Submission No 110a

INQUIRY INTO ROAD TOLLING

Organisation: Financial-Architects.Asia Pty Ltd

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Summary of Our Views

NSW (starting with Sydney) needs a comprehensive plan for Road Pricing & Australia may only have 10 years to fix its main source of transport funding as fuel taxes decline

Despite user views, virtually all Sydney tollways are under-priced in pure "cost of project" terms as all have been subsidised to some extent out of State budgets - which cannot continue to happen

New tollways are usually under-priced relative to private sector market benchmarks (relying on grants and budget subsidies), but with high fixed escalation rates all motorways can become over-priced

Previous proposals by the Transport Reform Network for Universal Road User Charges (URUC'S) also tended to under-price except for their peak hour surcharging notion (+ have other faults)

There are huge inequities in Sydney's current tollway pricing (see Appendix A)* but most imbalance is caused by past State practice of giving road usage for free (which can't continue) and this has resulted in severe under-investment in suburban rail, aggravating congestion

People living in the North-West and South-West are disadvantaged
People from the East, North, South & to a lesser extent North-East, are advantaged

However, advantage versus disadvantage from toll costs, overall also depends on rail alternatives and some parts of Sydney just do not have any or adequate rail alternatives - that needs fixing

Most proponents of Road Pricing reform argue for distance-based pricing but purely distance-based pricing is not fully cost-reflective (location is very important)

We have devised methodology which shows that most estimates for distance-based pricing under-rate the per km pricing needed for an economically rational system

Proposed PPP dealings on 'monetising' the State funding of WestConnex look likely to make the current situation worse and may frustrate true reform

Projects like the Western Harbour Tunnel and Beaches Link will not pay for themselves

Tinkering with individual tolls will be counter-productive long term and we need either comprehensive "Network Tolling" or a system like Singapore's ERP

We are taking a 10+ year view here of Government finances and a 25+ year view of needs for infrastructure investment, uninfluenced by the likely ebbs and flows of political cycles. We abhor the prospect of short-term political expedients influencing major policy areas like transport infrastructure (eg road pricing) because they do affect the very back-bone of a city's and a State's existence, and ignore the question of fairness to future generations.

*** Note that the table of projected toll rates in Appendix A, applying from different directions of travel to the CBD or to Mascot Airport, is from our 2014-15 work and has not been updated for latest inflation and escalation expectations, so should only be used as a general guide on the level of inequities, rather than relying on many given specific toll charge amount.**

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Thursday 13th April, 2017

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Dear Parliamentary Committee Secretariat

Thank you for the opportunity for us to update and augment our initial submission. This has provided the scope to remove the Commercial Confidentiality restriction we initially placed on our last minute submission, and also to add additional material and explanation leading on from our earlier submission to the Charles Casuscelli-led Inquiry into Road Access Pricing in 2013, which has not been made public. Thus we confirm that this material now included herein can be made public, after review of content having been undertaken accordingly.

The ideas we presented to the Federal sphere from 2012 and the 2013 Casuscelli Inquiry were broad in scope and encompassed not just the question of road pricing but also the necessity for a new approach to utilising Governmental borrowing power to catalyse transport infrastructure projects which would otherwise not occur. So they essentially, in thrust, had 3 elements:

1. **The notion of a plan for Long Term Infrastructure Funding** which involved Federal-State joint funding within a national overarching framework with some State and Territory specific features. This would utilise the Commonwealth's superior credit rating and flexibility in terms of budgeting revenues to support projects, together with State supervision and responsibility at the more detailed project evaluation and procurement levels.

   The concepts were specifically targeted at land transport and sought to overcome past policy barriers to cost-justifying rail investment whilst also facilitating a more prudential approach to road funding - this was largely to be effected by means of what we called a Transport Network Improvement Fund, which was actually a "fund of funds", in that within the national system it had sub-funds dedicated to each of the States or Territories.

2. **New sources of funding** which included greater access to road pricing but not following the same PPP formulations as had been used in the past, plus extra rail funding sources from a real estate development overlay - which we note is now commonly talked about under the general heading of "value capture". This was combined with greater use of the Commonwealth balance sheet by envisaging the Commonwealth either directly borrowing to start certain large projects, or by guaranteeing certain project-specific fundraising by the relevant State sub-funds (in other words credit upgrading, being thus a contingent liability on the Federal balance sheet rather than one directly "on balance sheet"). This was specifically so that bonds could be issued, backed by infrastructure, targeted for investment by the long term superannuation fund sector, which is of continually growing importance in the Australian project finance scene.

3. **Revisions to the method of project evaluation and prioritisation**, addressing 2 main aspects - the term horizon over which projects could be evaluated or compared, and the discount rates that would be used in establishing benefit-cost ratios. We note here that one of the pre-requisites of our suggestions was to find ways of eliminating political bias and interference from the professional evaluation of project worth and ranking. We note in that regard that attempts towards this were being made and have been further made since, in the context of roles for bodies like Infrastructure Australia and Infrastructure NSW - though we still feel that there is a way to go in getting those bodies to a satisfactorily independent and professionally laudable standard of work, because they remain hindered by the constraints which governments and the political processes place upon them.

BACKGROUND - WHAT'S WRONG WITH THE CURRENT REGIME

Some of this was covered in our 6/3/17 letter which we reproduce below for completeness. We suggest the reader start with viewing the slide we include headed "Summary of Our Views". It would take more time than we have here to supply full background to our development of these views but a lot of them would be fairly familiar to readers of transport news and opinions. Where we possibly stand out is in the politically unpopular opinion, which is nevertheless soundly financially and economically based, that **most people are under-estimating what road user charges should be**. That may well be a direct conflict for your Inquiry, but we like to tell the truth from our professional research and work. We reason - with good cause - that **under-pricing of road usage has led to under-pricing of rail fares and under-investment in mass transport solutions**, leading to our current state in Sydney of unwanted congestion.

So what we are concerned about is bias in the transport sphere towards investment in roads relative to rail, and biases or shortcomings which lead to short term emphasis versus the long term horizon (as much as 50 years plus*) which we think should be taken into account in evaluating backbone infrastructure which can be transformational in nature, like urban rail and inter-city high-speed rail. ** given that our inter-city rail is 100+ years old, it needs a very long term perspective*

In short we would like to see more emphasis on the long term 'load movement capacity' advantages of modern rail relative to roads, over distance. In arguing this we tend to strike bias, particularly because many government decision-makers think the next motorway or major road investment is the most urgent and is the way to alleviate congestion and create freer flow conditions for motor vehicles carrying either passengers or freight. Also because governments of all persuasions in recent decades have struggled with the business case justifications for major rail investment and have found it relatively that much easier to support motorway projects funded on a fixed term PPP concession basis. However, partly that is due to biases in methods of project evaluation, with high discount rate requirements which naturally mitigate in favour of 30-40 year PPP's versus (say) 100 year assets in the case of backbone rail systems.

Less controversial is possibly what we say, as illustrated in Appendix A, that the outcome of a few **decades of reliance on one-off motorway project PPP's has left Sydney with a future hotchpotch of different toll rates and no overall rationality in the system**. We call this "incoherence" (and of quite a high order), and it is readily illustrated by comparing costs for daily commuting to the central CBD from North West or South West with the price that one pays if one comes in from the East or South. [Note that the values in Appendix A were projected forward to 2023 in anticipation of the expected completion date of WestConnex, but that table was calculated some time back and would be slightly different if re-done today, which we have not had the time to do - it is still clear enough on the general point though].

The next two pieces of evidence which we submit are Appendix B, which has some theoretical computations we recently did for a presentation to Engineers Australia (NSW Transport Society chapter), and then Appendix C which has latest per Km toll rates for the best known toll road in Canada - the 407ETR in Toronto. These two items of evidence suggest firstly that for even relatively standard major road projects outside the city centre, necessary user charges (when tested on an investor market-price basis), are higher than people generally expect, but also that tunnelled projects near to the congested centre need a very high toll rate to be truly cost-justified. Then further that the Canadian data suggests we are not alone in these assessments and indeed city motorways do need high user charges to be commercially viable.

BENCHMARK DISTANCE CHARGE RATES BASED ON PROJECT COST

Appendix B figures are computed in the manner we described in our 6/3/17 letter (attached) so for a reasonable understanding of how they have been computed we recommend that letter be read now - they represent a fully cost reflective approach to pricing the tolls on a distance only basis. That is to say, they firstly reflect the adjudged project cost (in current day terms) for the given piece of roadway, then they fairly simply reflect the design parameters of that road - which tends to be easy if we assume they all fall into the category of 2 x 2 lane roadways. We of course need to mention here that latest pre-by election publicity of the Northern Beaches Link suggested that it might be being planned as 2 x 3 lanes rather than 2 x 2, and that the Western Harbour Tunnel might also be 2 x 3 - so that might lead to changes in the outcomes for those roadways, but until we know whether the costs previously quoted have changed in some corresponding fashion, we cannot reliably update those figures. In any event the computations highlight that they will give high per Km values, regardless, relative to the other examples quoted in the table.

The key thing which is observable from the table is that the inner city motorways (and this would already have been obvious from the cases of Cross City Tunnel and Lane Cove Tunnel) are very expensive to build and therefore on a PPP basis require a commensurately higher toll rate to justify private sector investment. The other pertinent point to observe is that if the roadway is in an area that is not heavily congested then there is quite a difference in the per Km value if one uses capacity as the basis of pricing rather than (as would the private sector making a hard dollar investment) on the basis of expected AADT or utilisation level. So Hunter Expressway goes from, say, 10c per km per car to 40c if utilisation levels are taken into account [we make no assumption here about future patronage or ramp-up to it; it is just a broad correction factor].

A range of 10c per Km to over $1 (or even $2 per Km) for our NSW examples can then be compared with the figures in Appendix C where they are generally in the broad range of 30-40c per Km except weekends where they are in the low 20c per Km range. However, remember that this is for a very large, wide mega-multi-lane motorway which stretches over more than 100 Kms in length. It might be hard to draw a line from the 407 ETR values except to say that they are in the same broad ballpark as WestLink M7 distance rates and the proposed new WestConnex distance-based rates (but subject to quite a few extra quirks to do with the Canadian trip measurement systems and whether or not a vehicle has a transponder reading).

NETWORK TOLLING - SOME RELEVANT HISTORY

In late 2009 **Infrastructure Partnerships Australia** produced a paper titled "**Urban Transport Challenge: DRIVING REFORM ON SYDNEY'S ROADS**" which promoted ideas for network tolling in Sydney. Here are some excerpts giving salient points:

"Sydney would benefit from a new model which allows the Sydney Motorway Network to operate as under a single tolling structure….The principle recommendation of this paper is that the New South Wales Government and motorway operators consider and agree to implement a variable, time of day tolling system for Sydney's various motorways….This paper proposes a revenue sharing approach which protects the commercial interests of concession holders, while using network tolling to optimise utilisation and generate additional revenues that would be invested in developing new public transport and completion of the network….Under a model in which the Network is operated as a whole network, decisions to complete vital extensions like the M4 East would depend on whether its costs could be recovered through a combination of the new toll and additional revenue contributed from the network tolling regime. By contrast, to proceed on a stand-alone basis under the status quo, the project would have to depend on its own tolls and a significant taxpayer contribution."

Then in March 2014 IPA combined with the **Transport Reform Network** (a roads industry policy group under the auspices of Roads Australia, in conjunction with State motorists groups and many corporations in the roads industry) to produce a paper titled: "**Road Pricing and Transport Infrastructure Funding**". We say this is a very important report for two key reasons:

(1) **That it suggested a very comprehensive approach to road pricing**, e.g., it for the first time proposed a URUC or Universal Road User Charge model, whereby the ***"URUC model would cover all vehicles and the entire road network. In place of existing Fuel Excise taxation and fixed access and registration charges, vehicles would likely attract direct user charges that include elements to price vehicle mass, distance travelled and location of travel and time of journey".***
Further: ***"Charges could include the following components:***

- ***A fixed 'network access' charge to reflect common road user costs,***
- ***Variable charges, according to distance or distance location (e.g. urban versus regional, road type), and***
- ***Variable charges could be imposed according to time (e.g. peak periods) and distance (e.g. for travel in defined metropolitan areas) or distance-location (e.g. key corridors)".***

(2) **However, as will be seen by comparing our per Km rates with their recommendations, it got its calibration of road costs wrong by an order of material magnitude, due to the methods it used.** We shall return to this point later in the text, but just to finish on the potted history of industry lobbying efforts for reform, we shall mention one more item.

