



# Tunnels of Auckland

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Particularly Rail Tunnels, Actual and  
Conceived.

# Auckland's Tunnels

- Road tunnels
- Sewer tunnels – collection and outfall
- Stormwater tunnels
- Full bore water supply tunnels – raw and treated water
- Tunnels for water supply pipes
- Dam spillway tunnels
- Power cable tunnels
- Coastal defences tunnels
- Air raid shelter tunnels
- **Railway tunnels**

# Tunnels

While they can be problematic to build, they rarely give much trouble in service

Regarded as relatively proof against earthquake damage – the portals the main risk area

The Parnell sewer tunnel collapse was a rare exception – appears to have been erosion of soft material outside the tunnel lining into the sewer which caused the collapse. Very difficult to fix as a service had to be maintained - even if a degraded one.

# Building Tunnels

Lots of different methods:

- Cut and Cover
- Face excavation with conventional temporary support if needed, e.g. steel sets, then permanent lining
- Pipe thrusting
- Tunnel Boring Machine (TBM) with concrete sectional lining installed behind the TBM
- Submerged Tube – river and harbour crossings – tunnel sections floated to a prepared location - sunk – joined together underwater, buried and then dewatered

All have been used in Auckland

## Recent TBM's

- North Shore Sewerage Outfall
- Waterview Motorway Tunnels (turned and drove back in parallel)
- Vector Power Tunnel (two TBMs from different sites)
- City Rail Link (turned and drove back in parallel)
- Watercare Central Sewer Interceptor (two different sized TBMs, one relocated for a second use) (Current)

# Building Tunnels

## Tricky bits

- Varying geology – one technique may not work over a whole route
- Getting around existing tunnels and deep building foundations
- Services to build the tunnel – power, compressed air, water, ventilation, drainage – needed at the tunnel face
- Getting working space at portal areas
- Disposal of tunnel muck (rarely has any other value)
- Moving muck in the tunnel and outside
- Production and movement of tunnel liner elements (TBMs)
- Equipping the tunnel for use – for road and rail tunnels this can be considerable

# Tunnel Builders

- New Zealand's history of underground mining yielded a legacy of skilled tunnelers
- **In WW1:** "The New Zealand Tunnelling Company (*of the Corps of New Zealand Engineers*) formed in October 1915 was made up mainly of experienced miners. It worked exclusively on the Western Front from March 1916 until the end of the war, serving separately from the rest of the New Zealand Division. It conducted mine warfare in 1916 before switching to preparing underground caverns around Arras."
- This legacy carried over into the water supply tunnels in the Hunuvas and the Auckland Drainage Board interceptor tunnels
- Imported expertise is now more common.

# Railway Tunnels 1

- Getting away from Auckland's foreshore was impeded by hills behind
- **First Parnell** 1864-1873 – single track
- **Second Parnell** – double track built 1914–1915 – parallel to first - floor lowered to allow electrification 2010
- Old Parnell tunnel reuse:
  - as an air raid shelter 1942
  - for a temporary power cables to supply to the city in the 1998 power crisis (The new cables are in a new 9 km long tunnel)
- Next tunnel southwards – **Mercer** – Daylighted 1956.
- Better route south than Parnell still involved a tunnel, **Purewa** on the Westfield Deviation 1925-1929. Double track 596m long. Also lowered for electrification.



# Railway Tunnels 2

- Going to the north involved lots of tunnels – 13 to Whangarei
- Tunnels enlarged by floor lowering to better accommodate container traffic - completed 2020 – but still no link to Marsden Point
- Swanson Tunnel was big enough for conventional trains to allow a passenger service from Helensville
- Suburban service from Helensville ended 1990, resumed for a trial period 2008-2009
- No prospect of renewal without electrification – and the Swanson tunnel is a barrier to that.

