GOVERNMENT OF WESTERN AUSTRALIA

Department of **Planning, Lands and Heritage**

Western Australian Planning Commission

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Urban Growth Monitor

Perth Metropolitan, Peel and Greater Bunbury Regions

11

January 2020

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Published by the
Western Australian Planning Commission
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140 William Street
Perth WA 6000

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Published January 2020

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1 Executive summary

This is the 11th edition of the Western Australian Planning Commission's (WAPC) *Urban Growth Monitor*, which tracks land supply and land consumption through development for the Perth metropolitan, Peel and Greater Bunbury regions. This edition presents information relating to zoned land supply calculated as at 31 December 2018.

The analysis presented in this report may not precisely reflect the dynamics of urban growth at the time of publishing as the *Urban Growth Monitor* relies on a range of data sources, some of which are lagging data indicators. It's also important to note that the variety and complexity of information available for monitoring land supply continues to evolve. The model is, therefore, refined as new inputs and analytical techniques become available, to ensure a best-practice approach to understanding land supply is maintained.

The term 'land supply' can be used in a variety of contexts with different meanings and implications. The *Urban Growth Monitor* refers to land supply as the amount of undeveloped land zoned for urban purposes in a region scheme.

Residential land buyers, on the other hand, frequently use the term 'land supply' in reference to the number of developed and serviced lots available to purchase. In the context of the *Urban Growth Monitor*, this is viewed as 'lot supply' and an undersupply would be referred to as a 'lot shortage'.

In addition to the availability of land zoned for urban development, the *Urban Growth Monitor* provides information on:

- consumption rates of urban zoned land
- how long the current land supply will last
- residential dwelling density
- the rate of residential infill development in the Perth metropolitan and Peel regions.

1.1 Key findings

The tiered land supply assessment model used in the *Urban Growth Monitor* provides a detailed analysis of the stock of land zoned urban or urban deferred within the Metropolitan, Peel and Greater Bunbury region schemes. In 2018, there was a net gain of 2,710 hectares of land zoned for urban development across the three region schemes.

Based on historical land consumption rates (30 per cent infill/70 per cent greenfield), it would take approximately 33 years to fully consume the stock of undeveloped land zoned for urban development in the Perth metropolitan and Peel regions. The temporal land supply extends to 62 years under current policy targets (47 per cent infill/53 per cent greenfield), as identified in the *Perth and Peel@3.5million* suite of documents.

These estimates are based on the stock of land zoned for urban development as at 31 December 2018. They do not account for potential changes to the stock of undeveloped urban and urban deferred zoned land through rezonings or environmental requirements identified as part of future State and Commonwealth environmental approvals. The rates of consumption in each scenario allow for the full area consumed by urban development, including non-residential requirements such as schools, roads, reserves and commercial projects.

In addition to the stocks of land zoned for urban development under the Metropolitan and Peel region schemes, the *Perth and Peel@3.5million* suite of documents identifies how the city can accommodate a population of 3.5 million people. *Perth and Peel@3.5million* identifies an adequate supply of suitable land to support long-term strategic and sustainable development, and to encourage better use of existing infrastructure. Achieving the objectives described in *Perth and Peel@3.5million* will require increasing the level of infill in existing urban areas and promoting greater dwelling density in greenfield developments.

The average dwelling density of greenfield growth areas in the Perth metropolitan and Peel regions was 22.2 dwellings per net site hectare for dwellings constructed in 2018. This represents a significant increase, from approximately 15 dwellings per hectare in 2010, but remains slightly below the long-term strategic target of 26 dwellings per hectare.

The net infill rate, which accounts for demolition activity, for the Perth metropolitan and Peel regions was approximately 38 per cent in 2018, down from 42 per cent in 2017 and 41 per cent in 2016. The actual proportion of new dwelling creation that occurs in infill areas is expected to vary from year to year. Fluctuations can be attributed to factors such as dwelling demolitions, the number of background and major infill projects completed in the reporting year and the impact of major greenfield land releases.

The following points represent the key findings for each aspect of land supply reported in the *Urban Growth Monitor*.

Land zoned for urban development

- At the end of 2018, approximately 116,640 hectares of land in the Perth metropolitan, Peel and Greater Bunbury regions was zoned for urban development.
- Of this, 97,090 hectares (84 per cent) was located in the Perth metropolitan region, 9,140 hectares (eight per cent) in the Peel region and 8,990 hectares (eight per cent) in the Greater Bunbury region.
- In addition to these stocks, 1,430 hectares of land located within Redevelopment Authority areas but not zoned for urban purposes, was also identified and is included in the tiered land supply assessment.
- During 2018, scheme amendments delivered a 2,710-hectare net increase in the stock of land zoned for urban development under the Metropolitan Region Scheme.
- There was no change in the stock of land zoned for urban development within the Peel Region Scheme or the Greater Bunbury Region Scheme.
- Around 73 per cent (85,610 hectares) of the total land zoned for urban development was urbanised and 27 per cent (31,040 hectares) was non-urbanised.

Land consumption

- In 2018, 430 hectares of land within the Perth metropolitan, Peel and Greater Bunbury regions were consumed by subdivision, while 580 hectares were consumed by dwelling construction. This represents the lowest annual volume since monitoring commenced in both cases.
- In the 20-year period to 2018, an average of 880 hectares per annum of urban zoned land was consumed by subdivision, and 820 hectares per annum was consumed by construction in the Perth metropolitan and Peel regions.
- An average of 70 hectares per annum was consumed by subdivision in the Greater Bunbury region.
- If land consumption through urban development were to continue at a rate consistent with the 20-year average, it would take an estimated 33 years to entirely deplete existing stocks of undeveloped urban and urban deferred zoned land in the Perth metropolitan and Peel regions.
- If current policy targets for infill and density, as reflected in the *Perth and Peel@3.5million* suite of documents are achieved, annual zoned land consumption will decline, and the theoretical land supply would be extended to approximately 62 years.
- Based on the Greater Bunbury region's historical consumption rate, existing stocks of non-urbanised land could theoretically meet demand for the next 54 years.

Infill

- In the context of the *Urban Growth Monitor*, infill refers to the construction of new residential dwellings in urbanised areas that meet specific density criteria defined as part of the infill model.
- In 2018, a total of 13,820 dwellings were constructed in the Perth metropolitan and Peel regions. Of these, 6,540 were constructed in infill areas, and 7,280 constructed in greenfield areas.
- Net infill dwellings (dwellings constructed within infill areas minus the number of dwellings removed from the existing stock through demolition) totalled 4,440 in 2018.
- The net infill rate for the Perth metropolitan and Peel regions was approximately 38 per cent in 2018, down from 42 per cent in 2017.
- Of the 4,440 net infill dwellings, 3,090 were in the Central sub-region and 1,350 in the outer sub-regions of the Perth metropolitan and Peel regions.

Dwelling density

- The *Perth and Peel@3.5million* suite of documents sets a target of 15 dwellings per gross urban zoned hectare for new residential development which equates to 26 dwellings per net site hectare.
- The conversion of the established gross dwelling density measure to an equivalent number of dwellings per net site hectare allows for accurate reporting.
- The 'net site dwelling density by build year' is a measure of the average number of dwellings per net site hectare, based only on lots on which dwellings were constructed within each calendar year.
- The 'net site dwelling density by build year' for greenfield development areas in the outer Perth metropolitan sub-regions (including Peel) was 22.2 dwellings per net site hectare for 2018. This represents a significant increase, from approximately 15 dwellings per hectare in 2010, but remains slightly below the long-term strategic target of 26 dwellings per hectare.
- The 'net site dwelling density by build year' for all sites (including infill areas) in the Perth metropolitan region was 28.8 dwellings per hectare for 2018.

The *Urban Growth Monitor* is prepared on behalf of the WAPC to fulfil the requirements for tracking and modelling land supply as outlined in the *Planning and Development Act 2005*. It is a component of the Department of Planning, Lands and Heritage's Urban Development Program which reports on land demand factors, the supply pipeline, subdivision, housing activity and infrastructure.

2 Tiered land supply assessment

2.1 Introduction to the tiered land supply assessment

This section presents data on the tiered land supply assessment model, the central output of the *Urban Growth Monitor*.

The tiers can be summarised as follows:

Tier 1: stock of land potentially available for urban development (based on region scheme zoning)

Tier 2: development status of land zoned for urban development

Tier 3: land-use dynamics of land zoned for urban development, incorporating local planning schemes

Tier 4: spatial distribution of current residential subdivision approvals

Within the context of the *Urban Growth Monitor*, the term 'land zoned for urban development' is used to encompass the stock of urban and urban deferred zoned land under the Metropolitan, Peel and Greater Bunbury region schemes, unless otherwise stated. This, the 11th edition of the *Urban Growth Monitor*, presents information relating to land supply calculated as at 31 December 2018. The regional and sub-regional summarised outputs of the tiered land supply assessment are outlined in Appendix 1. A more detailed description of the four tiers can be found in the glossary of this document.

2.2 Tier one – land zoned for urban development

In 2018, the total stock of land zoned for urban development under the region schemes was approximately 115,220 hectares (ha). This is 2,710 hectares more than in 2017, with the total increase in stock of urban zoned land being within the boundaries of the Metropolitan Region Scheme.

The stock of land designated for urban development in redevelopment authority areas that exists outside of land zoned urban or urban deferred in the region schemes has not changed since 2017. Inclusive of the additional redevelopment authority areas, a collective stock of 116,640 hectares of land was identified for urban development across the three regions, as at 31 December, 2018 (Table 1).

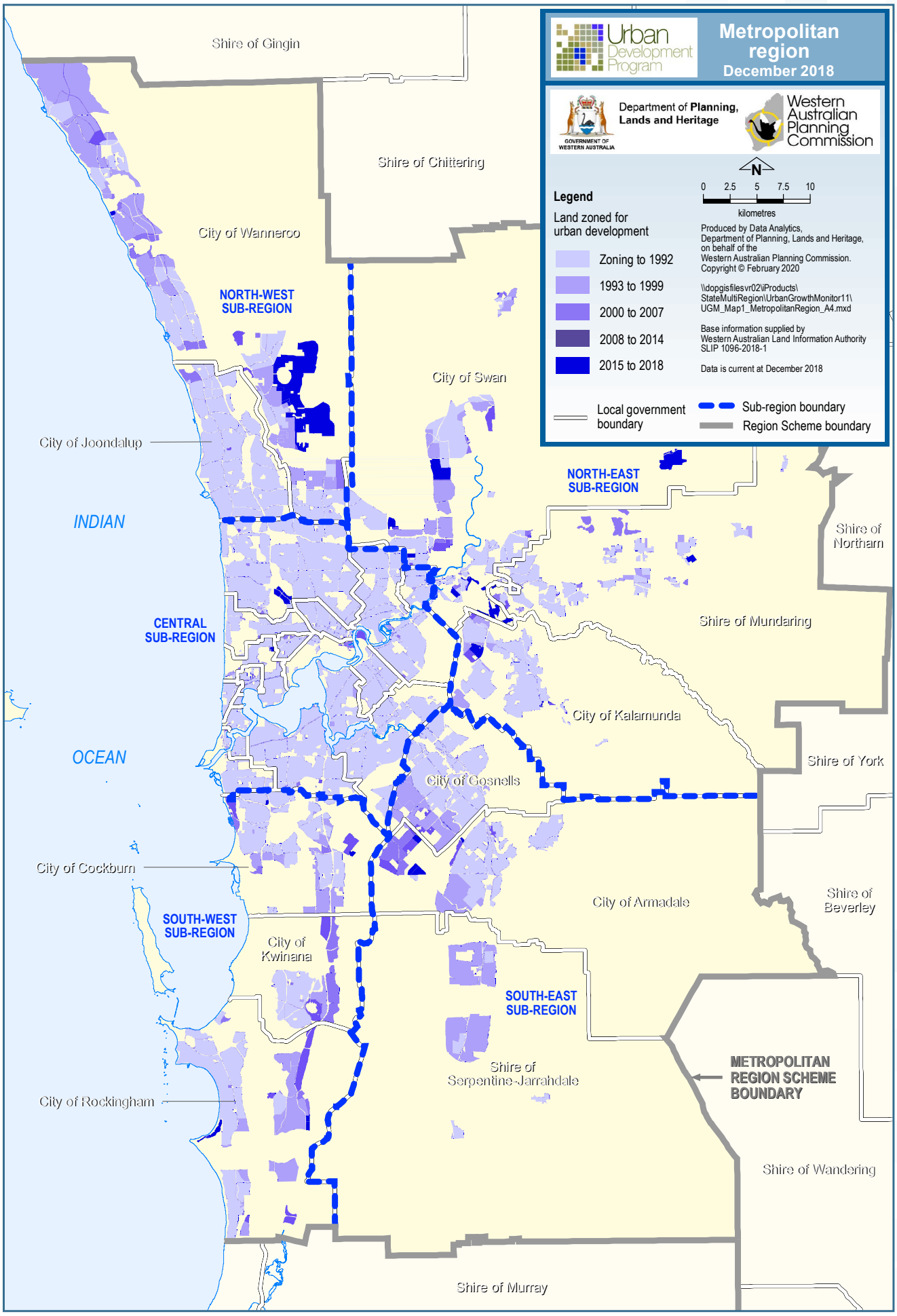
Table 1: Change in stock of land zoned for urban development

Region scheme	Description	Stock (ha) 2013	Stock (ha) 2014	Stock (ha) 2015	Stock (ha) 2016	Stock (ha) 2017	Stock (ha) 2018	Change (ha) 2017 to 2018
Metropolitan Region Scheme	Urban zoned land	88,240	88,680	89,400	89,690	89,880	90,520	630
	Urban deferred zoned land	4,940	4,810	4,790	4,530	4,490	6,570	2,080
	MRS subtotal	**93,170**	**93,490**	**94,190**	**94,220**	**94,380**	**97,090**	**2,710**
Peel Region Scheme	Urban zoned land	9,060	9,060	9,120	9,120	9,010	9,010	0
	Urban deferred zoned land	130	130	130	130	130	130	0
	PRS subtotal	**9,190**	**9,190**	**9,250**	**9,250**	**9,140**	**9,140**	**0**
Greater Bunbury Region Scheme	Urban zoned land	8,070	8,070	8,160	8,270	8,270	8,270	0
	Urban deferred zoned land	870	870	790	720	720	720	0
	GBRS subtotal	**8,940**	**8,940**	**8,960**	**8,990**	**8,990**	**8,990**	**0**
Total region schemes	Urban zoned land	105,370	105,810	106,680	107,080	107,170	107,800	640
	Urban deferred zoned land	5,940	5,810	5,710	5,370	5,340	7,410	2,080
	Total land zoned for urban development	**111,300**	**111,620**	**112,400**	**112,460**	**112,500**	**115,220**	**2,710**
Additional redevelopment authority land		–	–	–	–	1,430	1,430	0
Total zoned land available for urban development		**111,300**	**111,620**	**112,400**	**112,460**	**113,930**	**116,640**	**2,710**

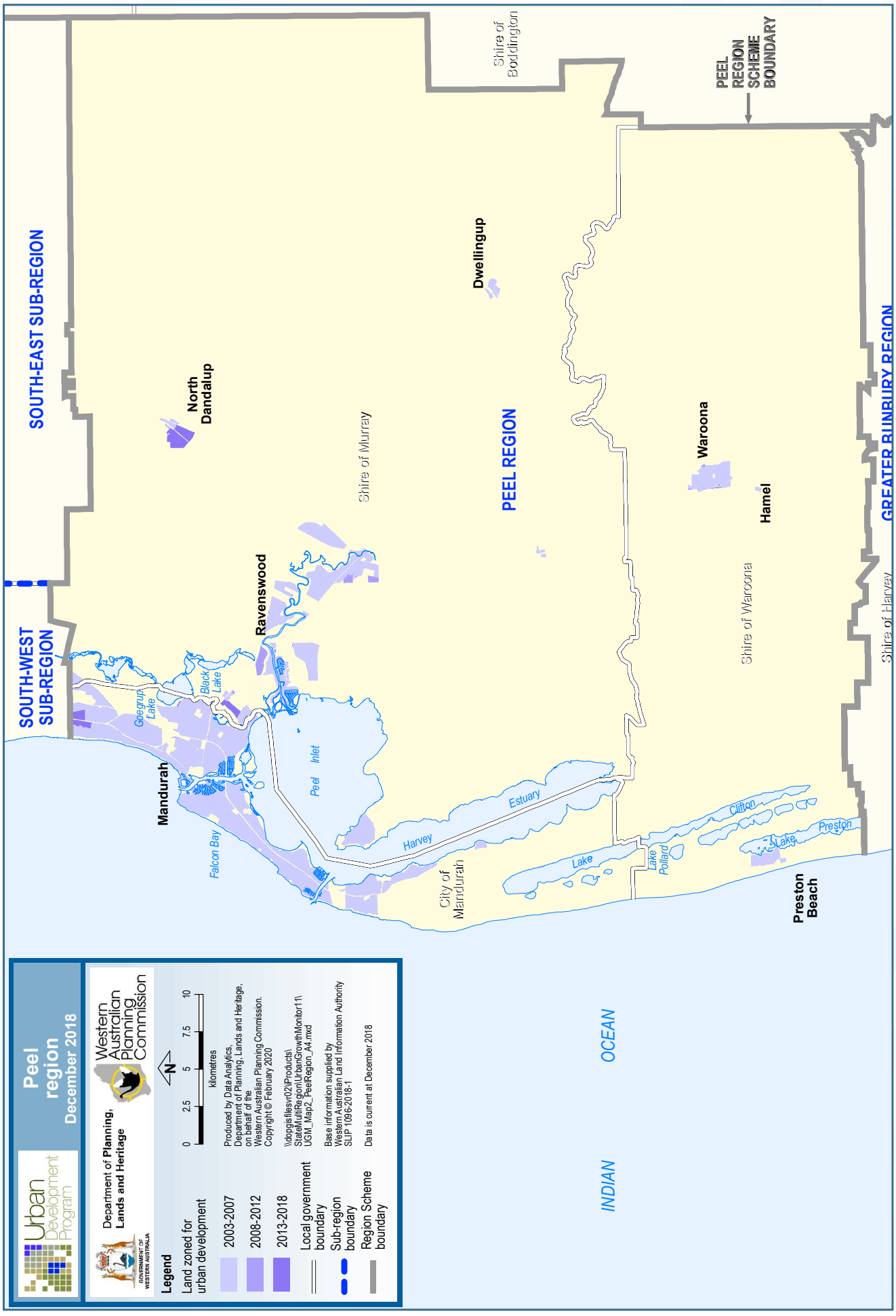
Source: Department of Planning, Lands and Heritage (2019)

Note: Figures may not sum due to rounding. Data calculated as at end of each calendar year. As the analysis of additional redevelopment authority land is a new addition for 2017 and onwards, there are no figures for previous years.

