

# **Land Use Planning and its Role in Transforming the Adelaide-Gawler Line into a Transit Corridor of Connected Transit Oriented Developments**

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## **Abstract**

The 2010 30 Year Plan for Greater Adelaide (2010 30YPGA) is a milestone achievement in the planning of public transit networks for the Greater Adelaide metropolitan area because of its explicit strategy of intensifying development densities along the city's major transport corridors and its vision of creating a network of transit oriented developments serviced by high quality integrated transport services.

The improvements to the Adelaide-Gawler commuter rail line which are envisaged in the new Plan, call for increased urban densities 800m on either side of the rail line together with several transit oriented developments (TODs) along its 42km length. In addition to the efficiency and viability of public transit along the Adelaide-Gawler line being dramatically improved, the functionality, vibrancy, diversity and quality of urban life also have the potential to be significantly revitalised.

This paper reviews the Portland paradigm that has strongly influenced the content and policy direction of Adelaide's 2010 30 Year Plan for Greater Adelaide (2010 30YPGA), and then reviews the latest policy changes for transforming the Adelaide-Gawler commuter rail line into a genuine public transit corridor that is part of a wider metropolitan public transit network. The example of Mawson Lakes, an emerging TOD along the Adelaide-Gawler commuter rail line is used as a case study for exploring how this urban transformation is currently progressing and should provide lessons for the future planning and development of other proposed TODs along this line, such as at Salisbury and Elizabeth.

## **1. Introduction**

Adelaide, a city of 1.1 million people, is characterised by an urban physical form with extremely low urban densities of approximately 6.0 persons/ha covering an area of 1827km<sup>2</sup> (ABS, 2006). Single storey residential dwellings, mostly on individual allotments, constitute almost 87% of the metropolitan area's building stock, and with each of these dwellings, there is an average of 1 car per dwelling (ABS, 2006). In the journey to work, just under 70% of metropolitan Adelaide's residents used a private car as either a driver or passenger for either part, or all of their journey to work (ABS, 2006). Rail made up only 2.1% of commuter trips and trams (light rail) a mere 0.3% of trips (ABS, 2006).

Physically, the take up of land seems to accentuate the physical impact of the city, because by an accident of geography, the city is confined to a long triangular coastal plain wedged between the Gulf of St Vincent in the west and the barrier formed by the 700m high Mount Lofty Ranges to the east. This slightly distorted triangle is over 80km from its apex at Sellicks Beach to the triangle's base at Gawler, although at its widest point it is 25km from east to west, along an alignment that is almost parallel with Grand Junction Road. This linear city form is less than optimal from a travel perspective, particularly in a city such as

Adelaide that is Central Business District (CBD) centric attracting 22% of metropolitan Adelaide's work trips, because if hypothetically Adelaide were of perfectly symmetrical shape around the CBD with the metropolitan area's built form occupying a perfect circle, then the metropolitan edge would be a mere 24km distant as opposed to around 40km north-east and south-west of the CBD.

The implications of this physical urban form for the city means that with the car fulfilling the majority of the Adelaide metropolitan area's transport task, an already environmentally inefficient means of travel is made much worse in its environmental impact, with many car trips much longer than they need to be, at least for residents travelling by car between their homes to the CBD from beyond this hypothetical 24km radius. Moreover, there is a significant social cost associated with commuter travel with this inefficient urban form due to lost time and the imposition of a significant extra cost burden. Although typical free-flow commuter travel speeds on Adelaide's arterial roads approach an average of 45km/h (Newman & Kenworthy, 1989), this can drop to an average 20-25km/h in congested peak hour traffic conditions resulting in travel times to the metropolitan fringe of nearly 90 minutes (or 3 hours for a return commute) (RAA, 2009). Adelaide's economic potential is also constrained by this lack of travel urban efficiency, because the time and travel cost of moving around the city restricts access to economic opportunities, making return cross metropolitan trips consume the best part of a working day. Workers forced to live out on the metropolitan fringe, in addition to having a restricted private and family life, would also have their work availability constrained by these travel limitations.

Adelaide's urban form and travel behaviour patterns appear to present an intractable planning and policy challenge. The present metropolitan boundaries of the city's form are impossible to withdraw back from to an optimal urban spatial extent as implied by an equidistant metropolitan boundary because of the city's unique geographical circumstances and the practical effect of existing use property rights. Whilst a linear form is not ideal in a purely theoretical construct of urban form, it nevertheless can offer practical advantages for trunk routes if one casts aside the obvious disadvantage of increased trip lengths, by virtue of the fact that rail operates best with lines that are as straight as possible. The Spaniard, Don Arturo Soria y Mata's Ciudad Lineal, which was conceptualised as long ago as 1882, was based on the notion that a transport corridor of theoretically infinite length 500m wide accommodating communal land uses with residential development 200m on either side of this corridor as the most effective urban form in balancing the needs of local access by residents (typically as a pedestrian) to local community land uses (including employment) and interregional travel (Ratcliffe, J., 1981).

In the lead-up to the gazettal of Adelaide's 2010 30 Year Plan for Greater Adelaide (2010 30YPGA), the Department of Planning and Local Government (DPLG), has recognised the need to restrict the spread of Adelaide due to the need to comply with carbon emissions reduction targets, the loss of valuable farming land to the city's north, the Adelaide Hills and Willunga Basin in the south, and a recognition of the economic risks posed by Australia's growing dependence on oil imports which are increasing in cost as the phenomenon of Peak Oil results in the world's remaining oil reserves become increasingly difficult and expensive to extract.

Implementing a Metropolitan Urban Growth Boundary, restraints on the volume of urban trips made and a modal switch from car based trips to public transit trips and increased urban densities are obvious broad urban planning policy responses, however, given that the South Australian State Government had set a population growth target for Adelaide of 560,000 people over the next three decades (GSA, 2010), the DPLG recognised that a metropolitan plan would require a long term approach encompassing a changed urban structure and built form type, that not only dealt with the Adelaide's currently unsustainable travel patterns but which accommodated this future population growth in an environmentally sustainable manner as well. The key conceptual component of the planning response expressed through Adelaide's 2010 30YPGA is essentially a network of 14 TODs within 5 1600m wide

designated transit corridors that form transects radiating out from the Adelaide CBD across the metropolitan area of Adelaide, which is complemented by a hierarchy of an additional 20 activity centres designed with TOD principles to meet local needs locally and reduce the pressure for longer metropolitan trips (GSA 2010).