# Railway Tunnels 3

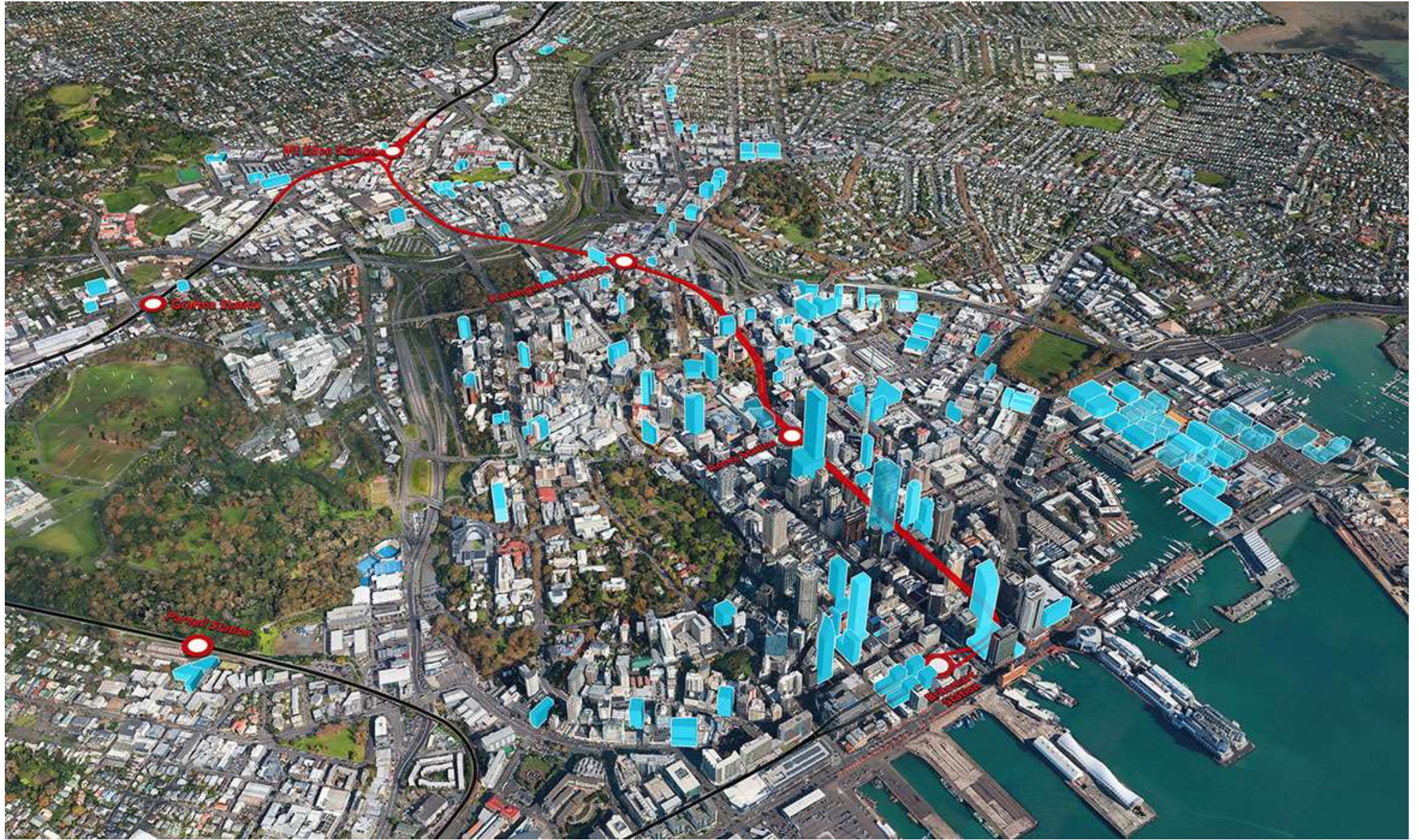
Prospective ones:

- Several historic proposals made, similar to the current CRL
- “Robbie’s Rail” 1972 Auckland Rapid Rail Transit Plan
- The tunnelled version of the Light Rail scheme 2017-2023
- Waitemata Crossing Vision, 2023 Light rail under the harbour to Albany
- Southdown – Avondale – protected route since WW2 – tunnel needed at Onehunga – no immediate likelihood

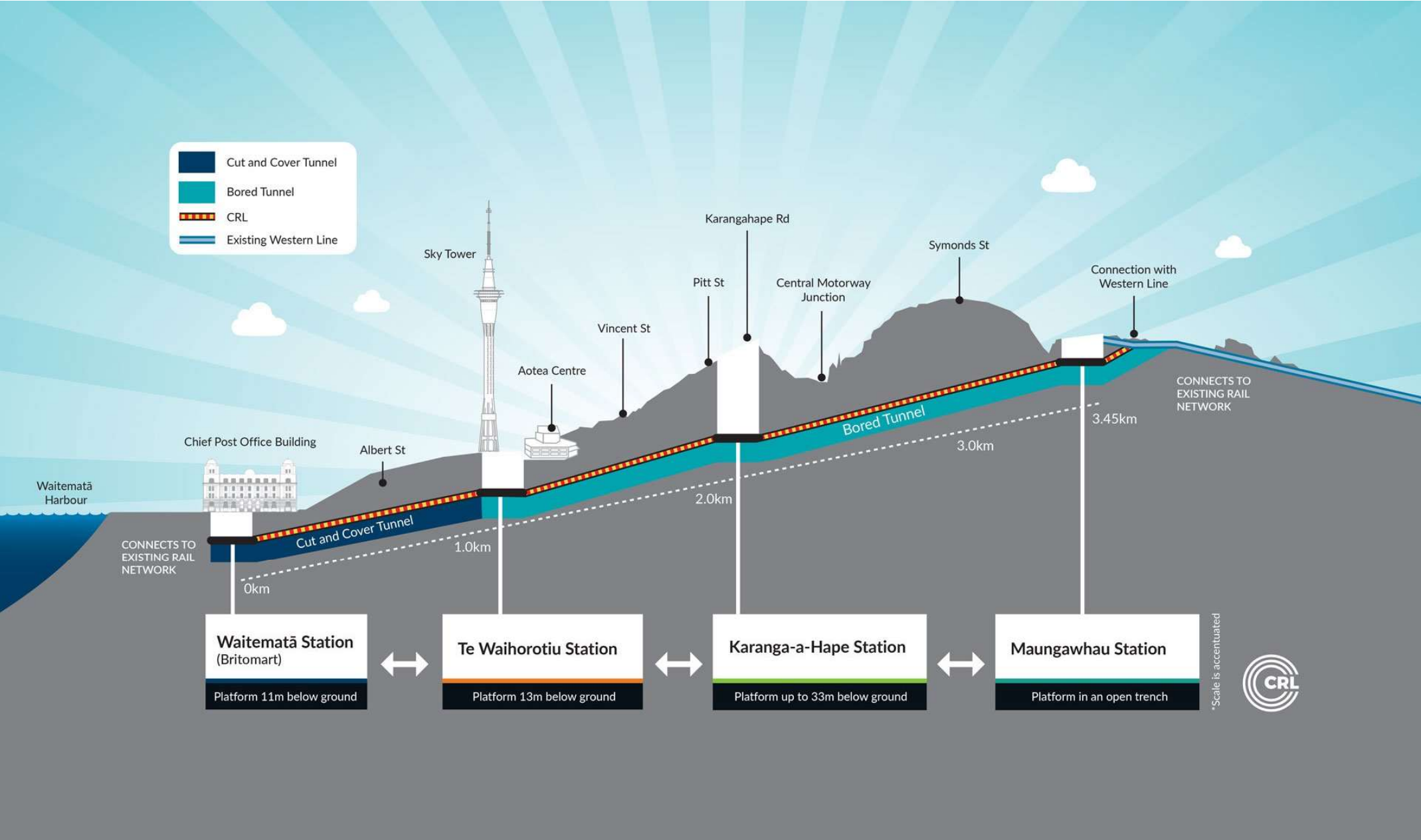
Actually happening:

