Moorebank Precinct West Concept Proposal

On page 45 reads the proposed modification does not substantially change the nature of the development or use of the site and it supports the broader project benefits and their contribution to the public interest, including employment and shifting freight to rail, thereby reducing the impact of heavy vehicles on the road network.

The main reasons why people are objecting to an Intermodal freight terminal at Moorebank are for the following reasons:
The exit ramp off Moorebank Avenue onto the M5. Article from the NRMA Magazine May/June 2019 issue and reads as following: The M5 Motorway at Moorebank has been voted the single worst congestion hotspot in NSW, after the NRMA conducted the largest transport survey in the State's history.

- The site is unsuitable for this type of development as it has only one road that is Moorebank Avenue (It is like it is on an island.)
- The proposal would adversely impact on the local and surrounding community.
- The technical reports provided with the application are inadequate and do not address the issues, they acknowledge that issues exist and that's as far as they go.
- The MPW and MPE application should be considered together to address increasing impacts and there should be one master plan for the entire Intermodal project. If they had one Master Plan given all the information we know now the project would never have been approved from the start.
- The proposal is not substantially the same as the Concept Approval and section 96(2) is not the correct planning process to assess the proposal.
- The increase in truck movement would have adverse community impact on the whole of the Liverpool Community as the existing road system is inadequate.
- We have had our State and Federal members object to this project, they have spoken in Parliament about their objections, but it still proceeds on.
- The Liverpool City Council is also objecting to the proposal.

The Legislative Council committee has called for the government to investigate freight rail options between the Port of Newcastle, Port Botany, and Port Kembla.
The committee has also recommended that the government review its Port Policy, including the potential for a container terminal in Newcastle, once the

Federal Court proceedings have concluded, or at such time as the House determines.
In 2014, the Port of Newcastle was leased to a private sector operator for a period of 98 years. Recently, that operator referred to as the Port of Newcastle has sought support for plans to develop a container terminal in Newcastle, which is argued, would enable economic growth in the Newcastle and Hunter region and alleviate congestion in Sydney, therefore reducing the need for public work infrastructure in Sydney. The Port of Newcastle has claimed that it is currently uneconomical for it to pursue a container terminal development due to provisions contained within the Ports Commitment Deeds.
I will not read any more of the document out as have limited time.
I will give you my submission that I sent to the legislative Council committee.

Approximately 1,600,000 cubic metres of fill to raise a site generally by 2 to 3 metres. 46,130 Cubic metres was proposed. The Department states Page 7 Executive Summary the modifications does not substantially change the nature of the development.
The location of imported fill should not indirectly impact on biodiversity values of the conservation area. This statement is incorrect as some of the fill will be washed into the conservation area, how much will depend on the rain, how long it lasts and its intensity.
Why does the site have to be raised by 2 or 3 metres, and up to 3.6 metres in some locations? Nothing in the report tells me why the levels have to be raised.
Nothing in the report tells me that the Floodplain will be protected or filled. I presume the whole of the Floodplain will be filled.
The two detention basins have been cut into the conservation area Page 33.
What is stated in the document is 1% Annual exceedance probability

All flood levels are taken from the Weir.
Have we forgotten about the flooding on the Georges River and the most important part of the River is its floodplain area. (Riparian zone).

The Georges River is one of the most populated urban catchments in Australia, with over 1 million people living in the catchment.

The Georges River runs adjacent to the CBD of Liverpool and is over 100 kilometres long, from its headway near Appin, the River flows north towards Liverpool, through Chipping Norton Lake scheme, and then through

Bankstown to Botany Bay. It has a number of major branches, Cabramatta Creek, Prospect Creek, Harris and Williams Creeks.

The Georges River has a catchment area of 890 square kilometres.

Flood History: The Georges River has a long history of flooding and most of the flood data has been recorded at the Liverpool weir.

The weir was constructed in 1836 as a causeway crossing of the River and a source of fresh water for Liverpool.

To reach a one in 100 year flood the water rises 9 metres above the weir.
This event occurred 4 times from 1873 -1900. That's 4 times in 27 years.

From 1900 we have reached 6 metres above the weir 15 times.

The largest flood ever recorded at the weir was in 1873, 10.3 metres above the weir. The water came to the steps of St Luke's Church
The largest flood in the past 100years was in 1956 when the flood water was 8.2 metres above the weir.

The last significant floods occurred in 1986 and 1988 when the flood water was 7.2 and 7.3 metres above the weir.

Chipping Norton Lakes

The Lakes Scheme was part of an overall rehabilitation program following extensive sand extraction from the Georges River at Chipping Norton.
The scheme, which was developed in 1977, resulted in a series of 150 hectares of Lakes connected within the River.
Although rehabilitation of the area was a major objective of the scheme, it still proved a positive flood mitigation benefit to the area.

Like most river systems in New South Wales, the Georges River has more than its share of flooding problems.
At times it has been the subject of perhaps more flooding investigations than any other area in Australia.

It also has a wonderful showcase of different types of floodplain management measures that have been undertaken by different Councils in an attempt to reduce flooding problems.

The Georges River around the Liverpool Area:

There are times when flooding issues appear to have been given a low priority, or possibly overlooked.

More recently, the Federal Government owned land and some 2 million tons of fill has been proposed within the floodplain area, apparently without any assessment of its impact on flooding. That is equivalent to 2 billion litres of additional water to be displaced in the Georges River to raise the flood levels.

The Floodplain Area or (Riparian Zone)
This is the area when the water goes over the banks of the River or Creek.
This water is then held with the Floodplain Area to stop flooding of residential homes.
When the water breaks out from the Floodplain Area it then becomes a major problem and flooding occurs.
One ton of fill displaces 1000 litres of water.

Summary
I am reminding everyone in this room the Flooding problems existing and will always exist on the Georges River and its creeks.
The most important thing I can say now is that our floodplain areas are our protection from flooding and they should never be filled.


1986 Flood on the Georges River

The Liverpool City Council has a policy: The loss in flood storage in a 100 year flood must be compensated; excavation of a similar volume would be required to ensure that there is no impact on flood levels and for compliance with requirements in Council's DCP.

The ability to subdivide the land as part of a future development application. This is a clear indicator that the project will be a white elephant and they want to start selling the warehouses as individual developments.

The increase in building height above the Liverpool City Council DCP because they lifted the ground height.

Transfer the containers by heavy vehicles between the MPE IMT facility and MPW warehouse. How will this affect the general traffic, how many containers per day and for how many hours.

