

*Supplementary submission to the House of Representatives  
Standing Committee on Transport and Regional Services Inquiry into the Integration of  
regional rail and road freight transport and their interface with ports*

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## 1. Introduction

This submission will expand on some remarks of interest made by those giving evidence to the Committee on 1 August 2006 in Sydney. It is supplementary to submissions numbered 116, 133, 139 and 177, and will give some recent freight statistics (Table 1) and comment on the recent draft Sydney - Melbourne Corridor Strategy.

<b>Table 1</b>	<b>Australian surface freight tasks (and tonnages)</b>				
	<b>Billion tonne kilometres</b>				<i>(million tonnes)</i>
	1994-95	1998-99	2002-03	2003-04	2003-04
<b>Rail</b>					
Coal	28	33±	44	46	(239)
Iron Ore	47	50±	66	72	(220)
Other Intrastate	18	24±	21	23	(119)
Interstate	17	20±	26	27	(16)
<b>Total</b>	<b>110</b>	<b>127 ±</b>	<b>158</b>	<b>168</b>	<b>(594)</b>
'Govt.' rail *	62	67	41±	43±	(162)
Non-Govt. **	48	60±	117±	125±	(432)
<b>Road</b>					
B-Doubles	9	19	35	38.2	-
Road trains	15	20	19	25.2	-
Interstate	26	30 ±	37 ±	-	-
Articulated trucks	89	99	116	121.3	769
<b>Total road</b>	<b>119</b>	<b>127</b>	<b>153</b>	<b>157.7</b>	<b>1696</b>
<b>Sea (domestic)</b>			<b>117</b>	<b>121</b>	<b>53</b>

\* Includes former State and Federal Government operated systems in 1994-95, Queensland Rail (QR) only in 2002-03 and 2003-04

\*\* Excludes Government operated systems, all except QR in 2002-03 and 2003-04

Note: coal and iron ore includes relatively small domestic movements, also data caveats, and this table updates a Table given in an earlier submission.

References include: For rail, Steering Committee on National Performance Monitoring (1996), Bureau of Transport and Regional Economics (BTRE - *Competitive neutrality between road and rail* Working Paper No 40 1999), various Annual Reports, ARA (2005a) and some estimates (indicated by ±). For road, Australian Bureau of Statistics (ABS - 2004, 2005 SMVU). Note that "total road" includes light commercial vehicles (6.6 btkm in 2003-04) and rigid trucks (27.8 btkm in 2003-04). For sea BTRE (2006, Waterline).

In the nine years from 1994-95 to 2003-04, iron ore and coal rail freight increased some 57 per cent to 118 billion tonne kilometres (btkm), the interstate rail freight task increased 59 per cent to 27 btkm (with most growth occurring on the East-West corridor) and the remaining rail freight task increased 28 per cent to 23 btkm. During the nine years to 2003-04, the articulated road freight task increased about 36 per cent to 121 btkm, with a four fold increase in the B-Double freight task.

The expansion of freight in the five years from 1998-99 to 2003-04 is also impressive. Here, iron ore and coal rail freight increased a substantial 42 per cent and the interstate rail freight task increased 35 per cent (again with most growth occurring on the East-West corridor). The total rail freight task increased 32 per cent and the articulated road freight task increased about 22 per cent, with a doubling of the B-Double freight task.

The income from rail freight services in 2002-03 was about \$3 billion<sup>1</sup> (hire and reward earnings plus the market value of ancillary freight operations). The hire and reward road freight industry income for 1999-2000 was about \$18.2 billion<sup>2</sup>.

## 2. Data deficiencies

Obtaining accurate and up to date land freight data in Australia continues to be of concern. In 1990, the Productivity Commission<sup>3</sup> noted that *"There is a lack of up-to-date transport data in Australia, impeding public debate and sound policy formation"*. The Australian Transport Council<sup>4</sup> proposed in 2004 a national data framework. Despite some recent efforts to improve the provision of comprehensive and up to date transport data, the BTRE in a report<sup>5</sup> released mid June 2006 noted ongoing rail freight data deficiencies. It is clear more resources are needed to produce timely freight data. This is will be needed to assist planning to meet the challenge of "Twice the Task" in freight movements.

## 3. How long has an inland route been proposed?

If this question relates to Darwin, then Sir Harold Clapp's visionary 1945 report proposed, inter alia, that a new standard gauge 'strategic and developmental railway' be provided. This was to include new lines from Bourke to Longreach, with gauge conversion from Longreach - Winton - Hughenden - Townsville - Dajarra and a new line from from Dajarra to Birdum, and conversion of the narrow gauge Birdum - Darwin line to standard

<sup>1</sup> Australasian Railway Association (2004) *Australian Rail Industry Report: 2003*

<sup>2</sup> Australian Trucking Association (2004) *Trucking - driving Australia's growth and prosperity*

<sup>3</sup> Productivity Commission (1999, p8) *Progress in Rail Reform*

<sup>4</sup> *National Transport Data Framework 2004* Australian Transport Council

<sup>5</sup> *Freight measurement and modelling in Australia* 2006 Report No 112, page 58

gauge. Before then, there was as early as 1902 a Sydney newspaper article that suggested Darwin could be reached by rail from either Adelaide or Queensland.

