

## Hobart West Bypass - Concept Proposal September 2019

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### 1. Summary

This submission proposes an engineering solution to Hobart's traffic congestion. It reviews the background leading up to the current situation, examines a range of options for a combined road and tunnel system to bypass to Hobart's CBD while providing a non-stop link to adjacent suburbs. The cost and benefit of the proposed Hobart West Bypass are also provided.

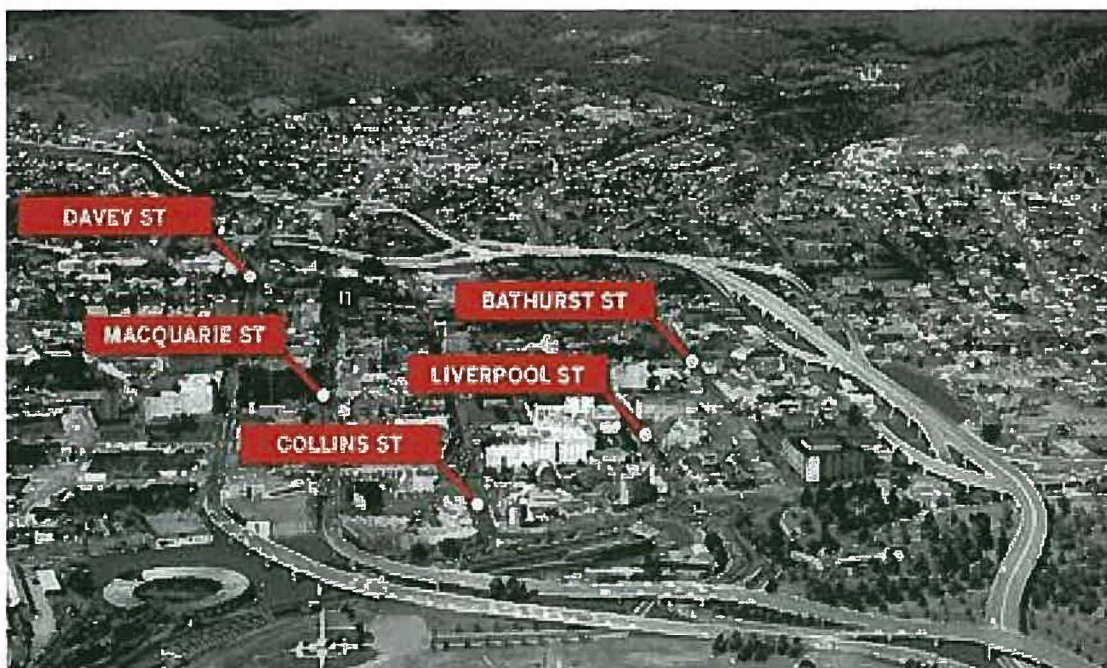
Other engineering solutions to address traffic congestions in the greater Hobart area are also identified.

Importantly, this submission should be read in conjunction with those from urban geographer, Bob Cotgrove and submissions from the Nick Evers Group.

### 2. Background

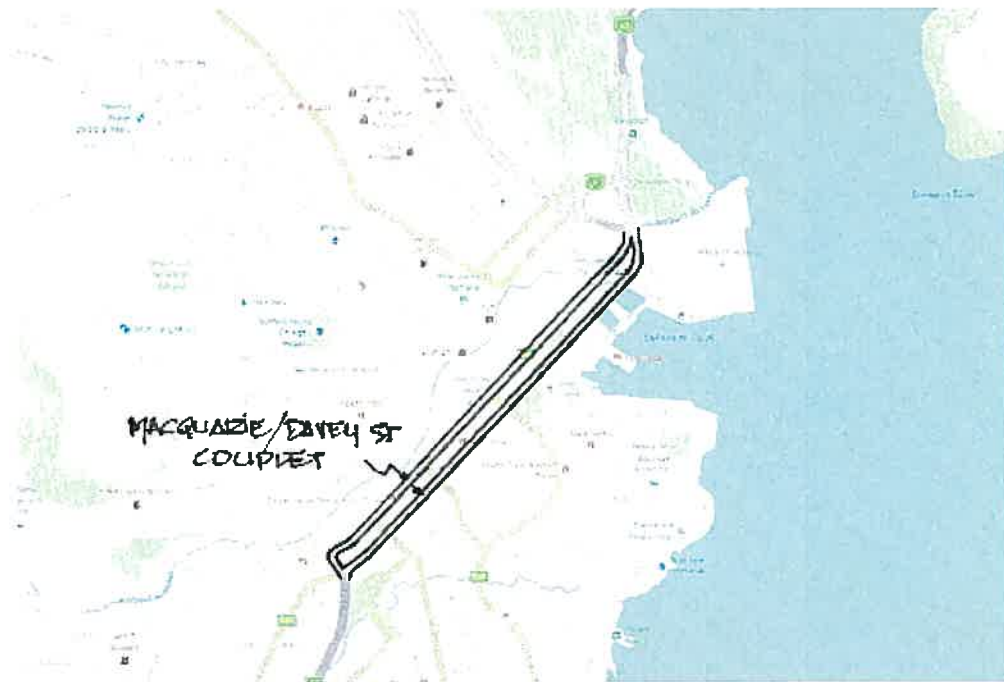
In the 1960's the Tasmanian Department of Public Works, the Transport Commission and the Hobart City Council commissioned the first Urban Transportation Study in Australia for the City of Hobart. It was carried out by Wilbur Smith and Associates and was to determine the best way to link the 3 arterial roads into and out of Hobart while avoiding (or bypassing) the city centre.

A series of flyovers and roads linking the Southern Outlet to the Brooker Highway and the Tasman Highway was proposed and although some properties along the route were acquired the Wilbur Smith Proposal was never pursued.



## 2. Background (cont.)

A series of one way streets was then adopted until the 1980's when the Macquarie and Davey Streets Couplet was conceived as a further alternative to a Western Bypass.



Since the Macquarie Street/Davey Street Couplet was introduced, traffic on Macquarie and Davey Street has essentially been managed by synchronising the 14 sets of traffic lights on Macquarie Street from the end of the Southern Outlet to Burnett Street on the Brooker Highway and on Davey Street synchronising the 12 sets of traffic lights from the cenotaph to start of the Southern Outlet.

Cross arterials from Sandy Bay, Tarooma and Battery Point and from West Hobart and North Hobart have also been managed by synchronising traffic lights at 26 intersections leading to delays.