Robert Storey

18th June 2019

Submission: into the impact of Port of Newcastle Sale arrangements on Public Works Expenditure in New South Wales.

Thank you for giving me the opportunity to make some comments about the Port of Newcastle and the Intermodal at Moorebank.
I am the Environment Officer for the Liverpool Action Group who is a small group of residents that are worried about issues in the Liverpool City Council Area.
I am concerned about the current limitations on container ports such as the Port of Newcastle and Port Kembla at Wollongong as this arrangement was made to support the Intermodal at Moorebank.
The Intermodal at Moorebank was never feasible and could not meet the standards required for Development adjacent to residential areas and for this reason it was categorised as a State Significance Development.
How any rational person could put a polluting development on the banks of the Georges River 3 km away from the City of Liverpool leaves me dumbfounded.
The traffic issues (One road that is Moorebank Avenue) the M5 and the Hume Highway are at peak capacity now and these issues can never be resolved.
This clearly demonstrates that the people who make these decisions are not forward thinking and have no value for the people that live in the area of Liverpool.
I still have faith in the human race, even though much of its behaviour throughout history has been pretty stupid and not calculated to aid the survival of our species.
I hope that common sense will prevail and the issues that are not in the interest of the Community will be addressed and an outcome that meets everyone's requirements will be achieved.

Thank you for reading my comments.
Robert Storey

[redacted]

06/01/2019

Chair's foreword

This inquiry was established to consider the impact of the Port of Newcastle sale arrangements on the state's public works expenditure. The inquiry also considered the Port Commitment Deeds (PCDs) which formed part of the Port of Newcastle transaction and the Port Botany and Port Kembla transaction, and the extent to which the PCDs limit container movements.

This inquiry has highlighted the complexities of the ports transactions, and has underlined the importance of container freight to the state's economy. A key issue canvassed throughout the inquiry was the proposal to develop a container terminal at the Port of Newcastle. Much of the evidence received by the inquiry was contradictory in this regard. The Port of Newcastle argues that while the proposed development will increase economic development in the area and reduce transport pressures in Sydney, the proposal is currently uneconomic due to provisions contained within the PCDs. On the other hand, the NSW Government argued that the leasing arrangements are based on long-term ports policy, which supports Port Botany as the state's primary container port.

Shortly after this inquiry began the Australian Competition and Consumer Commission (ACCC) commenced proceedings in the Federal Court against the operators of Port Botany and Port Kembla for making agreements with the state that the ACCC alleges had an anti-competitive purpose and effect. With this in mind, and within the context of the timing of the imminent election, the committee has recommended that the Legislative Council establish a future inquiry to examine the ports transactions, the PCDs and their broader impact. The committee has also recommended that the government review its ports policy, including the potential for a container terminal in Newcastle, once the Federal Court proceedings have concluded, or at such time as the House determines.

The committee did however make a number of findings. We found that Newcastle container limitations have not significantly impacted public expenditure on Sydney's transport infrastructure projects, which are driven by a number of factors including Sydney's growing population. We also found that the PCDs were not disclosed to the public or to the Parliament.

It was valuable to hear from local government and business representatives from Newcastle and the Hunter who support the development of a Newcastle container terminal as it would increase regional economic growth. We have encouraged the government to analyse the potential economic impact of a Newcastle container terminal. We have also called for the government to investigate freight rail options between the Port of Newcastle, Port Botany and Port Kembla.

Finally, I thank my committee colleagues for their efforts during this inquiry, the Public Works Committee's second in this Parliament. On behalf of all committee members, I also wish to thank all those who provided written submissions and appeared at the public hearing, and the committee secretariat and Hansard for their professional assistance throughout.

The Hon Robert Brown MLC
Chair

Chapter 1 Port of Newcastle leasing arrangements

This chapter sets out introductory information on the leasing arrangements for three New South Wales based ports. It discusses the ports leasing arrangements, including provisions contained within the Port Commitment Deeds (PCDs), as well as recent calls for a container terminal to be developed at the Port of Newcastle.

Introduction

1.1 In 2014, the Port of Newcastle was leased to a private sector operator for a period of 98 years. Recently, that operator (referred to as the Port of Newcastle throughout this report) has sought support for plans to develop a container terminal in Newcastle, which it argues would enable economic growth in the Newcastle and Hunter region and alleviate congestion in Sydney, therefore reducing the need for public works infrastructure in Sydney.

1.2 The Port of Newcastle has claimed that it is currently uneconomic for it to pursue a container terminal development due to provisions contained within the Port Commitment Deeds. This chapter discusses the arrangements that form part of the Port of Newcastle and the Port of Botany/Kembla transactions, particularly the PCDs which contain provisions regarding a container freight threshold and related financial obligations.

Ports policy in New South Wales

1.3 Freight is a substantial driver for the state's economy. The NSW Government states that freight activities contribute $66 billion to the state's economy each year and 200,000 people are directly employed in freight transport.[2] Container freight is a significant and growing part of the national and state freight industry, with the number of containers (by twenty-foot equivalent unit or TEU) handled by Australia growing by 11.6 per cent to 8 million in 2017-18.[3] The Australian Competition and Consumer Commission (ACCC) has indicated that this is due to increases in domestic demand for imports fuelled by population and economic growth, as well as growth in refrigerated and empty container exports.[4]

1.4 There are several large commercial ports in New South Wales. (See figure 1 below) Port Botany is the state's main container port, and plays a major role in the state's economy. It is also the state's primary liquid and gas port. The government has forecast container cargo handled by Port Botany to increase by 77 per cent from 14.4 million tonnes in 2016 to 25.5 million tonnes in 2036.[5] Currently, Port Botany has a capacity of more than 7.2 million TEU but currently only handles 2.6 million TEU between three stevedoring terminals.[6]

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2 NSW Government, *NSW Freight and Ports Plan 2018-2022* (2018), p 18.

3 AlphaBeta, *Global Gateway for NSW: the economic impact of a container terminal at the Port of Newcastle*, (2018), p 2; Australian Competition and Consumer Commission (ACCC), *Container stevedoring monitoring report 2017–18*, (2018), p 15.

4 ACCC, *Container stevedoring monitoring report 2017–18*, (2018), p 15.

5 NSW Government, *NSW Freight and Ports Plan 2018-2022* (2018), p 28.

6 Submission 21, NSW Ports, p 3.

Recommendations

Recommendation 1 **17**

That the Legislative Council consider establishing an inquiry into the ports transactions, and specifically container limitations and associated financial obligations contained within the Port Commitment Deeds, at the conclusion of the Federal Court proceedings involving the Australian Competition and Consumer Commission and NSW Ports or at such time as the House determines.

