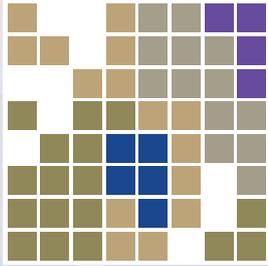




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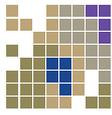
# Urban Growth Monitor

Perth Metropolitan, Peel and Greater Bunbury Regions

14

February 2023





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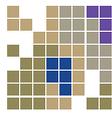
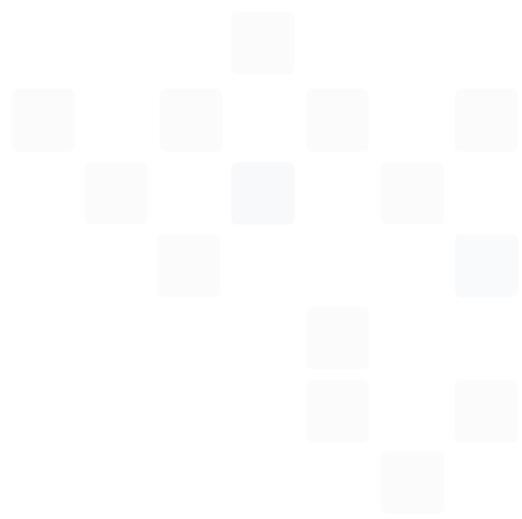
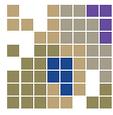


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# 1 Executive summary

This is the 14th edition of the *Urban Growth Monitor*, presenting information relating to land zoned for urban development calculated as at 31 December 2021.

The *Urban Growth Monitor* is prepared on behalf of the Western Australian Planning Commission (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, reporting on land demand factors and supply pipeline, subdivision, housing activity and infrastructure.

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. Methodologies will continue to improve as new data and technologies become available.

The land supply analysis within the *Urban Growth Monitor* represents a broad assessment of land zoned for urban development. Information presented in this report is intended to assist but not substitute the more detailed site-specific assessments required at the district and local planning level in determining the availability of urban land for residential or other urban purposes.

The term 'land supply' can be used in a variety of contexts with different meanings and implications. As the focus of the *Urban Growth Monitor* is on land zoned for urban development, 'land supply' in this context refers to the amount of undeveloped land zoned for urban purposes in a region scheme. Urban land encompasses a range of land uses including residential, commercial, light industrial and public purposes.

Residential land buyers, on the other hand, often use the term 'land supply' in reference to the number of developed and serviced lots available to purchase for the purpose of dwelling construction. In the *Urban Growth Monitor*, this is referred to as 'lot supply' and an undersupply is termed a 'lot shortage'.

Maintaining suitable stocks of land for urban development requires an understanding of the existing stocks of zoned land and of the rate at which urban land is consumed by development. The analysis of land consumption in the *Urban Growth Monitor* uses gross consumption rates obtained over a 20-year period. Gross land consumption refers to the total area of land consumed for urban development, inclusive of both residential and non-residential uses. In the context of the *Urban Growth Monitor*, gross consumption rates are considered the most appropriate as it provides a more accurate indication of the volume of land consumed by urban development.

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

- consumption rates of urban zoned land (also assessed as a gross measure)
- residential dwelling density; and
- 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 2021, there was a net gain of 1,470 hectares of land zoned for urban development across the three region schemes.

Based on historical development patterns, it would take approximately 27 years to consume the stock of non-urbanised land available for development. These estimates are based on the stock of land zoned for urban development as at 31 December 2021. Temporal supply estimates use gross consumption rates, which take into account both residential and non-residential requirements such as schools, roads, reserves and commercial projects.

The consumption rates assumed in this scenario are based on the 20-year average rate of land consumption across Perth and Peel. The theoretical land supply may therefore be extended if rates of residential infill development and greenfield densities continue to improve.

Over time there will be further additions to the stock of urban and urban deferred land. The *Urban Growth Monitor* will continue to track urban land supply and consumption to ensure that stocks of land for urban development are maintained into the future. Methodologies will continue to improve as new data and technologies become available.

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 new development in greenfield areas in the Perth metropolitan and Peel regions was 23.4 dwellings per net site hectare for dwellings constructed in 2021. This represents an increase from 15 dwellings per net site hectare in 2010, but remains slightly below the long-term strategic target of 26 dwellings per net site hectare.

The net infill rate, which accounts for demolition activity, for the Perth metropolitan and Peel regions only, was approximately 29 per cent in 2021, down from 44 per cent in 2020, 43 per cent in 2019, and 38 per cent in 2018. The rise in greenfield dwelling construction during 2021, combined with lower completion volumes of large-scale infill projects, has contributed to reduced levels of infill development in 2021 in comparison to previous years. 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. Future infill rates will indicate if the COVID-19 pandemic may also have contributed.

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 2021, there was approximately 117,140 hectares of urban and urban deferred zoned land in the Perth metropolitan, Peel and Greater Bunbury regions
- in addition, 480 hectares of land intended for urban development but not zoned urban or urban deferred in the region schemes was identified within DevelopmentWA redevelopment areas and included in the tiered land supply assessment
- during 2021, there was a 310-hectare net increase in land zoned for urban development under the Metropolitan Region Scheme and a 1,160-hectare net increase under the Greater Bunbury Region Scheme
- there was no change in the stock of land zoned for urban development within the Peel Region Scheme
- around 76 per cent (89,610 hectares) of land identified for urban development is developed with urban uses and 24 per cent (28,020 hectares) is non-urbanised (undeveloped).

## Land consumption

- in 2021, 820 hectares of land within the Perth metropolitan, Peel and Greater Bunbury regions were consumed by subdivision, while 510 hectares were consumed by dwelling construction
- in the 20-year period to December 2021, an average of 890 hectares of land per annum were consumed by subdivision, and 850 hectares per annum was consumed by construction in the Perth metropolitan and Peel regions
- in the Greater Bunbury region, an average of 60 hectares per annum was consumed by both subdivision and by construction in the 20 years to 2021
- if land consumption continues at a rate consistent with the 20-year average, it would theoretically take an estimated 27 years to deplete existing stocks of non-urbanised land available for urban development in the Perth metropolitan and Peel regions
- based on the Greater Bunbury region's historical consumption rate, existing stocks of non-urbanised land could theoretically meet demand for the next 58 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 2021, in the Perth metropolitan and Peel regions:

- a total of 10,260 dwellings were constructed - of these, 4,150 dwellings were constructed in infill areas and 6,110 in greenfield areas
- net infill refers to dwellings constructed within infill areas minus the number of dwellings removed from the existing stock through demolition - in 2021, net infill totalled 2,450 dwellings
- of the 2,450 net infill dwellings, 1,620 were in the central sub-region and 830 in the outer metropolitan sub-regions and Peel
- the net infill rate was approximately 29 per cent in 2021, down from 44 per cent in 2020
- the rise in greenfield dwelling construction during 2021, combined with lower completion volumes of large-scale infill projects in 2021, has resulted in reduced levels of infill development during 2021 relative to previous years.

## Dwelling density

- *Perth and Peel@3.5million* sets a target of 15 dwellings per gross urban zoned hectare for new residential development, which is equivalent to 26 dwellings per net site hectare
- the gross dwelling density measure is converted to an equivalent 'net site dwelling density' target to enable the density of only new residential development to be measured
- 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 with dwellings constructed within each calendar year.

In 2021:

- the 'net site dwelling density by build year' for greenfield development areas in the outer Perth metropolitan sub-regions and Peel was 23.4 dwellings per net site hectare; which represents an increase from approximately 15 dwellings per net site hectare in 2010, but remains slightly below the long-term strategic target of 26 dwellings per net site hectare
- the 'net site dwelling density by build year' for all sites (including infill areas) in the Perth metropolitan and Peel regions was 25.6 dwellings per net site hectare.

## 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, as well as land identified for urban purposes in redevelopment authority areas. This 14th edition of the *Urban Growth Monitor* presents information relating to land supply calculated as at 31 December 2021. The regional and sub-regional summarised outputs of the tiered land supply assessment are outlined in Appendix 1. See the *Frequently Asked Questions* document on the Department of Planning, Lands and Heritage website for a detailed explanation of each tier.

This edition of the *Urban Growth Monitor* contains updates to the tiered land supply assessment model. While the general structure of the model remains the same, this year’s model uses the Department of Planning, Lands and Heritage’s Integrated Regional Information System. The Integrated Regional Information System has been used in other Urban Development Program products such as the *Regional Land Supply Assessments* and the *Economic and Employment Land Monitor* reports.

Using the Integrated Regional Information System for the *Urban Growth Monitor’s* tiered land supply assessment model enables more accurate analysis of the availability of land for urban development, as it makes use of a greater range of attribute information from Landgate than the previous tiered land supply assessment model. As a result, for 2021, there are additional land use categories in tiers two and three and shifts in the stocks within the land use categories from previous years. Further information on these categories are provided in sections 2.3 and 2.4.

## 2.2 Tier one – land zoned for urban development

In 2021, the total stock of urban and urban deferred zoned land under the Metropolitan, Peel and Greater Bunbury region schemes was approximately 117,140 hectares. This is a net increase of 1,470 hectares more than in 2020, with most of the increase in stock being urban deferred zoned land within the boundaries of the Greater Bunbury Region Scheme.

For 2021, the stock of land designated for urban development in redevelopment authority areas outside of land zoned urban or urban deferred in the region schemes constituted 480 hectares. The reduction in stocks of redevelopment authority land during 2021 was due to the normalisation into the region schemes of portions of the Central Perth, Subiaco, Armadale and Midland redevelopment areas. In total, there was a collective stock of 117,620 hectares of land identified for urban development across the three region schemes as at December 31, 2021 (Table 1).

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

Region scheme	Description	Stock (ha) 2016	Stock (ha) 2017	Stock (ha) 2018	Stock (ha) 2019	Stock (ha) 2020	Stock (ha) 2021	Change (ha) 2020 to 2021
Metropolitan Region Scheme	Urban zoned land	89,690	89,880	90,520	90,770	90,860	91,360	490
	Urban deferred zoned land	4,530	4,490	6,570	6,770	6,680	6,500	-180
	<b>MRS subtotal</b>	<b>94,220</b>	<b>94,380</b>	<b>97,090</b>	<b>97,540</b>	<b>97,550</b>	<b>97,860</b>	<b>310</b>
Peel Region Scheme	Urban zoned land	9,120	9,010	9,010	9,010	9,010	9,040	30
	Urban deferred zoned land	130	130	130	130	130	90	-30
	<b>PRS subtotal</b>	<b>9,250</b>	<b>9,140</b>	<b>9,140</b>	<b>9,140</b>	<b>9,140</b>	<b>9,140</b>	<b>0</b>
Greater Bunbury Region Scheme	Urban zoned land	8,270	8,270	8,280	8,280	8,280	8,340	60
	Urban deferred zoned land	720	720	720	720	710	1,810	1,100
	<b>GBRS subtotal</b>	<b>8,990</b>	<b>8,990</b>	<b>8,990</b>	<b>8,990</b>	<b>8,990</b>	<b>10,150</b>	<b>1,160</b>
Total region schemes	Urban zoned land	107,080	107,170	107,800	108,060	108,150	108,740	580
	Urban deferred zoned land	5,370	5,340	7,410	7,600	7,520	8,410	890
	<b>Total land zoned for urban development</b>	<b>112,460</b>	<b>112,500</b>	<b>115,220</b>	<b>115,670</b>	<b>115,670</b>	<b>117,140</b>	<b>1,470</b>
Additional redevelopment authority land		–	1,430	1,430	1,260	1,030*	480	-550
<b>Total zoned land available for urban development</b>		<b>112,460</b>	<b>112,500</b>	<b>116,460</b>	<b>116,630</b>	<b>116,600</b>	<b>117,620</b>	<b>920</b>

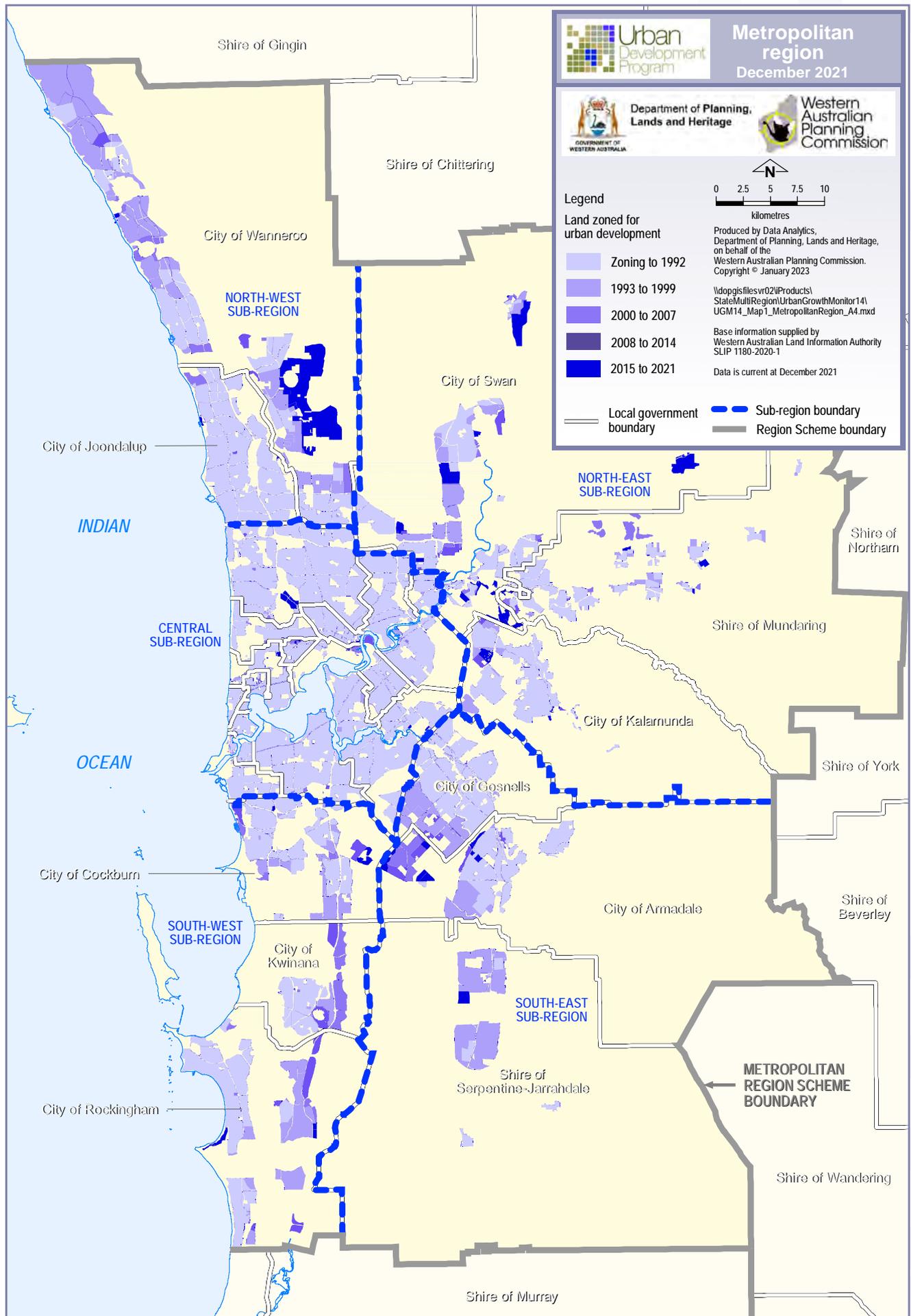
Source: Department of Planning, Lands and Heritage (2022)

Note: Figures may not sum due to rounding.

