



Capacity for Growth Study 2006

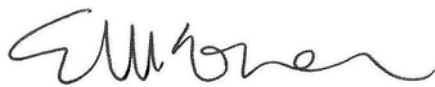
Methodology and Assumptions Summary

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Capacity for Growth Study 2006 Methodology and Assumptions

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1 Introduction

The Capacity for Growth study monitors and reports on residential, business and rural land availability within the region. The results of this study are presented in the Capacity for Growth Study 2006 Final Results Report March 2010 (TR 2010/014).

The Auckland Regional Policy Statement (ARPS) requires that Capacity for Growth surveys be undertaken once every five years for the purposes of managing urban containment (Section 2.6.3.6). The Capacity for Growth study is also required for monitoring the progress and implementation of the Auckland Regional Growth Strategy (ARGS) and has been a significant part of the Growing Smarter Evaluation 2007. This is the third study in the series with previous reports prepared and reported to the council in 1998 and 2003.

This report is the companion piece to the Capacity for Growth Study 2006 Final Results Report March 2010 (TR 2010/014). It provides the details the methodologies and assumptions used in the study.

The purpose of this document is threefold:

To summarise the methodologies of the five Capacity for Growth sub-studies:

- Vacant and Vacant Potential land,
- Residential Infill and Refill,
- Brownfield Land,
- Redevelopment of Business Land, and
- Rural Area Study.

To summarise the detailed assumptions behind the demand forecasts:

- Population Projections,
- Residential Demand by Land Type,
- Rural Area Residential Demand,
- Business Land Demand, and
- Business Floor Space Demand.

To provide the detailed assumptions and methodologies behind the land area classifications:

- Business Land by Group 1 and Group 2 Business Activities,
- Residential Land by Residential Intensity and Housing Type, and
- Generalised Rural Zone Type.

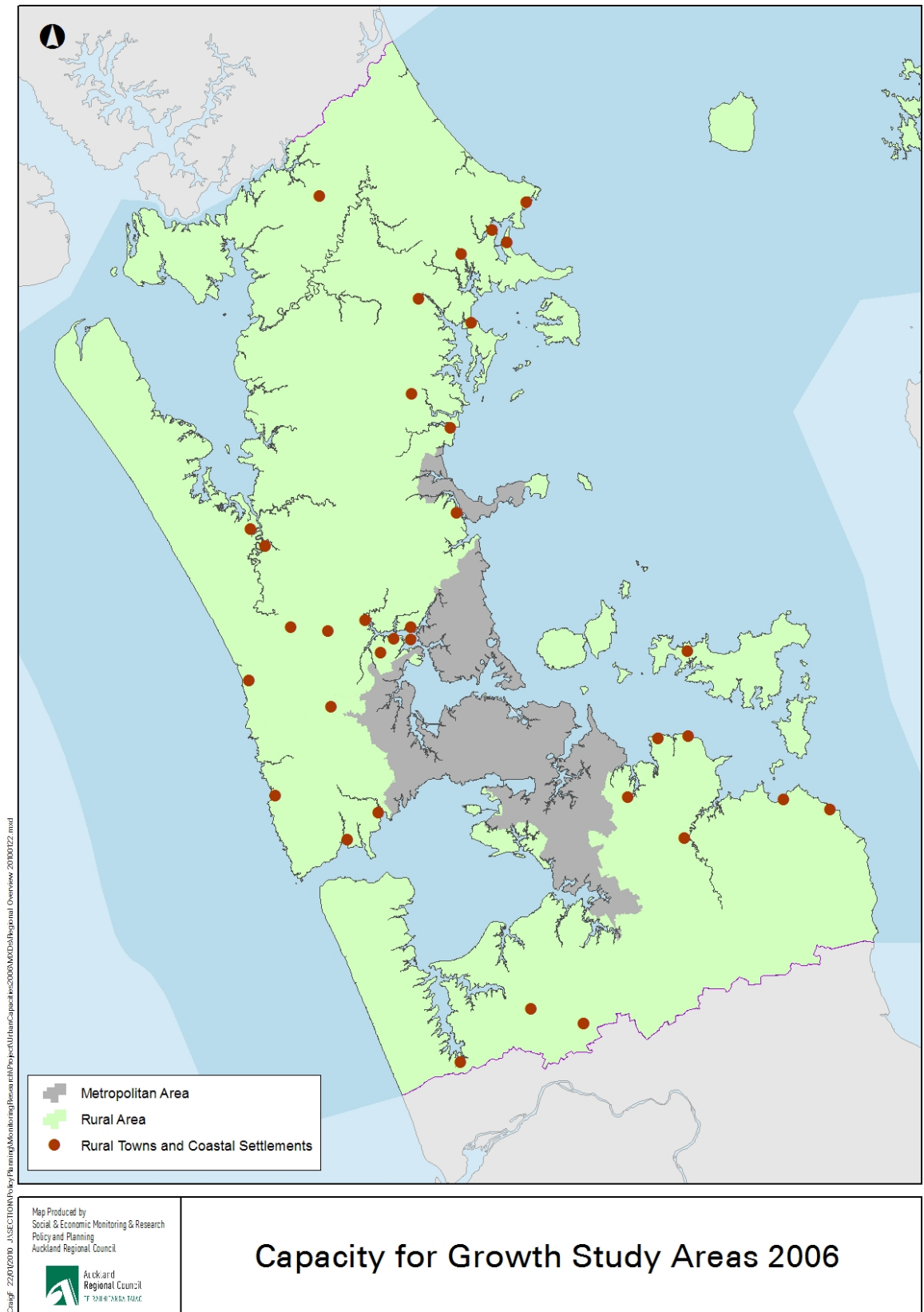
The Capacity for Growth study was conducted and managed by the Auckland Regional Council's Social and Economic Research and Monitoring team. The process of

confirming methodologies and checking results has involved officers from each of the region's seven territorial authorities.

Where possible, measures have been kept consistent with the previous studies. Where measures have varied, or new measures have been added, agreement on the methodology applied was reached by the regional working group (which consists of land-use and economic development planners from the territorial authorities – see acknowledgements).

For the purposes of the Capacity for Growth study the Auckland region includes the Auckland Metropolitan Area, the Rural Towns and Coastal Settlements and the Rural Area. These areas are shown on the map at Figure 1 page 3.

Figure 1: Capacity for Growth Study Areas



2 The Capacity Study Measures and Methodologies

The Capacity for Growth Study 2006 includes five sub studies: the Vacant Land study, the Brownfield Land study, the Residential Infill and Refill study, the Redevelopment of Business Land study and the Rural Area study. These five studies are the means by which the raw capacity data is captured. This section details what each study is designed to achieve and outlines the methodology and assumptions applied.

2.1 Vacant Land Study

The 2006 study is a zero-based full assessment¹ of vacant land within both metropolitan Auckland and the region's rural towns and coastal settlements.

There are two components to the vacant land study:

- Vacant land: is defined as any parcel of land that is zoned for residential or business activities that contains no buildings.
- Vacant potential land:
 - a. Business land: is defined as any parcel of land that has one or more business activity buildings on it and includes a portion of undeveloped or vacant land (i.e. the parcel is partially vacant and therefore underutilised).
 - b. Residential land: is any parcel of land with a site size greater than 2000m² that has one or more residential buildings on it and includes a portion of undeveloped or vacant land (i.e. the parcel is partially vacant and therefore underutilised).

2.1.1 Vacant Land Methodology

The Vacant Land study used a custom built Geographical Information System (GIS) application to identify, assess and capture vacant sites. The databases used in the assessment are listed and described in Appendix A: Database Inventory and Zoning Assumptions for the Metropolitan and Rural Towns and Coastal Settlement Areas.

2.1.1.1 Business zoned land

Using the Vacant Land GIS Application every parcel with a business zoning was checked to see if it was vacant or partially vacant (approximately 20,000 parcels in

¹ Every residential and business zoned parcel in the study has been assessed for capacity i.e. the study is not limited to assessing those parcels identified in previous studies as having capacity. A zero based approach was taken as District Plan rules can change over time and because the subdivision of parcels can lead to capacity being created.

tota). For vacant potential parcels the portion of the site that was vacant was recorded. Sites with designations² were excluded.

The results were checked with each territorial authority to ensure that no capacity was captured that could not be built on e.g. where a reserve had been purchased or vested but the zoning had not yet changed.

Capacity results for vacant business land are reported in total hectares.

The zones surveyed as well as the capacity assumptions applied are listed by territorial area in Appendix A: Database Inventory and Zoning Assumptions for the Metropolitan and Rural Towns and Coastal Settlement Areas.

