

Sydney Basin Rail Link

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Background

The more recent road-based proposal¹ to build an extension off the southern end off the F3 to somewhat bypass the northern end of Pennant Hills Road is yet another attempt to “fix” the road freight congestion problem through the Sydney basin. This fix may well reduce the immediate road freight congestion in this part of the Sydney basin, but it is a continuation of a series of very expensive motorways.

Economically, increased supply in the form of an extended motorway will then induce increased demand for road freight that will in turn create more demand for more motorways. Comparatively, rail freight has a far lesser carbon (diesel / oil) footprint² than road freight, and economically, rail freight is much better for Australia.

My reasoning for creating this innovative strategy was that I could very clearly see that the long distance road freight solution had gone through several iterations but the road congestion problem is gradually increasing. This road-only based freight transport situation needs to be analysed from an entirely different point of view, as there are many flaws in the current and proposed freight transport strategies.

De-Congesting Sydney's Road Freight

No matter what strategy is taken to improve the road interchange at Hornsby, (or the M5, M7 to F3, or elsewhere in NSW for that matter) the sheer volume of longer-distance road freight will always continue to be a major cause to congest the roads in the Pennant Hills – Wahroonga / Hornsby area, (and NSW).

In engineering language “*roads are generally engineered for light loads, rail tracks are engineered for heavy traffic*”. With advances in rail engineering to use concrete sleepers and heavy-duty mechanical aides, freight rail transport is highly capable of speeds well exceeding 100 km/h with much less wheel/road friction, far less wind drag and considerably less carbon footprint than equivalent road freight movements³.

Heavy-duty highways are extremely expensive to both build and maintain as the road freight vehicles cause considerable damage, just because of their weight and speed, and this excessive cost in national productivity seems not to be accounted for.

If the problem of low productivity road freight is to be curbed, then an innovative strategy is necessary to look well outside the standard thinking practices and minimise the causes of congested long distance road freight in NSW, where a large proportion of this road freight travels north - south across the Sydney basin.

This document outlines an innovative strategy to propose a relatively inexpensive, almost straight rail freight line corridor across the Sydney basin from Casula to Hornsby. This is a straight-line distance of about 35 km so that rail freight could be transported across the Sydney basin via this rail corridor in less than 40 minutes.

¹ http://www.infrastructure.gov.au/roads/F3toM7Review/corridor_diagrams.aspx

² <http://www.moore.org.au/senh/2010/National%20Freight%20Network%20Plan.pdf>

³ <http://www.moore.org.au/senh/2010/National%20Freight%20Network%20Plan.pdf>

With this rail corridor in place across the Sydney basin, this rail-based bypass would provide a highly economic alternative to the monopoly of road freight only, where in particular for longer distance freight, rail could be used as the viable alternative.

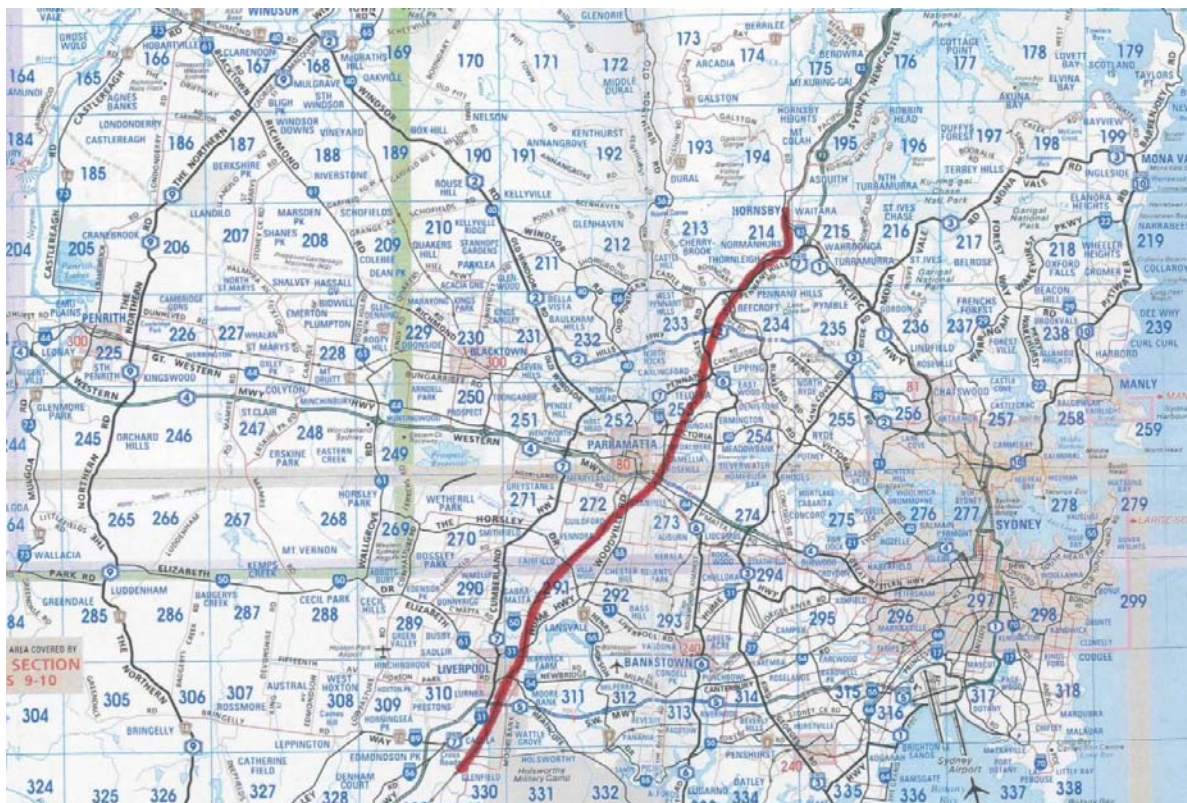
Cross Sydney Basin Link

There is no relatively fast rail link for freight that traverses north - south across the Sydney basin link (except through Strathfield), or the worst-case scenario – via the Harbour Bridge. In both cases this path encounters some tight turning circles that makes relatively fast rail transport with long trains literally impossible.