Transforming Adelaide into a transit oriented city away from its current orientation to the private car is a daunting undertaking even within the generous 30 year time frame provided for in the 2010 30YPGA, given the extremely low base that it has to launch off from. Even with the \$2.6bn investment in public transit announced in 2008 by the South Australian Government's Department of Transport, Energy and Infrastructure (DTEI), and the commitment to increase urban densities within the networked TODs and activity centres on TOD principles, the capacity of the Plan to accommodate not only the increased population growth but increase urban densities for the existing population appears limited. For example, the 14 TODs will only accommodate an additional 60,000 people (i.e. approximately 4,300 persons per TOD), and the additional 20 activity centres (most likely built at a lower scale to the main TODs realistically may not accommodate more than another 60,000 people at around 3,000 persons/activity centre.

Even the population growth target could be viewed as overly optimistic. Sydney for example, a city with almost 4 times Adelaide's current population, in its metropolitan strategy "City of Cities" (NSW Government, 2005), anticipated population growth of 1.1 million over a similar timescale to the 2010 30YPGA (27% versus 55% for Adelaide), and Sydney's growth is within the context of a city that internationally is considered Australia's premier city and therefore the most likely to attract migrants. Given that Adelaide almost certainly will need to rely on immigrants to reach its population targets, it does remain to be seen whether natural population increase will realize the South Australian Government's population growth targets.

The potential relief valve for future population growth for Adelaide, if it does happen, is that the scoping of land theoretically available for development has expanded far beyond what could normally be considered to be the metropolitan area's city limits, with the northern limit of Greater Adelaide extended up to 45 km northwards to include the towns of Mallala and Kapunda, 40km eastwards out to the town of Mt Pleasant in the eastern foothills of the Mt Lofty Ranges, and 45km further south to take in Cape Jervis, Victor Harbor and Goolwa. Admittedly, this spread of the 2010 30YPGA is designed to include the city's rural hinterland that is functionally and economically part of metropolitan Adelaide, nevertheless, already the Plan has nominated substantial urban growth precincts around Mt Barker, Goolwa, Roseworthy, Buckland Park, Angle Vale and Virginia.

When combined with the additional road accessibility now provided just beyond Adelaide's northern metropolitan boundary by the new Northern Expressway linking Gawler with Port Adelaide that opened in 2010, restricting the growth in new car trips in these areas will be difficult, if not impossible. With regard to rail, lifting rail transit (including trams), from less than 3% of commuter trips to a level that makes Adelaide a genuine transit oriented city, (i.e. 60% or more) and which accommodates the 55% population increase planned for metropolitan Adelaide in the 2010 30 YPGA, would require a 25 fold increase in commuter transit by rail or around 12% per annum compounded growth rate in passenger trips yearly for the 30 year time-frame set out in the plan. Investment in rail transit infrastructure is lumpy by nature, hence, unless new lines are planned, it remains to be seen to what extent the planned upgrades of Adelaide's metropolitan rail transit will have the capacity to accommodate this level of growth in commuter trips, particularly since with the exception of the \$300m 6km Seaford Rail Extension, most of the investment in rail is currently focusing on upgrading existing rail corridors and the planned new commuter trains do not have the passenger carrying capacity of for example, Sydney's 8 carriage double deck trains. The crush capacity of Adelaide's commuter trains is typically about 300 passengers compared with 2000 passengers in a Sydney double deck commuter train.

The key objective in the remainder of this paper is to examine the role of land use planning in transforming the Adelaide-Gawler line into a transit corridor of linked TODs and as a critically important component of the broader objective of the 2010 30YPGA to develop Adelaide into a city of networked TODs and transit corridors. Given that the achievements in encouraging public transit and TODs in Portland, Oregon in the USA was the prime source of inspiration for the South Australian State Government in setting out a transit and urban development strategy based on TODs in their 2010 30YPGA, this paper will review the Portland approach and its lessons for Adelaide. The Adelaide-Gawler rail corridor is then discussed, and the emerging TOD of Mawson Lakes is examined in terms of the lessons it offers in attempting to achieve the same outcome for the other nominated TODs along the corridor of Salisbury and Elizabeth. This paper then concludes with the lessons for policy emerging from this paper's analysis and suggests policy recommendations to ensure that the 2010 30YPGA achieves its intended outcomes for transit and the development associated with it.

## **2. The Portland Role Model**

For many years, literature within the planning field (Newman and Kenworthy, 1989; Hutchings, 2007; Mees, 2010) has highlighted Adelaide's status as amongst the worst of Australian cities afflicted with car-oriented low density suburban expansion. However, when the 1994 Planning Strategy was gazetted (GSA, 1994), it was not intended to reinforce this dubious honour, but nevertheless, it appeared to have failed to limit Adelaide's growing metropolitan boundaries and although residential densities had increased in newer areas, the style of development was still essentially low rise free-standing dwellings on separate allotments largely designed to be accessed primarily with a private car. Despite Adelaide having a thoughtful planning community concerned about Adelaide's sprawling urban form, market forces and an apparent abundance of relatively cheap land and housing packages, attracted new households to the metropolitan fringe and ex-urban townships such as Mount Barker and Victor Harbor. The only effective limit on the speed of Adelaide's growing urban sprawl appeared to be the lack of transport infrastructure (principally in the form of high speed urban arterial roads or transit) and the State Government's pace of land release for new suburban sub-divisions. The introduction of Australia's Goods and Services Tax (GST) in 2000 by the Howard Government, which was accompanied by the First Home Buyers Grant of up to \$14,000 for new homes, added further impetus to the growth in home building on the metropolitan fringe, particularly with the inclusion of sunset clauses that brought forward first home purchases and/or encouraged people into building who might not have otherwise done so.

When the Rann Labor South Australian State Government took the mantle of office in 2002, it was clearly concerned about the failure of its Planning Strategy to manage and contain Adelaide's urban expansion to environmentally sustainable levels, and it set out to establish a relationship with Portland in Oregon, USA, a city of a similar size and scale as Adelaide with a national reputation for significant success in introducing commuter rail networks and partnerships in setting up TODs. There had been previous overtures by the Olsen Liberal State Government when Dianne Laidlaw was the Transport Minister in investigating the "Portland" solution, but these were at a nascent stage. The current Government's relationship with Portland included fact finding missions with visits by the Premier Mike Rann and Transport Minister Pat Conlon to Portland, reciprocal visits of relevant professionals and culminated in the appointment of Fred Hanson, a former Director of Portland's Trimet public transit agency, as a "Thinker in Residence", to provide independent advice of an international calibre on the directions that Adelaide's transit should take.

It's worth examining what was so special about Portland's approach to transit and why it attracted the South Australian Government in seeking solutions to the challenges of reinvigorating public transit in Adelaide. The impressive features of the Portland approach lie in its use of funding mechanisms (both public and with public-private partnerships for the TODs), land use planning policies, community engagement and Portland's physical

achievements in getting new public transit infrastructure and TODs underway. Portland could very easily have directed its investment into highway funding, rather than transit, and in spite of strident opposition from local development interests, it still managed to achieve sufficient investment in rail transit and TODs for it to claim that it had an integrated, functioning transit system, complemented by TODs and appropriate development attuned to the commuting needs associated with rail transit.

