

## 10.0 Rural residential capacity methodology

### 10.1 Background

The PAUP proposes a new approach to rural residential growth when compared to the region's legacy district plans.

An Auckland Council press release summaries for a general audience the policies and objectives addressed in the Proposed Auckland Unitary Plan (Auckland Council, 2013b):

#### **Preserving productive farmland**

3/07/2013

Managing the effects of rural and countryside living, while preserving productive farmland, were among issues discussed by councillors and local board chairs at the third Auckland Plan Committee draft Unitary Plan workshop today. Subjects raised for political direction included:

- Rural subdivision
- Countryside living lot sizes, location and extent
- Mixed-rural zone
- Second or subsequent dwellings on rural sites

There was general agreement with the direction of the Auckland Plan for rural areas to remain rural in character and future rural population growth to be focused in existing towns and villages. These sentiments were reflected in much of the feedback so far on the draft Unitary Plan. Suggested approaches discussed at the workshop today included:

- No net increase in the number of rural sites, to protect productive land and avoid fragmentation
- Investigate additional countryside living areas and potential for different lot sizes around rural towns and villages
- Review the location of the mixed rural zones and whether additional mixed rural zones would be appropriate
- Investigate providing for second or subsequent dwellings.

There are four main approaches to enabling additional dwellings in rural zones now provided for in the PAUP, these are:

1. Latent vacant site development, but subject to various site criteria
2. 'Traditional' subdivision based on minimum site area and/or consideration of a few overlays, the latter approach applied mainly in precincts (largely being translations of legacy provisions)
3. Transferable Rural Site Subdivision (TRSS) under two quite separate, but overlapping approaches:
  - a. TRSS via vacant site amalgamation (requires identification of donors and receivers), and
  - b. TRSS via significant environmental area (SEA) protection (requires identification of donors and receivers), and

4. Provisions enabling additional 'second or subsequent' dwellings for larger sites without necessarily facilitating subdivision.

In contrast to previous legacy plans, development capacity in rural areas is deliberately limited in the PAUP, resulting in a planning approach that seeks to not increase the net number of rural titles from the existing count while still facilitating a reasonable level of dwelling growth for rural purposes. This requires an expansion on previous Capacity for Growth Study approaches to consideration of subdivision as a mechanism for calculating dwelling potential (on a one dwelling per title basis, more or less) to a much more complex approach reflecting the new PAUP framework.

The PAUP enables some provision for additional dwellings without subdivision, and limited 'traditional' subdivision in certain locations, generally where legacy rules have been rolled over as precincts. A limited number of PAUP rural zones enable a traditional 'minimum site area' approach to subdivision, and there are also 'density bonus' provisions in certain 'Transferable Rural Site Subdivision' (TRSS) receiver locations facilitating receipt of donor sites.

The majority of rural residential development from subdivision is expected to occur by way of TRSS, where 'donor' sites in specified zones with particular features or attributes (such as the appropriate area and type of Significant Environmental Area (SEA)) are able to be used to create (or transfer) potential to other specified 'receiver' locations where parcels in those receiver locations have the necessary attributes (such as site area) to do so.

Calculation of the capacity under each option at the parcel level is relatively straightforward, as most locations in the region now operate under the single set of consistent rules, meaning a smaller set of rules has been required to be modelled, though their individual complexity more than makes up for the lack of numbers. The rural residential capacity component of the Capacity for Growth Study 2013 assesses each title in Auckland's rural area for its latent development potential, subdivision and/or Transferable Rural Site Subdivision (TRSS), and potential for subsequent dwellings potential under the PAUP.

The following sub-sections of this report outline the approaches used to model these rules, and the assumptions and limitations used are part of these approaches.

The TRSS provisions enable the transfer of potential from site to site around the region as well as a limited increase in the number of rural lots. Due to the nature of the relationships between donor and receiver sites, it remains difficult to predict the actual source and destination of these transfers at a sub-regional scale.

#### 10.1.1 TRSS: measuring the potential for transfer and receipt, and impacts on location specific growth calculations.

Under TRSS provisions, the number of dwellings in the rural area is enabled to be moved around and increased and we can quite accurately identify the *potential* amount of this transfer or receiver ability increase on a parcel basis. *Where* those dwellings will ultimately be located and the number of titles they will end up occupying is a little harder to ascertain under the TRSS provisions - which allow but do not necessarily require, transfer of that potential to a very wide range of potential receiver locations. The potential for transferability between titles is measurable at the individual parcel level and at the regional scale, as the ability for an individual title to donate and/or receive can be calculated (along with any other development options) but is not able to accurately determined for any scale in between (such as a local board, catchment, or other study area). This is mainly because the relationship between donors and receivers is unknown and unknowable - there is no way to say that a *particular* vacant site will be used as a vacant donor (over say being developed in situ), and then if that title will be used to construct a dwelling or create a title on a *particular* receiver site, as the two are not required to be related in any way before the TRSS transaction occurs. In fact the PAUP specifically states that donor sites can be created without any receiver being prior known.

We can calculate each site's potential to donate or receive, but not if that will happen or where particular donors will get received on a per parcel basis. For this reason if any sub-regional geography is chosen (such as a local board area) we can indicate the total number of titles with the potential to donate TRSS, latent potential, second and third dwellings and receivers, but we cannot aggregate

these figures to say what the total number of dwellings in that given geography may be after all of these options are taken or otherwise, as donated titles may leave the assessment area, or be received from outside it and vice versa.

Additional complications arise in the aggregation of results due to the number of (usually mutually exclusive) development options a parcel may have. In contrast to legacy district plans, this issue was solved by assessing all options and choosing the single approach that delivered the greatest number of dwellings (as a proxy for the greatest return to owner/highest capacity possible). Under the PAUP rules the modelled options where there is more than one, are often for a single dwelling, either happening *in situ*, or existing as a TRSS opportunity that can potentially occur 'elsewhere' - that is on potentially thousands of potential receiver titles that are not required to have any prior relationship with the donor. For this reason capacity is reported at the sub-regional level as 'without TRSS' only, 'with TRSS' total being ascertainable at the regional scale only. Total potential for donation and receipt within any given geography is possible but total growth outcomes for that geography are not.

## 10.2 Rural residential assumptions and limitations

Below are the main assumptions and limitations that are specific to the rural residential component of this study. These are in addition to the assumptions and limitation for the study as a whole outlined in earlier sections:

- Where an existing title has more than one dwelling, existing dwellings are allocated to any potential new lots before new vacant title/TRSS are created. This is based on the assumption that this would be required by any consenting processes. Therefore the dwelling yield may be less than the number of new rural titles that is possible to be created, and results cannot be used to forecast subdivision consents or new titles (e.g. for development contributions calculations). This also applies to non-subdivision based development opportunities, such as second dwellings and vacant sites.
- The study has not assessed the potential for rural based employment, only dwellings.
- Where subdivision is used as the mechanism for determining a net dwelling yield, the model does not actually model 'subdivision' as lines on a map, but rather the mathematical potential for a minimum lot area to fit within a potential candidate area, less current dwelling count and any other constraints, and rounded down to the nearest integer (or whole dwelling).
- Rural capacity is calculated at the individual title scale (and is reported at the macro scale). Considerably different outcomes could occur where more than a single title is utilised in a single application (i.e. the study does not consider combinations of titles or amalgamation to gain more subdivision potential, mainly because there is no objective, repeatable or practicable way of predicting which if the infinite combinations and iterations of titles would be likely or feasible, and is anecdotally rare in any case).
- Rural assessment has been undertaken on a 'title' level (where as the urban assessments on a 'parcel' level).
- No accounting is made for minor household units/subsidiary dwellings which are now limited to certain 'legacy plan' based precincts, but may enable considerable increase in 'dwelling' stock in those locations. Additional modelling could be undertaken in the future to investigate this potential.
- Potential for "Second and Third dwellings" (as per the plan provisions) has been calculated for those sites where this option is available.
- No modelling of boundary adjustments or other cadastral variations to create alternative cadastral patterns (with potentially different dwelling yield outcomes) has been (nor feasibly can be) made.
- The assessed PAUP rural zones include titles that are partly or wholly inside the metropolitan limits (or RUB), as well as those outside, but do not include the urban type zoning of rural towns (as defined for this study) or special areas and structure plans (as

defined for this study). Some special areas are 'rural' in nature (and are discernable in the results report tables).

- Results include currently vacant titles that cannot be subdivided, that are assumed to have an underlying 'right' to erect a single dwelling, irrespective of district plan rules controlling location or bush clearance, in a similar manner to the treatment of urban residential parcels. However the PAUP does also have particular rules that do require consent for a dwelling (as a land use activity) and these are also calculated. This set of parcels may also have potential to erect a dwelling as a permitted activity, be amalgamated with an adjoining title and transfer the development potential to a receiver, protect SEA and transfer the bonus lots, be a TRSS receiver, subdivide or any number of other options.

### 10.3 Calculating rural residential capacity

Rural residential capacity has been calculated based on selected parameters of the rural subdivision and general rules applying to each title that falls within the 'rural area' spatial and/or zone category definition and is not in a special area; rural town; business area; or otherwise inside a metropolitan residential zone.

The definition of 'rural area' used in this study is outlined in Table 41 and shows the location of the Rural assessment area, which is further refined by zoning classification as 'rural' - see Appendix K: Proposed Auckland Unitary Plan rural zones (CfGS zones) and assumptions.

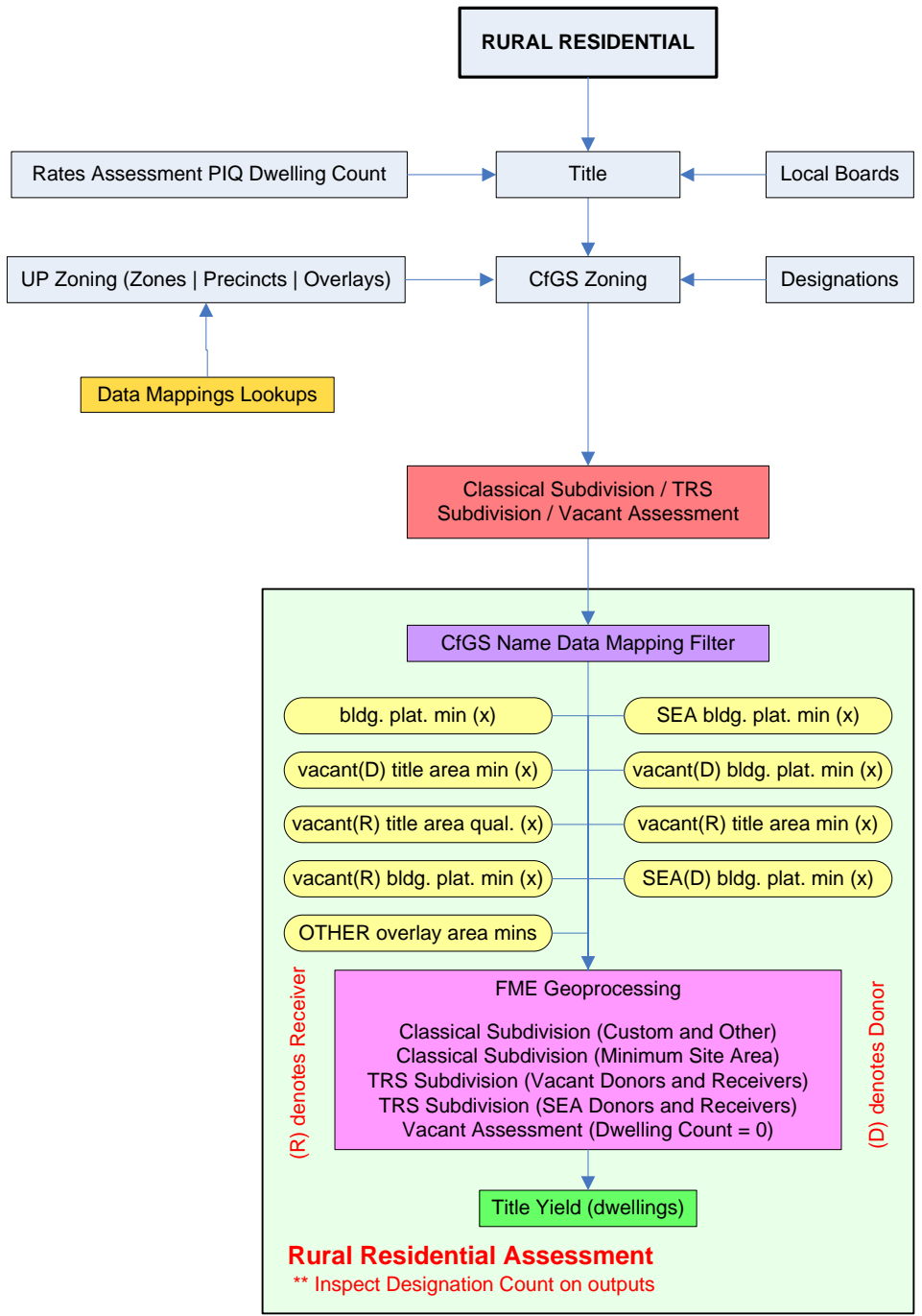
**Table 41: Rural area description**

Location Type	Description	Assessment Method	Smallest geographic unit analysed
Rural area	Properties with a rural zoning (from Zone LUTs) that are outside of the 2010 Metropolitan Urban Area and those properties that are within the Metropolitan Urban Area that are zoned for rural use, excluding areas that have been identified as forming part of a rural town, or zoned Future Urban.	Rural residential component – titles analysed for rural residential development potential (latent potential, subdivision, TRSS, and additional dwellings) to derive a net dwelling potential.	Title

The interrelationship between development options and zoning is complex, but within this complexity there are patterns. A number of similar approaches have been grouped together into 'rule groups' to use the same workbench, with different parameters. FME workbenches were created for each 'rule group' to calculate potential capacity under a set of similar rule approaches applying across the suite of zones. A significant number of zones also allow for more than one approach to subdivision, meaning that the number of potential subdivision approaches exceed the number of zones. In these cases, each option has been assessed. Note that there are issues with determination of *which option* would be taken by a land owner with multiple options, (as in many cases the maximum number of dwellings enabled remains the same between options) with consequential calculation issues for the spatial determination of where any future dwelling may occur (onsite, or transferred somewhere else, or receiving additional dwellings).

A large number of spatial features were also developed from both PAUP related data sets, and existing geo-spatial datasets to feed the various workbenches to enable the calculation of such criteria as the potential for SEA protection and similar. Details about these overlays can be found in Appendix F: Data and sources utilised in study, with description and source - with maps illustrating the extent and location, and sources of each of these spatial features shown in sections below.

**Figure 58: Diagram of rural residential capacity calculation**



All yields are given as a measure of the potential for net dwelling increase, after accounting for any existing dwellings on the title.

The investigation of subdivision potential is only undertaken to better calculate the potential for additional dwellings. Dwelling yield is not a measure of potential new titles, nor a projection of subdivision consents, which may be less than, equal to or greater than dwelling yield depending on the circumstance. Titles that have a current dwelling count of zero and have no calculated potential for subdivision are assumed to have the potential for a single additional dwelling (yield equals one) as a basic property right. A further assessment of the potential for 'permitted' dwellings on vacant titles has also been undertaken to reflect new PAUP criteria (as far as possible) for compliance with new

dwelling consent status rule, given that not meeting this criteria makes the establishment of a dwelling on those sites a 'non-complying activity'.

All calculation results are rounded down to the nearest whole integer, for example if a zone has a subdivision rule allowing one title per 1.0 hectares<sup>40</sup>, and a candidate title is 2.9 hectares with a single existing dwelling, the yield calculation would be:

$$2.9 \text{ ha} \div 1 \text{ ha} = 2.9 \text{ sites}$$

$$2.9 \text{ rounded down} = 2$$

$$\text{Potential of 2, minus existing dwelling count of 1} = \text{Yield of 1}$$

In this example the dwelling potential of the remaining 0.9 hectares lot is ignored, as it does not strictly comply with the modelled rules. A possible 'real world' application of such a result is that the title may have a 1.0 hectare new lot and a 1.9 hectares balance or two 1.45 hectares titles or any variation thereof. An alternative scenario may be that a three (or more?) lot subdivision consent where one or more lots is smaller than 1.0 hectare may be applied for by way of application under a higher consent category, but as that is beyond the rule parameters modelled and subject to the consent process<sup>41</sup> we have not considered this potential further. Decimal yields are contained in the raw outputs for further analysis, but these are less relevant under the PAUP rules than under legacy district plan rules due to the very stringent criteria applied.

Where accounting for existing dwellings results in a negative yield (i.e. the current number of dwellings exceeds the potential subdivision potential under current rules) these are recorded as a yield equalling zero. This is done because this study is assessing potential capacity for *additional* dwellings, not gross potential for new titles, and the rules do not require the removal of legally established existing development.

The approach taken to calculate capacity was to group subdivision approaches into groups representing similar approaches for processing purposes. These are described in general terms in section 10.3.1 (Rural capacity calculation rule groups), with individual approaches discussed in more detail in the following section 10.3.2 (Rural capacity calculations).

### 10.3.1 Rural capacity calculation rule groups

For the calculation of development opportunity, the various options for development are classified into four main 'rule groups':

1. Vacant sites/latent potential (capturing vacant site development)
2. Minimum site area subdivision (the 'traditional' approach to rural residential growth)
3. TRSS (to calculate donor and receiver potential under each of the TRSS approaches); and
4. Custom and other being a catchall for those that did not fit into the preceding groups, as shown in Table 42 below.

Further details of the approach taken to modelling each group is outlined in the relevant rule group sub-sections below.

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<sup>40</sup> This example rule was used in the legacy plan report, and was relatively common under Legacy rules, but could only occur under the PAUP rules in a Countryside Living Zone identified as a TRSS receiver.

<sup>41</sup> All subdivision is subject to resource consent. The point is that such applications would no longer be assessed at the consent category that the rules specifying the minimum lot size are, so moves the proposal into a higher category subject to more discretionary assessment and analysis, which is not easily modelled in an objective manner. We neither suggest nor imply that planning assessment can or should be undertaken by algorithm.

**Table 42: Rural residential capacity calculation groups**

Development option	Development option sub-type	
0. Vacant sites/latent capacity	0A: Unoccupied_title_yield	
	0B: Permitted_unoccupied_title	
1. Minimum site area subdivision	1A: Subdiv_1A_150ha	
	1B: Subdiv_1B_CSLpreTRSS	
2. Transferable rural site subdivision	2a. Vacant site amalgamation	2A1: TRSS_2A1_Vacant_Donor
		2A2: TRSS_2A2_Vacant_Receiver
	2b. Sea protection	2B1: TRSS_2B1_SEA_Donor
		2B2: TRSS_2B2_SEA_Receiver
3. Custom and Others	3B1: Greenhithe A	
	3B2: Rodney landscape group	
	3B3: Clevedon 3	
	3B4: Runciman A & B	
	3C: Second_and_Third_Rural_dwelling	

### 10.3.1.1 Rural rule group 0: Vacant sites/latent potential

This group covers vacant sites, which have been assessed in two ways;

- 0A: all vacant titles, and
- 0B: those vacant titles where it is a Permitted Activity to erect a dwelling.

Previous studies included calculation of vacant titles as any title with a rural zoning where the current dwelling count was equal to zero, as having a latent potential for at least one dwelling (as an underlying property right allowing reasonable use, which we have taken to mean residential occupation<sup>42</sup>). This category remains included, as 'unoccupied title'. This is calculated as:

$$\text{Unoccupied title} = (\text{dwelling count} = 0)$$

A new assessment to identify those unoccupied titles where it is a PAUP permitted activity to erect a dwelling, given that the PAUP outlines a number of criteria for this test to be met (where, these criteria are not met it is a Non-Complying Activity - see Part 3, Chapter I, Section 13, Rule 2.6.1).

Identification of vacant parcels where the establishment of a dwelling is a Non-complying Activity is therefore discernable from those reported parcels where:

$$(\text{Unoccupied title} = 1) \text{ AND } (\text{permitted unoccupied title} = 0)$$

The 'unoccupied title' starting set is also the starting input for the vacant TRSS donor candidate set, though a number of criteria (similar to the 'permitted unoccupied title' criteria but with some differences) are applied before the computationally intensive neighbour testing process is launched.

See also section 10.3.2.10, which describes second and third rural dwellings, which is a form of 'latent potential', but as a very late addition to the PAUP have been included in the 'custom and other' calculation group. This rule enables the construction of additional dwellings on larger rural sites (greater than 40 hectares in area) without prior (nor necessarily allowing subsequent) subdivision.

<sup>42</sup> On rural zoned sites only - parks, reserves, roads and etc will not be captured in this set and we do not include them in this assumption that reasonable use includes occupation in a permanent dwelling house

### 10.3.1.2 Rural rule group 1: Minimum site area subdivision

This option exists in only a few zones in the rural area, mainly Rural Production and Mixed Rural zones at 150 hectares minimum site area, and in the Countryside Living zone (CSL) (which can be modified by TRSS 'bonus' capacity where these provisions exist) at four hectares minimum site area or less.

#### 1A. 150 hectare minimum

In the Rural Production and Mixed Rural zones the minimum site area for subdivision is 150 hectares. Very few titles in these zones are 300 hectares or more, the majority of which are in isolated locations. Accordingly the 150 hectare minimum rule generates very little subdivision potential, and can be considered to be effectively nil in terms of feasibly realisable growth potential.

As most sites meeting these criteria also would have other, higher yielding options for development (including the option of plan changes or non-complying activity applications) it is considered unlikely that this rule will be utilised by land owners in other than the rarest situations.

None of the other rural zones (Rural Coastal, Rural Conservation) have an option for traditional subdivision of the actual parcel, but these do allow for TRSS donation (via both vacant sites and SEA protection) and receipt to and from other receiving zones, and in some instances (subject to coastal policy overlays) second and third dwellings.

#### 1B. CSL without TRSS

Countryside Living zones (CSL) where a minimum site area<sup>43</sup> provision is enabled, usually allows freehold minimum site area subdivision to between one and four hectares.

Some (but not all) CSL areas are also provided with a 'bonus' density provision enabling increased development where a qualified TRSS donation right is utilised either from Vacant Site amalgamation or SEA protection. This is discussed in the TRSS provisions below.