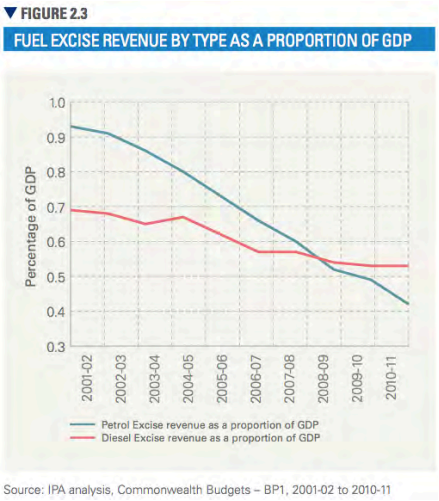
This is that in February 2015 the **NRMA** promoted its concept of network tolling in a paper titled: "**Improving the Performance of Sydney's Road Network**", from which we provide the following excerpts:

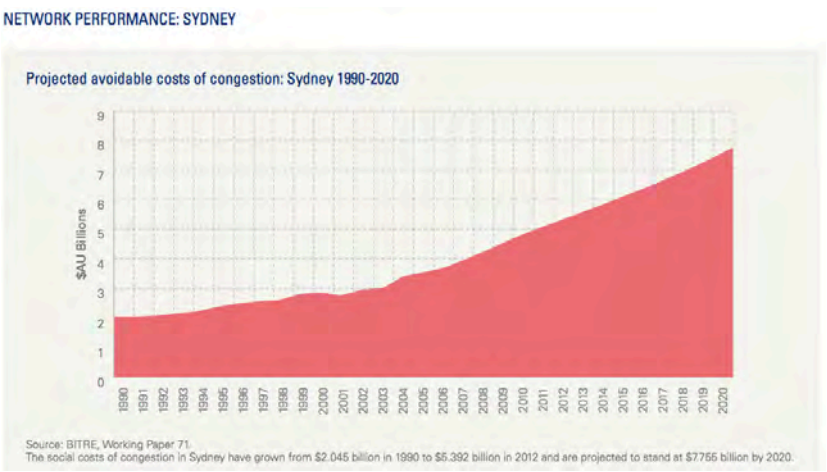
"To implement a network wide road tolling strategy in Sydney, there is a need to disconnect funding arrangements with pricing for road users…We believe that disconnecting funding from pricing could be achieved by shifting toll price setting to an independent toll road pricing agency (eg, the Independent Pricing and Regulatory Tribunal (IPART))…We believe that placing the tolling role with an independent agency provides arms-length decisions from government on road tolls, to achieve its performance obligation. Indeed, the agency could also take on the role of monitoring the performance of RMS on the achievement of its own road performance objectives."

So this went further than IPA or the TFN/Roads Australia in that it intimates something more along the lines of what the UK had been toying with, which was prompted by a Confederation of British Industry campaign suggesting that highways and roads be moved onto a regulated asset base framework, like occurs with highly regulated utilities such as electricity and gas.

THE TRN URUC FRAMEWORK AND VALUES

It is useful to quickly reflect on the key reasons TRN/IPA had for being so strong on the need for road pricing reform, and then on the key values they promoted for their preferred scheme.
The two charts below tell the story of "the why"? On one hand the starkly declining contribution of Fuel Taxes being the main revenue traditionally considered as available for funding roads - more than halving in GDP terms for petrol excise. On the other hand the emerging problem of growing congestion costs, exacerbated by under-investment in efficient transport infrastructure in major cities, such as Sydney.





But then we get to the problem, which is "the how"?
Here are the two components of their URUC model scheme, firstly the distance based charging element and then the overlay (as a de facto form of congestion charge) being the time of day surcharging. The two components were said to raise revenue on an approximate 60:40 split. The values in the 2nd table reflect the introduction of ***"an additional price component for major capital cities (or other areas of high demand) based on the time and location at which the road network is accessed"***.

▼ TABLE 5.1

WEIGHTINGS AND CHARGES – DISTANCE BASED ROAD USER CHARGE

VKT BY VEHICLE	ESTIMATED PROPORTION VKT 2007 (%)	VEHICLE IMPACT WEIGHTING	ESTIMATED CHARGE (C/KM)
Motor cycles	0.95%	0.50	2.29 c/km
Passenger cars			
Small	39.21%	1.00	4.57 c/km
Medium	26.14%	1.20	5.49 c/km
Passenger vans & Light buses	1.30%	1.30	5.95 c/km
4WDs: passenger	12.45%	1.50	6.86 c/km
4WDs: light commercial	6.37%	1.70	7.78 c/km
Light commercials & Other light vehicles	12.58%	2.00	9.15 c/km
Light rigid trucks	0.95%	2.30	10.52 c/km
Buses: 2 axle: GVM 3.5 to 4.5 tonne	0.04%	2.50	11.43 c/km

▼ TABLE 5.2

WEIGHTINGS AND CHARGES – TIME BASED ROAD USER CHARGE

TIME PERIOD	PROPORTION VKT	TIME OF DAY WEIGHTING	ESTIMATED CHARGE (C/KM)
Weekday - AM Peak (7am - 9am)	12.18%	1.00	14.42 c/km
Weekday - InterPeak (9am - 3pm)	24.54%	0.40	5.77 c/km
Weekday - PM Peak (3pm - 6pm)	18.31%	0.90	12.98 c/km
Weekday - Night time (6pm - 7am)	19.20%	-	
Weekend - 7am - 9am	1.95%	-	
Weekend - 9am - 3pm	11.70%	0.30	4.33 c/km
Weekend - 3pm - 6pm	5.56%	-	
Weekend - 6pm - 7am	6.57%	-	

As will be seen the values in their Table 5.1 are generally lower than virtually all of the per Km toll rates we came up with for the sample of roadways in Appendix B. If these rates were applied to just Motorways then they would seriously under-price the matter. Even adding in the 2nd component from their Table 5.2 the maximum per Km rate they get for Medium sized cars is 19.91c in the AM peak, which is in line with the factor we found for the Proposed M12 (based on the cost figure for that project promulgated by the Federal Government before the M12 road design was studied in detail), and based on capacity without being able to adjust for expected utilisation and ramp-up. It is slightly less than our theoretical rates for a hypothetical F3 duplication, but it is below half of the WestConnex per Km rate, absent the flag fall, and way less than the sort of rates we started to see for the expensive tunnelled projects Western Harbour Tunnel and Norther Beaches Link. **So what is the catch?**

The answer is that they costed total VkT in all of Sydney, not just on Motorways, and this will only work if Network Tolling is applied with GPS tracking so that users pay for all Kms.

We strongly doubt whether that will happen and we think it more likely that the roads industry lobby, if it succeeds, will bring about time-based charging on tolled motorways whilst charging for use of other roads is put on the political back-burner. Hence our warning about under-pricing, and remember what the background is, namely that road pricing is needed to fill a future growing gap in transport funding caused by a secular decline in receipts of Fuel Excise. **Under-pricing therefore means future under-investment, and perhaps severely so.**

Nevertheless, this exercise in comparison has been useful in clarifying that there are probably 2 stark choices in terms of adopting Network Tolling:

(A) **Using GPS tracking**, like in Singapore, where the government announced in February last year that: ***"All Singapore vehicles will have their existing ERP in-vehicle unit replaced by the new GPS-tracking on-board unit (OBU)"*** as soon as 2020 - this will: "***enhance tax collection with coverage over the entire island"***.
So, under this type of scheme, all road use can be measured and paid for.

(B) Adopt it **just for motorways and major arterial roads where gantries for transponder detection can be economically installed**. This will leave the city "rat-runs" and anything other than interstate highways in the country, non-chargeable. However, there were very insightful suggestions by roads executive John Gardiner (I think whilst independent) in private submission to the 2013 Casuscelli Inquiry, which we think it is useful to re-cap here.

In relation to time of day charging with peak time surcharges, an idea which had been picked up by Infrastructure NSW at that point, Mr Gardiner stated:
"The concern is that, whilst this may be a good first step along a pathway of reform, it sets up the government for ongoing accusations of broken promises. In order to be effective, the time of day charge must deliver an improved quality of service, acceptable to the motorist. Otherwise, if traffic congestion eases, then once again returns, the extra charge is a "rip- off" – extra money for no benefit. Time of day charges work for a while, then they have to be increased in order to be effective and the increase necessary can well be in excess of inflation ". The implication here is that Transurban, for one, might benefit significantly from the TRN proposals!

Mr Gardiner then went on to explain his idea for a new scheme to replace the existing motor vehicle registration setup and tied in with the elimination of fuel excise. It had two elements as follows:

(I) A per kilometre charge (he called it the **BASE**) which would vary vehicle to vehicle, depending on vehicle size, safety inclusions and emissions controls. BASE would be shown on the registration label of the motor vehicle. Based on expected mileage, it could be payable in monthly instalments, with an adjustment at the end of the year. Without going into full details, he basically calibrated it in a way that gave 7.5c per Km for a mid-range car, but could vary between 3.75c/km for a vehicle with advanced safety features and low emissions to 11.25c/km for an older car with high emissions and limited safety features. For a high performance freight mover, the range could vary between 12.75c/km and 20.25c/km.

(II) A 2nd charge which was a multiple of **BASE**, which he called **SAT** (for Safe Arrival on Time) which would only apply on urban motorways. He calibrated **SAT** to be a minimum if 3 times **BASE**, but he suggested that **SAT** increase above its minimum whenever there is a risk of congestion, with no upper limit, changing dynamically every 15 minutes over 5 km segments of the motorway system. His proviso and a key redeeming feature vis-a-vis the rewards to toll road owners, was that **SAT** would only be payable if a minimum average speed over the segment had been delivered. This put the onus back onto motorists to avoid peak periods, and not reward toll road owners if congestion slowed traffic too much, but it would necessitate that drivers had access to good forward-looking information systems in relation to emerging traffic conditions.

Whilst we still have not made our minds up about the design of his second element, we do agree that his first element provides a similar framework, if not scale, to what we would suggest be adopted as the missing piece under Network Tolling choice (B) above, so that the regime is a complete road pricing one. That is to say a per Km charge that can apply for all distance travelled over a year, in lieu of the existing format of registration charges. This means “rat running” (or tollway avoidance) will at least have some cost, which is a necessity if fuel taxes are going to evaporate. If this happens then to avoid double-counting, credit should be given for Kms travelled on Motorways and arterials that are tolled. Thus, effectively registration fees would be converted to an Access Charge based on access to not specifically tolled roadways, and also based on expected usage, as later adjusted to actual, if GPS systems are not adopted.

We shall return to this notion after now dealing with another aspect. This is: why we favour an “all-modes” Transport Network Improvement Fund for future major infrastructure planning, rather than what many have called for, which is just a roads fund.

THE NETWORK TOLLING SCHEME IDEAS WE PUT FORWARD IN 2013

Without going into the IP detail of our proposals for a Long Term Infrastructure Funding Corporation ("LTIFC") framework, which was alluded to on page 1, we can say that one of the things we envisaged was for it to work in concert with our concepts for road pricing reform utilising our version of Network Tolling, in the case specifically of Sydney motorways. By design, the LTIFC works generally by resorting to Government borrowing, in a "fund of funds" framework, where each State would have its own identifiable sub-fund but be backed by Commonwealth credit standing. This is for purpose of producing infrastructure-backed bonds (securitisation) that could be invested in by the large long term superannuation funds, but with project construction and completion risks not taken by them.

When combined with the notion of our Network Tolling Scheme for Sydney, the LTIFC could borrow to invest in the motorways that were not yet tolled, and one advantage of starting with a pool of existing motorways over an individual toll road project was that the patronage risk would be substantially lessened and the riskiness of traffic projections would be dampened both by the pooling and by the established nature of the assets. It could then invest in new "green fields" motorways or rail lines, not yet built, with Governments taking more of the risks in that situation and the Super funds taking lesser risk exposures until patronage, etc, had been proven (that is, higher risk/margin project securitisation, with greater collateral coverage). That is similar to how WestConnex funding has turned out so far, but we envisaged a longer period of "bedding down" for the portfolio than it seems the State is planning to adopt next year for its monetisation of WestConnex.

