CBD PEDESTRIAN ANALYSIS

TECHNICAL REPORT
CITY OF MELBOURNE
JUNE 2014

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SGS Economics and Planning Pty Ltd
ACN 007 437 729
www.sgsep.com.au
Offices in Canberra, Hobart, Melbourne, Sydney

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Glossary

Term	Definition
Agglomeration economies	The benefits which flow to firms from locating in areas which have access to a large number of other firms and a deep labour pool.
Centroid	A defined point within a travel zone from which all trips are assumed to start or end. Centroids are located to reflect the centre of activity in a travel zone, not necessarily the geographic centre. Centroids are connected to the network via centroid connectors, abstract links that represent general access into the formal network.
Connector	Abstract links that connect centroids to network nodes and represent general access from a TAZ to the formal transportation network
Effective job density	The level of employment relative to the time taken to gain access to that employment, adjusted by the current mode split of those workers in their travel to employment.
Employment density	Number of jobs allocated within an area (jobs/area)
Link	A primary element of a transportation network defined by a starting and an ending node and having attributes such as length, travel time and/or speed, and capacity.
Node	A point joining two or more links in a transportation network.
Pedestrian network	An interconnected set of points (nodes) and lines (links) that represent possible routes from one location to another. Commonly used for analysis of moving resources through a set of interconnected features. It includes determination of optimum paths using specified decision rules.
Travel zone	The basic geographical unit of analysis for conventional travel forecasting. All locations in a study area are contained in only one analysis zone, the number and size of which depend on the scale and scope of the modelling effort.

Executive Summary

Walking connections in the city of Melbourne are a crucial enabler of its vibrant economy. Melbourne's streets, laneways and arcades create a dense network of walking connections. The value of the network is multiple billions of dollar per year. That walking connections are so valuable should not surprise. Connectivity is the reason high-value jobs concentrate in cities.

The role of cities in the global economy is increasing and has become a subject of intense study. That study depends on a concept called Agglomeration Economics.

The fact so many highly productive companies crowd onto valuable land in the central business district of Melbourne would be a puzzle if not for the value of face-to-face connections. The value of face-to-face connections is increasing in the modern economy, despite the proliferation of communications technology. They are especially important to the knowledge economy, which dominates Melbourne's CBD.

The term agglomeration economic is used in spatial economics to describe the benefits which flow to firms from locating in areas which have a higher density of economic activity.

Face-to-face connections can be made via trips in private or public transport, or by foot. The value of walking connections is an important public policy question.

- If a change to a road is made to give priority to wheeled traffic, that will hurt pedestrian connectivity. What is the value of that impact?
- If a developer proposes a building with a laneway or arcade cutting through it, what is the value of that access?

These questions have previously been tough to answer accurately. But ground-breaking modelling by SGS Economics and Planning – presented in this report- changes that.

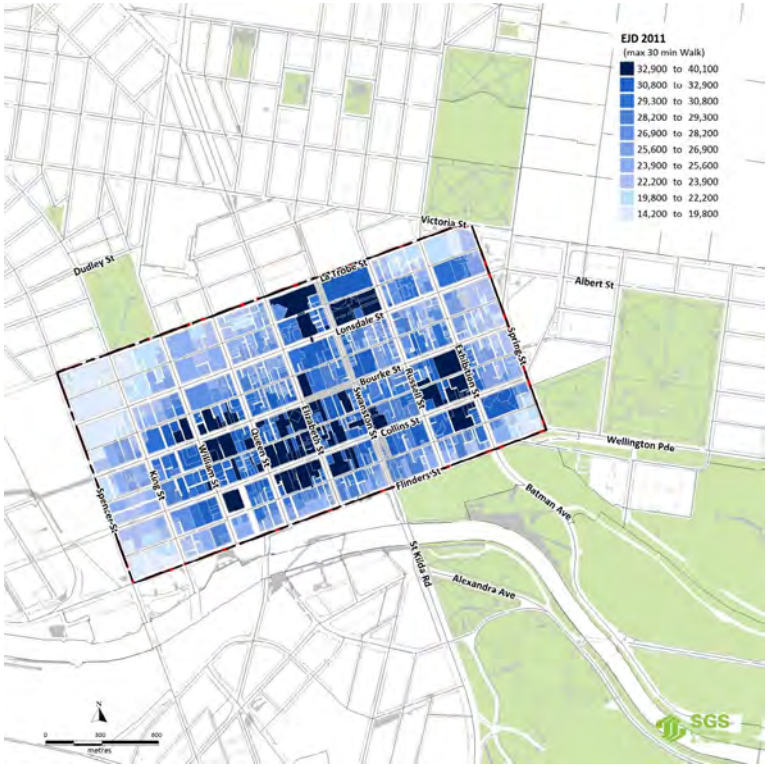
By developing a highly detailed model of the city, SGS has been able to show that some places have better access to a greater proportion of all the jobs in the city.

Places with better access to more jobs are said to have a higher EJD score.

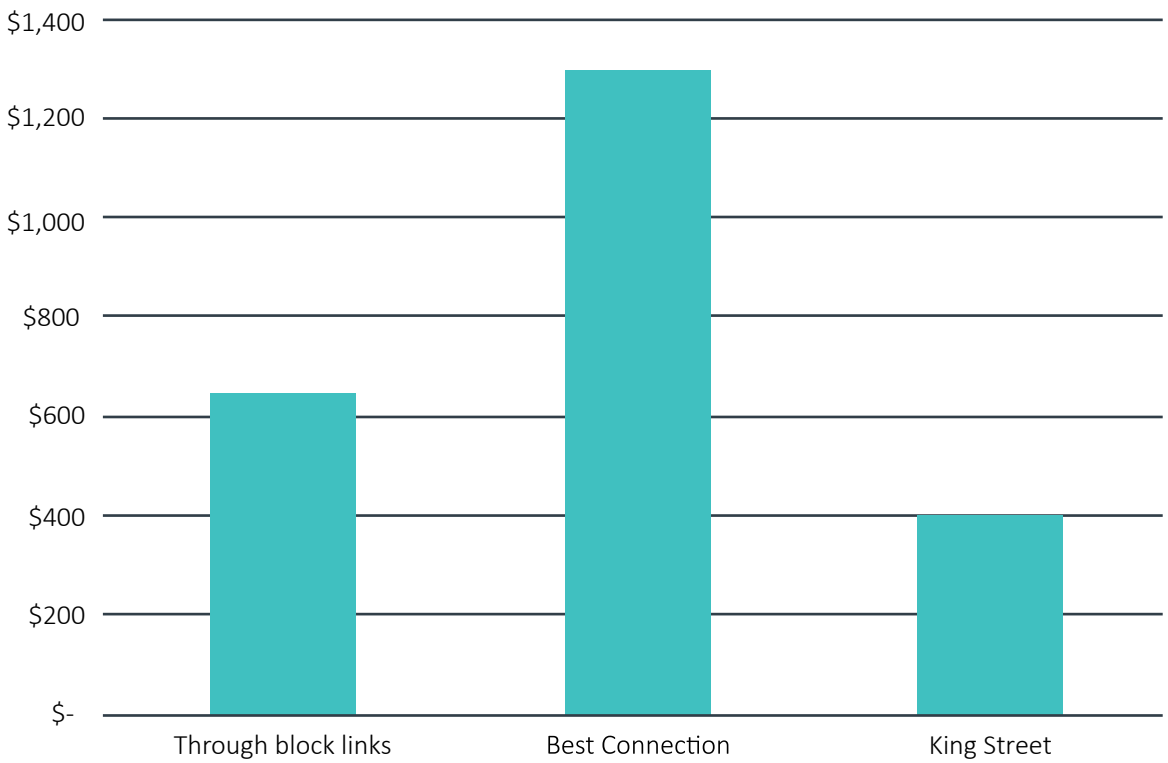
EJD stands for Effective Job Density. The measure is more sophisticated than simple job density. It includes measures of accessibility as well. Areas with great access to lots of jobs get high EJD scores. Areas with high EJD scores can be thought of as excellent places to open a business that interacts with other businesses, or simply great spots to host a business meeting.

EJD scores can be developed for access by private or public transport, or by walking. Areas with great access by walking are given a high Walk EJD score.

Walk EJD Scores for Melbourne's CBD



Impact on Gross Value Added ($Million 2009-10)



Higher Walk EJD scores indicate places from which it would be easy to walk to thousands of people's workplaces.

High Walk EJD scores are generated when a place is near a lot of jobs, or when a place has very good pedestrian connectivity. Very high Walk EJD scores happen when a place has both.

Areas of Melbourne's CBD near Elizabeth and Collins St are a good example, where lots of tall office buildings exist above a pedestrian network with excellent laneways and road crossings. Areas near King and Latrobe Street score worse, with lower density of employment and worse pedestrian connections.

Places to which more city employees could easily walk are locations in which productivity is higher, and in which more highly productive industries choose to locate.

The link between productivity and the Walk EJD score is measured at 6.6 per cent. In the CBD's $32 billion economy, that value suggests a very important economic effect of pedestrian connectivity.

Changes to pedestrian access could yield economic impacts worth hundreds of millions of dollars per annum. For example, simply changing pedestrian priority across King Street could be worth $400 million per year to the CBD economy.

01 Valuing pedestrian connections

> Job density measures do not reveal how advantages accrue in areas near to or well-connected to dense employment areas. Creating the Walk EJD score overcomes that.

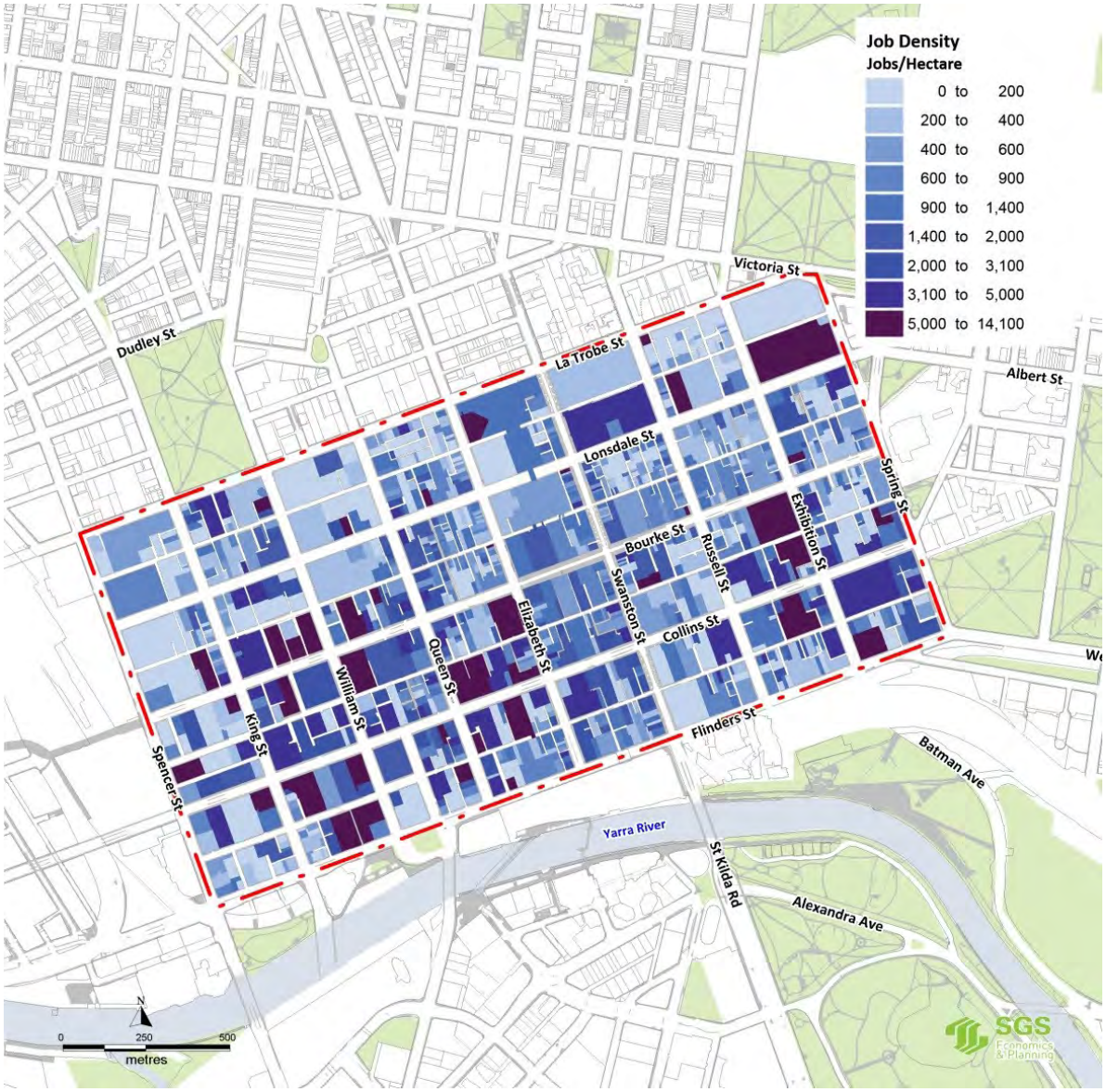
Measuring the number of pedestrian connections is easy. But measuring their value is hard. Not all pedestrian connections are equal. To understand the economic importance of a link, you need to know which parts of the city are most economically important. There have long been ways to look at that. But all have limitations. For example, job density.

Job density measures do not reveal how advantages accrue in areas near to or well-connected to dense employment areas. Creating the Walk EJD score overcomes that. It requires combining the location of jobs with a measure of connectivity.

The method used here to create the EJD score is consistent with the method used to assess the economic impact of a range of transport and land use projects. Examples of Melbourne projects include the Melbourne Metro, East West Link, Rowville Rail Link, Arden-Macaulay Metro Station, and a range of tram and train service improvements. The method is detailed in full in the Council of Australian Governments Reform Council report *Productivity and Agglomeration Benefits* in *Australian Capital Cities*[1], where the resulting measure is referred to as "effective job density."