The CSL area rules are identified by the 'additional subdivision controls' overlay, but also in a number of precinct rules. There are no 'general subdivision' rules that apply to the CSL zone as a whole or generically – thus, if a CSL zoned site is not within the additional subdivision overlay or otherwise identified in a precinct there are no subdivision rules to apply to these sites, and capacity has not been assessed, as the PAUP has not enabled any<sup>44</sup>. There are also a number of locations where there is overlap between precincts and overlays, which due to our data preparation processes, the overlay rules will take priority<sup>45</sup>.

We understand the correct or intended zoning to be applied to these 'missing' and overlapped areas will be included in the council's submission to the hearings panel to amend the various rules and data to reflect the most appropriate approach to be applied, and this will be incorporated into subsequent modelling in due course. These CSL locations are shown in Figure 59 below.

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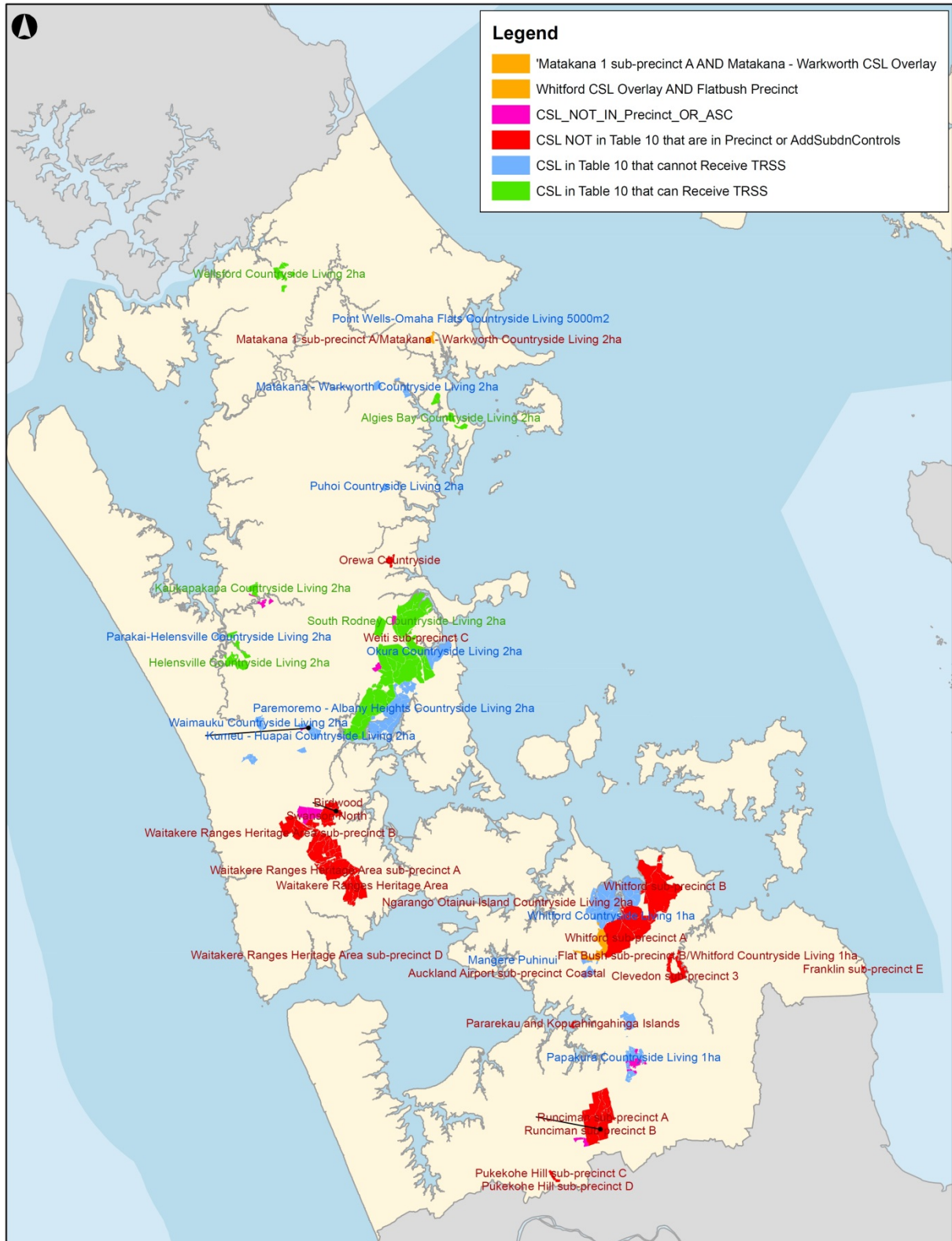
<sup>43</sup> Note that the average is used where rules outline a minimum and an average net site area. For the purposes of capacity calculations, the minimum is of no relevance (it may however influence how that capacity might be ultimately arranged on the subdivided title, but not how much capacity is possible from the title as each 'minimum' area site must be offset by a larger one to maintain the rule average) so the largest of the two provided values (being the average) has been used as the input variable. This same approach applies to CSL TRSS receiver provisions.

<sup>44</sup> It is understood that this situation is the result of last minute amendments to the extent of the CSL zone that were not matched by adjustments to the additional subdivision controls. We understand that one of the Auckland Council submission points has sought to address this issue, based mainly on the feedback from the model development process. Decisions of the hearings panel on this submission (and others) will be incorporated into future modelling processes in due course, most likely post-Council consideration of recommendations and subsequent update to the required spatial data (and rules).

<sup>45</sup> As for CSL generally, resolution of these issues will be subject to hearings panel and Council consideration of submissions (if any) on these issues.



**Figure 59: Countryside living locations by rule source and development type**



### 10.3.1.3 Rural rule group 2: Transferable rural site subdivision (TRSS)

There are two separate approaches to TRSS outlined in the PAUP:

- Vacant site amalgamation, and
- Significant Environmental Area (SEA) protection.

Each approach has quite different donor and receiver site attributes, and a varying list of spatial exclusions and specific site criteria. In summary however, vacant site TRSS allows the transfer of 'latent potential' from a qualifying vacant site to a wide range of other 'receiver' locations, with the additional requirement that the vacant site be absorbed into a neighbouring 'amalgamating' title. The newly combined amalgamated site (vacant site plus a valid neighbouring one) must also meet certain criteria once combined.

The key parameters controlling the capacity for TRSS under the rule is the nature of the vacant title and its adjoining neighbours, but the rule does not create any new dwelling opportunities, or increase the net number or rural titles - it only enables the movement of them around, ideally (but not necessarily) from more sensitive locations to less sensitive ones.

SEA protection TRSS on the other hand, allows the creation of transferable title rights from areas within the SEA coverage of the plan, following additional identification and classification (into the various SEA TRSS classes), pest and weed control, legal protection and fencing of various sizes of ecology based on its class within the PAUPs SEA layer. Note that environmental features not within the specified PAUP SEA layer are not valid features for the purpose of this rule. Once these criteria are met and appropriate actions taken, the SEA allows the creation of 'SEA bonus' TRSS lots, which must be transferred to specified receiver locations, which the PAUP specifies as only certain CSL precincts.

Key parameters controlling capacity for TRSS under this rule are the size and quality/class of the SEA features. This rule does facilitate a net increase in the number of dwellings and titles in the rural area, (via the bonus lots) but that increase is only 'realisable' in the identified receiver areas, all of which are in the Countryside Living zone, which can be generally considered to be less sensitive than the sites with SEA donating the TRSS.

The specific rules applying are outlined in full in the subdivision section of the PAUP. They have been summarised into the key aspects utilised in modelling outlined in Table 43 below.

**Table 43: TRSS Rule summary**

TRSS method	2A: Vacant site amalgamation	2B: SEA protection
TRSS Donors	2A.1 Vacant donors	2B.1 SEA donors
Donor Zones	Both sites (vacant title and adjacent amalgamate) must be in: Rural Production Mixed Rural Rural Coastal Rural Conservation Future Urban	Not specified.  (Sites in all rural zones are potential SEA donors, provided they have the requisite SEA features).
Donor site attributes required	Two sites required, at least one of which must be vacant. Vacant site must abut/adjoin the other amalgamating site. Both must be a minimum area of one hectare and when combined have a maximum density of one dwelling per 40 hectares.	Contain SEA of specified area/category not already protected by covenant (or other legal protection).

TRSS method	2A: Vacant site amalgamation	2B: SEA protection
Donor site exclusions (attributes the site must not have)	Must not be a road severance or closed road lot, or subject to designation.	Must not be a road severance or closed road lot, or subject to designation.
TRSS receivers	2A.2 Vacant Receivers	2B.2 SEA Donors
Receiver zones	Rural Production (one TRSS per receiver only) Mixed Rural (one per two hectares of site area) Countryside Living (where TRSS provisions exist) Note also Rural Subdivision Table 6 requirements outlining from zone to zone relationships (not specifically modelled but will apply at point of transfer) <del>Rural and Coastal Villages (TBD)</del>	Countryside Living zones where TRSS provisions exist <del>Rural and Coastal Villages (TBD)</del>
Receiver site attributes required	<b>All receivers:</b> Demonstrate compliance with the general and Auckland wide subdivision standards with the exception of the minimum lot size. <b>Receiver not in CSL:</b> Be at least two hectares, and have at least two hectares in balance area after receiving TRSS (i.e. min area greater than four hectares). (Note Rural Production can receive only one TRSS). <b>Receiver in CSL:</b> Comply with the minimum lot size with TRSS provisions in the relevant CSL Precinct (refer additional subdivision controls overlay)	<b>All receivers:</b> Demonstrate compliance with the general and Auckland Wide subdivision standards. Identified as a CSL TRSS receiver location in Subdivision Rules Rural Table 10 (Part3, Chapter H, Section 5, Rule 2.3.3.8.c.ii). Have at least six metres of frontage for each proposed new lot.
Receiver site exclusions/overlays	Outstanding Natural Character (ONC) High Natural Character (HNC) Outstanding Natural Landscape (ONL) Significant Environmental Area (SEA) Receiver site exclusion areas Contain no Elite or Prime land. (Area of LUC 1, 2 or 3 soils on parcel must be zero)	ONC HNC ONL SEA Receiver site exclusion areas

For TRSS approaches, donor and receiver potential is calculated separately, and effectively form 'buckets' of potential - potential to donate TRSS (donors) and potential to receive TRSS (receivers).

The actual transfer of potential TRSSs from a single donor to a single receiver is not modelled as that is more dependent on 'happy coincidence' between inter-personal relationships and market issues, quite distinct from any plan enabled potential for transfer, between *potential* donors and *potential* receivers. Note also that there are overlaps between the donor and receiver 'buckets', particularly for vacant site TRSSs (some sites can both donate and receive TRSS, though in some instances the options are mutually exclusive) and there is overlap between the buckets for vacant and SEA donation and receipt (all four buckets overlap). These issues have not been resolved such that estimates at a sub-regional scale of growth (or decline) in the number of dwellings or rural titles can be ascertained at any sub-regional scale.

Countryside Living is one of many receiver locations for vacant site TRSS, but is the only location where SEA protection TRSS can be accommodated. All CSL areas with the potential to receive TRSS are in the northern rural area. Thus, there may be potential for the numerical ability for SEA lots to be transferred, will be reduced by vacant lots, 'taking up the available slots' in CSL, which may have flow on negative effects to the permanent enhancement and protection (via covenants, weed and pest control and fencing etc., in addition to the general PAUP protections) of SEA, if SEA protection lot incentive is not able to be transferred. This is discussed further below and the rules themselves are listed in Table 10 of the rural subdivision rules of the PAUP (Auckland Council, 2013a).

The high cost and threshold for TRSS to first be consented and created, fenced and covenanted, which then of course needs to then paid for by a receiver, on a one-to-one basis suggests that TRSS may not be a particularly economic proposition. Therefore the actual numbers of transfers is likely be significantly lower than the *potential* for transfer, but this has not been the subject of any detailed analysis. While it may be economic for receivers in highly desirable locations to purchase TRSS from sites in less desirable locations, it is unlikely to remove latent vacant site development potential from highly sensitive, yet highly desirable areas.

There is also a potential 'double jeopardy' issue with small (smaller than one hectare) sites that were not created in accordance with the permitted activity dwelling criteria, such as road severance lots or 'paper town lots, which are relatively common in some areas of Franklin - Such sites are not valid TRSS donors (so they cannot be amalgamated and 'transferred' to more suitable locations) and erecting a dwelling on them is a Non-Complying Activity. We understand from the rules applying to these sites that development of them is considered to be undesirable (being a Non-Complying Activity), but as they are not transferable either (to presumably more suitable locations), then their likely development outcome will be that they are ultimately be developed, in situ resulting in the effects the consent classification seeks to avoid (by making it difficult to consent), but not does provide an alternative.

#### 10.3.1.4 Rural rule group 4: Custom and other

Various other rural overlays and precincts (many are 'rollovers' of legacy zones) also provide for some Minimum lot Area type approaches, but often in consideration of additional factors such as bush cover, various landscape factors or slope, depending on the relevant issue in the locality and legacy planning regime.

As the majority of these precincts and overlays are 'rollovers' of legacy planning provisions modelling approach has accordingly been 'copied' from the 2012 Capacity for Growth Study, but a large proportion of them have also been 'translated' from legacy plans or represent legacy plan changes that have now been incorporated into the PAUP provisions, and require modelling to reflect the PAUP.

A number of locations and development approaches are included in this group including second and third rural dwellings.

### 10.3.2 Rural capacity calculations

The sections below outline the detail of the calculations, assumptions and methodology undertaken to calculate each individual development option.

The allocation of rural zones to processing groups is shown in Appendix K: Proposed Auckland Unitary Plan rural zones (CfGS zones) and assumptions and Appendix M: Rural zone processing guide.

#### 10.3.2.1 Specified building areas, safe building platforms (SBP) and the protection of ecological values

The subdivision of rural sites is subject to the general rules for all subdivisions laid out in various subdivision, rural and general sections of the plan. We have pulled the majority of these rule requirements from various parts of the plan as spatial requirements combined together into a single set of criteria used as a spatial overlay and used for all rural subdivision to test for suitable building platform/specified building area compliance.

This approach is used as a 'base' standard against which all rural development is modelled, except where more detailed (and therefore stringent or different) requirements are imposed by the relevant precincts or overlay.

These rather dispersed rules are collated and paraphrased below:

- Each proposed site for a residential building must be able to contain provide at least 5000 square metres 'specified building area' (Part 3, Chapter H, Section 5, Rule 2.3.3.1.c.i)
- However Subdivision Rule 2.3.1.c.ii (Part 3, Chapter H, Section 5) requires only 2000 square metres of this 'specified building area' (we have termed this smaller area are 'building footprint area') to be clear of:
- The one per cent (1%) annual exceedance probability (AEP) floodplain (Part 3, Chapter H, Section 5, Rule 2.3.3.1.c.ii and also Part 3, Chapter H, Section 5, Rule 2.2.3.2).
- Any required yard setbacks (Part 3, Chapter I, Section 13, Rule 3.2) including coastal protection yards, road yards, quarry buffer areas, and similar 'yard' type features
- Any required provision for appropriate esplanade reserve of 20 metres in width from specified features (i.e. lakes, the sea and rivers) (Part 3, Chapter H, Section 5, Rule 2.1.6)
- Subdivision rule 2.2.3.2 (Part 3, Chapter H, Section 5) also outlines that all subdivision applications must *show the location of* indigenous vegetation within SEA, wetlands, rivers lakes and streams, provide a report assessing them from an appropriately qualified person, give effect to policies and objectives that promote the protection of valuable natural features, and that the council *may* require these features to be protected by fencing, weeding, pest control, and/or providing access, but does not definitively state that they are to be avoided (c.f. site shape factor requirements for residential and business subdivision. As we cannot assess each feature 'on the ground', nor determine if an unknown future subdivision layout 'gives effect to objectives and policies' without assessing a layout against them, this should be noted as a limitation of the analysis. We also note that applications deemed to not meet this requirement would be assessed as a Non-Complying Activity. Therefore we have assumed, that SEA, wetlands, rivers, lakes and streams are not suitable for inclusion in the smaller 'building footprint area'.
- Account is also taken of the general rule expectation that development would also be located outside of various other hazards, ecological and landscape features, elite soils and other features mentioned in the particular rule, precinct or overlay discussed in more detail in the individual capacity calculation section below.
- Considering all of the above, only the 2000 square metres 'building footprint area' is tested, with the 5000 square metres tested against site area only (i.e. provided a title is larger than 5000 square metres and has an area free of the listed features larger than 2000 square metres the title is deemed to pass these combined tests.

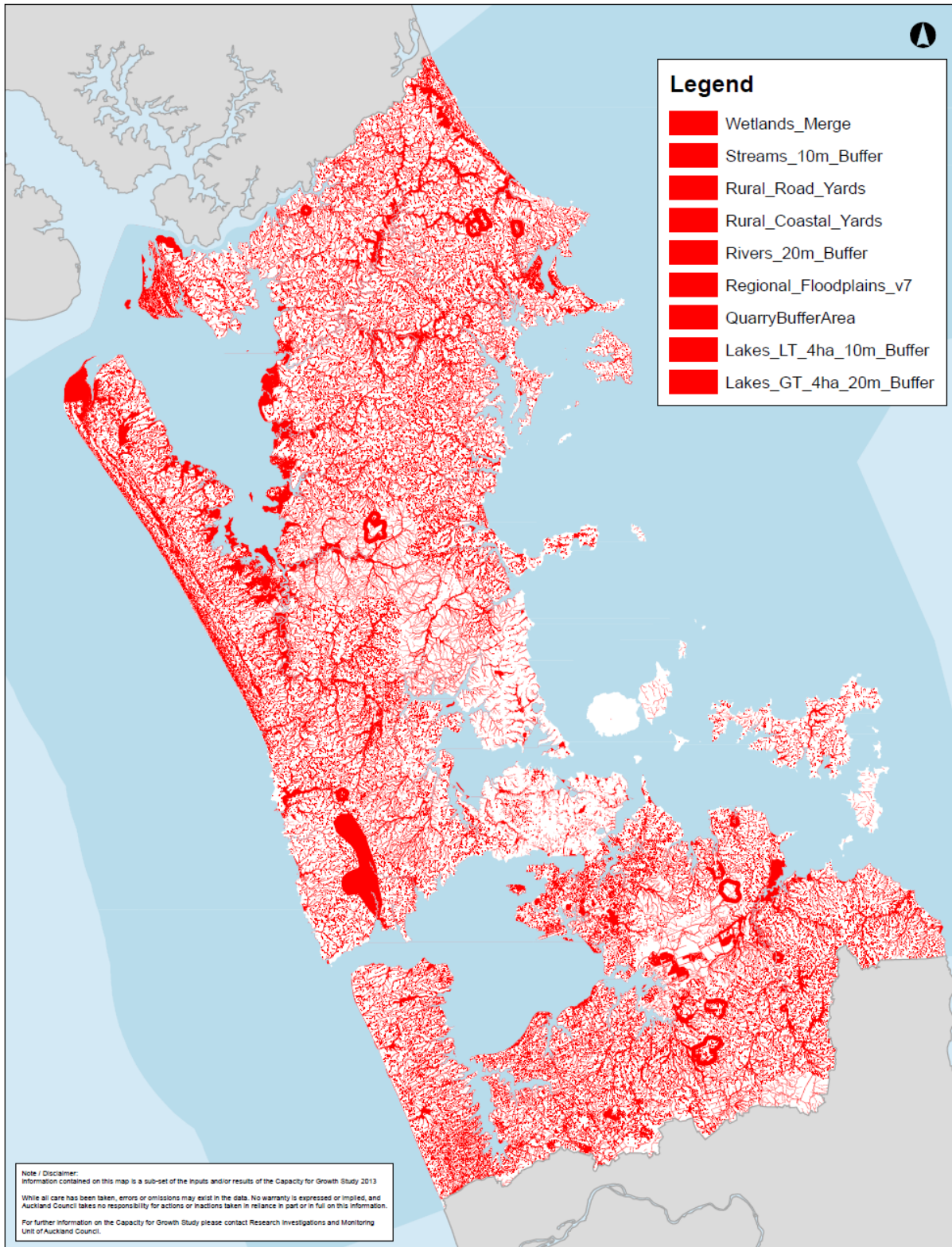
These rules can be further summarised (and have been applied) as follows:

- Title area big enough to contain a specified building area (5000 square metres)?
- Net area of title after removing land within various overlays larger than the building footprint area (2000 square metres)?

Below Figure 60 illustrates the spatial extent of this basic rural specified building area constraint, which appears to be very extensive, but there is a remarkable amount of land 'in between' that meets the criteria for development.

The interpretation of whether the rules require the entire starting title, the proposed title, or just the defined building platform areas are required to be clear of the identified hazards/features are of key importance to the resulting yields in the situation where these features are so extensive. The plan is relatively unclear with respect to these matters, and in discussions with the Unitary Plan Rural team we have taken the most conservative approach, which is consistent with the general Resource Management Act (RMA) approach to interpretation (strictest applies/precautionary principle).

Figure 60: Rural specified building area constraints (general)



### 10.3.2.2 Latent capacity 0A: Vacant titles

This is measured consistent with the other measures of vacant parcels in the residential zones and previous studies.

Note also that titles meeting this criteria are also candidates for Permitted dwelling vacant titles and vacant donor sites (these two are subsets of vacant titles), as well as potential overlapping with other development options such as subdivision or TRSS options.

#### **Calculation:**

Select titles where that are presently vacant (dwelling count equals zero); no other testing undertaken.

IF (*dwelling count* = 0) THEN (*unoccupied title yield* = 1), ELSE (*unoccupied title yield* = 0)

### 10.3.2.3 Latent capacity 0B: Vacant titles where dwelling is permitted

This is a far more complex calculation than vacant titles taking account of the specific requirements of Rule 2.6.1 (Part 3, Chapter I, Section 13), but also the spatial requirements of the Coastal Policy Overlay mentioned in Rule 2.6.2 (Part 3, Chapter I, Section 13) Table 1, and the specific requirements of other overlays where known.