2.1.1.2 Residential zoned land

The residential vacant land capture was undertaken in the same way as the business vacant land capture except vacant potential was only assessed where parcels had a land area greater than 2000 m² (sites under 2000 m² are assessed for infill potential. See section 2.3 Residential Infill and Refill Study).

Again identified parcels were checked with the territorial authorities to ensure that no capacity was captured that could not be built on.

Capacity results for vacant residential land are provided as "total number of dwellings units". The GIS application calculated the total number of dwelling units for each vacant land parcel. One of three density calculations was applied to a parcel depending upon its land area. For example, for parcels between 0 and 2,000 m² the basic district plan zoning density was applied. For parcels between 2,000 m² and two hectares a factor was removed from the land area to allow for the provision of access, open space and utility reserves (typically 25%). For parcels over two hectares a factor of 13 dwelling units per hectare³ was applied.

For zones without an operative residential or business zoning, such as future expansion zones at Long Bay in North Shore City and Hingaia in Papakura, the most recently calculated capacity yields were provided by the relevant territorial authority.

Houses under construction are calculated as capacity (i.e. capacity to house a family). Under construction means a dwelling does not have a completed roof (assessed from aerial imagery).

The Vacant Land Study does not assess the potential for Minor Household units⁴.

Capacity results for vacant residential land are reported in total residential dwelling units.

² Designation site: a parcel or parcels designated for network utilities under section 166 of the Resource Management Act 1991.

³ This factor is based upon case studies of subdivisions within the metropolitan area on residentially zoned parcels over 2ha between 2001 and 2006. The study showed an average density of 13 dwellings per hectare regardless of district plan density provisions. This is an increase from the 2001 assumption of 10 dwellings per hectare.

⁴ Minor household units or *granny flats*, are permitted on a site in addition to another larger residential unit in some zones. Typically these cannot be disposed of independently from the larger residential unit.

The zones surveyed as well as the capacity assumptions applied are listed by territorial area in Appendix A: Database Inventory and Zoning Assumptions for the Metropolitan and Rural Towns and Coastal Settlement Areas.

2.2 Brownfield Land Study

Brownfield land is a new measure in the 2006 study. It was identified as a source of business activity capacity in a report commissioned by the regional Business Land and Economy Group (BLEG) and was initially considered to be a subset of the vacant and vacant potential measures. However, as the capacity assessment progressed it became apparent that brownfield land was a form of urban development in its own right and was therefore integrated into the Capacity for Growth study.

Brownfield land is defined as “existing business zoned land that has been developed, but is either not in current use, or is significantly underutilised, and could be regenerated or redeveloped for business purposes.” (Urbanista Ltd, 2007: p.4)

Brownfield land was included in response to the fact that vacant land, although being rapidly taken up, was not the sole source of land for further business development. Historically the redevelopment of previously used sites within the urban area has been part of the city’s on-going development and is a reflection of the dynamics operating between the age of the stock, changing business activities and practices, changing locational needs and changing land values amongst other things. Including this measure provides a more comprehensive assessment of the availability of business land for business growth.

The BLEG Brownfield report identified that while some brownfield land could be readily redeveloped, other parcels would face significant obstacles to redevelopment, e.g. potential contamination, existing industrial or commercial activities and site reconfiguration. The availability and certainty of capacity from brownfield sites needs to be considered with these limitations in mind (Urbanista Ltd, 2007: p3).

The Brownfield study is a zero based full assessment of brownfield land within both metropolitan Auckland and the region’s rural and coastal settlements.

The new brownfield land definition did capture some land that had previously been identified as vacant or vacant potential. These areas of overlap have been identified and double counting has been avoided. However, care does need to be taken when referring to these results.

The full Brownfield Land Study is included as Appendix .

2.2.1 Brownfield Land Methodology

A set of candidate brownfield parcels were selected using GIS. To be selected, parcels had to meet the following criteria: be business zoned land, parcel size greater than 5000 m² and have an improved value less than 30% of the capital value.

Each of the candidate parcels were then manually assessed on-screen using the 2006 aerial imagery and the following criteria: level of on-site activity, condition of structures and buildings, and formality of use if the parcel was used for storage.

The remaining parcel selection was then checked through with territorial authority officers.

Capacity results for Brownfield business land are reported in total hectares.

The capacity assumptions applied are included in the full Brownfield Land study included as Appendix J.

2.3 Residential Infill and Refill Study

Infill housing is the term given to the action of adding dwelling(s) to the front or rear of an existing residentially developed site.

“Infill housing provisions have existed in district plans since the 1970s. These provisions were introduced as a policy response to what was seen as unsustainable levels of suburban fringe development in the Auckland region. By introducing infill-housing provisions it was hoped that this would provide opportunities to intensify existing urban areas of Auckland, which were of a very low density. However, when these provisions were introduced, reliable calculations of how much capacity this would create were not done.” (ARC Capacity for Growth study, 2003: p11)

Infill began in the more central Auckland suburbs and then rapidly spread through most pre-1980 suburbs⁵. The Auckland Metropolitan Area: Capacity for Growth 2001 study identified a variation on the typical infill dwelling to the front or rear of an existing house – the redevelopment of the whole site. Redevelopment resulted in the removal and replacement of the original house with two, three or more townhouses.

Refill is therefore defined as “the removal of the existing dwelling and *refilling* to the maximum permitted density”.

Refill is not likely to occur uniformly across all of Auckland (in some cases it may not occur at all)⁶. However, it is necessary to know what capacity exists in this form for a number of reasons:

- to understand the implications of the policy,
- to understand what the net impact of a policy change would be,
- to help understand the infrastructure consequences including projecting traffic demand, and
- to know which areas will be affected by down zoning e.g. for heritage protection reasons.

⁵ Opportunities for infill are relatively low in post 1980 subdivisions due to the smaller size of the subdivided site and the more central position of the original dwelling.

⁶ Refill appears to be influenced by factors such as land values, market pressures and a willingness to sell, hold or redevelop.

The Infill Study does not assess the potential for Minor Household units⁷.

The 2006 study is a zero based full assessment of infill and refill opportunities within both metropolitan Auckland and the region's rural and coastal settlements.

2.3.1 Residential Infill and Refill Study Methodology

The 2003 study established a methodology for assessing each individual residential parcel in the region for infill and redevelopment capacity. This methodology required the development of a custom Geographic Information Systems (GIS) application. The 2006 study builds on this regionally accepted methodology.

The first step was to load all the necessary databases into the GIS. These databases included district plan zoning (seven territorial authorities), zoning density assumptions (checked with territorial authorities), zoning development controls (yards set-backs, access way requirements, bush protection, etc), Digital Cadastral Data Base (DCDB)⁸, dwelling data (Quotable Value New Zealand (QVNZ)), building footprints, and 2006 aerial imagery. The databases used in the assessment are listed and described in Appendix A: Database Inventory and Zoning Assumptions for the Metropolitan and Rural Towns and Coastal Settlement Areas.

From this database a first round of candidate parcels was identified. Identification was completed by running each parcel through the GIS databases and identifying those parcels with theoretical residential infill (see Figure 2).

The candidate parcels were then individually assessed on screen using the GIS application tools. For parcels with digital building footprints available (NSC, WCC, ACC, PDC) the GIS application had already made an assessment of the availability of a building platform and of an access-way⁹. In these cases the assessment involved confirming or amending the on-screen data. In cases where digital footprints were not available the first step of the assessment involved digitising the existing dwelling outline. The GIS application then calculated the building platform and access way areas and the calculations were confirmed or amended.

In all, over 200,000 parcels were assessed in this manner.

Refill (the removal of the existing dwelling and redevelopment to the maximum permitted density), was calculated automatically by the GIS application. Two counts of refill were recorded: theoretical and modified. The theoretical count simply captured capacity on all parcels where the maximum number of potential dwellings is greater than the existing number. The modified count only records capacity where the maximum number of potential dwellings is at least twice the existing number (i.e. used

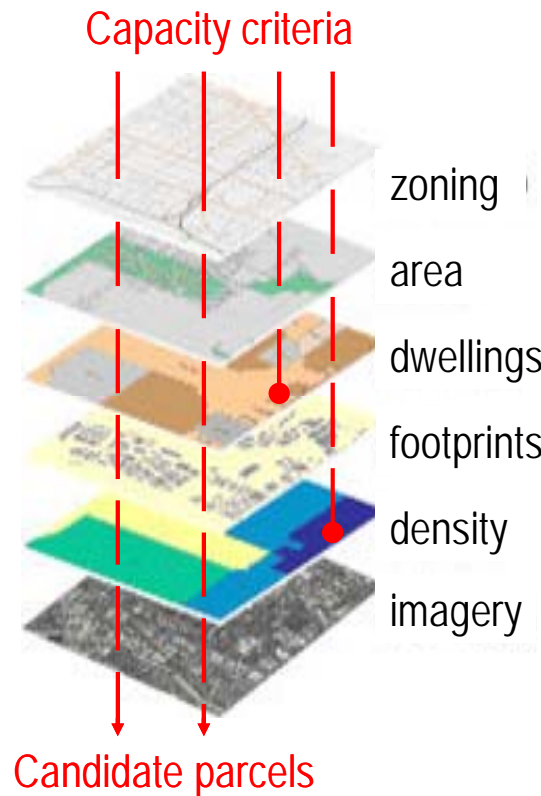
⁷ Minor household units (sometimes referred to as *granny flats*), are permitted on a site, in some zones, in addition to another larger residential unit. Typically these cannot be disposed of independently from the larger residential unit.

