Monday, 5 May 2014

Public Infrastructure Inquiry
Productivity Commission
Locked Bag 2, Collins Street East
Melbourne Vic 8003

For *Attention: Greg Murtough*

Dear Sirs

ROAD PRICING & PUBLIC INFRASTRUCTURE

Our original submission alluded to infrastructure project origination mistakes made by politicians, made suggestions about the role and positioning of Infrastructure Australia, the funding of long term public infrastructure and an integrated Federal-State framework for a possible national infrastructure fund. However, it then concentrated mainly on the subject of road pricing. This note presents a more concise picture of our views and concerns about a roads pricing regime, and attempts to put our attitudes and thoughts into a practical context, by way of certain examples.

There is a problem at present - especially in Sydney, and this note will really focus on Sydney. We suffer road congestion, and it is not just in peak hours. The transport backbone of the city has been let to fall behind development and the situation is now seriously hindering productivity, with long periods by executives and others spent stuck in traffic, each of us trying to get the better of the system, but together causing all of us unnecessary hindrance and inefficiency.

Each of Ken Henry, Michael Lambert, Kerry Schott and now the Productivity Commission itself, have raised the issue of road pricing, saying we need to get better at systems of user charging. So did Infrastructure Australia under Michael Deegan, but on issues like the Pacific Highway upgrades, their ideas were defeated by it being a greater challenge at the time than most motorways. Infrastructure Partnerships Australia and the Transport Reform Network (IPA/TRN) have now proposed a Universal Road User Charge (URUC), nation-wide, which (to simplify) amounts to about 5.5 cents per km for medium-sized cars, and 10.5 c for light trucks, plus significant loadings for peak hour travel - see table overleaf.

We presume that IPA/TRN are relying on the HVCI reforms to address the issue for heavy trucks. The rates they propose for light trucks run quite counter to the recent practices in private toll roads, where the de facto standard is that trucks pay 3 times the toll rate of cars. Nothing significant was said by IPA in their submission about the existing private toll roads but we imagine road owners like Transurban will very much welcome suggestions of a circa 13-14c per km extra for peak hour travel by all vehicles on their tollways. Ken Henry called for mass-distance-location pricing, but we think the IPA have prioritised congestion over location and underplayed the mass factor. Most importantly, ***we think their prices are too low overall****, and we suspect they basically have been mis-calibrated.*

IPA/TRN Recommendations
Universal Road User Charge (URUC) Formulae using PAYGO

IPA/TRN Formulae	**URUC**		**URUC**
VEHICLE CATEGORY	Component One [Distance]	TIME PERIOD	Component Two [Time]
	c/km		**c/km**
Motor Cycles	2.29	Weekday AM peak	14.42
Small Cars	4.57	Weekday InterPeak	5.77
Medium Cars	5.49	Weekday PM peak	12.98
Vans/Light Buses	5.95	Weekday Nights	-
4WD Cars	6.86	Weekends 9am-3pm	4.33
Light Commercials	9.15	Weekends - Other times	-
Light Rigid Trucks	10.52	SUM OF TWO COMPONENTS - MAIN TYPES	
Buses: GVM 3.5-4.5 t	11.43	TOTAL AM Peak - Cars	19.91
Heavy Vehicles > 4.5t	???	TOTAL AM Peak -Trucks	24.94

Nb See IPA's Submission Table 5.1 & 5.2 for complete detail

We say that only by beginning to price our motorways and key roads on a comprehensive - preferably network - basis, will the circle of high capital subsidies to costly road corridors, creating induced demand leading to further congestion, be capable of being reversed, by making it viable for the more productive competing modes, such as rail, where applicable, to attract the necessary capital to install more people and goods moving capacity. Sydney needs to get its passenger rail fare box revenue up out of the low 20%'s. It can only do that by massive investment in new capacity, to provide a superior service like Singapore's or other Asian and European cities.

In our submission we criticised previous Federal Government reliance on the PAYGO ("pay as you go") method of comparing road expenditures with road revenues in a single year, or averaged over a relatively short period of years. In the Hearing on 14 April, we likened it to driving the system by looking in the rear vision mirror rather than ahead. We used several examples of tunnelled toll roads and their resultant capital costs per km to illustrate that PAYGO was possibly worse still - like driving by looking in the rear vision mirror without realising there is a steep hill climb ahead, and not realising that not only did one need to stay on course but one had to anticipate the need to accelerate in time.

Regrettably, PAYGO has now been applied by the influential IPA in their submission to the Commission. We think in doing this the combination of basing their suggestions on PAYGO data and their skating over some aspects of recent road projects in our major cities (particularly the necessity for tunnelling and the extra costs entailed), leads them to the wrong formulation of road user charges.

We included in some slides prepared for the Commission Hearing in Sydney, some charts in which we tried to illustrate conceptually what was the danger of this URUC being set too low, and particularly being set on a PAYGO basis. The charts exhibit costs to future generations going up the steep ascent we referred to above. It is important, we think, that the Commission examine this question of possible inter-generational impacts. That can only come from taking a forward looking rather than rear vision mirror approach. Will our cities continue to develop motorway links underground, with high capital cost consequences? It seems inevitable that for cities like Sydney, that tunnelling costs for both road and rail projects are going to be a regular feature of transport planning that did not exist to any great degree (say) 20-30 years ago.