Traffic management of the Couplet using traffic lights has become more difficult particularly in peak periods where the volume of traffic reaches and exceeds capacity resulting in a slowing of traffic speeds. This then leads to further delays and gridlock.

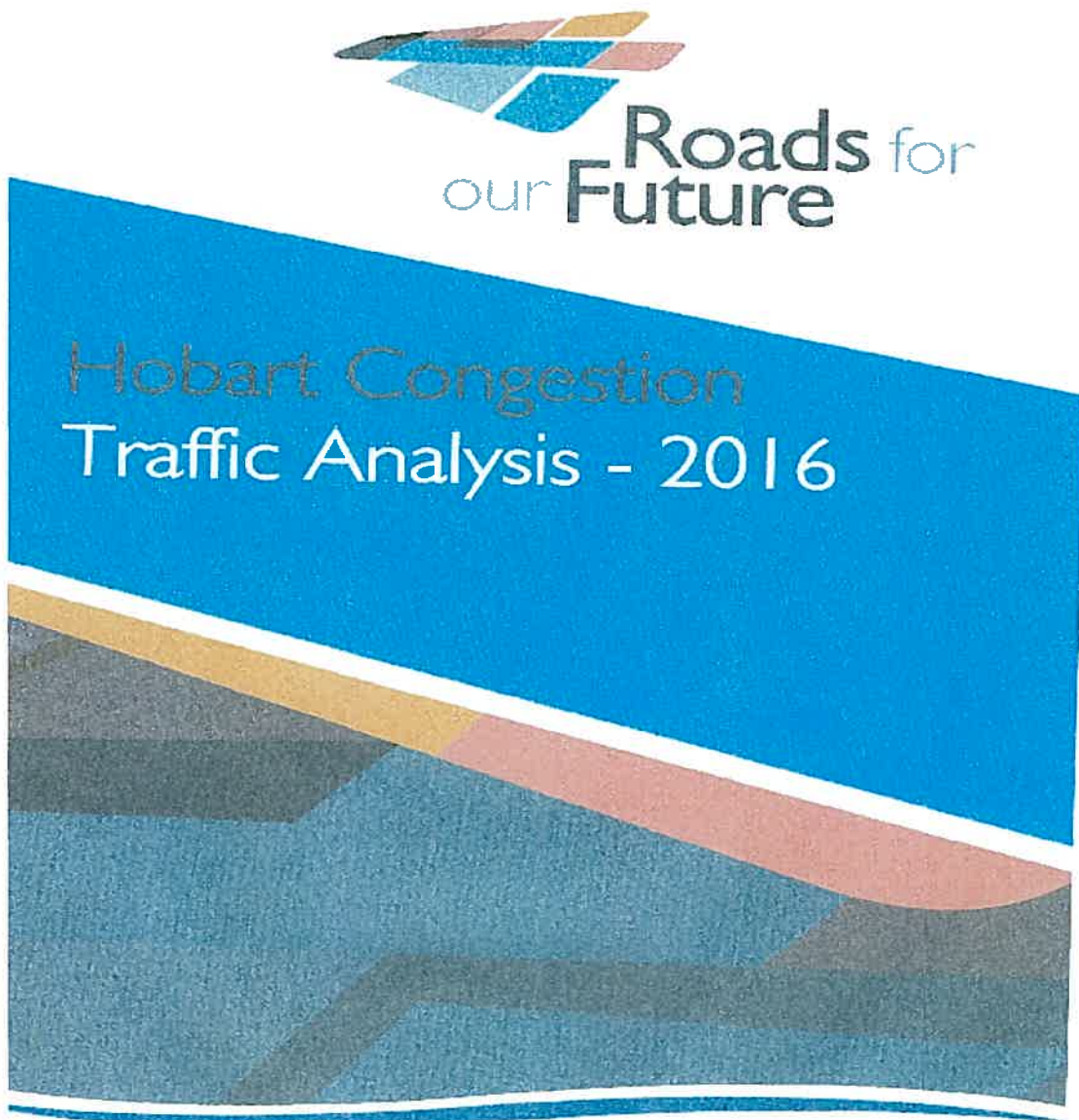
It is also worth noting that during the late 1970's the Public Works Construction Division was sold off and it became the Department of Main Roads. The engineering design and construction capability was gradually reduced during the late 1980's and early 1990's before it became the Department of Roads and Transport. It was finally absorbed into the Department of State Growth around 2010. It now has a more of a planning and project management role than an engineering role.

In the 1990's the Bowen Bridge was constructed to relieve some of the cross town traffic from the increasingly overloaded Tasman Bridge as it approached its capacity of 75000 vehicles per day. However the extra traffic capacity of the Bowen Bridge has never been realised by not completing the eastern shore link between the Bowen Bridge and the Tasman Highway at Mornington. Despite having the extra lane morning and evening, the Tasman Bridge is again reaching capacity.

### 3.Recent Developments

In 2016 the Department of State Growth commissioned a study by GHD titled “Hobart Congestion Traffic Analysis 2016”.The study counted vehicles in various locations along Macquarie and Davey Streets and at several intersections.

It appears to be the last legitimate vehicle count survey of its type that provide reliable data for these streets. It also showed how much of the traffic, on Macquarie Street in particular, was using Molle and Harrington Streets as “de facto” bypasses of the CBD.



Department of State Growth



The Study also found in 2016 that 64,500 vehicles used the Macquarie and Davey Streets couplet daily and with a projected growths of 1.1% for the Tasman Bridge, 1.5% for the Brooker Highway and 3.6% for the Southern Outlet the capacity of the Macquarie/Davey Street Couplet, particularly during peak periods, will result in reduced vehicle speeds. All of this has come to pass in only 3 years.

### **3.Recent Developments (continued)**

Since 2016 the capacity of Macquarie Street and Davey Streets has been regularly exceeded in peak hours resulting in partial gridlock on the approaches and at several intersections. I suspect that the volume of traffic since the 2016 Study is now in excess of 70,000 vehicles per day.

In 2018 the Department of State Growth conducted a further survey using vehicle number plate recognition that highlighted the growth in peak hour traffic.

However, it appears that the Department's definition of the Hobart CBD is that it extends north/south from Creek Road traffic lights in New Town to Tasuni in Sandy Bay and east/west from South Hobart to Glebe. (Logically the Hobart CBD would encompass the area between Sullivans Cove and say Liverpool Street.)

This "revised" CBD enables them to say that a larger number of vehicles only make trips only to and from the CBD and a bypass would have a major impact.