The structure diagram in Appendix D hereto, illustrates the (2013 version) LTIFC framework for facilitating Network Tolling. As will be seen it seeks to provide a greater role for Government sorting out the incoherence of different toll rates in different parts of the city. [*Of course, that degree of incoherence will reflect itself in even greater inequities once the WestConnex is completed, unless it's pricing strategies are changed before then*]. A government role was envisaged for collection of all newly priced tolls and for allocation of them to the various road owners. Of course, this does not mean that parts of those functions would not be contracted out, even to existing toll road operators. But government is at the centre of our design and the private sector plays roles that it is best at - the original rationale for PPP's. Importantly it will be up to government to establish the re-negotiated concession terms, such that contracts are complied with, and users get the benefit of any toll price reductions possible, whilst not giving up too much "profit leakage" to the incumbent owners.

The envisaged pricing scheme (2013 version) is illustrated in Appendix E, but we need to add some additional clarifying comments.

1. ZONE DEFINITION

The graphic merely shows an illustrative concept where there are four main charging zones. Whilst there is some method to where the zone boundaries sit, a lot more detailed analysis would be needed to define them clearly, if not to weigh up just how many zones should apply. The general principle we adopted to arbitrarily set the zones was weighing up land price effects (higher land prices exist generally the closer to the central CBD, with lower as a generality when one moves to the outer zones) in combination with measures of existing road congestion. The land price effects were considered because that is a very important determinant of how much it costs to build a given road. The congestion effects were considered because that is what we are trying to counter. Also the combination of these two factors did give us rates that were closer to a match for existing tolled motorways, and it is a concern (especially with the TRN URUC proposals) if proposed rates differ significantly in impact from existing contracted tolls, because that would make negotiations with existing toll road owners that much more problematic. As a consequence it might increase the chances of "profit leakage" through those owners gaining "super profits" as an outcome of the required re-negotiations.

If the system was to be more like Singapore then many more segments would apply - as they have almost a hundred gantries at last count, and their ERP pricing can vary in as small as 5 minute segments at some times of day/week. However, to introduce such a detailed matrix of pricing parameters would make it extraordinarily difficult to negotiate with the existing toll road owners as there is no traffic modelling that would assist ex-ante. We suggest that an ERP-type detailed framework be a later stage possibility, but that it be studied more closely in the meantime by Transport for NSW for useful insights.

2. RATES

As will be seen, the rates we adopted (10c, 20c, 30-50c, then $1) do very broadly match the shape of things from our examples in Appendix B and WestConnex, except for the 2 new cross-harbour tunnel projects. As stated above they also do minimise somewhat the disruption to rates in existing toll concessions, although it may be feasible to start such a Network Tolling Scheme with existing toll road rates undisturbed, at least in the first instance. The main situations of change would be the Cross City Tunnel, the Lane Cove Tunnel and to a lesser extent the Eastern Distributor.

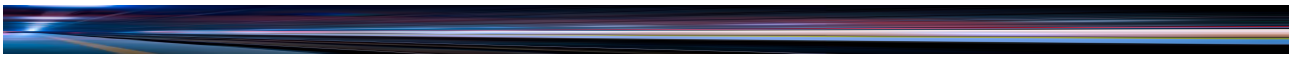
Whilst on this question of rates, we might also point out a fallacy in TRN's URUC scheme - namely the use of a "universal" RUC based on VkT over the whole of the State. As will be seen from their Table 5.1 the universal charge for small and medium sized cars throughout the State would be 4.5-5.5c per Km. So let's consider this applying in country areas and to begin with just focus on the Pacific Highway being upgraded to dual carriageway north of Hexham.

That project, some 666 Kms in length, which they say will be finished in 2020, is capable of being analysed for market-priced tolling in much the same manner as our Appendix B results. When finished this project will have costs somewhere between $15 and $20 billion and on an AADT figure between 20,000 and 30,000 vehicles per day (the only really heavy traffic sections being south and north of the project corridor), I get a rough market value no more than about $3 bn or so - showing again that TRN's rates are too low to apply to interstate highways. So what is implied here is that their URUC needs to be broken down further according to standard of roadway. It also implies that there is a very high hidden long term cost to taxpayers in the Pacific Highway upgrades, which makes it even more curious that governments have not embraced High-Speed Rail in the same vein.*
** [Well, theoretically at least, using the benchmark parameters we derive from Transurban stock pricing on ASX, but of course it would not be representative of Transurban's average portfolio holdings at all - hardly up to the same investment standard]*

3. STAGING

Some comment on possible staging considerations is warranted because clearly such a scheme could not be implemented in a "big bang" style. [That is why we have 4 steps in our transitioning table at the foot of Appendix E]. As will be seen from the left hand section of our 2013 structure diagram, we had envisaged at that time the east-west corridors across the middle part of Sydney as 1st priority for switching to the new tolling regime, in conjunction with evening out tolling on the one-way concession for the Eastern Distributor, and moving the Harbour crossings to 2-way tolls. So let us briefly consider a few examples in practice.

The Harbour Bridge is complicated to measure for distance pricing purposes, being 1.2Kms for the Bridge span but either 2.2 Kms or 2.5 Kms for the Cahill Expressway section depending on source of data. The Harbour Tunnel has been measured at 2.8 kms in Wikipedia and at 2.3 Kms just for the Tunnel according to Transfield data. So both roads introduce intricacies for a purely distance oriented charging scheme, if treated alone. With a flag fall of $1.00 (suggested for all major bridges) and a distance rate of $1.00 per km, however, we get between $3.20 and $3.80 for one-way tolls. It would be desirable to keep these equal (say $3.50) unless the approaches (Gore Hill Freeway, Warringah Freeway) were also being distance-tolled. This may indeed be what happens if the Berejiklian Government goes ahead with the Western Harbour Tunnel project as, absent distance tolling, it seems inadvisable to charge more for one crossing than another unless one is prepared to see traffic flows distorted by such cost differences.



So far as the Eastern Distributor is concerned RMS shows its measurement as 6.0 Kms and at $1 flag fall plus $1 per Km, this would be a $7 trip each way, whereas its current toll rate as of time of writing is $7.02 for Class A vehicles. So this would be a doubling of effective cost if it wasn't transitioned. That transitioning can, of course, occur just in the situation of southbound travel, which is not presently tolled. Alternatively the ED owners could be offered the opportunity to have tolls both ways at something near to half the current tolls and for a profit-sharing scheme also to be embodied in the re-negotiations, if the Network Tolling Scheme overall is to be introduced.

These are just some of the practical considerations and we have never said there would not be much detail and complexity in reforming so important a part of Sydney's transport infrastructure management. However, likely fewer complications would occur in the zones away from the Central one, as the motorway system is more simple there.

4. BENEFITS

Remember too that there are benefits for motorists from things like the Cross City Tunnel becoming more usable by lowering the price. At 2.1 Kms length it would have a pure distance toll (for cars) of $2.10 each way - at 100% Network Tolling implementation - versus $5.51 at present (full distance, not the Sir John Young Crescent exit). This would be expected to give rise to greater usage, although the outcomes are not so predictable due to the choke points at entry.

The benefits we saw to the State were that upon eventual adoption of the whole Network Tolling Scheme, extra funds raised for the Transport Network Improvement Fund (a parallel in this way to the Restart NSW fund) would enable rail network improvements such as a fast east-west axis through Parramatta and improvements to the network's cross flow capability (by constructing new north-south oriented connectivity). That was based on our preliminary assessment that the institution of such a scheme could raise potentially $20-$30 billion over time out of road pricing and monetising the new revenue streams.

As illustration of possibilities we will mention here just two of the rail options we have worked on in conjunction with engineering associates, at a high level of design and a reasonable level of viability study. There are many other options for augmentation of Sydney's rail network, which is sorely needed if we are to avoid the worst future prospects of road congestion. Some of the various rail improvement options put forward in recent history are shown in Appendix F.

FAVOURED RAIL IMPROVEMENTS EX-TRANSPORT NETWORK IMPROVEMENT FUND

EAST-WEST: A fast to high-speed rail link between Western Sydney Airport and the City's commercial heart (roughly Town Hall area) via Parramatta. This idea had as its precursor the Western FastRail concept from 2002, which went to Blacktown & Penrith and was tunnelled east of Westmead. This proposal has been named **Sydney FastLink**, and is shown on our web site.

- 25 minutes Badgerys Creek to City; 12 minutes Parramatta to each end -

NORTH-SOUTH: A speeded up path using the existing rail corridor from Campbelltown through Liverpool and Fairfield to Parramatta, followed by a tunnelled link to the North West Metro line at either Norwest or Castle Hill - a proposal that has been named the New Cumberland Line. This would work by segregating the South line from the Inner West line of the T2 Sydney Trains network and doing some improvements to the corridor (in safety and signalling, and some track) but also adopting faster rolling stock than existing suburban or planned metro train sets.

- 17 minutes Campbelltown to Liverpool; 12 minutes Liverpool to Parramatta -
[Currently 48 minutes total]

The **New Cumberland Line** concept fits in with the Greater Sydney Commission's aim to make Parramatta Sydney's 2nd CBD, as does the routing of the Badgerys Creek airport fast rail link through Parramatta. These combined, and with other existing requirements, suggest that Parramatta should be developed as a new centralised rail Nexus with at least 8 lines going through its CBD, suggesting an under grounding of rail, just as was adopted in WA with the Perth City Link re-generation project. [**What other major city of such size does not have underground rail to free up surface land?**]

Each of these options have some fairly beneficial prospects of value capture and/or value sharing which may not yet have been contemplated by the State. By moving to fast rail it is also expected that modal shift from roads will be higher, patronage robust and growing, and higher fare box revenues relative to costs possible. A 2nd stage of Western Sydney Aiport would also improve rail finances if these links are built. Remember also that eventually WSA with 2 runways, and fully developed for 80 million+ passenger movements, would generate much greater rail demand. Accordingly a conventional metro, we think, might run out of capacity in such a situation, certainly to the east of Parramatta. **Sydney FastLink** envisages throughput capacity of 70-75,000 passengers per hour, versus 40,000 per hour for the announced (but not yet finally confirmed) Sydney Metro West.

CONCLUDING COMMENTS

We apologise that we have not had the time until now to complete this submission. However, having incurred delay we now see that comments are arising in the press about other submissions, presentations and lobbying on the matter, so we think we would like to make a few extra points.

1. IPA only submitted a cover letter reinforcing its original submission to the Casuscelli Inquiry. So it has not responded to arguments against the things it has supported in the past. We repeat that there is much wrong with the TRN proposals which they backed.
2. NRMA has reported (referred to earlier) that it believes toll price schemes should be referred to IPART - a measure which we applaud in the hope that getting IPART more engaged will lead to some positive progress, importantly with an economic foundation. We note that Peter Boxall is reported to have said that IPART would like to be involved, yet Ken Kanofski was reported to be against that, which suggests to us that the right sort of progress will not be made on road pricing until Transport for NSW adopts different principles and policies. [As we have said the envisaged arrangement for monetising the State's investment in WestConnex and the suggestions of including Western Harbour Tunnel and Beaches Link projects in the same framework, in our view can only augur a worsening of the current inequities and lack of true road reform.]
3. The NRMA astutely argued in their February 2015 paper for the separation of pricing from funding for road users. This may be the only way in the short term for some of the inequities to be overcome, but we would argue that full separation is not advisable - because it is road costs that need to be funded and to separate pricing from costs too much will ultimately lead us down the wrong path economically. Long term greater discipline in tying charges to costs, providing done democratically with enough community knowledge and involvement, is highly desirable. Hence IPART or like involvement is crucial.
4. We have shifted this submission out of just commenting on road pricing to discussing in some respects its interplay with rail investment issues. We think that the state of Sydney's transport network is such that it over-emphasises road use and, due to institutional framework weaknesses, we are now suffering the pains of congestion due to decades of under-investment in rail. We think the latter should be the higher priority until this situation can be re-balanced. We have a catch cry of some relevance which is:
   "So long as trains cannot compete with roads, we'll keep building roads, so we need to choose rail investment that is roads-competitive, namely fast and convenient, and just as rail requires fares to be paid, so roads should have a cost-reflective price. Eliminate biases".