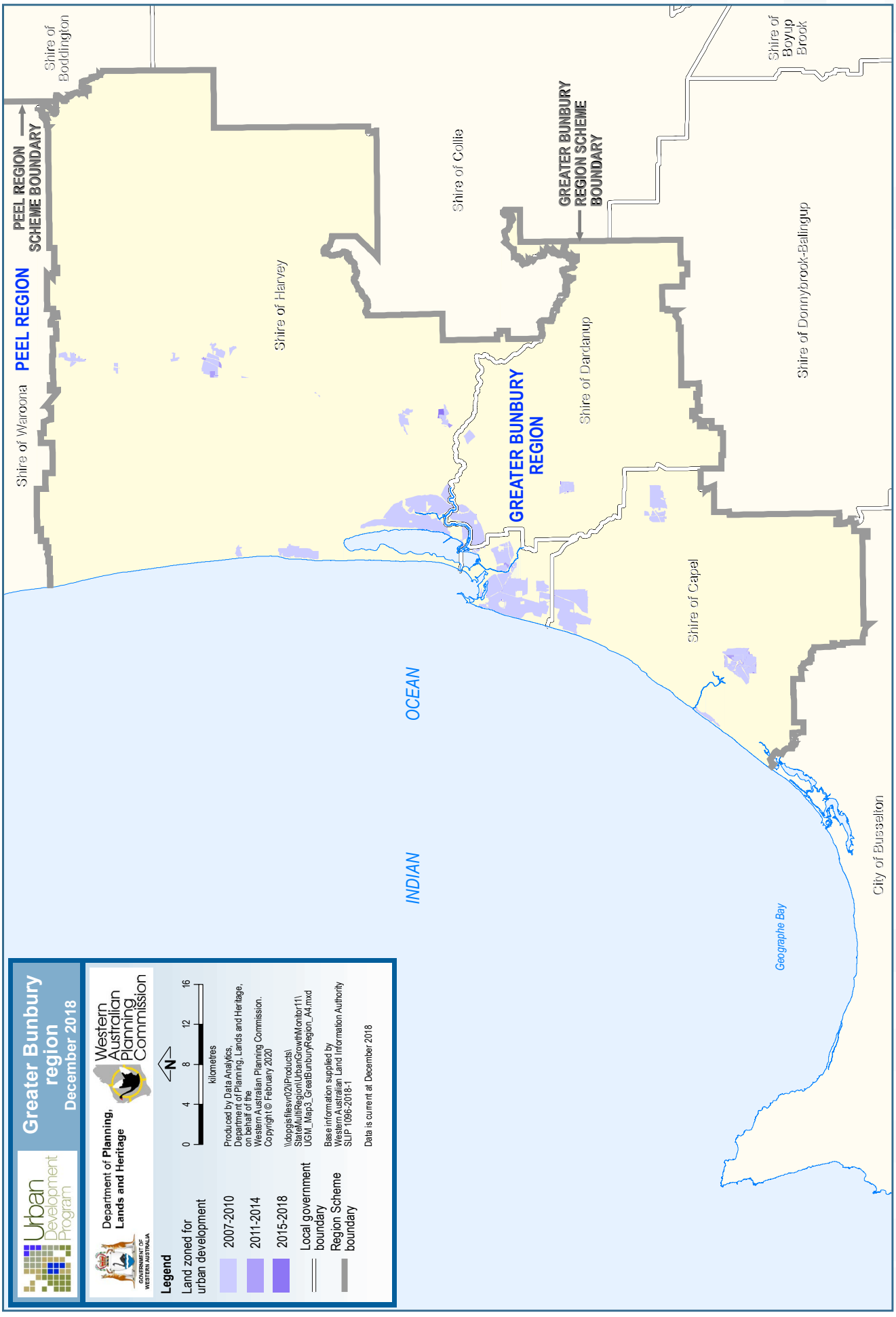
Map 1: Change in stock of land zoned for urban development over time – Perth metropolitan region



Map 2: Change in stock of land zoned for urban development over time – Peel region



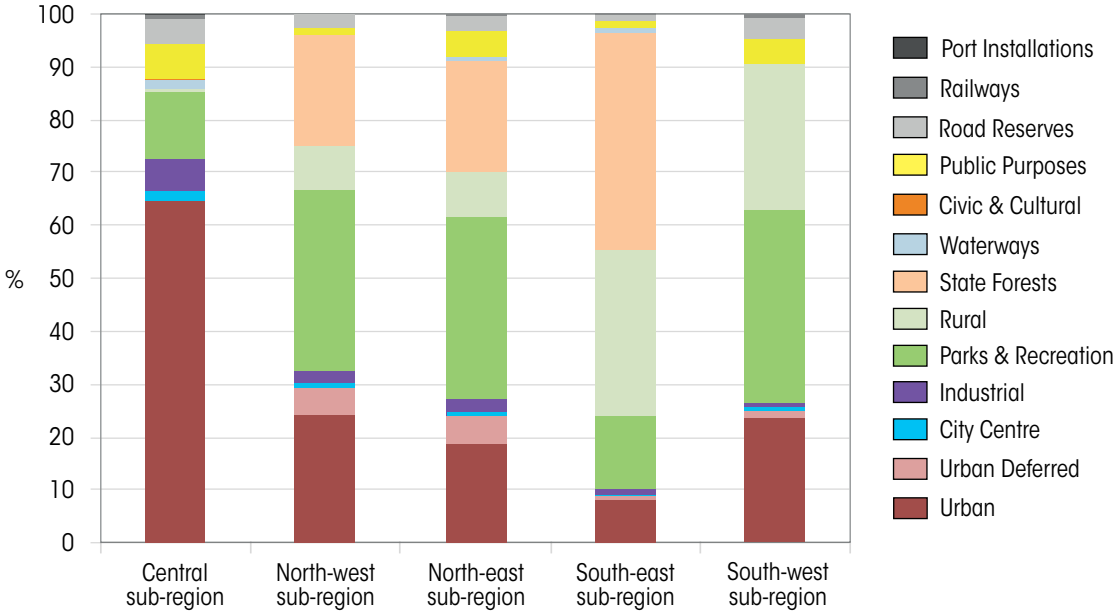
Map 3: Change in stock of land zoned for urban development over time – Greater Bunbury region



Metropolitan Region Scheme

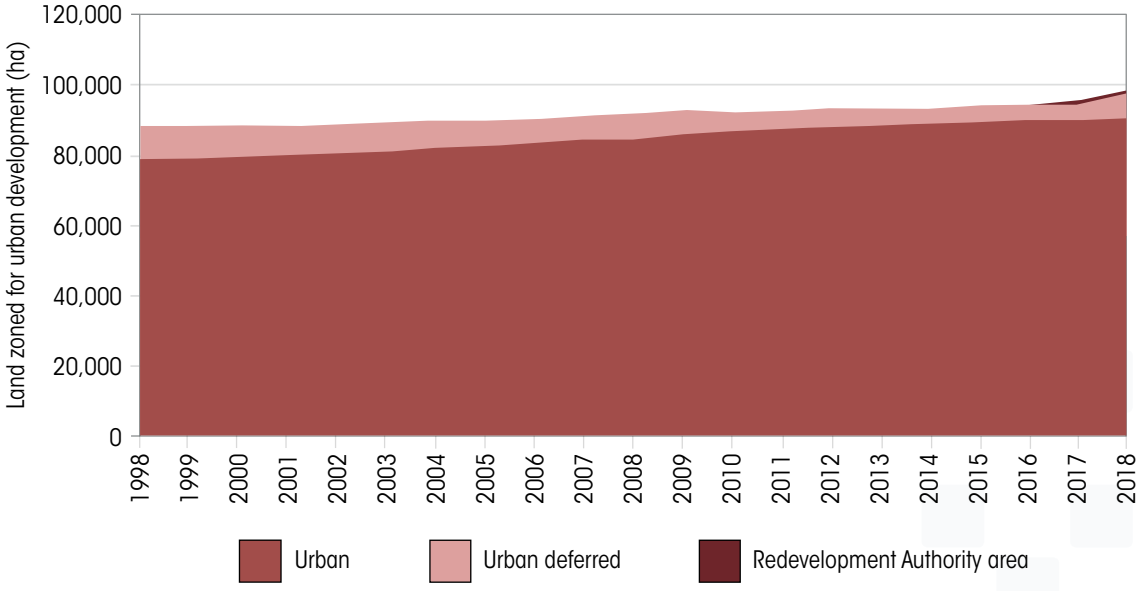
In 2018, the stock of urban and urban deferred zoned land accounted for around 18 per cent of the Metropolitan Region Scheme (MRS). The proportion of region scheme zones and reservations for each sub-region is shown in Figure 1. In 2018, there was a net increase of 2,710 hectares in the total stock of land zoned for urban development (Figure 2).

Figure 1: Metropolitan Region Scheme: Major land use zones and reserves



Source: Department of Planning, Lands and Heritage (2019)

Figure 2: Metropolitan Region Scheme: Urban and urban deferred zones 1998-2018



Source: Department of Planning, Lands and Heritage (2019)

Peel Region Scheme

The Peel Region Scheme (PRS) covers approximately 283,850 hectares, of which three per cent is zoned either urban or urban deferred. In 2018, there was no change in the stock of urban and urban deferred zoned land (Figure 3).

Greater Bunbury Region Scheme

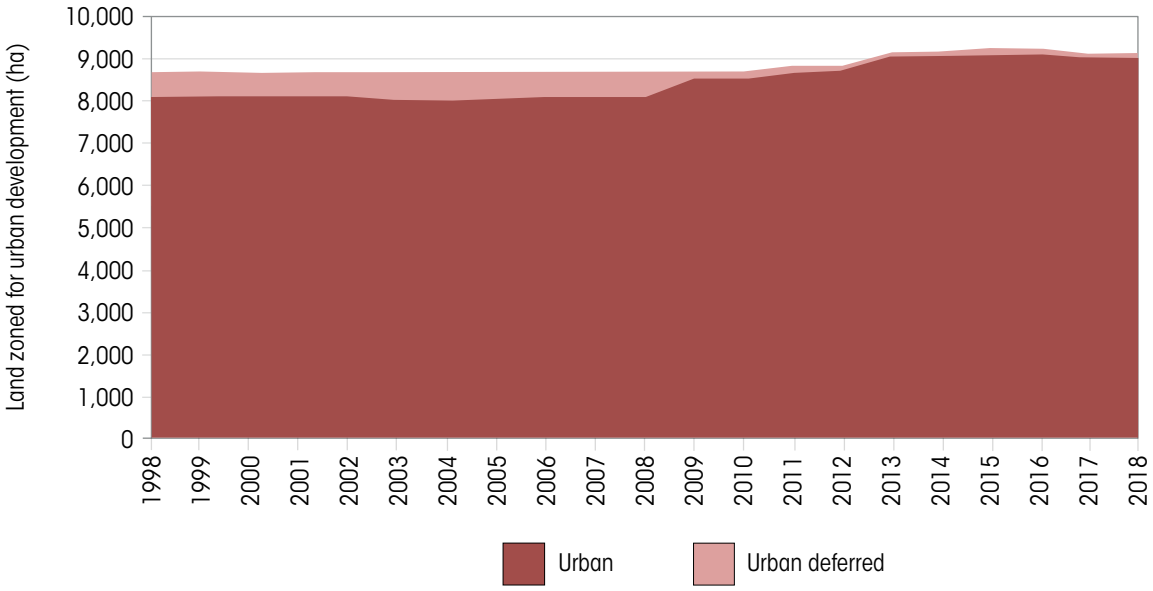
The Greater Bunbury Region Scheme (GBRS) encompasses approximately 288,440 hectares, of which three per cent is zoned for urban development. In 2018, there was no change in the stock of urban and urban deferred zoned land (Figure 4).

Redevelopment authority areas

The *Metropolitan Redevelopment Authority Act 2011* identifies land in the Perth metropolitan area for redevelopment and is governed by Development WA. The majority (69 per cent) of these areas coincide with land zoned urban, urban deferred or city centre under the MRS.

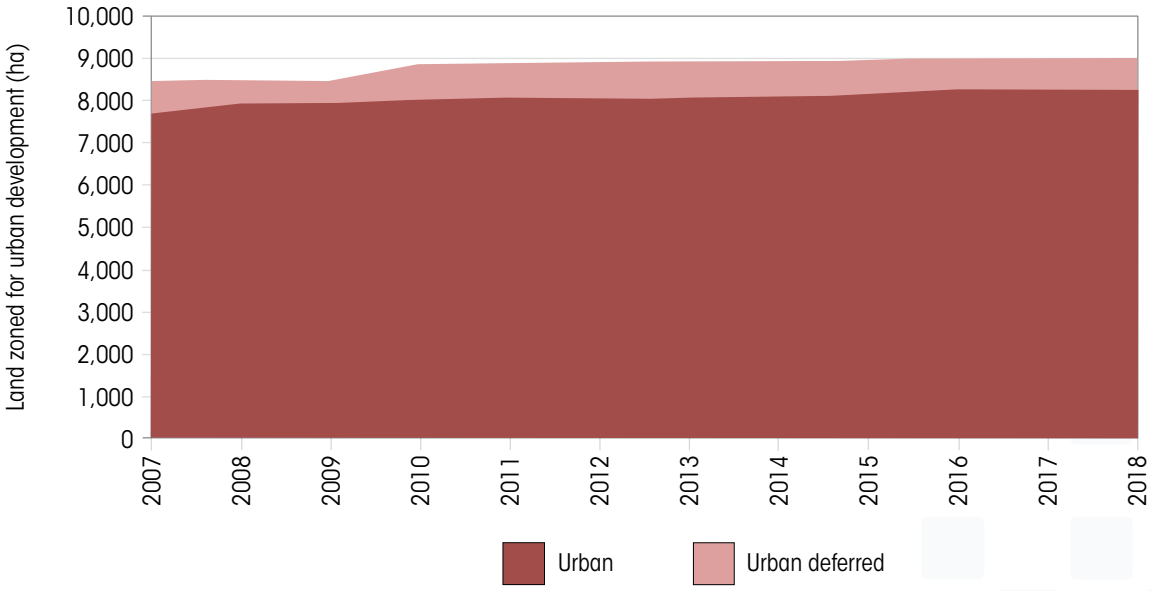
There is, however, a significant stock of land identified for urban development within redevelopment areas that is zoned for non-urban purposes under the MRS. Collectively, these areas add approximately 1,430 hectares to the total stock of land zoned for urban development in the Metropolitan region. Most of this additional stock is located within the Armadale redevelopment area.

Figure 3: Peel Region Scheme: Urban and urban deferred zones 1998-2018



Source: Department of Planning, Lands and Heritage (2019)

Figure 4: Greater Bunbury Region Scheme: Urban and urban deferred zones 2007-2018



Source: Department of Planning, Lands and Heritage (2019)

2.3 Tier two – development status of land zoned for urban development

2.3.1 Urbanised and non-urbanised land

Of the stock of land zoned for urban development, 85,610 hectares (73.4 per cent) is urbanised and 31,040 hectares (26.6 per cent) is non-urbanised. The degree of urbanisation varies substantially between regions and sub-regions (Table 2 and Figure 5).

