Tasman District Council and Nelson City Council

Population Projections 2018-2058 Results

March 2023

Revised June 2024

DOT Consulting

Foreword

These projections were developed to inform long term planning for Tasman District and Nelson City Councils. The projections are not forecasts of predicted future populations, but are calculations of what will happen if specific assumptions about fertility, mortality, and migration are met in the future. Many social and economic factors influence population change, including central and local government policies, and the relationships between these various factors are complex. As a result of this complexity, the reliability of projections tends to decrease over time and as population size decreases, that is, there is greater uncertainty in population projections the further forward in time we go. These projections provide information on plausible scenarios for future populations to help inform decision making.

Valuable methodological support was provided by Dr. Natalie Jackson (previously Professor of Demography, University of Waikato; Adjunct Professor of Demography, Massey University; Natalie Jackson Demographics Ltd). Any errors that remain are the responsibility of DOT loves Data.

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Revision June 2024:

Figures 4 and 5 have been updated to fix an error on the X axis (age groups were offset by 5 years).

1. Executive Summary

This report presents the results and approach for population, household and dwelling projections for Tasman District, Nelson City (Territorial Authorities), and their associated Statistical Area 2 (SA2s).

About the projections

Population projections were developed for 2023-2058 by age group and sex in five-year projection windows via a standard cohort component method. The Estimated Resident Population (ERP) count by age and sex at June 2018 is the population base.

The population projections require the following inputs:

1) the base population by age and sex;
2) assumptions regarding fertility rates and age at childbearing for females,
3) assumptions regarding life expectancy and survivorship by age and sex, and
4) assumptions regarding migration rates by age and sex.

Household and dwelling projections require assumptions regarding:

5) average household size and
6) the ratio of population to dwellings

Three projection variants were produced: high, medium and low, using corresponding variations to the input assumptions in order to generate each projection scenario.

Initial projections (population numbers, migration, natural increase and household and dwelling estimates) at SA2 level will be constrained to the output at TA level, by calculating population share for each element and prorating the total.

Key results

For both Nelson City and Tasman District:

- The population is expected to grow over the projection period, but at a decreasing rate
- Population ageing is driving changes in age structure
- Over a quarter of the population will be aged over 65 years in 2058
- Deaths will outnumber births (natural decrease) from the 2040s, and both regions will increasingly rely on migration for continued population growth
- We assumed that relatively high net migration among adults aged 25-40 years will continue. This delays the transition to natural decrease by sustaining birth numbers.

2. Assumptions and Methodology

Population projections were developed for Tasman District, Nelson City and their respective SA2s for the period 2018-2058. Projections are constructed in five-year periods for each sex and five-year age group using data and assumptions about population fertility (births), mortality (survivorship and life expectancy), and migration.

The projections are made via a standard cohort component method based on 2021 statistical geographies. The **population base** used in the projections will be the Estimated Resident Population (ERP) count by age and sex at June 2018. The underlying assumptions for both TAs and their respective SA2s were developed using the same methods and approach.

2.1 Cohort component method

These population projections are generated using a cohort component method (CCM). To implement the projections using this methodology, DOT loves Data developed R statistical code based on the methodology of Preston et. al (2006) using a modified version of the statistical code package "CCMP".

A CCM approach projects the future population by first reproducing, then surviving, migrating and 'ageing' the base population in a stepwise manner, separately for males and females in five-year age groups. Each step is repeated for each five-year projection period using assumptions regarding future mortality, migration and fertility.

Births generated for the previous five-year period are assigned to the 'new' 0-4 years age group and each surviving age group is aged five years, i.e. those aged 0-4 years in the preceding period become the new 5-9 years cohort at t+5 years, where t represent the beginning of the projection period. The 'new' oldest age group (85+ years) is produced by summing survivors in the two upper age groups (80-84 years and 85+ years) from the previous five-year period. Migration by age-and sex is then added to the surviving and aged population.

2.2 Projection assumptions

To generate the population projections, four main inputs are required:

- the base population by age and sex
- assumptions regarding fertility rates and age at childbearing for females
- assumptions regarding life expectancy and survivorship by age and sex
- assumptions regarding migration rates by age and sex.

Table 1: Summary of population projection assumptions and inputs

Input/ Assumption	Type	Definition	Details
Population base	Population in 2018	Census-based Estimated Resident Population	As at 30 June 2018, by sex and 5-year age groups for each TA and SA2. More recent population estimates, up to 2022 have been used to inform the first projection window to 2023
Fertility	Distribution (base assumption)	Age-specific fertility rates (ASFR)	A three-year average of ASFRs for women in their reproductive years (aged 15-45 years), by five-year age groups. Average of ASFRs between 2019-2021. TA-level data
	Level	Total Fertility rate (TFR)	SA2 & TA-level assumption data used to weight the base ASFR rates over the projection period.
Mortality	Distribution (base assumption)	Survivorship by age and sex, 2017-2019	The probability of surviving from one age group to the next, by sex. TA-level data
	Level	Life expectancy (at birth)	SA2 & TA-level assumptions data used to weight baseline survivorship over the projection period. Results in very minor adjustments to survivorship in older age ranges over projection period.
Migration	Distribution (base assumption)	Age-sex specific migration rates (%)	Generated for SA2 and TAs as the average of the last 3 inter-censal periods using residual net migration method.
	Level	Rates static over projection periods	With exception of modified rates for the first projection period informed by data to 2022.

To generate the household and dwelling projections, two additional assumptions are required:

- Average household size (occupied private dwellings / usually resident population)
- Dwelling ratio (total private dwellings / estimated resident population)

Data for generating the base population, fertility and mortality assumptions, average household size and dwelling ratio were sourced from Statistics NZ. Migration assumptions were generated using a residual migration methodology incorporating Statistics NZ

population, survivorship and births data. Three assumption variants (high, medium and low) were generated for each assumption type.

2.2.1 Fertility assumptions

Determining the number of births in each five-year period involves assumptions concerning the distribution of births (age at childbearing) and future fertility levels.

The number of births is projected by applying age-specific fertility rates (ASFR) for women in their reproductive years (aged 15-45 years) to the numbers of women at each age. The baseline distribution assumption (Figure 1) is the average ASFR for each age group between 2019-2021, calculated at the TA level for Tasman District and Nelson City Council using data published by Statistics NZ (2021a). The resulting number of births for each age-group of women is summed and then apportioned to each sex based on the sex ratio at birth: 105.5 males per 100 females.

Figure 1: ASFR assumptions (3-year average) and estimated ASFR (2018-2021) by 5-year age group, Tasman District & Nelson City

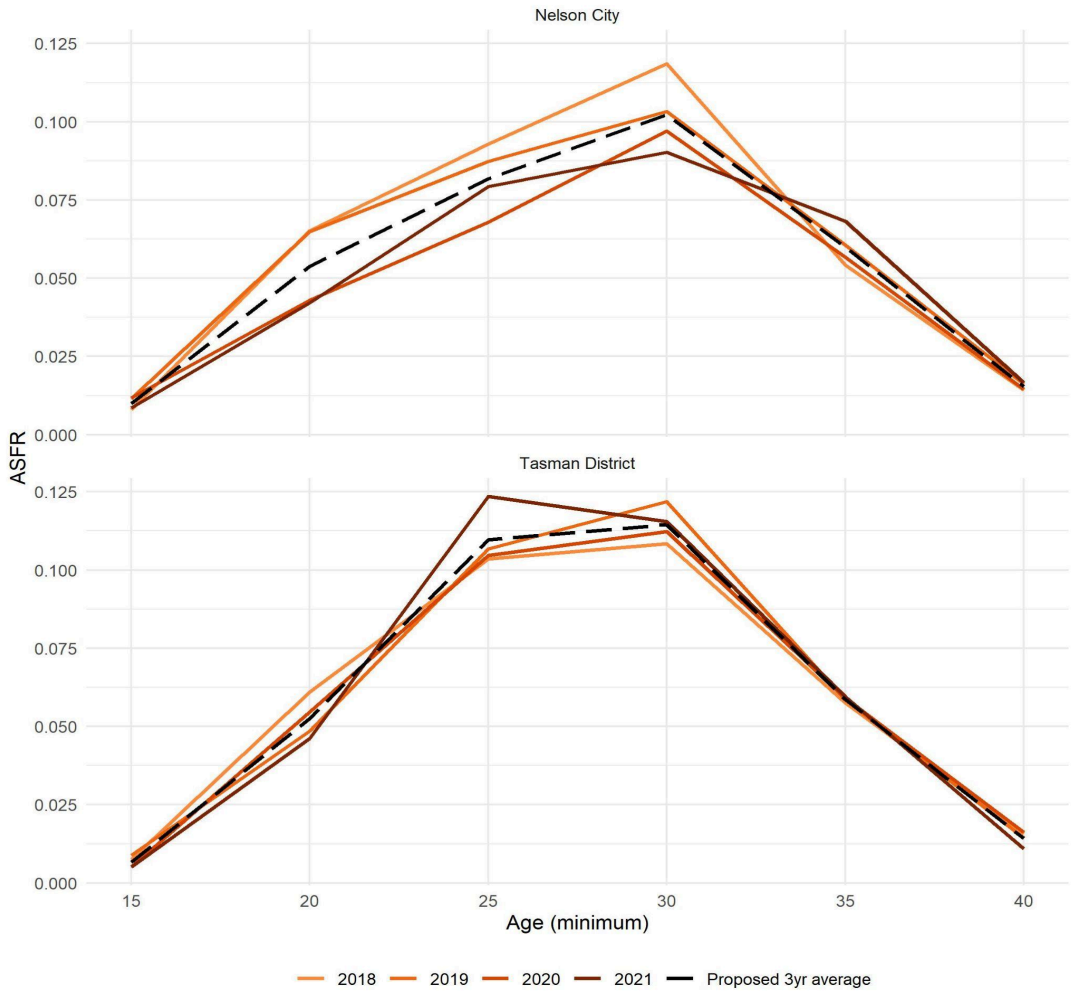


Figure 1 demonstrates that the shift to later child-bearing has already occurred, with peak fertility now among women aged 30-34 years, closely followed by 25-29 years of age. This trend to later ages for childbearing is in keeping with trends nationally. The shift to peak ASFRs among 30-34 year old women occurred between 2001-2006 for Nelson City and between 2013-2018 for Tasman District and is expected to remain stable based on international trends. Accordingly, the age-distribution of births is kept constant over the projection period with the TA-level age-profile of births applied to each SA2.

Figure 1 also reveals a general trend towards lower ASFR for women under 30 years. There is some variance in the data for older age groups, especially for the 30-34 years and 35-39 years age and the 2021 data appears somewhat anomalous overall relative to the 2016-2020 trend. This may represent a short-term deviation linked to covid social and economic disruptions in 2020-2021 and small declines in ASFR for most age groups, as per the trend to 2020, are anticipated in future years.

Table 2: Total Fertility Rate assumptions by variant, Nelson City and Tasman DIstrict

Nelson City

5yrs ended	High	Medium	Low
2023	1.75	1.65	1.55
2028	1.70	1.58	1.47
2033	1.70	1.57	1.43
2038	1.72	1.56	1.40
2043	1.74	1.56	1.39
2048	1.76	1.56	1.37
2053	1.79	1.56	1.34
2058	1.82	1.56	1.29

Tasman District

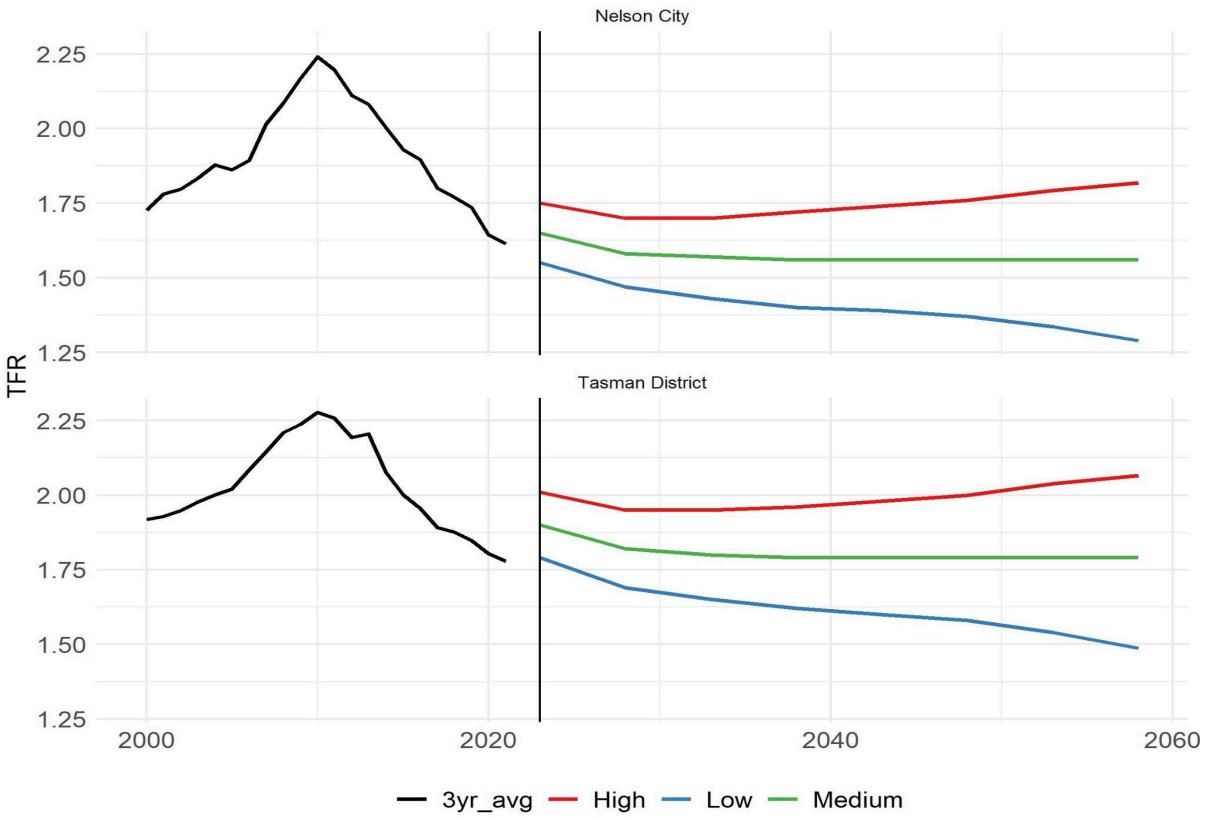
5yrs ended	High	Medium	Low
2023	2.01	1.90	1.79
2028	1.95	1.82	1.69
2033	1.95	1.80	1.65
2038	1.96	1.79	1.62
2043	1.98	1.79	1.60
2048	2.00	1.79	1.58
2053	2.04	1.79	1.54
2058	2.07	1.79	1.49

While the distribution of births (maternal age-structure) remains constant, total levels of fertility vary over time based on assumed trends in the Total Fertility Rate (TFR). The TFR assumptions used in these projections are the subnational TFR projection assumptions developed by Statistics NZ (2022a) and available at TA and SA2s level for the periods 2023-2048 (Figure 2, Table 2). These are available as High, Medium and Low variants.

To develop fertility assumptions for the periods 2048-2053 and 2053-2058, we draw on the national TFR assumptions developed by Statistics NZ out to 2078. This involves calculating

the ratio of the subnational TFR assumption for each projection and area (SA2 and TA) in 2048 to that of the total New Zealand rate in 2048. This ratio is then applied to the national TFR rates for 2053 and 2058 (Figure 2, Table 2). This process is repeated for each assumption variant. The TFR assumptions are then used to weight the base ASFR rates for each projection period and each variant.

Figure 2. Total Fertility Rate estimates and future assumptions by variant, Nelson City and Tasman District



2.2.2 Mortality assumptions

Future patterns of mortality involve assumptions about the level of mortality (life expectancy at birth) and the distribution of deaths across age groups (survivorship by age). The effects of mortality are incorporated into the population projection by:

- surviving each five-year age group by applying the probability of surviving from one age group to the next, separately by sex.
- Ageing survivors five years.

The probability of surviving from one age group to the next is drawn from subnational 'life tables' published by Statistics NZ (2021b). The most recent data at subnational level, for the

periods 2017-2019, 2012-2014, and 2005-2007, indicate that the age-distribution of survivorship for both sexes has remained stable over this period (Figure 3). Deaths are concentrated in the upper ages, with some minor increases in survivorship in these upper age groups over recent years. As a result we use the most recent survivorship data by age and sex at subnational level (2017-2019) as the baseline survivorship assumption.

Table 3. Life expectancy assumptions by sex, 2023-2058, Nelson City & Tasman District

Nelson City

	Low		Medium		High	
5yrs ended	Females	Males	Females	Males	Females	Males
2023	84.0	80.8	84.5	81.3	85.00	81.80
2028	84.3	81.0	85.0	81.7	85.70	82.40
2033	84.8	81.5	85.7	82.4	86.40	83.20
2038	85.2	82.0	86.2	83.1	87.20	84.10
2043	85.6	82.4	86.8	83.7	87.90	84.90
2048	86.0	82.8	87.4	84.3	88.60	85.70
2053	86.3	83.2	87.9	85.0	89.30	86.50
2058	86.6	83.5	88.4	85.6	89.89	87.19

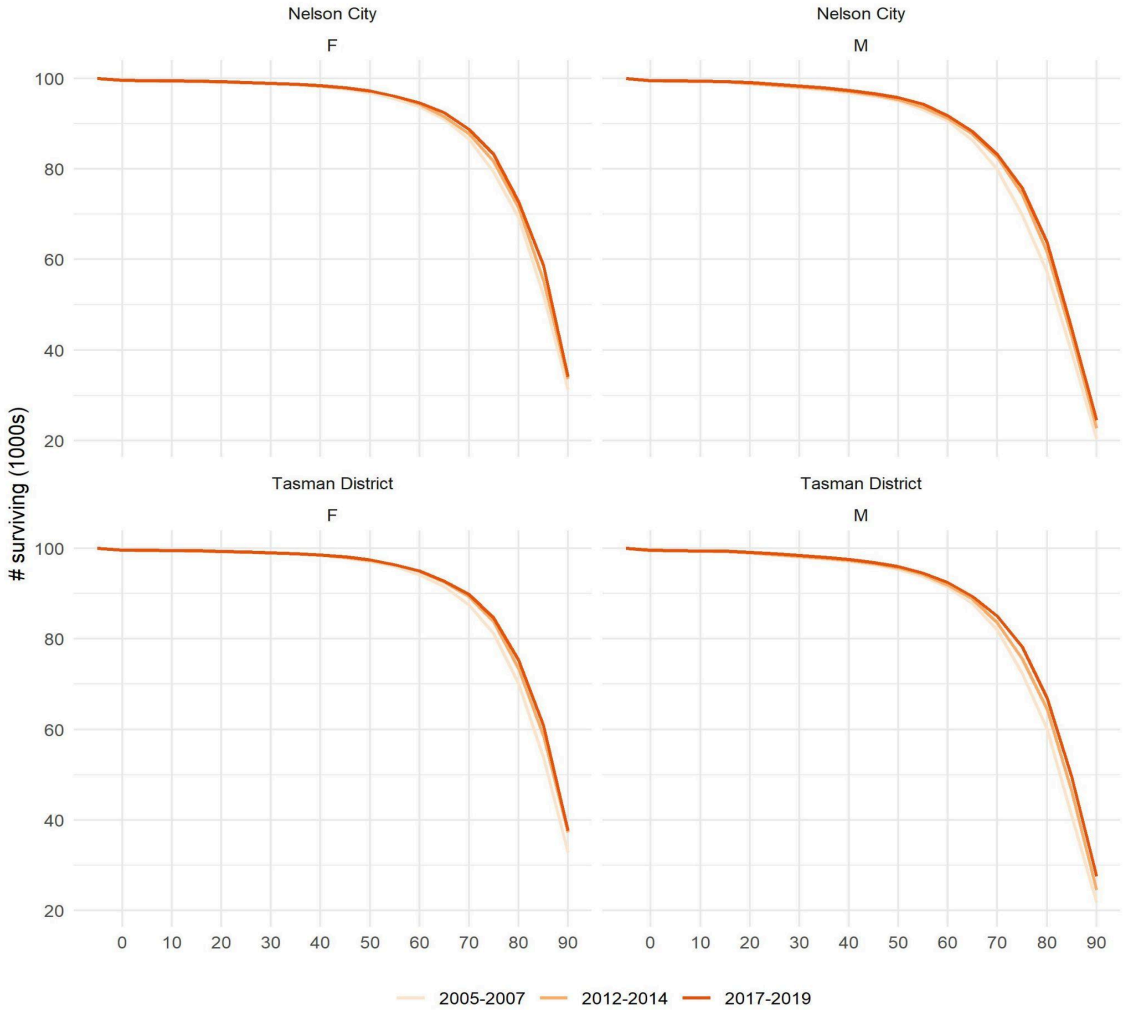
Tasman District

	Low		Medium		High	
5yrs ended	Females	Males	Females	Males	Females	Males
2023	85.40	82.20	85.90	82.70	86.40	83.20
2028	85.70	82.50	86.40	83.20	87.10	83.80
2033	86.20	82.90	87.10	83.80	87.80	84.70
2038	86.60	83.40	87.60	84.50	88.50	85.50
2043	87.00	83.80	88.20	85.20	89.20	86.30
2048	87.40	84.20	88.70	85.80	89.90	87.10
2053	87.70	84.61	89.21	86.51	90.61	87.91
2058	88.01	84.91	89.71	87.12	91.21	88.62

The minor increases in survivorship evident at older ages will likely continue, but at a decelerating rate, in step with small expected increases in life expectancy. Assumptions about future trends in life expectancy use Statistics NZ's latest published subnational life expectancy assumptions. These assumptions are available by sex for Tasman District and Nelson City and their associated SA2s for the period 2023 to 2048 (Statistics NZ, 2022a) as three assumption variants: high, medium and low (Table 3). National level assumptions have been published to 2073 (Statistics NZ, 2022b).

As for the fertility assumptions, to develop subnational assumptions for each variant for the periods 2048-2053 and 2053-2058, we calculate the ratio of the life expectancy assumption for each area to that of the New Zealand rate in 2048. This ratio is then applied (prorated) to the national rates for 2048 and 2058. These assumptions about future life expectancy are used to weight the baseline age distribution of survivorship over the projection period to generate the three variant assumptions.