In reality the 2016 Study found that 19,200 out of 34,900 vehicles per day on Macquarie Street continued on to either the Tasman Bridge or Brooker Highway. This represents 55% of daily traffic and does not include the vehicles that have "bypassed" at either Molle Street, Harrington Street or Argyle Street.

In November 2018 The RACT held a forum for their 30 year "Greater Hobart Mobility Vision". The expert panel included only one engineer experienced in traffic and transport. It was dominated by urban planners and urban strategists who were focussed on ending traffic on our roads.

Suggested options to improve traffic flow include the following;

- Bypass Road and Tunnel system
- Link roads around Greater Hobart
- Clearways on Macquarie Street
- Park and Ride from suburban parking lots
- Ferries
- Light Rail
- Autonomous buses and Trackless Trams
- Bike riding and
- Walking.

A combination of these options will only be part of a long term solution that will include a move to electric vehicles. The need to allow heavy transport, trade vehicles and private vehicles to bypass the CBD will always be required.

The volume of traffic entering and exiting the city will only increase in the short term once the traffic from large subdivisions being developed around Kingston, Cambridge and Sorell is taken into account.

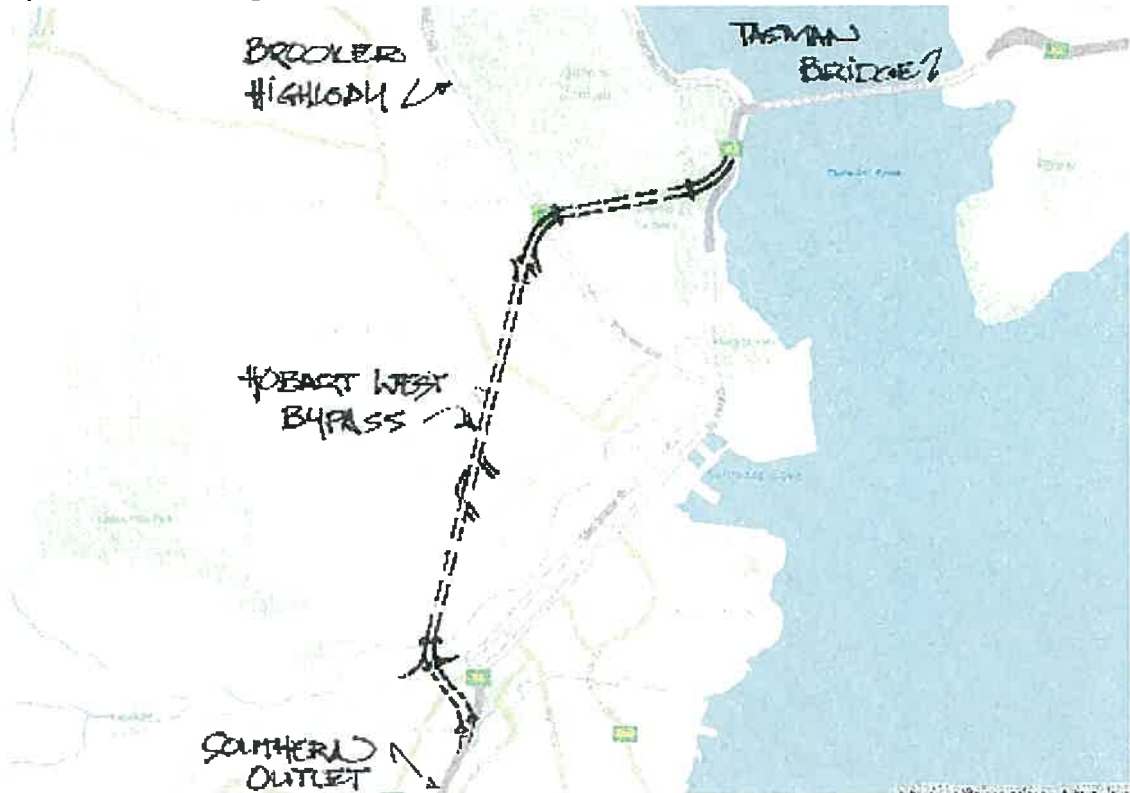
It is also interesting to note that it has been reported that the proposed replacement Bridgewater Bridge will only cater for some 20,000 vehicles per day compared to the 70,000 vehicles per day in Hobart's CBD.

The need for an engineering solution such as a West Bypass (as proposed in the 1960's) appears inevitable.

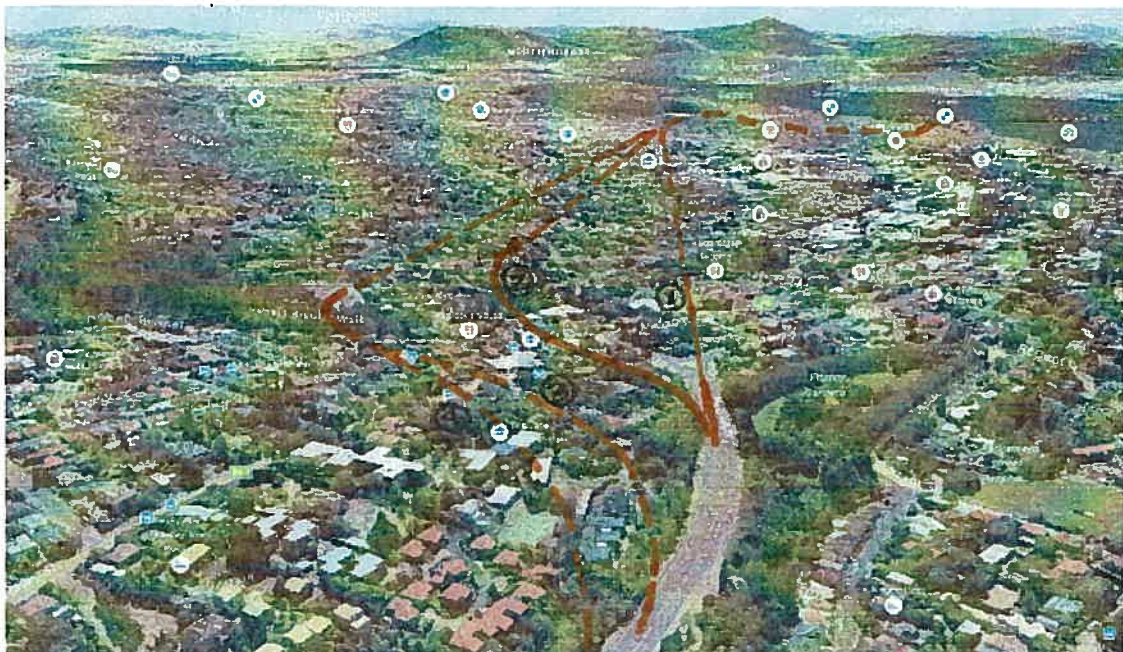


#### 4.Hobart West Bypass Proposal

The Hobart West Bypass proposal would connect the 3 arterial roads, the Southern Outlet, the Brooker and Tasman Highways with a 80kph nonstop road and tunnel system, 4.4km long and also allow connection with traffic from the adjacent suburbs.



