Wellington City – Planning for Future Growth

Preliminary Baseline Scenario Development

Results and Methodology

Prepared for Wellington City Council
Prepared by Beca Limited

8 February 2019

Contents

Appendices

Revision History

Revision Nº	Prepared By	Description	Date
1	**Henry Carthew**	Draft for review	20/12/2018
2	**Henry Carthew**	Issued as final	22/01/2019
3	**Henry Carthew**	Inclusion of sea level rise in hazard scenario	08/02/2019

Document Acceptance

Action	Name	Signed	Date
Prepared by	**Henry Carthew**		08/02/2019
Reviewed by	Alex Fullerton		
Approved by	**Nathan Baker**		
on behalf of	Beca Limited		

1 Introduction

The Wellington City Council (WCC) is planning for up to 80,000 more residents over the next 30 years. A review of the Urban Growth Plan and the District Plan are underway to provide for this future growth. This is known as the 'Planning for Growth' project. This project responds to the National Policy Statement on Urban Development Capacity (NPS-UDC) which requires the Council to provide sufficient capacity to meet residential demand over the short, medium and long term.

Wellington City has historically maintained a compact urban form and this policy underpins the City's planning documents. The community also confirmed that this approach should be maintained into the future through the Our City Tomorrow engagement which was completed at the end of 2017.

Given the expected growth, and the range of other issues that must be considered (e.g. natural hazard risk, transport infrastructure), WCC is testing its current growth approach (which favours a compact urban form) against alternative approaches.

To highlight the differences in various growth management approaches, this report investigates, at a high-level, some extreme (i.e. deliberately contrasting) scenarios. This preliminary work will help develop baseline information that will allow WCC to develop some more refined scenarios for community engagement in 2019. That engagement will assist the public in understanding the different options for accommodating future growth and how this might impact on their community and the things they value.

The following scenarios were assessed:

Scenario	Summary Description
1. Baseline	Highlights where growth can realistically be accommodated under the current District Plan settings using numbers developed under Council's NPS-UDC model.
2. Suburban Centres	Demonstrates growth focussed around suburban centres. Uplift was based on proximity to sub-regional, district and town centres from the current District Plan.
3. Centralisation	Demonstrates growth focussed in the CBD and inner residential areas.
4. Natural Hazards	Demonstrates growth focussed away from areas at risk of natural hazards and towards town centres and high frequency bus routes.
5. Greenfield	Demonstrates growth focussed in possible future greenfields and the existing and proposed greenfield areas of Upper Stebbings Valley and Lincolnshire Farm in North Wellington.

Population was distributed in these scenarios based on where additional population can be feasibly accommodated (i.e. zoned and serviced by infrastructure).

At this preliminary stage, only growth within the Wellington City boundary has been considered in isolation. Consideration of wider growth trends in the regional context is being undertaken separately to this report.

It is expected that the preferred approach to growth will draw the most desirable aspects of these extreme scenarios into a blended, balanced and more nuanced scenario. The next steps will be to assess the relative benefits of each of these scenarios and explore which elements to take forward for further investigation. This will be the subject of further work in early 2019.

Methodology and assumptions relating to these scenarios have been included in Appendices A and B respectively.

2 Results

A summary of the results of the analysis is included below for each scenario. In each scenario, two different growth projections were tested – the medium projection (increase of 50,000 people) and the high projection (increase of 80,000 people). All scenarios build on the baseline scenario (Scenario 1) and include this population growth.

Results of each scenario are mapped into high-level typologies based on density. Figure 1 describes the high-level zone types and the different typologies expected in each zone. Map 1 on the following page shows the suburbs and the higher level areas which have been used to summarise the results of each scenario. These areas are the 'sectors' which have been used for the NPS-UDC modelling.

Figure 1: Visualisation of high level zones and typologies

Map 1: Wellington City Suburbs and NPS Zones

2.1 Scenario 1: Baseline

Overview

This scenario highlights where growth can realistically be accommodated under the current District Plan settings using numbers developed under Council's NPS-UDC model.

The residential capacity model developed by Council in response to the NPS-UDC is a multi-step development feasibility model that assesses the city parcel by parcel. Each parcel is compared for an infill development, if possible, but also a comprehensive redevelopment. And each parcel is developed for a range of typologies, as appropriate according to the zoning, including standalone housing, terrace housing or an apartment.

In this scenario only those realisable developments have been included. That is parcels that have been assessed as being economically feasible under the NPS-UDC model with a rate reduction to account for the fact that not everything that is economically feasible will be developed.

Two greenfield areas have also been included – Upper Stebbings and Lincolnshire Farm in North Wellington. Both areas were identified as future growth areas in the Northern Growth Management Framework adopted by Council in 2003. Lincolnshire Farm is already identified in the District Plan as a greenfield area, with an accompanying structure plan. A structure plan for Upper Stebbings is currently being developed and will require a District Plan change to enable development in this area.

Ohariu, Makara and Makara Beach were not modelled as part of the NPS-UDC and so have not been included in the scenario.

Results

The results of this modelling has been summarised into areas in the table below and shown in Map 2.

Area	2018 Population Estimate*	Estimated Population growth 2018-48*	Realisable Population Estimate**	Shortfall
East Wellington	36,630	6,460	3,980	2,480
Inner Wellington	35,150	13,190	2,102	11,088
North Wellington	49,900	20,970	13,317	7,653
South Wellington	23,000	4,910	684	4,226
Wellington Central/CBD	21,560	17,800	15,499	2,300
West Wellington	49,910	7,260	8,591	-
Total	216,150	70,590	44,173	27,747

*Based on Forecast ID 2018 High projection. **Based on NPS-UDC modelling

These results indicate that under the current district plan including existing and proposed greenfields Wellington City could accommodate an additional 44,000 people. However, population projections for Wellington City predict an increase of between 50 and 80,000 people over the next thirty years, therefore this shortfall in population will need to be accommodated through modification to the WCC District Plan. The shortfall by area is illustrated in Map 3. None of the scenarios modelled consider infrastructure capacity. An assessment of this will be undertaken as part of the next phase of multi criteria analysis work.

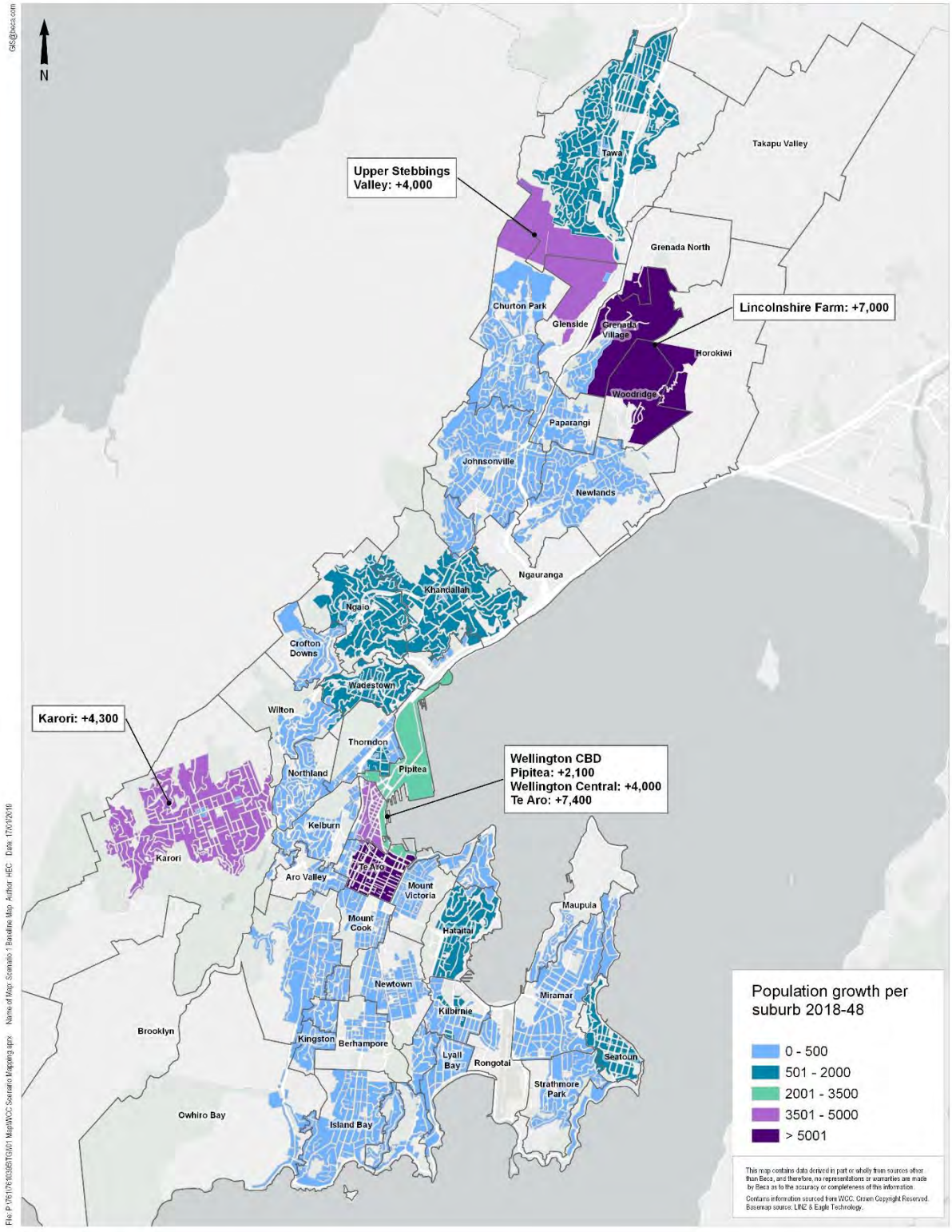
Preliminary Scenario 1:
Baseline

This scenario demonstrates the realisable population under current district plan provisions using NPS-UDC modelling over a 30 year time period to 2048.