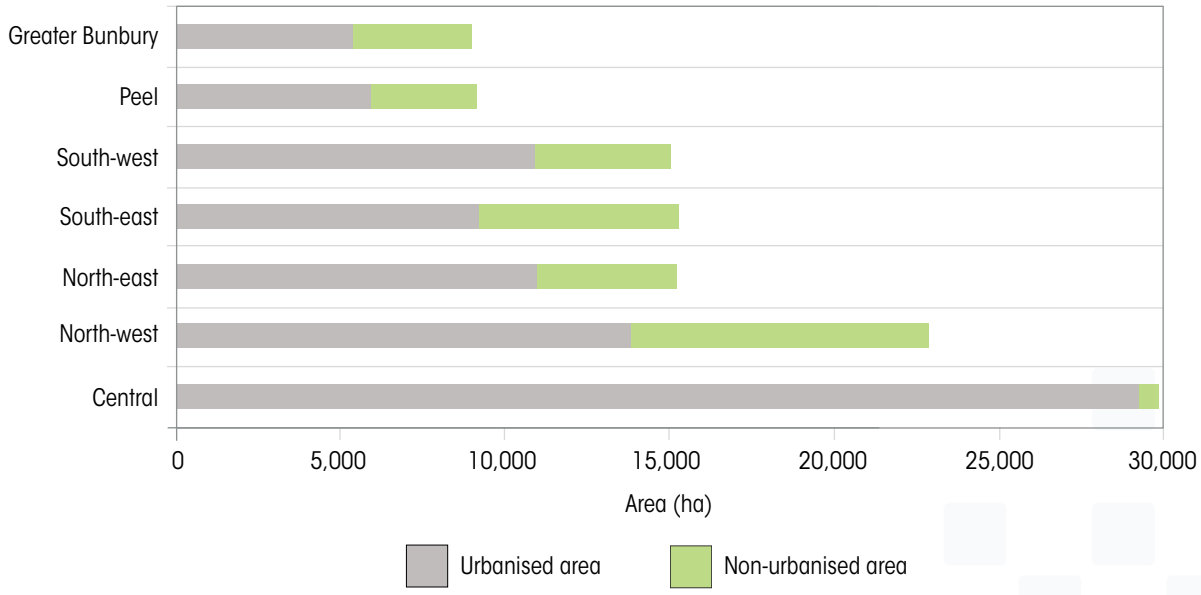
Table 2: Urbanised and non-urbanised land

Region/sub-region	Urbanised area (ha)	Non-urbanised (greenfield area) (ha)	Total land zoned for urban development (ha)	Urbanised (%)
Central sub-region	29,300	650	29,950	97.8%
North-west sub-region	13,860	9,050	22,910	60.5%
North-east sub-region	10,990	4,230	15,220	72.2%
South-east sub-region	9,230	6,120	15,350	60.1%
South-west sub-region	10,910	4,170	15,080	72.3%
Perth metropolitan sub-total	**74,300**	**24,220**	**98,520**	**75.4%**
Peel region	5,920	3,220	9,140	64.8%
Perth and Peel sub-total	**80,220**	**27,440**	**107,650**	**74.5%**
Greater Bunbury region	5,390	3,600	8,990	60.0%
Total	**85,610**	**31,040**	**116,640**	**73.4%**

Source: Department of Planning, Lands and Heritage (2019)

Note: Figures may not sum due to rounding.

Figure 5: Urbanised and non-urbanised land



Source: Department of Planning, Lands and Heritage (2019)

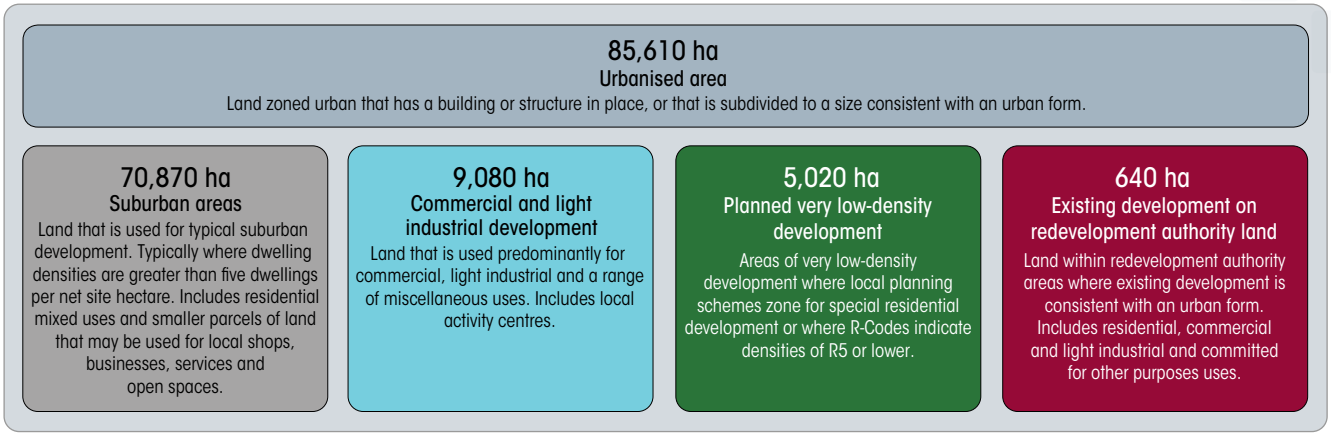
2.3.2 Urbanised area

The urbanised area consists of urban zoned land and redevelopment authority land and can be further categorised into:

- suburban areas
- commercial and light industrial development
- planned very low-density development
- existing development on redevelopment authority land.

Figure 6 and Table 3 show the distribution of each land-use category in urbanised areas. The North-west, South-west and Central sub-regions have the largest share of suburban usage (89, 90 and 87 per cent respectively). Planned very low-density development is prevalent in the North-east sub-region and Greater Bunbury region at 23 and 21 per cent, respectively. Almost half of the commercial and light industrial development on urban zoned land in the Metropolitan region was located in the Central sub-region.

Figure 6: Existing land uses in urbanised area



Source: Department of Planning, Lands and Heritage (2019)

Note: Figures may not sum due to rounding.

Table 3: Existing land use by sub-region – urbanised area

Region/sub-region	Suburban area (ha)	Commercial and light industrial development (ha)	Planned very low-density development (ha)	Existing development on redevelopment authority land (ha)	Total (ha)
Central sub-region	25,570	3,520	30	170	29,300
North-west sub-region	12,380	1,460	30	0	13,860
North-east sub-region	7,430	890	2,540	130	10,990
South-east sub-region	7,380	810	710	330	9,230
South-west sub-region	9,810	950	150	0	10,910
Perth metropolitan sub-total	**62,560**	**7,640**	**3,460**	**640**	**74,300**
Peel region	4,780	710	420	0	5,920
Perth and Peel sub-total	**67,350**	**8,350**	**3,880**	**640**	**80,210**
Greater Bunbury region	3,520	730	1,140	0	5,390
Total	**70,870**	**9,080**	**5,020**	**640**	**85,610**

Source: Department of Planning, Lands and Heritage (2019)

Note: Figures may not sum due to rounding.

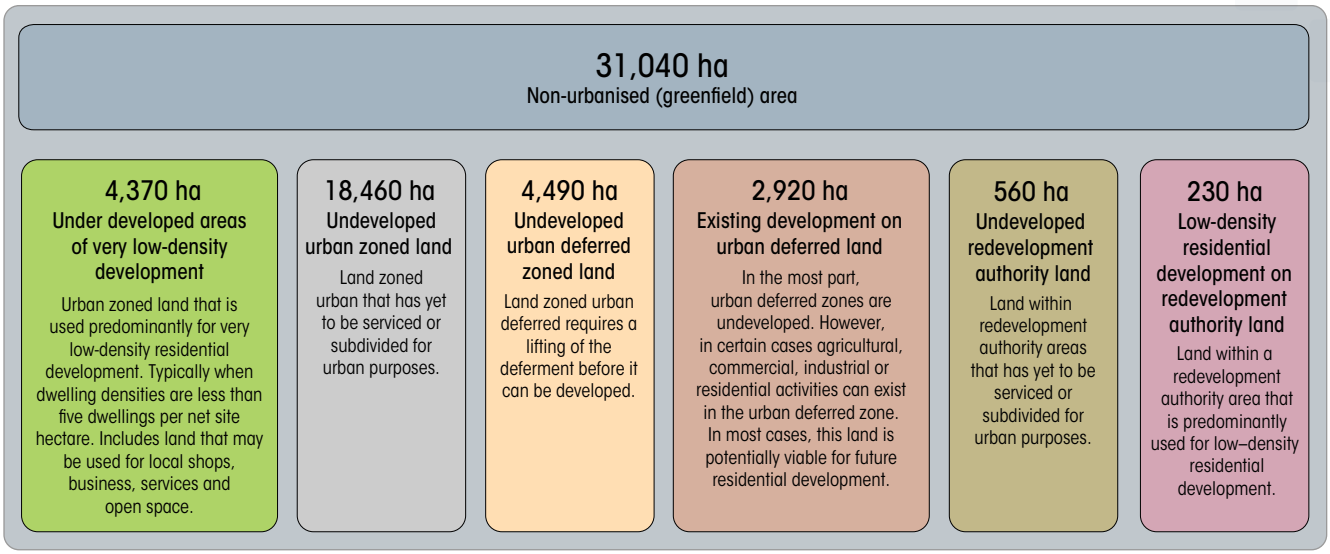
2.3.3 Non-urbanised area

The non-urbanised area includes urban, urban deferred and redevelopment authority land and consists of:

- under-developed areas of very low-density development (urban zoned land with no R-Code or special residential zoning developed to very low densities)
- undeveloped urban zoned land
- undeveloped urban deferred zoned land
- existing development on urban deferred land
- undeveloped redevelopment authority land
- low-density residential development on redevelopment authority land.

Figure 7 and Table 4 provide further detail on the existing land-use distribution in non-urbanised areas. A small amount of non-urbanised land exists in the Central sub-region (650 ha), with other sub-regions having between 3,000 and 9,000 hectares of non-urbanised land. Redevelopment authority land not otherwise zoned urban, urban deferred or city centre comprises three per cent of the non-urbanised area.

Figure 7: Existing land uses in non-urbanised areas



Source: Department of Planning, Lands and Heritage (2019)

Note: Figures may not sum due to rounding.

Table 4: Development status by sub-region – non-urbanised area

Sub-region	Under-developed very low-density development (ha)	Undeveloped urban zoned land (ha)	Undeveloped urban deferred zoned land (ha)	Existing development on urban deferred zoned land (ha)	Undeveloped redevelopment authority land (ha)	Low-density residential development on redevelopment authority land (ha)	Total (ha)
Central sub-region	140	490	0	10	10	0	650
North-west sub-region	110	4,900	2,190	1,850	0	0	9,050
North-east sub-region	1,220	2,580	200	210	10	0	4,230
South-east sub-region	1,510	2,530	880	430	530	230	6,120
South-west sub-region	570	2,800	540	260	0	0	4,170
Perth metropolitan sub-total	**3,550**	**13,310**	**3,820**	**2,750**	**560**	**230**	**24,220**
Peel region	310	2,790	70	60	0	0	3,220
Perth metropolitan and Peel sub-total	**3,850**	**16,100**	**3,880**	**2,810**	**560**	**230**	**27,440**
Greater Bunbury region	510	2,370	610	110	0	0	3,600
Total	**4,370**	**18,460**	**4,490**	**2,920**	**560**	**230**	**31,040**

Source: Department of Planning, Lands and Heritage (2019)

Note: Figures may not sum due to rounding.

2.4 Tier three – land use dynamics incorporating local planning scheme zones

Tier three provides further information on the dynamics of land use within the urbanised and non-urbanised areas. This level of the tiered assessment model incorporates local planning scheme zones into the analysis on the dynamics of land availability and introduces the concepts of committed and permitted (secondary) uses.

Committed uses refer to land zoned urban or urban deferred that is unlikely to be available for residential development due to non-residential zones or reserves in a local planning scheme such as local authority reserves, public purpose zones, schools and local businesses.

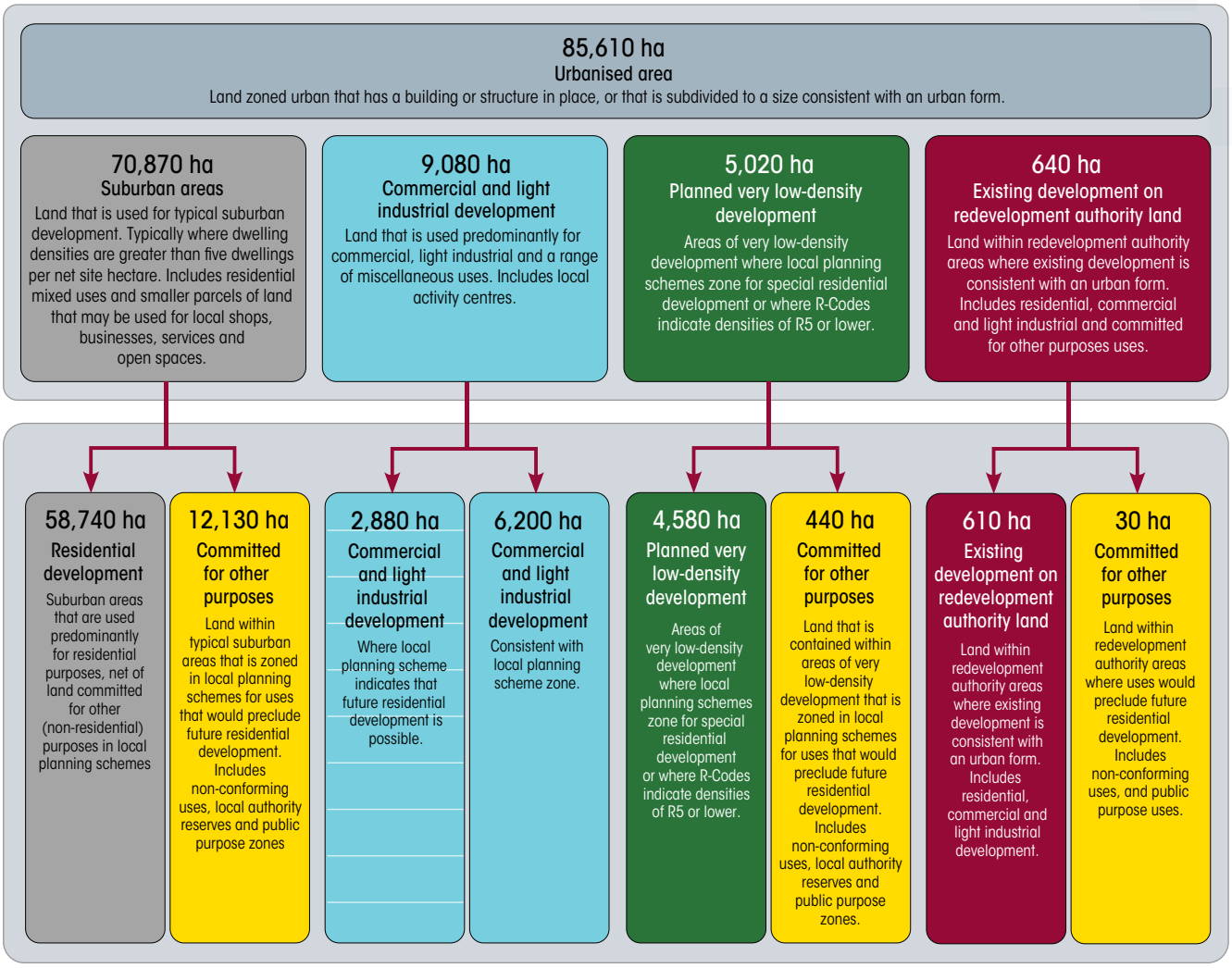
Permitted (secondary) uses refer to land where the actual use differs in type from the principal objective of the land-use zone in the local planning scheme. Permitted (secondary) uses are typically a commercial or light industrial use on land that could potentially accommodate residential development in the future.

This section compares the proportions of committed and permitted (secondary) uses between urbanised areas and non-urbanised areas. From the comparison, it is possible to evaluate how much non-urbanised land will likely be unavailable for future residential development through local planning scheme zonings.

2.4.1 Urbanised area – land-use dynamics incorporating local planning schemes

Figure 8 and Figure 9 indicate that approximately 69 per cent of the urbanised area across the three region schemes is used primarily for residential purposes. The remaining 31 per cent of urbanised land essentially accommodates non-residential uses, with 15 per cent of urbanised areas committed for other purposes and 10 per cent occupied by commercial and light industrial development.

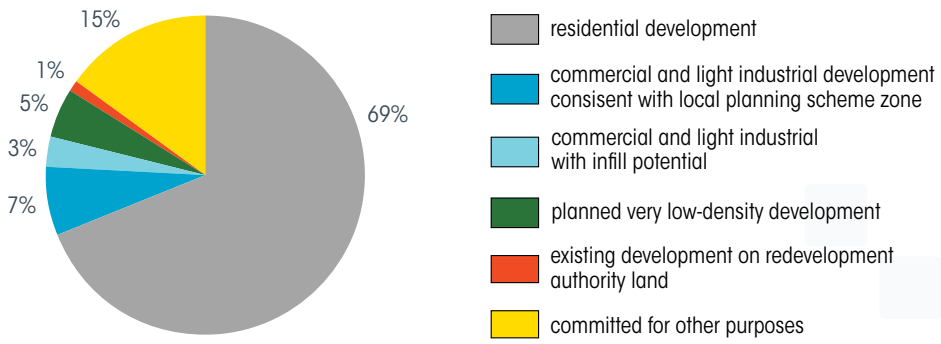
Figure 8: Land-use dynamics of urbanised areas



Source: Department of Planning, Lands and Heritage (2019)

Note: Figures may not sum due to rounding.

Figure 9: Land-use dynamics in urbanised areas



Source: Department of Planning, Lands and Heritage (2019)

Note: Figures may not sum due to rounding.

2.4.2 Non-urbanised – land-use dynamics incorporating local planning schemes

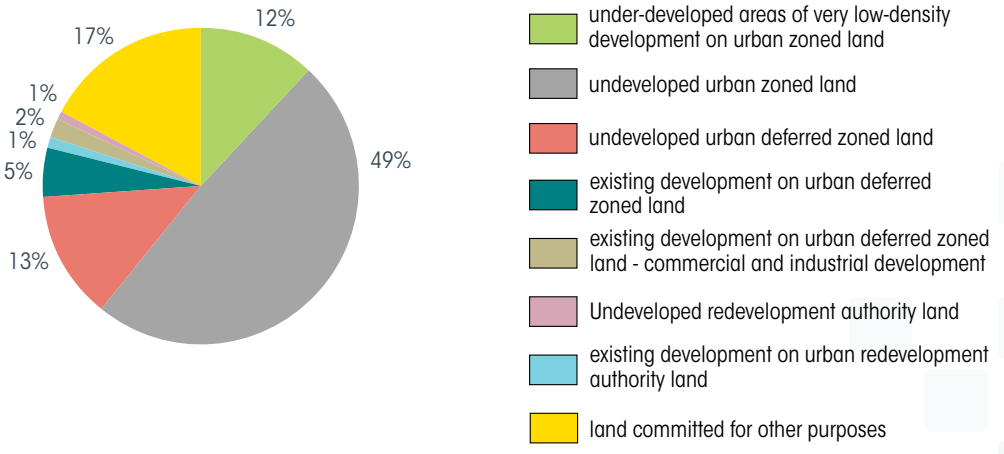
In the context of non-urbanised land, the purpose of assessing the impact of local planning schemes is to identify how much land within the non-urbanised stock is committed for other purposes and may therefore affect the stock of land available for future residential development. By comparing the proportion of committed uses on urbanised land (Figure 8 and Figure 9) it is possible to evaluate how much non-urbanised land is likely to be unavailable for future residential development through local planning scheme zonings.