In developing mechanisms to test for the criteria listed in Table 44 below, we noted that a number of the rule criteria relate to the way in which the title 'came into existence', which is not possible to test for with the high level title data available. In practice this will require the careful review of every individual title's documentation, and some cross checking with old, sometimes incomplete paper records, and would be part of the documentation required to be provided by applicants and cross checked by planners at the time of consent. Because of this, we have not been able to test for all of the rules' criteria directly, and accordingly the results may potentially represent an over count of 'valid' permitted vacant title development. However as we have not been able to ascertain a relationship one way or the other between the effect of dwelling construction on existing privately owned rateable properties (being the effect that is to be managed by this rule), and the original title creation mechanism (being the rule trigger) that is not otherwise captured by title size, shape factor or other such site attribute criteria that is already tested for, and therefore any over count may actually be very minimal.

The selection of titles where the parcels meet the relevant criteria for permitted activity dwellings are outlined in Table 44 below.

**Table 44: Vacant title where dwelling is permitted: rule summary**

Rule	Modelling note/comment	Modelling test parameters
<i>Not a closed road or road severance allotment</i>	Not tested, insufficient data to discern	Not tested
<i>If a council, or its predecessor did not grant consent to its creation its net site area must exceed 2 ha</i>	<p>Two tests here,            1: A Territorial Authority (TA) must have granted consent,            ELSE            2: The title area must be larger than 2 ha.</p> <p>Comment:            The TA consent is not discernable from data available, so a title issue date test is used as a proxy, being newer than 1973 when most TA's should have had a Town and Country Planning Act (1977) District Scheme well developed.</p> <p>2. If the title is older than this, then it must be larger than 2 ha.</p>	<p><math>\_title\_area\_calculated &gt; \\$VACANT\_TITLE\_AREA\_MIN (=20,000)</math>            OR  <math>\_title\_issue\_date\_newest &gt; 19721231</math></p>
<i>... title issued under the Land Transfer Act (1952)...</i>	Not tested, insufficient data to discern; see title date test.	Not tested
<i>... must be separately recorded on a Valuation Roll at 1 November 2010...</i>	Not explicitly tested, but assessment geography is legal title areas.	Title geography as input
(paraphrased) ... an additional spatial requirement for some locations in the Rural Coastal zone means a dwelling on these sites (within Rural Coastal Policy Overlay) is a Restricted Discretionary Activity (see rural zone rules). Rodney Landscape Precincts also require dwellings (all dwellings are buildings) to obtain consent.	Spatial overlay with Rural Coastal Policy Overlay and Rodney Landscape Overlays.	Spatial overlay with <i>Rural Coastal Policy Overlay</i> and <i>Rodney Landscape Overlays</i> .

#### 10.3.2.4 Minimum site area subdivision 1A: 150 hectare subdivision

The assessment of capacity is driven by the CFGS\_ASSESS\_RURAL\_LUT Minimum Title area values and only applies *where CFGS\_UID in (ZN\_4\_11, ZN\_4\_16)* - i.e. Mixed Rural and Rural Production Zones.

This is the 'classic subdivision' option provided in the PAUP for rural areas, other than some precincts and the CSL areas where TRSS is not enabled.

#### 10.3.2.5 Minimum site area subdivision 1B: Countryside Living (without TRSS)

The rules in this group are driven by CFGS\_ASSESS\_CSL\_LUT minimum title area values and associated CSL location overlay, which is a subset of the additional subdivision controls overlay combined with the additional data from other precincts and overlays, all of which has been reconfigured to suit the requirements of our modelling approach (CSL\_LUT variables added). See also Figure 59.

Note rule requirement for all parcels to have a minimum road frontage of 15 metre if front sites, minimum of six metre road frontage if they are to be rear. For calculation purposes, it is assumed all



new (and parent) sites will be 'rear sites' and use six metre frontage limitation, titles not meeting this rule are Non-Complying and so non-passing of this test is fatal to their chances of containing modelled capacity (the yield on sites with larger than six metres of frontage is zero) as it steps consent category beyond that modelled.

Because of the difference in frontage required for front (larger than 15 metres required) and rear sites (larger than six metres required), this rule is less onerous (or more generous) than perhaps intended (as frontage length/six metres > frontage length/15 metres).

Note that no accounting of the percentage front and rear parcel requirement mentioned elsewhere in the rural subdivision rules has been made, which may limit the number of 'rear' sites.

#### 10.3.2.6 TRSS 2A1: Vacant donors

Not all parcel tests required by the various vacant donor rules (Part 3, Chapter H, Section 5, Rule 2.3.3) are included in the model (i.e. not road severance parcel, or sites on approved scheme plans, but not yet on individual titles (i.e. have 223 but not 224c)). Thus, the calculations may include some road severance parcels (that pass the other tests) potentially increasing yield, but this will be more than offset by not accounting for consented lots that have not yet been converted to titles. (See also comments regarding latent potential – permitted vacant sites above).

Unimplemented consented lots: The rules also allow the transfer (as TRSS) of pre-approved but not-implemented lots "...shown on an approved scheme plan of subdivision which would, if given effect to, create sites that could be used under these rules". As with all assessments in this study, the title cadastre at the time of assessment is used, as lots not yet titled do not form part of the existing cadastre we cannot model them.

Data from as yet unimplemented resource consents could be used to add to the potential donor list if required, but is beyond the scope of this current study.

Territorial authority granted: As the body granting consent (or purpose of creating the tile – e.g. road severance lot) cannot be directly ascertained without resource intensive manual investigation of every single rural title document, a 'title age' test has been included as a proxy to allow the capturing of titles that are smaller than 1ha, that were 'granted consent by a territorial authority'.

The assumed minimum title age is 1973, on the basis that no/few TAs had valid district schemes prior to this date, effectively assuming all consents from 1973 onwards were granted by 'council or a predecessor'.

Vacant sites and their neighbouring amalgamatee: A test added to the vacant donor rules (as compared with the DAUP) requires that both the resulting amalgamated titles (the vacant title and the neighbouring title that it must be amalgamated into) must be:

- Within a specified set of zones, and
- The combined area of both must be greater than 40 hectares and
- Resulting density must be no greater than one dwelling per 40 hectares.

These requirements seem relatively simple, but are very complex to test for, as the attributes of all abutting parcels are required to be considered in addition to that of the vacant parcel. This requires a two-step process:

- Finding otherwise valid vacant parcel candidates
- Testing abutting neighbouring sites to ensure the combination of both pass the required tests.
- Vacant parcels without suitable neighbouring sites are not valid TRSS, but (contrary to our initial suspicions) few sites are without suitable neighbours, and many sites have more than one neighbour. This is possible as the 'abutting' test does not specify a minimum abutment length, which if introduced (e.g. to ensure reasonable access between each 'part' of the

amalgamated title) may limit amalgamation potential considerably, as many neighbours are fairly tenuous in their spatial relationship.

A concatenated (comma separated) list of the 'CRC ID' (unique title ID provided by modelling process) of the amalgamation candidate parcels is also appended as an attribute on the vacant donor parcel for future investigations of potential parcel combinations, as illustrated in Figure 61 below, which shows the CRC IDs of all rural titles (black text), as well as vacant TRSS donor titles with the concatenated list of potential amalgamation candidates CRC IDs (in red text with white outline).

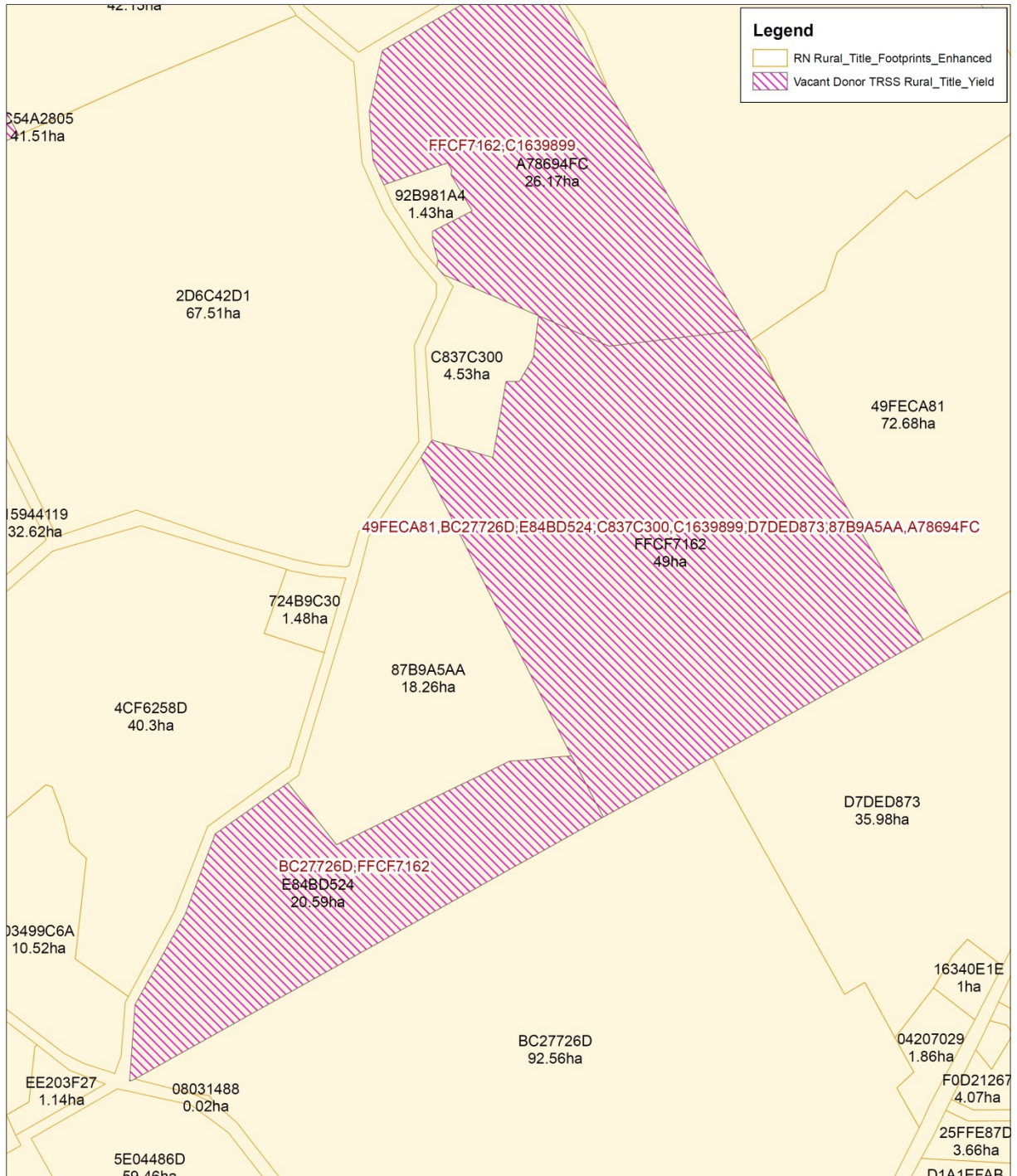
Close investigation of the concatenated amalgamatee candidate list for each vacant title enables the suitable candidates for the vacant donor title to amalgamate into to be individually identified, and considered further.

In reviewing these results, we have noted that a significant proportion of potential amalgamation combinations are between adjacent 'vacant donor TRSS titles' (which is not precluded by the rules and indeed is a logical possibility) rather than into existing occupied titles. This suggests that either, the practical potential for transfer of TRSS potential 'future dwellings' to other locations may not be as high as the total number of vacant candidates, or, on the other side of the equation, those now combined (large sites) could be further combined with ever smaller, but as yet unidentified titles<sup>46</sup>, but in this case, while the potential combinations increase, the likelihood of these increasingly complex land transactions occurring on a widespread basis, decreases.

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<sup>46</sup> Amalgamation Candidate combinations are, like the rest of the analysis in this study, based on the cadastral pattern as it currently exists. If two (or more) adjacent vacant titles were amalgamated with a third (or more) title, the CRC\_ID iterations would be substantially different, as the combined area of the two vacant sites would decrease the required size (and dwelling count) of the third (or subsequent) amalgamatee.

**Figure 61: Vacant TRSS candidate parcels and potential amalgamatee parcels**



### 10.3.2.7 TRSS 2A2: Vacant receivers

Vacant amalgamation receiver titles are those that are enabled to be subdivided on the basis that a TRSS potential from a donor located elsewhere, is transferred to them. Note that this calculation is completely independent of the donor calculation, in that each process is calculating the individual titles *potential* for donating and/or receiving.

This results in some overlap between the two sets, with several sites having potential as both donors and receivers, but in a practical future options sense, these options are mutually exclusive. This issue and others noted earlier are key reasons why accurate calculation of the potential for net increase in dwellings in the rural area generally, or specific areas in the rural area specifically is very difficult to

ascertain as it requires each title's 'preferred' option to be determined, of which there are many potential iterations.

General rules: The rules for calculating vacant receivers are relatively simple, and very close to 'traditional subdivision', other than the requirement that uptake of that potential is related to the transfer of latent potential from another site.

In Rural Production, parcels meeting certain criteria (two hectares for new parcel plus balance greater than two hectares equals four hectares minimum qualifying parcel) are enabled to receive vacant donors at a rate of *one per existing title* (Part 3, Chapter H, Section 5, Rule 2.3.3.4.c.x). In Mixed Rural, the effective density upon receipt of TRSS is *one per two hectares* (Part 3, Chapter H, Section 5, Rule 2.3.3.4.c.iv and v), also requiring a four hectares minimum size, the difference being that each additional two hectares title area allows for the receipt of further TRSS. Countryside Living (CSL) also operates on a density basis, the actual site areas controlled by a spatial overlay and linked table in the rules.

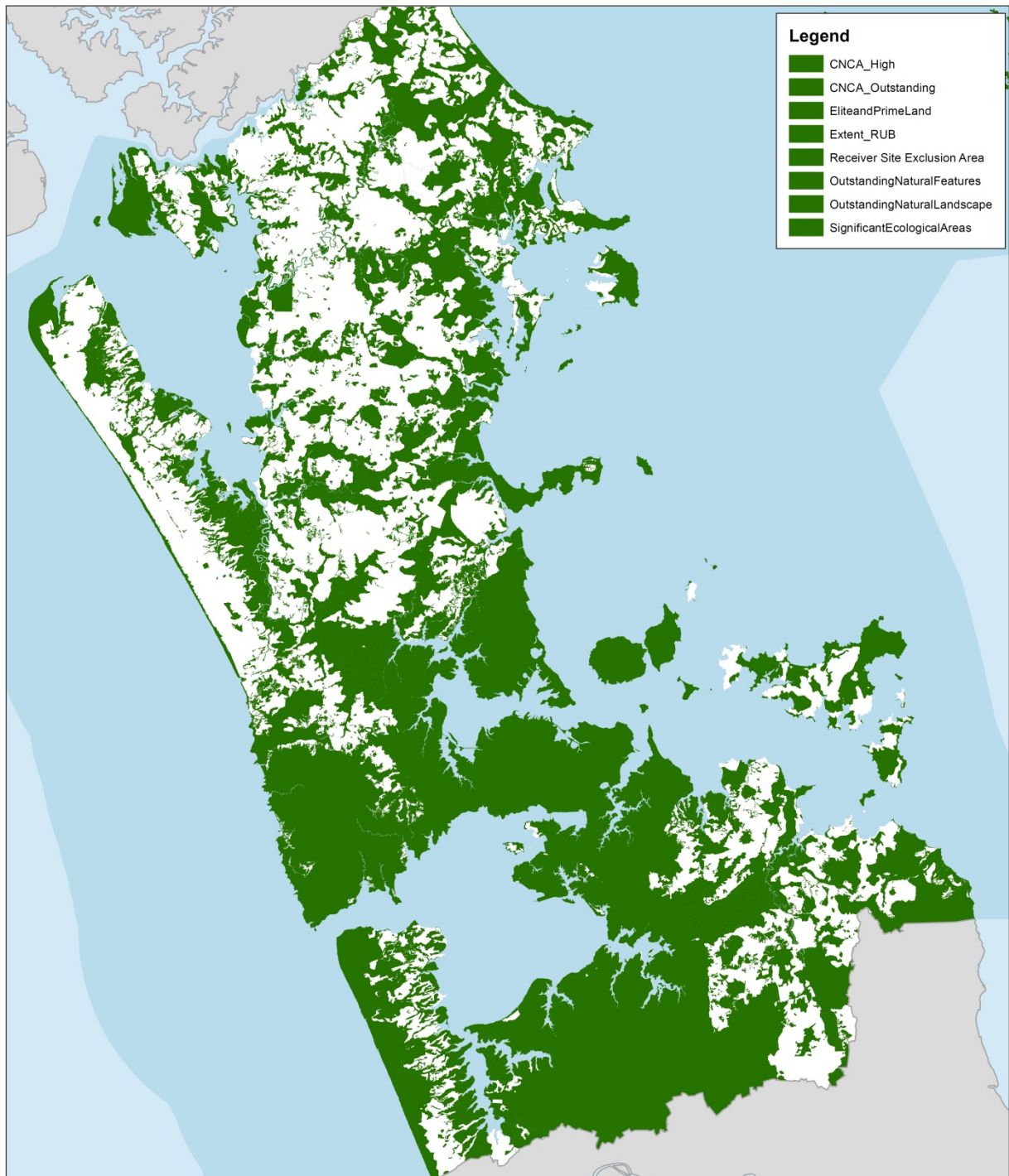
Exclusion features: In developing the model, there was considerable discussion with the Unitary Plan team over whether the list of features in listed in Part 3, Chapter H, Section 5, Rule 2.3.3.4.c.iii required that the entire starting title be clear of them, or just any proposed new title created (i.e. does '*...following amalgamation, all receiver sites must...*' ... '*...be located outside of...*' mean the same thing as the term '*...following amalgamation, all receiver sites must...*' ... '*...contain no...*' as the term is used with respect Elite Soils in Part 3, Chapter H, Section 5, Rule 2.3.3.4.c.vii?).

It was decided that the more conservative approach would be taken with these features being considered as *exclusions* (maximum area of feature on title must be less than or equal to zero), with the architecture of the model being designed to allow for the movement of these features from 'exclusions' (maximum area equal to zero) to 'constraints' (area of feature on title must allow room for specified building area) if a more liberal interpretation was to be taken in the future.

CSL and Rural Production zones also require there to be no elite soils on the receiver title (Part 3, Chapter H, Section 5, Rule 2.3.3.4.c.viii), and we have determined that the features listed in (Part 3, Chapter H, Section 5, Rule 2.3.3.4.c.iii) (ONC, HNC, ONL, SEA and Receiver Site Exclusion Areas) will be treated as exclusions (area of 0m<sup>2</sup> on receiver title rather than net area clear of).

Figure 62 below illustrates the combined extent of these TRSS Vacant Receiver 'exclusion' features.

Figure 62: TRSS vacant receiver exclusion features



Countryside Living: CSL zones receiver potential are driven by a particular subset of rules outlined in Table 10 of Rule 2.3.3.8.c.iii (Part 3, Chapter H, Section 5), which outlines those CSL locations (spatially identified via the additional subdivision controls overlay) where TRSS receipt is possible, essentially as a 'density bonus'. In each of these three (of nine) named CSL locations the 'base' rule is for a two hectares minimum, with the receipt of TRSS allowing for the effective density to be reduced to one hectare.

Figure 59 shows the location of the CSL areas enabled to accommodate TRSS. Note that they are all located in the northern rural area of the region, meaning SEA donor sites from the southern part of the region will need to move into the northern if they are to be realised.

Rural Production: Titles in the Rural Production Zone, may receive a single TRSS lot, if the title is larger than four hectares (allowing for a two hectare balance lot and a minimum two hectares TRSS lot). No testing is made for existing dwelling(s) in the Rural Production zone, as how this is to be dealt with is not specified in the rules, and there are other rules in the plan also enabling multiple dwellings to exist on certain larger rural titles.

Thus, any Rural Production sites over four hectares (two hectares minimum in addition to two hectares for the balance lot) is treated as a potential receiver irrespective of the number of dwellings on it (subject to the other spatial exclusion testing criteria mentioned above, and the general rural subdivision provisions regarding specified building areas applies for each new transfer site (and the inevitable dwelling that goes along with it). 'Existing dwelling count' check functionality could be added if required, however clarification would be required as to whether existing dwellings would be enabled to be on its own individual title by using a TRSS up first (where subdivision is not otherwise enabled) before additional TRSS allow new dwellings on new vacant parcels, and the interface between this expectation and the general dwelling rule applying in rural zones.

Mixed Rural: Titles in the Mixed Rural zone may receive unlimited number of TRSS donors at a rate of one per two hectares (1:2 hectares), with a minimum two hectare 'balance lot' (requiring a starting area of four hectares).

Given the 1:2 hectares rule, it has been assumed (in contrast to Rural Production) that each existing dwelling on the title would be put onto its own 'two hectare block' before any new vacant two hectare blocks were created. Although the same provision for multiple dwellings exists on larger sites in this zone as for Rural Production; given that titles must be at least 40 hectares in area before a second dwelling is permitted, this potential inconsistency will make only small numerical impacts on the (already large) receiver potential of large (larger than 40 hectares in area) Mixed Use titles. On the other hand, this assumption may also undercount the potential TRSS transfer potential if *any number* of existing dwellings is enabled to be located on the two hectares balance lot rather than being allocated their own two hectares lot before any TRSS are enabled.

Mixed Rural TRSS is subject to the other spatial exclusion testing criteria mentioned above, and the general rural subdivision provisions regarding specified building areas applies for each new transfer site (and the inevitable dwelling that goes along with it).

Potential vs. growth: Note that the receiver calculation is the calculation of titles *potential* to receive TRSS and be developed as a result, and there is no actual relationship between donors and receivers either generally or particular titles specifically, either modelled or assumed. The potential for parcels to ultimately take up this opportunity to develop in the way modelled does of course depend on a specific future donor-to-receiver transfer relationship, but this is not what is being calculated, nor can it be realistically be done using parcel attributes.