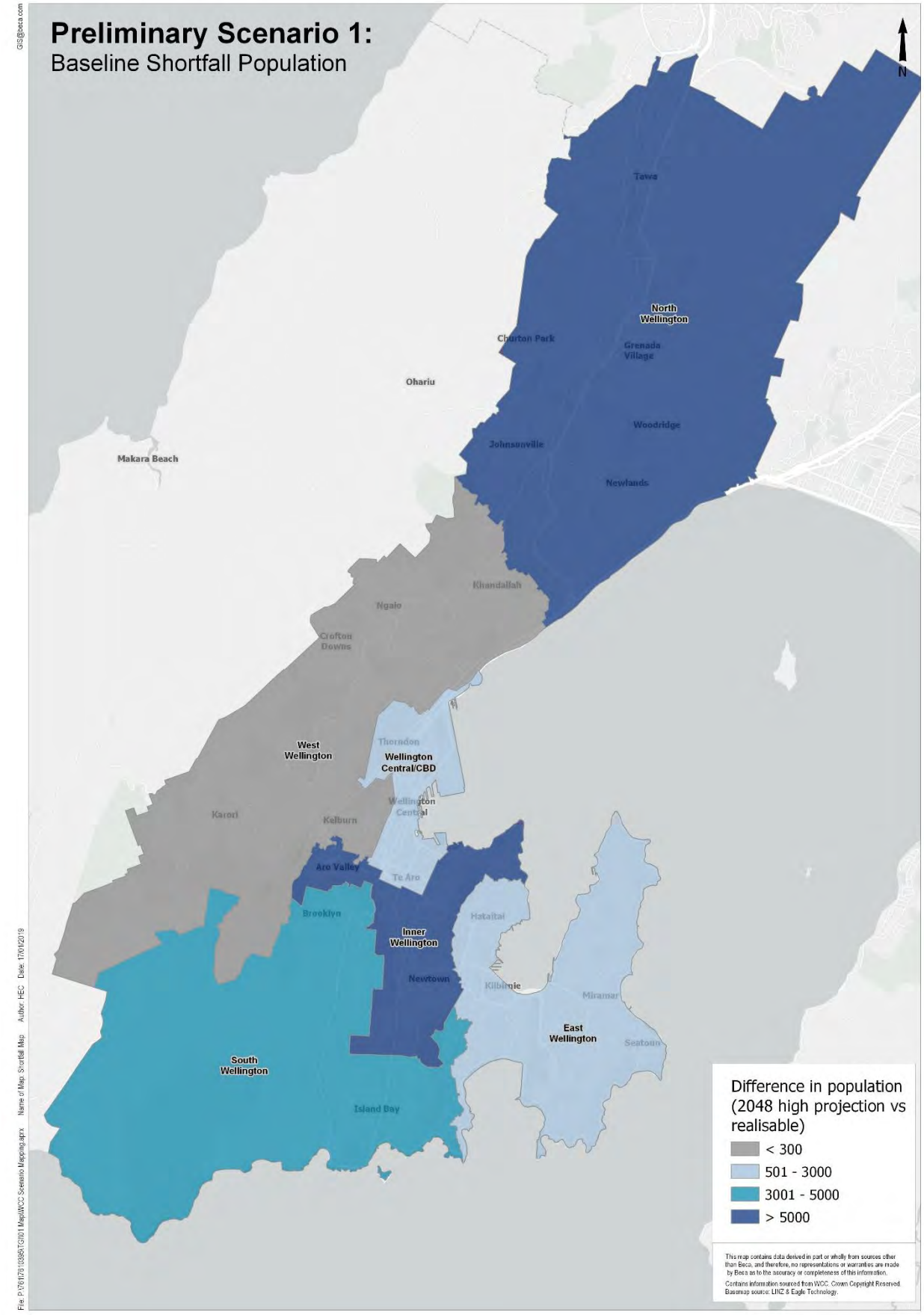
Infill and redevelopment population: **33,000**

Greenfield population: **11,000**

Total additional population accommodated: **44,000**



Map 2: Baseline Population Growth



Map 3: Population Shortfall

2.2 Scenario 2: Suburban Centres

Overview

This scenario demonstrates growth focussed around suburban centres. Growth was distributed based on proximity to sub-regional, district and town centres from the current District Plan.

Results

Figure 2 highlights the population difference by typologies between the baseline scenario and the 50,000 and 80,000 Suburban Centres scenarios modelled.

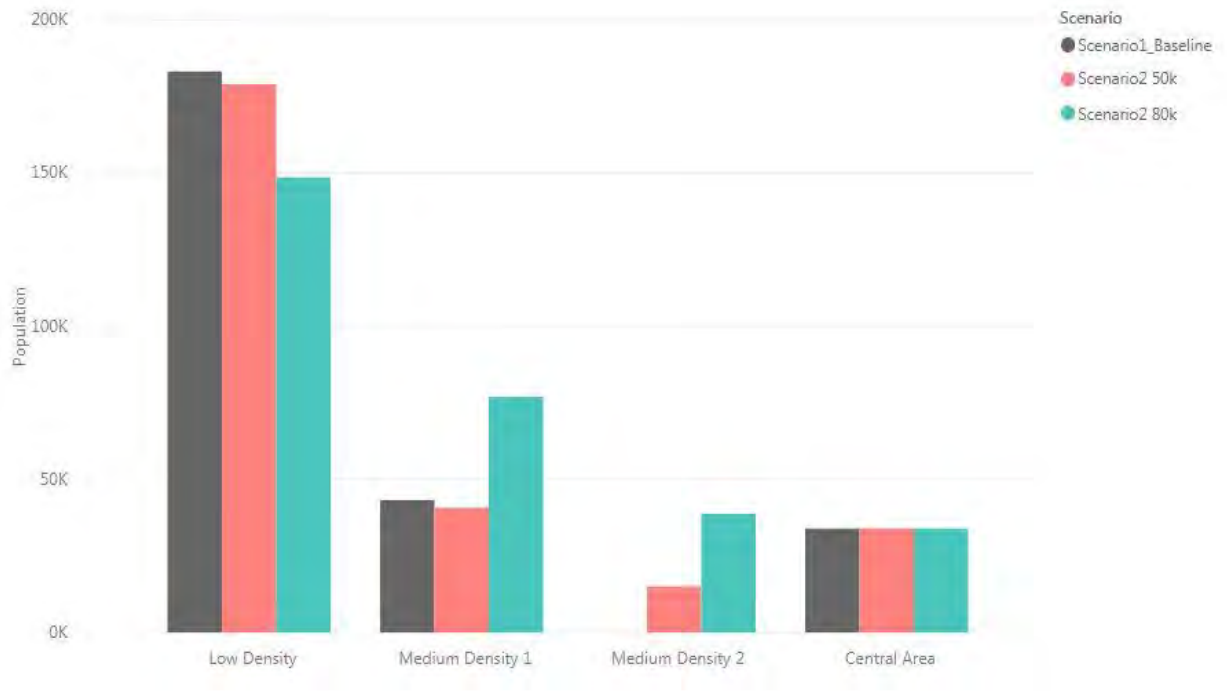
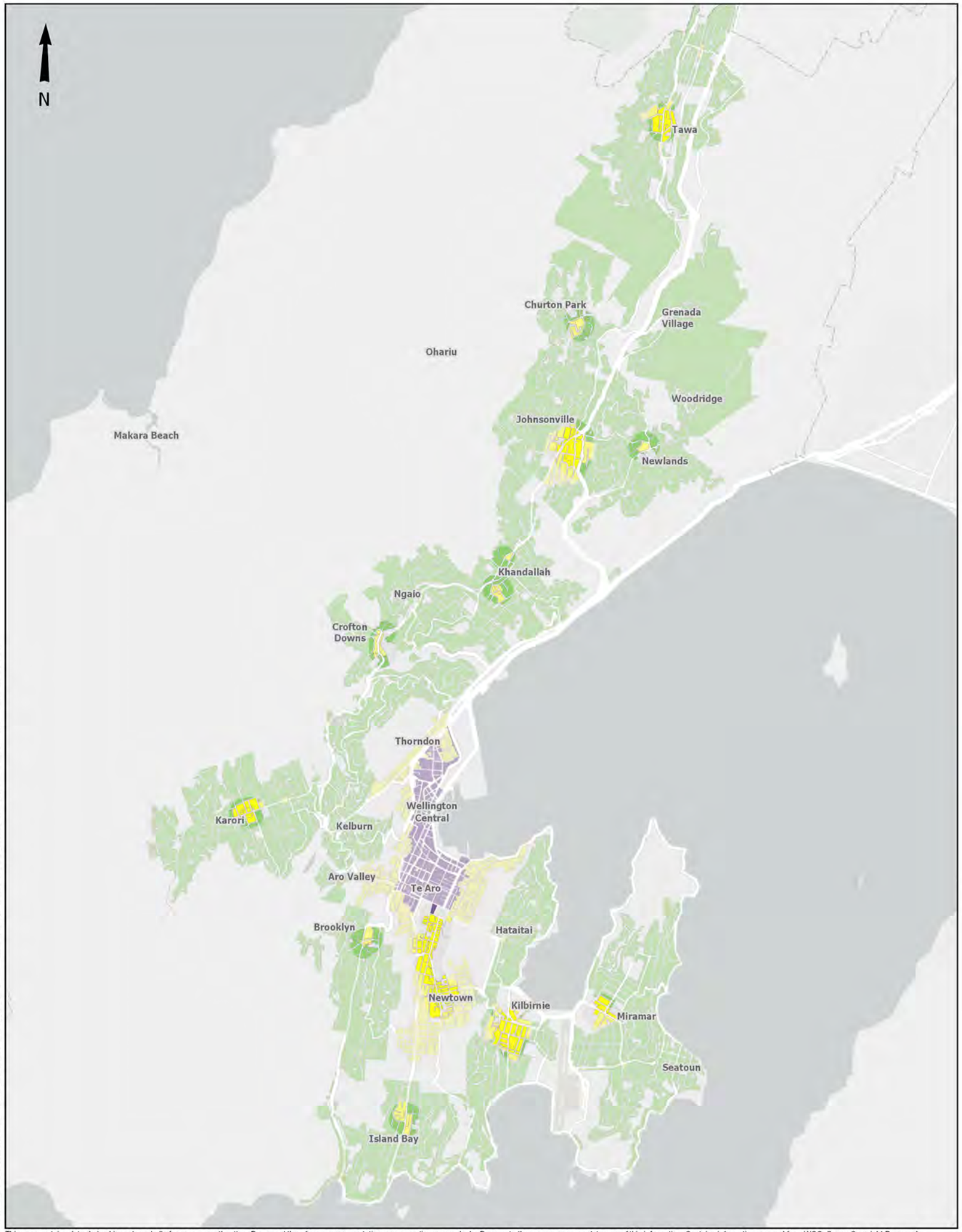


Figure 2: Suburban Centres Scenario – Typology and Population Changes

Ohariu, Makara and Makara Beach were not affected by this scenario and therefore have not been included.

The 50,000 scenario would see some more medium density housing in Newtown, Karori and Miramar with other suburban centres remaining largely unchanged. The 80,000 scenario illustrates a significant amount more medium density housing with some suburbs undergoing substantial change – in particular Karori, Miramar, Johnsonville and Tawa where the housing typology allows for low rise apartments (up to 4 floors). The preliminary changes for this scenario are highlighted on the following page.



Preliminary Scenario 2:
Suburban Centres

This scenario demonstrates growth focussed around suburban centres.

