23

EXTENDED CLEARWAYS - THE ISSUES

CHRISTOPHER HALLAM
ENGINEER
TRAFFIC AUTHORITY OF N.S.W.

A. DIMITRIC
ENGINEER
DEPARTMENT OF MAIN ROADS, N.S.W.

ABSTRACT:

With increasing emphasis on improving the efficiency of a given road system, it is being considered in some States to introduce clearways or zones of 'no parking' extending up to twelve or twenty-four hours. Full consideration must be given to the social and economic costs which would be incurred by commercial premises and homes on such clearway routes. A methodology to evaluate these costs is presented. Evaluations were made on two trial routes, and a sensitivity analysis relating the above costs to changes in vehicle speeds is given. Possible warrants and policies are presented for discussion.

EXTENDED CLEARWAYS - THE ISSUES *

INTRODUCTION

Urban arterial congestion has become a problem of increasing proportions in Australian cities in the last two decades. It was considered by many that an urban freeway construction program would solve these problems. However in a city such as Sydney with extensive nineteenth and early twentieth century land use developments ringing the central business district, such a policy is economically very difficult and socially very disruptive. Transport policy has thus shifted from a construction emphasis to a Transport System Management emphasis. The objective of such a policy is to co-ordinate the individual transport elements through operating, regulatory and service policies so as to achieve maximum efficiency and productivity for the system as a whole. Techniques used to achieve this objective include traffic signals -isolated and co-ordinated -, tidal flow operation of roads, bus and transit lanes, bus priority at signals, toll policies and parking policies. An often used parking technique is to declare a section of road a Clearway, prohibiting vehicles (other than buses and taxis) from stopping during nominated hours. To date, hours of operation have generally been during peak-periods only. There are exceptions in Perth, where some arterial routes are designated ' no parking any time'. These effectively operate as 24 hour Clearways.

REVIEW

While qualitative judgements indicate the value of Clearways, there is an absence of quantitative information proving either their benefits or disbenefits. A literature review yielded only five reports on Clearways, all dealing with peak-hour Clearways. The earliest report, by Newby (1959), found no significant change in the accident pattern caused by the introduction of Clearways on sections of roads in south-east England. Pak-Poy (1963) reported on peak-period parking bans on the Anzac Highway, Adelaide. The only result of statistical significance was a marginal reduction in travel time. The first Sydney Clearways were proclaimed in 1967. The Department of Main Roads (1969) monitored the operation of five peak-period Clearways; Parramatta Road, Victoria Road, Princes Highway, Oxford Street and Military Road. In summary, it was found that the Clearways provided a smoother flow of traffic and generally increased traffic volumes without significantly reducing travel times. Over the Parramatta and Victoria Road routes, there was a mean capacity increase of 8.0%. McSusky and Richbell (1970) studied the effect of peak-period 'Urban Clearways' in Sheffield, England. (An 'Urban Clearway' is defined as a 'clearly defined route subjected to restrictions on waiting, loading and the picking up and setting down of passengers (limited to two minutes)'). They found a significant increase in mean vehicle speed (+14%) and a non-significant increase in capacity (4%). There was a 12%

---

* The views expressed in this paper are those of the authors and do not necessarily represent the views of the Traffic Authority of N.S.W. and the Department of Main Roads, N.S.W.

reduction in the number of reported accidents, but in view of accident trends and controls, this was not considered statistically significant. Cameron, Crinion and Summers (1974) reported on the operation of four sections of peak-period Clearways in Adelaide. No significant change in capacity was found. Driving difficulty was monitored by measures of acceleration noise, heart rate, respiration rate and secondary task performance. There was no significant difference between the 'before' and 'after' periods in these measures. Overall, there was a marginally significant increase in accident occurrence. A relevant point in their report, however, was: 'The most likely reason for a failure to show beneficial effects is that there was no problem in the first place. Average speed over the 32 km test route was approximately 38 k.p.h.'

These results show the complex interaction between the supply (capacity) and demand on the road system and the resultant travel time through the system. They also point out the deficiency in accurate quantitative information on an important and politically sensitive traffic management technique.