At a global level (and within certain zones where the rules provide for limited transfer into the zone from other zones) the amount of donors and receivers can be compared, but there is no way to say that donor title  $x$  TRSS will ultimately be utilised on receiver title  $y$ , as they are not required to have any discernable pre-existing relationship before this occurs.

Some localised transfer requirements are built into the rules for some locations but this only localises the issue within those locations as the transfer between donor and receiver in terms of growth (or reduction in latent) potential still remains as much of an issue within those locations as it does across the broader rural area.

#### 10.3.2.8 TRSS 2B1: SEA donors

The calculation of the potential to be a SEA donor is based on the parameters outlined in Rule 2.3.3.5 (Part 3, Chapter H, Section 5).

The rules allow the creation of 'TRSS bonus lots' in return for SEA enhancement and permanent legal protection, thereby incentivising enhancement and (as the SEA rules themselves only limit potential degradation caused by human induced land use activities, but not by weeds or pests, or potential future rule changes).

The rule does not specify the 'zone' that a donor site must be (though it will obviously need to be in the 'rural zone' group as the rule is within the rural section), only that the site must be 'In an SEA', though in practice it is the *area of SEA within* an existing title that determines TRSS donor potential.

Rule 2.3.3.5.a (Part 3, Chapter H, Section 5) outlines the specific requirements the SEA feature must meet in order to qualify as a donor feature, paraphrased below:

- identified as an SEA in the PAUP overlay;
- must not be otherwise legally protected or have previously been used for TRSS;
- contiguous and of a certain minimum size depending on whether it is 'wetland', 'threatened' or 'indigenous' and larger areas will qualify for extra lots as indicated in Table 45.

**Table 45: SEA Donor rule summary: SEA feature area minimums**

SEA feature type	Minimum SEA feature area for one TRSS donor lot	Minimum SEA feature area for two TRSS donor lots
Wetland	0.5 ha	1.0 ha
Threatened	3.0 ha	N/A
Indigenous	5.0 ha	8.0 ha

These rules in combination, required the creation of a new custom spatial representation of SEA, where the SEA in the PAUP has been modified as required to enable the calculation of potential on the basis of assuming to meet this rule criteria. Note that the rules require onsite evaluation and reporting by appropriately qualified individuals. We have used available corporate data sets to create proxies. The way the rules and the model works also required that the SEA sub-layers be overlapping. That is, all unprotected SEA is 'Indigenous', all 'wetlands' are threatened, and are by definition are also Indigenous, all threatened are by definition also Indigenous (but, not all 'threatened' is necessarily 'wetlands'). The following worked example illustrates the overlapping SEA concept further:

If the SEA were split into single, non-overlapping distinct features, a site with a contiguous area of uncovenanted SEA (say six hectares) which was over the minimum five hectares area limit that was partly made up of wetland (of say 0.4 hectares) and partly of threatened (of say 2.5 hectares) would leave only  $6.0 - (0.4 + 2.5) = 3.1$  hectares of indigenous SEA, that would not qualify, which is not the desired outcome:

*Total Uncovenanted SEA Area on Title = 6.0 ha;*  
*Wetland SEA Area = 0.4ha, >0.5ha = Not Qualify*  
*Threatened SEA Area = 2.5ha, >3.0ha = Not Qualify*  
*Indigenous SEA Area = 3.1ha, >5ha = Not Qualify.*

*= Title does not qualify for TRSS donor*

Using the overlapping approach, covering the same SEA, means that the assessment process would instead result in:

*Total Uncovenanted SEA Area = 6.0;*  
*Wetland SEA Area = 0.4ha, >0.5ha = Not Qualify*  
*Threatened SEA Area = 2.9ha, >3.0ha = Not Qualify*  
*Indigenous SEA Area = 6.0ha, <5.0ha = Qualify*

*= Title Qualifies as TRSS using 'Indigenous' SEA class.*

Therefore more SEA is permanently protected through the TRSS incentive. Given that all SEA on the title is required to be protected and enhanced, irrespective of the nature of the triggering feature, the intended SEA protection and enhancement outcomes are achieved.

### SEA layer creation:

The classified SEA features were created using the following approach:

- Take spatial SEA feature from PAUP spatial dataset
- Indigenous:
  - Clip out known covenants and other legally protected areas (only known covenants layers from council's geospatial repository, known as SDE, were used) = Uncovenanted\_SEA = **SEA\_Indigenous**
- Wetlands:
  - Create a merged 'wetlands' layer from all council SDE features where the name suggests this. (In the absence of a definitive regional spatial representation of wetlands which is currently under development) = Wetlands\_Merged
  - Union Wetlands\_Merged with Uncovenanted\_SEA, select areas that are within both features = **SEA\_Wetlands**
- Threatened:
  - Create a rare and threatened species and ecosystems layer from:
    - Rare and threatened ecosystems polygon features as supplied by the Environmental Strategy and Policy Unit
    - Rare and threatened species location (point features) supplied by the Environmental Strategy and Policy Unit
    - Buffer rare and threatened species location (point features) by 100 metres to create features with an area greater than three hectares (point location represents GPS of sighting, assume species mobility/point sample error, also  $\pi 100^2$  smaller than three hectares, but many are clipped to SEA and by title boundaries)
  - Merge rare ecosystems and species features = Rare\_andThreatened\_Merged
  - Union Rare\_andThreatened\_Merged with Uncovenanted\_SEA, select areas that are within both = **SEA\_Rare\_Threatened**.

The created features are shown in Figure 64 below, along with the original PAUP SEA layer (parts unclassified and therefore visible as PAUP SEA in dark green), are already 'legally protected' as indicated by proxy covenants layer. SEA in parks and reserves, or the Coastal Marine Area (CMA) is included in the input SEA feature layer, as the location of candidate Rural titles will serve to exclude this SEA from resulting in donors being created (i.e. there are no donor candidate titles that are in the Public Open Space (POS) zone, so SEA on POS is not removed before processing – this also preserves the flexibility of the feature to be used if the zoning changes).

Wetland Buffer: The required 20 metre buffer area around wetlands (see Part 3, Chapter H, 5.2.3.3.5.b) is not required to be considered in the spatial criteria to identify donors, and doing so would artificially increase the candidate SEA area coverage potentially triggering false wetland feature positives. The wetland and buffer area is required to be protected and enhanced, and fenced, but only once a TRSS SEA is created, (along with all other SEA features on the donor site as per the requirements of the general subdivision and other parts of the SEA donor rules.

It is therefore unnecessary to consider the buffer in the spatial candidate processing, as it is only an issue for the location of the protective fencing post TRSS granting, though this will likely play a role in the feasibility consideration for prospective SEA protection by land owners, as the 20 metre buffer can increase the fenced area and perimeter (affecting fence length and overall cost) significantly, particularly on the smallest wetlands, but as the wetland gets larger the marginal effect of the buffer reduces.



Figure 63: 20 metre buffer effect on fenced area and perimeter (based on consideration of a theoretical circular wetland feature that does not about any existing fence line or boundary or other SEA)

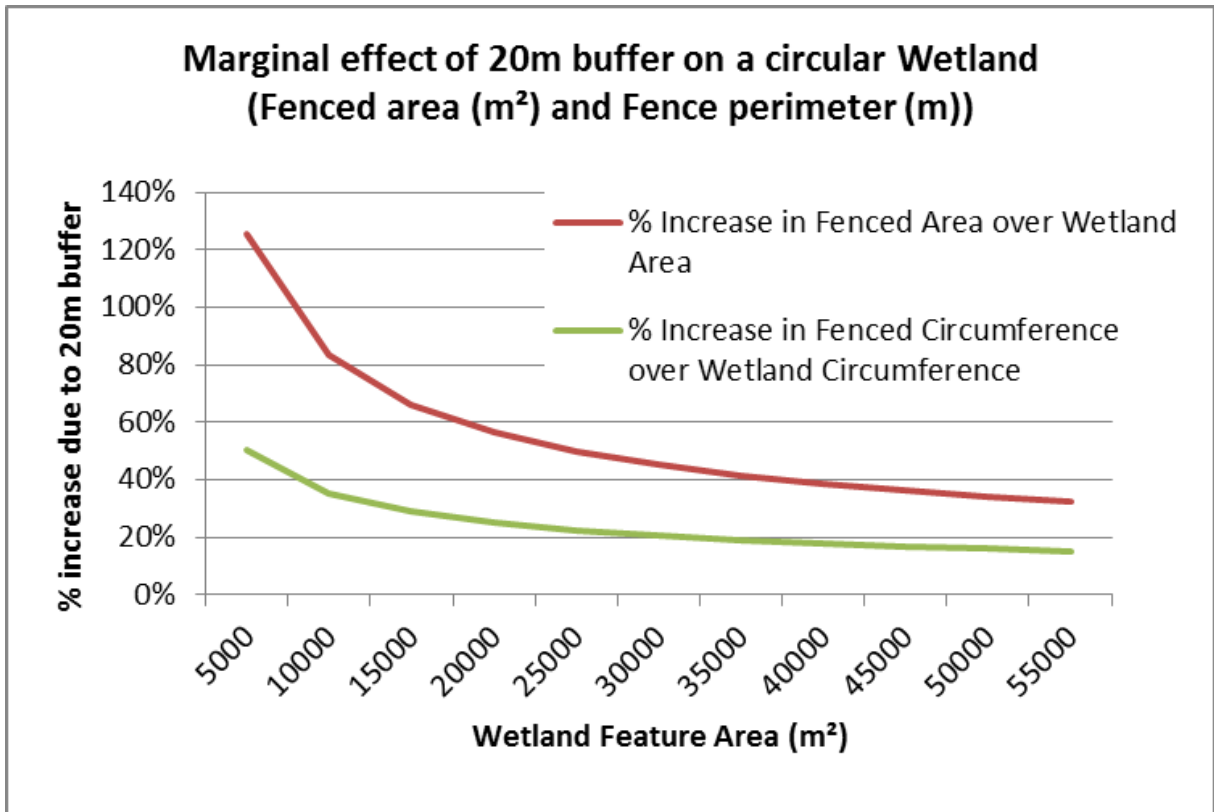
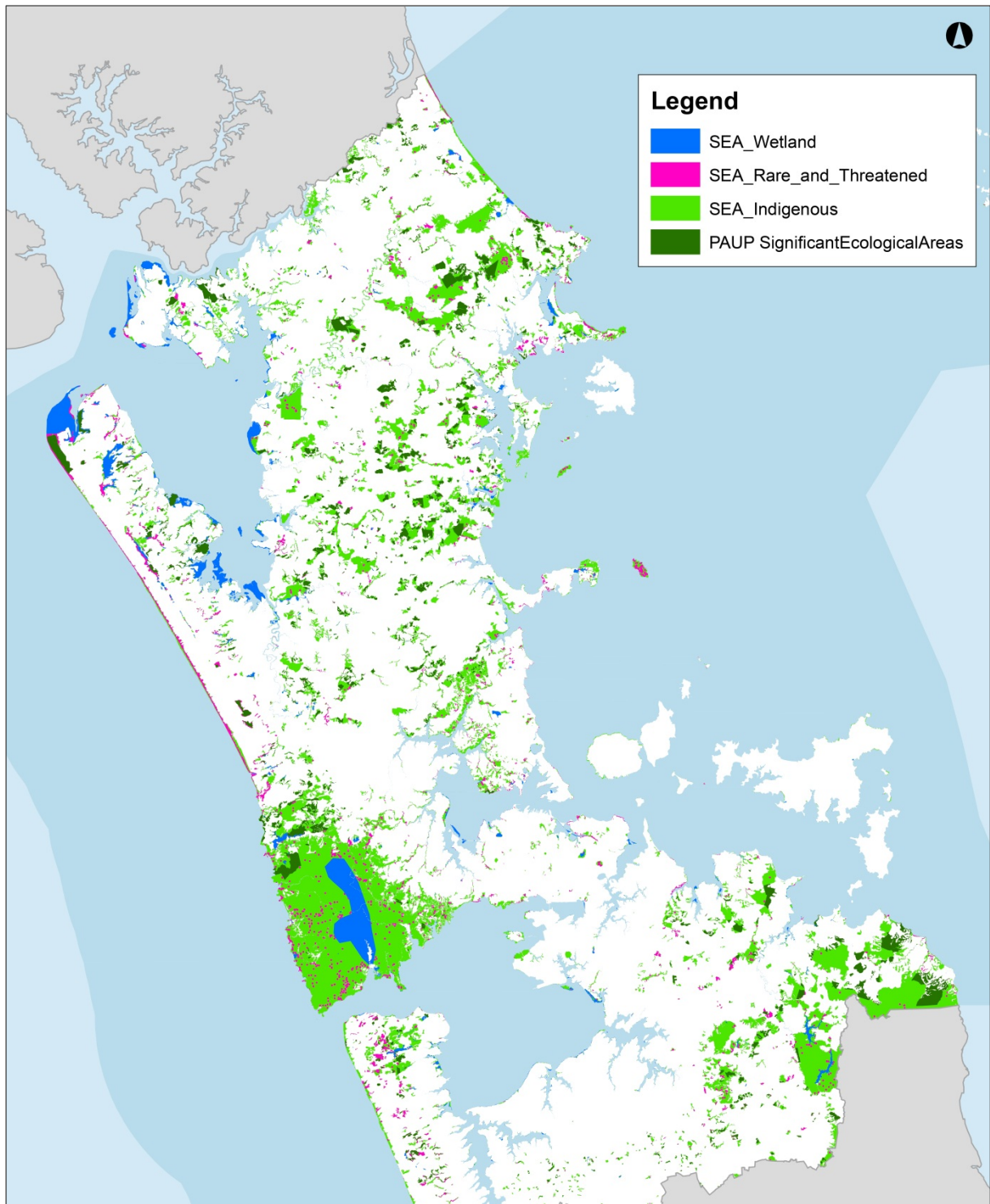


Figure 64: Regional SEA TRSS feature classification coverage

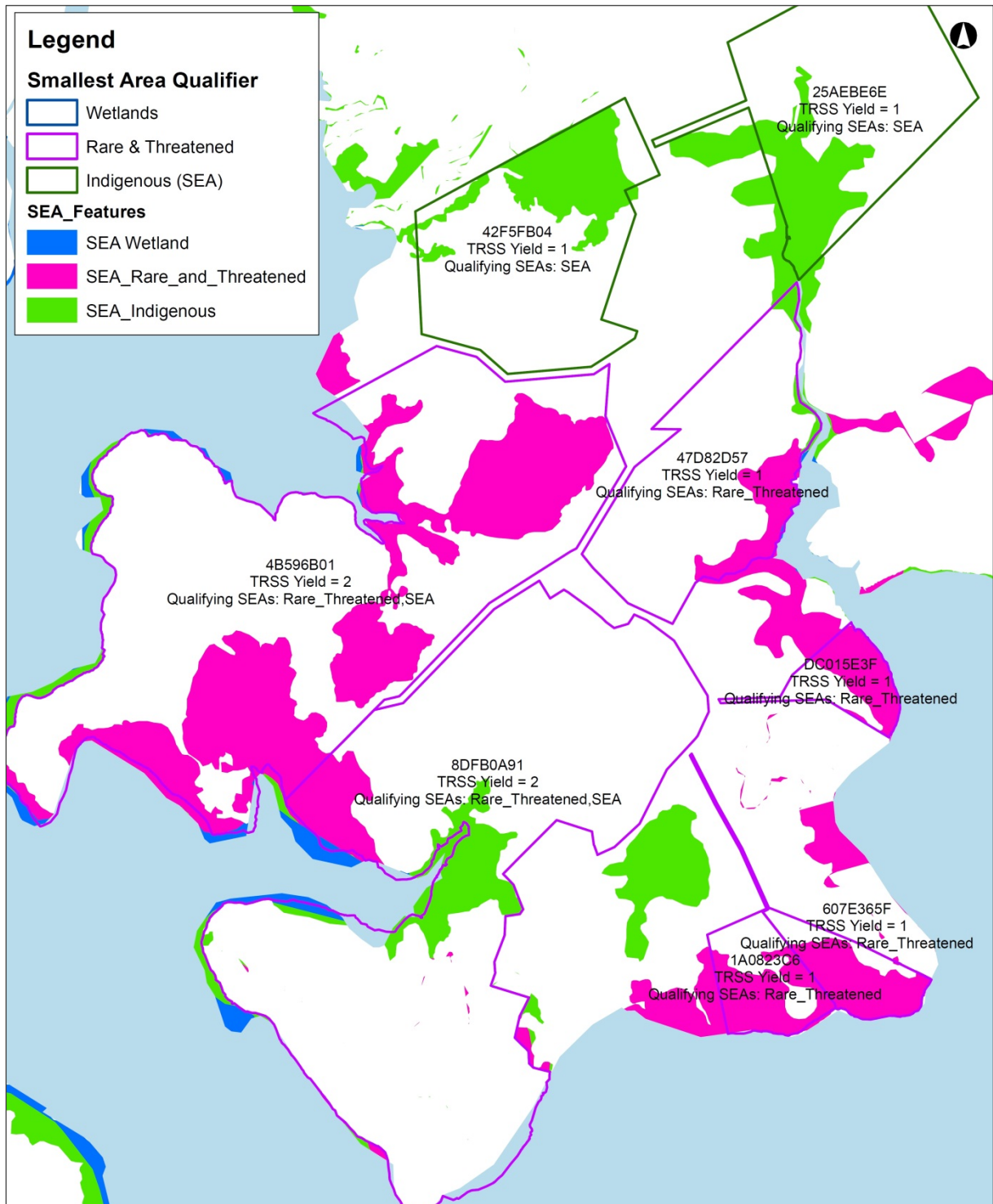


**Output Attributes:** In addition to the calculation of standard potential donor TRSS yields (count of SEA TRSS), the model also outputs a concatenated list field "yield overlay qualifiers" containing the type of SEA feature on the title that passed the qualification thresholds and triggered the TRSS donor potential.

The total area of un-covenanted SEA on the parcel (that will be required to be protected as per the rules, not just the triggering feature, but excluding any wetland buffer) can also be ascertained from the

field "\_area\_net\_max\_trss\_2b1\_sea\_donor\_overlay". This can be used to illustrate the type of SEA that triggers the ability for TRSS donation by classifying the fields into groups based on what sequence of SEA they contain, as illustrated in Figure 65 below.

**Figure 65: SEA donor parcel investigation example**



### 10.3.2.9 TRSS 2B2: SEA receivers

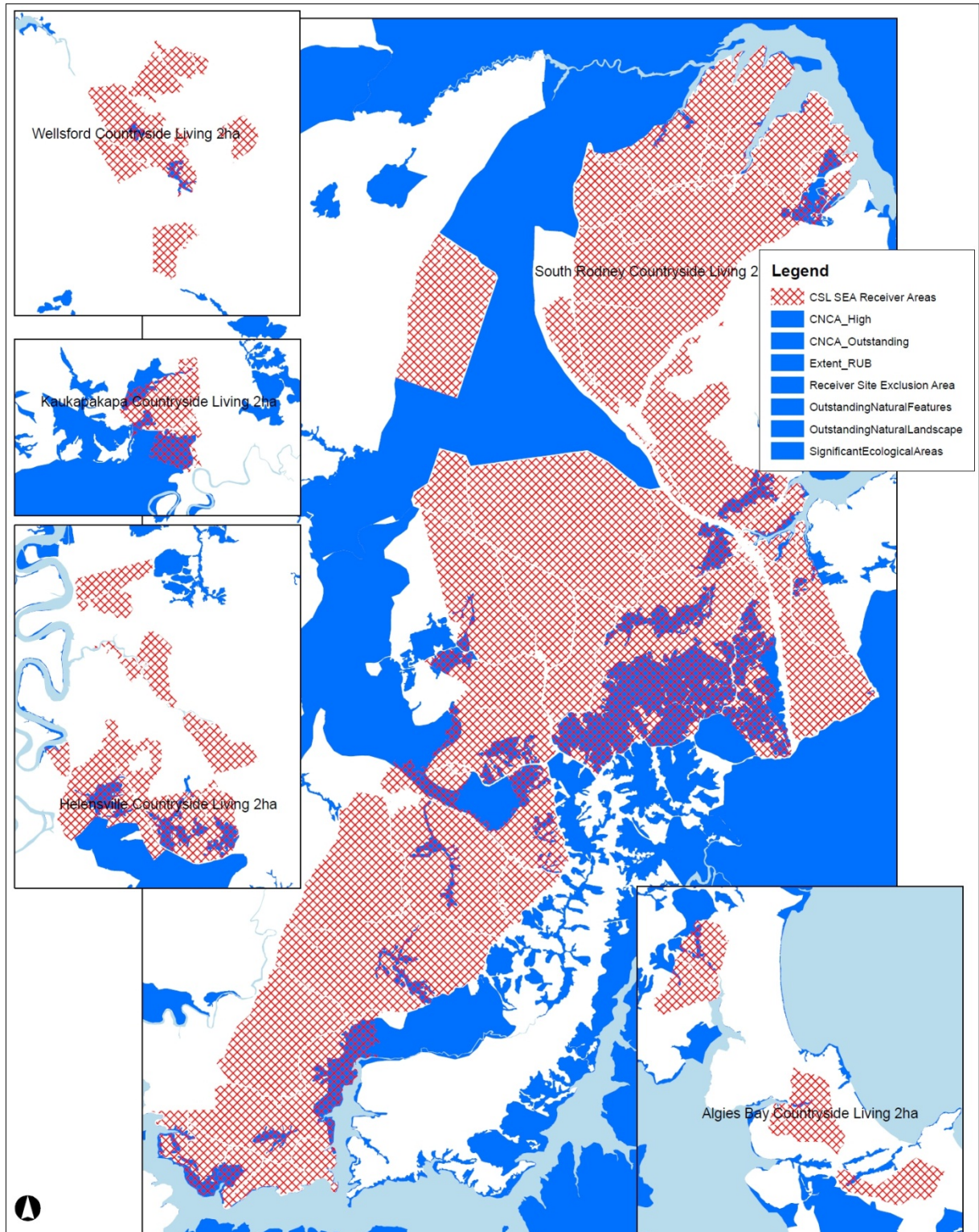
The calculation of SEA receiver potential is based on the parameters set out in Rule 2.3.3.5 (Part 3, Chapter H, Section 5), in particular Table 7. This rule controls the criteria for titles potential to receive TRSS from the two donor processes, and convert them in to new titles and ultimately, dwellings. These rules state that the only receiver zone for SEA protection TRSS is specified Countryside Living zones where the potential for TRSS receipt is specifically enabled<sup>47</sup>. This is because SEA protection donors allow for *an increase* in the net number of rural titles through the creation of 'new' titles (rather than the *movement of existing* development 'rights' as per vacant amalgamation TRSS) and thus CSL zones have been identified as the most appropriate location for receipt of this additional density. These locations are all in the north of the region and are closely correlated with Countryside Living (Town) Zone under the former Rodney District Council (RDC) District Plan, where these areas were also the donating location for RDC's similar version of TRSS, transferable development rights from SEA protection lots enabled across the RDC rural area (refer {Fredrickson, 2013 #49}). Similar provisions under other TA's legacy plans, most notably Franklin Plan Change 13 have not been carried over and are specifically precluded (Franklin District Council legacy plan TRS receiver locations are located within the PAUP "Receiver Site Exclusion Area" overlay). Figure 59 highlights the location of these PAUP receiver zones.

