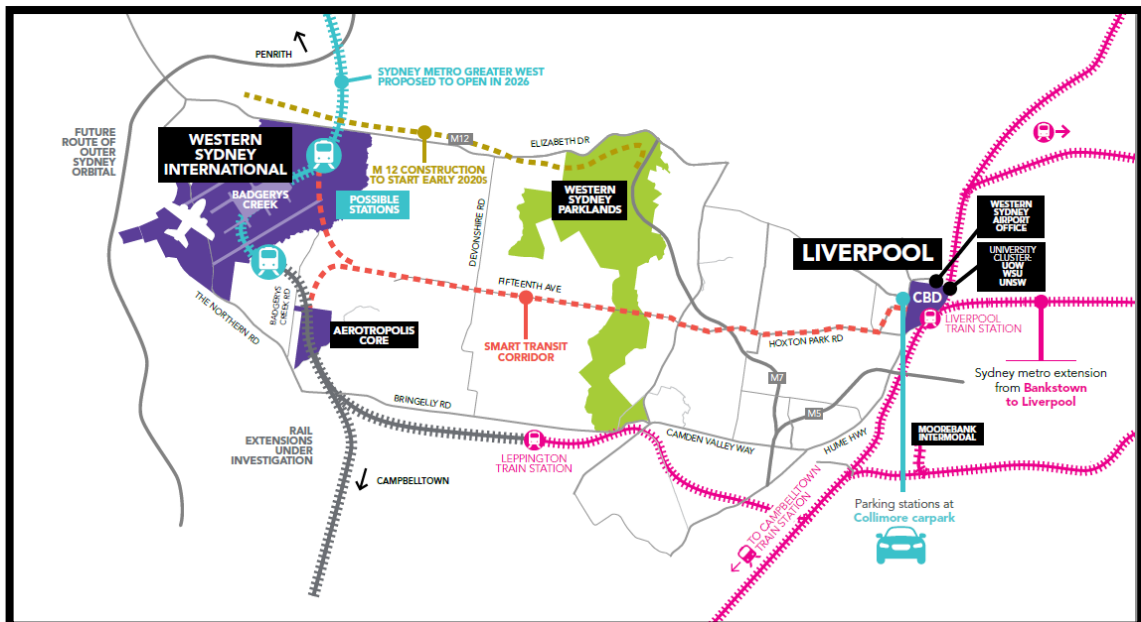


Developing a Transit Activated Corridor – the Liverpool Case Study



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SBEnc 1.62 – Sustainable Centres of Tomorrow: People and Place

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1. Introduction

This report provides a summary of the Case Study work undertaken with the Liverpool City Council as part of a national research project through the Sustainable Built Environment National Research Centre, as part of the project referred to as Sustainable Centres of Tomorrow: People and Place (SBEnc 1.62). The focus of this research initiative has been exploring the city shaping potential of Trackless Tram Systems to help facilitate urban renewal and more sustainable urban forms in a range of cases studies around Australia. Effectively this case study is about how Liverpool City Council is developing a Transit Activated Corridor using a potential Trackless Tram System that links Liverpool to the new Western Sydney International (Nancy-Bird Walton) Airport.

Outlined below are the planning and development challenges faced by the Liverpool City Council as they respond to the challenges of the growth pressures in Western Sydney. This is followed by a brief summary of the Trackless Tram Systems – an emerging mid-tier transit solution – which highlights the role of Transit Activated Corridors. The report also outlines the learnings from the stakeholder workshops and related discussion held with Council staff and stakeholders as well as highlighting the steps being taken towards delivery.

2. Context

The Liverpool City Council in Sydney's South West is facing significant growth challenges, expected to grow from a population of 230,000 which has doubled over the last 20 years and is expected to grow to almost 400,000 over the next 20 years.¹ The Liverpool area is also the home to many immigrants and has one of the largest concentrations of people from a refugee background in Australia. Liverpool has an historic central area with a professional services, retail and healthcare focus, surrounded by new suburbs and a large number of productive manufacturing and warehousing employment opportunities. It is well connected to the rest of Sydney and the next phase of growth is to create links westward.

A big part of the next-phase growth in this part of Sydney is being driven by the very significant infrastructure investments into the Western Sydney International (Nancy-Bird Walton) Airport (WSIA) which is some 20 kilometres west of the Liverpool City Centre.