The change in Portland's approach commenced with the introduction of the Oregon Transportation Planning Rule (OTPR) in 1991 by the then Oregon Land Conservation and Development Commission (OLCDC) for the purposes of clarifying the development process for a new highway proposal beyond Portland's Urban Growth Boundary. Before OTPR, there had been previous events that demonstrated Portland's commitment to focusing on public transit, for example, with the creation of a metropolitan public transit agency in 1969 called TriMet, although admittedly, this phoenix emerged through the bankruptcy of a private bus operator; the creation of a no fare area in the city centre with a Downtown Transit Mall in 1975 (which continues for light rail but was rescinded for buses in 2010); and in 1986, the commencement of a major new rail system from funds that became available from a cancelled Highway Project. Another milestone in transit was achieved in 2001, with Portland being the first modern light rail system to be established in North America, linking Portland State University with the Pearl District of up-market city apartments in a 4km long loop route (Adler and Dill, 2004).

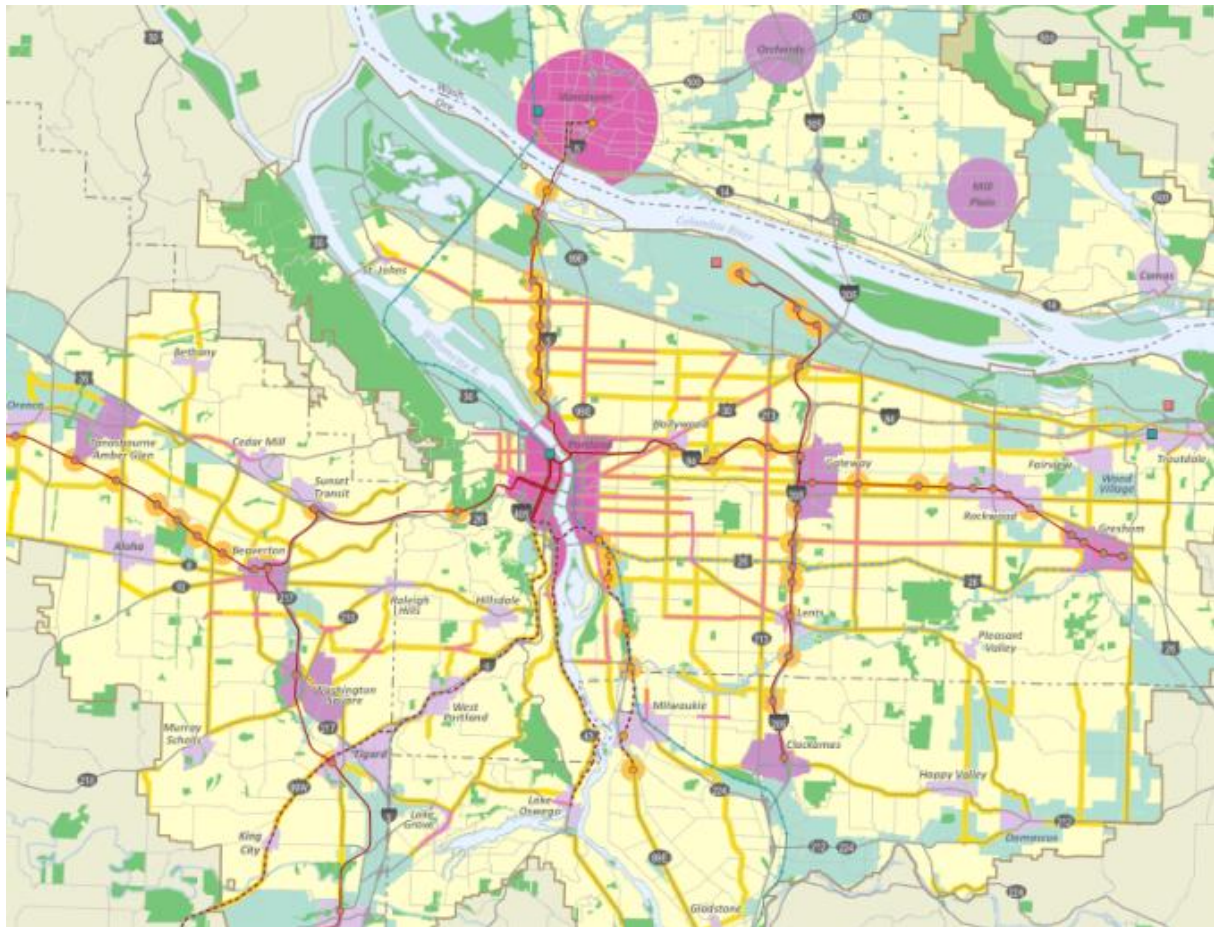
The OTPR demanded an integrated set of urban form and related transport objectives be adhered to and that no single mode of transport be relied upon. Intense community activism through the 1000 Friends of Oregon provided further impetus for action. Within 2 years of the adoption of the OTPR (although the timing was later relaxed), local governments were required to adopt land use and design regulations that were to provide a land use development context that would support alternative modes of transport to the private car, under the regulatory headings of "building orientation and street connectivity". Essentially in practice, this meant orienting building frontages as close to the street and transit stops as possible and reducing parking availability. Other requirements included the need to provide bikeways, bike parking facilities, pedestrian ways, designating land along transit routes for transit oriented development and requiring larger scale developers to provide either a transit stop or a connection to a transit stop if demanded. Within 4 years, transport system plans were also mandated that had to reduce principal reliance on private cars. An overall reduction in vehicle miles travelled (VMT) of 10% over 20 years was also set as a particular performance target (Adler and Dill, 2004; MRG, 2011).

The most important element of the OTPR in facilitating a shift to public transit and TODs, however, was that when Portland developed its Metro 2040 Growth Concept Plan in 1995 (see figure 1), a plan that included higher density, mixed use TODs, it was able to redirect transportation funding away from highway investments into other modes of transport and provided a legal framework to convince local governments to prepare complementary plans. Portland's sustained commitment over nearly 30 years to transit and making it functional attracted widespread acclaim, including from Robert Cervero (1998, p416), an American California based academic and transit expert of international renown, who singled out Portland as being at the forefront of cities within the United States in making the strongest commitment towards integrating transit and urban development and the city most likely to become a great Transit Metropolis.

