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THE VALUE OF COASTAL LAND: AN APPLICATION OF TRAVEL COST

METHODOLOGY ON THE NORTH COAST OF N.S.W.

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With only minor exceptions, the immediate coastline of N.S.W. is held in trust for the use and enjoyment of the people of N.S.W. and visitors to the State.

An acceptable valuation of this land would assist a wide range of discussions, inquiries, budget and strategy meetings. An important part of any overall valuation would be a measure of the non-market benefits accruing from this resource.

This paper describes a travel cost analysis which utilises a visitor interview survey carried out on the N.S.W. North Coast to estimate the consumer surplus accruing to the visitors. As the perception of scenic, unpolluted beaches combining with a desired climate is found to be the main reason for the visits, (and tourism is the major income generator to the region), the surplus constitutes a major part of the social benefit accruing from that coastline.

### BACKGROUND

With only minor exceptions, the immediate coastline of New South Wales is public land held in trust for the use and enjoyment of the residents of, and visitors to, the State.

Historically the major concern on the New South Wales coastline had been the management of coastal lands in accordance with the hazards associated with climate, coastal recession and navigation into ports and river estuaries.

However, the coastline is now recognised as a limited resource which is very important, not only as a generator of income to the State and National economy, but also as a major contributor to the general well-being of both local residents and holiday makers from near and far.

Similarly, the immediate coastal foreshores are now demanded for a large number of activities, whereas previously the major land uses were associated with the agricultural or fishing industries. Some of the diverse activities that the land is prized for are recreation, residential outlook, mineral sand mining, corporate resort accommodation and building sand extraction, as well as conservation of historic and environmental attributes. The relative value of the coastline for each activity is of major interest in planning.

The development or degradation of this public land interacts closely with the adjacent private lands and the method in which both areas are developed, physically and economically, can have far reaching implications for the nation. Most of the coastal land is Crown reserve. It is administered, managed, and protected by the Department of Conservation and Land Management, usually through incorporated private trusts or local government councils acting as trustees.

The large range of possible uses of coastal land make it difficult to ensure the objective of sustained utilisation whilst also maximising current benefit for the population and so maintaining, or raising, quality of life.

Ascertaining a current value of the resource assists in ensuring that the land is at least being maintained, or the benefit as measured in non market terms is being raised.

The argument has been made that beaches that have a large utilisation by local residents, and less long distance visitors, are as valuable as areas that many long distance travellers enjoy. A counter argument is that concentration of residents or their residences could in fact lower the net social benefit to the State although it might be raising some individual's enjoyment.

Beach maintenance and improvement also pose many questions. On the one hand it can be argued that State and Federal assistance with beach improvement and maintenance is warranted when the value of the facility is greater to visitors, but only local or private funding is warranted where the value mainly accrues to local residents or individual landholders. This opinion is countered by the view that local residents and landholders should maintain the resource as they benefit from money spent by the visitors in the local area adjacent to the facility.

It follows there is a place for economic investigation, especially in the areas of cost benefit analysis and non-market valuation of coastal lands. This data could assist in the planning of development and also establishing appropriate values from which maintenance expenditure levels and targets for financial returns can be established.

To initiate economic analysis on the NSW coastline, the Department of Conservation and Land Management undertook a survey of visitors and residents on the North Coast, New South Wales.

This paper reports a travel cost analysis utilising data from the survey and provides an initial indication of the non market value of three study areas and the annual value of the NSW North Coast.

#### SURVEY OUTLINE

Some reasons why a valuation and particularly careful management are required on the NSW North Coast are;

1. Tourism is vital to the economy of the region, generating over \$662 million in the area<sup>(1)</sup> compared to an estimated \$160 million total gross value of agricultural commodities.<sup>(2)</sup>
2. Outside Sydney, the North Coast has the highest annual increase in population in the State, and excluding international immigrants, its growth rate exceeds that of Sydney.<sup>(3)</sup> There is, therefore, a rapidly increasing pressure on land for all commercial, residential and recreational activities.
3. The area has a warm temperate climate (latitude 28-32°), and relatively low freehold land prices compared to areas to the North and South. It is within easy travelling distance from the major population centres of Sydney, Hunter Valley and Brisbane but without some of the constraints of past development policy or proliferation of permanent structures. These attributes create a potential area of conflict between entrepreneurs considering developments with high profit potential and community pressure for the development style close to the coastline not to follow the pattern of the adjacent coastlines in Southern Queensland or Central NSW.