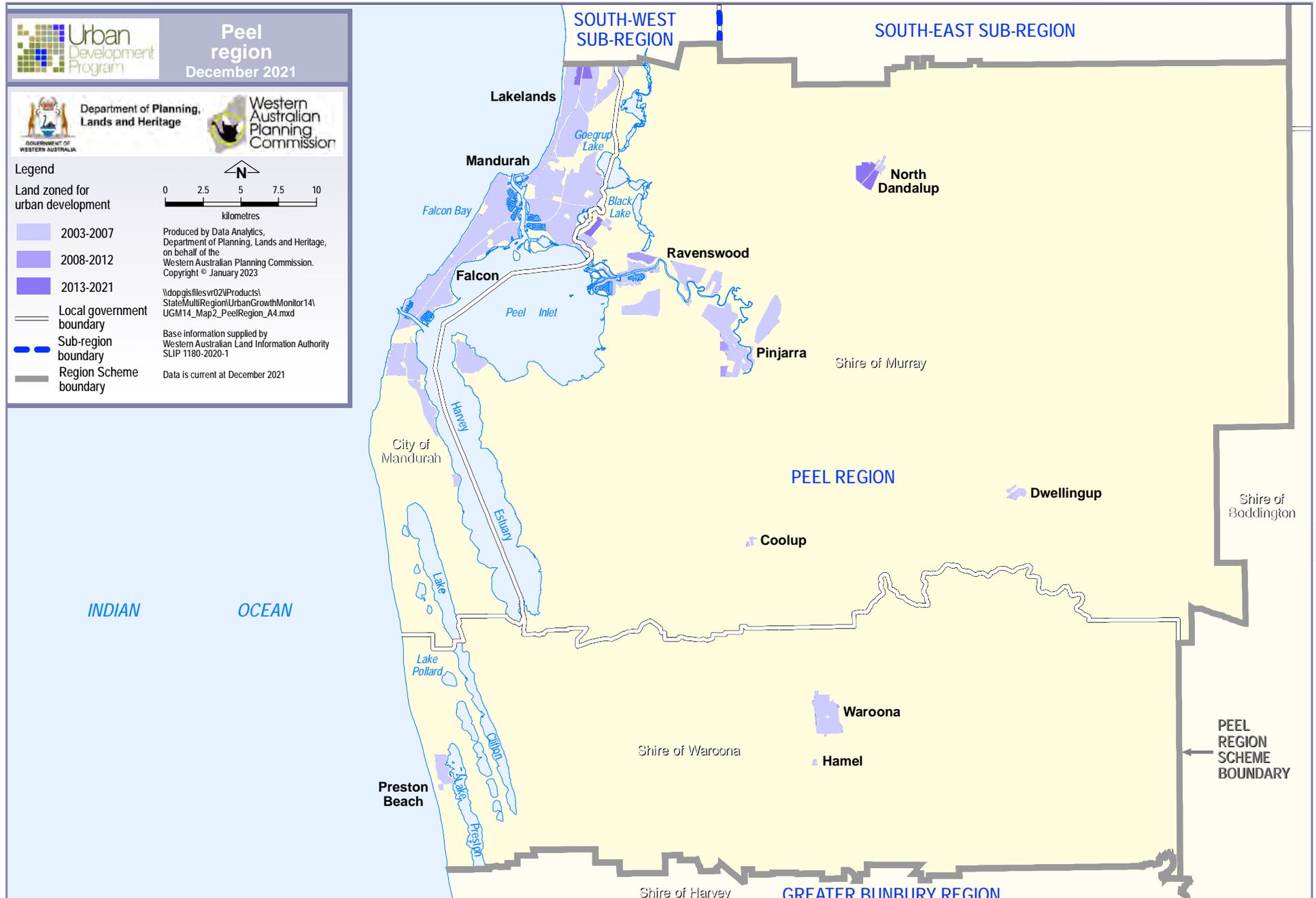
Data calculated as at end of each calendar year. As the analysis of additional redevelopment authority land is a new addition for 2017 and onwards, there are no figures for 2016.

\* In 2020, in addition to the normalisation of redevelopment authority land into the MRS, the stocks were refined to exclude land identified for industrial purposes.

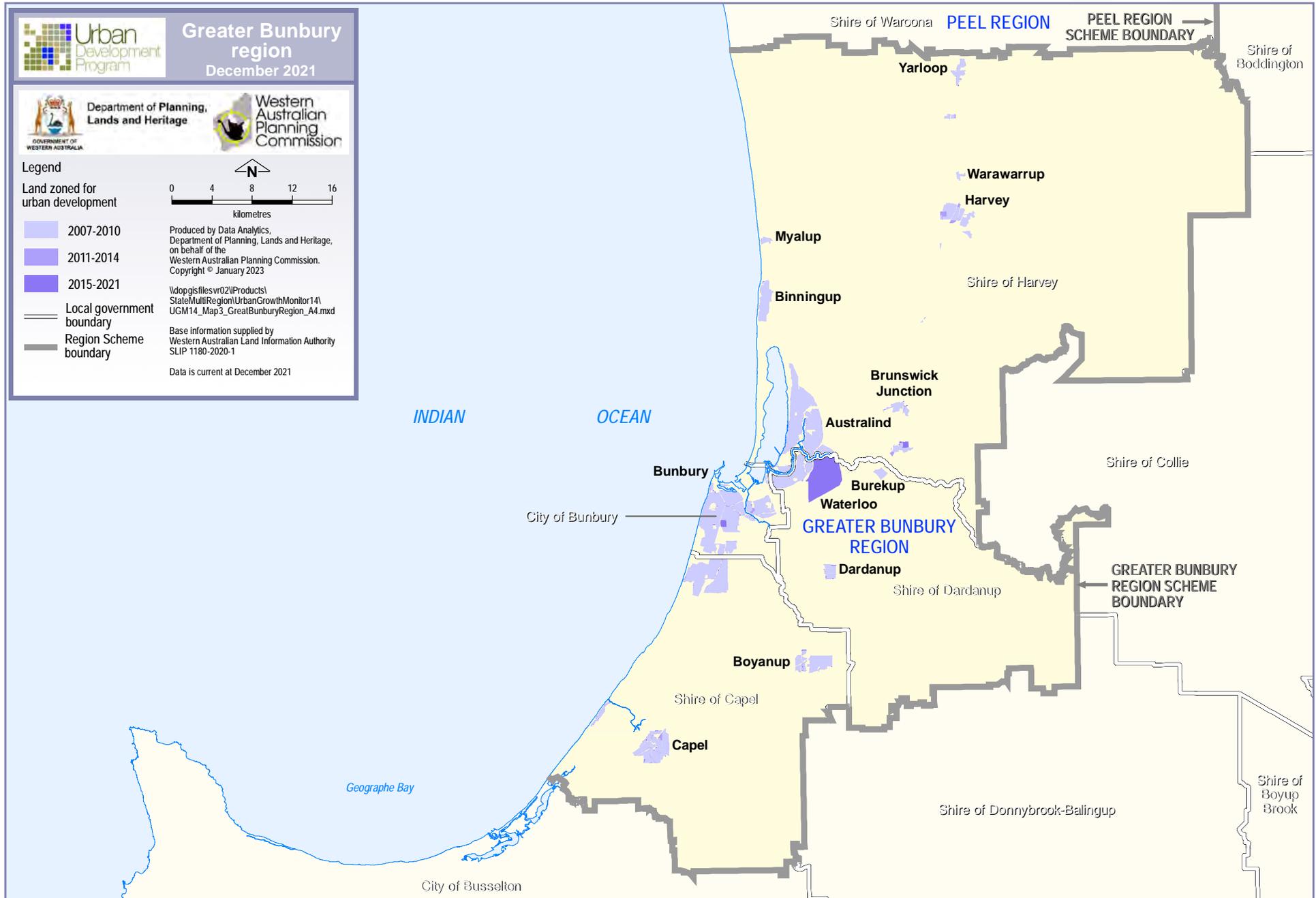
**Map 1: Change in stock of land zoned for urban development over time – Perth metropolitan region**



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



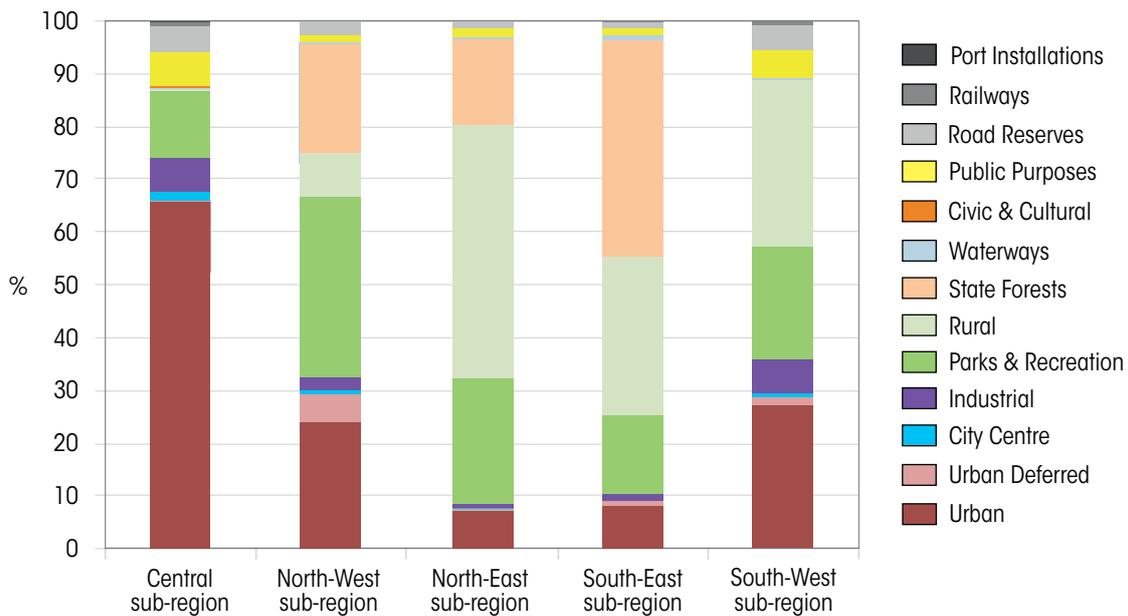
## Metropolitan Region Scheme

In 2021, 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, while Figure 2 shows the changes in the stock of land for urban development over time in the MRS.

## Peel Region Scheme

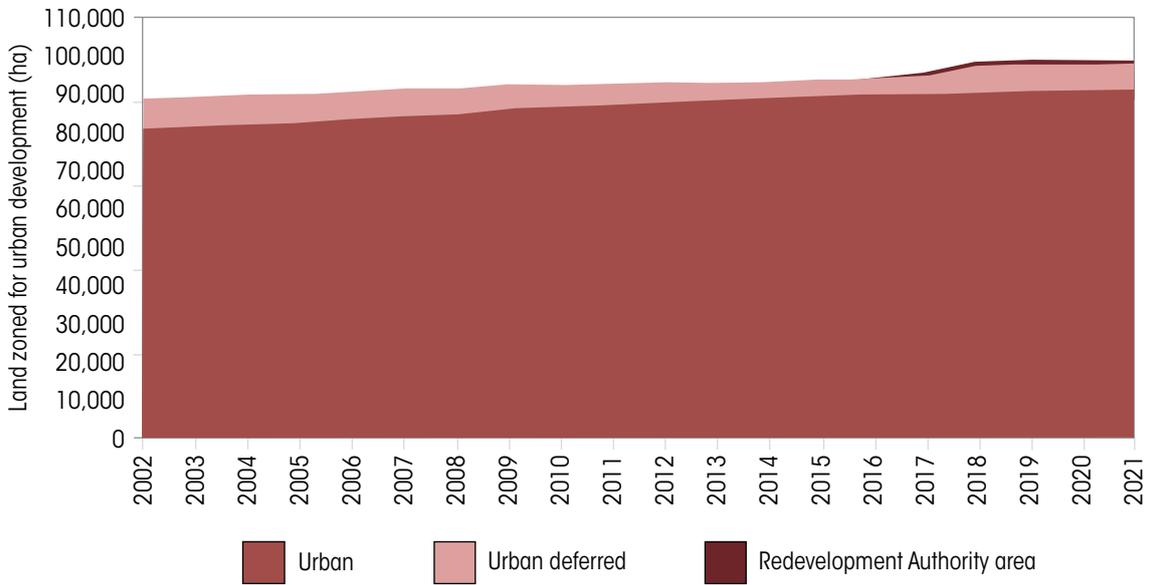
The Peel Region Scheme (PRS) covers approximately 270,570 hectares, of which three per cent is zoned either urban or urban deferred. In 2021, approximately 30 hectares of urban deferred zoned land was rezoned to urban. (Figure 3).

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



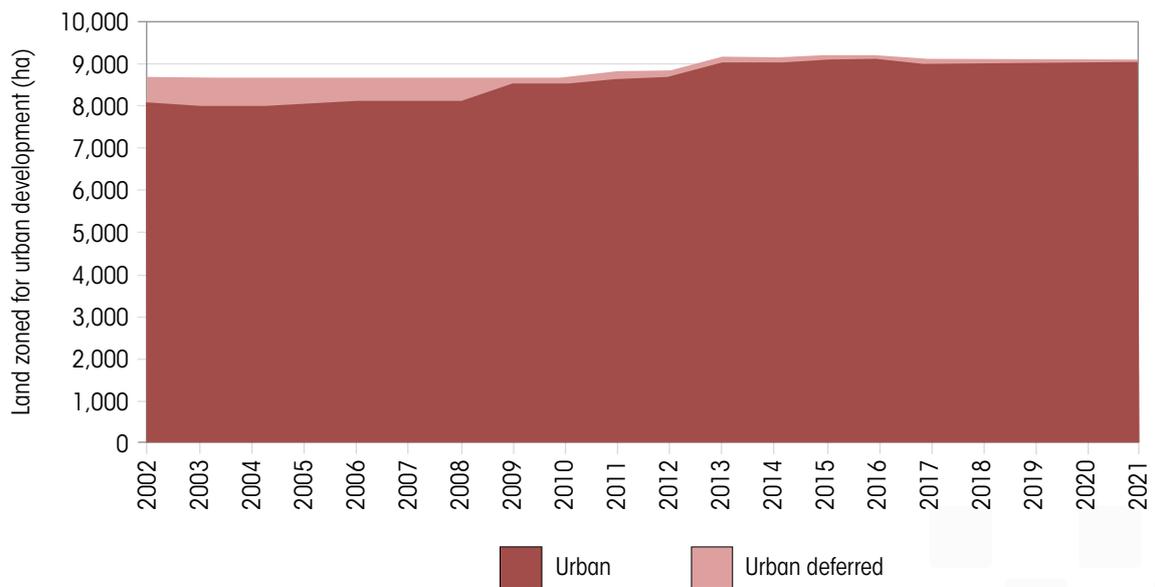
Source: Department of Planning, Lands and Heritage (2022)

**Figure 2: Metropolitan Region Scheme: Urban and urban deferred zones 2002-2021**



Source: Department of Planning, Lands and Heritage (2022)

**Figure 3: Peel Region Scheme: Urban and urban deferred zones 2002-2021**



Source: Department of Planning, Lands and Heritage (2022)

## Greater Bunbury Region Scheme

The Greater Bunbury Region Scheme (GBRS) encompasses approximately 288,200 hectares, of which four per cent is zoned for urban development. In 2021, there was a 60 hectare increase in urban zoned land and an 1,100 hectare increase in urban deferred zoned land. The addition to urban deferred stocks occurred in Wanju, in the Shire of Dardanup. (Figure 4).