Four options for a West Bypass road and tunnel proposal were considered.

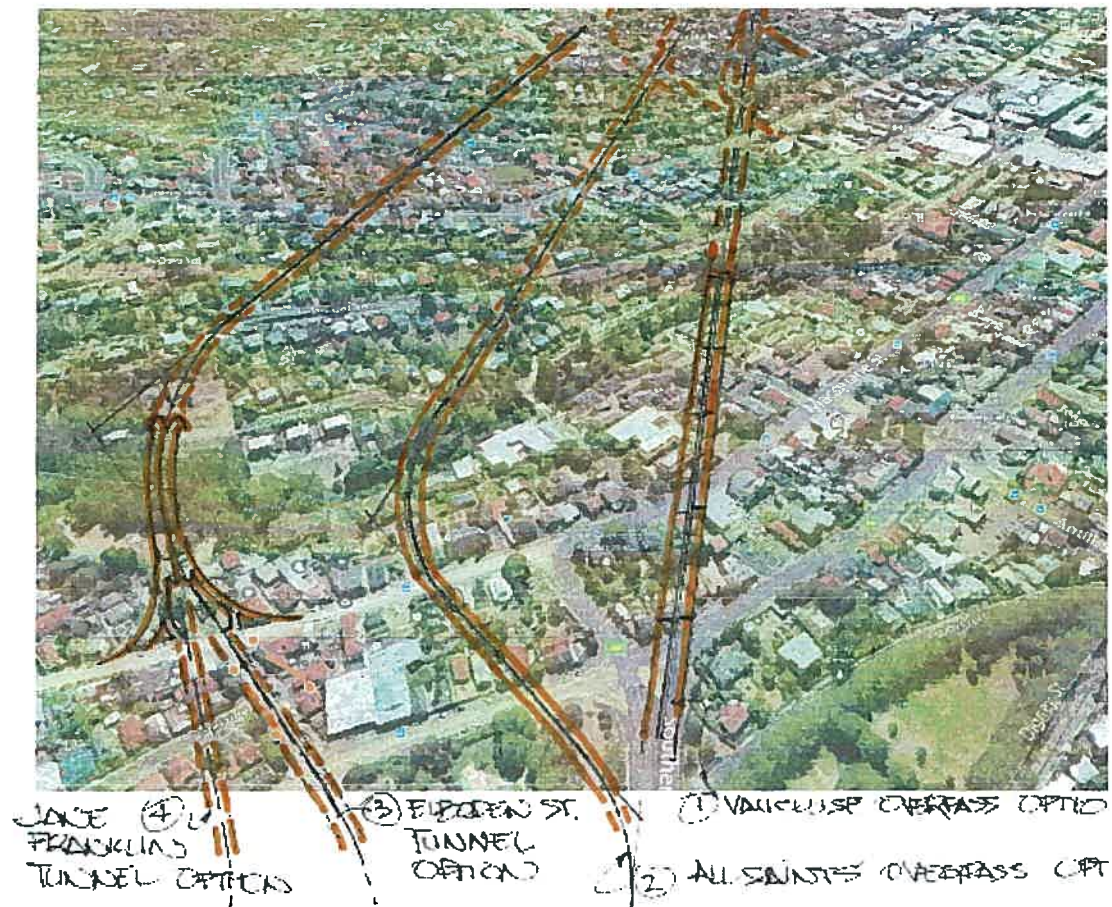


The preferred option is to construct 2 parallel, 2 lane roads and 2 lane tunnels connecting the 3 arterial roads.

#### 4.Hobart West Bypass Proposal (continued)

The first section of roads and tunnels would be 2.95 kilometres long. For vehicles travelling north they would veer left near the end of the Southern Outlet, pass under Jane Franklin Hall, Davey and Macquarie Streets.

There would be on/off ramps at Macquarie Street near Males Sand depot and an overpass over the Hobart Rivulet.



The Jane Franklin Tunnel Option 4 above is preferred for the following reasons;

- There is more cover over the tunnels,
- It requires fewer property acquisitions
- It utilises the only open space for junctions and tunnel locations
- It vastly reduces the need for long road overpasses.
- It can be constructed with little or no disturbance to existing traffic.

It is however some 400m longer than Options 1 and 2.





After crossing Hobart Rivulet the bypass would be in twin tunnels under West Hobart and North Hobart and resurface at Burnett Street adjacent to the Campbell St. Primary School.

On/off tunnels could be considered at Molle Street and at Barrack Street for traffic to and from Sandy Bay and Taroona.

There is also scope for a multi-story underground car park at the recently sold K&D site with commercial space above.

The approach tunnels and road overpasses to the Brooker Highway at the Burnett Street junction is shown below;



