



Reducing Impacts of Climate Change on the Urban and Built Environment

Urban Growth Scenarios for Wellington City

Prepared for NIWA (FRST Contract C01X0805)

JULY 2010

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REVISION SCHEDULE

Rev No	Date	Description	Prepared By	Reviewed By	Approved By
1	16/7/2010	Draft Final	C van Halderen	S Allan	L Gardiner
2	3/10/2011	Removed reference to Project 13 in title. Final	C van Halderen		L Gardiner

NIWA

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1 Introduction

The purpose of "Project 13" is to establish urban growth scenarios for Wellington City for use in the RiskScape model. This project forms part of the research programme contracted by the Foundation of Science, Research and Technology ("FRST"). This programme will assist central and local government identify opportunities and reduce the impacts of climate change on urban and built environments and infrastructure, through the development and use of science based risk assessment process and adaptation options.

NIWA is leading the overall programme with assistance from MWH NZ Ltd, GNS Science and BRANZ. In Project 13, MWH's knowledge and planning experience, particularly in the practical understanding of urban built environment and infrastructure, has been used to interact closely with the needs of GNS Science in formulating urban growth scenarios for Wellington for input to the RiskScape tool.

Wellington City is identified as one of the climate change case studies for the research programme, and Project 13 will provide planning advice to support the work being undertaken on risk assessment and development of engineering adaptation options that will lead to the overall project goal of an Urban Impacts Toolkit.

This report reviews the strategic planning policies and plans to identify "rules of thumb" or principles for future growth taking into account historical trends. This work has been undertaken in close consultation with Wellington City Council. These "rules of thumb" will be taken further by GNS to align with the RiskScape risk assessment tool.

2 Methodology

The following methodology has been used in undertaking Project 13 to establish urban growth scenarios for Wellington to use in RiskScape:

2.1 Understand RiskScape

Understand and identify the requirements and/or criteria used in RiskScape. Three meetings have been held with Iain Matcham of GNS to obtain an understanding of the datasets RiskScape currently uses, to focus on defined assets and establish or quantify parameters to be used in the analysis tool. The urban growth scenarios have been formulated with these parameters in mind.

2.2 Review planning policies and strategies for Wellington

There are numerous policy documents that set out strategies for future growth in Wellington City and environs. A list of plans and policies that have been reviewed for this project is set out at the end of this report. Some of the most important factors are summarised in section 4 below. Most of this information was sourced from the internet on the Wellington City Council website and other useful links. A hierarchy of plans exists which set out proposals for future growth in varying levels of detail.

2.3 Engage with Wellington City Council planners/strategists

Wellington City Council (WCC) and Greater Wellington Regional Council (GWRC) are authorities responsible for formulating strategies. With the focus of this project on Wellington City, details on urban development have been obtained primarily from the Principal Advisor Urban Strategy and Centres in the City Planning Team at Wellington City Council¹. Much of this information attempts to update population

¹ Personal communication with Paul Kos. Meeting held on 20 January 2010, and subsequent emails and telephone calls.

projections and reprioritise growth areas based on the Council's current and developing policy. In communications with Paul, he has pointed out that the growth scenarios must be viewed as a broad guide and that details may change over time based on a number of unknown factors such as population forecasts etc. Maps are indicative only. Extracts from his internal report² summarising information on "Areas of Change" have been used in this report and provide valuable information for the RiskScape tool.

2.4 Identify principles for future growth or "rules of thumb"

The planning policies and strategies for Wellington identify a series of agreed principles for future growth. These principles have been prepared by both WCC and GWRC in consultation with the wider community and civic leaders to guide the city and region into the future. These principles, or "rules of thumb" as described for this project, are summarised in section 5 of this report.

2.5 Report

Report back summarising the approach, the findings of the review of policies and strategies, and providing guidelines to be taken further by GNS to align with the RiskScape risk assessment tool.