As to an adequate level of RUC's we have raised the question of stark contrast - for cars - between (i) the IPA's 5.5c per km, (ii) the statements by Tony Shepherd that he had always thought of 35c per km as being necessary, (iii) the fact that Westlink M7 is now at 38c per km (before one hits the cap), and then (iv) the Canadian example of the 407 ETR which has rates between 19c and 30c in round figures. [N.b. in Toronto, truck tolls are 3 times car tolls just like they will be in Sydney's latest deals, for each of the M7, M2 and North Connex (and also mooted for West Connex)]. So, not only is IPA's URUC too low, but by reference to examples of private toll roads here and in Canada (see latest 407 ETR rates overleaf), the truck to car ratio clearly seems too low.

We in fact came up with a different formulation over 12 months ago. This was by looking at Sydney's Motorways on a 'network tolling' basis, in order to (in stages) overcome the disparities in toll rates per km on the different sections of the motorway network. The illustration of our proposals had zones (or ovoid rings) around Sydney, radiating from the CBD out, with inner motorways priced at $1.00 per km, then 50c, 40c, 20c, and 10c as one got more distant from the main congestion. Those rates, we might mention, were designed also to raise significant funding for Government, to be put into a Transport Network Improvement Fund, and invested in new rail capacity in conjunction with staged road enhancements, to address legacy issues of under-capacity, and ***such that transport capacity growth preceded, rather than followed, the prospect of induced demand.***

TOLL RATES - CANADA'S 407 ETR TOLLWAY - Light Vehicles and Heaviest Vehicles (nb 3 times)

Light Vehicle
5000kg & under *
Passenger cars, vans, limos, pickups, sport utility trucks, light duty trucks

	Transponder Recorded	Video Recorded
Regular Zone Rate (see map below)		
Peak Period *Mon-Fri: 6am-7am, 9am-10am, 3pm-4pm, 6pm-7pm*	28.30¢ /km	28.30¢ /km
Peak Hours *Mon-Fri: 7am-9am, 4pm-6pm*	30.20¢ /km	30.20¢ /km
Light Zone Rate (see map below)		
Peak Period *Mon-Fri: 6am-7am, 9am-10am, 3pm-4pm, 6pm-7pm*	26.90¢ /km	26.90¢ /km
Peak Hours *Mon-Fri: 7am-9am, 4pm-6pm*	28.70¢ /km	28.70¢ /km
Midday Rate (entire highway) *Weekdays 10am-3pm*	24.06¢ /km	24.06¢ /km
Midday Rate (entire highway) *Weekends & Holidays 11am-7pm*	22.25¢ /km	22.25¢ /km
Off Peak Rate (entire highway) *Weekdays 7pm-6am, Weekends & Holidays 7pm-11am*	19.35¢ /km	19.35¢ /km
Monthly Transponder Lease	$3.40**	$0.00
Annual Transponder Lease	$21.50***	$0.00
Monthly Account Fee	$0.00	$3.40
Video Toll Charge	$0.00 per Trip	$3.95 per Trip
Trip Toll Charge (This is not a per kilometre charge)	$0.80 per Trip	$0.80 per Trip

Toll Rates Effective February 1, 2014

IMPORTANT: A $50.00 Unrecognizable Plate Charge plus tolls per trip are billed to light vehicles without a valid transponder whose rear licence plate's identifying features are altered, not visible to or recognizable by the toll system.

Heavy Multiple Unit Vehicle

Heavy Multiple Unit Vehicle
Over 5000kg *
Trucks or tractors with one or more trailers

	Transponder Recorded	Video Recorded
Regular Zone Rate (see map below)		
Peak Period *Mon-Fri: 6am-7am, 9am-10am, 3pm-4pm, 6pm-7pm*	84.90¢ /km	84.90¢ /km
Peak Hours *Mon-Fri: 7am-9am, 4pm-6pm*	90.60¢ /km	90.60¢ /km
Light Zone Rate (see map below)		
Peak Period *Mon-Fri: 6am-7am, 9am-10am, 3pm-4pm, 6pm-7pm*	80.70¢ /km	80.70¢ /km
Peak Hours *Mon-Fri: 7am-9am, 4pm-6pm*	86.10¢ /km	86.10¢ /km
Midday Rate (entire highway) *Weekdays 10am-3pm*	72.18¢ /km	72.18¢ /km
Midday Rate (entire highway) *Weekends & Holidays 11am-7pm*	66.75¢ /km	66.75¢ /km

* Gross weight or registered gross weight

** Charged each month regardless of how many trips taken plus $1.00 monthly for each additional transponder attached to the account.