⁸ Digital Cadastral Data Base (DCDB), parcel attributes including boundaries and properties.

⁹ A building platform was assumed to be a minimum of 250 m² made up of dwelling 120 m², private space 100 m² and 30 m² for margin of confidence. An access way is assumed to be 3m in width.

as a proxy for sufficient incentive to redevelop¹⁰). Only the modified refill results are reported in this study.

Figure 2: GIS Database Layers Used to Select Candidate Parcels



No infill or refill capacity is recorded against parcels that are a part of post-1980 subdivisions. Observations show that the redevelopment of parcels within post 1980 subdivisions is rare¹¹.

Capacity results for infill are reported in total residential dwelling units.

The zones surveyed as well as the capacity assumptions applied are listed by territorial area in Appendix A: Database Inventory and Zoning Assumptions for the Metropolitan and Rural Towns and Coastal Settlement Areas.

2.4 Business Land Redevelopment Study

Redevelopment on business zoned land is a measure of the additional capacity available from the intensification of currently developed business areas (e.g. the CBD,

¹⁰ The modified count is based upon case study examples which indicate that redevelopment occurs generally on sites where the number of dwellings is significantly increased. More research is recommended in this area to understand the factors that influence when and where redevelopment occurs.

¹¹ This is due to the nature of post-1980 subdivision and development - smaller parcels size and the central location of dwellings on the parcel - and the fact that this dwelling stock is still relatively new.

town centres such as New Lynn and Manurewa and business areas such as Penrose and Wairau Park).

Business Land Redevelopment capacity is a new measure to the study. The regional Business Land and Economy Group, the Regional Growth Strategy Growing Smarter 2007 evaluation and the Capacity for Growth study Peer Review ((Urbanista Ltd, 2005: p.11) all identified the need for a measure that provided an understanding of the additional business and residential capacity available in the region's business areas (for example, the replacement of a two storey building with a 10 storey development). It was acknowledged that while vacant and brownfield are useful measures of the gross land area available for development, a measure of the additional capacity available from intensification of sites was necessary.

The methodology for assessing business land redevelopment capacity was developed by a working group of territorial authority officers throughout 2007. The methodology was applied to 136 business areas across the region¹². An inventory and maps outlining these business areas by territorial authority are included as Significant Areas.

The methodology identified the need to assess two capacity scenarios: theoretical redevelopment (based on district plan development control rules), and a more conservative assessment, modified theoretical redevelopment (which was based on the contemporary densities of development currently being experienced in the region).

The supply of redevelopment capacity is subject to a number of constraints and significant uncertainty. These constraints will impact upon the timing and extent (if any) of the capacity that is actually taken-up or realised. Constraints include the pattern of existing activities and ownership, infrastructure, accessibility, land banking, owner preference, and the economic viability of redevelopment.

An assessment of the residential redevelopment capacity of business land was made in the 2003 study. The methodology used in that study differs from the methodology used in this 2006 study and as such the results cannot be compared directly.

Capacity results for redevelopment of business land are reported using the following three measures:

- business activity floor space (m²),
- Employment Count¹³ (ECs), and
- residential activity (dwelling units).

The full Redevelopment of Business Land Study is included at Appendix K.

¹² The business areas selected met the following criteria: be business zoned land, be or expected to become an area of significant employment, be a recognised area of change, be recognised by Territorial Authorities as a discrete business area. All centres in the Regional Policy Statement Schedule 1A were included.

¹³ The Employee Count (EC) is a head count of all salary and wage earners used by Statistics New Zealand. For more information on the EC measure refer to <http://www2.stats.govt.nz/domino/external/omni/omni.nsf/23f076d733ded7e74c256570001d92b4/d1b7ded58bafa223cc256fb900146eff?OpenDocument>

2.4.1 Business Land Redevelopment Methodology

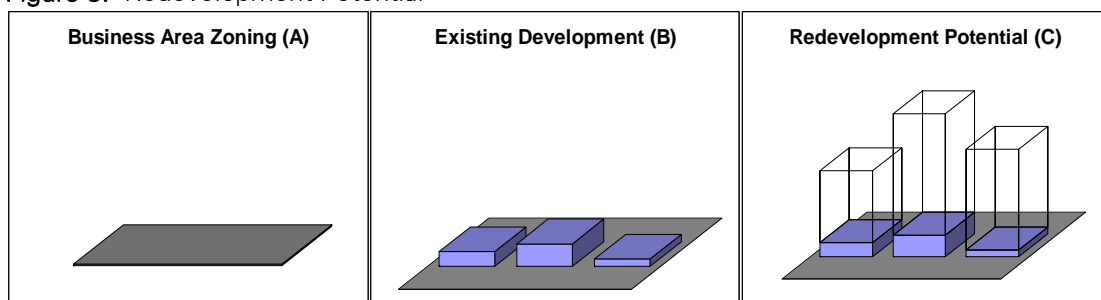
A detailed explanation of the methodology used to assess business land redevelopment capacity is summarised in the background technical report, "Assessing the Redevelopment Capacity of the Business Zoned Land in the Auckland Region February 2006" included as Appendix K. What follows is a brief summary of the methodology from that report.

The methodology developed was based upon the following assumption:

$$\text{Redevelopment Capacity} = \text{Redevelopment Potential} - \text{Existing Development}$$

This formula is illustrated in Figure 3 where redevelopment capacity is represented by the non-shaded area in diagram (C).

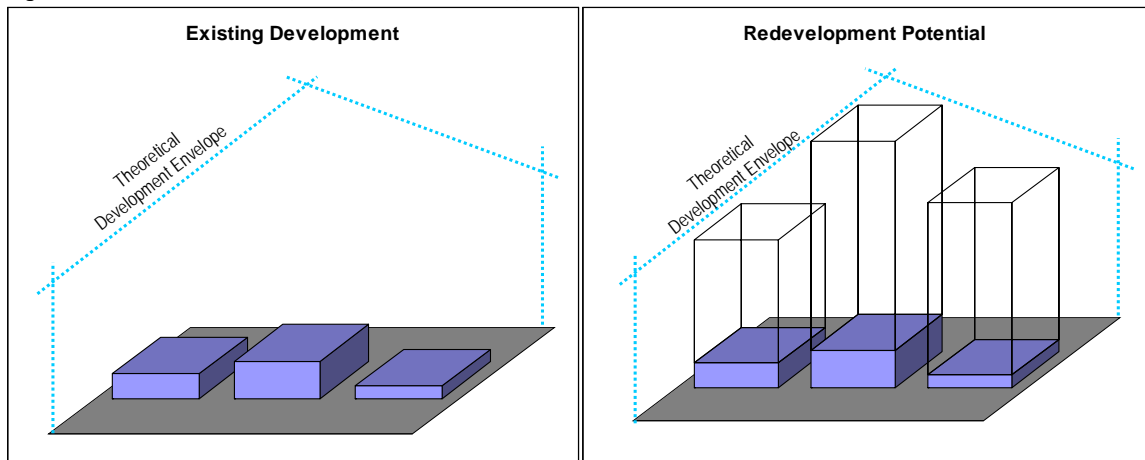
Figure 3: Redevelopment Potential



The development potential of business areas across the region is set by district plan development control rules for a zone (e.g. height limits, coverage controls etc). These rules effectively define a zone's theoretical development envelope (Figure 4). The development envelopes were then converted into a Floor Area Ratio (FAR) for each zone. (FARs are a convenient method for describing built form and are readily converted into floor space as they describe the ratio of floor space to site area permitted¹⁴.) The FARs were then applied to each of the business areas to provide a total floor space for that business area.

