

THE WARRINGAH TRANSPORT CORRIDOR: AN ASSESSMENT

P.W. ABELSON

Senior Lecturer in Economics, Macquarie University
Alderman Mosman Council

ABSTRACT: *The proposed Warringah Freeway would cost well over \$100 million to open and would have a significant impact on the distribution of population in Sydney. Its supporters claim that the combination of traffic and urban development benefits would justify the freeway in due course and that a corridor should be reserved for it. Its opponents argue that other road projects have greater priority, that it is wrong on both efficiency and equity grounds to develop Warringah, that there are environmental objections to the freeway and that it is wrong to tie up public funds in idle land holdings. Apart from environmental issues which are outlined but not discussed in detail, the paper provides a comprehensive and critical discussion of the issues. It concludes that the opportunity costs of reserving the Corridor for a possible freeway are significantly less than the potential benefits of the freeway and that reservation of the corridor for a possible freeway is the correct land use planning strategy.*

Introduction

1.1 The Warringah Transport Corridor (see Figures 1 and 2) has a long history. Investigated during the 1930's, it was formally adopted by the State Government in the Main Road Development Plan of 1953 and the reservation was prescribed in the Warringah, Manly and Willoughby Planning Schemes in 1963, 1968 and 1970 respectively. However because of the high transport and urban service costs, the Sydney Region Outline Plan (N.S.W. State Planning Authority, 1968) questioned the desirability of developing Warringah and recommended further detailed studies. In 1974 the Sydney Area Transportation Study recommended that the Warringah freeway be part of the long term road network in Sydney.

1.2 Doubtless reflecting the Planning Authority's opposition to growth in Warringah and the State Government's preference for public transport over freeways, in 1976 the Urban Transport Advisory Committee, an inter-departmental committee reporting to the Minister for Transport and Highways, excluded the Warringah freeway from its recommended 10 year programme of works. A year later, the New South Wales Government abandoned a number of corridors, including the Warringah Corridor. This provoked representations from the 5 local councils most involved, all of which favoured its retention.

1.3 In response the Government established an independent Inquiry under Mr. D. Kirby to "inquire into, report upon and make recommendations relating to possible future and alternative uses of the Warringah Freeway Corridor reservation and with particular reference to the proposal made by the Northside Councils to the Minister for Transport and Highways on April 14th, 1978, to retain the reservation as a Transport Corridor". At the time of writing the Inquiry has received over 800 submissions, including some very lengthy ones, and conducted hearings over a period of 6 months. Publication of its report is expected around April 1983.

1.4 The battlelines, reflecting the history of the Corridor, are clearly drawn. The major proponents of retention (or more accurately reinstatement) of the transport corridor are the Department of Main Roads (DMR) and the 5 Northside Councils. The DMR assisted by W. D. Scott Pty. Ltd. produced a 2-volume cost benefit analysis of the freeway which concluded that "It is the Department's view that the former Corridor Reservation should be reinstated in the relevant Planning Schemes now". The submission by the consultants R. Travers Morgan Pty. Ltd. et. al. on behalf of the councils reached similar conclusions.

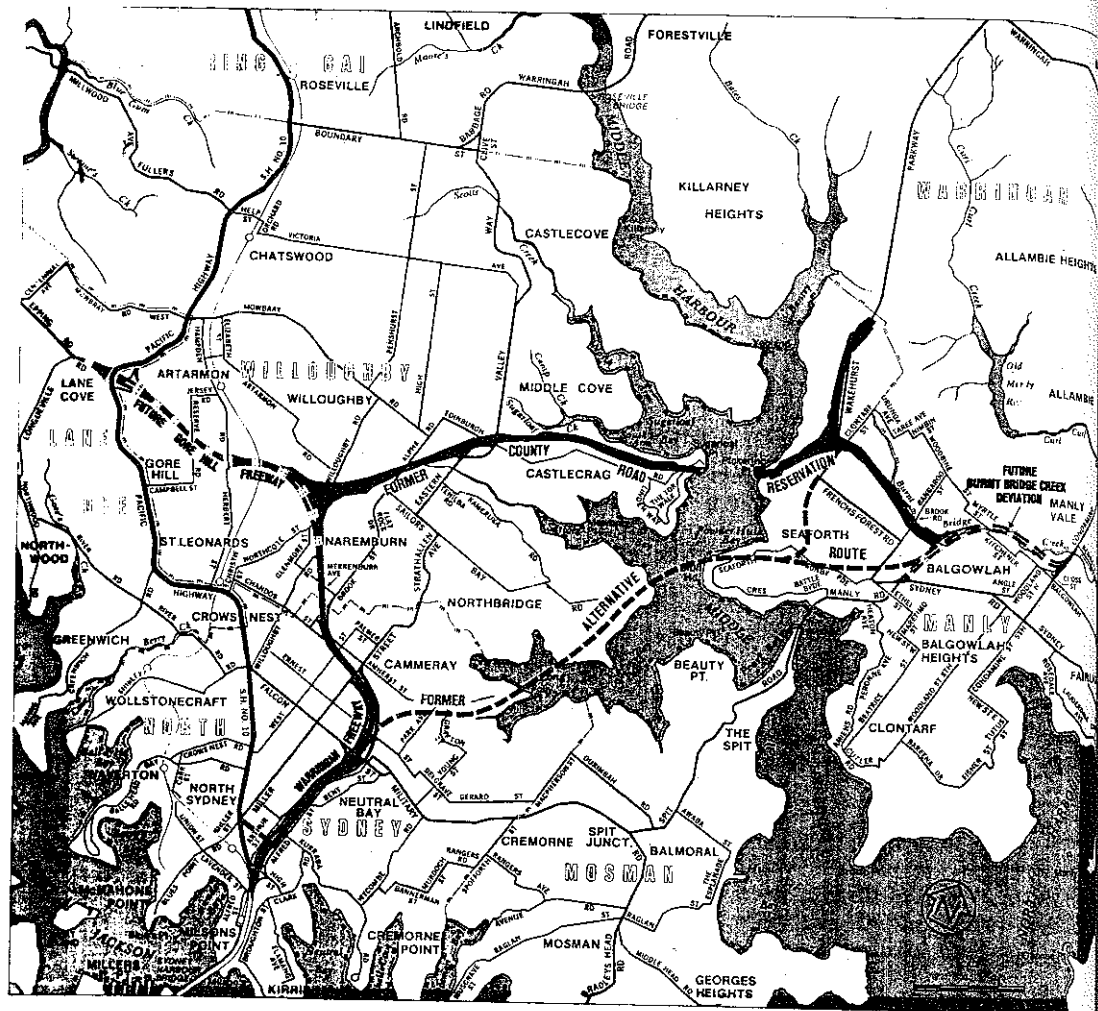
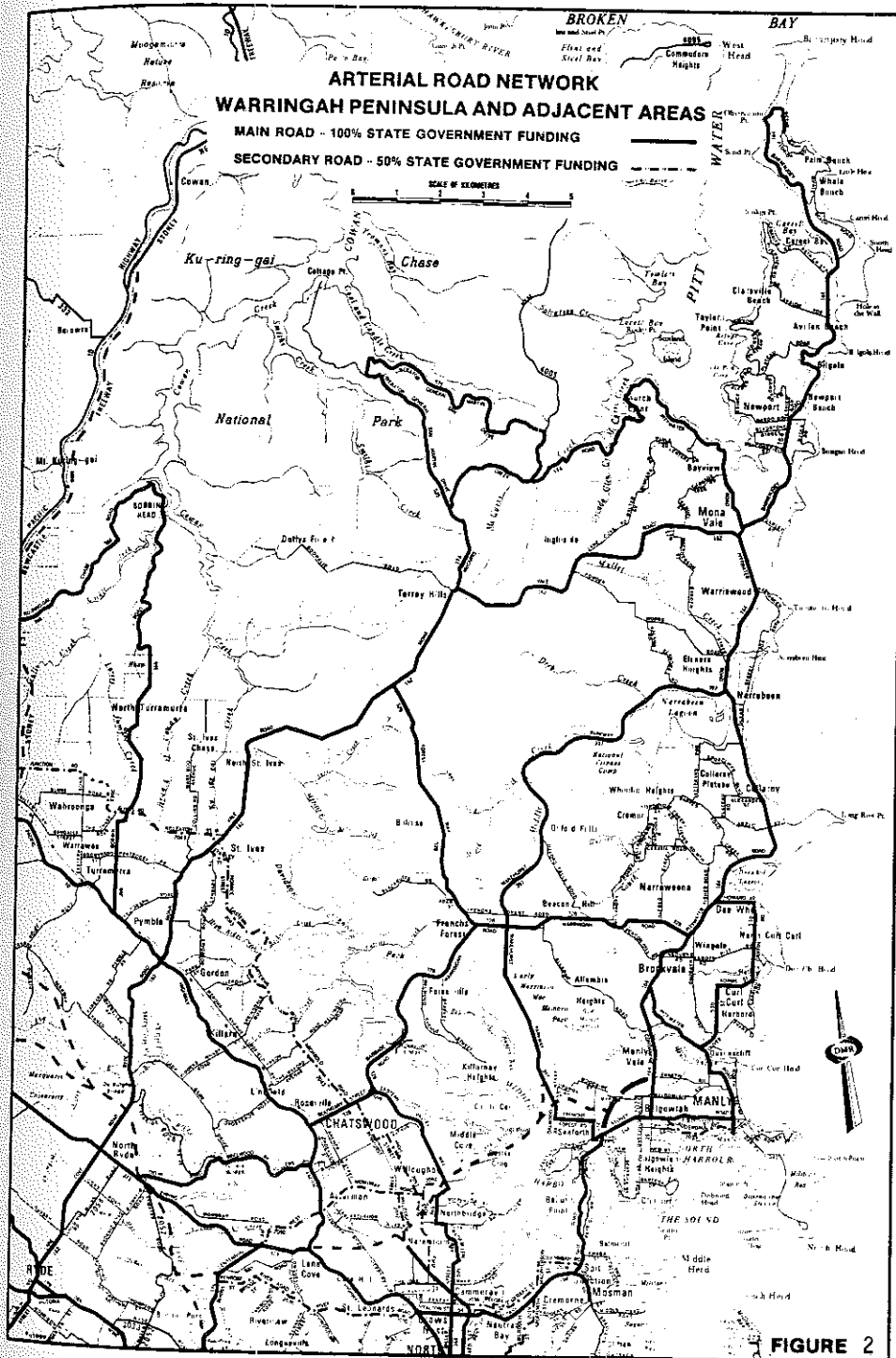