Portland can certainly claim unambiguous successes in terms of transit infrastructure, transit services (rail, light rail and bus) and in the development of genuine TODs. However, on the principle planning objectives of reducing traffic congestion, VMT and transit ridership rates for residents living within Portland's nominated TODs, the outcomes are positive, but short of



**Figure 1: Portland (Oregon, USA) 2040 Growth Concept Plan with transit routes, TODs and Urban Growth Boundaries.**



Source: <http://www.oregonmetro.gov/index.cfm/go/by.web/id=29882>

the intended performance targets. VMT were reduced by 7.4% (from 1996-2001), transit ridership increased to just over 7% during the period 1990-2000 (not much better than Adelaide!), and at Steele Park Station, one study by the Cascade Policy Institute found that 70% of light rail riders were park and ride commuters with 8% of residents around the stations walking or cycling to work, indicating some change in commuter travel behaviour, albeit but of a limited nature (Barton, 2003). Podobnik (2009), in an unpublished paper, determined that for Orenco Station, the stand out achievement amongst Portland's TODs, that whilst social objectives were achieved, the station failed to increase primary reliance on mass transit for commuting. A Google search of Fred Hanson's role as General Manager of Portland's TriMet, provides a vox populi (Redden, 2010; Rose 2010; Maus, 2010; Church, 2011) that uncovers scathing criticisms of TriMet's management for a policy emphasis favouring rail over buses, inefficiencies and wasting public monies (perhaps predictably from

the Transit Riders Union), which may not be a completely fair reflection of what occurred given that during Hanson's 11 year tenure with TriMet (ending in 2010) transit ridership increased by 32% to 101.4 million trips and TriMet expanded its rail network to 238% to 126km (Adelaide's is 120km), nevertheless, it does raise the question of how policy makers can avoid negative public perceptions with multi-billion dollar infrastructure, service and development investments of this nature. TriMet did collaborate with the community and developers throughout the process of implementing its Metro 2040 Growth Concept Plan, to minimize and address public criticism, but it appears that this may not have been sufficient.

### **3. The Adelaide-Gawler Transit Corridor**

Between Adelaide's Central Railway Station and Gawler Central Railway Station, there are currently 26 stations, extending over a line distance of approximately 42km. The 2010 30YPGA has nominated 4 stations along this corridor as TODs and they are (with indicative distances from Adelaide noted in brackets): Bowden (1.2km); Mawson Lakes (13km); Salisbury (18km); and Elizabeth (24km). The Urban Growth Boundary lies between Gawler and Munno Para, and while Gawler have expressed interest in exploring the feasibility for a TOD, this has not yet been formalised in any of the planning for the area. Figure 2 indicates the location of the TODs and transit corridors proposed in the 2010 30YPGA.

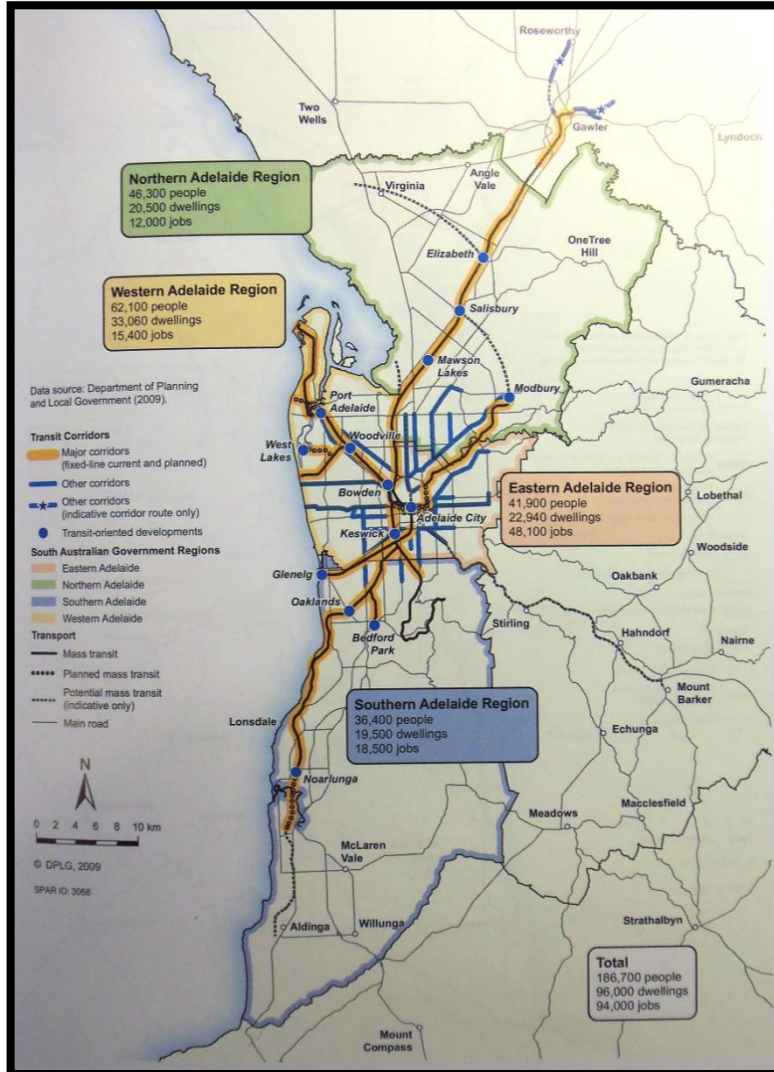
Planning for TODs is currently well underway at Bowden and Mawson Lakes and indeed, much of the development finally expected to make up the TOD at Mawson Lakes has already been built. What Mawson Lakes lacks, however, is an appropriate development at its bus-rail interchange and instead, it features a drainage creek with a large at grade long stay open car park for approximately 800 cars. The spacing for each of the planned TODs is well suited for express transit services and each of the TODs will serve as rail-bus interchanges to ensure effective integration with local transport networks in the form of bus feeder services.

Cross-metropolitan transit services are provided by bus, but these are very inefficient compared to travel by private car. The recent completion of the Northern Expressway in 2010 may encourage car-oriented development north of this rail corridor and potentially reduce rail commuter patronage, particularly between Gawler and the city. The 2010 30YPGA (GSA, 2010) does nominate the Adelaide-Gawler rail as metropolitan Adelaide's longest transit corridor with higher development densities planned along its entire length. The planned population increase is fairly modest, with 46,300 people to be accommodated in 20,500 homes and with 12,000 jobs. All of Adelaide's 14 TODs and 20 other nominated transit sites will accommodate about 60,000 dwellings out of a total expected metropolitan growth of 96,000 dwellings for 186,700 people with 94,000 jobs. Hence, two thirds of Adelaide's expansion over the next three decades will be in the form of TODs, either at a TOD or in a transit corridor served by TODs. Whilst development densities may be modest by world standards (buildings are unlikely to exceed 10 floors and most will be between 2 and 6 floors), this signals a remarkable transformation in Greater Adelaide's urban form. To the rail or bus based commuter, once the Plan is complete, Adelaide will appear to be an urbane environment of reasonable density, even if the reality of a low density city predominates away from the TODs and their transit corridors bisecting Adelaide. Importantly, the significant achievement of the 2010 30YPGA is that it sets in place an urban skeleton that allows a new urban form to evolve around it.