Infill, redevelopment and greenfields: 44,000

New population around centres: 6,000

Total additional population accommodated: **50,000**

Estimated population by typology

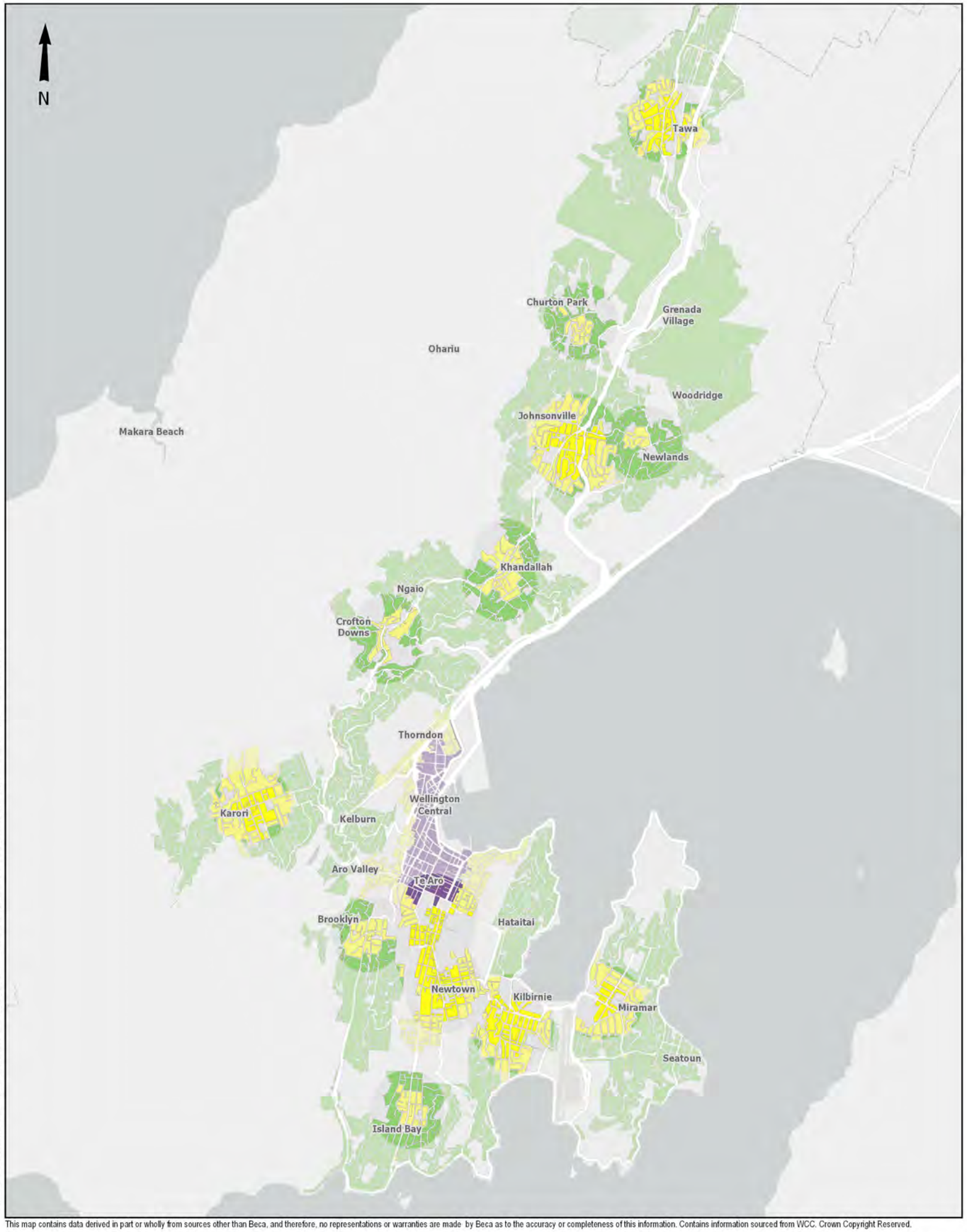
Typology	Total Population 2048
Low Density	177,660
Medium Density 1	40,396
Medium Density 2	14,914
High Density 1	-
Central Area	33,663
Total	266,633

Estimated population by area

Area	Current Population	Baseline scenario growth	Scenario 2 Growth	Total Population 2048
East Wellington	36,637	3,980	853	41,470
Inner Wellington	35,152	2,102	884	38,138
North Wellington	49,904	13,317	2,578	65,799
South Wellington	22,990	684	503	24,177
Wellington Central/CBD	21,578	15,499	581	37,658
West Wellington	49,893	8,591	908	59,392
Total	216,154	44,173	6,306	266,633

Low Density
Medium Density 1
Medium Density 2
Central Area
Other

File: P:\761\76103951\GIS\01 Map\WCC Scenario Mapping.aprx Name of Map: Scenario 2 Polycentric 50k Map Author: HEC Date: 18/01/2019



Preliminary Scenario 2:
Suburban Centres

This scenario demonstrates growth focussed around suburban centres.

Infill, redevelopment and greenfields: **44,000**

New population around centres: **36,000**

Total additional population accommodated: **80,000**

Estimated population by typology

Typology	Total Population 2048
Low Density	147,613
Medium Density 1	76,376
Medium Density 2	38,448
High Density 1	-
Central Area	33,688
Total	296,125

Estimated population by area

Area	Current Population	Baseline scenario growth	Scenario 2 Growth	Total Population 2048
East Wellington	36,637	3,980	5,400	46,017
Inner Wellington	35,152	2,102	1,918	39,172
North Wellington	49,904	13,317	14,060	77,281
South Wellington	22,990	684	3,876	27,550
Wellington Central/CBD	21,578	15,499	725	37,802
West Wellington	49,893	8,591	9,819	68,303
Total	216,154	44,173	35,798	296,125

Low Density
Medium Density 1
Medium Density 2
Central Area
Other

File: P:\76\17610395\TGN\01 Map\WCC Scenario Mapping.aprx Name of Map: Scenario 2 Polycentric 80k Map Author: HEC Date: 18/01/2019

2.3 Scenario 3: Centralisation

Overview

This scenario demonstrates growth focussed in the CBD and inner residential areas.

Results

Figure 3 highlights the population difference by typologies between the baseline scenario and the 50,000 and 80,000 centralisation scenarios modelled.

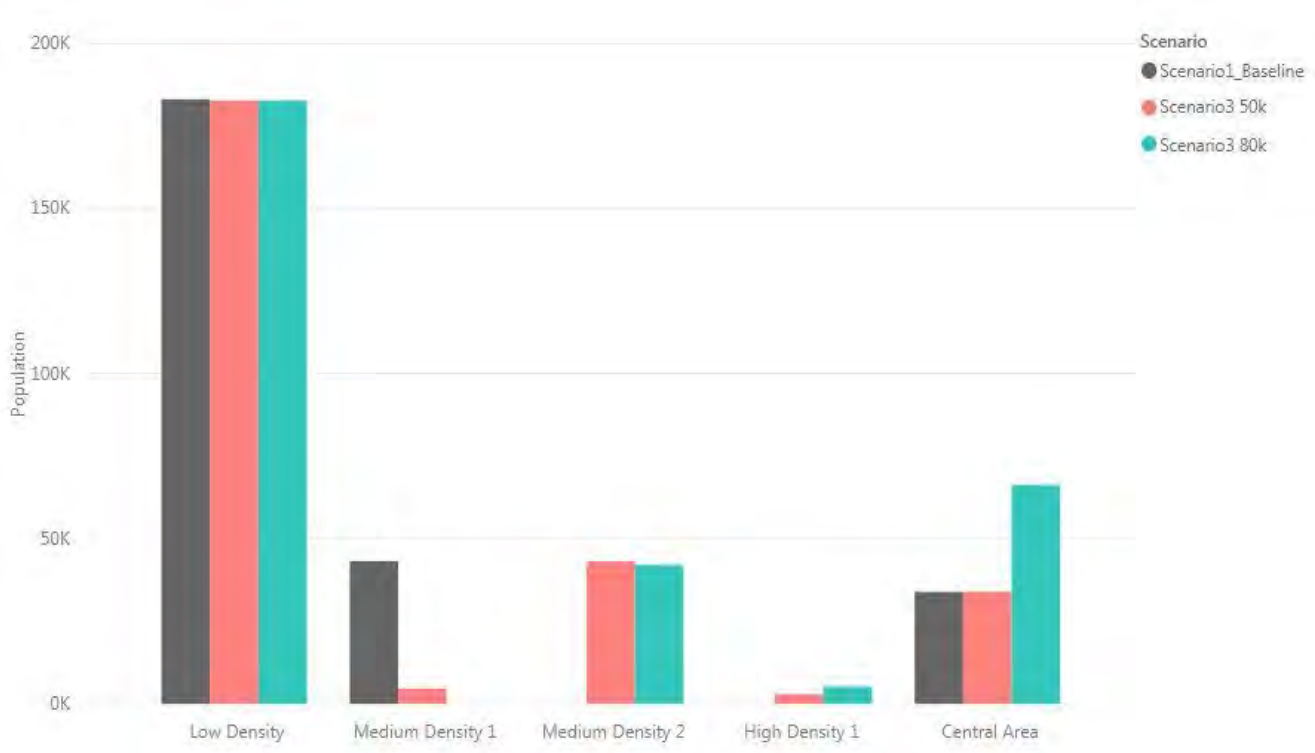
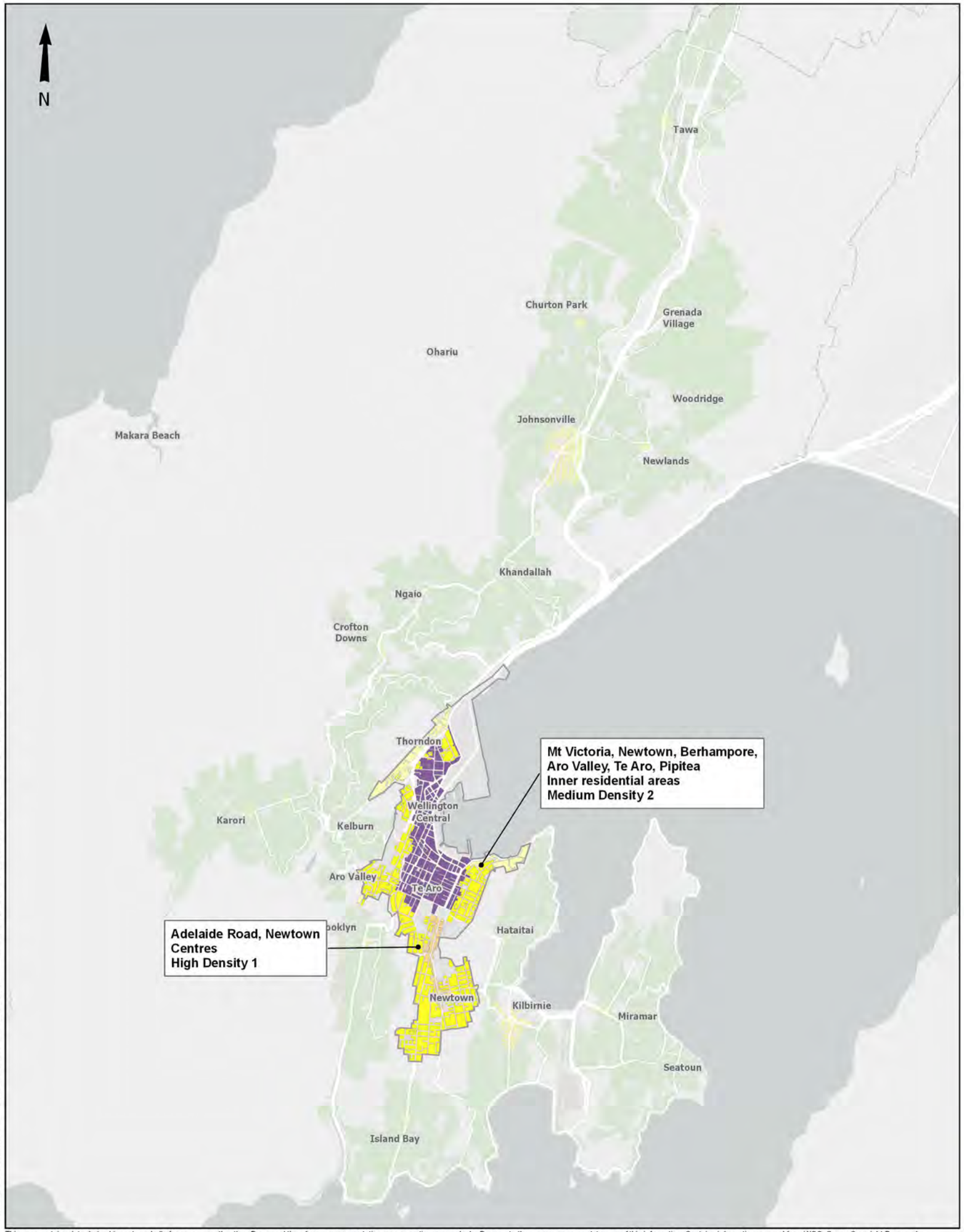