Recommendation 2 **26**

That the NSW Government conduct a detailed investigation of freight rail options between Ports Botany, Newcastle and Kembla, including options for line duplication and dedicated freight-line construction, to ensure strategic future corridors are preserved, to optimise rail modal share of freight transport, to better align capacity to meet future demand and to improve the rail service reliability.

Recommendation 3 **35**

That the NSW Government conduct a review of the state's ports policy, including the potential for a container terminal at the Port of Newcastle, at the conclusion of the Federal Court proceedings involving NSW Ports, or at such time as the House determines.

lease of the Port of Newcastle, with gross proceeds of $1.75 billion from the transaction. The then Treasurer, the Hon Andrew Constance MP, indicated that Newcastle would receive $340 million of the gross proceeds, with the remaining proceeds of $1.2 billion to be invested in the Restart NSW infrastructure fund.[24]

The Port Commitment Deeds

1.19 Contractual agreements between the port lessees and the government are set out in Port Commitment Deeds (PCDs). NSW Ports, and the Port of Newcastle agreed to and signed the PCDs at the time of each transaction.[25] The Treasurer signed the PCDs on behalf of the State of New South Wales.[26]

1.20 It should be noted that the PCDs for Port Botany and Port Kembla were entered into as part of the lease transaction in 2013. That deed was entered into between the State Government and NSW Ports. On the other hand, the PCD between the state government and Port of Newcastle was entered into in 2014.[27] In evidence before the inquiry, Ms Marika Calfas, Chief Executive Officer, NSW Ports, stated:

> The port commitment deeds mirror the well-planned New South Wales Government strategy for port development. The Port of Newcastle port commitment deed is an arrangement between the Port of Newcastle and the New South Wales Government willingly agreed to by the Port of Newcastle shareholders. NSW Ports is not a party to that deed.[28]

1.21 The Port Botany and Port Kembla PCDs contain provisions that require the government to provide a payment to the Port Botany/Port Kembla Port Manager should container volumes through the Port of Newcastle exceed a certain threshold. This support is payable if each of the following conditions are met:

- Container volumes through Newcastle exceed a threshold level of 30,000 TEUs (twenty-foot equivalent units) as at June 2013 escalated at the higher of 6% pa or the growth rate of container throughput at Port Botany ('excess'). The threshold has to be exceeded for two years.[29]
- The Port Manager demonstrates to the reasonable satisfaction of the State that Port Botany or Port Kembla is not at full capacity.
- The Port Manager demonstrates to the reasonable satisfaction of the State that container throughput is less than it would have been if Newcastle did not exceed the threshold and that there is a reasonable, material, causal connection between the 'excess' at Newcastle and the reduction in trade at Botany/Kembla.[30]

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24 Media Release, Hon Andrew Constance MP, *Port of Newcastle transaction finalised*, 30 May 2014, p 1.

25 Submission 16, NSW Government, p 16.

26 Answers to questions on notice, NSW Treasury, 11 February 2019, p 2.

27 Submission 22, ACCC, pp 9-11.

28 Evidence, Ms Marika Calfas, Chief Executive Officer, NSW Ports, 31 January 2019, p 23.

29 Based on 30,000 TEU and a compounding increase of 6 per cent p.a., that is equivalent to 42,555 TEU in 2020, 76,210 TEU in 2030, 136,481 TEU in 2040, and 244,417 TEU in 2050.

30 Submission 16, NSW Government, p 16.

1.22 The submission from the Australian Competition and Consumer Commission (ACCC) noted that the above provisions have a term of 50 years.[31]

1.23 Under the Newcastle PCD, the financial obligations of the state were contractually passed through to the Newcastle Port lessee.[32] The government stated that 'this arrangement was known to the bidders and the ACCC ahead of the transaction'.[33] Mr Rodd Staples, Secretary, Transport for NSW, stated in relation to the Port of Newcastle bidding process:

> It was a long-term lease following a competitive process during which the port commitment deed obligations were disclosed to all bidders. The bidders had the opportunity to seek their own independent legal and expert advice during the process. It is a commercial agreement entered into by the parties of their own volition.[34]

1.24 The government advised that as of January 2019, the Port of Newcastle had 'not paid any PCD support related amounts to the State'.[35] Container volumes at the Port of Newcastle are currently about 10,000 TEU per annum.[36]

Calls for a container terminal at the Port of Newcastle

1.25 Port of Newcastle has led recent calls for the development of a container terminal at the Newcastle port:

> ... we submit that the NSW Government lift its limitations on container port operations in New South Wales, and Port of Newcastle be permitted to build a 1.7-million TEU container terminal in its port precinct.[37]

1.26 Port of Newcastle has indicated that the PCDs and the requirement for the support payment to Port Botany should the container threshold be exceeded are the main impediments to the Port of Newcastle developing a container terminal. Mr Craig Carmody, Chief Executive Officer, Port of Newcastle, argued that the PCD financial obligations mean that it is uneconomic for the Port to develop a container terminal:

> None of the investors in this are prepared to give me a single dollar until that port commitment deed [PCD] is out of the way. Economically, it just does not work.[38]

1.27 In supplementary questions, Mr Carmody was asked to identify the investors behind the proposed development of a container port at Newcastle. In answer to this question, Mr Carmody indicated that 'discussions with investors are commercial-in-confidence'.[39]

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31 Submission 22, ACCC, p 8.

32 Submission 16, NSW Government, p 16.

33 Submission 16, NSW Government, p 15.

34 Evidence, Mr Rodd Staples, Secretary, Transport for NSW, 31 January 2019, p 11.

35 Submission 16, NSW Government, p 16.

36 Submission 16, NSW Government, pp 16, 20.

37 Submission 14, Port of Newcastle, p 3.

38 Evidence, Mr Craig Carmody, Chief Executive Officer, Port of Newcastle, 31 January 2019, p 7.

39 Answers to supplementary questions, Mr Craig Carmody, Chief Executive Officer, Port of Newcastle, 12 February 2019, p 9.

NEWS

THE BIG STORIES THAT IMPACT MEMBERS

Huge response to Rate Your Road survey

More than 23,000 people weigh in on the most dangerous and congested roads in NSW

THE M5 MOTORWAY at Moorebank has been voted the single worst congestion hotspot in NSW, after the NRMA conducted the largest transport survey in the state's history. A total of 23,400 people were asked to rate roads on a scale of 'very poor' to 'excellent' (based on a score out of 100) for congestion, condition and safety.