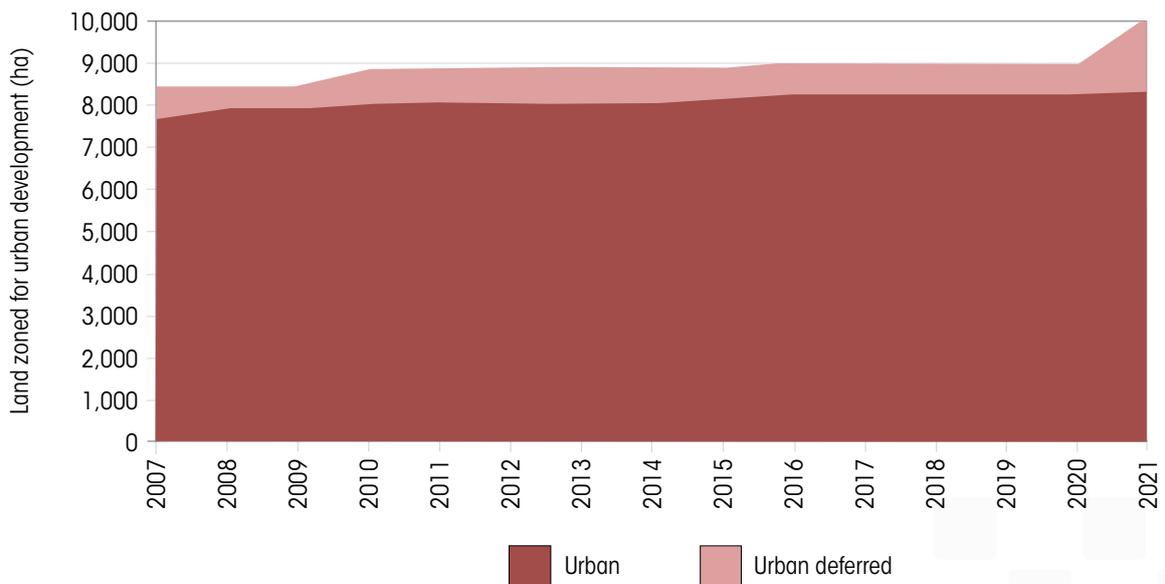
## DevelopmentWA (Redevelopment authority) areas

The *Metropolitan Redevelopment Authority Act 2011* identifies land in the Perth metropolitan area for redevelopment and is governed by DevelopmentWA. Most of the land identified for urban development coincides with land zoned urban or urban deferred under the MRS.

There is, however, a portion of land within redevelopment areas that is not zoned urban or urban deferred under the MRS but has been identified for urban development. Collectively, these areas add approximately 480 hectares to the total stock of land identified for urban development in the Metropolitan region.

In 2021, there was a reduction in the stock of redevelopment authority land identified for urban development as portions of the Central Perth, Subiaco, Midland and Armadale redevelopment areas were normalised to the urban zone in the MRS.

**Figure 4: Greater Bunbury Region Scheme: Urban and urban deferred zones 2007-2021**



Source: Department of Planning, Lands and Heritage (2022)

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

### 2.3.1 Urbanised and non-urbanised land

As shown in Table 2, of the stock of land zoned for urban development, 89,610 hectares or 76 per cent is developed with urban uses and 28,020 hectares (24 per cent) is non-urbanised. The urbanised and non-urbanised portions vary between regions and sub-regions (Figure 5).

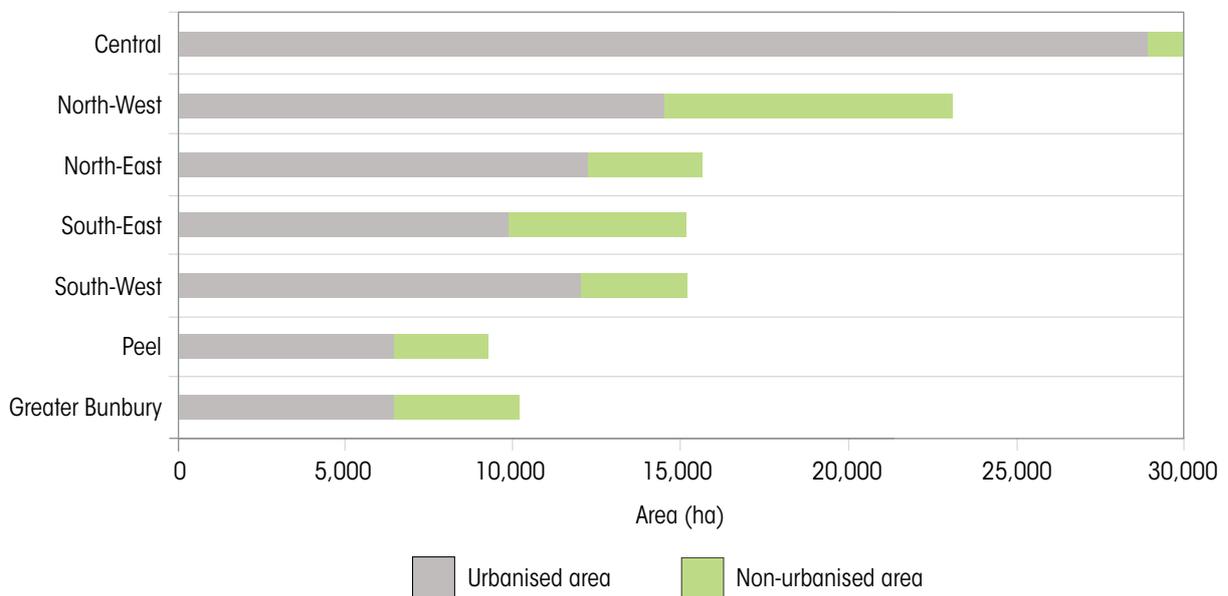
Table 2: Urbanised and non-urbanised land

Region/sub-region	Urbanised area (ha)	Non-urbanised (greenfield area) (ha)	Total land zoned for urban development (ha)	Urbanised (%)
Central sub-region	28,690	1,110	29,800	96%
North-West sub-region	14,370	8,550	22,920	63%
North-East sub-region	12,110	3,410	15,530	78%
South-East sub-region	9,770	5,270	15,030	65%
South-West sub-region	11,910	3,140	15,050	79%
<b>Perth metropolitan sub-total</b>	<b>76,860</b>	<b>21,480</b>	<b>98,340</b>	<b>78%</b>
Peel region	6,410	2,720	9,140	70%
<b>Perth and Peel sub-total</b>	<b>83,270</b>	<b>24,210</b>	<b>107,480</b>	<b>77%</b>
Greater Bunbury region	6,340	3,810	10,150	62%
<b>Total</b>	<b>89,610</b>	<b>28,020</b>	<b>117,620</b>	<b>76%</b>

Source: Department of Planning, Lands and Heritage (2022)

Note: Figures may not sum due to rounding.

**Figure 5: Urbanised and non-urbanised land**



Source: Department of Planning, Lands and Heritage (2022)

### 2.3.2 Urbanised area

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

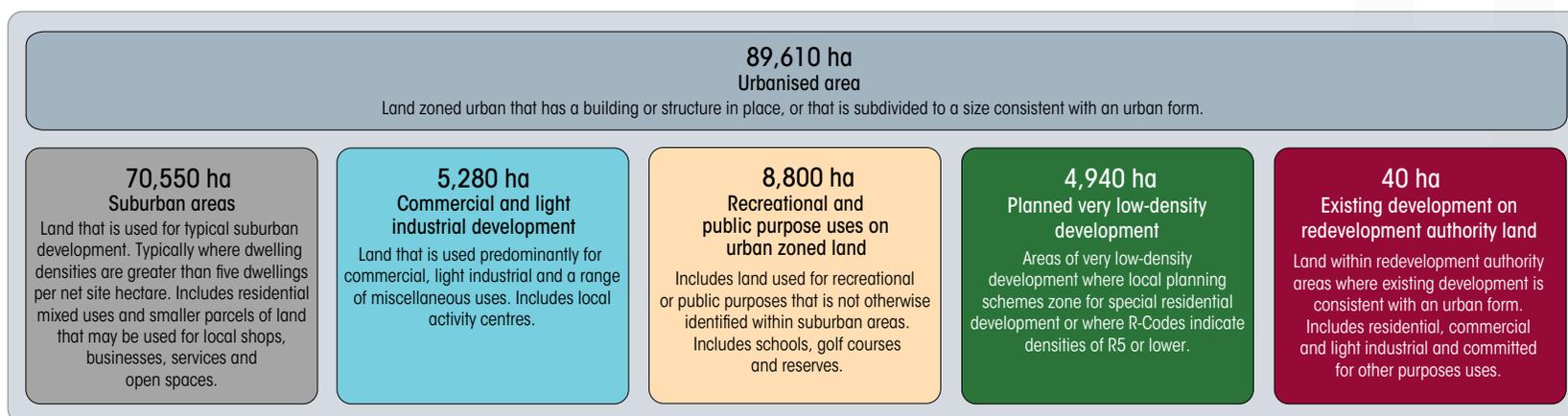
- suburban areas
- commercial and light industrial development
- planned very low-density development
- existing development on redevelopment authority land
- recreational and public purposes on urban zoned land.

Recreational and public purposes on urban zoned land is a new category developed to accommodate the improvements in land use classification as a result of using the Integrated Regional Information System as the *Urban Growth Monitor's* tiered land supply assessment model. This category includes urban zoned land used for leisure or recreational activities that are outside of suburban areas.

Figure 6 and Table 3 show the distribution of each land-use category in urbanised areas. The Central and North-West sub-regions have the largest share of suburban usage (86 and 84 per cent respectively).

Planned very low-density development is prevalent in the North-East sub-region and Greater Bunbury region, constituting 21 and 18 per cent respectively. Recreation and public purposes on urban zoned land outside of suburban areas, constitute nine per cent in the metropolitan region.

**Figure 6: Existing land uses in urbanised area**



Source: Department of Planning, Lands and Heritage (2022)

Note: Figures may not sum due to rounding.

**Table 3: Existing land uses in urbanised areas by sub-region**

Region/sub-region	Suburban area (ha)	Commercial and light industrial development (ha)	Recreational and public purpose uses on urban zoned land (ha)	Planned very low-density development (ha)	Existing development on redevelopment authority land (ha)	Total (ha)
Central sub-region	24,600	1,960	2,090	30	10	28,690
North-West sub-region	12,140	650	1,560	30	0	14,370
North-East sub-region	7,820	300	1,470	2,520	0	12,110
South-East sub-region	7,570	660	870	630	30	9,770
South-West sub-region	9,590	940	1,240	150	0	11,910
<b>Perth metropolitan sub-total</b>	<b>61,730</b>	<b>4,500</b>	<b>7,220</b>	<b>3,360</b>	<b>40</b>	<b>76,860</b>
Peel region	4,880	280	820	440	0	6,410
<b>Perth and Peel sub-total</b>	<b>66,610</b>	<b>4,780</b>	<b>8,040</b>	<b>3,790</b>	<b>40</b>	<b>83,270</b>
Greater Bunbury region	3,940	490	760	1,140	0	6,340
<b>Total</b>	<b>70,550</b>	<b>5,280</b>	<b>8,800</b>	<b>4,940</b>	<b>40</b>	<b>89,610</b>

Source: Department of Planning, Lands and Heritage (2022)

Note: Figures may not sum due to rounding.

### 2.3.3 Non-urbanised area

Tier two of the land supply assessment identifies the gross area of non-urbanised land zoned for urban development before any allowances are made for existing or future infrastructure requirements or potential zone changes. The non-urbanised area includes urban, urban deferred and redevelopment authority (DevelopmentWA) land and consists of:

- under-developed areas of very low-density development (urban zoned land with no Residential Design Code (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
- existing agricultural uses on urban and urban deferred zoned land.

Existing agricultural uses on urban and urban deferred zoned land is a new category developed to accommodate the improvements in land-use classification as a result of using the Integrated Regional Information System as the *Urban Growth Monitor's* tiered land supply assessment model. This category includes land zoned residential in local planning schemes that is classified by Landgate's Valuer General's Office as being used for farming or other agricultural activities.

Figure 7 and Table 4 provide further detail on the existing land-use distribution in non-urbanised areas.

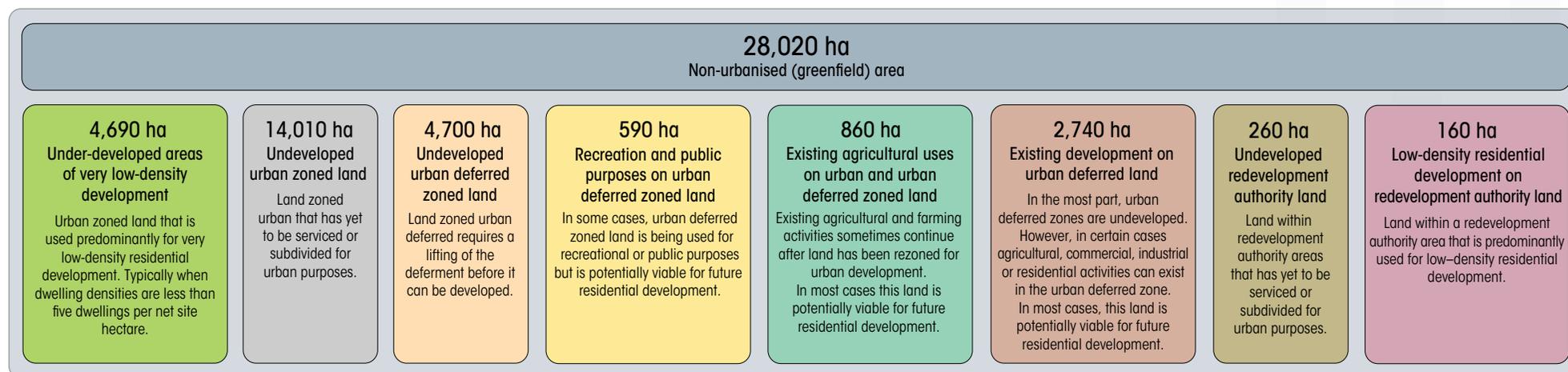
A small amount of non-urbanised land exists in the Central sub-region (1,110 ha), with other sub-regions having between 3,000 and 8,500 hectares of non-urbanised land. Redevelopment authority land not zoned urban, urban deferred or city centre comprises just over one per cent of the non-urbanised area.

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

Tier three provides further information on the dynamics of land use within 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 refers 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 business.

Figure 7: Existing land uses in non-urbanised areas



Source: Department of Planning, Lands and Heritage (2022)

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)	Recreation and public purpose uses on urban deferred zoned land (ha)	Existing agricultural uses on urban and 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	320	770	0	0	0	10	0	0	1,110
North-West sub-region	200	4,380	2,290	160	60	1,460	0	0	8,550
North-East sub-region	1,120	1,730	200	20	40	310	0	0	3,410
South-East sub-region	1,830	1,550	570	70	230	600	260	160	5,270
South-West sub-region	410	2,000	220	300	0	210	0	0	3,140
<b>Perth metropolitan sub-total</b>	<b>3,880</b>	<b>10,430</b>	<b>3,280</b>	<b>550</b>	<b>330</b>	<b>2,600</b>	<b>260</b>	<b>160</b>	<b>21,480</b>
Peel region	300	2,320	50	0	10	40	0	0	2,720
<b>Perth and Peel sub-total</b>	<b>4,180</b>	<b>12,750</b>	<b>3,330</b>	<b>550</b>	<b>340</b>	<b>2,640</b>	<b>260</b>	<b>160</b>	<b>24,210</b>
Greater Bunbury region	510	1,260	1,370	40	520	100	0	0	3,810
<b>Total</b>	<b>4,690</b>	<b>14,010</b>	<b>4,700</b>	<b>590</b>	<b>860</b>	<b>2,740</b>	<b>260</b>	<b>160</b>	<b>28,020</b>

Source: Department of Planning, Lands and Heritage (2022)

Note: Figures may not sum due to rounding.

Permitted (secondary) uses refers 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.

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

As mentioned earlier in the chapter, the inclusion of the Integrated Regional Information System into the tiered land supply model allows for a finer grain analysis of land use. This has resulted in the creation of a new land-use category within the urbanised area and reclassification of land within tier three.

With the additional layer of analysis provided through the Integrated Regional Information System, some of the land previously identified for residential development has been identified as currently being utilised for non-residential purposes and has been reclassified into committed for other purposes or the recreation and public purpose categories. Some of the land within the recreation and public purpose category can accommodate future residential development where the local planning scheme indicates that it is possible. Once residential development occurs, it is assumed that this land will transition to be part of the suburban area.

