How will you Make your way?

Fact sheet 7

# Technology Options

## What type of Mass Transit technology options are available?

## Reference Projects

The Options Analysis shortlisted the long list of options down to five reference projects:

1. Quality Bus Corridor,
2. Bus Rapid Transit,
3. Light Rail Transit (with wires),
4. Trackless Trams,
5. Light Rail Transit (without wires).

These five reference projects are predominately Category B systems, except for the Quality Bus Corridor which is a Category C system.

## Category descriptions

The mass transit options are typically classified under three right-of-way categories per international literature[1]:

**Category A:**
**Fully segregated from other traffic both horizontally and vertically**

- Examples include passenger trains, metro, subway, some light rail systems, the Brisbane Busways.
- Corridors are typically fenced.
- Crossing of other transport corridors are grade separated
- Vehicles on these systems achieve high average speeds because of there are no intersections to slow down for, and stops are typically spaced further apart.

**Note:** No Category A option is considered viable in the coastal urban corridor because it would require to be elevated structures and/or tunnels.

**Category B: Partially segregated tracks or lanes.**

- Examples include light rail transit, bus rapid transit, trackless tram.
- These systems share intersections with other traffic streams (refer to Figure 2).
- Crossings are traffic signal controlled.
- The mass transit vehicle will typically have its own signal (a T lamp or a B lamp).
- Vehicles on these systems achieve moderate average speed because of the segregation signal priority, and increased stop spacing compared to suburban bus systems.

**Category C: Operator on roads with mixed traffic.**

- Examples include street bus services in mixed traffic such as the Sunshine Coast's current bus system, or some older Melbourne tram lines. Refer to Figure 3.
- Vehicles on these systems achieve slower average travel speeds that are generally uncompetitive with an equivalent car trip in the same corridor.

[1] Vol 1 – Urban Public Transportation Systems – Vukan R. Vuchic

## Category Examples


*Figure 1: Category A: railway grade separated from the roadway beneath*

*Figure 2: Category B: light rail in Melbourne. Note: general traffic lanes are separated from the mass transit trackway*

Figure 3: Category C: Melbourne tram in mixed traffic. Suburban buses operate as Category C too.

## Key Features of Category B Reference Projects

The common features of Category B mass transit system are:

- Measures to improve average travel speeds:
  - A dedicated running way – typically in the centre of the road
  - Traffic signal priority at intersections. This is achieved with detectors in the dedicated running way located far enough upstream of the intersection to allow the signal phasing to be interrupted and allow the mass transit vehicle through without stopping.
- Measures to minimise waiting times at stops
  - Pre-paid fares
  - Many doors for entry and exit
  - Level boarding to allow accessibility for parents with children in prams, and people with limited mobility to easily move into the vehicle.
- Measures to improve customer experience / patronage:
  - Turn up and go frequencies (a vehicle every 7½ minutes)
  - Very high ride quality allowing users to comfortably use devices for work or entertainment.
  - Comfortable vehicles and stations
  - Security measures at stations
  - Improved access to the system through high quality, shaded pedestrian paths leading the stations, legible and convenient crossings etc.

## Reference Project: Bus Rapid Transit (BRT)

The Bus Rapid Transit option uses 25 metre-long, bi-articulate, battery electric, rubber tyred buses with capacity for approximately 140 passengers. The reference vehicle for this option is the Brisbane Metro vehicle, scheduled to arrive in Australia later this year.

*Figure 4: Render of the Reference Project - BRT in Nicklin Way. Note the side platforms*

**Key features specific to this system:**

- High pavement loads require specially constructed high strength pavement
- Electric vehicle ride quality is better than a standard bus because gear changes are not required
- The dedicated busway is wider than the other reference projects. This is because the vehicle is not guided, so separators are required for safety. The busway can be as wide as 11.2m, where the reference projects with guided vehicles require only 8m. Narrower busway configurations are possible for constrained parts of the corridor, but in some cases the speed needs to be limited to 50km/h for safety.
- The reference vehicle has doors on one side. This means all stations must have side platforms. Where traffic runs beside the platform, a concrete crash barrier is required to protect the people waiting on the platform.
- Raised platforms make it easier to wheel a pram or wheelchair on and off, however unlike light rail or trackless tram options, there may be a gap between the platform and the vehicle.
- Approximate cost: $1.52 billion
- Estimated construction timeframe: 35 months

## Reference Project - Light Rail Transit (LRT)

Light Rail Transit uses 45-metre long modern rail vehicles with a capacity of approximately 300 passengers.