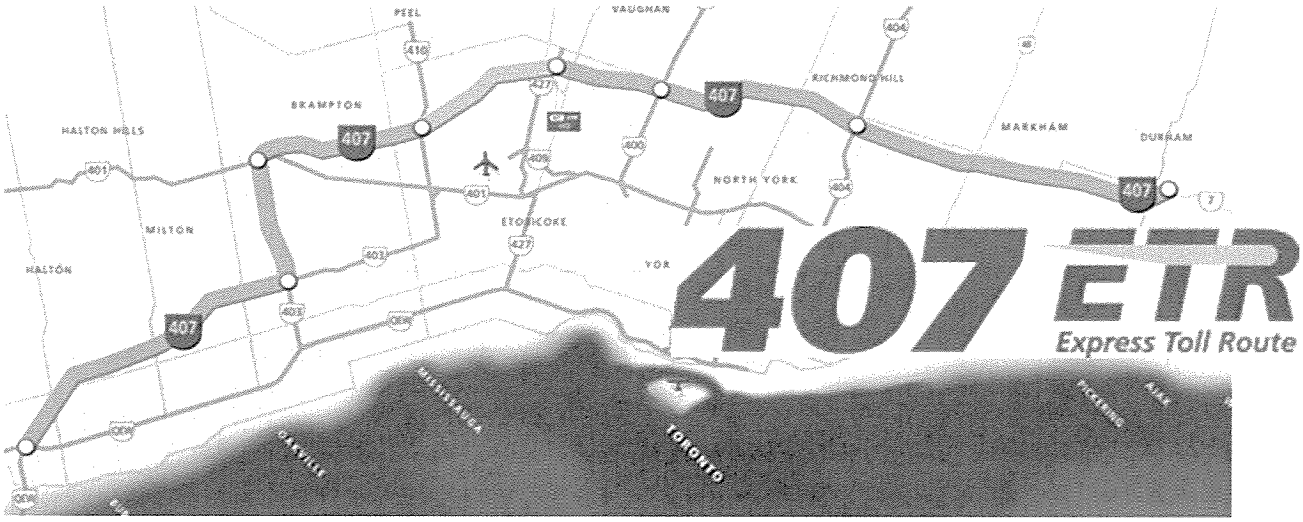
*** Annual fee is non-refundable. Charged annually regardless of how many trips taken plus $9.95 for each additional transponder attached to the account and $5.00 for each additional transponder attached to the account if there are 6 months or less from the annual anniversary date.

Note: "Anniversary date" is the date that the customer signed up for the Annual Transponder Lease Plan.

Note: Where a light vehicle with a transponder does not have the entry or exit of the trip recorded, a calculated trip will be applied. Where the entry or exit of a light vehicle without a transponder is not recorded, the vehicle will be charged a Light Video Flat Toll. Details on calculated trips and Flat Tolls can be found in the Frequently Asked Questions section of the website.

All fees are plus applicable taxes.

108 Km Route skirting Toronto, Ontario - CANADA'S 407 ETR TOLLWAY - part of Highway 401



We had also looked at the cases of the Pacific Highway and the Hume Highway. That came initially from our analysis of the case for High Speed Rail, where we identified a number of biases in the analysis and method of approaching such decisions. We had called for NSW to adopt a process of seeking to value the critical intra-state highways which were national links (essentially the Hume, Pacific, New England and Newell), on a replacement cost basis when deciding upon new backbone infrastructure such as major interstate rail lines. This was to ensure that comparisons were on a like-with-like basis and to address the concept of inter-generational fairness. That is, if one transport mode was being subsidised, then the project evaluation of other competing modes should be considered on the same basis as to degree of subsidisation; in general this does not happen for roads versus rail.

We noted in our submission how Infrastructure Australia had proposed introduction of tolling on the upgraded Pacific Highway route as a condition of the $9.1 billion of new funding that was being sought in 2011. In the event PwC advised NSW that for Motorway standard sections of the Pacific a toll rate of between 42c and 59c per km might be needed to attract private investment, so it was concluded (at the time) that this was not feasible, and certainly not politically palatable. When we examined the Pacific Highway, in the different context of network tolling, we got lower figures. There are certainly different ways of approaching such a matter, but for the rates to be as low as 5.5c, for cars, would imply a high degree of subsidisation remaining. We say more about that below.

So we repeat what we have urged on the Commission, namely that as a priority it seek to resolve the above differences in approach and pricing suggestions. Solutions to road pricing are urgently required, but they must be comprehensively considered and a sustainable system introduced.

To reinforce what we have said about the IPA's recommended URUC rates being too low, we present below a simple table of computed capital costs per km for selected motorway projects, ranked in order of costliness. It will be seen how the costs jump into a higher order of magnitude whenever the roadway requires major tunnelling. The IPA approach of averaging historic expenditures across all roads (and we suspect excluding these expensive privately funded examples) will clearly fail to capture true cost factors if our major cities face a future of more and more necessity for tunnelling. This is what we refer to as driving by the rear vision mirror rather than realising the steep hill climb that is looming ahead. So PAYGO won't work, and much more consideration is needed to forward planning, and a system that is sustainable as costs increase.

ROADWAY	Length Km	No. of Lanes	Capital Cost	Implied Costs per Km
E. & O.E			$ Billion	Round Figures $Million
Pacific Highway [1] (Upgrades since 1996)	654	2x2	16.2	**25**
Hunter Expressway	40	2x2	1.7	**43**
SWA [2] - Bringelly Rd Upgrade	10	2x2	0.5	**50**
SWA [2] - Northern Rd Upgrade	31	2x2	1.6	**52**
Westlink M7	39.5	2x2	2.3	**58**
SWA [2] - Elizabeth Dr Upgrade	14	2x2	1.25	**89**
Melbourne Citylink [3]	22	Varies & includes Tunnels	2.2	**100**
North Connex (est.)	9	Design 3x2, Initial 2x2	3.0	**333**
CLEM7 (incl. 4.8km tunnel) [4]	6.8	2x2	3.0	**441**
Cross City Tunnel [5]	2.1	2x2	1.0	**476**
Brisbane APL (incl. Busway) [6]	7.5	3x2 N-S, 2x2 E-W	5.6	**747**

Nb. These values are all in $ of the day and have not been harmonised by converting into current day values, so are not directly comparable, unless on PAYGO basis.