[1]SGS Economics and Planning, 2012, Productivity and Agglomeration Benefits in Australian Capital Cities

FIGURE 1: Job density in Melbourne's CBD



Source: SGS Economics & Planning

METHOD OF DEVELOPING WALK EJD SCORE

SGS planning modelled a pedestrian network for this project to measure connectivity between travel zones. The network was disaggregated into categories and assigned an average walk speed (Table 1). An example of this network is presented in Figure 2.

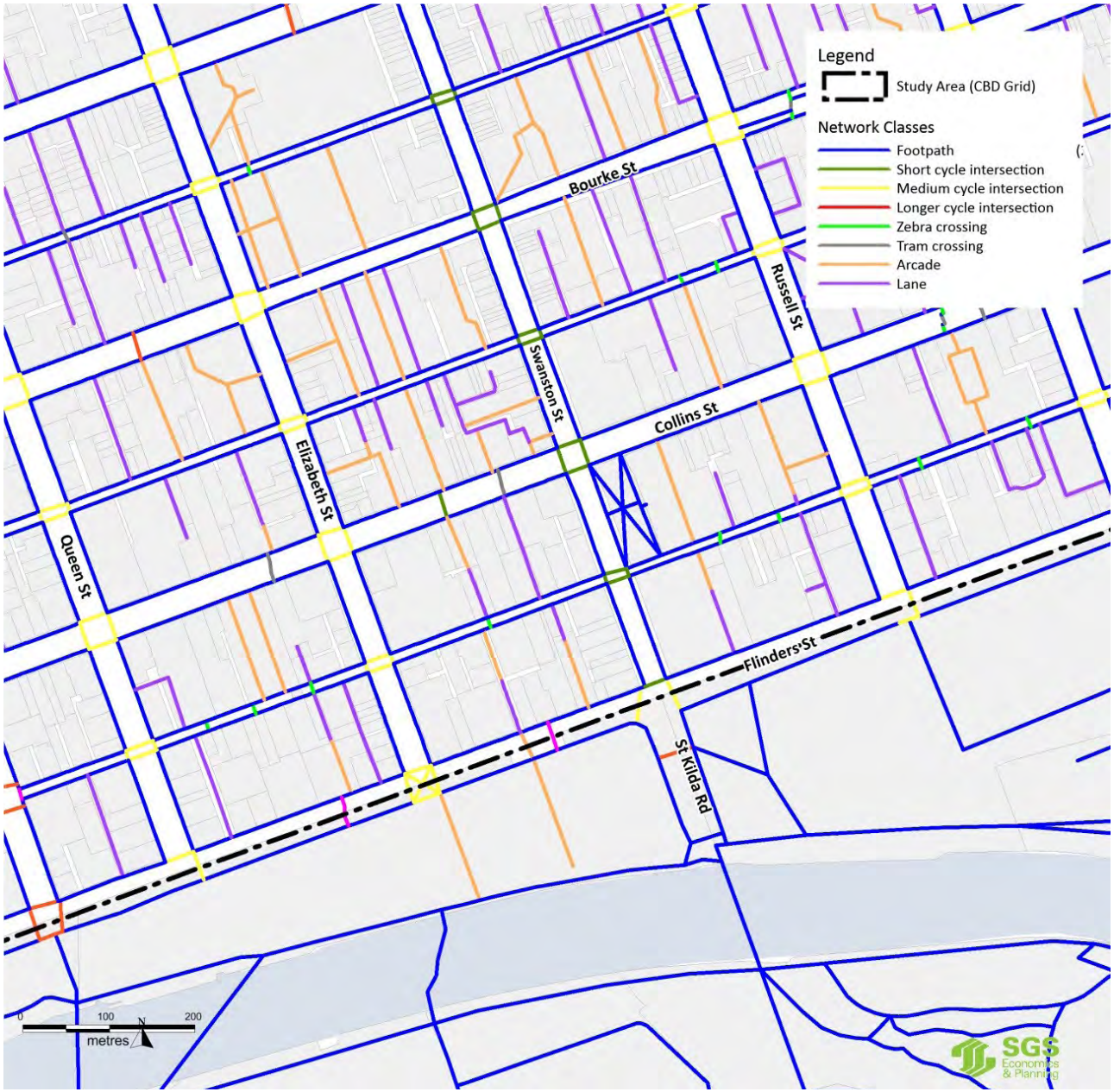
TABLE 1: NETWORK CATEGORY AND WALK SPEED

Type	Speed (Km/h)
Footpath	4
Lane	4
Arcade	4
Outer Areas Footpath	4
Crossings	
Main road intersections	2
‘Little’ street intersections	3
Zebra crossings	3
Access to tram stops	3
King Street intersections	1
Swanston Street intersections	3

Source: SGS Economics & Planning

These speeds were used as they best represent real world travel speeds when considering traffic light phasing and other delays in walking around the CBD grid.

FIGURE 2: Network design



Source: SGS Economics & Planning

ORIGIN AND DESTINATION CONNECTION

To improve the accuracy of the analysis, additional detail was given to the network by identifying and linking individual properties and their entrances. This allows the analysis to best represent the real world movements of pedestrians.

Travel zones outside of the study area were also connected to the network, as represented by red dots in Figure 3.

FIGURE 3: Network connection

Source: SGS Economics & Planning

Connecting the network made it possible for a pedestrian trip from any property within the CBD to any other property within the network to be modelled. This enabled the distance and travel time to be determined (see Figure 4).

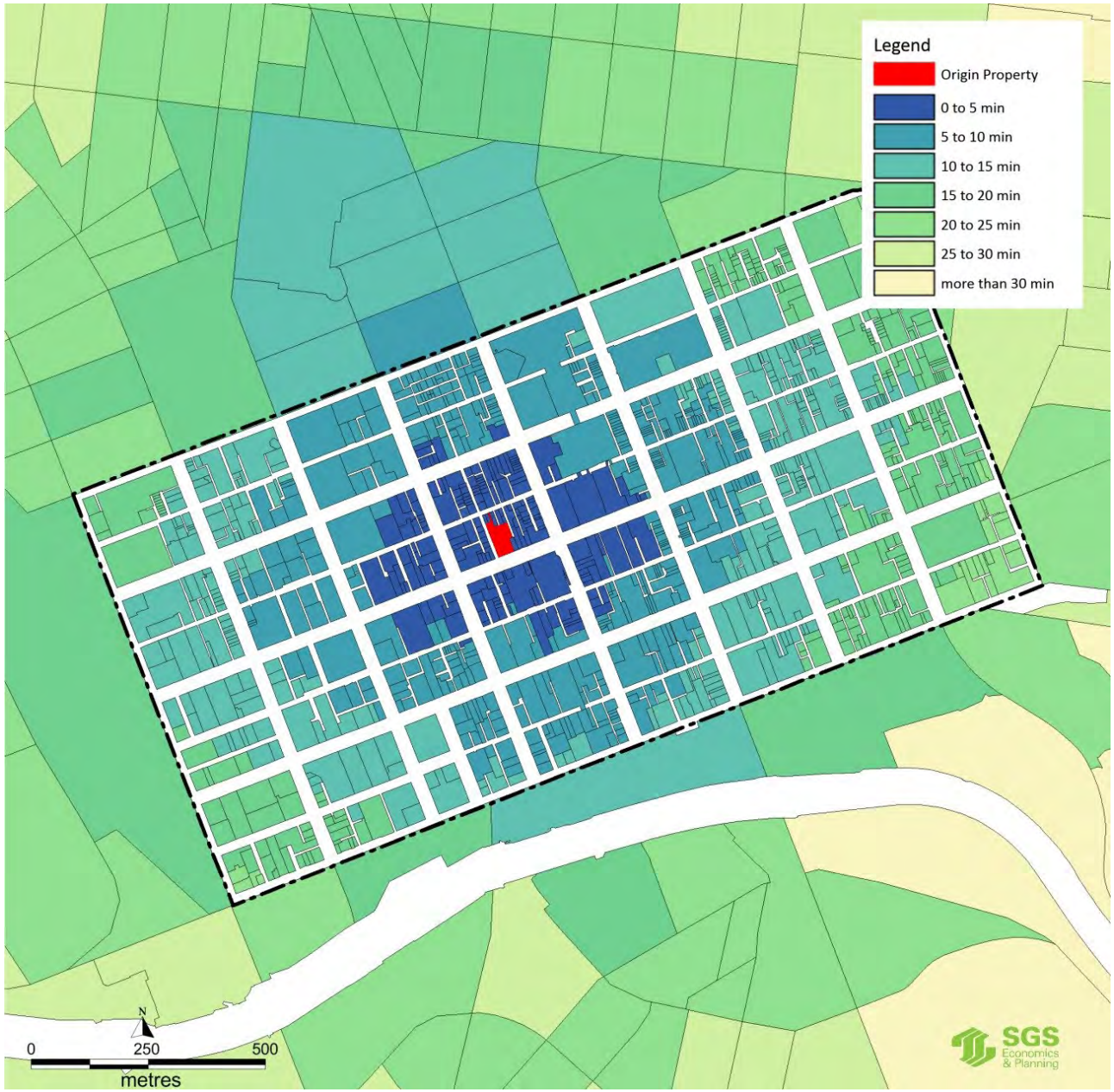
FIGURE 4: Pedestrian trip

Source: SGS Economics & Planning

This process was used to generate a travel time matrix to relate every property of the CBD grid to all other travel zones identified within the analysis. Figure 5 provides an example of the type of analysis undertaken using the travel time matrix. This can be repeated for all locations in the city, to show which areas have the best pedestrian connections.

Note how areas accessible within a certain time period are not arranged in a circle, but a jagged shape. Pedestrian access is determined by laneways and other linkages, especially road crossings.

FIGURE 5: Travel time from selected property

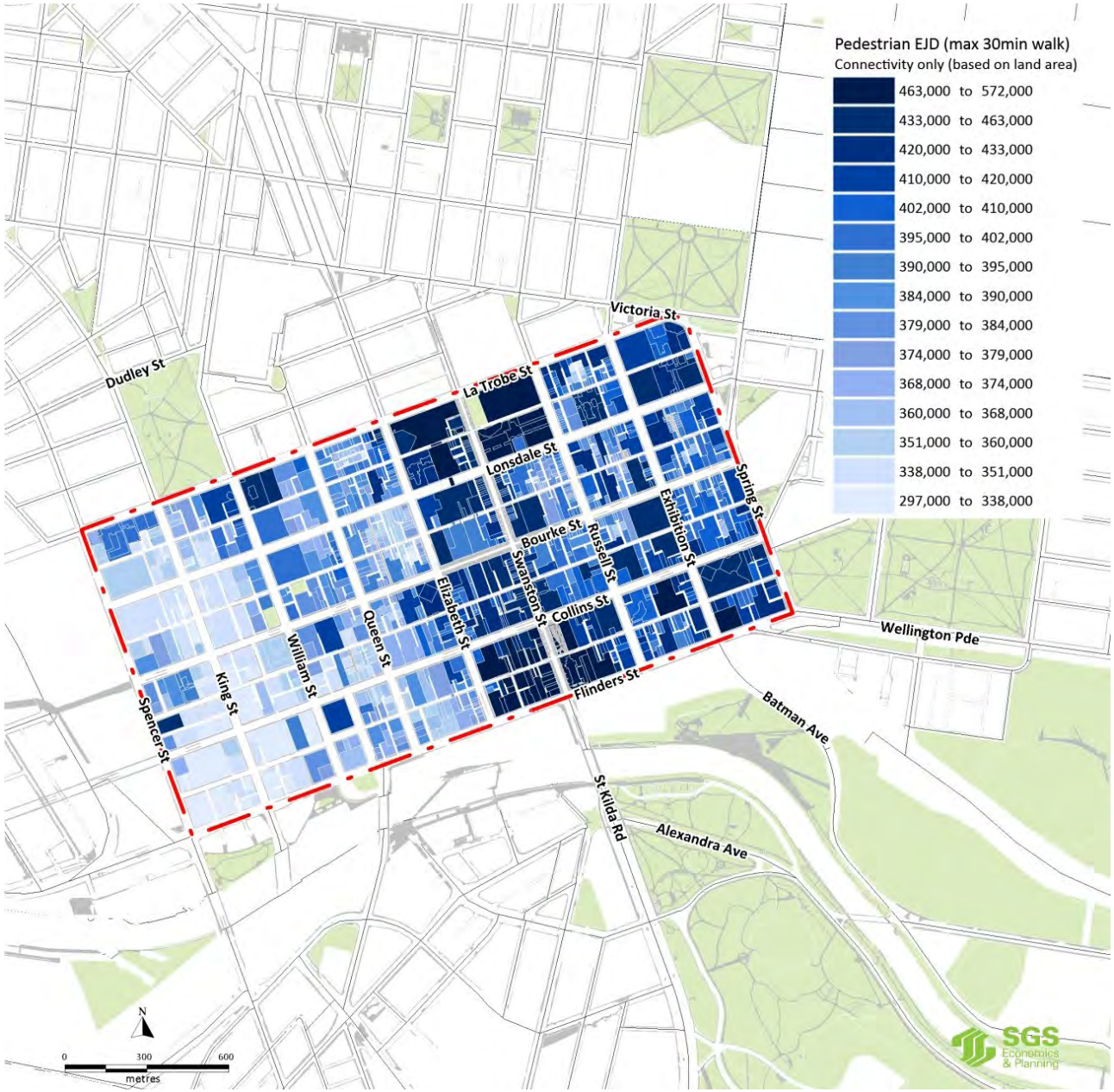


Source: SGS Economics & Planning

Melbourne's CBD exhibits significant variation in connectivity, as shown in Figure 6.

Note that Figure 6 shows only access to land area, not to jobs. Creating the Walk EJD score can be thought of as combining Figure 7 with the job density map. The result shows which locations in the CBD are most accessible – by walking – from most jobs.