The initial visitor survey was undertaken in January 1991, the month in which the greatest number of tourists visit the region. Due to financial constraints, areas representing Lower, Mid and Far North Coast were selected, (see Figure.1). Interviewers obtained a total of 544 satisfactorily completed questionnaires, representing 24,772 visitor nights from 53 foreshore areas (only one visitor refused to be interviewed). The survey method, validation of results and some visitor attitudes are described in Pitt (1991)<sup>(4)</sup>.

The data required from the interview by the Department covered a large number of topics, so it was not possible to ask all the questions required for an all encompassing travel cost analysis. The statistics pertaining to travel cost analysis were place of domicile, foreshore being visited, level of holiday expenditure, size of family group and mode of travel. Additional data on length of visit could be fitted to national statistics which enabled those sources to be confidently utilised for extrapolation.

#### METHODOLOGY

To obtain a social benefit value using the travel cost method, the basic assumption is that the cost of travelling to a location influences the quantity of visits from a given population group. The theory of travel cost analysis is outlined in Sinden and Worrell<sup>(5)</sup> and Faber<sup>(6)</sup>.

The method has been widely used to value recreational areas. However, the only known studies of beaches in Australia were of Adelaide metropolitan beaches for the Coastal Protection Board of South Australia<sup>(7)</sup> and Mooloolaba Spit, Queensland<sup>(8)</sup>.

Valuation of a recreational area with travel cost methodology is simplest when there is no resident population in the area and there are no factors other than the recreational experience gained from the area to influence the travellers' choice of holiday venue. These conditions are not met in this instance. Thus, the valuation derived from travel costs of visitors in this study does not describe the full social benefit of the recreational facility. There are a considerable number of other beneficiaries whose enjoyment and utilisation of the coastal lands adds to the total non market value, for example residents' seaview, their use by local sporting and interest groups, etc.

The valuation in this study does give an indication of a minimum value to which additional values can be added as economic analysis of other aspects are undertaken.

The analysis is based on the conventional demand function :

$$Q = f (TC , X_1 \dots X_n)$$

Where Q is the number of visitors to the coastal area by a given sample of the population and TC is the travel cost and  $X_1$  to  $X_n$  are other explanatory variables.

By plotting Q against TC for various groups of visitors from different travel zones, a demand curve is derived. The area under the demand curve describes the consumer surplus associated with a particular venue if the following assumptions are made:

1. That the consumer surplus of the visitor from the closest travel zone is equivalent to the travel cost of the most distant traveller.
2. That all people in a particular zone have the same demand for the same activities at a given cost.
3. That the only difficulty in overcoming distance is the financial cost of the journey.

In other instances, the valuation derived from travel cost analysis could be attributable to a number of resources. However the survey results indicated that over 95% of the visitors being sampled were in the area for a holiday and in all zones the reason that no accommodation was available in an alternative location scored a significantly low response.

The perception of scenic, non-polluted beaches and a pleasant climate were given as the main reasons for choosing the North Coast venues by over 80% of groups. This would suggest that the great majority of consumer surplus calculated in the analysis can be attributed to the coastal lands as opposed to other recreational venues or activities in the region.

#### TRAVEL COST ASSUMPTIONS

Over 91% of visitor groups travelled to the area by private vehicle. When calculated per visitor, the number travelling by other than private vehicle was insignificant. Obviously vehicle costs vary as to the fuel and repair outlay per kilometre, the number of people travelling together and the age of the vehicle. To obtain a standardised vehicle cost, the Government rate for a private medium sized vehicle (52.5c/km) was divided by the average group size, (3.5 visitors over 12 years of age) resulting in a vehicle cost of 15c/km.