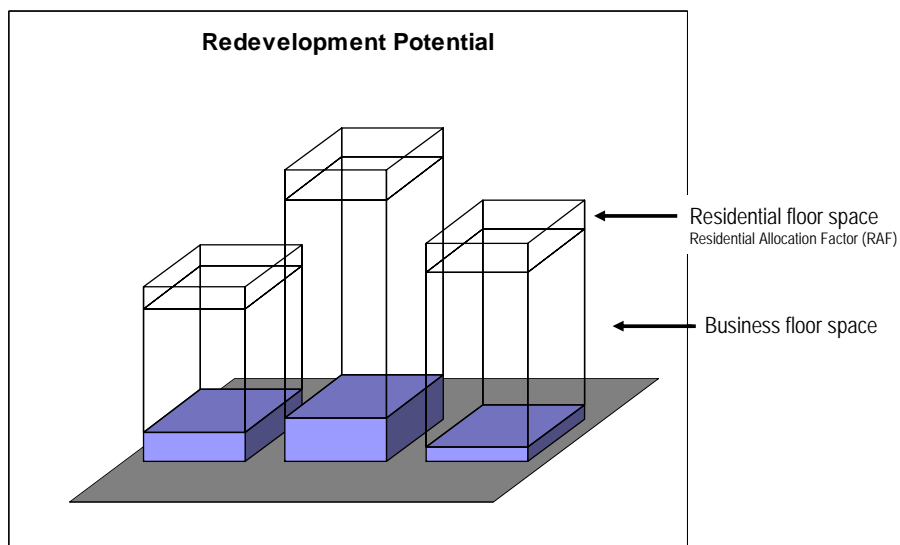
¹⁴ For example, FAR of 2:1 means that a parcel of 1000 m² can have up to 2000 m² of floor space developed on it. This floor space may be in the form of a two story building that covers the whole site or a four story building that covers 50% of the site.

Figure 4: Theoretical Development Envelope



Some business zones permit residential development (i.e. mixed-use). In such cases a Residential Allocation Factor (RAF) was applied to the total floor area¹⁵ to derive the total floor space available for residential activity (Figure 5). The balance of the floor space was assumed to be available for business activities.

Figure 5: Residential Allocation Factor

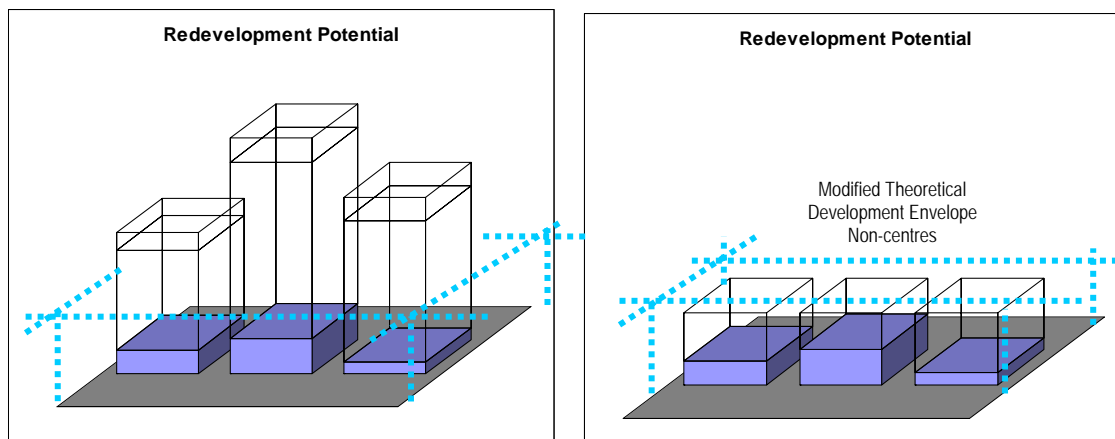


The methodology included two assessments; an entirely theoretical assessment and a modified theoretical assessment. The theoretical assessment was based entirely upon the development envelopes permitted under District Plan rules. The modified theoretical assessment scaled back the theoretical potential in situations where no height limit existed or where unrealistic typologies of development would be

¹⁵ The majority of District Plans do not include a guide to the final mix of business and residential activity. The RAF was assessed based upon a mix of the following from each territorial authority: strategic objectives and/or expectations, town centre plans, case studies of contemporary development, and officer advice.

required¹⁶. The effect of this modified approach is to reduce the development envelope and therefore the overall redevelopment capacity of these areas¹⁷ (Figure 6).

Figure 6: Modified Theoretical Development Envelope



Finally the total business and residential floor space figures were converted into employment counts (ECs) and residential dwelling units respectively. Business floor space was converted into employment using a set of employee to workspace assumptions¹⁸ (i.e. the average floor space per employee). Residential floor space was converted to dwelling units by applying a 100 m² per dwelling factor¹⁹.

The full methodology is presented in Appendix K: Redevelopment of Business land Study.

2.5 The Rural Area

The rural capacity study examined the residential development potential of the rural area. For this study the rural area is defined as all the non-urban land in the region outside the Metropolitan and Rural Towns and Coastal Settlement areas. It includes all rural zoned land, countryside living areas, landscape and ecological protection areas.

The Rural Capacity study is the first study of its kind to occur at a regional level. While there have been a number of local studies carried out by territorial authorities, these have not had consistent methodologies, data sources or date stamps.

Policy makers have indicated that the effects of “countryside living” are an issue within the rural area (i.e. the impacts on rural character, pressure on roading and other

¹⁶ Some business zones do not have maximum height limits applying only a height-in-relation to zone boundary control. In some cases this could result in the possibility of 30+ level developments. In industrial areas such a built form typology is not expected and therefore a scale of development based upon contemporary development examples within the region was applied. In centres the development assumptions of similar centres were applied.

¹⁷ Theoretical capacity was calculated (using GIS modelling) and recorded for all zones. Refer to Appendix K Assessing the Redevelopment Capacity of the Business Zoned land in the Auckland Region (ARC 2007).

¹⁸ Work space ratios (the average floor space occupied by an employee) were used to convert floor space into employment. Workspace ratio assumptions were calculated for each of the 17 ANZSIC level 1 industrial divisions.

¹⁹ 100 m² per dwelling unit was based upon case study examples. It assumes medium to high density multi unit development and includes an area for utilities, parking and entry etc).

infrastructure, and conflicts between lifestyle and farming activities, etc). To assist policy makers with their understanding of the issues this study provides both quantification and location information about countryside living capacity.

The ARPS defines countryside living as “low density residential development on rural land. It includes the concepts of rural-residential development, scattered rural-residential lots, farmlets, residential bush lots, retirement lots, large-lot residential development and the like. It is similar to low density residential development where it occurs within urban areas.”

Countryside living is currently provided for across the region in two ways:

- by way of specific countryside living or rural residential zones, and
- by way of incentive or performance provisions other rural type zones.

An area limit of eight hectares or less has been applied to further define countryside living activities within the general rural area (parcels with a land area of eight hectares or under are assumed to be more likely used for countryside living activities and parcels over 8 hectares are assumed to be more likely used for general rural activities).

Capacity results for the rural area are reported as vacant titles and as new titles created by subdivision.

2.5.1 Rural Area Capacity Study Methodology

The rural capacity study used an automated GIS modelling tool to calculate additional dwelling capacity in the region’s rural areas. This tool is based upon the Infill and Vacant tool. The key difference is that the Infill and Vacant study visually checked sites, while the Rural Capacity study automatically checks titles using GIS datasets.

This methodology was chosen for a variety of reasons. These included:

- the rural area is large, so visually checking is impractical and is likely to be unreliable,
- it will be easy to incorporate new, more accurate datasets,
- regular monitoring is possible using updated dwelling and title information, and
- scenario modelling of alternative rules can be carried out.

The limitation with this approach is that the information is only as good as the databases available. This is most likely to occur with the dwelling data, which is sourced from ARC’s rates database. Case studies of sample data showed that in some cases the number of observed dwellings on a property did not match with the rates database. However, the total number of dwellings calculated by the capacity assessment was within 7% of 2006 Census results.

The first step in the application was to load the relevant databases. These databases included title boundaries, number of dwellings per title, vegetation cover, wetland areas, soil types, and wastewater lines.

The rules in each district plan can be categorised into two main groups:

- Density based rules. These rules use a minimum site size as the sole basis for subdivision. Only title area and the number of dwellings are used to calculate capacity; and
- Incentive based rules. These rules reward protection or enhancements of features on titles. Rules take into account factors such as vegetation cover. This information is supplied by the various GIS databases.

The second step involved running the GIS model. The model assesses each title against the rules of the district plans, and produces a subdivision potential for each title. For district plans that allow a number of subdivision variations in each zone, the title was assessed against all the variations, and the highest potential was chosen (based upon the assumption that landowners would seek to maximise their potential return from their land).