Fig. 1. The Warringah Transport Corridor

1.5 The major opponents of the freeway are the Department of Environment and Planning (DEP), the Castle Crag Progress Association (CCPA, representing residents affected by the Corridor), and the Total Environment Centre (TEC). In its submission, the DEP trenchantly criticised the DMR's case for the freeway arguing that other road investments would give much better economic returns, that development of other parts of Sydney was strongly preferred and, that public funds should not be locked up for so long in idle investment. The DEP concluded that the "County Road Reservation NOT be reinstated", a view shared most emphatically by the CCPA and the TEC¹.

¹ Although the CCPA commissioned the TEC to present its case against the Corridor, there seems little doubt that the TEC in its own right would oppose the Corridor as it did the Kyeemagh-Chulora Corridor.

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The DEP did add that "the option of developing North Warringah in the longer term should not be foreclosed by development in the Corridor which would substantially increase the real costs of ultimate acquisition" and recommended that an S 117 direction of the Minister for Planning and Environment be used to freeze zoning at present levels. However in the hearing before the Commissioner, the ex-Deputy Director of the DEP, Dr. J. Paterson, suggested that this latter recommendation should be regarded more as an option if the Commissioner felt it necessary to protect the route for a future freeway than as a firm recommendation.

1.6 The history of the Warringah Transport Corridor, the large number of submissions to the Inquiry and the strength of feelings of residents, public servants, professionals and politicians on the subject attest to the importance of decisions about the Corridor. Under the State Government's current planning policies, only minimal development in Warringah Shire is permitted chiefly on the grounds that existing transport routes could not cope with additional traffic. If a freeway were developed in the Corridor, it is generally agreed that Warringah Shire could accommodate at least 80,000 more people. This would represent a significant redirection of the development of Sydney away from the western, inland areas into the more accessible northern coastal areas.

1.7 Section 2 describes the case for the freeway as expressed by the DMR. There follows an assessment of the major elements of the benefit cost analysis including the demand forecasts and the user benefits, with a separate section given over to the contentious issue of the benefits of land development. Further sections compare the expected returns from the Warringah freeway with those of other road projects, discuss whether it would be preferable to develop other areas of Sydney, and consider equity issues. Other important issues such as traffic restraint policies and the role of public transport are addressed in Section 8. Alternative land use strategies for the Corridor are evaluated in Section 9. There is a brief concluding section.

The DMR Case for the Warringah Transport Corridor

2.1 The DMR case can be summarised as follows. Despite the introduction of intensive traffic management techniques, the road infrastructure to the Warringah peninsular is inadequate. There is significant peak hour congestion and it cannot cope with any increase in population in the peninsular. After a review of alternative

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improvements, the Department selected 9 major options for detailed cost-benefit analysis (CBA), including a "Base Case" and five options in all which excluded the Corridor. As shown in Table 1, the Department estimated a net present value of more than \$300 million and a benefit cost ratio of 2.4 for the 6 lane freeway in the Corridor. Assessing environmental and equity issues separately, the Department considered that on balance neither set of factors constituted an argument against the freeway. Finally the DMR argued that it was appropriate planning procedure to reserve the Corridor for a future freeway.

Table 1. A Summary of the DMR's Results

(\$m, 1981 prices)

Option Network	1 Base	2 Base	3 Base	4 Up- grade	5 4 Lane F'way	6 4 Lane F'way	7 6 Lane F'way	8 6 Lane F'way	9 Partial Upgrade
Addl Population	0	0	80000	0	0	80000	0	80000	0
Addl Prim Empl.	0	10000	0	0	0	0	0	0	0
COSTS AND BENEFITS									
Land Opportunity	0	0	0	-47	-96	-96	-96	-96	-18
Construction	0	0	0	-53	-107	-107	-120	-120	-21
Maintenance	0	0	0	-5	-5	-5	-6	-6	-2
User Vehicle	0	20	-315	23	79	13	79	46	11
User Time	0	9	-159	40	102	68	119	84	19
User Accident	0	0	0	0	25	25	27	27	0
Land Devt/Service	0	0	-46	0	0	-46	0	-46	0
Land Cost Diff.	0	0	-51	0	0	-51	0	-51	0
Land Value Diff.	0	0	472	0	0	472	0	472	0
NPV	0	29	-99	-42	-2	273	3	310	-11
BCR	-	-	-	.6	1.0	2.3	1.0	2.4	0.7

Note: Costs are shown as negative, benefits as positive.

2.2 The alternative road improvements considered by the DMR were

- (1) A Base Case, i.e. the present network with minor traffic management and road improvements that would be implemented whatever the decision on the Corridor.
- (2) A major upgrade option, which included some 15 projects additional to the Base Case including an extra 2 lane bridge at the Spit and several additional lanes adjacent to the existing network, e.g. along the Spit road, the Wakehurst Parkway and the Eastern Valley Way.
- (3) A partial upgrade option including 7 of the 15 projects in the major upgrade option.
- (4) Within the Corridor, a 6 lane arterial and 4 and 6 lane freeway solutions. The arterial would be of lower standard and offer more access than a freeway. A tunnel alternative was also considered.
- (5) Adjacent to the Corridor two further arterial alternatives also crossing Middle Harbour at Sugarloaf Point, but utilising and extending much of the existing road system.
- (6) Improvements in the northern part of the study area, including an upgraded Mona Vale road.
- (7) Alternative corridors.

2.3 Of these alternatives all the arterial solutions, the tunnel, the northern improvements, and alternative corridors were rejected prior to the detailed CBA. Although, the arterial within the Corridor would be lower cost than a freeway, it would provide substantially less capacity and inferior service to the freeway. Arterials adjacent to but outside the Warringah Corridor were held to have no advantages and greater environmental disadvantages. A tunnel was estimated to be prohibitively expensive. The Northern improvements were held to be wrongly oriented or too distant from major travel movements, especially those to the CBD. Alternative corridors were rejected on several grounds, notably the cost and difficulty of developing them compared with the historically established Corridor.