I am proposing a direct rail freight link between Casula and Hornsby.

A slight change in strategic network planning would provide an immense business benefit for rail freight services, while dramatically reducing the number of road freight vehicles on the main highways of Eastern Australia and through Sydney's Pennant Hills Road and the Hornsby / Wahroonga area.

Instead persisting with the Strathfield / Redfern centric rail strategy, an innovative strategy is to consider that Strathfield / Redfern is fully congested, and therefore alternative path must be a reality and this path must have a minimum of bends in it so that rail freight can transit with a minimum of time (and a maximum of speed).



As shown as a red line on the above copy of a Gregory's / Sydways road/rail map of Sydney, the proposed rail freight path between Casula and Hornsby is almost straight and positively augments existing commuter rail services and facilities.

The proposed rail path totally avoids both Strathfield and Epping. From Hornsby, the path would go through Pennant Hills station and then go into a new 4 km tunnel that would pass under the suburb of Beecroft, the M2 and the suburb of Carlingford; where it would join the existing Carlingford line through to Rose Hill.

South of Rose Hill a new 4.2 km tunnel would traverse under Parramatta Road (between Clyde and Granville stations) and surface north of Guildford station to pick up the South rail line. From Guildford southward, the line is almost straight through to Casula to through connect towards Campbelltown, Goulburn, (Canberra), Wagga Wagga, Albury, Wangaratta, and Melbourne.

The total distance of this proposed rail line would be about 37 km and the total distance of tunnels would be about 8.2 km (22% of the distance). Most of the existing rail track and/or easement is already in place and severely under-utilised.

Building the Cross Sydney Basin Corridor

Almost 80% of the existing rail freight path / corridor exists; using some of the much underutilised existing commuter rail tracks that are already in place. This leaves about eight kilometres of tunnel for rail track in a near-level tunnel structure for most of the way, minimising the overall investment in this proposed NSW infrastructure.

There is already a two-path rail track from Hornsby to and through Pennant Hills. There also rail track from Carlingford through to Rose Hill and this passes under the M4 Freeway and Parramatta Road and then turns towards Clyde then towards Strathfield. From Casula looking north, there is existing track and easement to Guildford that is almost straight, and generally in line with Hornsby.

These three pieces of rail track form an almost linear corridor between Casula and Hornsby. Two tunnels, each about 4 km long are required to join the existing three rail sections over the nominal 37 km span between Casula and Hornsby. With these the two tunnels in place, then the existing rail tracks can be joined as an almost straight rail corridor between Casula and Hornsby to make the whole Eastern Continent rail link a practical and a serious infrastructure business⁴ concern as a fast cross-Sydney Basin transit path for both freight and commuter services.

Judging from the estimated cost for the earlier proposed Carlingford to Epping line tunnel and associated stations re-construction of about \$2.5 Bn, then each tunnel component and extended connections would cost about \$1.8 Bn to \$2.2 Bn as there is a minimum of commuter stations to be built or changed, so the total capital expenditure should be about \$3.6 Bn to \$4.4 Bn.

The return on investment can be quite large as this rail easement will allow freight trains to pass through from Brisbane to Sydney or Melbourne without having to be “broken up” or be shunted to get around tight corners. The oil costs for road freight are considerably higher for road freight than the equivalent bulk rail freight, so this means a real step in gross productivity for NSW associated businesses.

These track extensions will also provide an infrastructure synergy with the existing commuter rail services so that commuter trains could loop from “Hornsby – Pennant Hills – Carlingford – Lidcombe – Strathfield – Central – Chatswood – Epping – Hornsby”. The other established route of Hornsby – Chatswood – Central – Strathfield – Epping – Hornsby” would provide the constant flow of trains necessary to make both these routes very viable. A new route ***Hornsby – Liverpool*** is another real time saver for rail commuters. The other synergy would be feeding these railway stations with locally scheduled busses to link with these railway stations.

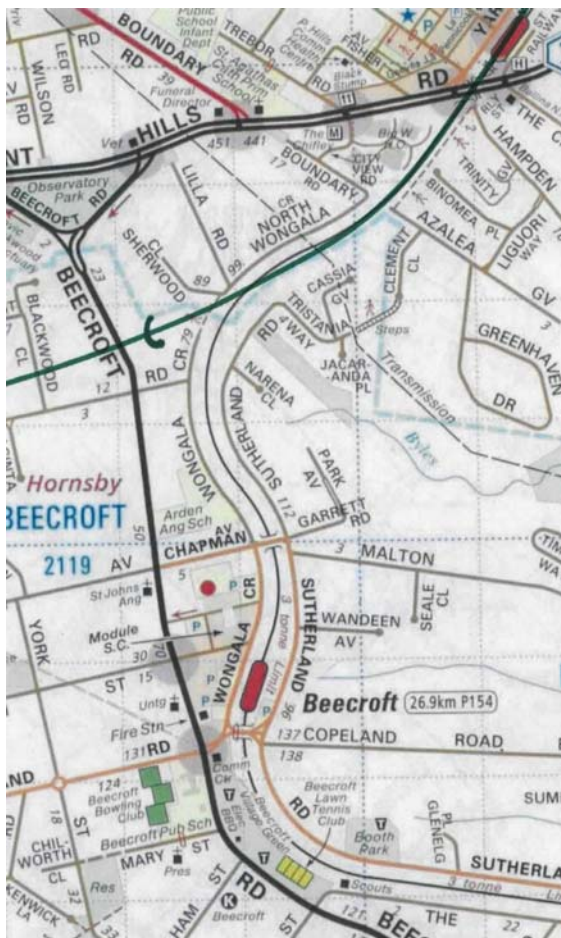
⁴ <http://www.moore.org.au/busn/01/What%20is%20Your%20Core%20Business.pdf>

Hornsby – Pennant Hills - Carlingford

By thinking outside the “Strathfield square” and not travelling out of Strathfield towards Hornsby via Epping; but instead by travelling from Hornsby to Strathfield via Epping, the lateral point of view is entirely different.