In instances where subdivision was a discretionary activity advice on how these were to be assessed was taken from working group officers. The general approach was not to include discretionary activities unless officers reported that such applications were in general being granted.

The final step involved summarising the results into categories. Four scenarios are possible for any given title:

1. Parcel has no potential, and already has a dwelling on it. This title will receive no possible extra dwellings.
2. Parcel has no potential, but is vacant. This title will receive one possible extra dwelling, as a title is assumed to physically accommodate a dwelling.
3. Parcel has capacity potential, and is vacant. The potential number of dwellings is calculated.
4. Parcel has capacity potential, and a dwelling upon it. The potential is taken away from the total number of dwellings on the title.

The rural capacity results are reported in two categories: vacant titles (with and without further subdivision potential) and occupied parcels with potential. Vacant titles are made up of scenarios two and three above, while occupied parcels with potential are calculated using scenario four. A vacant parcel has to be at least 400m² in land area to be included as a vacant parcel category. (Any vacant parcel smaller than this is assumed unlikely to developed in a rural setting²⁰.)

The zones surveyed and capacity assumptions applied are listed by territorial area in Appendix B Rural Capacity Study Databases and Zoning Assumptions.

²⁰ 400m² was also used as a cut off point in the ARC's evidence to the LGAAA Hearings.

3 Demand Assumptions

The following section summarises the demand assumptions that have been used in the Capacity for Growth study. The demand assumptions are combined with past development trends to provide an indication as to how long Auckland’s capacity will last under current planning policy.

3.1 Region Population Projections

The Capacity for Growth study uses the Statistics New Zealand and the Auckland Regional Council Population and Household Projection series²¹ as an indicator of future regional population growth.

Table 1: Auckland Region Population Projection Series 2006 to 2051

Period To March...	Usually Resident Population		
	Low Projection	Medium Projection	High Projection
2006	1,371,000	1,371,000	1,371,000
2011	1,451,921	1,482,950	1,514,006
2016	1,534,338	1,596,817	1,659,613
2021	1,615,217	1,709,679	1,804,948
2026	1,693,285	1,820,565	1,949,336
2031	1,766,700	1,928,117	2,091,968
2036	1,831,298	2,028,530	2,229,479
2041	1,887,164	2,122,169	2,362,567
2046	1,935,515	2,209,898	2,491,741
2051	1,976,526	2,290,877	2,615,130

Source: Statistics New Zealand and ARC

3.2 Metropolitan Area Residential Demand

Years to exhaustion measures have been estimated for both:

- total residential capacity, and
- residential capacity by capacity type (vacant land, infill and residential on business land).

The following sections explain both the methodologies applied.

3.2.1 Metropolitan Area Total Residential Demand

The Capacity for Growth study uses the Statistics New Zealand and the Auckland

²¹ Statistics New Zealand and the Auckland Regional Council prepare a series of population and household projections based upon census and population estimates once every three to five years. The method used to project future populations is the cohort component model. This method involves the calculation of the likely future size of population cohorts (5 yearly and by sex) based upon the effects of migration, fertility and mortality.

Regional Council Household Projection series as a proxy for future housing demand.

Outputs of the Household Projection series are available at Census Area Unit (CAU)²² resolution. The CAUs that best fit the Metropolitan Urban Limit area (MUL) were selected. The resulting MUL household projections are summarised in Table 2 below. (Territorial authority metropolitan area household projections were also generated, this area is summarised in Appendix C.)

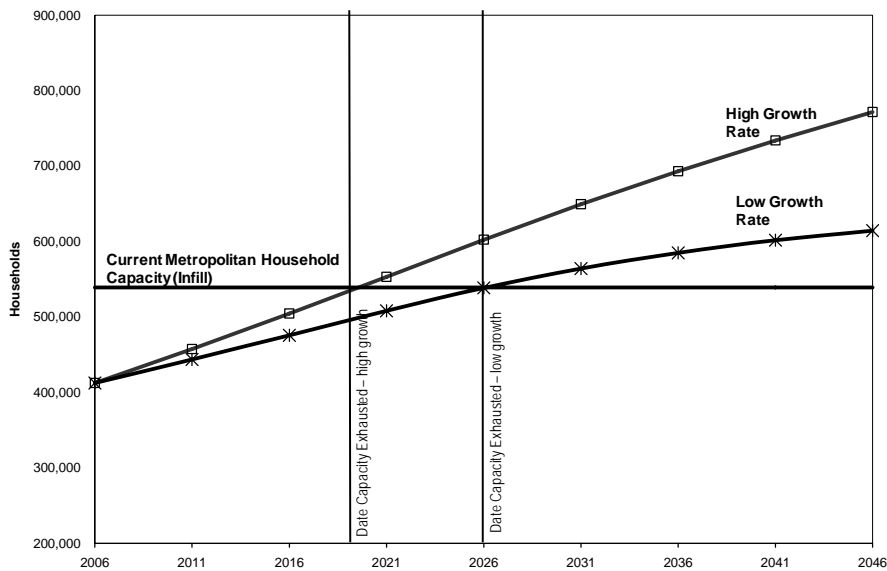
Table 2: Auckland Region Household Projection Series 2006 to 2046 (Metropolitan Auckland)

Period To March...	Household Projections		
	Low Projection	Medium Projection	High Projection
2006	412,542	412,542	412,542
2011	443,532	450,625	457,454
2016	475,801	490,396	504,442
2021	508,217	531,071	553,109
2026	538,492	570,954	602,397
2031	564,179	607,429	649,438
2036	584,919	639,761	693,130
2041	601,751	668,657	733,906

Source: Statistics New Zealand and ARC

Total residential capacity²³ is then mapped against these projections.

Figure 7: Projected Years until 2006 Residential Capacity Exhausted (includes Infill), Metropolitan Auckland



Source: Statistics New Zealand and ARC.

The Infill study identified two measures of infill: Infill and Refill. The Infill results are mapped in Figure 7. The intersection of the capacity line by the high and low

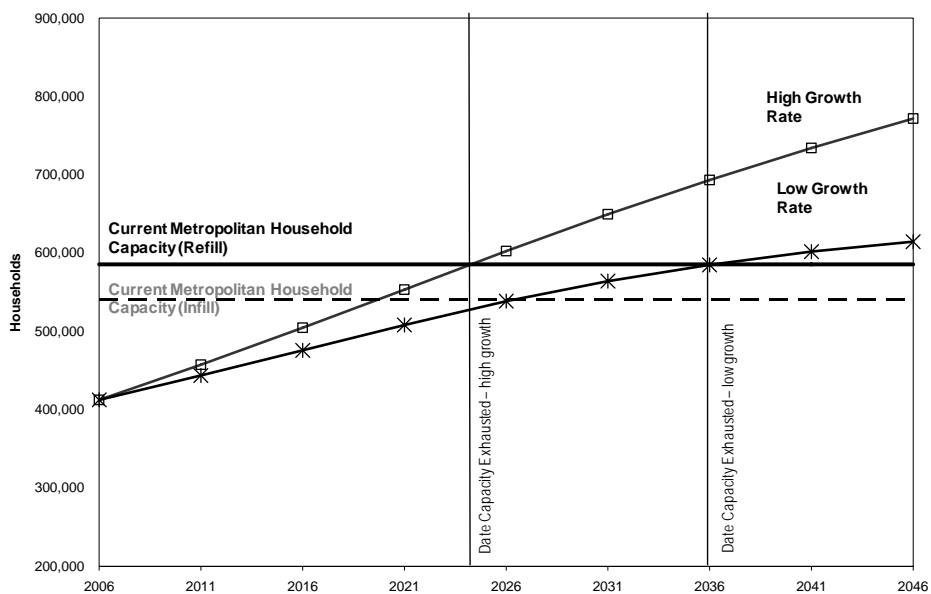
²² A Statistics NZ statistical unit. Area units are aggregations of meshblocks. They are non-administrative areas that are in between meshblocks and territorial authorities in size. Area units must either define or aggregate to define, regional councils, territorial authorities and urban areas. http://www.stats.govt.nz/methods_and_services/surveys-and-methods/classifications-and-standards/classification-related-stats-standards/area-unit/definition.aspx

²³ Total metropolitan residential capacity equals the Census number of dwellings as at 2006 (412,542) plus capacity at 2006.

projections provides an estimate of when capacity constraints could occur (i.e. in this case, between 14-20 years).

Refill identified the capacity for an additional 44,795 dwelling units. This additional capacity is mapped on Figure 8. Including Refill extends the supply of capacity by four to 10 years depending on the growth rate.