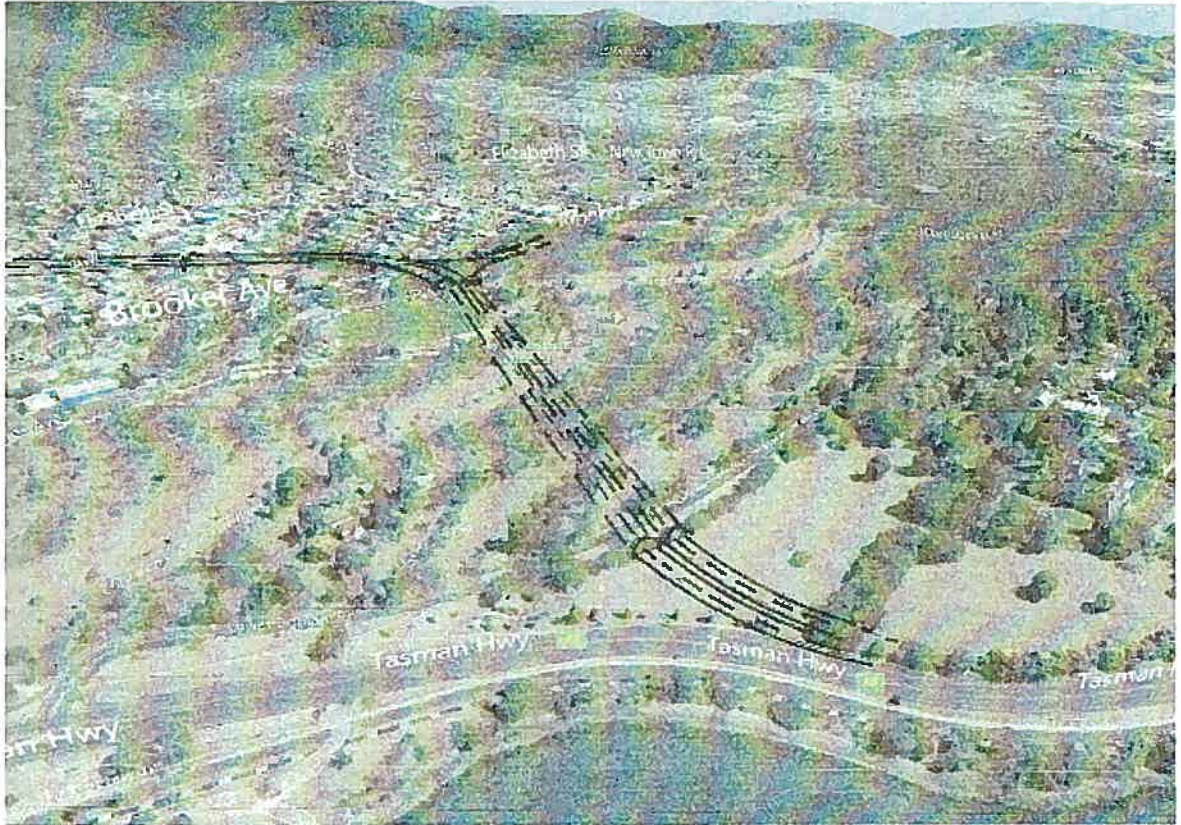
There would be an overpass at Brooker Avenue.

On/off ramps would again provide access to the bypass from Burnett Street and Campbell Street as well as traffic on Brooker Highway wanting to travel south around the CBD

#### **4.Hobart West Bypass Proposal (continued)**



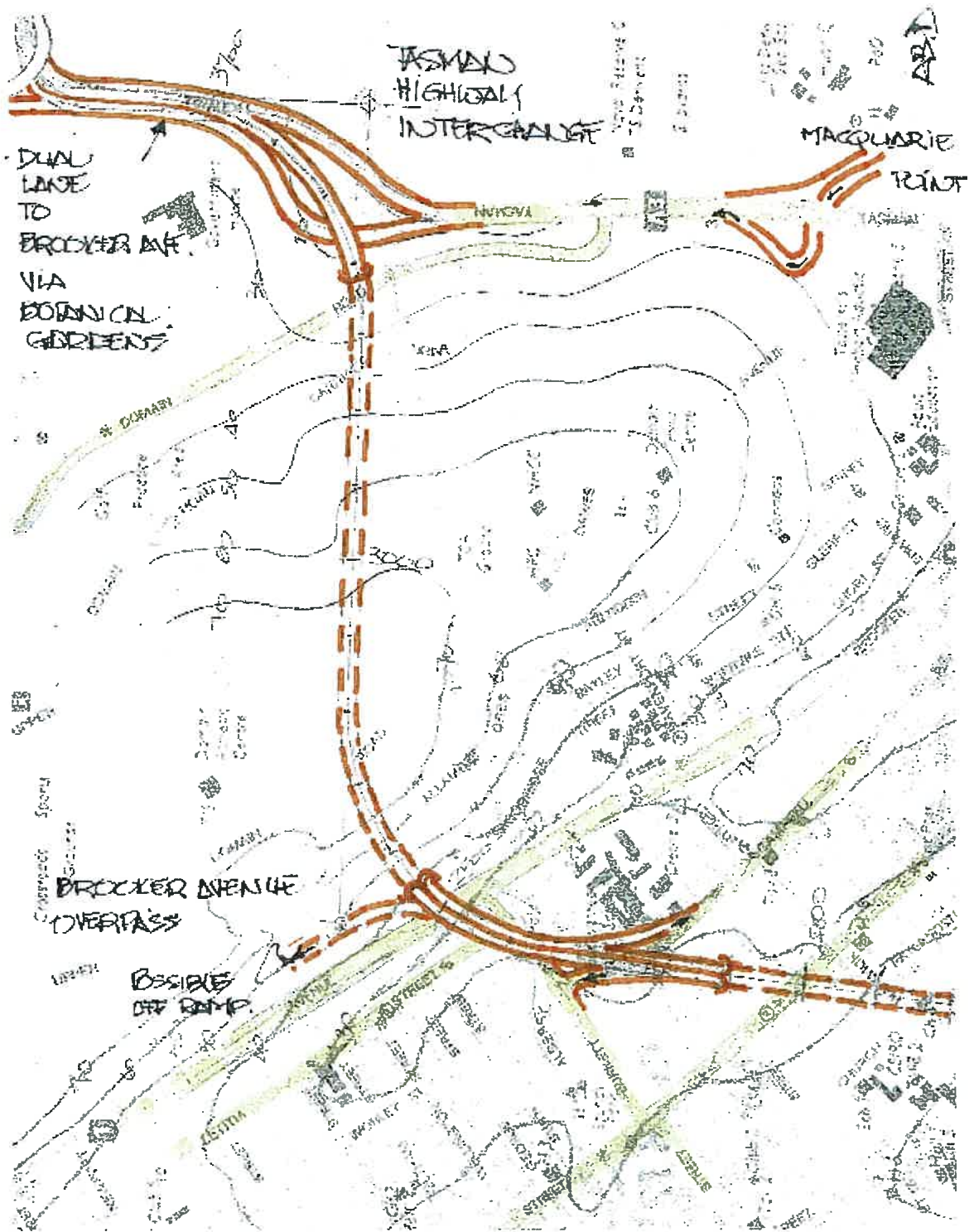
The second section of roads and tunnels would be 1.45 kilometres long and run from the Brooker Highway and pass under the Hobart Domain exciting south of Government House on the approaches to the Tasman Bridge as shown below.



This section of tunnels and roadway could be constructed with limited disturbance to existing traffic to and from the Tasman Bridge.