Figure 3. Survivorship (lx) by age and sex (number surviving at each age from a hypothetical cohort of 100,000 people), 2005-2007, 2012-2014, 2017-2019, Tasman District and Nelson City



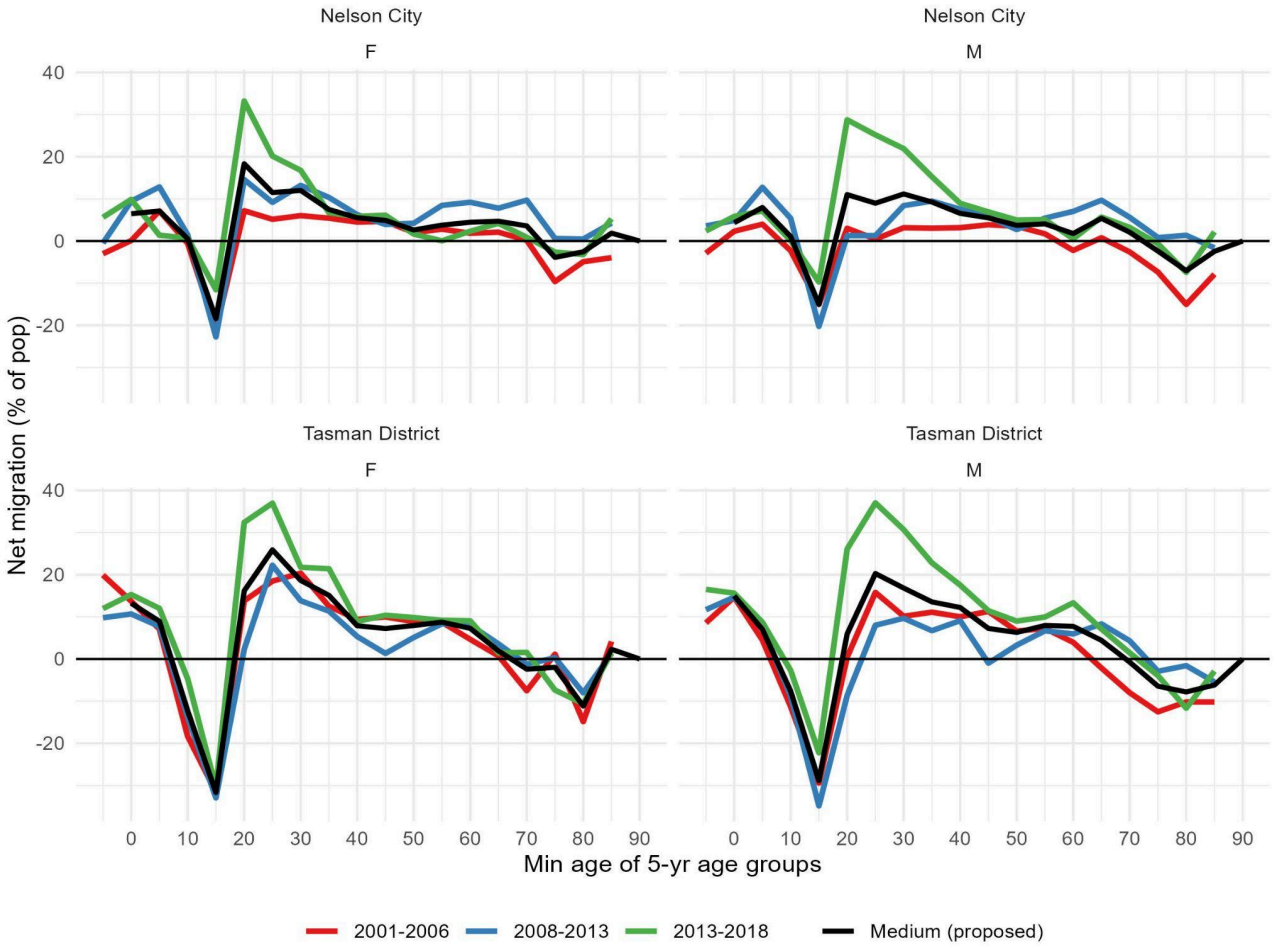
Note: Age is on X-axis. Y-axis is the number surviving to that age. For purposes of these projections survivorship at 90 years and over = 0.

2.2.3 Migration assumptions

The effects of migration are applied to the population by estimating age-sex-specific migration rates and applying these to the start population for each migration period.

We use migration rates, rather than predetermined migration numbers, as this allows the model to *generate* the total number of migrants at each projection step by applying age- and sex-specific migration rates to the population. This contrasts with predetermining the *numbers* of migrants and applying these to the population throughout the projection period irrespective of scale and direction of population change. This ensures that migration numbers keep pace with the growth or decline of the population, rather than migrants becoming a larger portion of a declining population or a smaller proportion of a growing population.

Figure 4. Migration rate (%) assumptions (medium variant) by sex and age compared to observed periods



As migration is a continuous process, we approximate this by assuming that half of the migrants for each projection period arrive at the start of the interval and are subject to the same fertility and mortality rates as the start population they have joined. The remaining half of migrants are added at the end of the migration period and aged-5 years.

The baseline age-sex profile for migration is drawn from past age-sex specific net migration rates for Tasman District, Nelson City and each SA2 (Figure 4). Past migration rates were modelled via a 'residual migration methodology' using a standard cohort component technique for the periods 2001-2006, 2008-2013, 2013-2018 for each TA and SA2. For example, to estimate net migration between 2006 and 2013:

- Estimated Resident Population numbers by age and sex at the 2013 censuses are reproduced and survived to the subsequent census (2018). This results in an 'expected' population in the absence of migration.
- The difference between the expected and the observed populations in 2018 for each age-sex group is used to approximate the net migration age-sex profile.

The TA-level net migration age profile in Figure 4 highlight some general patterns of migration for Nelson and Tasman:

- For both TAs, the age profile of migrants is broadly stable across time periods and characterised by:
    - a net loss of young adults (typically 15-20 year olds) and some older groups
    - net gain in most other age groups, notably in adults aged 20-40 years.
- A peak in migration levels in 2013-2018 (Tasman 4,800 and Nelson 3,550 total migrants), particularly for 20 to ~40 year olds.
- The period of lowest net migration was in 2008-2013 for Tasman (1,210) and in 2001-2006 for Nelson (570).

Table 4. Migration rate (%) assumptions by sex, age, and variant Tasman District and Nelson City

Tasman District

	Low		Medium		High	
Age group	Females	Males	Females	Males	Females	Males
0-4 years	10.05	11.16	13.40	14.88	16.75	18.61
5-9 years	5.82	4.83	7.76	6.43	9.70	8.04
10-14 years	-15.13	-10.14	-12.10	-8.12	-9.08	-6.09
15-19 years	-40.60	-35.58	-32.48	-28.46	-24.36	-21.35
20-24 years	12.87	3.98	17.16	5.31	21.45	6.64
25-29 years	19.02	14.17	25.36	18.90	31.71	23.62
30-34 years	13.69	13.74	18.25	18.32	22.81	22.89
35-39 years	11.53	9.54	15.37	12.72	19.21	15.90
40-44 years	5.92	9.53	7.89	12.70	9.87	15.88
45-49 years	4.68	4.92	6.25	6.56	7.81	8.20
50-54 years	5.48	4.70	7.30	6.27	9.13	7.84
55-59 years	5.94	4.67	7.92	6.22	9.90	7.78
60-64 years	5.58	5.65	7.44	7.53	9.29	9.42
65-69 years	0.99	3.10	1.32	4.13	1.65	5.16
70-74 years	-2.76	0.84	-2.21	1.13	-1.65	1.41
75-79 years	-1.84	-8.26	-1.48	-6.61	-1.11	-4.96
80-84 years	-15.55	-9.73	-12.44	-7.79	-9.33	-5.84
85-89 years	1.62	-13.77	2.15	-11.01	2.69	-8.26

Nelson City

	Low		Medium		High	
Age group	Females	Males	Females	Males	Females	Males
0-4 years	4.56	3.72	6.08	4.96	7.60	6.21
5-9 years	6.26	6.29	8.34	8.38	10.43	10.48
10-14 years	0.26	0.41	0.34	0.55	0.43	0.68
15-19 years	-23.25	-20.19	-18.60	-16.16	-13.95	-12.12
20-24 years	14.52	8.64	19.36	11.52	24.21	14.40
25-29 years	7.51	6.70	10.01	8.93	12.51	11.16
30-34 years	8.61	8.15	11.48	10.86	14.35	13.58
35-39 years	5.33	5.95	7.11	7.93	8.89	9.92
40-44 years	4.42	4.54	5.89	6.06	7.37	7.57
45-49 years	2.96	4.11	3.95	5.48	4.94	6.85
50-54 years	1.86	2.67	2.49	3.56	3.11	4.45
55-59 years	2.04	3.44	2.71	4.59	3.39	5.74
60-64 years	3.15	2.21	4.20	2.94	5.25	3.68
65-69 years	3.20	3.63	4.27	4.83	5.34	6.04
70-74 years	3.29	0.88	4.39	1.17	5.48	1.46
75-79 years	-5.52	0.03	-4.42	0.04	-3.31	0.05
80-84 years	0.06	-11.30	0.08	-9.04	0.10	-6.78
85-89 years	0.48	-8.33	0.64	-6.67	0.79	-5.00

- Some variation in age-specific migration rates is present between time periods. Variation between periods is greatest for young to middle-aged adults.

Data for the last four years (2018-2022), which covers the disruptions from Covid indicate migration comparable to past patterns. The main differences over the last four years suggest there was a reduction in the net migration loss of 15-20 year olds and a divergence in migration levels between Nelson and Tasman. For Nelson, migration between 2018-2022 appears similar to pre-2013 patterns, whereas for Tasman, migration during this period looks similar to the peaks seen in 2013-2018 especially for males. This may reflect differences in the contribution of international and internal migration between the two regions during the disruptions of the Covid pandemic.

We use the **average age-sex net migration rates of the periods 2001-2006, 2008-2013 and 2013-2018** as the baseline/medium assumption (Figure 4, Table 4). This incorporates some effects from the recent migration highs of 2013-2018.

At the SA2 level, due to the tendency of some small population numbers to generate extreme migration rates for some age-sex groups, SA2 rates were constrained to the range of the mean +/- standard deviation of the age-sex specific rates across the entire TA to reduce bias from small population sizes.

Table 5. Estimated migrant numbers with baseline migration rates applied to 2018 ERP

	High +25%	Medium	Low -25%
Tasman District	3,545	2,170	790
Nelson City	2,990	2,137	1,287
Note: Tasman uses an adjusted rate for the 2018-2023 period in the final projections			

Separate rates are generated for each TA (Table 4) and SA2. When applied to the 2018 ERP, the medium (baseline) assumption migration *rates* generate net migration *numbers* (Table 5) for Tasman District that are comparable to observed net migration numbers of 2,200 between 2001-2006. For Nelson City, these rates generate migrant numbers similar to the 2,070 net migrants estimated for the 2008-2013 period.

Projection variants

To generate the high and low migration variant assumptions, we adjust the baseline (medium) migration variant by **adding and subtracting 25%** to the rates for each age-sex group respectively to set the **high and low projection variants** (Table 6). These adjustments are based on observed variability in historic net migration rates. This approach ensures

consistency across projection variants, i.e. any one age-specific rate will always be lower in the low variant than the equivalent age-specific rate in the medium and high variants (Table 4).

Applied to the 2018 ERP, these variants create migrant numbers under the high scenario that approaches the 2013-2018 highs (4,800 and 3,500 migrants for Tasman and Nelson respectively) and substantially higher than long-term averages. The low variants generate migration *numbers* similar to those reported for Tasman in 1981-1996 (+930), but fewer than the recent low seen in 2008-2013 (+1,200). For Nelson City, the below variant generates migrant *numbers* intermediate between the net migration of 2001-2006 (+570) and 2008-2013 (+2,070).

Statistics NZ holds its migration assumptions constant between 2028-2048. We therefore also hold migration *rates* constant to 2058, with the exception of an adjusted migration *rate* for Tasman District in the first migration period (2018-2023). This is due to available data to 2022 indicating exceptionally high net migration for Tasman District for this period, while Nelson City appears to be experiencing net migration similar to the 3-period average (Figure 5).

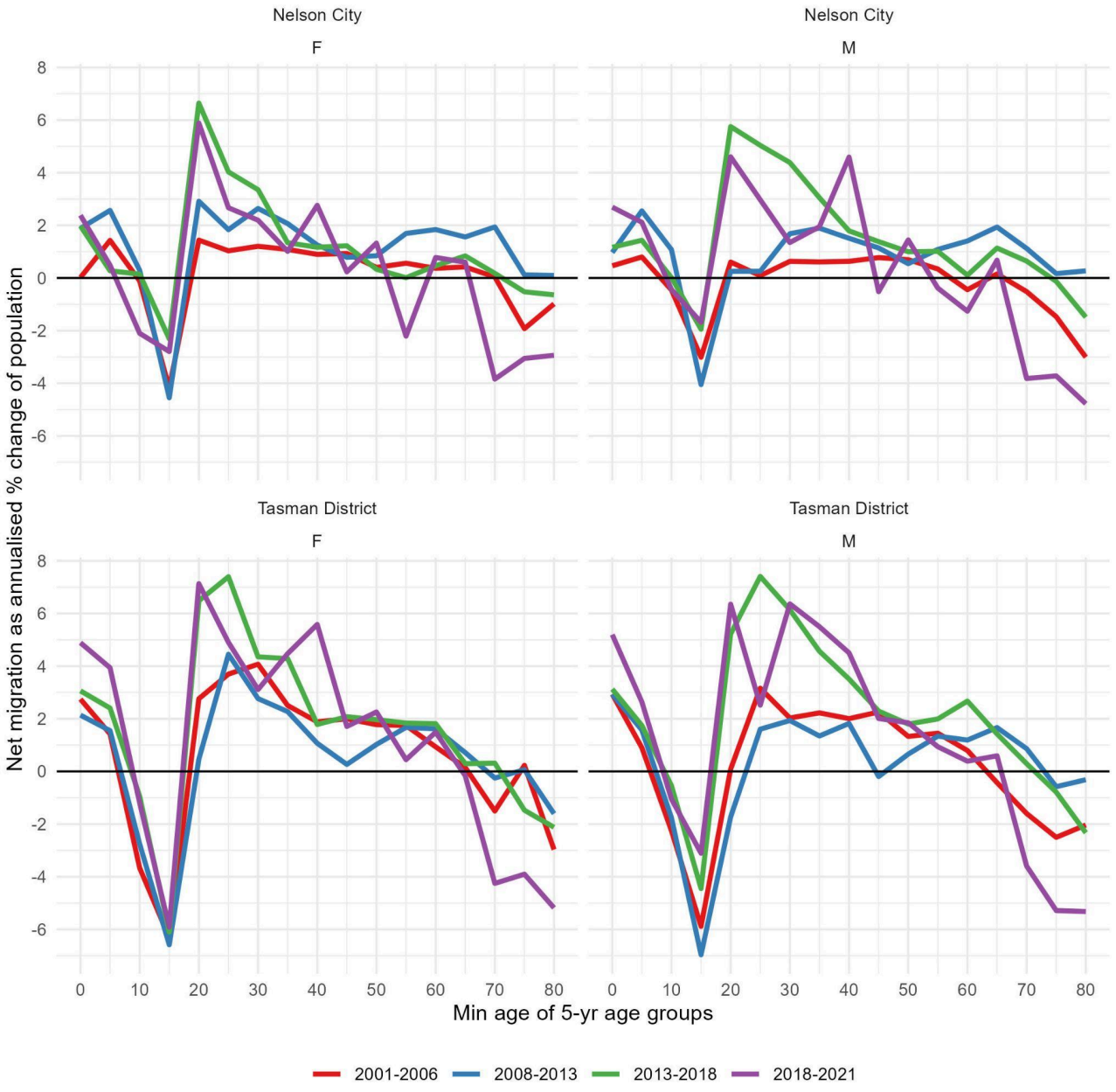
Note that although migration *rates* are constant between 2028-2058, these generate differing *numbers* of migrants in each period, with migrant *numbers* increasing as the projected population increases and decreasing with population decreases.

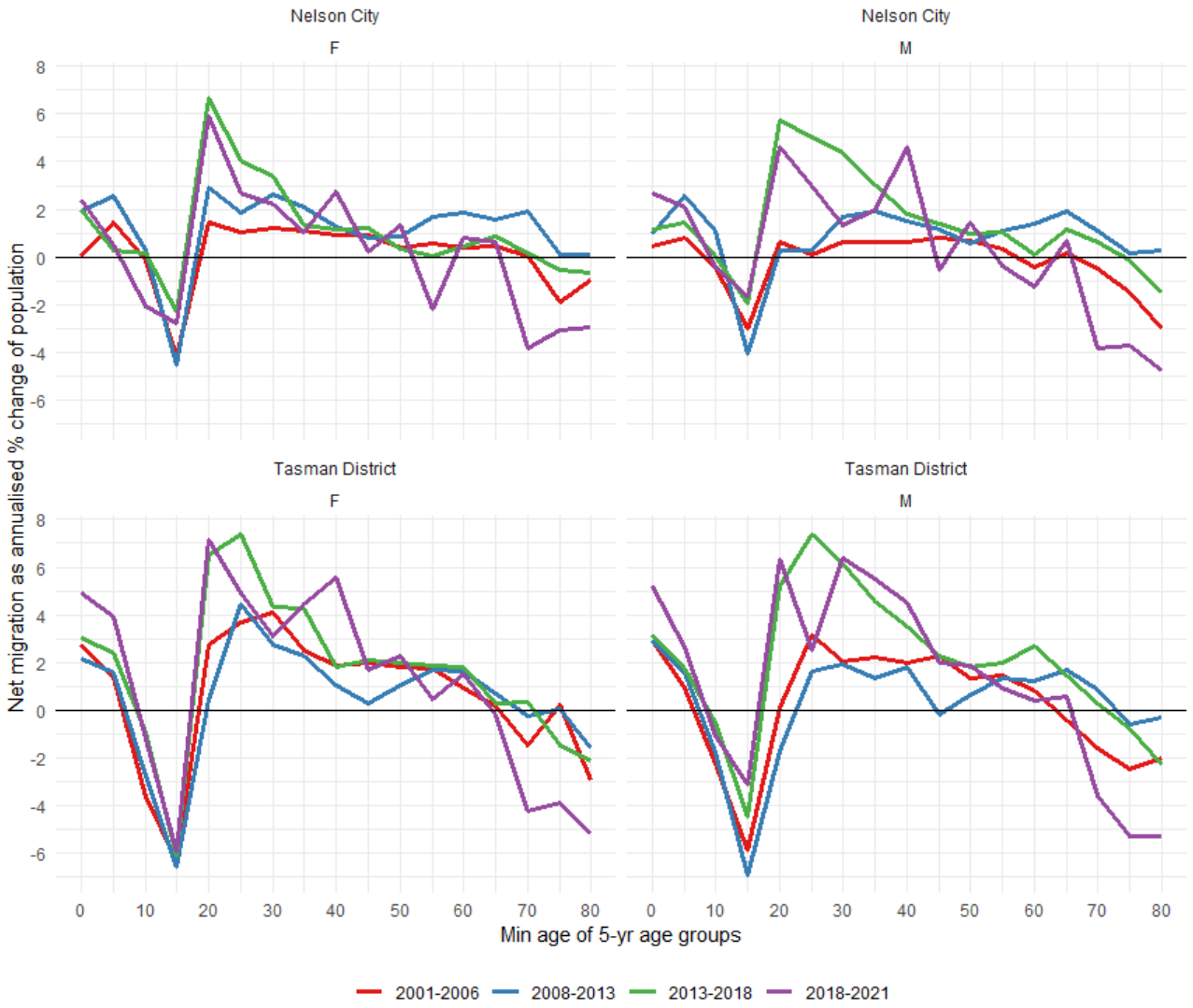
Table 6. Estimated migrant rate adjustments for Tasman for projection period 1 (2018-2013)

Tasman District	High	Medium	Low
% adjustment to baseline	+50	+40	+30
Estimated net migration numbers generated from 2018 ERP	5,172	4,600	4,038

Data for Nelson City suggests that net migration for the period 2018-2023 is tracking close to average (medium variant) and so no adjustment is required.

Figure 5. Annualised net migration rates, for last 3 intercensal periods and the 4 years 2018-2022, Nelson City & Tasman District





2.3 Household and Dwelling assumptions

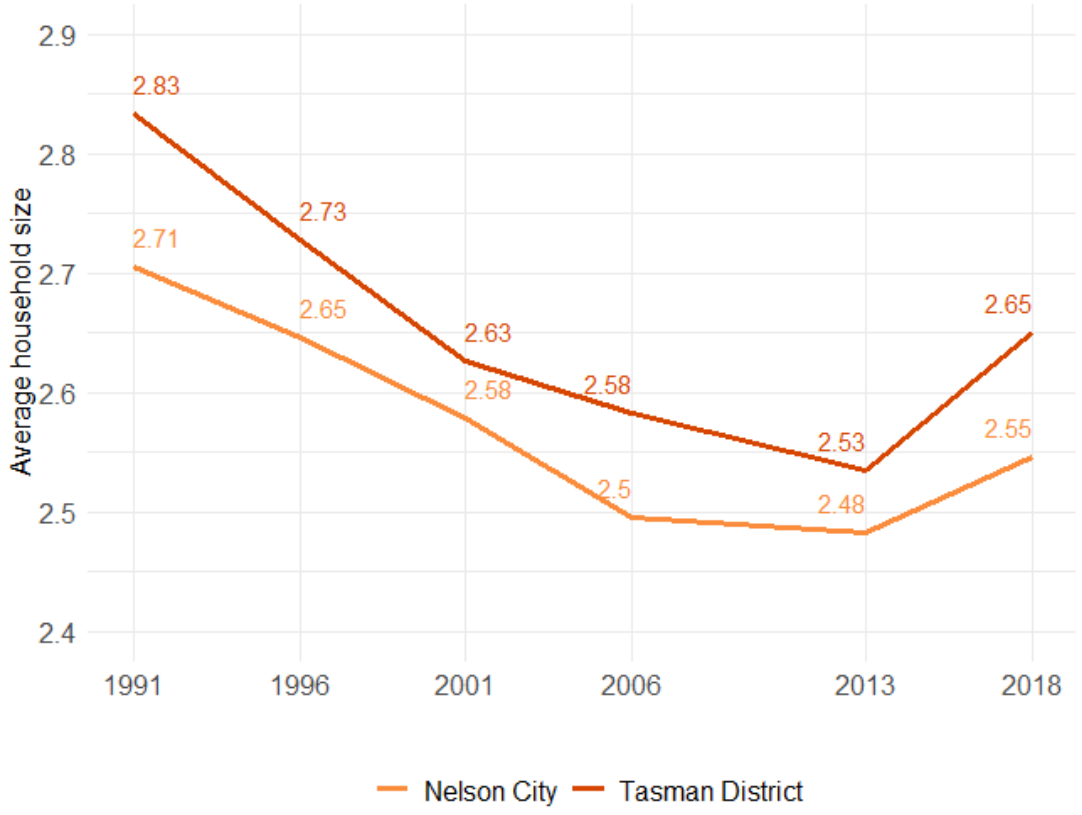
The projected number of households and dwellings are derived from projected population numbers and assumptions about average household size and the dwelling ratio respectively. As for the population projections, three projection variants (high, medium, low) are generated. These projections represent the required numbers of households and dwellings in order to maintain future assumptions about average household size and dwelling ratio.

2.3.1 Household assumptions

Household projections estimate the number of private occupied dwellings based on assumptions about average household size.

Household numbers for each projection period are generated by applying the average household size ratio to projected population numbers for each TA and SA2. This represents the number of households required to maintain the assumed future average household size.

Figure 6. Average household size estimates (ratio of census usually resident population to occupied private dwellings), 1991-2018, Tasman District & Nelson City



Past estimates of average household size are calculated for each TA and SA2 by dividing the Census Usually Resident Population (CURP) by the number of occupied private dwellings on census night. Dwelling data was sourced from Census data published from Statistics NZ (2019).

Due to data quality issues associated with the 2018 Census associated with the dwelling occupancy[1] variable and an unexpected pattern in household size, we use the **2013 average as the base assumption for household size** for all areas (TAs and SA2s). This results in a baseline of **2.53 for Tasman** and **2.48 for Nelson** (Figure 6).

Average household size assumptions for each projection variant are then generated by modifying the base assumption in line with the variant trends in subnational average

[1] Statistics NZ reports the variable 'count of dwellings' to have a data quality rating of "high", 'dwelling type' has a rating of "moderate", while 'dwelling occupancy' did not receive a rating in the 2018 Census.

household size assumptions (for both TAs and SA2s) published by Statistics NZ (2021c) for the period 2018 to 2043. Our assumption declines from ~2.5 persons per household for both TAs to 2.23 and 2.33 persons per household for Tasman and Nelson respectively under the medium (and low) variant(s) in 2058 (Table 7).