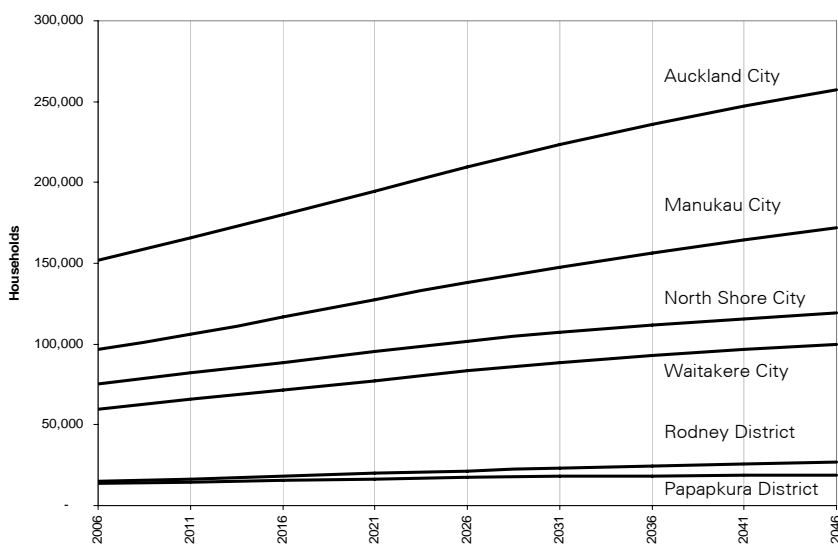
Figure 8: Projected Years until 2006 Residential Capacity is Exhausted (includes Refill), Metropolitan Auckland



Source: Statistics New Zealand and ARC.

The projections series show that the territorial authority areas do not grow at the same rate, due to differing local population age structure and rates of migration (Figure 9).

Figure 9: Household Projection Series (Medium) 2006 to 2046 by Territorial Authority



Source: Statistics New Zealand and ARC.

Each territorial authority's years to exhaustion has been estimated using these local projection assumptions.

3.2.2 Residential Demand by Capacity Type

An assessment of the number of years of supply by capacity type, i.e. Vacant, Infill or Residential on Business Land has been made in this report. This has been done by applying past development trends to future residential demand (i.e. the MUL household projections)²⁴.

Analysis of past residential building consents (2001-06) reveals that 40% of all residential development has occurred on Vacant land, 32% on Infill land and 28% on Business land (80% of this within the CBD). (Refer to Table 3 and Source: ARC Regional Monitor Built Environment Building Consent Database

Figure 10 below.)

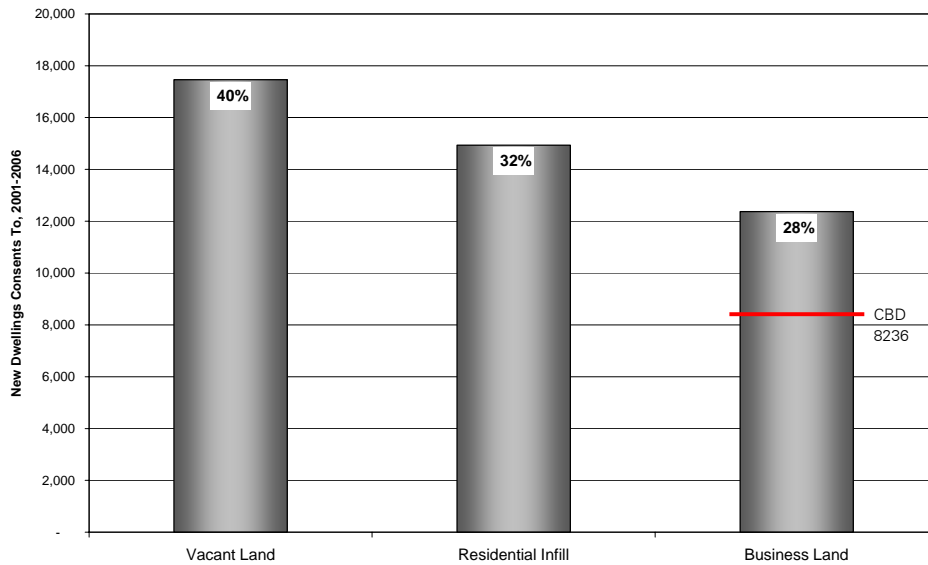
Table 3: Location of New Dwellings Consented To, 2001-2006, Metropolitan Auckland

<i>Number of New Dwellings Consented to</i>	Vacant Land	Residential Infill	Business Land	Total
Rodney District	1,497	1,024	3	2524
North Shore City	3,395	2,573	401	6369
Waitakere City	3,142	2,381	287	5810
Auckland City	1,954	5,459	10,774	18187
Manukau City	6,454	3,342	905	10701
Papakura District	1,016	154	6	1176
Auckland Metropolitan Area	17,458	14,933	12,376	44767
<i>Percentage of Dwellings Consented to</i>	Vacant Land	Residential Infill	Business Land	Total
Rodney District	59%	41%	0%	100%
North Shore City	53%	40%	6%	100%
Waitakere City	54%	41%	5%	100%
Auckland City	11%	30%	59%	100%
Manukau City	60%	31%	8%	100%
Papakura District	86%	13%	1%	100%
Auckland Metropolitan Area	39%	33%	28%	100%

Source: ARC Regional Monitor Built Environment Building Consent Database

²⁴This approach does not take into account the effects a reduction in the supply of one capacity-type will have on the demand, and therefore the rate of take-up in other capacity types (e.g. as infill opportunities reduce more opportunities to develop on business land may be sought).

**Figure 10: Location of New Residential Units Consented to, 2001 to 2006
Metropolitan Auckland**

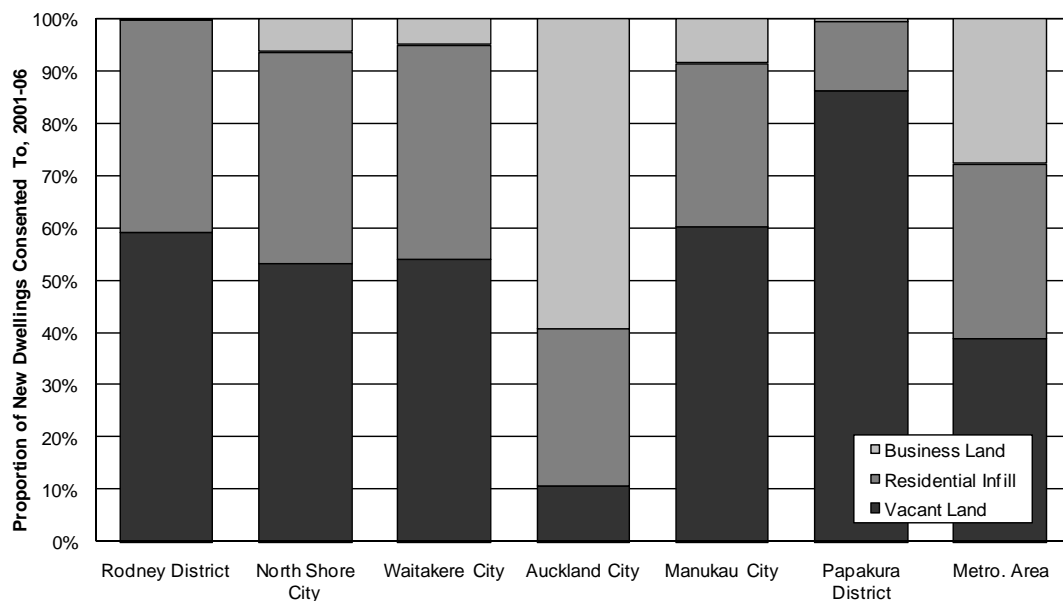


Source: ARC Regional Monitor Built Environment Building Consent Database

Residential development by capacity type is distributed quite differently across the territorial authority areas. With very limited vacant land and no greenfield areas to expand into Auckland City still accommodates the most residential growth. Source: ARC Regional Monitor Built Environment Building Consent Database

Figure 10 below shows that the majority of this has been by way of development on business zoned land.

**Figure 11: Location of New Residential Dwellings Consented to, 2001-2006, by
Territorial Authority**



Source: ARC Regional Monitor Built Environment Building Consent Database

By applying these past development trends to the take-up of current capacity (e.g. 40% of all future residential dwelling units will be on vacant land, 32% on infill and 28% on business land) an estimate of the years to exhaustion can be made. Take-up is based upon the high and low household projection series.

Table 4 shows the distribution of residential capacity and the expected years to exhaustion by capacity -type based upon current planning policy (2006).