In addition to the zone requirements, receiver parcels are also required to be of sufficient area to accommodate additional lots under a standard minimum lot size approach, including the provision of specified building areas, but also, must not contain any ONC, HNC, ONL, or SEA, or be in any receiver site exclusion area, or inside any RUB areas. The extent of these features is very similar to those shown in Figure 62 with the exception of elite or prime soils, which is not listed as an exclusion for SEA receivers. (Note: The CSL receiver calculations for vacant and SEA TRSS is exactly the same). Figure 66 below illustrates the extent of these features with a focus on the identified CSL receiver areas. Note that the CSL receiver areas are illustrated with a transparent red hatching allowing the solid exclusion areas to be seen behind.

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<sup>47</sup> The rules also provide for some as yet unspecified Rural & Coastal Towns to be receivers, but as these are not yet specified they have not been modelled, but can be added in a subsequent round of modelling.

**Figure 66: Countryside living vacant and SEA TRSS receiver locations with site exclusion features**



### 10.3.2.10 Custom and others

#### Introduction

This group is the remaining zones that do not fall into the other processing groups, also showing how each location is grouped for modelling:

**Table 46: Custom and other rural developments**

Modelling process group	CfGS UID	CfGS name	Rule section/notes
3B.1	PR_10_206_0	Residential precinct Greenhithe sub-precinct A	Part 3, Chapter K, Section 5, Subsection 12
3B.2	PR_10_341_0	Residential precinct Rodney Landscape sub-precinct A Wellsford	Part 3, Chapter K, Section 5, Subsection 40 Not in table General Rules apply
	PR_10_342_0	Residential precinct Rodney Landscape sub-precinct B Ti Point	Part 3, Chapter K, Section 5, Subsection 40
	PR_10_343_0	Residential precinct Rodney Landscape sub-precinct C Sandspit	Part 3, Chapter K, Section 5, Subsection 40
	PR_10_344_0	Residential precinct Rodney Landscape sub-precinct D Chenery Road Whangaparaoa	Part 3, Chapter K, Section 5, Subsection 40
	PR_10_345_0	Residential precinct Rodney Landscape sub-precinct E Riverhaven Road Whangaparaoa	Part 3, Chapter K, Section 5, Subsection 40
	PR_10_346_0	Residential precinct Rodney Landscape sub-precinct F Coal Mine Bay Whangaparaoa	Part 3, Chapter K, Section 5, Subsection 40
	PR_10_347_0	Residential precinct Rodney Landscape sub-precinct G Balboa Dr Whangaparaoa	Part 3, Chapter K, Section 5, Subsection 40
	PR_10_348_0	Residential precinct Rodney Landscape sub-precinct H Silverdale	Part 3, Chapter K, Section 5, Subsection 40
	PR_10_349_0	Residential precinct Rodney Landscape sub-precinct I Scotts Landing	Part 3, Chapter K, Section 5, Subsection 40
	PR_10_350_0	Residential precinct Rodney Landscape sub-precinct J Leigh	Part 3, Chapter K, Section 5, Subsection 40 Not in table General Rules apply
3B.3	PR_11_263_0	Comprehensive precinct Clevedon sub-precinct 3	Part 3, Chapter K, Section 6, Subsection 5
3B.4	PR_11_565_0	Comprehensive precinct Runciman sub-precinct A	Part 3, Chapter K, Section 6, Subsection 24
	PR_11_566_0	Comprehensive precinct Runciman sub-precinct B	Part 3, Chapter K, Section 6, Subsection 24

#### 3B1: Greenhithe A

Rule 2.1.1 (Part 3, Chapter K, Section 5, Sub-section 12): "within Greenhithe Sub precinct A, the minimum site size for subdivision is 2ha"

A simple 'minimum lot size' approach taken to this calculation.

### 3B2: Rodney landscape group

These sub-precincts are all within the former Rodney District (now Rodney Local Board and Hibiscus and Bays Local Board areas) and encompass a number of underlying base zones.

Table 2 in Rule 2.2.4 (Part 3, Chapter K, Section 5, Sub-section 40) provides guidance on site sizes for this group. For sub-precincts not listed in the table the 'General' rules apply (from Table 1 in Part 3, Chapter K, Section 5, Subsection 40, Rule 2.1.2).

The rules also require the protection of 'landscape values' and avoidance of 'physical constraints', by requiring the locating of building platforms outside these features (treated as 'constraints'), but the titles may encompass them (c.f. agreed approach taken to 'exclusions' and 'constraints' in the 'general' subdivision modelling).

A new combination of building platform constraint features has been created to represent the landscape and physical features, from the models base building platform exclusion and constraint spatial database. In this process group they are all used as 'constraints' rather than 'exclusions', and each site must demonstrate the existence of a 'safe building platform' or 2000 square metres area clear of them, in addition to and within each of the minimum title areas. Note that the testing is done mathematically on the basis of net area calculations and therefore modelled outputs may require quite contorted lot boundaries and potentially tightly clustered development, which may be difficult to achieve or consent in reality.

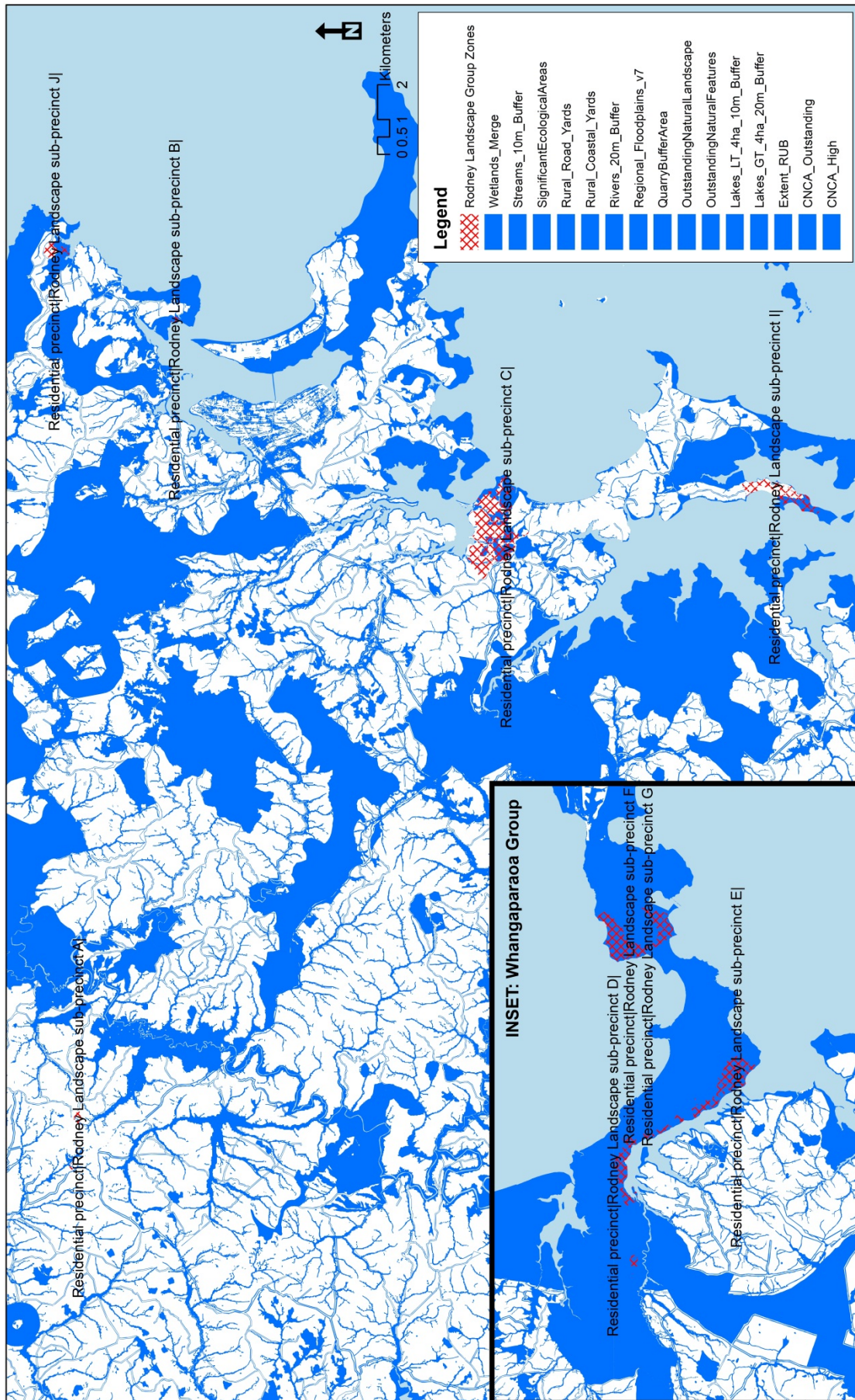
Table 47 below outlines the key variables for site areas, VAR\_1 is the filter for minimum area of potentially qualifying titles, VAR\_2 is the minimum title area post subdivision.

**Table 47: Rodney landscape group minimum site areas**

CfGS UID	CfGS name	VAR 1	VAR 2
PR_10_341_0	Residential precinct Rodney Landscape sub-precinct A Wellsford	16,000	8,000
PR_10_342_0	Residential precinct Rodney Landscape sub-precinct B Ti Point	16,000	8,000
PR_10_343_0	Residential precinct Rodney Landscape sub-precinct C Sandspit	16,000	8,000
PR_10_344_0	Residential precinct Rodney Landscape sub-precinct D Chenery Road Whangaparaoa	8,000	4,000
PR_10_345_0	Residential precinct Rodney Landscape sub-precinct E Riverhaven Road Whangaparaoa	8,000	4,000
PR_10_346_0	Residential precinct Rodney Landscape sub-precinct F Coal Mine Bay Whangaparaoa	8,000	4,000
PR_10_347_0	Residential precinct Rodney Landscape sub-precinct G Balboa Dr Whangaparaoa	8,000	4,000
PR_10_348_0	Residential precinct Rodney Landscape sub-precinct H Silverdale	16,000	8,000
PR_10_349_0	Residential precinct Rodney Landscape sub-precinct I Scotts Landing	8,000	4,000
PR_10_350_0	Residential precinct Rodney Landscape sub-precinct J Leigh	16,000	8,000

Below Figure 67 shows the location of the Rodney landscape precincts (red hatching), along with the building platform constraints combined (solid blue). Where blue is visible behind red hatching, these areas are constrained by the overlay features.

Figure 67: Rodney landscape group - zone location and constraints





### 3B3: Clevedon 3

Sub-precinct 3 is a sub-area of the Clevedon Precinct (refer Part 3, Chapter K, Section 6, Subsection 5).

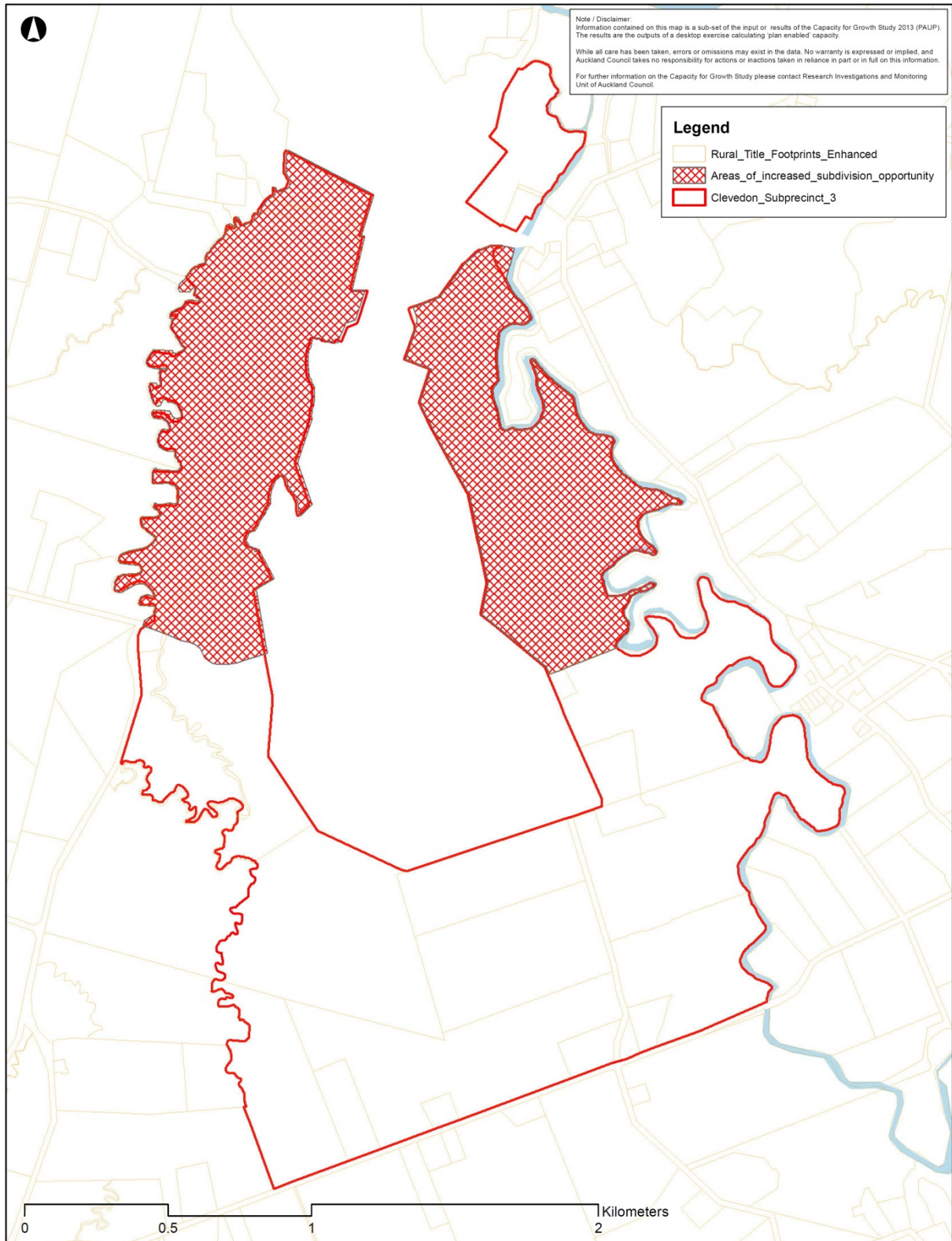
A number of custom overlays have been created to reflect the Clevedon Precinct 3 provisions, in particular, the area of the precinct plan and the '*areas of increased subdivision opportunity*' that are indicated within the precinct plan. These areas are shown in Figure 68 below.

Land in titles outside the precinct boundary cannot be used under this rule (Part 3, Chapter K, Section 6, Subsection 5, Rule 5.2.7.3). Accordingly the precinct area must be used as a spatial limit on the titles prior to processing.

Within this clipped precinct area a further additional subdivision opportunities layer exists. Land within the precinct and within the '*areas of increased subdivision opportunity*' can be developed at a maximum density of one dwelling per two hectares. However land outside '*areas of increased subdivision opportunity*' (but still within the precinct), can be developed at one site per four hectares (1:4 ha).

This complex set of nested overlays requires a series of clips to create parcel portions in each of the categories, with each 'part' of the title having its yield calculated separately (including various overlays for building platforms as so on) then recombined for an overall title yield. Other than this complication, within the various title parts, the standard approach for CSL receivers without TRSS applies, and building platform constraint testing applies.

**Figure 68: Clevedon 3 precinct and area of additional subdivision opportunity**



### 3B4: Runciman A & B

A 'rolled over' precinct within the former Franklin District that allows for subdivision at a maximum density of 2.5 hectares<sup>48</sup> in both sub-precincts provided a number of noted landscape values and features are 'avoided, protected and enhanced'. A range of visual criteria are also invoked but these cannot be tested for other than onsite by landscape professionals, and again we consider this to be a matter relating to the most appropriate *arrangement* of enabled capacity rather than a factor affecting the *amount* of capacity enabled.

In Runciman sub-precinct B, in addition to the standard rules also applying in A and B, density is permitted at 1:1.5 hectares (in clusters) provided the site area is greater than 20 hectares. Amalgamation (title grouping into a 'site' for the purposes of application) is permitted to achieve this minimum application area, but this cannot be tested for other than by assuming the entire Area B is a single 'site', so this has not been done. Division of the entire combined area of titles within Area B by 1.5 hectares would provide an indication of the upper limit of density, but would be relatively unrealistic outcome and we have considered it unreasonable to do so. No single parcel is >20ha in this sub-precinct. In effect both sub-precincts have been modelled as a single Precinct, but readers should note the potential for higher density outcomes in B if amalgamation occurs, or multi-site applications are made.

A customised set of features has been created from the constraints and exclusion database. We note in particular the existence of Franklin Rural Exclusion Area and the RUB, as both of these features apply over all or some of the Precincts; we have therefore considered these to be constraints rather than exclusions. If they were treated as exclusions, no capacity would be realisable in this precinct despite the rules clearly suggesting otherwise.

These important features are permitted onsite (else no subdivision in the area could eventuate), but no specified building area may fall on them. That is, these features are treated as building platform constraints, not title exclusions (c.f. general rural subdivision modelling). These features are illustrated in Figure 69 below.

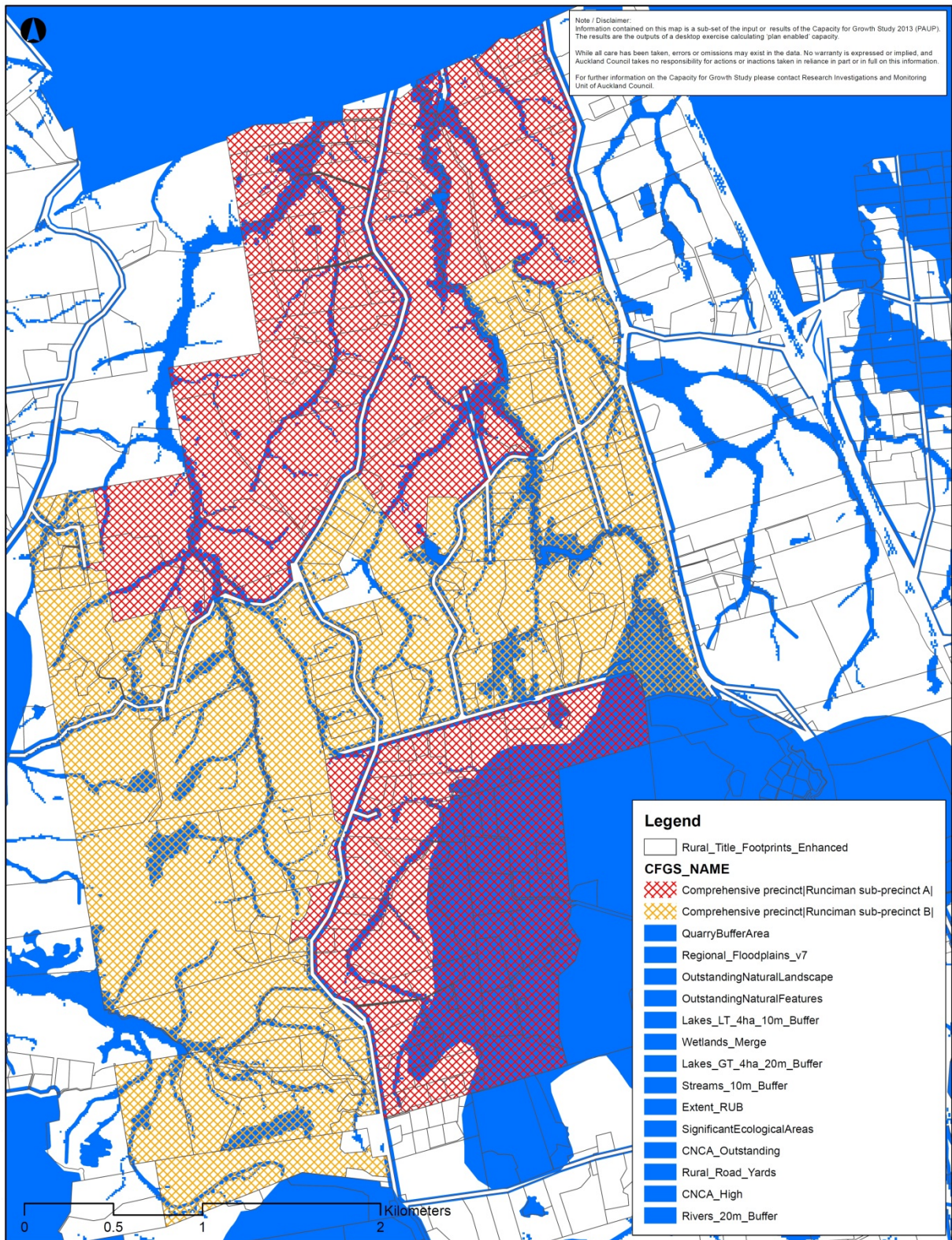
A feature that is not currently included, but should be as it is listed in the rules applying to the precincts, is *slope greater than 15 degrees* (26.79 per cent), which is not currently available in PAUP data sets and we have not calculated from LiDAR data for this small area (20 per cent slope calculations were limited to the urban area due to processing limitations). The time-cost of creating a small input slope feature relative to the effect on regional capacity meant that this was ignored, and treated as a matter for arrangement of capacity rather than the amount of it.