- City Rail Link (CRL) Twin 3.45k rail tunnels up to 42m underground between Waitematā Station (Britomart) and Maungawhau Stations. Two new underground stations. Mixture of cut and cover and TBM











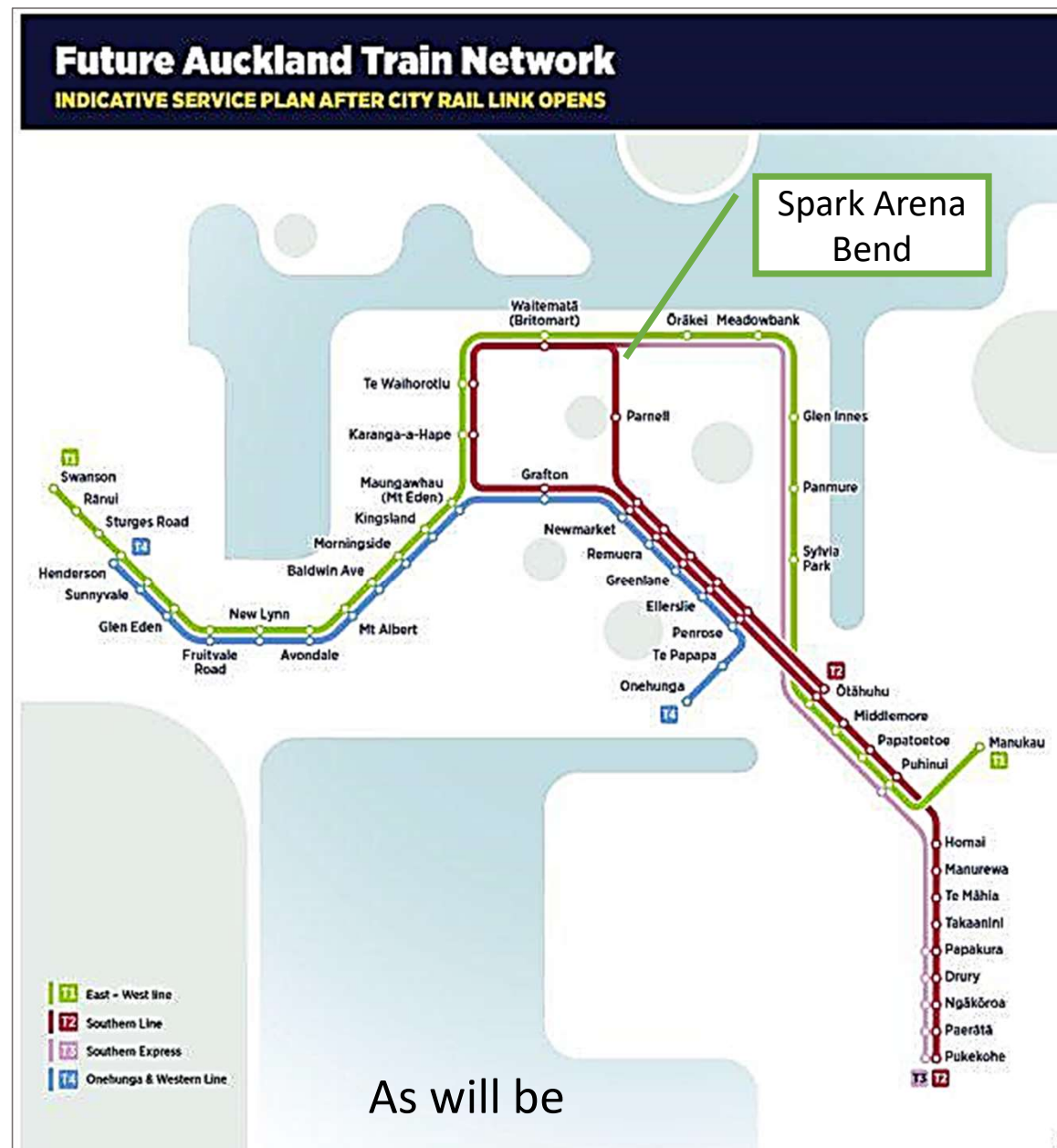
The Western line does not go through Newmarket, rather trains divert into it then back out onto the Parnell line.