FIGURE 6: Walking connectivity (how much land can easily be accessed on foot)



Source: SGS Economics & Planning

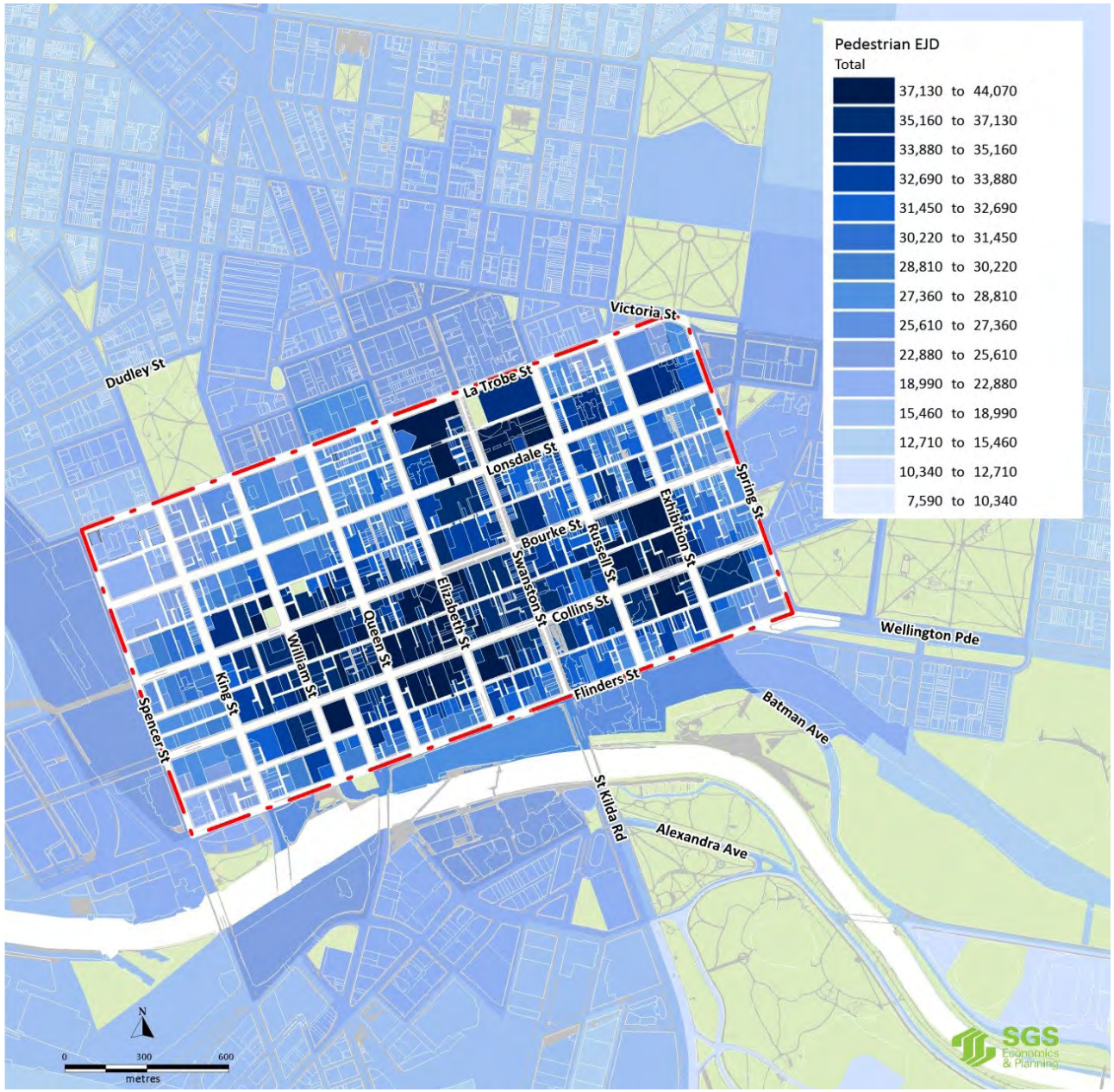
The areas within the CBD best connected to jobs are located:

- at the eastern end of Collins Street (1)
- surrounding Melbourne Central and QV (2), and
- south of Bourke Street between William Street and Elizabeth Street (3).

The first two locations have high levels of walk connectivity – they provide a lattice of connectivity on which employment and economic activity can grow. The high Walk EJD of the third location is mostly related to the large number of jobs physically located there.

Further detail on the development of the Walk EJD score can be found in the Appendix.

FIGURE 7: Walk EJD score



Source: SGS Economics & Planning

02

Pedestrian connectivity is linked to economic activity

> If the Walk EJD for each travel zone within the CBD grid was reduced by 10 per cent, say through a commensurate reduction in accessibility, the value of the economy of the CBD grid would be reduced by $2.1 billion.

The Walk EJD score above is important as it proves to be a good predictor of where very productive businesses want to locate. This is consistent with the findings of agglomeration economics.

To measure the link between walking connections and productivity a 'rough' measure of labour productivity was produced. The approach is based on SGS estimates of average Gross Value Added (GVA) (the sum of wages and profits) per worker for each sector (see Table 2). For industrial sectors where no production is done in the CBD, head office employees are assigned the average GVA per worker, across all industries. Agriculture and Mining employment in the City of Melbourne was deemed to consist of purely office based employment. Figure 8 presents the average labour productivity per worker for buildings in the CBD grid.

Labour productivity is the value of production (GDP) per hour worked. Labour productivity reflects not only the contribution of labour, but is also influenced by the contribution of capital and other factors of production (land, labour, capital and enterprise).

TABLE 2: Estimated gross value added per worker

Industry	Average GVA per worker
Agriculture and Mining	$141,623
Manufacturing	$ 91,908
Electricity, Gas, Water and Waste Services	$ 91,908
Construction	$ 91,908
Wholesale Trade	$ 91,908
Retail Trade	$ 46,278
Food and Beverage Services	$ 21,329
Accommodation	$ 257,740
Transport, Postal and Storage	$ 91,908
Information Media and Telecommunications	$ 159,288
Rental and Hiring Services	$ 368,225
Real Estate Services	$ 368,225
Business Services	$ 141,623
Admin and Support Services	$ 91,908
Public Administration and Safety	$ 97,816
Education and Training	$ 29,120
Health Care and Social Assistance	$ 76,661
Arts and Recreation Services	$ 42,388
Other Services	$ 35,927

Source: SGS Economics & Planning

The measure is ‘rough’ as labour productivity requires hours worked as a measure of the labour input. This rough measure wouldn’t capture an instance where a worker (in the same industry) in one location worked 40 hours a week while a worker in another location worked 45 hours a week. However, there is a lack of data on hours worked at such a fine geographical level; furthermore, there is limited data explaining how industry GVA may vary across the CBD grid.

FIGURE 8: CBD Grid - Building labour productivity

Source: SGS Economics & Planning

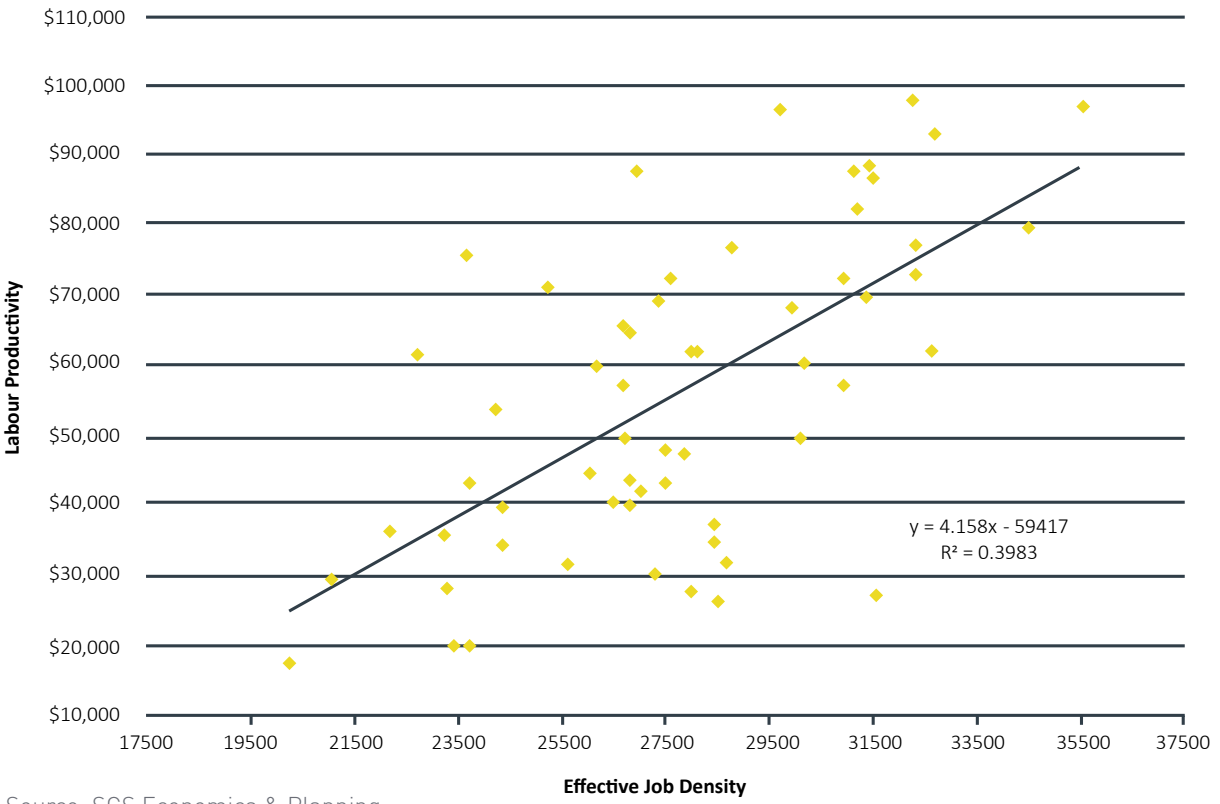
Figure 9 illustrates the relationship between Walk EJD and labour productivity for each block in the CBD. Blocks with higher Walk EJD tend to have higher levels of labour productivity. The variation in Walk EJD explains almost 40[2] per cent of the variation in labour productivity. This is a reasonably strong relationship considering all the other factors that influence labour productivity. The elasticity is 6.6 per cent. This observed relationship fits with the empirical findings from the agglomeration literature (see Table 3). For more information on this topic please refer to the COAG Reform Council Paper[3].

TABLE 3: Elasticity from other studies of agglomeration

Author	Elasticity	Location of Analysis
Graham (2006)	0.13	Uwnited Kingdom
Rawnsley & Szfraniec (2010)	0.08	Melbourne
Mare and Graham (2009)	0.07	New Zealand
Trubka (2009)	0.07	Australia
Ciccone (2000)	0.06	United States of America
Ciccone & Hall (1996)	0.05	European Union

Source: Various

FIGURE 9: Walk EJD and labour productivity



Source: SGS Economics & Planning

This relationship provides an opportunity to place an economic value on walking within the CBD grid.

Research indicates that locations with high levels of connectivity attract more productive firms. It should be noted that if walkability levels were to be reduced, a business could maintain its connectivity by relying on other transport modes (trams, taxis, bus, train, etc.); however, these alternatives would impose additional costs on the business.

[2]As measured by the R-Squared statistic.
[3]http://www.coagreformcouncil.gov.au/agenda/docs/cities/productivity_and_agglomeration_benefits.pdf

SGS has estimated that, in 2009-10, the value of the economy of the CBD grid was worth $32.8 billion (internal SGS analysis). If the Walk EJD for each travel zone within the CBD grid was reduced by 10 per cent, say through a commensurate reduction in accessibility, the value of the economy of the CBD grid would be reduced by $2.1 billion (a 6.6 per cent reduction in the value of the economy).

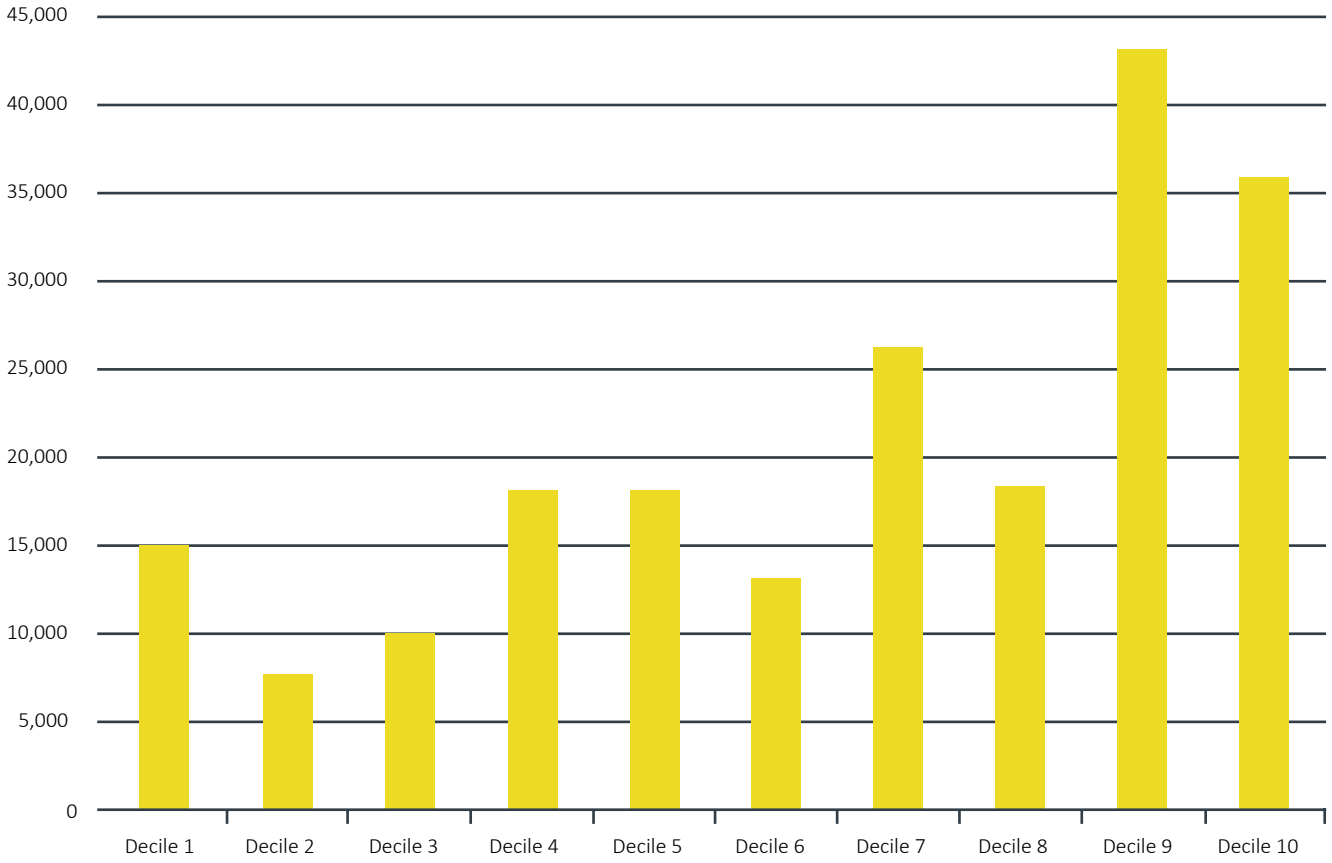
In simple terms, if the time taken for every walking trip in the CBD grid was increased by 10 per cent (via changes to light phasing or a reduction of walk speed due to congestion etc) then firms would be less inclined to interact with each other. This reduced interaction would lead to a decline in business activity, which would in turn lead to reduced income (GVA).