Table 4: Residential Capacity Supply by Capacity Type, Metropolitan Auckland

Capacity Type	Estimated Extra Dwelling Unit Capacity	Supply (years) High to Low Growth Rate 2006
Vacant Land	59,263	16 to 24
Infill Housing	20,302	6 to 10
Residential redevelopment in Business Zones	69,370	21 to 40
Total (with Infill)	148,935	14 to 20
Refill Housing	64,151	20 to 35
Total (with Refill)	192,784	18 to 29

This approach is then applied to each of the individual territorial authority areas.

3.3 Metropolitan Business Land

Years to exhaustion measures have been estimated for vacant business land and for the redevelopment of business land (i.e. business floor space and employment). The following sections explain the methodologies applied.

3.3.1 Business Vacant Land - Supply and Demand

The years to exhaustion for vacant business land are approximated by comparing available land to the past rates of business land take-up (i.e. by dividing total available land by past rates of development).

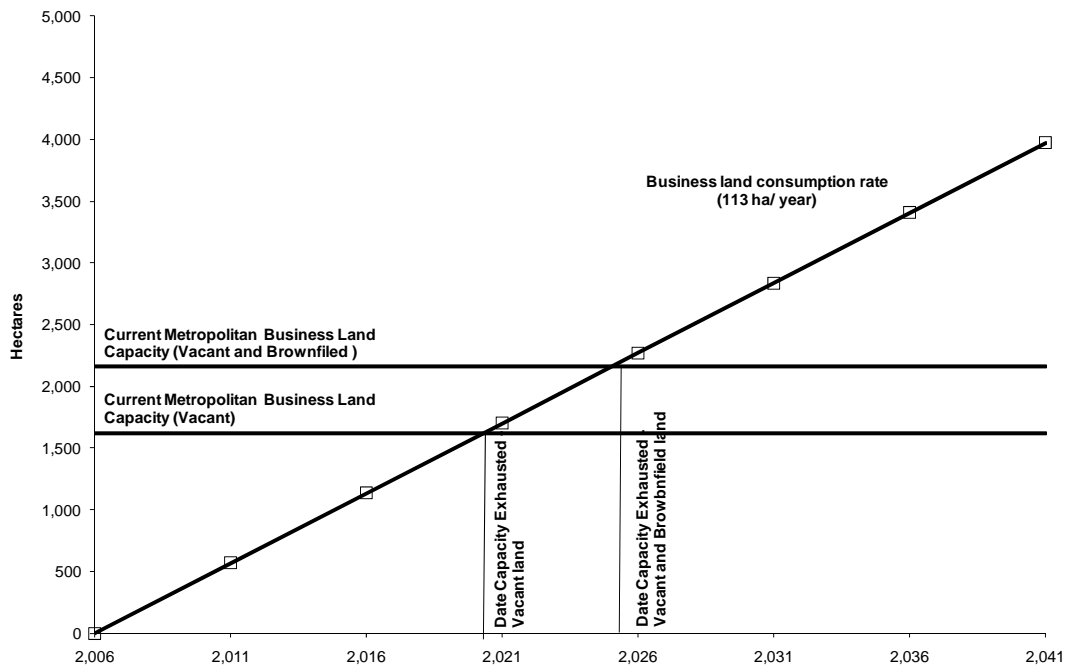
Past rates of business land take-up were calculated by comparing vacant land totals between the Capacity for Growth studies i.e. 1996, 2001 and 2006. Rates of consumption were based upon the 10 year average and calculated for each territorial authority individually to reflect local trends. Results of this analysis, by territorial authority, are recorded in **Error! Reference source not found.** Appendix D: Vacant Business Land Consumption Rates 1996-2006.

Years to exhaustion were then calculated for vacant business land and vacant business land plus Brownfield land²⁵. Both measures of capacity are shown on Figure 12: Projected Years until all 2006 Business Land Capacity is Potentially Exhausted,

²⁵ Brownfield land is a new measure in the 2006 study. Its inclusion increases the business land capacity total. Brownfield land is subject to a number of development constraints. These constraints are described in Section 2.2 (Brownfield Land Study).

Metropolitan Auckland (Vacant and Vacant and Brownfield) below. Together these measures indicate a land supply of between 13 to 17 years.

Figure 12: Projected Years until all 2006 Business Land Capacity is Potentially Exhausted, Metropolitan Auckland (Vacant and Vacant and Brownfield)



3.3.2 Business Floor Space and Employment – Supply and Demand

Two basic proxies of future business floor space demand were compared to existing capacity in the Redevelopment of Business Land Study. These were:

- a projection of past commercial floor space trends, and
- the Economic Futures Model²⁶ (EFM) employment projections.

The following is an extract from that study:

Past Commercial Floor Area Building Consents as a Proxy for Future Demand:

The approach has been to look at the average annual rate of commercial floor area supply from building consents issued in the past ten years (1996-2006) and use this as a proxy for future demand. The annual rate of demand is then compared to the Redevelopment of Business Land floor area capacity thus providing an estimate of the number of years to exhaustion. The exercise recognised that the development dynamics of centres (Group 2 intensive land-use activities) and industrial areas (Group 1 extensive industrial activities) differ considerably. Therefore projections were calculated for each area type as well as for all business land. The outputs are shown in Table 5 and Figure 13.

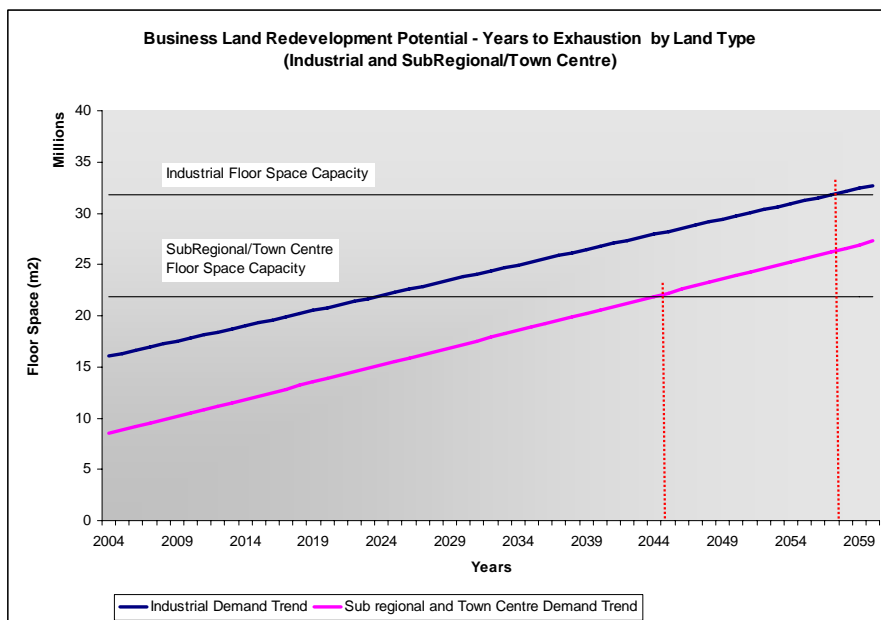
²⁶ The Economic Futures Model prepared for the ARC by Market Economics Limited. This model projects employment change by industry sector to 2031.

Table 5: Projected Years to Exhaustion by Business Land Category (Modified Theoretical Scenario)

Business Land Category Type	Redevelopment Capacity	Annual average commercial floor space consented to 1996-2006	Projected years to all Redevelopment Capacity exhausted
Sub regional and Town Centre	13,091,000m ²	335,700m ² /yr	39 years
Industrial	15,496,000m ²	298,400m ² /yr	52 years
All Areas	28,588,000m ²	634,100m ² /yr	45 years