The proportion of urban zoned land intended for future commercial or light industrial use will be identified as more detailed planning is undertaken and ultimately reflected in local planning schemes. Around four per cent of the total stock of urban deferred zoned land is currently occupied by commercial or light industrial development, although this could transition to other forms of urban development in the future.

The total stock of undeveloped urban, urban deferred and redevelopment authority land comprises around 64 per cent of the non-urbanised area. This stock is potentially available for future residential development. This compares with around 69 per cent of urbanised land that is presently used for residential development (Figure 9 and Figure 10).

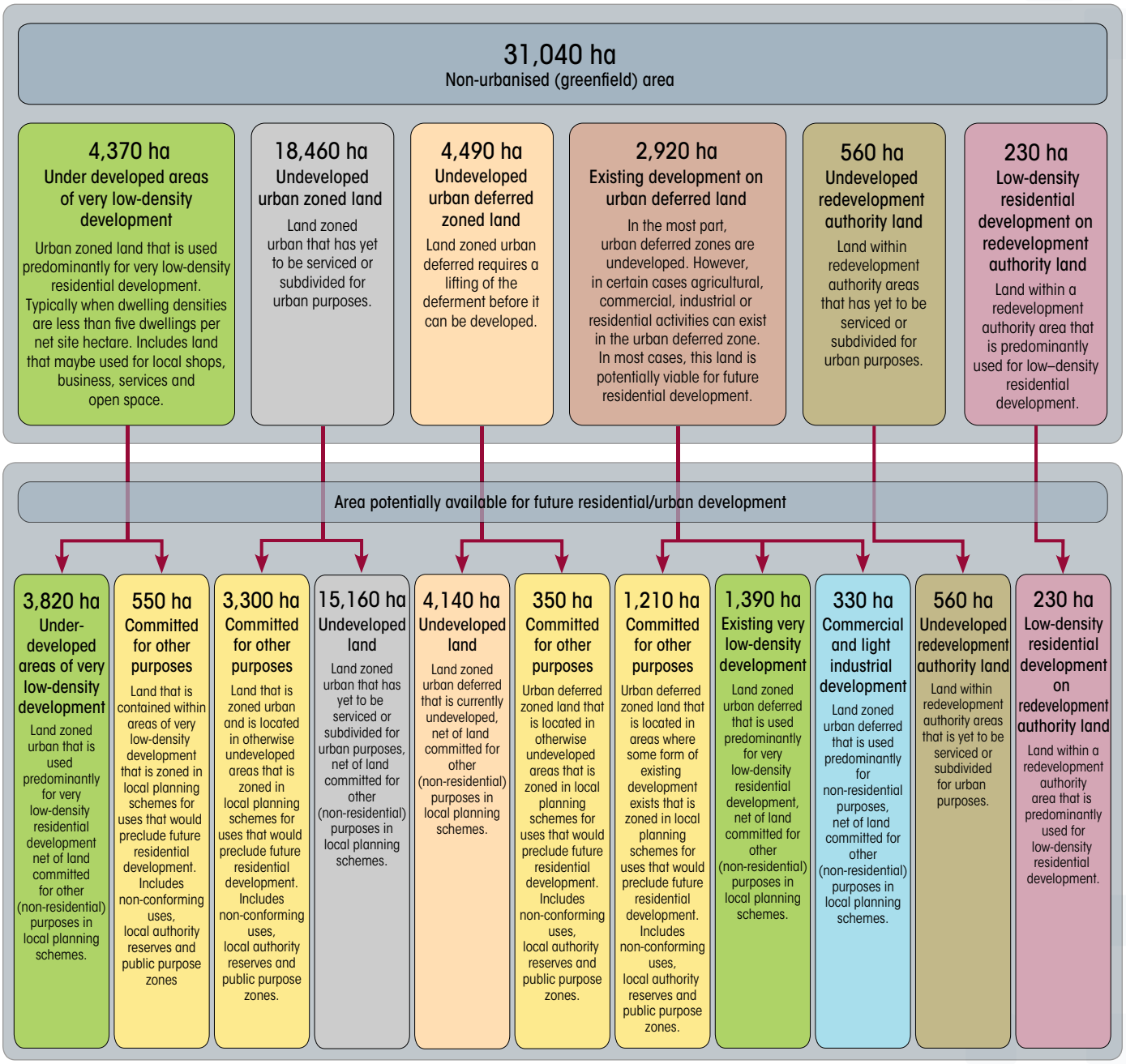
While the specific dynamics of future land zoning decisions remain unknown, it is assumed that ultimately this land will have a similar composition to current urbanised land. Based on previous development patterns, the overall share of non-urbanised stock that may not be available for residential purposes is likely to be from 20 per cent to 30 per cent of urban zoned land. In the future, it is likely that planned very low-density development will fall as a share of the non-urbanised stock, given the policy transition towards higher-density development in fringe areas.

Figure 10: Proportion of committed uses on non-urbanised land zoned for urban development



Source: Department of Planning, Lands and Heritage (2019)

Figure 11: Land-use dynamics of non-urbanised areas incorporating local planning schemes



Source: Department of Planning, Lands and Heritage (2019)

Note: Figures may not sum due to rounding.

2.5 Tier four – spatial distribution of current residential conditional subdivision approvals

As at 31 December 2018, there were approximately 51,700 residential lots (strata and freehold) with current conditional subdivision approvals across the Perth, Peel and Greater Bunbury regions (Table 5). Of these, around 71 per cent were located in non-urbanised areas, with the remaining 29 per cent in urbanised areas. Within the urbanised area, 42 per cent of conditional approvals were strata subdivisions, compared to just five per cent in non-urbanised areas.

Table 6 shows the distribution of conditional subdivision approvals based on tier three of the land supply assessment. Within urbanised areas, 92 per cent of conditional approvals for residential subdivision are in suburban areas. A further seven per cent are located in areas currently identified as accommodating commercial or light industrial uses.

Table 5: Spatial distribution of strata and freehold lots with conditional approval for residential subdivision (as at 31 December 2018)

	Urbanised area			Non-urbanised area			Total		
Region/sub-region	Strata (lots)	Freehold (lots)	Total (lots)	Strata (lots)	Freehold (lots)	Total (lots)	Strata (lots)	Freehold (lots)	Total (lots)
Central sub-region	3,240	1,300	4,540	350	410	760	3,590	1,710	5,300
North-west sub-region	790	2,250	3,040	360	5,820	6,190	1,150	8,070	9,220
North-east sub-region	620	1,020	1,640	200	5,460	5,660	820	6,480	7,300
South-east sub-region	620	680	1,300	270	7,000	7,270	890	7,680	8,570
South-west sub-region	650	2,340	3,000	450	10,500	10,940	1,100	12,840	13,940
Perth metropolitan sub-total	**5,930**	**7,580**	**13,510**	**1,630**	**29,190**	**30,820**	**7,560**	**36,770**	**44,330**
Peel region	120	710	830	40	3,950	3,990	150	4,660	4,810
Perth and Peel sub-total	**6,050**	**8,290**	**14,340**	**1,660**	**33,140**	**34,800**	**7,710**	**41,430**	**49,140**
Greater Bunbury region	190	450	640	70	1,850	1,920	260	2,300	2,560
Total	**6,240**	**8,740**	**14,980**	**1,740**	**34,990**	**36,720**	**7,980**	**43,720**	**51,700**

Source: Department of Planning, Lands and Heritage (2019)

Note: Figures may not sum due to rounding.

Table 6: Spatial distribution of lots with conditional approval for residential subdivision (as at 31 December 2018)

	Urbanised area			Non-urbanised area			
Region/sub-region	**Suburban areas (lots)**	**Commercial & light industrial development (lots)**	**Planned very low-density development (lots)**	**Under-developed very-low-density development (lots)**	**Undeveloped urban and urban deferred zoned land (lots)**	**Undeveloped redevelopment authority land (lots)**	**Total (lots)**
Central sub-region	4,530	0	10	230	520	0	5,300
North-west sub-region	2,620	420	0	310	5,650	0	9,220
North-east sub-region	1,450	110	70	410	5,250	0	7,300
South-east sub-region	1,260	30	10	1,390	4,820	720	8,570
South-west sub-region	2,670	320	0	1,490	9,450	0	13,940
Perth metropolitan sub-total	**12,540**	**890**	**90**	**3,830**	**25,690**	**720**	**44,330**
Peel region	820	0	0	10	3,980	0	4,810
Perth and Peel sub-total	**13,360**	**890**	**100**	**3,840**	**29,670**	**720**	**49,140**
Greater Bunbury region	520	110	10	40	1,880	0	2,560
Total	**13,880**	**990**	**100**	**3,880**	**31,550**	**720**	**51,700**

Source: Department of Planning, Lands and Heritage (2019)

Note: Figures may not sum due to rounding.

3 Land consumption rates

This section examines land consumption rates across the Perth metropolitan, Peel and Greater Bunbury regions and their implications for future land supply. The *Urban Growth Monitor* calculates land consumption in two ways – land consumption based on built form (construction) and land consumption based on subdivision.

The first methodology tracks land consumption by examining when and where non-urbanised land is consumed by the construction of new buildings. Land is considered consumed once construction is complete.

The second method examines where and when subdivision occurs. For this method, it is assumed that subdivision into lots smaller than 2,000 square metres is done so for urban purposes.

Both methodologies assess the gross area consumed by urban development, including non-residential requirements such as schools, roads, reserves and commercial projects.

3.1 Land consumption trends over time

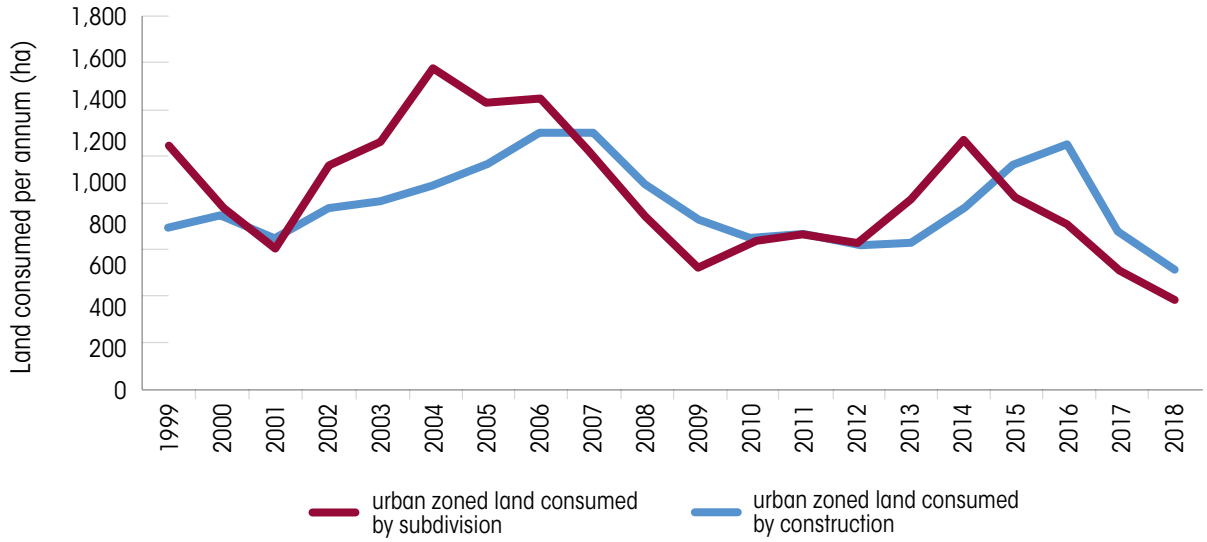
Figure 12 depicts annual land consumption rates based on built form (construction) and subdivision. The two approaches to measuring land consumption reveal similar trends, with annual changes in land consumption by subdivision generally preceding the corresponding change in built form land consumption. This pattern is to be expected, as lots must be created before dwelling construction can occur.

From 1999 to 2018, an average of 950 hectares per annum of urban and urban deferred zoned land across the three region schemes was consumed by subdivision. The average rate of land consumption by construction was 900 hectares per annum in the same period (Table 7).

Land consumption by construction and subdivision for 2018 were the lowest recorded over a 20-year period. In 2018, land consumption by construction was down 180 hectares from the previous year. Land consumption by subdivision in 2018 was down 150 hectares from the previous year.

The volume of land consumption by construction has followed recent subdivision consumption trends, and has continued to contract substantially in the past year. The lower rate of land consumption by subdivision in recent years indicates a continuation of the ‘lot absorption’ phase.

Figure 12: Annual consumption of land zoned for urban development for the Perth metropolitan, Peel and Greater Bunbury regions



Source: Department of Planning, Lands and Heritage (2019) based on Landgate State-wide Property Records and Cadastre, Landgate (2019)

Table 7: Land consumption trends

	Consumption in 2018	Average consumption (1999-2018)
Land consumption by construction	580 ha	900 ha
Land consumption by subdivision	430 ha	950 ha

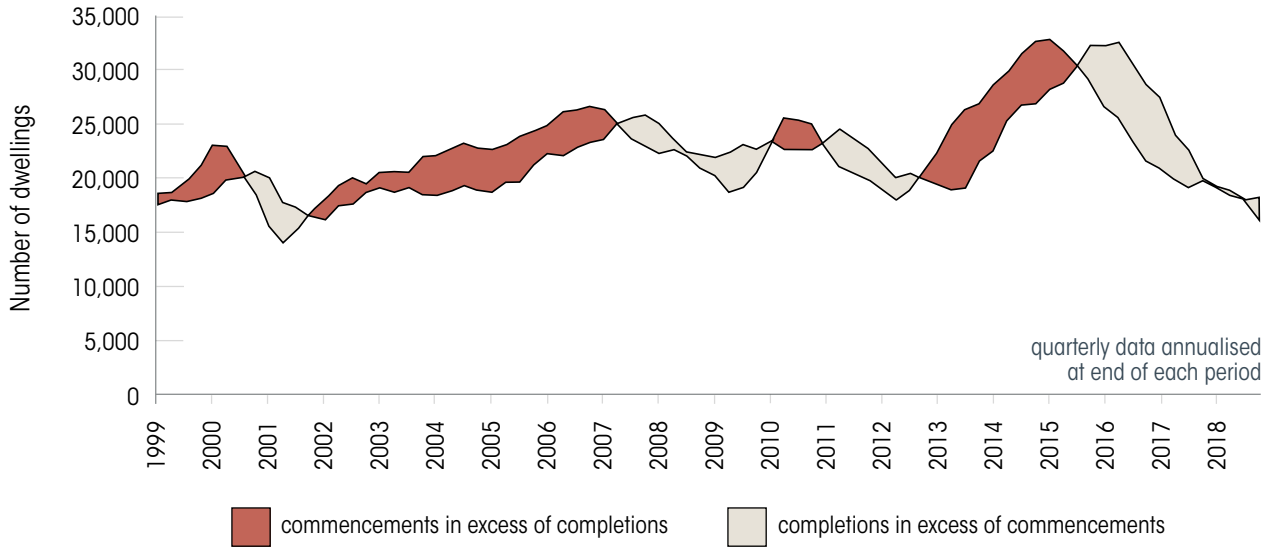
Source: Department of Planning, Lands and Heritage (2019)

3.2 Additional indicators of land consumption

Between 2012 and 2015, there was a substantial increase in residential construction activity across Western Australia. Since 2015, completions have exceeded commencements, reflecting the substantial contraction in the residential construction sector (Figure 13).

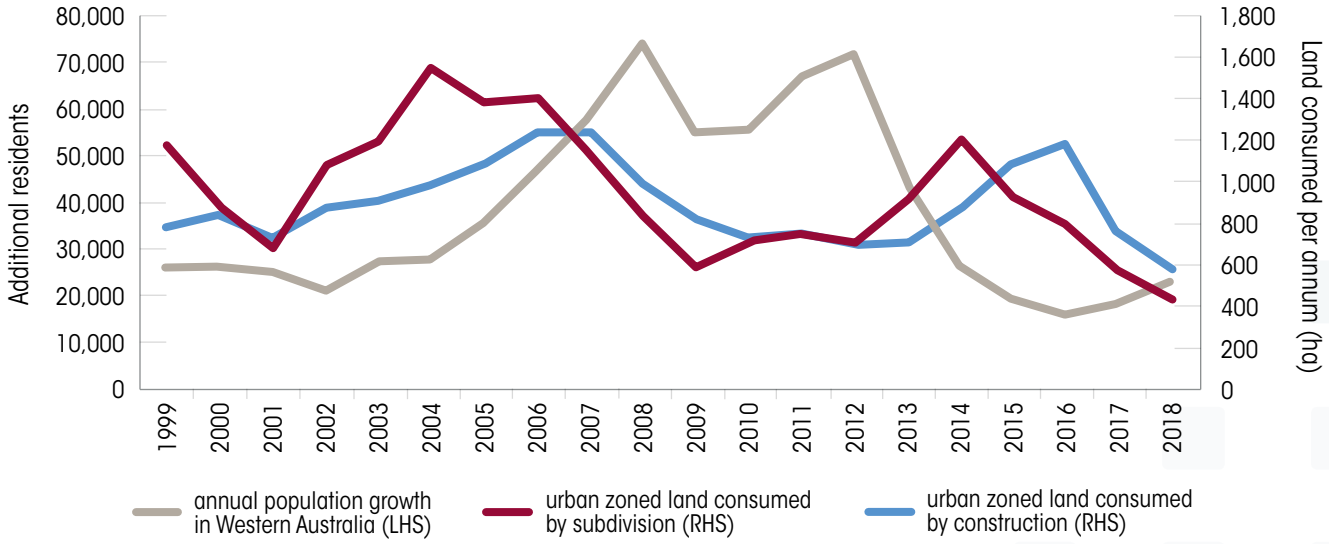
Population growth remains well below the long-term average, which is reflected in the low rates of land consumption, measured by both construction and subdivision (Figure 14). It is probable that both metrics will remain below average levels while population growth, and consequent demand for new dwellings, remains low.