Figure 8 and Figure 9 indicate that approximately 53 per cent of the urbanised area across the three region schemes is used primarily for residential purposes. The remaining 47 per cent of urbanised land essentially accommodates non-residential uses, with 33 per cent of urbanised areas committed for other purposes and 11 per cent occupied by commercial and light industrial development

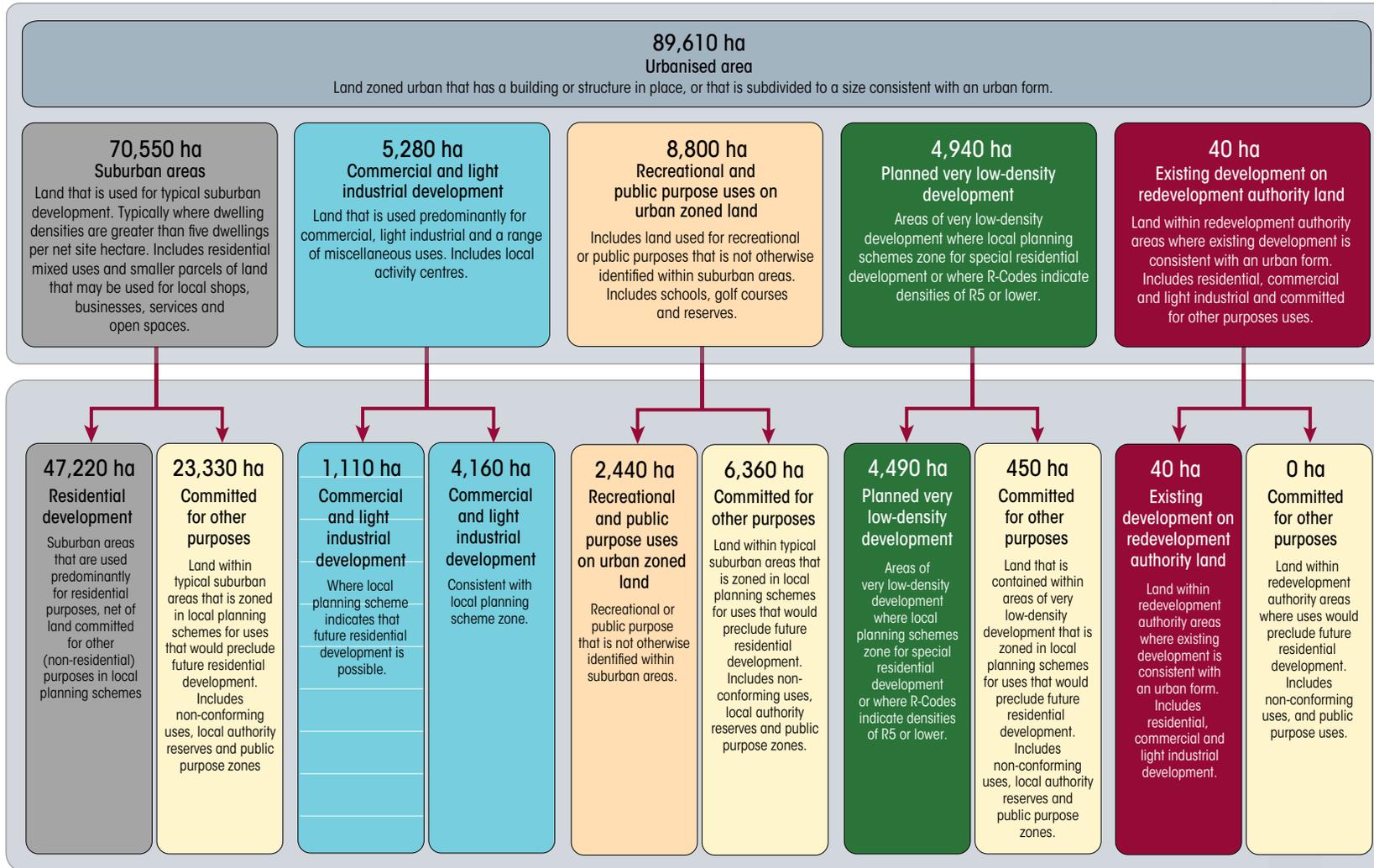
### 2.4.2 Non-urbanised area – land-use dynamics incorporating local planning schemes

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 be unavailable for future residential development.

The total stock of undeveloped urban, urban deferred and undeveloped redevelopment authority land comprises around 63 per cent of the non-urbanised area (Figure 10 and Figure 11). This land is potentially available for future residential development.

Around one per cent of non-urbanised land is currently occupied by commercial or light industrial development, compared with around six per cent for urban zoned land. As planning and development progresses, a greater proportion of the non-urbanised stock could transition to commercial or light industrial uses in the future.

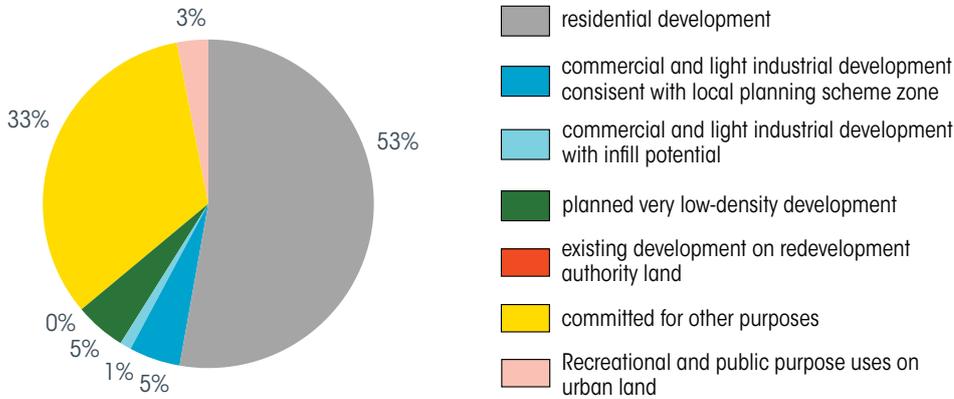
**Figure 8: Land-use dynamics of urbanised areas**



Source: Department of Planning, Lands and Heritage (2022)

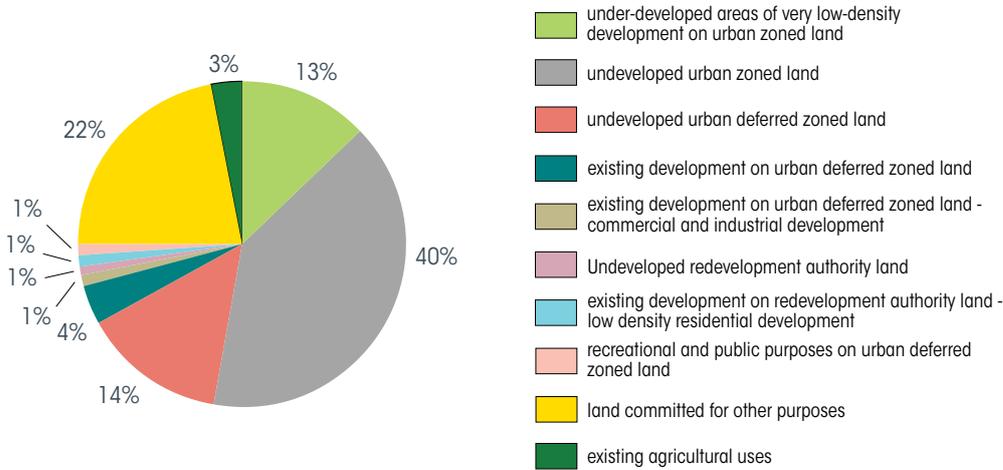
Note: Figures may not sum due to rounding.

**Figure 9: Land-use dynamics in urbanised areas**



Source: Department of Planning, Lands and Heritage (2022)

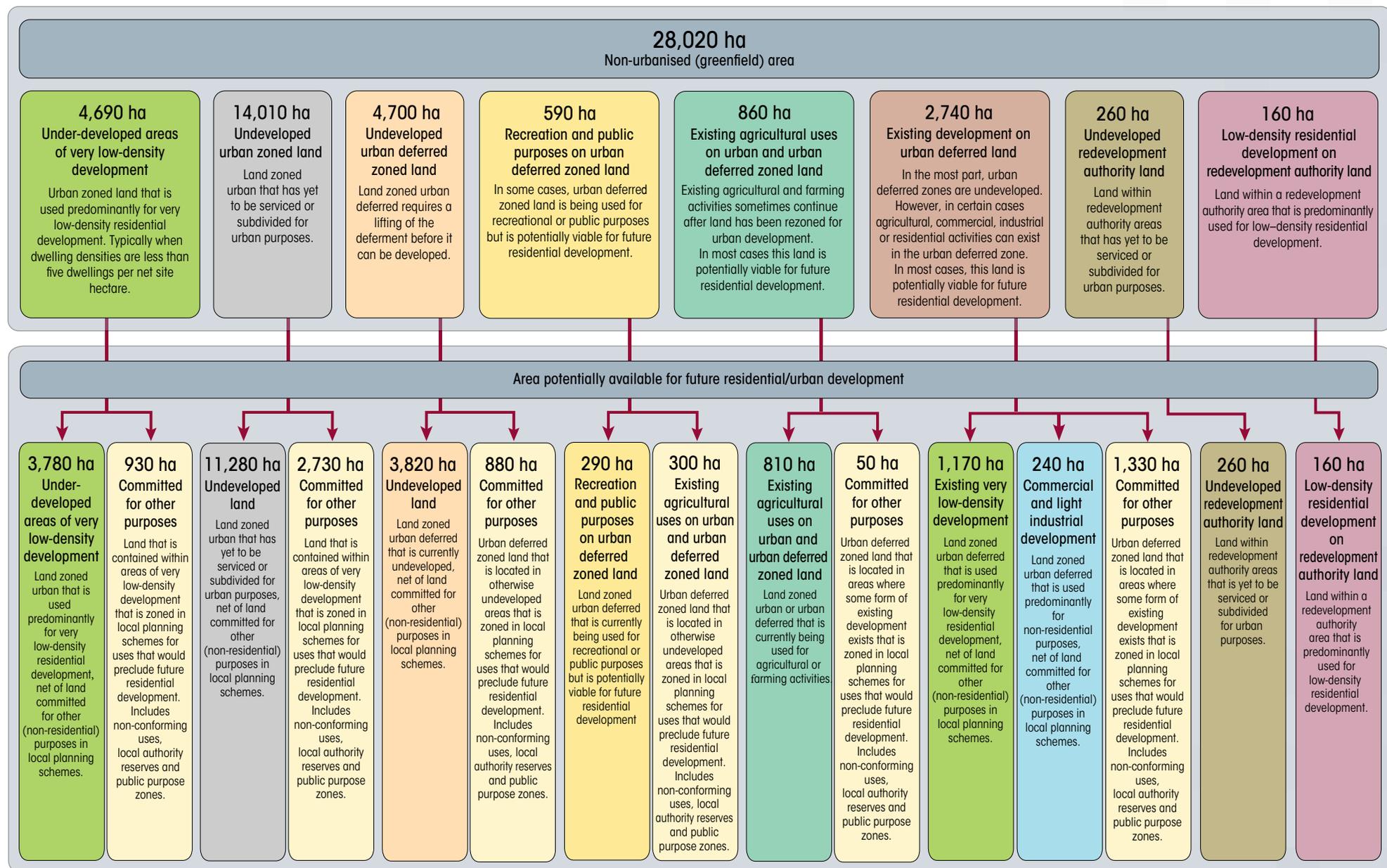
**Figure 10: Proportion of committed uses on non-urbanised land zoned for urban development**



Source: Department of Planning, Lands and Heritage (2022)

While the specific dynamics of future land zoning decisions remain unknown, it is assumed that ultimately non-urbanised land will have a similar composition to current urbanised land. Based on previous development patterns, it is likely that from one third to just under half of the overall share of the non-urbanised stock may be unavailable for residential purposes. In the future, it is likely that 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 11: Land-use dynamics of non-urbanised areas incorporating local planning schemes



Source: Department of Planning, Lands and Heritage (2022)

Note: Figures may not sum due to rounding.

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

As at 31 December 2021, there were approximately 56,120 residential lots (strata and freehold) with current conditional subdivision approval across the Perth, Peel and Greater Bunbury regions (Table 5). Of these, around 66 per cent were in non-urbanised areas, with the remaining 34 per cent in urbanised areas. Within the urbanised area, 35 per cent of conditional approvals were strata subdivisions, compared to just three per cent in non-urbanised areas.

The South-West sub-region had the greatest stock of residential lots with current conditional approvals, with 13,800 lots (25 per cent) being in the South-West, followed by the North-West with 11,680 lots (21 per cent).

Table 6 shows the distribution of conditional subdivision approvals based on tier three of the land supply assessment. Within urbanised areas, 85 per cent of conditional approvals for residential subdivision are in suburban areas, five per cent are in areas currently identified as accommodating commercial or light industrial uses and nine per cent are on land identified as being for recreation and public purposes.

Table 5: Spatial distribution of strata and freehold lots with conditional approval for residential subdivision (as at 31 December 2021)

Region/sub-region	Urbanised area			Non-urbanised area			Total		
	Strata (lots)	Freehold (lots)	Total (lots)	Strata (lots)	Freehold (lots)	Total (lots)	Strata (lots)	Freehold (lots)	Total (lots)
Central sub-region	3,440	1,440	4,880	180	400	580	3,620	1,840	5,460
North-West sub-region	990	2,290	3,290	180	8,220	8,400	1,170	10,510	11,680
North-East sub-region	570	2,720	3,290	220	4,450	4,670	790	7,170	7,960
South-East sub-region	670	1,520	2,190	280	6,680	6,960	950	8,200	9,140
South-West sub-region	730	3,400	4,130	120	9,550	9,670	850	12,950	13,800
<b>Perth metropolitan sub-total</b>	<b>6,400</b>	<b>11,370</b>	<b>17,770</b>	<b>980</b>	<b>29,300</b>	<b>30,270</b>	<b>7,370</b>	<b>40,670</b>	<b>48,040</b>
Peel region	140	550	690	80	4,460	4,540	210	5,010	5,220
<b>Perth and Peel sub-total</b>	<b>6,530</b>	<b>11,930</b>	<b>18,460</b>	<b>1,050</b>	<b>33,760</b>	<b>34,810</b>	<b>7,580</b>	<b>45,690</b>	<b>53,270</b>
Greater Bunbury region	180	680	860	70	1,930	2,000	240	2,620	2,860
<b>Total</b>	<b>6,710</b>	<b>12,610</b>	<b>19,320</b>	<b>1,120</b>	<b>35,690</b>	<b>36,810</b>	<b>7,820</b>	<b>48,300</b>	<b>56,120</b>

Source: Department of Planning, Lands and Heritage (2022)

Note: Figures may not sum due to rounding.