Current research by the Traffic Authority of N.S.W. seeks to evaluate the social and economic costs and benefits of Clearways extended in time. Current Clearway hours in New South Wales are 6.30 - 9.30 am and 3.30 - 6.30 pm. The extended Clearway period studied was 6.30 am - 6.30 pm. Work has also been done on possible extended Clearway implementation policies and warrants. Conclusions have not been reached in this part of the research, but suggestions are put as to possible policy directions. The research to date has been carried out be Traffic Authority Secretariat staff and by staff from the consultant firm of W.D. Scott & Co. Pty. Ltd.

BENEFITS

A number of interviews were conducted with various organisations reflecting interests affected by Clearway operations. Special discussions were held with the N.S.W. Police Traffic Branch, the Road Transport Association of N.S.W., the Transport Worker's Union (N.S.W.), the N.R.M.A., representatives of the N.S.W. Chambers of Commerce and Industry and several Councils. Extensive samples of shop-keepers and shoppers were interviewed, and discussions were held with residential groups.

The perceived community benefits from Clearways are gained in the form of

- -Reduced travel time.
- -Reduced vehicle operating costs.
- -Reduced accidents.

As pointed out in the REVIEW, a generally applicable quantification of the changes in these parameters has not been able to be made to date.

EXTENDED CLEARWAYS - THE ISSUES

DISBENEFITS AND COSTS

The major perceived community disbenefits from Clearways are as follows:

Commercial Areas

- -Increased costs associated with delivery of goods.] if off-street loading and unloading facilities not available
- -Increased costs associated with despatch of goods.]
- -Increased costs to salesmen and business representatives in walking time.
- -Increased costs to shoppers in walking time.

While most shopkeepers saw Clearways being responsible for a loss in turnover and thus in profit, the total community disbenefit is zero, since the purchases from one area will transfer to another area. It thus becomes an equity issue for the individual shopkeepers affected.

Residential Areas

- -Problems of private car parking for residents and visitors.
- -Problems of delivery, particularly infrequent deliveries of heavy items.
- -Problems of putting down and picking up passengers, particularly schoolchildren.
- -Possible increases in rear end collisions with residents vehicles when entering driveways.

An evaluation model to quantify these disbenefits is presented.

Costs

The direct costs of Clearways are as follows:

- -Installation and maintenance of signs and pavement markings.
- -Acquiring and developing land for off-street parking, where essential.
- -Provision of rear access and loading facilities for commercial premises.
- -Any roadworks related to the efficient functioning of the traffic system after the introduction of the Clearway.
- -Enforcement of Clearway restrictions.

LEGAL ISSUES

An analysis of the relevant State laws (Pure Food Act 1908 - 1953 and associated Regulations and the Motor Traffic Act and associated Regulations, 1909 (amended)) revealed no specific problem with extended Clearways in relation to the unloading of goods. The Transport Industry (State)

award is more restrictive. This award specifically restricts the hours of work under day (non-penalty) rates to an eight hour day from between 7.00 am to 5.30 pm (or from 6.00 am to 4.30 pm for employees carting fruit and/or vegetables). There could therefore be conflicts in arranging deliveries outside the proposed extended Clearway hours of 6.30 am to 6.30 pm.

EVALUATION MODEL

Pickup and Delivery Costs

Data was collected from the shopkeeper survey which enables an estimate to be made of the number of visits by pickup and delivery vehicles, and by salesmen. This was classified into generation rates for seven classes of premises, j1 - j7:

- j1 - variety, liquor, supermarket, food stores.
- j2 - clothing, footwear, fabric stores.
- j3 - furniture, floor coverings, household textiles stores.
- j4 - hardware building products, electrical stores.
- j5 - chemists, booksellers, newsagents, photographic, florists, jewellers, music and sporting goods stores.
- j6 - estate agents, dry cleaners, financial, professional and other business services.
- j7 - service stations and automotive sales and repairs.

The analysis can be carried out for different periods of the week, k:

k=1	Weekdays -	9.30 am - 3.30 pm
k=2	Weekdays -	before 9.30 am
k=3	Weekdays excl. Thurs. Fri. -	after 6.30 pm
k=4	Thursday -	after 6.30 pm
k=5	Friday -	after 6.30 pm
k=6	Saturday -	before 12.30 pm
k=7	Saturday -	12.30 pm - 6.30 pm
k=8	Saturday -	after 6.30 pm
k=9	Sunday -	all day

The total cost per year deriving from pickup and delivery vehicles, PUDCST, is defined:

$$PUDCST = \Sigma\ (j,k)\ NOACC\ (j) \times [NUMDEL\ (j,k) \times CDEL + NUMPUM\ (j,k) \times CPUP]$$

where

NOACC (j) = the number of premises of type j which have no off-arterial access for pickups and deliveries. (i.e. no rear lane or side street). This is estimated on site.

