GOVERNMENT OF WESTERN AUSTRALIA

Department of **Planning, Lands and Heritage**

Western Australian Planning Commission

Urban Growth Monitor

Perth Metropolitan, Peel and Greater Bunbury Regions

15

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The Department of Planning, Lands and Heritage acknowledges the traditional owners and custodians of land and waterways across Western Australia. The Department is committed to reconciliation to improve outcomes for Aboriginal and Torres Strait Islander peoples and to work together to provide a culturally-safe and inclusive environment.

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1 Executive summary

This is the 15th edition of the *Urban Growth Monitor*, presenting information relating to land zoned for urban development calculated as at 31 December 2022.

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 ***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. Within the Metropolitan Region Scheme (MRS), there was a net reduction of 10 hectares of urban zoned land during 2022, as various public-school sites across the metropolitan region being transferred from the urban zone to the public purpose zones. Meanwhile, there were no changes in the stock of urban and urban deferred zoned land in the Peel and Greater Bunbury 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 2022. Temporal supply estimates use gross consumption rates, which considers 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 23.5 dwellings per net site hectare for dwellings constructed in 2022. This represents a significant 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.

After accounting for demolition activity, the net infill rate for the Perth metropolitan and Peel regions only, was approximately 31 per cent in 2022, up from 29 per cent in 2021. The net infill rate has fluctuated between 28 per cent and 44 per cent since monitoring began in 2011. 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 the extent to which the COVID-19 pandemic may have also influenced infill development.

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 2022, there was approximately 117,140 hectares of urban and urban deferred zoned land in the Perth metropolitan, Peel and Greater Bunbury regions.
- In addition, there was 350 hectares of land intended for urban development within DevelopmentWA areas that is not zoned urban or urban deferred. and is included in the tiered land supply assessment.
- During 2022, there was a 10-hectare net reduction in land zoned for urban development under the Metropolitan Region Scheme.
- There were no changes in the stock of urban and urban deferred zoned land within the Peel Region Scheme and the Greater Bunbury Region Scheme.
- Around 77 per cent (90,010 hectares) of land identified for urban development is developed with urban uses and 23 per cent (27,470 hectares) is non-urbanised (undeveloped).

Land consumption

- In 2022, 590 hectares of land within the Perth metropolitan, Peel and Greater Bunbury regions were consumed by subdivision, while 520 hectares were consumed by dwelling construction.
- In the 20-year period to December 2022, an average of 860 hectares of land per annum were consumed by subdivision, and 830 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 2022.
- 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 59 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 2022, in the Perth metropolitan and Peel regions:

- A total of 9,620 dwellings were constructed. Of these, 3,740 dwellings were constructed in infill areas, and 5,880 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 2022, net infill totalled 2,600 dwellings.
- Of the 2,600 net infill dwellings, 1,720 were in the Central sub-region and 880 in the outer metropolitan sub-regions and Peel.
- The net infill rate was approximately 31 per cent in 2022, up from 29 per cent in 2021.
- Large scale infill projects yielding over 50 dwellings per lot comprised around one in 10 of all infill development in 2022. This contrasts with 2019, when these high-density infill projects accounted for over a quarter of all infill development.

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 2022:

- The 'net site dwelling density by build year' for greenfield development areas in the outer Perth metropolitan sub-regions and Peel was 23.5 dwellings per net site hectare. This represents a significant 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 26.6 dwellings per net site hectare.

2 Land for urban development

2.1 Introduction

This section presents analysis on the stock of land zoned for urban development using a geographic information systems (GIS) based tiered land supply assessment model.

The land supply tiers can be summarised as follows:

Tier 1: land zoned 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' encompasses urban and urban deferred zoned land under the Metropolitan, Peel and Greater Bunbury region schemes, and land identified for urban purposes in redevelopment authority areas.

This 15th edition of the *Urban Growth Monitor* presents information relating to land supply calculated as at 31 December 2022. The summarised regional and sub-regional 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* continues to utilise the updated tiered land supply assessment model from the 14th edition. This updated model uses the Department of Planning, Lands and Heritage's Integrated Regional Information System (IRIS). The IRIS 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 IRIS 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 compared to the former tiered land supply assessment model. As a result, there are additional land use categories in tiers two and three from the 14th edition onwards. Further information on these categories is provided in sections 2.3 and 2.4.

2.2 Tier one – land zoned for urban development

The total stock of urban and urban deferred zoned land under the Metropolitan, Peel and Greater Bunbury region schemes was approximately 117,140 hectares at the end of 2022. Within the Metropolitan Region Scheme (MRS), there was a net 10-hectare reduction in urban zoned land, primarily due to several school sites being transferred from the urban zone to the public purpose zones. There were no changes in the volume of urban land within the Peel and Greater Bunbury Region Schemes during 2022.

Outside of land zoned urban or urban deferred, the stock of land designated for urban purposes in redevelopment authority (DevelopmentWA) areas constituted 350 hectares. In total, there was a collective stock of 117,480 hectares of land identified for urban development across the three region schemes at the end of 2022 (Table 1).

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

Region scheme	Description	Stock (ha) 2017	Stock (ha) 2018	Stock (ha) 2019	Stock (ha) 2020	Stock (ha) 2021	Stock (ha) 2022	Change (ha) 2021 to 2022
Metropolitan Region Scheme	Urban zoned land	89,880	90,520	90,770	90,860	91,360	91,330	-30
	Urban deferred zoned land	4,490	6,570	6,770	6,680	6,500	6,520	20
	MRS subtotal	**94,380**	**97,090**	**97,540**	**97,550**	**97,860**	**97,850**	**-10**
Peel Region Scheme	Urban zoned land	9,010	9,010	9,010	9,010	9,040	9,040	0
	Urban deferred zoned land	130	130	130	130	90	90	0
	PRS subtotal	**9,140**	**9,140**	**9,140**	**9,140**	**9,140**	**9,140**	**0**
Greater Bunbury Region Scheme	Urban zoned land	8,270	8,280	8,280	8,280	8,340	8,340	0
	Urban deferred zoned land	720	720	720	710	1,810	1,810	0
	GBRS subtotal	**8,990**	**8,990**	**8,990**	**8,990**	**10,150**	**10,150**	**0**
Total region schemes	Urban zoned land	107,170	107,800	108,060	108,150	108,740	108,710	-30
	Urban deferred zoned land	5,340	7,410	7,600	7,520	8,410	8,430	20
	Total land zoned for urban development	**112,500**	**115,220**	**115,670**	**115,670**	**117,140**	**117,140**	**-10**
Additional redevelopment authority land		1,430	1,430	1,260	1,030	350*	350	0
Total zoned land available for urban development		**112,500**	**116,460**	**116,630**	**116,600**	**117,490**	**117,480**	**-10**

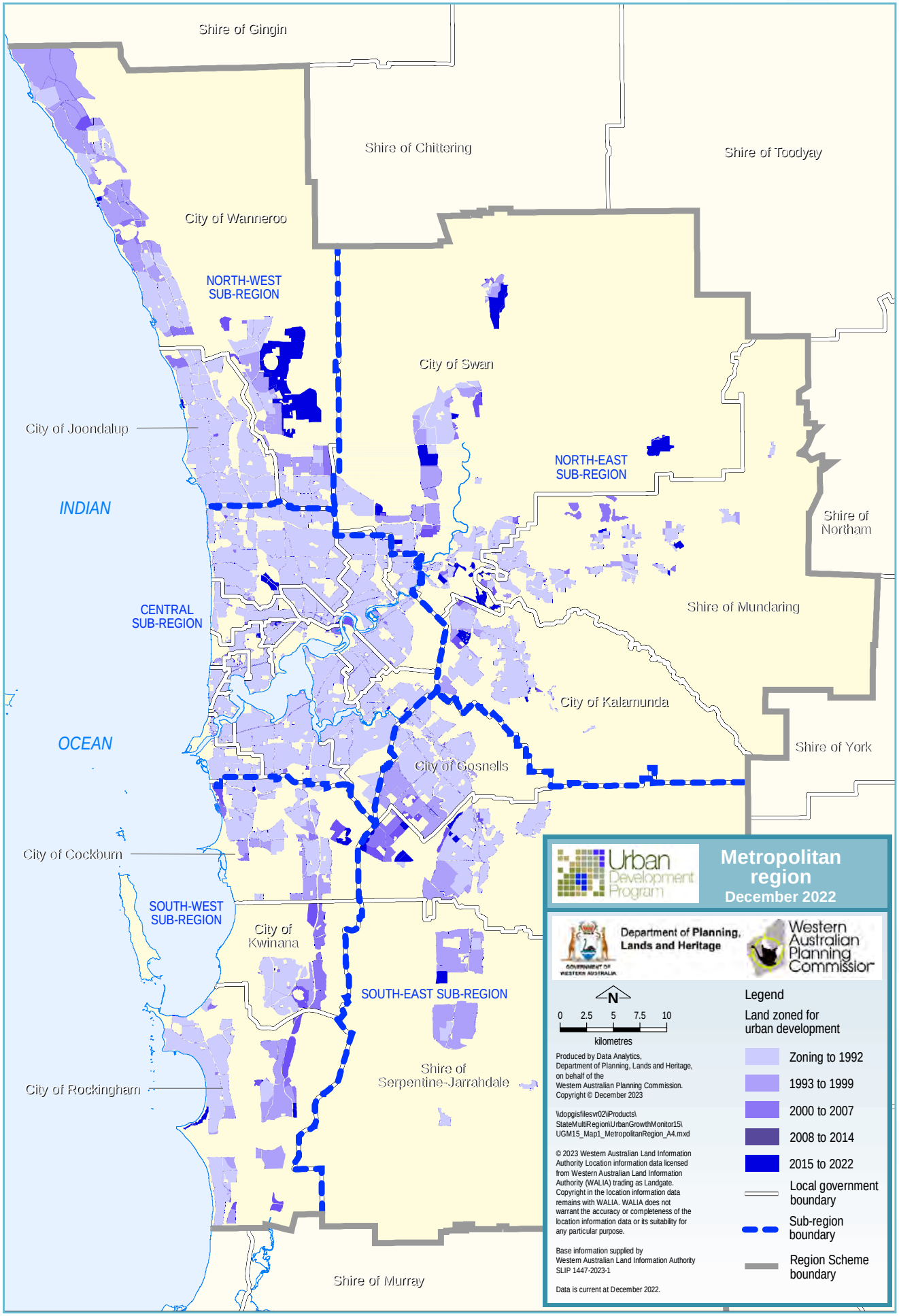
Source: Department of Planning, Lands and Heritage (2023)

Note: Figures may not sum due to rounding.

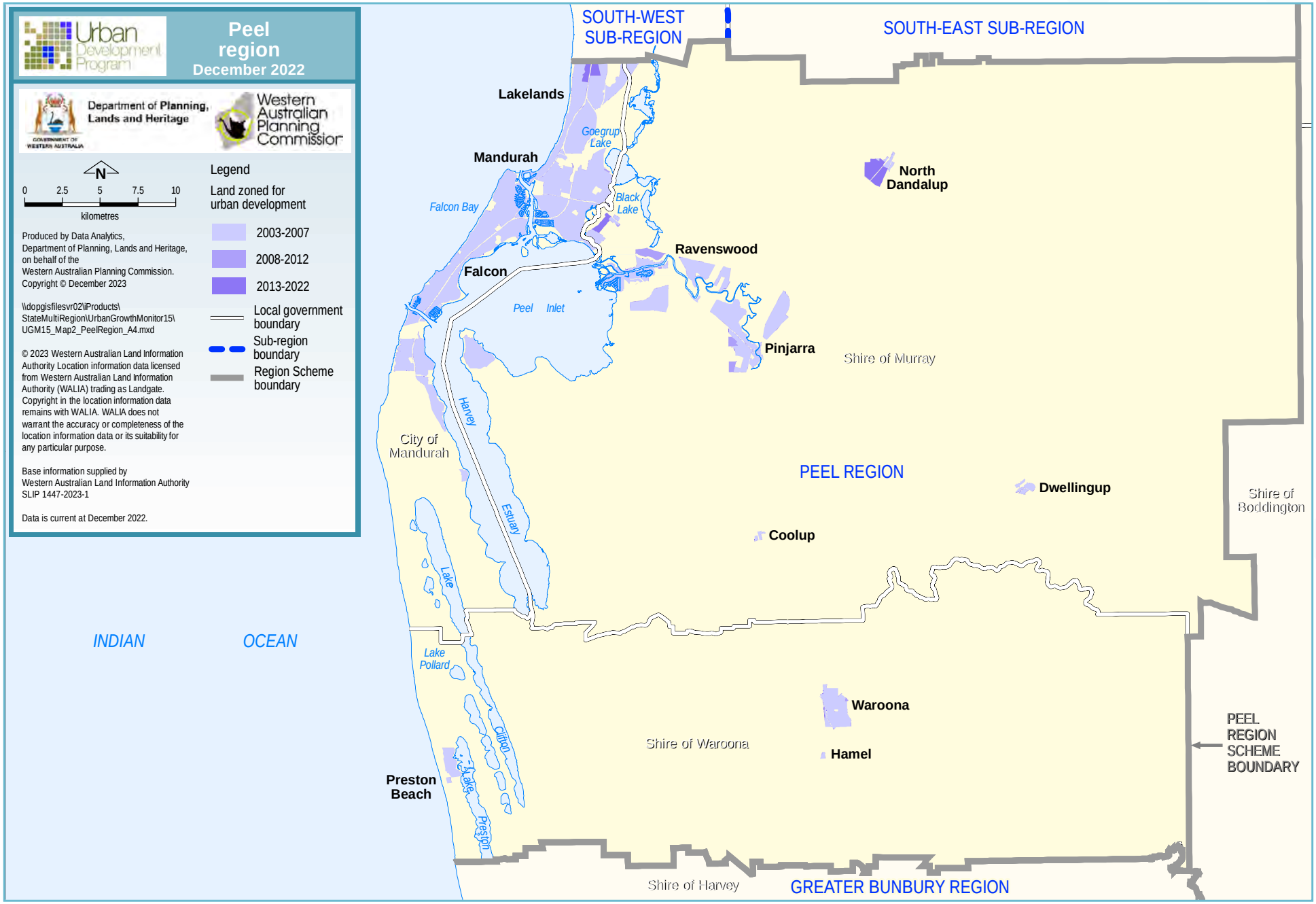
Data calculated as at end of each calendar year.