(1) Pacific Highway figures are an amalgam of different projects, some unfinished, some new sections, some widening or straightening. From other sources, not independently verifiable, some sections data missing. Latter proposals to Infrastructure Australia were for $9.1 bn at $34M/Km.

(2) SWA: Sydney West Airport - from recent announcements by PM Abbott and NSW Roads Minister Gay

(3) More complex roadways, not easily comparable {Data Source: Omega Centre/Uni of Melb.]

(4) CCT original cost stated as $680M, later estimated actual @ $1.0 Billion [Source: S. Charlton, CEO of Transurban].

(5) Official figure from Clem7 web site.

(6) AirportLink data via Brisconnections to ASX, but includes estimated loss on contracts by Leightons Group.

Referring to another part of the Commission's draft report, we say that rather than a road fund, the Commission should recommend a transport network improvement fund, where emphasis can be given to maximising productivity by choosing optimal transport projects to fund, or choosing optimal combinations of projects. Such a transport network investment fund could invest in new transport corridors, could fund road as well as rail connections (both passenger and freight), including to airports. Moreover, if our suggestions of a joint Commonwealth-State framework for such funds was adopted, it might also help catalyse funding for light rail, busways, and transport interchanges, freight intermodals, etc., as the case may be in the various cities and States/Territories.

In passing, we might note that in the National Commission of Audit reports just released, the Shepherd Commission has recommended a single national funding pool for transport infrastructure projects be set aside by the Commonwealth for allocation to the States on a formulaic basis (proposed basis not yet specified) with the States to have responsibility for project selection, but subject to meeting cost benefit analysis and other criteria managed by the Commonwealth.

However, we repeat that this will not work towards most productive outcomes if such pool is merely a road fund, rather than a complete transport network improvement fund, which recognises that it is the transport system overall that benefits the community, not just one mode of transportation.

DETERMINING MINIMUM ROAD USER CHARGE (RUC) RATES

We attach a detailed Appendix which deals with the concept of establishing a Minimum RUC rate per km per vehicle. This shows current per km Minimum RUC rates of ***11c to 15c per km****, for roads such as the 40 km* ***Hunter Expressway****, and the proposed non-Motorway standard links to a new Sydney West Airport (namely,* ***The Northern Rd and Bringelly Rd*** *upgrades of 31km and 10km length respectively). Those rates are based on a capacity standard which we have adopted, which may be subject to criticism and further analysis, but we have taken care to ensure that if anything they under-state rather than over-state a required Minimum RUC. Because these rates are above the rates recommended by the IPA & TRN, we say that by us estimating conservatively, it should be convincing evidence that the IPA proposals are inadequate.*

For the ***Pacific Highway****, we found that if it was to be costed at the level of Westlink M7 historical capital costs (again a conservative assumption, because if the M7 was being built today, its capital costs would be significantly higher), the Minimum RUC on this same standard basis, would also work out at* ***15c per km****. However, no private owner could make a satisfactory return at that level because over its full distance, the utilisation of the Pacific Highway is far below its rated maximum capacity.*

We were a little surprised to find that the projected capital costs of the ***Elizabeth Drive*** *upgrade, to take traffic from the Westlink M7 to the new Sydney West Airport, were high enough to create a Minimum RUC rate of* ***23c per km****. Just where this project will finish*

up seems problematical at present, because clearly in private hands it would have to be priced at much lower than full capacity utilisation initially. When we look at a simple alternative of pricing it ***at 50% utilisation*** *relative to our standard of rated capacity,* ***the RUC works out at 46c per km, or $6.42 for the full 14km distance****. Clearly, the IPA recommendations based on their Deloittes' report, fall well short of this level.*

When we jump to our ***North Connex*** *results, we find a Minimum RUC rate of* ***86c per km for 9km of tunnels, or $7.71 for a one way trip****. This is actually close to what we project as the Hills M2 toll upon forecast opening of the North Connex link, which it has been said will determine the pricing of North Connex. And yet, the NSW Government has announced forecast usage of the tunnels at only around one-third of our standard rated maximum capacity. That is reflective of our claim that* ***announced toll levels combined with NSW official traffic forecasts will only fund about one-third of that project****.*

When we look at the Brisbane tolled tunnel examples of the ***CLEM7 and Airport Link****, on our standard rating basis they would have Minimum RUC rates in the* ***$1-$2 range per km****. Both of these projects are either subject to, or potentially about to have, class action litigation concerning traffic forecasting, and since we have done analytical and modelling work on Brisconnections, specifically, we shall comment no further at this stage. Suffice to say that the tolls on these tunnels, even given they are reflective of overly optimistic traffic forecasting and hence understatement of the investor returns normally required, work out per km at far in excess of the IPA recommendations for a URUC, and even for its rates loaded for peak periods.*

These successive examples of:-
1st category - Hunter Expressway, Bringelly Rd, The Northern Rd & Pacific Highway,
2nd category - Elizabeth Drive M7 Extension - which on capital costs would seem to roughly parallel an updated capital cost per km for the Westlink M7,
3rd category - North Connex tunnels,
4th category - Brisbane's CLEM & Airport Link tunnels,
each seem to involve successive jumps in the most likely band of RUC rates per km.

We can certainly conclude from this outcome that a universal RUC like the IPA proposes, would seem to fail to capture various of the underlying capital cost economics. A regulated asset base concept should not suffer this disadvantage, and network tolling concepts within cities would seem to overcome the effects of short, tunnelled links on the overall system. So we conclude by suggesting that these alternatives are far preferable to the IPA scheme, even if it's rates were made more realistic.