5. We have herein outlined some of our earlier ideas on a national Long Term Infrastructure Funding framework targeting land transport infrastructure, and exhibited what we think is needed which is a Transport Network Improvement Fund, financed largely by future reformed road pricing. Whilst we argue for higher road charges generally, we also want them to be fairer and systematically determined, as well as phased in through practical transitional measures. This would necessitate people paying more, but it is possible that this could be facilitated by the raised charges coming after the increased rail investment rather than simultaneous with projects as part of financing them. That would necessitate governments borrowing to invest in land transport infrastructure but if user access and usage charges are rationally set, such as in a Network Tolling Scheme or a Singapore-style ERP scheme, then that borrowing will be sound and prudently managed.
6. A test for the new Berejiklian Government's adherence to good standards is coming up in two situations: (a) the completion of scope for the WestConnex and its usage pricing strategy, and (b) the Audit Office examination of aspects of NorthConnex (see Appendix G). We worry that the WestConnex dealings with financiers will take us further down the wrong path, away from sensible Network Tolling. We also look forward in the hope that the NSW Audit Office is given adequate resources and information to be able to truly test the criteria highlighted in red text in that Appendix. Following which they can report very transparently and independently on those matters relative to what your Committee finds as a result of running this present Road Tolling Inquiry.

We would be happy to respond to any questions on this expanded submission providing it doesn't lead us into commercial-in-confidence territory, but I can confirm that what we have now written herein is available to be released publicly should the Committee wish to do so.

Yours Faithfully
Best Regards

IAN F BELL
Actuary, Director & Principal
13/4/17

Summary of Our Views

NSW (starting with Sydney) needs a comprehensive plan for Road Pricing

All Sydney tollways are under-priced in pure "cost of project" terms

New tollways also tend to be under-priced
However, with high fixed escalation rates all motorways can become over-priced

Previous proposals by Transport Reform Network for Universal Road User Charges (URUC'S) also tended to under-price except for their peak hour surcharging notion

There are huge inequities in Sydney's current tollway pricing*

People living in the North-West and South-West are disadvantaged
People from the East, North, South & to a lesser extent North-East, are advantaged

However, advantage versus disadvantage overall also depends on rail alternatives

Most proponents of Road Pricing reform argue for distance-based pricing

We have devised methodology which shows that most estimates for distance-based pricing under-rate the per km pricing needed for an economically rational system

Proposed PPP dealings on 'monetising' the State funding of WestConnex look likely to make the current situation worse and may frustrate true reform

Projects like the Western Harbour Tunnel and Beaches Link will not pay for themselves

Tinkering with individual tolls will be counter-productive long term and we need either comprehensive "network tolling" or a system like Singapore's ERP

This submission has been prepared at a late stage, with consent given to an extension of time, but due to other commitments it includes items that we have not had the time to update*.

*** In particular the table of projected toll rates applying from different directions of travel to the CBD or to Mascot Airport, shown in Appendix A, has not been updated for latest inflation and escalation expectations, so should only be used as a general guide on the level of inequities, rather than relying on many given specific toll charge amount.**

- **ANNEXURE** : **OUR PREVIOUS LETTER REPRODUCED HERE FOR COMPLETENESS** -

6th March, 2017

Ms Sharon Ohnesorge
A/Director | Upper House Committees
Parliament of New South Wales
Parliament House, Macquarie Street Sydney NSW, 2000 Australia
By Email to: sharon.ohnesorge@parliament.nsw.gov.au
CC By email to: gpsc2@parliament.nsw.gov.au [ATTN: Tina Higgins]

Dear Sharon & Tina

I refer to recent email correspondence wherein you provided an extension of time to respond to the Inquiry, in light of our being unaware it was in process.

We had made confidential submissions to the Road Access Pricing Inquiry run under Chairman Charles Casuscelli in 2013. We also presented concepts for network tolling of Sydney motorways to Transport for NSW subsequent to that and developed further thoughts in responding to the Inquiry into Public Infrastructure by the Federal Productivity Commission in 2014, amongst many other instances of speaking out on faults in prevailing road pricing and the biases against rail and public transport generally that are a consequence of that.

We think that the systems for pricing road usage in Sydney (and indeed the whole of Australia) result in a high degree of incoherence with many resultant inequities, because of their reliance nowadays on motorway tolling concessions via Public-Private Partnerships ("PPP's") of fixed term. This is only getting worse and the WestConnex toll pricing formulations could significantly worsen and perpetuate a situation which will prove extraordinarily difficult to re-structure. Especially, in the event that the WestConnex project proceeds into a stage of "monetisation" of the State's funding position, via a similarly structured type of fixed term, essentially fixed price curve, PPP (whether in one or more "deals"). It is the nature of the PPP pricing which is the main fault, but other faults persist. Changes are needed.

We favour a more comprehensive and rational system of pricing road access and road usage (Note: access and usage do not have to be lumped into the one basket), with the best world benchmark being Singapore's system and how it evolved its current Electronic Road Pricing (ERP) scheme.

We realise there are some practical political consequences in any raising of prices for road usage, even when there are new motorways. However, very generally speaking, roads in Australia are under-priced. Whilst not a popular notion, this will be shown to be an inconsolable future fact when the advent of electric and other non-fossil fuelled vehicles, start to become prevalent. For it is then that it will be more clearly seen that fuel taxes as a source of revenue for maintaining, and building new, or extending existing, roads are on a future systemic and potentially rapid decline - thereby necessitating an alternative to that as a source of revenue supporting land transport infrastructure.

The situation in Sydney is particularly dire. It is not only that most roads are under-priced or not priced at all, it is even worse than that. There are **huge inequities from motorway tolling*** depending on which part of the city one lives in and travels to. See the Appendix A table, which we haven't had time to update.

*** Also see Michael West article at:** ***http://www.smh.com.au/business/the-economy/ppp-plundering-takes-its-toll-on-love-20160212-gmshyp.html***

The situation giving rise to inequities is partly a combination of history (when given roads were constructed) and the vexed issue of land prices (meaning that some motorways nowadays are extraordinarily expensive to construct because corridors for them were never set aside years earlier when the land was cheaper to acquire) **. However there is also another reason - namely that we do not have a systematic network wide approach to pricing. We only price when convenient.

**** See further Michael West article at:** ***http://www.smh.com.au/business/if-you-thought-using-a-toll-road-was-costly-try-building-one-20140810-102i5o.html***

Some have attempted to pose solutions to this. An example is promotion by the NRMA and other roads lobbies, banding together under the banner of the Transport Reform Network (sponsored by Roads Australia). In 2014 they produced what might be interpreted as a draft manifesto, shown within a jointly commissioned report at this link:

http://www.aaa.asn.au/storage/1-road-pricing-and-transport-infrastructure-funding-reform-pathways-for-australia.pdf

There is much of immense value in this report, and as usual the joint sponsor Infrastructure Partnerships Australia, despite being an industry lobby group, shows themselves to understand and admit to a whole host of the important issues. However, our own submission to the Productivity Commission provided stark evidence that this Transport Reform Network report had wrongly calibrated the URUC's (Universal Road User Charges) as a per km set of figures. That is because of two factors:-

a) the data for road-related revenues versus road-related expenditures was just wrong, mainly due to being incomplete (this has been largely fixed, we understand, from 2015, by BITRE);
b) it ignored the very high cost of construction of inner city motorways, like Melbourne's East-West Link and Sydney's WestConnex *(see 2nd Michael West article above)*;

Essentially the PAYGO methodology for heavy vehicle pricing was faulty, mainly because of incorrect underlying data, but also because with its 7 year averaging it lagged behind present values, whereas new motorway construction actually has to look forward several years to emerging cost parameters.

We cannot provide a comprehensive analysis to demonstrate this point given the short time available but we do have some computations we performed recently for presentations on the subject of High Speed Rail (HSR), which because of the way we approached comparative infrastructure project options (road versus rail), did lead us into theoretical comparisons of the market-based pricing of a duplication of the F3/M1 versus the economics of Newcastle-Central Coast-Sydney HSR and, to back that up, quoting other examples of well-known road projects using our adopted methodology. We presented the small set of examples of theoretical road pricing shown in Appendix B using a simple methodology which we shall endeavour to explain.

The table in Appendix B was the outcome of our rough figure work on these examples for theoretical road pricing. It is a guide to what you get as a user charge per km if you want to cover 100% of the costs. That is, it is based on eliminating subsidies for both road and rail, in this case the road examples quoted.

You will note, if you read the Transport Reform Network report mentioned earlier, that **we derive much higher per km user charges than they did**. That is a very significant outcome, and this is with interest rates at a historic low and hence Transurban's stock market valuation based on these low rates, which may soon start to be "normalised" (to use US Federal Reserve terminology) thus increasing.

THE BENCHMARKING METHODOLOGY - SIMPLIFIED

We start by a process of benchmarking where, within our computational engine, we work off key stock market parameters for Transurban as if they were to buy the roads shown in the list. It is all theoretical, of course, but it is a measure using actual stock market implied methods of valuing a portfolio of toll roads. The examples use data at early January 2017. For an attempt at consistency, in the table most capital costs were updated to approximate $2016 values. [That's one choice in a regulated asset base system, namely "replacement value"]. The main exceptions being those like Hunter Expressway, recently completed but without us having sufficiently reliable final "out-turn" construction cost data. In any event the methodology as applied currently is only a guide, so super-accuracy and detail was not one of the aims.

The user or toll charges then vary with cost of project. You can see this occurs to quite a degree – that's because under this approach they are **fully cost-reflective**, as Federal Infrastructure Minister Paul Fletcher has intimated should happen. To repeat, no government grants or subsidies (whether open, or the more usual, hidden) are allowed for in the method. Where appropriate we then convert these full-length toll figures into a per km, distance-based, charge. One can see the degree of variation in this, too, from the table.

There are two separate sections to the table. The top section of the table, prices only on "standardised flow capacity" and the bottom two examples are where we know from public pronouncements that initial utilisation numbers are, or are expected to be, under full capacity, so they are priced on an adjusted basis - which after all, is representative of how a private sector buyer would approach things in practice. If we knew more utilisation values (that is, forecast traffic data) then we could have expanded that section. It is indeed an aspect that in some instances can be very important. An example we quoted in Newcastle, is that some $15-$20 billion has been spent or committed on Pacific Highway Upgrades since 1996, and yet the utilisation in the region of Grafton to Ballina (almost the last of the scheduled upgrades to occur) is in the ballpark of 10,000 vehicles per day or only about 10-15% of theoretical capacity.

Reverting to a description of the methodology, we should point out that basing the top set on standardised flow capacity - which is lane flow rate under Highway Capacity Manual standards for adequate free flow, multiplied by an expansion factor for average hours per day, to equate to AADT*** - is another technical decision, which is why having a formal regulator with the

resources to derive these parameters could be important. It may be that application of enough resources and skills (or pure data collections, for a dynamic pricing system like in Singapore) would then take the methodology to a more robust level.

*** ***We used 10 times in this benchmarking, though in practice it can vary depending on where one is in the city.***

Nevertheless, one of the key decisions is do the Road User Charges get priced on "capacity" or on "utilisation", because the latter will undoubtedly increase the prices? It is the only theoretical way to approximate a "market price" test, but it will result in some roads looking uneconomic - and maybe that is one of the benefits of such a system, i.e., roads will not get built if they can't pay their way, unless some socio-economic overlay to the framework is approved. Perhaps that will help the community get more rail investment, for instance, if rail does continue to provide capacity or other advantages.

I am not going to go into detail of how we compared HSR to duplicating or quadruplicating the F3/M1 corridor land transport provision. I've only got time here to point to the fact that we attempted to derive a theoretical capital cost for a full F3 duplication, for purposes that related to the case for HSR versus roads alternatives. There were and are a lot of uncertainties in that. Other people might come up with materially different costings, but that should not detract from exposition of this methodology - it is really more a question of do we have the best data? My estimates, according to the most experienced engineers may be called guesswork, but I did consult our own engineers for a "reasonableness test" and they are at least based on work by engineers SKM for NSW in 2002, and were merely updated to today's construction cost parameters as best I could.