From Hornsby, the rail is fairly straight until it gets near Beecroft station⁵, where the altitude is 135 m. The rail track passes through a “W” bend and the bend south of Beecroft station is very tight. It makes little sense to continue through this tight bend, so why not simply branch off at the very start of the northern-most bend nearer Pennant Hill Station?

At Pennant Hills station⁶, the altitude is about 165 m so there is a 30 m altitude difference in about 1700 m length of track, or a gradient of about 1:56 (1.78%), which is reasonably steep by freight rail standards.



There are some very tight bends in the Beecroft – Cheltenham rail track section that severely limit the capacity of this route from its full potential to provide a comparative and relatively high speed, long rail freight services (and commuter services) across the Sydney basin.

My proposed rail alignment (shown in **Green**) would totally avoid these tight bends north and south of Beecroft railway station, by diverging at the start of the first bend south of Pennant Hills railway station, then pass a few metres lower than, and between both Sherwood Close and Wongala Crescent.

The proposed rail track would then proceed into a tunnel well under Beecroft Road and follow well under the altitude of near Albert Road, (also The Glen, Carlisle Crescent), towards Carlingford station.

The offset costs of the extra rail track from Epping to past Beecroft can be directly transferred into this project and combined into the current project⁷ to introduce new heavy gauge rail tracks in the Hornsby – Epping rail section.

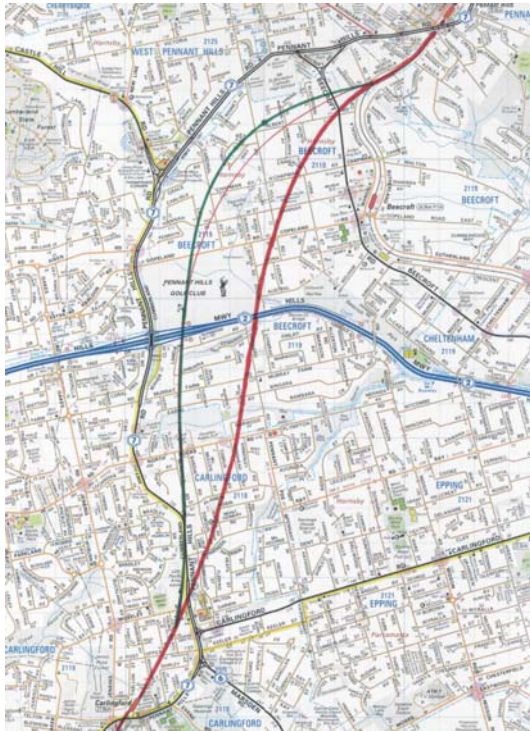
⁵ http://en.wikipedia.org/wiki/Beecroft_railway_station

⁶ http://en.wikipedia.org/wiki/Pennant_Hills_railway_station

⁷ https://majorprojects.affinitylive.com/public/fcb008d6b28611bd4b61791a8db23376/Final%20Draft%20SSI%20Application%20Supporting%20Document_Jan_2012_PR_5252.pdf

The Carlingford – Pennant Hills Tunnel

The first consideration was the minimum height necessary for the tunnel from rail to tunnel roof. As the standard⁸ for rail overhead wiring is nominally 5.2 m above the rails; allowing 0.8 m for insulators and “play” this is a rail to minimum ceiling height of 6.0 m. Allowing 1.0 m for concrete bridging over the track – this means that the minimum rail to ground level is about 7.0 m. The Chatswood Epping tunnel⁹ concurs.



The ideal rail corridor for the northern 4 km tunnel would be a very gentle “S” from Carlingford station through to Pennant Hills station, branching into the western curve south of Pennant Hills.

This initially proposed rail path is shown as the more direct red line starting tangentially about 1 km south of Pennant Hills station and going straight into the adjacent hill slope, immediately west of the existing rail line then heading virtually straight to Carlingford station.

The rail line needs to pass under the suburbs of Beecroft and Carlingford, but there are valleys, the M2 motorway, the Golf Club, school fields, large buildings, and other infrastructure to contend with. The second proposed path (to the west by about 750 m) may be an easier contour to keep underground.

By starting a proposed pair of parallel round tunnels south of Pennant Hills station the rail tracks connecting towards Hornsby would have an absolute minimum of bending south of from Pennant Hills station as the bends at Beecroft will be avoided.

This proposed tunnel pair would start into the hillside at the northern end of Beecroft suburb (south of Pennant Hills Road), about 900 m south-west from the Pennant Hills railway station. The tunnel would have an invert altitude of about 149 m, cross well under Beecroft Road and generally track along under the spur, somewhat parallel to Pennant Hills Road.

From initial inspection it appears that the green easement line may encounter far less “surfaced tunnel” problems than the red easement line.

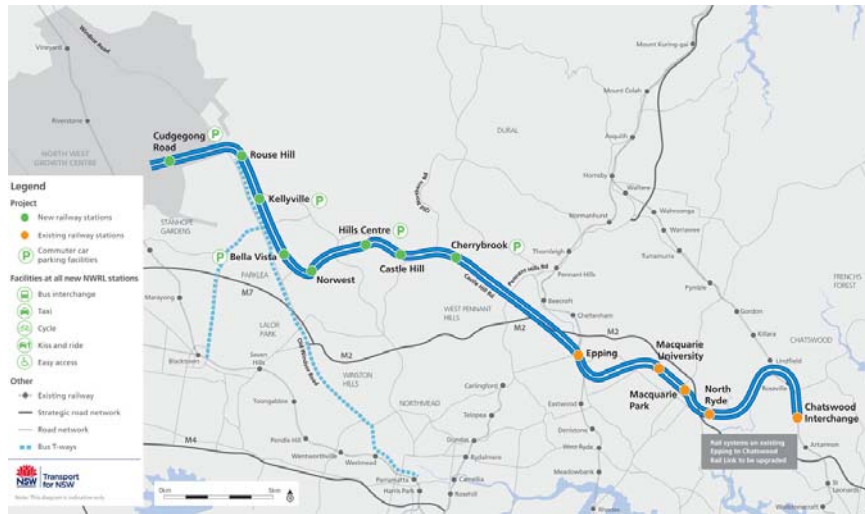
North of Carlingford station the rail easement seems to have been built over, so it will be necessary to lower Carlingford station and associate tracks by about 5 m (or more) to get under the nearby buildings in the firing line of the proposed railway easement. Another option is to alter the rail alignment to follow the west side of the power grid alignment.