3 RiskScape

RiskScape³ is a multi-hazard risk and impact analysis tool and is a joint venture between GNS and NIWA. It converts hazard exposure information into the likely impacts for a region, for example, through damage and replacement costs, casualties, economic losses, disruption, and number of people affected. The RiskScape programme works closely with, shares resources, and is reliant on core natural hazards research.

The main components and the sequence of operations of the RiskScape tool range from simulating the natural hazard through to calculating losses and impacts from the vulnerable areas of exposed communities and their assets. Five natural hazards have been implemented to date – floods, earthquakes, volcanoes, tsunamis and wind storms.

Outputs will be tailored towards a number of different uses including those described below.

3.1 Risk Reduction

The most obvious use relates to increasing the resilience of communities through prudent mitigation measures. The model will be capable of defining the risks that communities are currently exposed to. As additional hazards are added, then the importance of exposure to a community will become apparent and measures to reduce risk can be prioritized (i.e. for which hazard do we get the best benefit for funding spent on risk reduction). Active fault locations and fault classes will be included within RiskScape, at least on a regional scale. Where more accurate detail is known, this can be introduced and if the accuracy is sufficient, RiskScape will provide input into both LIMs (land information memoranda, available from Councils on request) and planning controls to avoid or mitigate risks from natural hazards, as well as asset design and management.

² Review of Infill – Summary Information on Population, Density for the Growth Spine Areas of Change (undated) – emailed 5 May 2010

³ <http://www.riskscape.org.nz/home>

3.2 Realistic response planning

The application of hazard scenarios will enable realistic planning approaches to be developed for the range of hazards present. “What-if” scenarios can be followed through, such as in major bridge failures or water supply disruptions, or what areas should be attended to first. The multi-hazard approach will enable response teams to focus on both likely and the more severe infrequent events.

3.3 Response to a disaster

With the inclusion of the near real-time response scenario following or during an actual event, the RiskScape model can be a valuable tool in prioritising responses to specific events and quickly estimating the scale of damage and casualties to guide allocation of resources. This will be possible both at local/regional and central government levels, and emergency management response strategies can be developed accordingly. This use of RiskScape during an event is contingent on having previously developed a full suite of hazard-risk scenarios, and also the availability of appropriate asset databases. Project 13 aims at expanding that asset data to enable future forecasting of scenarios.

3.4 Land Use Planning

Natural disasters are largely man-made. The most effective way to reduce the impact from these hazards is through changing the nature or management of resources in areas at risk. A key approach for doing this is land use planning. To plan land uses so that they are sustainable and sensitive to the natural processes of nature, it is necessary to identify and map areas at risk and have a good understanding of what the potential consequences might be. RiskScape has the potential to become an integral part of the planning process by providing this information.

Project 13 aims to provide input into all four of these RiskScape outputs. By defining realistic future urban growth scenarios for urban Wellington, RiskScape can identify and map areas of growth within the urban area. The tool can then be used to define the risks that future communities may potentially be exposed to and estimate the potential scale of damage should an event occur.

Parts of Wellington are particularly prone to risks of flooding, landslips and earthquakes. The higher concentrations of population resulting from implementing policies to increase residential densities can also provide insight into the “what-if” scenarios by realistically defining what approach to take. Further practical application of RiskScape in land use planning may assist in defining policies which aim to avoid development, or to apply mitigation measures to reduce the risk of damage to the urban environment.

4 Strategic Planning Policies

4.1 Resource Management Act

The Resource Management Act 1991 (the RMA) is the main law setting out how the environment should be managed, and especially how the environmental effects of our activities should be managed. The RMA is based on the idea of managing resources sustainably, and it encourages communities to plan for the future environment.

District and regional plans are one of the most important aspects of the RMA and councils have to prepare plans to help them manage the environment in their area. Regional policy statements set the basic direction for environmental management in the region. Regional plans tend to concentrate on particular parts of the environment, like the coast, soil, a river or the air. They set out how discharges or activities involving these resources will be managed to stop the resources being degraded or polluted. District plans concern the use and development of land. It sets out the policies and rules a council will use

to manage the use of land in its area, and identifies what needs to be taken into account if a development is not permitted.