2.4 The DMR did not consider a rail option on the grounds that the State Rail Authority and the Northside Councils Consultants were considering it. Neither favoured a rail alternative. But as shown in Table 1, the DMR did evaluate the road options with and without major population changes in Warringah Shire.

2.5 Costs and benefits were estimated to the year 2021 on the assumption that the freeway would be constructed between 1984 and 1991. Constant 1981 prices, a real discount rate of 10 per cent per annum and a discount year of 1991 were adopted. Net present values (NPV's) and benefit cost ratios (BCR's)

defined as
$$\frac{\text{all discounted net benefits}}{\text{land opportunity, construction and maintenance costs}}$$
 were estimated.

2.6 There are within the corridor some 300 dwellings and vacant residential land and open space upon which another 200 dwellings could be constructed. A further 100 dwellings would be affected by the freeway. Approximately one third of the wholly affected dwellings and most of the vacant land is owned by the Government. For evaluation purposes all dwellings and all vacant land were costed at residential market values,¹ forecast to occur prior to construction, 6 to 7 years before the freeway, and discounted forward to 1991. Acquisition costs in the upgrade options were also assessed at market prices.

2.7 No special problem arises on construction or maintenance costs (other than the normal estimation problems). No allowance was made for the relatively insignificant reduction in maintenance costs on other roads if a freeway were opened.

2.8 The traffic forecasts were generated from the traditional four-step model of trip generation, trip distribution, mode split and network assignment, the only models calibrated for the Sydney Region. To generate traffic forecasts the DMR assumed that population in Manly Warringah would increase by 9% from 221,000 to 230,000 between 1976 and 1991 (medium forecasts, DEP, 1979), the workforce would increase by 6 per cent, per capita incomes by 35 per cent and per capita car ownership by 29 per cent. The DMR further assumed that the proportion of the local workforce with local jobs would rise from 47 to 51 per cent and that the real price of fuel would rise by 113 per cent over this period.²

¹ In 1981 prices the publicly owned land and dwellings were valued at \$27.0 million and privately owned land at \$20.7 million.

² This was based on a doubling of real prices between 1971 and 1991. Real prices actually fell by 6 per cent between 1971 and 1976.

2.9 These assumptions resulted in a forecast increase in AM peak two-hour trips originating in Manly Warringah of 9 per cent by 1991, made up of a 16 per cent increase in trips within the area and a 1 per cent increase in trips leaving the area (from 18,500 to 18,600). The number of cars leaving the area was forecast to fall by 1 per cent (from 15,500 to 15,300) with the distribution between the Spit Bridge, Roseville Bridge and Mona Vale routes virtually unchanged.¹ The peak hour forecasts were factored to daily and annual levels on the basis of traffic surveys. Although sensitivity tests were made of the impact of the freeway, limited additional population in the Warringah Peninsular and lower car ownership on trip forecasts, the evaluation of user benefits was carried out with unchanged trip levels over the 1991 to 2021 period. To predict the traffic implications of 80,000 more persons in the peninsular, the DMR maintained the previous assumptions with regard to workforce participation and employment ratios and predicted a 38 per cent increase in both daily work trips and in AM peak hour trips leaving the peninsular.

2.10 Using these forecasts and the State Transport Study Group's trip distribution model, the DMR estimated total travel distances and times by car, light and heavy trucks by type of road (surface or freeway) by journey purpose (business or leisure) under peak hour conditions for each option for the whole of Sydney. Savings in vehicle kilometres and hours were estimated with reference to the Base Case and factored to annual levels. Unit values for vehicle operating costs and travel time savings were based on Bayley and Bath (1976) updated to 1981 prices.

2.11 Note that according to the DMR's calculations, the addition of 80,000 people to Manly Warringah would reduce the benefits of the freeway to existing users and traffic speeds on the freeway would fall (see columns 7 and 8, or 5 and 6, in Table 1). These user benefits do not include benefits to generated traffic which are captured through measures of development benefits.

1 In 1976, there were 8,800 2 hour AM peak trips over the Spit Bridge, 8,300 over the Roseville Bridge and 1,450 along the Mona Vale Road.

2.12 Accident rates are developed from accident rates per road class (distributor roads, divided and undivided arterials, and freeways) and accident costs per type of accident (fatal, personal injury and property damage).

2.13 The undiscounted benefits of developing Warringah Shire (B) were assessed as

$$B = (WTP_W - WTP_O) - (RC_W - RC_O) \quad (1)$$

$$= (WTP_W - RC_W) - (WTP_O - RC_O) \quad (2)$$

where WTP represents the amount households would be willing to pay for developed land, RC are the resource costs of developing land and subscripts w and o represent Warringah and other areas respectively.¹ The resource costs included were water and sewerage costs and the opportunity cost of the raw land.² The development costs were assumed to occur between 1987 and 1991 and the benefits between 1991 and 1995. Both were discounted to 1991.

2.14 The DMR conducted sensitivity tests with changes to the discount rate, life of the project and construction costs. None altered the thrust of the estimated results.

2.15 Environmental and social factors were considered under a number of heads namely air quality, noise and physical and biological environment, visual impacts, open space, severance, fuel consumption and acquisition. The main conclusions were

- (1) The freeway would significantly reduce carbon monoxide concentrations along existing routes serving Manly/Warringah without creating an air quality problem in the Corridor.
- (2) The freeway would reduce traffic noise in secondary streets currently used by through traffic. For the most part noise would be below the 10 criterion of 65-70 dB(A) along the Corridor.
- (3) Adverse impacts on the physical environment, for example through erosion and siltation would be controlled.
- (4) Visual impacts are subjective, but sensitive design can minimise adverse effects.

1 Although the DMR used Equation 1, their approach was not stated so explicitly.

2 By implication other resource costs, e.g. distributor roads and power services, are assumed constant in Warringah and elsewhere.

- (5) There is sufficient active and passive open space around the corridor.
- (6) Local access can be maintained with some cross freeway accesses and possibly some pedestrian only crossings.
- (7) The freeway would reduce fuel consumption.
- (8) Upgrading the existing network involves major surgery with acquisition of approximately 55 dwellings and 87 commercial buildings, and considerable disruption of existing activities. The DMR argues that it is environmentally and socially the least attractive option.

2.16 The DMR's review of equity issues concentrates on the gains and losses to North Shore residents. It is claimed that many households and businesses in this area would 'gain', while those in or close to the corridor would 'lose' and there would be increased congestion on some roads and on the Harbour Bridge. The DMR argues also that residents of other areas would gain by being able to upgrade their standard of residential amenity, by better access to the beaches and because under certain taxation and/or freeway charging methods the surplus from the project could be transferred to them.

An Assessment of the DMR's Estimates

3.1 As is generally the case the estimates of user benefits have attracted more criticism than have the estimated costs. Thus the TEC gives three reasons why it believes the traffic forecasts are too high. (1) Significantly increased travel by ferries and buses from the peninsula¹ in the second half of the 1970's as a result of improved services indicate that public transport's market share could be increased further. (2) Persons of pensionable age are forecast to increase by 45 per cent in Manly Warringah between 1976 and 1991 and by 70 per cent by the year 2001, so that crude labour participation rates will fall. (3) Working from home is expected to rise.

3.2 On the other hand despite the increase in public transport travel, there has been no drop in road travel. The DMR's forecasts are premised on real fuel prices more than doubling between 1976 and 1991, which is unlikely. The DMR allow for no increase in peak hour traffic after 1991 either with increasing incomes or with the advent of the freeway. And perhaps more significantly, forecast recreational traffic is virtually unchanged throughout the whole period.

¹ Patronage of Manly ferries increased 40 per cent between 1976-77 and 1979-80. Bus patronage was up 12 per cent between 1974 and 1979 as a result of a 49 per cent fall in travel time on the transit lane.