Similarly, food, refreshment, and overnight expenses incurred on the journey were standardised to:-

Roadside light refreshment	\$2.50	per visitor
Roadside meal	\$6.00	per visitor
Overnight accommodation & meal	\$25.00	per visitor



Travel cost analysts usually also include the traveller's loss in income as a cost factor. Test surveying indicated that response to an income question would be low and, to ascertain whether the visit was causing actual loss (for example from a closed business) or was allowed for in terms of employment (recreational leave award, etc.) would reduce time available for other questions.

Additional refinement of the value would be obtained if cost of equipment used at the activity venue was included. Recent work suggests a variable be added to the model to allow for the possibility that proximity to preferred recreation sites influences the distance visitors chose to live from that site.<sup>(9)</sup>

It is suggested that by ignoring loss in income and any costs other than those incurred between domicile base and recreational area, the value obtained in this study would represent a minimum value of the recreational area and by adding these travel cost refinements, the value would be elevated.

#### ZONES AND VISITOR NUMBERS

To allow for variations in population densities, the number of visits, (Q), was expressed as a percentage of the population in an area a particular distance from the recreational venue. Populations were calculated by dividing Australia into 35 population areas (e.g. lower Hunter Valley, Blue Mountains, Northern Tablelands) and then grouping the national census data according to those areas.<sup>(10)</sup> Census and survey statistics were adjusted to represent populations over 14 years to be compatible with statistics from the Bureau of Tourist Research (BTR).<sup>(11)</sup>

The distance of each area from the Lower, Mid and Far North Coast sample zones was calculated and the population areas were then grouped into nine zones depending on the one way distance from domicile to coastal venue:-

ZONE	DISTANCE
1	< 100km
2	100 - 300km
3	300 - 500km
4	500 - 700km
5	700 - 900km
6	900 - 1100km
7	1100 - 1300km
8	1300 - 1500km
9	> 1500km

In a similar manner, data from the survey was grouped as to place of domicile in the nine zones, and travel costs (TC) for the nine different zones were calculated (Table 1).

N.S.W. Tourism Commission annual visitor statistics for Greater Taree, Coffs Harbour and Tweed local government areas were divided into monthly quantities using ratios produced by BTR. The January number of holiday visitors was then grouped into the distance zones using the survey ratios (Table 2a, 2b, 2c).

To avoid working with very small figures, Q was expressed as number of visitors per 10,000 population from each zone ( $Q_v$ ).

## ANALYSIS OF RESULTS

Regression analyses were undertaken individually for each sample area and also for the 27 sets of data to represent the North Coast overall.

The most consistent fitting obtained was for the power function model  $y = ax^b$  estimated in its logarithmic form:-

$$\log_e (Y) = a + b \log_e (x)$$

$$\text{i.e. } \log_e Q_v = a + b \log_e (\text{Travel Cost})$$

The estimated consumer demand curves were calculated and were very highly significant both for the individual areas and the overall data, confirming the hypothesis that quantity of visits,  $Q$ , was significantly dependant on travel cost, TC.

The demand curves for the four areas analysed are represented by the equations.

$$\text{Area One (Lower Coast)} \quad Q_{VL} = 907,092 (\text{TC})^{-2.082}$$

$$[ t^{***}, R^2 \ 0.9622 ]$$

$$\text{Area Two (Mid Coast)} \quad Q_{VM} = 9,681 (\text{TC})^{-0.949}$$

$$[ t^{***}, R^2 \ 0.6302 ]$$

$$\text{Area Three (Far Coast)} \quad Q_{VF} = 1,931 (\text{TC})^{-0.796}$$

$$[ t^{**}, R^2 \ 0.4949 ]$$

$$\text{Overall North Coast} \quad Q_{VT} = 20,431 (\text{TC})^{-1.221}$$

$$[ t^{***}, R^2 \ 0.5955 ]$$

Utilising the equations and the travel costs from Table I, corresponding  $Q_V$  values were calculated. The consumer surplus (CS) for visitor groups from each zone was estimated from the area under the curve, making the assumption that the consumer surplus for visitors from greater than 1500 km was insignificant.