Only minor changes in the average household size are expected over the projection period and between projection variants and we extrapolate the decline in household size out to 2058.

Table 7. Average household size assumptions by variant, 2018-2058, Tasman District & Nelson City

	2018	2023	2028	2033	2038	2043	2048	2053	2058
Tasman District									
Low	2.53	2.43	2.43	2.33	2.33	2.33	2.23	2.23	2.23
Medium	2.53	2.43	2.43	2.33	2.33	2.33	2.33	2.23	2.23
High	2.53	2.43	2.43	2.43	2.33	2.43	2.43	2.43	2.33
Nelson City									
Low	2.48	2.48	2.38	2.38	2.38	2.38	2.33	2.33	2.33
Medium	2.48	2.48	2.48	2.38	2.38	2.38	2.38	2.33	2.33
High	2.48	2.48	2.48	2.48	2.38	2.48	2.48	2.48	2.38

Note: The baseline 2018 assumption in the projections uses the 2013 estimate.

2.4.2 Dwelling assumptions

Dwelling numbers are projected in a similar manner to household numbers based on assumptions about the number of people per dwelling (occupied and unoccupied) applied to projected population numbers.

For each TA and SA2, the past ratio of estimated resident population (ERP) to total dwellings (hereafter dwelling ratio) was calculated for previous Census years using data published by Statistics NZ (2019) (Figure 7). As total dwelling counts are considered by Statistics NZ to be of high quality, **the ratio for 2018 has been used as the base assumption**.

The dwelling ratio for each area was then prorated for the period 2018-2058 following the pattern indicated by Statistics NZ for Tasman District, Nelson City, and their respective SA2s to 2043. These ratios are then held constant to 2058.

Only minor changes in the dwelling ratio are expected over the projection period and between the three projection variants. As the proportion of occupied dwellings to total dwellings has remained stable over time (Figure 8) we use the Statistics NZ trend in average household size to modify the base dwelling ratio over the projection period. Table 8 shows the resulting dwelling ratio assumptions for 2023-2058 for Tasman District and Nelson City.

Figure 7. Dwelling Ratio (estimated resident population / all private dwellings), 2001-2018, Tasman District and Nelson City

Figure 8. Occupied private dwellings as percentage of total, 2001-2018, Tasman District and Nelson City

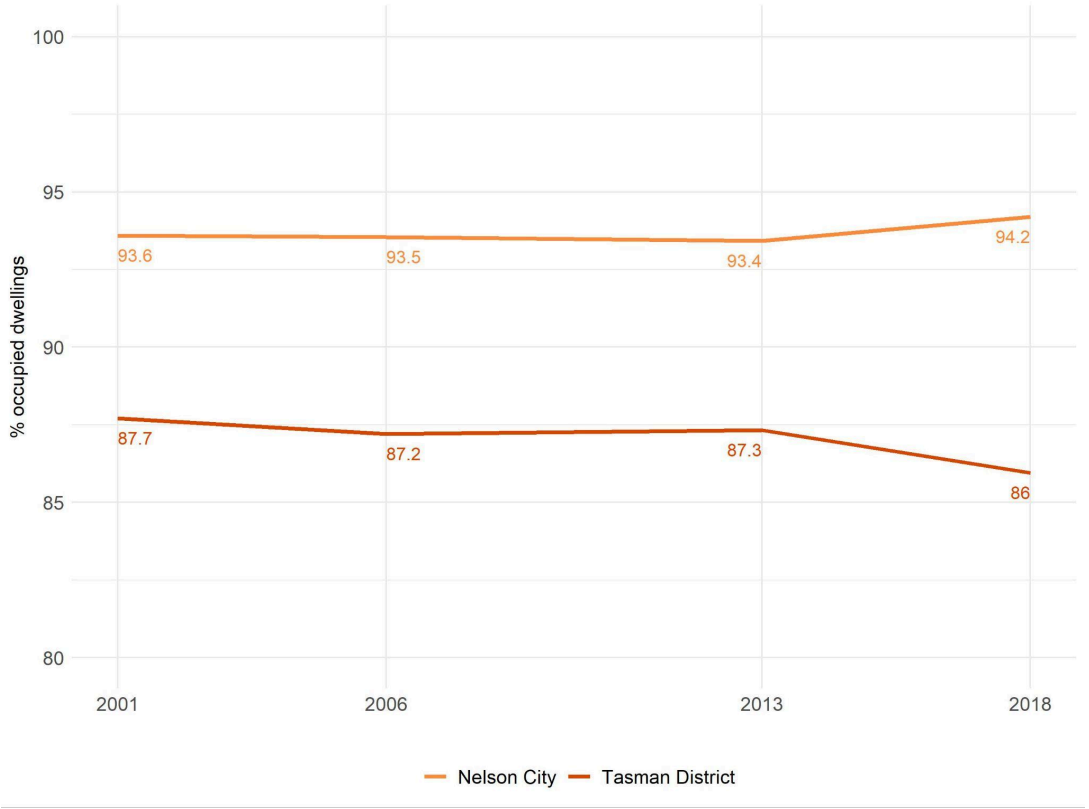


Table 8. Dwelling ratio assumptions by variant, 2018-2058, Tasman District & Nelson City

	2018	2023	2028	2033	2038	2043	2048	2053	2058
Tasman District									
Low	2.28	2.19	2.19	2.10	2.1	2.10	2.00	2.00	2.00
Medium	2.28	2.19	2.19	2.10	2.1	2.10	2.10	2.00	2.00
High	2.28	2.19	2.19	2.19	2.1	2.19	2.19	2.19	2.10
Nelson City									
Low	2.40	2.40	2.30	2.30	2.3	2.30	2.25	2.25	2.25
Medium	2.40	2.40	2.40	2.30	2.3	2.30	2.30	2.25	2.25
High	2.40	2.40	2.40	2.40	2.3	2.40	2.40	2.40	2.30

Note only minor changes in the dwelling ratio are expected over the projection period and between the three projection variants (Table 8). A projected increase in dwelling *numbers* will signify that additional dwellings will be required to maintain the stated people-to-dwellings

ratio, while a decline in numbers signifies fewer dwellings will be required to maintain that ratio (*not* that there will be fewer dwellings per se). The differing proportions of occupied and unoccupied dwellings in each geographic area should be considered when interpreting projected dwelling numbers.

2.4 Projection variants and differences with Statistics NZ subnational population projections

All three projection variants use approximately the same low, medium, and high fertility and mortality assumptions as Statistics NZ (2022a). In addition, there are only moderate differences in mortality and fertility between the three variants. The biggest difference between projections and variants is therefore driven by different migration assumptions.

For migration, DOT uses higher base (Medium variant) net migration assumptions compared to Statistics NZ. These are based on observed past migration *rates*, rather than predetermined migration *numbers* for each projection period. This means that migration numbers change in step with population growth and decline.

- The **medium** migration assumptions equate to the average of observed migration by age and sex for the periods 2001-2006, 2008-2013 and 2013-2018.
- The **high** migration assumptions equate to the medium migration assumption plus 25% applied separately to each age/sex group.
- The **low** migration assumptions equate to the medium migration assumption minus 25% applied separately to each age/sex group.

The High and Low variants represent scenarios if net migration is sustained at levels notably higher or lower than the historical *average*, but comparable to observed high and lows. It is unlikely, however, that very high levels of migration would continue unabated across the projection timeframe, and so these variants should be considered possible, though unlikely, scenarios of population change. They are not intended to represent upper or lower limits but to illustrate plausible alternative scenarios of future demographic behaviour and provide an indication of the inherent uncertainty of demographic behaviour. It should also be noted that they also do not encapsulate extreme events such as major disasters, wars, or pandemics.

2.5 Broader demographic context

The future New Zealand population is going to be larger and older. The national population is expected to grow over the next 40 years, albeit at a slowing rate (Statistics NZ, 2022c).

Population ageing is occurring across large parts of New Zealand as a result of increased life expectancy and declining total fertility rates (Statistics NZ, 2022c; Jackson & Brabyn, 2017; The New Zealand Initiative, 2014). Approximately 40% of New Zealand's TA's are projected to experience natural decrease within the next 20 years (Jackson & Cameron 2018). The shift reflects higher proportions of the population at older ages. Population ageing generates challenges for a range of public policies, including those related to healthcare, housing, and the labour force.

Household composition is also changing, in part in response to population ageing and reduced fertility levels, although it is also influenced by changes in family formation and break-up, and ethnic diversity. Nationally, the number of one-person and couple-without-children households is increasing, leading to a reduction in average household size.

New Zealand is also experiencing a progressive downward trend in fertility levels, and a shift to having children later in life (Statistics NZ, 2022c), both of which are trends experienced internationally in most developed countries (The New Zealand Initiative, 2014). Life expectancy is also increasing nationally, but at a declining rate as we approach the natural limit of human life spans. Increased life expectancy and declining fertility rates will cause a slow down in population growth, as fewer people will be born each generation to reproduce and replace the population. An additional implication of which is that this feeds back into increasing the ratio of old to younger people in the population.

For the country as a whole, population growth through natural increase will decline over the next few decades due to structural ageing. By the 2050s, deaths are expected to outnumber births (natural decrease). As a result, populations will be increasingly reliant on migration to stave off population decline. Slowing population growth and an ageing population will have wider societal effects, notably in labour markets.

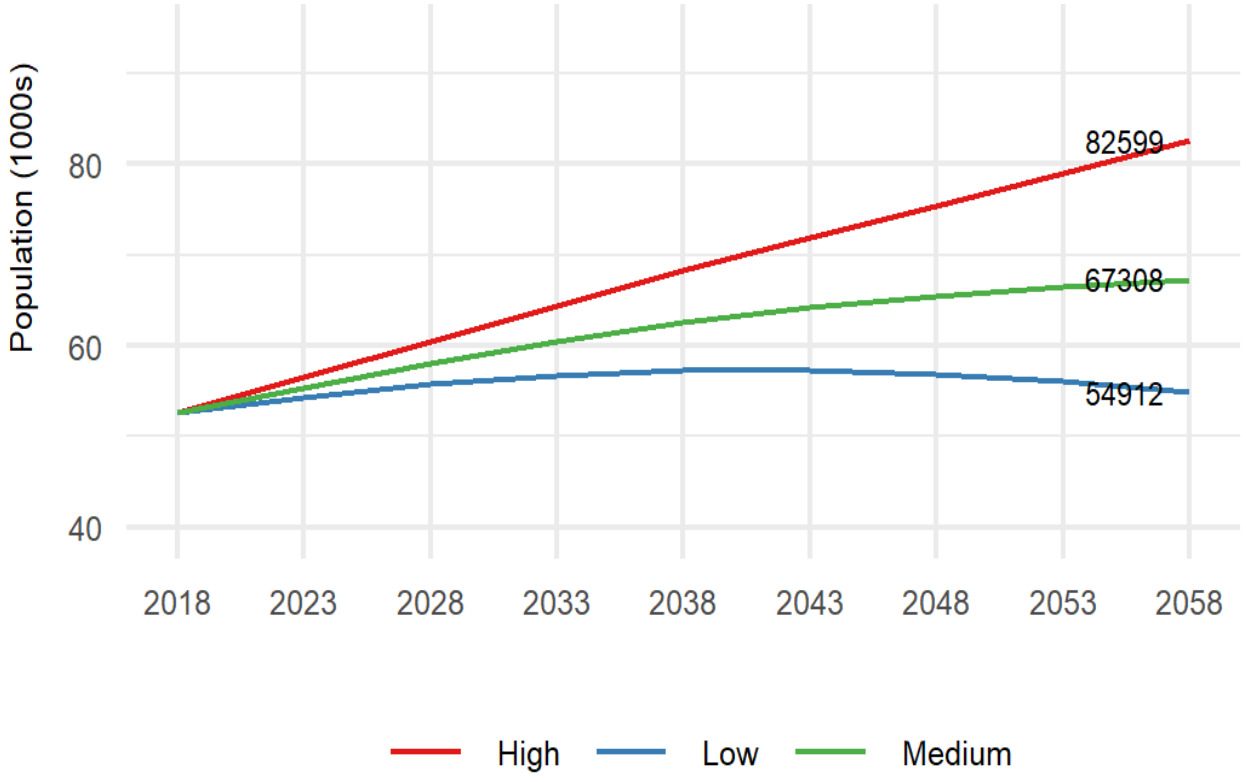
3. Results: Nelson City

An overview of the results for Nelson City are provided below. Please refer to the .csv data files for detailed results at TA level and SA2s. A summary of SA2 results is provided in section 3.4.

3.1 Total population

Figure 9 shows the overall projection results for Nelson City (see also Table 9). The population size of Nelson City increases under both the medium and high variants and remains broadly stable under the low variant. Under the medium variant the population (rounded to nearest 10) is projected to increase 27.8% from its estimated base of 52,660 in 2018 to 67,310 in 2058. Projected numbers under the high variant reach 82,600 in 2058 (+56.8%). Under the low variant, numbers reach 54,910 in 2058 (+4.3%).

Figure 9. Total population projections, by variant, 2018-2058, Nelson City



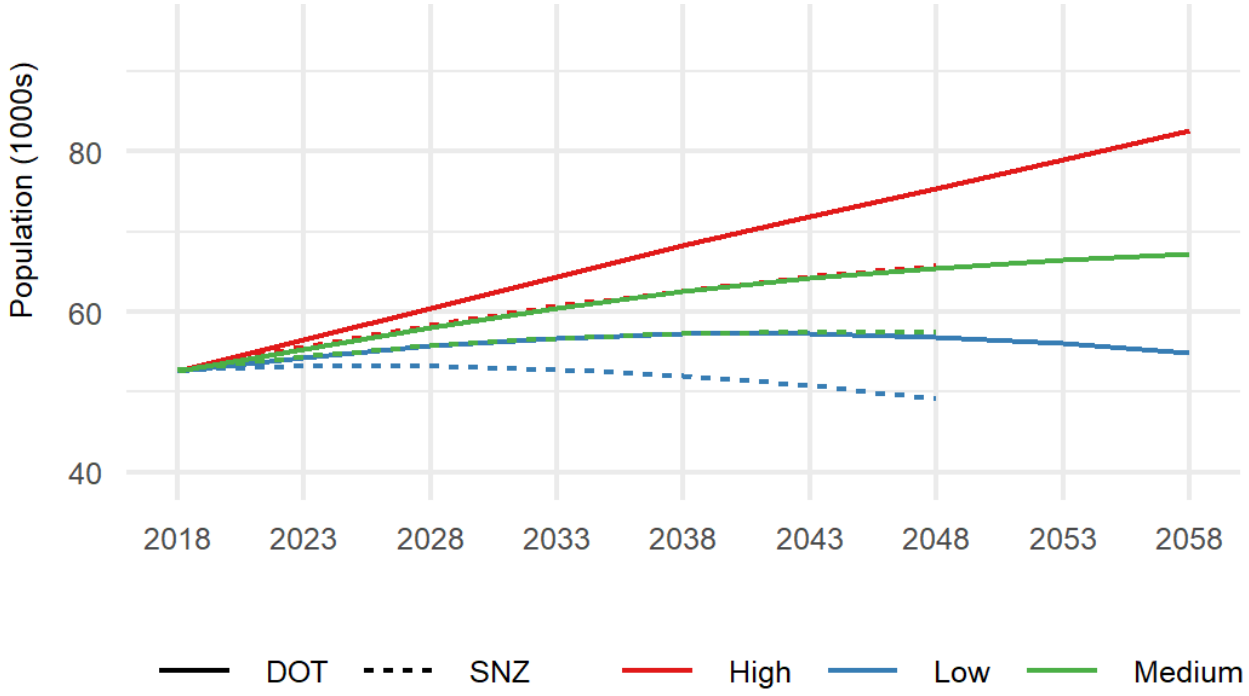
3.1.1 Comparison with Statistics NZ projections

Figure 10 contrasts the DOT projections with those produced by Statistics NZ (2022c). DOT's projections are higher for each variant primarily due to higher net migration assumptions employed in the DOT model. DOT's projection methodology, using average migration rates,

generates higher numbers of migrants than the predetermined migration numbers used by Statistics NZ. All three variants use similar fertility and mortality assumptions as Statistics NZ (2022a)

Total population numbers from the medium variant are similar to those from Statistics NZ High projection variant and the Low projection variant results are comparable to Statistics NZ's Medium variant. See section 2.4 for more information of the differences between the two sets of projections.

Figure 10. Comparison of total population projections for DOT and Statistics New Zealand, by variant, 2018-2058, Nelson City



3.1.2 Population change

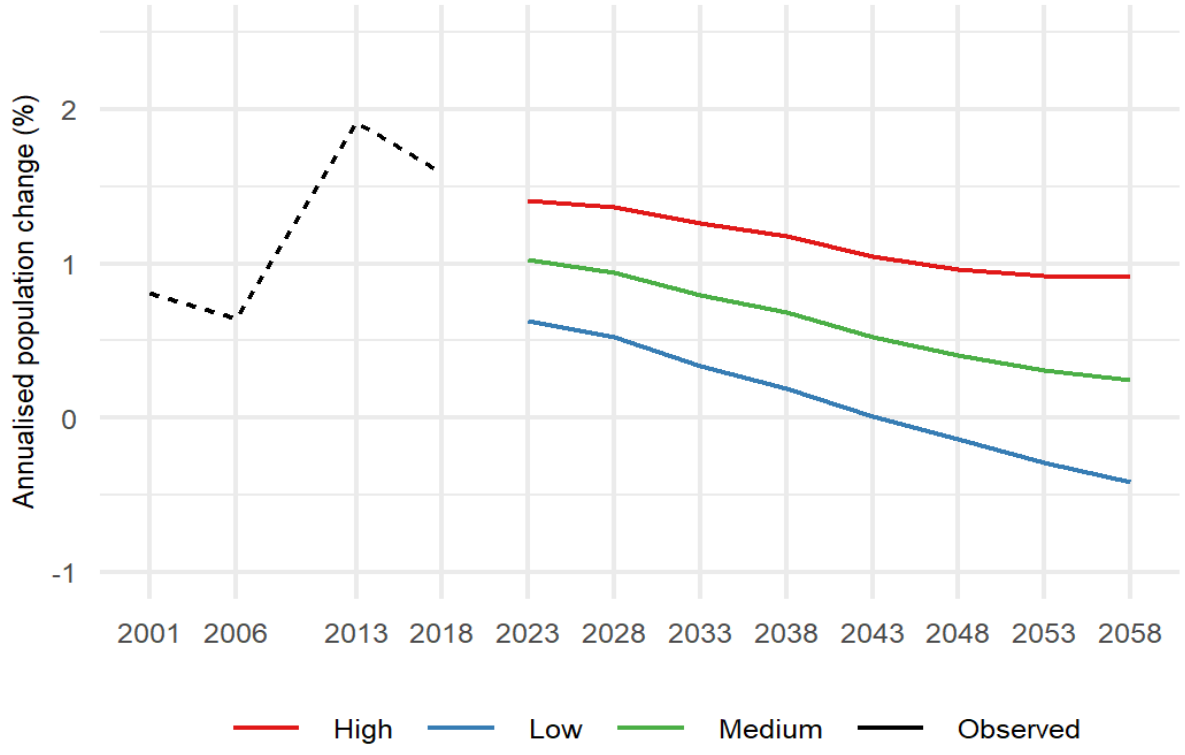
Between 2001 and 2018 average annual growth rates ranged between 0.64% and 1.91%. Population growth rates between 2006-2018 were unusually high compared to long term patterns (approximately double the rates for 1996-2006) and it is unlikely that growth will continue at this rate for the duration of the projection period.

These results show relatively modest average annual growth rates in comparison across the projection period (Figure 11, Table 9). Under the Medium projection, average annual growth ranges from 1.02% between 2018-2023 to 0.25% between 2053-2058. Under the high variant annual growth rates range from 1.41% between 2018-2023 to 0.91% in 2053-2058. While average annual growth rates for both the Medium and High projection variants remain positive across the projection period, population growth slows over time.

Table 9. Total population projections and average annual change, by variant, 2018-2058, Nelson City

	High		Medium		Low	
Proj. year	Pop	Annual pop change %	Pop	Annual pop change %	Pop	Annual pop change %
2018	52,660		52,660		52,660	
2023	56,479	1.41	55,406	1.02	54,340	0.63
2028	60,436	1.36	58,064	0.94	55,778	0.52
2033	64,347	1.26	60,419	0.80	56,717	0.33
2038	68,234	1.18	62,509	0.68	57,253	0.19
2043	71,866	1.04	64,159	0.52	57,283	0.01
2048	75,402	0.96	65,470	0.41	56,885	-0.14
2053	78,927	0.92	66,485	0.31	56,064	-0.29
2058	82,599	0.91	67,308	0.25	54,912	-0.41

Figure 11. Annualised population change, by variant, 2018-2058, Nelson City



Negative growth (declining population) is projected for the Low variant from 2048 with average annual growth rates ranging from 0.63% between 2018-2023 down to -0.41% between 2053-2058. The declines in growth rates over time for all three projection variants align with expectations of population ageing and reduced fertility levels.