Figure 3: Centralisation Scenario - Typology and Population Changes

Ohariu, Makara and Makara Beach were not affected by this scenario and therefore have not been included.

The 50,000 scenario sees a general increase in medium density in the inner residential areas changing from current provisions to allow for some low-rise apartments (up to 4 floors) and medium rise apartments (up to 6 floors) in Newtown and along Adelaide Road. The 80,000 scenario increases the number of medium density areas in the inner residential zone, expands the area of mid- rise apartments in Newtown and Adelaide Road and adds a significant number of high rise apartments in the CBD. A small amount of population is accommodated in the inner residential areas with a significant increase in population in the Wellington CBD. The preliminary changes for this scenario are highlighted on the following page.



File: P:\761\761039\5TGIS\01 Map\WCC Scenario Mapping.aprx Name of Map: Scenario 3 Centralisation 50k Author: HEC Date: 18/01/2019

Preliminary Scenario 3:
Centralisation

This scenario demonstrates growth focussed in the CBD and inner residential areas.

Infill, redevelopment and greenfields: **44,000**

New population in inner residential areas: **6,000**

Total additional population accommodated: **50,000**

Estimated population by typology

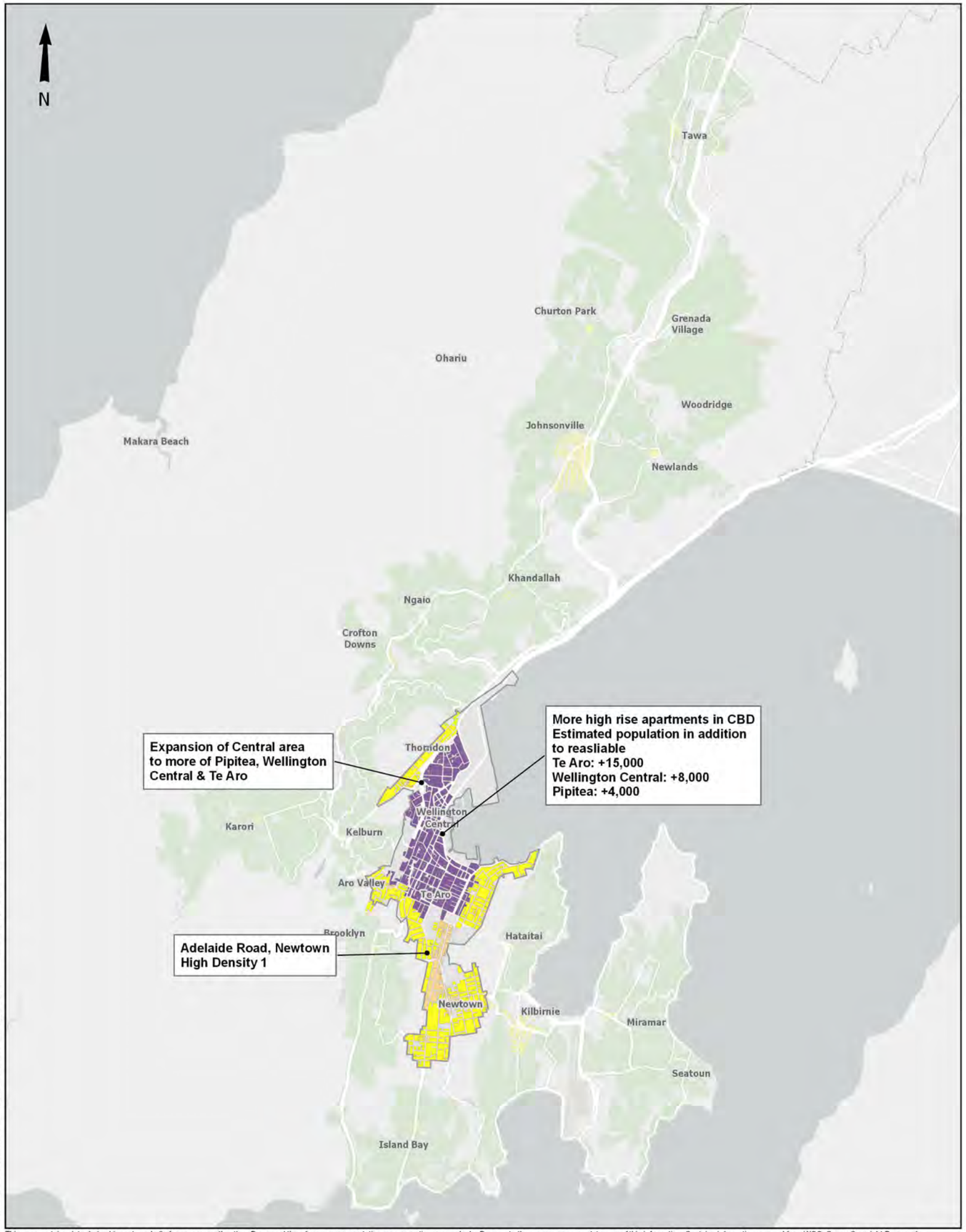
Typology	Total Population 2048
Low Density	182,425
Medium Density 1	4,592
Medium Density 2	43,086
High Density 1	2,870
Central Area	33,857
Total	266,831

Estimated population by area

Area	Current Population	Baseline scenario growth	Scenario 3 Growth	Total Population 2048
East Wellington	36,637	3,980	-	40,617
Inner Wellington	35,152	2,102	5,064	42,318
North Wellington	49,904	13,317	-	63,221
South Wellington	22,990	684	-	23,674
Wellington Central/CBD	21,578	15,499	1,440	38,517
West Wellington	49,893	8,591	-	58,484
Total	216,154	44,173	6,504	266,831

- Low Density
- Medium Density 1
- Medium Density 2
- High Density 1
- Central Area
- Other

Beca



File: P:\76\17610395\TGIS\01 Map\WCC Scenario Mapping.aprx Name of Map: Scenario 3 Centralisation 80k Author: HEC Date: 18/01/2019

Preliminary Scenario 3:
Centralisation

This scenario demonstrates growth focussed in the CBD and inner residential areas.

Infill, redevelopment and greenfields:	44,000
New population in central area:	27,000
New population in inner residential areas:	9,000
Total additional population accommodated:	**80,000**

Estimated population by typology

Typology	Total Population 2048
Low Density	182,576
Medium Density 1	-
Medium Density 2	42,075
High Density 1	5,200
Central Area	66,294
Total	296,146

Estimated population by area

Area	Current Population	Baseline scenario growth	Scenario 3 Growth	Total Population 2048
East Wellington	36,637	3,980	-	40,617
Inner Wellington	35,152	2,102	6,077	43,331
North Wellington	49,904	13,317	-	63,221
South Wellington	22,990	684	-	23,674
Wellington Central/CBD	21,578	15,499	29,742	66,819
West Wellington	49,893	8,591	-	58,484
Total	216,154	44,173	35,819	296,146

- Low Density
- Medium Density 1
- Medium Density 2
- High Density 1
- Central Area
- Other

Beca

2.4 Scenario 4: Natural Hazards

Overview

This scenario demonstrates growth focussed away from areas at risk of natural hazards and towards town centres and high frequency bus routes. Ground shaking, liquefaction, tsunami risk, sea level rise and flooding were considered as the key natural hazards in this scenario. This is based on the WCC District Plan hazard maps.

Results

Figure 4 highlights the population difference by typologies between the baseline scenario and the 50,000 and 80,000 natural hazard scenarios modelled.