*Figure 5: Render of Light Rail Transit on Nicklin Way*

**Key features specific to this system:**

- Accepted as the benchmark in terms of ride quality
- Guided by flanged wheels in grooved steel tracks
- Doors both sides allow island platforms to be used removing the need for concrete crash barriers between traffic lanes and platforms.
- The conventional electricity supply system with overhead wires is proven in operation in over 400 systems throughout the world.
- Stray current[2] issues are unique to systems with overhead wires.
- Approximate cost: $1.82 billion
- Estimated construction timeframe: 39 months

Whilst the tracks are typically laid concrete, the light rail options are unique in their ability to be constructed with grassed or paved trackway finishes to improve visual amenity. Such finishes would be appropriate for high amenity areas such as Alexandra Parade, in the Maroochydore CBD and parts of Mooloolaba. Figure 6 below shows a section of light rail with grassed track.

*Figure 6: Render of Light Rail Transit on Nicklin Way*

[2] During normal operation, the electrical current flows from a traction power station, through the overhead wires via a pantograph on the vehicle to the vehicle's electric motors. It then returns to the traction power station via the rails. If an electrically conductive underground pipe near the rails results in a return path of lower electrical resistance compared to the rail, the return current will travel along the pipe. At the point where the current jumps to the pipe, and at the point where it jumps back to the usual return path, corrosions can occur potentially resulting in failure of the pipe. Some of the stray current issues observed in recently constructed systems were found to result for non-ideal construction methodology. There have also recently been significant improvements in mitigation measures such as stray current collection systems built into the track slab. The cost estimate for this reference project includes stray current collection.

## Reference Project: Trackless Tram (TT)

The Trackless Tram uses a 32 metre long, battery powered, rubber tyred, multi axle guided vehicle. It has a capacity of approximately 200 passengers. This is an evolving technology, with test systems operating in three cities in China.

*Figure 7: Render of the Trackless Tram on Nicklin Way*

**Key features specific to this system:**

- The technology is being refined to attempt to achieve near light rail ride quality.
- Doors both sides allow island platforms to be used, removing the need for concrete crash barriers between traffic lanes and platforms.
- The vehicle is guided by two lines painted on the road surface. GPS technology also assists in guidance and radar assists with crash prevention. A driver is still required.
- Being such new technology, with no systems operating in equivalent conditions, there are higher risks. These may reduce in the years between now and first stage of the Sunshine Coast Mass Transit system.
- The vehicle is 150mm wider than the National Heavy Vehicle Regulators maximum limit[3]. Consequently, the path to accreditation by the National Heavy Vehicle Regulator for use on public roads is unclear.
- Approximate cost: $1.54 billion
- Estimated construction timeframe: 35 months

## Reference Project: Wire-free light rail transit (wLRT)

A wire-free light rail system - identical to the light rail option, minus the overhead wires, with on-board electricity storage and charging equipment at select stations.

*Figure 8: Render of the wire-free Light Rail Transit on Nicklin Way*

**Key features specific to this system**:

- On-board electricity storage may take the form of batteries, super capacitors, a combination of both, or potentially even hydrogen fuel cell technology.
- It is only in recent years that wire-free mass transit has emerged. The Newcastle light rail system operates wire-free, though this line is only 2.7km in length.
- It is reasonable to expect that by the time the first stage of the Sunshine Coast Mass Transit system is procured, wire-free technology will have improved, and commercially viable and reliable systems will be available for long routes.
- The cost estimate for this option was built up from the conventional (overhead wires) light rail reference project, with modifications for the revised charging equipment, addition of batteries, and removal of the stray current collection system.
- Approximate cost: $1.78 billion
- Estimated construction timeframe: 39 months

[3] https://www.nhvr.gov.au/files/201602-0113-general-dimension-requirements.pdf access 23 March 2021

## Reference Project: Quality Bus Corridor (QBC)

A high-frequency bus service running in a combination of dedicated kerbside bus lanes and bus in general traffic lanes, using 19 metre long single articulated vehicles with capacity for approximately 110 passengers.

*Figure 9: Render of the Quality Bus Corridor on Nicklin Way*

**Key features specific to this system:**

- high-quality, higher capacity vehicles (compared to standard suburban buses). Options for low emissions (electric or hydrogen fuel cell buses) are recommended by the Options Analysis for consideration.
- pre-paid boarding to minimise lost time at stops.
- quality bus stops to improve user comfort.
- Turn up and go frequencies (a vehicle every 7½ minutes
- The possibility to reduce the need for passengers to change from feeder buses to the mass transit system because some feeder buses could use the priority lanes along the corridor.
- Security measures such as CCTV at stations
- Requires step up entry into vehicle making it difficult to wheel a pram or wheelchair on and off.
- Where there are no bus lanes, and because cars will be able to turn from the dedicated bus lane at some intersections, buses will still get stuck in traffic and signal priority is not possible
- Approximate cost: $493 million
- Estimated construction timeframe: staged roll out over three years.

## Would you like more information?

If you would like more detail on the evaluation process and outcomes you can review chapter 11 of the Options Analysis report.

## Have your say

Help decide for today and tomorrow.

Visit council's website to take our survey and see where you can talk with us www.sunshinecoast.qld.gov.au