That is not to say we are ignorant of the utility of peak time loadings, but we think that concept helps most with spreading throughput during the day rather than the significant uplifts in transportation capacity that are needed. We see peak time loadings (or off-peak discounts, which seem to be mentioned less) as an independent issue, sometimes better dealt with by cordon or area charging schemes. The concept can be applied within a Regulated Asset Base regime or within a Network Tolling regime, in any event, if required.

QUALIFICATIONS TO THIS SUBMISSION:

The analytical work behind this and our earlier submitted information, is best described as "high level". The absence of publicly available data, in sufficient detail, for specific roadways means that we could not create the sort of financial models for them for analytical purposes, that were possible in the case of our work on the Brisconnections float's potential class action. Nor are our methods therefore reflective of the detail that might be involved in an "equity case" or "bank case" model of any privately funded toll road project. In particular, we are not road traffic engineering or modelling experts, and have relied upon general rather than specific knowledge of those aspects.

Car vs Truck Tolls or RUC's:

The ratio of the Light Rigid Truck RUC (10.52 cents per km) to the Medium-Sized Cars RUC (5.40 cents per km) in the IPA submission, is less than 2-to-1. By way of contrast, both the Canadian example of the 407 ETR and the latest concession agreements involving Transurban with NSW and Victoria, postulate a standard ratio of 3-to-1 of toll rates for Trucks (as defined) versus Cars. We tend to think this is becoming the industry standard in the private sector.

The methods we have used are not able to delineate the impacts of car traffic from truck traffic, partly because the experience of those proportions are quite road-specific and we do not have relevant data available for all such roads. The variation in practice is illustrated by the below examples:-

(i) We understand that on the Mt Ousley Rd, now part of the M1 route south of Sydney, reported truck traffic is often 15% or more of the total (various sources).

(ii) In the NSW Government media release of 16/3/2014 regarding North Connex project, NSW Roads Minister Gay was quoted as saying:

"Pennant Hills Road has six lanes of traffic, which currently carry about 80,000 vehicles each day including 10,000 heavy vehicles – more than double the average proportion of heavy vehicles on NSW roads."

- That is, a proportion equal to just over 12.5% of total vehicle traffic.

(iii) In the original PDS for the Brisconnections IPO, the traffic forecasts report by ARUP envisaged 9.34% of traffic in 2012 and 10.02% in 2016 for the combined categories of Light Commercial Vehicles and Heavy Commercial Vehicles, as defined for that concession. In other words, a forecast of around 10%.

(iv) In the presentations for Macquarie Infrastructure Group's acquisition of a majority interest in Statewide Roads' M4 (Sydney) concession in 1999, it was estimated that truck traffic on the M4 Motorway was 5% of the total traffic flows.

If 10% of vehicles are "Trucks" and the ratio of Truck to Car tolls or RUC's is the above 3-to-1, then our Minimum RUC in the relevant case needs to be divided by the following factor to convert it to a Car equivalent rather than an 'all vehicles' equivalent:-

Division Factor = 0.9 (Cars proportion) + 3 x 0.1 (Trucks proportion) = 1.2

For a Trucks proportion of 15%, this would be:-

Division Factor = 0.85 (Cars proportion) + 3 x 0.15 (Trucks proportion) = 1.3

That would reduce a Minimum RUC ('all vehicles' basis) as shown in the Appendix for The Northern Rd project, from 13 cents per km (approx.) to 10 cents per km (approx.) for Cars. Simultaneously, that for Trucks would become 30 cents per km (approx.).

A table of Division Factors of this style for a range of proportions of Trucks traffic is exhibited below. We do not believe the scale of such factors is material enough to detract from our conclusions.

DIVISION FACTORS FOR CONVERTING 'All Vehicles' RUC or Toll to 'Cars only' RUC or Toll	
Proportion of "Trucks" ex-Total Traffic Flow	Division Factor Applicable if Truck Toll/RUC Ratio is 3:1
5.0%	1.1
7.5%	1.15
10.0%	1.2
12.5%	1.25
15.0%	1.3

We look forward to discussing the contents of this Supplementary Submission, with the Commission, as requested.

Yours sincerely

IAN F BELL, FIAA, Actuary & Director

Warning: This is not a professional report which has been paid for on a commercial basis. All due care has been taken in its production, but readers should note the qualification 'errors and omissions are excepted', and that ***no legal responsibility is hereby taken should any reader rely on our work*** *without commissioning a full professional report on the relevant aspects of it.*

APPENDIX : DETERMINING ROAD USER CHARGE (RUC) RATES

We now attempt to show in as simple way as we can, without specific motorway traffic modelling, how far wrong the IPA/TRN recommendations might be.

In the absence of road-specific traffic modelling, we can use rules of thumb developed originally by the USA Transportation Research Board, and adapted to Australian conditions by Austroads and others. We refer here to the Highway Capacity Manual - see the Australian version below.