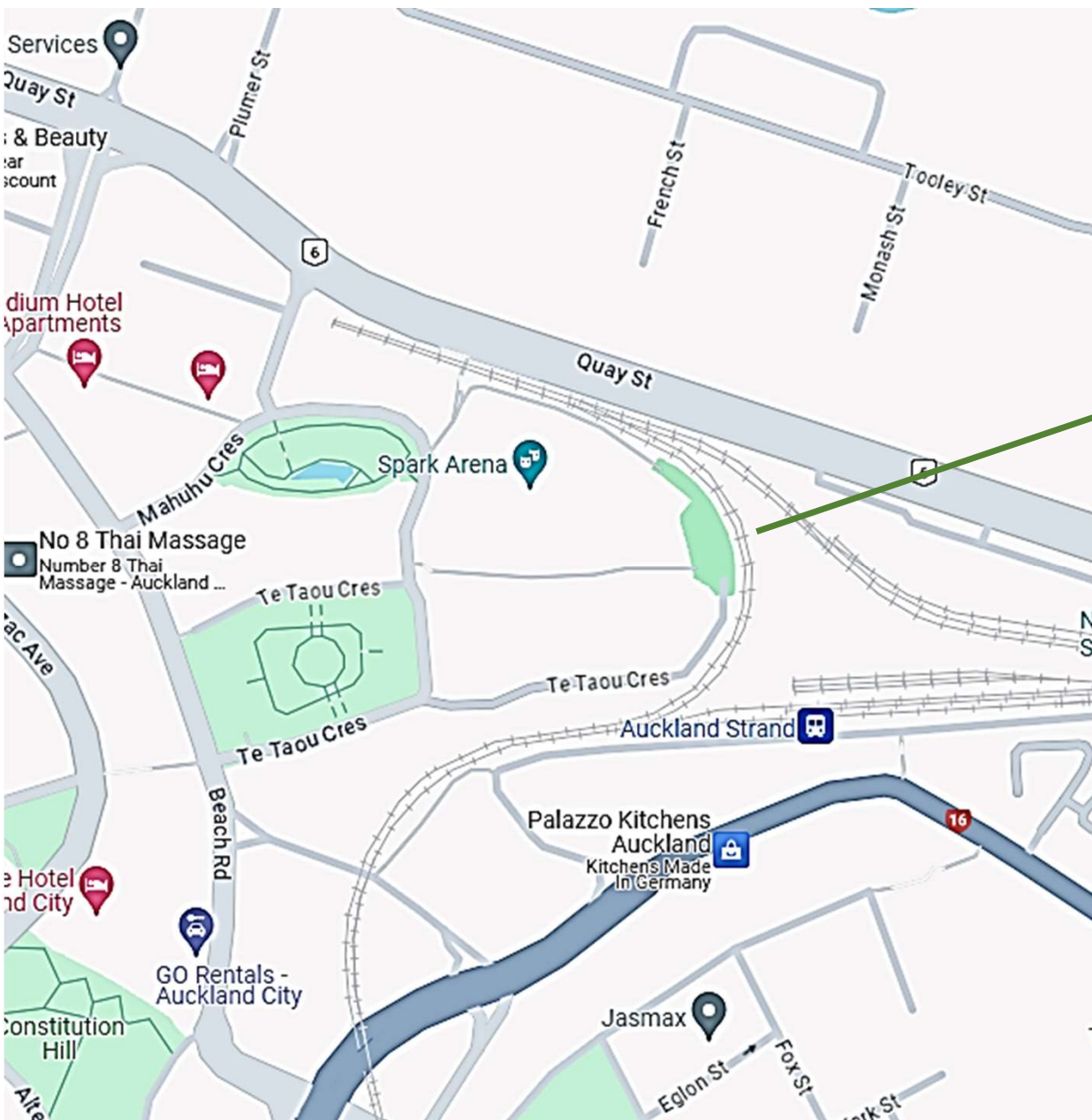
All three routes through Parnell traverse a very tight bend around the Spark Arena into Britomart

Newmarket becomes a conventional pass-through station

Only one of four routes will go round the Spark bend

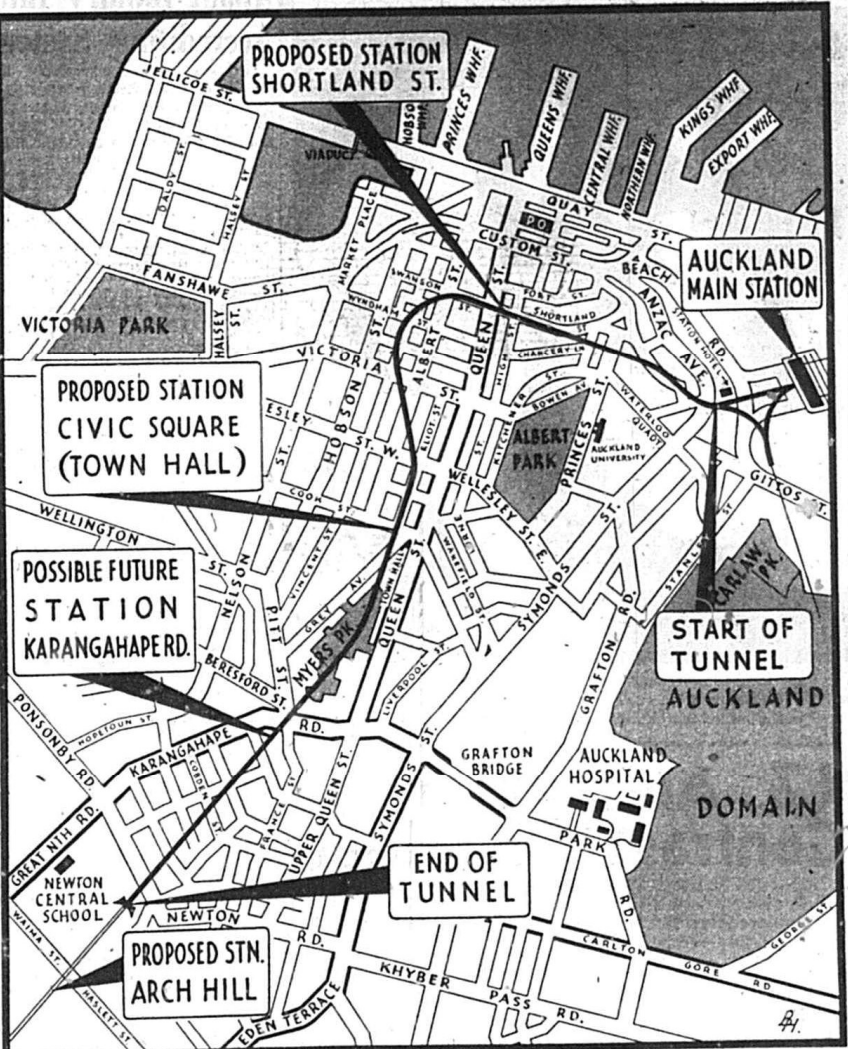
Freight limits capacity south. Third line needed – first part past Puhinui Station under way.