* The 2021 stock of redevelopment authority land has been revised for this edition due to an area miscalculation in the previous edition.

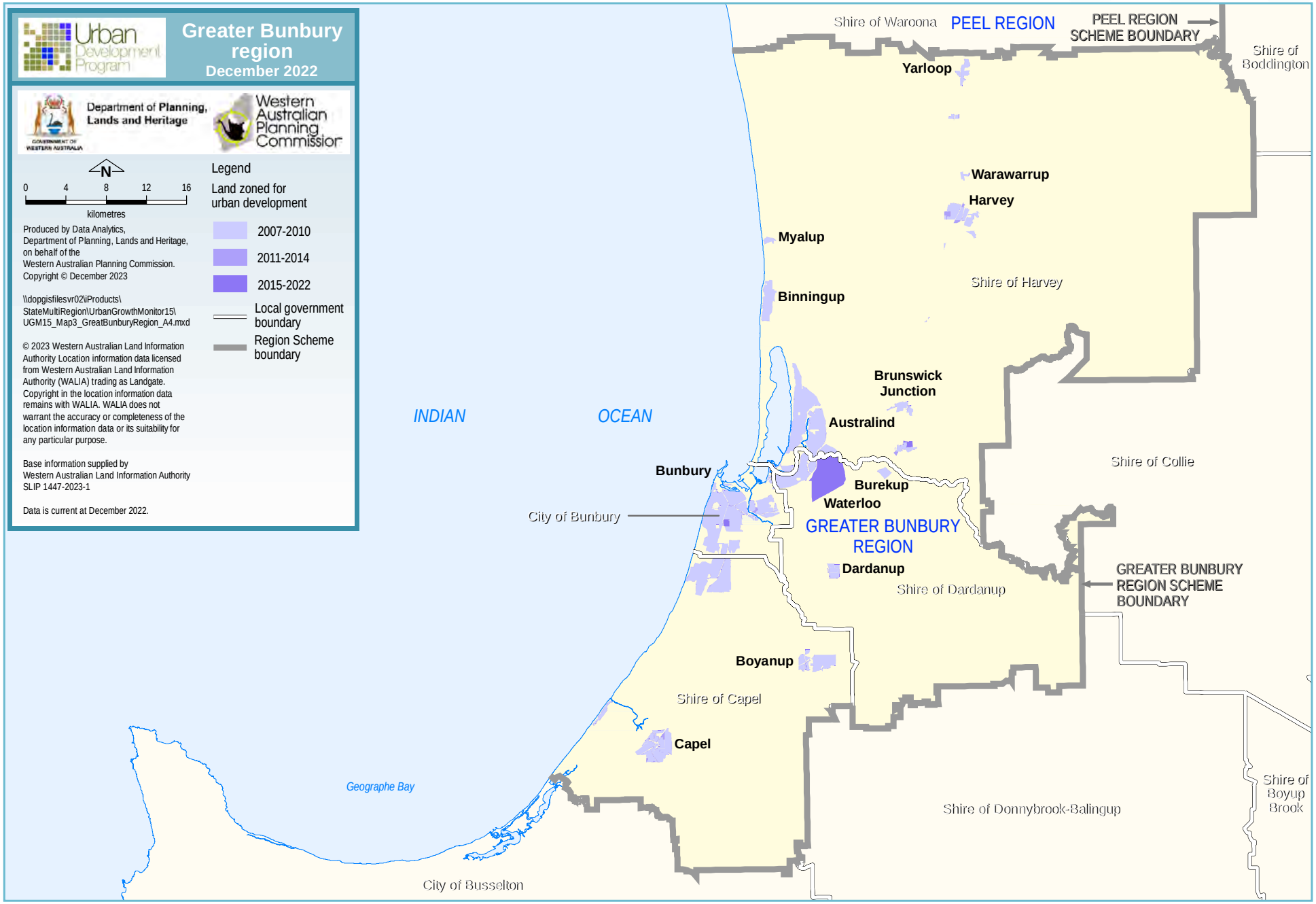
Map 1: Change in stock of land zoned for urban development over time – Perth metropolitan region



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



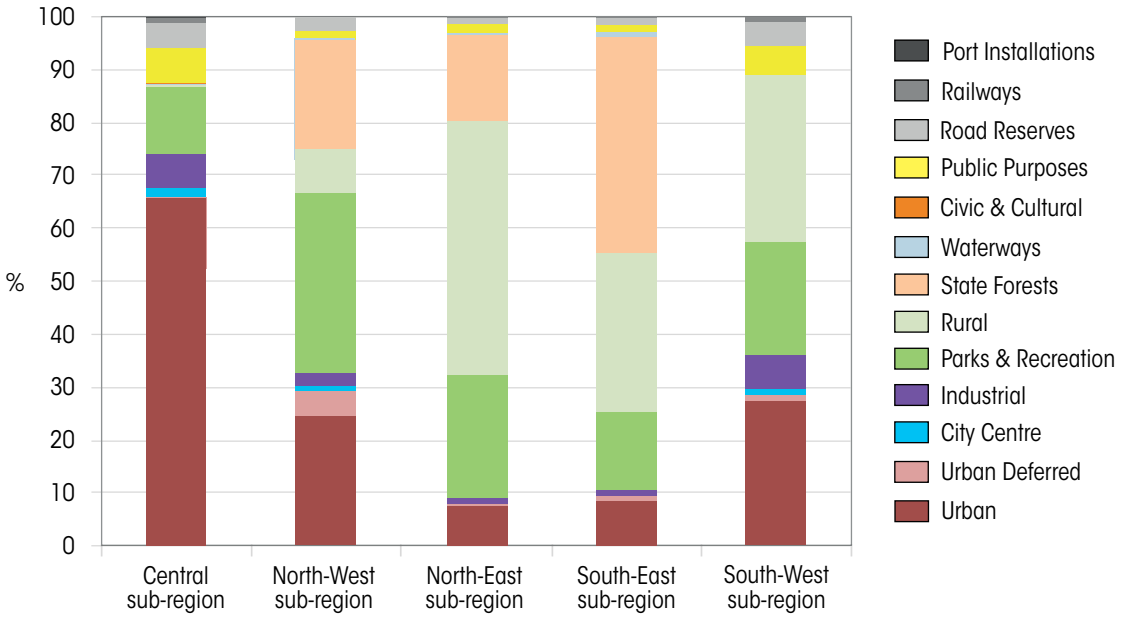
Metropolitan Region Scheme

In 2022, the stock of urban and urban deferred zoned land accounted for around 18 per cent of the 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 identified for urban development over time in the MRS.

Peel Region Scheme

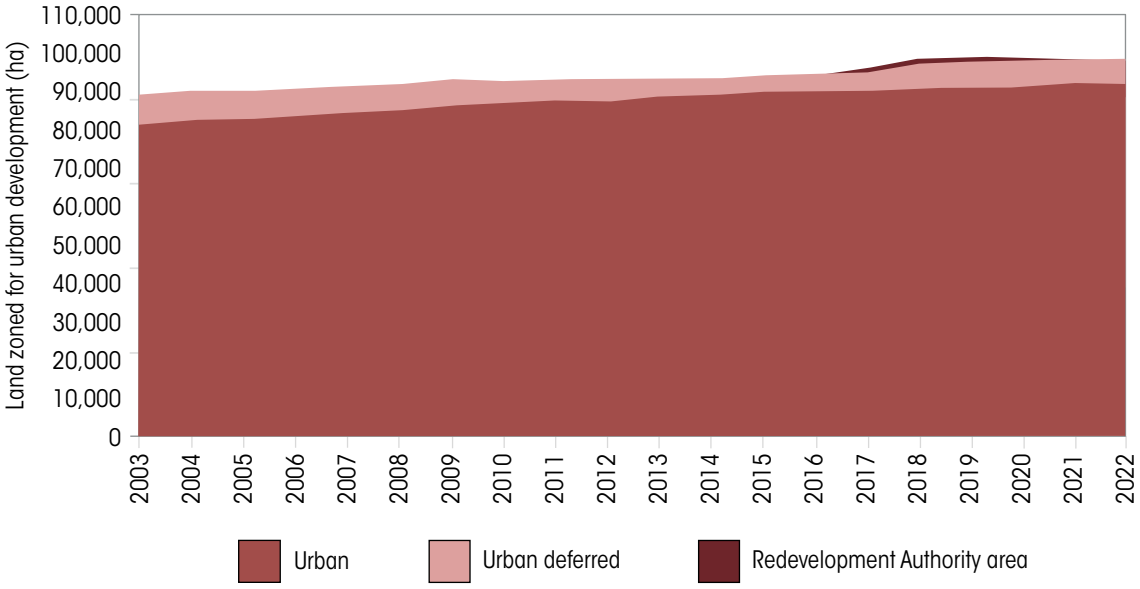
The Peel Region Scheme (PRS) covers approximately 270,570 hectares, of which three per cent is zoned urban or urban deferred. In 2022, there was no change in the stock of urban and urban deferred zoned land. (Figure 3).

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



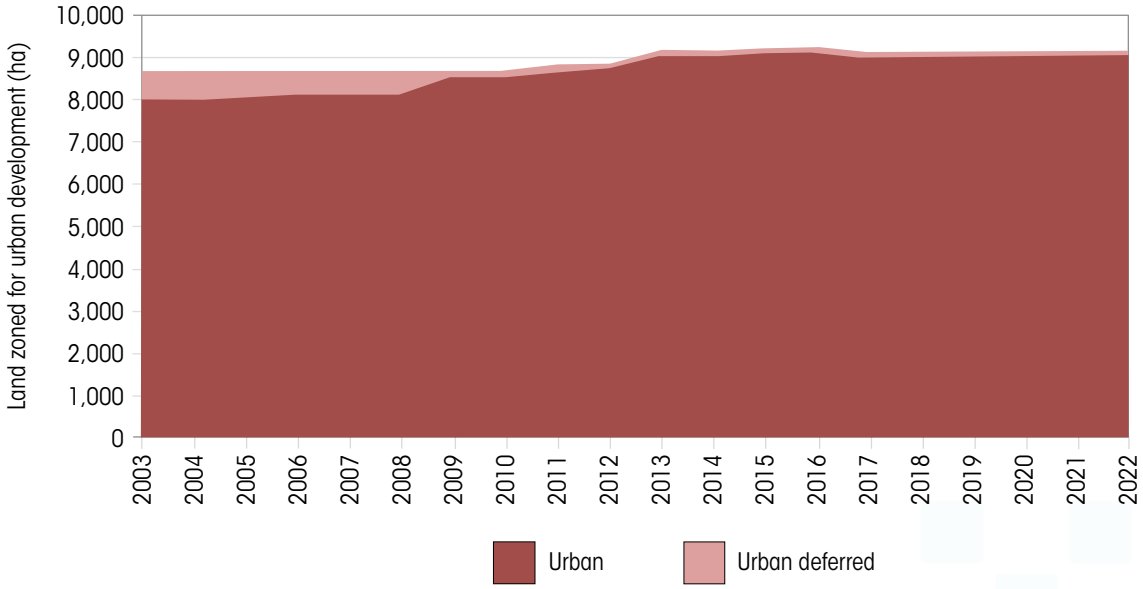
Source: Department of Planning, Lands and Heritage (2023)

Figure 2: Metropolitan Region Scheme: Urban and urban deferred zones 2003-2022



Source: Department of Planning, Lands and Heritage (2023)