⁸ <http://engineering.railcorp.nsw.gov.au/disciplines/rollingstock/Specification%20for%201500%20volt%20traction%20supply.PDF>

⁹ http://engineering.railcorp.nsw.gov.au/Disciplines/Civil/TMC_132_V1-0.pdf

Lowering the Carlingford station about 5 metres will reduce the gradient back to Telopea and provide more clearance under Carlingford, the M2, the Pennant Hills Golf Course and Beecroft residences. There is more detail in the Appendix.

Further detail about the proposed tunnel route for this area is in the Appendix.



The proposed Epping to North-West suburbs rail line¹⁰ will pass through Beecroft suburb but not Beecroft station, nor Cheltenham station. The stylised picture of the proposed North West rail track route was taken from the footnote reference and is shown above, showing this line leaving directly from Epping (underground) station.

In Beecroft, the North-West suburbs rail tunnel will cross the Sydney Basin tunnel at virtual right angles at about Hannah Road and Cardinal Avenue, where that tunnel will have an invert altitude of about 80 m.

At the tunnel crossing point, the proposed Sydney basin link tunnel will have an invert altitude of about 120 m. I believe that the ground level elevation at this point is about 145 m, so these tunnels should not interfere with each other or of the occupants in the houses above.

The proposed path for the northern tunnel from Carlingford is shown in Green and the idealised rail corridor for the same section is shown in Red. Ideally the red path would be taken as it is much straighter, but it may be more prone to surface and / or upset the lifestyle of many people and businesses in Beecroft and Carlingford.

If Carlingford station is lowered by several metres (as strongly suggested above and in the Appendix) then this lower altitude will still cross well over the top of the North-West rail tunnel in Beecroft, but a straighter alignment may be possible, allowing the trains to run both faster and safer through this section and the associated sections.

This faster transit speed will amount to a considerable saving in time and that saved time will relate as a significantly increased patronage by both the freight and commuter users of this proposed rail link.

Lost time is lost money

¹⁰ <http://northwestrail.com.au/>

Carlingford to Rose Hill Section

The Carlingford to Rose Hill section of rail exists, but only as a single track. This track has some broad bends and that will somewhat limit the speed of trains – unless the track can be straightened out with Addington Road having its alignment changed to accommodate the proposed smoother rail bends.



It seems that the elevation difference between Rose Hill station (about 12 m) and Carlingford station (about 100 m) is about 82 m overall.

Over a distance of nominally 4800 m this is an average gradient of about 1:58 (1.72%), which is not too steep by rail freight standards.

There may be justification to straighten the rail track wherever possible when this track is made into a double path.



Dundas – Kissing Point Road Overpass is very easy to make into double track rail.

The big construction problem is that south of Rose Hill station, there is a major crossroads of James Ruse Drive, the M4 and Parramatta Road in combination with the Western rail line connecting with the Carlingford spur at Clyde station. There is also a stormwater drain in this area that is prone to flash flooding.

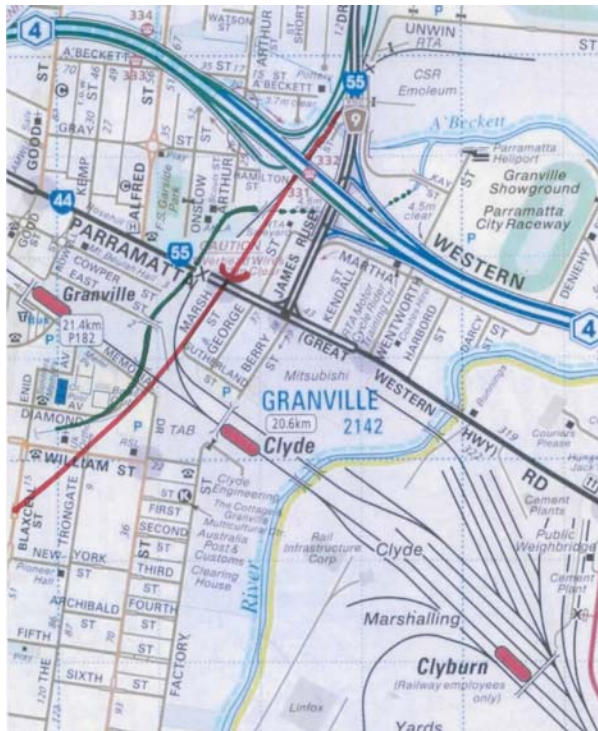
There is considerable transport infrastructure is just off the bottom of the above map, and there are two strategies that are considered here to get through this tangle of roads, rails and stormwater channels.

These strategies are discussed in the next part of this document.

Rose Hill – Granville / Clyde Underpass

This part of the proposed infrastructure was deliberately expanded because it is rather difficult to “thread the needle” of a dual rail tunnel through this area without making a few subtle changes to the immediate and surrounding area.

The picture below shows my initial strategy at threading through this narrow corridor.



This strategy was that south of Rose Hill station, it may be practical to split the rail lines under the M4 and run the proposed new rail lines lower so that they fall about 7 m in 900 m (1:128) and pass under Parramatta Road (rail track level about 7 m below ground level) and run the new tunnel directly (just) under Marsh Street Granville, then pass under the rail turning to Clyde station and then the proposed rail line would pass under the Western railway line.