#### 4.Hobart West Bypass Proposal (continued)

Details of the proposed junction with the Brooker Highway and Tasman Bridge are shown below.



#### 4.Hobart West Bypass Proposal (continued)



**Tunnels;** Twin parallel tunnel would be 10.5 metres in diameter and carry 2 lanes of traffic in each direction. There would be provision for an emergency lane and interconnection between tunnels in the event of an emergency as shown below. This is standard international practice.



Contemporary road tunnels of this type have been constructed throughout Europe, Asia and Australia using Tunnel Boring Machines (TBM's)



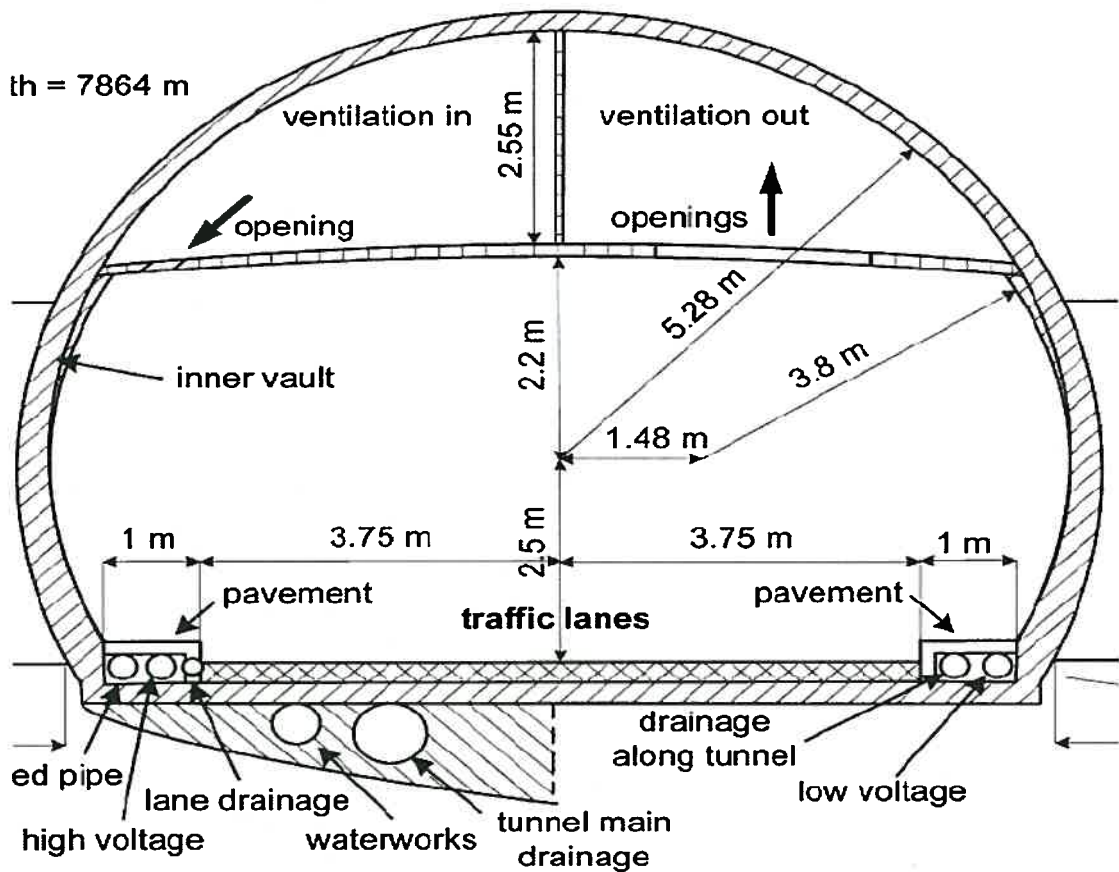
Each tunnel would have a capacity for in excess of 4000 vehicles per hour travelling in each direction at 80 km/hr assuming 40 metres between each vehicle.

#### **4.Hobart West Bypass Proposal (continued)**

Bypass roads and tunnels are unconstrained by traffic intersections allowing continuous traffic flow say from Kingston to Hobart Airport.



Tunnel cross-sections are described below.



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## 4.Hobart West Bypass Proposal (continued)

Geological conditions assumptions are described below.

The first 2.95 kilometres of roads and tunnels would likely be in sandstone and be very suitable for TBM tunnelling machines. Sandstone is evidenced in the cliffs adjacent to the Hobart Rivulet north of Macquarie St., in the cuttings of the St. Virgils College Oval and St. Marys College tennis courts in Barrack St.

The remaining 1.45 kilometres of roads and tunnels appears to be in dolerite as evidenced in the old HCC quarry on the Brooker Highway north of Burnett St. Tunnel sections in dolerite could also be excavated by TBM's albeit a little slower.

**Design Assumptions** are described as follows.

The roads, tunnels and on/off ramps would be designed in accordance with the Australian Standards for Road Design known as Ausroads (formerly NAASRA).

- The design speed adopted is 80 kilometres per hour.
- 2 lane dual carriageway (2 lanes each way) roads and tunnels would move at least 4000 vehicles per hour each way at that design speed assuming a conservative 40 metres per vehicle.
- West Bypass traffic could be discharged and accepted at up to 5 transfer nodes.
- Transfer nodes could be located at the Macquarie St. near the Hobart Rivulet, at Molle St. for cross city traffic from Sandy Bay and Battery Pt., at Murray and Elizabeth St. for cross city traffic from the northern suburbs, another at Campbell St. and the Burnett St. and Brooker Highway entry/exit point with last transfer node at the Tasman Bridge for traffic entering the city or going south.
- Overpasses at Brooker Avenue and the Tasman Bridge approach would allow for through traffic to proceed unhindered. Good examples of this occur at the Eastern Outlet at Mornington and now at the new Huon Highway Overpass at Kingston.  
Overpasses are the most effective traffic movers providing continuous traffic flow but are not always the cheapest.
- Slopes on the pavement surfaces have been designed to allow groundwater and stormwater drainage to drain to existing surface watercourse or pipe drainage.
- Ventilation would be provided at the tunnel obverts and interlinked dual tunnels allow emergency management in the event of accidents.