Figure 3: Peel Region Scheme: Urban and urban deferred zones 2003-2022



Source: Department of Planning, Lands and Heritage (2023)

Greater Bunbury Region Scheme

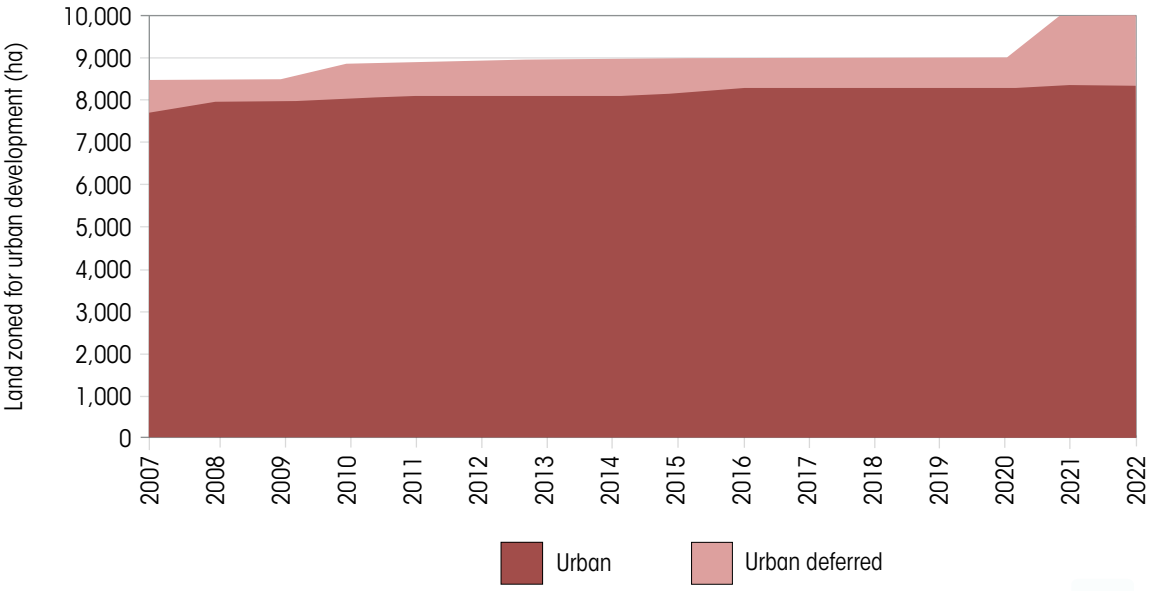
The Greater Bunbury Region Scheme (GBRS) encompasses approximately 288,260 hectares, of which four per cent is zoned for urban development. In 2022, there was no change in the stock of urban and urban deferred zoned land (Figure 4).

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 coincide with land zoned urban or urban deferred under the MRS.

There are however, portions of land within redevelopment areas that are not zoned urban or urban deferred but are designated for urban development. Collectively, these areas add approximately 350 hectares to the total stock of land identified for urban development in the Metropolitan region.

Figure 4: Greater Bunbury Region Scheme: Urban and urban deferred zones 2007-2022



Source: Department of Planning, Lands and Heritage (2023)

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, 90,010 hectares (77 per cent) is developed with urban uses and 27,470 hectares (23 per cent) is non-urbanised. The urbanised and non-urbanised portions vary between regions and sub-regions (Figure 5).

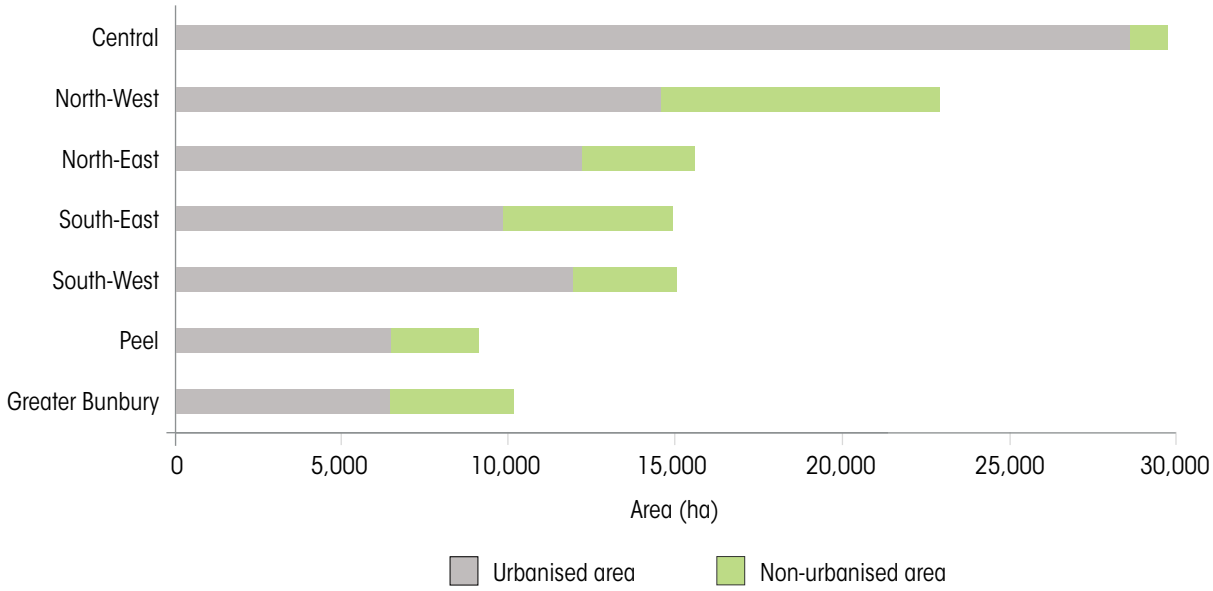
Table 2: Urbanised and non-urbanised land

Region/sub-region	Urbanised area (ha)	Non-urbanised area (ha)	Total land zoned for urban development (ha)	Urbanised
Central sub-region	28,650	1,150	29,800	96%
North-West sub-region	14,540	8,350	22,890	63%
North-East sub-region	12,190	3,380	15,570	78%
South-East sub-region	9,820	5,090	14,920	66%
South-West sub-region	11,940	3,090	15,020	79%
Perth metropolitan sub-total	**77,140**	**21,060**	**98,200**	**79%**
Peel region	6,480	2,660	9,140	71%
Perth and Peel sub-total	**83,620**	**23,720**	**107,330**	**78%**
Greater Bunbury region	6,390	3,760	10,150	63%
Total	**90,010**	**27,470**	**117,480**	**77%**

Source: Department of Planning, Lands and Heritage (2023)

Note: Figures may not sum due to rounding.

Figure 5: Urbanised and non-urbanised land



Source: Department of Planning, Lands and Heritage (2023)

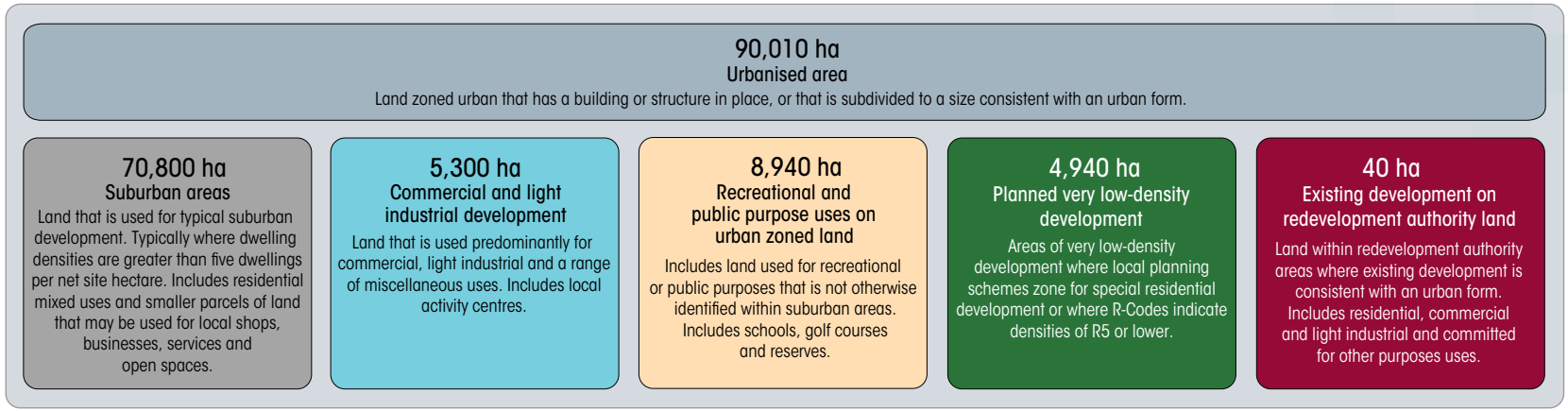
2.3.2 Urbanised area

The urbanised area consists of urban zoned land and redevelopment authority (Development WA) 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.

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.

Figure 6: Existing land uses in urbanised areas



Source: Department of Planning, Lands and Heritage (2023)

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	24,530	1,970	2,110	30	0	28,650
North-West sub-region	12,230	680	1,600	20	0	14,540
North-East sub-region	7,910	310	1,440	2,520	0	12,190
South-East sub-region	7,620	660	900	610	40	9,820
South-West sub-region	9,630	940	1,210	150	0	11,940
Perth metropolitan sub-total	**61,920**	**4,570**	**7,260**	**3,340**	**40**	**77,140**
Peel region	4,930	230	870	450	0	6,480
Perth and Peel sub-total	**66,850**	**4,810**	**8,130**	**3,790**	**40**	**83,620**
Greater Bunbury region	3,950	490	800	1,150	0	6,390
Total	**70,800**	**5,300**	**8,940**	**4,940**	**40**	**90,010**

Source: Department of Planning, Lands and Heritage (2023)

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 (Development WA) land and consists of:

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

Figure 7 and Table 4 provide further detail on the existing land-use distribution in non-urbanised areas. A small amount of non-urbanised land exists in the Central sub-region (1,150 hectares), with other sub-regions having between 3,000 and 8,400 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

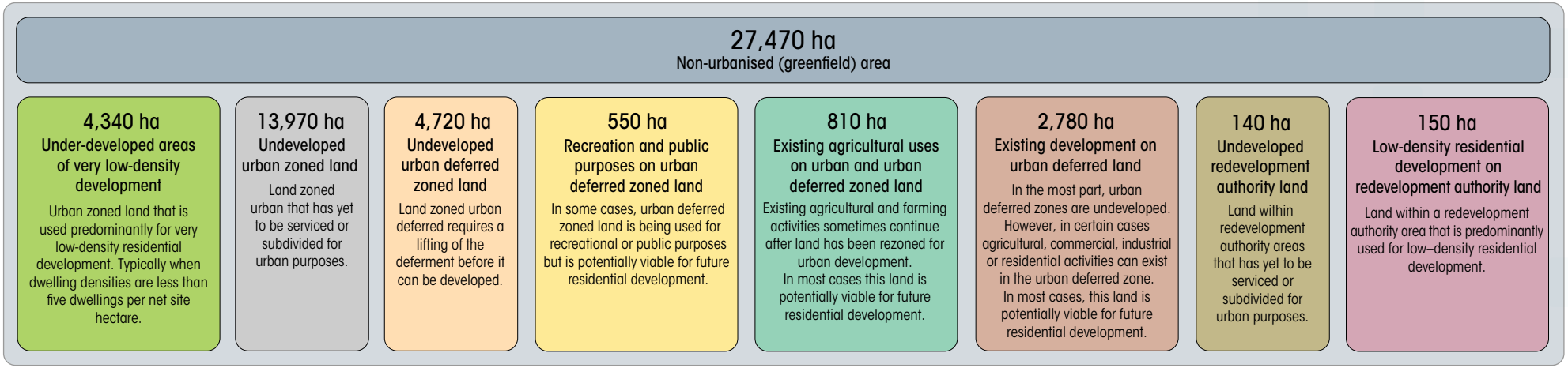
Tier three provides further information on the dynamics of land use within urbanised and non-urbanised areas. This level of the tiered assessment model incorporates local planning scheme zones into the analysis on the dynamics of land availability and introduces the concepts of committed and permitted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

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

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

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.

Figure 7: Existing land uses in non-urbanised areas



Source: Department of Planning, Lands and Heritage (2023)

Note: Figures may not sum due to rounding.