Table 6: Spatial distribution of lots with conditional approval for residential subdivision  
(as at 31 December 2021)

Region/sub-region	Urbanised area				Non-urbanised area			Total (lots)
	Suburban areas (lots)	Commercial and light industrial development (lots)	Planned very low-density development and existing development on redevelopment authority land (lots)	Recreational and public purpose uses on urban zoned land (lots)	Under-developed very low-density development and existing development on urban deferred land (lots)	Undeveloped urban, urban deferred and redevelopment authority land (lots)	Existing development on urban deferred and existing agricultural uses on urban and urban deferred land (lots)	
Central sub-region	4,820	20	10	40	230	350	0	5,460
North-West sub-region	2,870	420	0	0	180	8,180	40	11,680
North-East sub-region	2,760	260	40	230	610	3,840	220	7,960
South-East sub-region	2,060	0	30	90	1,680	4,600	680	9,140
South-West sub-region	3,520	330	0	280	1,020	8,650	0	13,800
<b>Perth metropolitan sub-total</b>	<b>16,030</b>	<b>1,020</b>	<b>80</b>	<b>650</b>	<b>3,720</b>	<b>25,610</b>	<b>940</b>	<b>48,040</b>
Peel region	650	40	0	0	60	4,470	0	5,220
<b>Perth and Peel sub-total</b>	<b>16,670</b>	<b>1,060</b>	<b>80</b>	<b>650</b>	<b>3,780</b>	<b>30,080</b>	<b>940</b>	<b>53,270</b>
Greater Bunbury region	840	10	0	0	50	1,700	250	2,860
<b>Total</b>	<b>17,510</b>	<b>1,070</b>	<b>90</b>	<b>650</b>	<b>3,830</b>	<b>31,780</b>	<b>1,190</b>	<b>56,120</b>

Source: Department of Planning, Lands and Heritage (2022)

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

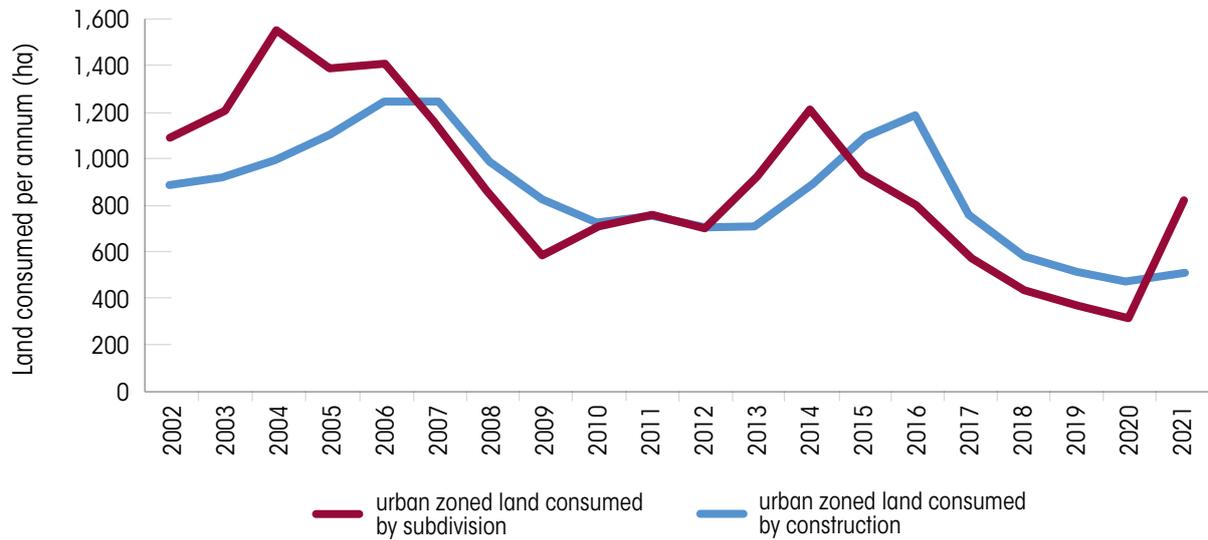
Figure 12 depicts annual land consumption rates based on built form (construction) and subdivision. The two approaches to measuring land consumption reveal similar trends, with annual changes in land consumption by subdivision generally preceding the corresponding change in built form land consumption.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

From 2002 to 2021, an average of 890 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 850 hectares per annum in the same period (Table 7).

There was a recovery in both metrics of land consumption during 2021. Land consumption by construction in 2021 was approximately 9 per cent more than in 2020 while consumption by subdivision during 2021 was commensurate with the 20-year average.

The low rates of land consumption by subdivision in the years prior COVID-19 represented a prolonged period of the 'lot absorption' phase and reflects the lower rates of population growth and economic activity at that time. The recovery in land consumption by subdivision reflects the impact of the Government COVID-19 stimulus measures introduced during 2020. Land consumption by construction is expected to continue rising in the next few years as the higher volume of dwellings that commenced construction during 2021 (Figure 13) reach completion.

**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 (2022) based on Landgate State-wide Property Records and Cadastre, Landgate (2022)

Table 7: Land consumption trends

	Consumption in 2021	Average consumption (2002-2021)
Land consumption by construction	510 hectares	850 hectares
Land consumption by subdivision	820 hectares	890 hectares

Source: Department of Planning, Lands and Heritage (2022)

## 3.2 Additional indicators of land consumption

Dwelling commencements totalled 22,770 in the year to December 2021, a 67 per cent increase compared to the 12 months to December 2020 and represents a recovery from the low volumes of dwelling commencements between 2016 and 2020 (Figure 13).

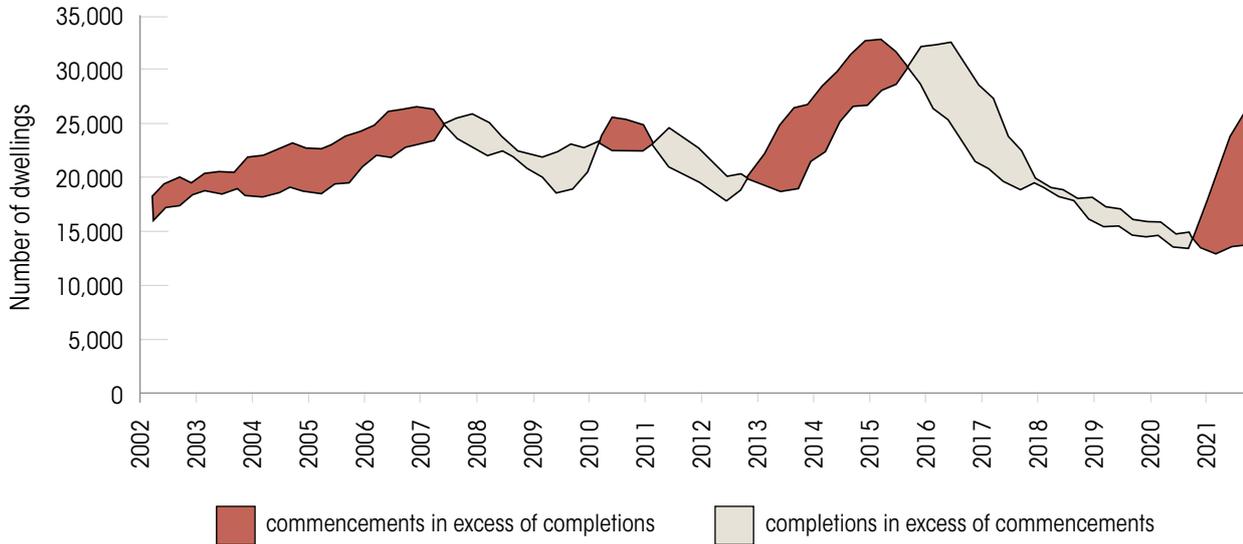
Generally, trends in the number of dwelling commencements precede trends in land consumption based on built form, due to the time required for construction. During 2021, the volume of dwelling commencements exceeding dwelling completions accelerated. This is expected to be temporary, as labour and supply constraints limit the volume of dwellings that may be commenced in the immediate future.

Population growth picked up slightly in 2021, after several years of steady declines (Figure 14).

Changes to the rate of land consumption are largely driven by population growth and economic conditions which influence the level of investment in housing. Though the impacts of COVID-19 are yet to be fully realised, population growth is expected to continue to recover in the near future, and it is possible that both metrics of land consumption may experience a period of volatility in the short term.

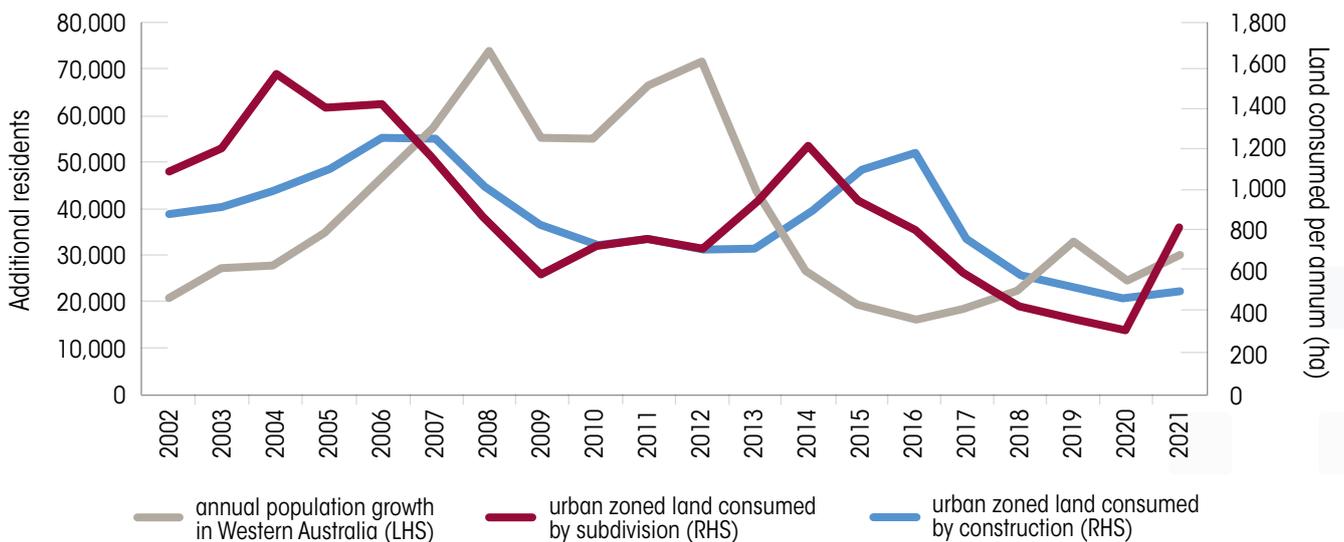


**Figure 13: Dwelling commencements and completions (annualised) for Western Australia**



Source: Australian Bureau of Statistics (2022) Cat. No. 8752.0 – Building Activity, Australia

**Figure 14: Population growth and land consumption**



Source: Australian Bureau of Statistics (2022) 3101 National, State and Territory population, Department of Planning, Lands and Heritage (2022) based on Landgate State-wide Property Records and Cadastre, Landgate (2022)

## 3.3 Temporal land supply

Temporal land supply is an estimate of the theoretical timeframe to consume the stock of non-urbanised land currently zoned for urban development. Temporal land supply estimates use 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.

As mentioned earlier, land consumption in the *Urban Growth Monitor* assesses the gross area consumed by urban development, which includes both residential and non-residential requirements. Temporal land supply estimates use the stock of non-urbanised land zoned for urban development.

It is important to note that the timeframes discussed are theoretical. 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.

In calculating temporal supply, a deduction to the stock of non-urbanised land is made to remove residual parcels of non-urbanised urban zoned land committed to non-residential purposes in or adjacent to urbanised areas. Though non-urbanised, these residual land parcels are not genuinely available for development. In aggregate, these land parcels reduce the stock of non-urbanised land used in the temporal land supply assumptions by approximately 3,570 hectares across the three region schemes.

Table 8 below 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.

Based on historical development patterns, it would take approximately 27 years to consume the stock of non-urbanised land available for development in the Perth metropolitan and Peel regions. The consumption rates assumed in this scenario are based on the 20-year average rate of land consumption across Perth and Peel. The theoretical land supply may therefore be extended if rates of residential infill development and greenfield densities continue to improve.

Temporal supply estimates are based on gross consumption rates which incorporate both residential and non-residential requirements. By using gross consumption rates these scenarios allow for the share of non-urbanised land likely to be utilised for non-residential uses as areas are developed.

It is acknowledged that some development sites contain a larger share of environmental assets than others and that these features may restrict traditional greenfield development. It is envisioned, however, that housing targets can still be achieved in these areas through innovative density solutions that seek to leverage the amenity of local environmental assets.

Over time there will be further additions to the stock of urban and urban deferred land and the *Urban Growth Monitor* will continue to track urban land supply and consumption to ensure that stocks of land for urban development are maintained into the future. Methodologies will continue to improve as new data and technologies become available.

Table 8: Temporal land supply estimates based on highest and lowest consumption rates – Perth metropolitan and Peel regions only

<b>2021 stock of non-urbanised land available for development</b>	21,050 hectares
<b>Highest rate of land consumption (2007)</b>	1,110 hectares
<b>Average rate of land consumption (2002-2021)</b>	790 hectares
<b>Lowest rate of land consumption (2020)</b>	440 hectares
<b>Years' supply at highest consumption</b>	19 years
<b>Years' supply at average consumption</b>	27 years
<b>Years' supply at lowest consumption</b>	48 years

Source: Department of Planning, Lands and Heritage (2022)

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

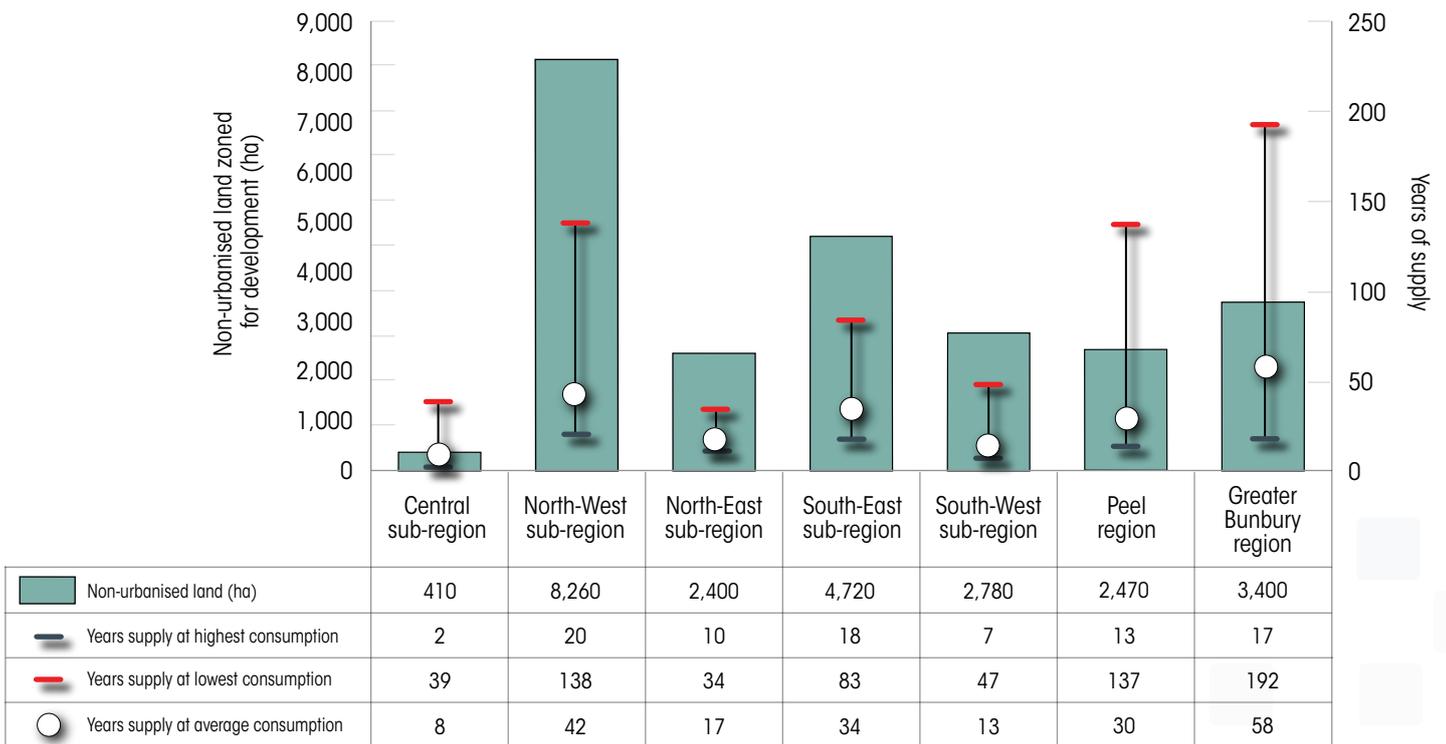
Temporal supply estimates exclude residual non-urbanised urban zoned land committed for other purposes that are adjacent to urbanised areas

### 3.4 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.

Sub-regions differ on the stock of available non-urbanised land that can be developed for urban purposes. This is to be expected as sub-regions are not geographically alike with each sub-region having its own attributes that may appeal to different buyers. 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 15).

**Figure 15: Estimated temporal supply of land zoned for urban development by sub-region (based on historical rates of land consumed by subdivision)**



Source: Department of Planning, Lands and Heritage (2022)

Note: Temporal supply estimates exclude residual non-urbanised areas committed for other purposes that are adjacent to urbanised areas.

## 4 Infill development trends over time

### 4.1 Demolitions and infill

Demolitions can represent a leading indicator of future dwelling construction, as dwelling demolition often facilitates 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.

Department of Planning, Lands and Heritage research indicates that the average demolition rate (demolitions as a proportion of new dwellings constructed) across Perth and Peel over the past decade has been roughly 13 per cent, with annual figures between eight and 18 per cent.