The Liverpool City Centre has evolved from its role of historical base as the 3rd urban settlement in the New South Wales colony, being the furthest navigable point on the Georges River. This centre now faces the challenges of many of the centres across metropolitan Sydney, with pressure for redevelopment and renewal that can be based on sound foundations of an urban structure that was laid out in the colonial period.

The other big growth driver in this part of Sydney has been the strategic planning process led by the Greater Sydney Commission – referred to as the Western City District plan² which establishes the growth framework for the region and identifies Liverpool City Centre as an important centre for growth in terms populations, jobs and services.

The critical infrastructure to drive the next phase of growth in Liverpool is to create a Transit Activated Corridor from the Liverpool CBD to the new airport creating new opportunities for housing and employment along the corridor.

¹ <https://forecast.id.com.au/liverpool>

² <https://www.greater.sydney/western-city-district-plan> (accessed on 4 May 2020).

Liverpool City Council is seeking to achieve this through the City Deal process. Liverpool is part of the Western Sydney City Deal which is a partnership between the Australian Government, NSW Government, and local governments of the Blue Mountains, Camden, Campbelltown, Fairfield, Hawkesbury, Liverpool, Penrith and Wollondilly. The intent of that process is to help coordinate the creative efforts and resources of the partners 'to create world-class jobs and a great quality of life through the vision of the Western Parkland City'³.

These big picture planning processes provide the broader regional context within which this study has taken place. As an active participant in these processes, Liverpool City Council elected officials and staff have developed proposals and policies to realise the opportunities these growth pressures provide. In particular, investigating and advocating for the establishment of a high-quality transit solution that would link Liverpool City Centre and the Western Sydney Airport and the future Aerotropolis. The vision is for a new technology mid-tier transit system to support the economic development of the western suburbs; and urban renewal and development projects along a potential route along Fifteenth Ave to the new airport.

As part of this process Liverpool City Council partnered with researchers from Curtin University⁴ to assess proposals for this corridor. In particular it introduced a mid-tier transit system – in the form a Trackless Tram system which is electric, guided by sensors that help provide a high quality ride experience and which can reach the airport in around 30 minutes from the CBD. Importantly this system would both help provide an important transport option for the people of Liverpool, as well as act as a catalyst for growth in the city centre and urban intensification along key parts of the corridor – both in Greenfield and exiting areas.

During the study process the Liverpool City Council also prepared and released the draft Liverpool Strategic Planning Statement (LSPS) for public comment⁵. The LSPS includes a section on the Fifteenth Avenue Smart Transit (FAST) Corridor and Council's aspirations for the corridor as their flagship project which was partly influenced by this study process.

³ <https://www.infrastructure.gov.au/cities/city-deals/western-sydney/> and note that the first annual report of progress of that City Deal is reported at <https://www.infrastructure.gov.au/cities/city-deals/western-sydney/files/western-sydney-progress-report-2019.pdf> (accessed on 4 May 2020).

⁴ Through the Sustainable Built Environment National Research Centre – as part of Research Project called – *SBEnc 1.62: Sustainable Centres for Tomorrow* project.

⁵ See https://issuu.com/liverpoolcitycouncil/docs/draft_local_strategic_planning_stat?fr=xKAE9_zU1NQ