Table 5.1 Level of Service Criteria for Basic Freeway Segments

Level of Service	Density	Design Speed 110 km/h			Design Speed 100 km/h			Design Speed 80 km/h		
	pc/km/lane	Speed[a] km/h	v/c[b]	MSF[c]	Speed km/h	v/c	MSF	Speed km/h	v/c	MSF
A	≤7.5	≥96	0.35	-	-	-	-	-	-	-
B	≤12.5	≥91	0.54	1,100	≥80	0.49	1,000	-	-	-
C	≤18.8	≥86	0.77	1,550	≥75	0.69	1,400	≥69	0.67	1,300
D	≤26.3	≥74	0.93	1,850	≥67	0.84	1,700	≤64	0.83	1,600
E	≤41.9	≥48	1.00	2,000	≥48	1.00	2,000	≥45	1.00	1,900
F	>41.9	<48	d	d	<48	d	d	<45	d	d

a. Average travel speed.
b. Volume/capacity ratio.
c. Maximum rate of service flow per lane under ideal conditions, rounded to the nearest 50pc/h/lane.
d. Highly variable.

Source : Adapted from TRB (1985) Table 3.1.

Source: Austroads, 1999, *Guide to traffic engineering: roadway capacity*. Vol.2, Austroads Publication No. AP–11.2/88, Sydney, p.20.

What we say is that, if a motorway's traffic is evaluated as to its rated maximum service flow, for an appropriate number of hours per day(*) to get estimated maximum AADT (Average Annual Daily Traffic) then the yearly vehicle flow statistic from this rating indicates the maximum number of vehicles over which annual servicing costs (both capital and ongoing) should be spread. Call the relevant values "Maximum Rated AADT Capacity" and "Maximum Rated Annual Vehicle Flow", respectively. Then, if one does this appropriately, a measure can be obtained for the Minimum Road User Charge (MRUC) per km of lane way length, by dividing a suitable measure of the annual servicing costs (see below) by the Maximum Rated Annual Vehicle Flow. That is:-

MRUC = ASC (Annual Servicing Costs) / MRAVF (Maximum Rated Annual Vehicle Flow)

where *MRAVF = Maximum Rated AADT Capacity x Expansion Factor x 365*

(*) For the Expansion Factor (no. of hours per day of peak flow equivalent) we rely on Dr Michelle Zeibots, who for Melbourne's East-West Link and Sydney's Cross City Tunnel, advised the use of an expansion factor of 10 hours for a 'single peaking' toll road. This standard value would be reviewed case by case in practice.

For our best measure of Annual Servicing Costs we adopt an analogy to commercial real estate valuation. In property valuation, valuers use a "Cap Rate" (capitalisation rate) to convert the passing flow of net rental income, into a capital value. This is also analogous to using a dividend yield to value listed company shares. The distinctions between these concepts lie in the distinguishing features of the alternative investment sectors, but also by the way in which ongoing costs need to be accounted for. That is to say, in the case of commercial property, the Cap Rate is separated from the question of building depreciation, and in the case of listed shares, the operating costs of the company (and also taxation effects) have to be met before a dividend can be paid - with only some technical exceptions under Corporations Law.

In the case of a Motorway or user-charged highway, the Cap Rate would need to be set to allow appropriately for the costs of running the toll/RUC recording & collection systems, and also the ongoing additional operating expenses of maintaining the roadway in suitably serviceable condition. Luckily, we already have a major ASX-listed local toll road operator (Transurban) which owns a broad spread of toll road concessions, and is continually rated by the stock market in respect of such factors. So, our suggestion is to use the Transurban experience as a guide to the relationship between annual servicing costs and capital. Their accounts show that about 20% of toll revenues get used up in annual ongoing costs. They have just purchased Queensland Motorways Limited, which had a higher annual expense ratio, partly on the basis that Transurban will, over a period of years, be able to rationalise costs down to that level. Likewise with their purchase of the Lane Cove Tunnel.

Having regard to the fact that Transurban has been selling off a dividend yield of circa 5% per annum in recent times, which has expanded to around 5.75% in consequence of the discounted equity raising for their QML acquisition, we say that it would presently be appropriate to adopt an annual Cap Rate of up to 7.5% to determine the revenue requirements for a RUC scheme. That is to say, 7.5% less 20-25% for expense margin, gives a net 5.6-6% as potentially distributable, close to Transurban indicators. So valuing a toll revenue stream at a 7.5% Cap Rate - if that revenue stream is sufficiently certain and is inflation linked - should be a reasonable rule of thumb for valuation purposes.

We are, of course, aware that this is not the kind of detailed modelling that Transurban and other major toll road owners might undertake in pricing a toll revenue stream, but ***our purpose here is to establish a reasonably simple benchmark to the Minimum RUC*** *on a presently un-tolled Motorway or Highway,* ***in the absence of professionally modelled, detailed, traffic forecasts.***

SELECTED EXAMPLES OF ROAD USER CHARGE (RUC) RATES

We provided a slide presentation to the Commission, prior to the 14 April Sydney Hearing, containing a number of examples of motorways with varying historical construction costs ranked by capital cost per km. Refer earlier table (page 6 hereof) for a wider set of such examples. We now apply the method for Minimum RUC rate to some of these motorways.
These are all motorways configured with 2 x 2 lanes, except for Brisbane Airport Link, where we show results as if it was rated at 4 lanes equivalent and also as if that rating should be (say) 5 lanes on average.