Figure 13: Dwelling commencements and completions (annualised) for Western Australia



Source: Australian Bureau of Statistics (2019) Cat. No. 8752.0 – Building Activity, Australia

Figure 14: Population growth and land consumption



Source: Australian Bureau of Statistics (2019) Cat. No. 3101 – Australian Demographic Statistics, Department of Planning, Lands and Heritage (2019) based on Landgate State-wide Property Records and Cadastre, Landgate (2019)

3.3 Temporal land supply

Temporal land supply is an estimate of the length of time it is likely to take to consume the stock of non-urbanised land currently zoned for urban development. Temporal land supply estimates are constructed using historical rates of consumption based on construction and the amount of non-urbanised land available for development.

The estimates depend on two key variables:

- the stock of under-developed or undeveloped urban and urban deferred land; and
- the rate at which that land will be consumed.

Temporal land supply estimates include all the stock of non-urbanised land zoned for urban development. It is important to note that not all areas of non-urbanised land are readily available for development. Urban zoned land may be withheld from development for a variety of reasons, including:

- an ongoing active rural use, such as poultry farm or horticulture
- owner preference to maintain a rural lifestyle, despite an urban zoning
- land fragmentation
- environmental constraints
- lack of capacity (financial or other) to develop the land for urban purposes
- the need for significant infrastructure investment to open up the area (for example, trunk sewer)
- owners' and developers' intentions regarding the timing of any potential development.

The degree to which these constraints encumber urban development can vary from making prospective developments less profitable (and therefore less appealing to developers) to making them unviable. Few of these constraints would be likely to permanently prevent development in an area. The frequency and scale of such impediments can be uncertain and may have a significant impact on temporal land supply timeframes.

Table 8 displays the temporal land supply estimates for the Perth metropolitan and Peel regions only. Temporal land supply estimates for Greater Bunbury are discussed in section 3.5.

Table 8: Temporal land supply estimates based on highest and lowest consumption rates

2018 stock of non-urbanised land	27,440 ha
Highest rate of land consumption (2007)	1,110 ha
Average rate of land consumption (1999-2018)	820 ha
Lowest rate of land consumption (2018)	520 ha
Years' supply at highest consumption	25 years
Years' supply at average consumption	33 years
Years' supply at lowest consumption	53 years

Source: Department of Planning, Lands and Heritage (2019)

Note: These estimates assume no further addition to the stock of land zoned for urban development.

3.4 Temporal land supply scenarios

Using historical consumption rates for the Perth metropolitan and Peel regions, future rates of land consumption can be examined for the following two scenarios:

1. Historical density and infill rates (based on a 20-year average)
2. Current policy targets for density and infill.

An objective of the *Perth and Peel@3.5million* suite of documents is to promote a better balance between greenfield and infill development. To achieve this, the intention is to increase the proportion of infill housing and to increase dwelling density in greenfield developments in order to reduce the overall rate of land consumption.

The temporal land supply timeframes discussed in the *Urban Growth Monitor* are based on historical consumption rates, rather than deriving future consumption rates from population projections. The infill rate and greenfield dwelling densities of the urban growth scenarios discussed in this section are outlined in Table 9 and Figure 15.

For each gross hectare of land consumed under a 'business as usual' approach, 0.48 hectares would be required to produce the same number of dwellings under current policy targets.

Based on historical development patterns, it would take approximately 33 years to fully consume the stock of undeveloped urban and urban deferred zoned land (30 per cent infill/70 per cent greenfield). The temporal land supply estimate extends to 62 years under current policy targets (47 per cent infill/53 per cent greenfield) as reflected in the *Perth and Peel@3.5million* suite of documents.

The scenarios discussed are based on the stock of undeveloped urban and urban deferred zoned land as at 31 December 2018. They do not account for future changes to the stock of land zoned for urban development or environmental requirements identified as part of future State and Commonwealth environmental approvals.

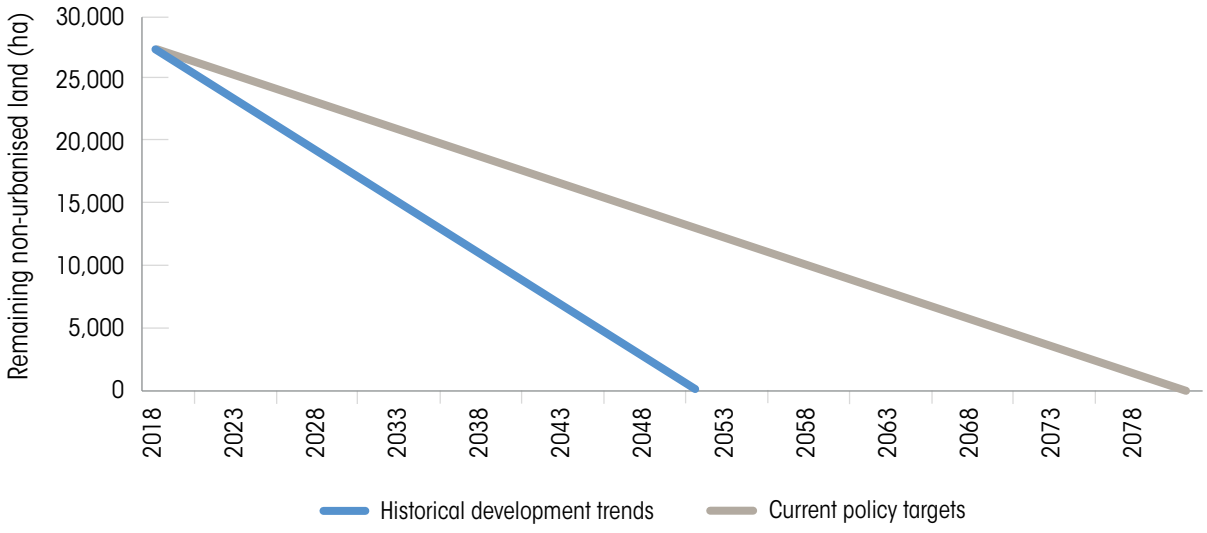
Table 9: Land consumption scenarios

	Historical average rate	Current policy targets
2018 stock of undeveloped non-urbanised land	27,440 ha	
Infill development	30%	47%
Greenfield development	70%	53%
Greenfield density	10 dw/guz ha	15 dw/guz ha
Consumption rate	830 ha	440 ha
Temporal land supply	33 years	62 years

Source: Department of Planning, Lands and Heritage (2019)

Note: dw/guz refers to dwellings per gross urban zoned hectare.

Figure 15: Temporal land supply scenarios

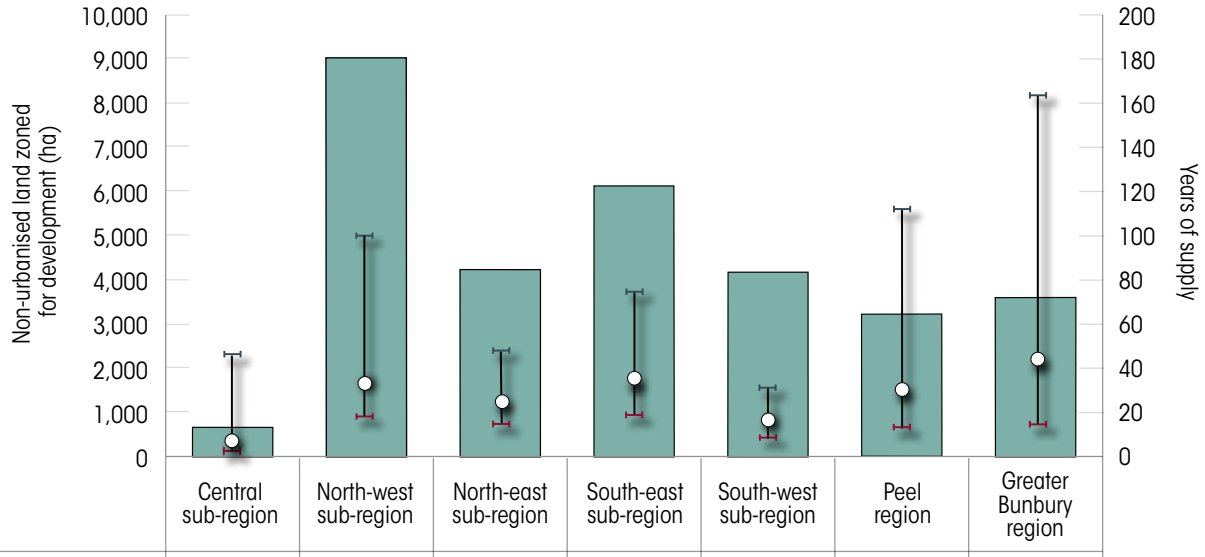


Source: Department of Planning, Lands and Heritage (2019)

3.5 Temporal land supply by sub-region

Sub-regional temporal land supply estimates are developed using historical consumption rates over a 20-year period, measured by subdivision and the amount of non-urbanised land available for development in each sub-region. All sub-regions and regions, except for the Central sub-region, have many years' supply of undeveloped land available for development, based on historical average consumption rates (Figure 16).

Figure 16: Estimated temporal supply of land zoned for urban development by sub-region (based on historical rates of land consumed by subdivision)



	Central sub-region	North-west sub-region	North-east sub-region	South-east sub-region	South-west sub-region	Peel region	Greater Bunbury region
Non-urbanised land (ha)	650	9,050	4,230	6,120	4,170	3,220	3,600
Years supply at highest consumption	2	22	18	23	10	17	18
Years supply at lowest consumption	58	124	60	93	38	139	203
Years supply at average consumption	8	41	30	43	19	37	54

Source: Department of Planning, Lands and Heritage (2019)

3.6 What population will the current land zoned for urban development support?

Table 10 and Figure 17 display the populations for the Perth metropolitan and Peel regions under the two development scenarios discussed. A dwelling occupancy rate of 2.6 persons per dwelling[2] is used for these scenarios. The development scenarios assume that all non-urbanised land will be development-ready as the population expands.

The population estimates consider only the stock of non-urbanised land zoned urban or urban deferred as at 31 December 2018. They do not include anticipated changes to the stock through rezoning or environmental requirements as part of future State and Commonwealth environmental approvals. The *Perth and Peel@3.5million* suite of documents identifies an adequate supply of suitable land to support long-term growth.

2. Based on the average household size for Greater Perth at the 2016 Census.

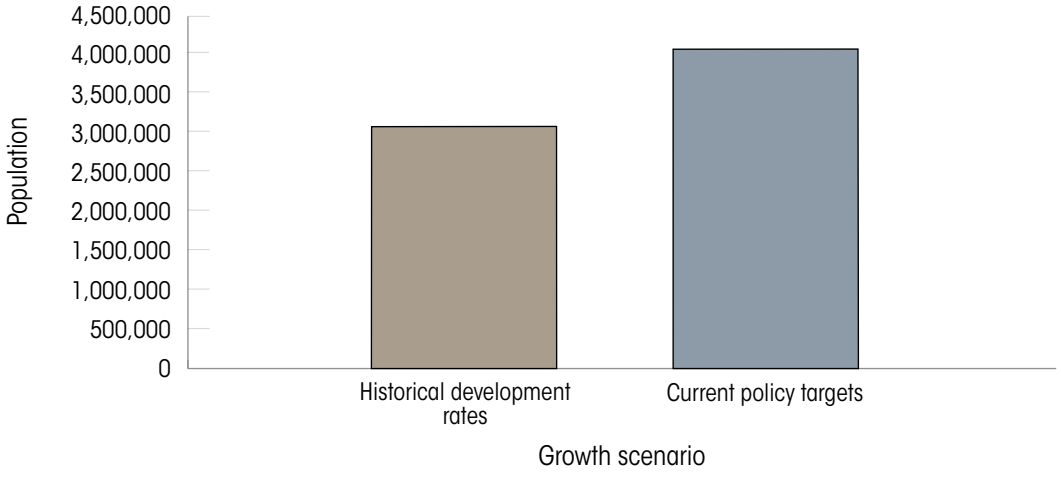
Table 10: What population will the current land zoned for urban development in Perth metropolitan and Peel regions support?

	Historical development rates	Current policy targets
2018 stock of undeveloped non-urbanised land	27,440 ha	
Infill assumption	30 per cent	47 per cent
Average density assumption	10 dw/guz ha	15 dw/guz ha
Greenfield dwellings the undeveloped non-urbanised land could deliver	274,370 dwellings	411,560 dwellings
Number of new dwellings that infill could deliver	117,590 dwellings	364,960 dwellings
Total number of new dwellings that could be delivered	**391,960 dwellings**	**776,520 dwellings**
Number of people per dwelling	2.6 persons per dwelling	
Number of people the new dwellings can house	1,019,090	2,018,950
Existing population in Perth metropolitan and Peel (ERP June 2018)	2,064,390	2,064,390
Total population the current stock of land zoned for urban development can support	**3,083,480**	**4,083,340**

Source: Department of Planning, Lands and Heritage (2019)

Note: Figures may not sum due to rounding.

Figure 17: What population will the current land zoned for urban development in Perth and Peel support?



Source: Department of Planning, Lands and Heritage (2019)

4 Infill development trends over time

4.1 Demolitions and infill

Demolitions can represent a leading indicator of future dwelling construction, as in many cases, dwelling demolition may facilitate further dwelling construction at higher densities. Measuring the loss of dwellings through demolition allows the calculation of the net infill rate, which provides a much truer indication of dwelling stock changes than the gross infill rate.

Gross infill: refers to the number of dwellings constructed within infill areas regardless of the number of dwellings removed from the dwelling stock through demolition.

Net infill: refers to the number of dwellings constructed within infill areas minus the number of dwellings removed from the existing stock through demolition (it is assumed that all dwelling demolitions are carried out within infill areas).

Net infill is used to calculate the annual infill rate for the Perth metropolitan and Peel regions, which was approximately 38 per cent in 2018, down from 42 per cent in 2017.

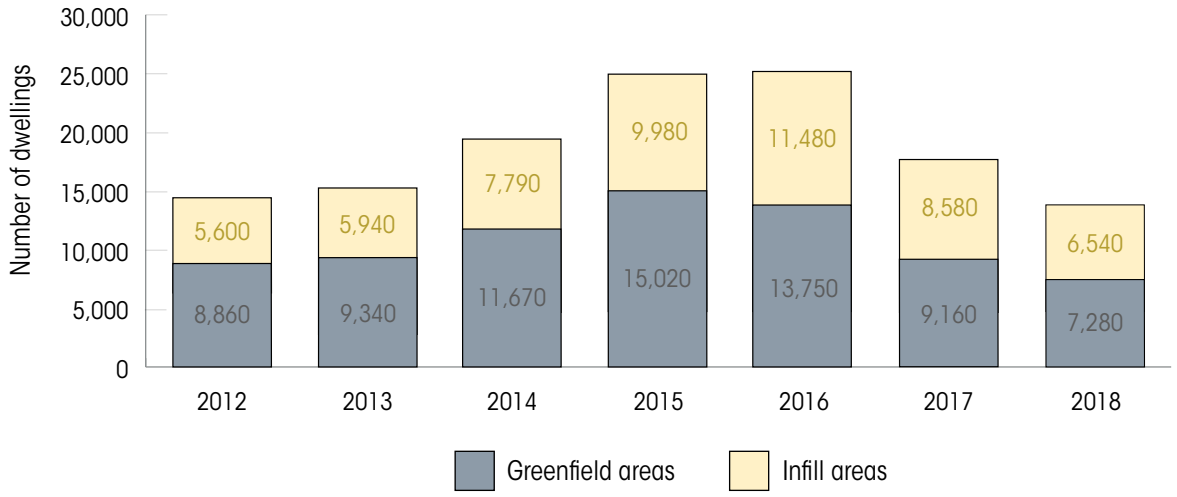
Department of Planning, Lands and Heritage research indicates that the average demolition rate (demolitions as a proportion of new dwellings constructed) across the Perth metropolitan and Peel regions over the past decade has been roughly 13 per cent, with annual figures between eight and 15 per cent.

4.2 Infill and greenfield dwelling construction

Using the infill model and demolition data collected from annual surveys, gross and net infill dwelling development and greenfield dwelling construction can be determined at the metropolitan, sub-regional and local government scale. Landgate's property valuation database is used to obtain the location of all dwellings for which construction is completed in a given year. It is only when dwelling construction is completed, and dwellings are captured in Landgate's property valuation database that dwelling development can be measured.