The afternoon congestion between Moorebank and Liverpool on the M5 Motorway saw it receive 510 votes, edging out Epping Road at Ryde, which had 474 votes for its congestion.

Taking a broader view, the Pacific Highway received 1092 votes for various points along its length, making it the most complained about road in the state. Its combined score was just 50 out of 100. While the Barton Highway didn't receive as many votes (372), it scored just 38 out of 100 – the lowest among the top 10 major roads and highways. It was also the only road to make it into the top 10 hotspots for safety concerns – the other nine were complaints about congestion.

In general, respondents outside the Sydney metropolitan area were worried about the safety of roads. The New England Highway at Uralla and the Newell Highway at Moree, in the state's north, were both nominated for a lack of safety, as were Inglewood Road at Gumly Gumly and the Sturt Highway at San Isadore in the Wagga Wagga region.

"More than half of NRMA Members live in regional and rural communities, so it's important we stand up for the interests of all our Members," says NRMA Director for New England/North West region, Fiona Simson.

"The fact that so many people completed this survey shows transport and road issues are at the forefront of the state's concerns, particularly those in regional communities," Ms Simson adds.

"Safety and road conditions featured prominently when locals had their say, and this isn't surprising – almost 80 per cent of fatalities on our roads happen in regional areas. For the most part, these are locals who drive these roads day in day out."

NRMA spokesman Peter Khoury says the data collected from this survey will be critical as the NRMA works to improve the transport network. "These survey results are telling. In Sydney, some of the most congested roads will soon be transformed with the completion of WestConnex and NorthConnex. We expect to see very different results for Pennant Hills Road, Parramatta Road, the M5 and the Pacific Highway once these are completed."

He says that the message from this survey to policymakers in all levels of government is simple – as long as our cities and towns continue to grow, so too must the commitment to visionary policies around roads and public transport.

"Delivering the roads and public transport services of the future – both on land and through our famous Sydney Harbour – is critical to NSW reaching its business and tourism potential. Perhaps most importantly of all, it's how we can ensure our citizens get home to their families safely and quickly every night," Mr Khoury says.

Credit: Simon Alekna

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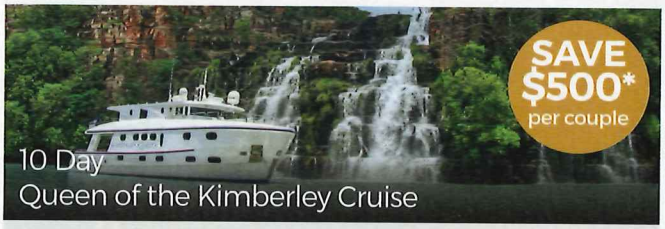

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DEPARTS > 3 AUG 2020

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Flights included!

7 Day Breakaway To Brilliant Brisbane

- Luxury 'Gold Class' coach ex Brisbane
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- Tamborine Rainforest Skywalk
- Gallery Walk
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11 Day Victoria's High Country Haven & Snowys In The Spring

- One way economy class flights ex Sydney to Melbourne
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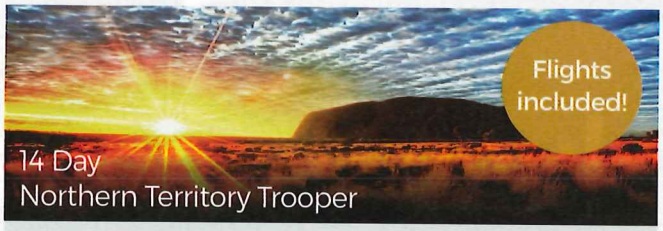
- Discover Wallace's Hut, Red Stag Deer Farm and the Man from Snowy River Museum
- 2 nights Albury, Jindabyne, Bowral & Newcastle
- Overnight Tumbarumba & Coffs Harbour
- Visit Canberra & Port Macquarie
- 30 meals

DEPARTS > 9 NOV 2019

Per Person Twin Share **$4150**



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14 Day Northern Territory Trooper

- 3 nights 5 star at Ayers Rock with wine & nibbles at an Uluru sunset, Field of Light at sunrise, camel trek and 25-minute helicopter flight of Uluru & Kata Tjuta area
- Sounds of Silence specialty dinner
- Overnight at Kings Canyon Resort
- 3 nights Alice Springs
- Visit West MacDonell Ranges, Standley Chasm, Ormiston Gorge, Simpsons Gap & relax at Mataranka Thermal Springs
- 2 nights Kakadu including a 30-minute scenic flight
- 2 nights 5 star Darwin
- Return flights from Sydney
- 37 meals

DEPARTS > 7 JUNE 2019

Per Person Twin Share **$7990**

Flights included!

4 Day King Island Interlude

- 3 nights King Island including town tour of Currie
- Shag Lagoon, Quarantine Bay, Whistler Point, Yellow Rock River and Shannon wreck
- Property tour & paddock to plate lunch with Tom and Anna Perry
- Disappointment Bay
- Cape Wickham Lighthouse
- King Island Dairy
- Penguins at Grassy Harbour
- King Island Historical Society Museum
- Return flights from Sydney
- 8 meals including finale dinner

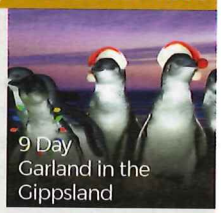
DEPARTS > 21 OCTOBER 2019

Per Person Twin Share **$2450**

Christmas tours available with daily excursions & all meals

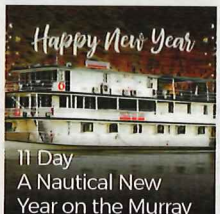
11 Day New Zealand Nutcracker

5 Day Fraser Island Festive Flair

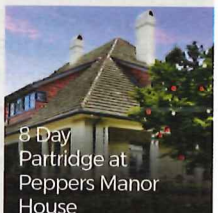


9 Day Garland in the Gippsland

11 Day Tinsel in Tassie



11 Day A Nautical New Year on the Murray



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2001 FLOODPLAIN MANAGEMENT AUTHORITIES CONFERENCE
WENTWORTH SHIRE COUNCIL

HAVE WE FORGOTTEN ABOUT FLOODING ON THE GEORGES RIVER?

John Maddocks,
Senior Engineer, Bewsher Consulting

ABSTRACT

Flooding on the Georges River was once the subject of intense scrutiny. Much money was invested on flood mitigation works that partially address the flood problems. Is there now a growing risk that the remaining flood problems will be forgotten?