3.3 Without a formal model of traffic demand it is not possible to weigh these arguments and suggest precise answers. My own view is that increasing incomes and car ownership are more likely to influence the number of business and recreational vehicle trips¹ than are changes in public transport service levels, which I expect to be relatively minor. Unless labour participation rates fall substantially, the DMR's traffic forecasts appear more likely to be low than high, especially for recreational traffic.

3.4 As shown in Table 1, excluding urban development benefits, the estimated value of travel time savings exceeds that of all other benefits. Assuming that travel time savings are estimated accurately,² the unit value of travel time savings is a critical parameter, particularly the value of \$0.88 per hour associated with savings on commuting and leisure trips. The TEC argues that savings of travel time of less than 5 minutes are valueless. In fact the figure of \$0.88 which is some 10 per cent of the average hourly wage, is very low compared with the typical value of around 25 per cent found in commuting situations (Harrison and Quarmby, 1969) which include small time savings. Casual observation also suggests that the DMR valuation is low, even for small travel time savings. These are useful if they are predictable, as they tend to be for commuters. Moreover it is believed that the value of travel time savings increases with income over time but this is not allowed for in the DMR's study.

3.5 Close examination of the DMR's submission also reveals some inconsistencies, for example with respect to the projected population for Manly Warringah and to the traffic implications of increases in this population. These appear to be minor. If anything in its travel demand forecasts and its estimated values for commuter time savings, the Department underestimated the benefits of the freeway. However a complete evaluation of the Department's forecasts, for example of capital costs and traffic flows and their implications, is beyond the scope of this paper.

1 The elasticity of car ownership with respect to income is around 1, (Abelson and Baker, 1982).

2 Professor Blunden argues that with the freeway some commuters will prefer to travel closer to the peak hour (x) than to travel slightly faster at their previous time (y) and suggests that the travel time savings is therefore exaggerated. However, if consumers prefer x to y, their perceived benefits must be at least as great from x as from y.

The Benefits of Urban Development

4.1. As we saw (Equation 1) the DMR assessed the net benefits of development of Warringah as the extra amount households would pay for developed land there less the extra amount it would cost to provide the land. The implication is that there will be a fixed amount of development in Sydney and that development of Warringah would exclude a similar amount of development (measured in physical units) elsewhere.

4.2. If Warringah is developed in addition to other areas, the discounted benefits would be

$$B = \sum_{i=1}^n \frac{(WTP_w - FRC_w)}{(1+r)^{i-1}} \quad (3)$$

where FRC_w represents the full resource costs of developing Warringah, including roads, communications, and power services, r is the social time preference rate and i is the year $1, \dots, n$. If the discounted benefits of development outside Warringah exceed the discounted costs, Equation 3 attributes higher net benefits to the development of Warringah than does Equation 1.

4.3 Figure 3 illustrates Equation 3, with the demand curve 'D' representing households' willingness to pay for land in Warringah and the supply curve 'S' representing the full resource costs of supplying the land. If the supply of serviced land is constrained for environmental or other reasons, the net benefit of providing more serviced land in Warringah is represented by the hatched area.

4.4 Figure 4 illustrates the impact of development in Warringah on prices elsewhere.¹ Again an environmental constraint on the supply of serviced land is assumed. Development in Warringah would cause the demand for land elsewhere to fall from D_0 to D_1 and prices to fall from P_0 to P_1 . The monetary gain to new home buyers would be equal to the loss to landowners. In this case the lower land values do not reflect any reduction in services and are not included in the estimated net present values. If financial constraints cause the supply of serviced land outside Warringah to fall below Q^* to say Q_1 the hatched area between the D_1 demand curve and

¹ For simplicity land outside Warringah is assumed to be of standard quality.

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the supply curve is debited against the benefits shown in Figure 3.

4.5 In practice the extreme assumptions of total or of zero exclusion of equivalent development outside Warringah are both unlikely. More likely, some deferment would occur. In this case, the discounted benefits would be

$$B = \sum_{i=1}^n \frac{(WTP_w - FRC_w)_i}{(1+r)^{i-1}} - \sum_{d=1}^m \frac{(WTP_o - FRC_o)_d}{(1+r)^{i-1}} \quad (4)$$

where d equals years of delay ... m. The second expression on the right hand side represents the costs of deferring development.

4.6 In its submission to the Inquiry, the DEP claimed that "there is no imaginable benefit for the Sydney population as a whole in removing from the portfolio of land production some 23,000 lots available to purchasers at 1981 price of \$22,750 and substituting for them a similar number of allotments available to the purchaser at \$70,380", and argued that conventional cost benefit studies do not include land development values. However in the hearing¹ the DEP accepted the DMR's evaluation method for land use benefits "as being legitimate if consistently applied" and argued that the real objection of principle was inconsistency in application.

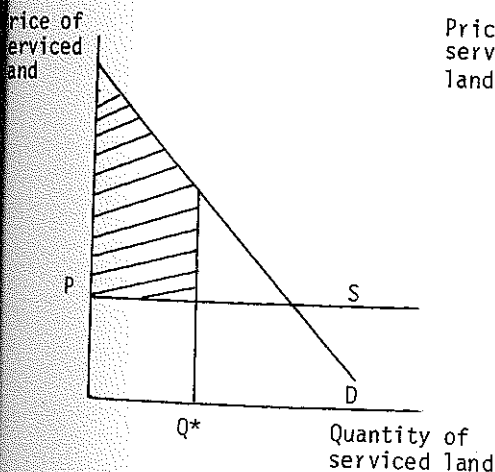


Fig. 3 Benefits of development of Warringah

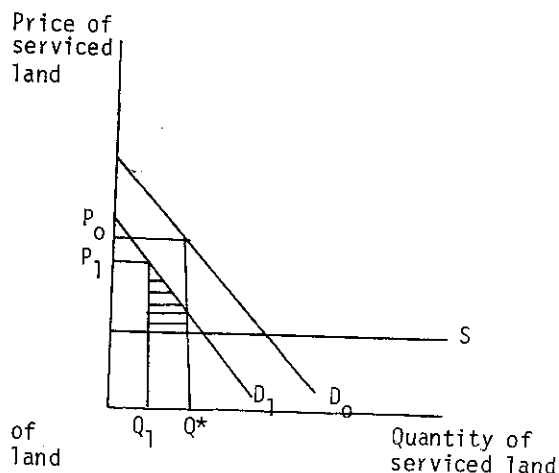


Fig. 4 Possible loss of benefits due to reduction in development elsewhere

¹ Transcript, November 1, p. 49.

4.7 The DEP's revised view appears to be a more reasonable statement of principle, subject to the modifications to the DMR's formula we have noted. Higher land values in this context are not themselves a benefit but a measure of the value households receive from the services generated by certain residential locations.¹ Other things being equal, the development of more highly valued land does create a greater stream of household benefits and it is not uncommon to include increases in land values as measures of benefits in benefit cost studies (see MANS 1978, Freeman, 1980, Abelson 1982). Of course any expenditure of resource costs to achieve these benefits must be fully debited against the benefits. As other issues of principle (project comparability and equity) are discussed in later sections, we turn now to empirical matters.

4.8 The DMR estimated that in 1981 prices households would pay approximately \$47,500 for a serviced lot in Warringah compared with \$22,500 for a similar size lot in Campbelltown, but that the Warringah lots would require an additional \$1,650 for capital costs and reticulation of water and sewerage services and an additional \$2,700 for raw land. The first and third figures were based on Reports of the Valuer General, the service costs were obtained from the M.W.S. and D.B.

¹ The qualifier "in this context" is important. Sometimes changes in land values do not reflect net social benefits or costs. Indeed an example is given earlier in this section.

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4.9 In order to allow for the larger lots in Warringah, the DMR factored the V.G.'s land values for Warringah down by around a third from \$70,000 per lot. This factoring down would appear excessive as building land is significantly more valuable than garden space. But the DEP argues that the \$25,000 differential in site values exaggerates the amenity differences. It argues that land values in Warringah would fall as supply increases sharply and that land in Campbelltown is attractive, its price being depressed merely because supply temporarily exceeds demand.