### 4.2 Infill and greenfield dwelling construction

In previous *Urban Growth Monitor* reports, demolition data was collected from annual surveys and all demolitions were assumed to occur in infill areas for the purposes of calculating net infill.

Since 2020, Landgate's property valuation database has been able to provide demolition data, which allows for the location of each full dwelling demolition in any given year to be identified. This represents an improvement in the way infill and greenfield dwelling construction can be measured, as demolitions can be differentiated depending on whether they occur in infill or greenfield areas, allowing for a more accurate calculation of net infill.

Using the infill model and demolition data, gross and net infill and greenfield dwelling development 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 any given year. It is only when dwelling construction is completed, and dwellings are captured in Landgate's property valuation database that they are included in the infill assessment.

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.

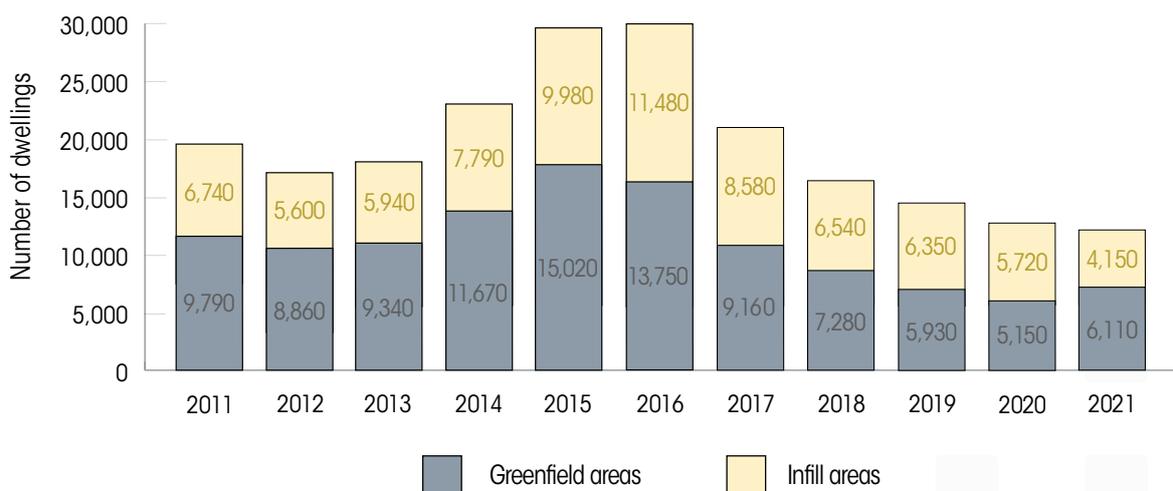
In 2021, the number of gross dwellings constructed in Perth and Peel was 10,260, the lowest annual volume of residential construction recorded since infill monitoring began in 2011. For context, an average of 16,450 dwellings per year were constructed from 2011 to 2021. Residential construction in 2021 was 6 per cent lower than in 2020 (10,860 dwellings), and 59 per cent lower than the peak of 25,230 dwellings constructed in 2016.

Of the 10,260 gross dwellings constructed, 4,150 dwellings were in infill areas and 6,110 were in greenfield areas (Figure 16). Of the 4,150 gross infill dwellings, approximately 840 dwellings or 20 per cent were part of infill projects yielding over 50 dwellings per lot. This compares with:

- 2020 – 1,230 dwellings (22 per cent)
- 2019 - 1,730 dwellings (27 per cent)
- 2018 - 1,060 dwellings (16 per cent)
- 2017 - 1,510 dwellings (18 per cent).

After the peak of 15,020 dwellings constructed in greenfield areas in 2015, the number and proportion of dwellings built in greenfield areas declined until 2020. During 2021, there was a recovery in greenfield dwelling construction following the introduction of Government stimulus measures in 2020. In 2021, a total of 6,110 gross dwellings were built in greenfield areas across Perth and Peel, an increase of 19 per cent from 5,150 dwellings in 2020. Once demolitions in greenfield areas are considered, approximately 5,940 net dwellings were built in greenfield areas throughout Perth and Peel in 2021.

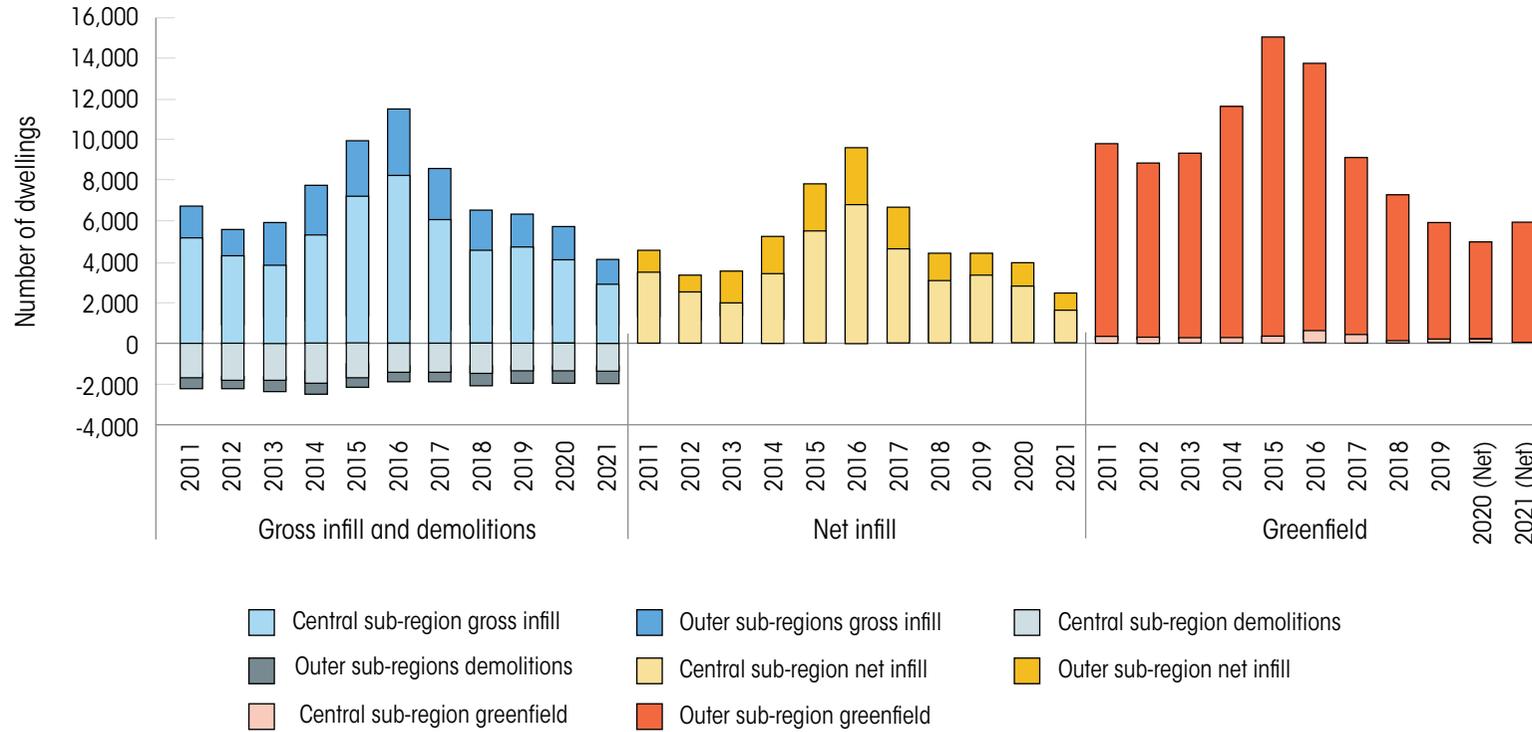
**Figure 16: Gross dwelling construction 2011-2021**



Source: Department of Planning, Lands and Heritage (internal databases) (2022)

Numbers have been rounded.

**Figure 17: Dynamics of dwelling development 2011-2021**



Source: Department of Planning, Lands and Heritage (internal databases) (2022)

The annual number of infill dwellings constructed continued to decline during 2021, as the bulk of large-scale infill projects which began prior the COVID-19 pandemic reached completion during 2019 and 2020. Net infill development in 2021 (once demolitions are accounted for), was 2,450 dwellings.

The recovery in greenfield dwelling construction, combined with lower volumes of large-scale infill projects being completed has contributed to reduced levels of infill development in 2021, in comparison to 2019 and 2020. Net infill development is used to calculate the annual infill rate for the Perth metropolitan and Peel regions, which was approximately 29 per cent in 2021, down from 44 per cent in 2020. Future infill rates may indicate if the COVID-19 pandemic may also have contributed to reduced levels of infill development.

Key measures of dwelling dynamics relating to monitoring infill are presented in Figure 17, Table 9 and Table 10.

Table 9: Dynamics of dwelling development 2011-2021 – Central sub-region

Measure	Central sub-region										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Gross infill	5,190	4,310	3,840	5,330	7,200	8,240	6,040	4,560	4,710	4,120	2,900
Demolitions	1,710	1,810	1,840	1,940	1,670	1,400	1,390	1,480	1,380	1,350	1,320
Net infill	3,480	2,500	2,000	3,390	5,530	6,840	4,650	3,090	3,330	2,820	1,620
Greenfield	350	280	280	250	380	650	400	150	230	220	160

Source: Department of Planning, Lands and Heritage (internal databases) (2022)

Note: Numbers may not sum due to rounding. Net greenfield reported from 2020.

Table 10: Dynamics of dwelling development 2011-2021 – Outer sub-regions

Measure	Outer sub-regions										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Gross infill	1,550	1,300	2,100	2,460	2,780	3,240	2,540	1,980	1,640	1,600	1,250
Demolitions	490	430	520	580	500	510	520	630	580	600	550
Net infill	1,080	860	1,580	1,890	2,280	2,730	2,020	1,350	1,070	1,160	830
Greenfield	9,440	8,590	9,060	11,420	14,650	13,100	8,760	7,130	5,700	4,750	5,950

Source: Department of Planning, Lands and Heritage (internal databases) (2022)

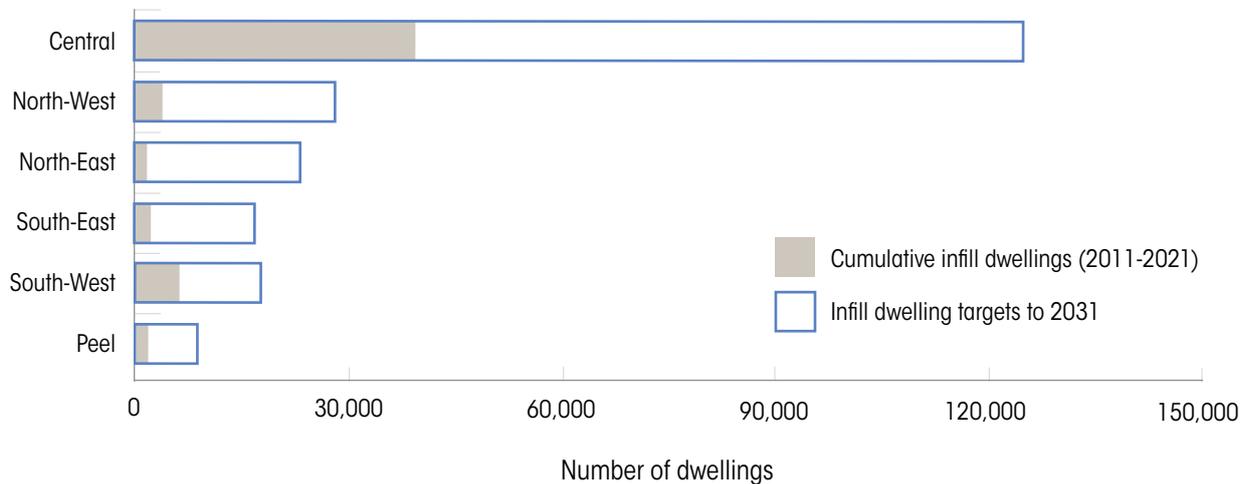
Note: Numbers may not sum due to rounding. Net greenfield reported from 2020.

## 4.3 Infill dwelling targets

*Perth and Peel@3.5million* sets out infill dwelling targets to 2031 and 2050. These 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 reviewing their local planning framework.

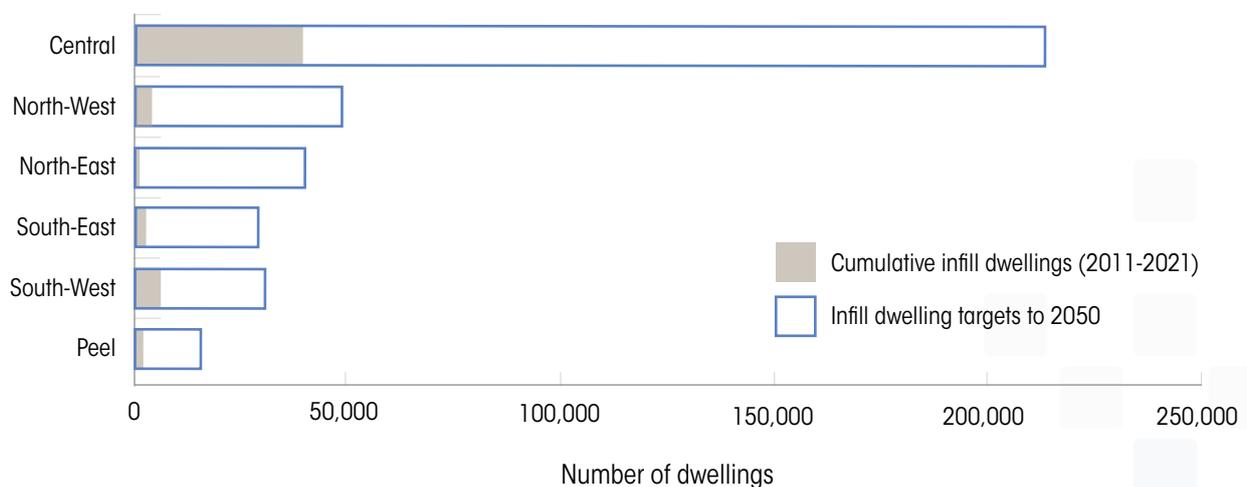
Figures 19 and 20 below show the progress towards these targets by sub-region, representing the cumulative number of net infill dwellings built from 2011, when monitoring began, through to 2021.

**Figure 18: Progress towards infill dwelling targets to 2031**



Source: Department of Planning, Lands and Heritage (internal databases) (2022)

**Figure 19: Progress towards infill dwelling targets to 2050**



Source: Department of Planning, Lands and Heritage (internal databases) (2022)

It is important to note that infill dwelling development is expected to vary from year to year and is unlikely to progress in a linear fashion. In addition, the rate of infill in the outer sub-regions is likely to grow over time, as these areas become increasingly urbanised. It is expected that urban consolidation and regeneration will play a key role in infill development, particularly for the Central sub-region.

## 4.4 Infill profile

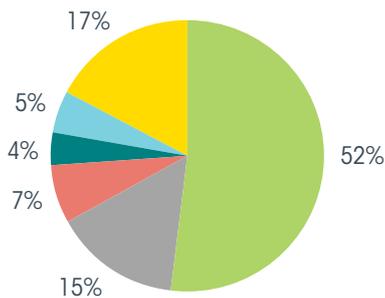
### 4.4.1 Infill dwellings per lot

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

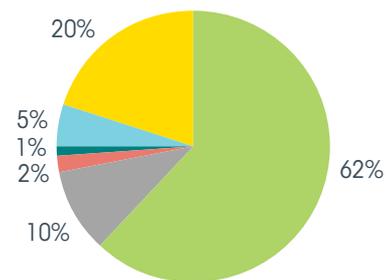
From 2011 to 2021, infill developments yielding one dwelling per lot such as duplex and triplex developments made up half of all infill development (with annual figures ranging between 41 per cent and 61 per cent). Infill developments yielding more than 50 dwellings per lot such as apartments comprised 17 per cent of infill dwellings constructed during this period, with annual figures ranging between four per cent and 27 per cent (Figure 20).

The share of high-density infill projects yielding 50 dwellings or more per lot was 20 per cent in 2021, higher than the average for the 2011 to 2021 period but below the peak of 27 per cent in 2019 (Figure 21).