Otherwise the standard approach to all subdivision and building platform constraint testing applies.

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<sup>48</sup> Note that 'clustering' is enabled but is irrelevant to the calculation of capacity, because it relates to the future layout of that capacity

**Figure 69: Runciman A & B location and SBP constraints**



### 3C: Second & third rural dwellings

A provision has been included in the rural zone rules, allowing more than one dwelling per site without subdivision (Part 3, Chapter I, Section 13, Rule 2.6). Table 1 of the rule (number of dwellings per site) outlines what is permitted in the zones, a copy of this table can be seen as Table 48 below.

**Table 48: Number of dwellings per site, by rural zone as per Rule 2.6 Table 1 (Part 3, Chapter I, Section 13)**

Dwelling	Rural Coastal, Mixed Rural and Rural Production zones	Rural Conservation or Countryside Living zones	Dwellings in the Pakiri, Whangateau to Waiwera, Kaipara South Head and Harbour to Muriwai to Te Henga coastal areas (Coastal Policy Overlay Areas)
One dwelling per site	P	P	RD
Two dwellings per site where the site is > 40 ha	P	D	D
Three dwellings per site where the site is > 100 ha	P	D	D
More than three dwellings per site	D	D	D

Note for brevity we refer to the Pakiri, Whangateau to Waiwera, Kaipara South Head and Harbour to Muriwai to Te Henga coastal areas collectively as the “Coastal Policy Overlay Areas”.

This table/rule is interpreted as:

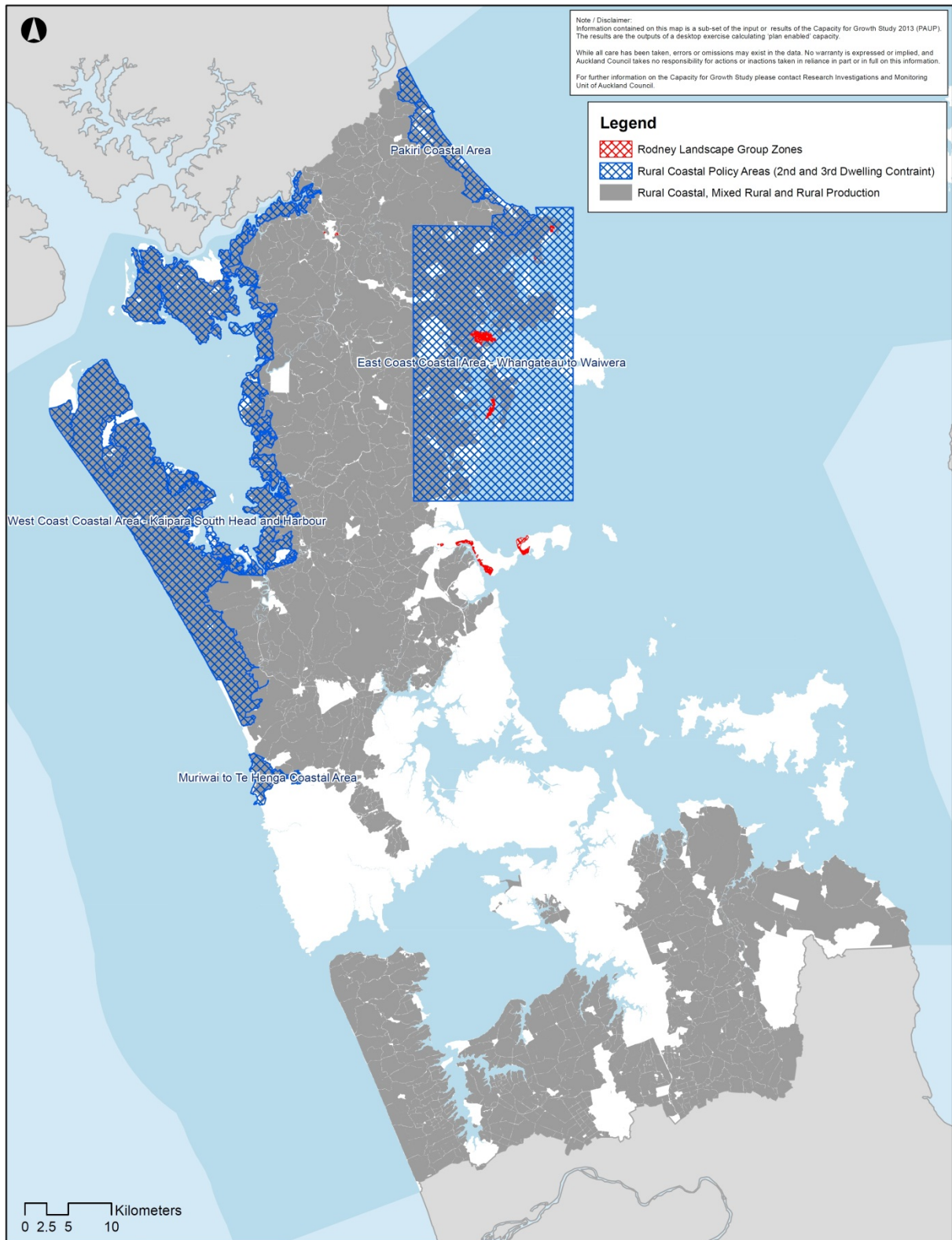
- *If the title is in the Rural Coastal, Mixed Rural, or Rural Production zone and not in the listed Coastal Policy Overlay areas, and, if the title is large enough then more than one dwelling on the title is possible, at the rate shown in the table.*
- *Rural Conservation and Countryside Living Zones can only have one dwelling per title, and if title is in the listed Coastal Policy Overlay areas, only one dwelling is allowed, but that also requires Restricted Discretionary consent. No second or third dwellings in the Coastal Policy Overlay Area are permitted; no dwellings in the Rodney Landscape Overlay area are permitted.*
- *Activities listed as Discretionary are not modelled (i.e. more than 3 dwellings)*

We have also included the Rodney Landscape Overlay provisions in the policy exclusion as this particular overlay also requires buildings within it to be subject to Discretionary consent assessments.

These combined constraints are shown in Figure 70, with Coastal Policy Overlay in Blue Hatch, Rodney Landscape Overlay in red, and the relevant zones mentioned in the rule indicated in Grey.

Standard Building Platform tests apply for all these new additional dwellings as well, we have used the same test criteria as for general subdivision, as seen in Figure 60.

**Figure 70: Second and third rural dwellings: zones and constraints**



## 11.0 Modified capacity: site shape factor

### 11.1 Background

This section of the report looks at the assessment of capacity when taking into account 'site shape factor' (SSF) requirements as outlined in the residential subdivision provisions of the PAUP

This analysis is an extension to the capacity modelling work undertaken for the PAUP, and assesses the over 300,000 residential parcels (and their capacity) against a number of SSF constraints that they possibly intersect. Note that this assessment is undertaken after the candidate areas have been identified and yields determined, by intersecting the whole parcel with capacity against the constraints, rather than modelling capacity around constraints. The latter approach may produce different outcomes, but this is currently beyond our spatial processing capability to investigate, and as the discussion below points out such an approach is likely to produce overly conservative outcomes as the constraints do not automatically preclude development. Instead we have assumed that constraints will impose a range of costs and barriers to future development (that may or may not be overcome) rather than totally exclude it.

The PAUP includes provisions requiring the demonstration of a 'site shape factor' for residential zoned parcels for vacant site fee simple subdivision. This provision is contained in the subdivision rules (Part 3, Chapter H, Section 5, Rule 2.3.1.2) and is supported by other city wide rules in the plan regarding the avoidance of hazards and more specific zone provisions. The modelling of potential for additional dwellings in the PAUP's rural zones has incorporated tests for a 'specified building area' (as per Part 3, Chapter H, Section 5, Rule 2.3.3), and as such this type of capacity has not been included in this modified capacity assessment.

It is worth keeping in mind that the degree to which the existence of these SSF constraints will actually preclude development eventually occurring is dependent on a combination of many other factors, including but not limited to:

- The perceived or actual cost (in time and dollars) of overcoming the constraint
- The degree to which the constraint impacts on practical development, engineering, or layout. For example bridging or moving a small section of underground pipe in practical terms is not an issue, but resolving steep slope and flooding issues that together cover 90 per cent of the site area are
- The form and nature of the residential development proposed for a site. For example heritage trees could be avoided by clustering development outside of the drip line, slope may be less of a constraint where good views exist; and
- Market interest in the area and the degree to which any cost is able to be overcome by potential gain from development.

A series of spatial queries are used to test for a parcel's 'intersection' with the various constraints. The constraints are variable in shape and nature, and an area or net coverage per cent threshold will favour bulky polygon constraints over various point and line sourced ones which may (or may not) impose a greater level of risk, or constraint, to any development.

The single capacity base layer (one capacity for all parcels with more than one option) used in this assessment is the 'ARFM inputs' (see Section 13.0), but excluding 'rollover' areas.

Capacity modelling is undertaken at the parcel scale, and for consistency with previous studies, consideration of individual parcels interaction with broader scale constraints has not been undertaken. This is mainly because constraints can and do change over time, and in addition a dataset that contains all land otherwise developable is a useful dataset, and follows our "model all, filter later" approach (as, for example a data set that pre-excludes land affected by a certain constraint is not useful for cost benefit analysis of proposed works that may address that constraint).

At the time of development, investigation of cost benefit analysis of flood protection works (or clustering of development to avoid the section of the site affected by flooding) for example would determine whether land could be developed or not. This is also a key reason why the results of this study cannot be used directly as a growth projection. Accordingly a number of rules in the plan, that are not specifically listed in the input parameters in the sections above have not been incorporated directly into the 'raw' capacity modelling, largely because there are so many.

One of the major rules not considered, which helpfully combines the majority of these factors into a single requirement, is specific consideration of PAUP Subdivision Rule 2.3.1.2.c (Part 3, Chapter H, Section 5)<sup>49</sup> repeated below (Auckland Council, 2013a):

*Site shape factor - Each proposed vacant site must contain the following:*

- a. access and manoeuvring that meets the requirements of the Auckland wide and zone rules*
- b. private outdoor space required by the zone*
- c. a rectangle measuring eight metres by 15 metres must be able to be located outside any of the following:*
  - i. natural hazard area identified in a council natural hazard register/database or GIS viewer*
  - ii. slopes greater than an average of one in five*
  - iii. protected root zone of a notable tree*
  - iv. Significant Ecological Area or Outstanding Natural Feature or Outstanding Natural Landscape overlay*
  - v. scheduled historic heritage place, or site or place of significance to Mana Whenua*
  - vi. network utility installations, including private and public lines*
  - vii. building line restrictions in the Unitary Plan and on a Certificate of Title*
  - viii. right-of-way easements*
  - ix. area of esplanade reserves and esplanade strips required by the Unitary Plan*
  - x. yard setback required by the underlying zone*
  - xi. riparian, lake or coastal protection yard.*
  - xii. separation distance from national grid transmission lines.*

Some aspects of the list are included for facilitated modelling (access), some are simply assumed to be met (outdoor space), others are considered constraints that would be overcome in the development process, or are a prerequisite for development (network infrastructure). Further details are included in Table 49: Site shape factor components below.

As the infill modelling in particular seeks to find land of sufficient area to meet the site size requirements (rather than designing the location of the building on that site) direct testing has not been incorporated. We have however created a post processing approach to 'filter' those parcels that contain development opportunities against these criteria, which could inform more nuanced investigations. The key reasons some of these features are not considered within the main residential modelling processing are outlined below:

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<sup>49</sup> A similar rule is contained within business subdivision rule 2.3.2.3.a (Part 3, Chapter H, Section 5), but no site shape factor is specified, instead referring to a 'building complying with the rules of the applicable zone avoiding' the listed features. Compare also with rural subdivision where the specified building area rules are factored into the parcel level analysis, mainly due to processing limitations (calculation of net areas on 100 candidate parcels is reasonable, calculation of net building platform areas within a constrained parcel landscape across 400,000 plus residential parcels is beyond our current processing capability - finding space within 'raw' parcels is already a multi-day process, hence the filtering approach)



- Geo-processing capability - calculation and testing of building platforms within the raw cadastral landscape is beyond the limits of our computer hardware and software capabilities. The constraints layers, even when simplified have a considerably higher spatial index value (they are very complex, messy shapes) that would exceed these limits.
- "Capture all, filter later" approach - we have taken an approach whereby the primary purpose of the study is creating a data set for use as an input to further more detailed investigations, not all of which are currently known. The study therefore is finding land that has sufficient space for additional development, under a subset of rules, which can be further tested post processing depending on the purpose that is being investigated. For example, a number of parcels contain slopes that are greater than 20 per cent but in locations where this enables good views it could be assumed that this will not preclude development over the longer term. In locations subject to flooding (one percent (1%) AEP) investigations of alternative flood works may require investigation of all development precluded by flooding as part of a cost benefit analysis.
- Series consistency - previous studies have not necessarily excluded land subject to various constraints, and the consideration of what is a constraint also changes over time, both in terms of economics, engineering, social acceptance and planning regimes.
- Constraint variability - we can relatively quickly consider new information or additional layers post processing, but inclusion of the constraints within the process would lead to slow turnaround times (see also first point) and limit the utility of the output data to a single use, not multiple uses. In this way, we consider the study outputs as 'land census data' that *always* requires filtering (or at least appreciation of the limitations of the data) before being used for a particular purpose.

Spatial constraints however be accounted for by undertaking further modelling once our base results have been generated, by identifying land that is affected by these provisions, or other constraints that may change over time (e.g. new heritage features discovered or listed, new flood modelling, sea level rise, tsunami hazards, character areas, new building constraint rules (geotechnical, slope), infrastructure capacity etc.).

The SSF constraints outlined in Subdivision Rule 2.3.1.2.c (Part 3, Chapter H, Section 5) have a related spatial extent and this allows us to 'intersect' these features with the generated capacity results, creating a new output dataset which can be filtered based on the constraints identified against them. IN effect this process is an example using constraints listed in the SSF rule as an example of the post modelling filtering process.

The SSF constraints used in the spatial queries collectively represent the modelled criteria for provision of a 'site shape factor in residential zones for vacant site subdivision'. However, intersection of the constraint with a parcel does not necessarily indicate that a safe building platform cannot be provided on a given site. Rather there may be issues to be aware of with the location or extent of any building platform, or consent status of the application for development may be increased - i.e. the development capacity utilisation chance may be reduced due to cost, delay or concern about resale value or council processing issues.

Additional constraints such as character overlays (captured by the subdivision rules), current owner intentions, or market issues have not been considered but can be considered through additional analysis.

We did not include 'networks' infrastructure (as required by the rule) for two main reasons:

- The data processing requirements of the complex spatial networks made it infeasible with the technology available (the spatial index is poor), and
- The existence of network infrastructure is a necessary *prerequisite* for development potential, so excluding sites that do intersect infrastructure is counterproductive.
- Existence or otherwise of known network infrastructure does not reveal capacity or capability for connection

Assessment of yards, access, open space and setbacks was not undertaken as these are included in the site level assessment modelling already and are assumed to be met by the minimum site size and shape criteria. Building lines and ROW Easements are not included as we do not have this information.

The existence of these constraints may impose consent category and cost implications for development on those sites subject to them.

The analysis provides an indication of the locations where these issues may be most acute, but it does not indicate whether or not capacity is actually reduced. However, for the purpose of this methodology we presume they do.

## 11.2 Methodology

The methodology sub-section for this modified capacity (site shape factor) modelling process has been broken down into two sections

1. The outlining of the datasets used to create the combined layers that represent constraints, and
2. The process of using these created constraints layers to calculate a modified capacity result for the PAUP.

### 11.2.1 Combined constraints datasets for intersection

In order to undertake the 'filtering' of the residential capacity results by using constraints, first a series of constraints layers needed to be generated. The input datasets used to create our combined constraints layers are outlined below in Table 49. This table also notes the provision of the PAUP rules from which the constraints chosen have been used to represent.

**Table 49: Site shape factor components**

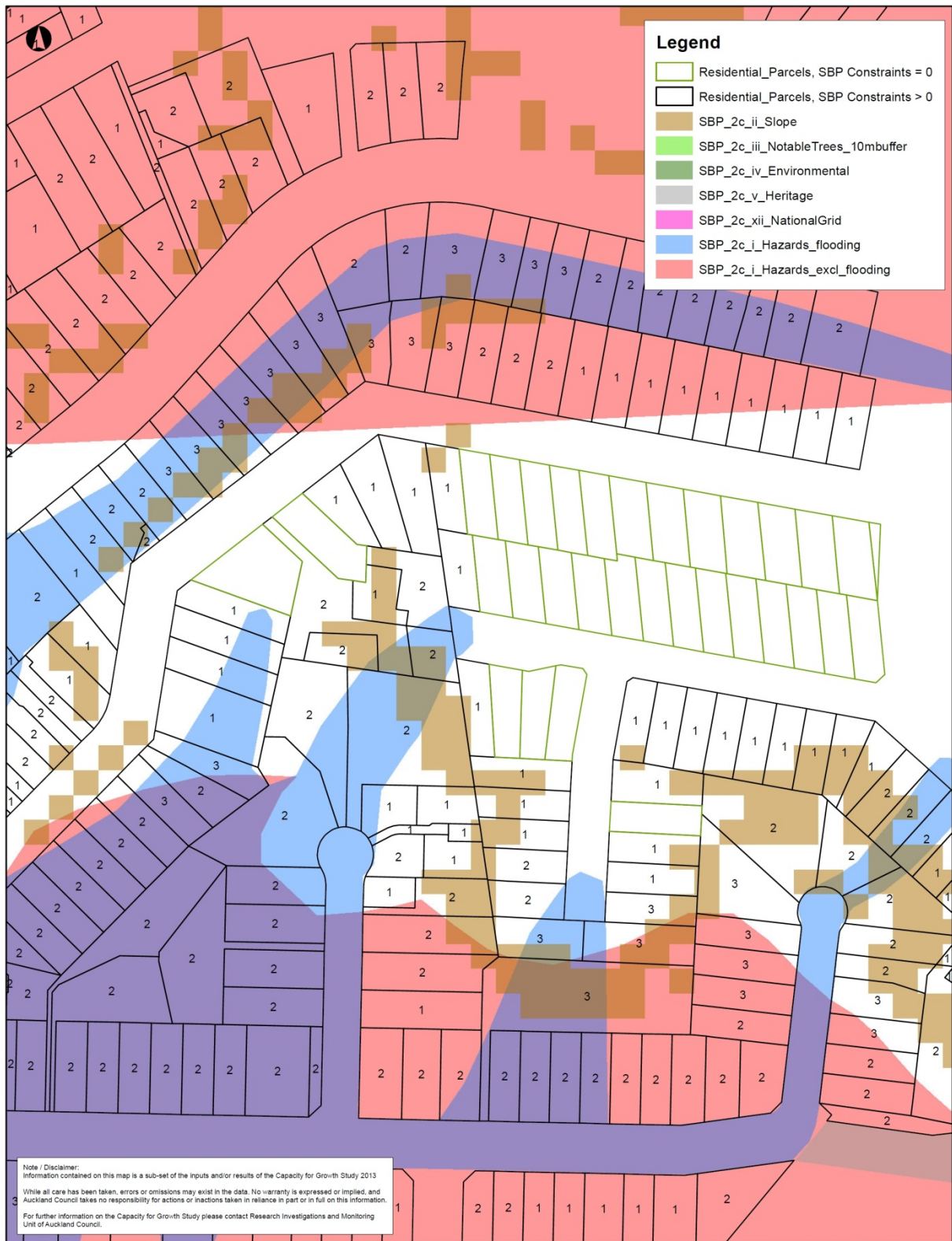
Provision	Spatial features used	Description
Access and manoeuvring that meets the requirements of the Auckland wide and zone rules	Access is tested at the parcel candidate level using access width. Private outdoor space is a proposal design issue and is not 'modelled'. Both are assumed to be complied with (or sites meeting the minimum site size and etc. in the model are implicitly compliable within the minimum site size/shape factor required by the zone rules).	
Private outdoor space required by the zone		
Natural hazard area identified in a council natural hazard register/database or GIS viewer	Selected Hazards used: Coastal Inundation (UP) Regional Floodplains v7 (AC Storm water team) Closed Landfills (DAUP data) Liquefaction Soil Class 234 (SDE\Geology) Slope Instability High (SDE\Geology) Rain Instability High (SDE\Geology) Drury and Wairoa Fault Lines (10 m buffer)	These hazard features have been collected from various sources within council's SDE, and combined into a single coverage, with the exception of flooding, which has been included but kept separate. Significant data cleansing of the flooding layer has been undertaken but it remains a highly complex shape for processing (poor spatial index value). It is assumed that these features would form a good proxy for the contents of any database as suggested in the rule, in the absence of further information. We note that coastal inundation is the only 'hazard' included in the PAUP dataset, but is not the only hazard the council is aware of.