For an inland route from Melbourne to Brisbane, an early proposal was given <sup>6</sup> in 1979 by Ken Thomas (founder of TNT). His article included a map including Brisbane - Wallangarra (dual gauge) - Orange - Albury - Melbourne - Adelaide as well as Sydney - Orange - Perth. The aim was to provide an “inland rail system” to link the five mainland State capitals (which then housed 60 per cent of Australia’s population) with provision of an “80 knot” speed capability. This is 148 km/h approaching the 160 km/h mentioned to the Committee by Mr. O’Rourke on 1 August.

Subsequent references to an inland route include this writer<sup>7</sup> and, Rimmer and Dick<sup>8</sup> who noted that “... *an inland Brisbane-Melbourne rail link could be achieved at moderate cost by connecting from Cootamundra along wheat lines to the existing New England line and completing a new line beyond Tenterfield to Fisherman Islands terminal. This new link could be eventually upgraded to carry double-stack containers. Such a development would open the way for a major rail interchange in western New South Wales at the intersection of the East/West and North/South lines. ... The immediate justification would be to facilitate domestic goods movements but scope would be created for redistribution of international freight.*” In this context, particular reference is made to trade with Asia.

An inland Melbourne - Brisbane railway going through Parkes and near Goondiwindi (and not far from the Newell Highway) would traverse much easier terrain and hence have a higher energy efficiency than would a railway going through Wallangarra<sup>9</sup>. A railway near the Newell Highway would be an even more attractive option should a tunnel (proposed as far back in 1984 by the then Queensland Premier) be built under the Toowoomba Range. If the tunnel had good clearances with standard gauge or dual gauge track (as suggested by Mr Ian McFarlane in 1986 and noted by this writer (loc.cit)) and if improvements in clearances were made between Melbourne, Cootamundra, Parkes, Moree, and Brisbane, it would allow for double stacked container operations.

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<sup>6</sup> “*Making our railways pay*” Sydney Morning Herald on 10 May 1979

<sup>7</sup> Laird P, 1986 *Australian Freight Railways*, 11th Australasian Transport Research Forum (ATRF), Proceedings, Vol 1, p.215-239, Darwin

<sup>8</sup> Rimmer H and Dick H, 1992, *Synthesising Australia; national integration in a dynamic Asia - Pacific Economy* pp 287-306 of Papers of the 17th ATRF

<sup>9</sup> Laird, Michell and Adorni-Braccesi, 1998, *Melbourne - Brisbane rail upgrading options - Inland or Coastal*, ATRF, Sydney, Vol 22, p 243-258)

#### 4. How many circles?

It was noted at the hearing on 1 August that “A Sydney – Brisbane freight train turns many circles”. How many circles? Using computer track file data which gives at 10 metre intervals the grade and the radius of any curve, it is possible to calculate the angle subtended by each curve on the track. Adding these angles gives the number of circles as in Table 2. It can be seen that **a train moving between Sydney and Brisbane turns a total of about 177 circles** – some 88.5 to the left and 88.5 to the right. This reflects the original ‘Branch Line’ status of over half the track.

This Table also gives other Sydney-Brisbane track information, and data for Sydney - Melbourne. The steam age alignment of much of the Albury - Glenlee track is also apparent from Table 2.

**Table 2 Aggregate lengths of rail track with curve radius tighter than 800 metres, number of circles traversed, and with gradients steeper than 1 in 66 and/or tight radius curves**

Section of Track	Length km	Curves less than 800 m radius	Number of of circles	Steep grades on tight curves	Steep grades and/or tight curves
<b>North South Corridor Melbourne - Acacia Ridge</b>					
MELBOURNE - GLENLEE (53 km south of SYDNEY)					
Melbourne - Albury	312	6	7	3	44
Albury - Goulburn	421	89	41	17	131
Goulburn - Glenlee	165	50	23	0	52
Sub total	898	145	71	20	227
STRATHFIELD (near SYDNEY) - ACACIA RIDGE (near BRISBANE)					
Strathfield - Maitland	181	57	27	14	74
Maitland - Grafton	506	237	111	0	237
Grafton - Acacia Ridge	274	102	39	14	127
Sub-total	962	396	177	28	439
<b>TOTAL</b>	<b>1860</b>	<b>541</b>	<b>248</b>	<b>47</b>	<b>666</b>
Percentages		29 %		2 %	36 %

Reference Laird (1998)<sup>10</sup> with data rounded and number of circles added. The Bethungra spiral is excluded.

<sup>10</sup> Laird, 1998, *Rail freight efficiency and competitiveness in Australia*, Transport Reviews, Taylor and Francis, London, 1988 Vol 18, No 3, p241 - 256

## 5. Are shared corridors feasible?

Shared road and rail corridors have worked well in Queensland for many years, and most recently with the Tugun bypass for the Pacific Highway and extension of the Gold Coast Railway to Coolangatta airport. However, in NSW, with the exception of Tugun which had a strong Queensland Government influence, the Roads and Traffic Authority (RTA) of NSW and the relevant rail authorities over the years have been less than enthusiastic to explore the use of shared land corridors for road and rail upgrades.