TABLE 4: Impact of reduced walking connectivity in CBD grid

Scenario	Impact $ million	% impact on economy of City of Melbourne
10 per cent reduction	2,179	6.6%
20 per cent reduction	4,563	13.9%
30 per cent reduction	6,947	21.1%

Source: SGS Economics & Planning

FIGURE 10: City of Melbourne employment growth 1996-2011, EJD decile



The link between connectivity and economic output grows over time, because better-connected areas tend to grow faster.

Figure 10 is based on EJD analysis using private car and public transport at a metropolitan scale. It presents employment growth in each EJD decile across the whole of Melbourne between 1996 and 2011. This indicates that places with high connectivity encourage the growth of employment and economic activity. It is likely a similar relationship exists between Walk EJD and employment growth.

03

Modelling change scenarios

> This reduced interaction would lead to less business activity which leads to a reduced income for Melbourne.

Three specific scenarios were developed to further demonstrate the value of walking to the City of Melbourne's economy:

- Improving connectivity across **King Street**, reducing delays for pedestrians (**Figure 11**)
- Creating a **high level of connectivity** for each block (see **Figure 12**).
- Removing **existing through block links** within the CBD grid (see **Figure 14**).

Highlighting the importance of walking to the CBD economy, if the walking connectivity within the CBD grid was reduced by 10 per cent, the value of the economy of the CBD grid would be reduced by $2.1 billion. This represents a 6.6 per cent reduction in the value of the economy. In simple terms, if the time taken for every walking trip in the CBD grid was increased by 10 per cent (via changes to light phasing or walk speeds were reduced due to congestion etc) then firms would be less inclined to interact with each other. This reduced interaction would lead to less business activity which leads to a reduced income for Melbourne.

These estimates should be treated as upper estimates, as businesses could maintain their connectivity in the face of reduced walkability by switching to other transport modes (trams, taxis, bus, train, etc.), albeit these alternatives would impose additional costs on businesses. The estimates do provide an indication of the scale of the value of walking to the economy.

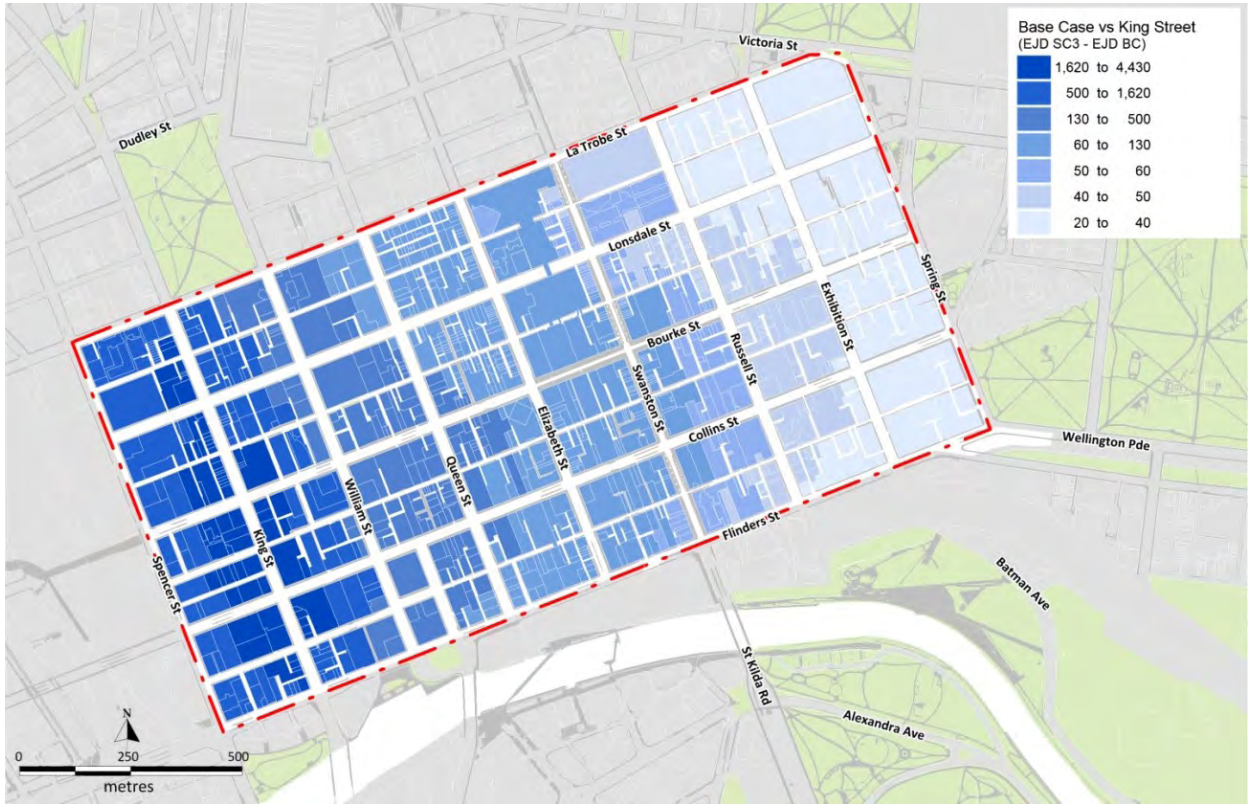
For each scenario, a new Walk EJD Index was created and compared to the base case Walk EJD Index. The impact of the three scenarios is presented in the following chapters.

3.1 King Street scenario

King Street is Melbourne's highest-traffic thoroughfare. What would be the effect of improving pedestrian access across it?

Figure 11 shows that better pedestrian connectivity across King Street would improve Walk EJD scores for the entire city. More jobs become accessible from more places, but the improved scores are concentrated along King Street. The value of the improved connectivity is estimated at $400 million.

FIGURE 11: King Street walk EJD index compared to base case



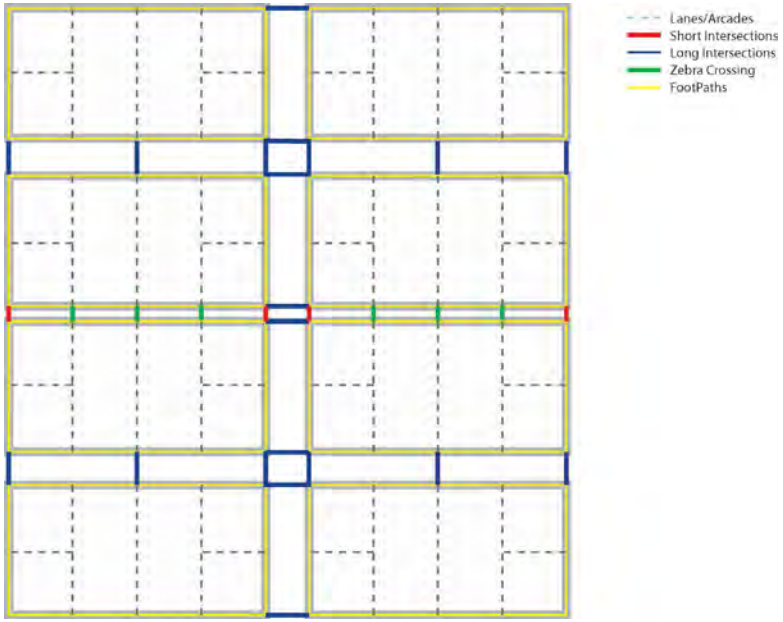
Source: SGS Economics & Planning

3.2 High connectivity scenario

Figure 12 illustrates a high connectivity scenario, which imagines good quality connections at all intersections as well as at mid-block points, lanes and arcades. Figure 13 shows the Walk EJD of this scenario compared to the base case Walk EJD.

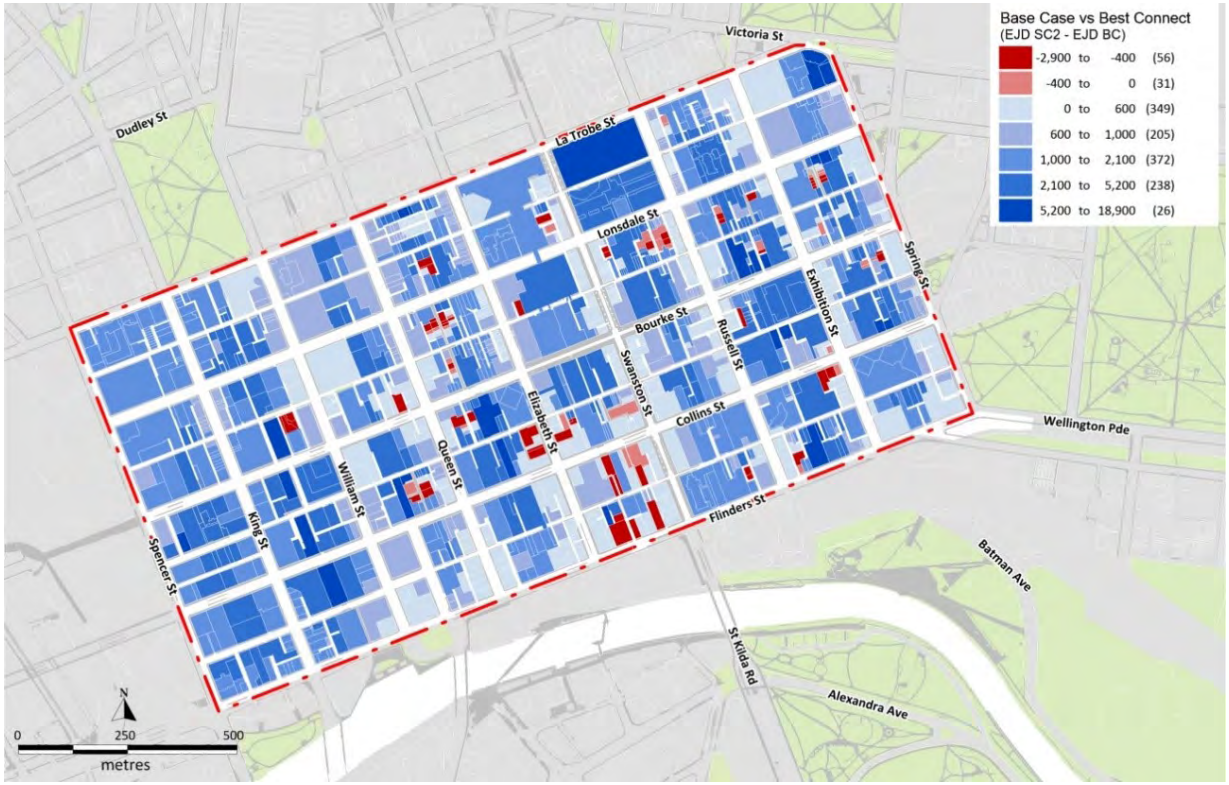
Figure 13 shows that introducing the high connectivity scenario would improve Walk EJD scores for most of the city, as more jobs are accessible from more places. Notable are the red areas, where the current linkages are superior to those imagined in the high connectivity scenario. The value of this scenario is estimated at $1.3 billion.

FIGURE 12: High connectivity scenario



Source: SGS Economics & Planning

FIGURE 13: High connectivity walk EJD score compared to base case



Source: SGS Economics & Planning

3.3 No laneways scenario

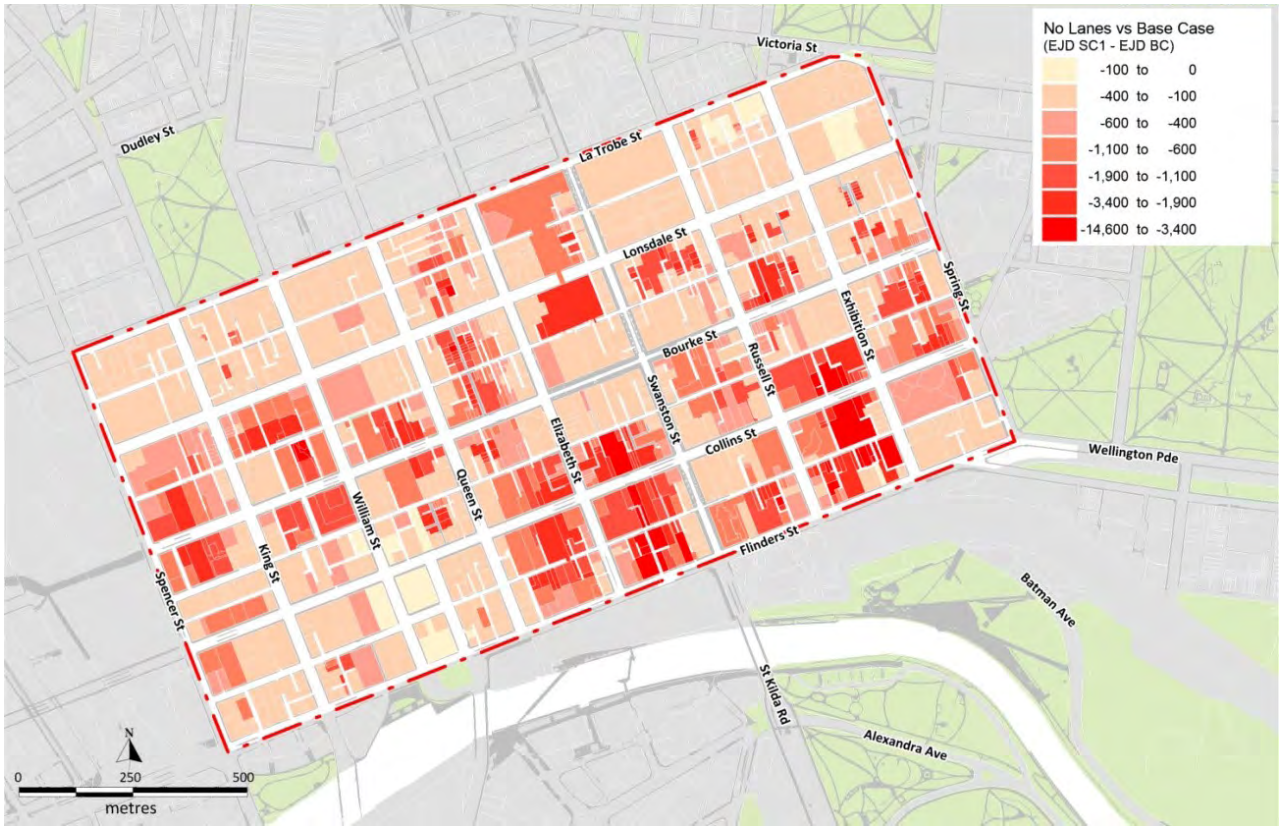
This scenario models the hypothetical scenario in which through block links are removed (ie. no laneways) (see Figure 14).