There are several RTA buildings in the firing line of this proposed track north of Parramatta Road, and these would have to be demolished or repositioned so that the proposed line can pass through / under this area. *(A new building could be built around and over the proposed rail alignment.)*

From here, heading SSW the wide loop in the stormwater drain will need to be moved to the west by about 20 m to 25 m to be under the existing car-park to make way for the rail tunnel pair as it heads down in the adjacent park and into the gently sloping Granville hill.

Stormwater Channel Issue

With the above strategy, there is a problem with the easement of a large stormwater drain that runs through the Granville Bowling Club grounds, under the Western rail line, under Parramatta Road and under the existing spur rail line to Carlingford, before the channel then passes under James Ruse Drive, the M4 entry side-road, Kay Street and finally into A'Beckett Creek.

Near the Granville Bowling Club it is relatively inexpensive to move the easement of the stormwater path to accommodate the proposed new dual train line tunnels, for either option (as the thick green line on the above map shows).

The current stormwater path crosses under the existing Carlingford spur line about 250 m north of Parramatta Road. At that point, the invert level of the stormwater channel is about 5 m below ground level. With stormwater channels, it must be understood that these flood, so the rail level for the tunnel entry must be higher than the ground level at this point.



The picture above shows the car parking area to the west of the stormwater channel and the Granville Bowling Club building is to the east (of to the left of this picture) of the proposed dual tunnel for the proposed railway. The picture above right shows the Western line being about 3 m above the roadway and bridge over this stormwater channel.

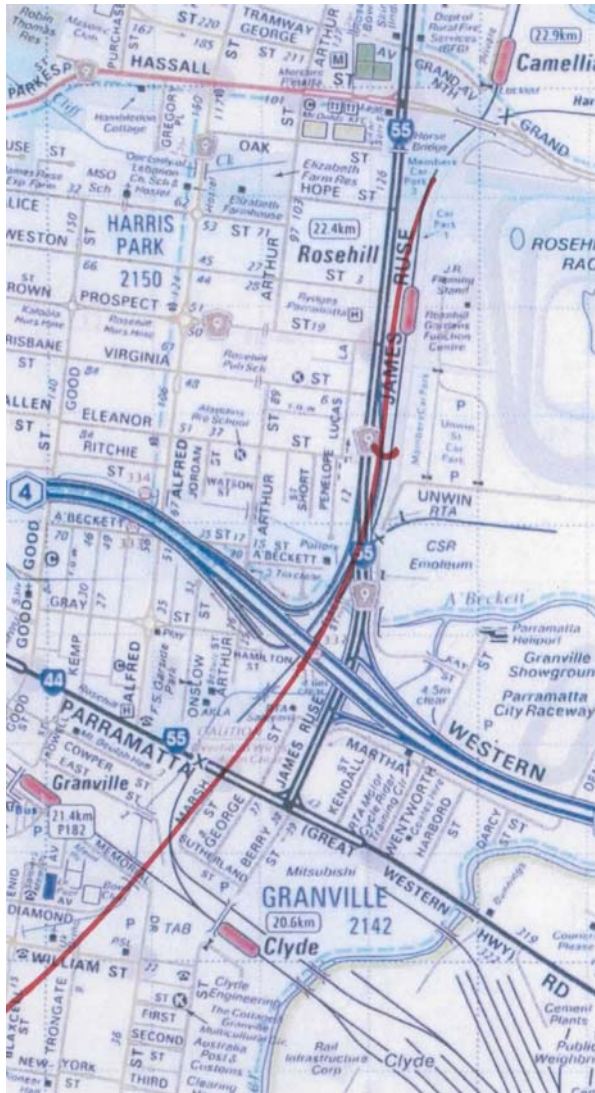


The two pictures above show the nominal invert level of the stormwater channel with reference to Parramatta Road (in the left picture) and a stormwater tributary feeding in, under the rail spur to Clyde.

So, this first strategy of a dual tunnel entry just north of Parramatta Road is impracticable unless the stormwater channel is diverted at Memorial Drive Granville to go east and run about 500 m and follows south of the Western rail line past Clyde station into the Duck River. As this area is a known for flash floods, the diversion storm water channel may minimise future water damage to homes businesses in the Granville area, but it will not assist in making this tunnel safe from flooding.

A Longer Tunnel is More Economical and Practical

Considering the high number of implications by having a shorter tunnel with the entry just north of Parramatta Road, it seems far more economical and practicable to start the tunnel near Rose Hill station, about 1 km north of Parramatta Road and run the rails of the tunnel about 17 m below ground level from about the M4 crossing over, until about William Street Granville, then follow the most level direct course towards the exit in Guildford near the south end of Guildford Park.



So, the rails would be switched / split about 250 m north of Rose Hill station and run on the west side of the current lines for about 600 m as they drop about 7 m in altitude, (gradient 1:88) and continue underground.

Here the proposed rail tracks align with the rail lines that go to Clyde, Lidcombe, Strathfield but the proposed rails track in the tunnels continue down to about 14 m under the tracks above as they approach and go under the M4, but diverge slightly to the east as the tunnel now clears under the stormwater channel.

The proposed tunnel's rail track line level continues down to about 17 m under Parramatta Road and levels out there under the spur line to Carlingford from Clyde, and the Western Rail line.