The Georges River is one of the most populated urban catchments in Australia, with over 1 million people living in the catchment. Floods that occurred in 1986 and 1988 heightened community concerns regarding flooding. However, as the time since the last significant flood increases, the community's awareness of the flood risks is diminishing. The floods in the 1980's were also relatively small events. Floods that occurred in the late 1800's were much more severe, in some places one building storey above the 1986 or 1988 flood levels. Will the community and authorities be prepared when the next large flood occurs?

Flooding was extensively studied in the 1970's and 1980's. This culminated in the construction of a physical model that provided design flood levels between East Hills and Liverpool. The model was kept for several years, but was demolished due to storage limitations at the laboratory where it had been constructed. For many years there was no overall model available to review design flood profiles or to test development options. A numerical model of the Georges River was recently established by Bewsher Consulting to address these issues.

This paper highlights a number of issues for the Georges River, including:

- Community awareness and education of flooding;
- An overview of flood mitigation works undertaken within the catchment;
- The impact and planning considerations for the probable maximum flood, which can be up to 5m higher than the 100 year flood; and
- The challenges ahead for those concerned with management of the floodplain and catchment.

The potential damage bill from major flooding on the Georges River is enormous (over $300M in a 100 year flood) and ranks as one of the most severely flood prone valleys in the State. Concerted action by all levels of government are necessary to ensure that the Georges River receives the attention and funding necessary to minimise its very significant flood risks.

1. INTRODUCTION

Like most river systems in New South Wales, the Georges River has more than its share of flooding problems. At times it has been the subject of perhaps more flooding investigations than any other area in Australia. It is also a wonderful showcase of different types of floodplain management measures that have been undertaken by different Councils in an attempt to reduce flooding problems.

So who could possibly forget about flooding on the Georges River?

The Community ? The last significant floods occurred in 1986 and 1988. As time goes by memories are starting to fade. But these were only small floods. No one remembers the big flood that occurred in 1873, which was more than 3m higher than the 1986 or 1988 floods (at Liverpool weir).

Local Government ? There are examples of development in the catchment that may not be considered appropriate under present day practice. There are times when flooding issues appear to have been given a low priority, or possibly overlooked. The significance of the probable maximum flood, which can be up to 5m higher than the 100 year flood, may also have been overlooked.

The Commonwealth Government ? The Commonwealth Government became partners with the State and Local Government in implementing major flood mitigation projects along the Georges River. However, Commonwealth funding on the Georges River was removed several years ago, despite some projects being only partially completed. More recently, filling of federally owned land has been carried out within the floodplain, apparently without an assessment of its impact on flooding.

This paper aims to act as a reminder to the flooding problems experienced on the Georges River and to highlight some of the challenges ahead for those responsible for its management.

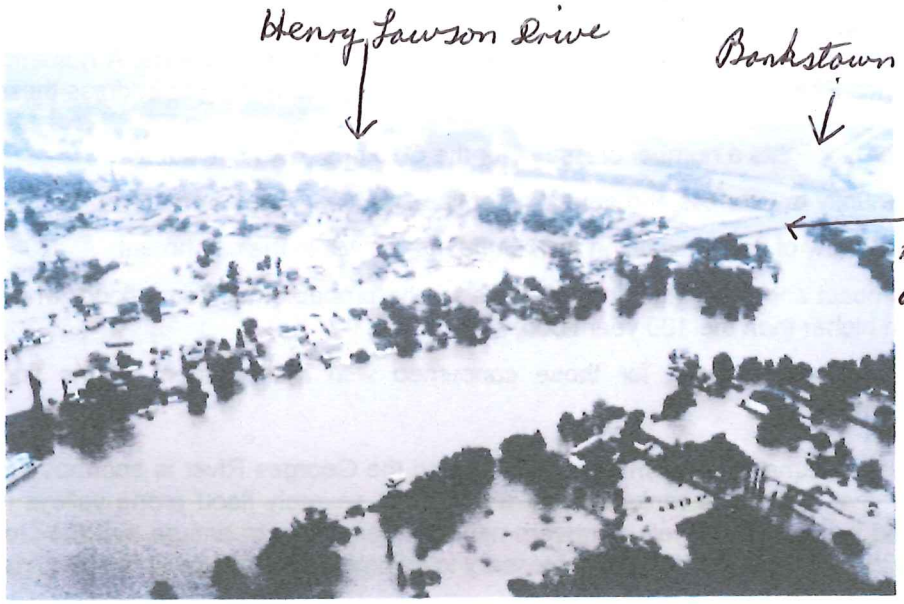


Photo 1
1986 Flood on the Georges River

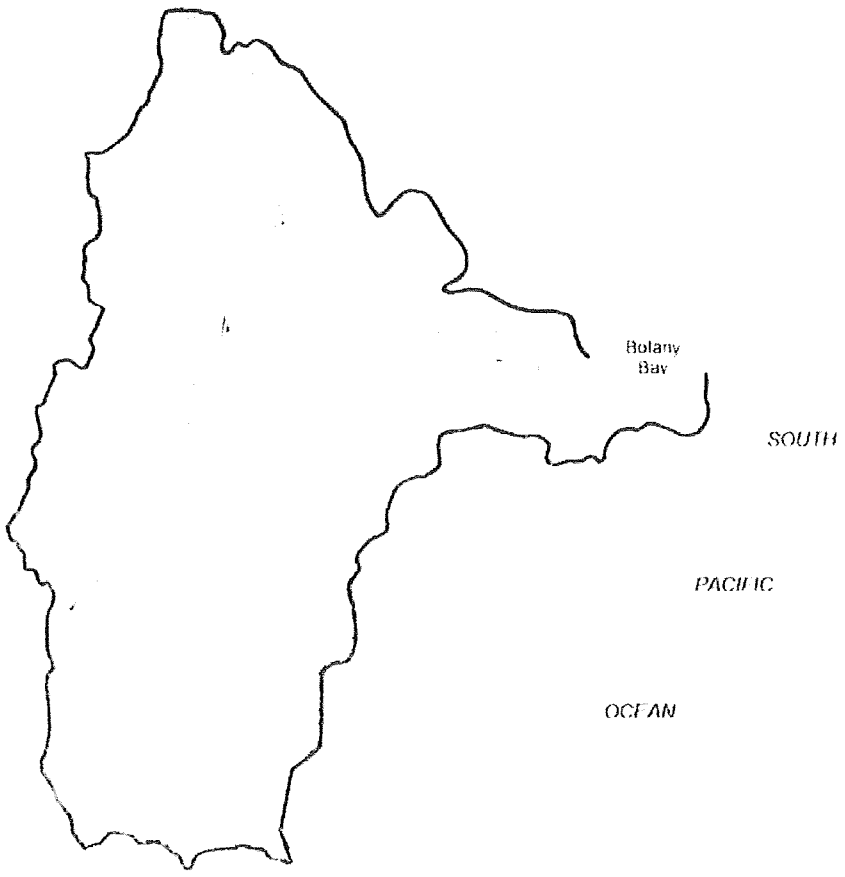
2. THE GEORGES RIVER CATCHMENT

The Georges River is located in and to the south-west of Sydney, as shown on Figure 1. The river itself is about 100km long. From its headwaters near Appin, the river flows north towards Liverpool, through the Chipping Norton Lakes Scheme, and then east through Bankstown to Botany Bay.