The red areas reveal the parts of the city in which laneways are currently very important in providing access to jobs. The value of the laneways is estimated at $600 million.

3.4 Value of scenarios

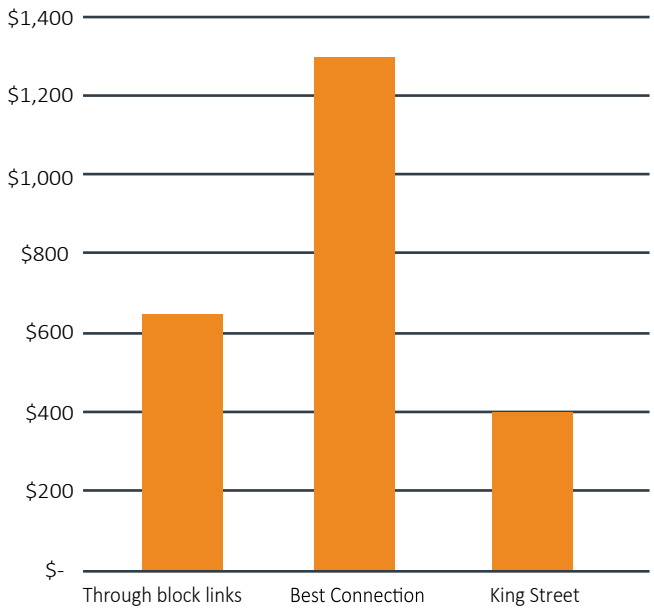
The economic value of each scenario is presented below (see Figure 15). Improving connectivity across King Street would add $400 million to the economy, through block links are worth over $600 million to the economy, while the best connection scenario is valued at almost $1.3 billion.

FIGURE 14: No laneways walk EJD index compared to base case



Source: SGS Economics & Planning

FIGURE 15: Impact on gross value added ($million 2009-10)



Source: SGS Economics & Planning

04 Expansion of area

> Melbourne’s CBD is not an island. It is networked into surrounding areas that are growing in economic importance.

Melbourne's CBD is not an island. It is networked into surrounding areas that are growing in economic importance.

Changes in pedestrian access inside the Hoddle grid can affect walkability outcomes from beyond the grid. Similarly, changes to pedestrian access outside the city proper can affect pedestrian accessibility within the grid. A complete assessment of the walkability of inner Melbourne must include inner suburbs.

Understanding the areas adjacent to the CBD is likely to become increasingly important as Melbourne grows. As metropolitan areas mature, those with a centralised economic structure, such as Melbourne, tend to see CBD activity extend into nearby suburbs, as emerging firms take advantage of lower rents on the CBD fringe.

These areas provide some of the benefits of a CBD location with lower cost. Over time, these inner locales can develop into industry clusters as they concentrate around existing businesses and facilities, thus expanding the area where agglomeration economies are achieved in Melbourne.

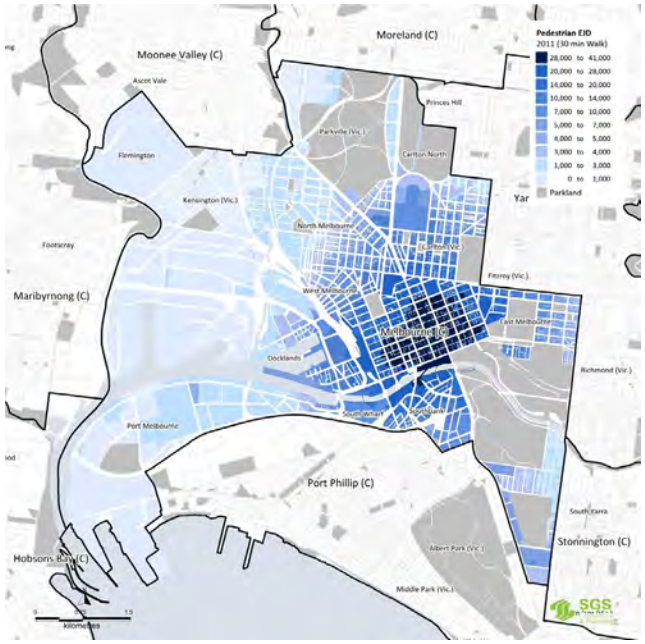
In order to capture the importance of the CBD's linkages with its surrounds, the Walk EJD score was applied to an expanded study area, covering the City of Melbourne Local government area.

The expansion of the study area considered accessibility to jobs as well as the impact of development of E-Gate. It adopted a similar methodology for determining walking travel time and Walk EJD, only this was calculated for the whole municipality.

The process of developing a model to expand the study area is explained in more detail in the technical appendices.

Figure 16 further illustrates accessibility to employment, using Walk EJD as a measure. The CBD has the highest density of jobs available within a 30 minute walk. Density gradually decreases towards suburbs surrounding the CBD, and is quite low in residential areas of Kensington and parts of North Melbourne and Parkville. Due to the land-intensive nature of employment in Port Melbourne, Walk EJD is quite low.

FIGURE 16: Walk EJD (2011)



Source: SGS Economics & Planning

FUTURE EMPLOYMENT

Using the current pedestrian network and employment projections for the City of Melbourne, employment density forecasts were developed for 2016, 2021, 2026 and 2031.

Using the revised employment density with the travel time matrix for pedestrians, Walk EJD forecasts were prepared. The following figure displays the change in Walk EJD for 2016, 2021, 2026 and 2031. Again, the most significant projected change is an increase in Walk EJD for North Melbourne.

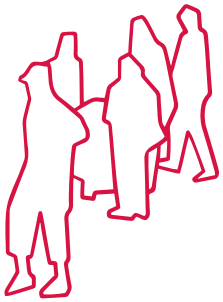
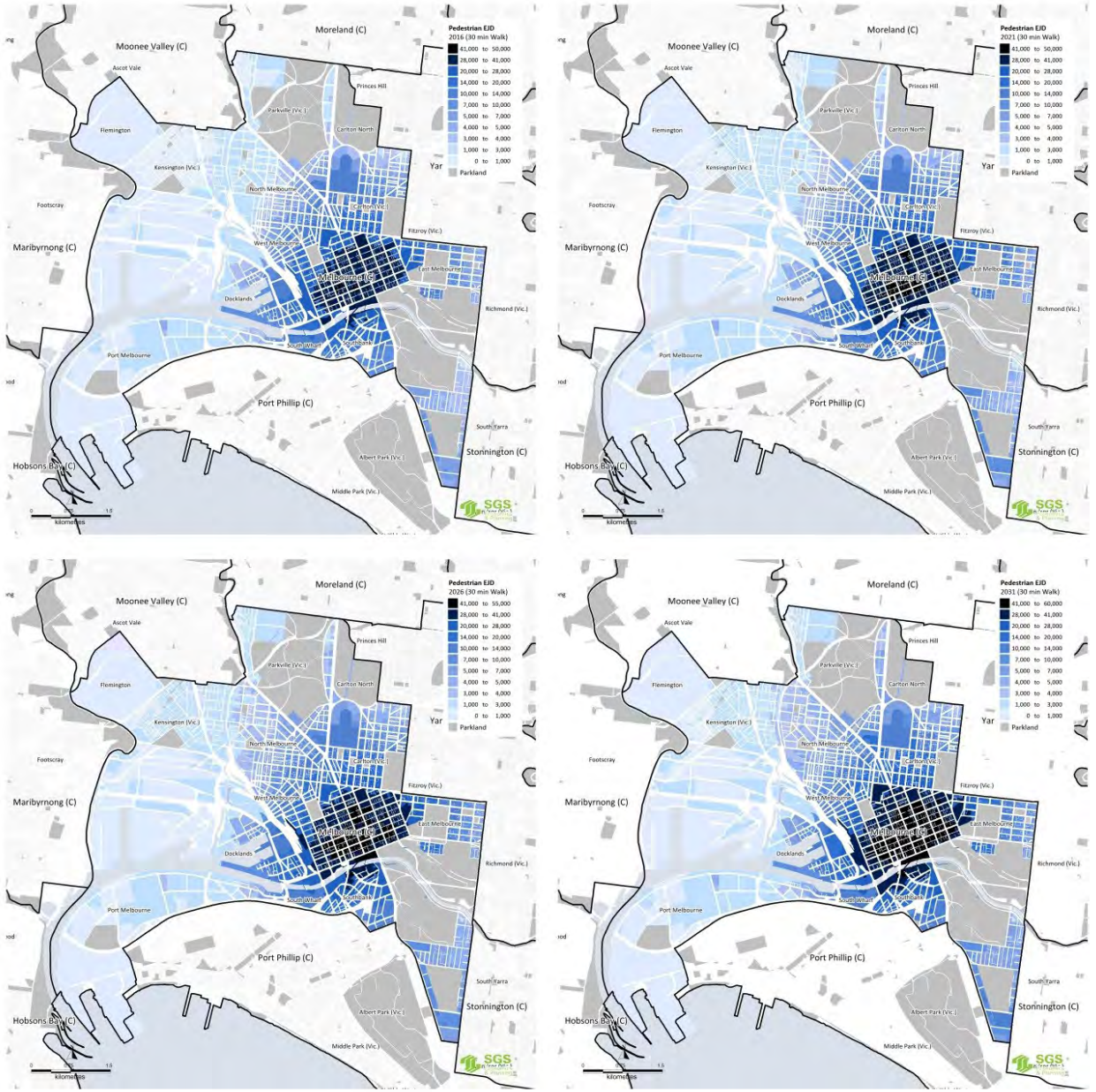


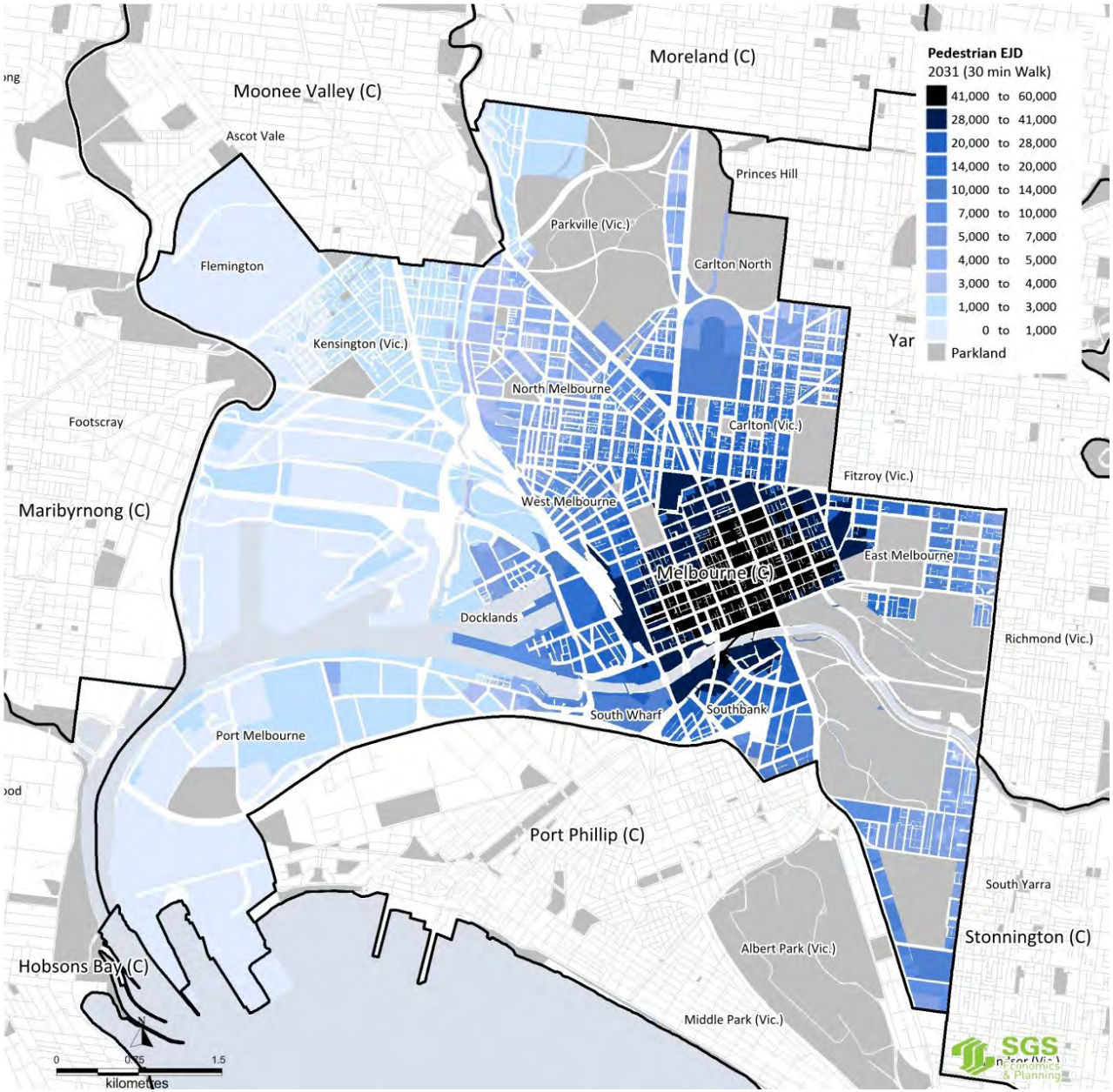
FIGURE 17: Future effective job density (2016-2031)



Source: SGS Economics & Planning

Figure 18 provides a more detailed look at Walk EJD in 2031, When North Melbourne is projected to improve to mirror the accessibility enjoyed by Carlton, West Melbourne and East Melbourne.