One recent example where a shared corridor was overlooked is the upgrading of the Pacific Highway between Kempsey and Eungai. A further example is the proposed upgrade of the Pacific Highway between Moorland and Herons Creek. Here, the related Environmental Impact Statement, on public exhibition to 5 August 2005, failed to mention the prospect of shared corridors. This is despite the Federal Government's new AusLink Programme emphasizing the need for an integrated approach to road and rail infrastructure.

It is suggested that **upgrading the Pacific Highway and leaving the present NSW North Coast Railway in its present 'steam age' alignment is a recipe for a further increase in the number of heavy trucks on the Pacific Highway.**

More comment on this follows in Appendix A with some excerpts of the May 2006 final report on Pacific Highway Upgrades from the General Purpose Standing Committee No. 4 of the NSW Legislative Council. An example of a major rail deviation for the Maitland Brisbane corridor is outlined in Appendix B.

## 6. The AusLink Sydney Melbourne corridor strategy

The foreword of the draft Corridor Strategy released in early August 2006 by the Department of Transport and Regional Services on the AusLink website (<http://www.auslink.gov.au>) notes in part: *Consistent with the spirit of AusLink, the Sydney-Melbourne Corridor Strategy is a collaborative initiative that was developed by:*

*Australian Government Department of Transport and Regional Services;*

*NSW Department of Planning;*

*Roads and Traffic Authority (NSW);*

*NSW Ministry of Transport;*

*Department of Infrastructure (Victoria);*

*VicRoads (Victoria); and*

*Department of Urban Services (ACT).*

Conspicuous by its absence in this list is the Australian Rail Track Corporation or ARTC. The inclusion of road authorities and exclusion of rail authorities is also a feature of the Brisbane - Cairns and Perth - Adelaide corridor strategies. **In the original spirit of AusLink, it is suggested that the final strategies for each corridor should be developed and owned by rail track authorities as well as road authorities.**

The Sydney Melbourne Corridor Strategy is of interest as this corridor joins Australia's two largest cities. It also has other special features, as outlined in Appendix C. These include the high expenditure to date on the Hume Highway (over \$5 billion to date from 1974 to 2004 in today's terms with a further \$1.4 billion to 2009) and the relatively low expenditure to date on the Sydney - Melbourne railway.

As in the earlier submission from this writer to the Committee re the Brisbane – Cairns corridor strategy, **it is suggested that the final AusLink strategy for each corridor should address factors such as road and rail track pricing, external costs and oil vulnerability.**

Appendix C also addresses major rail deviation proposals. The three larger proposals were outlined in the 2001 ARTC Track Audit, and noted by the Australian Transport Council<sup>11</sup>. However, none of these proposals rated a mention in the draft Sydney Melbourne Corridor Strategy. This is despite the strategy noting as a key challenge *"Rail track condition and configuration that limits transit time, reliability, use of higher productivity vehicles, and competitiveness against road transport."* The strategy summary (at a glance) notes *"The performance of the track reflects its alignment which was established in the 19th century."* However, as outlined in Appendix C, the real problem is the alignment mostly constructed in the 1910s. **It now needs straightening.**

## **7. What 19th Century trappings do rail operators face in Australia?**

Australian railways face major impediments in moving freight in an efficient manner. Some of these impediments are multiple gauges and regulatory impediments imposed by the various State Governments. All of these impediments reflect failings of Australian federalism which in part is due to Federation in Australia occurring at a later date (1901) than either Canada (1867) or the US. It is of note that by and large, these problems were mostly resolved in the late 19th Century in both Canada and the United States. Other impediments are early 20th century ("steam age") mainline track alignments.

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<sup>11</sup> *National Guidelines for Transport System Management In Australia* 2004 Volume 3 page 248

## APPENDIX A Pacific Highway Upgrades

In May 2006, the General Purpose Standing Committee No. 4 of the NSW Legislative Council released its final report on Pacific Highway Upgrades. The following is of potential interest to the present inquiry.

A. From the Committee Chair, The Hon Jenny Gardiner MLC

The central finding of this Final Report is that New South Wales lacks a comprehensive freight strategy. Such a strategy is needed to guide the Pacific Highway Upgrade Program. This need will become more pressing with the predicted doubling of the freight task by 2020. The development of a comprehensive NSW Freight Strategy should be a collaborative effort involving all levels of government and neighbouring states.

This Inquiry demonstrated that coastal residents are extremely concerned about the dangers of mixing local and heavy vehicles on the Highway. Many North Coast residents claimed that heavy vehicles are having a deleterious impact on their communities and that this situation worsened dramatically when B Doubles were allowed onto the Highway in 2002.

...There was widespread community support for greater use of rail freight to reduce the environmental and safety impact of heavy vehicles. While substantial investment is needed to improve rail infrastructure on the key freight corridors in New South Wales, the Committee supports greater use of rail freight.