4.10 The significance of the increased supply in Warringah can be illustrated with the following formula

$$\Delta LP = \Delta HP = - \frac{1}{-e} \Delta Q \cdot \frac{HP}{Q} \quad (5)$$

where LP is the price for a standardised lot of serviced land, HP is the equivalent house price, e is the price elasticity of demand for houses in Warringah, Q is the quantity of housing, and Δ represents 'change in'. Assuming e = -2.0 (as housing in different areas is highly substitutable), the impact on land prices of releasing 22,900 new lots on to the land market at one time would be given by

$$\Delta LP = \frac{1}{-2.0} \cdot 22,900 \cdot \frac{120,000}{70,000} = - \$19,620 \quad (6)$$

Market prices would fall much less if the lots were sold over 5 to 7 years. If say 3,500 lots were marketed annually the discount according to Equation 6 would be \$3,000. In our view this is a less significant factor than the downward bias in the DMR's factoring down of Warringah prices to standardise lot size.

4.11 It should be stressed that the purpose of production is to relieve scarcity. However pleasant land is in Campbelltown, if there is an adequate supply, its price reflects the stream of benefits which additional lots will provide. The material question is therefore whether future prices in Campbelltown will exceed current prices (in real terms). Given the availability of land, only small real increases appear likely.

4.12 The picture on costs is not entirely clear. It seems to be agreed that the cost of providing plant and reticulation for water and sewerage to Warringah would be of the order of \$12,000 per allotment. But in evidence to the Commissioner Mr. White of the MWS and DB claimed that these services could be provided elsewhere in Sydney for between \$4,000 and \$8,000 an allotment¹ which is well

¹ Transcript November 1, p. 37. In its submission the DEP accepted the DMR's cost estimate but at the hearing cast doubt on them.

below the figures used by the DMR apparently on advice from the MWS and DB. Doubtless the differential depends on the areas being compared, on the scale of the development and on its timing. But it should be recognised that if Warringah displaces other development, it should displace that with the least surplus of benefit over cost. Also the raw land prices used by the DMR in Warringah and Campbelltown probably include some speculative element. This should be excluded from a true measure of the opportunity cost of this land.¹

4.13 The DMR's estimated timing of the development of Warringah Shire has been criticised by the Lands Department, the MWS and DB and the DEP. It is said that land could not be developed by 1991 and that it would take a long (unspecified) time to sell 23,000 lots in Warringah. As discussed in Section 6, it would be more prudent to plan on developing Warringah for the mid-1990s. The arguments for a longer sale period are the difficulty of selling homogeneous land in one area and the time taken to sell land in Menai. However it is possible to produce a variety of housing forms and prices from the 23,000 lots and the Menai analogy is unconvincing. Ultimately speed of sale depends upon asking prices and the number of lots for sale elsewhere in Sydney. Given annual lot sales of around 16,000 in Sydney in the 1970's, it would seem reasonable to expect some 3,000 lot sales annually in Warringah in the late 1990's without any discount in the price, especially given the scarcity in that area. Of course if sales are deferred, so too would be some costs.

4.14 Finally it may be questioned whether the land use benefits are attributable to the freeway? The brief answer is yes, so long as the DEP disallows virtually all developments in Warringah on the grounds that access routes cannot cope with more traffic.² If this policy were relaxed and development permitted, the relevant benefit would be the relief of congestion. An estimate of the freeway benefits in this case is obtained by a comparison of the first 6 rows in columns 3 and 8 in Table 1. These indicate that the freeway would have a net present value of \$409 million or a benefit cost ratio of 2.8.³

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1. Generally the opportunity cost is the loss of open space and amenity. In the MacArthur area, some urban development also sterilises major coal reserves.
 2. This policy is documented in the submissions of the DMR and Northside Councils.
 3. This point must be qualified if a significant increase in employment in Warringah occurs - see para 8.1.

4.15 These considerations are brought together in Table 2, which shows the DMR's estimates along with some alternatives and results using Equations 1,3 and 4. The results which show a range of NPV's from \$193 million to \$314 million are interesting for a number of reasons. First, the discounted NPV of development benefits is very sensitive to the timing of the development. This may indicate that the freeway, if justified, should be deferred, a point to take up later. Secondly, not surprisingly, the NPV is sensitive to the sale prices assumed for Warringah lots. Thirdly, more surprisingly, the net benefits with Equation 3 are lower than with Equation 1. This arises because with an average 4 year lag assumed between development costs and sales, and with the figures in Table 2, there is a discounted net loss on marginal development outside Warringah. It is better therefore for development in Warringah to exclude equivalent marginal development elsewhere (Equation 1) than for it to be additional to it (Equation 3).

Comparability with other road projects

5.1 We have argued that the DMR underestimated the traffic benefits and overestimated the urban development benefits of a freeway opening in 1991. Very broadly these modifications might reduce the project's NPV to around \$250 million compared with the DMR estimate of \$310 million.¹

5.2 To estimate the BCR we need to establish the appropriate formula. The BCR provides a measure of return to the employment of scarce capital, which in our context is presumably capital funds available for road works. The opportunity cost of open space (which is borne by the DMR to a limited extent only) and recurrent road maintenance costs would then be included in the numerator rather than the denominator, which would increase the BCR. But if we allow also for the lower freeway benefits in para. 5.1, the BCR falls from 2.4 (the DMR's estimate) to around 2.2.

5.3 It might be argued that all public capital is scarce and that public expenditure on urban services should also be included in the denominator. This would reduce the BCR for the freeway to around 2. However as the BCR on marginal urban development appears to be close to 1, including those capital expenditures in the denominator would greatly reduce the BCR's on alternative projects. For the purposes of practical comparison we shall stick with the BCR's based on capital expenditure for road works, but it should be recognised that BCR measures tend to be more arbitrary than are NPV's.

¹ The sensitivity of the results to improvements in the Base Case, including congestion pricing is discussed in Section 8.

Table 2 Revised Estimates of the Benefits of Developing
Warringah Shire

(Based on 22,875 lots and 1981 prices)

<u>Variable</u>	<u>DMR estimates</u>	<u>Alternative estimates</u>
Price of standard lot (\$)		
Warringah	47,500	52,500 ¹
Other	22,500	22,500
All water and sewerage costs per lot (\$)		
Warringah	12,000 (approx)	12,000
Other	10,350 (approx)	8,000
Raw land per lot (\$)		
Warringah	5,681	4,500
Other	3,004	2,250
Other development costs per lot (\$)		
Warringah	not given ²	8,000
Other	" " ²	8,000
Timing of Warringah development		
Infrastructure	1987-1991	1991-1995
Sales	1991-1995	1994-2000
NPV of development benefits discounted to 1991 (\$m)		
Equation 1	375	295(394) ⁵
Equation 3 ⁷	not given ⁴	262(316) ⁵
Equation 4 ⁷	not given ⁴	277(335) ⁵

1 Based on sales over 7 year period .

2 DMR assumed equal costs in Warringah and other cases .

3 Some of these costs could probably be deferred more than is assumed here .

4 Depends on estimates for "other development costs" .

5 Figures in these brackets are based on DMR's timescale for development.

6 Figures in these brackets assume selling price of \$47,500 for Warringah allotments and our timescale for development .

7 Assumes that development outside Warringah would be deferred 10 years.

5.4 Would a benefit cost ratio of around 2 be sufficient to justify the Warringah freeway? The DEP contends that it would not. The Department argues that as urban development benefits are not included in other transport studies, only transport costs and benefits should be included. The BCR for the Warringah freeway is then around 1. Drawing on a confidential government document S.T.S.G. Report No. 151, the DEP describes measures of 'traffic need' which indicate that the needs in Manly-Warringah are relatively minor. It then argues that the BCR for the current road program in western Sydney is around 9 and that there would be similar high yielding road projects in the Menai release and the Gosford Wyong areas.

5.5 Three main questions arise. Firstly, assuming that urban development benefits (or generated traffic benefits) are legitimately ascribed to roads which open up land that would not otherwise be developed, how would the inclusion of such benefits affect the NPV's or BCR's of other road projects? Without access to S.T.S.G. Report No. 151, it is not possible to answer this (and many other) questions accurately as we do not know how generated traffic benefits (which are an alternative measure of the benefits) have been treated. However, it would seem that in general Sydney's arterial road infrastructure does not constrain urban development. Significant development benefits would accrue only to local roads connecting developments to the infrastructure.