The river has a number of major tributaries, including:

- Bunburry Curran Creek;
- Cabramatta Creek;
- Prospect Creek;
- Harris and Williams Creeks;
- Salt Pan Creek; and
- Woronora River.

The Georges River has a catchment area of 890km^2. With a population of over 1 million, it is one of the most populated catchments in Australia. Almost 1/3 of Sydney's population is located within the catchment. The catchment also contains significant areas identified for future urban development under the Sydney Region Urban Development Program.



Locality Sketch
Figure 1

The administrative framework for managing the river, floodplain and catchment is complex. There are 12 different government authorities that share the catchment. Each Council has their own planning controls to manage the risk of flooding and to safeguard the environmental qualities of the river. There are a further 9 Government Agencies with an interest in the river or the catchment. Whilst there are many stakeholders with an interest in the Georges River, there is no single authority with vested responsibility for managing the flood risk or the well being of the river for the whole community.

3. FLOOD HISTORY

The Georges River has a long history of flooding. Most flood observations have been recorded at the Liverpool weir, which was constructed in 1836 as a causeway crossing of the river and a source of water for Liverpool. The weir still exists today, with its historical significance recognised by the National Trust and the Australian Heritage Commission.

A histogram of available flood records at the Liverpool weir is represented on Figure 2.

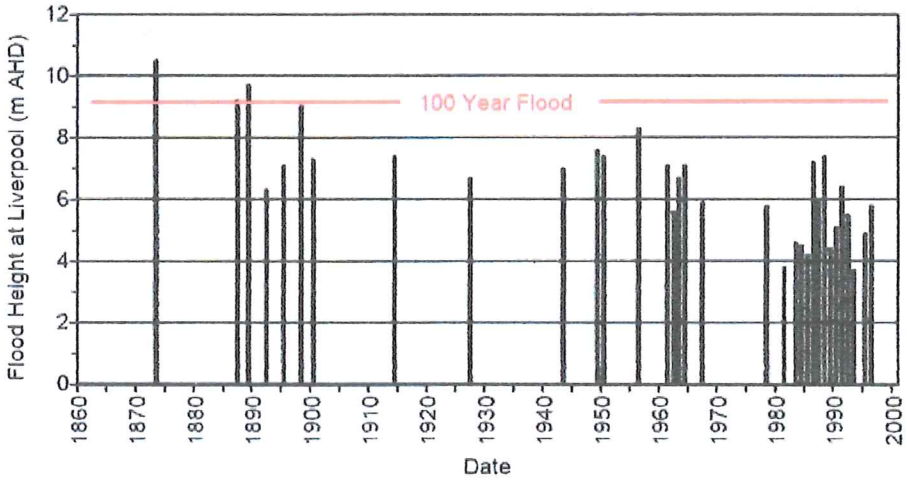


Figure 2
Flood Records at Liverpool

Many people living on the banks of the Georges River will remember the 1986 and 1988 floods. These are the largest floods to have occurred over the last 30 years. Both floods are estimated to be about a 20 year flood. It has been estimated that the 1988 flood inundated over 1,000 residential properties along the Georges River, Prospect Creek and Cabramatta Creek, with an estimated damage of over $40M (2000).

Very few people will remember the 1956 flood, which was the largest flood to have been recorded over the last 100 years. However, this flood is still relatively small compared to other historical floods that have occurred.

No one living remembers the 1873 flood. This is the largest flood to have been recorded along the Georges River. The level at Liverpool was 1m higher than the estimated 100 year flood. Three other large floods, similar to a 100 year flood, are reported to have occurred towards the end of the 19th century.

Thus whilst the Georges River has a long history of flooding, those floods that are remembered by residents are relatively small in comparison to others that are possible, and that have occurred in the past.

4. STUDIES UNDERTAKEN

Flood behaviour on the Georges River has been extensively studied since the mid 1960's. The methods of analysis have varied markedly, including simplified procedures, flood frequency analysis, physical model studies and more recently computer modelling.

4.1 Simplified Procedures

The first major investigation of flooding on the Georges River was undertaken by Harry Scholer in 1966 [Scholer 66]. Flood levels were derived on the assumption that the floodplain between Liverpool and East Hills was comprised of four interconnected ponds. A relationship was derived between water levels in each pond and the flood height at the Liverpool gauge, based on analysis from floods that occurred in 1950, 1956, 1961, 1963 and 1964. A flood prediction model, comprising a number of charts, was proposed for flood warning purposes.

4.2 Flood Frequency Analysis

Further research in the late 1960's was largely based on flood frequency analyses of the historical records at Liverpool. The main investigations were undertaken by Munro, Stewart, and Rowe and Ennis. The results of the different analyses varied significantly. This was largely due to the treatment of some of the earlier, less reliable flood records and the period of analysis.

Flood inundation maps were later derived for the Lower Georges River [Sinclair Knight & Partners, 1978] based on flood frequency analysis at Liverpool and the observed 1956 flood gradient.

4.3 Physical Model Studies

Most of the flood mitigation investigations were carried out by the Public Works Department at their Manly Hydraulics Laboratory, using steady-state physical models. The first investigation was an investigation of flood mitigation options for the Milperra-Moorebank floodway [Public Works Department, 1983], which ultimately led to the adoption of extensive voluntary purchase schemes for both Liverpool and Bankstown Councils. The model was later extended downstream to East Hills for investigations of the proposed M5 motorway crossing. It was later further extended downstream to Picnic Point, to allow investigations of flood mitigation works at East Hills and Carinya Road.