Table 4: Development status on non-urbanised areas by sub-region

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	330	800	0	0	0	10	0	0	1,150
North-West sub-region	180	4,190	2,290	160	60	1,460	0	0	8,350
North-East sub-region	880	1,930	210	0	40	320	0	0	3,380
South-East sub-region	1,740	1,590	560	60	220	630	140	150	5,090
South-West sub-region	410	1,950	220	300	0	210	0	0	3,090
Perth metropolitan sub-total	**3,540**	**10,460**	**3,290**	**530**	**320**	**2,630**	**140**	**150**	**21,060**
Peel region	290	2,260	50	0	10	40	0	0	2,660
Perth metropolitan and Peel sub-total	**3,830**	**12,720**	**3,340**	**530**	**330**	**2,670**	**140**	**150**	**23,720**
Greater Bunbury region	510	1,250	1,380	30	480	100	0	0	3,760
Total	**4,340**	**13,970**	**4,720**	**550**	**810**	**2,780**	**140**	**150**	**27,470**

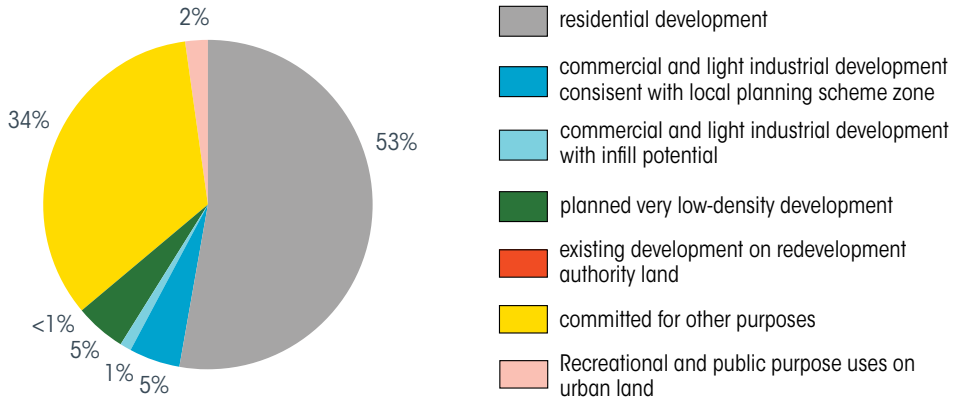
Source: Department of Planning, Lands and Heritage (2023)

Note: Figures may not sum due to rounding.

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

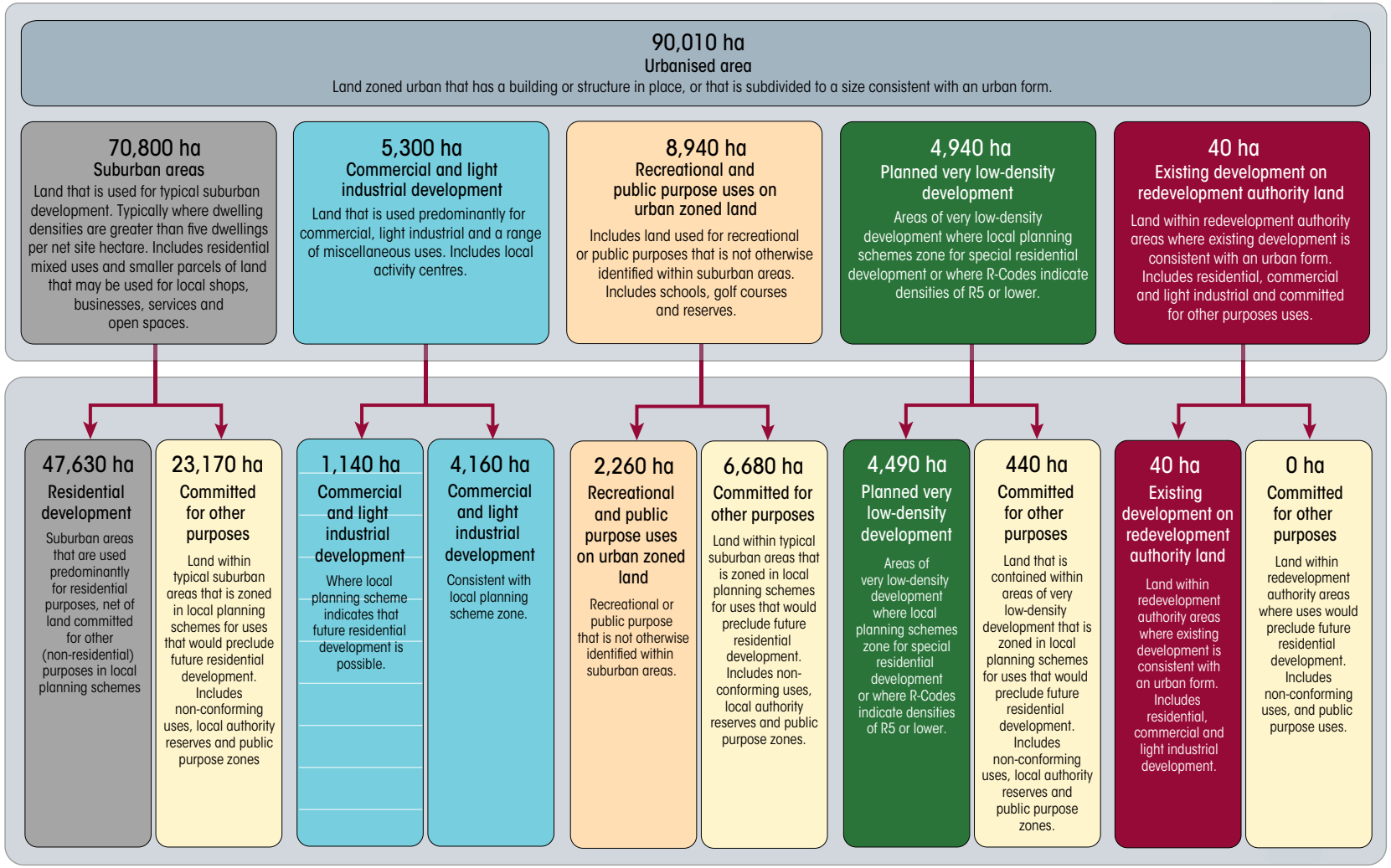
Figure 8 and Figure 9 indicate that approximately 53 per cent of the urbanised area across the three region schemes is used primarily for residential purposes. The remaining 47 per cent of urbanised land essentially accommodates non-residential uses, with 34 per cent of urbanised areas committed for other purposes and six per cent occupied by commercial and light industrial development

Figure 8: Land-use dynamics in urbanised areas



Source: Department of Planning, Lands and Heritage (2023)

Figure 9: Land-use dynamics of urbanised areas



Source: Department of Planning, Lands and Heritage (2023)

Note: Figures may not sum due to rounding.

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

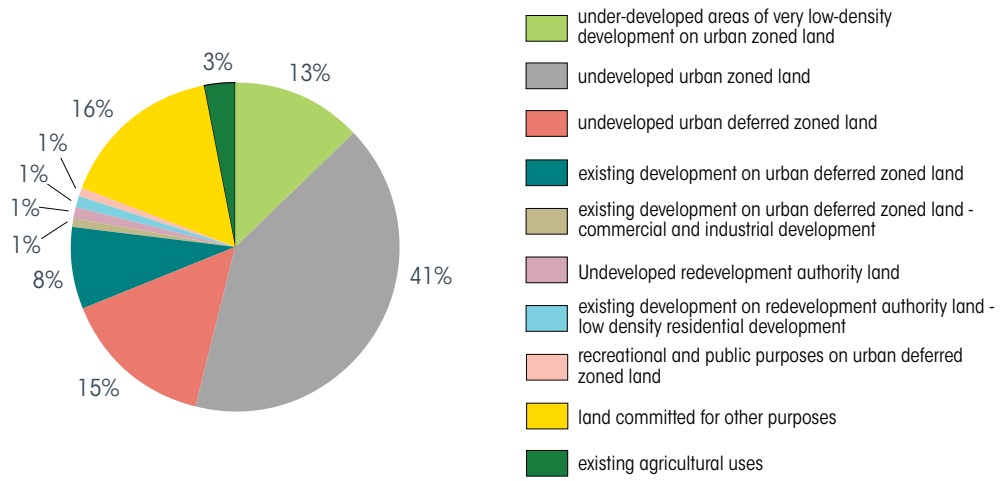
Incorporating local planning schemes into the assessment of urban land supply helps to estimate how much non-urbanised land may be available for residential development and how much will be required for non-residential uses.

The total stock of undeveloped urban, urban deferred and undeveloped redevelopment authority land comprises around 57 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 urbanised 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.

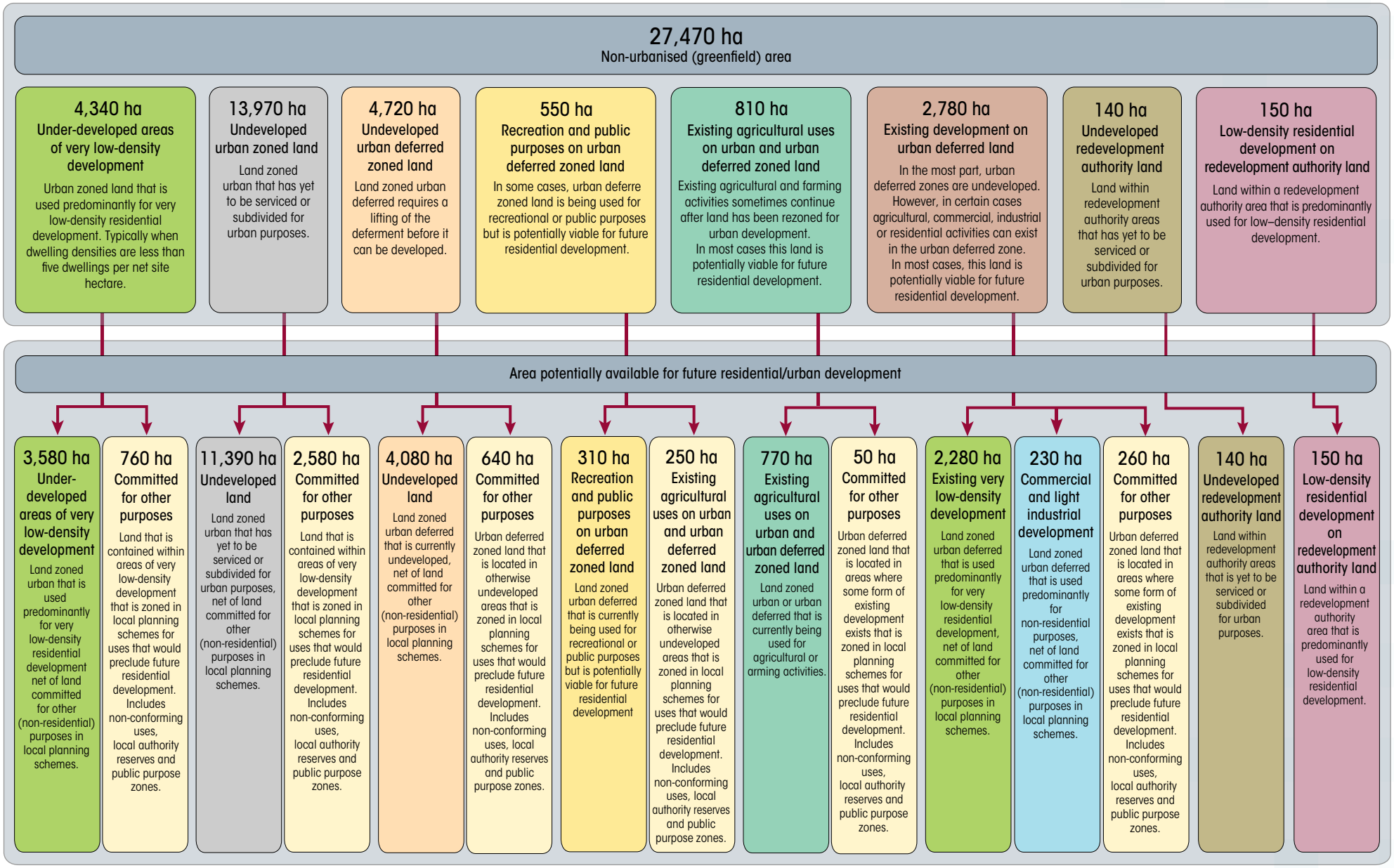
While the specific dynamics of future land zoning decisions remain unknown, it is assumed that ultimately non-urbanised land will have a similar composition to current urbanised land. Based on previous development patterns, it is likely that one third to just under half of the overall share of the non-urbanised stock may be unavailable for residential purposes. Additionally, it is possible that very low-density development will fall as a share of the non-urbanised stock, given the policy transition towards higher-density development in greenfield areas.

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



Source: Department of Planning, Lands and Heritage (2023)

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



Source: Department of Planning, Lands and Heritage (2023)

Note: Figures may not sum due to rounding.

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

As at 31 December 2022, there were approximately 59,080 residential lots (strata and freehold) with current conditional subdivision approval across the Perth, Peel and Greater Bunbury regions (Table 5). Of these, around 63 per cent were in non-urbanised areas, with the remaining 37 per cent in urbanised areas. Within the urbanised area, 32 per cent of conditional approvals were strata subdivisions, compared to just three per cent in non-urbanised areas.