NUMDEL (j,k) = the annual number of delivery calls per premise of type j per hour of Clearway, for the time periods k.

NUMPUP (j,k) = analogous to NUMDEL (j,k) for pickup calls or despatches from premises.

CDEL = the average delay cost per delivery call.

CPUP = the average delay cost per pickup call.

Tables 1 and 2 show the values of NUMDEL and NUMPUP as derived from the shopkeeper survey. For values of k greater than 5, NUMDEL and NUMPUP are assumed to be zero.

TABLE 1
Values of NUMDEL (j,k)

j \ k	1	2	3+4+5
1	556	223	-
2	344	19	-
3	312	133	28
4	835	240	-
5	478	147	38
6	135	54	-
7	955	269	48

TABLE 2
Values of NUMPUP (j,k)

j \ k	1	2	3+4+5
1	127	56	6
2	25	6	6
3	181	15	15
4	236	148	7
5	99	99	35
6	77	19	-
7	444	228	31

CPUP and CDEL have two components, vehicle depreciation and interest, and vehicle occupant time cost, each dependent on the delay time. The appendix tabulates vehicle operating costs and occupant time costs. Assuming 75% of pickup and delivery vehicles are light trucks and 25% are heavy trucks,

total vehicle cost = $6.60 per vehicle hour.

The delay time is dependent on the numbers of loading/unloading trips. An average of 3 trips for deliveries and 6 trips for despatches is assumed, at an average walking speed of 6,000 metres per hour. CPUP and CDEL then become:

CPUP = 1.32 x PDIST (cents)
CDEL = 0.66 x PDIST (cents)

where
PDIST = average distance between the front of a group of premises without off-arterial access, and the nearest side street available for parking, (metres) as measured on site.

Sales Representative Costs

The total cost per year of a Clearway extension deriving from sales representatives and other business visitors, REPCST, is given by

$$REPCST = \Sigma\ (j,k,)\ x\ NOACC\ (j)\ x\ NUMREP\ (j,k,)\ x\ CREP$$

where
NOACC (j) = previously defined.
NUMREP (j,k,) = the annual number of business calls per premise of type j for the time period k.
CREP = the average delay cost per business call.

Table 3 shows the assumed values of NUMREP as derived from the shopkeeper survey. NUMREP is assumed to be zero for k greater than 5.

TABLE 3
Values of NUMREP (j,k,)

j \ k	1	2	3+4+5
1	208	16	-
2	234	16	-
3	241	-	-
4	516	21	-
5	356	32	5
6	251	45	-
7	413	29	29

As for CPUP and CDEL, CREP has two components, vehicle depreciation and interest, and vehicle occupant time cost, each dependent on the delay time. For business cars and occupants,

total vehicle cost = $10.38 per vehicle hour.

The number of walk trips per call is assumed to be 1. The nett extra walking distance, RDIST, is defined as

RDIST = PDIST + (PERIM/2)

where
PDIST = as previously defined.
PERIM = the distance along side streets between the arterial

and the perimeter of parking for the shopping centre. This is measured on site. Where the perimeter occurs is a judgmental assessment

Again with a walking speed of 6,000 metres/hour and the above factors, CREP becomes

CREP = 0.346 x RDIST (cents).

Shopper Costs

Shoppers and customers of business premises will suffer extra walking distances resulting from the displaced parking spaces. The total cost of this is a function of the size of the centre, i, and the period of the day, k. Categories of i are defined:

i=1 - 1 to 4 enterprises
i=2 - 5 to 15 enterprises
i=3 - 16 - 40 enterprises
i=4 - 41 - 200 enterprises
i=5 - over 200 enterprises

The total annual cost to customers of business premises who would use the displaced spaces is given by

$$CUSCT = \Sigma (k)\ NSPACE \times HOURS (k) \times NUMCUS (i,k) \times CCUS (i,k) \times DAYS (k)$$

where

NSPACE = the number of parking spaces (including loading zones, etc.) on the arterial and within the boundary of a shopping centre which will be displaced. This is measured on site. Where spaces not individually marked, assume 6 metres per space.