Provision	Spatial features used	Description
Slopes greater than an average of 1 in 5	Slope (greater than 20 per cent)	CfGS: Custom 2 m LiDAR raster to polygon conversion where slope is greater than 20% gradient (1:5)
Protected root zone of a notable tree	PAUP: Notable Trees (point features)	PAUP inputs converted to CfGS features: conversion of points to polygons using buffer distance based on discussions with AC Natural Heritage Team (10 m)
Significant Ecological Area or Outstanding Natural Feature or Outstanding Natural Landscape overlay	Significant Ecological Area Outstanding Natural Feature Outstanding Natural Landscape	PAUP overlays, as supplied.
Scheduled historic heritage place, or site or place of significance to Mana Whenua	Historic Heritage (point) Historic Heritage Extent of Place Sites and Places of Significance To Mana Whenua (point) Sites and Places of Value to Mana Whenua	PAUP overlays converted to CfGS features: Historic Heritage point features not within an 'Historic Heritage Extent of Place' to be buffered by a 10 metre radius as proxy for extent of place in absence of other information. Sites of Value are supplied as polygons (100 m radius) and Sites of Significance are supplied as points and refer to landscapes and particular features (pa sites, urupa, islands etc. The relevant SoS rule refers to a 50 m radius buffer from these points, so this buffer distance has been applied
Network utility installations, including private and public lines	Wastewater network Water supply network Storm water network Wholesale and retail features, <u>excluding</u> private lines	<b>Combined feature created but not included in testing</b> As features are also a <i>prerequisite for development</i> , most parcels will intersect the combined feature. Features cleaned and buffered by nominal pipe diameter. Private lines excluded because they are regularly relocated as part of the development process Actual locations are not always accurately reflected in SDE (refer asbuilt plans)
Building line restrictions in the Unitary Plan and on a Certificate of Title	Information contained on Certificate of Title not available.	<b>Not tested – partly implicit in capacity modelling process</b> No data Note: Building lines are generally a historic anomaly, and are not an available spatial layer, and have been replaced by more flexible tools, such as road widening designations or yard rules for the most part.
Right-of-way easements	Information contained on Certificate of Title not available.	<b>Not tested – partly implicit in capacity modelling process</b> No data. *Note that 'plan compliant' access to infill sites is included as a requirement in the infill modelling process, however no assurance that this will modelled access is consistent with ROW or that modelled development does not use ROW space

Provision	Spatial features used	Description
Area of esplanade reserves and esplanade strips required by the Unitary Plan	Lakes Coastline Streams greater than three metres wide	CfGS: 20 m buffers created from esplanade requiring features. Buffer distance (in plan) may be greater than 'ground' distance.
Yard setback required by the underlying zone	Cadastral boundaries and PAUP rules	<b>Implicit in capacity modelling process</b> Not tested separately or created as a single layer as provision is included in general spatial model parameters for development calculations at a parcel level. Inclusion of this data in a spatial overlay would result in all parcels in zones where the rules contain a yard setback being 'constrained'.
Riparian, lake or coastal protection yard	Coastline Lakes Streams greater than three metres wide	CfGS: various distance buffers created from yard requiring features. Buffer distance (in plan) may be greater than 'ground' distance. Significant overlap with rule provisions ix and x.
Separation distance from national grid transmission lines	Electricity Transmission Corridor	PAUP overlay converted to a Capacity for Growth Study feature - Inner Urban and Rural parameters used.

Below Figure 71 shows the combination of SSF constraints layers, over a residential parcels layer. The numbers indicate the count of unique constraints the parcel intersects. Given the majority of these parcels are already occupied, the presence of these matters has not precluded their original development, but existing dwellings may be arranged in such a way that new development falls within the more difficult portion of the parcel. This analysis does not identify this aspect, but tags each parcel with the SBP constraint count for further investigations and use as an indicator of potential issues.

Figure 71: Example of SFF constraints count on residential parcels<sup>50</sup>



<sup>50</sup> Note: SBP in the legend of this map refers to 'safe building platforms' rather than SFF. For the purposes of this study they are the same.

## 11.2.2 Intersection of constraints layers with capacity results

After the composition of the representative constraints layers, this information is intersected with a region-wide parcel dataset. This allows us to cross-reference any capacity results against the parcel it falls on, while also maintaining information about the type and number of constraints that may fall on any one parcel. The input datasets used and the process employed to undertake this analysis is detailed below.

### Input datasets:

The combined constraints layers, as outlined in Table 49 are used as data inputs, the names of which are summarised in Table 50 below.

**Table 50: Site Shape Factor feature classes**

Input feature	Provision
SBP_2c_i_Hazards_wo_Flooding SBP_2c_i_Hazards_Flooding	Natural hazard area identified in a council natural hazard register/database or GIS viewer
SBP_2c_ii_Slope	Slopes greater than an average of 1 in 5
SBP_2c_iii_NotableTrees	Protected root zone of a notable tree
SBP_2c_iv_Environmental	Significant Ecological Area or Outstanding Natural Feature or Outstanding Natural Landscape overlay
SBP_2c_v_Heritage	Scheduled historic heritage place, or site or place of significance to Mana Whenua
SBP_2c_vi_Networks <b>Created but not used</b>	Network utility installations, including private and public lines
SBP_2c_ix_x_xi_Setbacks <b>Created but not used</b>	Area of esplanade reserves and esplanade strips required by the Unitary Plan
	Yard setback required by the underlying zone <sup>51</sup>
	Riparian, lake or coastal protection yard.
SBP_2c_xii_NationalGrid	Separation distance from national grid transmission lines.

In addition to these constraints layers, this modelling process also used the following input datasets:

- Parcels
- Residential capacity (ARFM inputs) results

### Calculation:

1. Base parcel layers are intersected with the nine constraints layers identified in Table 49, creating a new parcel layer which includes the type and number of constraints that intersect with each parcel.
2. Residential capacity (ARFM inputs) results and joined to the base parcel layer (with constraints attributes).
3. A new 'residential capacity (ARFM inputs) with constraints counts' is outputted to be used in analysis.

Results from this processing of the capacity results are then used for analysis, which has been reported as part of the *Capacity for Growth Study 2013 (Proposed Auckland Unitary Plan): Results technical report*.

<sup>51</sup> Note that yards are largely incorporated into site modelling parameters and are not included in the spatial constraint layer.

## 12.0 Special areas (including structure plan areas)

While special areas and structure plan areas are discussed as a single group in this report, they each have distinct qualities. Structure plan areas are areas that are identified for development (residential, business rural or a mix of all three) but where the rules for a variety of reasons were not modelled, or modellable. Special areas are generally locations where specific special activities are, or will be located, which depending on perspective can be considered as partly residential and/or business uses (e.g. hospitals, airports, marinas and quarries), but primarily are special in some way. Capacity figures for structure plan and special areas are collected/measured and reported differently to the other types of capacity covered in this study. Table 51: Description of structure plan and special areas below describes these differences:

**Table 51: Description of structure plan and special areas**

Area type	Description
Structure plan area	<p>Areas subject to 'structure planning' generally providing a relatively prescriptive and integrated planning structure applying to all of the land within the structure plan area. Such approaches generally apply to large scale greenfields development areas and are increasingly common as a planning approach to reflect local issues or where 'standard zoning' may generate undesirable outcomes. Examples include Flat Bush and Massey North.</p> <p>Interested readers are referred to the relevant structure plan documentation for more information including greater detail on the individual structure plan areas.</p>
Special area	<p>Generally apply either as an unusual base zoning or overlay to recognise some unusual or 'special' current or future activity.</p> <p>In most cases capacity for 'non-special' activities is considerably curtailed, and accordingly no yield has been calculated. Examples include major infrastructure such as hospitals.</p> <p>Special areas are also sometimes applied as a 'holding zone' prior to future Structure Plan processes.</p> <p>Interested readers are referred to the relevant district plan sections for more information and detail on the individual special areas.</p>

Due to the nature or state of their land use planning or timing these areas have not been modelled by us. The figures are based on information provided from a range of sources, and reflect the latest understanding of the future of these locations either as outlined in the PAUP or in information publically available at the time of notification of the PAUP/strike date of this study

Structure plans generally contain a number of existing parcels or titles over which potential is distributed unevenly (i.e. not in relation to parcel area), or require that some future structure planning process (e.g. comprehensive development plan) be undertaken before capacity can be known. Thus the individual parcels making up the identified area have not been allocated an individual capacity yield (as existing parcels are not a relevant consideration in most structure planning processes), but are instead aggregated (to the structure plan or special area level) and *share a single yield figure that applies to the area as a whole*.

These figures have been primarily sourced from the relevant structure plan, precinct, or overlay documentation, and amended where required following discussions with Operative District Plan teams to reflect more recent developments and knowledge. Like the rest of the figures reported in this report, the structure plan and special area yields are 'plan enabled' capacity, reflecting the intentions of the relevant planning documentation. Some structure plans are more prescriptive than others, and some envisioned development that is quite considerably different from what is actually being built in these

areas. Readers with a more detailed interest in the special areas should refer to the relevant precinct or structure plan in the PAUP, or other public processes for more information, particularly with respect to better understanding sub-area distribution of growth.

Capacity for structure plans should therefore only be considered an indication of *what 'should' happen* in these areas (if the currently available 'plan' is followed in the future), but *not necessarily what will happen*, particularly if the structure plan is not anticipated to commence for some time. Statutory Plans can and do change, as does the market, and future preferences.

In Future Urban zones (FUZ), where the exact future land use is yet to be determined, we can only indicate that the current proposed rules effectively allows for no development, *until such time as a structure plan is approved*.

Plan enabled capacity in the FUZ is therefore zero, until the zone is changed to something else through the plan change process. However, in some instances we are aware of legacy planning intentions for these locations and have assumed that these will provide at least a starting point for more detailed structure planning, and have reflected this information *only where it exists* as 'pipeline capacity'.

Given the rapid pace of change in these areas, including through the provisions of the Special Housing Areas Act 2013, we can only suggest that readers take the information presented as indicative of the situation at the time of writing only, and make their own investigations where more specific or up-to-date detail is required.

## 12.1 Why don't we model these areas?

These areas are not modelled as the structure plan or special area generally provides clear parameters for development within the area, and modelling on an 'existing parcel' would provide no additional benefit or increased understanding of potential for development within the wider area, and in most cases is also relatively difficult to do.

An example structure plan from the PAUP, Figure 72: Orewa Countryside, illustrates this issue. No modelling process could replicate the outcome envisioned by this structure plan, accordingly we 'calculate' capacity from the maximum number of lots indicated, less those that are occupied, leaving a potential for additional dwellings. Therefore no 'modelling' is necessary, however some monitoring (existing development in the area) and simple calculation is still required.

The formula below indicates the approach taken, which can be applied to capacity for dwellings, or business land or whatever the intended 'development' output of the structure plan is:

$$\begin{aligned} & \textit{Structure Plan Capacity} \\ & = \textit{Structure Plan Maximum Development Potential} - \textit{Existing development} \end{aligned}$$



Figure 72: Orewa Countryside Precinct

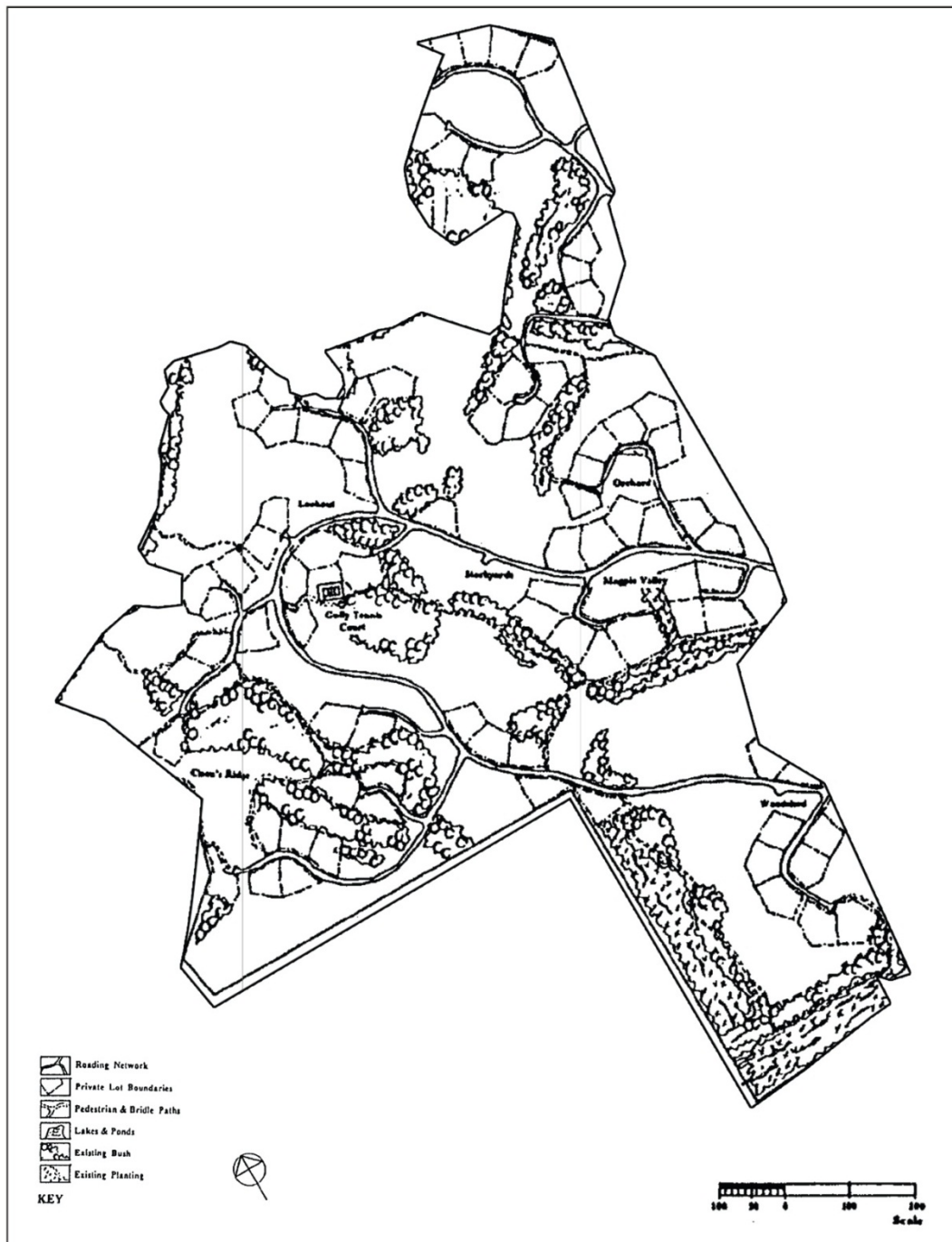


Image sourced from Auckland Council (2013a)

Other reasons for not modelling capacity using our parcel based approach in these structure plans and special areas include:

- Structure plans are based on a combination of environmental, cultural and economic assessments to generate a comprehensive and integrated plan for an entire area. Usually such approaches are applied across large areas with relatively few owners in order to create comprehensive sustainable new urban areas. In this manner most structure plans are 'cadastre blind' and existing ownership patterns are more or less irrelevant for the initial layout and distribution of development potential within the Structure Plan. This compares with 'established' zonings where development occurs in a relatively ad-hoc manner within the underlying cadastral framework.

- The structure plan is often very detailed and in many cases provides a maximum dwelling yield, negating the need for any modelling.
- Some locations state that a future planning process (e.g. Comprehensive Development Planning) is required to be undertaken to determine the appropriate outcome. We cannot second guess these future processes.
- 'Pre-existing' title or parcel boundaries within the special area are not necessarily a logical geography for calculating capacity from most structure plans, and should such parcel level detail be required then reference should be made to the relevant structure plan.
- Many structure plans are the result of a long and heavily negotiated process following landscape, ecology, urban design and infrastructure requirements as well as wider strategic and growth management requirements, interacting with specific land owner/developer requirements. These outcomes cannot be replicated in a computer model.

The practical constraints above with respect to estimating total yield should however be differentiated from what we are able to do with respect to tracking development as it occurs which can be done to some level of detail. Uptake to date can be compared to the estimated total yield to provide an estimated remaining capacity yield, which is the key reported metric, contained within the *Capacity for Growth Study 2013 (Proposed Auckland Unitary Plan): Results* technical report.

A full list of special areas considered as part of this study can be found in Appendix O: Special areas with type, location and expected future development yields at the end of this report.

Note that where information has not been provided to us, or we are unable to ascertain with certainty the future outcomes for an area we have not provided a capacity figure.

## 13.0 Using capacity results as inputs into the Auckland Residential Futures Model

### 13.1 Background

One of the important uses of the Capacity for Growth Study results is as an input into the Auckland Residential Futures Model (ARFM), commonly known as the Auckland Growth Model.

For more information on the Auckland Residential Futures Model, refer to Auckland Council technical report; *Auckland Futures Growth Model 2012*, TR2012/014.

The Capacity for Growth Study results are used as the shorter term (10-15 year) dwelling supply input of the 30-40 year model run to determine how many additional dwellings can be accommodated in an area in accordance with planning decisions that have been made, and this in turn is used to distribute the numbers of additional households and people (demand) into those areas, which is used for a wide range of corporate planning purposes (Owen, 2012).

In order for the capacity data to be used as an input into the ARFM, the capacity results must be engineered to create a 'single figure per parcel' or 'flattened' view of capacity, as the Study outputs are reported as a range - Capacity from Infill or Capacity from Redevelopment, with a number of parcels having options under both approaches. In addition, an attached/detached dwelling typology is also required to be provided, and all of this information input to the model at 2006 Meshblock geography (the base areas the growth model operates at).

The section below outlines in detail the process to do this.

### 13.2 ARFM input creation methodology

The conversion of 'raw' capacity outputs into ARFM model inputs requires the creation of a multi-step process to create meshblock scale inputs containing a single dwelling capacity figure with an attached/detached split, using the following steps:

- Create a single parcel scale capacity view
- Aggregate capacity to meshblock scale
- Apply dwelling typology splits to meshblock totals based on assumed development outcomes and zoning of parcels contributing to capacity totals.

In order to create the ARFM inputs, a small FME workbench model was created.

This section of the report gives an overview of the method used to undertake this analysis.

#### 13.2.1 Create single capacity option at parcel scale

The model imports all capacity values, and where one parcel has one development option, that goes forwards unaltered. Where a parcel has more than one development option (infill or redevelopment) then a choice must be made, and the remainder of this section will focus on the decision making process.

The model uses assumptions to make choices between the development types possible on a parcel (infill vs. redevelopment), where more than one option was identified in the study. This single view is created by making a selection as to what development option is considered most likely to occur on a parcel for those parcels that have both infill capacity (room for an additional development on the parcel without removing existing development) and redevelopment capacity (capacity for development on a parcel if the existing development was removed). All other parcels with only a single option are carried

forward unaltered. Essentially this provides a third capacity figure, somewhere between the reported infill and redevelopment capacity totals.

This 'one parcel - two choices' option only occurs on residentially modelled parcels of an area less than 2000m<sup>2</sup>, that have both an Infill (existing development remains) and a Redevelopment (existing development removed) yield greater than zero. Although this size category of site does potentially encompass the majority of urban residential sites, sites with both options are a smaller proportion of these due to the PAUP rules applying in combination with the layout of existing development on the site, and in many cases do not produce different dwelling yield outcomes (infill yield equals redevelopment yield). The assumption used for determining which option will be taken is the consideration of the value of the improvements (IV) on a parcel relative to capital value (CV) of the parcel.

In this instance we have assumed only those parcels with an improvement value to capital value (IV:CV) ratio of less than or equal 30 per cent will be redeveloped – that is, the improvements (dwellings and other buildings, fences, retaining, driveways etc.) on the parcel are worth 30 per cent of the total value of the land and improvements. All other parcels (IV:CV greater than 30 per cent) are assumed to be 'infilled', (the existing improvements on the parcel are not removed) which is consistent with previous approaches to populating the ARFM model, and also with previous redevelopment assessments (Fontein et al., 2011).

IV:CV ratio is a useful indicator of the likelihood of redevelopment, because if a parcel has a high improvement value relative to its total overall value (CV) it is assumed that the chances of the improvements (including pools, tennis courts as well as other buildings) being removed or demolished to make way for redevelopment are lower, as the removal of the IV is a sunk cost that must be recovered through resale of the new development. Maintaining the assessment as a ratio allows the assessment to respond to the underlying land value (LV) which is the other component of CV ( $CV = IV + LV$ ). Thus, redevelopment will occur only where the improvements are 'undercapitalised' with respect to the value of the parcel as a whole, otherwise infill (the addition of more IV without removing the existing) is assumed to occur.

After the assessment, the capacity information relating to the parcel and the capacity 'source' chosen by the process is passed forward into a new set of outputs, which in turn lets us calculate an overall 'single' capacity number which will be somewhere between the Infill and Redevelopment totals range.

Note that in order to supply sufficient capacity (consistent with council land use planning assumptions regarding population and dwelling growth) to the model to accommodate projected long term demand, 100 per cent of this new plan enabled capacity is assumed to be available as potential supply. This is considered a slightly unlikely outcome (that 100 per cent of enabled capacity is taken up), but given beyond the current PAUP a definitive view of what the land use pattern will be has yet to be determined (to the level of detail required), is a necessary and reasonable one.

However, as the ARFM model operates at a mesh block scale, the individual parcel capacity is not directly utilised, thus, plan enabled capacity is used as a proxy for supply across the entire meshblock. This allows for the situation where site specific enabled development opportunities are not taken up for a wide range of reasons to be offset by non-complying development on other sites within the mesh block, whilst still remaining consistent with the input PAUP planning framework.

Further amendments to the ARFM model can be made to account for assumed future planning decisions such as SHA areas, future Greenfields developments (in the FUZ and elsewhere) and other developments, such as are reflective of the High Level Auckland Plan Development Strategy in the longer term including updates.

The input datasets and the process used to create the 'single view' of capacity are detailed below.

**Input datasets:**

- Residential parcel base-layer (including residential parcels that fall within roll-over areas)
- Residential infill capacity results
- Residential vacant potential capacity results

- Residential redevelopment capacity results

#### Calculation:

1. Import and merge infill and vacant potential results into one dataset (simply referred to as 'infill' from here on).
2. Tag infill parcels with 'infill' attribute label.
3. Import and Tag redevelopment parcels with 'redevelopment' label.
4. Join infill results to base parcel dataset.
5. Join redevelopment results to base parcel dataset.
6. Filter parcels into one of two categories.
7. Single Option: Parcels that have only one capacity type total against them ('infill', 'redevelopment', or 'neither' (i.e. zero)).
8. Multi option: Parcels that have more than one capacity totals against them (both 'infill' and 'redevelopment').
9. If parcel only has infill capacity against it output as an 'infill' tagged parcel and include the infill capacity number.
10. If parcel only has redevelopment capacity against it, apply a filter to select only those parcels that have an IV:CV ratio of less than 0.3. Output selected parcels, tagged as 'redevelopment' and include the redevelopment capacity number in output total.
11. For parcels that have both infill and redevelopment capacity, filter into two categories.
12. Identify parcels that have an IV:CV ratio greater than or equal to 0.3.
13. Identify parcels that have an IV:CV ratio less than 0.3.
14. If a parcel has a IV:CV ratio greater than or equal to 0.3 it is deemed that the likelihood of the existing dwelling/building/improvements on the parcel being removed in order to undertake redevelopment are low, as such parcels in this category are tagged as 'infill' and output with the infill capacity number included.
15. If a parcel has a IV:CV ratio less than 0.3 it is deemed that the likelihood of the existing dwelling/building/improvements being removed in order to undertake redevelopment are high, as such parcels in this category are tagged as 'redevelopment' and output with the redevelopment capacity number included.
16. Finally merge data from Steps 8, 10 and 11 to create a single parcel based dataset, with only one capacity type and capacity yield per parcel is created.