Spark Arena Bend

ANOTHER STEP TOWARDS UNDERGROUND



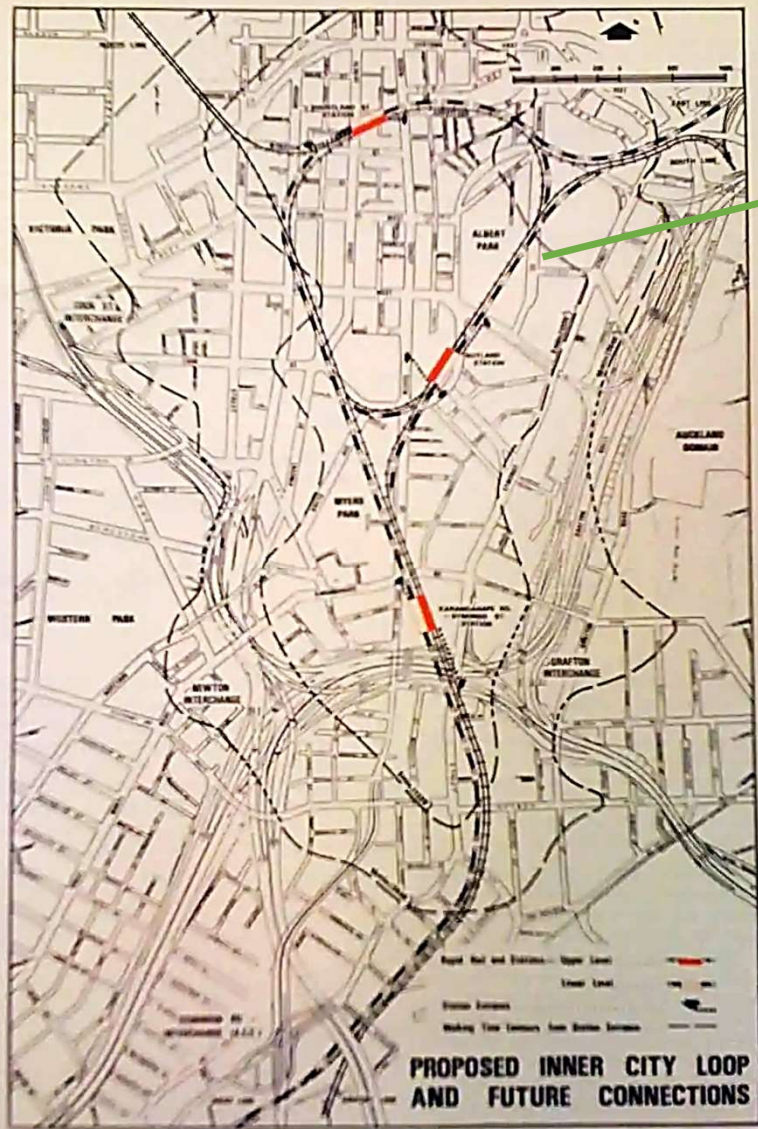
Construction of two bridges which will connect the Auckland station and the Newmarket line with the entrance to the underground route near the Station Hotel, is the first work expected to be done this year on the city's underground railway scheme. Some test borings for the bridges' foundations have already been taken in the Beach Road and station areas and this morning a survey was made in the Upper Shortland Street area.

Vegetable Growers  
Not Answering  
Output Questions

The Department of Agriculture is

1953:  
“.... the first work expected to be done this year....”