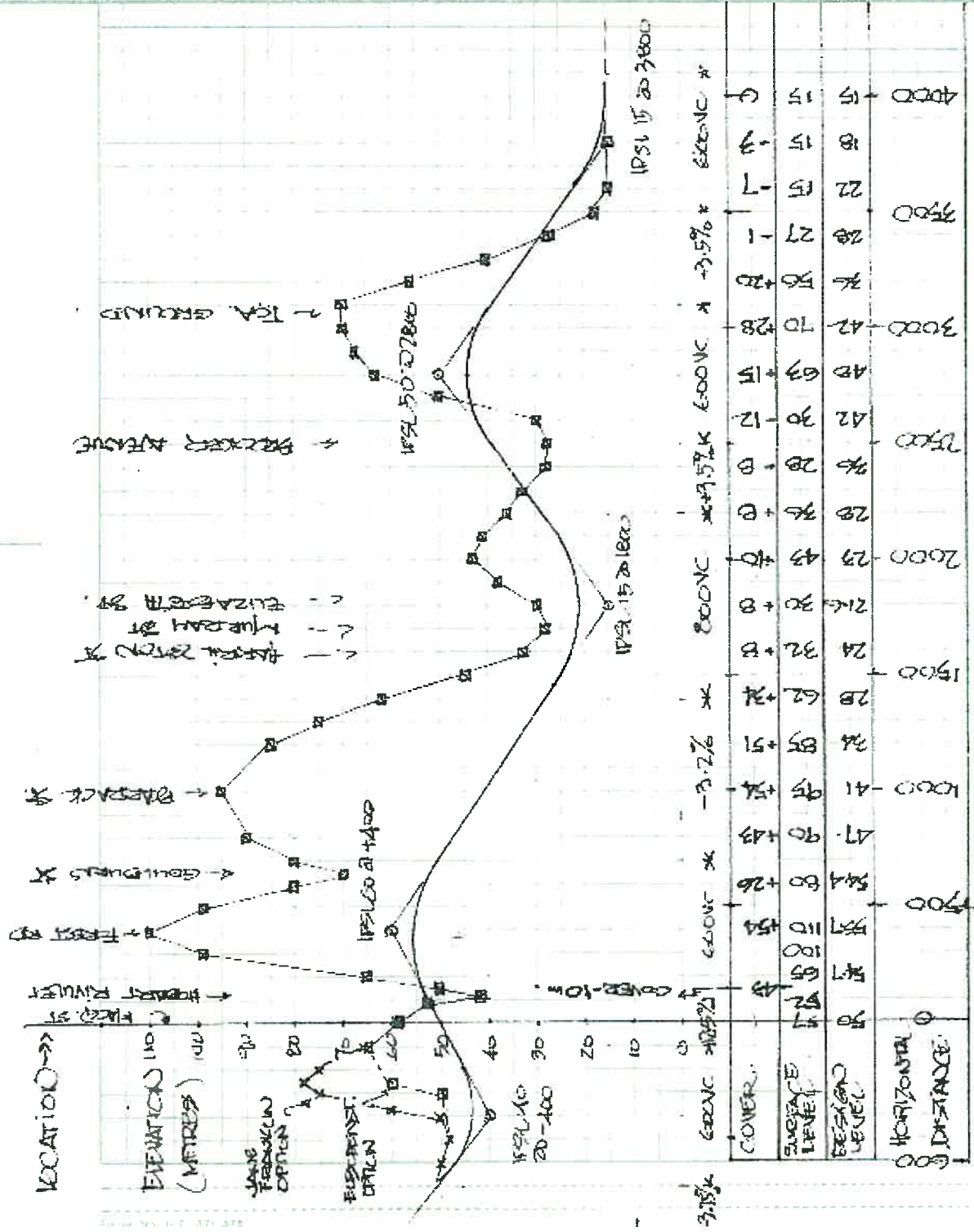
# 4. Hobart West Bypass Proposal (continued)

THE HYDRO-ELECTRIC COMMISSION



## VERTICAL ALIGNMENT FOR "JANE FRANKLIN & ELSDEN ST OPTIONS"

APR 2019  
JUNE 2019





#### 4.Hobart West Bypass Proposal (continued)

##### Costs

(a) **Tunnels:** Contemporary tunnels of the types proposed using Tunnel Boring Machines have been estimated at \$125k per metre and include a segmented concrete lining which is mandatory in Australia. The length estimates are as follows;

Chainage -400 metres to 50 metres	= 450 metres
Chainage 180 metres to 2300 metres	= 2120 metres
Chainage 2550 metres to 3400 metres	= 850 metres
<u>Total length of each tunnel</u>	<u>= 3520 metres</u>

(b) **Roadworks:** Contemporary roads of dual carriageway configuration have been estimated between \$50k to \$150k per metre based on location and terrain. An average figure of \$100k/m per metre has been adopted.

Overall length of roads and tunnels of 4400 metres minus 3520 metres of tunnels  
(excluding exit/entry ramps) = 880 metres

<b>Investigation, Business Case &amp; Preliminary Design</b>	= \$ 12million
<b>Detail Design, Site Establishment, Project Management</b>	= \$123million
<b>Tunnels</b> 3520metres x 2 @ \$125k/metre	= \$880million
<b>Roadworks</b> 880metres x 2 @ \$100k/metre	= \$176 million
<b>Land Easement Acquisition</b>	<u>= \$ 20 million</u>
	Sub-total = \$1211 million
20% Contingency	<u>= \$ 242 million</u>
<b><u>Total Cost Estimate</u></b>	<b><u>=\$1453 million</u></b>

This is a substantial cost but in comparison it is substantially less than the Bowen Bridge, Southern Outlet or indeed the Tasman Bridge.

## **4.Hobart West Bypass Proposal (continued)**

### **Benefits**

The benefits of a Hobart West Bypass are as follow;

- It provides a nonstop route linking the Southern Outlet, Brooker Highway and Tasman Highways avoiding the current bottlenecks of Macquarie and Davey Streets.
- It provides a welcome alternative for heavy transport vehicles, lighter delivery transport, trade vehicles and private and public vehicles.
- It raises the capacity of roads bypassing the Hobart CBD by an additional 2000 vehicles per hour per lane or 8000 vehicles per hour for the 2 lanes each way.
- The increased capacity of up to 192000 vehicles per day would satisfy Hobart's growth for many decades.
- The bypass relieves the current traffic on Macquarie and Davey Streets allowing the cross arterial traffic greater access to the proposed bypass and the inner Hobart CBD.
- It restores the more pedestrian friendly nature of Hobart between Sullivan's Cove and the CBD as the Gehl Report recommended.
- It relieves the damage to heritage buildings on Macquarie and Davey Streets from heavy traffic vibration.
- It requires significantly less property acquisitions than an above ground bypass route.
- It would provide easier access to additional parking stations around the CBD.
- All construction activities and construction materials, except for the Tunnel Boring Machines, can be sourced within Tasmania.
- Construction would have minimal impact on existing roads because it is mostly road tunnel.
- Excavated material can be either recycled for road material or used for shoreline fill for an extension to the Royal Hobart Botanical Gardens or the proposed Battery Point Walkway.
- In the longer term the bypass would be suitable for mixed use such as road and rail.