**Figure 20: Number of dwellings per lot, 2011–2021**



**Figure 21: Number of dwellings per lot, 2021**



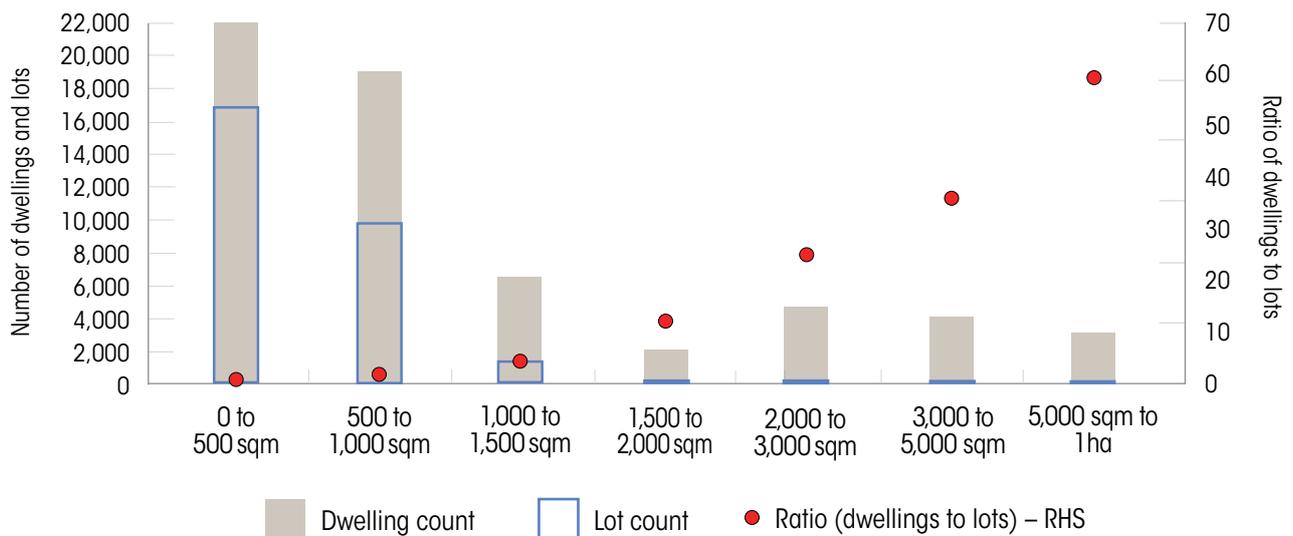
Source: Department of Planning, Lands and Heritage (internal databases) (2022)

#### 4.4.2 Infill dwellings by lot size

Figure 22 depicts the average number of infill dwellings constructed by lot size, based on dwellings built in infill areas between 2013 and 2021. The data suggests that larger lots typically yield a higher number and density of dwellings than smaller lots in infill areas.

It's worth noting 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, depending on the specific dynamics of each project. 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 22: Average number of infill dwellings by lot size, 2013-2021**



Source: Department of Planning, Lands and Heritage (internal databases) (2022)

## 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 11 presents the calculation of gross zone dwelling density by sub-region.

Table 11: Gross zone dwelling density by sub-region – urban zone

Region/sub-region							
	2015	2016	2017	2018	2019	2020	2021
Central sub-region	11.7	11.9	12.0	12.1	12.1	12.2	12.8
North-West sub-region	9.1	9.3	9.4	9.4	9.5	9.5	9.4
North-East sub-region	6.9	6.9	7.0	7.3	7.3	7.4	7.1
South-East sub-region	8.7	8.8	8.7	8.7	8.8	8.9	8.6
South-West sub-region	9.3	9.5	9.8	9.9	10.0	10.0	9.6
<b>Perth metropolitan average</b>	<b>9.8</b>	<b>9.9</b>	<b>10.0</b>	<b>10.1</b>	<b>10.2</b>	<b>10.3</b>	<b>10.2</b>
Peel region	7.9	7.9	8.2	8.2	8.2	8.3	7.8
<b>Perth metropolitan and Peel average</b>	<b>9.7</b>	<b>9.8</b>	<b>9.9</b>	<b>10.0</b>	<b>10.1</b>	<b>10.1</b>	<b>10.1</b>
Greater Bunbury region	6.2	6.2	6.2	6.4	6.4	6.4	5.6

Property valuation database, Landgate (2022) and Integrated Land Information Database, unpublished data, Department of Planning, Lands and Heritage (2022).

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 development.

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 section 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 12 presents net site dwelling density based **only** on urban zoned land, while Table 13 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 12: Net site dwelling density by sub-region - urban zone

Region/sub-region	As at December						
	2015	2016	2017	2018	2019	2020	2021
Central sub-region	20.1	20.7	20.6	20.8	21.2	21.4	21.6
North-West sub-region	16.0	16.1	16.2	16.4	14.7	14.7	14.8
North-East sub-region	9.9	9.7	10.2	10.4	10.2	10.3	10.4
South-East sub-region	10.8	10.8	11.7	11.8	12.1	11.9	12.0
South-West sub-region	15.0	15.4	15.8	16.0	16.2	16.4	16.6
<b>Perth metropolitan average</b>	<b>15.5</b>	<b>15.8</b>	<b>16.1</b>	<b>16.2</b>	<b>16.1</b>	<b>16.1</b>	<b>16.2</b>
Peel region	12.8	12.9	13.1	13.3	13.3	13.3	13.4
<b>Perth metropolitan and Peel average</b>	<b>15.3</b>	<b>15.6</b>	<b>15.9</b>	<b>16.0</b>	<b>15.9</b>	<b>15.9</b>	<b>16.0</b>
Greater Bunbury region	9.1	9.2	9.2	9.2	9.3	9.4	9.3

Property valuation database, Landgate (2022) and Integrated Land Information Database, unpublished data, Department of Planning, Lands and Heritage (2022).

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 13: Net site dwelling density by sub-region - urban zone and city centre zone

Region/sub-region	As at December						
	2015	2016	2017	2018	2019	2020	2021
Central sub-region	20.6	21.2	21.1	21.3	21.8	22.1	22.2
North-West sub-region	16.2	16.3	16.3	16.6	14.8	14.9	15.0
North-East sub-region	9.9	9.7	10.3	10.4	10.3	10.4	10.5
South-East sub-region	10.8	10.9	11.7	11.8	12.1	11.9	12.1
South-West sub-region	15.1	15.6	16.0	16.2	16.4	16.6	16.7
<b>Perth metropolitan average</b>	<b>15.8</b>	<b>16.1</b>	<b>16.4</b>	<b>16.5</b>	<b>16.4</b>	<b>16.5</b>	<b>16.6</b>
Peel region	12.8	12.9	13.1	13.3	13.3	13.3	13.4
<b>Perth metropolitan and Peel average</b>	<b>15.6</b>	<b>15.9</b>	<b>16.1</b>	<b>16.3</b>	<b>16.1</b>	<b>16.2</b>	<b>16.3</b>
Greater Bunbury region	9.1	9.2	9.2	9.2	9.3	9.4	9.3

Property valuation database, Landgate (2022) and Integrated Land Information Database, unpublished data, Department of Planning, Lands and Heritage (2022).

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 in section 5.2) which refers to the **collective dwelling density as at a specific point in time**.

Table 14 presents net site dwelling density by build year based **only** on lots on urban zoned land while Table 15 is based on lots on urban zoned land **in addition to** lots on city centre zoned land.

Annual fluctuations to the net site dwelling density by build year are to be expected as it is based only on lots developed in the reporting year. As a result, it is important to consider the overarching density trends of residential development in relation to the strategic target.

Temporal changes in dwelling densities can be observed over the ten-year period from 2012 to 2021. In this timeframe, the net site dwelling densities by build year for all Perth metropolitan sub-regions have shown an increase. For Peel and Greater Bunbury, the net site dwelling densities by build year have remained relatively consistent over the period.



Table 14: Net site dwelling density by build year – urban zone

Local government area	Year of dwelling construction									
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Central sub-region										
Bassendean	24.1	18.8	33.6	20.4	35.8	28.7	31.4	22.6	22.5	24.2
Bayswater	24.3	24.0	25.7	27.7	39.8	31.0	28.6	25.3	38.4	24.6
Belmont	23.4	26.6	47.8	72.8	53.6	59.5	37.4	75.6	57.1	20.5
Cambridge	17.0	15.1	16.0	31.1	45.8	33.7	23.2	17.2	16.2	77.9
Canning	23.6	24.2	23.6	27.5	28.3	27.1	27.1	29.9	26.1	24.6
Claremont	23.3	21.6	20.9	55.9	61.5	21.7	207.7	89.1	22.1	99.1
Cottesloe	17.4	22.6	17.7	19.8	17.9	21.6	27.3	20.0	18.1	19.7
East Fremantle	16.3	14.8	18.7	23.7	78.0	20.2	19.6	22.0	25.6	14.9
Fremantle	36.3	25.6	26.3	39.9	31.7	29.7	35.1	31.3	62.8	22.4
Melville	17.5	17.8	18.2	19.4	22.3	20.9	24.6	31.8	23.3	20.4
Mosman Park	15.4	14.7	14.5	17.0	13.4	18.7	17.6	17.4	19.8	61.0
Nedlands	14.1	14.0	15.7	14.1	34.5	13.6	12.4	12.9	14.3	16.8
Peppermint Grove	11.3	8.2	-	6.0	8.6	11.3	8.8	9.3	7.4	0.0
Perth	250.6	67.8	124.8	325.8	121.2	55.1	530.5	252.5	136.6	0.0
South Perth	18.5	22.0	20.6	19.4	24.2	33.4	52.1	29.5	32.34	28.8
Stirling	29.4	28.5	32.7	34.2	38.9	38.0	34.9	28.0	27.50	35.1
Subiaco	30.2	39.1	82.7	31.9	33.7	26.8	25.9	21.7	26.38	20.5
Victoria Park	34.4	35.7	31.1	32.2	55.1	29.5	37.0	60.5	42.37	24.8
Vincent	60.4	65.2	80.0	114.7	83.6	114.7	49.1	45.9	51.00	40.5
<b>Central sub-region average</b>	<b>25.5</b>	<b>25.4</b>	<b>29.7</b>	<b>35.0</b>	<b>38.7</b>	<b>34.6</b>	<b>35.2</b>	<b>32.8</b>	<b>30.8</b>	<b>31.2</b>
North-West sub-region										
Joondalup	18.5	20.5	18.6	19.2	19.3	21.9	22.3	28.0	27.5	29.3
Wanneroo	23.6	23.9	23.9	25.8	25.1	26.4	26.4	26.6	25.7	23.4
<b>North-West sub-region average</b>	<b>22.7</b>	<b>23.4</b>	<b>23.2</b>	<b>24.9</b>	<b>24.2</b>	<b>25.5</b>	<b>25.2</b>	<b>27.1</b>	<b>26.3</b>	<b>24.9</b>
North-East sub-region										
Kalamunda	21.5	22.4	23.5	24.8	25.0	28.4	16.7	14.8	13.6	20.5
Mundaring	17.2	16.4	15.7	16.2	12.9	19.3	5.8	5.6	7.9	6.4
Swan	6.3	6.2	10.4	8.9	8.0	8.6	25.9	26.2	26.2	25.4
<b>North-East sub-region average</b>	<b>18.3</b>	<b>19.1</b>	<b>21.2</b>	<b>21.4</b>	<b>21.2</b>	<b>24.1</b>	<b>22.3</b>	<b>21.5</b>	<b>22.1</b>	<b>22.6</b>

Table 14: Net site dwelling density by build year – urban zone (cont.)

Local government area	Year of dwelling construction									
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
South-East sub-region										
Armadale	20.9	22.6	21.5	23.5	24.8	23.8	24.5	24.9	26.5	24.4
Gosnells	20.6	22.2	23.4	28.7	26.5	27.0	27.5	25.1	26.0	22.5
Serpentine-Jarrahdale	17.3	16.7	20.1	20.4	13.1	18.8	20.4	21.8	19.9	20.6
<b>South-East sub-region average</b>	<b>20.1</b>	<b>21.2</b>	<b>21.6</b>	<b>23.9</b>	<b>20.6</b>	<b>23.5</b>	<b>24.5</b>	<b>24.3</b>	<b>24.9</b>	<b>23.2</b>
South-West sub-region										
Cockburn	24.7	26.6	33.7	30.1	34.1	38.3	33.7	31.6	30.4	30.7
Kwinana	22.1	24.0	24.2	25.9	27.0	26.8	26.0	25.1	26.1	25.9
Rockingham	20.1	20.1	22.3	22.5	23.4	24.7	24.1	22.8	22.6	22.3
<b>South-West sub-region average</b>	<b>21.8</b>	<b>22.7</b>	<b>25.6</b>	<b>25.8</b>	<b>27.9</b>	<b>30.3</b>	<b>28.7</b>	<b>27.3</b>	<b>26.8</b>	<b>27.4</b>
<b>Perth metropolitan region average</b>	<b>22.2</b>	<b>22.6</b>	<b>24.6</b>	<b>26.6</b>	<b>27.4</b>	<b>28.4</b>	<b>28.1</b>	<b>27.5</b>	<b>27.0</b>	<b>26.4</b>
Peel region										
Mandurah	18.7	18.7	19.2	21.0	21.5	22.7	20.1	17.8	17.3	18.1
Murray	17.8	16.3	16.5	16.5	18.2	16.0	13.4	15.1	17.0	17.6
Waroona	10.7	7.2	9.0	10.1	10.1	13.9	8.4	0.5*	5.6	9.5
<b>Peel region average</b>	<b>18.4</b>	<b>17.7</b>	<b>18.3</b>	<b>20.1</b>	<b>21.0</b>	<b>21.7</b>	<b>18.8</b>	<b>11.7</b>	<b>17.0</b>	<b>17.9</b>
Greater Bunbury										
Bunbury	18.2	19.4	20.5	18.7	19.6	20.6	18.8	21.7	20.3	19.7
Capel	10.0	9.2	12.6	16.3	18.9	6.0	11.2	7.7	10.1	11.2
Dardanup	15.4	13.8	14.7	15.0	13.8	16.7	17.3	18.8	16.2	19.2
Harvey	12.4	10.2	9.8	10.2	9.2	7.5	9.2	11.0	11.2	11.7
<b>Greater Bunbury average</b>	<b>12.6</b>	<b>11.3</b>	<b>12.0</b>	<b>13.6</b>	<b>13.6</b>	<b>9.1</b>	<b>11.2</b>	<b>12.5</b>	<b>12.5</b>	<b>13.3</b>

Source: Property valuation database, Landgate (2022) and Integrated Land Information Database, unpublished data, Department of Planning, Lands and Heritage (2022).

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.

\* In 2019, there were a low number of dwellings built on a large volume of land in Waroona resulting in a density of 0.5 dwellings per net site hectare.