B. Five recommendations were made in the report. This includes (p113)

*That the NSW Government act on its responsibility for strategic transport planning for freight by developing an integrated NSW Freight Strategy, and work through CoAG to develop a national freight strategy to encourage integrated strategic planning for all modes of transport.*

*In addition to developing a strategy to guide all freight movements in New South Wales, the NSW Freight Strategy should:*

- outline measures to encourage a shift from road to rail freight, including through integrated strategic planning for both road and rail upgrades*
- investigate the adequacy of less extensive upgrades to the Pacific Highway on the Mid and Far North Coasts, taking into consideration the outcomes of investigations concerning the North Coast Highway Strategy investigate including the feasibility of incorporating the Summerland Way and measures to shift freight from road to rail.*

C. The Committee supported the view that a major upgrade (the Yelgun-Chinderah deviation) and approval of B-Doubles, both in August 2002, had led to 'induced heavy traffic'. The report noted an increase of 340 heavy vehicles per day from 2001 to 1230 in late 2002. There was only a fall of about 50 heavy trucks per day on the New England Highway. Since about 2002, there was an increase in B-Doubles from about 120 per day to 300 per day, with a fall of about 105 semitrailers per day. The Committee considered there was a need for improved data on freight movements between Sydney and Brisbane, and called upon the RTA to expedite this.

D. Many NSW North Coast residents are concerned about the increasing number of B-Doubles and the way some heavy trucks are driven (with areas of complaint on p 67 including very dangerous tailgating, excessive speeds of up to 130 km/h and deliberate cutting off of smaller vehicles at the end of overtaking lanes). Noise is a further concern and had been addressed by an early Noise Taskforce Report. Some residents wanted some of the heavy trucks diverted back to the New England Highway but this received some opposition).

No fewer than nine pages of the report addressed support for rail freight and increasing rail's share of the land freight task (p102) *"There was considerable support among Inquiry participants for greater use of rail freight as a means of decreasing the number of heavy vehicles on the road, thus improving road safety and lessening the environmental impact of road freight. However the Committee also heard that support for rail freight must be balanced against the advantages of road transport, which tends to be more cost and time efficient."*

The support from many residents for more use of rail included that of a Mr Armstrong from Coffs Harbour who noted (on page 102) *'To make rail freight attractive and hopefully remove much freight from the Pacific Highway, it goes without saying that the rail line from Sydney to Brisbane along and through the coastal population centres must be straightened and duplicated.'*

F. As noted at a public hearing of the Committee held 21 March, implementing shared road and rail corridors would *'be putting into practice the Government's policies on the environment and land transport.'* Discussions between the ARTC and the RTA were noted in the report (p109). However, to date, shared corridors for Pacific Highway upgrades and rail upgrades remain restricted to the Tugun Bypass at the initiative of Queensland Transport and Queensland Rail.

## **APPENDIX B "How benefits could flow from one section of realignment"**

From Track and Signal, Vol 10 April May June 2006 page By Alex Stoney

Construction of a 67 kilometre section of new track along the Karuah Valley in New South Wales to replace the existing 91 kilometre Hexham-Stroud Road section (see map) with its poor alignment could halve transit times and reduce fuel by 40 per cent.

It is one example of how planning realignments on the north-south line could dramatically improve rail operational efficiency and save money. The existing track has 22 km on 400 metre radius curves, 12.2 kms on curves 400-600 metre radius, and 7.2 kms on curves with a radius of 600-810 metres. The effect of this alignment is to require trains to traverse the equivalent of 18.5 complete circles of curvature.

A 67.2 km track deviation ... with a ruling gradient of 1:80 has for most of its length a ruling curvature of 2200 metres with no tunnels. Trains going either way would reduce the curvature to less than one circle. Train simulation (using Simtrain by Samron Pty Ltd) indicates that for a 'standard' intermodal freight train of three locomotives (mass 132 tonnes each) hauling a trailing load of 3,900 tonnes and 1,500 metres long, averages



(north-south train movements) are shown in Table 1. Assumed updated cost parameters in 2009 values (at 3% pa inflation) for such a train are as given in Table 2.

**Table 1– Reference train simulation outputs**

	Extg	New	Reduction
Track Length (KM)	90.8	67.2	23.6
Transit time (min.)	82	40	42
Fuel Use (litres)	1582	952	630
Brake Work (kWh)	1335	207	1128

**Table 2 – Reference train cost inputs**

Time Penalty	\$8.36 per min
Fuel Cost	\$0.75 per litre
Braking	\$0.13 per kWh

Track maintenance cost in 2009 terms (variable only) \$0.61 per thousand gtkm plus \$1.30 per thousand gtkm on track with curves of less than 400 metre radius \$0.91 on curves of radius 400-600 metres, and \$0.41 on curves of radius 600-810 metres. Base cost is about \$7700 per kilometre of track. Applying these parameters to the simulation results gives the following savings for use of new track as compared with the existing track for the reference train:

- O To the train operator – about \$960 per train movement
- O To the track owner variable costs – \$240 per train movement

The present estimated intermodal interstate freight volume (Sydney-Brisbane and Melbourne-Brisbane) on this section of track is 4.7 million gross tonnes per annum (mtpa). With about 2.4 mtpa net requiring 1094 trains per annum, this would generate a saving to operators of \$1 million per annum.

The present bulk (mainly coal) and steel freight and the XPT is about 5.8 mtpa gross which has a potential \$1.3 million per annum saving on the above basis. The overall train operator savings are then some \$2.3 million per annum. For the track owner the overall annual savings are about \$0.8m. These are variable costs (reduced maintenance, less distance and less curvature for 2444 trains per year) plus an annual per kilometre base cost saving. The total is about \$3 million per annum in 2009 terms on present traffic (which would be expected to increase over time).