The Regional policy statement is the overarching document, and its objectives and policies must be “given effect to” by Councils through district and regional plans⁴. Every district or regional plan is different and reflects the desires and aspirations of the local community. Non-statutory documents in the form of area plans, urban development strategies and other informal plans can also be used to provide guidance to Councils on future development.

4.2 Local Government Act

The Local Government Act 2002 (the LGA) provides the general framework and powers under which New Zealand's 85 democratically elected and accountable local authorities operate. Part 6 of the Act promotes greater accountability between local authorities and their communities and a long-term focus for the decisions and activities of the local authority. It includes a requirement for local authorities to facilitate a process with their communities, at least every six years, and to identify community outcomes for the intermediate and long-term future of the district or region. The role of the local authority is to facilitate the process, with the community having ownership of the identified outcomes. Part 6 also requires local authorities to prepare a ten-year LTCCP (Long Term Council Community Plan), which is to be reviewed every three years. The LTCCP describes the community outcomes and priorities and the activities the local authority will undertake to contribute to the outcomes. The plan is designed to integrate decision-making and include information on the key policies of the local authority. It also describes linkages between activities and how they are funded⁵.

4.3 Building Act

The Building Act 2004 covers the construction, alteration, demolition and maintenance of new and existing buildings throughout New Zealand. It sets standards and procedures to ensure buildings are safe and healthy, and deals with aspects such as building strength, foundations and aspects such as flood proofing. It covers how work can be done, who can do it, and when it needs to be consented and inspected. The Building Act as it relates to buildings is implemented by local district and city councils. Under the Building Act, the Building Code defines the minimum standards buildings must meet (to the extent required by the Building Act). In contrast to the plans prepared under the RMA, the Building Code provides a common set of minimum rules for the whole country.

4.4 Planning Tools in Wellington

Numerous policy documents set out strategies for future growth in Wellington city and environs. A list of plans and policies that have been reviewed for this project are set out at the end of this report. Some of the most important factors are summarised below.

Policies and strategies give high level guidance and direction on developing and implementing a vision and an integrated framework to achieve sustainable growth of the Wellington region. Of particular importance is the Urban Development Strategy (2006)⁶ which sets out the Council's stated approach to managing growth and change for Wellington City and is built around a 50 year growth concept that reinforces the physical characteristics that make Wellington distinctive. At the implementation level is the Wellington City District Plan which is the primary document that manages land use and development within the Wellington City Council's territorial boundaries. It contains rules that set parameters for

⁴ <http://www.mfe.govt.nz/rma/practitioners/index.html>

⁵ http://www.localcouncils.govt.nz/lqip.nsf/wpg_URL/About-Local-Government-Local-Government-Legislation-Local-Government-Act-2002?OpenDocument

⁶ Urban Development Strategy, Directing growth and delivering quality (Wellington City Council), July 2006

developments or land use proposal. The LTCCP (2009/19) sets out the Council's outcomes for the next 10 years and defines the aspirations for the city. This is developed in response to the city and regional community outcome processes and reflect the community aspirations set down in those processes. To guide the Council in achieving the outcomes, the Council has developed strategies for each of the key activity areas: governance, environment, economic development, cultural wellbeing, social and recreation, urban development, and transportation. The Annual Plan deals with community assets and sets out the short term goals for the community.

4.5 Important Facts and Assumptions

- Population of Wellington grew by 16,000 over the past 5 years
- Demographic projections show that Wellington will require some 23,000 new dwellings to house 37,000 more residents by 2051⁷
- Of these dwellings over 60% will be for high or medium density housing
- 34.7 km² open spaces (Town Belt, Outer Green Belt, reserves)
- Key Assumptions have been made based on Council policies⁸
- Household size for all new growth in the city over the period 2001 to 2051 equates to approximately 1.8 people per new household, which will be apportioned as follows to better reflect household formation relative to dwellings:
 - High density development : 1.5p/household
 - Medium density development: 1.8p/household
 - Low density development : 2.0p/household
- 36% of the total growth will demand high density housing, and 30% will demand medium density housing. The remaining 34 % will demand low density mainly detached housing.
- There is a deficit in housing for small families and people living alone

4.6 Principles

The following planning principles are recognised as “rules of thumb” in identifying trends in urban growth. These principles are described in further detail in section 5.