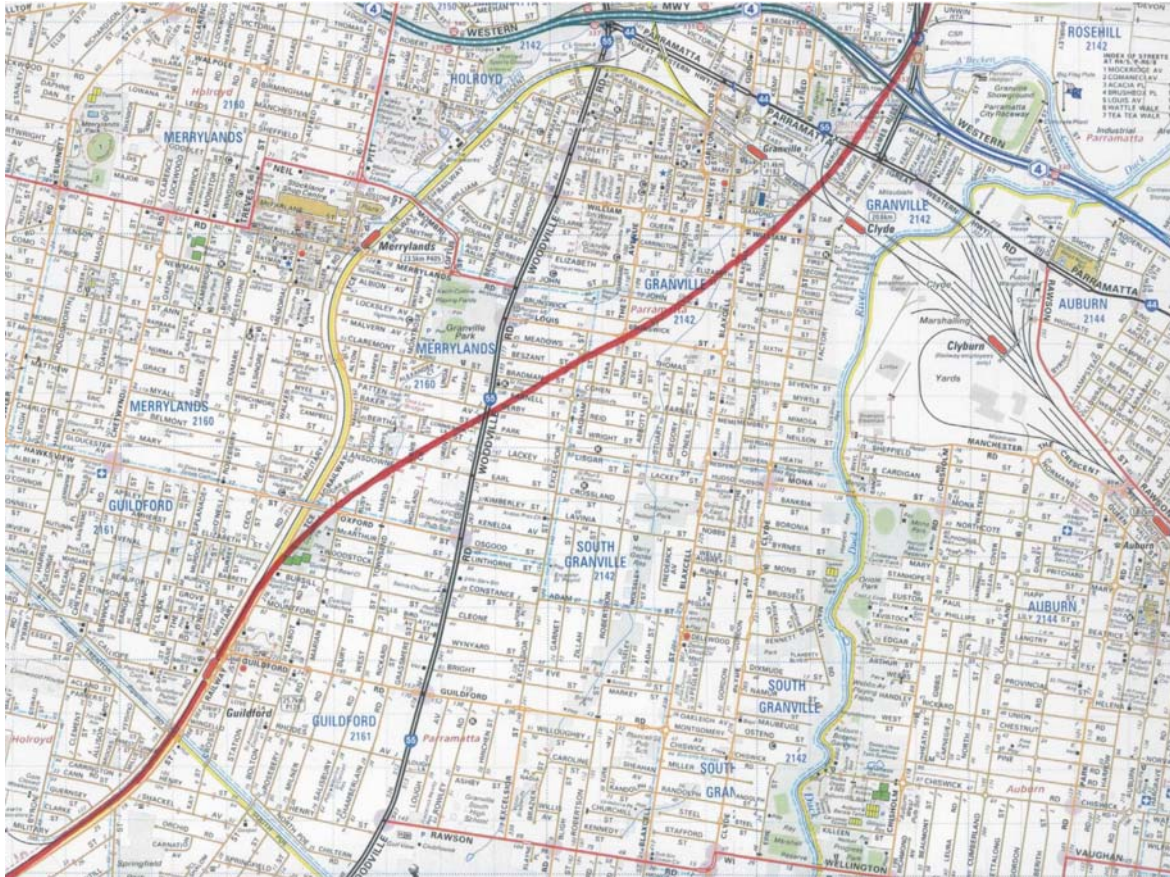
From there the proposed tunnel would track virtually under the bend in the stormwater channel and then proceed towards the Guildford exit point.

In this case the roof of the tunnel will be about 10 m below ground level and not be prone to flash flooding. The tunnel will need to be well sealed (with concrete) to minimise seepage problems.

Although this tunnel is another 800 m longer than the original consideration of about 3400 m, totalling about 4200 m, the amount of ancillary work is really minimised, and that significantly reduces the overall project preparation, construction time, and makes this tunnel very practical and very cost effective.

The Rose Hill – Guildford Tunnel

The proposed Rose Hill – Guildford tunnel would be about 4.2 km long (with the second strategy to get through the Rose Hill – Granville / Clyde infrastructure) and be almost straight. The tunnel would start just north of Unwin Road, near Rose Hill Racecourse, then continue through to about Elizabeth Street, Guildford, where the tunnel's rails would join with the existing rail track or use its own rail track past Guildford station.



The map above shows the proposed rail corridor that would connect the Carlingford spur line into the Cumberland / South lines with a minimum of turns and a minimum of rail switch points.

There are no hard bends in this proposed track connecting through from near Granville and Clyde stations through to join just north of Guildford station.

At the Guildford end of the tunnel (tracing NNE) the proposed rail line tracks would start descending near Guildford station, and then pass under / branch off at about Elizabeth Street, Guildford, which is about 600 m north of Guildford station.

With a nominal gradient of a bit less than 1:86, the rails would be about 7 m below nominal ground level by Elizabeth Street, Guildford, and by Oxford Street, Guildford (across the open playing field) the rail level would be at least 10 m below ground level. The park can therefore continue to be used for sport, as the ceiling of the tunnel would be at least 1 m below the ground surface.

The elevation of Guildford¹¹ station is about 33 m. Tracing NNE, by Woodville Road / Derby Street, Merrylands, the rail altitude would be about 16 m, and by about William

¹¹ <http://www.exploroz.com/Places/23876/NSW/Guildford.aspx>

Street, Granville, the rail altitude would be level with the northern end of this tunnel, where the nominal rail altitude is about –15 m.

The majority gradient would be about 1:100 and the two curves have a radius of about 2600 m, so rail freight trains could pass through here at relatively fast speeds.



The above picture shows the South / Cumberland lines north viewed from the Oxford Street overpass, looking south towards Guildford station (near the top right). There is plenty of space on both sides to fit another pair of lines and/or reposition these lines so that a tunnel can start near the far end of the playing field and continue under this playing field for an easy entry.

The Guildford – Casula Link

Going south from Guildford, the rail corridor already exists and is virtually straight as far south as Warwick Farm. South of Warwick Farm, the track is in place and almost straight through to Casula and onwards towards Goulburn, Wagga Wagga, Albury and Melbourne.

Rail Network Synergies

Carlingford Spur Now a Loop and Transit line

Spur railway lines have an inherently high overhead as the trains need to be turned around by reversing at the end or a large rail (balloon) loop is necessary so that the train can be quickly turned around with a very low overhead.

For several decades the Telopea / Carlingford line has been a “dead horse” track that connects from Clyde (on the western line travelling west from Sydney) to Carlingford, as the terminal station on this spur, now it would be part of a major freight and commuter transit link, capable of transiting huge volumes of freight daily.