Like all Pacific Highway projects, rail deviations will need inclusion of external benefits to get an acceptable cost-benefit ratio. It can be demonstrated using unit external costs adjusted to 2009 values (inflated by 3% pa) that there is an external costs of \$24.20 for each tonne of road-hauled intercity freight. This is against \$2.20 per tonne for rail line haul and \$1.80 for road pickup and delivery. Accordingly for each tonne of intercity freight between Sydney and Melbourne by road diverted to rail, with road pickup and delivery there is a net reduction of external costs of about \$20.

Ref: Article Australian Freight Railways for a New Century (P.Laird, M.Michell, A.Stoney, G Adorni-Braccresi at the 2005 AusrailPlus conference).

## APPENDIX C The Sydney-Melbourne Rail Corridor - options for the 21 st Century

Background of an unpublished paper presented at the Australian Rail Summit  
Sydney July 2006 Dr Philip Laird, University of Wollongong and Rail CRC

- . why the present rail corridor is substandard
- . the Hume Highway and line haul road competition
- . where to following the present ARTC work programme
- . the benefits of track straightening
- . at what oil prices might electrification be worth considering?

### Setting the scene

The main use of the Sydney to Melbourne railway is the movement of about one million tonnes (mt) of intermodal freight between the two cities over about 940 km of track. There is also some interstate steel traffic and intrastate freight (including wheat to Port Kembla) along with regional and interstate passenger trains.

Over the next three years, extensive work on this railway will be undertaken by the Australian Rail Track Corporation (ARTC - 2006). This is with a view to improving reliability and reducing freight transit times from 13.5 hours to 10.7 hours for 1500 metre trains and 11.5 hrs for 1800 metre trains. In addition to the South Sydney Freight Project (\$192m), the following Sydney - Melbourne rail works are planned for completion, by 2009, with alliance contractor Australian Rail Consortium;

- construction of 16 passing lanes consisting of double track sections resulting in some 220 kms of new line,
- New concrete sleepers - now for most of the length of the line
- Ballast top-up and tamping of existing concrete sleepers over 130 kms,
- Boosting capacity to the Dynon / Melbourne Port precinct,
- Construction of a direct standard gauge connection between Brooklyn and Sunshine in Melbourne to provide direct access between the North-South and East-West corridors, and
  - Installation of eight sets of facing cross overs on double track to improve operational flexibility.

In addition, by the end of 2006, communications and signalling systems will be upgraded, and the 1880 Murrumbidgee Bridge at Wagga Wagga with its 20 km/h speed restriction is due to be replaced.

With reduced rail freight transit times, plus increased capacity and reliability and a reduction in above rail costs of at least 6 per cent (Owens, 2006) rail's modal share of Melbourne - Sydney intermodal freight is expected to increase from the present low level of about 10 per cent to 17 per cent. The ARTC 2001 Track Audit indicated a 20 per cent share if a 10.5 hour transit time was achieved.

It is of note that an older Bureau of Transport and Regional Economics (BTRE - 1990) report shows road and rail having approximately equal Sydney - Melbourne freight tonnages in 1970. Since then, road's modal share has steadily grown from about 50 per cent to about 90 per cent, with the BTRE (2003) noting their Sydney - Melbourne intermodal tonnages of 0.97 mt for rail and 9.17 mt for road in 2003-04; also, on the basis

of past trends (with little or no rail upgrading), 2014-15 projected tonnages of 0.84 mt for rail and 13.45 mt for road. Rail's modal share would then be 6 per cent.

There are many reasons for the increase in road's modal share of Sydney – Melbourne line haul freight. These are mainly service factors (including reliability and transit time with road having some advantage in door to door delivery) and price factors. Price factors in turn include fuel costs (where rail freight is about three times more energy efficient than road for line haul general freight) plus road and rail access pricing. This is currently the subject of a Productivity Commission inquiry.

### **Why the present rail corridor is substandard**

Along with clearances, the main problem is the 'steam age' alignment. This is shown in Table 2 of the present submission.

The excessive curvature on the NSW Main South line is mostly due to a series of deviations constructed between 1912 and 1922 as part of duplication to ease ruling gradients for loaded north-bound trains from 1 in 40 to 1 in 75 (or 1 in 66 when compensated for curvature). This work was completed in stages (e.g. Mittagong to Goulburn in 1915) and also included a major deviation from Picton to Mittagong (completed in 1919). However, Picton - Cootamundra grade easing was at the expense of increasing point to point distance by about 24.5 km (Laird, 2005a), and more curvature.

By way of example, the section between Goulburn and Yass was extended in length from 84.6 kilometres to 93.1 kilometres as a result of duplication and deviations. The "new" alignment had a total of 39 curves of radius 400 metres (20 chains) or less (with 7 curves as tight as 280 metres). On the other hand, the Whitton alignment it replaced had a ruling curvature of 400 metre radius applying at only 7 curves. Indeed, M - Train simulation has shown that a modern superfreighter moving over the 19th Century alignment would give transit time savings of 12 per cent and fuel savings of 12 per cent when compared with the present track. Moreover, upgrading this section to modest Fast Freight Train standards (with a ruling gradient of 1 in 66 and no curve tighter than 800 metres) would give 25 per cent savings in time and fuel.