Figure 12. Components of population change, by variant, 2018-2058, Nelson City

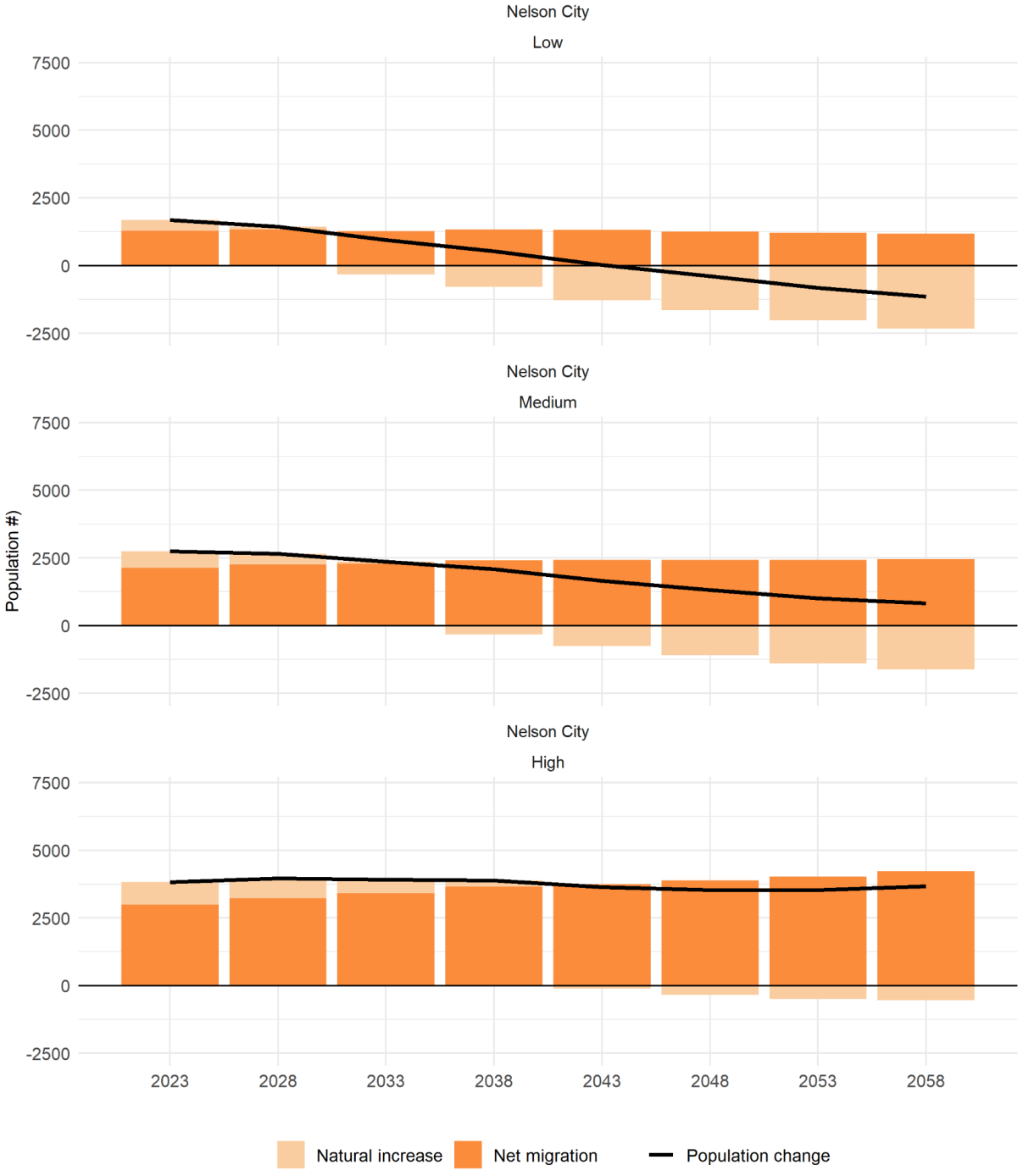


Table 10. Components of population change, by variant, 2018-2058, Nelson City

	2023	2028	2033	2038	2043	2048	2053	2058
High								
Change in population	3,819	3,957	3,911	3,887	3,632	3,536	3,525	3,672
Net migration	2,990	3,226	3,401	3,649	3,745	3,880	4,025	4,219
Natural increase	829	731	510	238	-113	-344	-500	-547
Migration as % of pop. change	78.29	81.53	86.96	93.88	103.11	109.73	114.18	114.90
Natural increase as % of pop. change	21.71	18.47	13.04	6.12	-3.11	-9.73	-14.18	-14.90
Medium								
Change in population	2,746	2,658	2,355	2,090	1,650	1,311	1,015	823
Net migration	2,137	2,257	2,283	2,414	2,418	2,418	2,420	2,449
Natural increase	609	401	72	-324	-768	-1,107	-1,405	-1,626
Migration as % of pop. change	77.82	84.91	96.94	115.50	146.54	184.44	238.42	297.57
Natural increase as % of pop. change	22.18	15.09	3.06	-15.50	-46.55	-84.44	-138.42	-197.57
Low								
Change in population	1,680	1,438	939	536	30	-398	-821	-1,152
Net migration	1,287	1,332	1,263	1,328	1,309	1,252	1,208	1,181
Natural increase	393	106	-324	-792	-1,279	-1,650	-2,029	-2,333
Migration as % of pop. change	76.61	92.63	134.50	247.76	4,363.33	314.57	147.14	102.52
Natural increase as % of pop. change	23.39	7.37	-34.50	-147.76	-4,263.33	-414.57	-247.14	-202.52

3.1.3 Components of population change

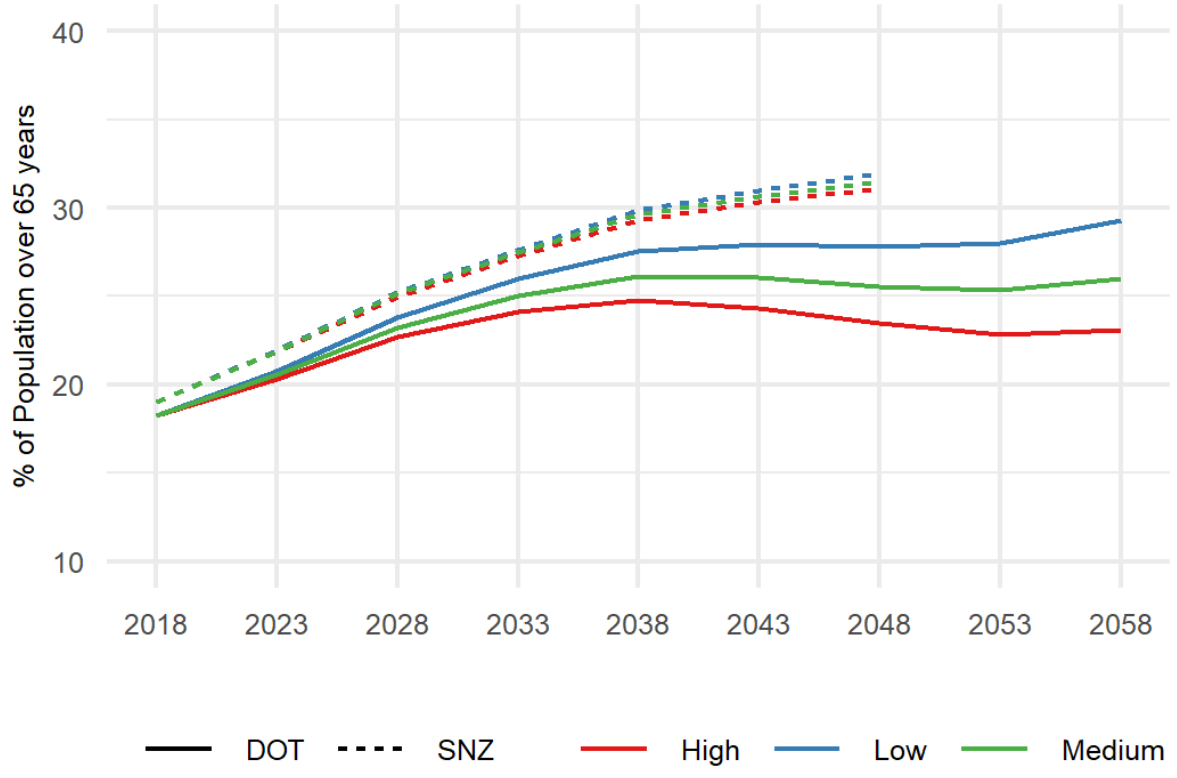
The relative contributions of net migration and natural increase/decrease to Nelson's projected population growth varies across time and between projection variants (Figure 12 and Table 10). Net migration is the major contributor to the district's growth under the Medium and High variants. Under the Medium variant, the generated number of migrants

remains relatively stable over time, while net migrant numbers increase moderately over time under the High variant. For the Low projection variant, net migration is a key contributor to growth till 2038, after which the effects of natural decrease become dominant. Migrant numbers decline over time under the low projection variant, but these declines are relatively modest.

3.2 Age-Sex structure

Population ageing is evident from the trend in projected population numbers by broad age group (Table 11, Figure 13, see data files for population by five-year age group) and in ageing indices (Table 12). In 2018, the population of Nelson City ranked 27th oldest out of 67 TAs with 19.1% of the population aged over 65 years (compared to 15.0% nationally). By 2022, this had increased to 21.2% compared to 16.4% nationally (Statistics NZ 2022d).

Figure 13. Percentage of population aged 65 years and over, by variant, 2018-2058, Nelson City



DOTs projected proportion of the population aged 65+ years falls below Stat'S NZs values, in large part due to higher migration assumptions. Under the three scenarios 30.8%, 25.5%, and 24.5% of the population are projected to be aged 65 years and over under the low, medium and high scenarios respectively. Statistics NZs (2022c) projections indicate that by 2048 Nelson City would become New Zealand's 11th oldest population.

Table 11. Population by broad age group and variant, 2018-2058, Nelson City

	2018	2023	2028	2033	2038	2043	2048	2053	2058
High									
0-14	9,200	9,416	9,578	10,192	10,804	11,437	12,017	12,567	13,176
15-24	5,820	6,175	6,336	6,284	6,335	6,723	7,114	7,568	7,991
25-54	20,300	21,116	22,322	24,004	25,993	27,285	28,226	29,390	30,266
55-64	7,330	7,949	8,129	7,947	7,606	8,231	9,517	10,251	10,906
65-74	5,700	6,471	7,523	8,176	8,383	8,209	7,867	8,466	9,754
75+	4,310	5,352	6,548	7,744	9,113	9,981	10,661	10,685	10,506
Total	52,660	56,479	60,436	64,347	68,234	71,866	75,402	78,927	82,599
Medium									
0-14	9,200	9,090	8,807	8,864	8,987	9,128	9,184	9,161	9,096
15-24	5,820	5,992	6,052	5,913	5,662	5,659	5,737	5,847	5,913
25-54	20,300	20,717	21,383	22,418	23,698	24,266	24,314	24,491	24,335
55-64	7,330	7,883	7,984	7,712	7,264	7,728	8,747	9,158	9,433
65-74	5,700	6,411	7,390	7,958	8,079	7,813	7,368	7,806	8,810
75+	4,310	5,313	6,448	7,554	8,819	9,565	10,120	10,022	9,721
Total	52,660	55,406	58,064	60,419	62,509	64,159	65,470	66,485	67,308
Low									
0-14	9,200	8,771	8,093	7,653	7,402	7,187	6,928	6,575	6,111
15-24	5,820	5,811	5,777	5,563	5,034	4,727	4,570	4,437	4,309
25-54	20,300	20,316	20,462	20,905	21,566	21,527	20,858	20,314	19,438
55-64	7,330	7,816	7,840	7,479	6,934	7,248	8,026	8,157	8,123
65-74	5,700	6,351	7,257	7,746	7,785	7,429	6,897	7,186	7,941
75+	4,310	5,275	6,349	7,371	8,532	9,165	9,606	9,395	8,990
Total	52,660	54,340	55,778	56,717	57,253	57,283	56,885	56,064	54,912

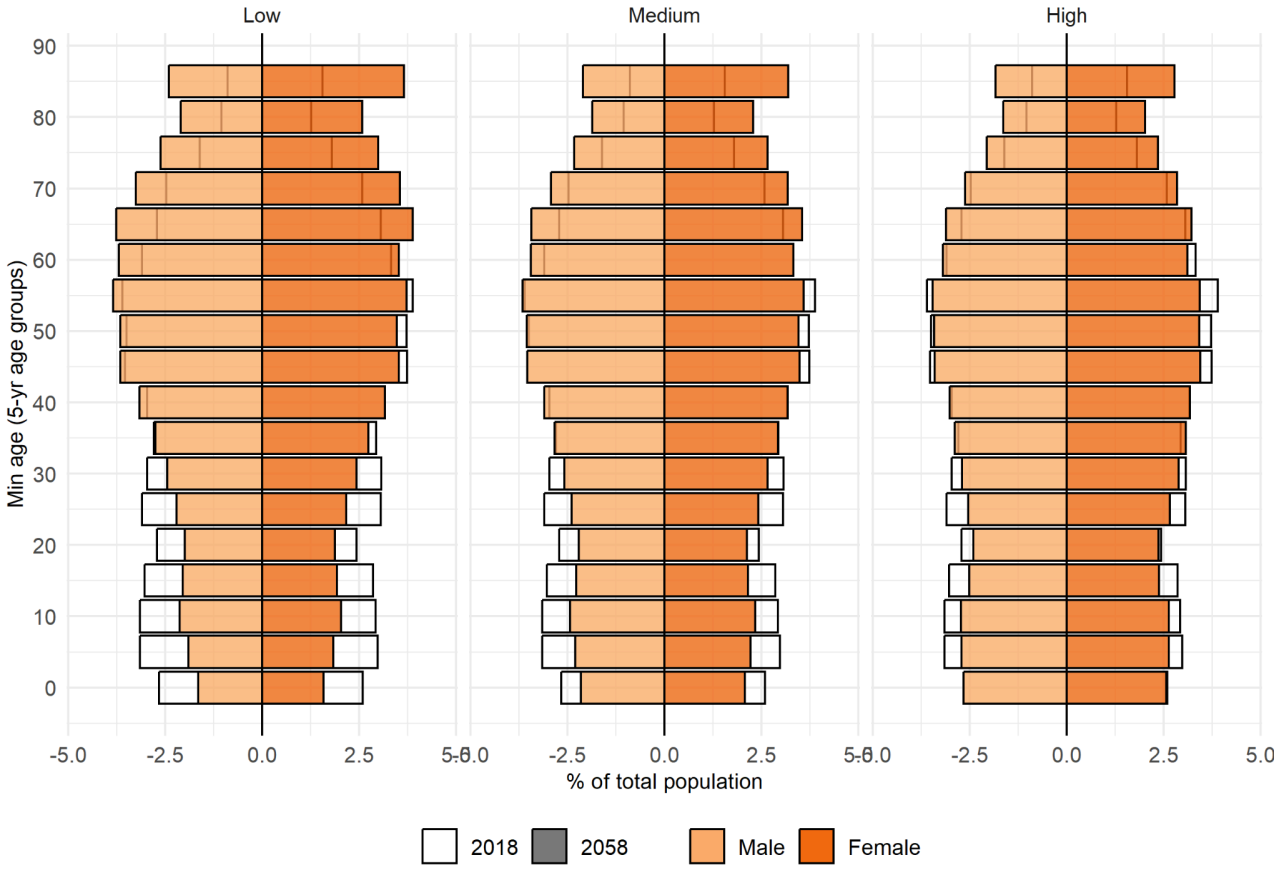
Table 12. Ageing indices & percent in key reproductive years, by variant, 2018-2058, Nelson City

	2018	2023	2028	2033	2038	2043	2048	2053	2058
% in Key Reproductive Ages (20-39 yrs)									
High	23.07	23.96	23.93	23.48	22.96	22.19	21.72	21.32	21.53
Medium	23.07	23.76	23.54	23.03	22.55	21.65	21.03	20.34	20.18
Low	23.07	23.54	23.13	22.55	22.09	21.04	20.26	19.20	18.62
% aged 65 years and older									
High	19.01	20.93	23.28	24.74	25.64	25.31	24.57	24.26	24.53
Medium	19.01	21.16	23.83	25.67	27.03	27.09	26.71	26.82	27.53
Low	19.01	21.40	24.39	26.65	28.50	28.97	29.01	29.58	30.83
Ratio 65+ years: 14 years and under									
High	1.09	1.26	1.47	1.56	1.62	1.59	1.54	1.52	1.54
Medium	1.09	1.29	1.57	1.75	1.88	1.90	1.90	1.95	2.04
Low	1.09	1.33	1.68	1.98	2.20	2.31	2.38	2.52	2.77

A population is considered to be approaching the end of natural increase once 20% or more of the population are aged over 65 years. This threshold will be crossed by 2023 under all projection variants (Figure 13). The ratio of older people (65+ years) to children (0-14 years) for Nelson City is already above 1 (2018 ratio = 1.09). By 2058, we project this ratio will increase further under all variants, ranging from 2.8 (Low) to 1.5 (High) (Table 12).

A further sign that a population is reaching the limits of sustaining itself through natural increase is a reduction in the proportion of women in key reproductive ages (aged 20-39 years). This trend is evident across all three variants and is visible when comparing the age-sex structure (proportions of the total population in each age/sex group) in 2018 and projected for 2053 (Figure 14, Table 11). The 'bite' in the age structure over the main reproductive age groups (primarily reflecting net migration loss at those ages) changes little over time, even with high migration. Although proportions aged 65+ years are projected to increase substantially, the age structures also remain relatively similar by variant. Proportions of younger ages in 2053 are lowest under the low variant and highest under the high variant.

Figure 14. Population pyramids by age, sex and variant, 2018 vs 2058, Nelson City



2058 population (orange shades) overlies the 2018 population (clear/outline).

3.3 Household and Dwelling projections

Projected household and dwelling numbers for Nelson city are presented in Tables 13 & 14.

Under the medium projection, the number of households (occupied private dwellings) will need to increase 36.2% between 2018 and 2058 if the assumptions regarding future average household size are met (Table 7). Average household size is projected to decline under all three variants, with the Medium projection indicating a decline from 2.48 in 2018 to 2.33 in 2058.

Change in household number between projection windows is positive throughout the projection period for the Medium and High projection variants (Table 7). Under the Low projection scenario, fewer households would be required to maintain the assumed household size ratio in the 2050s.

The projected total number of private dwellings follows a similar pattern, increasing by 36.3% between 2018 and 2058 (Table 14). Additional dwellings will be needed in each projection

period to maintain the assumed dwelling ratio (average number of people per private dwelling) under the High and Low variants. Under the Low scenario, fewer dwellings will be required to maintain this ratio in the 2050s (rather than there being fewer dwellings *per se*).

3.3.1 Interpreting change in household and dwelling numbers

Increases and decreases in the projected numbers represent changes in the demand for homes over the projection period based on household size and dwelling ratio expectations, and not a change in actual numbers of physical dwellings and households. That is, projected numbers indicate if additional or fewer households and dwellings are required to sustain the expected ratios for household size and dwellings, not an actual increase (new builds) or decline (destruction, abandonment, or repurposing) in dwellings and households in the region. A projected increase in dwelling *numbers* signifies that additional dwellings will be required to maintain the stated people-to-dwellings *ratio*, while a decline in numbers signifies fewer dwellings will be required to maintain that ratio.

The differing proportions of occupied and unoccupied dwellings in each geographic area should be considered when interpreting projected dwelling numbers.

Household and dwelling numbers increase by a greater margin than population numbers, under all three variants, due primarily to population ageing. That is, population ageing typically sees a reduction in average household size, in part because there are fewer children per household, more people live as couples without children and, especially at older ages, more people live alone. Added to this is the growing tendency for people to have a second (holiday or weekend) home, especially at mid-older ages, which contributes to the relative increase in dwelling numbers. The latter is particularly important at SA2 level, where unoccupied dwelling rates vary dramatically.

Table 13. Household projections, by variant, 2018-2058, Nelson City

	2018	2023	2028	2033	2038	2043	2048	2053	2058
High									
Population	52,660	56,479	60,436	64,347	68,234	71,866	75,402	78,927	82,599
Avg. household size	2.48	2.48	2.48	2.48	2.38	2.48	2.48	2.48	2.38
Households (#)	21,208	22,746	24,339	25,915	28,669	28,943	30,367	31,786	34,705
Change (#)		1,538	1,593	1,576	2,754	274	1,424	1,419	2,919
Change %		7.25	7.00	6.47	10.63	0.96	4.92	4.67	9.18
Medium									
Population	52,660	55,406	58,064	60,419	62,509	64,159	65,470	66,485	67,308
Avg. household size	2.48	2.48	2.48	2.38	2.38	2.38	2.38	2.33	2.33
Households (#)	21,208	22,314	23,384	25,386	26,264	26,957	27,508	28,534	28,887
Change (#)		1,106	1,070	2,002	878	693	551	1,026	353
Change %		5.22	4.80	8.56	3.46	2.64	2.04	3.73	1.24
Low									
Population	52,660	54,340	55,778	56,717	57,253	57,283	56,885	56,064	54,912
Avg. household size	2.48	2.48	2.38	2.38	2.38	2.38	2.33	2.33	2.33
Households (#)	21,208	21,884	23,436	23,830	24,055	24,068	24,414	24,061	23,567
Change (#)		676	1,552	394	225	13	346	-353	-494
Change %		3.19	7.09	1.68	0.94	0.05	1.44	-1.45	-2.05

Table 14. Dwelling projections, by variant, 2018-2058, Nelson City

	2018	2023	2028	2033	2038	2043	2048	2053	2058
High									
Population	52,660	56,479	60,436	64,347	68,234	71,866	75,402	78,927	82,599
Dwelling ratio	2.4	2.400	2.400	2.400	2.300	2.400	2.400	2.400	2.300
Dwellings (#)	21,950	23,542	25,192	26,822	29,679	29,956	31,430	32,899	35,928
Change (#)		1,592	1,650	1,630	2,857	277	1,474	1,469	3,029
Change %		7.253	7.009	6.470	10.652	0.933	4.921	4.674	9.207
Medium									
Population	52,660	55,406	58,064	60,419	62,509	64,159	65,470	66,485	67,308
Dwelling ratio	2.4	2.400	2.400	2.300	2.300	2.300	2.300	2.250	2.250
Dwellings (#)	21,950	23,095	24,203	26,280	27,189	27,907	28,477	29,562	29,927
Change (#)		1,145	1,108	2,077	909	718	570	1,085	365
Change %		5.216	4.798	8.582	3.459	2.641	2.042	3.810	1.235
Low									
Population	52,660	54,340	55,778	56,717	57,253	57,283	56,885	56,064	54,912
Dwelling ratio	2.4	2.400	2.300	2.300	2.300	2.300	2.250	2.250	2.250
Dwellings (#)	21,950	22,651	24,261	24,670	24,903	24,916	25,293	24,928	24,416
Change (#)		701	1,610	409	233	13	377	-365	-512
Change %		3.194	7.108	1.686	0.944	0.052	1.513	-1.443	-2.054

3.4. SA2 Results Summary - Nelson City

Figure S1a (Appendix) shows the total projected population for each SA2 and a comparison with the Statistics NZ subnational projections for each area and variant.

Four SA2s had an estimated population of <80 persons in 2018: Port Nelson (n=35), Inlets Nelson City (n=35), Saxton (n=40), and Nelson Airport (n=80). We have included the data for all SA2s in the final data output files for completeness, but these populations are too small to produce reliable projections for individual analyses. For small populations with under 1,000 persons in 2018, these have been flagged in the data files as some caution should be used in interpreting their results due to the inherent larger errors involved in modelling small populations.

The SA2s with the largest projected population in 2058 (under the medium projection) are Omaio (n = 7,229), Aldinga (n=4,484), Washington (n=4,217), Suffolk (n=4,052), and Atawhai (n=3,873). In comparison the largest SA2s in 2018 were Omaio, Aldinga, The Wood, Washington, and Enner Glenn.

The five SA2s with the largest population growth (under the Medium variant) between 2018 and 2058 are Omaio, Nayland, Daelyn, Suffolk, and Broadgreen-Monaco. The Omaio population is projected to approximately double, while the other four SA2s are projected to increase by 43%-55% between 2018 and 2058. However, Daelyn has a small population and so this result should be interpreted with some caution.

Focussing only on communities with a projected population of over 100 people in 2058, four SA2s are projected to experience population declines. These are Maitai (-24.2%), Marybank (-9.0%), Victory (-3.3%), and Rutherford (-3.3%). However, all but Rutherford had a population smaller than 1,700 in 2018. Tahunanui and Brittania are projected to increase modestly (4.6% and 3.2% respectively) over the projection period to 2058.

Eleven SA2s are projected to have over a third of their population aged over 65 years in 2058. The larger of these include The Wood, Britannia, Aldinga, Omaio, Suffolk, Marybank, and Maitai.

The youngest projected suburbs in 2058, i.e. those with the largest proportion of 0-14 year olds, is projected to be Broadgreen-Monaco (20.1%), Toi Toi (17.8%), Nayland (17.7%), Nelson Rural (16.6%), and Washington (16.4%).

Please refer to the data files for full SA2 level results.