It is also worth remembering that the Hobart West Bypass proposal would cater for substantially more traffic than the current Midlands Highway. It may also qualify as an infrastructure project of national significance.



## 4.Hobart West Bypass Proposal (continued)

### Timing

A suggested project program would likely be spread over 10 years with 2 years allowed for each of 5 phases shown below.

- **Phase 1** would be for Feasibility study, Business Case development and approval and Preliminary Design and Development approval
- **Phase 2** would be for Final Design Completion, Contract Preparation and Award together with Easement acquisitions
- **Phase 3** would be to establish tunnel staging and drive points and commence elevated road construction.
- **Phase 4** would be to commence tunnel driving and surface roadworks
- **Phase 5** would be to complete tunnels, elevated roads and surface roadworks

### **Photo of Typical Road Overpasses.**

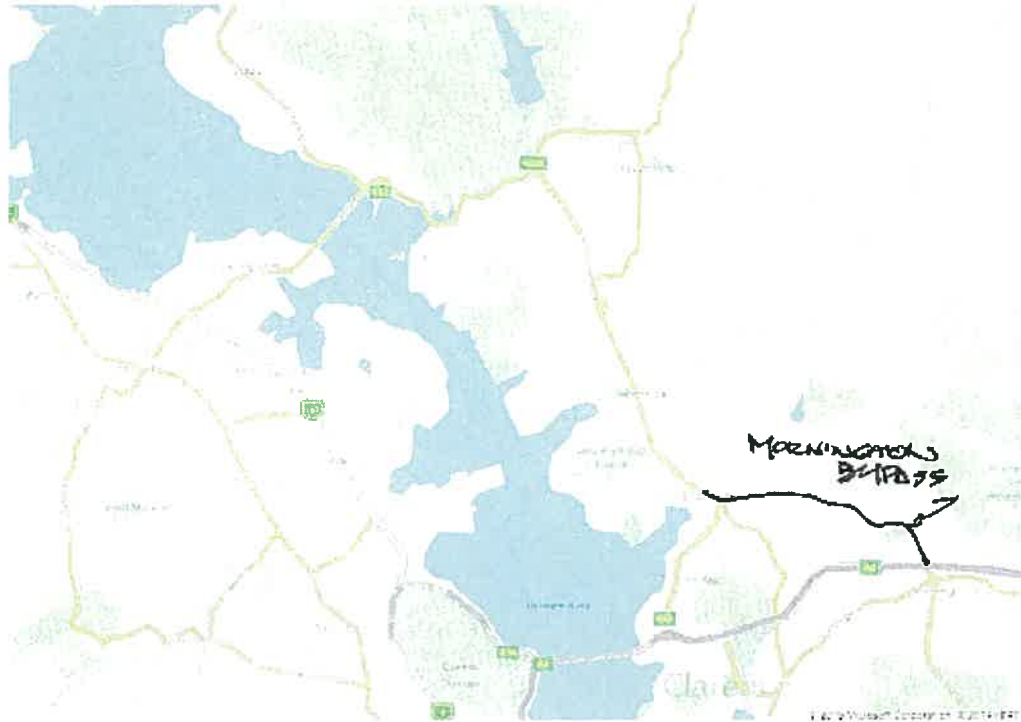


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## 5. Further Congestion Easing Suggestions

Further congestion easing engineering options suggested are as follows;

### 1. Mornington Bypass to Bowen Bridge Bypass



### 2. Brooker Highway additional lane from Botanical Gardens.





## 5. Further Congestion Easing Suggestions (continued)

### 3. Macquarie Point to Tasman Highway avoiding Hobart CBD



ALTERNATIVE ACCESS NORTH AT MACQUARIE PT

### 4. Airport Roundabout Overpass



TASMAN HIGHWAY @ AIRPORT ROUNDABOUT  
4 LANE OVERPASS  
AT EXISTING ROUNDABOUT



## **Anthony Bruce (Tony) Denne, MIEAust, CP Eng. (Ret)**

Tony Denne is a retired Civil Engineer with 40 years of experience with Hydro Tasmania.

He was involved in survey, hydrological and geological investigations, design of roads, canals and villages including water supply and wastewater treatment associated with the design and construction of hydro schemes in the Gordon, Mersey Forth, Pieman and King & Anthony areas.

The author was also responsible for the design and construction of more than 100km of Hydro roads including design of the last 26 km of Pieman Road, last 5km of Heemskirk Road, Mt. Jukes Road from Queenstown to John Butters Power Station, and the Lyell Highway deviation from Bradshaws Bridge to Linda and construction roads at Murchison, Bastyan, Reece and Anthony dam sites.

He also designed and managed contracted upgrades of roads and drainage of Hydro depots at Moonah, Warrane, Devonport, Smithton, Exeter, Derby, Huonville, King Island and Flinders Island and New Norfolk.

He was also retained by the Southern Midlands Council for 4 years as their engineering consultant and redesigned their wastewater treatment plant and town water supply as well as carrying out the review, inspection and supervision of roads and private subdivisions in the municipality.

His roads and canals design team at Hydro Tasmania also provided the design of 2 overtaking lanes on the Midlands Highway at Oatlands and Antill Ponds in a joint venture with JMG engineering consultants.

He was also involved in project management and strategic asset management planning for Hydro Tasmania's civil assets post construction including upgrades at Trevallyn, Poatina, Tungatinah, Tarraleah and Lake Margaret Power Schemes.

He is the author of several engineering papers on asset upgrades including a Hydro Power Engineering Exchange award winning paper on canal redesign and refurbishment. He also presented internationally at Hydropower conference in Portland, Oregon on related topics.

Prior to his retirement in 2008 he was Principal Engineer, Civil for Generation Division, Hydro Tasmania and was responsible for the sign off of all the design and construction of civil works on existing and planned schemes for Hydro Tasmania. These included Woolnorth wind farm, Poatina reregulation pond, Trevallyn Power Station headrace tunnel, Tarraleah and Tungatinah Power Station switchyard upgrades.

He also employed and supervised over twenty engineering students, graduates and doctorates in collaboration with University of Tasmania.