Ensuring that commuting travel speeds and time are competitive with competing

travel modes (in this case the private car) is a critically important planning principle for transit corridors and the TODs located within them. The Mawson Lakes TOD performs well in this regard, and whilst quicker than travel by car in both directions (station to station), the margins are not particularly great when compared with driving

**Figure 2: Proposed TODs in the 30 Year Plan for Greater Adelaide**

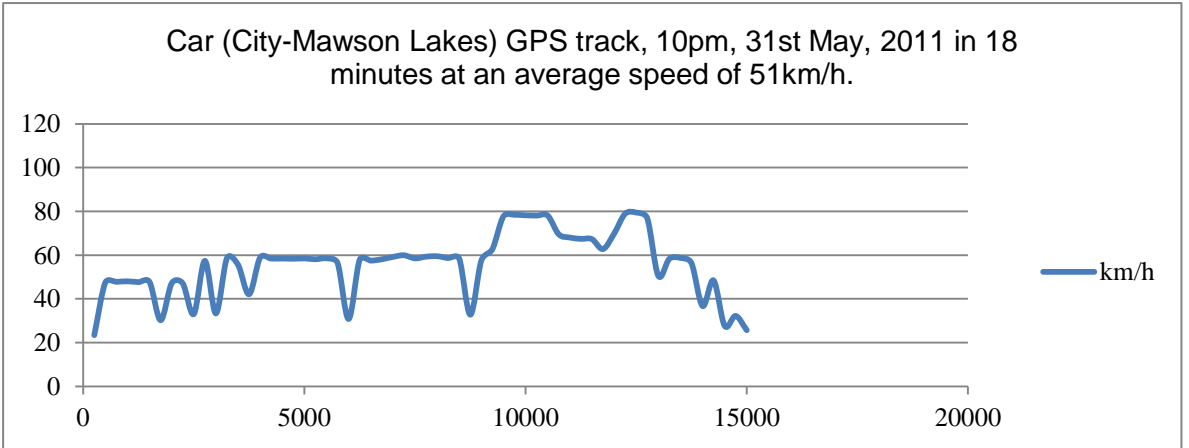
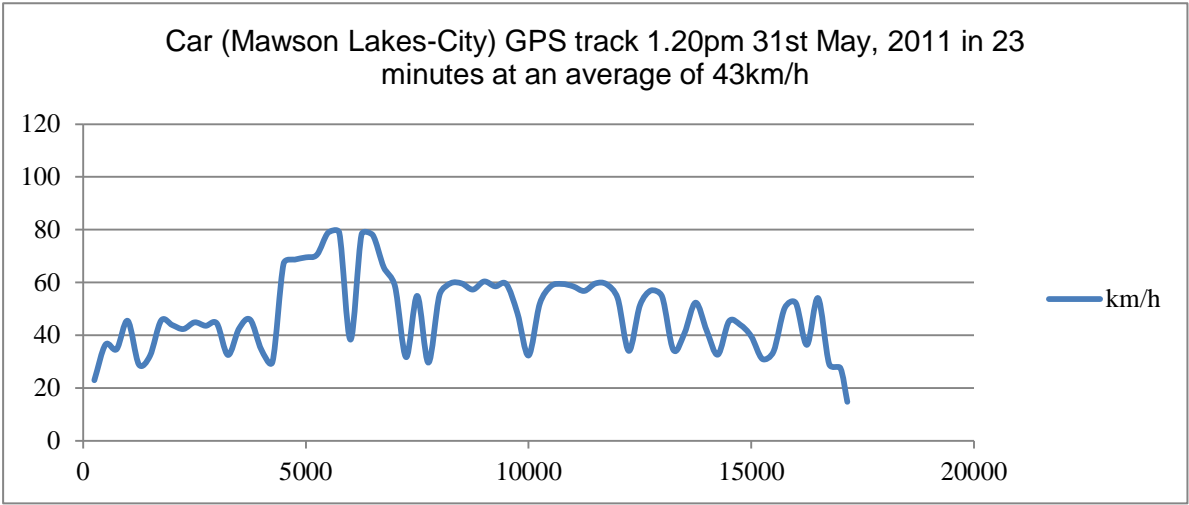
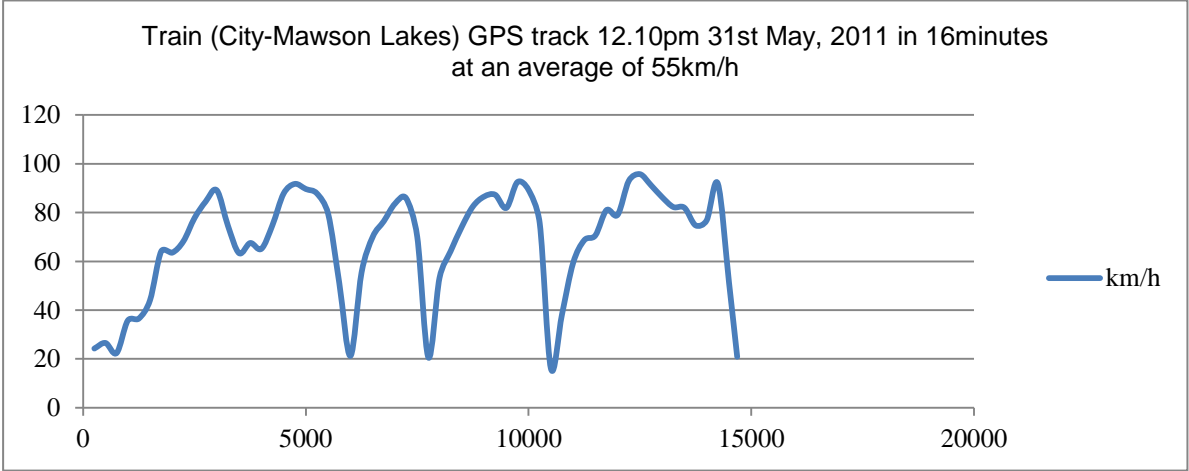


Source: Department of Planning and Local Government, February, 2010

a car in free flow traffic conditions by the most direct routes available. Figure 3 illustrates that the train managed to complete the trip quicker than travelling by private car in optimal free flow road conditions, requiring 16 minutes to travel the 15km distance between Mawson Lakes and Adelaide's city centre at an average speed of 55km/h, compared with the Mawson Lakes-city by car (station to station) requiring 23 minutes over 17km at an average speed of 43km/h and the return trip by car over a distance of 15km requiring 18 minutes at an average speed of 51km/h. A slightly longer return trip by car is necessitated by having to take a different return route due to turning bans in the city because of the tram routes. Multiple GPS tracking runs were not required because the train complied with the scheduled timetable and the car trips were completed in off-peak traffic conditions when traffic delays were negligible. The train trip is identical in both directions. When the travel