- Maintain the city's compactness
- Focus development along a “growth spine”
- Better integrate land use and transport.
- Improve quality of urban design
- Foster “sense of place”
- Create better housing choices
- Promote commercial activities
- Establish “Areas of Change”
- Identify risk prone areas

5 Principles

5.1 Compact City

- Encourage a city with a contained urban form and more intensive development focused on the city centre, key suburban centres and major transport corridors.
- Allow intensive development of some areas while protecting others from development.
- Encouraging commercial, office, residential and industrial uses in the central area and suburban centres adjacent to main transport routes.

⁷ UDS Working Paper 9 (revised 2008)

⁸ UDS Working Paper 9 - Quantifying the Growth Spine, MERA 2003, 2004, 2005 Property Economics 05, SGS 05 (p 25)

5.2 Growth Spine

- Focus development along a “growth spine” running from Johnsonville through the city centre to Newtown and Kilbirnie, to ensure that growth occurs where the benefits are greatest and the harm least.
- Promote development focusing on Adelaide Road precinct and Kilbirnie.
- Reinforce and improve compact corridor form.

5.3 Land use and transport

- Ensure that land and infrastructure are integrated and used efficiently.
- Focus growth close to existing transport networks.
- Provide a safe and efficient transport network.
- Encourage a transition towards public transport and other alternatives by providing infrastructure. That that supports buses cycling, walking.
- Improve public transport connections.
- Design major roads to support our centres.

5.4 Urban form

- Foster a “sense of place” through the development of public spaces (ie. Waterfront, Lambton Quay).
- Improve the quality of urban design and improve connections between green spaces in and near centres.
- Protect places that have a citywide character and heritage value.
- Preserve and protect neighbourhood character.
- Build on culture and place.
- Strengthen green belts and open space corridors.

5.5 Housing choice

- Encourage growth in housing and employment in key centres with good infrastructure and public transport.
- Promote housing choice.
- Promote infill housing by increasing numbers of apartments and townhouses.
- Northern area will be the prime location for ‘greenfields’ residential development and largely residential with a mix of densities – higher near transportation nodes.
- Build on and strengthen existing communities.
- Improve the range and location of our housing stock.

5.6 Commercial

- Maintain and strengthen the city's centres to provide accessible shopping, facilities and services
- Promote the central area and main centres as ideal locations of commercial activity
- Mature our sub-regional centres.
- Reinforce a strong regional CBD

5.7 Areas of Change

- Identify “areas of change” in suburban centres and promote bus lanes, walking and cycle plans
- Criteria used for “areas of change”
 - Areas less than 20 minutes walk from the Golden Mile (CBD)

- Areas less than 10 minutes walk from town centres (Tawa, Johnsonville, Karori, Newtown, Kilbirnie, Miramar)
- Areas less than 5 minutes walk from smaller centres
- Areas best served by public transport
- Areas with good carrying capacity (infrastructure and support services)
- Avoid areas with environmental hazards (flooding and earthquake risks and significant resource values such as bush remnants)
- Rates of growth in rural areas will continue to be low and there is no proposal to amend the rules to facilitate intensive rural lifestyle development.
- There will be some reduced capacity for residential infill development and medium/high density housing in outlying residential areas that are not well provided for in terms of public transport.
- There is capacity for a small amount of medium density within existing inner residential areas and a small amount of high density apartment living in Oriental Parade.
- Some of the expected demand for medium density development will be directed to areas surrounding Johnsonville town centre and Kilbirnie town centre.
- The majority of demand for medium density will be directed to Suburban Centres on the growth spine, in particular, Johnsonville, Kilbirnie and Adelaide road. There will be some demand for high density in Adelaide road, and to a lesser extent Johnsonville and other dispersed centres.
- Residential development will be discouraged in Suburban Centres where these centres are industrial based employment centres or 'work centres'.
- The majority of high density apartment style residences will be located in the Central Area, with the remaining occurring in Adelaide road, and a small amount in Johnsonville and other areas such as Oriental Parade.
- The majority of student accommodation will be provided off-campus and there will be minimal residential development within institutional precincts.