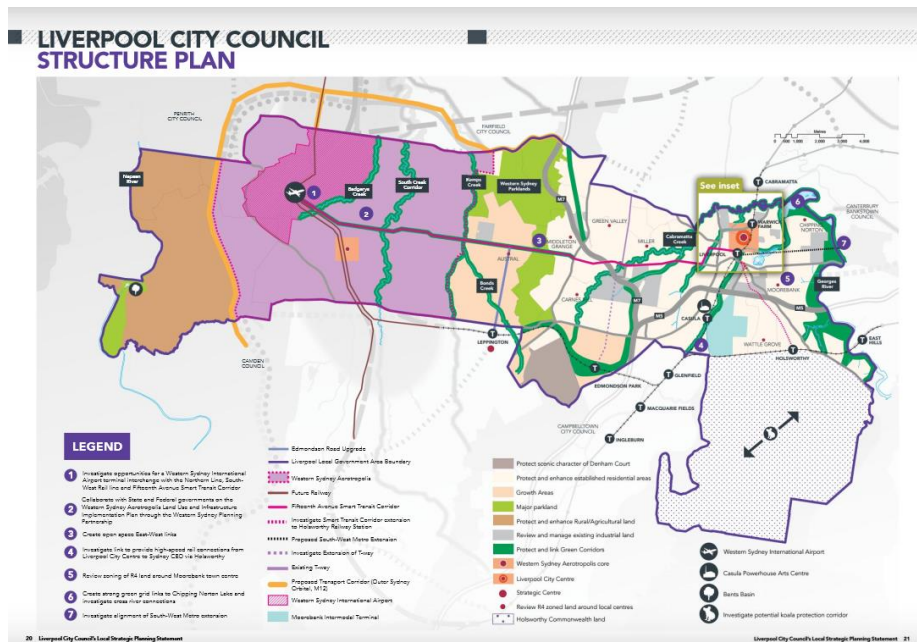


Figure 1. Liverpool’s Structure Plan highlighting the 15th Avenue link between the new airport and Liverpool City Centre (Source: Liverpool Strategic Planning Statement)

3. What are Trackless Trams?

Trackless Tram Systems (or TTS) are an emerging transit technology that offers considerable advantages as compared to Light Rail Transit (LRT) as a mid-tier transit solution – between bus systems and heavy rail. These include the much lower cost and minimal disruption to implement. A TTS will also deliver operational efficiencies, social, environmental and economic benefits transformational to the development of cities and in particular to enable a much greater involvement of private developers in enabling the project to be funded and financed. This makes it very suitable to being part of a City Deal.

The TTS technology is proven and rapidly developing as shown in Figure 2 below. The vehicle offering is diverse and there are currently several manufacturers developing products that will potentially meet the requirements of this emerging global market. Trackless Trams provide a missing part of most city’s transport system (key publications and films on this work can be found [here](#) and [here](#)).



Figure 2. Trackless Tram Type Vehicles (Source: Verschuer, M (2019) Public Transport Technical Tour – Summary Report, SBEnrc, <https://sbenrc.com.au/research-programs/1-62/>)

Trackless Trams can do all that a Light Rail does but at a much lower cost. It can enable:

1. A high capacity, high profile, electric transit system that can help establish an identity for this part of Sydney by creating a much needed link between the new airport and the Liverpool City Centre, providing service and employment linkages.
2. More residential and commercial investment in the city centre, especially facilitating service and knowledge economy jobs.
3. Establish a high quality public transport link to suburban growth areas – fostering opportunity for a more consolidated urban form as urban development grows towards the airport.
4. Create opportunities for grid stabilisation and recharge services for other electric vehicles and electric micro-mobility. These opportunities are similar to those being pursued in Canberra where the ACT government is electrifying their bus fleet.

There are a range of alternative manufacturers of Trackless Tram type vehicles that provide different solutions to the task of creating a new technology, electric mid-tier transit system. This is a fast growing area with rapid innovation. For the purposes of this study a reference vehicle was required and the CRRC vehicle (the ART) was selected as an example of a ‘trackless tram’ purporting to achieve LRT system quality. The technical details of the ART are provided below as an indicator of how a mid-tier transit system operates:

Specifications of the Trackless Tram

- The ART system consists of the vehicles and the operation management system.
- Vehicles are bi-directional and consists of 2-5 car. Multiple wide doors and internal spaces provide universal access.
- Tracking a virtual rail the vehicle provides ride quality and comfort equivalent to a rail.
- V2V and V2G wireless communication and management systems ensures highly efficient and safe tram operation.

Three car characteristics

- Length 31.64m
- Width 2.65m
- Vehicle load 48 ton, axle weight 9 ton drive, 7.5 ton steer axles
- Maximum range 200km
- Max. speed 70kph
- Max. ramp slope 13%
- Min. radius of turning circle 15m
- Floor height 330mm (100% low floor)
- Charging options include deep charge at depot or on route opportunity flash charge pantograph 10 minutes provides 25km extra range.
- Battery, pantograph and super capacitor capacities can be adjusted to suit requirements
- Carbon fibre and aluminium body 25 year design life
- Operation of the vehicle can be manually by the driver or with various levels of assistance

4. What are Transit Activated Corridors?

Transit Oriented Development (TOD) has long been advocated in transport policy and is accepted as a key way for cities to increase investment in urban rail to reduce car dependence. Whereas TOD's are built around heavy rail and traditional tram systems, Transit Activated Corridors (TAC) are built along road transit corridors where development is being sought as well as quality transit being needed.