5.6 Secondly what weight, if any, should be placed on the measures of traffic need quoted by the DEP? Again lack of access to S.T.S.G. Report No. 151 is a handicap. Without it, it is difficult to understand Table 6 in the DEP's submission which suggests that congestion in such areas as Blacktown, Sutherland and Penrith is significantly worse than in North Sydney, Mosman and Manly. The accessibility indicators in Table 7, the percentage of jobs reached within 40 minutes and the average travel time to work from each LGA, like all such indicators, are poor criteria for the selection of road priorities on efficiency or equity grounds. Accessibility indicators do not provide a measure of the marginal benefit of road investments or allow for relative costs. Consequently they are inconsistent with and inferior to benefit cost criteria. Moreover selection of road schemes on the basis of accessibility indicators encourages inefficient residential location decisions and increases total travel on the road network (which may or may not be undesirable but which is certainly inconsistent with the 'accessibility objective' of reducing average journey to work times). With respect to equity in many cities there is a positive correlation between time taken to work by a given mode and the income of households in the area of origin. Even in Sydney the time taken to work is a crude and inadequate measure of the income level of the commuter (or of his or her household).

5.7 Thirdly and most critically, regardless of the validity or otherwise of the estimated benefit cost ratio of around 9 for the existing road program to the mid 1980's, what is the medium or long term BCR for other road projects? The DEP states that "It is believed that projects in other regions of Sydney would also produce benefit cost ratios of this order (of 9), although this analysis has not so far been systematically undertaken". On the other hand in lieu of detailed work on marginal BCR's, Beesley (1981) draws on South Australian evidence and on a study by the Bureau of Transport Economics which indicate marginal BCR's of the order of 1.6 to 2.0 for urban roads.

5.8 Where does this take us? It seems unlikely that a road project with a benefit cost ratio of 2 would be justified on efficiency grounds out of public funds in the near future. However, if the project were deferred to open in say 1995, the BCR would rise closer to the 2.4 estimated by the DMR. This would appear to make it competitive for public funds. Of course if private finance were available for the freeway, the relevant criterion of viability would be its NPV, not the BCR. On the NPV criterion and on efficiency criteria, the freeway would be justified before 1995. It is necessary now to consider strategic equity and environmental issues which are not fully part of the benefit cost calculation.

Strategic Urban Development Issues

6.1 Numerous reasons have been advanced in favour of the prevailing western oriented urban development strategy for Sydney to the exclusion of further development of Warringah. For completeness I have listed below all the main points although some are discussed in other sections.

6.2 In its submission the DEP argued that because of existing and scheduled land releases, the extent of sunk public investment in urban services and the time required to change the direction of investment in urban services, "the pattern (of development) as projected is at least for the next 10 years or so quite unstoppable". At the hearing, the DEP agreed "that there's no question that it would be possible" to develop on a new front in the 1990's but contended that this would involve dishonouring political commitments.

6.3 The substantive economic issue is one of cost. Given that there is nearly \$100 million worth of unused water and sewerage infrastructure in Menai and Fairfield, the marginal service cost of locating population there is apparently close to zero.¹ Moreover the incremental cost of adding on to these schemes may be low. But

1 DEP Submission, February 1982, p.10.

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this point is not additional to those discussed in section 4. If the development of Warringah takes the place of development elsewhere, the difference in the marginal costs of providing services is taken fully into account in Equation 1. If the marginal water and sewerage costs outside Warringah are say \$2000 per lot rather than the \$8,000 assumed in Table 2, the discounted NPV of developing Warringah in 1991 would be \$182 million compared with the \$295 million shown.¹ However, according to the MWS and DB, there is not much residual capacity in the system and in most growth areas new headworks and systems would be required for both water and sewerage, especially by the 1990's.

6.4 It is argued that development should not proceed on too many fronts and that the rate of sales from the development of Warringah would be slow in such a high priced area. These are again empirical matters. The proposition about the number of fronts reduces to one of costs. That about the rate of sales reduces to one of revenue forecasts. Both are accounted for (in principle) in the assessment in Section 4.

6.5 Financial constraints on capital for land development are also seen as a reason for preferring the less costly western strategy. Using the alternative estimates in Table 2, total development costs would be one third higher in Warringah than elsewhere. Given an absolute budget constraint this would mean that one third fewer lots could be developed, i.e. some 17,040 allotments could be provided in Warringah compared with 22,875 elsewhere. If we allow for this drop in allotment creation, then using Equation 1 the NPV of development of Warringah would fall from \$295 million to \$229 million. The reduction in allotments would also have a minor impact on average house prices in Sydney, which does not affect the estimated NPV but which has equity implications. It should be stressed however that the assumption of a fixed budget makes no allowance for revenue variations under alternative development strategies which is unrealistic.

1 It is perfectly rational to forego income or benefits available at zero outlay for incomes or benefits obtainable only with some outlays. It is the differences between benefits and outlays which matter.

6.6 The issue of access costs to Warringah is of course the central subject of this paper. But there is a separate access issue of historic concern ¹ - the impact of an extra 80,000 people on a second harbour crossing - which requires special attention. The DMR's estimates in Table 1, which assume no second crossing, suggest that the development of Warringah and the construction of the freeway can be justified without a second crossing. This holds even though the extra population in Warringah adds to the congestion on the total road system in Sydney including the Harbour Bridge (compare the user benefits in columns 7 and 8). Logically then the decision whether or not to develop Warringah is independent of a decision on a second harbour crossing. Likewise the second crossing should be justified independently - it could not draw on development benefits ascribed (correctly) to the freeway. In so far as a second crossing would provide additional traffic benefits to Warringah residents (as compared with column 8) a part of the costs should be attributed to these residents. But given rational decision making the extra costs should be less than the additional benefits.

6.7 There would appear to be three possible objections to this conclusion. Firstly, the DMR may have underestimated the system's traffic congestion in case 8 (and thus over-estimated the benefits of development of Warringah) so that a second Harbour crossing would be required to relieve the congestion. Secondly, the DMR estimates make no allowance for the external effects of increased traffic on shopping areas, parking roads, pedestrians etc. around the southern end of the Bridge (if anything the congestion externalities at the northern end should be reduced by the freeway). Thirdly the increase in population in Warringah could add to the political pressures for a second crossing, thus enhancing the possibility that an unjustified crossing would be constructed (i.e. one where costs exceed benefits). While the second point has weight, the first and third points have the unsatisfactory characteristic of presupposing that wrong estimates or decisions are made. On the other hand the cost of a wrong decision could be high and the possibility of it cannot be dismissed out of hand.²

6.8 Continuing the case against Warringah it is argued that even if development was economically feasible, it would have a low priority for environmental and social reasons. Attractive bush and other open space areas would be threatened by the additional population. And socially the area would be too homogeneous and not allow for a mix of socio-economic groups. The land would be too costly

1 It was a point of concern in the Sydney Region Outline Map (1968).

2 Since I wrote the paper, the State Government has announced that it will not construct a second Harbour crossing.

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for development by the Housing Commission. In our view, these points can be exaggerated. Efficient planning can protect the environment and through zoning controls allow for a wide mix of housing sizes and types.

6.9 Undoubtedly a major factor in the western strategy is the desire to develop a "more robust long term structure for the metropolitan region than having yet another part of the city dependent upon the CBD".¹ As the reasons have not been articulated precisely it is not easy to do justice to the argument, but let us consider efficiency reasons first. On efficiency grounds it can be argued that businesses and households do not take account of the pollution and congestion they cause and that planning needs to correct for this to prevent 'over-heating' of the CBD. Furthermore there may be some threshold level of activity required to make sub-regions viable, which would justify subsidising development there. On the other hand there may be positive externalities in concentrated business areas, commonly described as agglomeration economies, and unexploited economies of scale in the provision of urban services in traditionally built up areas. Recognition of this latter possibility is presumably one of the factors behind the current urban consolidation strategy which represents, if not a change in policy, a change in emphasis. Despite the importance of the debate there appears to be little quantified evidence as to whether a dispersed Sydney would be more or less efficient than a concentrated one.