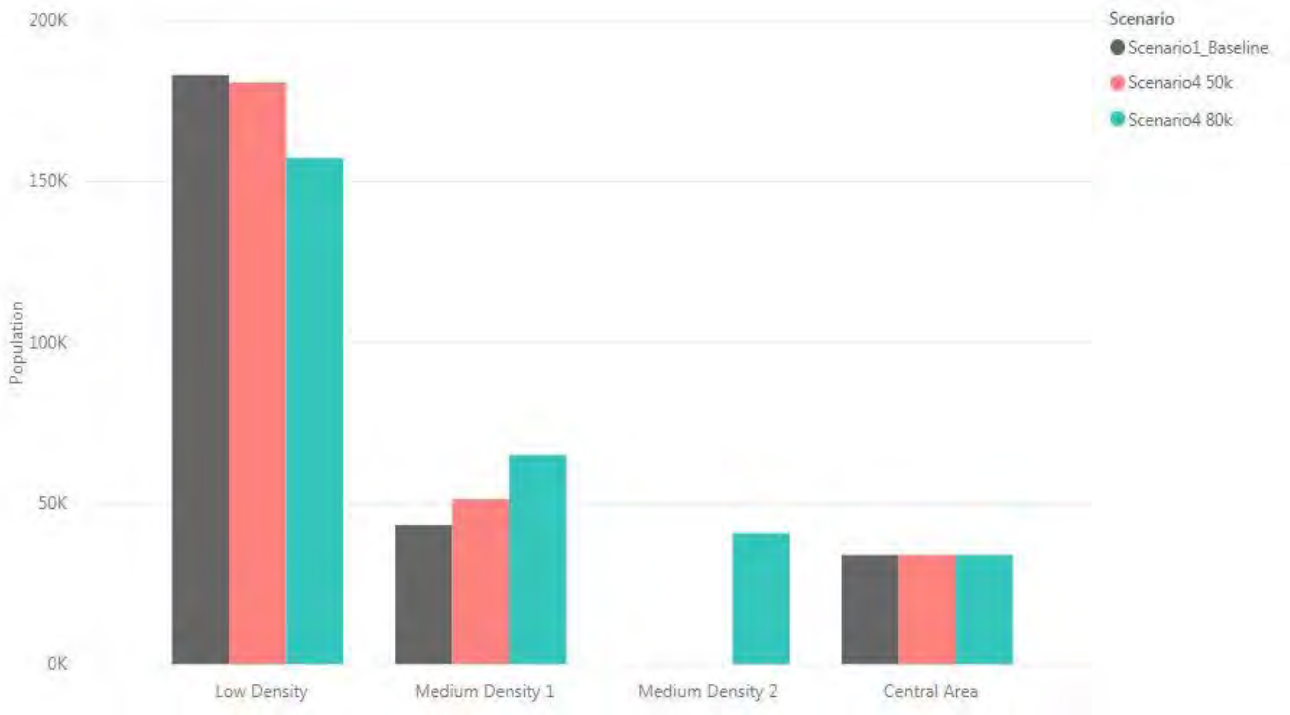


Figure 4: Natural Hazard Scenario - Typology and Population Changes

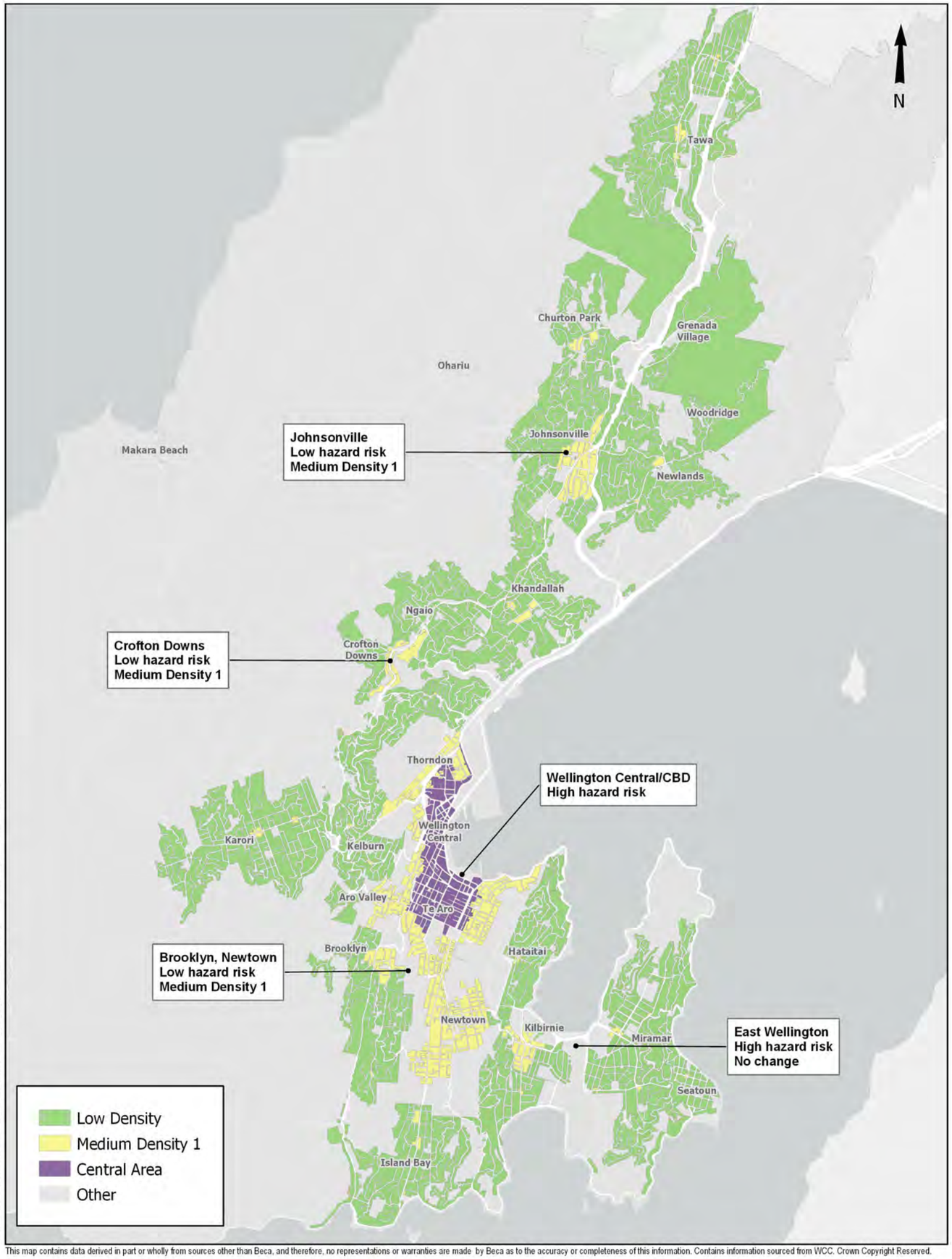
Ohariu, Makara and Makara Beach were not affected by this scenario and therefore have not been included.

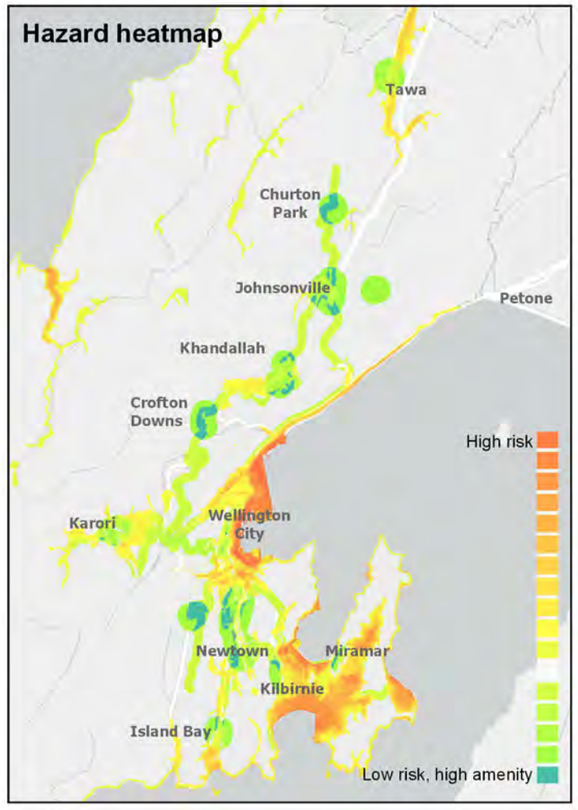
The 50,000 scenario shows a general increase in medium density 1 typologies (mix of detached and terraced houses) in the inner residential areas and Brooklyn/Crofton Downs. The 80,000 scenario increases medium density 1 provisions in Karori, Broadmeadows and Northland with more medium density 2 in Newtown, Brooklyn, Tawa, Crofton Downs, Johnsonville and Newlands. The CBD and East Wellington areas remain largely unchanged due to their comparatively high hazard risk. The preliminary changes for this scenario are highlighted on the following page.

Preliminary Scenario 4:
Natural Hazards

This scenario demonstrates growth focussed away from areas at risk of natural hazards and towards town centres and high frequency bus routes.

Infill, redevelopment and greenfields:	44,000
New population away from hazards:	6,000
Total additional population accommodated:	**50,000**





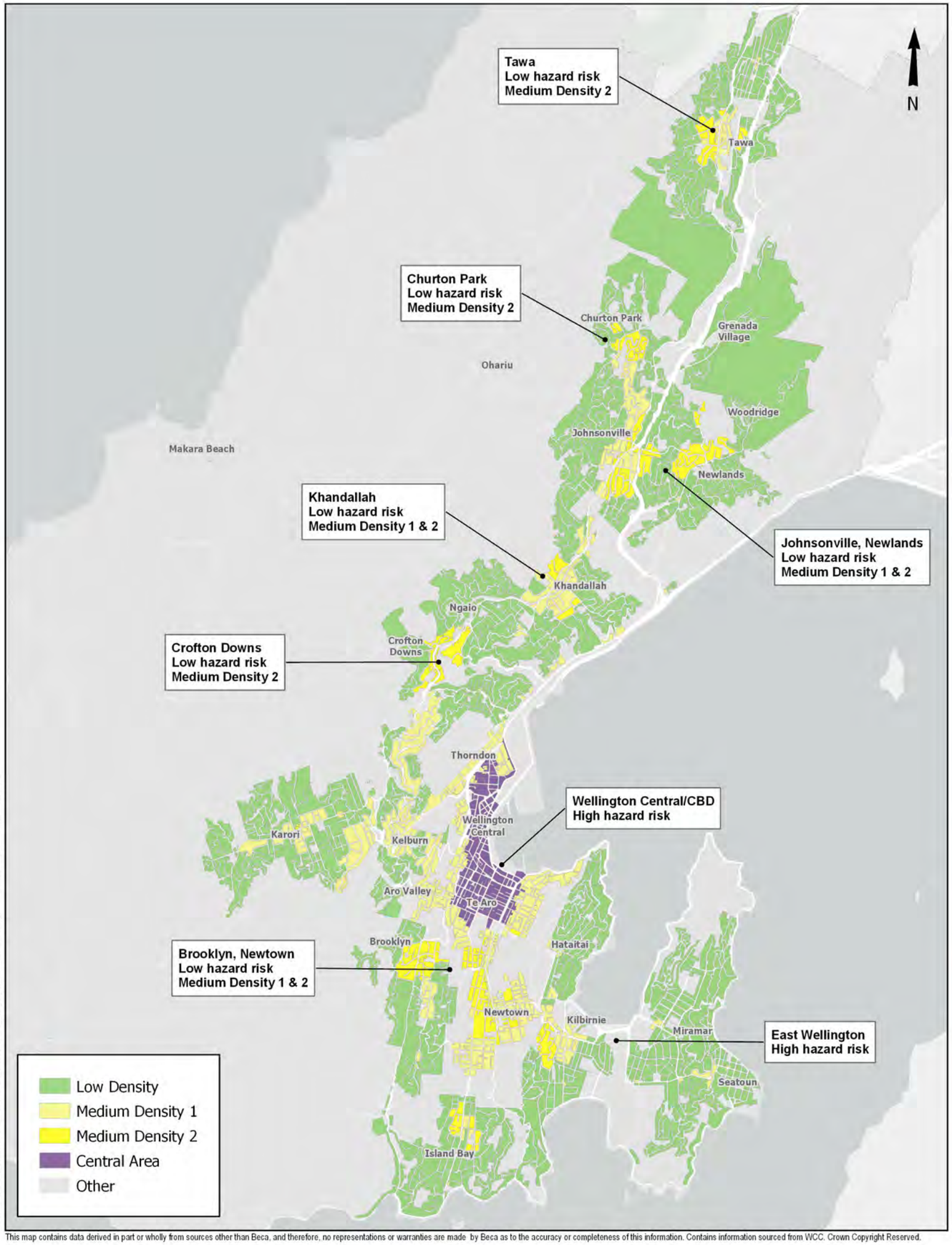
Estimated population by typology

Typology	Total Population 2048
Low Density	180,814
Medium Density 1	51,283
Medium Density 2	-
High Density 1	-
Central Area	33,914
Total	266,011