Despite growing levels of congestion and increasing travel times large parts of the inner, middle and outer suburbs of many cities remain poorly serviced by transit options that do not compete with cars and which do not enable urban regeneration. In many areas infill has happened without upgrading infrastructure and the results have left much to be desired. Thus TAC have been proposed as a new integrated development and transit model that incorporates new transit technology solutions along main road corridors to both compete with cars and to facilitate a string of urban regeneration in precincts as depicted in Figure 3 below. Importantly this model also incorporates the emerging opportunities for micro-mobility electric scooters, skate boards, bikes and other devices like three-wheelers for aging populations. These technologies are providing new opportunities to enable end-of-trip integration. This model can work with autonomous electric shuttles to provide an integrated Mobility-As-A-Service (MaaS) offering for start and end-of-trip travel. New transport options presented by these emerging technologies will require management to enhance station precincts for walkability and not promote more car-dependent end-to-end travel.

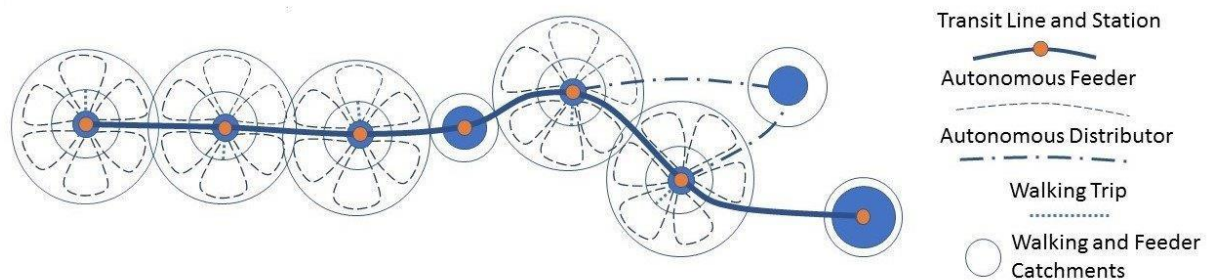


Figure 3. Transit Activated Corridor model (Source: Authors)

5. The Study Process

This study involved two workshops (of approximately 50 participants each) with a range of staff from the City, transport and planning agencies, Western Sydney Airport Company and developers or their consultants, along with some other local stakeholders. Meetings were also held with key agency representatives, such as Infrastructure NSW and Greater Sydney Commission, land owner representatives of key sites along the route and the advocacy group Committee for Sydney – as a way of communicating the potential of the proposals for Fifteenth Ave and gauging feedback.

Workshop 1 - The first workshop focused on introducing the concept of Trackless Trams – and exploring possible corridors, routes and development opportunities along Fifteenth Ave – mainly to Council staff. The workshop involved reviewing the potential corridors and clearly opted for Fifteenth Avenue though some other options close to the CBD emerged. The participants reviewed the potential route examining the nodes and places where redevelopment and or redevelopment would be catalysed by the implementation of TTS. The workshop was informed by studies into the route by ARUP – who undertook a review of a range of corridor configurations for Fifteenth Avenue,

depending on the future role and function of the corridor, including examining potential corridor width, characteristics of the public transport and the adjoining land use of the urban and natural form. A key finding of that work was the idea of establishing a 40 metre corridor as the starting point for more detailed planning and design.

A number of key factors came out of that workshop which helped shape further investigations and review at the second workshop; these included:

- The investigation is not just about a transit system – it's about the city shaping potential of a TAC. In fact, the conclusion was that the TTS is more about city shaping and how that effects the development patterns along corridor both in a redevelopment and new urban areas than it is about transport.
- The value of maintaining the aspiration of a 20 minute time link between Liverpool to Airport (later revised to c. 30 minutes after some modelling).
- There was dialogue about whether there was value or not in being – 'mode agnostic' – the view tended towards saying that to achieve the TAC outcomes the vehicle either needed to be a Trackless Tram or some other equivalent zero-emissions, road-based solution that was a step-change improvement on the low quality bus services historically provided in outer-urban suburbs of Sydney
- The value of exploring productive opportunities of the peri-urban land uses closer to the airport (ie high intensity horticulture etc.) and not assuming that the whole corridor will be suburbanised. This was seen as part of the economic story for the area.

The other factor that came up in post workshop debriefs and dialogue with other stakeholders was the whole issue of integrating the landscape oriented development, as advocated by the Greater Sydney Commission, highlighting the importance of shaping the expanding city around landscape amenity as well as transit urbanism. Thus landscape-oriented development in some parts of the Fifteenth Street corridor would be needed as well as transit-oriented development in other parts of the corridor.