The results for Minimum RUC are shown in the following table [Refer firstly to the column headed HIGH AADT CASE, RUC per Km, and see the Notes below the table]:-

MOTORWAY EXAMPLES - Per Km Road Pricing READY RECKONER					
RATED MAXIMUM AADT CAPACITY ---> Annual Vehicle Flow ASSUMED					
	Maximum Flow	Expansion Factor	Days	Annual	Implied
No. Lanes	Vehicle per Hour	Hours per Day	per Year	Vehicle Flow	AADT
4	2,000	10	365	29,200,000	80,000
4	2,000	7.5	365	21,900,000	60,000
			ROAD USER CHARGE READY RECKONER		
ROADWAY COST EXAMPLES	Capital Cost per Km	7.5% RUC Revenue Yield	HIGH AADT CASE: RUC per Km	LOWER AADT CASE : RUC per Km	Adjusted to 50% of Maximum Rated Capacity
Pacific Highway @ Upgarde Cost	24,850,038	$ 1,863,753	$ 0.06	$ 0.09	
Hunter Expressway	42,500,000	$ 3,187,500	$ 0.11	$ 0.15	$ 0.22
Pacific Highway @ M7 Cost Level	58,227,848	$ 4,367,089	$ 0.15	$ 0.20	$ 0.30
Elizabeth Dr Upgrade	89,285,714	$ 6,696,429	$ 0.229	$ 0.306	$ 0.459
Bringelly Rd Upgrade	50,000,000	$ 3,750,000	$ 0.128	$ 0.171	$ 0.257
Proposed Northern Rd Upgrade	51,612,903	$ 3,870,968	$ 0.133	$ 0.177	$ 0.265
M7	58,227,848	$ 4,367,089	$ 0.15	$ 0.20	
North Connex	333,333,333	$ 25,000,000	$ 0.86	$ 1.14	$ 1.71
CLEM7	441,176,471	$ 33,088,235	$ 1.13	$ 1.51	
Brisbane APL	746,666,667	$ 56,000,000	$ 1.92	$ 2.56	
Adjusted from 5 to 4 Lanes average *	597,333,333	$ 44,800,000	$ 1.53	$ 2.05	
* Note: APL is 4 lanes East-West & 6 lanes North-South, so for simplicity an avergae of 5 lanes is shown here					

NOTES TO TABLE:

[A] Column HIGH AADT CASE

i) Pacific Highway @ Upgrade Cost does not of course reflect the full capital cost, but as will be seen the Minimum RUC is greater than the IPA/TRN URUC recommendation of 5.5c per km for medium sized cars. On that basis they would definitely under-cost that Highway;

ii) As can be seen when we re-value the capital cost of the Pacific Highway to even historical Westlink M7 levels, the Minimum RUC rate becomes nearly 3 times as high as IPA's recommended rate;

iii) The Hunter Expressway seems to have been subsidised to at least a degree of 10-15c per km - probably considerably more given the likely utilisation factor, by being left as an un-tolled or non-RUC roadway;

iv) Westlink M7 results are of course an under-statement because we are only using historical capital cost on a roadway that was completed many years ago (that is, by not updating that costs in real terms or to current construction cost benchmarks);

v) The rates for the Brisbane tolled tunnels are a large order of magnitude above IPA's recommended rates;

vi) We comment separately on North Connex and the Sydney West Airport cases later.

[B] Column headed LOWER AADT CASE

i) This column uses the lower expansion factor of 7.5 hours shown as an alternative in the top part of the table, which relates to the Implied AADT of 60,000 vehicles and an Annual Vehicle Flow of 21.9 million. This is shown to demonstrate what happens when we vary this basic assumption in the rule of thumb for Minimum RUC;

ii) It should have been obvious that by using a lower traffic flow across which to spread the annual RUC revenue, then the per km rates would be higher, but we have included this column just for comparison purposes, in order to show that our opinion on IPA's recommended RUC rates is not being harsh to them. All RUC rates are commensurately higher by a ratio of 29.2 million over 21.9 million, or an additional one-third.

[C] Column headed ADJUSTED TO 50% OF MAXIMUM RATED CAPACITY

i) Here we show alternative values for those of the examples which are not presently tolled. Our minima were worked out at 80,000 AADT but this column takes 50% of that, namely 40,000 AADT just to illustrate what the order of effect might be if each motorist was charged according to the road's assumed actual utilisation;

ii) As will be seen the resultant rates (despite the fact that roads such as the Pacific Highway certainly operate at less than 50% of maximum capacity - in which case this column is still conservatively expressed) are all of the order of, or higher than, the kind of per km toll rates in the 407 ETR in Canada. Moreover, they approach except in two instances (the planned Elizabeth Drive upgrade for the new Sydney West Airport, and the new North Connex) the present per km rate of 37.6 cents on un-capped trips along the Westlink M7.

iii) We comment in more detail below on the Sydney West Airport roads proposals, and on the North Connex example.

NORTH CONNEX

To take one example, that of the proposed North Connex tunnels, this tolled Motorway is being configured as (initially) 2 x 2 lane motorway tunnels of 9km length, for an estimated capital cost of $3 billion, or $333 million per lane km. At the Wahroonga junction with the F3/M1, the AADT has hovered around 80,000 in recent years. If we look at Maximum Rated AADT Capacity using 2,000 vehicles per hour maximum service flow, then we get:

Maximum Rated AADT Capacity = 2,000 x 4 lanes x Expansion Factor of 10 (Zeibots)
= 80,000

Then, using the Capital Cost per Km, we establish - using the 7.5% Cap Rate value - that for a Minimum RUC, annual real terms RUC revenue per km needs to be:

= 7.5% x ($3,000,000,000/9 km)
= $25,000,000

To get $25,000,000 annual revenue from a Maximum Rated AADT Capacity of 80,000 (which equals Maximum Annual Vehicle Flow of 29.2 million), then the Minimum RUC per km works out at:-

MRUC = $25,000,000 / 29,200,000
= $0.86 per km.