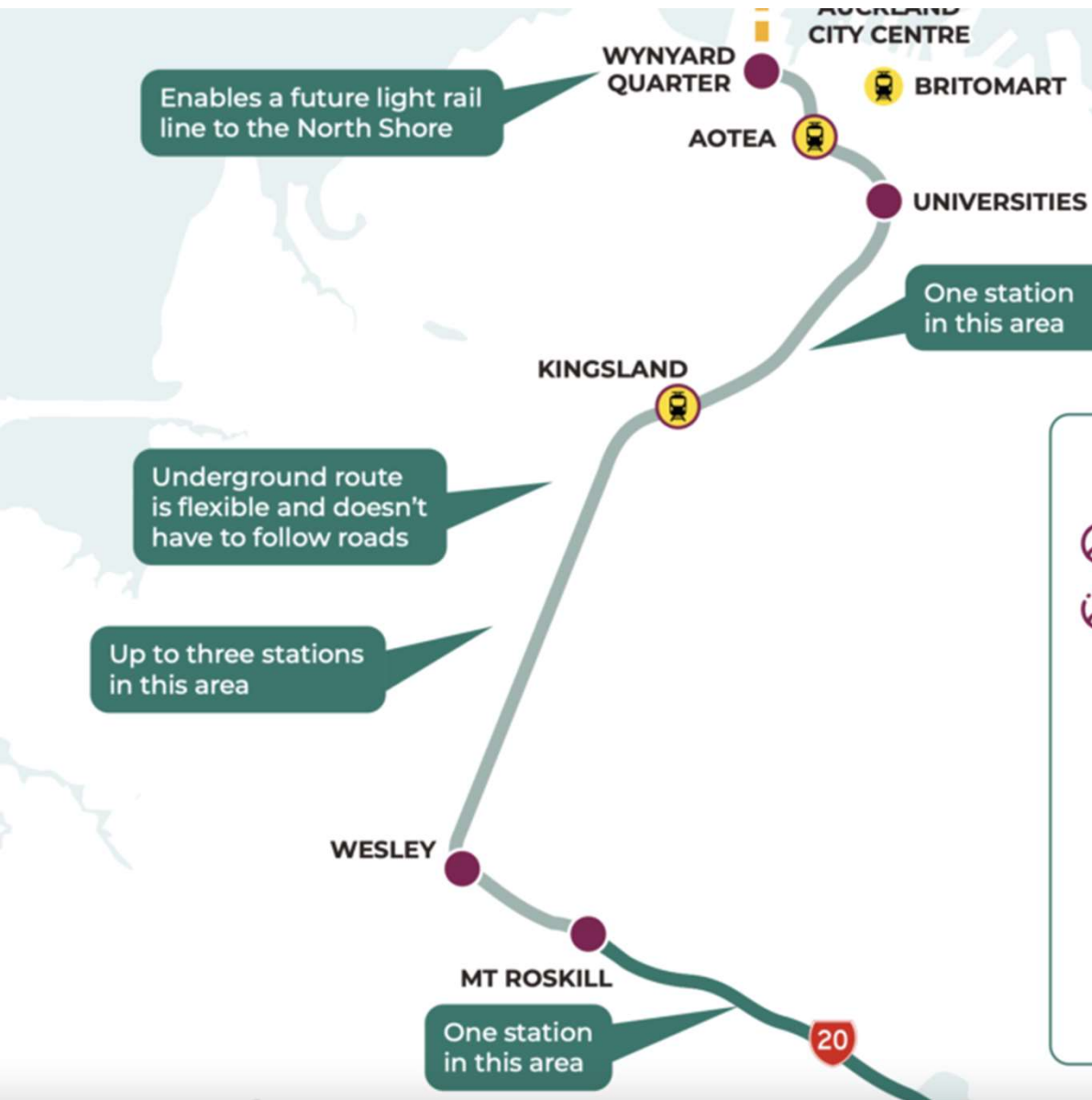
Map No 4.

Single track, one way ring

“Robbie’s Rail”





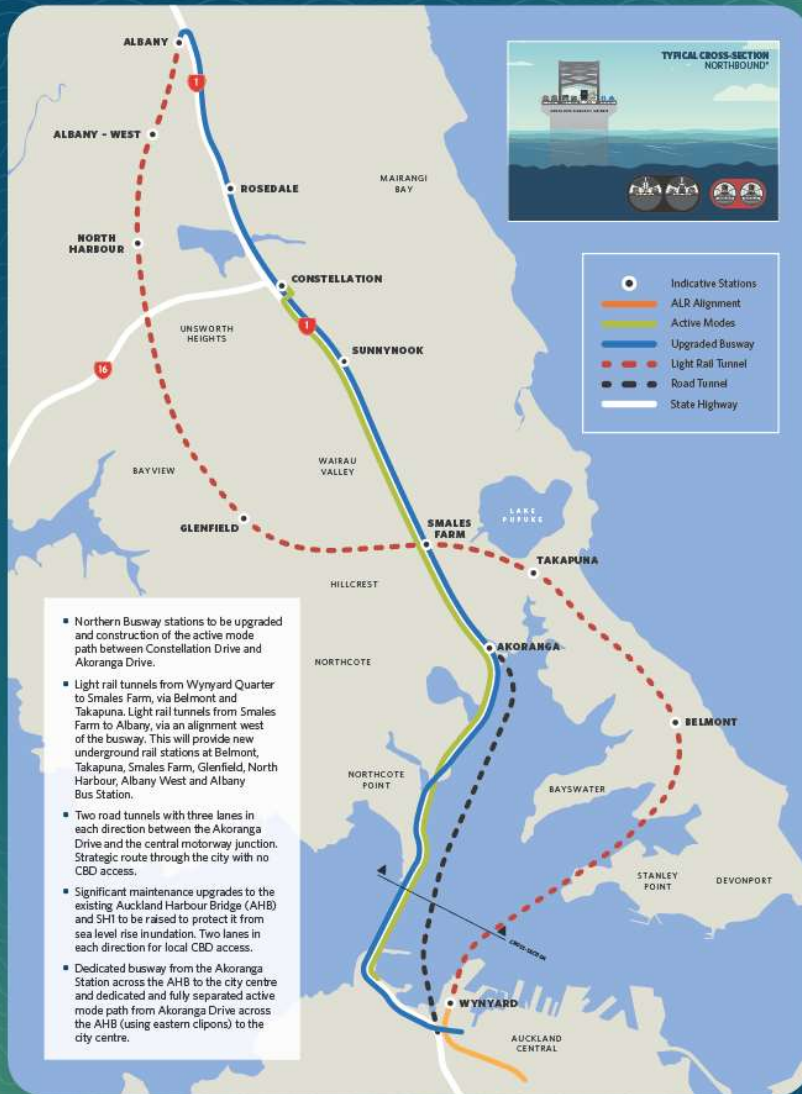


## Light Rail to Mt Roskill / West Auckland / the Airport

- The final version before it was dumped, was tunnelled from Wynyard to Mt Roskill
- Twin tunnels?
- \$14.6 B estimate “Indicative” Treasury though much more.
- Expenditure up to cancellation \$228M

Confused: objectives, ownership, funding, technology, procurement.