HOURS (k) = the number of hours per day by which the Clearway will be extended, during each time period (k).

NUMCUS (i,k,) = the number of customers who would have used that space in a one-hour period, for centre size i and time period k.

CCUS (i,k) = the average cost per customer of the delay resulting from displacement of the space, for centre size i and period k.

DAYS (k) = the number of days per year that the extended Clearway will be in operation for each time period k, shown in Table 4.

Numcus (i,k) is derived as follows:

$$NUMCUS (i,k) = 60 \div TIME (i,k) \times [1 - VAC (k)] \times OCC (k)$$

where

TIME (i,k) = the average length of stay, in minutes, for centre size i and period k, shown in Table 5.

VAC (k) = the observed vacancy factor for period k: this is equal to the number of vacant arterial spaces (excluding loading zones, etc.) divided by NSPACE.

OCC (k) = the average number of adult occupants per vehicle, for the period k, shown in Table 6.

The nett extra walking distance CDIST (k) is equal to the distance from the arterial to the perimeter of parking for the centre plus one-eighth of the average block length, BLOCK, which is measured on site:-

$$CDIST\ (k) = PERIM\ (k) + 0.125 \times BLOCK$$

This is obtained from averaging the different walk distances between parking on the arterial and having to park on the side street. At a walking speed of 6,000 metres per hour and a private time cost of $1.55 per hour, CWALK (k) becomes

$$CWALK\ (k) = 0.051667 \times CDIST\ (k)\ \text{(cents)}$$

CCus (i,k) is derived from CWALK (k) by adjusting for the proportion of shoppers, PDIVRT (i) who will be diverted from the centre by displacement of the arterial spaces, to another centre. For the shopper transferring to a different centre, their average walk cost penalty will equal half the penalty for those shoppers who remain, since their cost penalty will vary from 0 to CWALK. PDIVRT (i) was derived from the survey and values are given in Table 7. Thus CCUS (i,k) is given by

$$CCUS\ (i,k) = PDIVRT\ (i) \times CWALK\ (k) \div 2 + (1-PDIVRT\ (i)) \times CWALK\ (k)$$

TABLE 4
Values of DAYS (k) (days)

k	DAYS	k	DAYS
1	250	6	50
2	250	7	50
3	150	8	50
4	50	9	50
5	50		

TABLE 5
Values at TIME (i,k) (minutes)

k \ i	1	2	3	4	5
1	20	40	45	60	60
2	10	10	20	20	20
3	120	120	120	120	120
4	20	40	45	60	60
5	120	120	120	120	120
6	20	40	45	60	60
7	10	10	20	20	20
8	120	120	120	120	120
9	10	10	20	20	20

TABLE 6
Values of OCC (k) (persons)

k	OCC	k	OCC
1	1.02	6	1.60
2	1.00	7	1.20
3	1.60	8	1.60
4	1.60	9	1.20
5	1.60		

TABLE 7
Values of PDIVRT (i) (percent)

i	1	2	3	4	5
PDIVRT	54	22	16	10	8

Shopkeeper Costs

The loss in turnover of shopkeepers on Clearways can be estimated, though it should be remembered that this is a separate equity issue and does not enter the overall benefit-cost analysis. The proportion of total adult shoppers diverting to a different centre, PTURN (i), was found from the surveys and values are listed in Table 8.

TABLE 8
Total shoppers diverting to different centre (percent)

i	1	2	3	4	5	TOTAL
PTURN%	5.7	2.9	2.8	1.6	0.6	1.8

The shopper survey indicated that shoppers who would divert stayed an estimated 36 minutes in the centre, compared with an estimated 70 minutes for all shoppers. It would therefore be reasonable to assume that the amount spent by diverted shoppers would be much less than the average for all shoppers. Since a correction factor for this was difficult to quantify, a rough estimate for loss of turnover, TNVCST, -and because of the above, an over-estimate - can be obtained from the relation

$$TNVCST = \Sigma\ (j)\ NPREM\ (j) \times PQ1\ (j) \times PTURN\ (j)$$

PQ1 (j) = the average turnover per store. Estimates of this were obtained from the Australian Bureau of Statistics and are listed in Table 9.

