erosion.
5	Replace Tourmaline Culvert.	\$445 000	0.05	Culvert is undersized. Present works should prevent damage in all except major floods.
6	Acquire easement over lower floodplain No 1A Diamond Av.	\$ 30 000	0.47	Works to provide increased freeboard to Lots 477, 467 and 478 Diamond Av.

Notes: B/C: Benefit Cost Ratio  
N/A: Not Assessed

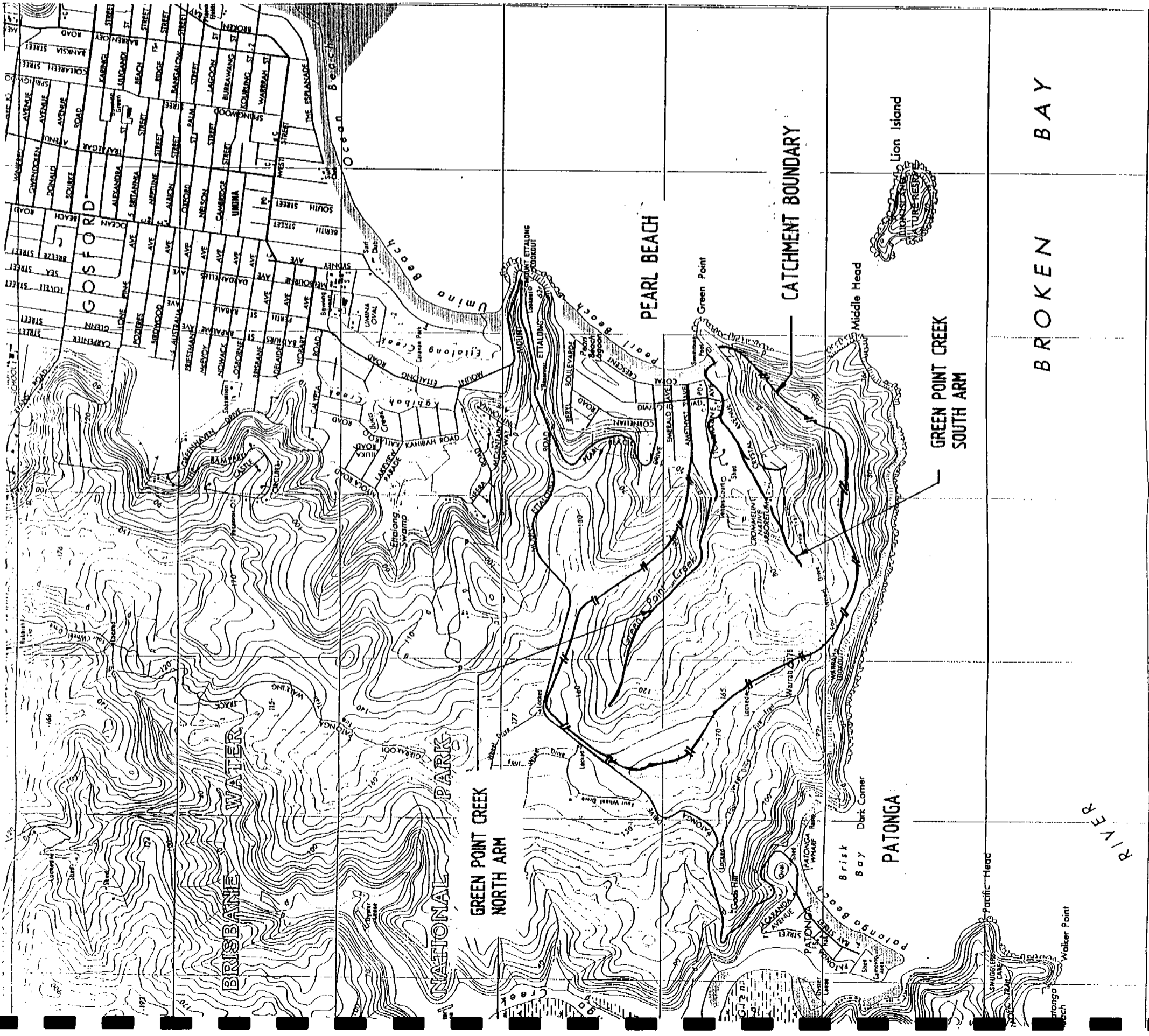


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REFERENCES

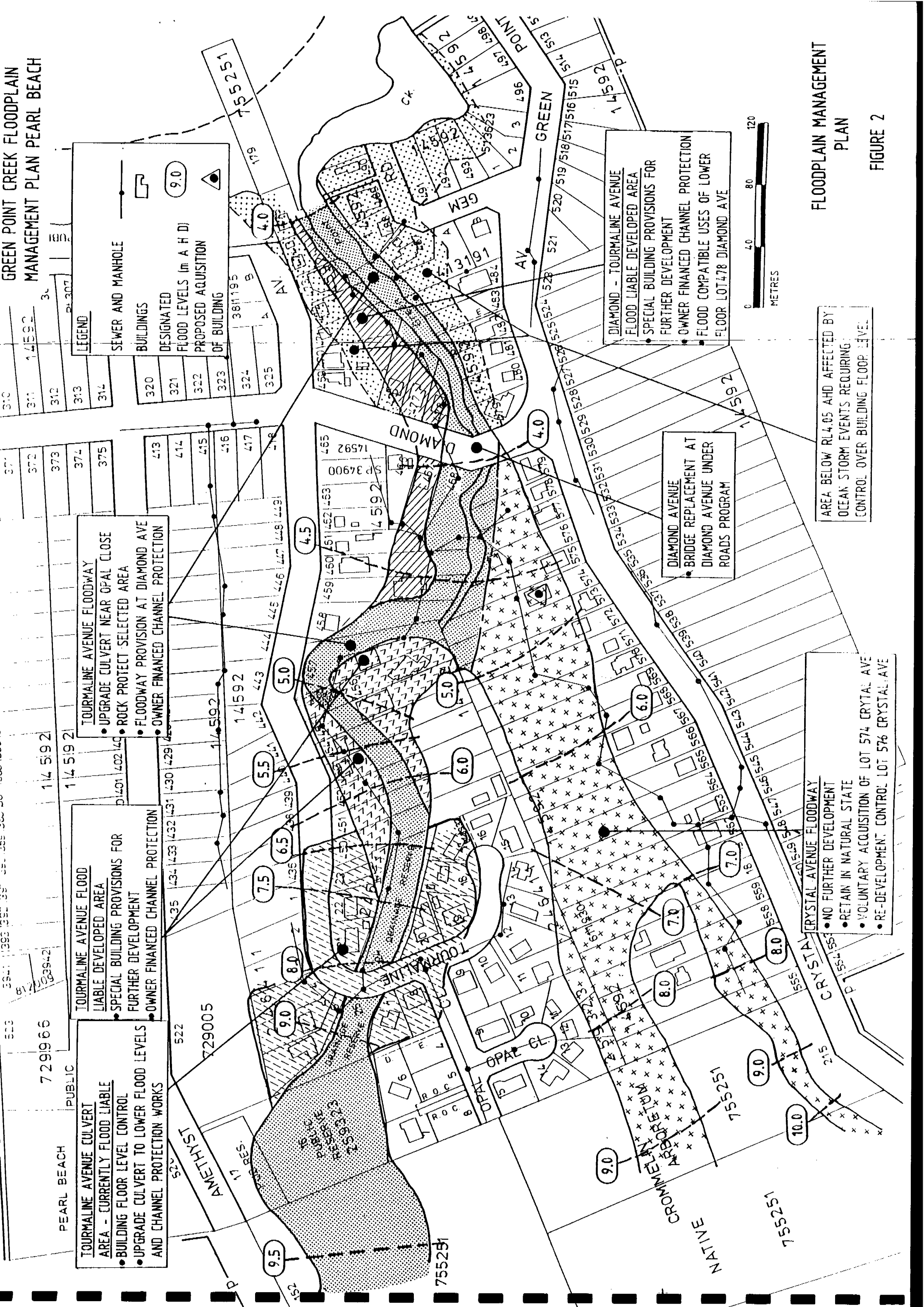
1. "Green Point Creek - Pearl Beach Floodplain Management Study", February 1992, prepared for Gosford City Council by Paterson Consultants Pty Limited.