Epping not Congested

Earlier network rail strategies¹² had looked at connecting the Carlingford line to Epping¹³ so that this would form a loop back into Sydney and/or form part of a link towards Sydney’s north-western suburbs from Epping. To all intents and purposes Epping is a major interconnect point, but linking the Carlingford line into Epping will create a congested node at Epping crippling future network infrastructure growth.

¹² <http://www.transport.nsw.gov.au/sites/default/file/prl/PRL-West-Report.pdf>

¹³ <http://www.smh.com.au/federal-election/gillards-2b-transport-fix-20100810-11y71.html>

The strategy stated here isolates Carlingford from Epping so that Epping can be the link to the North - West rail infrastructure, and Carlingford is then, the straight connection through to Hornsby for rail freight operations and commuter traffic.

Practical Commuter Loops

The big synergy about the proposed heavy gauge rail tunnel between Carlingford and Pennant Hills is that this line can have a dual purpose to create a circular link for the Commuter's Hornsby loop to link between ***Hornsby –Carlingford – Rydalmere – Auburn – Strathfield – Central – North Sydney – St Leonards – Chatswood – Gordon – Turramurra – Hornsby.***

Further, this leaves the ***Hornsby – Epping – Strathfield – Central – North Sydney – St Leonards – Chatswood – Macquarie Park – Epping – Hornsby*** loop in place too, to maximise commuter transport over much of Sydney's northern suburbs, and it provides a sensible leap-off point at Epping for the proposed North-Western commuter rail link. Concurrent to that purpose the North – South Cross Sydney basin link can use this same set of tracks as the prime rail freight link.

A new commuter line between ***Campbelltown and Hornsby*** will provide the opportunity for commuters to travel by relatively fast train between these two centres and stations in between with a commuter transit time of about 45 minutes including stops.

The main rail – rail freight interchange point for Sydney could be located near Casula and Campbelltown and Sydney could then have several (more than 15) road – rail freight interchange points distributed in the suburbs to really reduce freight transit delays for manufacturers / wholesalers and retailers.

So, not only does the commuter rail portion of this track really begin to pay for itself as the services through it will become far more available, but the ***rail freight portion of this track would very quickly provide the missing link that the Australian continental eastern coast desperately needs to provide freight interconnection across the Sydney Basin for connectivity between Melbourne and Brisbane.***

Appendix

Sydney's Transport Network Congestion

We have classical cases of under-engineered F2, F7, F5 and F3 road infrastructures around the Sydney metropolitan area and the northern end of the Pacific Highway is notorious for an unacceptably high rate of deaths due to road freight vehicles.

One of the prime reasons for road freight congestion and excessive long distance road freight usage is that current rail transport being limited to well under 30 km/h through most of the Sydney metropolitan because of long time delays due to extremely tight turning circles near Auburn, Chullora, Strathfield, Flemington, Auburn, Beecroft, Mascot and several other locations in the Freight rail network in Sydney.

The F3 highway north/west of Sydney and the Hume Highway south/west of Sydney are both overfilled with road freight transport because the excessive time taken by rail freight transport interchange in Sydney is far too time consuming, and there is no effective rail freight path north-south across the Sydney basin.

North of the Sydney basin, even though much of this F3 / highway is now three lanes in both directions, it soon converges into two lanes in both directions well before Newcastle and well before it gets to the Queensland border this highway is but a dual direction carriage way. This priority road freight strategy is the primary cause of why so many lives are lost in northern NSW vehicle collisions on these highways.

For several years, the standard reaction is to improve the road highway all the way from Melbourne to Brisbane. Funds for this road rebuild of the Pacific and Hume Highways would have been provided several times over if the road freight businesses had been taxed an equivalent amount as the rail freight. It therefore seems that successive Governments have been seriously compromised to maximise private road freight businesses at the expense of the taxpayers and rail infrastructure.

Sydney Basin Road Options

The main freight road link from Melbourne to Sydney is the Hume Highway near Casula, where the Highway splits into the M7 (Western Link Bypass), splits off to the M5 towards Kingsgrove, splits off to the Cumberland Highway via Wentworthville, or continues as the Hume Highway through Villawood. These several option provides a range of choices to traverse the Sydney Basin from South (West) to North on the way to Brisbane.

At the North (Hornsby) end of the Sydney Basin there are two primary freight road feeders and these are Pennant Hills Road, and the Pacific Highway. Pennant Hills Road is a major feeder, which picks up the large majority of freight road trucks from the M7, M2, the Hume Highway and the Cumberland Highway. The Pacific Highway picks up road freight trucks from Lane Cove Road and from Sydney's northern coastal peninsular.

Using GoogleMaps¹⁴ to find typical transit times a number of road scenarios were tried:

The Hume Highway, M7 and M2 then Pennant Hills Road to the F3 is about 59.0 km and takes about 0:50 hours.

¹⁴ http://maps.google.com.au/maps?q=narellan+road+campbelltown+to+george+street+hornsby&hl=en&gbv=2&um=1&ie=UTF-8&sa=X&ei=OGweUL6oG6ykiAfGtYCYAw&ved=0CAoQ_AUoBQ

The Cumberland Highway then Pennant Hills Road and this distance is 43.2 km and the transit time is about 0:56 hours : minutes.

Hume Highway through Liverpool, Cabramatta, Guilford, Harris Park, North Parramatta, North Rocks, onto Pennant Hills Road to Wahroonga then Hornsby. This road path is about 59.5 km long and will take about 1:13 hours : minutes.

Hume Highway through Liverpool, Greenacre, Parramatta, onto Pennant Hills Road to Wahroonga then Hornsby. This road path is about 47.2 km long and will take about 1:00 hours : minutes.

Hume Highway through Liverpool, Greenacre, Silverwater, onto Pennant Hills Road to Wahroonga then Hornsby. This road path is about 44.3 km long and will take about 0:59 hours : minutes.