A separate physical model had previously been constructed at the Manly Hydraulics Laboratory in 1979/80 to examine various aspects of the tidal hydraulics of the proposed Chipping Norton Lakes Scheme. In 1982 the model was modified to include overbank flow paths for the purpose of flood investigations for the Lakes Scheme. The model was later extended to incorporate investigations for both Prospect Creek and Rabaul Road.

To consolidate the results from the various model studies, a single physical model, capable of simulating a complete flood hydrograph, was constructed at the University of New South Wales' Water Research Laboratory. The model, which extended between Picnic Point and Liverpool, was used to determine design flood levels for the Georges River. Results from the model are summarised in the 1991 Georges River Flood Study Report [Public Works Department, 1991].

There were two limitations with the physical model. Firstly, due to scaling affects, it was not always possible to analyse the impacts of various development scenarios or other changes

to the river or floodplain. Secondly, the model occupied a considerable area, and the expense of keeping the model available indefinitely was not possible. Consequently, the model was dismantled about 7 years ago.

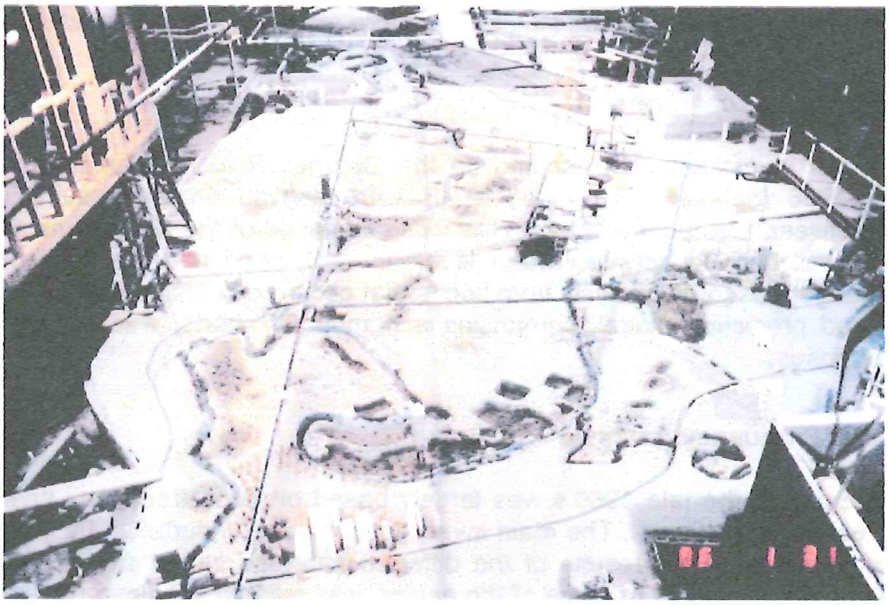


Photo 2
The Georges River Physical Model

4.4 Numerical Model Studies

For some time no model was available to test the impact that works on the floodplain, or other development scenarios, may have on flood behaviour.

Bewsher Consulting recently developed an extensive MIKE-11 hydraulic model of the Georges River [Bewsher Consulting, 1999]. The model was developed for Liverpool Council so that potential flood mitigation works and other development scenarios on the floodplain could be assessed. The model covers a river length of approximately 46km, between Botany Bay and Cambridge Avenue, at the Liverpool/Campbelltown Local Government boundary.

The model amalgamates a number of separate models, including:

- the physical model between Picnic Point and Liverpool [Public Works Department, 1991];
- a MIKE-11 in-bank tidal model downstream of Liverpool [Public Works Department, 1992]; and
- a MIKE-11 flood model upstream of Liverpool [Department of Land and Water Conservation, draft 1998].

The model did not set out to redefine design flood levels where these were already available. Instead the model was calibrated to match the results of past studies. This was achieved using calibration parameters that would normally be expected. In other areas, such as downstream of Picnic Point, design flood levels were derived for the first time.

The current MIKE-11 model provides a tool that allows Liverpool, and other Councils along the Georges River, to assess works and measures that may be considered on or near the floodplain.

5. FLOODPLAIN MANAGEMENT WORKS

There are many examples of floodplain management measures that have been undertaken by various Councils along the Georges River over the last 20 years. Some of the measures provide total protection against the flood risk in the area, whilst other measures provide a partial solution only. Examples of measures that have been adopted along the Georges River are discussed below.

5.1 Voluntary Purchase

The Moorebank-Milperra area is one of the worst floodways in New South Wales. Flood conditions are so severe, that both Liverpool City Council and Bankstown City Council adopted voluntary purchase programs to acquire and demolish buildings located on the floodway. Some 200 houses were identified for voluntary purchase at an original estimate of $20M (1983). The schemes commenced in the early 1980's, with financial assistance provided by the State and Commonwealth Governments. Over half of the houses have since been acquired and removed. Unfortunately Commonwealth assistance for the scheme was withdrawn several years ago, making its completion much more difficult.

5.2 House Raising

Whilst there has been no formal house raising program along the Georges River, one of the largest house raising programs within the State is being undertaken by Fairfield Council along Prospect Creek, one of the main tributaries to the Georges River.

Over 470 houses have been identified for house raising along Lower Prospect Creek. Some 126 of these houses have been successfully raised, or otherwise treated, at a cost of $5.5M. Many of the remaining houses are brick or brick veneer, which are difficult and costly to raise. Innovative alternatives to the traditional form of house raising have been explored, including the purchase, demolition and resale of vacant land with appropriate covenants. This results in the construction of new, elevated homes at a net cost that is only slightly higher than the cost of raising a timber house.

5.3 Levee Banks

There are several examples of different types of levee banks along the Georges River. A levee in the Kelso Park area was constructed in 1986 to protect 148 homes from floodwaters in the Georges River. Local drainage behind the levee and water quality considerations are significant issues with the levee bank. There has also been considerable pressure for intensification of development within the area "protected" by the levee.

Deflector levees were also constructed further downstream at Carinya Road at about the same time as the Kelso Park levee. The deflector levees provide limited protection to existing dwellings that are located on the banks of the Georges River. They do not stop the inundation of houses, but attempt to slow flood velocities to reduce the risk of major structural damage. Similar deflector levees are currently being constructed at East Hills, which also incorporates provision for improved evacuation.

5.4 Flood Compatible Redevelopment

In other areas along the Georges River, where the risk of flooding is lower or there are no practical flood mitigation measures, specific development controls have been stipulated to reduce the flood risk gradually over time, as redevelopment takes place. An example is

along Henry Lawson Drive in the vicinity of Rabaul Road. The Rabaul Floodway Study [Public Works Department, 1987] recommended that new or redevelopment should be allowed to proceed provided that:

< development is sited as close as possible to higher ground away from the river;

< minimum floor level requirements are satisfied; and

< the passage of floodwaters are not obstructed.