Within the Perth metropolitan region, the South-West sub-region had the greatest stock of residential lots with current conditional approvals with 13,410 lots (26 per cent), followed closely by the North-West with 12,640 lots (also 26 per cent).

Table 6 shows the distribution of conditional subdivision approvals based on tier three of the land supply assessment. Within urbanised areas, 86 per cent of conditional approvals for residential subdivision are in suburban areas, and five per cent are in areas identified as currently accommodating commercial or light industrial uses.

Within the non-urbanised area, 82 per cent of residential conditional approvals are on undeveloped urban, urban deferred or redevelopment authority land and 14 per cent are on land identified as underdeveloped areas of very low-density development on urban zoned land.

Table 5: Spatial distribution of strata and freehold lots with conditional approval for residential subdivision (as at 31 December 2022)

	Urbanised area			Non-urbanised area			Total		
Region/sub-region	Strata (lots)	Freehold (lots)	Total (lots)	Strata (lots)	Freehold (lots)	Total (lots)	Strata (lots)	Freehold (lots)	Total (lots)
Central sub-region	3,740	1,500	5,250	240	440	690	3,990	1,940	5,930
North-West sub-region	930	4,900	5,830	140	6,670	6,810	1,070	11,570	12,640
North-East sub-region	600	2,570	3,170	270	4,510	4,780	870	7,080	7,950
South-East sub-region	660	1,540	2,200	210	7,720	7,930	870	9,270	10,130
South-West sub-region	730	3,010	3,750	250	9,410	9,660	990	12,420	13,410
Perth metropolitan sub-total	**6,660**	**13,530**	**20,190**	**1,120**	**28,750**	**29,870**	**7,780**	**42,280**	**50,060**
Peel region	140	700	840	110	5,370	5,480	250	6,070	6,320
Perth and Peel sub-total	**6,800**	**14,230**	**21,030**	**1,230**	**34,120**	**35,350**	**8,030**	**48,350**	**56,380**
Greater Bunbury region	180	600	780	70	1,850	1,920	250	2,450	2,700
Total	**6,980**	**14,830**	**21,810**	**1,300**	**35,970**	**37,260**	**8,280**	**50,800**	**59,080**

Source: Department of Planning, Lands and Heritage (2023)

Note: Figures may not sum due to rounding.

Table 6: Spatial distribution of lots with conditional approval for residential subdivision (as at 31 December 2022)

	Urbanised area				Non-urbanised area			
Region/sub-region	**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)**	**Total (lots)**
Central sub-region	5,070	120	10	50	260	420	-	5,930
North-West sub-region	4,880	750	-	200	260	6,070	490	12,640
North-East sub-region	2,290	20	60	800	1,260	3,510	-	7,950
South-East sub-region	2,120	40	-	30	1,980	5,190	770	10,130
South-West sub-region	3,430	10	-	310	1,360	8,300	-	13,410
Perth metropolitan sub-total	**17,780**	**940**	**80**	**1,400**	**5,120**	**23,490**	**1,260**	**50,060**
Peel region	550	20	-	270	110	5,370	-	6,320
Perth and Peel sub-total	**18,330**	**960**	**80**	**1,660**	**5,230**	**28,860**	**1,260**	**56,380**
Greater Bunbury region	510	10	10	250	50	1,870	-	2,700
Total	**18,840**	**980**	**90**	**1,910**	**5,280**	**30,730**	**1,260**	**59,080**

Source: Department of Planning, Lands and Heritage (2023)

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

Annual land consumption rates based on built form (construction) and subdivision are depicted in Figure 12. 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.

From 2003 to 2022, an average of 860 hectares per annum of urban and urban deferred zoned land was consumed by subdivision across the three region schemes. Over the same period, the average rate of land consumption by construction was 830 hectares per annum (Table 7).

Table 7: Land consumption trends

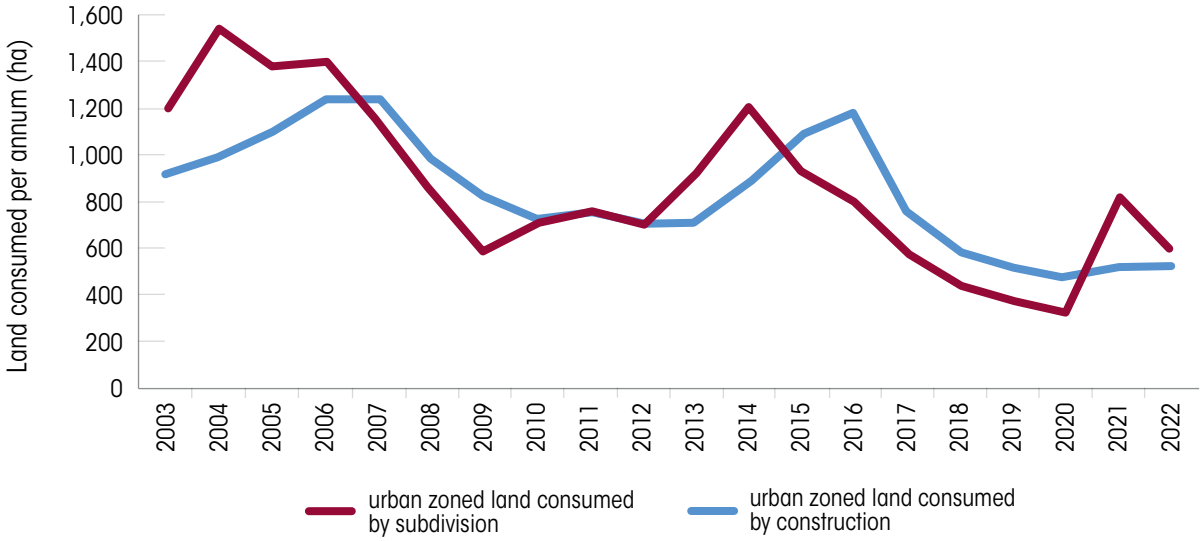
	Consumption in 2022	Average consumption (2003-2022)
Land consumption by construction	520 hectares	830 hectares
Land consumption by subdivision	590 hectares	860 hectares

Source: Department of Planning, Lands and Heritage (2023)

In 2022, land consumption was well below the 20-year average for both subdivision (-31 per cent) and construction (-37 per cent) (Table 7). In recent years, there has been some volatility with land consumption activity. It should be noted that since both measures track gross urban land consumption, non-residential development activity can also contribute to volatility in these metrics.

The low rates of land consumption in the years prior COVID-19 represented a prolonged period of 'lot absorption' and reflect the lower rates of population growth and economic activity at that time. The temporary COVID-19 stimulus measures introduced during 2020 contributed to a short-lived rise in consumption by subdivision. Persistent labour and materials constraints, however, have impacted the delivery of dwellings and consequently consumption by construction. Although a rise in land consumption by construction is expected due to the large volume of dwellings commenced but not yet completed, decreased dwelling commencement volumes during 2022 indicate that this boost may be short-lived (Figure 13).

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 (2023)

3.2 Additional indicators of land consumption

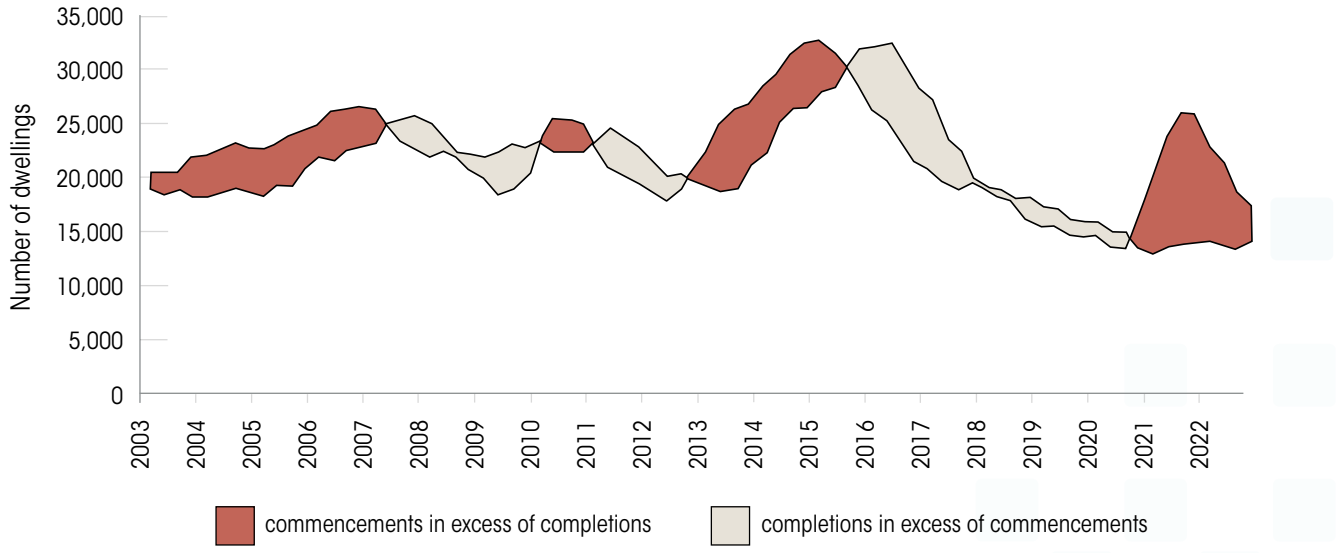
Dwelling commencements totalled 17,300 in the year to December 2022, a 33 per cent decrease from December 2021 (Figure 13). Generally, trends in dwelling commencements precede trends in land consumption based on built form due to the time required for construction.

In 2021, there was a rapid increase in dwelling commencements relative to dwelling completions, with commencements peaking around 25,960 dwellings in September 2021. During 2022, the volume of dwelling completions remained relatively stable. Dwelling commencements, while still exceeding completions, started to fall, as the impacts of interest rate rises and continued labour and supply issues likely tempered investment in new housing.

The increase in dwelling commencements without a corresponding rise in completions over the last couple of years led to approximately 27,570 dwellings being under construction as of the end of 2022, surpassing the previous peak of 27,200 dwellings in March 2015 (Figure 14).

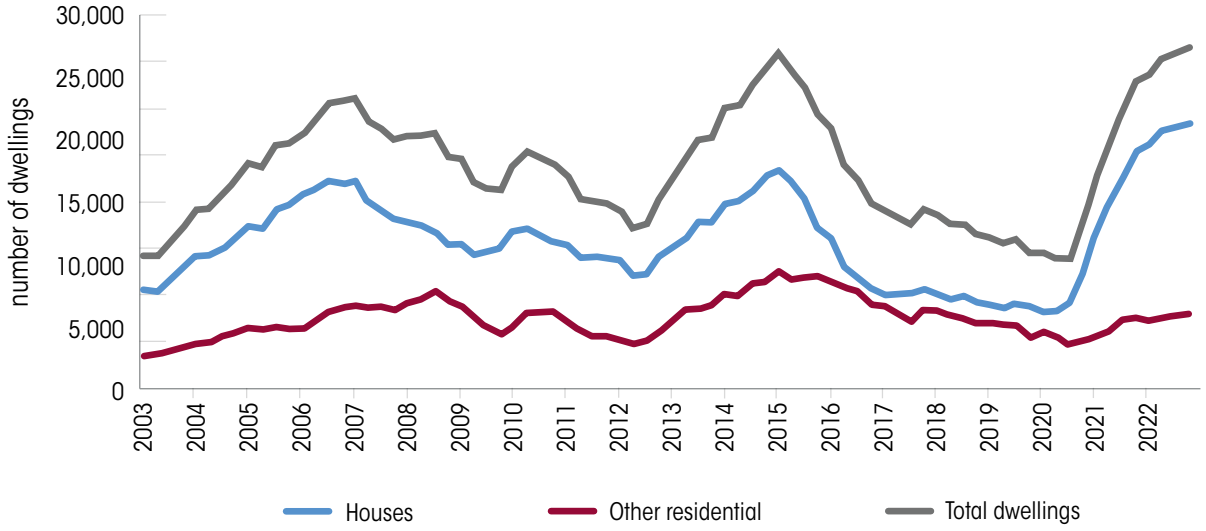
Changes to land consumption rates are largely driven by population growth and economic conditions which influence the level of investment in housing. Population growth picked up in 2021 and continued its increase in 2022 (Figure 15). It is expected that higher levels of population growth occurring during a period of rising interest rates and restrained levels of investment in new housing will contribute to further volatility in both metrics of land consumption in the short to medium term.