Gross dwelling construction in Perth and Peel totalled 13,820 dwellings in 2018. Of this, 6,540 were in infill areas and 7,280 were in greenfield areas (Figure 18). Gross dwelling construction in 2018 was 22 per cent lower than in 2017 and 45 per cent lower than in 2016. The fall in total dwelling construction corresponds with the decline in dwelling commencements seen in recent years (Chapter 2).

Figure 18: Gross dwelling construction 2012–2018



Source: Department of Planning, Lands and Heritage (internal databases) (2019)

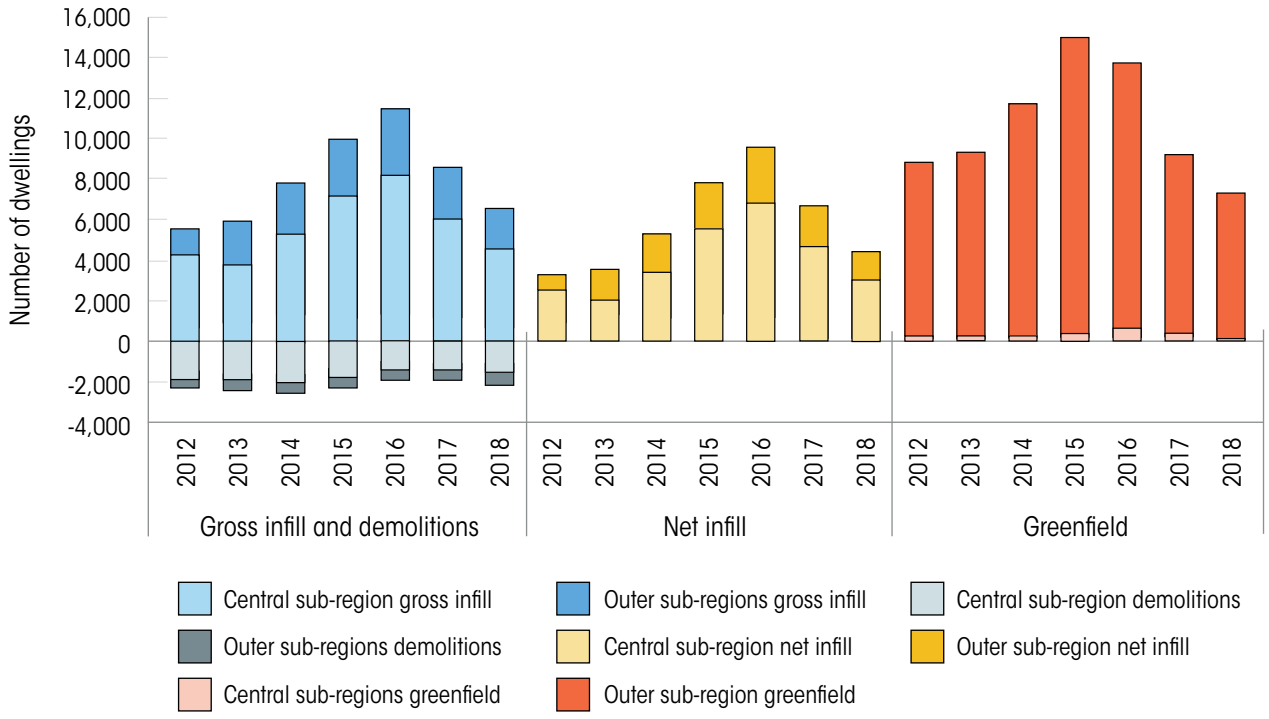
Numbers have been rounded.

It is the interplay of a range of dynamic demand-side and supply-side drivers for land and housing that ultimately results in the delivery of both infill and greenfield dwellings. Of the 6,540 gross infill dwellings, just over 1,000 dwellings were part of infill projects yielding over 50 dwellings per lot (compared to 2,200 dwellings in 2016 and 1,500 dwellings in 2017), indicating a reduction in the number of high-density infill projects over the past three years.

After the peak of 15,020 dwellings constructed in 2015 the number and proportion of dwellings built in greenfield areas has declined substantially. A total of 7,280 dwellings were built in greenfield areas across Perth and Peel in 2018, down 20 per cent from 9,160 in 2017. The reduction in greenfield dwelling development is broadly consistent with the general decline in residential construction over the period.

Dwellings built in greenfield areas accounted for 53 per cent of total dwellings constructed in 2018, compared to 52 per cent in 2017, 54 per cent in 2016, 60 per cent in 2015 and 2014, 61 per cent in 2013 and 2012. Figure 19 and Table 11 present key measures of dwelling dynamics relating to monitoring infill from 2012 to 2018.

Figure 19: Dynamics of dwelling development 2012–2018



Source: Department of Planning, Lands and Heritage (internal databases) (2019)

Table 11: Dynamics of dwelling development 2013–2018

Measure	Central sub-region						Outer sub-regions					
	2013	2014	2015	2016	2017	2018	2013	2014	2015	2016	2017	2018
Gross infill	3,840	5,330	7,200	8,240	6,040	4,560	2,100	2,460	2,780	3,240	2,540	1,980
Demolitions	1,840	1,940	1,670	1,400	1,390	1,480	520	580	500	510	520	630
Net infill	2,000	3,390	5,530	6,840	4,650	3,090	1,580	1,890	2,280	2,730	2,020	1,350
Greenfield	280	250	380	650	400	150	9,060	11,420	14,650	13,100	8,760	7,130

Source: Department of Planning, Lands and Heritage (internal databases) (2019)

Note: Numbers may not sum due to rounding.

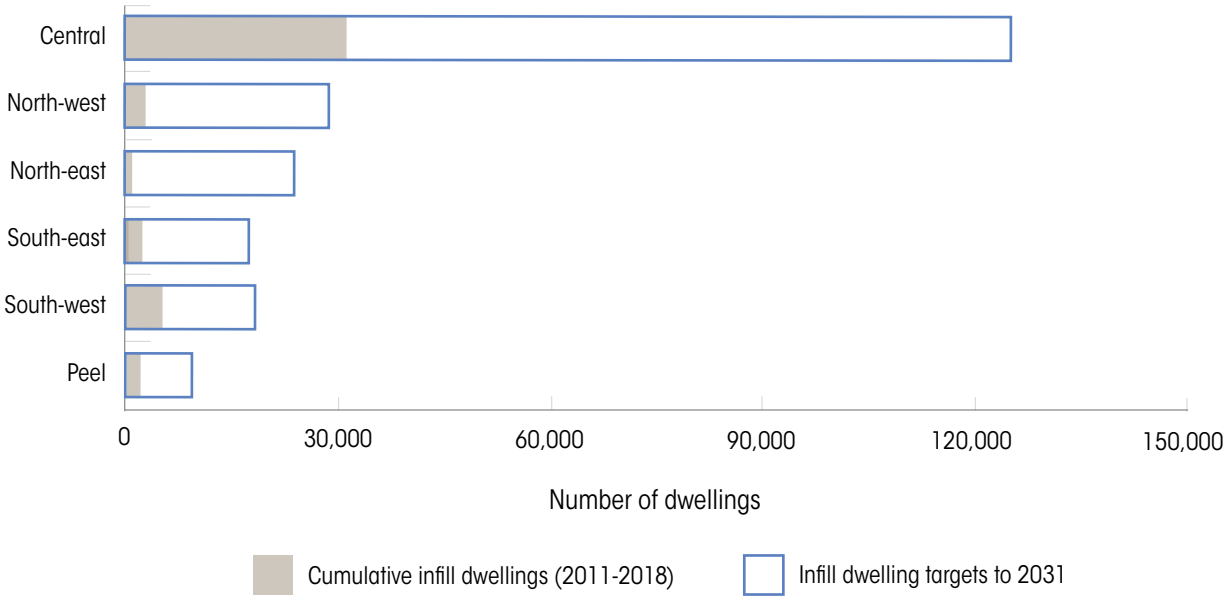
4.3 Infill dwelling targets

Infill dwelling targets to 2031 and 2050 are identified in *Perth and Peel@3.5million* suite of documents. The dwelling targets, in conjunction with the reporting in the *Urban Growth Monitor*, are intended to be used as a policy evaluation tool by local government when preparing local planning schemes and strategies.

The cumulative number of infill dwellings built between 2011 when infill monitoring began and 2018 for each sub-region against the infill dwelling targets to 2031 and 2050 are shown in Figure 20 and Figure 21.

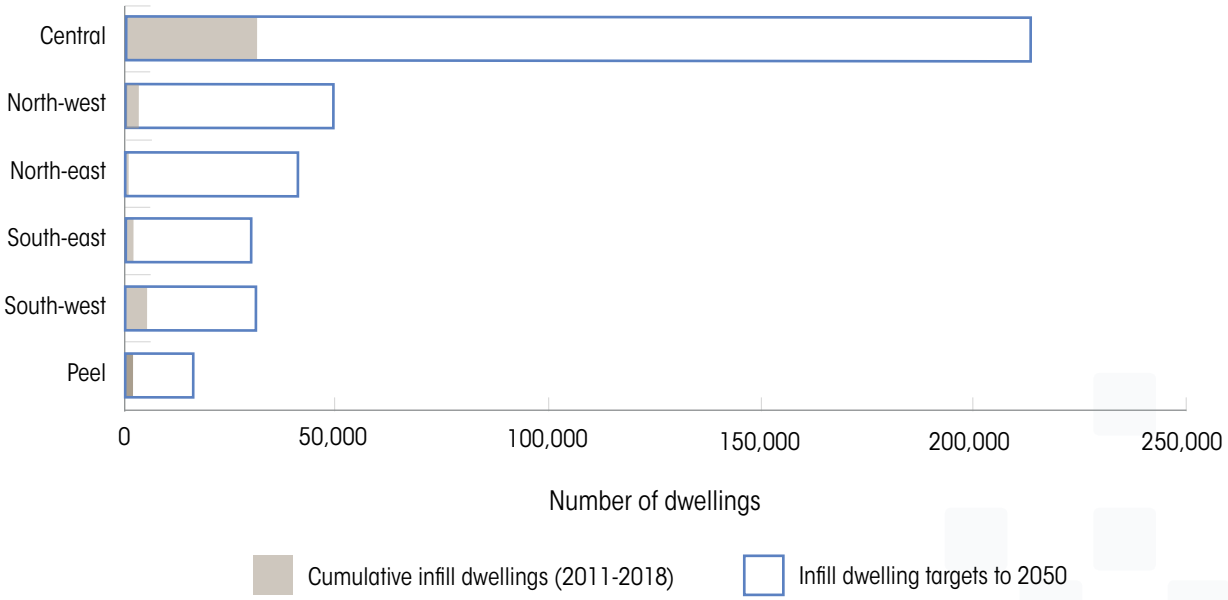
It is important to note that infill dwelling development is expected to vary from year to year and is unlikely to progress in a smooth or linear fashion. In addition, the rate of infill in the outer sub-regions is likely to increase in the future, as these areas become increasingly urbanised.

Figure 20: Progress towards infill dwelling targets to 2031



Source: Department of Planning, Lands and Heritage (internal databases) (2019)

Figure 21: Progress towards infill dwelling targets to 2050



Source: Department of Planning, Lands and Heritage (internal databases) (2019)

4.4 Infill profile

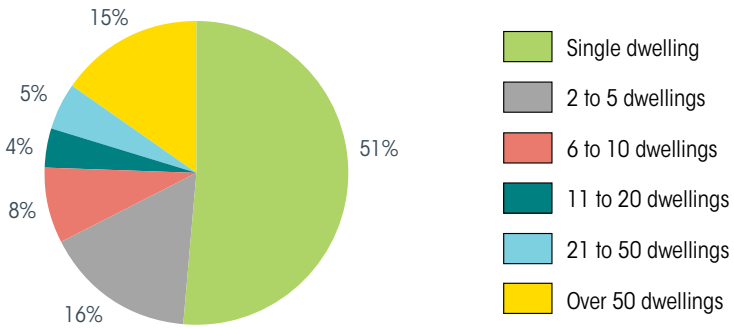
4.4.1 Infill dwellings per lot

The number of infill dwellings per lot provides an indication of the type of residential development that is occurring in infill areas.

Between 2011 and 2018, infill developments yielding one dwelling per lot made up half of all infill development (with annual figures ranging between 41 per cent and 61 per cent). Infill developments yielding more than 50 dwellings per lot made up 16 per cent of infill dwellings constructed during that period, with annual figures ranging between four per cent and 19 per cent (Figure 22).

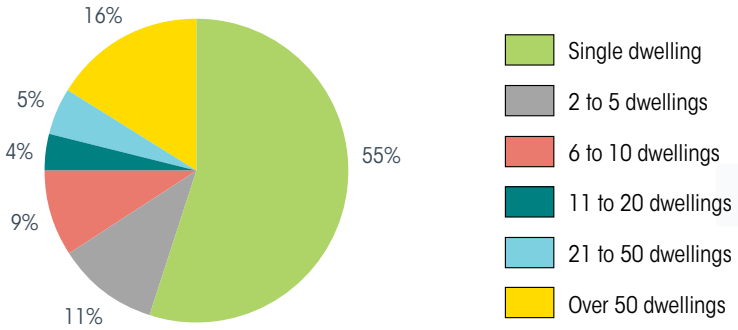
In 2018, infill developments yielding a single dwelling per lot comprised 55 per cent of all infill development, up from 45 per cent in 2017. The proportion of high density infill projects yielding 50 dwellings or more per lot was 16 per cent which is closely aligned with the longer-term trend (Figure 23).

Figure 22: Number of dwellings per lot, 2011–2018



Source: Department of Planning, Lands and Heritage (internal databases) (2019)

Figure 23: Number of dwellings per lot, 2018



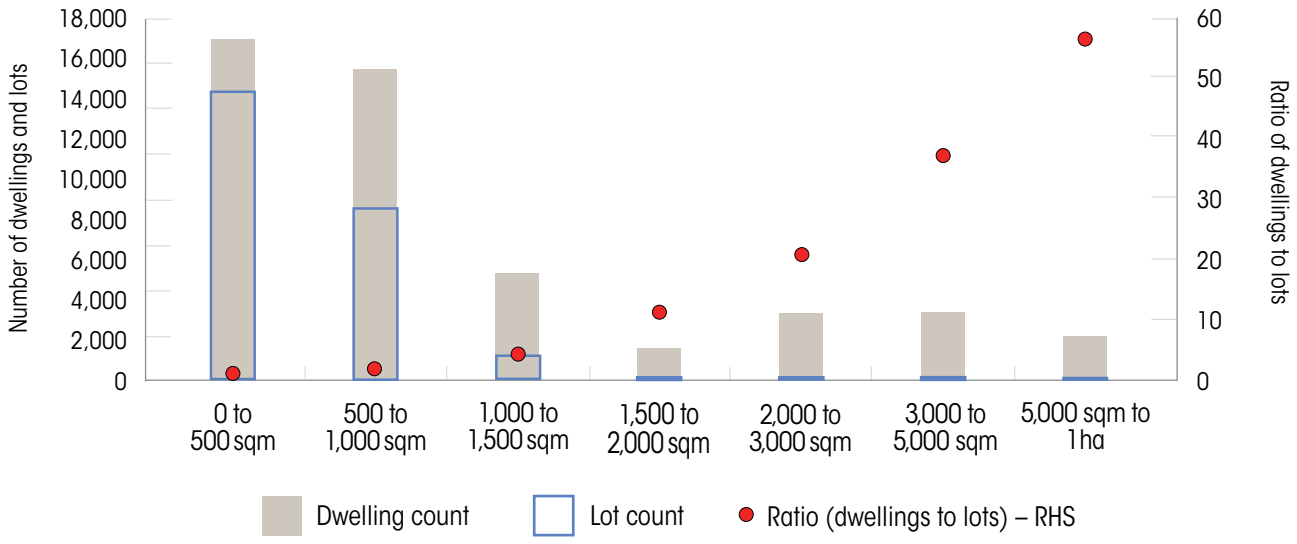
Source: Department of Planning, Lands and Heritage (internal databases) (2019)

4.4.2 Infill dwellings by lot size

Figure 24 depicts the average number of infill dwellings constructed by lot size, based on dwellings built in infill areas between 2013 and 2018. The data suggests that larger lots typically yield a higher number and density of dwellings than smaller lots in infill areas.

It is worth noting however, that the ratio of dwellings to lots for larger sized lots is based on a relatively small number of projects and can result in a variable ratio between dwellings and lot size. High-density residential infill projects may also incorporate other complementary land uses such as retail, commercial and office activities. The provision of the local planning schemes governing each project may also impact upon the optimal configuration of residential developments regarding building heights, plot ratio, design and land-use mix.

Figure 24: Average number of infill dwellings by lot size, 2013-2018



Source: Department of Planning, Lands and Heritage (internal databases) (2019)

5 Dwelling density

Dwelling density is the relationship between the number of dwellings and the available or utilised land area, and is usually described in terms of the number of dwellings per hectare. The *Urban Growth Monitor* has developed methodologies for measuring density at three different levels:

- Gross zone dwelling density
- Net site dwelling density
- Net site dwelling density by build year.

5.1 Gross zone dwelling density

Gross zone dwelling density measures the number of dwellings per gross urban or urban deferred zoned hectare, based only on urbanised land. As this measure relates to the entire stock of urbanised land, including local roads, parks and incidental uses, it is less sensitive than other measures to additions to the dwelling stock or increases in the intensity of residential dwelling development.

Table 12 presents the calculation of gross zone dwelling density by sub-region.