GREEN POINT CREEK  
FLOODPLAIN MANAGEMENT PLAN  
PEARL BEACH



PLAN SOURCE: 1:25000 SERIES BROKEN BAY  
CENTRAL MAPPING AUTHORITY

**GREEN POINT CREEK FLOODPLAIN  
MANAGEMENT PLAN PEARL BEACH**



**LEGEND**

- SEWER AND MANHOLE
- BUILDINGS
- DESIGNATED FLOOD LEVELS (m A H D)
- PROPOSED ACQUISITION OF BUILDING

**TOURMALINE AVENUE FLOODWAY**

- UPGRADE CULVERT NEAR OPAL CLOSE
- ROCK PROTECT SELECTED AREA
- FLOODWAY PROVISION AT DIAMOND AVE
- OWNER FINANCED CHANNEL PROTECTION

**TOURMALINE AVENUE FLOOD LIABLE DEVELOPED AREA**

- SPECIAL BUILDING PROVISIONS FOR FURTHER DEVELOPMENT
- OWNER FINANCED CHANNEL PROTECTION

**TOURMALINE AVENUE CULVERT AREA - CURRENTLY FLOOD LIABLE**

- BUILDING FLOOR LEVEL CONTROL
- UPGRADE CULVERT TO LOWER FLOOD LEVELS AND CHANNEL PROTECTION WORKS

**DIAMOND AVENUE BRIDGE REPLACEMENT AT DIAMOND AVENUE UNDER ROADS PROGRAM**

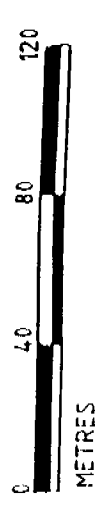
**DIAMOND - TOURMALINE AVENUE FLOOD LIABLE DEVELOPED AREA**

- SPECIAL BUILDING PROVISIONS FOR FURTHER DEVELOPMENT
- OWNER FINANCED CHANNEL PROTECTION
- FLOOD COMPATIBLE USES OF LOWER FLOOR LOT 478 DIAMOND AVE

**CRYSTAL AVENUE FLOODWAY**

- NO FURTHER DEVELOPMENT
- RETAIN IN NATURAL STATE
- VOLUNTARY ACQUISITION OF LOT 574 CRYSTAL AVE
- RE-DEVELOPMENT CONTROL LOT 576 CRYSTAL AVE