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



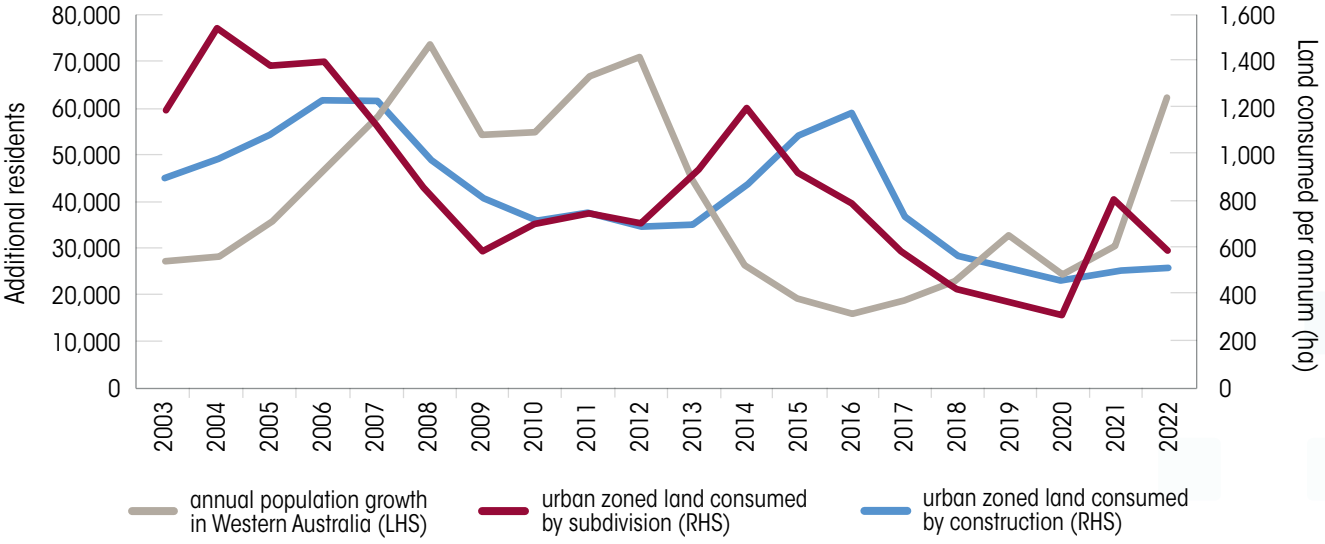
Source: Australian Bureau of Statistics (2023) Cat. No. 8752.0 – Building Activity, Australia

Figure 14: Dwellings under construction for Western Australia



Source: Australian Bureau of Statistics (2023) Cat. No. 8752.0 – Building Activity, Australia

Figure 15: Population growth and land consumption



Source: Australian Bureau of Statistics (2023) 3101 National, State and Territory population,
Department of Planning, Lands and Heritage (2023) based on Landgate State-wide Property Records and Cadastre, Landgate (2023)

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 uses. 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.

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

2022 stock of non-urbanised land available for development	20,810 hectares
Highest rate of land consumption (2007)	1,110 hectares
Average rate of land consumption (2003-2022)	770 hectares
Lowest rate of land consumption (2020)	440 hectares
Years' supply at highest consumption	19 years
Years' supply at average consumption	27 years
Years' supply at lowest consumption	48 years

Source: Department of Planning, Lands and Heritage (2023)

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

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 be extended if rates of residential infill development and greenfield densities improve in the future.

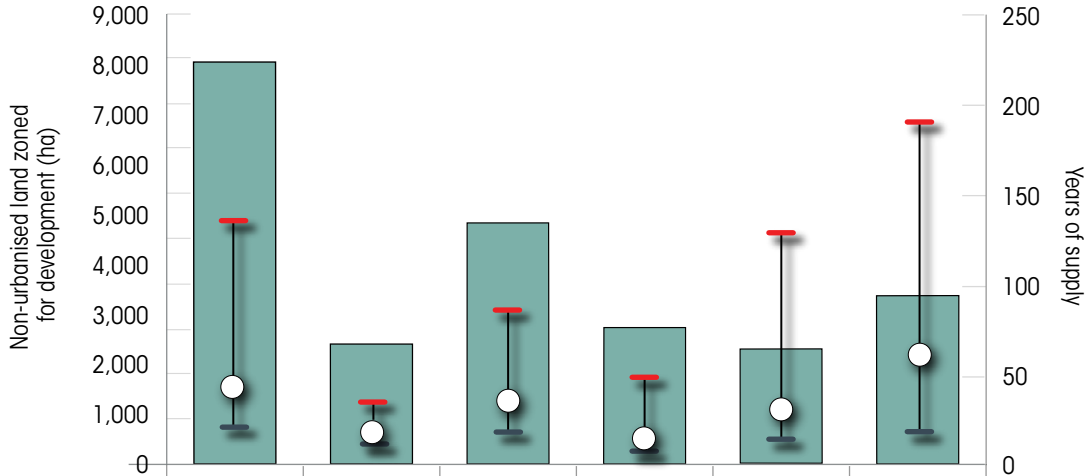
It is acknowledged that some development sites contain a larger share of environmental assets than others and that these features may restrict traditional greenfield development. It is envisioned, however, that housing targets can still be achieved in these areas through innovative density solutions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

3.4 Temporal land supply of outer metropolitan sub-regions, Peel and Greater Bunbury regions

Sub-regional temporal land supply estimates are developed using historical consumption rates over a 20-year period. They are estimated based on consumption by subdivision and the amount of non-urbanised land available for development in each sub-region. The Central sub-region has not been included in this section as future urbanisation in the Central sub-region is dependent on infill development rather than non-urbanised land supply. All sub-regions and regions shown, have many years' supply of undeveloped land available for development, based on historical average consumption rates (Figure 16).

Figure 16: Estimated temporal supply of land zoned for urban development by sub-region



	North-West sub-region	North-East sub-region	South-East sub-region	South-West sub-region	Peel region	Greater Bunbury region
Non-urbanised land (ha)	8,070	2,400	4,840	2,750	2,330	3,370
Years supply at highest consumption	20	10	18	7	12	17
Years supply at lowest consumption	135	34	85	47	129	191
Years supply at average consumption	42	18	34	13	29	59

Source: Department of Planning, Lands and Heritage (2023)

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 better representation of changes to the dwelling stock 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 earlier *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, demolition data sourced from Landgate's property valuation database has enabled a better understanding of the location of residential demolition activity. This represents an improvement in the way infill development is measured, as demolitions occurring outside of urbanised areas can be excluded from consideration when calculating the net infill rate.

Gross and net infill, as well as greenfield dwelling development is monitored using the infill model and demolition data. monitored 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 2022, the total number of dwellings constructed in Perth and Peel was 9,620, the lowest annual volume of residential construction recorded since infill monitoring began in 2011. If dwellings lost through demolition activity are considered in the calculations, just 8,360 dwellings (net) were added to the stock across Perth and Peel.

Total residential construction in 2022 was six per cent lower than in 2021 (10,260 dwellings), and 62 per cent lower than the peak of 25,230 dwellings constructed in 2016. For context, an average of 15,880 dwellings per year were constructed from 2011 to 2022.Approximately 61 per cent of total residential construction is in greenfield areas with the remainder (39 per cent) in infill areas (Figure 17).

After the peak of 15,020 dwellings constructed in greenfield areas during 2015, greenfield development declined until 2020. A slight increase in greenfield dwelling construction was identified following the introduction of Government stimulus measures in 2020.

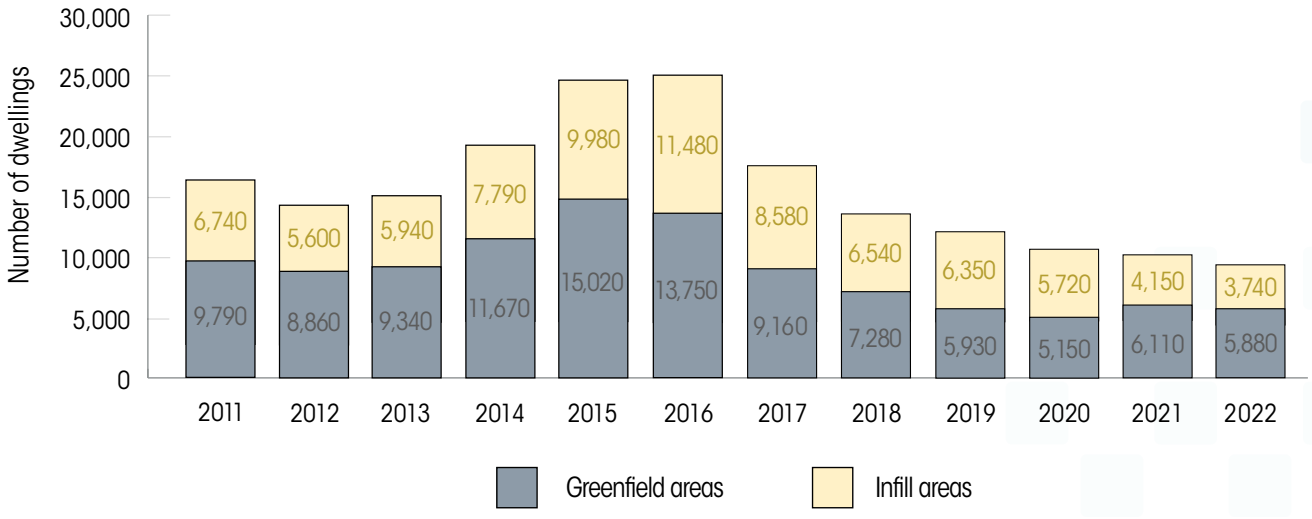
In 2022, a total of 5,880 dwellings were built in greenfield areas across Perth and Peel, representing a decrease of six per cent from 6,110 dwellings in 2021. Once residential demolitions in greenfield areas are considered, approximately 5,770 net dwellings were added to greenfield areas across Perth and Peel in 2022.

Though both greenfield and infill dwelling construction declined in 2022, net infill development (once demolitions are accounted for) was six per cent higher than in 2021, with 2,600 net infill dwellings constructed in 2022. The increase in net infill development was largely a function of below average volumes of dwelling demolitions during 2022 rather than an increase in dwelling completions in infill areas.

Net infill development, which is used to calculate the annual infill rate for the Perth metropolitan and Peel regions, was approximately 31 per cent in 2022, up from 29 per cent in 2021.

Key measures of dwelling dynamics relating to monitoring infill are presented in Figure 18, Table 9 and Table 10.

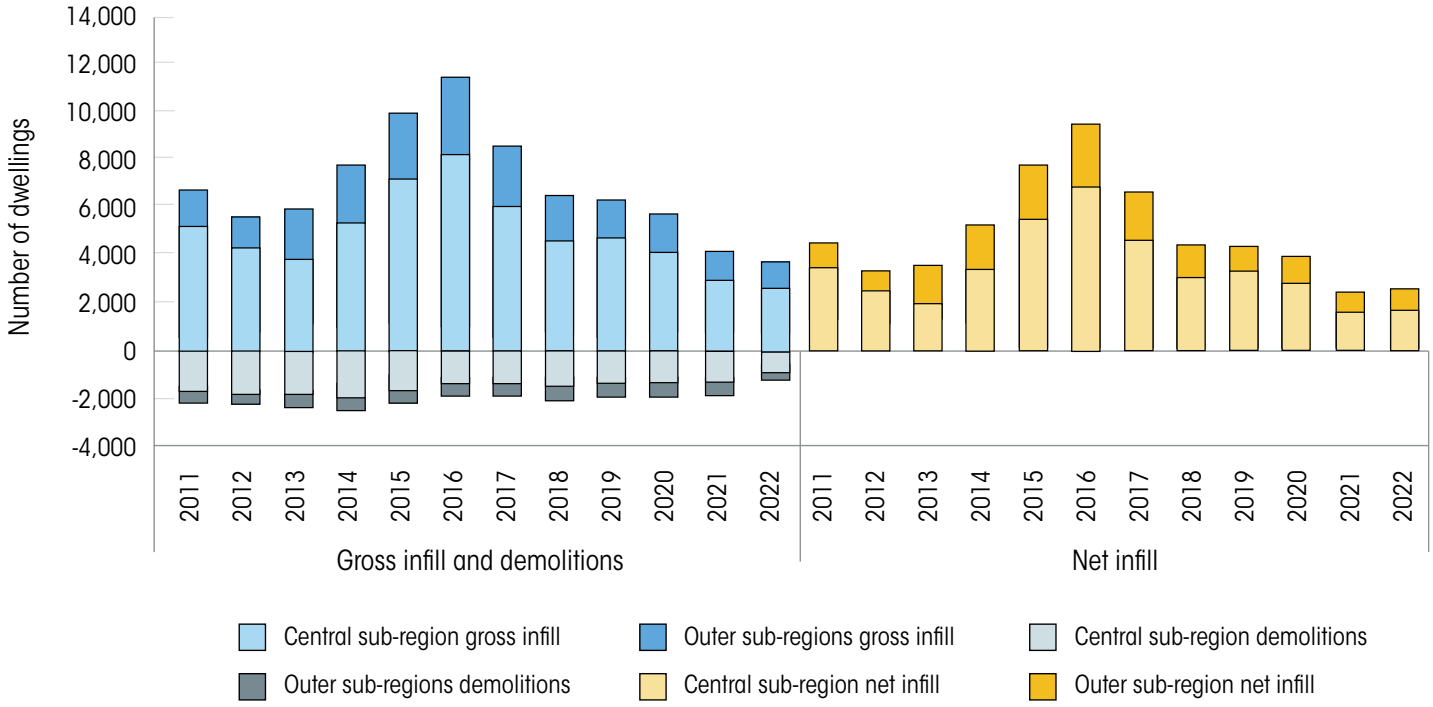
Figure 17: Gross dwelling construction 2011-2022



Source: Department of Planning, Lands and Heritage (internal databases) (2023)

Numbers have been rounded.