Estimated population by area

Area	Current Population	Baseline scenario growth	Scenario 4 Growth	Total Population 2048
East Wellington	36,637	3,980	-	40,617
Inner Wellington	35,152	2,102	774	38,028
North Wellington	49,904	13,317	1,584	64,805
South Wellington	22,990	684	1,190	24,864
Wellington Central/CBD	21,578	15,499	765	37,842
West Wellington	49,893	8,591	1,371	59,855
Total	216,154	44,173	5,684	266,011

File: P:\76117610395\TGI\01 Mapl\WCC Scenario Mapping aprx Name of Map: Author: HEC Date: 7/02/2019



File: P:\76117610395\TGI\01 Maps\WCC Scenario Mapping aprx Name of Map: Author: HEC Date: 7/02/2019

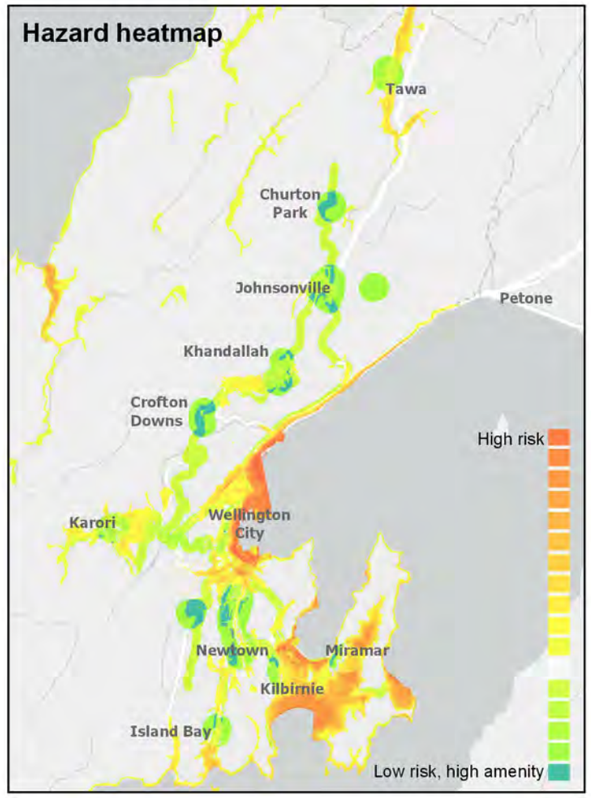
Preliminary Scenario 4:
Natural Hazards

This scenario demonstrates growth focussed away from areas at risk of natural hazards and towards town centres and high frequency bus routes.

Infill, redevelopment and greenfields: **44,000**

New population away from hazards: **36,000**

Total additional population accommodated: **80,000**



Estimated population by typology

Typology	Total Population 2048
Low Density	157,330
Medium Density 1	65,031
Medium Density 2	40,708
High Density 1	-
Central Area	33,915
Total	296,984

Estimated population by area

Area	Current Population	Baseline scenario growth	Scenario 4 Growth	Total Population 2048
East Wellington	36,637	3,980	1,141	41,758
Inner Wellington	35,152	2,102	1,763	39,017
North Wellington	49,904	13,317	13,603	76,824
South Wellington	22,990	684	6,713	30,387
Wellington Central/CBD	21,578	15,499	785	37,862
West Wellington	49,893	8,591	12,652	71,136
Total	216,154	44,173	36,657	296,984

2.5 Scenario 5: Greenfield Development

Overview

This scenario demonstrates how growth could be distributed in new and 'already planned' greenfield areas (Upper Stebbings and Lincolnshire Farm in North Wellington). Both areas were identified as future growth areas in the Northern Growth Management Framework adopted by Council in 2003. A possible future greenfield site in Ohariu has also been identified based on slope and proximity to existing infrastructure (indicating where it would be easier and more cost efficient for development).

Results

Figure 5 highlights the population difference by typologies between the baseline scenario and the 50,000 and 80,000 greenfield scenarios modelled.

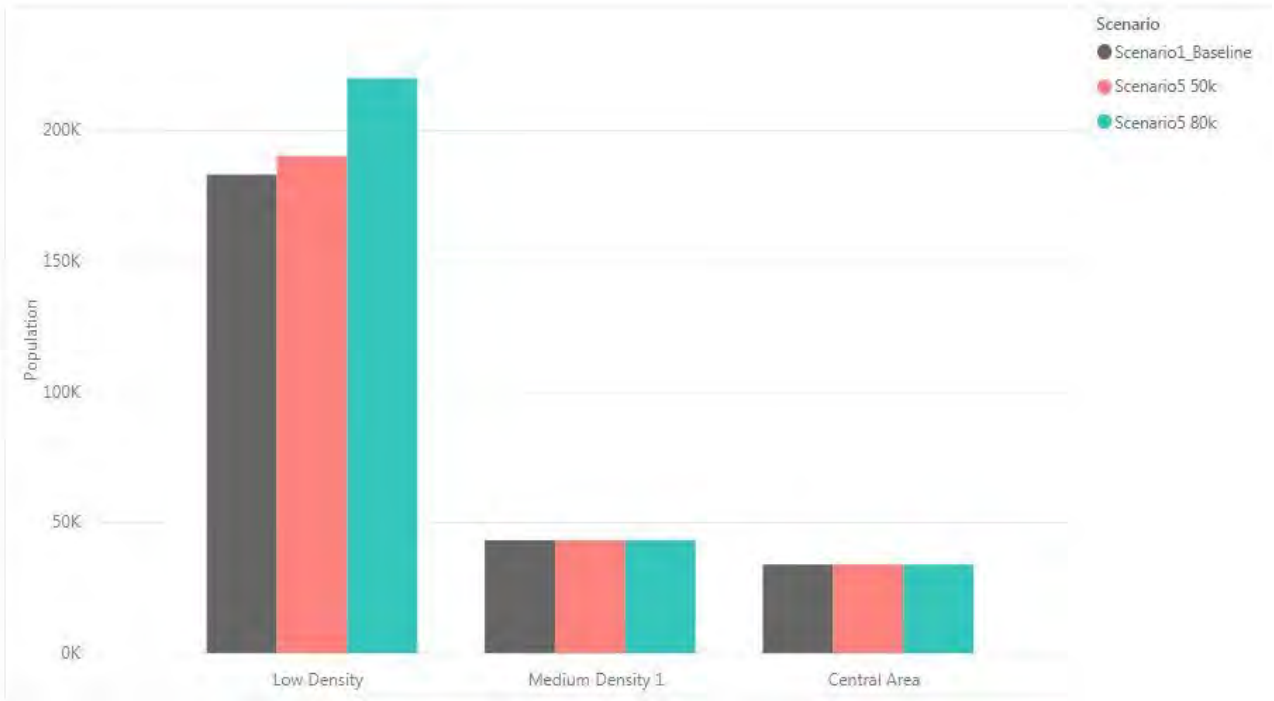
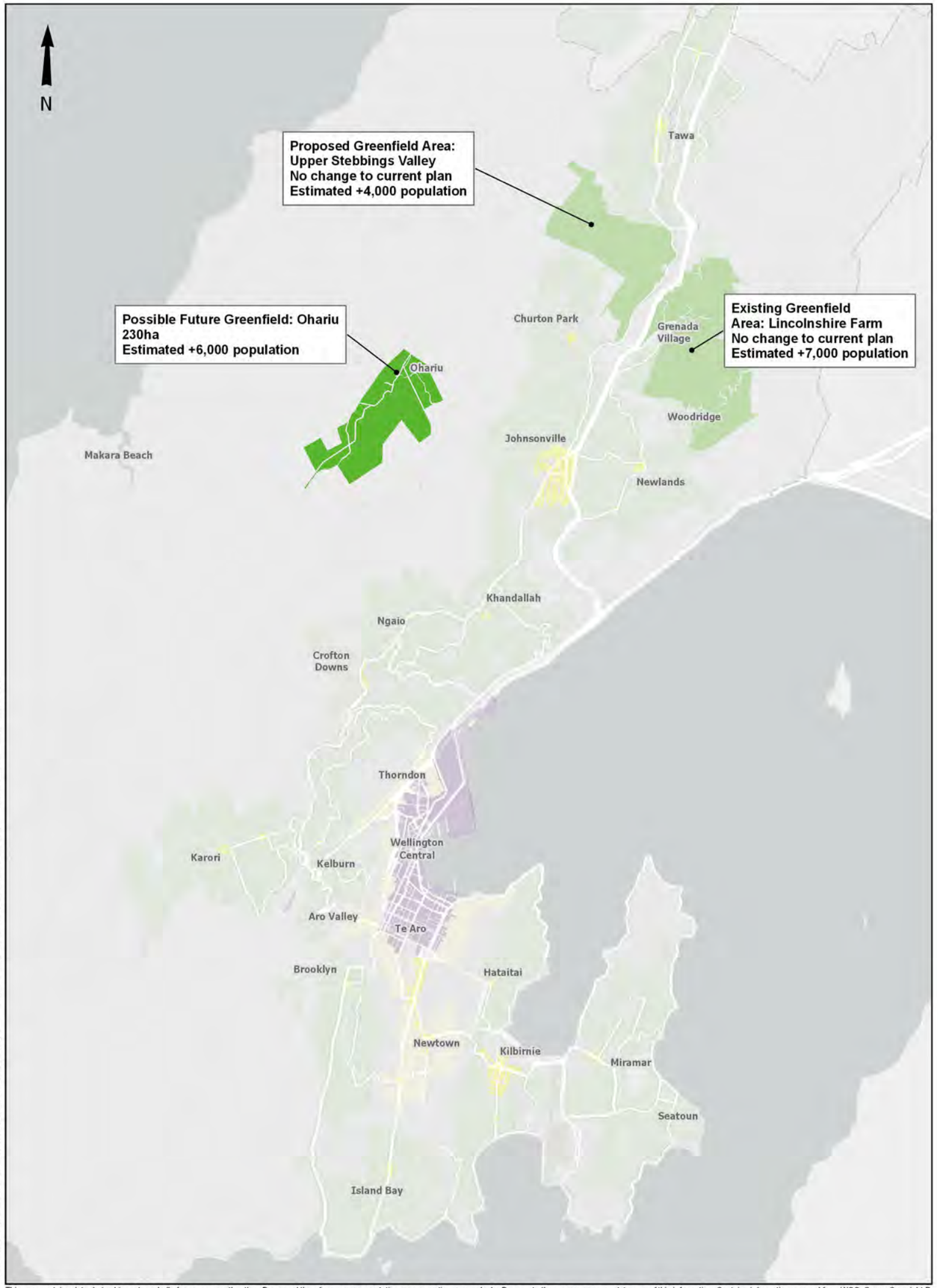