FIGURE 18: Walk EJD (2031)

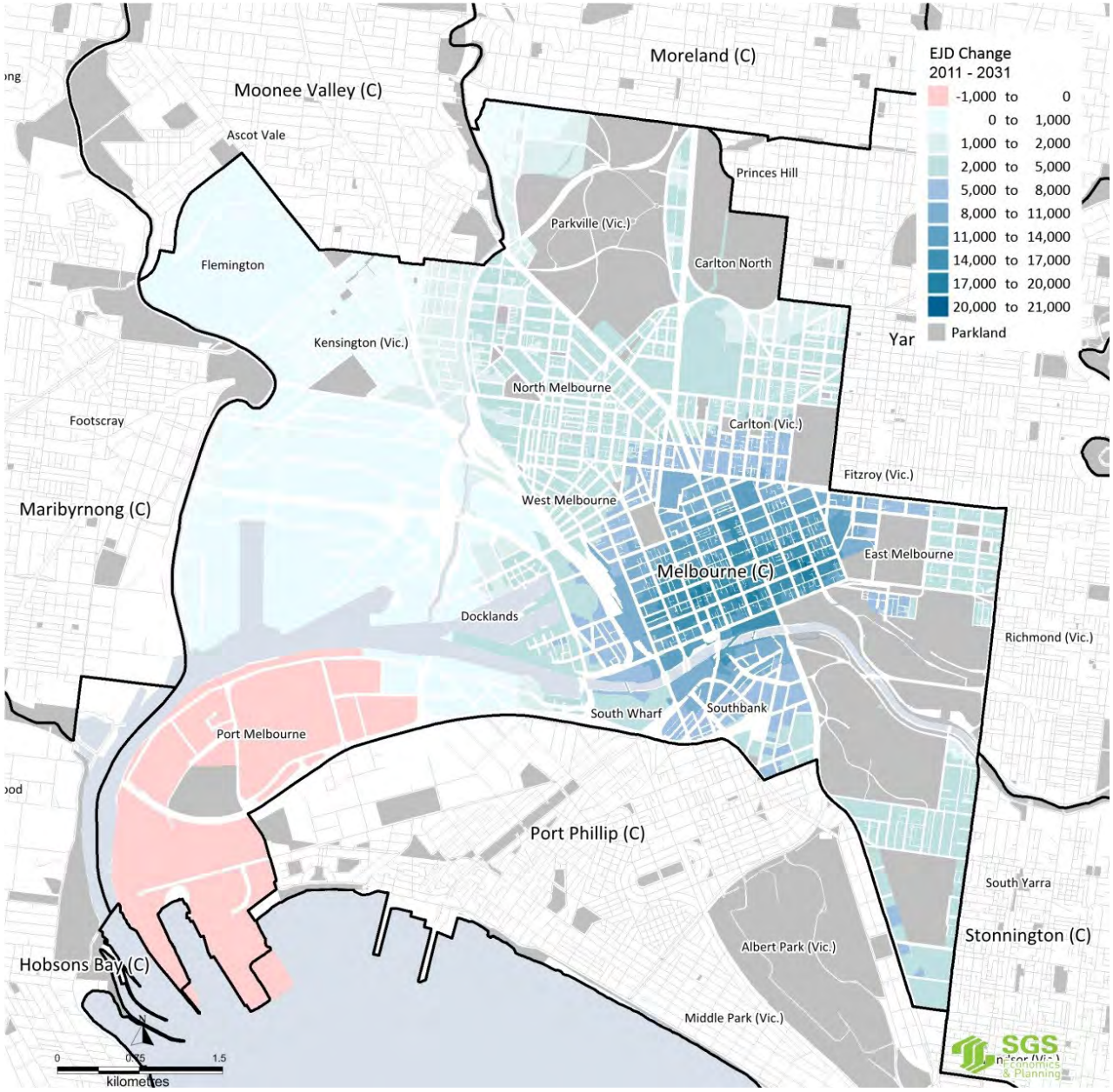


Source: SGS Economics & Planning

To further understand the change in Walk EJD, Figure 19 illustrates the uplift that is anticipated from 2011 to 2031. The map shows Walk EJD increasing most markedly in the CBD – due to the existing high levels of employment, this change is obscured in maps showing overall Walk EJD. This uplift is the result of a projected increase in the number of jobs and is not related to the pedestrian network. A reduction in employment over the 20 year forecast period shows a decrease in Walk EJD in Port Melbourne.

Note that analysis represented in Figure 19 does not model proposed changes to Fisherman's Bend.

FIGURE 19: Walk EJD change (2011-2031)



Source: SGS Economics & Planning

The model can also isolate the change in Walk EJD attributable to the development of the e-gate area to the north-west of Melbourne's CBD. Assuming two pedestrian links, marked in red in Figure 20, the new suburb contributes to a notable lift in walking accessibility to employment throughout West Melbourne and North Melbourne.

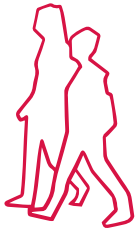
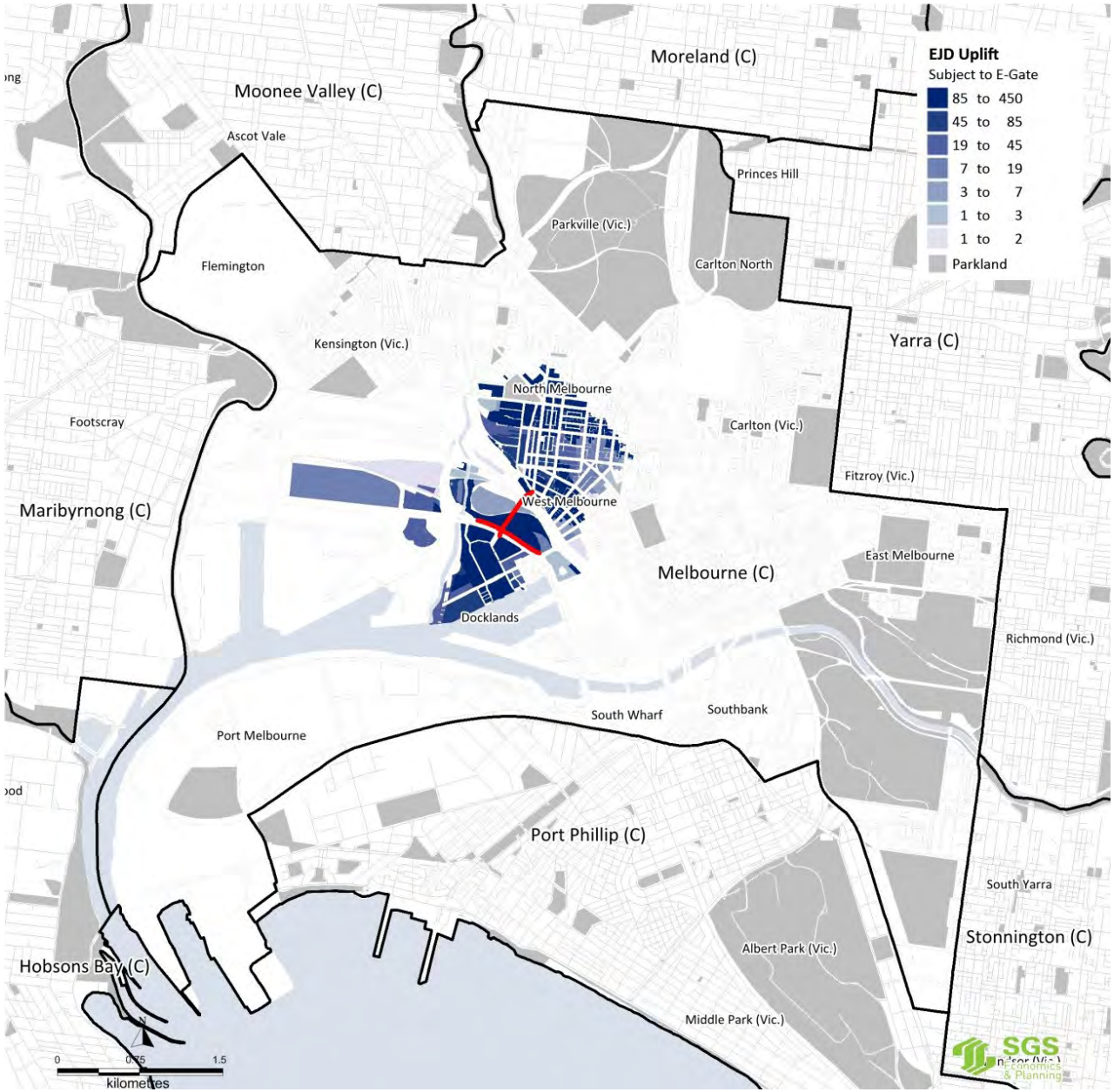


FIGURE 20: Change in walk EJD resulting from E-Gate



Source: SGS Economics & Planning

Technical Appendices and Additional Material

TRAVEL TIME MATRIX

The development of the Walk EJD score was an elaborate process.

Firstly, a travel time matrix was produced, involving three key tasks:

- defining the geographies to be used in the model
- designing a network to connect pedestrian trips, and
- connecting the network to the travel zones.

These tasks are described in more detail in the following section.

Travel zones

The project covers two areas, those within the study area (CBD grid) and those outside the study area (the surrounding area). The area outside of the CBD grid is used to provide an indication of the proximity of employment on the fringe of the CBD grid. For example, the corner of Swanston Street and Latrobe Street has a high degree of proximity to the jobs located at Melbourne University. To cover the data requirements of this step, three data sources were employed to develop travel zones for this analysis:

- **Property Boundaries** for the study area
- **CLUE Blocks** for areas located outside the study area, but within the City of Melbourne (for example Southbank and Docklands), and
- **Australian Bureau of Statistics (ABS) Statistical Area 1 (SA1)** for areas located within a 30 minute walk of the study area but outside the City of Melbourne (for example Fitzroy and South Melbourne).

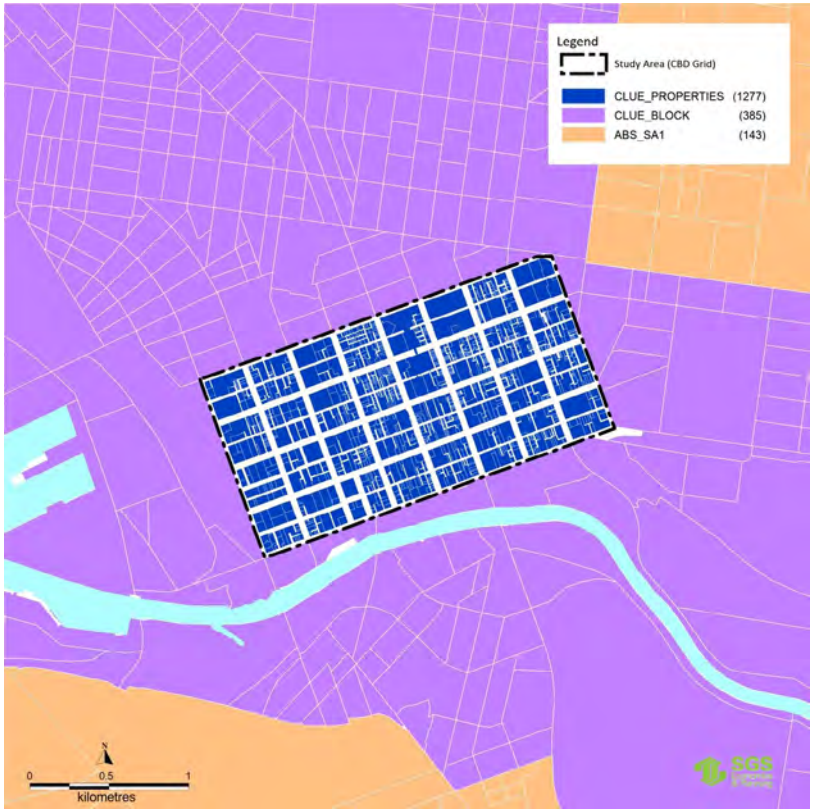
As shown in Table 5, there are a total of 1,805 travel zones included in the analysis. A graphic representation of the different zones is displayed in Figure 21.

TABLE 5: Travel zones

	Geography	Zones
Inside study area	Properties	1,277
	CLUE blocks	385
Outside study area	ABS-SA1	143
Total		1,805

Source: SGS Economics & Planning

TABLE 21: Travel zones



Source: SGS Economics & Planning

Source: SGS Economics & Planning

EFFECTIVE JOB DENSITY

EJD (w), known in technical terms as Effective Job Density, is a measure of connectivity of a location and can be used to understand the strength of agglomeration economies in a particular location. The term agglomeration is used in spatial economics to describe the benefits which flow to firms from locating in areas which have a higher density of economic activity.