Workshop 2 - These factors above led to design for the second workshop which focused on exploring the urban design questions and possible spatial arrangements for the corridor in a morning part of the 2nd workshop. The second part of the workshop started a dialogue around possible development models / business models for delivery of the corridor.

The factors above also led to the establishment of a set of key design factors for consideration in the second workshop in the form of the parameters outlined below in Figure 3.



Figure 4. Key design factors to inform 'Fifteenth Avenue Smart Transit (FAST) Corridor Design' (Source: City of Liverpool)

The workshop explored the whole notion of corridors, nodes and places – where the design target along the greater part of the corridor through faster sections would be of providing for 70km speed to achieve the 30 minute goal to the airport, and 30km or slower in the nodes and places where stations would be located in order to achieve high quality urban design and landscape qualities.

In this way the second workshop informed the preparation of a document prepared for Liverpool City Council by the urban designers SJB, referred to as 'Fifteenth Avenue Smart Transit (FAST) Corridor Design Framework' which set out to document a vision and principles to deliver a place-led transport corridor between Liverpool City Centre and the Western Sydney International (Nancy-Bird Walton) Airport (WSIA). Design intent for the corridor – informed by the workshop - led to a scheme that aimed to be responsive to the existing landscape and character of south west Sydney and to identify several urban centres along a multi-modal avenue. Importantly, the so-called FAST Corridor establishes a major urban structuring element for the significant growth, stimulated by the airport and employment land referred to as the Aerotropolis Growth Area. The expectation is that investments along this corridor will generate 200,000 jobs and provide for some 60,000 homes.

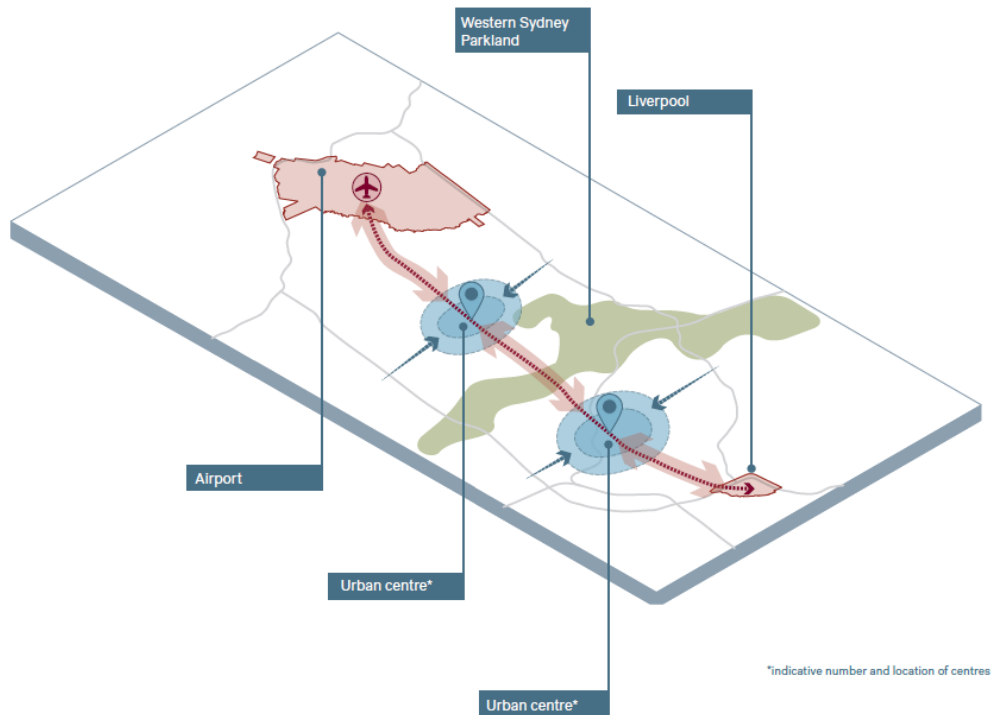


Figure 5. Graphic from ‘Fifteenth Avenue Smart Transit (FAST) Corridor Design Framework’ by SJB – illustrating corridor and need for key centres along the route.