6.10 It is important to put the numbers involved in the development of Warringah in perspective. If the freeway were to proceed it is envisaged that there would be some 100,000 more people in Warringah Manly in the year 2001 compared with 1981. There would most likely be at least 1 million more people in other parts of Sydney by that time.

6.11 The final objection to developing Warringah is one of equity. In part this reflects the general proposition that the dispersed strategy is more equitable than the concentrated one. In part it reflects more specific Warringah related arguments that Warringah is an affluent area and that the freeway would merely augment the residential choices of better off households and enhance the assets of already affluent landowners. These matters are taken up in the next section.

6.12 In summary, ignoring the to-be-discussed equity issues, the reasons advanced for a western oriented development strategy excluding Warringah are either incorporated in the figures (essentially in the costs) estimated in the earlier section on urban development benefits or appear to lack substance. If certain rather unlikely assumptions

¹ DEP evidence, Transcript Nov. 1, p. 32.

about infrastructure costs or financial constraints are maintained, the earlier estimates could overestimate the net benefit of developing Warringah by \$100 million in round figures. The greater the delay in developing Warringah, the smaller any overestimate would be. For the reasons given neither the possible impact of increased population in Warringah on a second harbour crossing nor the slight impact of this population on the concentration of Sydney would (on efficiency grounds) constitute significant arguments against the freeway.

Equity Issues: Principles and Evidence

7.1 Those who favour the WTC have argued broadly as follows. Regardless of the apparent incidence of the benefits and costs of the freeway, there is a sufficient surplus of benefits over costs and its incidence is sufficiently concentrated on certain roads and in certain residential areas for taxes and/or charges to be levied and the freeway to be self-financing. Consequently there would be no inequity relative to the status quo. And indeed, the surplus could provide a future source of funds for redistribution.

7.2 Further to this it is questionable whether each individual DMR project must be equitable (however defined). Rather it may be held that the DMR, or any similar organisation funded from general revenue, should aim to ensure that its total medium term package of expenditures is fair to the community as a whole. It would then be possible for any project taken singly to be inequitable (providing benefits to the rich at the expense of the tax-payer) but for its total program to be fairer with that project than without it.

7.3 This argument may readily be extended to apply to the whole transport program. This would require rail and bus subsidies in addition to road subsidies to be taken into account. Indeed in logic it could apply to the provision of all public goods and services, although the practical implications are daunting.

7.4 If we accept that road or transport programs as a whole should be fair, what do we mean? We mean, I think, that they should not make society more unequal than it would be without the program and that special assistance should be provided to households below some poverty line or suffering from some impediment to mobility. It should be noted that we have not included in these groups of needy households those who are not poor but who have poor road or urban services. It is fundamentally false to judge well-being on the basis of one or even a few items of consumption. If non-poor households choose to consume fewer social services or roads, they benefit by buying cheaper houses and consuming more of other goods. In general it is not more equitable to provide improved roads for average income households who live far from employment than for average income households who live closer to work.

7.5 Those who oppose the freeway would agree that it is not sufficient to consider only the costs and benefits of those directly involved with it. But they would argue that capital funds of the magnitude involved in the WTC and in the development of Warringah should be applied to more urgent needs. It is not sufficient that public expenditure programs be fair in the sense defined above. Rather they should be used actively to promote a general improvement in the distribution of income and services. It is partly on these grounds that the DEP promotes the decentralised western oriented development strategy for Sydney.

7.6 It is, I believe, possible to accept the distributional objectives implicit in the DEP's strategy without endorsing the means. Firstly there are strong cost-effectiveness reasons why transfer payments rather than public expenditure programs should be the principal instruments of distributional policy. The corollary is that service departments like the DMR should aim principally to provide an efficient set of services and that Treasuries and Departments of Social Welfare should be chiefly responsible for ensuring an equitable distribution of income and welfare.¹ The equity principle outlined in 7.4 ensures that the actions of service departments are not inconsistent with the distributional objectives of government. Acceptance of this principle makes possible rational discussion of the equity implications of the DMR program. Disagreement with it make rational dialogue difficult because however equitable the program is, it is always possible to argue that it fails to improve the distribution of welfare sufficiently.

7.7 Secondly, the extent to which the western oriented development strategy assists poor households is questionable. The chief beneficiaries of subsidised urban services are landowners and developers. A few households gain from purchasing below market price housing from the Lands Commission, but these are rarely poor households. Neither poor households in other parts of Sydney nor renting households in western Sydney gain from the western urban development strategy. To some extent these observations reflect the fact that compared with direct payment transfers, public expenditure programs are a crude and expensive way to assist poorer households.

7.8 Following our previous arguments, ideally the equity of the WTC should be assessed as part of the total road or transport program. In this vein the DEP observed that Warringah Manly is already privileged by highly subsidised bus services. On the other hand it has no rail services and households crossing the Harbour Bridge have paid the toll over many years. But no party has attempted to provide this analysis which is beyond the scope of this paper.

¹ The objectives of a coordinating department like the DEP are inevitably less clear cut.

7.9 The argument that the freeway and associated urban development could be self-financing has the attractive attribute that it distinguishes clearly between the initial incidence of the freeway and its final (real) incidence. The major beneficiaries initially will of course be landowners in Warringah, which includes the State Government. These landowners will experience an increase in raw land value of some \$20,000 per lot (at least) which is over \$450 million in total. This figure along with presumably non-subsidised user charges for the provision of urban services would more than cover the cost of the whole development. Thus the project could be more than wholly financed by some combination of betterment levies, service charges and road tolls.¹

7.10 Nevertheless the argument is vulnerable to the charge that the revenues are hypothetical and would never get collected. Thus the TEC argues that a betterment tax would not be practical because it would be too difficult to distinguish between lots which had benefited from the freeway and those which had not.

7.11 Nor does the self-financing argument deal with the many unquantified costs and benefits. It is not possible to do justice to all these here. Clearly households along existing routes will benefit at the expense of households in or close to the new corridor. Extra recreational trippers to Warringah and local businesses in Warringah (neither of which were included in the BCA) will benefit, and so on.

7.12 Of perhaps greater interest and potential concern is the possible impact of the development of Warringah on average houseprices in Sydney, which it is alleged will rise. Related to this it is argued that the development of Warringah will merely add to the residential choices of the rich and subtract from those of the poor. Much depends upon the scenario assumed. Let us assume initially that Warringah development excludes a similar number of houses elsewhere. Then for any given existing distribution of house prices, the development of Warringah would tend to raise average house prices initially. However the impact of an additional 20,000 houses on the average prices of around 1 million dwelling units would be negligible. Moreover, assuming no change in the total number of households there would be as much choice for poorer households as before, as richer households vacate their previous houses. In the longer run, the increase in the average prices would be even smaller, as the presence of these new high priced units in the market would provide a substitute for improvements that would have been made elsewhere. In so far as

1 Note too that if the value of travel time savings is understated, as I believe it is, these surpluses represent a possible additional source of income. However it is important not to double count income from increased land values and from the time savings which create the increase in land values.

development in Warringah increases (or reduces) the total stock of housing available it would tend to lower (or raise) house prices compared with the above scenario.

7.13 What conclusions can we draw? If some part of the freeway can be financed through levies and/or tolls and if the freeway is viewed as part of the DMR's total road program over the next 20 years, a case can almost certainly be made that the freeway would not be unfair (i.e. it would be part of a package which would not adversely affect the existing distribution of welfare). The more the freeway is self-financing, the more true this would be. On the other hand, if the road program is viewed (wrongly I believe) as an instrument of income redistribution policy, most likely more 'equitable' projects could be found. In any event, any simple correlation of a decentralised urban development strategy with reductions in income inequality should be viewed with caution.

Other Issues

8.1 The estimated return of any project depends critically on the selection of the Base Case(s). Do options 1 to 3 represent a fair set of Base Cases? And in particular would it be feasible to attract more employment to Warringah Manly and consequently more population without a new freeway? Almost certainly some such development would be possible. In this case attribution of all development benefits to the freeway is an overestimate of the returns to the WTC.