The travel time matrix was combined with travel zone industry employment data to estimate a Walk EJD value for each travel zone in the CBD grid using the formula below. Travel zones are defined as:

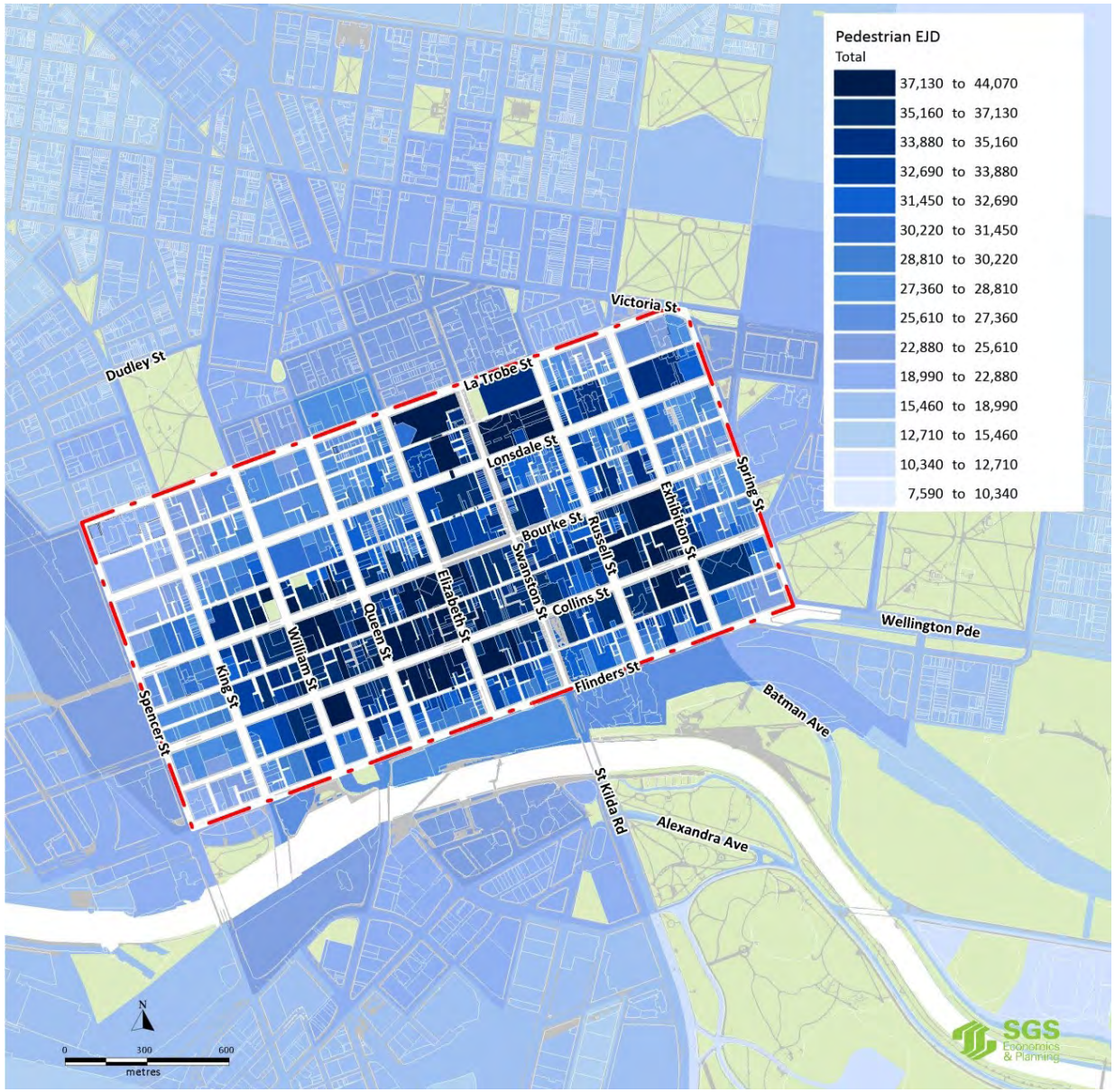
- CLUE Buildings (within the CBD grid)
- CLUE Blocks (for the rest of the City of Melbourne), and
- Australian Bureau of Statistics Statistical Area Level 1 (SA1) for areas outside of the City of Melbourne.

$$EJD_i = \sum_j \left(\frac{Employment_j}{Walk\ Travel\ Time_{ij}} \right)$$

That is, the effective job density (EJD_i particular travel zone (i) is a cumulative measure of the accessibility to all other jobs, determined by the sum of the number of jobs in each other travel zone scaled by travel time.

The number of jobs in each travel zone (denoted above as $Employment_j$ is the total number of jobs across all industries (including professional services, retail and so on).

FIGURE 22: Walk EJD



Source: SGS Economics & Planning

There are two drivers behind Walk EJD – the physical clustering of jobs and the ease of walking between jobs (i.e. connectivity). Figure 25 shows the employment density for a location using this formula:

$$\text{Employment Density}_i = \left(\frac{\text{Employment}_i}{\text{Land Area}_i}\right)$$

This represents a more traditional employment density (i.e. jobs per hectare). However, does not consider if there are many/few jobs within close proximity of the particular location. Land area is equal to lot area.

Presented in Figure 26 is the walk connectivity for a location using this formula:

$$Walking\ Connectivity_i = \sum_j \left(\frac{Land\ Area_j}{Walk\ Travel\ Time_{ij}}\right)$$

This effectively weights all of the land around a particular location by the time taken to walk to it. The result is an index of connectivity. A higher score represents improved walking connectivity and a lower score represents relatively poorer walking connectivity.

Figure 23 illustrates the distribution of jobs and job density, that is, the number of jobs per hectare. Figure 24 illustrates the floor area that can be reached within a 30 minute walk scaled by the distance to each land parcel. Together, the two maps show that the high employment density exhibited in the south western segment of the grid is a reflection of the large number of jobs that are clustered in that precinct (Figure 23); however, walking between jobs in this area of the CBD is relatively more difficult when compared to the eastern end of the CBD, where high Walk EJD is predominately driven by high walk accessibility.

FIGURE 23: Employment, distribution and density

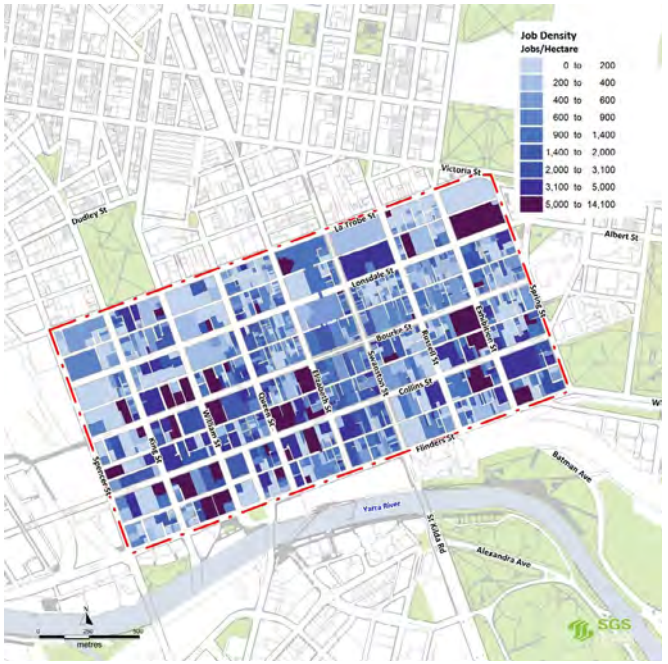


FIGURE 24: Walking connectivity, effective job density

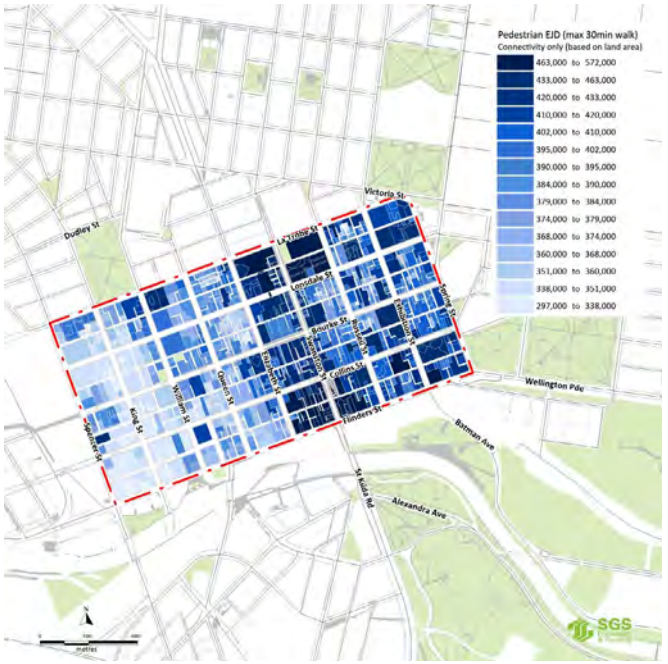
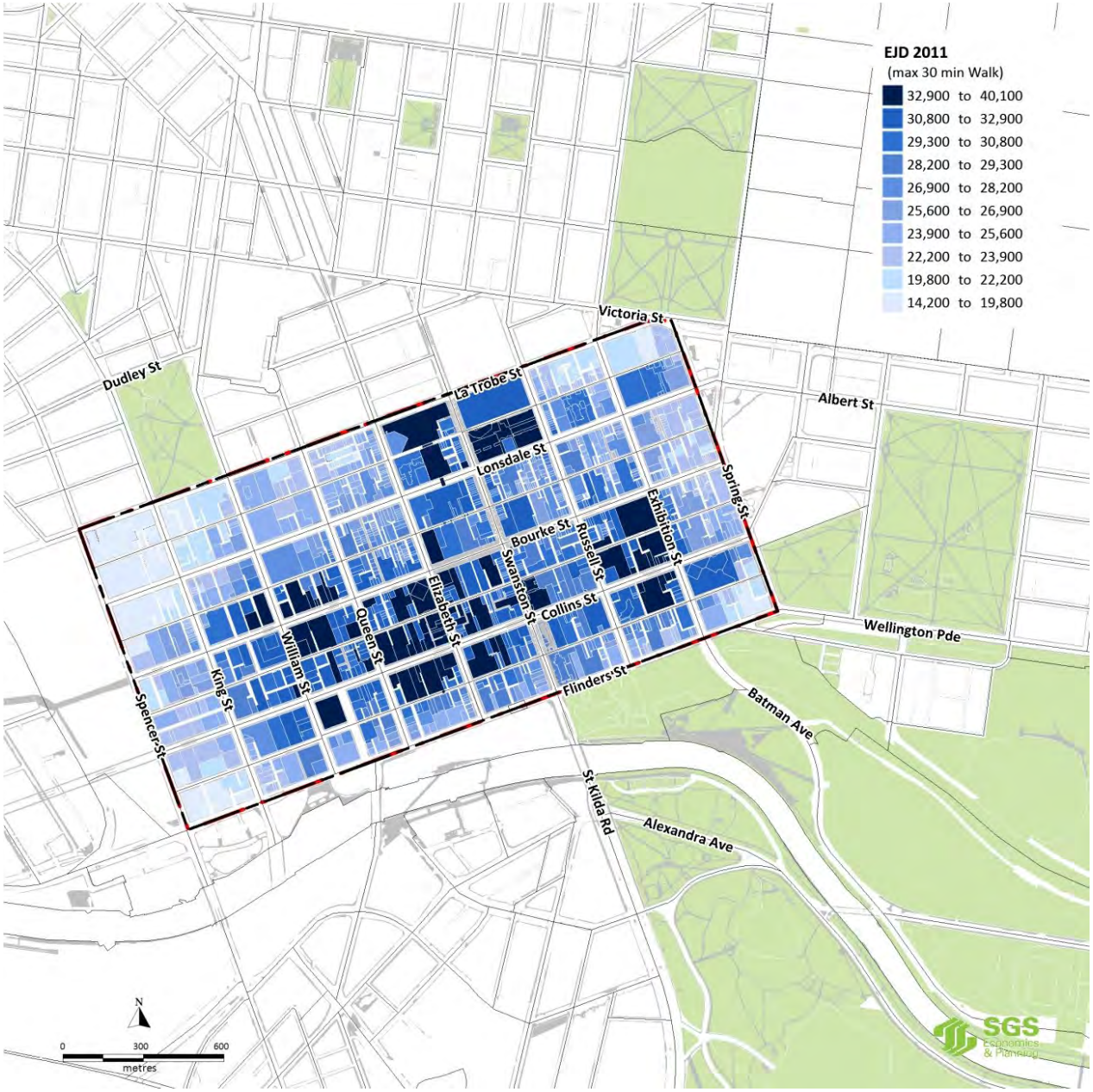
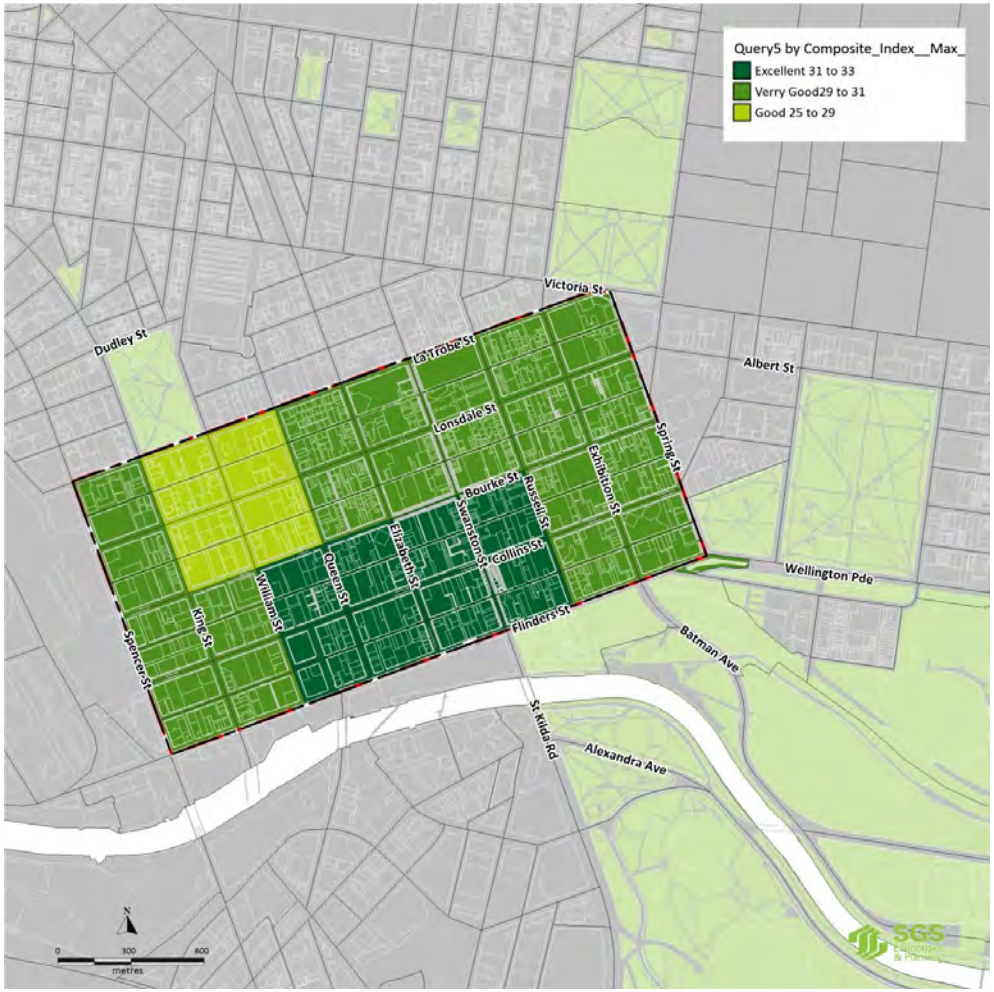