Note, however, that we get something over 20c per km or probably 25-30c if we roughly base it on early utilisation. That illustrates just how significant applying the best estimation methodologies and input values might be. There are many assumptions here but it's a useful guide. Without such a guide many mistakes will be made in pricing motorways and arterials now, which the coming advent of electric (and maybe driverless) vehicles will make look foolhardy - because under non-fossil fuelled vehicle dominance, as we said earlier, there will be only minimal fuel taxes and not enough roads revenue to enable road maintenance and building to continue. We are not at that stage yet, but it is becoming quite urgent that this future is faced by our Governments.

FINAL NOTE: The table of quickly computed estimates ignores a few nuances in the desirable computational methodology.

- Firstly, they are 'per vehicle', and if we continue to price heavy vehicle usage higher than light vehicle usage (which we clearly should) then the heavier vehicles would exhibit rates higher than these and the lighter vehicles (such as cars) commensurately lower. A simple formula might assist, which is that charges for light vehicles (if there only heavy and light vehicle classes) can be approximated from the "per vehicle" rates by the following generalised formula :

$$\text{Light vehicle rate} = \frac{\text{Per vehicle rate}}{\{\,[1+(\text{Heavy vehicle Multiplier} - 1) \times \text{Heavy vehicles as Ppn. of total vehicles}]\,\}}$$

Example: Proposed M12 (from table) Per vehicle rate = 20c/km
Assume Heavy vehicle multiplier = 3.0 times
Assume Heavy vehicles are 10% [0.1] as a proportion of total traffic
Light vehicle rate therefore = 20c/ [1+(3.0-1)*0.10] = $0.20/1.2
= $0.1667 per km
that is, = **about $16^{2/3}$ c/km**
Heavy vehicle rate = 3.0 x $0.1667 = $0.50 approx. OR **50c/km**
CHECK on this: Per vehicle rate = 90% x $0.1667 + 10% x $0.50
= $0.20

- Secondly, these prices have been worked out in today's interest rate environment. If interest rates 'normalise' in the period ahead due to USA Federal reserve or other factors, then the prices would be a degree higher. Again this is a suitable role for a pricing regulator (like IPART, in the NSW instance) as happens in other utility industries . Also our prices do not make specific assumptions about use of debt or equity by the notional "market-based" buyer the road - so we have avoided dealing with the issue of positive leverage, which is where debt rates are lower than gross running yields and hence it is favourable to own the roads via an internally geared investment structure.
- Thirdly we have implicitly included non-toll revenues from the Transurban parameters because of the way in which we have taken their data from the ASX records, and we have implicitly incorporated their framework for the cost of running electronic tolling systems and payment systems - both of these nuances we would expect to be eliminated or minimised in any comprehensive network-wide road user charge system, due to economies of scale and efficiency in collections. Hence some savings against the rates exhibited in the table should be possible on this account.

We will let our computed rates on Western Harbour Tunnel and (Northern) Beaches Link speak for themselves, but clearly without subsidisation from somewhere the tolls illustrated indicate a problem somewhat analogous to what happened with Brisbane's new toll roads CLEM7 and Airport Link - where resistance to high tolls saw drivers taking alternate routes. The only difference in the Sydney case being that there are only limited ways across the Harbour between north and south, and west of North Sydney they are not so convenient for many.

A possible response is to simply toll the northbound trips on the Sydney Harbour Bridge and Tunnel, and probably equalise the tolls on all three crossings in future. However, we much prefer that the whole question of network tolling and examination of rational pricing, like in our examples, is followed rather than just expedient short-term political decisions. We shall follow up with additional information if time permits.

Finally, may we remind the reader that subsidisation of roads versus rail is expected to become an even bigger issue in years to come, as the decline in fuel taxes puts pressure on Federal transport budgets. So this should really be about the whole transport system and how it is funded, not just about road tolling.

Yours faithfully

IAN F. BELL
Actuary & Principal

APPENDIX A

INEQUITIES IN SYDNEY TOLLS PRICING COST PER DAY DEPENDS ON WHERE ONE LIVES AND WHERE ONE TRAVELS TO

COSTS OF CBD COMMUTING FROM/TO			COSTS OF TRIPS TO/FROM MASCOT AIRPORT		
City Sector	Projected Daily Cost CARS	Projected Daily Cost HCV'S	City Sector	Projected Daily Cost CARS	Projected Daily Cost HCV'S
North East	$4.00	$4.00	North East	$12.83	$21.65
North	$4.00	$4.00	North	$12.83	$21.65
North West	$30.10	$82.29	North West	$38.92	$99.94
West	$18.63	$55.88	West	$18.63	$55.88
South West	$22.12	$86.90	South West	$13.30	$69.25
SW (no Cash Back)	$31.91	$86.90	SW (no Cash Back)	$23.08	$69.25
South	$8.83	$17.65	South	$0	$0
East (not via CCT)	$0	$0	East (not via CCT)	$8.83	$17.65

NB These toll rates all projected to 2023 on best guess basis using 2.5% pa inflation. Assumes nil Cash Back for HCV's. E.&.O.E

These values were calculated in 2015 but projected to 2023 for WestConnex opening, so they are not up to date but remain a useful guide as many of the motorways are on fixed escalation rates.

NOTE: Latest available figures for WestConnex itself suggest a projected toll rate each way for Cars capped at $7.95 (2016 value) which would become circa $10.93 for 2023 using the high 1% per quarter escalation rate and ignoring rounding impacts. This of course is not yet final pricing. ***On this basis the daily to and from trips from the West, even after capping, would be $21.86 for Cars and $65.58 for HCV's, showing the impact of the 1% per quarter minimum escalator.*** Moreover, the cost from the South West is expected to be higher given the likely separate tolls for the M5 South West and the New M5 part of WestConnex, with only the latter subject to a cap. Separate concessions basically means higher tolls, as caps cannot be applied across road owners. - INEQUITIES BETWEEN EAST AND WESTERN CITY DWELLERS WILL BE AMPLIFIED -

APPENDIX B

STANDARDISED ROAD PRICING BENCHMARKING
[We compute these as if Transurban was to buy each road]
Figures below @ Transurban market pricing early Jan'17

ROAD	CAPITAL COST Millions (est.)	APPROX. FULL LENGTH TOLL	Per Km Charge Rate	NOTES [Also see our submission for further detail]
CAPACITY-BASED	**Assuming 4 Lanes (2x2) Built or Operational**			
Western Harbour Tunnel	5,786	$14.20	$1.77	Incl. Rozelle connector
Beaches Link	3,143	$7.70	$1.42	Counts 5.4kms
M12 Proposed	1,246	$3.05	$0.20	15 kms option
The Northern Rd	1,585	$3.90	$0.11	34.8kms assumed
Bringelly Rd Upgrade	509	$1.25	$0.12	Excludes existing cost
Hunter Expressway	1,700	$4.20	$0.11	Historic cost
F3 Duplication*-Lo	12,400	$30.30	$0.21	147kms route
F3 Duplication*-Hi	14,450	$35.30	$0.23	155kms route
UTILISATION-BASED	**Assuming 4 Lanes (2x2) Operational**			
Beaches Link	3,143	$12.30	$2.28	Based on 50,000 AADT
Hunter Expressway	1,700	$16.60	$0.42	Current 20,000 AADT

* Tunnel cost per NorthConnex per km

Nb Rates are per vehicle, not broken into classes

The above computed values are a guide only but do provide support for a tiered approach to per km RUC rates according to distance. It is of course relevant that already WestLink M7 has distance-based charging, albeit with a trip cap, and the prevailing rate for that at present is $0.3946c/Km.
Likewise latest information for WestConnex has the per Km rate (excluding the flag fall) at $0.42.
Overleaf we show the latest table of rates for the 407ETR toll road in Toronto, Canada, which given that the Canadian Dollar and the $AUD are virtually at parity presently, shows a remarkable similarity of region in terms of $ / c values per Km (and they also have a flag fall, which is $1 per trip).
Again this indicates that tolls on Sydney motorways in future cannot be at the levels that the Transport Reform Network proposed in 2014. They can start at lower levels but the cost factors relating to construction, operation and maintenance will tend to drag them higher to these levels over time.

APPENDIX C

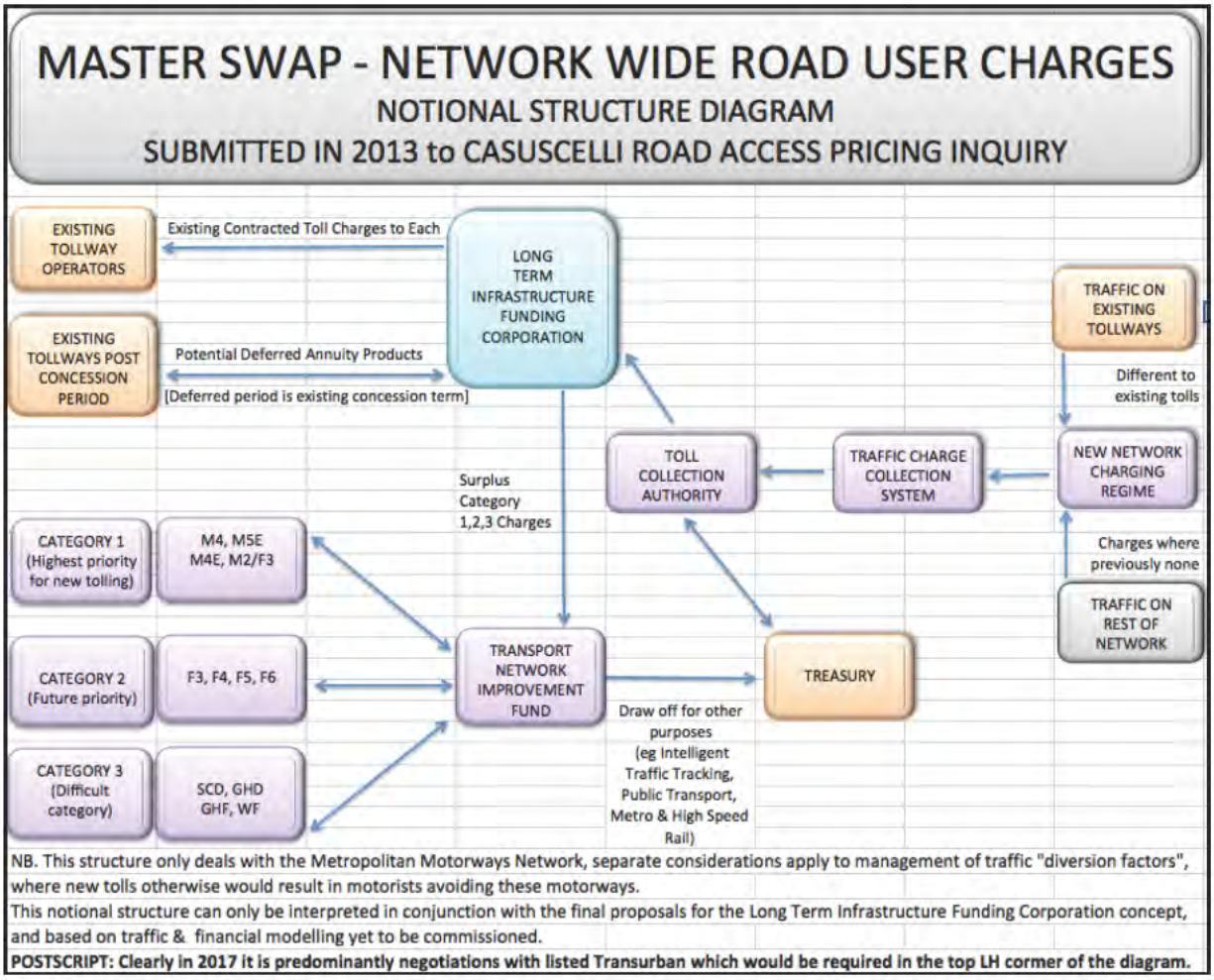
OVERSEAS EXAMPLE: 407ETR TOLL ROAD IN TORONTO, CANADA
TABLE OF TOLL RATES AT FEBRUARY, 2017

NOTE: Trip charge of $1 also applies (operates like a flag fall)
EB denotes Eastbound; WB denotes Westbound