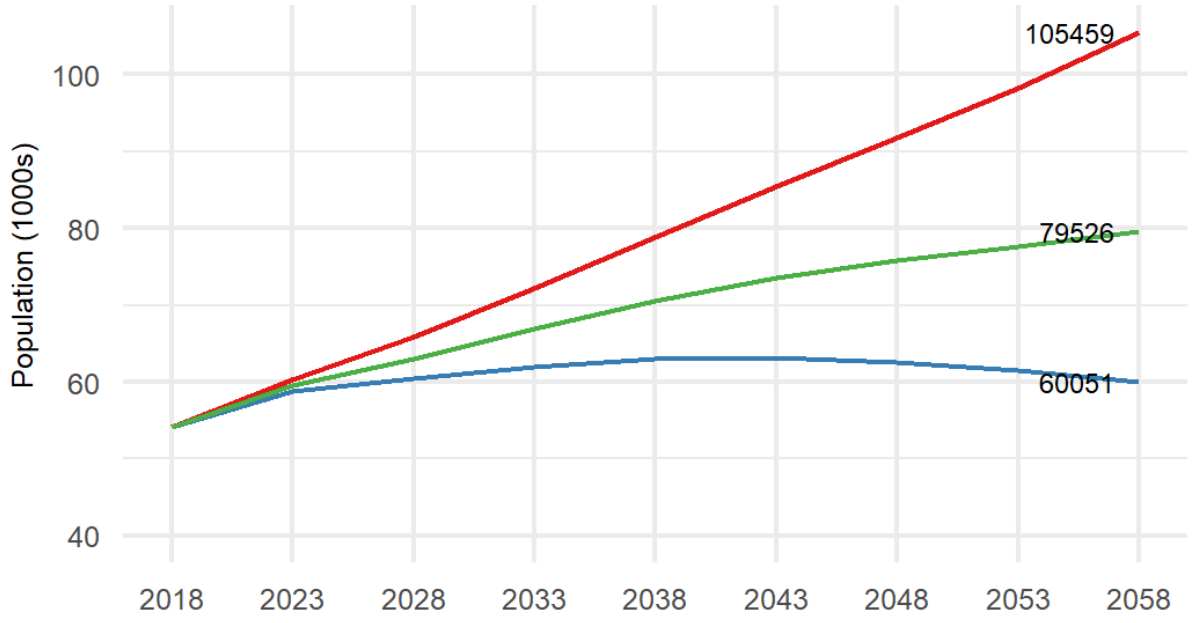
4. Results: Tasman District

Here we provide an overview of the results for Tasman District are provided below. Please refer to the data files for detailed results at TA level and for SA2 data. A summary of SA2 results is provided in section 4.4.

4.1 Total population

Figure 15 shows the overall projection results for Tasman District (see also Table 15). The population size of Tasman District increases under both the medium and high variants and remains broadly stable under the low variant. Under the medium variant the population is projected to increase 47.1% from its estimated base of 54,070, in 2018 to 79,530 in 2058. Projected numbers under the high variant reach 105,460 in 2058 (+95.0%). Under the low variant, numbers reach 60,050 in 2058 (+11.1%).

Figure 15. Total population projections, by variant, 2018-2058, Tasman District

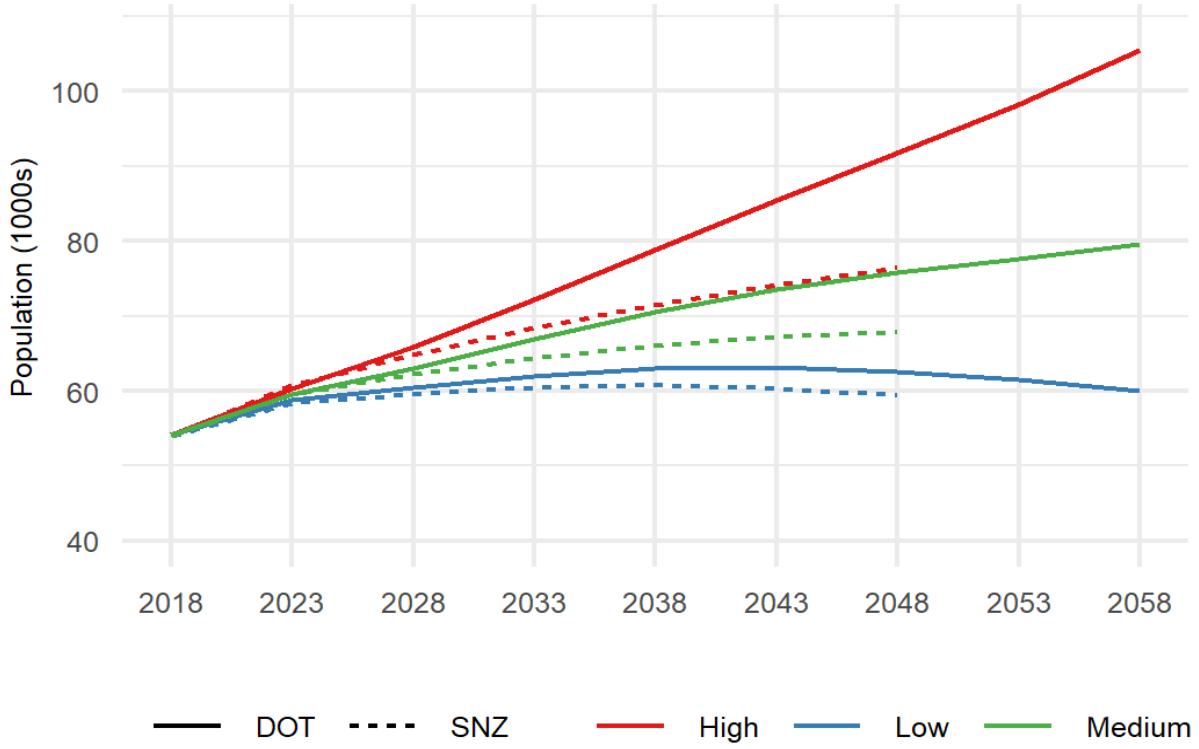


4.1.1 Comparison with Statistics NZ projections

Figure 16 contrasts the DOT projections with those produced by Statistics NZ (2022c). DOT's projections are higher for each variant primarily due to higher net migration assumptions employed in the DOT model. DOT's projection methodology, using average migration rates, generates more net migrants than the predetermined migration numbers used by Statistics NZ. All three variants use similar fertility and mortality assumptions as Statistics NZ (2022a).

Total population numbers from the medium projection variant are similar to those in Statistics NZ's High variant. Total population numbers in the Low variant is intermediate between Statistics NZ's Low and Medium outputs. See section 2.4 for more information of the differences between the two sets of projections.

Figure 16. Comparison of total population projections by DOT and Statistics New Zealand, by variant, 2018-2058, Tasman District



4.1.2 Population change

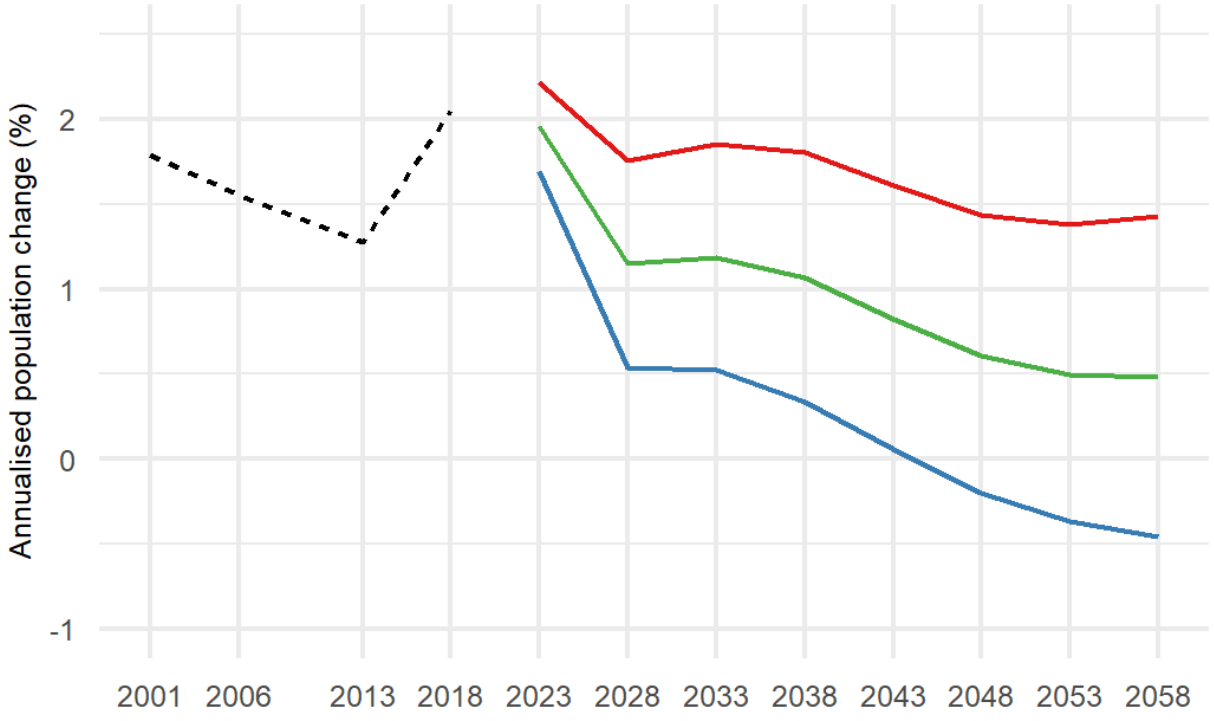
Between 2001 and 2018 average annual growth rates ranged between 1.31% and 2.13%. These results show relatively low-to-modest average annual growth rates in comparison (Figure 17). Average annual growth rates are positive across projection periods for both the Medium and High projection variants, although population growth slows over time. Under the Medium projection average annual growth ranges from 1.96% between 2018-2023 to 0.48% between 2053-2058. Under the high variant annual growth rates range from 2.21% between 2018-2023 to 1.43% in 2053-2058.

For the Low projection variant, population change is negative (declining population) from 2048 with average annual growth rates ranging from 1.70% between 2018-2023 down to -0.46% between 2053-2058.

Table 15. Total population projections and average annual change, by variant, 2018-2058, Tasman District

	High		Medium		Low	
Proj. year	Pop	Annual pop change %	Pop	Annual pop change %	Pop	Annual pop change %
2018	54,070		54,070		54,070	
2023	60,329	2.21	59,569	1.96	58,811	1.70
2028	65,822	1.76	63,071	1.15	60,406	0.54
2033	72,145	1.85	66,901	1.19	61,995	0.52
2038	78,885	1.80	70,541	1.06	63,046	0.34
2043	85,438	1.61	73,488	0.82	63,215	0.05
2048	91,739	1.43	75,747	0.61	62,589	-0.20
2053	98,235	1.38	77,635	0.49	61,442	-0.37
2058	105,459	1.43	79,526	0.48	60,051	-0.46

Figure 17. Annualised population change, by variant, 2018-2058, Tasman District



Population growth rates between 2013-2018 were unusually high (2.1% annual growth) compared to long term patterns and it is unlikely that growth will continue at this rate for the duration of the projection period.

The declines in growth rates over time for all three projection variants align with expectations of population ageing and reduced fertility levels.

Figure 18. Components of population change, by variant, 2018-2058, Tasman District

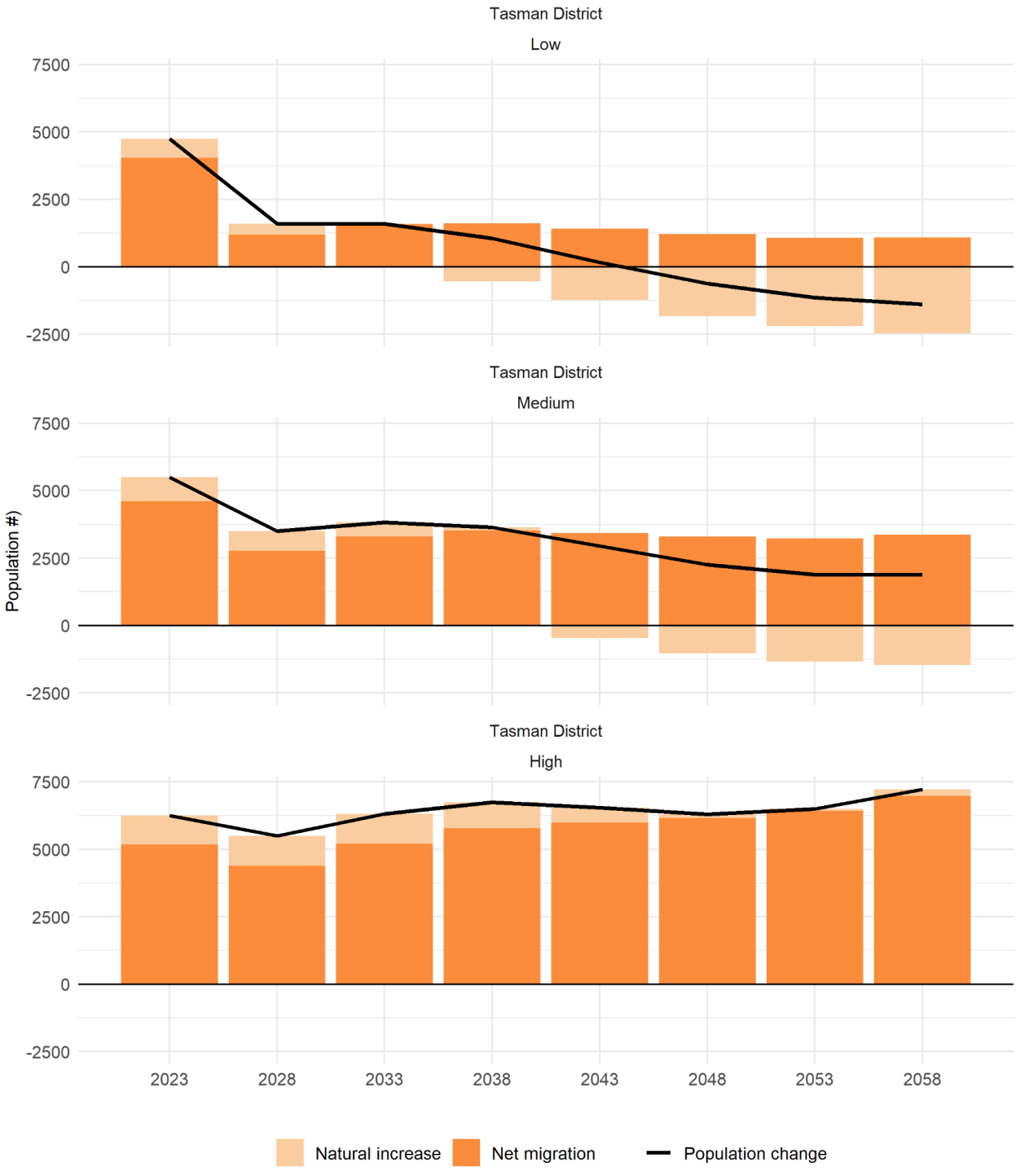


Table 16. Components of population change, by variant, 2018-2058, Tasman District

	2023	2028	2033	2038	2043	2048	2053	2058
High								
Change in population	6,259	5,493	6,323	6,740	6,553	6,301	6,496	7,224
Net migration	5,172	4,387	5,206	5,776	5,989	6,162	6,429	6,970
Natural increase	1,087	1,106	1,117	964	564	139	67	254
Migration as % of pop. change	82.63	79.86	82.33	85.70	91.39	97.79	98.97	96.48
Natural increase as % of pop. change	17.37	20.13	17.67	14.30	8.61	2.21	1.03	3.52
Medium								
Change in population	5,499	3,502	3,830	3,640	2,947	2,259	1,888	1,891
Net migration	4,600	2,757	3,303	3,519	3,421	3,297	3,230	3,355
Natural increase	899	745	527	121	-474	-1,038	-1,342	-1,464
Migration as % of pop. change	83.65	78.73	86.24	96.68	116.08	145.95	171.08	177.42
Natural increase as % of pop. change	16.35	21.27	13.76	3.32	-16.08	-45.95	-71.08	-77.42
Low								
Change in population	4,741	1,595	1,589	1,051	169	-626	-1,147	-1,391
Net migration	4,038	1,186	1,582	1,604	1,413	1,212	1,067	1,078
Natural increase	703	409	7	-553	-1,244	-1,838	-2,214	-2,469
Migration as % of pop. change	85.17	74.36	99.56	152.62	836.10	193.61	93.03	77.50
Natural increase as % of pop. change	14.83	25.64	0.44	-52.62	-736.09	-293.61	-193.03	-177.50

4.1.3 Components of population change

The relative contributions of net migration and natural increase to Tasman's projected growth varies across time and between projection variants (Figure 18 and Table 9). Net migration is the major contributor to the district's growth under the Medium and High variants. Under the Medium variant, the generated number of migrants remains relatively stable over time, while net migrant numbers increase moderately over time under the High variant.

For the Low projection variant net migration is a key contributor to growth till 2043, after which the effects of negative natural increase become dominant. Under the low variant, the generated number of migrants declines over time, but these declines are relatively modest.

Natural increase is only a small component of population change under all projection variants. For the Low and Medium variants, natural increase turns negative (natural decrease) between 2038 and 2043 and becomes a major component of population change during this time under the Medium and low variants. This shift from natural increase to natural increase is projected for a large proportion of New Zealand's TAs over the coming decades (Statistics NZ 2022c).

Net migration will be increasingly important in offsetting natural decrease and by the end of the migration period will be the main source of population growth. The maintenance of natural increase under the High variant is driven by higher net migration rates that help sustain the numbers of births for longer. However, by 2058 natural increase is barely positive. Due to the effects of structural ageing, it is unlikely that long term natural increase can be restored, and would be challenging to achieve even under very high fertility conditions.

4.2 Age-Sex structure

Population ageing is evident from the trend in projected population numbers by broad age group (Table 17, see the data files for population numbers by five-year age group) and in key ageing indices (Table 18). In 2018, the population of Tasman District ranked 16th oldest out of 67 TAs (Statistics NZ 2022d) with 20.7% of the population aged over 65 years (compared to 15.0% nationally). In 2022, this has increased to 23.1% compared to 16.4% nationally.

Statistics NZs (2022c) projections indicate that by 2048 Tasman District would become New Zealand's fifth oldest population. DOT's projected proportion of the population aged 65+ years in 2058 fall below Stat'S NZs values (Figure 19), in large part due to higher migration assumptions. Under the three scenarios 31.3%, 26.8% and 22.9% of the population are projected to be aged 65 years and over under the low, medium and high scenarios respectively (Table 18, Figure 19).

An indicator that a population is approaching the end of natural increase is when more than 20% of the population are aged 65+ years. Another indicator is if the ratio of older people (65+ years) to children (0-14 years) is above 1. Tasman District crossed both these thresholds in 2018. We project the ratio of over 65 year olds to under 15 year olds will increase under all variants, ranging from 2.8 under the Low projection to 1.3 under the High projection (Table 18).

Table 17. Population by broad age group and variant, 2018-2058, Tasman District

	2018	2023	2028	2033	2038	2043	2048	2053	2058
High									
0-14	9,630	9,707	10,480	12,337	14,115	15,691	16,653	17,302	18,308
15-24	5,570	6,666	6,121	5,413	5,841	6,867	7,951	9,078	9,779
25-54	19,440	20,891	22,740	25,570	28,650	31,373	33,838	36,363	38,050
55-64	8,230	9,264	9,956	9,887	9,155	9,288	10,779	12,579	15,165
65-74	6,900	7,917	8,889	9,853	10,590	10,528	9,755	9,885	11,451
75+	4,300	5,884	7,636	9,085	10,534	11,691	12,763	13,028	12,706
Total	54,070	60,329	65,822	72,145	78,885	85,438	91,739	98,235	105,459
Medium									
0-14	9,630	9,425	9,592	10,564	11,362	11,886	11,841	11,500	11,354
15-24	5,570	6,534	5,697	4,870	5,005	5,497	5,987	6,425	6,467
25-54	19,440	20,661	21,786	23,586	25,365	26,674	27,501	28,183	27,872
55-64	8,230	9,199	9,708	9,457	8,557	8,481	9,576	10,761	12,490
65-74	6,900	7,889	8,754	9,546	10,075	9,817	8,888	8,803	9,928
75+	4,300	5,861	7,534	8,878	10,177	11,133	11,954	11,963	11,415
Total	54,070	59,569	63,071	66,901	70,541	73,488	75,747	77,635	79,526
Low									
0-14	9,630	9,149	8,752	8,969	9,029	8,848	8,231	7,421	6,747
15-24	5,570	6,403	5,285	4,369	4,254	4,336	4,429	4,445	4,154
25-54	19,440	20,428	20,852	21,701	22,368	22,559	22,177	21,623	20,121
55-64	8,230	9,133	9,465	9,039	7,988	7,730	8,480	9,158	10,214
65-74	6,900	7,860	8,619	9,245	9,578	9,146	8,083	7,821	8,578

Figure 19. Percentage of population aged 65 years and over, by variant, 2018-2058, Tasman District