8.2 One of the arguments put by the CCPA and TEC is that there is too much traffic and that it ought to be restrained. In technical language this translates to the view that the social marginal costs of the traffic exceed the social marginal benefits and that a congestion tax or other form of traffic restraint should be adopted. Many writers have shown (see Abelson 1982) that failure to adopt adequate congestion prices results in an overestimate of traffic infrastructure needs. On the other hand the assumption by the DMR that there will be no congestion pricing leads it to reduce the possible traffic benefits of a six-lane freeway by \$85 million (compare the traffic benefits in options 8 and 7). Thus while the adoption of a congestion price policy on the Harbour Bridge, would defer the need for the freeway, it would probably not reduce the overall case for it.

8.3 Thirdly, are there better upgrade options than columns 4 and 9 (Table 1)? Both contain an array of carefully calculated improvements and it would appear from the thoroughness of the DMR's study that they represent a reasonable set of assumptions. Nevertheless, some optimisation of these options could probably be achieved.

8.4 What about public transport options? The submission by the State Rail Authority (March 1982) indicates that fixed rail alternatives are not economically viable. And the DEP in evidence ¹ states that the taxpayer subsidy for buses to Manly Warringah was of the order of \$12 to 15 million annually and that this represented a very poor result. We argued in section 3 that it would be unrealistic to expect an increase in bus patronage to resolve the transport congestion or to make viable the development of Warringah.

8.5 On the other hand, the DEP contends that it is a matter for concern that the freeway could result in a further erosion of the market for public transport. As the freeway is well placed to service southern Warringah households and to be serviced by the major Brookvale bus interchange, this fear may be exaggerated. It may however turn out that certain bus services are withdrawn to the benefit of the taxpayer but at a cost to non-car owning households.

8.6 Little attention has been paid in this paper to environmental and local issues. In particular no attempt has been made to evaluate the CCPA's proposal that the WTC be incorporated into a national Middle Harbour Park. However, it should be noted that the DMR's evaluation includes a very high opportunity cost for the land in the corridor of nearly \$100 million (when discounted forward to 1991).

¹ Transcript of hearing, November 4, p. 15.

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The DEP, while arguing that the local impacts of the freeway would be negative, concludes that they "pale into insignificance relative to the larger metropolitan issues dealt with elsewhere in this submission."

8.7 Our principal conclusion from this brief review of 'other issues' is that it may be possible to devise a better "Base Case" which allows for some more employment and development of Warringah. This in connection with a congestion pricing policy and possibly some additional minor upgrading of the existing road system could significantly reduce the return to opening the freeway in the early 1990's. More work should be done on these possibilities. But pending the outcome of that work there appears to be no viable alternative to the freeway in the longer run.

Land Use Alternatives for the Corridor

9.1 In all this discussion of freeways it is easy to overlook the fact that the immediate decision is one about land use. On the one hand the WTC could be abandoned and given over to residential development and improved open space. On the other hand the corridor could be reinstated and further development for non-freeway purposes stopped. A similar result could be achieved by a freeze on all development in the corridor under Section 117 of the E.P.A. Act 1979 without the formal establishment of a corridor. Alternatively, minor development could be permitted either within a proclaimed corridor or under a Section 117 order.

9.2 In our view the amount of development to be permitted in the corridor is the central issue and the choice between a corridor and a freeze under Section 117 is secondary. In terms of opportunity costs it is immaterial whether vacant land in the corridor is owned by the public or the private sector. Likewise it matters little whether public or private capital provides housing services in the corridor. While practical matters may incline one to prefer a corridor to an S 117 order or vice versa, we will not debate them here.

9.3 It is important to note that alternative land use decisions have different implications. It would be possible to decide to stop all development for say 5 years and then review the need for a corridor. It would be much more difficult to permit extensive land use developments and then to review or reverse this decision in 5 years time.

9.4 Let us first consider the costs and benefits of a corridor on the assumption that we know the future NPV and opening date of the freeway. Specifically in keeping with earlier discussion, we assume that the NPV of the freeway opening in 1995 would be say \$250 million. This then represents the benefit of the corridor in 1995 compared with its abandonment. It is important to note that this benefit allows for the estimated complete loss of all services from houses and

open spaces in the Corridor from some 7 years before the opening date of the freeway i.e. from 1988 in this example.

9.5 What then are the costs of the corridor? They are the opportunity costs associated with not being able to develop the land in the corridor which would be borne between 1983 and 1988, discounted forward to 1995. According to the DMR submission some 200 more lots could be developed in the corridor and another 30 lots are partially affected. These might be held to have an unexploited raw land residential value of around \$50,000 per lot in 1981 prices.¹ At a real interest rate of 10 per cent, this represents an annual cost of \$5,000 per lot or of \$1.15 million for the 230 lots. Summed over the 1983 to 1988 period and discounted forward to 1995, the cost would be of the order of \$18 million. Added to this should be some element for the opportunity costs associated with the inferior use of open space. Following the relative opportunity cost magnitudes estimated by the DMR in Table 14.1 of their submission, some 20 per cent would be added for open space costs, making the total opportunity cost of the corridor around \$22 million.

9.6 Let us suppose now that the NPV of the freeway is still \$250 million discounted to the opening date, but that it would not open to the year 2000. The costs of the corridor (additional to those included in the NPV calculation) would then be borne over the 1983 to 1993 period. Discounted forward to 2000, the residential and open space opportunity costs would be of the order of \$60 million. The benefit cost ratio of the Corridor compared with no corridor would be around 4 to 1. Clearly the lower the forecast NPV of the freeway and the further off its opening date, the lower would be the benefit cost ratio for the Corridor.

9.7 The above analysis can readily be extended to incorporate the possibility of limited development in the Corridor. For example if it was planned to open the freeway in the year 2000 and thus to start construction around 1993, any development for which the benefits exceeded the costs over the 1983 to 1993 period would be preferred to a complete freeze on land uses.

9.8 It may be argued that the assumption of certainty is unrealistic, which of course it is. Given the dominance of the Corridor over the no Corridor solution this does not matter. Only if the estimated costs and benefits of the corridor were more closely matched would it be necessary to allow for a possible distribution of outcomes. This could be done through the conventional process of attaching probabilities to the outcomes and maximising the expected net present value.

1 It would not be appropriate to base the opportunity cost on the value of the houses constructed because this represents the gross benefit from developing the land rather than the net benefit, which is the house price less building and development costs.

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9.9 It should be added, however, that this procedure does not allow for the gains that can be made from strategies which reduce uncertainty (Hirschliefer and Riley, 1979). It may be better in an uncertain environment to adopt a holding strategy rather than make a decision, such as the abandonment of the Corridor which would be expensive to reverse.

Conclusions

10.1 This paper has examined the major points in the DMR's submission in support of the proposed Warringah Freeway. It argues that the DMR has underestimated the traffic benefits and overestimated the development benefits. The latter overestimation occurs mainly because the development in Warringah is unlikely to be achieved as soon as the DMR forecasts. Possibly also the DMR has underestimated the extra costs of the development of Warringah. Moreover it may be possible to effect some improvement in the Base Case, against which the freeway is compared, by generating more employment in Warringah, by further minor improvements to the existing road system and by a congestion pricing policy.

10.2 Taking these factors into account, the Warringah Freeway opening in the mid-1990's would probably have a net present value of the order of \$200 million to \$300 million. This would represent a benefit cost ratio of around 2, which would make the freeway competitive with other publicly funded road projects.

10.3 The paper argues that there are no compelling urban planning or equity reasons for not constructing the Corridor. There is little evidence that a dispersed Sydney would be more efficient or equitable than a concentrated one. And if the freeway is partly self-financing and viewed as part of the DMR's total road program over the next 20 years, it would not be inequitable.

10.4 The estimated costs of retaining the Corridor for a possible freeway are less than \$1.5 million per annum. Even if the freeway were not opened till the year 2000, these costs would be small compared with the estimated benefits foregone if the Corridor were abandoned. Moreover it would be more costly to reverse a decision to abandon the Corridor than to retain it. It is concluded that retention of the Corridor for a possible future freeway is the correct land use decision.

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