TABLE 9
Average annual turnover per premise (j): June 1977

j	1	2	3	4
PQ1 (j) $	150,000	160,000	250,000	240,000
j	5	6	7	
PQ1 (j) $	140,000	40,000	540,000	

Costs in Residential Areas

It is considered that a form of licensing provision should be made for the irregular delivery of heavy goods, moving vans, etc. The scale of economic disruption that would be caused by regular light delivery services (milk, bread, garbage etc.) is small and of no overall significance.

The total cost of residents being forced to use a side street for parking where they would otherwise have parked on the arterial, RESCT, can be estimated from the relationship:

$$RESCT = \Sigma\ (m)\ MPARK\ (m) \times \frac{BLOCK}{2} \times 0.0465$$

where
MPARK (m) = is found from the summation of the number of residences per block which have zero, one, two, three and four off-street parking spaces, OPARK (0-4), calibrated by data found in the survey:

MPARK (m) = Σ(m) OPARK (0) x 1200 + OPARK (1) x 600 + OPARK (2) x 220 + OPARK (3) x 80 + OPARK (4) x 50

Average walking cost is $1.55 per hour x 1.8 occupants per car ÷ 6,000 metres per hour = 0.0465 cents/metre.

Trial Applications

The total disbenefits (costs) TOTCST, are thus given by

TOTCST = PUDCST + REPCST + CUSCST + RESCST

Two sections of road were chosen as trial applications of the evaluation model and data collection process.

The trial applications were for an extension of Clearway hours 9.30 a.m. and 3.30 p.m.

Liverpool Road, Ashfield

Liverpool Road, between Parrramatta Road and Milton Street, a length of 2.2 km, was studied. It currently has a Clearway proclaimed in the periods 6.30 - 9.30 a.m. and 3.30 - 6.30 p.m. in both directions. The section includes Ashfield shopping centre, an older style of commercial strip development, and some residential area.

A substantial proportion of commercial premises (90%) had, or could have, access for pickups, deliveries and business representatives other than through the front door. Consequently the costs PUDCST and REPCST are comparitively small. The number of displaced parking spaces, NSPACE, in the Ashfield shopping centre would not be large (94) and the distance to the perimeter of parking is normally less than about 200 metres. Thus the cost CUSCST is comparatively small. Residential premises generally had off-street parking for only one vehicle. Thus there is a moderate inconvenience cost to residents, RESCST. The values are listed in Table 10.

TABLE 10
Summary of Costs, Ashfield

Category	PUDCST	REPCST	CUSCST	RESCST	TOTCST
Cost $	1,920	2,120	8,960	8,070	21,070

An estimated average cost to convert premises to rear access is $1,000 per premise, for a total capital cost of $160,000.

Vehicle volume, speed and classification data was obtained for the period 9.30 am to 3.30 pm for both directions of travel on the trial route. Assumptions made were:

- Floating car travel times are approximately the same as truck and bus travel times.
- Vehicle occupancies are the same as general rates previously obtained.
- 10.8% of cars are business cars (from registration records.)

The weekday vehicle operating plus person time cost was $5,086, which is $1,271,427 per annum (250 work days). A sensitivity analysis can be performed to see what reduction in vehicle speed would be required to balance the cost TOTCST ($21,070) and rear loading capital cost ($160.000) of the extended Clearway. Amortising the rear loading capital cost over 5, 10, 15, 20 years, at 10% and 12% interest, to balance the total costs, mean speed would have to increase by the amounts shown in Table 11.

TABLE 11
Mean Speed Increase to Balance Costs (percent)

Interest \ Years	5	10	15	20
10 %	5.0	3.7	3.3	3.1
12 %	5.2	3.9	3.5	3.3

Samples of travel times were obtained in the evening peak-period, during current Clearway hours, for comparison with those obtained off-peak. While the sample sizes are not sufficient for a statistical analysis to be made, and they are of course for different periods and volumes, comparison of the figures is interesting, see Table 12.

TABLE 12
Mean Speed (k.p.h.)

Period / Direction	12.30 - 3.30 pm	3.30 - 5.30 pm	DIFFERENCE
INBOUND	24	34	+ 41.7 %
OUTBOUND	23	24	+ 4.3 %

Parramatta Road, Leichhardt

Parramatta Road, between Old Canterbury Road and Pyrmont Bridge Road, a distance of 2.2 km, was studied. It currently has a Clearway proclaimed in the periods 6.30 - 9.30 am and 3.30 - 6.30 pm in both directions. This section of road is comprised mainly of the Leichhardt shopping centre, a very old commercial strip development.