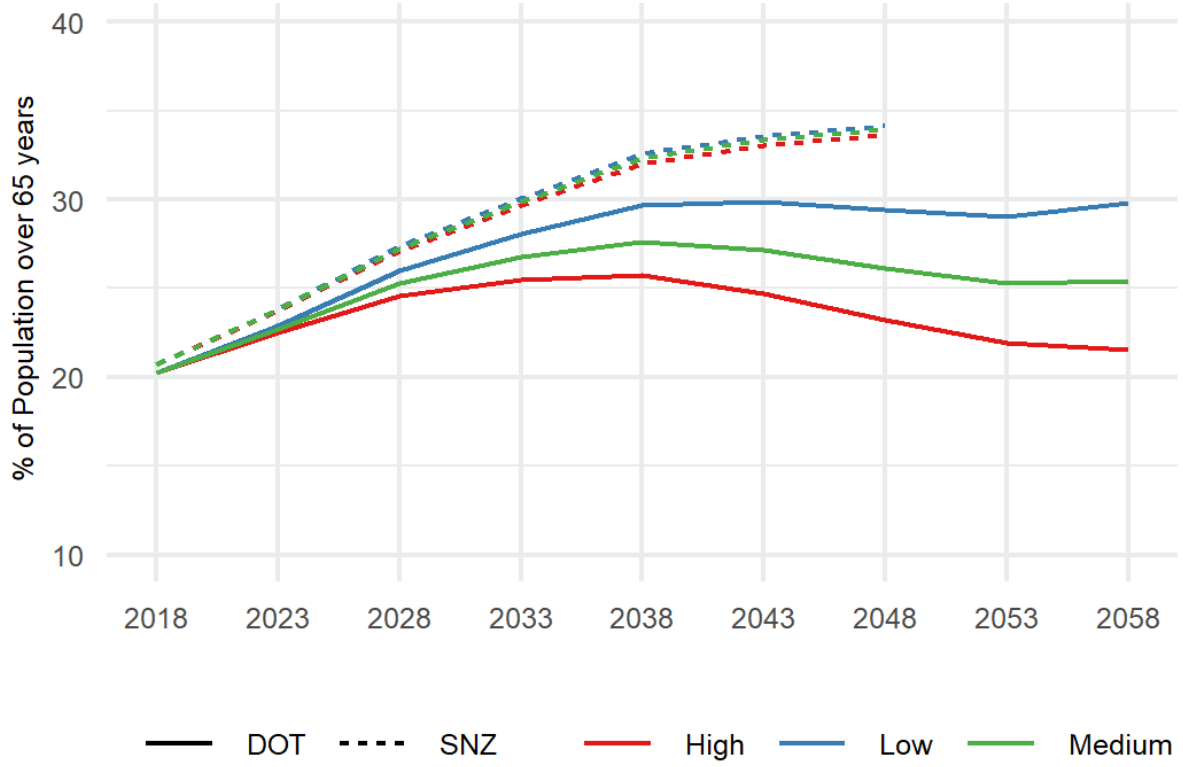
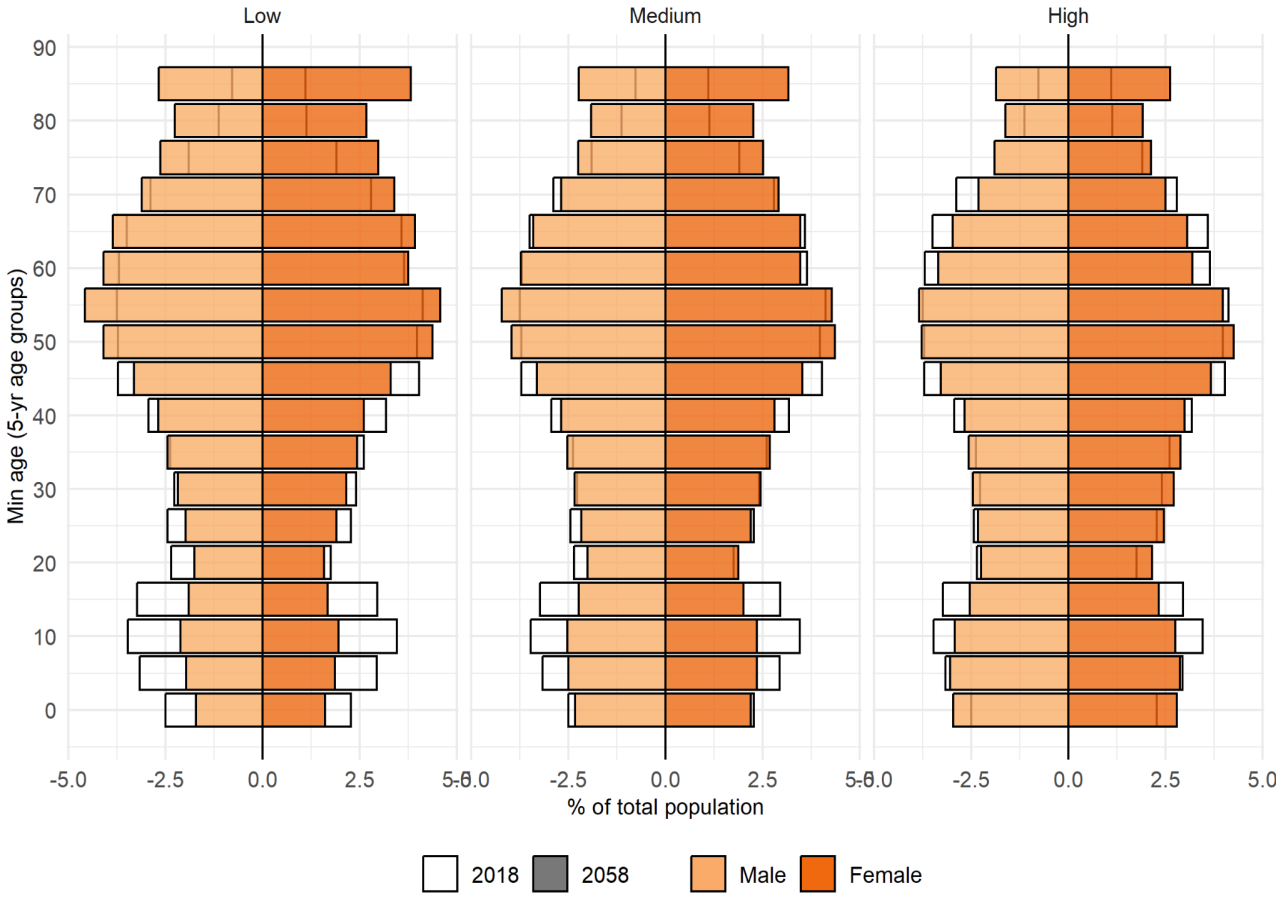


Table 18. Ageing indices & percent in key reproductive years, by variant, 2018-2058, Tasman District

	2018	2023	2028	2033	2038	2043	2048	2053	2058
% in Key Reproductive Ages (20-39 yrs)									
High	18.50	20.81	22.27	22.10	21.45	20.04	18.70	18.70	19.83
Medium	18.50	20.75	21.94	21.49	20.72	19.04	17.54	17.43	18.28
Low	18.50	20.68	21.58	20.82	19.90	17.91	16.24	15.98	16.47
% aged 65 years and older									
High	20.71	22.88	25.11	26.25	26.78	26.01	24.55	23.32	22.91
Medium	20.71	23.08	25.82	27.54	28.71	28.51	27.52	26.75	26.84
Low	20.71	23.29	26.57	28.90	30.78	31.23	30.79	30.59	31.33
Ratio 65+ years: 14 years and under									
High	1.16	1.42	1.58	1.54	1.50	1.42	1.35	1.32	1.32
Medium	1.16	1.46	1.70	1.74	1.78	1.76	1.76	1.81	1.88
Low	1.16	1.50	1.83	2.00	2.15	2.23	2.34	2.53	2.79

Another indicator that a population is reaching the limits of being able to sustain itself through natural increase is a reduction in the proportion of women in key reproductive (25-40 years) age groups (Table 18). This trend is evident in the population pyramid plots depicting the age-sex structure (proportions of the total population in each age/sex group) in 2018 and projected for 2058 (Figure 20). The 'bite' in the age structure over the main reproductive age groups changes little over time, even with high migration. The population age structure remains relatively similar by variant, with the proportion aged 65+ years projected to increase substantially. Proportions at the younger ages in 2058 are lowest under the low variant and highest under the high variant, driven primarily by differences in migration.

Figure 20. Population pyramids by age, sex and variant, 2018-2058, Tasman District



2058 population (orange shades) overlies the population pyramid for the 2018 population (clear/outline).

4.3 Dwelling and household projections

Projected household and dwelling numbers for Tasman District are presented in Tables 19 and 20. Under the medium projection, the number of households (occupied private dwellings) will need to increase 67.0% between 2018 and 2058 if the assumed future average household size is maintained (Table 19). The projected between-period change in household number is positive throughout the projection period for the Medium and High projection variants. Under the Low projection scenario, fewer households would be required to maintain the stated household size ratio in the 2050s.Average household size is projected to decline under all three variants, with the Medium projection indicating a decline from 2.54 in 2018 to 2.23 in 2058.

The projected total number of private dwellings follows a similar pattern, increasing by 67.9% between 2018 and 2058. Additional dwellings will be needed in each projection period to maintain the assumed dwelling ratio (average number of people per private dwelling) under the High and Medium variants. Under the Low variant, fewer dwellings will be required to maintain this ratio in the 2050s (rather than there being fewer dwellings *per se*).

4.3.1 Interpreting change in projected household and dwelling numbers

Increases and decreases in the projected numbers represent changes in housing demand over the projection period based on household size and dwelling ratio expectations. That is, projected numbers indicate if additional or fewer households and dwellings are required to sustain the expected ratios for household size and dwellings, and do not represent an actual increase (new builds) or decline (destruction, abandonment, or repurposing) in dwellings and households in the region. A projected increase in dwelling *numbers* signifies that additional dwellings will be required to maintain the stated people-to-dwellings *ratio*, while a decline in numbers signifies fewer dwellings will be required to maintain that ratio.

The differing proportions of occupied and unoccupied dwellings in each geographic area should be considered when interpreting projected dwelling numbers.

Household and dwelling numbers increase by a greater margin than population numbers, under all three variants, due primarily to population ageing. That is, population ageing typically sees a reduction in average household size, in part because there are fewer children per household, more people live as couples without children and, especially at older ages, more people live alone. Added to this is the growing tendency for people to have a second (holiday or weekend) home, especially at mid-older ages, which contributes to the relative increase in dwelling numbers. The latter is particularly important at SA2 level, where unoccupied dwelling rates vary dramatically.

Table 19. Household projections, by variant, 2018-2058, Tasman District

Tasman District

	2018	2023	2028	2033	2038	2043	2048	2053	2058
High									
Population	54,070	60,329	65,822	72,145	78,885	85,438	91,739	98,235	105,459
Avg. household size	2.54	2.43	2.43	2.43	2.33	2.43	2.43	2.43	2.33
Households (#)	21,329	24,796	27,053	29,652	33,827	35,116	37,706	40,376	45,222
Change (#)		3,467	2,257	2,599	4,175	1,289	2,590	2,670	4,846
Change %		16.25	9.10	9.61	14.08	3.81	7.38	7.08	12.00
Medium									
Population	54,070	59,569	63,071	66,901	70,541	73,488	75,747	77,635	79,526
Avg. household size	2.54	2.43	2.43	2.33	2.33	2.33	2.33	2.23	2.23
Households (#)	21,329	24,483	25,923	28,688	30,249	31,512	32,481	34,782	35,629
Change (#)		3,154	1,440	2,765	1,561	1,263	969	2,301	847
Change %		14.79	5.88	10.67	5.44	4.18	3.08	7.08	2.44
Low									
Population	54,070	58,811	60,406	61,995	63,046	63,215	62,589	61,442	60,051
Avg. household size	2.54	2.43	2.43	2.33	2.33	2.33	2.23	2.23	2.23
Households (#)	21,329	24,172	24,827	26,584	27,035	27,107	28,041	27,527	26,904
Change (#)		2,843	655	1,757	451	72	934	-514	-623
Change %		13.33	2.71	7.08	1.70	0.27	3.45	-1.83	-2.26

Table 20. Dwelling projections, by variant, 2018-2058, Tasman District

Tasman District

	2018	2023	2028	2033	2038	2043	2048	2053	2058
High									
Population	54,070	60,329	65,822	72,145	78,885	85,438	91,739	98,235	105,459
Dwelling ratio	2.28	2.190	2.190	2.190	2.100	2.190	2.190	2.190	2.100
Dwellings (#)	23,735	27,585	30,096	32,988	37,635	39,066	41,947	44,917	50,314
Change (#)		3,850	2,511	2,892	4,647	1,431	2,881	2,970	5,397
Change %		16.221	9.103	9.609	14.087	3.802	7.375	7.080	12.015
Medium									
Population	54,070	59,569	63,071	66,901	70,541	73,488	75,747	77,635	79,526
Dwelling ratio	2.28	2.190	2.190	2.100	2.100	2.100	2.100	2.000	2.000
Dwellings (#)	23,735	27,237	28,839	31,918	33,655	35,061	36,138	38,895	39,842
Change (#)		3,502	1,602	3,079	1,737	1,406	1,077	2,757	947
Change %		14.755	5.882	10.677	5.442	4.178	3.072	7.629	2.435
Low									
Population	54,070	58,811	60,406	61,995	63,046	63,215	62,589	61,442	60,051
Dwelling ratio	2.28	2.190	2.190	2.100	2.100	2.100	2.000	2.000	2.000
Dwellings (#)	23,735	26,891	27,620	29,577	30,079	30,159	31,357	30,782	30,085
Change (#)		3,156	729	1,957	502	80	1,198	-575	-697
Change %		13.297	2.711	7.085	1.697	0.266	3.972	-1.834	-2.264

4.4. SA2 Results Summary - Tasman District

Figure S2 (Appendix) shows the total projected population for each SA2 and a comparison with the Statistics NZ subnational projections for each area and variant.

Four SA2s from the Tasman district were removed from the analysis due to a 0 estimated population in 2018. These were the Oceanic Tasman Region, Inlets Golden Bay, Inlets Motueka, and Inlet Waimea West. Islands Tasman District had an estimated population of 70. We have included Islands Tasman District in the final data output for completeness, but this population is too small to produce reliable projections for individual analyses. For small populations with under 1,000 persons in 2018, these have been flagged in the data files as some caution should be used in interpreting their results.

The SA2s with the largest projected population in 2058 are Moutere Hills (n=6,962), Wakefield (n=5,192), Brightwater (n=4,636), Motueka North (n=4,615), and Motueka East (n = 3,918). In comparison, the largest SA2s in 2018 were Moutere Hills, Motueka East, Eastby Park, Motueka West, and Motueka North.

The five SA2s with the largest population growth (under the Medium variant) between 2018 and 2058 are Brightwater, Moutere Hills, Wakefield, Richmond South, and Motueka North. Of these, all but Motueka North (up 82.4%) are projected to approximately double over the projection period. Although the results for Richmond South should be treated with caution due its small population size.

Focussing on SA2s with populations of over 100 in 2058, three are projected to experience population declines between 2018-2058. These are Takaka Hills, Golden Bay / Mohua, and Richmond Central with projected declines of between 6.2% and 4.1%. Golden Downs is projected to have a modest increase of 3.4% respectively.

The SA2s with the highest projected proportion of people aged 65 years and over in 2058 are Fairose (43.4%), Richmond West (40.0%), Motueka East (38.6%), Templemore (38.1%), and Mapua (35.2%). Note however, that Mapua and Richmond West have populations under 1,000.

The youngest projected SA2s in 2058, i.e. those with the largest proportion of 0-14 year olds and a total population over 500, are Moutere Hills (23.2%), Lower Moutere (19.4%), Brightwater (18.6%), and Easby Park (16.3%).

Please refer to the data files for full SA2 level results.