Table 12: Gross zone dwelling density by sub-region – urban zone

Region/sub-region	As at December 2013	As at December 2014	As at December 2015	As at December 2016	As at December 2017	As at December 2018
Central sub-region	11.3	11.5	11.7	11.9	12.0	12.1
North-west sub-region	8.7	9.0	9.1	9.3	9.4	9.4
North-east sub-region	6.5	6.7	6.9	6.9	7.0	7.3
South-east sub-region	8.0	8.4	8.7	8.8	8.7	8.7
South-west sub-region	8.6	9.0	9.3	9.5	9.8	9.9
Perth metropolitan average	**9.4**	**9.6**	**9.8**	**9.9**	**10.0**	**10.1**
Peel region	7.4	7.7	7.9	7.9	8.2	8.2
Perth metropolitan and Peel average	**9.2**	**9.5**	**9.7**	**9.8**	**9.9**	**10.0**
Greater Bunbury region	5.9	6.1	6.2	6.2	6.2	6.4

Source: Property valuation database, Landgate (2019) and Integrated Land Information Database, unpublished data, Department of Planning, Lands and Heritage (2019).

Figures may not sum due to rounding.

Note: Density figures may change depending on the date of extraction as the Landgate property valuation database is periodically updated which may affect historical dwelling counts. This dataset is based only on urban and urban deferred zonings and is a subset of the full dwelling count.

The *Perth and Peel@3.5million* suite of documents sets a target of a 50 per cent increase to the 2010 average residential density of new residential areas in the Perth metropolitan and Peel regions, to 15 dwellings per gross urban zoned hectare.

The gross zone dwelling density data presented in section 5.1 relates to all residential development and does not correspond to the residential density targets set for new residential areas.

Progress towards the gross dwelling density target of 15 dwellings per gross urban zoned hectare is challenging to measure, as new residential development may not be easily separated from the entire urbanised extent based on location alone.

For this reason, the measure of net site dwelling density by build year represents a better method for accurately assessing the density of new dwelling development. The inclusion of the year of dwelling construction at a net site density scale of reporting allows for temporal changes in dwelling density to be more clearly observed. Net site dwelling density by build year is discussed in sections 5.3 and 5.4.

5.2 Net site dwelling density

Net site dwelling density is a measure of the number of dwellings per net site hectare, which includes only the site area of lots developed with dwellings. It refers to all dwellings regardless of when they were constructed, and is a snapshot of net site dwelling density as at the reporting period.

Table 13 presents net site dwelling density based only on urban zoned land, while Table 14 is based on urban zoned land in addition to land zoned city centre. Including the urban and city centre zones can result in higher dwelling densities where the city centre zone accommodates a large number of dwellings.

Table 13: Net site dwelling density by sub-region – urban zone

Region/sub-region	As at December 2013	As at December 2014	As at December 2015	As at December 2016	As at December 2017	As at December 2018
Central sub-region	17.0	19.8	20.1	20.7	20.6	20.8
North-west sub-region	13.7	15.9	16.0	16.1	16.2	16.4
North-east sub-region	9.4	9.7	9.9	9.7	10.2	10.4
South-east sub-region	11.8	10.7	10.8	10.8	11.7	11.8
South-west sub-region	13.4	14.6	15.0	15.4	15.8	16.0
Perth metropolitan average	**14.1**	**15.3**	**15.5**	**15.8**	**16.1**	**16.2**
Peel region	10.9	12.7	12.8	12.9	13.1	13.3
Perth metropolitan and Peel average	**13.8**	**15.1**	**15.3**	**15.6**	**15.9**	**16.0**
Greater Bunbury region	8.4	9.0	9.1	9.2	9.2	9.2

Source: Property valuation database, Landgate (2019) and Integrated Land Information Database, unpublished data, Department of Planning, Lands and Heritage (2019).

Figures may not sum due to rounding.

Note: Density figures may change depending on the date of extraction as the Landgate property valuation database is periodically updated which may affect historical dwelling counts. This dataset is based only on urban and urban deferred zonings and is a subset of the full dwelling count.

Table 14: Net site dwelling density by sub-region – urban zone and city centre zone

Region/sub-region	As at December 2014	As at December 2015	As at December 2016	As at December 2017	As at December 2018
Central sub-region	20.3	20.6	21.2	21.1	21.3
North-west sub-region	16.1	16.2	16.3	16.3	16.6
North-east sub-region	9.7	9.9	9.7	10.3	10.4
South-east sub-region	10.7	10.8	10.9	11.7	11.8
South-west sub-region	14.7	15.1	15.6	16.0	16.2
Perth metropolitan average	**15.6**	**15.8**	**16.1**	**16.4**	**16.5**
Peel region	12.7	12.8	12.9	13.1	13.3
Perth metropolitan and Peel average	**15.4**	**15.6**	**15.9**	**16.1**	**16.3**
Greater Bunbury region	9.0	9.1	9.2	9.2	9.2

Source: Property valuation database, Landgate (2019) and Integrated Land Information Database, unpublished data, Department of Planning, Lands and Heritage (2019).

Figures may not sum due to rounding.

Note: Density figures may change depending on the date of extraction as the Landgate property valuation database is periodically updated which may affect historical dwelling counts. This dataset is based only on urban and urban deferred zonings and is a subset of the full dwelling count.

5.3 Net site dwelling density by build year

Net site dwelling density by build year is a measure of the number of dwellings per net site hectare, based only on lots on which new dwellings were constructed within the stated calendar year. This differs from net site dwelling density (discussed section 5.2) which refers to the collective dwelling density as at a specific point in time.

Table 15 presents net site dwelling density by build year based only on lots on urban zoned land while Table 16 is based on lots on urban zoned land in addition to lots on city centre zoned land.

Table 15: Net site dwelling density by build year – urban zone

Local government area	Year of dwelling construction									
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Central sub-region										
Bassendean	22.8	22.6	21.1	24.1	18.8	33.6	20.4	35.8	28.7	31.4
Bayswater	27.0	27.0	24.4	24.3	24.0	25.7	27.7	39.8	31.0	28.6
Belmont	27.7	24.2	24.9	23.4	26.6	47.8	72.8	53.6	59.5	37.4
Cambridge	16.3	15.4	15.6	17.0	15.1	16.0	31.1	45.8	33.7	23.2
Canning	22.7	23.9	22.2	23.6	24.2	23.6	27.5	28.3	27.1	27.1
Claremont	40.4	17.1	24.6	23.3	21.6	20.9	55.9	61.5	21.7	207.7
Cottesloe	25.6	18.0	17.7	17.4	22.6	17.7	19.8	17.9	21.6	27.3
East Fremantle	17.4	17.2	18.8	16.3	14.8	18.7	23.7	78.0	20.2	19.6
Fremantle	27.5	36.4	37.4	36.3	25.6	26.3	39.9	31.7	29.7	35.1
Melville	18.4	20.0	17.8	17.5	17.8	18.2	19.4	22.3	20.9	24.6
Mosman Park	17.3	15.0	16.3	15.4	14.7	14.5	17.0	13.4	18.7	17.6
Nedlands	15.7	15.5	13.8	14.1	14.0	15.7	14.1	34.5	13.6	12.4
Peppermint Grove	10.6	9.9	15.0	11.3	8.2	-	6.0	8.6	11.3	8.8
Perth	174.9	204.2	311.0	250.6	67.8	124.8	325.8	121.2	55.1	530.5
South Perth	21.3	20.2	17.2	18.5	22.0	20.6	19.4	24.2	33.4	52.1
Stirling	28.8	31.0	29.9	29.4	28.5	32.7	34.2	38.9	38.0	34.9
Subiaco	27.0	29.8	21.3	30.2	39.1	82.7	31.9	33.7	26.8	25.9
Victoria Park	43.4	43.0	30.2	34.4	35.7	31.1	32.2	55.1	29.5	37.0
Vincent	53.2	39.0	37.9	60.4	65.2	80.0	114.7	83.6	114.7	49.1
Central sub-region average	**26.7**	**27.5**	**26.0**	**25.5**	**25.4**	**29.7**	**35.0**	**38.7**	**34.6**	**35.2**
North-west sub-region										
Joondalup	18.9	17.5	19.6	18.5	20.5	18.6	19.2	19.3	21.9	22.3
Wanneroo	21.0	21.2	23.4	23.6	23.9	23.9	25.8	25.1	26.4	26.4
North-west sub-region average	**20.7**	**20.8**	**22.7**	**22.7**	**23.4**	**23.2**	**24.9**	**24.2**	**25.5**	**25.2**
North-east sub-region										
Swan	19.9	19.5	21.5	21.5	22.4	23.5	24.8	25.0	28.4	16.7
Kalamunda	13.9	15.9	15.5	17.2	16.4	15.7	16.2	12.9	19.3	5.8
Mundaring	4.8	7.6	5.7	6.3	6.2	10.4	8.9	8.0	8.6	25.9
North-east sub-region average	**15.6**	**16.3**	**17.5**	**18.3**	**19.1**	**21.2**	**21.4**	**21.2**	**24.1**	**22.3**

Table 15: Net site dwelling density by build year – urban zone (cont.)

Local government area	Year of dwelling construction									
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
South-east sub-region										
Armadale	0	20.4	18.5	20.9	22.6	21.5	23.5	24.8	23.8	24.5
Gosnells	23.0	21.4	22.5	20.6	22.2	23.4	28.7	26.5	27.0	27.5
Serpentine-Jarrahdale	11.5	12.1	16.4	17.3	16.7	20.1	20.4	13.1	18.8	20.4
South-east sub-region average	**18.8**	**19.3**	**19.3**	**20.1**	**21.2**	**21.6**	**23.9**	**20.6**	**23.5**	**24.5**
South-west sub-region										
Cockburn	22.8	20.9	22.4	24.7	26.6	33.7	30.1	34.1	38.3	33.7
Kwinana	19.9	21.2	22.2	22.1	24.0	24.2	25.9	27.0	26.8	26.0
Rockingham	17.6	18.4	19.1	20.1	20.1	22.3	22.5	23.4	24.7	24.1
South-west sub-region average	**20.0**	**19.7**	**20.7**	**21.8**	**22.7**	**25.6**	**25.8**	**27.9**	**30.3**	**28.7**
Perth metropolitan region average	**21.2**	**21.2**	**21.9**	**22.2**	**22.6**	**24.6**	**26.6**	**27.4**	**28.4**	**28.1**
Peel region										
Mandurah	20.9	20.5	19.9	18.7	18.7	19.2	21.0	21.5	22.7	20.1
Murray	12.3	16.2	15.9	17.8	16.3	16.5	16.5	18.2	16.0	13.4
Waroona	5.0	11.0	5.8	10.7	7.2	9.0	10.1	10.1	13.9	8.4
Peel region average	**18.5**	**19.6**	**18.0**	**18.4**	**17.7**	**18.3**	**20.1**	**21.0**	**21.7**	**18.8**
Greater Bunbury										
Bunbury	22.3	21.5	20.6	18.2	19.4	20.5	18.7	19.6	20.6	18.8
Capel	12.3	11.8	11.0	10.0	9.2	12.6	16.3	18.9	6.0	11.2
Dardanup	13.7	13.5	13.7	15.4	13.8	14.7	15.0	13.8	16.7	17.3
Harvey	13.5	10.0	10.8	12.4	10.2	9.8	10.2	9.2	7.5	9.2
Greater Bunbury average	**14.1**	**12.4**	**12.5**	**12.6**	**11.3**	**12.0**	**13.6**	**13.6**	**9.1**	**11.2**

Source: Property valuation database, Landgate (2019) and Integrated Land Information Database, unpublished data, Department of Planning, Lands and Heritage (2019).

Note: Density figures may change depending on the date of extraction as the Landgate property valuation database is periodically updated which may affect historical dwelling counts. This dataset is based only on urban and urban deferred zonings and is a subset of the full dwelling count.

Table 16: Net site dwelling density by build year – urban and city centre zone

Local government area	Year of dwelling construction									
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Central sub-region										
Bassendean	22.8	22.6	21.1	24.1	18.8	33.6	20.4	35.8	28.7	31.4
Bayswater	27.1	27.2	25.0	24.7	24.3	25.7	29.1	40.4	32.3	29.5
Belmont	27.7	24.2	24.9	23.4	26.6	47.8	72.8	53.6	59.5	37.4
Cambridge	16.3	15.4	15.6	17.0	15.1	16.0	31.1	45.8	33.7	23.2
Canning	23.2	24.0	22.4	23.6	24.2	24.9	28.9	34.6	36.0	27.1
Claremont	40.4	17.1	24.6	23.3	21.6	20.9	55.9	61.5	21.7	207.7
Cottesloe	25.6	18.0	17.7	17.4	22.6	17.7	19.8	17.9	21.6	27.3
East Fremantle	17.4	17.2	18.8	16.3	14.8	18.7	23.7	78.0	20.2	19.6
Fremantle	33.8	36.5	37.4	45.3	25.8	28.8	47.0	55.3	34.8	63.9
Melville	18.4	20.0	17.8	17.5	17.8	18.2	19.4	22.3	20.9	24.6
Mosman Park	17.3	15.0	16.3	15.4	14.7	14.5	17.0	13.4	18.7	17.6
Nedlands	15.7	15.5	13.8	14.1	14.0	15.7	14.1	34.5	13.6	12.4
Peppermint Grove	10.6	9.9	15.0	11.3	8.2	-	6.0	8.6	11.3	8.8
Perth	304.1	251.8	367.2	303.7	192.5	277.6	267.8	359.7	542.4	537.3
South Perth	21.3	20.2	17.2	18.5	22.0	20.6	19.4	24.2	33.4	52.1
Stirling	28.8	31.0	29.9	29.4	28.5	32.7	34.2	38.9	40.7	34.9
Subiaco	27.0	29.8	21.3	30.2	39.1	82.7	31.9	33.7	26.8	25.9
Victoria Park	43.4	43.0	30.2	34.4	35.7	31.1	32.2	55.1	29.5	37.0
Vincent	63.9	39.0	37.9	60.4	65.2	80.0	114.7	83.6	114.7	49.1
Central sub-region average	**32.3**	**28.9**	**28.7**	**26.9**	**26.1**	**33.9**	**37.6**	**44.0**	**38.8**	**37.0**
North-west sub-region										
Joondalup	19.2	24.6	22.1	21.4	20.5	19.9	19.6	19.3	22.2	22.3
Wanneroo	21.0	21.2	23.4	23.6	23.9	23.9	25.8	25.1	26.4	26.5
North-west sub-region average	**20.7**	**21.7**	**23.2**	**23.2**	**23.4**	**23.4**	**24.9**	**24.2**	**25.6**	**25.3**
North-east sub-region										
Swan	20.5	20.3	21.6	22.2	22.5	23.7	25.0	25.0	28.4	16.7
Kalamunda	13.9	15.9	15.5	17.2	16.4	15.7	16.2	12.9	19.3	5.8
Mundaring	4.8	7.6	5.7	6.3	6.2	10.4	8.9	8.0	8.6	26.3
North-east sub-region average	**15.9**	**16.7**	**17.6**	**18.8**	**19.1**	**21.3**	**21.5**	**21.2**	**24.1**	**22.7**

Table 16: Net site dwelling density by build year – urban and city centre zone (cont.)

Local government area	Year of dwelling construction									
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
South-east sub-region										
Armadale	18.9	20.4	18.6	20.9	22.6	21.5	23.5	24.8	23.9	24.5
Gosnells	23.0	21.4	22.5	20.6	22.2	23.4	28.7	26.5	27.0	27.5
Serpentine-Jarrahdale	11.5	12.1	16.4	17.3	16.7	20.1	20.4	13.1	18.8	20.4
South-east sub-region average	**19.0**	**19.4**	**19.4**	**20.1**	**21.2**	**21.7**	**23.9**	**20.6**	**23.5**	**24.5**
South-west sub-region										
Cockburn	22.8	20.9	22.4	24.7	26.6	33.7	30.1	34.1	38.3	33.7
Kwinana	19.9	21.2	22.2	22.1	24.0	24.2	25.9	27.0	26.8	26.0
Rockingham	17.6	18.4	19.1	20.1	20.1	22.3	22.6	26.2	25.1	26.2
South-west sub-region average	**20.0**	**19.7**	**20.7**	**21.8**	**22.7**	**25.6**	**25.8**	**29.0**	**30.5**	**29.4**
Perth metropolitan region average	**23.0**	**21.8**	**22.8**	**22.8**	**22.8**	**25.7**	**27.2**	**29.0**	**29.7**	**28.8**
Peel region										
Mandurah	20.9	20.5	19.9	18.7	18.7	19.2	21.0	21.5	22.7	20.1
Murray	12.3	16.2	15.9	17.8	16.3	16.5	16.5	18.2	16.0	13.4
Waroona	5.0	11.0	5.8	10.7	7.2	9.0	10.1	10.1	13.9	8.4
Peel region average	**18.5**	**19.6**	**18.0**	**18.4**	**17.7**	**18.3**	**20.1**	**21.0**	**21.7**	**18.8**
Greater Bunbury										
Bunbury	22.3	21.5	20.6	18.2	19.4	20.5	18.7	19.6	20.6	18.8
Capel	12.3	11.8	11.0	10.0	9.2	12.6	16.3	18.9	6.0	11.2
Dardanup	13.7	13.5	13.7	15.4	13.8	14.7	15.0	13.8	16.7	17.3
Harvey	13.5	10.0	10.8	12.4	10.2	9.8	10.2	9.2	7.5	9.2
Greater Bunbury average	**14.1**	**12.4**	**12.5**	**12.6**	**11.3**	**12.0**	**13.6**	**13.6**	**9.1**	**11.2**

Source: Property valuation database, Landgate (2019) and Integrated Land Information Database, unpublished data, Department of Planning, Lands and Heritage (2019).

Note: Density figures may change depending on the date of extraction as the Landgate property valuation database is periodically updated which may affect historical dwelling counts. This dataset is based only on urban and urban deferred zonings and is a subset of the full dwelling count.