5.8 Risk prone areas

- Identify area with landslide hazards
 - Areas of moderate and high landslide (slope failure) susceptibility.
 - Steep cut slopes (>45°) are often susceptible to failure under wet conditions and earthquake loading and important to consider slope instability in future development.
- Identify areas with flood hazards
 - Areas of land known to be, or predicted to be inundated during a significant rainfall event this information has been grouped into three categories: high flood hazard; moderate flood hazard; and residual flood hazard.

6 Areas of Change

This section of the report identifies areas of potential change. The following areas define where higher residential densities are envisaged in the city. It is important to note that the planning process and the Wellington City District Plan create opportunities for development and are not “blueprints” for future development. While the District Plan will provide for certain densities, it is the landowners and development community to take up the opportunities to develop. This is largely driven by economic factors.

This data is considered useful for the RiskScape risk assessment tool. While these areas identified below are those areas most likely to see significant change in the future, the extent and exact location of change cannot be actually known or predicted. The areas will however provide realistic information on future urban growth scenarios for Wellington, which can be used to define the risks that future communities may potentially be exposed to.

Higher residential densities will be achieved primarily through residential infill development. Residential infill development is defined as⁹ “*the placement of one or more additional dwelling units on a lot within the area zoned inner and outer residential that is already occupied by one or more buildings.*” The definition clearly identifies that the focus of this is on ‘backyard infill’. The definition of infill does not cover redevelopment of a site by removal of an existing building and its replacement with a multi-unit dwelling, or the conversion of an existing building to one or more multi-unit dwellings.

In terms of identifying occupied parcels for further infill development, the key assumptions are generally based on the rules in the Wellington City District Plan for residential development.

- A 35% site coverage (max set out in the District Plan) was used as the basis for determining potential for new dwellings in outer residential areas.
- A 50% site coverage (max set out in the District Plan) was used as the basis for inner residential areas.

The scenarios analysis suggests that there is still considerable capacity for infill development in outer residential areas with potential for between 5,886 and 13,392 dwellings. The same cannot be said however for inner residential areas which are already quite dense. Here the scenario analysis suggests is only potential for between 537 and 686 dwellings through infill development.

Scenario 1 – potential number of dwellings based on total surplus land area

The following example illustrates how many dwellings could be built if:

Total surplus land area is used as the base – which would enable more than 1 dwelling to be built on larger surplus land sites.

Only 25% of the identified sites are viable for development due to physical access, market conditions and ownership.

The land available is based on a mix of building platform sizes (1/3@100m², 1/3@200m², 1/3@300m² for outer residential areas) (1/3@80m², 1/3@160m², 1/3@240m² for inner residential areas).

Outer Residential = 13,392 dwellings

7,250 dwellings @ 100m² building platforms

3,625 dwellings @ 200m² building platforms

2,417 dwellings @ 300m² building platforms

Inner Residential = 686 dwellings

374 dwellings @ 80m² building platforms

187 dwellings @ 160m² building platforms

⁹ Identifying sites for residential infill development in Wellington City, January 2007 (p 4)

125 dwellings @ 240m² building platforms

Total = 13,978 dwellings

Scenario 2 – potential number of dwellings based on number of identified surplus land sites

The following example illustrates how many dwellings could be built if:

Only 1 house was built on each surplus land site.

Only 25% of the identified sites are viable for development due to physical access, market conditions and ownership.