Figure 5: Greenfield Scenario - Typology and Population Changes

The 50,000 scenario shows a slight increase in low density housing through a new greenfield area in Ohariu. At a density of approximately 12 dwellings per hectare this area (with existing and proposed greenfields Lincolnshire Farm and Upper Stebbings Valley remaining as they are) could accommodate the proposed shortfall if population was to increase by 50,000 over the next 30 years. If the population increase was closer to 80,000 the new Ohariu greenfield area would need to be vastly expanded and could accommodate up to 28,500. Without any other zone changes across the rest of Wellington the remaining population would be accommodated by increasing the density in the Upper Stebbings and Lincolnshire Farm areas from 6 dwellings per hectare to 12 dwellings per hectare.

This scenario is based on a density of 20 dwellings per hectare in the Ohaiu area and all additional population is in the North Wellington area. Both of these scenarios would have a significant impact on the current makeup of Ohariu Valley and would require more detailed investigation into the viability and cost of such development. The preliminary changes for this scenario are highlighted on the following page.

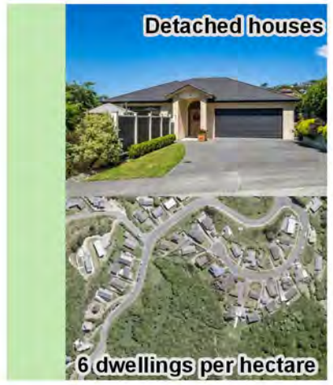


File: P:\76117610395\TGI\01 Mapl\WCC Scenario Mapping.aprx Name of Map: Scenario 5 Greenfield 50k Map Author: HEC Date: 18/01/2019

Preliminary Scenario 5:
Greenfield Development

This scenario demonstrates growth focussed in greenfield sites.

Infill and redevelopment:	33,000
Existing and proposed greenfields:	11,000
Possible future greenfields:	6,000
Total additional population accommodated:	**50,000**



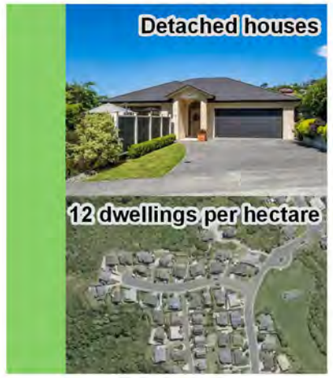
Existing and Proposed Greenfields

Upper Stebbings and Lincolnshire Farm in North Wellington were identified as future growth areas in the Northern Growth Management Framework adopted by Council in 2003.

In this scenario population estimates are based on the current projected number of dwellings for these areas.

400ha Lincolnshire Farm: estimated 7000 people
250ha Upper Stebbings Valley: estimated 4000 people

This is a density of approximately 6 dwellings per hectare.



Possible Future Greenfield

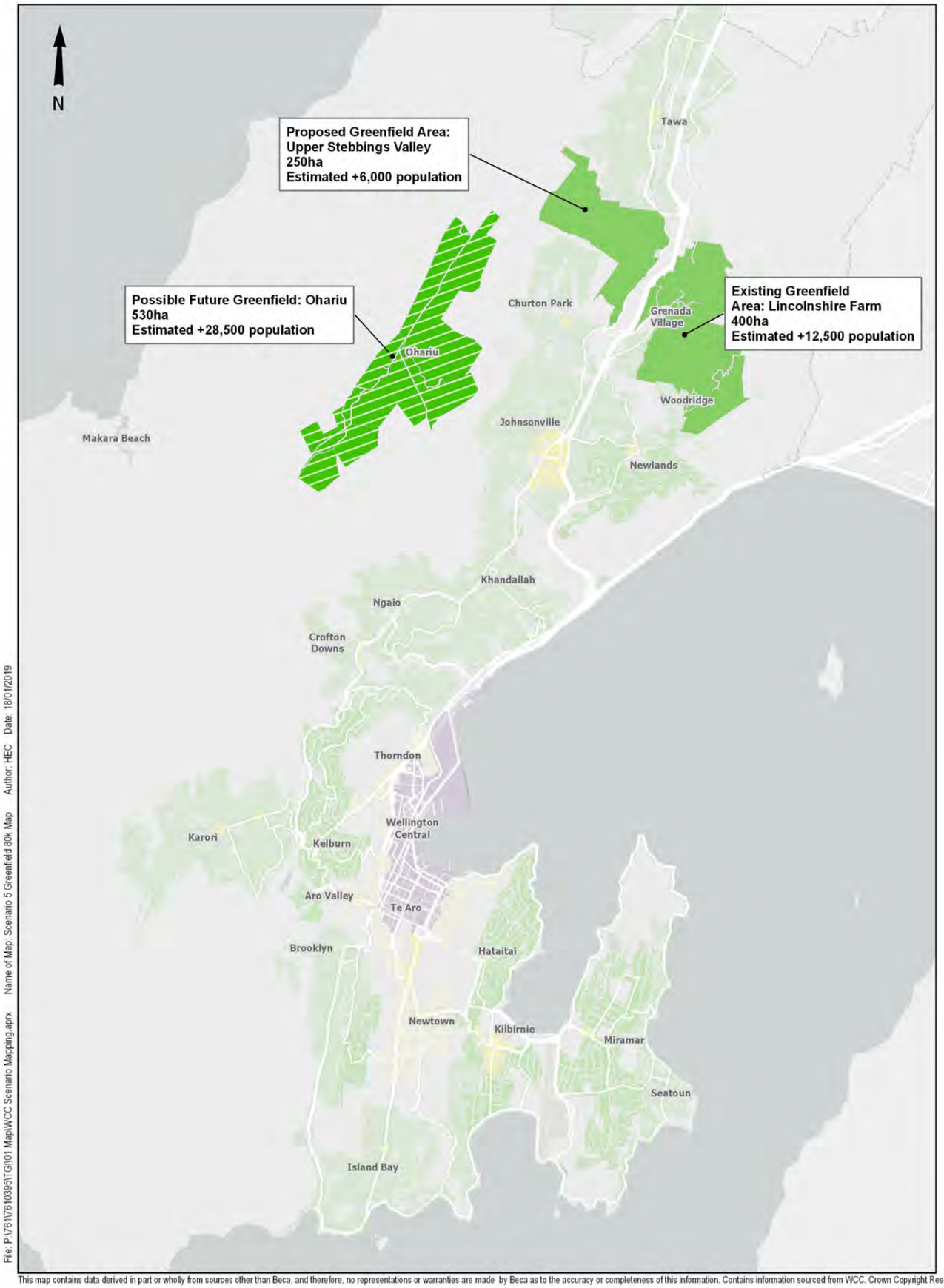
Based on slope and access to existing infrastructure a potential new greenfield area has been identified at Ohariu.

230ha Ohariu: estimated 6000 population.

This is a density of approximately 12 dwellings per hectare.

Estimated population by typology

Typology	Total Population 2048
Low Density	190,254
Medium Density 1	43,247
Medium Density 2	-
High Density 1	-
Central Area	33,915
Total	267,416

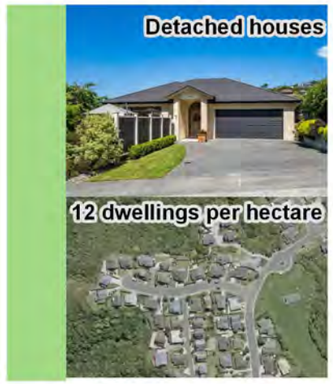


File: P:\76117610395\TGIS\01 Mapl\WCC Scenario Mapping.aprx Name of Map: Scenario 5 Greenfield 80k Map Author: HEC Date: 18/01/2019

Preliminary Scenario 5:
Greenfield Development

This scenario demonstrates growth focussed in greenfield sites.

Infill and redevelopment:	33,000
Existing and proposed greenfields:	18,500
Possible future greenfields:	28,500
Total additional population accommodated:	**80,000**



Existing and Proposed Greenfields

Upper Stebbings and Lincolnshire Farm in North Wellington were identified as future growth areas in the Northern Growth Management Framework adopted by Council in 2003.

In this scenario the population in these greenfield areas has been increased to a higher density (12 dwellings per hectare) than the current estimated number of dwellings.

400ha Lincolnshire Farm: estimated 12,500 people
250ha Upper Stebbings Valley: estimated 6,000 people

Possible Future Greenfield

Based on slope and access to existing infrastructure a potential new greenfield area has been identified at Ohariu.

530ha Ohariu: estimated 28,500 population.

This is a density of approximately 20 dwellings per hectare.

Estimated population by typology

Typology	Total Population 2048
Low Density	220,010
Medium Density 1	43,247
Medium Density 2	-
High Density 1	-
Central Area	33,915
Total	297,172

3 Overall Findings

This assessment has been undertaken at a high-level as a preliminary exercise to investigate deliberately contrasting scenarios. It is not intended that any one of these scenarios will be viable on their own, each have advantages and disadvantages to be further assessed.