Source: ARC Regional Monitor Built Environment Building Consent Database

Figure 13: Projected Years to Exhaustion: Business Floor Space



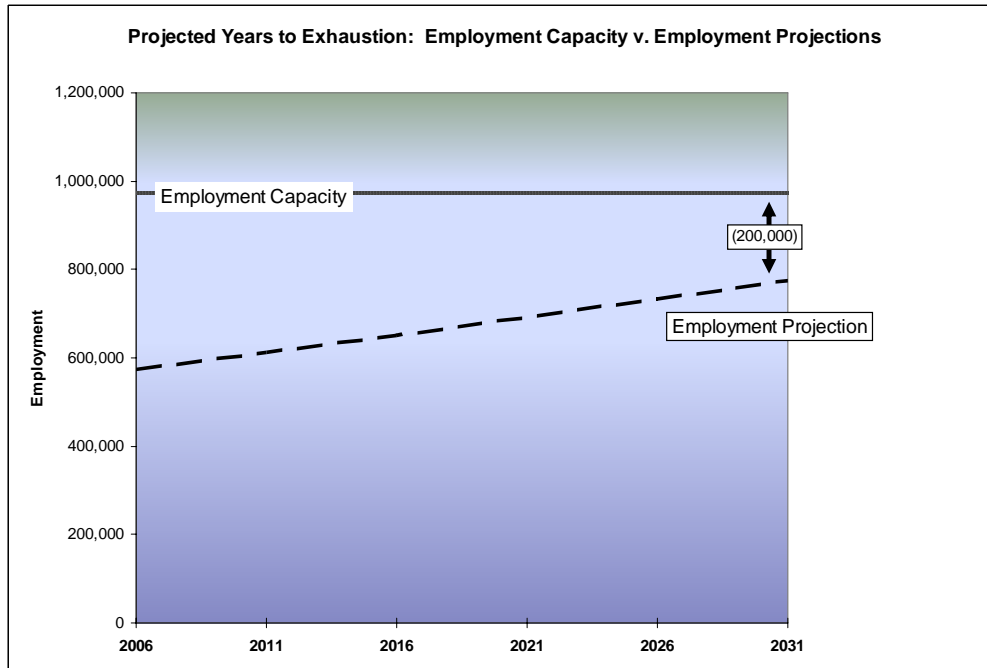
This approach is very basic and should be treated with caution. It assumes that all existing business zoned land will be redeveloped and that past rates of development will continue on into the future.

Employment Projections as a Proxy for Future Business Floor Space Demand:

The EFM provides employment projections for the region. These projections were used as a proxy for future employment demand and as such were compared to the Redevelopment of Business Land employment capacity figures. The EFM projected an employment population of 774,000 FTEs by 2031. This is an increase of 201,500 FTEs from the 2006 figure of 572,444 FTEs. When compared to an estimated employment capacity of 970,700 ECs there is unutilised capacity of 196,000 FTEs

remaining²⁷. Figure 14 compares the employment projections sourced from the Economic Futures Model (EFM) against the employment capacity identified in this report.

Figure 14: Projected Years to Exhaustion: Employment



Source: ARC Economic Futures Model

In conclusion, this report has looked at two very simple means of comparing estimated employment capacity against possible future demand (in order to establish whether the business land market is or could come under stress). Both of the indicators used suggest sufficient business land and development capacity is available under current district plans for future demand.

3.4 Rural Area

Matching supply with demand in the rural area is a problematic exercise. The 2006 Rural Capacity study was the first of its kind in the Auckland region, which means that there is no trend data to refer to. In addition, the Statistics NZ/ARC population projections used in the urban area do not fit well with the rural area; the projections are based at Census Area Unit level and in many cases these units are very large in the rural area making it difficult to exclude rural towns and settlements. Therefore, the two most obvious ways of placing the rural area's capacity in context are ruled out.

As a proxy for countryside living demand, analysis undertaken for the Auckland Regional Council's submission to the Local Government (Auckland) Amendment Act

²⁷ It is acknowledged that FTEs and ECs are not the same measure of employment and cannot be reliably compared. However, in this circumstance, because EC capacity is twice that of the FTE demand it is reasonable to assume that sufficient capacity exists within current district plans

2004 on countryside living was used²⁸. This found that approximately 650 building consents were issued on average each year for residential dwellings on countryside living sites. (The Submission used the 8 hectare or smaller title area as a definition of countryside living; so the two studies are comparable.) When compared to a countryside living capacity of 17,326 additional titles this shows there would be over 26 years of supply.

²⁸ Statement of Evidence 2007, David Lindsey, in the matter of Plan Changes to the District Plans- Countryside Living Data.

4 Land Area Classifications

The following section lists and describes the various land area classifications referred to in the Capacity for Growth study.

4.1 Business Land by Group 1 and Group 2 Business Activities

The region has adopted a business sector classification which groups activities by their land area requirements²⁹.

Classification Group 1 Business Sector includes land extensive industrial activities such as: manufacturing, construction, wholesale trade and transport and storage.

Classification Group 2 Business Sector includes activities that are land intensive: retail trade, accommodation, cafes, and restaurants, communication services, finance and insurance, property and business services, government administration and defence and personal and other services.

The Capacity for Growth study has taken these useful groupings and applied them to the region's 70 business-type zones in order to identify the supply of vacant land available to each Grouping.

Methodology:

Identify all the business land type zonings, special zones and designations from the region's district plans. Review individual zone objectives and provisions and classify as Group 1 or Group 2 accordingly. Where a zone permits both Group 1 and Group 2 type activities list as Mixed.

Refer to Appendix E for the Business Zone to Business Sector Group concordance.

4.2 Centers and Non-centre Areas

Centres were selected based upon territorial district plan zone classifications and included sub-regional, local and neighbourhood centres (mixed-use type zonings). Non-centres were the balance business zoned areas. Non-centres are characterised by industrial, manufacturing or single-use type zonings. Small business zones e.g. local shops are not included in the study. A full list of the business areas by centre and non-centre classification is listed in Appendix F.

4.3 Residential Land by Residential Intensity and Housing Type

There are 85 different residential zones applied to land across the region. In order to provide some insight into the type and intensity of housing that may result the zones

²⁹ The Auckland Region Business Land Strategy October 2006.

have been grouped into seven housing types based upon the Auckland Housing Choices guide³⁰, see Table 6 below:

Table 6: Residential Housing Types and Intensity

Residential Housing Typology	Residential Intensity	Dwellings per ha (Gross)	Dwellings per ha (Net)
Low-rise to High-rise	Urban Low to High Density	30 to 100+ dwelling units per ha	22 to 75+ dwellings per ha
Terrace to Low-rise	Suburban High Density	36 to 100 dwellings per ha	27 to 75 dwellings per ha
Town House to Terrace	Suburban Medium Density	25 to 33 dwellings per ha	19 to 25 dwellings per ha
Conventional Suburban to Town House	Suburban Conventional Density	10 to 22 dwellings per ha	8 to 17 dwellings per ha
Low Density Suburban	Suburban Low Density	7 to 8 dwellings per ha	5 to 6 dwellings per ha
Large Lot	Large Lot	1 to 5 dwellings per ha	1 to 4 dwellings per ha
Rural Lifestyle	Rural Lifestyle	1 dwelling per ha and less	1 dwelling per ha and less

Methodology:

First, the region's district plans were examined and all the residential-type zonings identified. Then the objectives and maximum permitted density provisions of each individual zone were noted. The densities were then compared to the Auckland Housing Choices guide and the zone classified accordingly.

Refer to Appendix H for the Residential Land by Residential Intensity and Housing Type concordance.

4.4 Rural Zone Type

There are 42 rural zones within the region's rural area. To simplify analysis these zones have been classified into one of four categories or types based upon the objectives of the individual zone. These general zone types are:

- Rural Residential/Countryside Living (7 individual zones),
- Rural General (11 individual zones),
- Landscape or Ecological Protection (23 individual zones), and
- Special Rural (1 individual zone).

Methodology:

The region's district plans were examined and the rural-type zonings identified. The individual zone objectives and provisions were reviewed and the zone then classified into a general zone type accordingly.

Refer to Appendix I for the Rural Area by Rural Zone Type concordance.

³⁰ Auckland Regional Growth Forum, Auckland Housing Choice, A guide to housing definitions commonly used in the Auckland Regional Growth Strategy, see Appendix G

5 Concluding Comments

The Capacity for Growth Study has now been completed for three periods, 1996, 2001 and 2006. The next study is scheduled for 2011.

The original methodologies have remained consistent throughout the three studies. This consistency has helped the study become a regional standard. To maintain this value is important that the capacity results continue to have a regional relevance and be trusted especially as new capacity issues emerge. These issues are often complex and can result in a range of possible outcomes. When addressing new capacity issues the approach developed to date has been one of first confirming the issue with a regional working group and then, if accepted, developing a methodology using a working group of territorial officers with the relevant expertise. It is recommended that this collaborative approach be continued under the new Auckland City arrangement.

The capacity for growth studies have benefited greatly over the past ten years from improving databases and technologies; especially GIS. With the proposed merger of the region's councils there is a real opportunity for a significant improvement in the region's understanding of capacity and development trends and inter capacity study monitoring. However, for this opportunity to be realised, it will require that disparate databases and processes become aligned, not an insignificant task.

As with all surveys, users of the information need remain aware of the study's limitations, i.e. in some cases district plan rules are complex and therefore the range of development outcomes are quite broad.

The full set of 2006 capacity results is available in the Capacity for Growth Study 2006 Final Report Technical Report 2010/014.

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