A substantial proportion of the premises had, or could have, rear access. (83%). Consequently PUDCST and REPCST were comparitively small in relation to the size of the Leichhardt centre. A relatively large number of parking spaces (424) would be displaced. This is offset by a relatively high observed vacancy factor (58%). However the distance to the perimeter of parking is quite large - around 400 metres on the north side and 250 metreson the south side. This leads to a fairly high value for CUSCST. Residential costs are insignificant due to the almost complete absence of residential buildings on the trial section. The values are listed in Table 13.

TABLE 13
Summary of Costs, Leichhardt

Category	PUDCST	REPCST	CUSCST	RESCST	TOTCST
Cost $	16,990	15,210	47,090	410	79,700

At $1,000 per premise, the total cost of converting all premises to rear access is $300,000.

As in the Ashfield trial, vehicle volume, speed and classification data was obtained for the period 9.30 am to 3.30 pm for both directions of travel.

The weekday vehicle operating plus person time cost was $9,921, which is $2,480,330 per annum. To balance the cost TOTCST ($79,700) and rear loading capital cost ($300,000) would require speed increases of the sizes listed in Table 14.

TABLE 14
Mean Speed Increase to Balance Costs (Percent)

Interest \ Years	5	10	15	20
10 %	6.4	5.2	4.8	4.6
12 %	6.6	5.4	5.0	4.8

Samples of travel times were obtained in the evening peak-period, during current Clearway hours, for comparison with those obtained off-peak. The sample sizes are not sufficient for a statistical analysis to be made, however comparison of the figures is of value. See Table 15.

TABLE 15
Mean Speed (k.p.h.)

Direction \ Period	12.30 - 3.30 pm	3.30 - 5.30 pm	DIFFERENCE
INBOUND	18	32	+ 77.7 %
OUTBOUND	21	29	+ 38.1 %

WARRANTS

The only Clearway warrant currently available is the ACORD warrant of 800 vehicles per hour per trafficable lane. Ideally a warrant for extending Clearway operations should incorporate means of assessing the social and economic costs. However the evaluation model presented above is site specific and does not lend itself to generalisations. A screening method is needed to identify potential extended Clearway routes, so that detailed analyses can be made on these routes. A suggested screening method based on the traffic volumes is to list routes for detailed analysis where they have a volume of 600 or more vehicles per hour per trafficable lane over 80% or more of the hours of the total suggested Clearway restrictions. Thus 24 hours volume distributions per direction per point on route would first be obtained. If the suggested Clearway restrictions are 6.30 am - 6.30 pm, then at least 80% of the twelve one-hour periods must have at least 600 v.p.h. per trafficable lane.

Twelve major arterial routes in Sydney currently with peak-period Clearways were studied. Twenty-four hour volume counts were obtained over a total of 69 points on these routes, and the volume criterion applied. This criterion was met for a total of 65 km on sections of these routes, when considering a Clearway 6.30 am - 6.30 pm. On this 65 km, the cost of acquiring land and construction two additional lanes would be approximately $295 million.

POLICIES

Introduction policies have not been finalised by the Traffic Authority. Satisfactory policies are particularly difficult to arrive at, given their political impact. The logical procedure to develop a policy is to start with a draft policy for discussion. Such a draft policy is outlined below. It is emphasised that this is one person's suggestion, rather than a draft policy of the Traffic Authority. It relates to the implementation of a 12 hour Clearway (6.30 am - 6.30 pm) over a three year period on routes selected.

Draft Extended Clearway Introduction Policy

0 - 18 months

(a) Goods deliveries

- Provide 'No Parking' zones for loading and unloading of goods. Number or length of zones to be strictly determined by current requirements. (An alternative would be to provide 'Lorry Zones' in lieu of 'No Parking' zones, once legislation is completed.)
- Where rear lane access is available, subsidize shopkeepers for a percentage of the cost of capital works to provide rear loading facilities. (An alternative would be to subsidize shopkeepers a fixed sum).

- Where rear lane access is not available, first subsidize Councils for a percentage of the cost of providing rear lane access, and then subsidize shopkeepers for rear access as per above.