The overall findings are summarised as follows:

Scenario	Summary of overall findings
1. Baseline	Based on the NPS-UDC dwelling numbers provided current plan provisions will only accommodate an additional 44,000 people. However, population projections for Wellington City predict an increase of between 50 and 80,000 people over the next thirty years. This scenario does not cater for the expected growth and therefore is not an acceptable way forward.
2. Suburban Centres	The Suburban Centres scenario primarily allows for more medium density housing around the suburban centres. This includes inner residential areas but also highlights that significant increases in density may be required in some of the outer residential areas.
3. Centralisation	The centralisation scenario would see a large increase in density in the inner residential areas and more high-density apartments in the CBD. To accommodate 80,000 people, more than 25,000 of these would likely need to be in the currently zoned central area. This is unlikely to be very plausible, therefore elements from other scenarios would also need to be considered.
4. Natural Hazards	Much of East and Central Wellington are at risk from natural hazards, therefore the natural hazard scenario sees more medium density housing in West and North Wellington.
5. Greenfield	The greenfield scenario (without changes in any other areas) would have a significant impact on the current makeup of Ohariu Valley which is currently zoned as Rural. A population increase from the current 800 to between 6,000 and 30,000 would be required.

Community consultation will be required under all scenarios outlined above.

A

Appendix A – Methodology

Methodology

The methodology used to develop these scenarios can be summarised into the following 4 steps.

1 Application of existing population

2 Application of baseline development

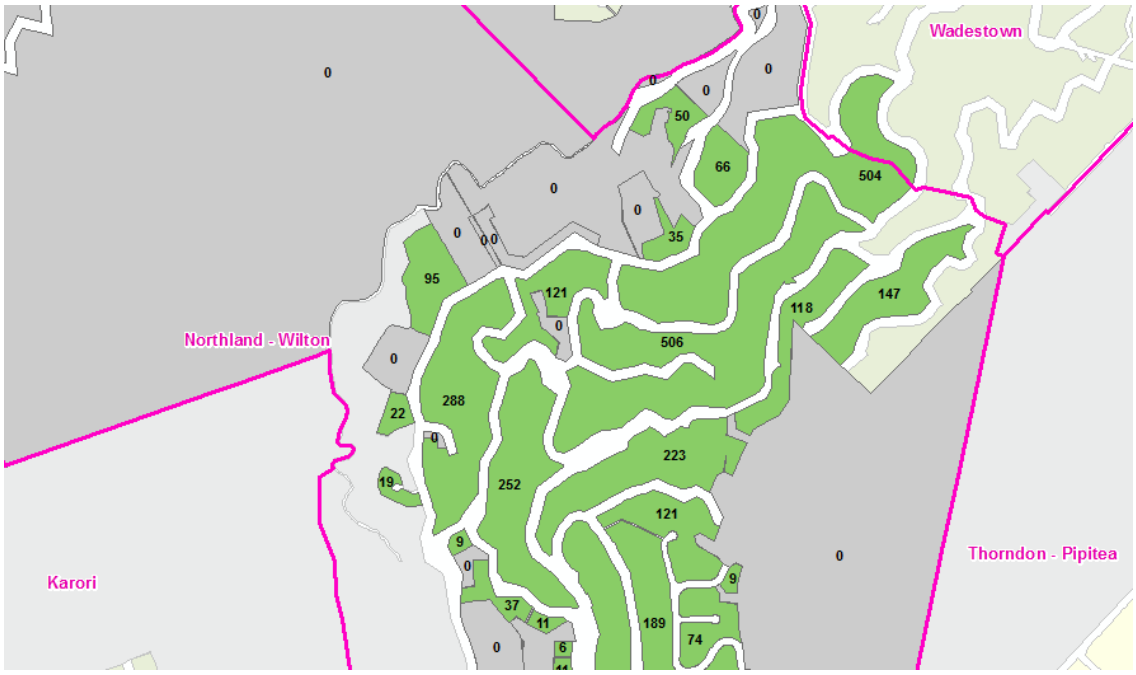
3 Development of criteria for uplifting zoning

4 Calculation of estimated future population

1. Application of existing population

Existing population was applied at a block level using the ForecastID high population growth figures for 2018. The ForecastID data summarised population numbers by suburb, therefore to apply population to blocks, the suburb total was pro-rated against area for each residential block in a suburb. 'Non-residential' blocks (zones rural, industrial precinct, business, airport, conservation and open space) from the current district plan did not get a population assigned. More information on the ForecastID methodology used to develop these numbers can be found here.

An example is included below for Northland/Wilton, where the total population of 5,862 is distributed to blocks based on the area and zone type of the block (population labelled).



2. Application of baseline development

Baseline infill and redevelopment was applied to the scenarios using the residential capacity model developed by Wellington City Council in response to the NPS-UDC. This is a multi-step development feasibility model that assesses the city parcel by parcel. Each parcel is also compared for an infill development, if possible, but also a comprehensive redevelopment. And each parcel is also developed for a range of typologies, as appropriate according to the zoning, including standalone housing, terrace housing or an apartment.

The data was provided in a table identifying the number of potential new dwellings in each suburb by district plan zone and typology (standalone, terrace, apartment). This was converted to population using some assumptions on number of people per dwelling type. These are listed in Appendix B. In a similar fashion to the existing population, these 'realisable' population numbers were applied to each block by pro-rating the population against area in each suburb and district plan zone.

3. Development of criteria for uplifting zoning

Some high-level zoning categories were developed for the future scenarios. They are

- Low Density 1
- Low Density 2
- Medium Density 1
- Medium Density 2
- High Density 1
- Central Area

More information relating to these high-level zones and the assumptions surrounding them can be found in Appendix B.

The development of the criteria for assigning zones varied depending on the scenario. An overview of this criteria is included in the table below. In all scenarios 'non-residential' blocks (zones rural, industrial precinct, business, airport, conservation and open space) from the current district plan were not considered for rezoning.

Scenario		
2	Suburban Centres	Uplift was based on proximity to sub-regional, district and town centres from the current district plan. The distance from these centres was varied to incorporate the required population.
3	Centralisation	Uplift was focussed in the CBD and inner residential areas. Denser residential zones were added around Adelaide Road and in areas nearer to the current Central Area zone as well as a general increase in all inner residential areas.
4	Natural Hazard	Uplift was focussed away from areas at risk of natural hazards and towards town centres and high frequency bus routes. A heatmap was developed to categorise blocks numerically depending on the risk and opportunity. Blocks with a higher number were given a higher density while negative values remain unchanged (i.e. no growth distributed to these areas).
5	Greenfield	Uplift was focussed in existing, planned and new greenfield areas. Possible future greenfield areas were identified based on slope and proximity to existing traffic routes (both indicating where it would be easier and more cost efficient for development).

4. Calculation of estimated future population

Future population was estimated based on the new high-level zone applied and some dwelling per hectare density assumptions (listed in Appendix B). Where a scenario did not impact a block, the existing and baseline population was applied to indicate no change. For areas which were zoned as suburban centres

under the current district plan the estimated population (calculated by population per hectare) was reduced by 90% to accommodate for the fact that most suburban centre usage is commercial.

B

Appendix B – Assumptions

Scenario wide

- Blocks were assigned to suburbs where more than 50% of the block was inside the suburb boundaries.
- Existing and baseline population was evenly distributed across all residential blocks, although in reality some parts of a suburb may be more densely populated than others.
- The following assumptions were used to allocate future population:

High Level Residential Zone	Typology	Dwellings per hectare	Population per dwelling
Low Density 1	Detached houses	12	2.8
Low Density 2	Small lots detached houses	20	2.8
Medium Density 1	Mix of detached and terraced houses	40	2.4
Medium Density 2	Mix of terraces houses and low-rise Apartments (up to 4 floors)	60	2.4
High Density 1	Mid-rise Apartments (up to 6 floors)	80	2.2
Central Area	Mix of Commercial and high-rise Apartments (15+ storeys)	115	2.2

Baseline Scenario

- NPS UDC numbers were provided by suburb, district plan zone and broken out into number of dwellings in different typology types ‘single house’, ‘terraced housing’ and ‘apartments’. These numbers were converted to population by using a population per dwelling of 2.8 for single houses, 2.4 for terraced houses and 2.2 for apartments.

Suburban Centres Scenario

- Sub regional, town and district centres we considered in this scenario as per the WCC Centres hierarchy in the District Plan.
- Rezoning was applied according to the following table:

Centre Type	Buffer 1 50k: 100m 80k: 190m	Buffer 2 50k: 300m 80k: 600m
Town Centre	Medium Density 2	Medium Density 1
Sub-Regional Centre	Medium Density 2	Medium Density 1
District Centre	Medium Density 1	Low Density 2

- Blocks were considered where more than 50% of each block fell inside the buffer zones.

Natural Hazard Scenario

- The following natural hazard layers were provided by WCC for use in this scenario
  - LIM potential flood hazards
  - Liquefaction potential

  - Ground shaking hazard zones
  - Tsunami evacuation areas
  - Sea level rise (1.4m)
- To determine areas to uplift positive values were applied where blocks where they were within 320m of centre zones or 120m of a 'high frequency' bus route (1, 2, 3, 7, 21, 22). Blocks which were more than 50% inside these buffer zones were considered.
- The following table highlights the relative weighting given to each hazard/amenity:

Feature	Category	Hazard Weighting
Ground Shaking	Zone 1 (Low)	0
	Zone 2	-2
	Zone 3 (Moderate)	-3
	Zone 4	-4
	Zone 5 (High)	-5
Flood Hazard	Inside area	-2
Liquefaction	Low	-1
	Moderate	-2
	High	-3
	Very High	-4
Tsunami	Yellow zone	-1
	Orange zone	-2
	Red zone	-3
Sea level rise	Inside 1.4m rise	-2
High Frequency Bus route	Within 120m of route	1
Town centre, sub regional centre, district centre	Within 320m of centre	3

- Weightings were assigned to each block based on the hazard score which had the largest area. In the example the selected block received a score of -4, due to a greater proportion (70%) of the block falling into the -4 weighting.
- Each block was mapped to a high-level zone based on the following table. Note that the existing zone would remain if it was already zoned a higher density.

Hazard weighting	High Level Zone (50k)	High Level Zone (80k)
-15 to -1	Low Density 1	Low Density 1
0	Low Density 1	Low Density 2
1	Low Density 1	Medium Density 1
2	Low Density 1	Medium Density 1
3	Low Density 2	Medium Density 1
4	Low Density 2	Medium Density 2
5	Medium Density 1	Medium Density 2
6	Medium Density 1	Medium Density 2

Greenfield Scenario

- Possible future greenfield sites were identified based on the slope table below:

Slope	Score/Class	Description
1°-31°	0	completely developable
31°-40°	0.5	semi-developable
40°-60°	0.75	mostly undevelopable
>60°	1	undevelopable

- Ohariu was selected as a possible greenfield site as it was the only viable rural area in the Wellington City region that had over 200ha of completely or semi undevelopable land, based on slope. Any significant natural areas, conservation zones were removed from the site.