Period	407 ETR Zone 1 (per km)		407 ETR Zone 2 (per km)		407 ETR Zone 3 (per km)		407 Highway 407 (east of Brock Road) and Highway 412 (per km)
Peak Period (AM) Mon-Fri: 6am-7am, 9am-10am	35.97¢ EB	34.65¢ WB	35.97¢ EB	35.97¢ WB	34.65¢ EB	35.97¢ WB	29.00¢
Peak Hours (AM) Mon-Fri: 7am-9am	42.42¢ EB	39.42¢ WB	42.42¢ EB	40.92¢ WB	39.42¢ EB	42.42¢ WB	29.00¢
Peak Period (PM) Mon-Fri: 2:30pm-4pm, 6pm-7pm	35.95¢ EB	37.32¢ WB	37.32¢ EB	37.32¢ WB	37.32¢ EB	35.95¢ WB	29.00¢
Peak Hours (PM) Mon-Fri: 4pm-6pm	40.85¢ EB	44.74¢ WB	44.74¢ EB	42.40¢ WB	44.74¢ EB	40.85¢ WB	29.00¢
Weekday Midday Weekdays 10am-2:30pm	30.88¢ EB	30.88¢ WB	30.88¢ EB	30.88¢ WB	30.88¢ EB	30.88¢ WB	23.00¢
Weekend Midday Weekends & Holidays 11am-7pm	28.29¢ EB	28.29¢ WB	28.29¢ EB	28.29¢ WB	28.29¢ EB	28.29¢ WB	22.00¢
Off Peak Weekdays 7pm-6am, Weekends & Holidays 7pm-11am	22.48¢ EB	22.48¢ WB	22.48¢ EB	22.48¢ WB	22.48¢ EB	22.48¢ WB	19.00¢

APPENDIX D

NOTIONAL (IDEAL) STRUCTURE DIAGRAM PRESENTED TO 2013 INQUIRY



NOTE: This is a historical version and some of our thinking has moved on since then, but generally the concepts remain valid, however noting that renegotiation with Transurban is just that much more complex and important now.

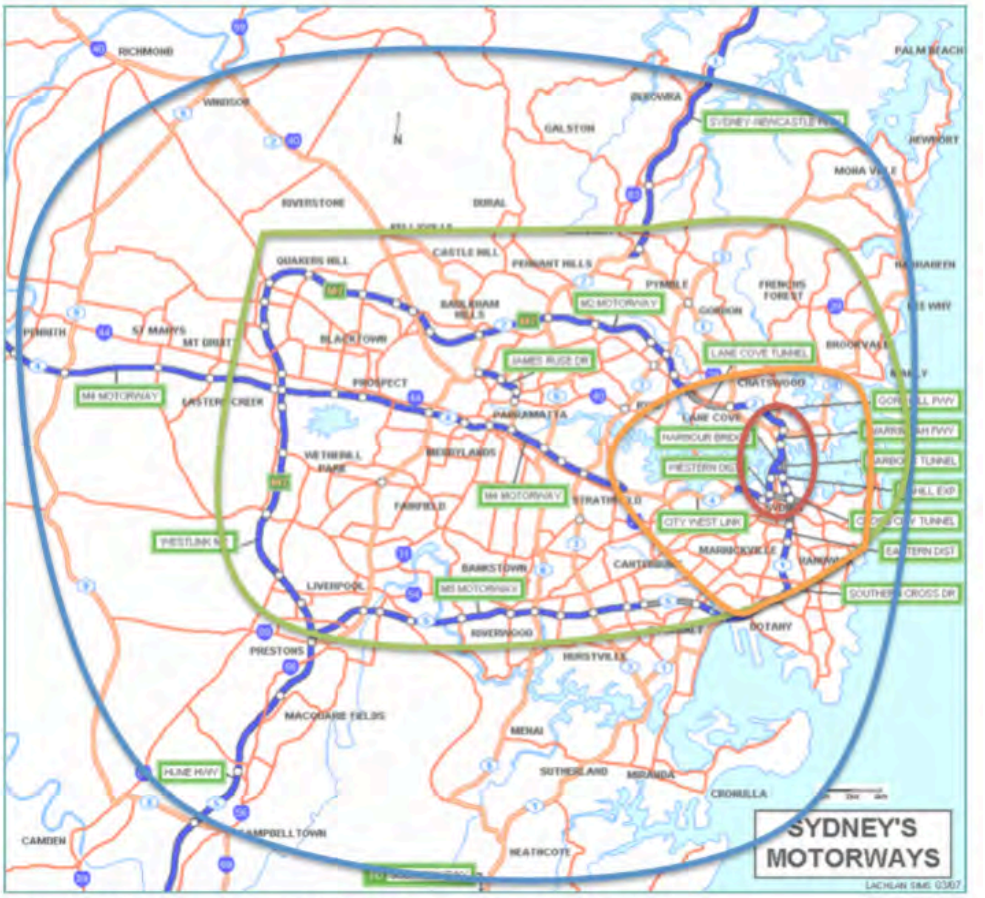
The references to Motorways follow the old notation. F notations are now an M notation with M4E and M4E being subsumed in WestConnex, and the F3/M2 Link being NorthConnex. SCD=Southern Cross Drive, GHD=General Holmes Drive, GHF=Gore Hill Freeway, WF=Warringah Freeway. SHB=Harbour Bridge, SHT=Harbour Tunnel and AB=Anzac Bridge were to be considered as special cases in the context of congestion pricing overlay, with possibilities of cordon or area charging if peak hour surcharging in the inner zones was not to be applied.

APPENDIX E

BASIC FRAMEWORK FOR A POSSIBLE NETWORK TOLLING REGIME
FOR SYDNEY MOTORWAYS AND ARTERIALS - SUBMITTED TO NSW IN 2012

SYDNEY MOTORWAYS – POSSIBLE ZONES – COLOUR KEY

- Central Charging Zone
- Inner Charging Zone
- Middle Charging Zone
- Outer Charging Zone



POSITIONS OF ZONES ILLUSTRATIVE OF PRINCIPLE ONLY
– more detailed mapping & consideration of intersecting points needed.

See overleaf for suggested scale of base benchmark toll rates and explanation.

PROVISIONAL ILLUSTRATION OF ZONED TOLL RATES

Zone	Toll per km
Outer Charging Zone	10 cents / km
Middle Charging Zone	20 cents / km
Inner Charging Zone (may be graded by proximity to Central Charging Zone)	30 cents / km 40 cents / km 50 cents / km
Central Charging Zone	$1 / km

NOTE: These are suggested (arbitrarily rounded) benchmark base distance charge rates, according to zone of travel, which would be indexed until they actually come into operation as part of the toll pricing formulation.

TRANSITIONING (PHASING IN PERIOD):

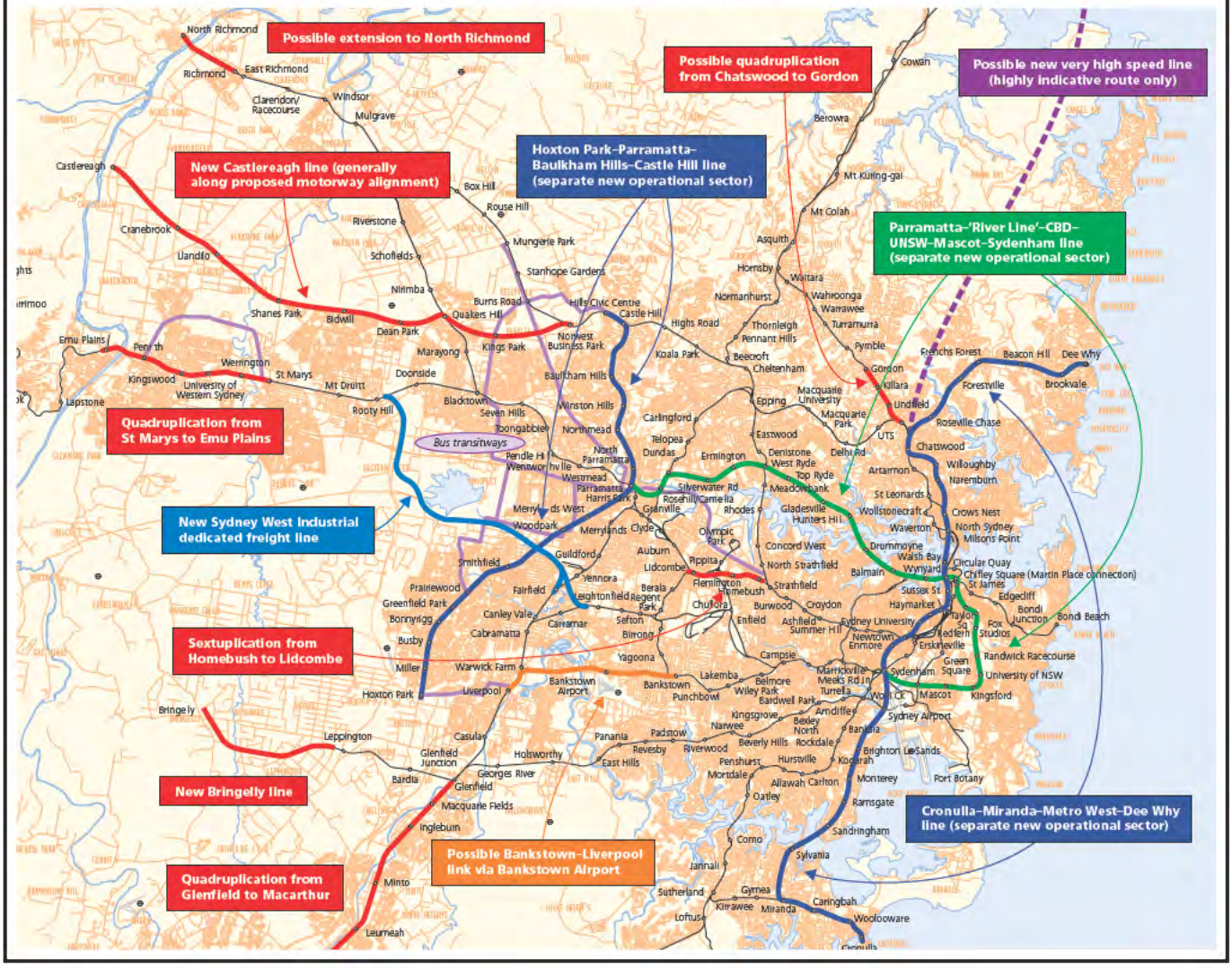
APPLICABLE PERIOD	PROPORTION OF INDEXED BENCHMARK VALUE TO BE APPLIED
At start of Regime	25% of Indexed value from above table
After 4 years from start	50% of Indexed value from above table
After 8 years from start	75% of Indexed value from above table
After 12 years from start	100% of Indexed value from above table

EXAMPLE: By year 8 Index has increased by 20% (just under 2.5% annual inflation) so Central Charging Zone Rate from that point onwards would be $0.90 per Km, and other rates would adjust correspondingly. E.g. Outer Zone rate would be 9c per Km.
That is: $1 x 1.2 x 75% =$0.90 and 10c x 1.2 x 75% = 9c.