**Figure 3: Comparison of Commuter Travel Time Performance between Mawson Lakes and Adelaide's City Centre (Adelaide Central Station)**



Notes:  
 (1) Vertical axis is km/h and horizontal axis is a travel distance in metres.  
 (2) An Edge 705 Garmin GPS unit with a history tracking function was used to obtain the plots with a data reading taken every 250m.

convenience aspect is factored into the commuter's decision about which travel option offers the greater travel utility, the train may not necessarily be more attractive than the car, particularly if the car trip provides better door to door convenience. In current optimum conditions, single level diesel-electric heavy rail cars can theoretically operate on this line at speeds of up to 110km/h in sets typically ranging

from 2-3 cars with a crush capacity of 260-390 passengers. Express services from Adelaide to Gawler Central will take 36 minutes and average 70km/h in 2016 once current track upgrading work to electrify the service is completed making it faster than car travel (currently averaging about 40km/h). Current patronage is about 16,000 people/day with the line upgrade work and development in the nominated TODs expected to increase patronage to 26,000 people/day in 2016. The relative low passenger densities along the line reflect the high proportion of non-residential uses (industry, aviation, defence, open space) and low intensity of development (of all development types including residential) (DTEI, 2010).

This transit corridor is critical in meeting Adelaide's current and future population growth and development aspirations with 3 of the nominated TODs in the 2010 30YPGA and a number of spur lines that branch off from it to serve future growth areas on the northern metropolitan edge at Virginia, Roseworthy and Concordia. The only significant strategic shortcoming for the corridor is that there is no mass transit connection between Tea Tree Gully at the end of the Obahn (or busway) to connect with Elizabeth via Golden Grove Village/Greenwith/Salisbury Heights, which are large areas of low density car dependent suburbs. Table 1 provides an analysis of the Adelaide-Gawler Commuter Railway Corridor. With the exception of Mawson Lakes, most stations are extremely minimalist affairs with an unattended platform, modest weather protection, minimal commuter parking and development unrelated to the transit opportunities afforded by the rail service. Taking the 2010 30YPGA at face value, as a populated transit corridor, infers that 343,000 people in 156,000 homes could be accommodated. Theoretically, the corridor could accommodate a population of about 80,000 people in 13 TODs and 11 transit activity centres, which would result in a fourfold increase in population along the corridor. In practice, achieving this level of investment in a TOD network will be a considerable development and planning challenge because of the large areas within the corridor held by large relatively sterile unpopulated land uses (i.e. defence, aviation, industry, parks and rural areas) and the park and ride model of rail commuting along most of the route. However, the emerging success of the TOD at Mawson Lakes, the first TOD along the corridor, shows what can be achieved with patient planning, staged development and investment.

Based on current work commuting patterns, one could expect approximately 45% of the population to commute. The proposed rail upgrade will probably be short of passenger capacity even if growth predictions are limited to the proposed TODs and transit activity centres along the corridor, with at least 36,000 daily commutes. Along the whole transit corridor, 154,000 commuters could be anticipated, 6 times the capacity of the rail transit corridor. Main road corridors such as Main North Road and the Northern Expressway are thus likely to remain as critical transport infrastructure corridors in parallel with the Adelaide-Gawler transit corridor, for the foreseeable future, unless the rail line is duplicated.

#### **4. The Mawson Lakes TOD on the Adelaide-Gawler Transit Corridor**

Figure 4 details the TOD Master Plan for Mawson Lakes. The bus-rail interchange is located just to the left of the major road bridge over the line at the centre of the radii. The Plan reflects the challenges of maximizing densities along the whole Adelaide-Gawler Transit corridor in having land uses that are antithetical to creating urbane walkable environments. For example, the north-east corner of the TOD was in fact part of Parafield Airport and the north-western side of the rail line was originally

blighted with contaminated flood prone land, a busy arterial road and rail freight marshalling lines. The northeast corner has now been transformed into an exclusive residential precinct with million dollar homes and virtually all of the site within the 800m radius that defines the TOD will be developed to a high standard with the types of active uses and urban densities one would expect in a TOD.

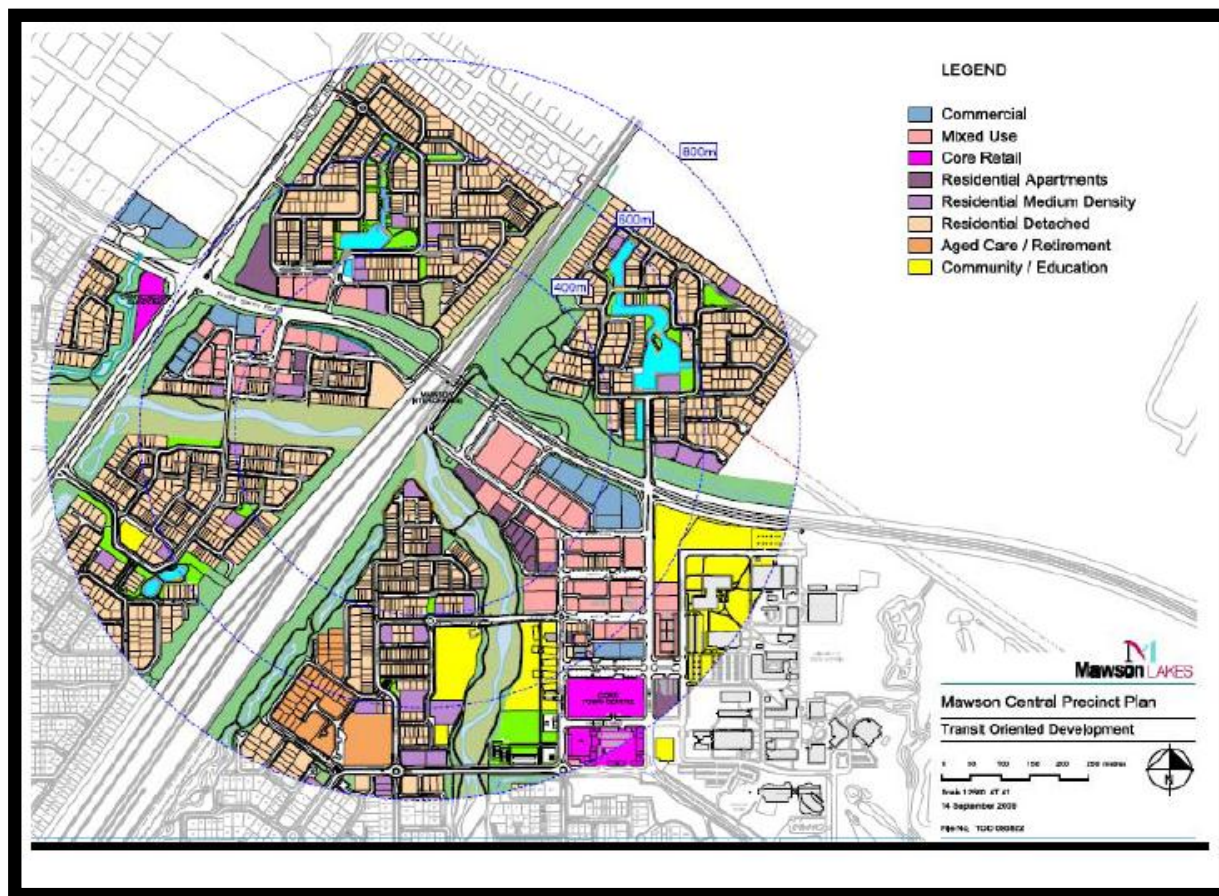
The plan is not perfect however, with a large drainage culvert and 800 space car-park severing the transit interchange from the town centre (located in the south-east quadrant), a lack of connectivity across the rail corridor and arterial roads and a centre that is asymmetrically positioned on the edge of the TOD precinct. The car-park is temporary, but it does raise a fundamental philosophical question about whether park and ride should be provided in the heart of TODs in a bid to provide the necessary commuter ridership, rather than relying on the local resident TOD population to fulfil this function. The DTEI's (DTEI, 2010) viewpoint is that accessing TODs should be by walking or feeder buses, but they are nevertheless wary of losing potential commuters by not providing long stay parking to commuters. Apparently continued investment in transit is contingent on early returns in increased commuter patronage. The problem with commuter parking, particularly when it is provided at grade in a centralized location is that it does undermine to objectives of a TOD because it creates inactive dead space and does little to enliven the active land uses in the TOD.