The benefit per visitor for each zone was calculated and applied to BTR statistics of numbers of visitors who had visited the region in the month of January. Consumer surpluses calculated from the four demand curves were:

$$CS_L = \$ 3\ 272\ 239$$

$$CS_M = \$12\ 035\ 849$$

$$CS_F = \$ 4\ 398\ 293$$

$$CS_T = \$21\ 969\ 163$$

*The consumer surplus represented by  $CS_T$  was the combined benefit accruing to the estimated number of visitors to the Far, Mid and Lower North Coast sample areas during January, representing an average individual benefit of \$150.85.*

The BTR statistics available indicated a total of 2.858 million people annually visit the local government areas which make up the NSW North Coast. Of the total, approximately 2.08 million were in the region for holiday and family purposes and would, according to the survey sample, benefit from the visitors' perception of scenic beaches, pleasant climate and absence of beach pollution.

*The aggregate non market benefit accruing to visitors to the N.S.W. North Coastline based on the average individual consumer surplus calculated in this study would be \$314 million per annum.*

Because the benefit represents a "whole experience" at a venue, care should be taken when interpreting and extrapolating the values, especially to small linear measurements.

Despite the above cautionary note, the local government boundaries used do not represent some physical "whole experience" boundary, nor are coastlines of similar length. To assist practical comparison and use, the consumer surplus per annum per 100 metres of shoreline was calculated for each of the sample areas;

$CS_L = \$51\ 000$  per 100 metres of coastline per annum.

$CS_M = \$219\ 000$  per 100 metres of coastline per annum

$CS_F = \$69\ 000$  per 100 metres of coastline per annum

#### DISCUSSION

##### 1) Drawbacks

Due to various assumptions, especially that the marginal benefit of the furthest travellers is nil, that visitor numbers from under 100 kilometres were not refined to a very short distance, and that only the benefit accruing to persons aged over 14 years is calculated, the value as calculated will be a minimum estimate.

The survey was restricted by financial constraints to three of the twelve local government areas along the coast. It would be very beneficial if data could be collected for the other local government areas. With additional research funds an improved estimate could be obtained by interviewing visitors at other

times of the year. Whilst those visitors' average consumer surplus might be lower, it could be higher if proportionately more visitors come from more distant locations where the climate in winter might be considered less acceptable than that of the NSW North Coast.

## 2) Applications

The study indicates that a conservative estimate of the non market value of the coastline of the NSW North Coast is in excess of \$314 million per annum. Whether this value should be inflated, or discounted, and over what period, makes a prediction of the long term 'asset' value controversial. Clearly however, the coastline is a valuable resource especially as this visitor benefit is only part of the total value.

The value of individual parts of coastline varies, and actions by individuals or planning authorities can raise or lower this value by making the venues more or less desirable. The survey results indicate that making the surrounds more in line with perceptions of scenic, non polluted beaches and a pleasant climate will increase the value. Development on headlands, rooftops visible from beaches or placement of advertising signs will decrease the value.

It should be noted that whilst the survey indicated a perception of "scenic beaches" would be best described as natural dunes and trees, and rocky headlands, recent research suggests natural should not necessarily be construed as native.<sup>(12)</sup>

Also visitors are seeking the NSW North Coast venues from north Queensland (much warmer) and from south eastern Victoria (much cooler). Care should be taken with each group when projecting an impression of a pleasant climate.

Generally, the supposed value of the coastline, and therefore expenditure on maintenance, has been determined by the revenue raised from accommodation, by visitors expenditure in local outlets or by subjectively considering local community attitudes to hazard and scenic values.

This study suggests the value is not simply in terms of income to the community but there are non market, social benefits running to many millions of dollars, certainly in excess of \$314 million per annum. Authorities should take this into account when allocating maintenance funds. If only 5% of the annual non market value was a justifiable maintenance expenditure, the authorities could spend over \$15 million per annum on maintenance over the 12 local government areas. Maintenance of the asset value would include promotion of visitors perceptions as well as vegetative and structural maintenance.

In this study, the non market value varied from \$219 000 to \$51 000 per 100 running metres of coastline, per annum. Comparison between the different areas valued might not have the simple conclusion that the intrinsic value of parts of the coastline differ substantially. It might suggest the carrying capacity of the coastline is being better utilised in different areas. Alternatively the value of that coastline in terms of social benefit accruing to holiday makers might have been reduced by increasing the benefit accruing to local residents or a smaller number of individuals. Whether the overall net value to the people of Australia is higher or lower in these cases would be an interesting area of future research.