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Appendix

Figure S1a. Total population by SA2 and variant, 2018-2058, Nelson City

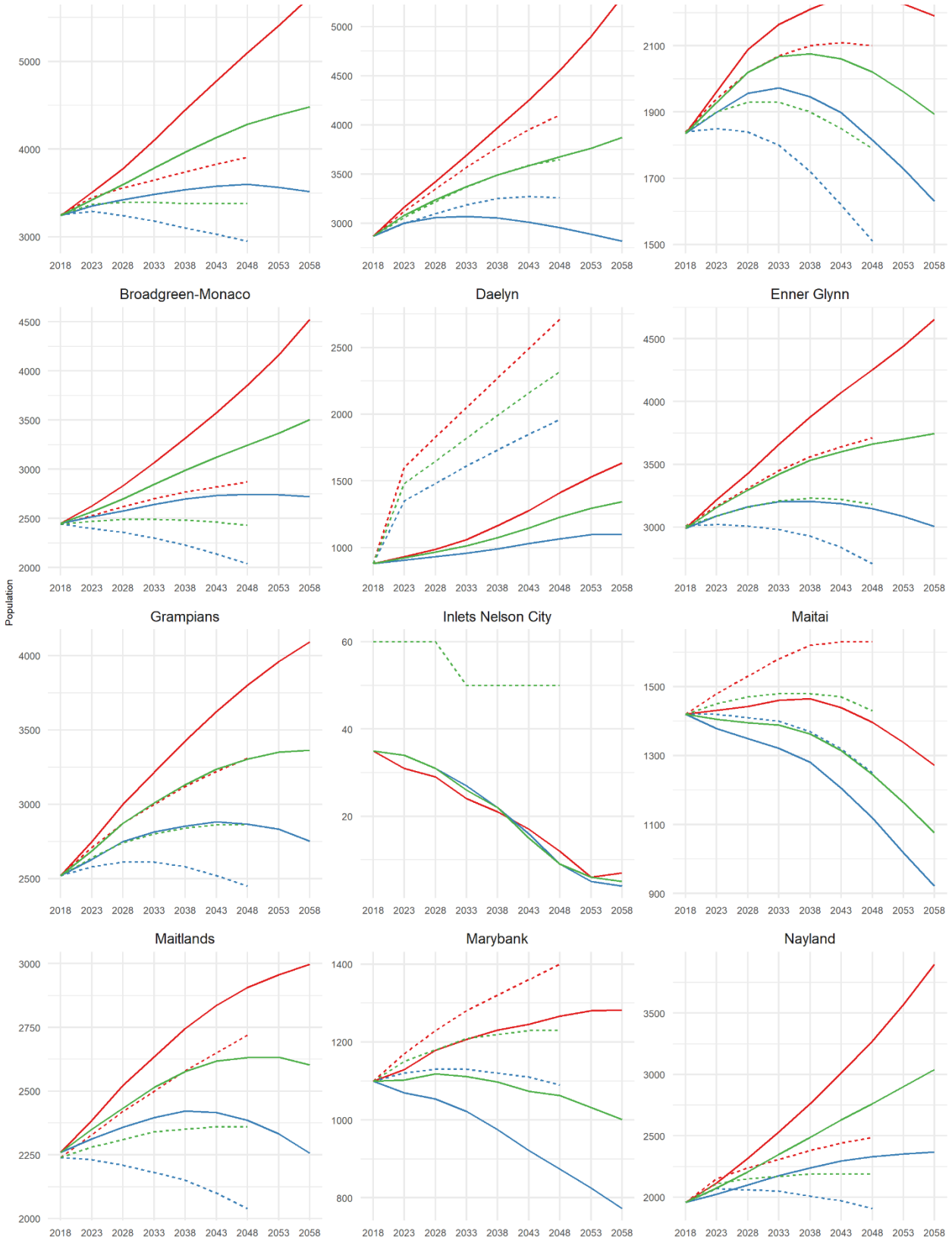

Figure S1a. Total population, SA2 - Nelson, cont 2

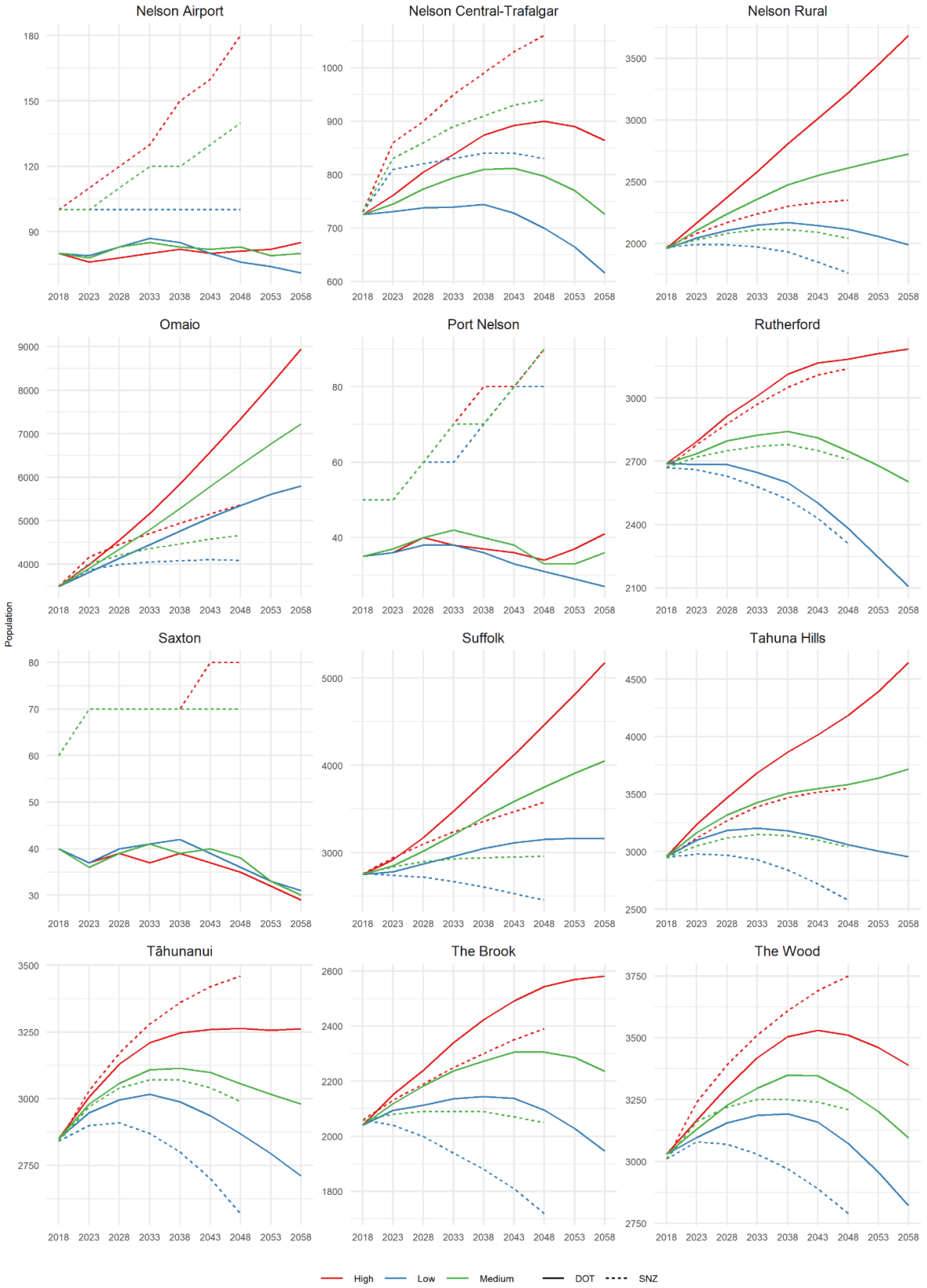

Figure S1a. Total population, SA2 - Nelson, cont 3

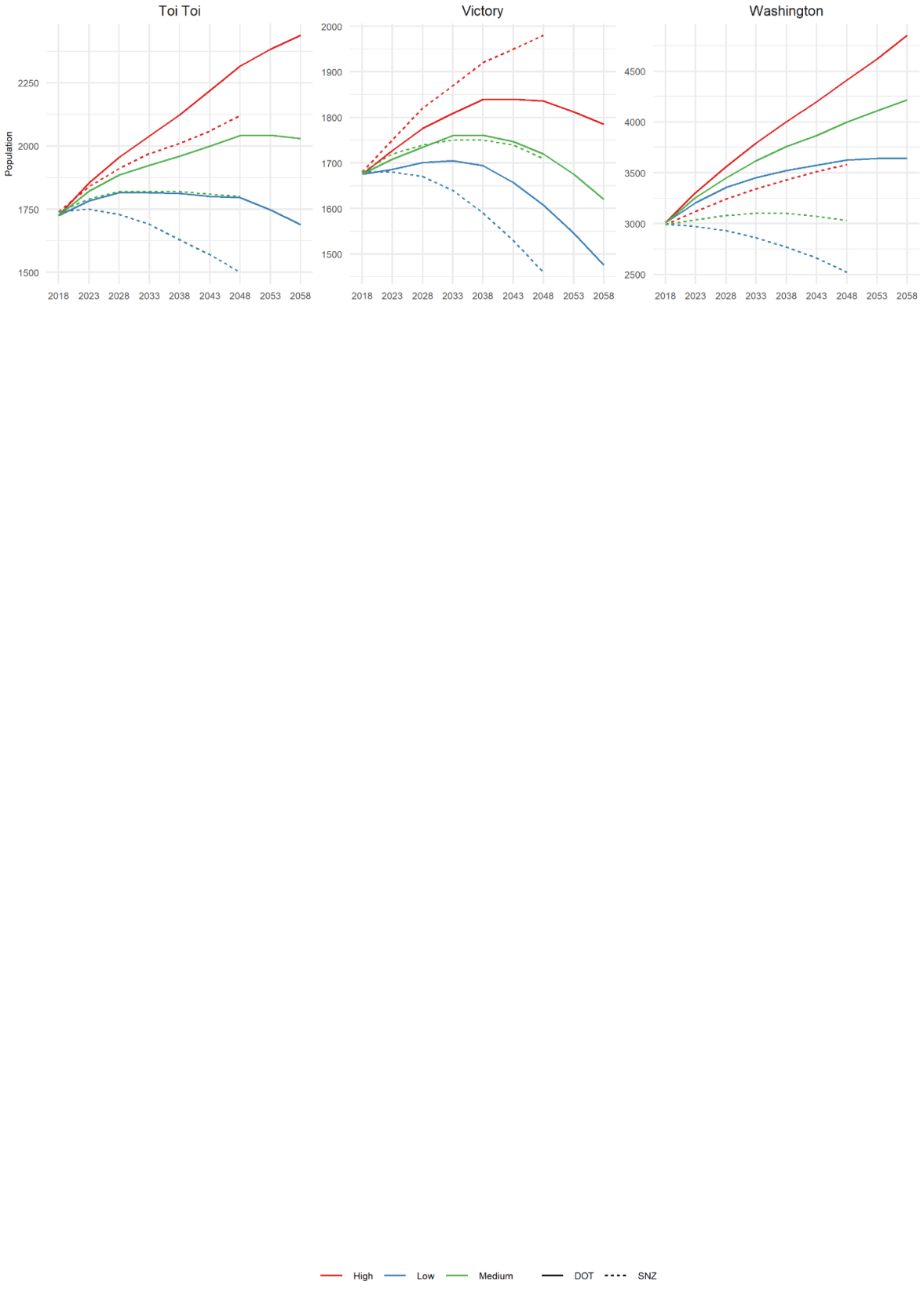

Figure S1b. Annualised population change for variant, by SA2 - Nelson City

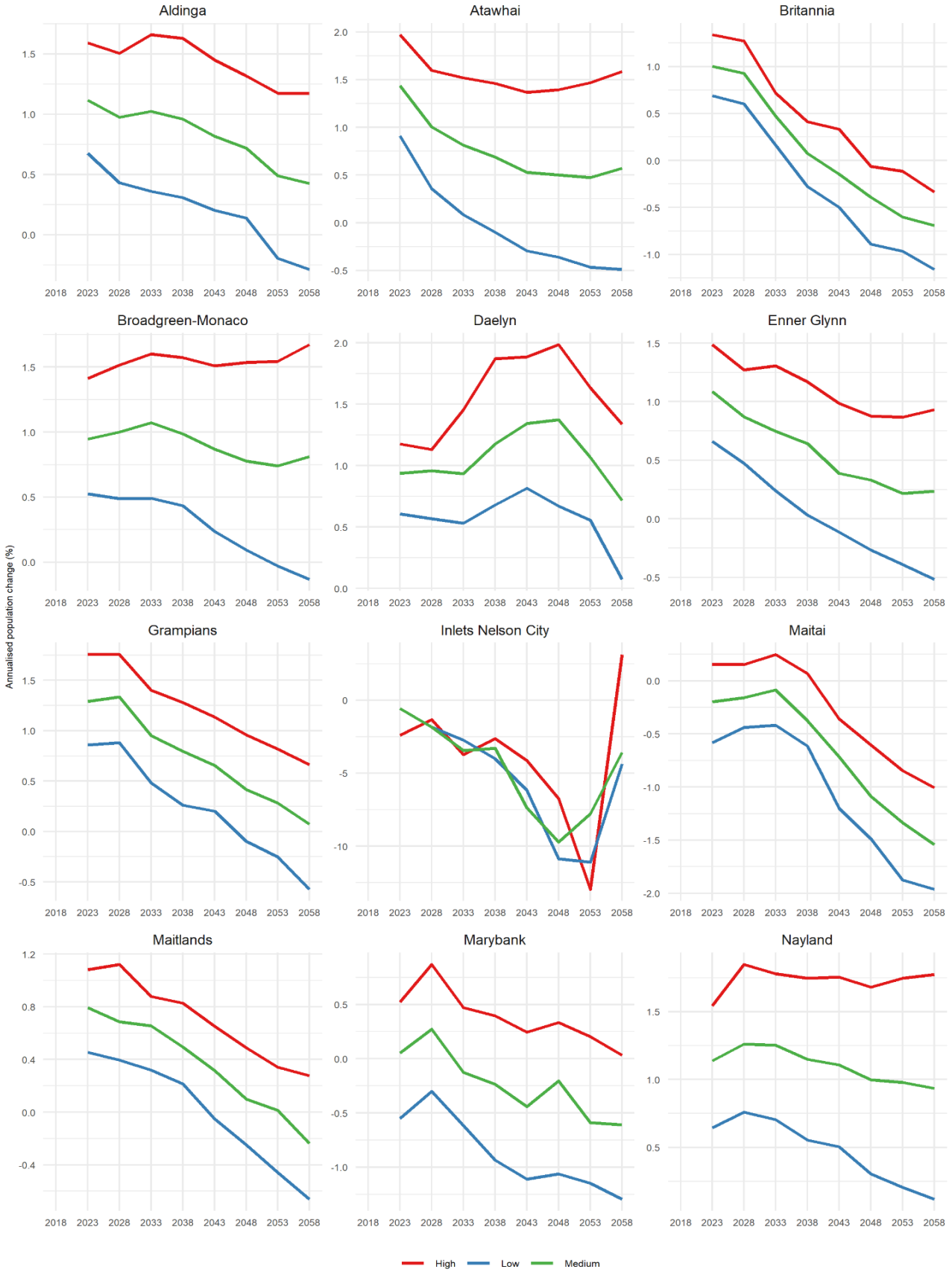

Figure S1b. Annualised population change, SA2 - Nelson, cont 2

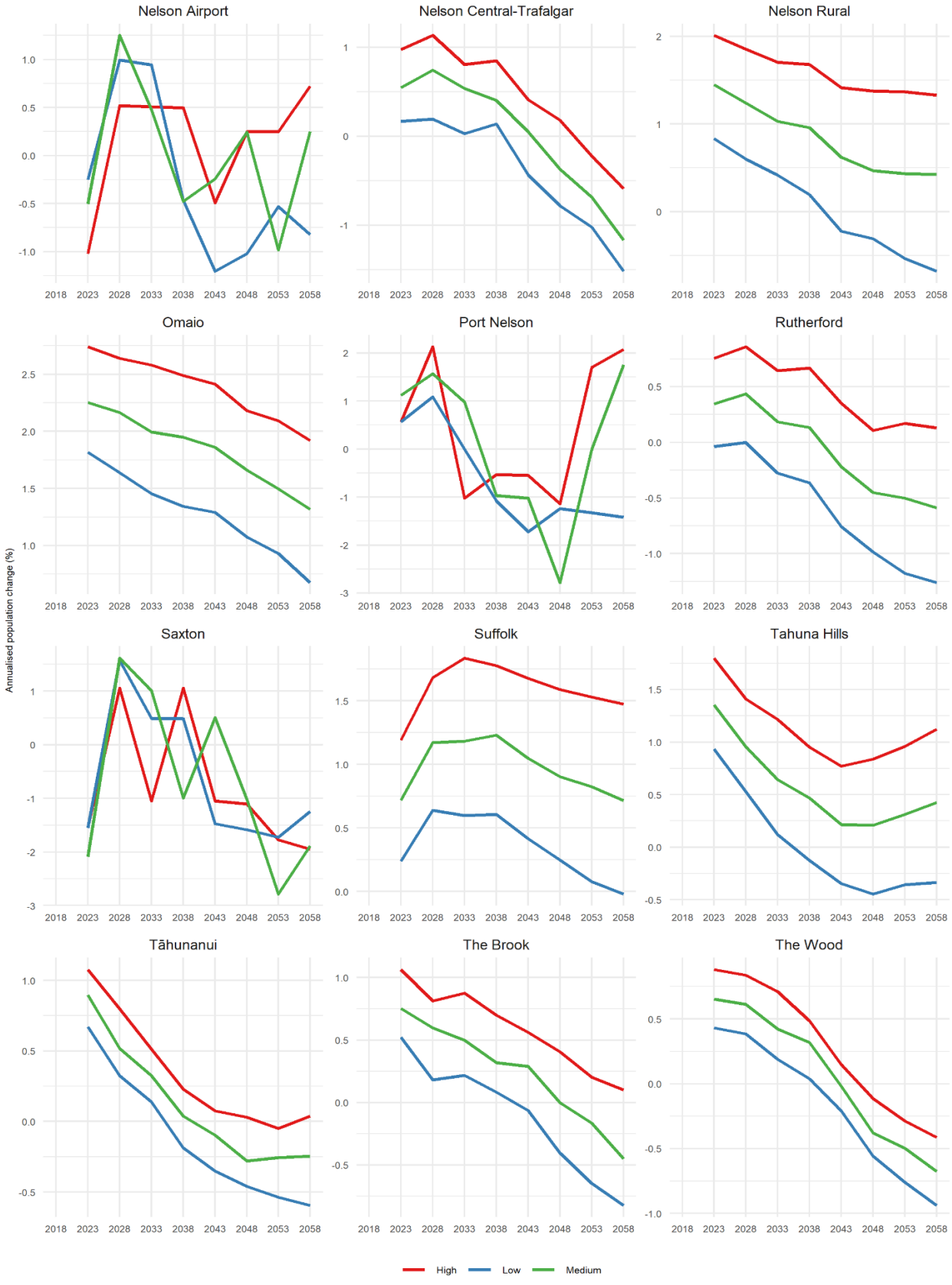

Figure S1b. Annualised population change, SA2 - Nelson, cont 3

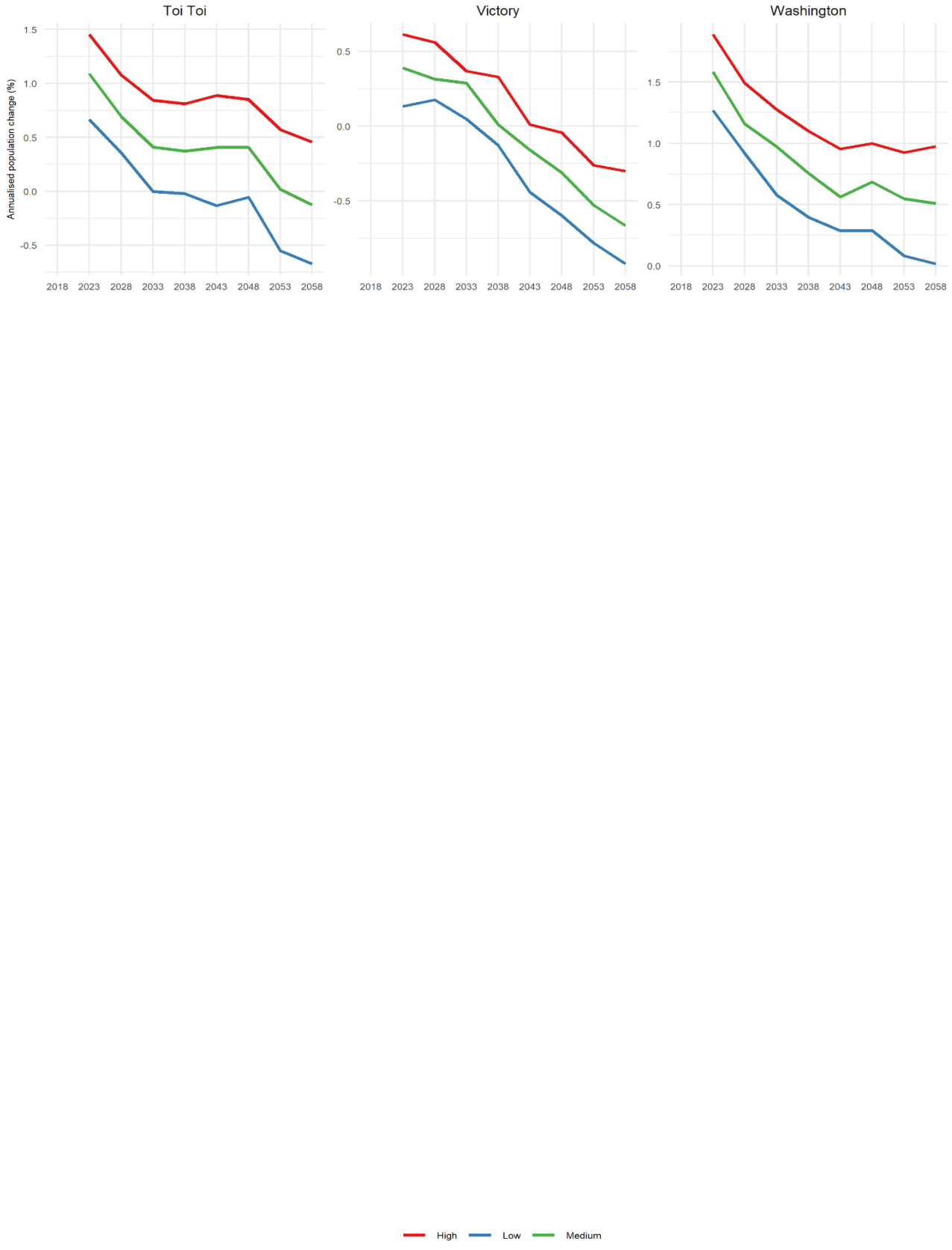

Figure S1c. Components of population change for Medium variant projections, by SA2 - Nelson City