Despite gross residential development densities in Mawson Lakes reaching levels that should make rail mass public transit viable (about 25-30 dwellings/ha), with mixed land uses, quality urban design and architecture, a coherent pedestrian network, feeder buses, traffic constraint strategies (e.g. street parking limited to 2 hours) and an orthogonal street grid with a high degree of permeability for pedestrian movements, Mawson Lakes does not have the pedestrian activity of a major city centre and probably never will. It is still too early to say if it has increased walking in the way that TODs should. This would depend on where park and ride commuters are coming from. Internal research by DTEI (DTEI, 2010) based on a car number-plate survey about a year ago suggests most park and ride commuters come from surrounding suburbs well outside the TOD because of the relatively high standard of public transit service to the city. One advantage of having the station and town centre about 600m apart is that it would induce walking traffic, particularly to the university campus about 700m to the south-east of the station. Lend Lease-Delfin, the TOD's developer, used the marketing mantra to "live, work and play", to sell homes it created at Mawson Lakes, which aligns closely with the concept of TODs being about living locally.

Severing residents' links with their cars has been more challenging. Whilst the level of private parking provision for dwellings is about half what it is compared to traditional low density suburbs in Adelaide, most households are still committed to car ownership and usage. This may be because the rail transit at this TOD is limited to providing access to the city centre or future TODs such as Salisbury and Elizabeth further north along the line. Still, it would be unfair to condemn the pioneering work that has been done at Mawson Lakes as too little in terms of making it completely transit based because although the 2010 30YPGA proposes a city of networked TODs, it will take several decades for that vision to be realized. The value of the Mawson Lakes TOD is that it will provide important lessons for future TOD designs in the Adelaide context for optimizing the planning objectives for TODs such as

increasing walking, transit and creating more engaged, vibrant and dynamic local communities.

**Figure 4: The Mawson Lakes TOD Plan**



Source: Delfin-Lend Lease, 2010, Mawson Lakes, South Australia

## 5. Conclusions

The example of Portland, Oregon in the USA has provided useful guidelines and exemplars of TODs, particularly from the land use planning perspective. Perhaps the strongest lessons to emerge from Portland's experience is that strong government regulation in the form of land use planning controls with a long-term strategic planning vision extending over decades, when combined with a government commitment to community consultation and funding the necessary transport infrastructure is essential to creating a metropolitan area with a networked system of TODs. A strong unitary coordinating public transit authority, TriMet with management prepared to fulfill the land use strategic planning vision has also played an essential and critical role.

The appointment of Fred Hanson, TriMet's former General Manager, as a South Australian "Thinker in Residence" in 2010, demonstrated the degree to which the South Australian government were impressed by his work of 11 years at the helm of TriMet. Research evidence evaluating the value of the Portland experience in achieving a modal switch to transit from private cars, however, is somewhat disappointing, given that the overall use of transit in Portland is not that dissimilar to Adelaide despite the massive investment in transit by Portland during the past four

decades. Portland compares favourably with other US cities in its use of transit (amongst the top 3-5 cities), but its performance hardly stands out and pales in comparison with transit usage in European and Asian cities.

Portland's citizens do not appear to be unanimous in their praise of TriMet's performance and there is community resentment at the focus on rail to the apparent detriment of buses. Still, Portland is a city that practices robust democratic debate, hence community criticism is to be expected and on balance, TriMet appears to have its supporters in the Portland community. The real value of the Portland experience in implementing a TOD networked city to Adelaide is that it underlines the need to invest in infrastructure and have very strong land use planning controls to attract the right type of developments. Even in Portland, attracting the right development to TODs is still its Achilles Heel. Just as Mawson Lakes has had difficulty in attracting the right type and density of development at the transport interchange, Portland has examples such as Steele Park, an intended suburban TOD which was unable to attract interest by developers to build medium density residential development with the result that it became little more than a park and ride transit stop.

With the 2010 30YPGA, which is not dissimilar conceptually and operationally to Portland's 2040 Growth Concept, metropolitan Adelaide has a strong land use strategic planning instrument that signals a powerful statement of intent about what type of city the State Government would like to see Adelaide emerge as over the next three decades. However, while the 2010 30YPGA provides very clear and unambiguous signals about where the 14 key TODs that will attract government investment will be located (and statements of planning intent for additional Activity Centres), what is unclear is how densities will be increased within the transit corridors and exactly what the character of the transit corridors will be. The rail transit corridors are somewhat problematical, because for the Adelaide-Gawler corridor to operate with a satisfactory service level with minimal stopping at minor stations, for many future residents residing in a transit corridor between TODs, the access to transit may be poor, unless the transit rail corridor is provided with parallel local transit services either as additional rail lines or bus based transit. The 30YPGA does not provide specific details on what type of transit performance could be expected within the transit corridors and currently, the South Australian government does not have any investment in commuter rail planned that would deal with the issue of meeting local transit needs within the 5 planned transit corridors. Rather, the emphasis into the foreseeable future is on commuter rail investment is on electrification, improving the rolling stock, operational coordination of services, improving transit speeds between the proposed TODs and existing station upgrades.