A specific DCP for floodplain development in the Carinya Road area was also developed by Bankstown City Council [Bewsher Consulting, 1997].

5.5 River and other Channel Improvements

Significant changes to the river regime were made as part of the Chipping Norton Lakes Scheme. The Lakes Scheme was part of an overall rehabilitation program following extensive sand extraction from the Georges River at Chipping Norton. The Scheme, which was developed in 1977, resulted in a series of 150ha of lakes connected with the river. Although rehabilitation of the area was the main objective of the scheme, it nevertheless provided a positive flood mitigation benefit to the area.

Other channel improvement works have been confined to the Georges River tributaries. Substantial channel improvement works have recently been undertaken through an industrial area of Bankstown, along a local tributary draining to the Georges River, known as Milperra Drain.

5.6 Upstream Retarding Basins

There is substantial new development occurring in the upper catchment areas, predominantly in the Campbelltown, Liverpool and Fairfield areas. New development usually leads to an increase in impervious catchment area, leading to increased runoff, with the potential to increase downstream flooding. Fairfield, Liverpool and Campbelltown Councils have developed drainage strategies in these new developing areas to ensure that the impacts of increased catchment runoff are mitigated by appropriate compensating measures. The three Councils have adopted schemes with numerous retarding basins that attempt to ensure that post-developed flows do not exceed pre-developed flows.

5.7 Flood Warning

Flood warning has been considered to be one of the main floodplain management measures for the Georges River for many years. In 1966 Harry Scholer developed flood prediction curves to be used by the then NSW Civil Defence Organisation [Scholer, 1966]. Today the Bureau of Meteorology provides a flood warning and flood prediction service for the State Emergency Service and other Authorities.

The Bureau provides flood predictions once the river is expected to exceed minor flood levels at Liverpool. Flood predictions are provided at the Liverpool weir and a number of other downstream gauges. The warning system aims to provide at least 6 hours warning of expected peak flood heights based on actual rainfall, and 12 hours warning based on predicted rainfall.

There is a good network of rainfall and river stations within the catchment. The Public Works and Services' Manly Hydraulics Laboratory also maintains a network of automatic water level recorders downstream of Liverpool. Results from these gauges are posted on the Internet in near-real time during flood events.

6. HAS THE PROBABLE MAXIMUM FLOOD BEEN FORGOTTEN ?

The topography of the Georges River Valley is fairly unique, in that the lower reaches of the river (from East Hills downstream) is confined to a narrow gorge. This acts as a restriction during large floods, resulting in a wide range in flood levels. It has been estimated that the probable maximum flood will be up to 5m higher than the 100 year flood along a significant portion of the river.

Most Councils along the Georges River have adopted the 100 year flood as their planning level. As a consequence, there is substantial development that is located just above the 100 year flood that will be at risk in larger floods. Little consideration to date appears to have been given to what will happen in the probable maximum flood, or how this risk should be managed.

Very few people within the community have an appreciation of how high flooding can come to on the Georges River. At best, they may remember the 1986 or 1988 floods. But these were small events, no greater than a 20 year flood. Much larger floods (like the 1873 flood, or larger) can and will occur.

With the release of the new Floodplain Management Manual, there is now a greater obligation for Council to consider all floods up to the probable maximum flood.

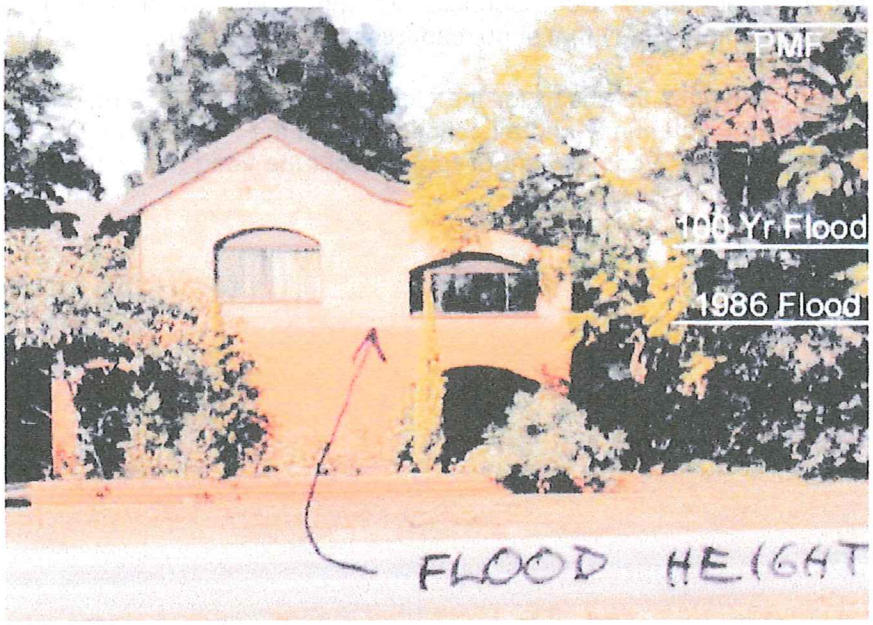


Photo 3
The Range in Flood Levels for many Houses in the Moorebank Area

7. THE CHALLENGES AHEAD

Numerous floodplain management studies have been undertaken on the Georges River over the last 20 years. These studies have been targeted at specific problem areas along the river and lower tributaries. In many instances the recommended measures have been implemented, or are in the process of being implemented.

One of the problems with this approach is that there is no overall plan for the entire floodplain. Areas where site-specific studies have not been undertaken may have been forgotten. Other measures relevant to the whole floodplain and catchment may also have been overlooked. Important considerations that are relevant to the whole area include:

- a review of the cumulative impact that floodplain development and flood mitigation works may have had on the overall flood behaviour in the river.
- management of the flood risk up to the probable maximum flood;
- appropriate and consistent planning controls for new development;
- emergency management procedures;
- public awareness to ensure the community does not forget about flooding; and
- a coordinated and prioritised plan of recommended measures.

A large proportion of the floodplain along the Georges River is located within the Bankstown and Liverpool Council areas. Both Councils will shortly embark on a joint Georges River Floodplain Management Study that should address the above issues.

So what other challenges lie ahead for the Georges River? Perhaps the greatest challenge is to ensure that the community and all concerned with the management of the river and its catchment do not become complacent or forget about the flood risk, particularly as the time since a major flood increases.

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