(b) Parking in shopping centres

- Declare 'No Parking' on one side of the street for the period 9.30 am - 12.30 pm. Declare 'No Parking' on the other side of the street for the period 12.30 pm - 3.30 pm.

- On sections and at times not covered by 'No Parking', introduce 'One Hour or 30 Minutes Parking', as per current parking demands, while at the same time providing for sufficient 'No Parking' (or Lorry Zones') for loading, unloading of goods, as mentioned in (a).

- Sections with no parking demand currently, to be proclaimed 'No Standing'.

Introduce 'Two Hour Parking' on all side streets. Lengths of zones to be determined by current arterial road parking which will be displaced by the ultimate introduction of the Extended Clearway.

(c) Deliveries and visiting in residential areas

- Authorise exemptions for perishable and heavy deliveries. Types and times of exemptions to be strictly controlled. (Perhaps by local Police Station).

- Otherwise, 'No Standing' imposed on both sides of street.

- No restrictions on side streets initially.

18 - 36 months

(a) Goods deliveries

- As rear facilities are provided in a block section, replace that section's 'No Parking' zone (or 'Lorry Zone') with a 'No Standing' zone.

(b) Parking in shopping centres

- Impose 'No Standing' on both sides of the road during both morning and afternoon except for 'No Parking' zones (or 'Lorry Zones') for loading/unloading. These to be phased out as in (a) above.

- Restrict side street parking to a mixture of 'One Hour' and 'Two Hour' zones in the zones where there was 'Two Hour' parking in first 18 months.

(c) Residential areas

As in 0 - 18 months, with the addition that the need for residential parking schemes on side streets is to be investigated if necessary.

36 months

- Introduce Clearway on both sides of road 6.30 am - 6.30 pm, allowing authorised exeptions for deliveries as in (c).

CONCLUSION

The issues affecting extended Clearways have been discussed and an evaluation model for the social and economic disbenefits has been presented. Draft warrants and policies have been presented for discussion. It is hoped that policies will be developed as soon as possible to enable the implementation of this important transport system management technique to proceed.

APPENDIX

Vehicle Operating Costs

The costs used were first developed for 1973/4 conditions from a number of sources, principally Bayley and Both (1976). These were updated for 1976/77 conditions by means of unpublished cost components provided by the Commonwealth Bureau of Roads. Costs are listed in Tables A1 to A6 below.

TABLE A1
Costs (excl. taxes) in cents/vehicle km 1976/77
Cars, Station Wagons Utilities, Panel Vans

SPEED KPH	FUEL	OIL	TYRES	R&M	D&S	TOTAL
10	4.50	0.07	2.21	5.63	0.97	13.38
15	3.08	0.07	1.55	3.86	0.97	9.53
20	2.34	0.06	1.18	2.93	0.97	7.48
25	1.92	0.06	0.94	2.41	0.97	6.30
30	1.63	0.06	0.81	2.05	0.97	5.52
35	1.44	0.06	0.70	1.81	0.97	4.98
40	1.29	0.06	0.63	1.61	0.97	4.56
45	1.18	0.06	0.57	1.47	0.97	4.25
50	1.08	0.06	0.52	1.36	0.97	3.99
55	1.01	0.06	0.48	1.27	0.97	3.79
60	0.91	0.06	0.46	1.14	0.97	3.54

TABLE A2
Costs (excl. taxes) in cents/vehicle km 1976/77
Light Trucks and Vans

SPEED KPH	FUEL	OIL	TYRES	R&M	D&S	TOTAL
10	6.06	0.48	4.97	9.77	4.47	26.29
15	4.84	0.32	3.37	6.63	3.61	18.41
20	3.42	0.25	2.56	5.07	3.18	14.48
25	2.77	0.20	2.10	4.10	2.92	12.09
30	2.34	0.17	1.77	3.48	2.75	10.51
35	2.06	0.14	1.55	3.06	2.63	9.44
40	1.82	0.13	1.38	2.70	2.54	8.57
45	1.64	0.12	1.23	2.42	2.46	7.87
50	1.51	0.10	1 12	2.23	2.41	7.37
55	1.40	0.10	1.05	2.06	2.36	6.97
60	1.28	0.09	0.96	1.89	2.32	6.54