Figure 18: Dynamics of dwelling development 2011-2022 – Infill



Source: Department of Planning, Lands and Heritage (internal databases) (2023)

Table 9: Dynamics of dwelling development 2011-2022 – Central sub-region

Measure	Central sub-region											
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Gross infill	5,190	4,310	3,840	5,330	7,200	8,240	6,040	4,560	4,710	4,120	2,900	2,580
Demolitions	1,710	1,810	1,840	1,940	1,670	1,400	1,390	1,480	1,380	1,350	1,320	890
Net infill	3,480	2,500	2,000	3,390	5,530	6,840	4,650	3,090	3,330	2,820	1,620	1,720
Greenfield	350	280	280	250	380	650	400	150	230	220	160	120

Source: Department of Planning, Lands and Heritage (internal databases) (2023)

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

Table 10: Dynamics of dwelling development 2011-2022 – Outer sub-regions

Measure	Outer sub-regions											
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Gross infill	1,550	1,300	2,100	2,460	2,780	3,240	2,540	1,980	1,640	1,600	1,250	1,160
Demolitions	490	430	520	580	500	510	520	630	580	600	550	370
Net infill	1,080	860	1,580	1,890	2,280	2,730	2,020	1,350	1,070	1,160	830	880
Greenfield	9,440	8,590	9,060	11,420	14,650	13,100	8,760	7,130	5,700	4,750	5,950	5,770

Source: Department of Planning, Lands and Heritage (internal databases) (2023)

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

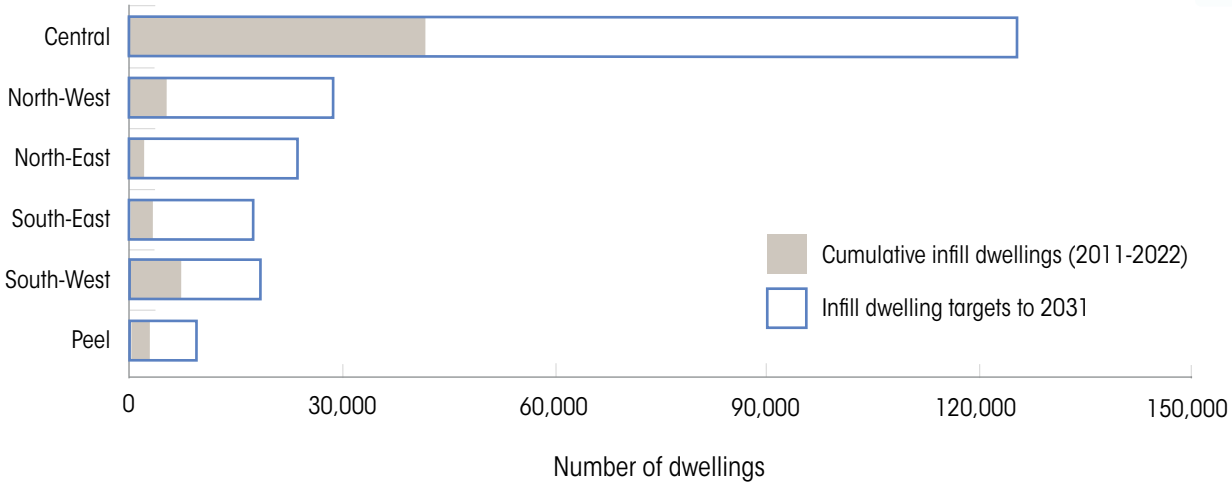
4.3 Infill dwelling targets

Perth and Peel@3.5million sets out infill dwelling targets to 2031 and 2050. These targets, in conjunction with annual *Urban Growth Monitor* assessments, 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 2022.

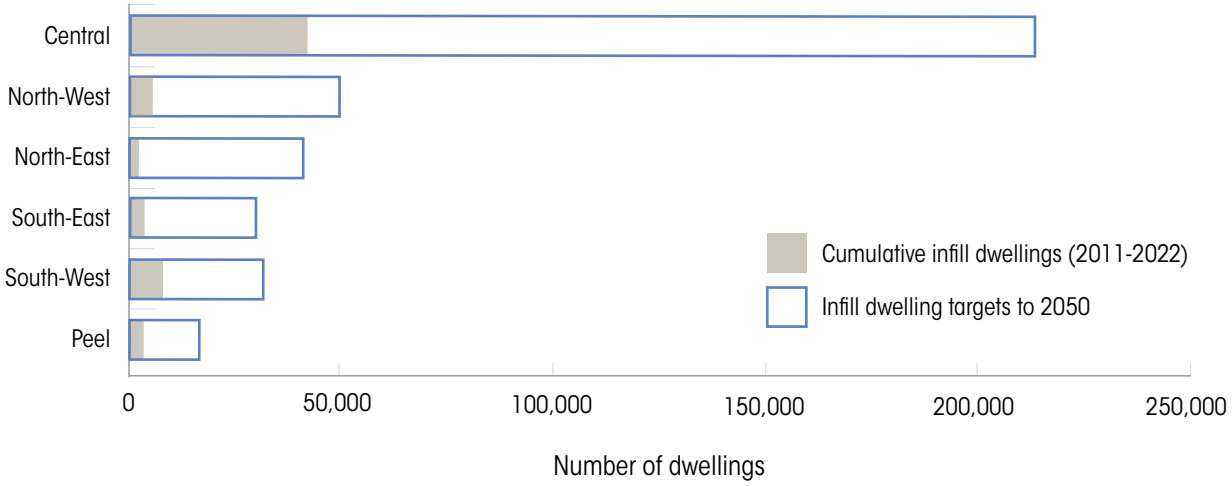
It is important to note that residential dwelling development is expected to vary from year to year and is unlikely to progress in a linear fashion. In addition, the rate of infill in the outer sub-regions is likely to grow over time, as these areas become increasingly urbanised.

Figure 19: Progress towards infill dwelling targets to 2031



Source: Department of Planning, Lands and Heritage (internal databases) (2023)

Figure 20: Progress towards infill dwelling targets to 2050



Source: Department of Planning, Lands and Heritage (internal databases) (2023)

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 being delivered in infill areas.

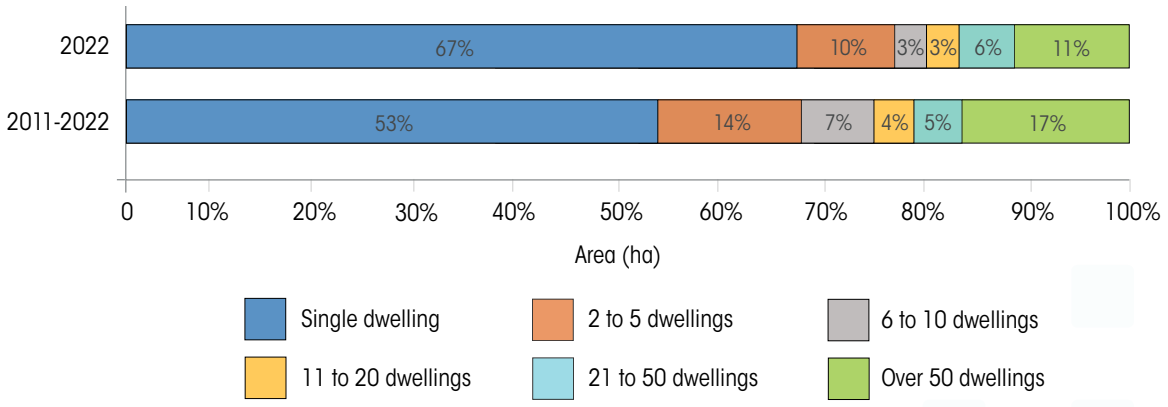
In 2022, over two thirds of all infill dwellings built comprised of single dwelling developments such as duplexes and triplexes (Figure 21). This is much higher than the average of 53 per cent for the period from 2011 to 2022.

Just under one quarter of infill dwellings were delivered through projects yielding more than five dwellings per lot during 2022. This is below the average for the 2011 to 2022 period, when one in three infill developments yielded more than five dwellings per lot).

Large-scale infill developments (projects yielding over 50 dwellings per lot) comprised around one in 10 of all infill development in 2022. High density infill projects as a proportion of all infill has been falling in recent years after peaking at just over a quarter of all infill in 2019 (Figure 22).

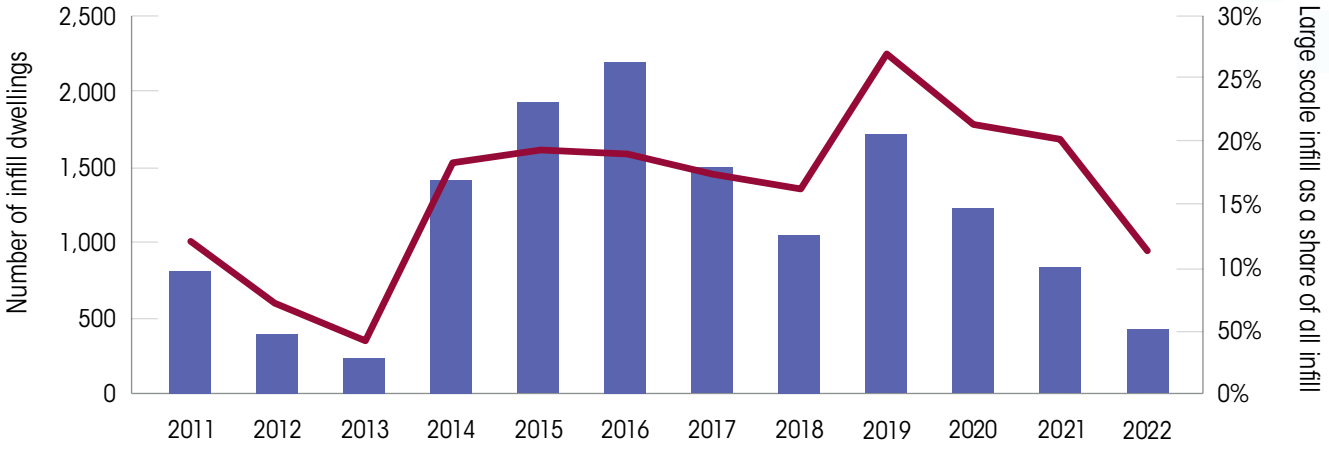
As discussed in section two, dwelling commencement volumes decreased during 2022, reverting to the levels experienced in the years leading up to COVID-19. Concerns around the availability and cost of both labour and materials, especially for higher density projects presents a challenge to infill development. As large-scale infill projects have longer construction timeframes than smaller projects, future infill rates may provide a clearer indication of the extent to which the COVID-19 pandemic may be influencing the current levels and built form of infill development.

Figure 21: Number of infill dwellings per lot, 2022 only and 2011 to 2022



Source: Department of Planning, Lands and Heritage (internal databases) (2023)

Figure 22: Infill developments yielding 50 dwellings or more per lot

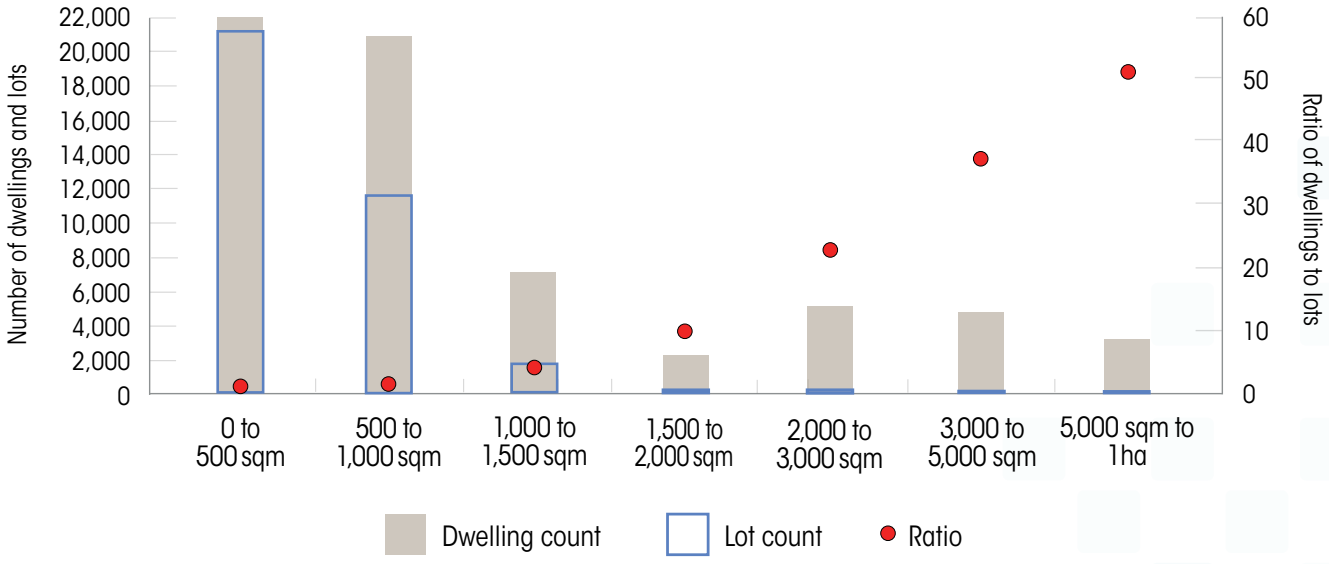


Source: Department of Planning, Lands and Heritage (internal databases) (2023)

4.4.2 Infill dwellings by lot size

Figure 23 depicts the average number of infill dwellings constructed by lot size, based on dwellings built in infill areas between 2013 and 2022. The data indicates that larger lots typically yield a higher number and density of dwellings than smaller lots in infill areas.