The amount of coastline in each local government area differs and the treatment of areas of national park, state recreation areas or other Crown reserves along the coast could substantially alter the present and future values.

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### CONCLUSION

The study has shown that on the North Coast of NSW the number of visitors is highly significantly related to travel cost. A non market benefit as measured by the consumer surplus of visitors is therefore appropriate.

Whilst an ongoing survey would refine the value, the study conducted in January 1991 suggests a non market value of the coastline of NSW North Coast in excess of \$314 million per annum is realistic. Unlike most other recreation studies using travel cost, the value calculated is only part of the overall value of the coastline resource.

This study was undertaken as a broad pilot investigation and it is hoped generated interest in economic analyses of the coastline and its environment so that more detailed coastal analysis can be carried out, especially regarding the value of public land. This would assist Government at all levels, as well as interest groups, to pin point areas where value can be raised, to justify increased expenditure on maintaining the resource and to plan for the use of the coastline resource and its environment for the best long term benefit, including non market benefit.

By providing a valuation of the coastline, decision makers may also be assisted in evaluating a wide range of proposals and comparing the benefits of those proposals in a quantified manner with the non market benefits, as measured by the consumer surplus of holiday makers from all over the nation.



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FIGURE 1. NEW SOUTH WALES LOCAL GOVERNMENT AREAS.