The last major upgrade of the Melbourne - Sydney track was the completion, in 1962, of an Albury – Melbourne standard gauge single line with CTC signalling. Other upgrades of note include: CTC signalling between Albury and Junee in 1984 (with some transition curve improvements for better XPT operations); the “One Nation” programme of capital works in 1992-95; and, the ARTC Albury – Melbourne track upgrade completed in 2001. However, there has not been one kilometre of rail deviations on the NSW Main South line built since 1946 when the Bethungra Spiral was completed.

Melbourne - Sydney axle loadings are subject to a 23 tonne axle load (TAL) limit for wagons moving no faster than 80 km per hour, or a 21 TAL limit for wagons moving no faster than 115 km per hour. Although this is adequate for most intermodal rail freight and some bulk and steel traffic, it is somewhat below US and Canadian Class I standards of 32.5 TAL moving at up to 100 km/h.

## **The Hume Highway and line haul road competition**

A major factor in road's high modal share has been the reconstruction of 86 per cent of the length of the Hume Highway to modern engineering standards with dual carriageways. This has mostly been achieved by full Federal funding, since 1974, with grants rather than loans, as part of the National Highway System. In 1974, for most of its length, the Hume Highway was a basic two lane sealed road connecting towns with some steep grades and winding sections. By 1994, all of Victoria and some 300 km of road in NSW south of Sydney had been constructed to dual carriageway standards. The estimated cost of reconstructing most of the Hume Highway is about \$5 billion in 2004 terms.

The benefits to the road freight industry of the reconstruction of the Hume Highway have included the use of faster and heavier trucks, a reduction in transit time for Melbourne - Sydney line haul road freight from about 15 to 10 hours, and heavier loads (under 36 tonnes Gross Vehicle Mass (GVM) to 42.5 tonnes GVM for an articulated truck with the option of 9 axle B-Doubles with a GVM of 65 tonnes).

The current allocation of Federal funds to the Hume Highway has appreciably increased since the 2004 AusLink White Paper. An outlay of \$715 million over five years was then noted, including an Albury internal bypass (\$341m). This 17 km bypass is now due for opening in mid 2007 at a cost of \$518m. In the May 2006 Budget, it was announced that an outlay of \$1398m of Federal funds would be made "*dramatically increasing the pace of converting the Hume Highway in southern New South Wales to four lanes by 2012*". This included construction of the 12 km Coolac bypass (in total \$145m) due to open in late 2008 and duplication of the Sheahan Bridge (\$3m) due 2008-09.

Line haul trucking also benefits with low road cost recovery from heavier long distance trucks, with the National Transport Commission giving conservative estimates of average annual subsidies of \$8400 for each 9 axle B - Double. This 'highway subsidisation' goes, in part, back to a 1954 Privy Council decision based on a wide interpretation of Section 92 limiting the ability of State governments to recover full road system costs from interstate trucks (Laird 2004). As noted above, relative access pricing for road and rail is now subject to an inquiry by the Productivity Commission.

In the meantime, mainline rail track is supposed to "pay its way" (e.g. loans raised for gauge standardisation in 1962 are still being paid off, with some current ARTC work funded by loans).

## **Where to following the present ARTC work programme ?**

Both the Australasian Railway Association (2005) and the ARTC have anticipated significant train operational and economic benefits from the relatively modest upgrades that are committed for completion by 2009. Further benefits would result from increased intermodal terminal capacity within Sydney. However, it is quite possible that by 2012 with completion of dual carriageways for the entire length of the Hume Highway, B-Triple trucks will be running between Sydney and Melbourne.

For rail freight to be competitive with trucks on this corridor, some track straightening will be required. As demonstrated by the NSW Roads and Traffic Authority in their highway upgrades, detailed advanced planning including environmental impact

assessment and land acquisition does take time. The Queensland difficulties experienced with Caboolture – Landsborough duplication on approved alignment, is of note. The real work is only now about to start, despite a pressing need for its completion, with initial funding provided in the late 1990s. Despite major planning efforts, work was set back in January 2004 and the project split into two sections in mid 2005 due to land acquisition problems and political sensitivities at a state level. Indeed, the Queensland Transport Minister, the Hon Paul Lucas MP (2005) has noted the need to “...reserve rail corridor land before it becomes a costly issue”.

Some directions from COAG may be necessary and/or special legislation given the difficulties faced by State Governments in dealing with transport corridor issues, and, the NSW Government's delay in approving intermodal freight terminals in Sydney.

Rail deviations for NSW were examined by the ARTC with some details released February 2005. Following an ARTC industry presentation of 31 May 2005 in Sydney, it was stated in regards to the North-South corridor that *"Deviations were considered at length in the development of the strategy but have not been included in the final strategy."* Instead *"it has been preferred to gain the reliability, transit time and capacity benefits from optimising infrastructure performance while remaining within the existing land corridor width."* ... also that *"The nature of deviations requires significant land acquisition, environmental assessment and detailed engineering analysis. ...Deviations will be further analysed for future AusLink funding packages and ARTC will undertake more detailed analysis of deviation options during this period."*

A major question for the next stage of North-South Rail upgrading will be to further improve Melbourne - Brisbane rail freight. There appear to be two main options.