The sites available are based on a mix of building platform sizes (1/3@100m², 1/3@200m², 1/3@300m² for outer residential areas) (1/3@80m², 1/3@160m², 1/3@240m² for inner residential areas).

Outer Residential = 5,886 dwellings

1,962 dwellings @ 100m² building platforms

1,962 dwellings @ 200m² building platforms

1,962 dwellings @ 300m² building platforms

Inner Residential = 537 dwellings

179 dwellings @ 80m² building platforms

179 dwellings @ 160m² building platforms

179 dwellings @ 240m² building platforms

Total = 6,423 dwellings

6.1 Central Area

Priority One (High) Staging: Underway Existing study area (red)

- Area: 216 ha
- Existing dwelling density: 22 dwellings/ha (gross)
- Public transport: excellent bus and rail
- Centre type: Regional CBD

Description of possible outcome

- High density apartment living
- Proposed dwelling density: 80 dwellings/ha



Comments

- The central area is already a major area of change
- Greatest benefit to the city by locating more of the future population here
- High priority and continued implementation

6.2 Adelaide Road

Priority One (High)

Staging: Planning for growth underway

Existing study area (red)

- Area: 30.8ha
- Existing dwelling density: N/A
- Public transport: high frequency bus route
- Centre type: CBD Fringe

Description of possible outcome

- Mixed use area, with apartment living above commercial uses
- Potential for medium density townhouse development on periphery
- Proposed dwelling density: 60 dwellings/ha



Comments

- Adelaide road is already undergoing considerable change
- There is considerable opportunity to locate more of the future population here, but this needs to be considered in terms of the overall land use vision for the area
- High priority and continued implementation

6.3 Johnsonville Town Centre

Priority One (High)

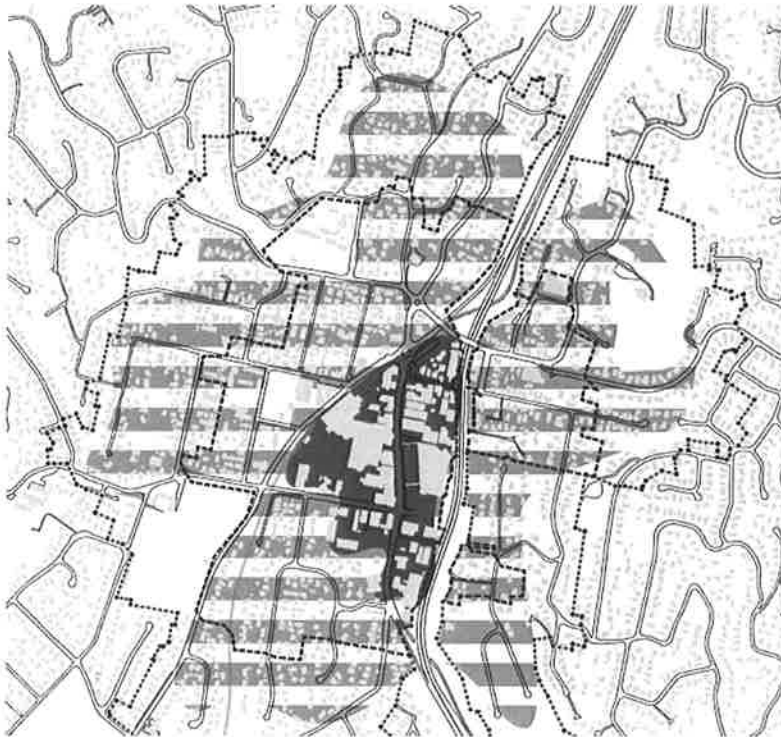
Staging: Planning for growth underway

Existing study area

- Area: 217 ha
- Existing dwelling density: 12 dwellings/ha (gross)
- Public transport: train, good bus
- Centre type: major town centre

Description of possible outcome

- Apartments in the town centre
- Medium density town house and terrace housing within a 10min walk from the centre
- Proposed dwelling density: 60 dwellings/ha