## Emerging Preferred Option



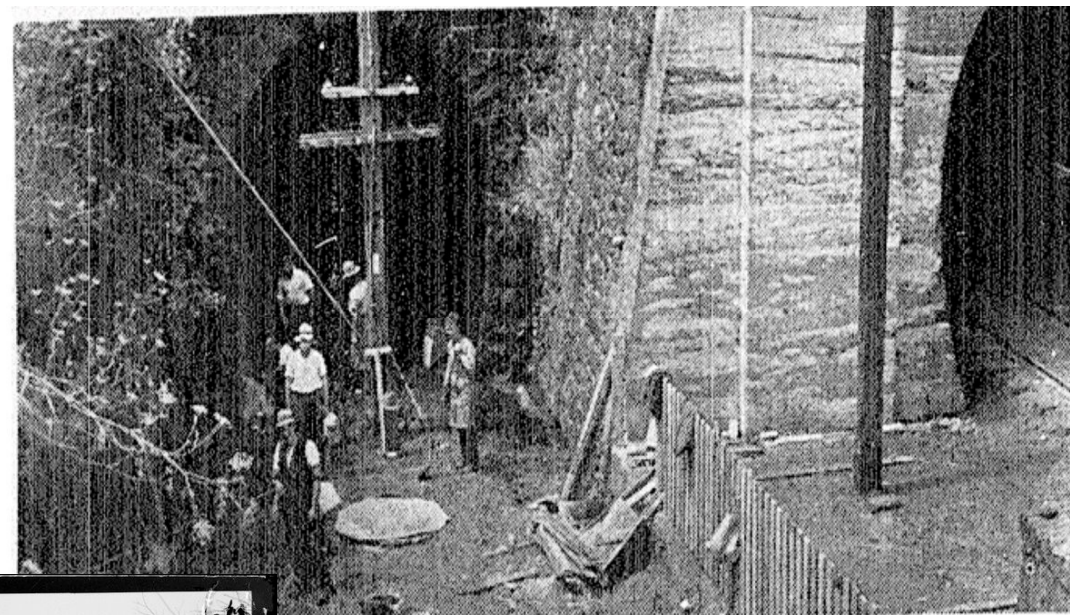
## Waitemata Crossing Vision 2023

Twin “Light Rail” tunnels Wynyard to Albany





First Parnell

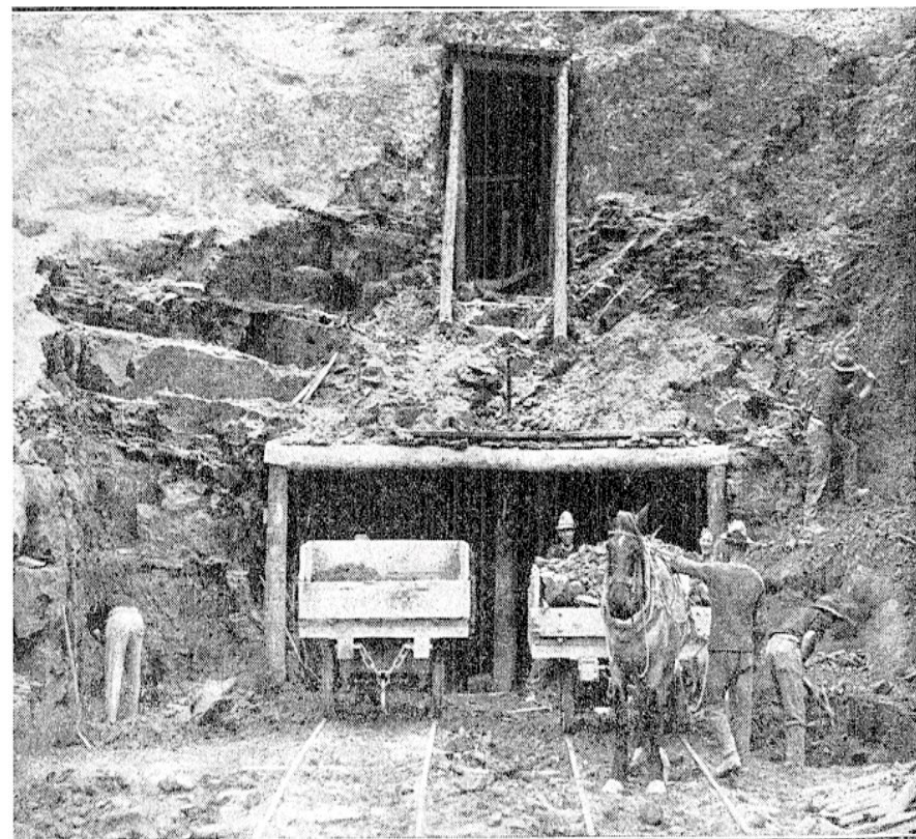