APPENDIX F

RAIL NETWORK AUGMENTATION OPTIONS #1

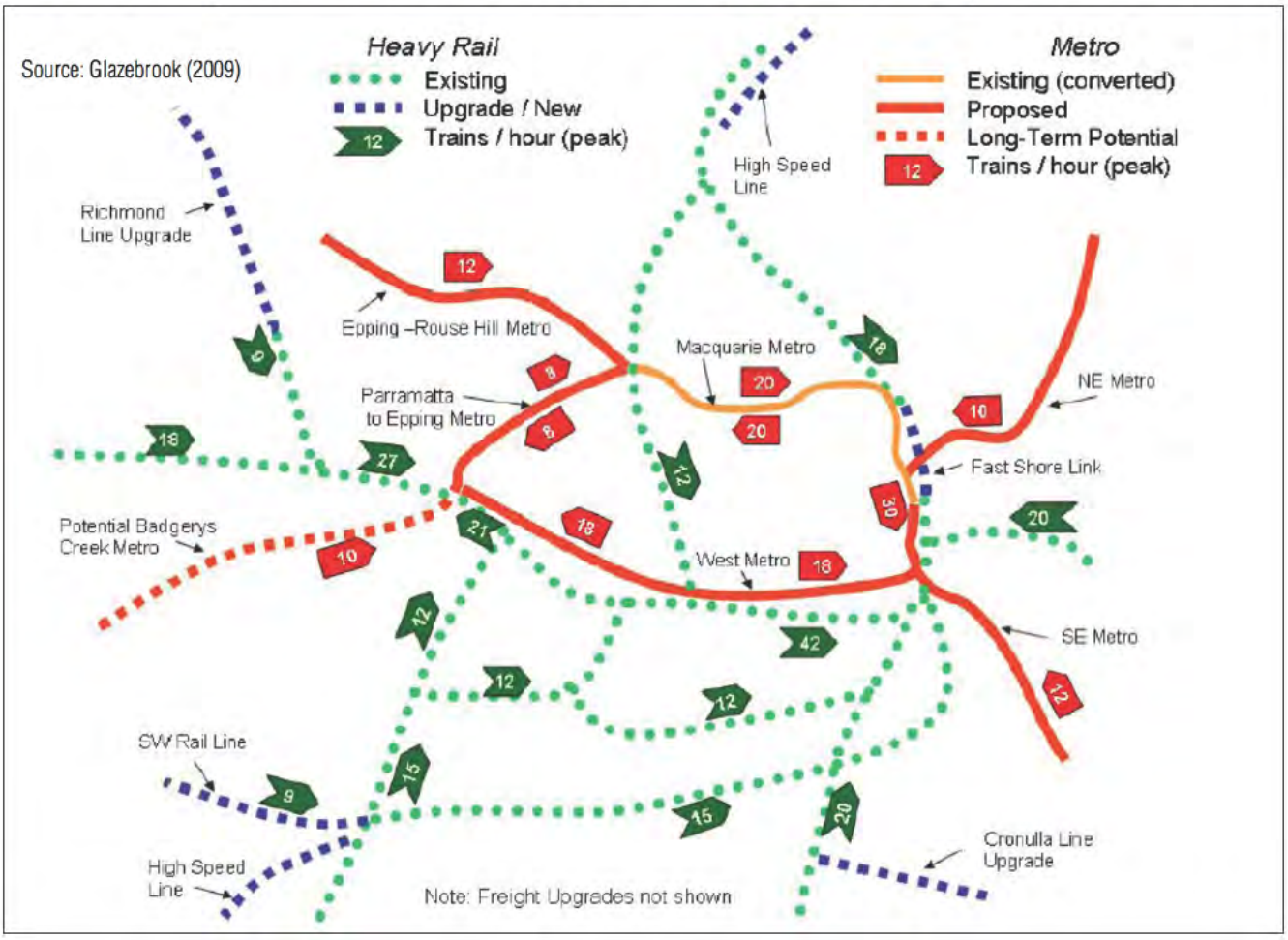
A PREVIOUS RAIL NETWORK CONCEPT/PROPOSAL
Christie Plan 2001



RAIL NETWORK AUGMENTATION OPTIONS #2

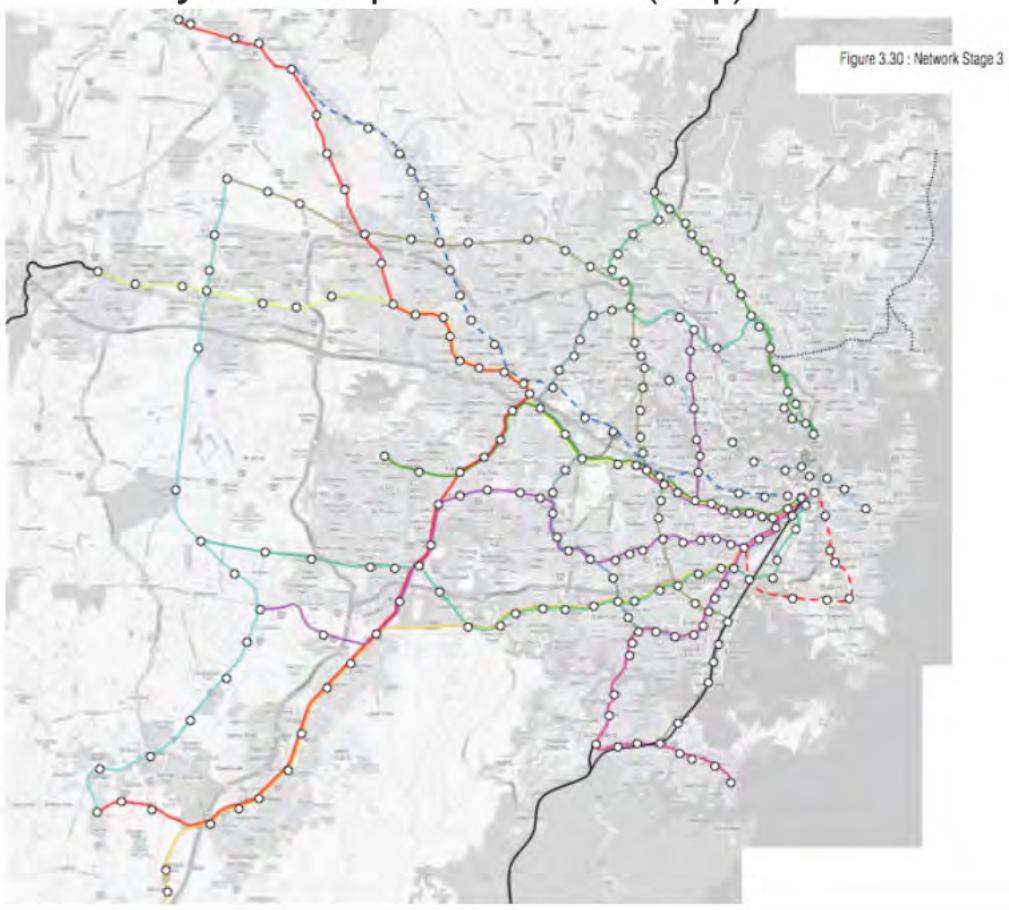
ANOTHER PREVIOUS CONCEPT/PROPOSAL - Glazebrook 2009

We are getting some of these metros (or similar) now - note High Speed also features

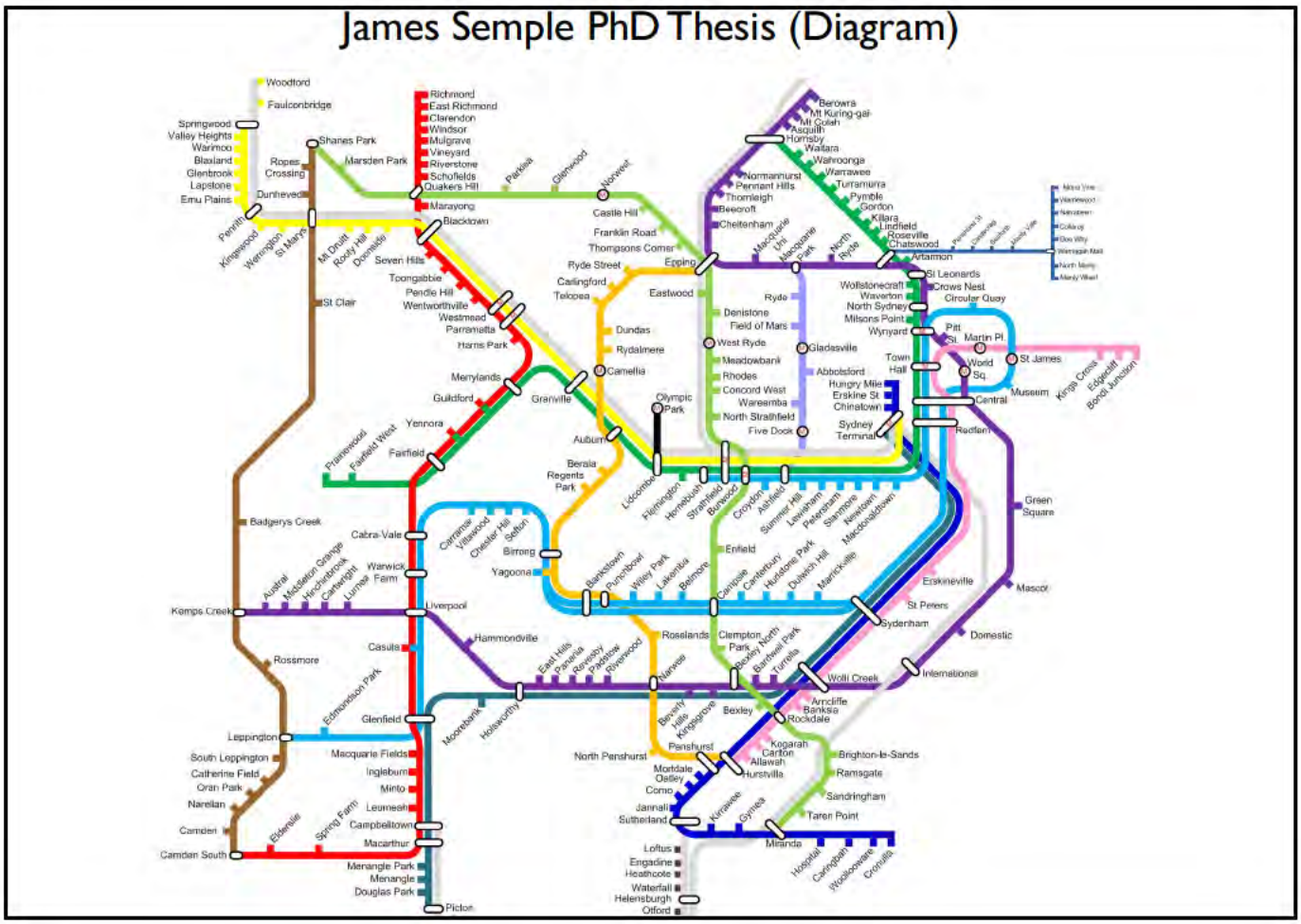


RAIL NETWORK AUGMENTATION OPTIONS #3

James Semple PhD Thesis (Map)