**AREA BELOW RL4.05 AHD AFFECTED BY OCEAN STORM EVENTS REQUIRING CONTROL OVER BUILDING FLOOR LEVEL**

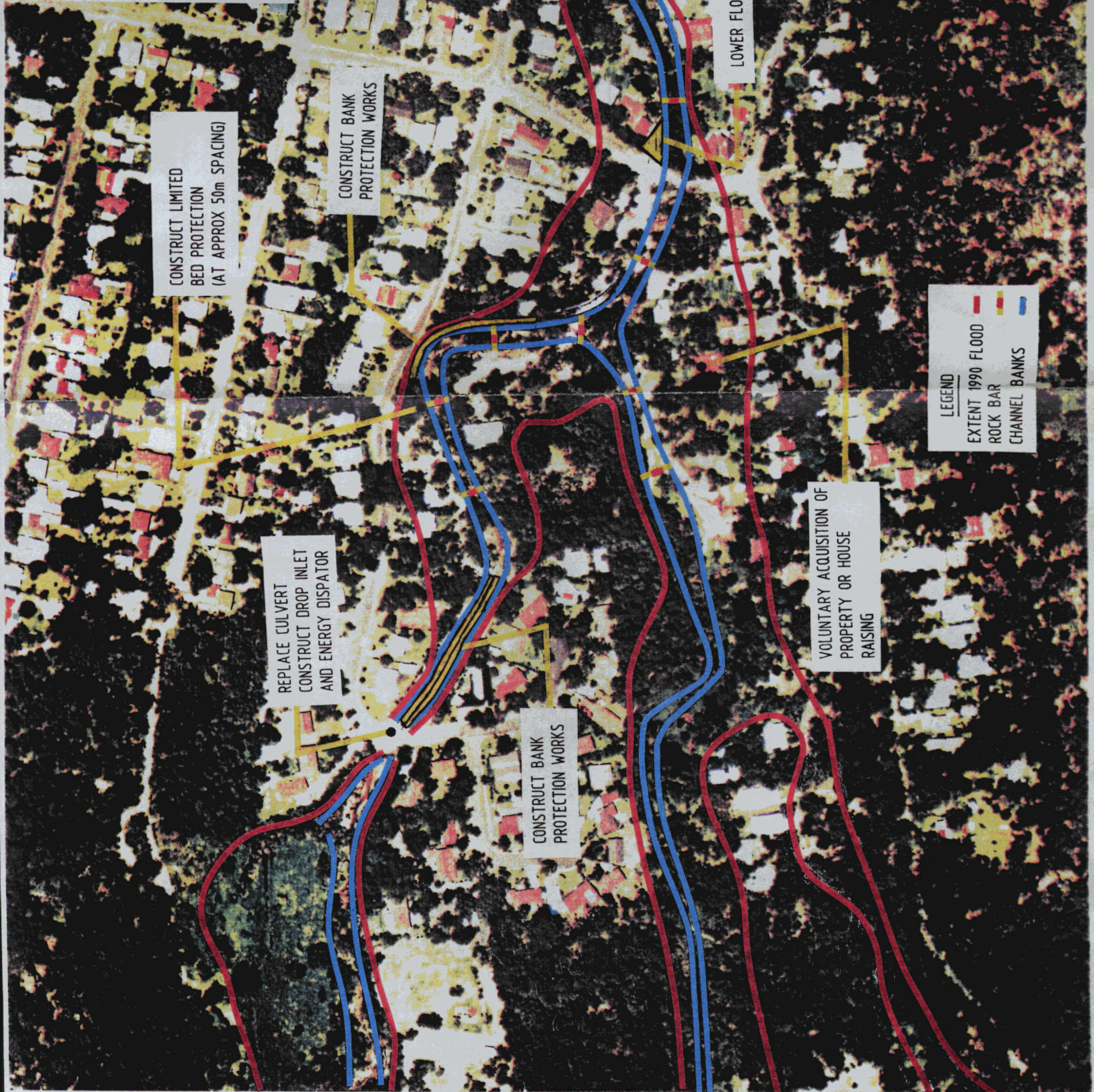


**FLOODPLAIN MANAGEMENT PLAN  
FIGURE 2**

**GREEN POINT CREEK FLOODPLAIN MANAGEMENT PLAN  
PEARL BEACH**

**PROJECTED WORKS COSTS**

TOURMALINE CULVERT WORKS	\$ 445,000
BANK PROTECTION WORKS	\$ 480,000
DIAMOND AVENUE FLOODPLAIN WORK	\$ 30,000
PROPERTY ACQUISITION	- DEPENDENT ON NEGOTIATION
BED PROTECTION WORKS	\$ 50,000



**LEGEND**  
 EXTENT 1990 FLOOD  
 ROCK BAR  
 CHANNEL BANKS

**PRELIMINARY FLOODPLAIN  
MANAGEMENT PLAN - WORKS  
FIGURE 3**

**End of Report**