A Construct an inland route through Parkes by extensive use of existing Victoria and New South Wales track with new construction in Northern NSW and South-East Queensland (with some challenges in getting from Ipswich to Acacia Ridge / Fisherman Islands as well as Gowrie - Grandchester).

B Address the severe operational constraints on the Short North line between Strathfield and Hexham by construction of a new passenger line on the Southern sections and a freight link from near Fassifern to Hexham (and onto Stroud Road).

Both options offer significant benefits. Over time, both should be built. Hopefully some guidance will be provided by the North South Rail Corridor Study as to the question of which option should proceed first. If the Inland Route does start in the next year or so, then this would affect the extent to which how much Main South track straightening should be undertaken and where it should be located.

Many NSW Main South rail deviation proposals have been studied, restudied, with results recycled into new reports. The 2001 ARTC Track Audit noted many of these proposals, including three major NSW Rail Deviations as follows:

Glenlee - Mittagong (Wentworth),  
Goulburn - Yass (Centennial), and  
Bowling - Frampton (Hoare).

The Wentworth deviation was proposed in 1991 by the Hon Bill Wentworth (1991) and had been also investigated by the Public Transport Commission in the late 1970s (Laird and Adorni-Braccesi, 1993). It could be initially constructed between Menangle to

Yanderra, and could also tie in with completion of the Maldon Port Kembla railway with a tie point at Wilton.

The Centennial deviation was a version of a Bicentennial proposal made in 1981 by Engineers Australia (Butcher 2002, and Railway Technical Society of Australasia - RTSA, 2002). The Hoare Deviation was noted (ARTC, 2001a) as 93.3 km of new construction between Bowning and Frampton and suggested by Mr John Hoare of Concord CE Pty Ltd (and former Westrail CCE) to the University of Wollongong. A later version between Bowning (initially Illalong Creek) and Cootamundra would save about 23 km in route length with superfreighters saving some 51 minutes of transit time. These proposals were noted by the Australian Transport Council (2004).

The combined length of deviations from Menangle to Aylmerton, Breadalbane to Yass, and, Bowning to Cootamundra is 164 km and they would replace 219 km of track on “steam age” alignment. Consideration is also recommended to two further deviations: Werai to Penrose, and to bypass the Bethungra Spiral.

### **The benefits of track straightening and strengthening**

The five main south rail deviations (Menangle to Aylmerton, Werai to Penrose, Breadalbane to Yass, Bowning to Cootamundra and a bypass of the Bethungra Spiral) would require construction of 196 km of new track, and replace about 256 km of 'steam-age' alignment. This requires trains to traverse about 50 circles of curvature. Some details are given in Table A.1. In short, the benefits to the train operator alone for a 'standard' intermodal freight train with two 4000 HP locomotives include a time saving of 105 minutes, a fuel saving of about 1340 litres of diesel (some 34 per cent of the average fuel use by the train on the old sections of track of 3910 litres), and a cost saving per train conservatively estimated at some \$1700.

However, the benefits of selected rail deviations do not stop with freight train operators and include:

1. Reduced point to point distance,
2. Faster and heavier freight trains,
3. Improved reliability of freight train operations,

**Table A1 Five potential NSW main south rail deviations: length and resource savings**

	Length km	Time min	Fuel Litres	Train \$
Menangle – Aylmerton	39	17	180	200
Werai to Penrose	15	7	90	90
Breadalbane – Yass	47	24	350	430
Bowning – Cootamundra	78	43	560	740
Bethungra Bypass	17	14	160	240
<b>Total</b>	<b>196</b>	<b>105</b>	<b>1340</b>	<b>1700</b>

Reference: Laird and Michell (2004) The simulated savings are based on SIMTRAIN and are the average in both directions for a standard intermodal train of two 4000 HP locomotives with a trailing load of 2600 tonnes over 1200 metres.

4. Improved rail passenger services (including Sydney to Southern Highlands / Canberra / Wagga Wagga etc - see for example Laird et al (2002), Gray (2004) RTSA (2002)),
5. Appreciable savings in fuel and brake wear to train operators,
6. Reduced track maintenance costs (over \$100 per freight train movement),
7. The potential for elimination of level crossings, flood mitigation, and improved clearances,
8. Reduced road accidents involving heavy trucks due to rail's expected increase in modal share,
9. Reduced diesel use and greenhouse gas emissions due to rail's superior energy efficiency in line haul freight (a factor of about three to one), and,
10. The ability of an upgraded rail system to defer considerable expenditure on the augmentation of road capacity. For example, under 'business as usual' there is likely to be pressure to augment the Campbelltown – Mittagong section of Hume Highway from 4 to 6 lanes.

In short, the experience in Australia and overseas is that rail deviations built to modern engineering standards give wide ranging benefits.