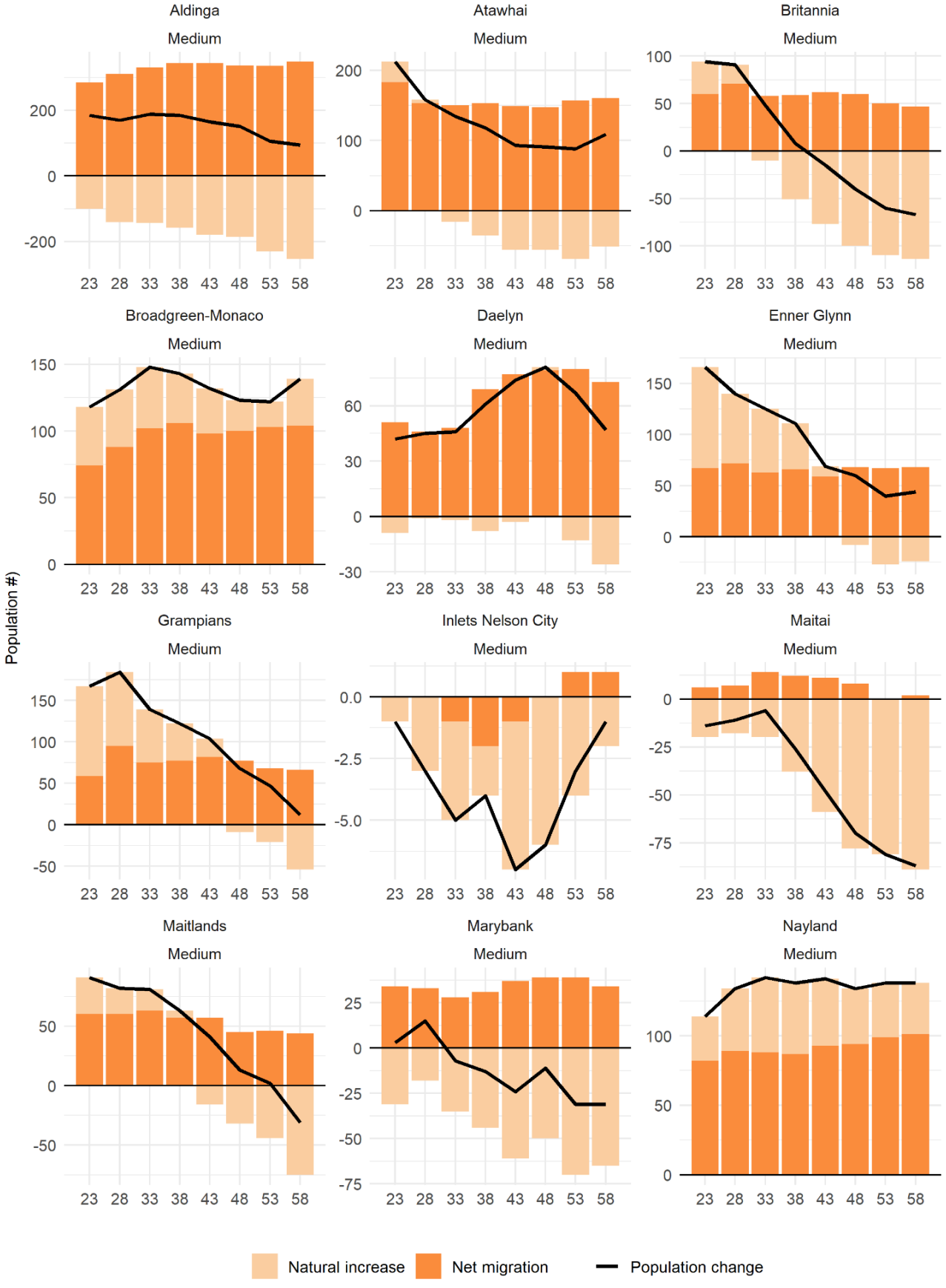

Figure S1c. Components of population change, SA2 - Nelson, cont 2

Figure S1c. Components of population change, SA2 - Nelson, cont 3

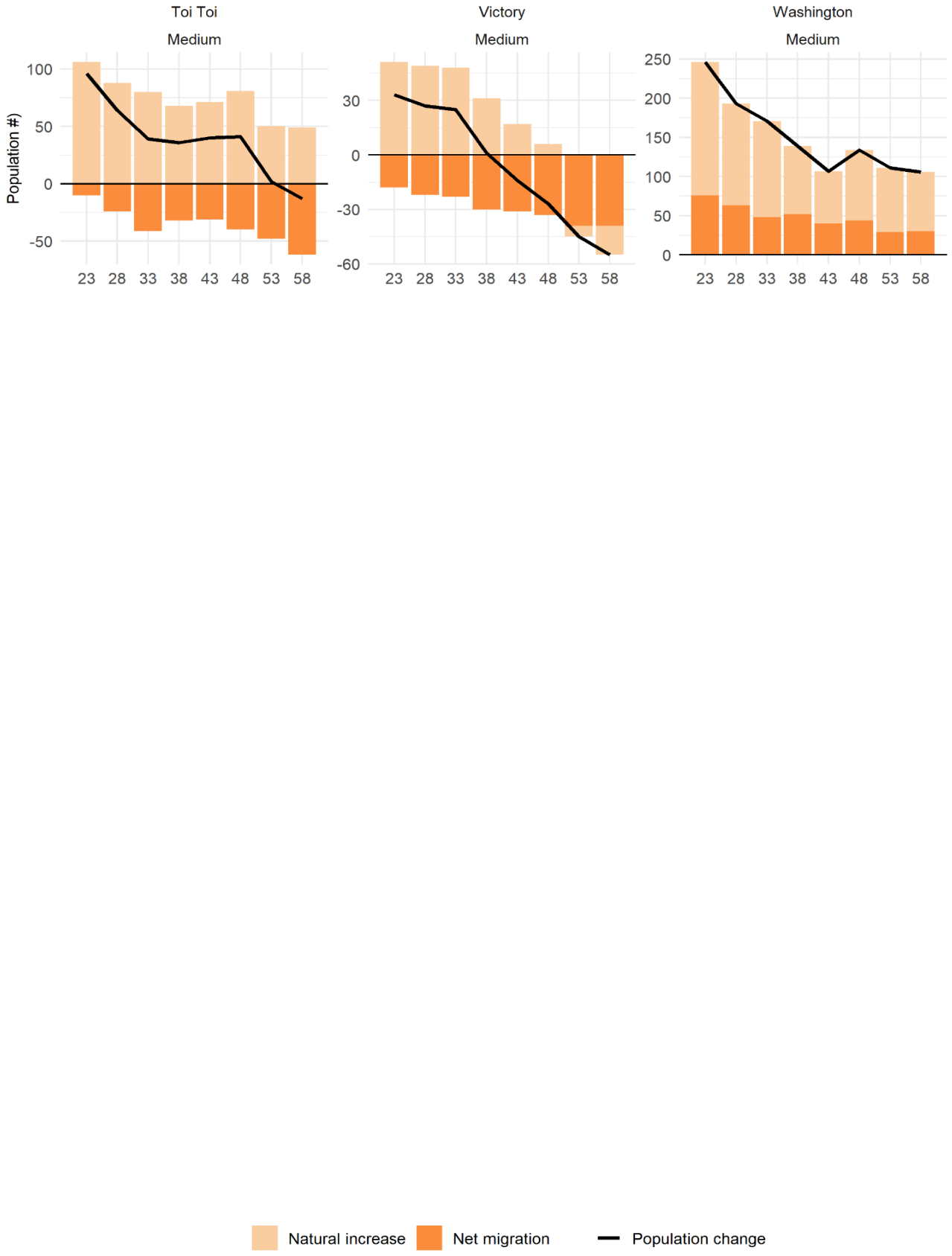

Figure S2. Total population by SA2 and variant, 2018-2058, Tasman District

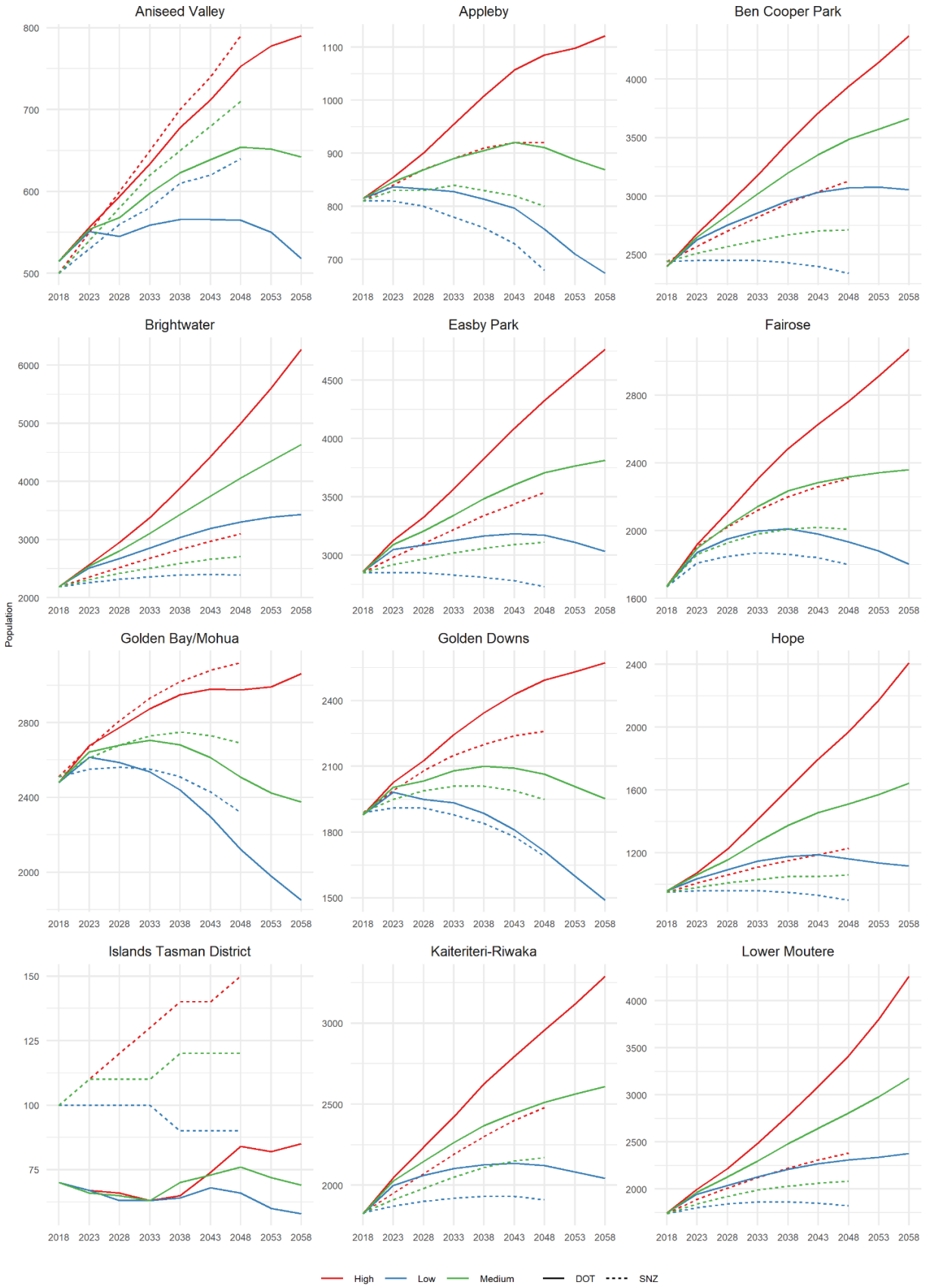

Figure S2. Total population, SA2 - Tasman, cont 2

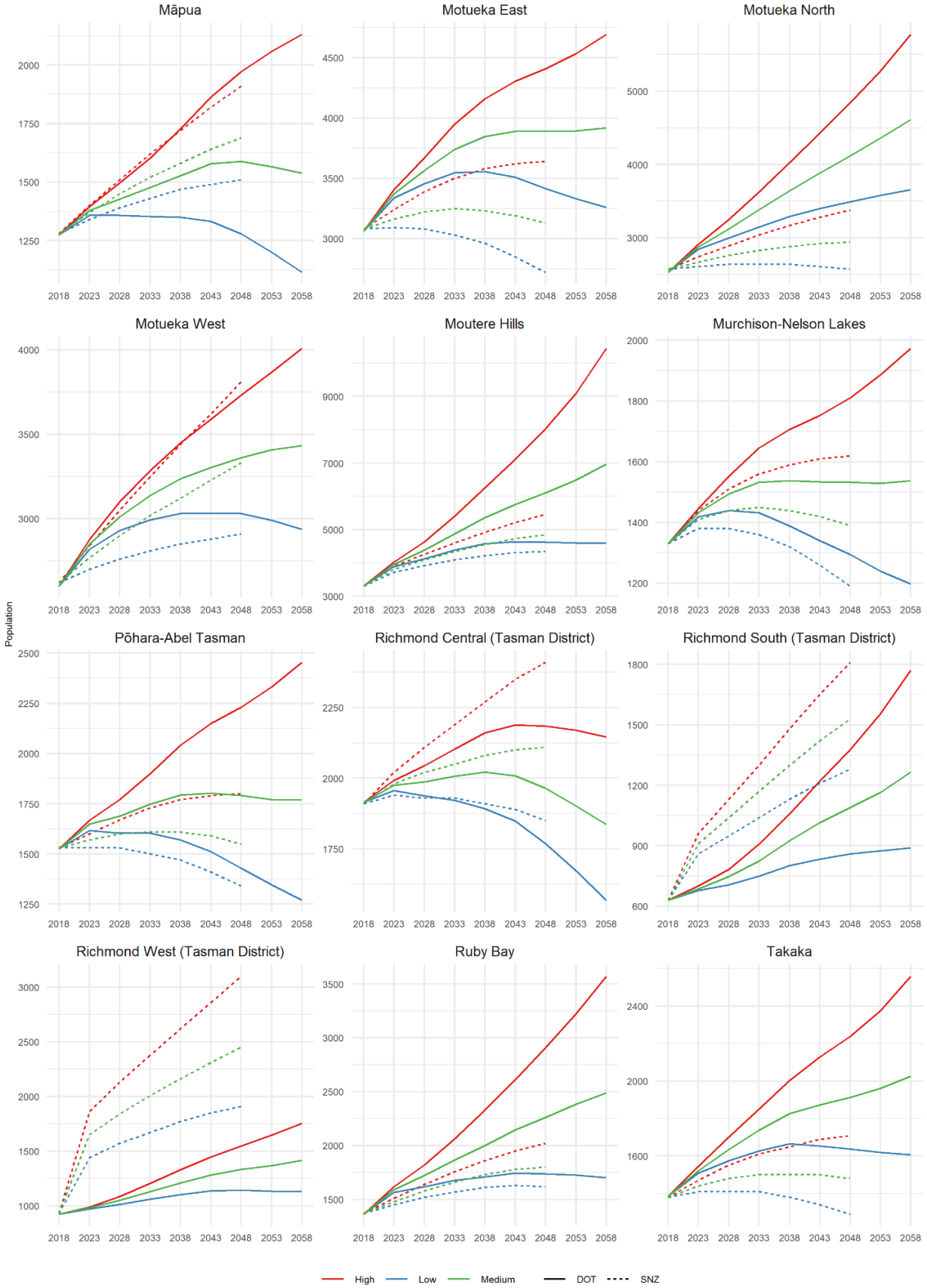

Figure S2. Total population, SA2 - Tasman, cont 3

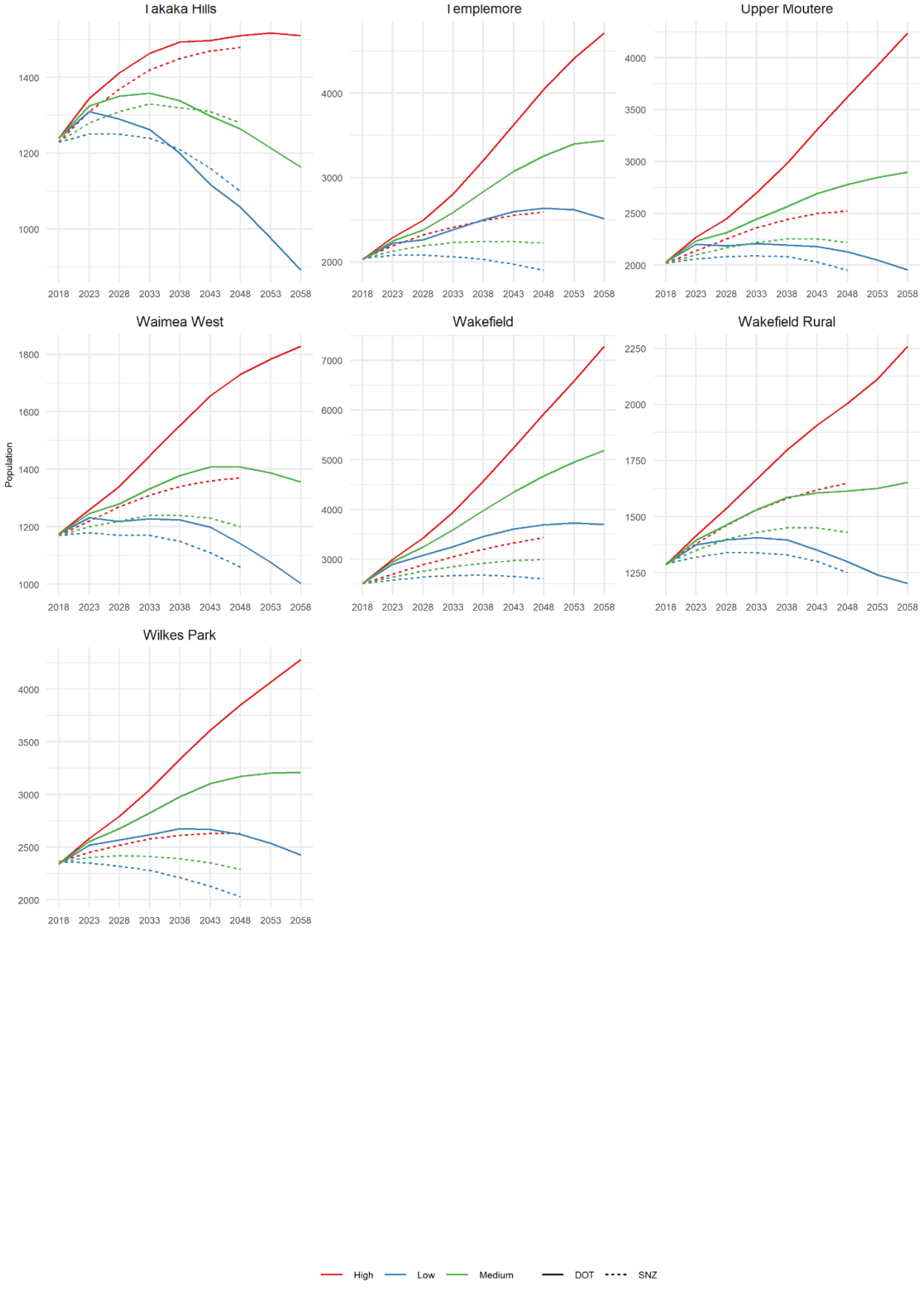

Figure S2b. Annualised population change for Medium variant projections, by SA2 - Tasman District

Figure S2b. Annualised population change, SA2 - Tasman, cont 2

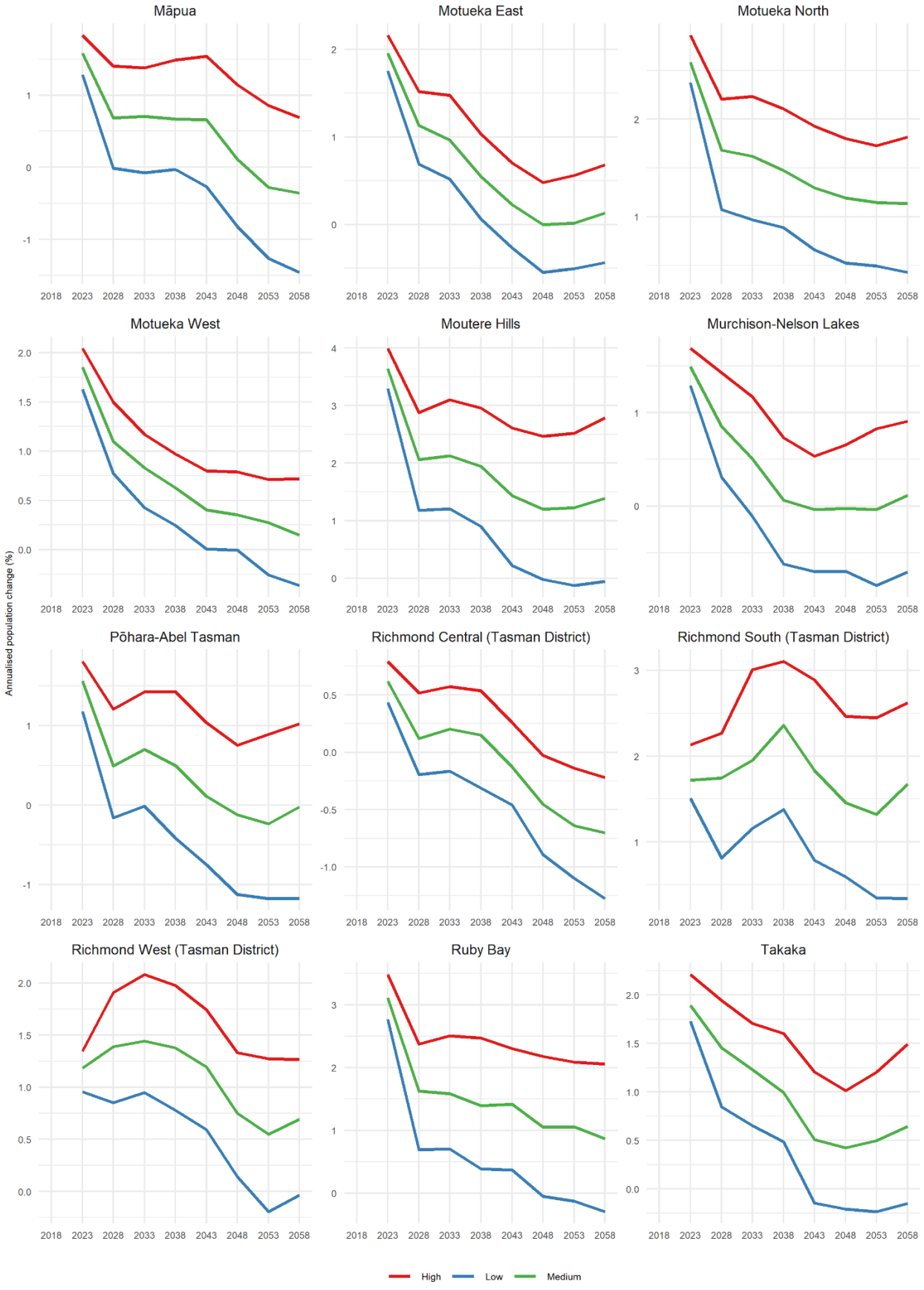

Figure S2b. Annualised population change, SA2 - Tasman, cont 3

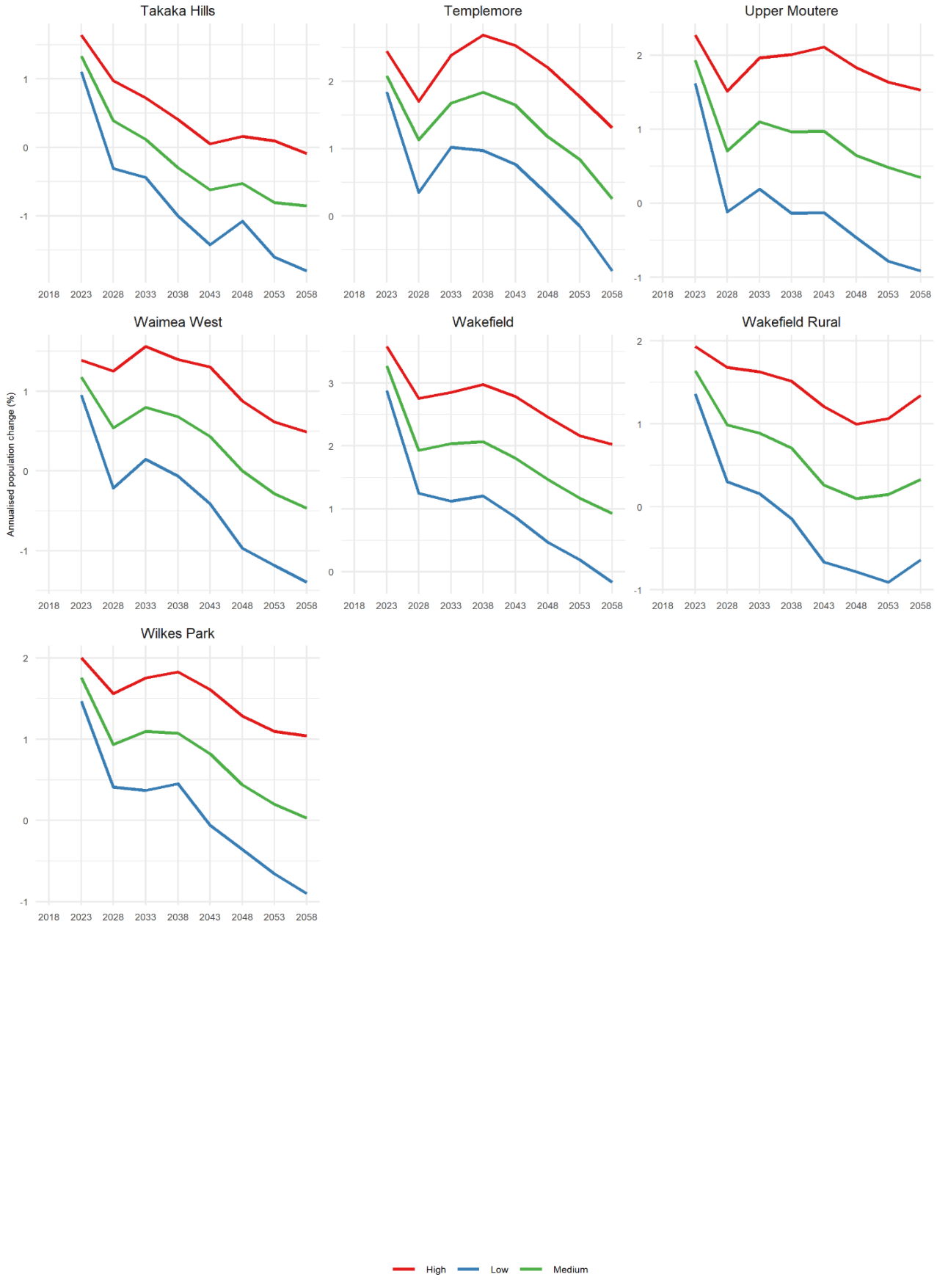

Figure S1c. Components of population change for Medium variant projections, by SA2 - Tasman District

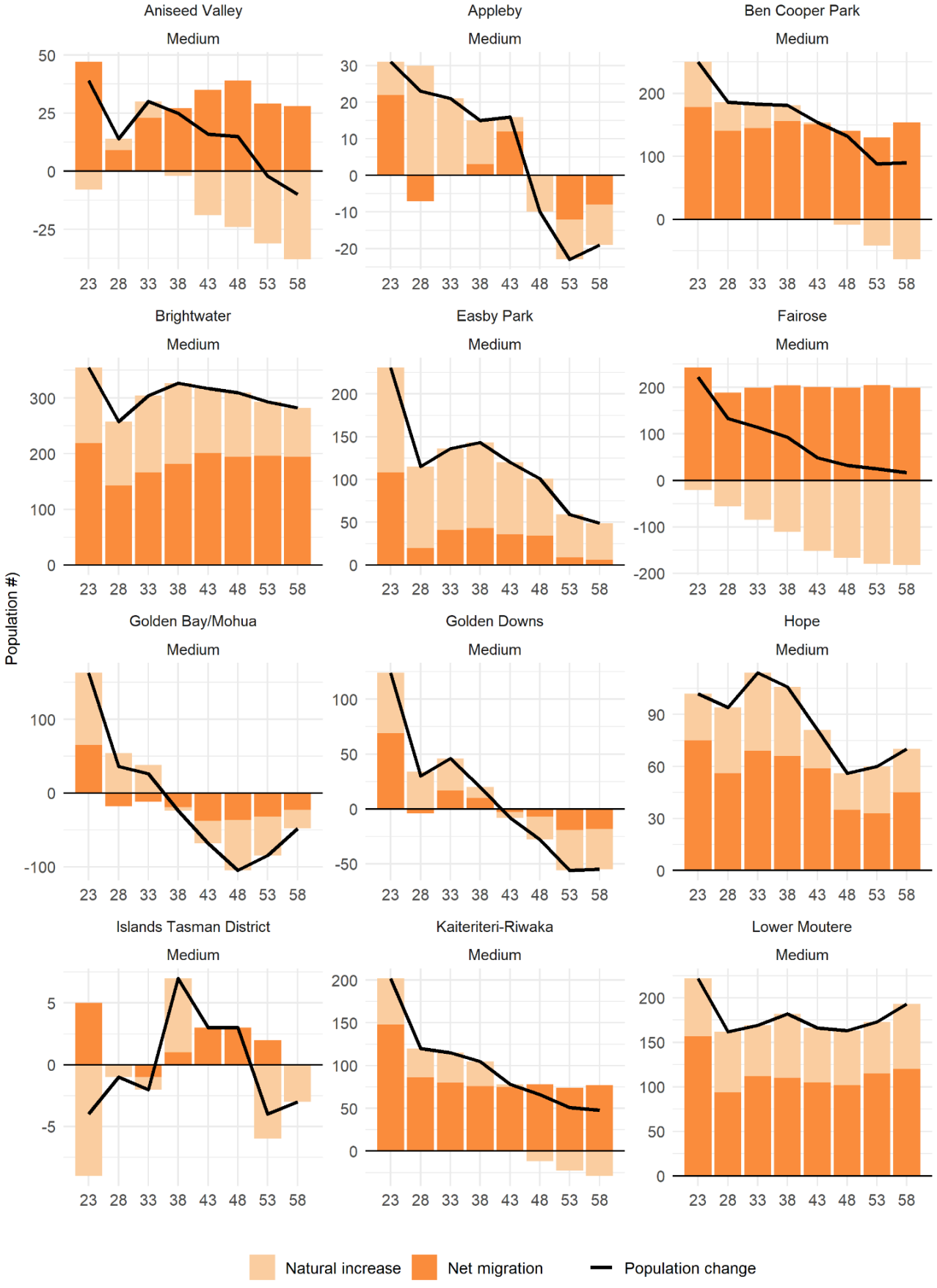

Figure S2c. Components of population change - SA2, Tasman, cont 2

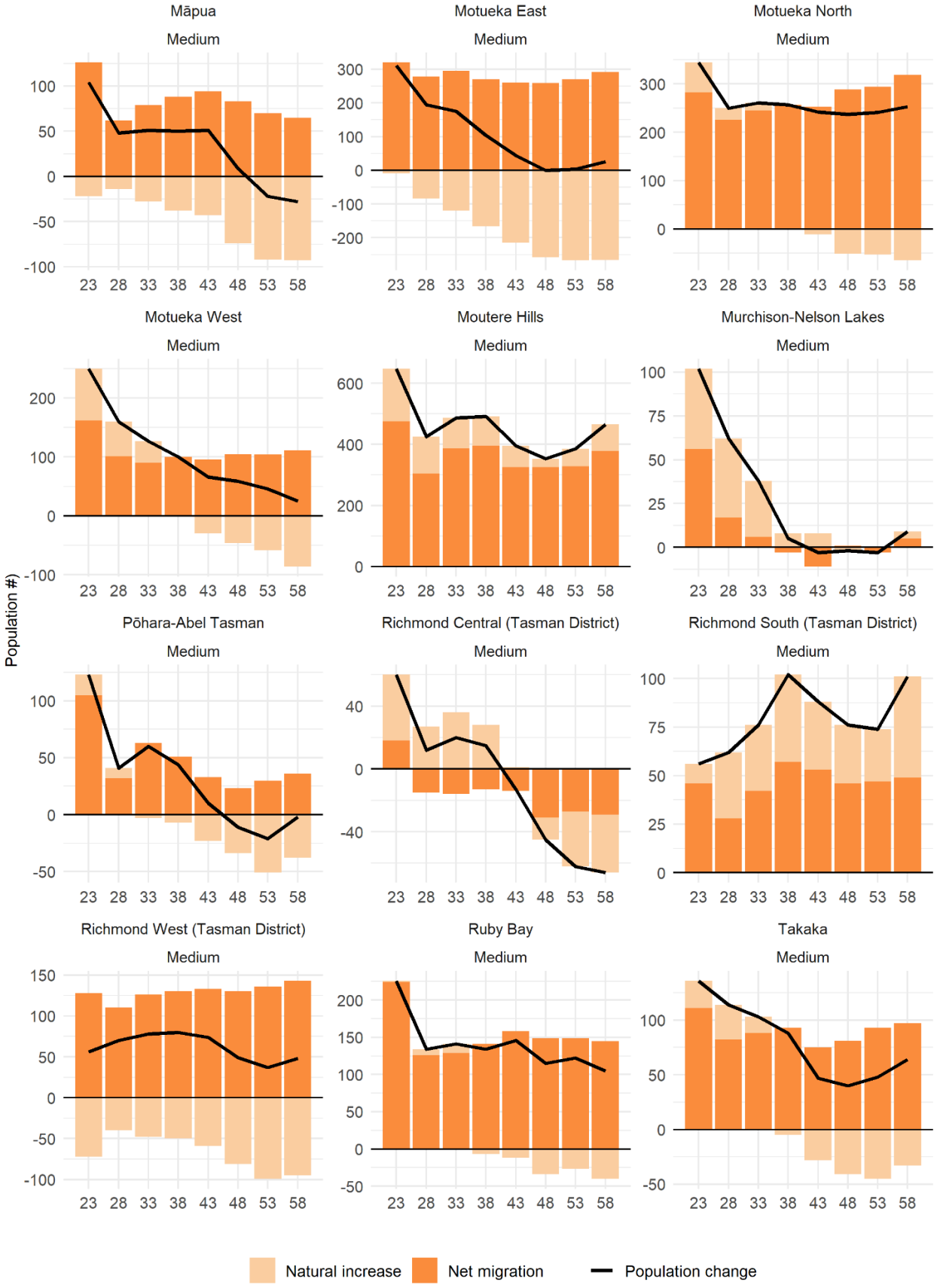

Figure S2c. Components of population change - SA2, Tasman, cont 3