For a 9 km trip along the North Connex tolled tunnel, at such a RUC rate, the toll would be 9 x $0.86 = around $7.70.

However, we note that, in announcements by the NSW Government regarding this project, some 30% of cars and 50% of trucks are expected to divert to the North Connex off Pennant Hills Rd. Applying these factors assuming 15% of traffic is trucks, then the AADT would be only 26,400 vehicles per day, namely substantially less than the above figures. The consequence of this is that, if the NSW Government traffic forecasts are right, the toll rates set by Transurban should be commensurately higher than our $0.86 per km, except to the extent that:-

a) Transurban can price the deal at less than an effective 7.5% Cap Rate; and/or
b) Transurban would apply an expansion factor of greater than 10 hours a day to the tunnel traffic; and/or
c) Transurban believes they can achieve a Maximum Service Flow rate of greater than 2,000 vehicles per hour per lane.

In short, it is extremely dubious that the combined possibilities a), b), or c) would be of such significance to make up the difference between a 26,400 daily vehicle flow and a rated AADT of 80,000 vehicles per day. That is one reason we felt comfortable in our original submission suggesting that the NSW Government's stated forecasts for North Connex traffic, if applying in practice, would result in only about one-third of the $3 billion cost being fundable (that is, 26,400 is around one-third of 80,000). Such a cross-check could be done more accurately in practice if official traffic forecasts by Transurban were made public and we had modelled the whole project and its financing over the full concession period.

SYDNEY WEST AIRPORT ROADS PACKAGE

In the co-ordinated announcements of a roads package for the proposed Sydney West (Badgerys Creek) Airport, the following 3 road upgrades were announced using Federal and State Government monies:

***Elizabeth Drive Upgrade**: $1.25 Billion for 14 km of 2 x 2 lane Motorway standard*
***Bringelly Rd Upgrade**: $500 Million for 10 km of 2 x 2 lane Highway standard*
***The Northern Rd Upgrade**: $1.6 Billion for 31 km of 2 x 2 lane Highway standard*

Elizabeth Drive would be linked to (and presumably integrated with as a toll road, as it has been already designated M7 nomenclature) the Westlink M7. However, The Northern Rd appears to replace or subsume previous plans for an M9 corridor. It is an upgrade to an existing road alignment rather than a new, straighter, more efficient alignment for the long term. No traffic or toll forecasts have yet been issued for the Elizabeth Drive M7 Extension.

As will be seen from the earlier table, the capital cost of the Elizabeth Drive Upgrade approaches double that per km of the other two projects. This is reflected directly in our Minimum RUC estimates of about 23c/km versus 13c/km for the other two roads.

However, the M7 Extension, being designated as a future toll road will not be subject to any general road user charge regime, but instead (presumably) to private sector standards of costing using market debt costs and market equity requirements. Whilst our standard 7.5% Cap Rate assumption is a useful indicator for converting capital cost to annual revenue required, it seems clear from statements made so far about the phasing in of Sydney West Airport that utilisation will start low and grow, perhaps rapidly but dependent on the staging of growth in use of SWA by airlines. Furthermore, in accord with the plan to have the SWA as a curfew free airport, it does seem possible that the M7 Extension will eventually experience a higher expansion factor than Dr Ziebots 'single peaking' 10 hours benchmark.

The answer will only come once the NSW Government and the private sector (presumably the Westlink M7 Consortium of Transurban and Canadian Pension Plan Investment Board), settle on patronage assumptions and risk sharing that are satisfactory to have the road taken into private hands. As with the proposals for West Connex, it may be that the M7 Extension starts in Government ownership before being transferred to the private consortium once traffic flows have settled sufficiently. Our RUC estimate of 31c/km for a lower AADT of 60,000 as the notional capacity, gives a toll from the interchange with the existing M7, for the full length, of $4.30 presently - which compares with the capped rate on the existing M7 of currently $7.52. If, alternatively, the private consortium was to price tolls as if 50% utilisation was a long term average equivalent to their own methods of pricing, then the 46c/km rate we show under that column would amount to about $6.40 for the full length trip along the upgraded Elizabeth Drive.

Comparing these full length tolls for the different upgrades is also useful.

FULL DISTANCE TOLLS FOR SWA UPGRADES ON ALTERNATIVE PER KM RUC BASES

UPGRADE SECTION	Toll @ Minimum RUC	Toll @ 75% Utilisation	Toll @ 50% Utilisation
Elizabeth Drive	$3.21	$4.28	$6.42
Bringelly Rd	$1.28	$1.71	$2.57
The Northern Rd	$4.11	$5.48	$8.22
SWA AVERAGE/Km	$0.156	$0.209	$0.313

One only has to consider the 50% utilisation basis for The Northern Rd and weigh into consideration that given the state of development in Western Sydney, it should experience a lower initial utilisation factor than the direct Elizabeth Drive link (and hence could be priced higher still), to realise that setting the RUC or toll on a utilisation, rather than capacity, basis will lead to a price barrier for individual motorists and possible diversion of traffic onto the longer routes, unless this possibility is overcome by the concept of network tolling (e.g. see averages figures highlighted in purple, to contrast with those for the individual sections) where drivers are charged for kilometres travelled more so than the capital cost factor of individual sections of the roads network.