The most recent Australian example of a rail deviation is at Bungaree on the Ballarat line completed in 2005 as part of Victoria's Regional Fast Rail project. The speed of building rail deviations and their cost depend on many factors. Most Queensland MLU deviations were completed within three years of approval, with an average cost of about \$1.3 million per km (in 1994 terms). As seen by QR MLU Project Manager Ross Hunter (1994): *"Without substantial upgrading, the quality of rail freight services possible could not keep pace with the quantum improvements enjoyed by our major competitor, road transport. ... The Mainline Upgrade Project is targeted at improving services and picking up market share, and reducing the costs of providing these services to enable rail to compete more effectively on price."*

Different deviations confer different benefits. By way of example, gauge standardisation between Perth and Kalgoorlie in the 1960s included a dual gauge route through the Avon Valley from Midland to Northam, with high clearances and easy ruling grades of 1 in 200, replacing an older section with ruling grades of 1 in 40 and poor alignment. This assisted in reducing Kalgoorlie - Perth freight train times from 31 hours to 13 hours, and passenger train times from 14 to 8 hours.

Today, as noted by ARTC, rail wins 81 per cent of interstate freight in and out of Perth. This would be simply impossible on the old track.

External costs of road and rail freight in both urban and non-urban areas were addressed in the ARTC (2001b) Track Audit. These estimates have been since revised (see, for example, Laird, 2005b) and, as at 2000, costs are 2.75 cents per ntkm for road haulage in urban areas, 1.98 for road haulage in non - urban areas, 0.43 for rail haulage in urban areas, and 0.17 for rail haulage in non - urban areas. These costs, adjusted to 2005 values suggest that under various assumptions (see Laird, 2005a), for each tonne of line haul road freight (840 km) moving between Sydney and Melbourne diverted to rail, with road pick up and delivery (total 50km), there is a net reduction of external costs of about \$16.70.

To estimate the increase in modal share of non-bulk Sydney - Melbourne freight that could be attributed to the five rail deviations, the Track Audit (ARTC, 2001) found that basic capital works would give rail a 20 per cent modal share of intercity intermodal freight and, a further 90 minute reduction of transit time would give a 26 per cent modal share. With linear extrapolation, a 105 minute reduction in transit time, gives rise to an 8.2 per cent increase in modal share. On this basis, and on recent Sydney - Melbourne intercity freight at about 11 mtpa, with the above \$16.70 per tonne, an estimated reduction in external costs of \$15 million per annum would result.

In a world of competitively neutral access charges for rail and road (for example, mass distance pricing for heavy trucks at New Zealand levels and current rail access prices) plus Sydney-Melbourne intermodal transit times being reduced to 9 hours (achievable with the construction of about 200 km of new track between Menangle and Junee to modern engineering standards), economic modelling showed that rail could aspire to a 50 per cent modal share of Sydney-Melbourne freight (Laird et al, 2002).

Currently, Sydney-Melbourne line haul road freight uses an estimated 19 litres of diesel per tonne of freight as opposed to about 7.5 litres for line haul rail freight, which would reduce to about 6.5 litres if the 200 km of new track was built. The difference, allowing for road pick up and delivery (at say one litre per tonne) when rail line haul is used if rail was now winning 50 per cent of freight, is about 54m litres of diesel on 2005 tonnages. This also assumes recent (2005) Sydney - Melbourne rail tonnages (intermodal and steel) of about 2 mtpa and 9.8mtpa tonnes of line haul intercity road freight.

### **At what oil prices might electrification be worth considering?**

As a partial consequence of the lead up to the 'second' world oil price shock (when a record price of \$US39 was reached on 27th February 1981 and in current terms is about \$90 see <http://www.sharelynx.com>), Sydney - Melbourne electrification was proposed in 1980 by the Federal Government. This followed an examination by consultants (Elrail, 1980) who proposed 25 000 volt AC electrification in stages, with Glenlee - Goulburn (165 km and with the most traffic) to be first completed by 1985. Although some Federal funding was offered, it was not taken up by the NSW and Victorian Governments, and the offer was withdrawn in 1981.

As noted above, if the Sydney - Melbourne line was to be upgraded to modern engineering standards and if rail was to attract 50 per cent of intercity land freight, there would be fuel savings of about 54 million litres of diesel fuel each year on current tonnages. If the line was also electrified, there would be a further saving of about 42 million litres of diesel. The total saving of diesel fuel would then be about 97 million litres a year for Sydney-Melbourne freight. This would increase over time. Further energy savings are possible with regenerative braking (Butcher, 2005).

In addition, Sydney - Melbourne electrification would also give fuel savings for Melbourne - Brisbane rail freight through Sydney plus Sydney - Perth traffic line through Cootamundra and Parkes.

Whilst the initial Sydney - Melbourne electrification proposal was questionable on economic grounds, it was no less attractive a proposition than the electrification of the Brisbane - Rockhampton - Emerald line in the late 1980s. As noted by former Prime



Minister Gough Whitlam (1997), the Queensland Main Line Electrification, at 25,000 volts AC, was a longer distance than Sydney - Melbourne

Although diesel - electric locomotives have much improved their efficiency since 1980 and continue to be favoured by Canadian and US Class I Railroads, if oil prices increase and remain above \$US100 per barrel, electrification should be reconsidered. However, any electrification should be preceded by extensive track straightening.

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