TABLE A3
Costs (excl. taxes) in cents/vehicle km 1976/77
Buses

SPEED KPH	FUEL	OIL	TYRES	R&M	D&S	TOTAL
10	10.13	0.87	3.51	7.85	9.80	32.16
15	7.11	0.59	2.47	5.52	7.98	23.67
20	6.13	0.52	2.14	4.75	7.12	20.66
25	5.10	0.44	1.86	3.95	6.58	17.93
30	4.41	0.38	1.54	3.42	6.11	15.86
35	3.96	0.33	1.38	3.07	5.93	14.67
40	3.59	0.30	1.25	2.79	5.74	13.67
45	3.29	0.29	1.25	2.54	5.54	12.86
50	3.08	0.26	1.06	2.37	5.47	12.24
55	2.88	0.25	1.00	2.23	5.35	11.71
60	2.72	0.23	0.95	2.11	5.33	11.34

TABLE A4
Costs (excl. taxes) in cents/vehicle km 1976/77
Heavy Traffic

SPEED KPH	FUEL	OIL	TYRES	R&M	D&S	TOTAL
10	11.54	0.93	5.41	10.40	9.05	37.33
15	8.45	0.68	3.94	7.61	7.36	28.04
20	6.80	0.55	3.20	6.11	6.52	23.18
25	5.77	0.46	2.72	5.20	6.01	20.16
30	5.15	0.42	2.43	4.64	5.68	18.32
35	4.74	0.38	2.23	4.26	5.44	17.05
40	4.53	0.36	2.13	4.08	5.25	16.35
45	4.12	0.33	1.93	3.72	5.11	15.21
50	3.91	0.32	1.84	3.53	5.00	14.60
55	3.91	0.32	1.84	3.53	4.91	14.51
60	3.71	0.30	1.75	3.35	4.83	13.94

TABLE A5
Costs (excl. taxes) in cents/vehicle km 1976/77
Semi-Trailers

SPEED KPH	FUEL	OIL	TYRES	R&M	D&S	TOTAL
10	13.12	1.00	9.02	11.52	11.37	46.03
15	9.46	0.73	6.44	8.31	9.48	34.42
20	7.74	0.59	5.34	6.81	8.54	29.02
25	6.67	0.51	4.60	5.87	7.97	25.62
30	6.02	0.46	4.23	5.30	7.60	23.61
35	5.38	0.41	3.68	4.72	7.33	21.52
40	5.16	0.39	3.50	4.53	7.13	20.71
45	4.73	0.36	3.31	4.15	6.97	19.52
50	4.52	0.35	3.13	3.97	6.84	18.81
55	4.30	0.33	2.94	3.78	6.74	18.09
60	4.09	0.32	2.76	3.59	6.65	17.41

TABLE A6
Travel Time Costs 1976/77

Vehicle Type	Value of travel time savings per person per hour	Vehicle Occupancy Rate	Value of travel time savings per vehicle hour
Private car etc.	$1.55	1.2	$ 1.86
Business car etc.	$7.21	1.4	$10.09
Light truck and van	$4.37	1.3	$ 5.68
Heavy truck	$3.99	1.3	$ 5.19
Semi-trailer	$5.51	1.0	$ 5.51
Bus crew	$3.51	1.2	$ 4.21
passengers	$1.55	20.0	$31.00
Total			$35.21

Accident Costs

Accident costs for 1976/77 are:

- fatal accidents $129,000
- personal injury accidents $ 5,260
- property damage accidents $ 800

REFERENCES

Bayley, C. and Both, G.J. (1976) "Evaluation Procedures for Urban Arterial Road Projects", A.R.R.B. Proceedings, Volume 8.

Cameron, C. Crinion, J.D. and Summers, J.A. (1974) "An Evaluation of Clearway Operation", A.R.R.B. Proceedings, Volume 7.

McSusky, A.R. and Richbell, L.E. (1970) "Sheffield Urban Clearway Study", Traffic Engineering and Control.

Newby, R.F. (1959) "Interim Report on the Effect of the "Clearways Experiment on Accident Frequency". Department of Scientific and Industrial Research.

Pak-Poy, P.G. (1963) "The Effect of Banning Kerbside Parking During Peak Hours on the Anzac Highway", Australian Road Research.

Scott, W.D. and Co. Pty. Ltd. (1977) "Social and Economic Costs (and Benefits) of Extended Clearways", unpublished.

Anonymous (1969) "Clearways - are they effective?", Main Roads, Volume 34, No. 3 Dept. of Main Roads.