This work led to further concept urban design work commissioned by Liverpool City Council that produced a built form proposal such as those in Figure 5 which illustrates the desired scale of development along the corridors. The corridor is intended to reduce sprawl, improve the availability and patronage of public transport, increase walking and healthy lifestyles, and preserve the amenity and productivity of rural areas. Fifteenth Avenue, as the link between the new airport and Liverpool, is likely to be a memorable gateway for many international travellers as the first time they view the Sydney skyline.

The key elements of the proposal are documented in video form which highlights the tangible benefits of the scheme (see Liverpool: <https://youtu.be/q4BnsyjrINc>).



Figure 6. Visualisation of potential urban development form in Liverpool LGA on FAST Corridor (Sources: Liverpool City Council (2020) ‘FAST Corridor Design Framework’)

The second part of the workshop focused on a conversation about possible development models/ business models for delivery of the corridor. This was very preliminary in nature, but it did offer some insights into the possibility of developing innovative delivery models. This might start with the notion of a 'Collaborative Dialogue' type approach (suggested by one of the developer representatives at the workshop).

This type of approach starts with conversation between potential development partners and the relevant agencies and council officers and starts with a vision of what is trying to be achieved. This vision becomes the basis of conversation about what can the city be able to 'offer' into a proposal and what groups like the Western Sydney Airport Company could 'offer' and what potential operator and or developers might 'offer'. This type of model is challenging under normal public sector procurement models, however guidelines for these types of approaches have been developed⁶ and there can be merit in exploring these options under the right situations⁷.

6. Other Research Linkages

Some of the other elements of the research process that has informed the work of Liverpool City Council in this space has been participation in the wider set of processes related to the investigations into the city shaping potential of the Trackless Tram systems. This has included:

- Involvement in the technical study tour to China and Europe conducted in June 2019 to experience, view and evaluate the current and emerging global technologies in electric public transit systems (inclusive of trackless trams)
- Information documented in the 'Frequently Asked Questions and the Myths Of Trackless Trams
- The workshop processes which were also informed by the document produced by the SBenrc research group called Sustainable Centres of Tomorrow: A Precinct Design Framework of Principles and Practices: A Literature Review.
- The wider national research project (which includes the other case studies in Townsville, Wyndham (Melbourne) and Perth) that this project forms a case study within, has been documented in the summary Industry Report.

These documents are available at: <https://sbenrc.com.au/research-programs/1-62/>

7. Insights about integrating Electric Mobility and / or Micro Mobility

Micro Mobility is rapidly growing in the world's cities, especially during the Covid shutdown, as it enables fast and comfortable local transport that can be quicker and more convenient than using a car due to the ease of parking. Micro mobility has been described by Horace Dedeu, (recognised as responsible for the term micro mobility) as the most disruptive form of new transit, more than autonomy (<https://www.youtube.com/watch?v=BZA7FQBgU-M>). He equates it to a smart phone and sees it as being something everyone uses in the near future. If this is to hold true then the

⁶ See for example:

https://www.infrastructure.gov.au/infrastructure/ngpd/files/National_Guide_to_Alliance_Contracting.pdf

And: [https://www.arcadis.com/media/D/C/F/%7BD5CF5C2D3-C3E0-4CB8-8793-](https://www.arcadis.com/media/D/C/F/%7BD5CF5C2D3-C3E0-4CB8-8793-9AC468DA2767%7DCMS_Guide_to_Contract_Alliancing_in_Construction.pdf)

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⁷ See for example: <https://www.csemag.com/articles/how-to-increase-project-success-with-collaborative-project-delivery/>

planning for mid-tier transit and transit hubs need to consider the infrastructure, access and design requirements for micro mobility.

Micro mobility also has the opportunity to provide last mile parcel delivery to cater for the growing market in online sales with distribution centres strategically placed to take advantage of access to ports as well as transport corridors where the mobility hub could incorporate local parcel distribution points. The Apps and communications technologies aiding personal mobility can also assist with parcel tracking and distribution. There remain issues with micro mobility that need to be resolved associated with safety and amenity especially in areas where there are vehicles travelling at speed and undocked shared vehicles cluttering the urban realm.

It is clear that these technologies for personal mobility play a role in future transport and need to be planned into the movement networks of cities. To date there would appear to be three ways cities are dealing with micro mobility – unregulated, trialled and regulated or banned. Some of the ways these vehicles have been integrated includes separation between these vehicles and pedestrians, making sure they are accessible and affordable for all and that there is docking for access, charging and parking.