As far as the TODs and Activity Centres are concerned, the 2010 30YPGA provides as much planning direction as could normally be expected in a metropolitan strategic planning document about the development, population and infrastructure outcomes expected with fulfillment of the Plan. As highlighted by an examination of the Adelaide-Gawler corridor, where it is lacking, and where there may need to be a supplementary plan or an update of the 2010 30YPGA, is in setting out a clear planning outcome and development guidelines for the transit corridors. For example, the key planning questions revolve around the type of rezonings required and how local transit will be dealt with between the TODs. Unlike Portland, Adelaide has not set itself reduction targets for private car usage, and whilst Portland's performance on this measure has been modest at best, nevertheless as argued by Adler and Dill



**Table 1: The Adelaide-Gawler Commuter Railway Corridor**

RAILWAY STATION	DISTANCE FROM CITY (km)	CURRENT LAND USE	Commuter parking "park and ride"	30YPGA proposal	Proposed Dwelling density (dwgs/ha)	30YPGA Planned population potential	What could be theoretically done	Theoretical population Potential
<b>1. Adelaide (City)</b>	0	CBD-High density residential, commercial, major retail, special uses, community, education, arts, culture, recreation	Major parking stations (>50,000 cars)	Increased population; Transit, walking, cycling.	100+	27,300 (additional)	Increased residential densities and mixed uses.	27,300
2. North Adelaide	2.7	Parklands/recreational	Negligible	Nil	25		Nil	
3. Ovingham	3.8	Low density residential	Negligible	Transit corridor	25		TOD	4300
4. Prospect	5.1	Low density residential and light industrial	Negligible	Transit corridor	25		Activity centre	2150
5. Regency Road	6.1	Low density residential and light industrial	Negligible	Transit corridor	25		TOD	4300
6. Kilburn North	8.5	Low density residential and light industrial	Negligible	Transit corridor	25		Activity centre	2150
7. Dry Creek	10.8	Industrial	Negligible	Transit corridor	25		TOD	4300
<b>8. Mawson Lakes</b>	14.9	Medium-high density residential, commercial, recreational, parkland, small retail, minor airport and education. Rail-Bus interchange, major park and ride.	Major (800+ cars)	TOD	25	4300	TOD	4300
9. Greenfields	15.5	Low density residential, minor airport	Minor	Transit corridor	25		Activity centre	2150
10. Parafield Gardens	16.5	Low density residential, minor airport	Minor	Transit corridor	25		Activity centre	2150
11. Parafield	17.7	Low density residential, minor airport	Minor	Transit corridor	25		TOD	4300
12. Chidda	18.8	Low density residential and light industrial	Negligible	Transit corridor	25		Activity centre	2150
<b>13. Salisbury</b>	20.2	Low density residential, recreational, parkland, large retail and education. Rail-Bus interchange	Moderate	TOD and Major District Centre	25	4300	TOD	4300
14. Nurlutta	21.5	Major industrial (Holden car plant), low density residential, recreation	Negligible	Transit corridor	25		Activity centre	2150
15. Elizabeth South	24.0	Low density residential, light industry, defence	Minor	Transit corridor	25		Activity centre	2150
<b>16. Elizabeth</b>	25.7	Major regional shopping centre, special uses, community, education, light industry, defence, recreation, low density residential	Moderate	TOD	25	4300	TOD	4300
17. Womma	27.3	Low density residential, light industry, education	Minor	Transit corridor	25		Activity centre	2150
18. Broadmeadows	28.3	Low density residential, special uses	Minor	Transit corridor	25		TOD	4300
19. Smithfield	30.3	Low density residential, light industry, major retail, some rural	Moderate	Transit corridor	25		Activity centre	2150
20. Munno Para (edge of Adelaide metropolitan area)	32.2	Low density residential, largely rural	Minor	Major District Centre	25		TOD	4300
21. Kudla (rural)	34.0	Rural village	Negligible	Greenbelt			Nil	
22. Tambelin	37.2	Low density residential, recreational, rural	Minor	Transit corridor	25		TOD	4300
23. Evanston	38.2	Low density residential, small retailing, education recreational, rural	Minor	Transit corridor	25		Activity centre	2150
24. Gawler	39.8	Low density residential, small retailing, education recreational, rural	Moderate	Transit corridor	25		TOD	4300
25. Gawler Oval	41.3	Recreational, High street retailing, community, cultural, education, special uses, low density residential, rural.	Negligible	Transit corridor	25		Activity centre	2150
26. Gawler Central	42.1	High street retailing, community, cultural, education, special uses, low density residential, recreational, rural.	Moderate	Major District Centre	25		TOD	4300
27. Concordia (hypothetical for proposed growth area)	45.8	Rural (nominated for urban development in 2010 30YPGA)	None	District Centre	25		TOD	4300
TOTAL						15,000 in nominated TODs		79550 in TODs or Activity Centres

**Notes:**

1. The transit corridor is 39km long and 1.6km wide (6240ha) and can theoretically accommodate up to 343,000 people in 156,000 dwellings at dwgs/ha based on the assumptions in the 2010 30YPGA. TODs are spaced about 2.5 to 3.5 km apart to maintain transit service levels.
  2. Activity Centres are assumed to have half the population of TODs and served by a secondary local transit system.
  4. The total population for the TODs and Activity Centres does not include the Adelaide CBD population.
- Source: Survey work by the author, Google Earth (2011) and The Government of South Australia (2010)

(2004), the regulatory requirement of the OTPR to require reductions in Portland's private car travel, was a major policy driver in forcing investment in TODs, public transit and infrastructure for walking and cycling.

The examination of the TOD Mawson Lakes, illustrated that a functional TOD is nearing completion, despite it lacking a centre-piece development around its transport interchange and its local street network being dissected by a creek, and arterial road and rail corridors. The complexity involved in getting Mawson Lakes to this stage of its development and its design having to fit in with the context of its local environment highlights an important aspect in developing TODs, in that each TOD will require unique planning solutions, although the basic planning principles will be similar. The proposed TODs at Salisbury and Elizabeth are in unique local contexts that are quite different to each other and Mawson Lakes, and hence will require tailored land use planning responses. For Salisbury, the challenge is in organizing a messy confluence of retailing, roads and rail in a constrained location. Elizabeth by contrast has a massive "big box" regional shopping centre that is somewhat antithetical to TOD planning principles, and reorientating it to the train station while not impossible, will pose a considerable planning challenge.

Adelaide is at a turning point. It has in the 2010 30YPGA an opportunity and a basis to create a more urbane metropolitan system based on environmentally sustainable transport and networked TODS linked by transit corridors. This planning vision can be fulfilled, providing that the Government engages the community to embrace this vision, remains committed to its metropolitan planning vision and is diligent in implementing its land use planning controls and in investing in public transit, walking and cycling infrastructure, TODs and increased urban densities.

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