### 13.2.2 Residential housing typology assumptions

As well as requiring a single capacity number for each meshblock, the ARFM requires the assumed dwelling supply data to be fed into the model with an attached or detached housing typology to enable the ARFM model to determine the demand for the capacity sourced dwelling types against its household type projections and associated household dwelling preferences matrix.

The definition of attached and detached dwellings used in the ARFM model is the same as used by Statistics New Zealand when collecting dwelling information as part of the census (Statistics New Zealand, 2013). Detached dwellings are single stand-alone houses, and Attached dwellings are those such as a unit, town house, duplex or apartment.

Previous inputs into the ARFM model made a broad assumption about housing typology based on the operative legacy district plan zones rules the capacity was sourced from. The creation of the ARFM inputs from the PAUP capacity results required the creation of a new PAUP-zone to anticipated housing typology concordance.

Where a zone was identified to have specified (or likely to result in) a specific housing typology, this was applied (e.g. the Single House zone provides for only detached dwellings, Centre zones only provide for attached dwellings).

Where the housing typology in the zone can be a mix of attached and detached (e.g. Mixed Housing zones and the THAB zone) assumptions were used to generate a 'percentage split' by attached and detached dwellings, with this split applied to all capacity from a particular zone at the meshblock level (i.e. individual parcels development typology is not predetermined, the parcels capacity is summed to the meshblock then split).

Table 52 indicates the proportion of dwellings in a meshblock and zone, by 'graph colour', that is of an attached typology.

- Mixed Housing provides for a mixed housing typology that is variable depending on the nature of the parcel that is developed – small parcels are mostly detached (allowance for walls to be common) but 'unlimited density (green) sites are assumed to be 100% attached and there is a range in between.
- Terraced Housing and Apartments zone provides for only terraced housing and apartments (100 per cent attached), and
- All other residential zones provide 100 per cent detached dwellings.
- It is presumed that 100 per cent of capacity in rural areas will be detached.
- All business area capacity (including centres) is 100 per cent attached.
- Structure plan inputs are manually handled by the ARFM modelling team based on inputs from the relevant Structure Planning teams/documentation.

**Table 52: Attached split by zone and parcel type for meshblock**

Zone name	Per cent of dwellings assumed to be attached					
	Infill	Vacant and redevelopment				
		Blue	Green	Grey	Red	Orange
Mixed Housing Suburban (Site class from area frontage graphs)	10%	20%	100%	20%	20%	20%
Mixed Housing Urban (Site class from area frontage graphs)	20%	40%	100%	40%	40%	40%
Terraced Housing and Apartment Building	100%	100%				
All other residential zones	0%	0%				
All rural dwellings	0%	0%				
All dwellings in business areas	100%	100%				
Dwellings in special areas	Not included in this allocation process					

### 13.2.3 Calculating final meshblock capacity figures

The input datasets and the process and assumptions used to create meshblock inputs of capacity; including housing typology is outlined in step-by-step process below.

#### **Input datasets:**

- Residential vacant capacity results
- Residential capacity (ARFM inputs) results
- Residential on business land (business redevelopment) capacity results
- Rural residential capacity results
- Meshblock dataset (2006)
- Attached versus detached housing assumptions by zone

#### **Calculation:**

1. Tag each of the parcels from the capacity results datasets with the meshblock they fall within (using a spatial query in FME). Output results to a series of spreadsheets.
2. Use a pivot table (in Microsoft Excel) to generate a table with capacity totals by meshblock number cross-tabulated by zone name and 'graph colour' for the Mixed Housing Zones.
3. Use the zone, and site colour to determine the split of capacity by housing typology in a single meshblock, based on table below
4. Special areas information is manually added by the ARFM Modelling team.
5. A few examples of how this is worked through follow:
6. If a meshblock has vacant residential capacity for 36 dwellings in the Mixed Housing Urban zone, with capacity for two dwellings 'blue', capacity for 19 dwellings coming from 'green' and capacity for 15 dwellings coming from 'grey'. 40 per cent of dwellings in the 'blue' category would be attached, 100 per cent from the green and 40 per cent from the grey. This sums to 25.8 attached dwellings (which is rounded to 26 dwellings), which makes the remaining dwellings from this meshblock and zone (10) detached.
7. A meshblock has capacity for eight dwellings, through infill, from the Single House zone. Zero per cent of dwellings in this zone are assumed to be attached (there is no site colour classification for this zone), so all eight dwellings are classified as detached.
8. A meshblock has capacity for 25 dwellings in the Terraced Housing and Apartment Building zone. One hundred per cent of the housing in this zone is attached (there is no colour classification for this zone), so all 25 dwellings are classified as attached.
9. This process is also undertaken for vacant residential capacity results and the ARFM residential capacity results.
10. Create a single spreadsheet from the previous steps, with capacity for attached and detached dwellings, by meshblock.

## 13.3 ARFM input creation: Results

Results from the re-processing of the capacity results outlined above are then used as the plan enabled dwelling supply input (supplemented with additional information particularly for FUZ and longer term assumptions) to inform the residential supply side of the ARFM model. For more information on the Auckland Residential Futures Model, refer to Auckland Council technical report; (Owen, 2012).

These results have also been used for other uses and processes, including in this study where a single capacity view is required.

### 13.3.1 Single Capacity option: results

There are 17,706 parcels with a proposed residential zoning across Auckland that have both an infill and redevelopment capacity development option. After running these parcels through our development type selection process we are able to create a 'single capacity total' for the Auckland region, as seen below in Table 16. Totals in the table below include vacant capacity, infill and vacant potential capacity or redevelopment capacity, residential on business capacity and pipeline capacity.

**Table 16: Comparison of total residential capacity totals; with infill, with redevelopment and, ARFM inputs**

Capacity totals	Capacity (dwellings)
Total residential capacity (utilising infill)	258,487
Total residential capacity (utilising redevelopment)	417,079
Total residential capacity (ARFM inputs)	274,149

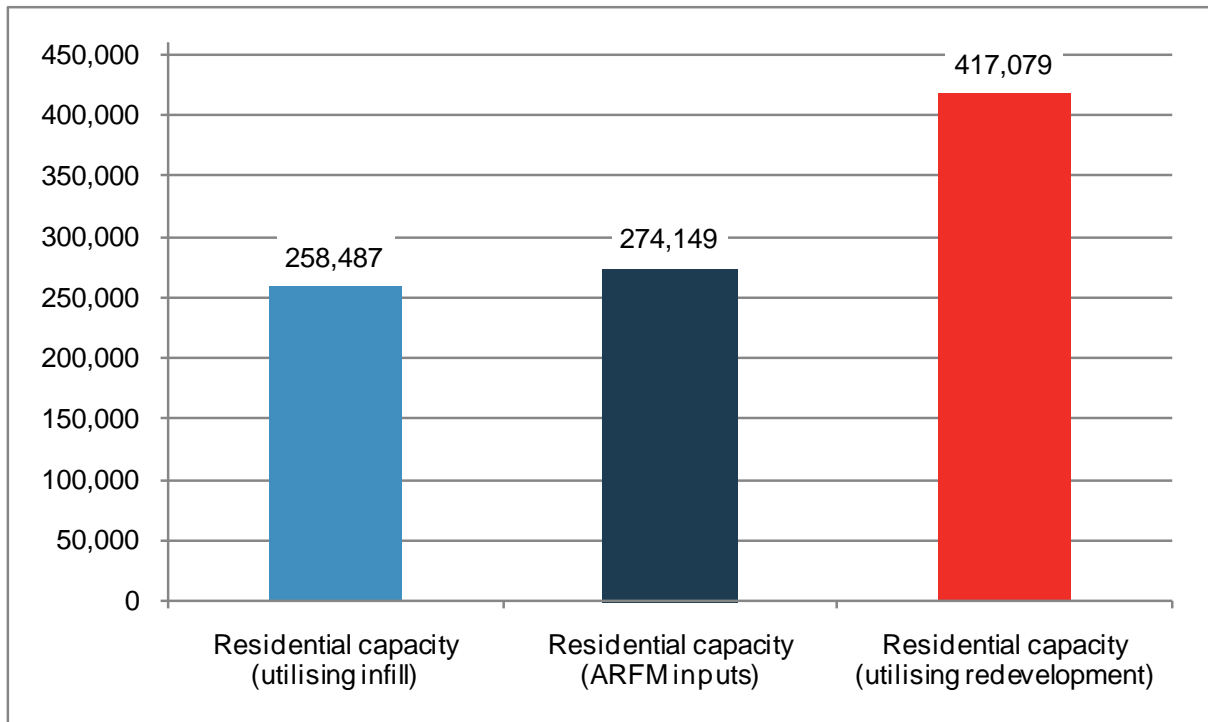
When displaying these capacity results on a graph (refer Figure 33) we can see that the newly generated capacity result sits between the modelled results (capacity with infill or capacity with redevelopment). Notably the newly generated ARFM input capacity sits very close the number for capacity when utilising infill total, in fact the difference of 15,662 dwellings from the capacity with infill total, is only a six per cent increase on the capacity with infill total.

Reasons that the ARFM input capacity total sits closer to the infill capacity total rather than the redevelopment capacity total is most likely related to the fact that many of the redevelopment opportunities that are available under the PAUP are on sites that have a high improvement value compared to their capital value, that is the value of the house and other improvements on the parcel make up more than 30 per cent of the total value of the property, and those sites collectively do not 'redevelop' to a significantly greater degree than if they were simply 'infilled'.

This approach also provides an example of the post-processing potential using the very rich and detailed data produced by the model using plan enabled capacity as the starting point.



**Figure 34: Comparison of residential capacity totals; with infill, with redevelopment and, ARFM inputs**

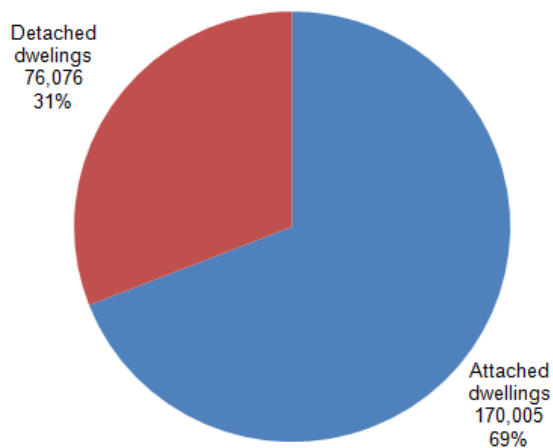


### 13.3.2 Housing typology splits: Results

As well as requiring a single capacity number, the Auckland Residential Futures Model requires capacity results to be fed into the model with an assumed housing typology associated to the capacity figure; this is provided as a mix of two dwelling types, attached dwellings (such as a unit, town house, duplex or apartment) or detached dwellings (single stand-alone houses).

By applying the housing typology methodology to the capacity results (ARFM inputs) we can see at a regional level the split between attached and detached dwellings (see Figure 35 below). The detached dwellings make up the largest proportion of dwellings, representing roughly two-thirds of capacity supplied to the ARFM model.

**Figure 35: Residential capacity (dwellings) (ARFM inputs) by dwelling type**



The housing typology split from the capacity (ARFM input) does not perfectly match the indicated typology splits stated in *The Auckland Plan*, where under the 70:30 and 60:40 scenarios the split would be 39 per cent detached and 61 per cent attached and, 46 per cent detached and 54 per cent attached respectively.

This is because this is not the complete dwelling supply for the total development period (FUZ, and other special areas are handled by the ARFM team, and assumed future planning decisions (such as future plans will provide, given the PAUP has a 10-15 year 'life') are not included, which would add more detached dwellings (FUZ) but also attached (assumed future urban planning decisions).

On the other hand, these figures also reflect the limited proportion of total supply of additional dwellings of a fully detached typology that is realistically achievable in an existing built up urban environment, and also that the PAUP allows the sharing of walls of dwellings that are more like detached dwellings in layout and form (but share a wall with another dwelling and therefore are classified as attached). The supply of future dwellings sourced from business areas in particular (100% attached), but also in combination with THAB and the more intensive MH sites are also a major component of the input dwelling supply, and indeed overall capacity calculated.

## 14.0 Glossary

**Business Areas and Centres:** The large contiguous areas of proposed business zoning that have a similar typology and are considered to be significant areas of employment, including urban and rural centres, as described in the technical papers written to inform *The Auckland Plan*. The geographic limits of these areas are defined by zoning as published in the PAUP. These areas are a subset of the urban area and rural towns.

**Future urban zoned areas:** Based on the zoning layer from the PAUP and is a new zoning encompassing 'unzoned' locations between the MUL and the RUB. Future plan changes and structure planning is required to be undertaken before the PAUP Future Urban zoning is changed (by plan change/variation) to a yet to be determined zoning pattern that enables development to occur in

**Greenfield Areas for Investigation:** Future greenfield areas as noted in *The Auckland Plan* (Auckland Council, 2012a) that at the time of publication of *The Auckland Plan* were not defined specifically, but their general location was indicated in the Development Strategy maps. Since this time work has been done as part of the PAUP process and some of these areas have been defined (Future Urban zoned areas within the proposed Rural Urban Boundary).

**Infill (residential):** The process, by which an additional dwelling or dwellings are added to either the front or the back of a residentially zoned parcel, which is already occupied by a dwelling. Infill capacity is measured on parcels that are smaller than 2000 m<sup>2</sup> and vacant potential is measured on parcels equal to or larger than 2000 m<sup>2</sup>.

**Metropolitan Urban Limits (MUL):** The extent to which the urban area of Auckland can develop, as defined by the Auckland Regional Policy Statement. Note that the MUL used in this study is based on the extents as at 1 November 2010. This MUL extent has been used as it is the basis on which monitoring of both *The Auckland Plan* and the PAUP will take place, and there is no other consistent and formalised definition of Auckland's urban area.

**Parcel:** A cadastral polygon with a legal description (can also be known as a property, section or lot). This geographic area is used to undertake capacity assessment within residential and business zones that are in the urban area.

**Rural residential:** Additional dwelling units on rural zoned titles, either through titles being currently vacant or through subdivision (based on the modelled consent category from district planning rules).

**Redevelopment (business):** The redevelopment of business land. This could include the removal of buildings from a parcel and the construction of new structures, or the addition of floor space to existing structures.

**Redevelopment (residential):** The removal of dwellings from a residential zoned parcel and the development of up to the maximum number of dwellings facilitated under the district planning rules as modelled. This could be under a range of consent categories, excluding Non-Complying and Prohibited zone dependent.

**Rural area:** Properties with a rural zoning, excluding areas that have been identified as forming part of a rural town (generally these areas fall outside of the MUL, but there are a few instances where this is not the case).

**Rural Towns:** Clusters of properties that have a proposed 'urban type' zone (including residential and business zones from the Zone LUTs) and are outside of the 2010 Metropolitan Urban Limits.

**Special areas:** Areas spread across the locations above that are not suitable for analysis by the other methods. In many cases these are structure plans, where an overall yield figure is provided for the structure plan area based on published information, and no modelling is required or it is not possible.

Special areas include locations of particular activities that are not modelled (e.g. hospitals, quarries, ports etc.).

**Title:** The land contained on a registered Certificate of Title. This geographic area is used to undertake capacity assessment within rural areas. Note that a title may contain one or many parcels.

**Transferable rural site subdivision (TRSS):** The transfer of the residential development potential of rural sites from one location to another through the subdivision process as proposed in the rural zone of the PAUP.

**Total business land:** Total area of business zoned land in a given area.

**Urban area:** Large contiguous areas of properties that have a proposed 'urban type' zone and are within the 2010 Metropolitan Urban Limits (Auckland Regional Council, 1999).

**Vacant (business):** Capacity (in hectares) of business zoned parcels that are currently wholly vacant (no buildings/structures).

**Vacant (residential):** Capacity for dwelling units on residential zoned parcels that are currently wholly vacant (no dwellings or buildings), either via subdivision or a dwelling as a right.

**Vacant potential (business):** Vacant potential is the measure of the vacant portion of parcel that is currently zoned for business use and is not already occupied in some way by a building. Generally this portion of the site is unoccupied and could be used for further development.

**Vacant potential (residential):** Refer Infill (residential).

**Zone LUT:** A Zone LUT is a 'look up table' which contains the simplified parameters of the zoning provisions of the PAUP which are used as an input into the modelling process.

The definitions for many of the above terms are sourced from the Land Use and Built Environment - Glossary of Terms (Fredrickson, 2013b). This glossary also includes many other terms used in this report, as well as other commonly used land use related terminologies. For a copy of this glossary, please contact the authors of this report.

## 15.0 References

- AUCKLAND COUNCIL 2012a. *The Auckland Plan*, Auckland, New Zealand, Auckland Council.
- AUCKLAND COUNCIL 2012b. *The Auckland Plan Addendum*, Auckland, New Zealand, Auckland Council.
- AUCKLAND COUNCIL 2012c. *Auckland Plan Issues Report: Strategic Business Classifications - Activities and Areas*. Auckland, New Zealand: Auckland Council.
- AUCKLAND COUNCIL 2013a. *Proposed Auckland Unitary Plan*, Auckland, New Zealand, Auckland Council.
- AUCKLAND COUNCIL 2013b. *Unitary Plan workshop supports protection of productive rural areas*. Auckland, New Zealand: Auckland Council.
- AUCKLAND REGIONAL COUNCIL 1999. *Auckland Regional Policy Statement*, Auckland, New Zealand, Auckland Regional Council.
- AUCKLAND REGIONAL GROWTH FORUM 1999. *Auckland Regional Growth Strategy: 2050*, Auckland, New Zealand, Auckland Regional Growth Forum.
- CITY OF SOUTH SAN FRANCISCO. 2011. *City of South San Francisco Zoning Ordinance: Frequently Used Standards - Rules of Measurement* [Online]. South San Francisco, CA: City of South San Francisco. Available: [http://www.flycode.net/rules\\_of\\_measurement.php?src=rulesmeasurement.htm](http://www.flycode.net/rules_of_measurement.php?src=rulesmeasurement.htm) [Accessed 19 March 2014].
- FONTEIN, P. 2012. *Auckland Unitary Plan - Total Development Potential Using a Fine Grained Analysis for the Howick Ward Area*. Auckland, New Zealand: Studio D4.
- FONTEIN, P., RAY, A. & ROBINSON, T. 2011. *Auckland Plan - Total Auckland Development Potential*. Auckland, New Zealand: Studio D4 & Jasmax.
- FREDRICKSON, C. 2013a. *Investigating potential for amalgamation of parcels located in the Mixed Housing Zone of the Draft Auckland Unitary Plan*. Auckland, New Zealand: Auckland Council.
- FREDRICKSON, C. 2013b. *Land Use and Built Environment Glossary of Terms*. Auckland, New Zealand: Auckland Council.
- FREDRICKSON, C. & BALDERSTON, K. 2013a. *Capacity for Growth Study 2012: Methodolgy and Assupmtions*. Auckland, New Zealand: Auckland Council.
- FREDRICKSON, C. & BALDERSTON, K. 2013b. *Capacity for Growth Study 2012: Results*. Auckland, New Zealand: Auckland Council.
- GAMBLE, S. 2010. *Capacity for Growth Study 2006*. Auckland, New Zealand: Auckland Regional Council.
- GRIFFIN5. 2007. *The Ziggurat* [Online]. Wikimedia Commons. Available: <http://commons.wikimedia.org/wiki/File:Sacramento-river-bank-pyramid-20.4.jpg> [Accessed 16 July 2014].
- JASMAX & AUCKLAND COUNCIL 2012. *Auckland Design Manual: Worked Examples - Infill Amalgamated Sites*. Auckland, New Zealand: Auckland Council.
- MERIDIAN HILL NEIGHBORHOOD ASSOCIATION. 2011. *Revised plans for apartment building at 15th & V* [Online]. Washington, DC: Meridian Hill Neighborhood Association. Available: <http://www.meridianhilldc.org/home/2011/8/14/revised-plans-for-apartment-building-at-15th-v.html> [Accessed Januray 2014 2014].

MINISTRY FOR THE ENVIRONMENT. 2008. *Designations and requiring authorities* [Online]. Wellington, New Zealand: Ministry for the Environment. Available: <http://www.mfe.govt.nz/rma/central/designations/> [Accessed 8 April 2014].

OWEN, P. 2012. *Auckland Residential Growth Model 2012*. Auckland, New Zealand: Auckland Council.

STATISTICS NEW ZEALAND. 2013. *Occupied Dwelling Type* [Online]. Wellington: Statistics New Zealand. Available: [http://www.stats.govt.nz/surveys\\_and\\_methods/methods/classifications-and-standards/classification-related-stats-standards/occupied-dwelling-type/definition.aspx](http://www.stats.govt.nz/surveys_and_methods/methods/classifications-and-standards/classification-related-stats-standards/occupied-dwelling-type/definition.aspx) [Accessed 17 March 2014].

THE CITY OF CALGARY. 2013. *Carpenter's Union Building (10 Street N.W.) Land Use Redesignation (Rezoning) Application* [Online]. Calgary, Canada: The City of Calgary,. Available: [http://www.calgary.ca/PDA/LUPP/Pages/Current-studies-and-ongoing-activities/Carpenter%E2%80%99s-Union-Building-\(10-Street-N.W.\)-Land-Use-Redesignation-\(Rezoning\)-Application.aspx](http://www.calgary.ca/PDA/LUPP/Pages/Current-studies-and-ongoing-activities/Carpenter%E2%80%99s-Union-Building-(10-Street-N.W.)-Land-Use-Redesignation-(Rezoning)-Application.aspx) [Accessed 19 March 2014].