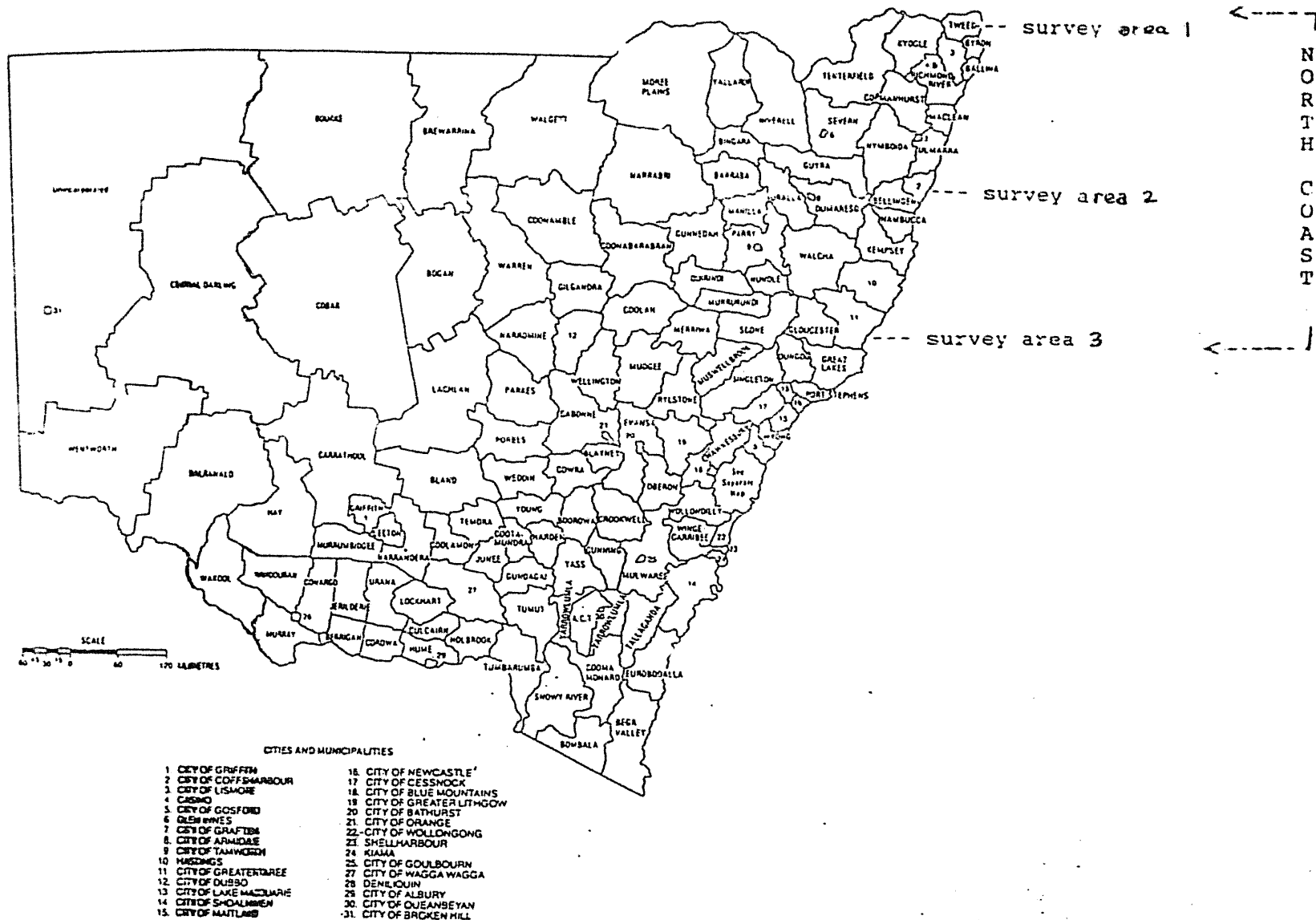


TABLE 1. TRAVEL COST CALCULATION

ZONE ( kms one way )	VECHILE COST ( \$ )	OTHER COST ( \$ )	TOTAL ( \$ )
< 100	21	-	21
100 - 300	60	-	60
300 - 500	120	5	125
500 - 700	180	17	197
700 - 900	240	67	307
900 - 1100	300	72	372
1100 - 1300	360	84	444
1300 - 1500	420	154	574
> 1500	480	200	680

TABLE 2a. CALCULATION OF NO. OF VISITORS PER 10,000 POPULATION ( $Q_v$ )

N.S.W. LOWER NORTH COAST

DISTANCE ZONE	TRAVEL COST	ZONE POPULATION OVER 14 YEARS	VISITORS TO VENUE DURING JANUARY	"Q"	" $Q_v$ "
< 100	21	147,000	17,112	0.1160	1160
100 - 300	60	448,000	9,982	0.0223	223
300 - 500	125	3,445,000	13,984	0.0040	40
500 - 700	197	1,634,000	2,300	0.0014	14
700 - 900	307	488,000	552	0.0011	11
900 - 1100	372	786,000	552	0.0007	7
1100 - 1300	444	2,936,000	874	0.0002	2
1300 - 1500	574	723,000	-	-	
> 1500	680	4,437,000	276	0.00006	0.6

TABLE 2b. CALCULATION OF NO. OF VISITORS PER 10,000 POPULATION ( $Q_v$ )

N.S.W. MID NORTH COAST

DISTANCE ZONE	TRAVEL COST	ZONE POPULATION OVER 14 YEARS	VISITORS TO VENUE DURING JANUARY	"Q"	" $Q_v$ "
< 100	21	94,092	4,902	0.0521	521
100 - 300	60	1,527,684	13,740	0.0090	90
300 - 500	125	497,810	7,7411	0.0155	155
500 - 700	197	3,318,626	21,482	0.0065	65
700 - 900	307	357,390	4,193	0.0117	117
900 - 1100	372	191,981	2,128	0.0110	110
1100 - 1300	444	543,500	1,032	0.0019	19
1300 - 1500	574	2,948,121	4,902	0.0017	17
> 1500	680	5,607,254	4,193	0.0007	7

TABLE 2c. CALCULATION OF NO. OF VISITORS PER 10,000 POPULATION ( $Q_v$ )

N.S.W. FAR NORTH COAST

DISTANCE ZONE	TRAVEL COST	ZONE POPULATION OVER 14 YEARS	VISITORS TO VENUE DURING JANUARY	"Q"	"Q <sub>v</sub> "
< 100	21	903,000	21,651	0.0240	240
100 - 300	60	939,993	4,356	0.0047	47
300 - 500	125	177,647	647	0.0036	36
500 - 700	197	190,491	431	0.0023	23
700 - 900	307	3,054,328	10,919	0.0035	35
900 - 1100	372	764,641	862	0.0011	11
1100 - 1300	444	417,905	647	0.0015	15
1300 - 1500	574	100,017	647	0.0065	65
> 1500	680	8,772,428	2,800	0.0003	3