There are various management options for dealing with these issues from licencing private operators to including micro mobility as part the public transport offering. The latter, is being done with micro-mobility firm Lime in cities like Amiens (<https://www.li.me/en-us/home/accc>) where free bikes and scooters have been deployed along with the introduction of the new Nemo electric mid-tier transit, making the rationalisation of routes more palatable to the community and providing greater accessibility across the whole city.

8. Moving Towards Delivery

The workshop and ongoing dialogue with the research team also provide the opportunity to inform discussion with planning and transport agencies, the Western Sydney Airport Corporation and important gateway agencies such as Infrastructure for NSW regarding the options for the potential extension of Fifteenth Avenue to Western Sydney International Airport.

Liverpool City Council has progressed these processes to build up the detailed design and costing information as tangible steps towards the ultimate delivery of the ‘Fifteenth Avenue Smart Transit (FAST) Corridor’. This has occurred through a variety of studies developed in partnership with NSW Government agencies. Some of these studies have been funded by Liverpool City Council, whereas others have been funded by the NSW Department of Planning, Infrastructure and Environment through the South West Growth Centres SEPP program. Investigations are also occurring pursuant to the NSW Government’s commitment in the Western Sydney City Deal to ensure that the new airport and aerotropolis is connected by rapid bus to Liverpool by the time of the airport’s opening in 2026.

Liverpool City Council have identified that critical issues for studies to examine include: route alignment, cross sections (including examining things like centre running vs side running), cost estimate, traffic and economic modelling, development and growth benefits, and strategic land use planning responses. Some of these studies have been focussed on a 6km section controlled by the Council directly, whereas other Council studies have taken a ‘whole of corridor’ approach. All of this work is helping Liverpool City Council to be well positioned to participate in interagency dialogues about planning rapid transit for the airport to Liverpool journey – and ensuring the potential for this project to result in a contemporary Transit Activated Corridor is maximised.

A notable feature of the Liverpool City Council case study is the focus by all levels of government on ensuring that collaborative governance processes are put in place.⁸ This collaboration builds on the lessons learnt out of the wider City Deal and other collaborative planning processes established for the Greater Sydney planning process – providing a framework for accountabilities for undertaking various elements of the investigations and agreed processes for conflict resolution through escalation processes.

Thus the next phase of Liverpool’s journey towards a world first Transit Activated corridor using the latest technology and urban systems, is to deliver it. How the TAC fits into other parts of the transit system and urban development future are provided in Figure 6.

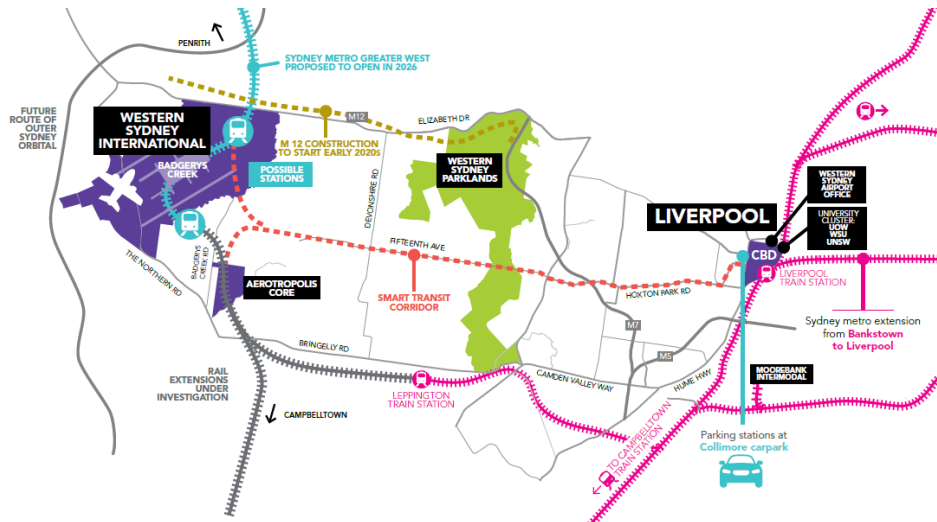


Figure 7. Liverpool’s Transit Activated Corridor along Fifteenth Avenue is ready to be delivered along with other transport improvements. (Source: Liverpool City Council)

⁸ <https://www.liverpool.nsw.gov.au/council/Media/media-releases/june-2020/shared-vision-for-public-transport-corridor-a-win-for-community>.