Comments

- The size and role of town centre means that it is an obvious candidate area for change.
- Community consultation has started – the idea of intensification around the town centre has been canvassed with the community for some time now.
- Improvements to physical infrastructure need to go hand in hand with growth to ensure livability is maintained.
- High priority and immediate staging

6.4 Miramar Town Centre

Priority Two (Medium)

Staging: After growth spine as resources become available

Existing study area (orange)

- Area: 79.8 ha
- Existing dwelling density: 18 dwellings/ha (gross)
- Public transport: high frequency bus route
- Centre type: Major town centre

Description of possible outcome

- Some apartment living above ground floor level in commercial areas
- Incremental approach to intensification with medium density close to town centre and lower density further from centre
- Area to be further refined
- Proposed dwelling density: 30 dwellings/ha



Comments

- The role and function of Miramar town centre means there is benefit in locating additional population here – this will help support its role and could provide a trigger for re-vitalising the town centre.
- The problem (as with much of the city) is that there is very little scope for intensification without major redevelopment, and currently the development economics are not great.
- Also needs coordination with transport improvements
- Medium priority & staging to be coordinated with transport infrastructure improvements

6.5 Kilbirnie Town Centre

Priority One (High)

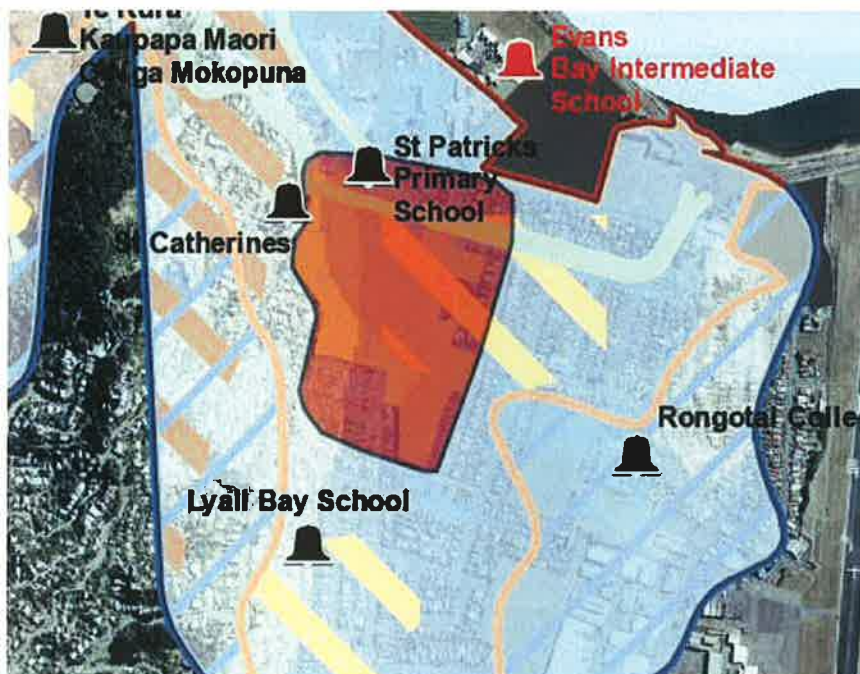
Staging: Planning for growth to follow Adelaide road

Existing study area (orange)

- Area: 22ha
- Existing dwelling density: 18 dwellings/ha (gross)
- Public transport: high frequency bus route
- Centre type: Major town centre

Description of possible outcome

- Apartment living above ground floor level in commercial areas
- Medium density townhouse and terrace housing in areas immediately adjacent to centre – these are few
- Proposed dwelling density: 40 dwellings/ha



Comments

- The location and function of Kilbirnie town centre means there is benefit in locating additional population here – this will help support its role and compete with Airport retail.
- While there is scope for increased residential in commercial areas, there is very little options in surrounding residential areas without major redeveloping and land amalgamation.
- High priority, particularly in commercial areas
- Staging – planning for growth to occur after Adelaide road as resources become available, needs to be a wider area study to confirm boundaries
- Also needs coordination with transport infrastructure improvements