First Parnell, air raid  
shelter conversion 1942



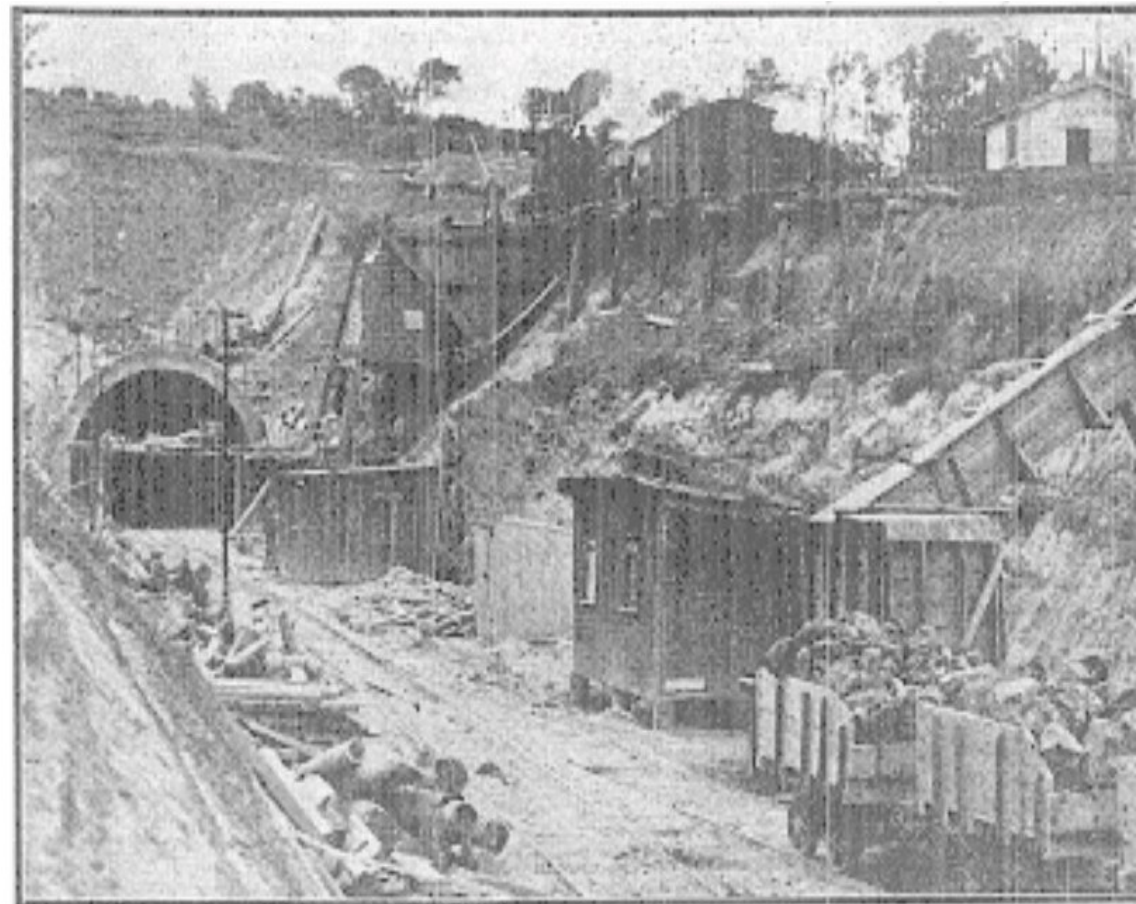
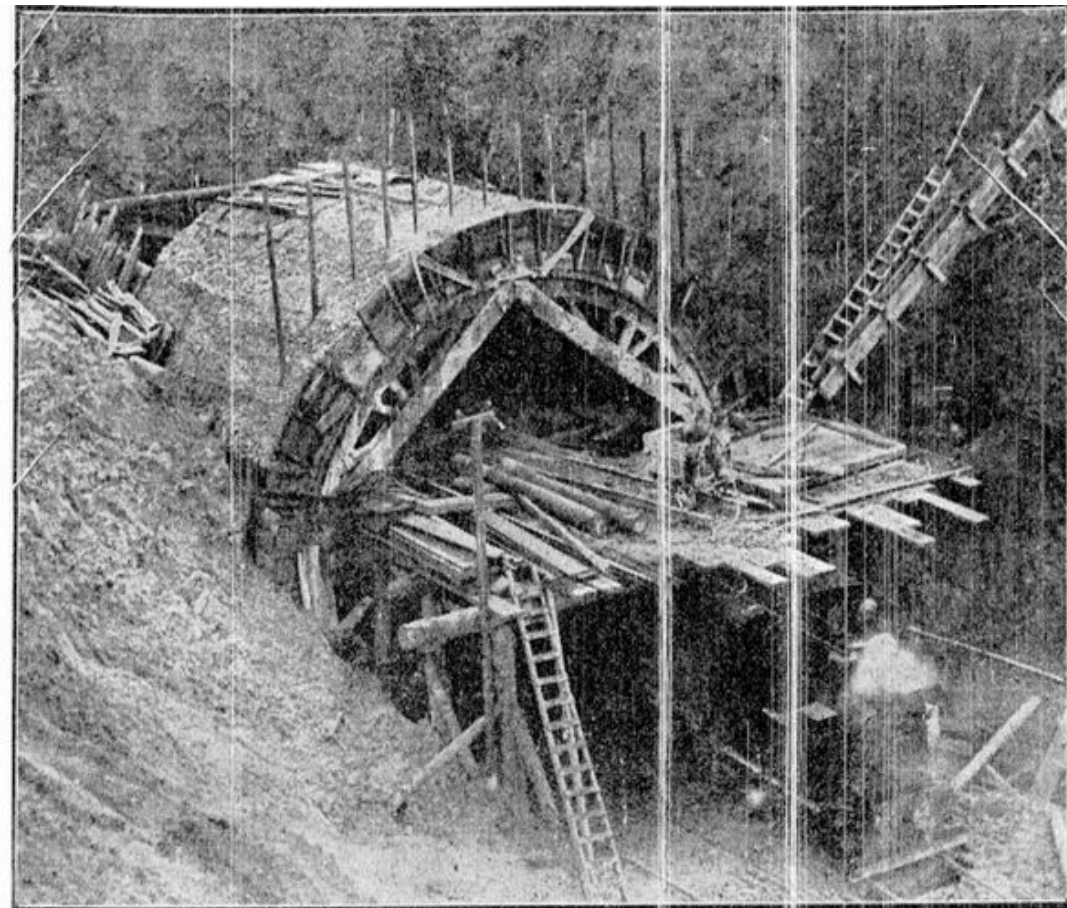
B 290  
Second Parnell





Purewa Tunnel Progress 1





Purewa Tunnel Progress 2