Figure 23: Average number of infill dwellings by lot size, 2013-2022



Source: Department of Planning, Lands and Heritage (internal databases) (2023)

It's worth noting that the ratio of dwellings to lots for larger sized lots is based on a relatively small number of projects each year 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 framework governing each project may also impact upon the optimal configuration of residential developments regarding building heights, plot ratio, design and land-use mix.

5 Dwelling density

Dwelling density is the relationship between the number of dwellings and the available or utilised land area. It 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	As at December							
	2015	2016	2017	2018	2019	2020	2021	2022
Central	11.7	11.9	12.0	12.1	12.1	12.2	12.8	12.9
North-West	9.1	9.3	9.4	9.4	9.5	9.5	9.4	9.5
North-East	6.9	6.9	7.0	7.3	7.3	7.4	7.1	7.2
South-East	8.7	8.8	8.7	8.7	8.8	8.9	8.6	8.7
South-West	9.3	9.5	9.8	9.9	10.0	10.0	9.6	9.7
Perth metropolitan average	**9.8**	**9.9**	**10.0**	**10.1**	**10.2**	**10.3**	**10.2**	**10.3**
Peel region	7.9	7.9	8.2	8.2	8.2	8.3	7.8	7.8
Perth metropolitan and Peel average	**9.7**	**9.8**	**9.9**	**10.0**	**10.1**	**10.1**	**10.1**	**10.2**
Greater Bunbury region	6.2	6.2	6.2	6.4	6.4	6.4	5.6	5.7

Property valuation database, Landgate (2023) and Integrated Land Information Database, unpublished data, Department of Planning, Lands and Heritage (2023).

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 (greenfield) residential areas in the Perth metropolitan and Peel regions, to 15 dwellings per gross urban zoned hectare.

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.

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.

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 progress toward the greenfield density targets is discussed in section 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 on urban and city centre zoned land. Including the city centre zone 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 and city centre zone

Region/sub-region	As at December							
	2015	2016	2017	2018	2019	2020	2021	2022
Central sub-region	20.6	21.2	21.1	21.3	21.8	22.1	22.2	22.4
North-West	16.2	16.3	16.3	16.6	14.8	14.9	15.0	15.0
North-East	9.9	9.7	10.3	10.4	10.3	10.4	10.5	10.7
South-East	10.8	10.9	11.7	11.8	12.1	11.9	12.1	12.3
South-West	15.1	15.6	16.0	16.2	16.4	16.6	16.7	17.0
Perth metropolitan average	**15.8**	**16.1**	**16.4**	**16.5**	**16.4**	**16.5**	**16.6**	**16.7**
Peel region	12.8	12.9	13.1	13.3	13.3	13.3	13.4	13.4
Perth metropolitan and Peel average	**15.6**	**15.9**	**16.1**	**16.3**	**16.1**	**16.2**	**16.3**	**16.5**
Greater Bunbury region	9.1	9.2	9.2	9.2	9.3	9.4	9.3	9.4

Property valuation database, Landgate (2023) and Integrated Land Information Database, unpublished data, Department of Planning, Lands and Heritage (2023).

Figures may not sum due to rounding.

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

5.3 Net site dwelling density by build year

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

Table 13 presents net site dwelling density by build year based only on lots on urban or city centre zoned land.

Table 13: Net site dwelling density by build year – urban and city centre zone

Local government area	Year of dwelling construction									
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Central sub-region										
Bassendean	18.8	33.6	20.4	35.8	28.7	31.4	22.6	22.5	24.2	21.0
Bayswater	24.3	25.7	29.1	40.4	32.3	29.5	25.6	39.2	24.6	24.8
Belmont	26.6	47.8	72.8	53.6	59.5	37.4	75.6	57.1	20.5	24.3
Cambridge	15.1	16.0	31.1	45.8	33.7	23.2	17.2	16.2	77.9	24.4
Canning	24.2	24.9	28.9	34.6	36.0	27.1	30.0	26.2	24.6	26.0
Claremont	21.6	20.9	55.9	61.5	21.7	207.7	89.1	22.1	99.1	17.9
Cottesloe	22.6	17.7	19.8	17.9	21.6	27.3	20.0	18.1	19.7	23.1
East Fremantle	14.8	18.7	23.7	78.0	20.2	19.6	22.0	25.6	14.9	17.7
Fremantle	25.8	28.8	47.0	55.3	34.8	63.9	30.9	67.7	22.4	58.4
Melville	17.8	18.2	19.4	22.3	20.9	24.6	31.8	23.3	20.4	36.1
Mosman Park	14.7	14.5	17.0	13.4	18.7	17.6	17.4	19.8	61.0	18.9
Nedlands	14.0	15.7	14.1	34.5	13.6	12.4	12.9	14.3	16.8	20.3
Peppermint Grove	8.2	-	6.0	8.6	11.3	8.8	9.3	7.4	-	12.2
Perth	192.5	277.6	267.8	359.7	542.4	537.3	545.4	1,103.2	-	-
South Perth	22.0	20.6	19.4	24.2	33.4	52.1	29.5	32.3	28.8	38.5
Stirling	28.5	32.7	34.2	38.9	40.7	34.9	28.0	27.5	35.1	30.4
Subiaco	39.1	82.7	31.9	33.7	26.8	25.9	21.7	26.4	20.5	254.5
Victoria Park	35.7	31.1	32.2	55.1	29.5	37.0	60.5	42.4	24.8	31.6
Vincent	65.2	80.0	114.7	83.6	114.7	49.1	45.9	51.0	40.5	51.3
Central sub-region average	**26.1**	**33.9**	**37.6**	**44.0**	**38.8**	**37.0**	**36.1**	**34.3**	**31.2**	**32.9**
North-West sub-region										
Joondalup	20.5	19.9	19.6	19.3	22.2	22.3	28.1	35.6	29.3	27.0
Wanneroo	23.9	23.9	25.8	25.1	26.4	26.5	26.6	25.7	23.4	26.0
North-West sub-region average	**23.4**	**23.4**	**24.9**	**24.2**	**25.6**	**25.3**	**27.1**	**28.9**	**24.9**	**26.2**
North-East sub-region										
Kalamunda	22.5	23.7	25.0	25.0	28.4	16.7	14.8	13.6	20.5	17.4
Mundaring	16.4	15.7	16.2	12.9	19.3	5.8	5.6	7.9	6.4	6.5
Swan	6.2	10.4	8.9	8.0	8.6	26.3	26.2	26.4	25.4	26.0
North-East sub-region average	**19.1**	**21.3**	**21.5**	**21.2**	**24.1**	**22.7**	**21.5**	**22.2**	**22.6**	**22.2**

Local government area	Year of dwelling construction									
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
South-East sub-region										
Armadale	22.6	21.5	23.5	24.8	23.9	24.5	25.0	26.5	24.4	25.3
Gosnells	22.2	23.4	28.7	26.5	27.0	27.5	25.1	26.0	22.5	24.6
Serpentine-Jarrahdale	16.7	20.1	20.4	13.1	18.8	20.4	21.8	19.9	20.6	18.9
South-East sub-region average	**21.2**	**21.7**	**23.9**	**20.6**	**23.5**	**24.5**	**24.3**	**24.9**	**23.2**	**23.5**
South-West sub-region										
Cockburn	26.6	33.7	30.1	34.1	38.3	33.7	31.6	30.4	30.7	30.3
Kwinana	24.0	24.2	25.9	27.0	26.8	26.0	25.1	26.1	25.9	26.0
Rockingham	20.1	22.3	22.6	26.2	25.1	26.2	27.0	22.5	22.3	22.7
South-West sub-region average	**22.7**	**25.6**	**25.8**	**29.0**	**30.5**	**29.4**	**28.7**	**26.8**	**27.4**	**26.5**
Perth metropolitan average	**22.8**	**25.7**	**27.2**	**29.0**	**29.7**	**28.8**	**28.9**	**28.7**	**26.4**	**26.6**
Peel region										
Mandurah	18.7	19.2	21.0	21.5	22.7	20.1	17.8	17.3	18.1	19.2
Murray	16.3	16.5	16.5	18.2	16.0	13.4	15.1	17.0	17.6	15.9
Waroona	7.2	9.0	10.1	10.1	13.9	8.4	0.5	5.6	9.5	5.9
Peel region average	**17.7**	**18.3**	**20.1**	**21.0**	**21.7**	**18.8**	**11.7**	**17.0**	**17.9**	**18.1**
Greater Bunbury region										
Bunbury	19.4	20.5	18.7	19.6	20.6	18.8	21.7	20.3	19.7	19.0
Capel	9.2	12.6	16.3	18.9	6.0	11.2	7.7	10.1	11.2	8.3
Dardanup	13.8	14.7	15.0	13.8	16.7	17.3	18.8	16.2	19.2	16.3
Harvey	10.2	9.8	10.2	9.2	7.5	9.2	11.1	11.2	11.7	12.1
Greater Bunbury average	**11.3**	**12.0**	**13.6**	**13.6**	**9.1**	**11.2**	**12.5**	**12.5**	**13.3**	**11.6**

Property valuation database, Landgate (2023) and Integrated Land Information Database, unpublished data, Department of Planning, Lands and Heritage (2023).

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.

Annual fluctuations to the net site dwelling density by build year are to be expected as the sample size is restricted to lots on which dwellings were constructed 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 to 2022. In this timeframe, the net site dwelling densities by build year for all Perth metropolitan sub-regions have broadly shown an increase. For Peel and Greater Bunbury, the net site dwelling densities by build year have remained relatively steady over the period.

5.4 Greenfield net site dwelling density by build year

The analysis in this section focuses specifically on 'net density by build year' trends in greenfield residential areas in the Perth metropolitan and Peel regions. This is a measure of the number of dwellings per net site hectare, based only on lots with new dwellings constructed within the stated calendar year. This allows for measuring greenfield development density trends 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 2022 constituted a collective net density of 23.5 dwellings per net site hectare. This was slightly below the strategic target, but represents significant progress from 2010, when targets where initially set, and the prevailing trend was a density of approximately 15 dwellings per net site hectare.

Annual fluctuations to the net site dwelling density by build year are to be expected as the sample size is restricted to lots on which dwellings were constructed 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 14.

Table 14: 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	2022
North-West	23.0	22.2	13.9	24.1	25.2	25.4	24.9	25.4
North-East	20.8	18.1	21.8	21.5	20.5	21.9	22.3	22.2
South-East	22.6	15.3	21.6	23.1	23.4	24.1	21.7	23.3
South-West	23.9	26.9	25.1	23.4	26.6	26.5	27.3	26.6
Peel	20	12.8	17.9	16.2	9.7	16.7	17.4	17.8
Perth metropolitan and Peel average	**22.3**	**19.3**	**19.9**	**22.2**	**21.3**	**23.4**	**23.4**	**23.5**

Property valuation database, Landgate (2023) and Integrated Land Information Database, unpublished data, Department of Planning, Lands and Heritage (2023).

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

Glossary

Subdivision approvals

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).

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.

SA1 Statistical area level 1 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 schemee.

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 exists 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^2 vacant residential lot would be considered as part of the urbanised area; however, a vacant residential lot of 10,000 m^2 that is not surrounded by urbanised development would be categorised as non-urbanised.

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

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

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

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.

E**xisting agricultural uses on urban or urban deferred zoned land** refer 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^2 are done so for urban purposes. Both methodologies explore consumption by looking at the gross urban area consumed and include all infrastructure that makes up urban development such as roads, reserves, schools and accompanying commercial development.

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

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

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

Land supply refers to the amount of 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.

Acronyms and abbreviations

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

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