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

Local government area	Year of dwelling construction									
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Central sub-region										
Bassendean	24.1	18.8	33.6	20.4	35.8	28.7	31.4	22.6	22.5	24.2
Bayswater	24.7	24.3	25.7	29.1	40.4	32.3	29.5	25.6	39.2	24.6
Belmont	23.4	26.6	47.8	72.8	53.6	59.5	37.4	75.6	57.1	20.5
Cambridge	17.0	15.1	16.0	31.1	45.8	33.7	23.2	17.2	16.2	77.9
Canning	23.6	24.2	24.9	28.9	34.6	36.0	27.1	30.0	26.2	24.6
Claremont	23.3	21.6	20.9	55.9	61.5	21.7	207.7	89.1	22.1	99.1
Cottesloe	17.4	22.6	17.7	19.8	17.9	21.6	27.3	20.0	18.1	19.7
East Fremantle	16.3	14.8	18.7	23.7	78.0	20.2	19.6	22.0	25.6	14.9
Fremantle	45.3	25.8	28.8	47.0	55.3	34.8	63.9	30.9	67.7	22.4
Melville	17.5	17.8	18.2	19.4	22.3	20.9	24.6	31.8	23.3	20.4
Mosman Park	15.4	14.7	14.5	17.0	13.4	18.7	17.6	17.4	19.8	61.0
Nedlands	14.1	14.0	15.7	14.1	34.5	13.6	12.4	12.9	14.3	16.8
Peppermint Grove	11.3	8.2	-	6.0	8.6	11.3	8.8	9.3	7.4	0.0
Perth	303.7	192.5	277.6	267.8	359.7	542.4	537.3	545.4	1103.2	0.0
South Perth	18.5	22.0	20.6	19.4	24.2	33.4	52.1	29.5	32.3	28.8
Stirling	29.4	28.5	32.7	34.2	38.9	40.7	34.9	28.0	27.5	35.1
Subiaco	30.2	39.1	82.7	31.9	33.7	26.8	25.9	21.7	26.4	20.5
Victoria Park	34.4	35.7	31.1	32.2	55.1	29.5	37.0	60.5	42.4	24.8
Vincent	60.4	65.2	80.0	114.7	83.6	114.7	49.1	45.9	51.0	40.5
<b>Central sub-region average</b>	<b>26.9</b>	<b>26.1</b>	<b>33.9</b>	<b>37.6</b>	<b>44.0</b>	<b>38.8</b>	<b>37.0</b>	<b>36.1</b>	<b>34.3</b>	<b>31.2</b>
North-West sub-region										
Joondalup	21.4	20.5	19.9	19.6	19.3	22.2	22.3	28.1	35.6	29.3
Wanneroo	23.6	23.9	23.9	25.8	25.1	26.4	26.5	26.6	25.7	23.4
<b>North-West sub-region average</b>	<b>23.2</b>	<b>23.4</b>	<b>23.4</b>	<b>24.9</b>	<b>24.2</b>	<b>25.6</b>	<b>25.3</b>	<b>27.1</b>	<b>28.9</b>	<b>24.9</b>
North-East sub-region										
Kalamunda	22.2	22.5	23.7	25.0	25.0	28.4	16.7	14.8	13.6	20.5
Mundaring	17.2	16.4	15.7	16.2	12.9	19.3	5.8	5.6	7.9	6.4
Swan	6.3	6.2	10.4	8.9	8.0	8.6	26.3	26.2	26.4	25.4
<b>North-East sub-region average</b>	<b>18.8</b>	<b>19.1</b>	<b>21.3</b>	<b>21.5</b>	<b>21.2</b>	<b>24.1</b>	<b>22.7</b>	<b>21.5</b>	<b>22.2</b>	<b>22.6</b>

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

Local government area	Year of dwelling construction									
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
South-East sub-region										
Armadale	20.9	22.6	21.5	23.5	24.8	23.9	24.5	25.0	26.5	24.4
Gosnells	20.6	22.2	23.4	28.7	26.5	27.0	27.5	25.1	26.0	22.5
Serpentine-Jarrahdale	17.3	16.7	20.1	20.4	13.1	18.8	20.4	21.8	19.9	20.6
<b>South-East sub-region average</b>	<b>20.1</b>	<b>21.2</b>	<b>21.7</b>	<b>23.9</b>	<b>20.6</b>	<b>23.5</b>	<b>24.5</b>	<b>24.3</b>	<b>24.9</b>	<b>23.2</b>
South-West sub-region										
Cockburn	24.7	26.6	33.7	30.1	34.1	38.3	33.7	31.6	30.4	30.7
Kwinana	22.1	24.0	24.2	25.9	27.0	26.8	26.0	25.1	26.1	25.9
Rockingham	20.1	20.1	22.3	22.6	26.2	25.1	26.2	27.0	22.5	22.3
<b>South-West sub-region average</b>	<b>21.8</b>	<b>22.7</b>	<b>25.6</b>	<b>25.8</b>	<b>29.0</b>	<b>30.5</b>	<b>29.4</b>	<b>28.7</b>	<b>26.8</b>	<b>27.4</b>
<b>Perth metropolitan region average</b>	<b>22.8</b>	<b>22.8</b>	<b>25.7</b>	<b>27.2</b>	<b>29.0</b>	<b>29.7</b>	<b>28.8</b>	<b>28.9</b>	<b>28.7</b>	<b>26.4</b>
Peel region										
Mandurah	18.7	18.7	19.2	21.0	21.5	22.7	20.1	17.8	17.3	18.1
Murray	17.8	16.3	16.5	16.5	18.2	16.0	13.4	15.1	17.0	17.6
Waroona	10.7	7.2	9.0	10.1	10.1	13.9	8.4	0.5*	5.6	9.5
<b>Peel region average</b>	<b>18.4</b>	<b>17.7</b>	<b>18.3</b>	<b>20.1</b>	<b>21.0</b>	<b>21.7</b>	<b>18.8</b>	<b>11.7</b>	<b>17.0</b>	<b>17.9</b>
Greater Bunbury										
Bunbury	18.2	19.4	20.5	18.7	19.6	20.6	18.8	21.7	20.3	19.7
Capel	10.0	9.2	12.6	16.3	18.9	6.0	11.2	7.7	10.1	11.2
Dardanup	15.4	13.8	14.7	15.0	13.8	16.7	17.3	18.8	16.2	19.2
Harvey	12.4	10.2	9.8	10.2	9.2	7.5	9.2	11.1	11.2	11.7
<b>Greater Bunbury average</b>	<b>12.6</b>	<b>11.3</b>	<b>12.0</b>	<b>13.6</b>	<b>13.6</b>	<b>9.1</b>	<b>11.2</b>	<b>12.5</b>	<b>12.5</b>	<b>13.3</b>

Source: Property valuation database, Landgate (2022) and Integrated Land Information Database, unpublished data, Department of Planning, Lands and Heritage (2022).

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.

\* In 2019, there were a low number of dwellings built on a large volume of land in Waroona resulting in a density of 0.5 dwellings per net site hectare.

## 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 State Government objectives. The strategic target of 15 dwellings per gross urban zoned hectare for new residential areas as set out in *Perth and Peel@3.5million* can be expressed as an equivalent target of 26 dwellings per net site hectare.

Residential development in greenfield areas across Perth and Peel during 2021 constituted a collective net density of 23.4 dwellings per net site hectare. This was slightly below the strategic target, but represents significant progress from 2010, when targets were initially set, and the prevailing trend was a density of approximately 15 dwellings per net site hectare.

Annual fluctuations to the net site dwelling density by build year are to be expected as it is based only on lots developed in the reporting year. As a result, it is important to consider the overarching density trends of residential development in relation to the strategic target.

The net site densities for greenfield development areas in each sub-region are shown in Table 16.

Table 16: Net site dwelling density by build year – urban, urban deferred and city centre zone – outer sub-regions

Region/sub-region	Year of construction						
	2015	2016	2017	2018	2019	2020	2021
North-West	23.0	22.2	13.9	24.1	25.2	25.4	24.9
North-East	20.8	18.1	21.8	21.5	20.5	21.9	22.3
South-East	22.6	15.3	21.6	23.1	23.4	24.1	21.7
South-West	23.9	26.9	25.1	23.4	26.6	26.5	27.3
Peel	20	12.8	17.9	16.2	9.7	16.7	17.4
<b>Perth metropolitan and Peel average</b>	<b>22.3</b>	<b>19.3</b>	<b>19.9</b>	<b>22.2</b>	<b>21.3</b>	<b>23.4</b>	<b>23.4</b>

Source: Property valuation database, Landgate (2022) and Integrated Land Information Database, unpublished data, Department of Planning, Lands and Heritage (2022).

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, urban deferred and city centre zonings and is a subset of the full dwelling count.

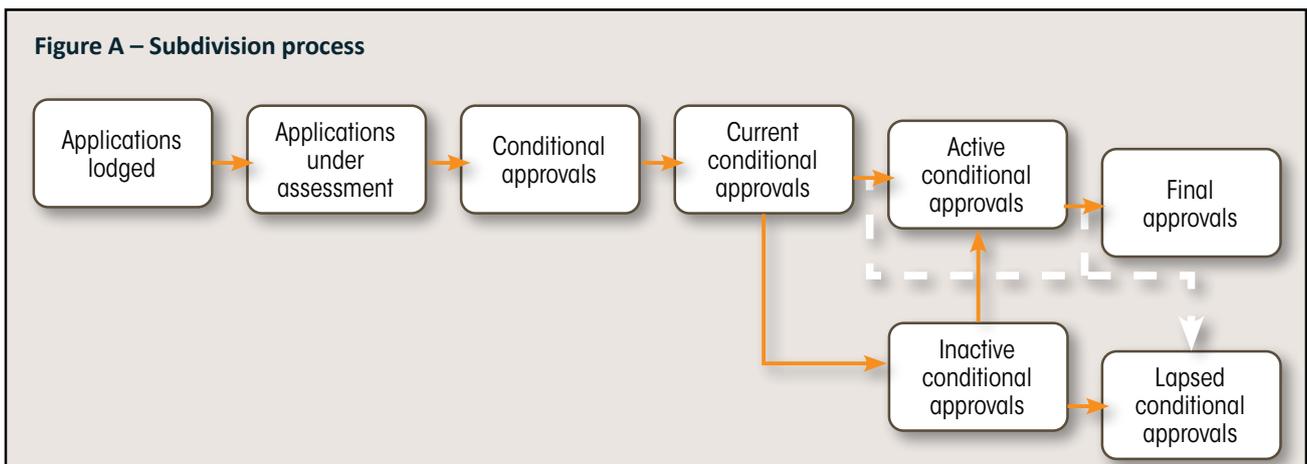
# Glossary

## 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 the 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.



**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** refer to 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 WAPC's 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** in the context of measuring residential infill, refers to the pulling down and removal of a residential dwelling, creating a vacant lot.

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

**Infill model** defines the spatial extent of infill areas in the Perth metropolitan and Peel regions using data from Australian Bureau of Statistics geographic catchment areas known as mesh blocks. These mesh blocks are aggregated into a larger scale, using the statistical area level one (SA1) boundaries of the 2011 Census to construct the spatial framework used to estimate infill volumes.

Gross residential densities, namely dwellings per hectare, for each SA1 in the Perth metropolitan and Peel regions are calculated using Census data. Based on the distribution of densities across Perth and Peel, a benchmark development density can be derived. Areas which have densities greater than the benchmark are considered to be infill areas. Conversely, areas with densities below the development benchmark are categorised as greenfield areas.

Locations which are geographically surrounded by areas with gross residential densities higher than the benchmark are also included as infill areas, regardless of their individual development density.

**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.

**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.

**Statistical Area Level 1 (SA1)** is the smallest unit for the release of Census data. They 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

### *Integrated Regional Information System (IRIS)*

The model is a geographic information system (GIS) based tool used to assess key measures of urban land use characteristics in the Perth metropolitan, Peel and Greater Bunbury region scheme areas. The IRIS model has been developed using a hierarchical classification system to allocate over 4,000 individual local planning scheme zone categories across Western Australia into one of seven simplified primary land-use categories, each with related secondary categories. The seven primary land-use categories are; industrial, commercial/business, residential, recreation/conservation, rural, special and infrastructure and public purpose.

It is noted that the number and range of land uses which may be permitted within a given zone may vary greatly between local planning schemes. To add to the complexity of this issue, local planning schemes allow for a range of land uses that may not be immediately apparent from the zone category name alone.

Whilst this issue is challenging, it demonstrates the difficulties of monitoring land-use and land tenure over time. The IRIS model is intended to rationalise the complications that exist within local planning schemes for the purposes of broadly assessing stocks of zoned land, temporal land supply and the dynamics of existing development across Western Australia

**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 500m<sup>2</sup> vacant residential lot would be considered as part of the urbanised area; however, a vacant residential lot of 10,000m<sup>2</sup> 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.

**Recreational and public purpose uses on urban zoned land** is land that is used for leisure or recreation activities that is not otherwise categorised as being within suburban areas. Includes sports grounds and reserves.

**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.

**Existing agricultural uses on urban or urban deferred zoned land** refers to land that is zoned residential in local planning schemes but is classified by Landgate's Valuer General's Office as being used for farming or other agricultural activities. In most cases this land is potentially viable for future residential development.

**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** 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** refers 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** refers to land within a redevelopment authority area that is not otherwise zoned urban or urban deferred, and 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<sup>2</sup> 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 undeveloped land zoned urban, industrial or commercial use, in a region scheme.

**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.

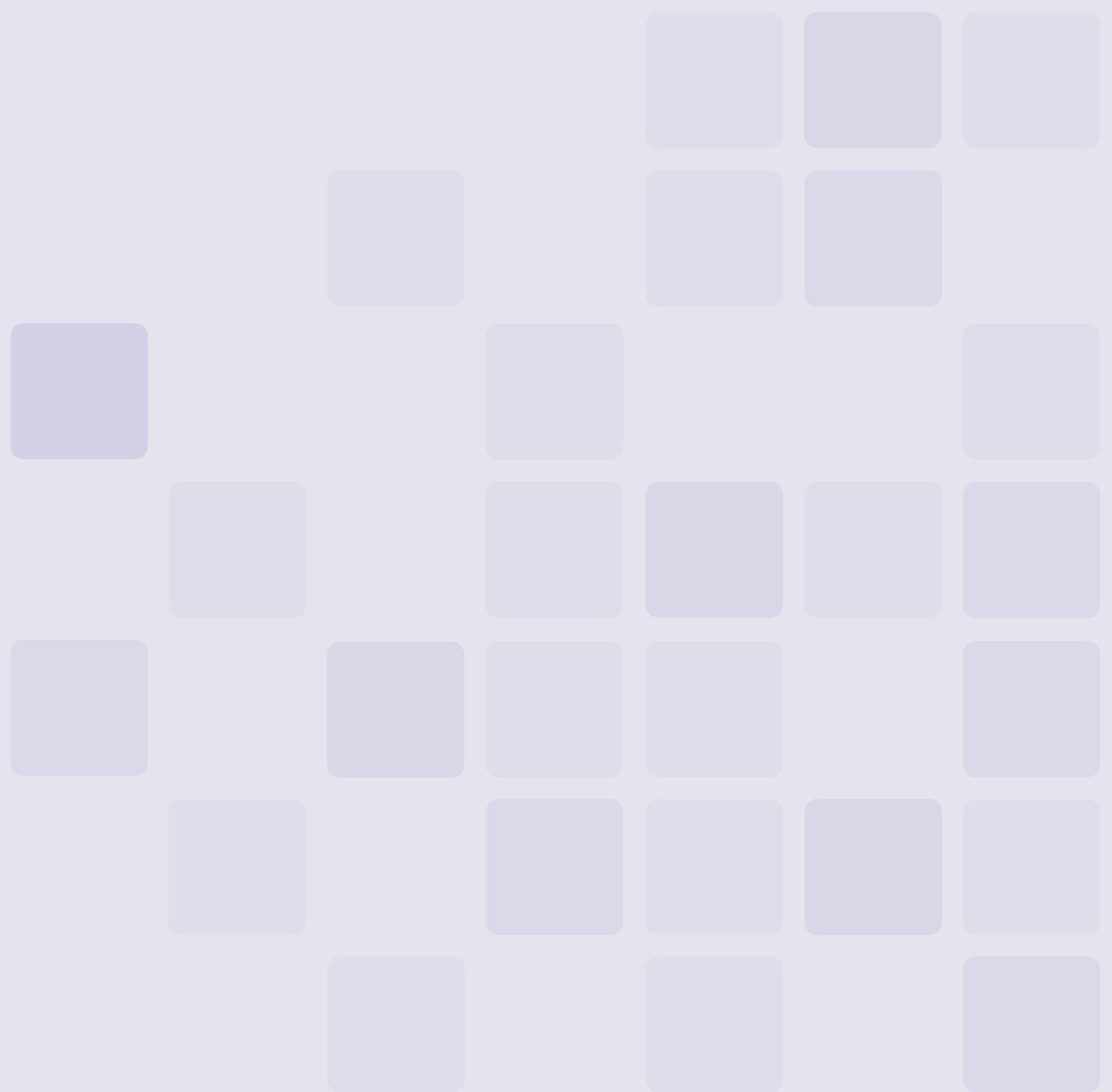
**Temporal land supply** is an estimate of the number of years it will take to completely consume land that is currently zoned for urban development. Temporal land supply can vary based on different development scenarios, particularly where different rates of density and infill are applied.

**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 <sup>2</sup>	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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