5.4 Net site dwelling density by build year (greenfield)

This analysis focuses specifically on 'net density by build year' trends in greenfield residential areas to measure observed greenfield development density against Government objectives. The strategic target of 15 dwellings per gross urban zoned hectare for new residential areas as set in the *Perth and Peel@3.5million* suite of documents can be expressed as an equivalent target of 26 dwellings per net site hectare.

Residential development in greenfield areas across the Perth metropolitan and Peel regions during 2018 constituted a collective net density of 22.2 dwellings per net site hectare. This was slightly below the strategic target, but represents significant progress from 2010, when targets where initially set, and the prevailing trend was a density of approximately 15 dwellings per net site hectare.

The net site densities for greenfield development areas in each sub-region are shown in Table 17.

Table 17: Net site dwelling density by build year – urban, urban deferred and city centre zone – outer sub-regions

Region/sub-region	2013 construction	2014 construction	2015 construction	2016 construction	2017 construction	2018 construction
North-west	23.3	21.4	23.0	22.2	13.9	24.1
North-east	17.9	19.3	20.8	18.1	21.8	21.5
South-east	20.0	19.9	22.6	15.3	21.6	23.1
South-west	22.2	22.3	23.9	26.9	25.1	23.4
Peel	17.1	17.8	20	12.8	17.9	16.2
Perth metropolitan and Peel average	**20.6**	**20.5**	**22.3**	**19.3**	**19.9**	**22.2**

Source: Property valuation database, Landgate (2019) and Integrated Land Information Database, unpublished data, Department of Planning, Lands and Heritage (2019).

Note: Density figures may change depending on the date of extraction as the Landgate property valuation database is periodically updated which may affect historical dwelling counts. This dataset is based only on urban and urban deferred zonings and is a subset of the full dwelling count.

Glossary

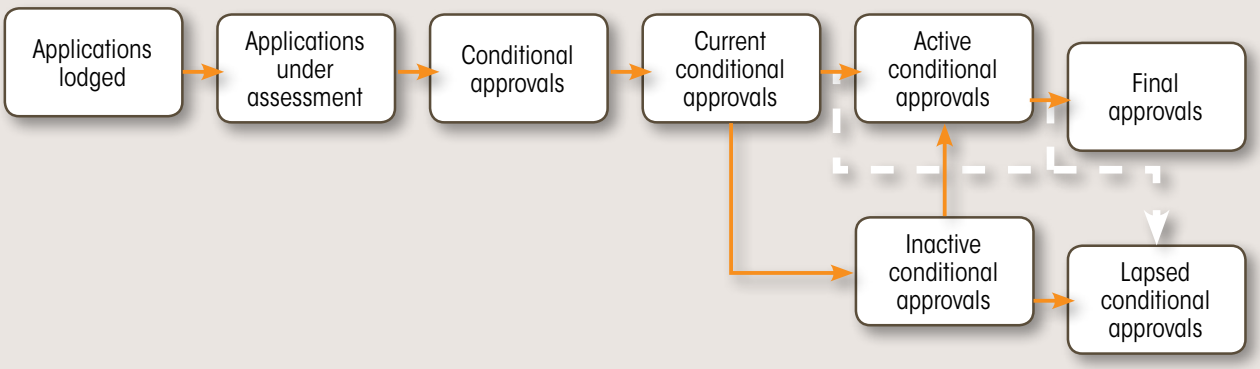
Subdivision approvals

Applications lodged refer to the number of lots in applications lodged with the Western Australian Planning Commission (WAPC) for the purpose of subdivision or strata development. This provides an indication of the confidence that developers have in future demand for residential land in the medium-term (12 months to four plus years).

Applications under assessment is measured as the total number of lots in subdivision and strata applications under assessment at a particular date (that is, last day of the quarter of year), including those applications for which a decision has been deferred.

Subdivision approvals are broken down into a series of discrete stages and sub-classifications as illustrated in Figure A.

Figure A – Subdivision process



Conditional approval is granted by the WAPC for subdivision to begin subject to certain conditions being met. The approval is preceded by an assessment of the proposed subdivision plan by statutory referral agencies, including servicing authorities. On receipt of conditional approval, the proponent may commence subdivision development in accordance with the conditions of approval. A conditional approval remains valid for three years when five lots or fewer are approved, and for four years when six lots or more are approved.

Current conditional approvals refer to those conditional approvals that are still valid but have not been yet issued with final approval. In general, these are approvals for which construction/servicing has not yet been commenced or is currently underway (see active conditional approvals).

Active conditional approvals refer to conditionally approved lots where a servicing agreement (agreement to construct) has been signed between the Water Corporation and the developer. These are termed lots on non-cleared agreements.

Inactive conditional approvals referto conditional approvals that have been granted and are still valid, but where a servicing agreement (agreement to construct) has not been signed between the Water Corporation and the developer.

Lapsed conditional approvals refer to approvals that have expired and the conditions have not been met.

Final approval is the Western Australian Planning Commission endorsement of the proponent's submitted plan/diagram(s) of survey describing the now complete subdivision, constructed in accordance with the conditions set down in the conditional approval. Final approvals are then registered with the Office of Titles where certificates of titles for the newly created lots can be issued.

Infill

Background infill occurs through ad hoc subdivisions and development in existing urban areas yielding fewer than five detached or attached dwellings.

Demolition refers to the pulling down and removal of a dwelling, creating a vacant lot.

Mesh Blocks are micro level geographical units that form the larger regions of the Australian Bureau of Statistics' Australian Statistical Geography Standard. There are approximately 347,000 mesh blocks covering the whole of Australia without gaps or overlaps. They broadly identify land use such as residential, commercial, agricultural and parks.

Greenfield areas are those with gross residential densities below the baseline as determined using the infill model.

Infill areas are those with gross residential densities above the baseline determined using the infill model.

Gross infill refers to the number of dwellings constructed within infill areas regardless of the number of dwellings removed from the stock through demolition activity.

Net infill refers to the number of dwellings constructed within infill areas minus the number of dwellings removed from the existing stock through demolition activity.

SA1 Statistical area level 1 are built from whole mesh blocks. SA1s are delimited using a number of criteria such as population, Indigenous population, urban and rural, local government area and transport.

Local planning schemes

Local planning schemes (LPS) are detailed planning schemes developed by local governments to manage the range of permitted land uses within specified locations. Within the Metropolitan, Peel and Greater Bunbury region schemes, local planning schemes must be consistent with the provisions identified in the relevant region scheme.

Region schemes

Metropolitan Region Scheme (MRS) is a large planning scheme for land use in the Perth metropolitan area. The MRS defines future land use, dividing it into broad zones and reservations. It requires local planning schemes to provide detailed plans for their part of the region. These schemes must be consistent with the MRS. This plan has been in operation since 1963 and provides the legal basis for planning in the Perth metropolitan region.

Peel Region Scheme (PRS) is a large town planning scheme that guides land use in the Peel region. This area includes the City of Mandurah and the shires of Murray and Waroona. The PRS defines the future use of land, dividing it into broad zones and reservations. It requires local planning schemes to provide detailed plans for their parts of the region. These schemes must be consistent with the PRS. This plan has been in operation since March 2003 and provides the legal basis for planning in the Peel region.

Greater Bunbury Region Scheme (GBRS) is a large town planning scheme that guides land use in the Greater Bunbury region. The GBRS includes the City of Bunbury and the shires of Harvey, Dardanup and Capel. The GBRS defines the future of land use, dividing it into zones and reservations. Local governments are required to provide detailed plans for their parts of the region consistent with the GBRS. The scheme has been in operation since November 2007 and provides the legal basis for planning in the Greater Bunbury region.

Region scheme amendment refers to the process of changing zones or reservations from one use to another in a region scheme. The amendment process requires proposed amendments to be advertised for wider community and government comment. The process is regulated by the Planning and Development Act 2005, allowing for extensive community consultation to review the proposal before a final decision is made. Region schemes may be amended in one of two ways: either as a major (substantial) amendment or as a minor (non-substantial) amendment.

Tiered land supply assessment

Tier one encompasses land zoned for urban development. The stock of land potentially available for urban development – land area (ha) split into urban and urban deferred zoned land in the Perth metropolitan, Peel and Greater Bunbury region schemes.

Urban deferred zone refers to land suitable for future urban development but where there are various planning, servicing and environmental requirements that need to be addressed before urban development can take place.

Urban zone refers to land where uses consistent with urban development are permitted, such as housing, commercial uses, light industry and recreation.

Redevelopment authority land refers to land identified for urban development within redevelopment authority areas and is not otherwise zoned urban or urban deferred in the region schemes.

Tier two encompasses the development status of land zoned for urban development – land area (ha). Split into urbanised areas and non-urbanised areas.

Urbanised area refers to land zoned urban that has a building or structure in place or that is subdivided to a size consistent with an urban form. Vacant lots consistent with the typical lot size for the designated land use, such as residential, are included as part of the urbanised area. For example, a 500 square metre (m^2) vacant residential lot would be considered as part of the urbanised area; however, a vacant residential lot of 10,000 m^2 that is not surrounded by urbanised development would be categorised as non-urbanised.

Suburban areas refer to land that is used for typical suburban development. Usually found where dwelling densities are greater than five dwellings per net site hectare, suburban areas include residential mixed uses and smaller parcels of land that may be used for local shops, businesses, services and open spaces.

Commercial and light industrial development is land that is used predominantly for commercial, light industrial and a range of miscellaneous uses and includes local activity centres.

Planned very low-density development are areas of very low-density development where local planning schemes zone for special residential development or where R-Codes indicate densities of R5 or lower.

Non-urbanised area refers to land zoned urban or urban deferred that is identified as undeveloped (vacant land) or land that has been developed at very low residential densities. Urban deferred zones accommodating existing uses (that is, not vacant), are also classified as non-urbanised.

Under-developed areas of very low-density development refers to urban zoned land that is used predominantly for very low-density residential development. Usually found where dwelling densities are less than five dwellings per net site hectare, this includes land that may be used for local shops, businesses, services and open spaces.

Undeveloped urban zoned land is land zoned urban that has yet to be serviced or subdivided for urban purposes.

Undeveloped urban deferred zoned land is land zoned urban deferred that is currently undeveloped.

Existing development on urban deferred land refers to undeveloped urban deferred zoned land. However, in certain cases agricultural, commercial, industrial or residential activities can exist in the urban deferred zone. In most cases this land is potentially viable for future residential development.

Existing development on redevelopment authority land refers to land within redevelopment authority areas not otherwise zoned urban or urban deferred that is developed with residential, commercial or light industrial uses consistent with an urban form.

Low-density residential development on redevelopment authority land refers to low-density residential development within a redevelopment authority area on land that is not otherwise zoned urban or urban deferred.

Undeveloped redevelopment authority land is land within redevelopment authority areas not otherwise zoned urban or urban deferred that has yet to be serviced or subdivided for urban purposes.

Tier three examines the impact that local planning schemes have on land availability and introduces the concepts of committed uses and conflicting uses.

Committed for other purposes refers to tier three and isolates and removes land that is unlikely to be available for residential development. This is typically land that is zoned in local planning schemes for uses that would preclude future residential development. It also includes local authority reserves and public purpose zones.

Permitted (secondary) uses refer to land where the actual land use differs from the principal intention of the land use zoning in the local planning scheme. Permitted (secondary) uses are typically commercial or light industrial usage on land that could theoretically accommodate residential development.

Urbanised area

Residential development refers to suburban areas that are used predominantly for residential purposes, net of land committed for other (non-residential) purposes in local planning schemes.

Commercial and light industrial development is split into areas where the local planning scheme indicates that future residential development is possible and areas where these uses are consistent with the underlying local planning scheme zone.

Planned very low-density development refers to areas of very low-density development where local planning schemes zone for special residential development or where R-Codes indicate densities of R5 or lower.

Existing development on redevelopment authority land refers to land within redevelopment authority areas not otherwise zoned urban or urban deferred that is developed with residential, commercial or light industrial uses consistent with an urban form.

Non-urbanised area

Under-developed areas of very low-density development refers to urban zoned land that is used predominantly for very low-density residential development. Usually found where dwelling densities are less than five dwellings per net site hectare, this includes land that may be used for local shops, businesses, services and open spaces.

Undeveloped urban zoned land is land zoned urban that has yet to be serviced or subdivided for urban purposes.

Undeveloped urban deferred zoned land is land zoned urban deferred that is currently undeveloped, net of land committed for other (non-residential) purposes in local planning schemes.

Commercial and light industrial development is land zoned urban deferred that is used predominantly for non-residential purposes, net of land committed for other (non-residential) purposes in local planning schemes.

Existing very low-density development is land zoned urban deferred that is used predominantly for very low-density residential development, net of land committed for other (non-residential) purposes in local planning schemes.

Undeveloped redevelopment authority land is land not otherwise zoned urban or urban deferred within redevelopment authority areas that is currently undeveloped.

Low-density residential development on redevelopment authority land refers to low-density residential development within a redevelopment authority area on land that is not otherwise zoned urban or urban deferred.

Tier four evaluates the spatial distribution of lots with a current conditional approval for residential subdivision in relation to tier two of the model.

Tier five provides information on the prospective flow of land into the stock of land zoned for urban development. Potential additions to this stock include major and minor region scheme amendments that propose additional urban or urban deferred zoned land. Also considered as part of this tier are various strategic plans and structure plans, as these may also require region scheme amendments before they can be implemented, therefore resulting in additions to the stock of land zoned for urban development.

Density

Gross zone dwelling density refers to the number of dwellings per gross urban zoned hectare, based only on urbanised land. This measure includes the urbanised portion of land within the urban zone including local roads, parks and other incidental uses.

Net site dwelling density refers to the number of dwellings per net site hectare (per urban or city centre zoned hectare, including only the site area of lots actually developed for residential use). Net site dwelling density includes only the internal site area of lots which have been developed with dwellings, regardless of when the dwellings were constructed, and is a snapshot of net site dwelling density as at the reporting period.

Net site dwelling density by build year refers to the number of dwellings per net site hectare (per urban or city centre zoned hectare, including only the site area of lots actually developed for residential use) based only on lots which were developed with dwellings constructed in the time period stated. This measure provides the most accurate indication of the changing nature of residential development, as it includes only the internal site area of lots developed with dwellings in the given year.

Other

Consumption of zoned land is land considered consumed when it has been fully developed for urban use. The *Urban Growth Monitor* uses two methodologies for calculating historical rates of land consumption:

- land consumption based on constructed dwellings
- land consumption based on subdivided land.

The first methodology tracks land consumption by examining when and where new residential properties and related infrastructure are constructed. The second method examines where and when subdivision occurs. An assumption is made that lots subdivided into parcels smaller than 2,000 m^2 are done so for urban purposes. Both methodologies explore consumption by looking at the gross urban area consumed and include all infrastructure that makes up urban development such as roads, reserves, schools and accompanying commercial development.

Dwelling refers to a self-contained suite of rooms, including cooking and bathing facilities, intended for long-term residential use (that is, a house, unit or apartment for example).

Dwelling commencements refers to when the first physical building activity has been performed on site in the form of materials fixed in place and/or labour expended. This includes site preparation but excludes delivery of building materials, the drawing of plans and specifications and the construction of non-building infrastructure, such as roads.

Land zoned for urban development is defined as land zoned urban or urban deferred in the Metropolitan, Peel or Greater Bunbury region schemes. In addition, land zoned for urban development includes land within redevelopment areas that is not otherwise zoned urban or urban deferred in the region schemes but has been designated for urban development under the *Metropolitan Redevelopment Authority Act 2011*.

Land supply refers to the amount of land that is zoned for urban, industrial or commercial use in a region scheme and is undeveloped.

Lot supply refers to the number of developed and serviced lots that are available to purchase, for the purpose of dwelling construction.

Stocks and flows are concepts used in statistical reporting, including reports by the ABS. They are related to the concept of system dynamics which analyse complex systems to better understand processes. Flows relate to the rate at which something is happening. They are variables measured over an interval of time and refer to a particular quantum (that is, hectares, lots and dwellings) per time period (that is, months, quarters, years). A key benefit is that flows can be compared across different stages of the approval and development pipeline to find the slowest part of the chain. Stocks are variables measured at one specific time, and they represent a quantity existing at that point in time (for example, as at 31 December 2012), which may have accumulated in the past.

Structure plan refers to a document, including spatial plans, that details the proposed layout of a future development area. In addition to illustrating details such as road configurations and the location of retail and community facilities such as shops, schools and public open space, a structure plan can also show details such as housing density, land-use classifications and buffer zones.

Temporal land supply is an estimate of the number of years it will take to completely consume land that is currently zoned for urban development. Temporal land supply can vary based on different development scenarios, particularly where different rates of density and infill are applied.

Urbanisation refers to the conversion of non-urbanised land into urbanised land. The *Urban Growth Monitor* measures rates of urbanisation by tracking consumption of non-urbanised land zoned for urban development.

Vacant lots refers to those lots that are undeveloped (that is, have no premises constructed) and that are located on residential or special zones as designated under the various local planning schemes in Western Australia. The base information is provided by the Valuer General's Office (VGO).

Acronyms and abbreviations

ABS	Australian Bureau of Statistics
DPLH	Department of Planning, Lands and Heritage
dw/guz ha	Dwellings per gross urban zoned hectare
GBRS	Greater Bunbury Region Scheme
ha	hectares
m^2	square metres
LHS	Left hand side (primary y-axis)
MRS	Metropolitan Region Scheme
PRS	Peel Region Scheme
RHS	Right hand side (secondary y-axis)
UDIA	Urban Development Institute of Australia
VGO	Valuer General's Office
WAPC	Western Australian Planning Commission

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