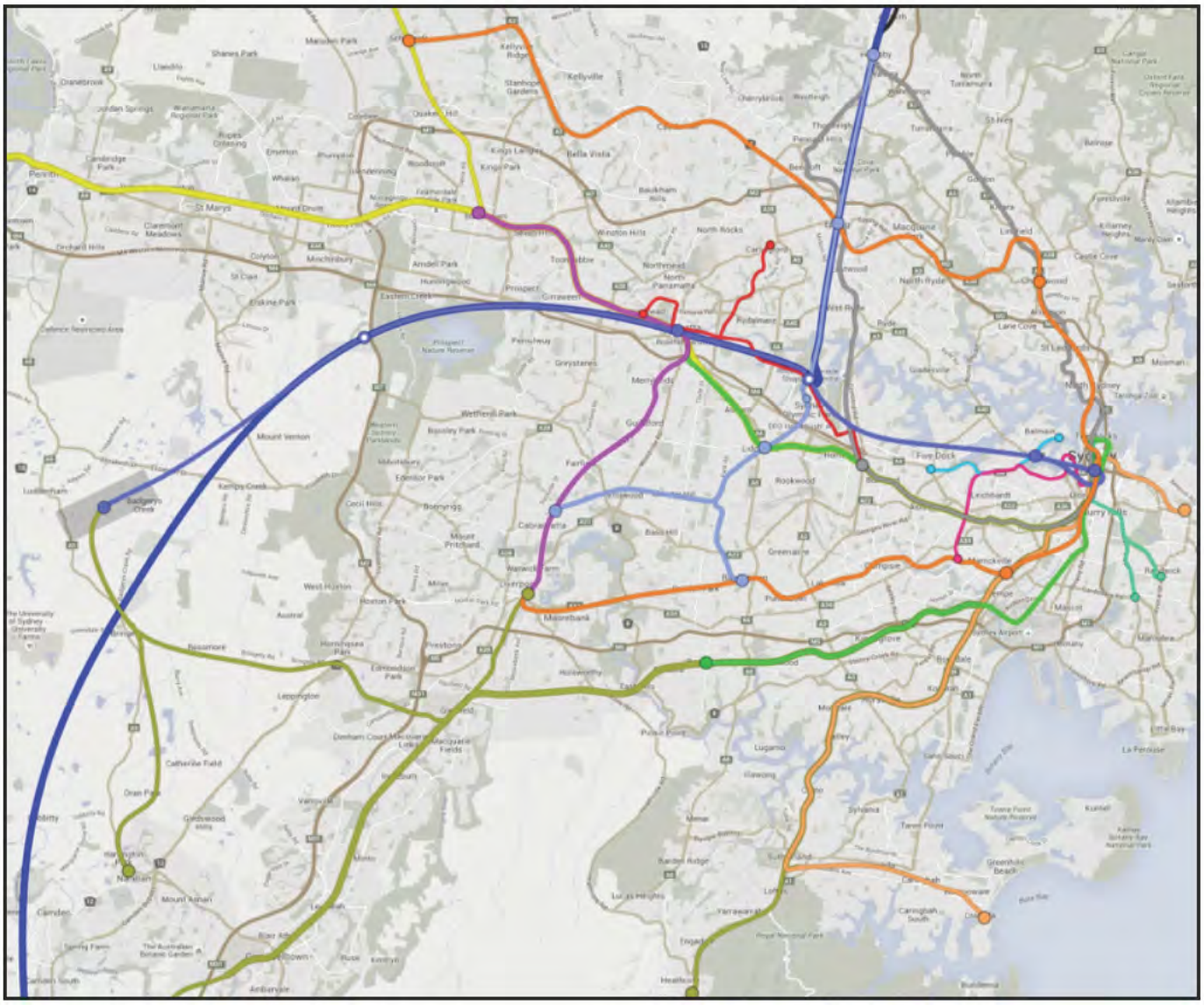


RAIL NETWORK AUGMENTATION OPTIONS #3



RAIL NETWORK AUGMENTATION OPTIONS #4

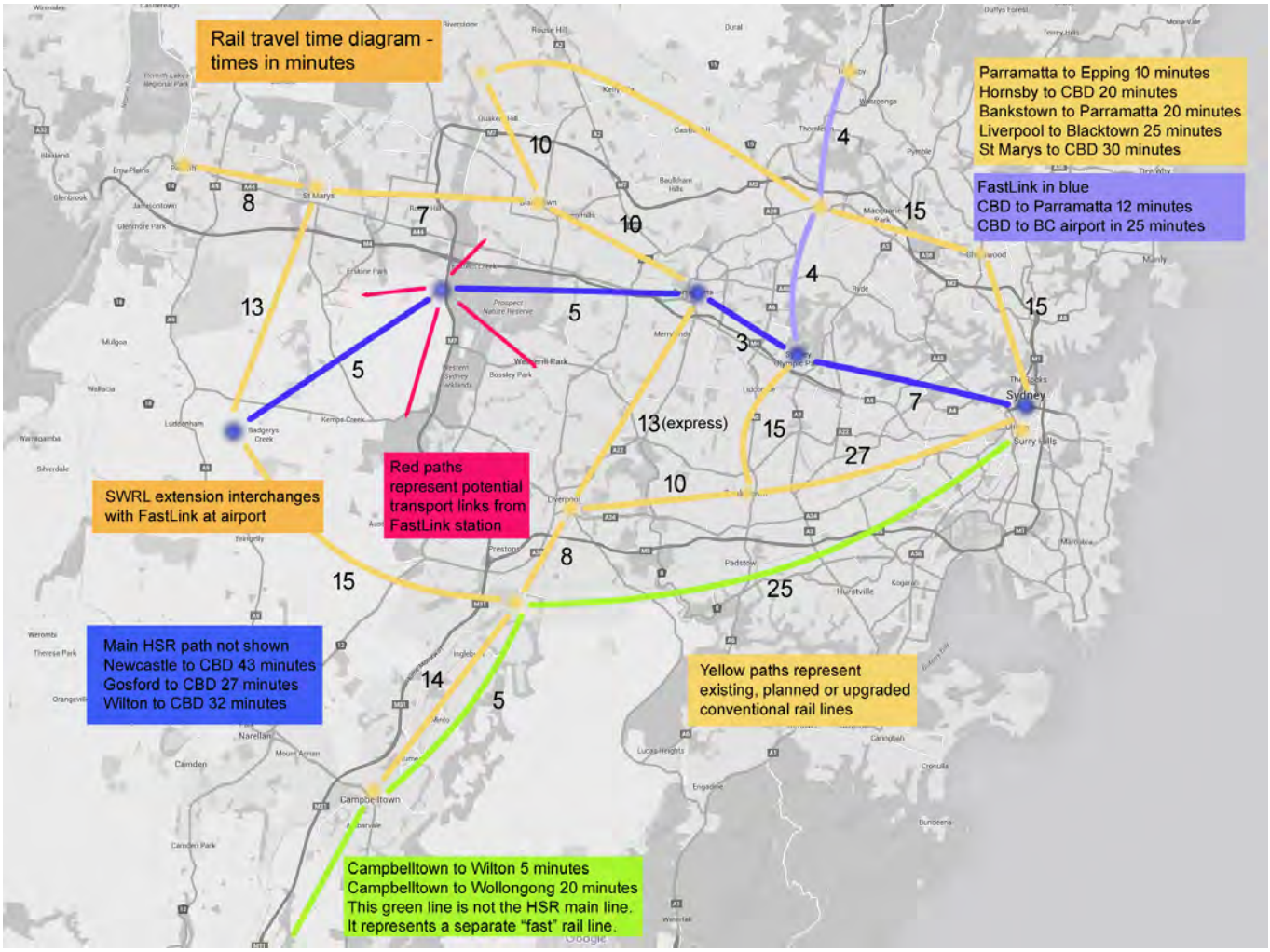
HIGH-SPEED RAIL, **Sydney FastLink** & UPGRADED LIVERPOOL-BLACKTOWN
Russel Lunney route design, 2016



Nb Light rail including options under consideration at the time shown in narrower lines.
New Cumberland Line concepts were developed after this design.

RAIL NETWORK AUGMENTATION OPTIONS #5

Sydney FastLink with transport interchange hub in WSEA
and VFT from Wollongong to Campbelltown via Wilton
(Using parts of Maldon-Dombarton Link corridor)
Sydney FastLink gives 25 minutes total transit time Badgerys Ck to City CBD
WSA-Leppington-East Hills line takes 40+ minutes to Central

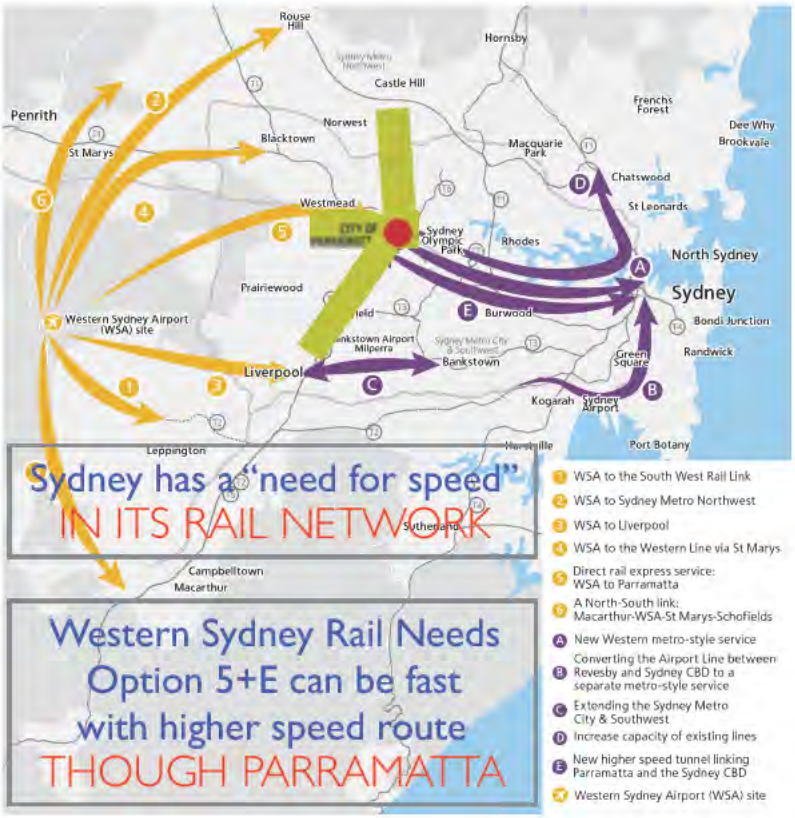


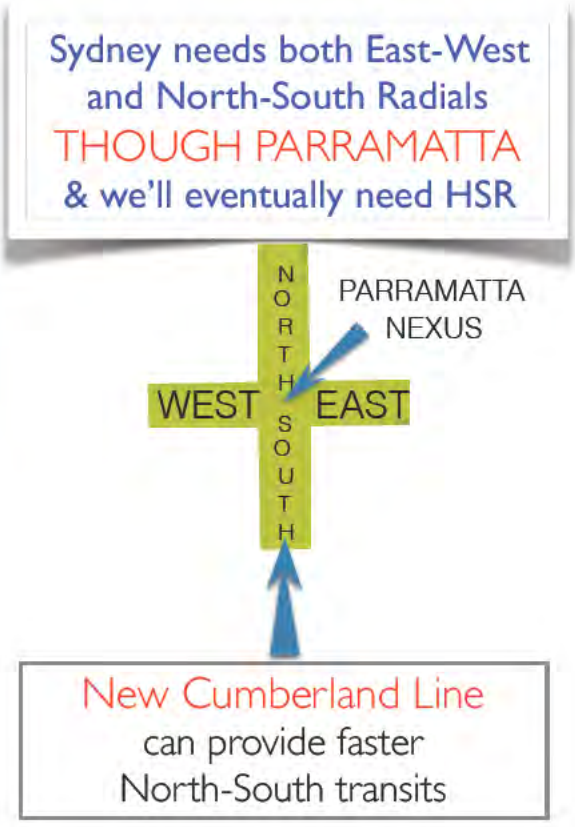
RAIL NETWORK AUGMENTATION OPTIONS #6

OUR CURRENT THINKING

A simple approach of building much faster lines than in the past, one East-West (taking in the Badgerys Creek airport requirement) and the other North-South (the latter integrating to the existing service from Campbelltown to Liverpool and on to Parramatta).

With these two axes at a fast enough modern standard many of the trip possibilities required for Western Sydney that do not naturally fall into the category of being much more viable by car, would be facilitated - enabling a move towards the aim of a 30 minute city.





APPENDIX G

AUDIT OFFICE OF NSW - UPCOMING TASK

Delivering major projects – NorthConnex

The NorthConnex motorway is a nine kilometre tolled tunnel linking the M1 Pacific motorway at Wahroonga to the Hills M2 motorway at West Pennant Hills. The $3.0 billion project, consisting of a construction budget of $2.65 billion, in addition to land and project delivery costs, is funded through a public private partnership. The NSW Government and Australian Government will each contribute up to $405 million to the project. The public private partnership funding model for the project initially came to the NSW Government as an unsolicited proposal.

The NorthConnex motorway was the first infrastructure project assessed through the unsolicited proposal process, and is a major infrastructure project in NSW.

This audit, which was included on the performance audit forward program two years ago, follows on from the 2015–16 performance audit on the assessment and governance framework for unsolicited proposals in New South Wales. The audit on unsolicited proposals found that that there was a lack of clarity about what regard government gives other relevant procurement processes and approval requirements when forming governance arrangements for unsolicited proposals.

The audit will assess whether the process used to determine the NorthConnex funding model adequately considered value for money for taxpayers and road users.

The audit will answer two questions, each with its own criteria.

1. How did the assessment of the North Connex funding model ensure value for money for NSW taxpayers?

Criteria:

- The processes used to estimate the initial project scope and budget were robust
- The use of traffic modelling, including as part of negotiating tolling concessions, was consistent with best practice and government requirements
- The process used to determine the NSW Government's contribution to the project cost was reasonable

2. **Did the assessment adequately consider the overall impact of tolling arrangements to road users and the community?**

Criteria:

- **The assessment considered the equity of tolling arrangements for road users**
- **The assessment considered the impact of tolling arrangements across the metropolitan road network**