Hume Highway through Liverpool, Lurnea, Padstow, Silverwater, onto Pennant Hills Road to Wahroonga then Hornsby. This road path is about 55.1 km long and will take about 1:06 hours : minutes.

The other common alternative is through Liverpool on the Hume Highway to Kingsgrove and up Lane Cove Road to the Pacific Highway at Gordon then to Hornsby and this distance is 52.9 km with a time of 0:55 hours : minutes.

This mapping very quickly shows that by road there are a number of somewhat parallel paths that are possible and that the M7, M2 / Pennant Hills Road is by no means the most direct route but it is the fastest because most of the path can be driven at 100 km/h, which is much faster than the other Road options.

The big criteria is that time lost is money lost.

This road mapping also shows that an almost direct path Casula - that is not on the highway is about 44.5 km where the almost direct route is about 35 km, so bends and corners in the suburban roads adds about 27% to the total length and considerably decreases the transport speed from about 100 km/h to about 40 km/h between these two points on the opposite ends of the Sydney basin.

Sydney Basin Rail Freight Options

Consider that rail freight transport has to traverse in a minimum of time from the southern Liverpool / The Cross Roads (near Casula) to Hornsby (about 35 km as the crow flies).

The big issue with this last road freight option is that this proposed freight rail path is very similar to the road freight connect between Casula and Hornsby. No matter how it is approached, rail freight will have to move extremely slowly through Granville / Auburn and Strathfield areas, or Regents Park – Auburn / Lidcombe areas, and through the Cheltenham – Beecroft – Pennant Hills area because of extremely tight turning circles near these stations, and further, these freight trains will have to wait for commuter trains because of network congestion.

So the rail freight train in these situations will be limited to about 30 km/h at the best and the comparative rail freight transit time track is about 60 km long. With an average rail speed of about 30 km/h because of the extremely tight turning circles, the traverse time will be about 2.0 hours, and large trains would be broken up to transit the Sydney basin between Hornsby and Casula.

So, with this pronounced train transit problem, it is no wonder that freight trains are not being actively used for transport freight between Melbourne and Brisbane, or from anywhere in Sydney towards Melbourne or towards Brisbane.

Rail Detail through Beecroft - Carlingford

Because of the undulating valleys in Beecroft my initial guess would be that it would track slightly north of Albert Road and cross about 23 m under Mangiri Road, cross under The Glen by about 35 m, cross under Carlisle Crescent and Hannah Street by about 30 m, cross (just) under the middle of the Pennant Hills Golf course and then cross about 10 m below the crest of the M2 at about 90 deg.

The rail line would then track about 200 m east of Pennant Hills Road just under the western end loop of Lamorna Avenue, cross under Murray Farm Road by about 20 m, cross under North Rocks Road by about 20 m, cross under the loop in Tripoli Avenue, and then cross under Pennant Hills Road / Woodstock Parade by about 30 m.

As this rail line passes across the M2 freeway, this tunnel may just surface north of Murray Farm Road over the small creek. In this case it may be highly advantageous to totally enclose the rail corridor at this small crossing to minimise noise from the rail freight service.

Carlingford Station Area

Immediately north of Carlingford station, the proposed rail path becomes rather difficult, as it seems that the rail easement has been sold off or was never instituted, and several large buildings have been constructed in or near the direct line of fire, north of Carlingford station as shown in the picture below left.



The picture above left shows the direct line of fire for Carlingford station¹⁵ has the back yard of a high-rise building on it as shown in the picture above left, and that building is very close if not well over expected the easement. To further aggravate these matters, a new set of two high-rise buildings are being built in Donald Street that are in the line of fire of what would be very close to the logical rail easement!

As an out, there is a large power line easement that runs NE over this rail alignment, and it heads into the hill, which is the Pennant Hills Road alignment spur. The western side of this power line alignment could be used as the entry point into the side of the escarpment and not affect any buildings at all.

¹⁵ http://en.wikipedia.org/wiki/Carlingford_railway_station

There really is nothing stopping the proposed dual railway tunnel from entering this easement near to where the existing power pylon is currently located as this pylon can be relocated several metres from where it is now – or simply have new foundation piers that extend past the invert level of the proposed dual railway tunnel.

From Telopea¹⁶ station, (which is only 64 m altitude), if the rail lines leading north into Carlingford station were lowered by about 2 to 5 metres (or more), then it would be much easier to cut a tunnel into the hill north of Carlingford station, reduce the steep gradient (1:46) between Telopea and Carlingford, and provide the necessary clearance so that the easement could cleanly pass well under some roads before getting deep into the spur where Pennant Hills Road is aligned.



As it is, Carlingford station is set on a ridge about 5 m high as shown in the picture above left, and it would be relatively easy to lower the altitude of Carlingford station by about 5 to 8 m, and progressively lower the 1400 m of track from Telopea to Carlingford. So then the altitude of the track at Carlingford station would be about 92 m and not 100 m, and the gradient from Telopea to Carlingford would be substantially reduced from 1:47 to 1:64.

With Carlingford station lowered by a some metres, now going north-east, the rail tunnel pair alignment would run under Shirley Street (corner), Post Office Street, Young Road (park), under Corey Place, cross well under Moseley Road and keep just west of and about 25 m or more under Pennant Hills Road.

The rail tunnel pair could then cross under Pennant Hills Road just north of Alamein Avenue / Pennant Hills Road junction and continue straight and under North Rocks Road, slightly to the west of the St Gerard Majella Catholic school and line up with the proposed track from under Murray Farm Road and under the western end loop of Lamorna Avenue.

The total length of this track between Pennant Hills and Carlingford would be about 6200 m and the altitude difference would be about 72 m, so the average gradient would be about 1:86 (1.16%), which is a gentle slope for all this distance. With Carlingford station lowered by about 8 m the altitude difference would be about 80 m and the gradient would be about 1:78 or about 1.3%.

Carlingford station could be moved north towards Carlingford Court and be underground, to give both infrastructures the synergy they both need to prosper from one another.

¹⁶ http://en.wikipedia.org/wiki/Telopea_railway_station