FIGURE 25: Walk EJD



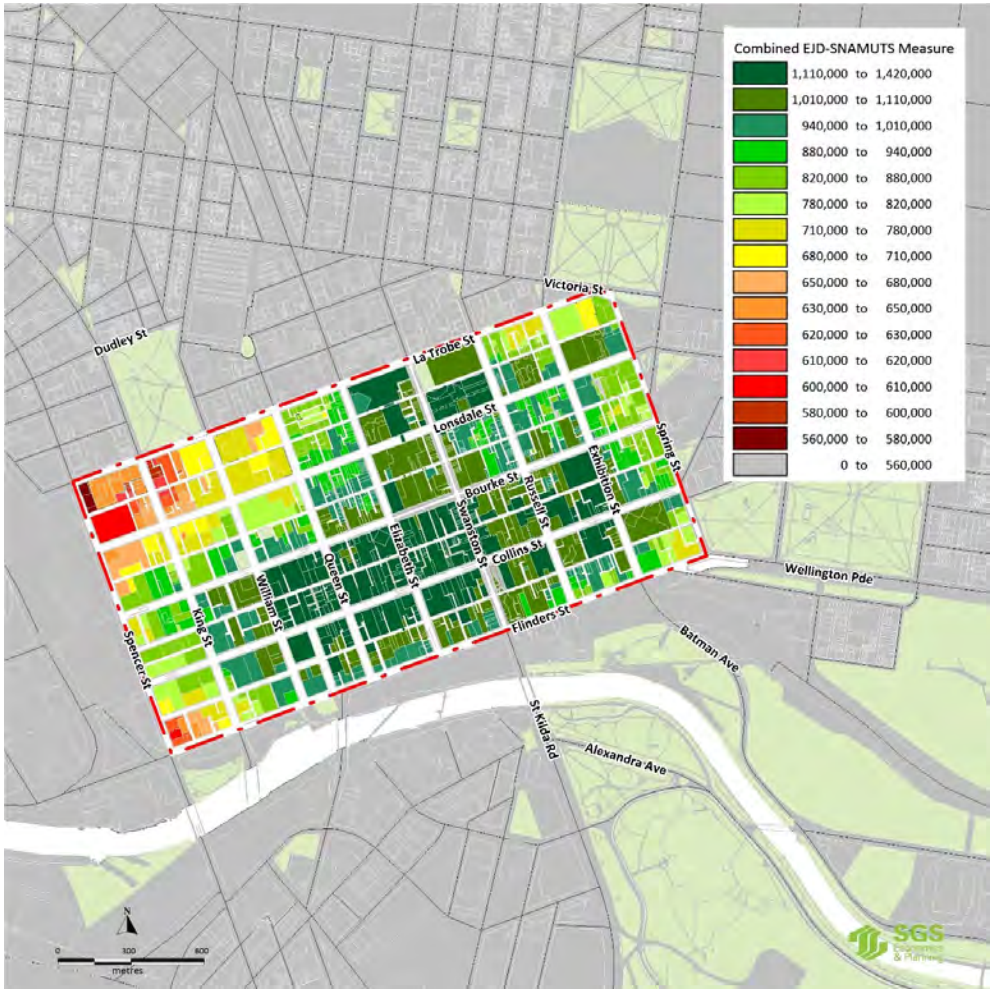
Source: SGS Economics & Planning

FIGURE 26: SNAMUTS Measure



Source: SGS Economics & Planning

FIGURE 27: Combined walk EJD=SNAMUTS Measure



Source: SGS Economics & Planning

To further understand the connectivity within the CBD grid, the Walk EJD was combined with the SNAMUTS (Spatial Network Analysis for Multimodal Urban Transport Systems).

Figure 27 shows a combined Walk EJD-SNAMUTS measure obtained by multiplying Walk EJD and SNAMUTS values for each property. This highlights areas which have both high connectivity via walking and high connectivity via public transport.

When the SNAMUTS is incorporated with Walk EJD, the areas with high connectivity within the CBD grid are extended. The length of Bourke Street, Collins Street and Flinders Street are seen to have higher connectivity, as do Spring Street, Elizabeth Street and Swanston Street. This is no doubt a result of the regular tram services along these routes. Conversely, the north-west corner of the CBD grid has poor connectivity, having low Walk EJD and SNAMUTS scores.

OTHER ANALYSES

The pedestrian network developed allows a range of different walking accessibility analyses to be undertaken. Travel time has been limited to a 30 minute walk and a range of scenarios have been tested. These include:

- access to parkland
- access to land excluding parkland
- future employment density and Walk EJD using employment scenarios, and
- the impact of the E-Gate development on access and Walk EJD.

Access to parkland

Figure 28 illustrates access to parkland within a 30 minute walk. Areas which border Royal Park, the Botanic Gardens, Fawkner Park, the MCG and Treasury Gardens show the highest levels of accessibility. Notably, access to parkland in the west of the municipality is quite low, and is most pronounced in Docklands, South Wharf and West Melbourne.

Figure 29 illustrates the pedestrian network's accessibility to all land, excluding parkland, Accessibility in this scenario is markedly reduced in areas near parkland, such as in the south east of the LGA and in Parkville. Accessibility within the CBD remains relatively the same, reflecting the permeability offered by smaller streets and laneways. Access in areas of Kensington is very high quality because of the dense network of streets and pedestrian connections.

FIGURE 28: Accessibility to parkland

Source: SGS Economics & Planning

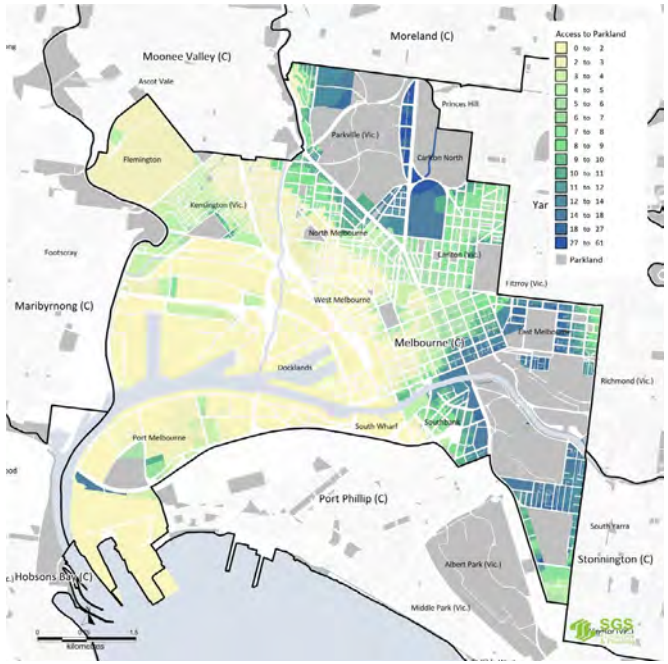
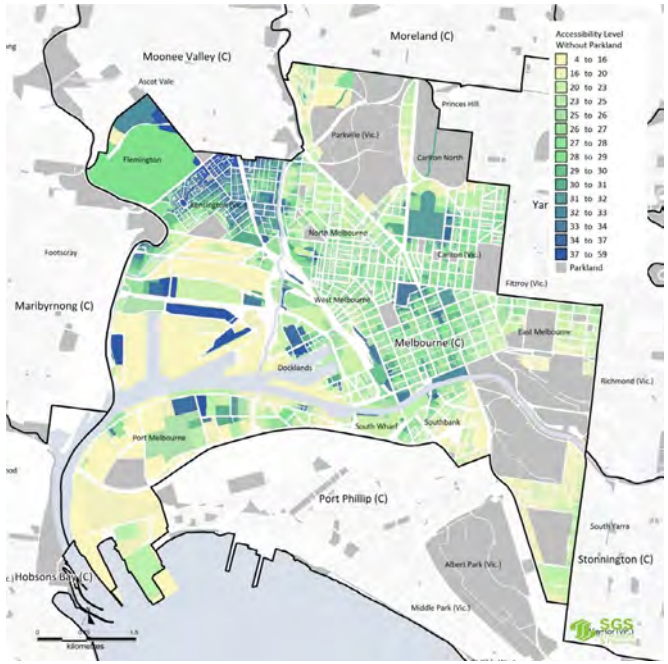


FIGURE 29: Accessibility to all land (excluding parkland)

Source: SGS Economics & Planning

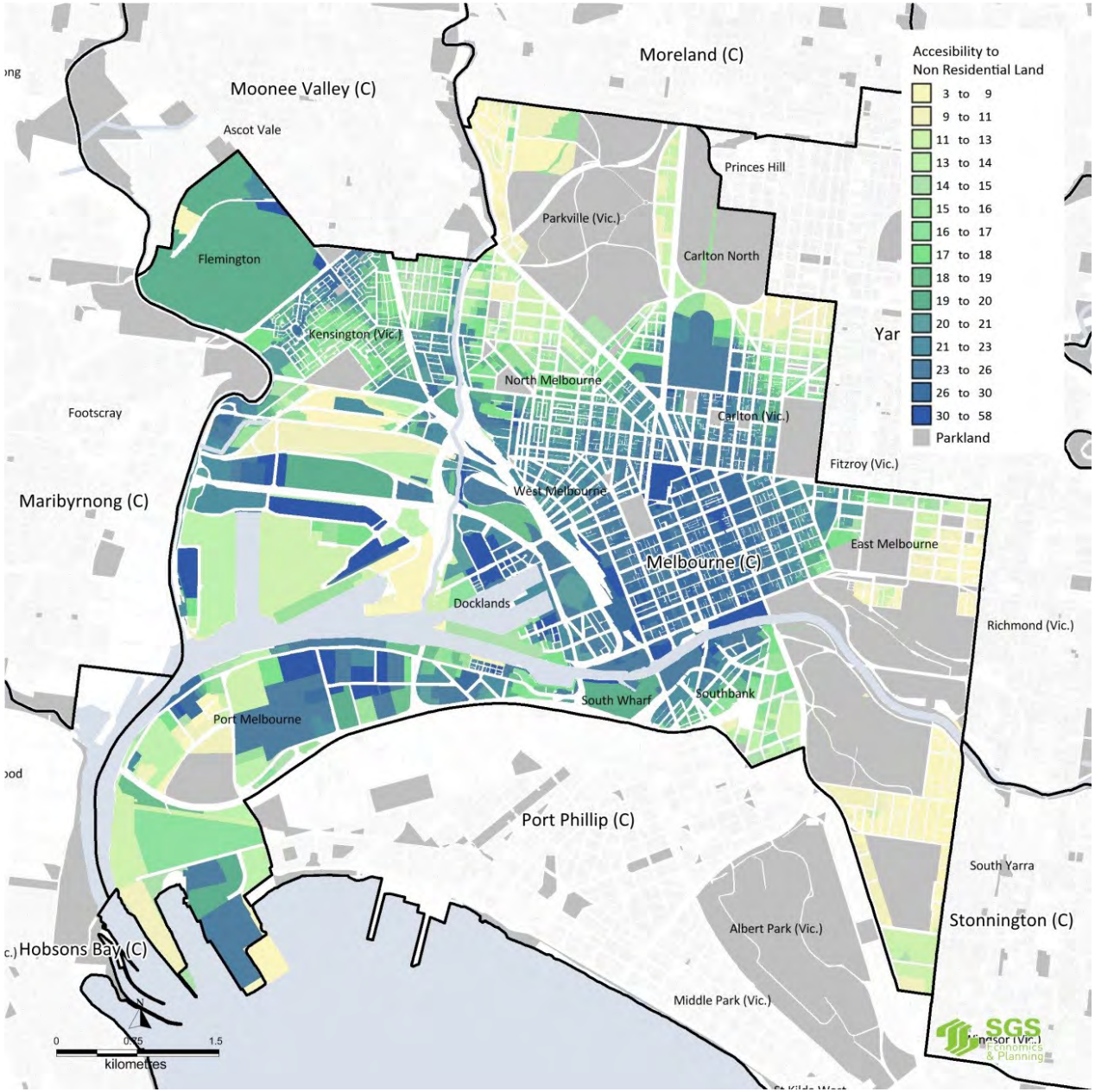


ACCESS TO EMPLOYMENT LAND

Current employment

Figure 30 illustrates the level of access to employment land within a 30 minute walk, as determined by land use zoning. The CBD, Docklands, Port Melbourne and southern parts of Carlton and North Melbourne have the highest accessibility. Lower accessibility is evident in the northern parts of Parkville, eastern parts of East Melbourne, North Carlton and South Yarra (those locations which fall within the City of Melbourne).

FIGURE 30: Access to employment land



Source: SGS Economics & Planning

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SGS Economics & Planning

Contact us

CANBERRA
Level 2, 28-36 Ainslie Avenue
Canberra ACT 2601
+61 2 6257 4525
sgsact@sgsep.com.au

HOBART
PO Box 123
Franklin TAS 7113
+61 421 372 940
sgstas@sgsep.com.au

MELBOURNE
Level 14, 222 Exhibition Street
Melbourne VIC 3000
+61 3 8616 0331
sgsvic@sgsep.com.au

SYDNEY
209/50 Holt Street
Surry Hills NSW 2010
+61 2 8307 0121
sgsnsw@sgsep.com.au