

BEFORE THE AUCKLAND UNITARY PLAN INDEPENDENT HEARINGS PANEL

IN THE MATTER of the Resource Management Act 1991 and the Local Government (Auckland Transitional Provisions) Act 2010

AND

IN THE MATTER of Topics:
059 Residential objectives and policies;
060 Residential activities;
062 Residential development controls; and
063 Residential controls and assessment

**SUPPLEMENTARY STATEMENT OF EVIDENCE OF
PATRICK MARINUS FONTEIN and ADAM JEFFREY THOMPSON**

9 OCTOBER 2015

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1.0 Executive Summary

1.1 The Auckland Unitary Plan IHP have requested Patrick Fontein (PF) and Adam Thompson (AT) to work with Council and to provide additional information on development capacity forecasts, as highlighted in Appendix A. This submission provides the outcomes of this peer review.

1.2 What this peer review has very clearly highlighted, is that when Council, the IHP or others want to make *locational changes of where zones are applied*, or when *considering the likely development capacity effect of increasing a height limit*, the ACDC will cope with this very well, without or minimal peer review.

1.3 It is when *the rules of a zone are changed* (as this ACAP), then the Look Up Tables (LUT's) have to also be changed. When LUT's are changed, the consequences of each change have to very carefully be reviewed on the likely impact, on the other related LUT's. This will be when a peer review is likely to be required, using property development professionals with expertise in this field.

1.4 The Table in Appendix D shows the development capacity of **64,420** of the PAUP (ACDC v1), has increased to **92,657** under ACAP (ACDC v2), a good increase showing the benefits of the ACAP modifications, but a long way away from the **181,182** additional development capacity envisaged by Council in ACAP (ACDC v1).

1.5 The main issue why ACAP v1 had such high feasible development capacity, is that under ACAP the allowable house numbers on each site were affectively doubled, but by not changing the LUT's, the same (large) size house was considered to be placed on a site half the size. The original LUT's worked on a ratio of house size x sale price \$/m², so the ACAP v1 assumed that the large house could be sold on a relatively small section, for a very high price. The details in this Report shows this to be flawed.

1.6 The introduction of a "\$ Ceiling" allowance has been made into the ACDC. This has had the effect of moderating the effect of (too) high new house prices on small sites.

1.7 The recent work carried out give us all confidence on what an outstanding asset the ACDC Model will be for Auckland Council. The vast differences in feasible development capacity numbers between v1 and v2, highlight that the ACDC Model should only be used again after a thorough "commissioning, testing and reviewing" of the ACDC Model has been completed in the next 1-2 months.

2.0 Introduction and Brief

- 2.1 The Auckland Unitary Plan IHP have requested Patrick Fontein (PF) and Adam Thompson (AT) to work with Council and to provide additional information on development capacity forecasts. The Memo provided to PF, AT and Auckland Council, on the 25th September 2015, is attached in Appendix A.
- 2.2 The information contained within this Submission is provided by both PF and AT, with the assistance of Kyle Balderston (KB) of Auckland Council RIMU, who has re-run the Auckland Council Development Capacity (ACDC) Model using the updated Look Up Tables (LUT's).
- 2.3 Both PF and AT have made submissions to the AUP IHP on Subjects 059, 060, 062 and 063, circa 22nd September 2015. PF and AT's background information, etc is provided in these submissions and will not be repeated here.
- 2.4 Following further submissions, further updated guidance was provided to PF, AT and Council by the IHP on the 30th September 2015. The Memo / Email provided to PF, AT and Council by Mr Phill Reid of the IHP is attached as Appendix B.
- 2.5 The Mr Reid Memo (as 2.4 above and Appendix B), provided guidance which included Mr David Hill to act as a Convenor for the 013 Expert Group Members (013EG), to allow those 013EG to contribute to the process.
- 2.6 Mr Hill's Memo back to Mr Reid, on the 5th October 2015, noting the 013EG input, is provided in Appendix C, covering 7 pages.

3.0 Code of Conduct

- 3.1 Both Patrick Fontein (PF) and Adam Thompson (AT) confirm that we have read the Expert Witness Code of Conduct set out in the Environment Court's 2014 Practice Note. We have read and agree to comply with that Code. This evidence is within our area of expertise, except where we state that we are relying upon the specified evidence of another person. We have not omitted to consider material facts known to us that might alter or detract from the opinions that we express.

4.0 Primary Initial Concerns of ACDC ACAP Version 1, run in August 2015

- 4.1 The ACDC15 Model was prepared in a very short time frame, and was only used to test the PAUP rules and the resultant development capacity that this created. The ACDC Model uses a series of data tables that were provided by the PDEG Group, that were co-opted as part of the 013EG.
- 4.2 There are extremely complicated mathematical formulae that drive the ACDC Model, using LUT's to pick up data from the various data tables provided. In the short amount of time available between the ACDC Model being created, and the 013EG Report being required to be issued, the sole focus of the ACDC15 outputs, was validating the formulae and data tables to run on the PAUP Rules and zonings.
- 4.3 The initial ACDC15 output results were peer reviewed by the PDEG and after a number of small "tweaks" to the formulae, the Members of the PDEG were satisfied that the output results, run under the PAUP Rules and Zonings, were fair.
- 4.4 PF was made aware on 13-14 August 2015 that Auckland Council's RIMU team had "re-run" the ACDC Model with different inputs (what became known as ACAP v1), and that the "development feasible" dwelling numbers had increased from the ACDC15 PAUP numbers of 64,420 (or 83,420 when including HNZC) to now be at 181,182. PF was asked whether he had any involvement in the "re-run" of the ACDC Model. PF had not.
- 4.5 Both PF and AT are supportive of the Auckland Council Amended Provisions (ACAP), however we were concerned about the assumptions applied by Council in the re-run of the ACDC15 model to test the potential increase in development capacity under the ACAP.
- 4.6 In PF and AT's submissions to the IHP circa 22nd Sept, specific requests were made to peer review the ACDC ACAP v1 results. This submission provides the outcomes of this peer review.

5.0 Review of the ACAP Version 1 Results

5.1 What this peer review has very clearly highlighted, is that when Council, the IHP or others want to make **locational changes of where zones are applied**, or when **considering the likely development capacity effect of increasing a height limit** within a Town Centre from (say) 4 storeys to 8 storeys, the ACDC will cope with this very well, without or minimal peer review. LUT's don't need changing for this.

It is when **the rules of a zone are changed** (as this ACAP), then the LUT's have to also be changed. When LUT's are changed, the consequences of each change have to very carefully be reviewed on the likely impact, on the other related LUT's. This will be when a peer review is likely to be required, using property development professionals with expertise in this field.

5.2 As highlighted in 4.1 and 5.1 above, the ACDC Model is in its infancy and is not yet ready to cope with Rule changes created by ACAP, without ACDC LUT adjustment by property development professionals.

5.3 Appendix D provides a Table that compares the differences in development capacity outputs for the:

- i. Auckland PAUP (ACDC v1),
- ii. the ACAP (ACDC v1) and
- iii. the ACAP (ACDC v2).

5.4 Appendix D highlights that almost all of the increase in development capacity between the PAUP (ACDC v1) and the ACAP (ACDC v2), was in the Mixed Housing Suburban Zone (MHS). In the "MHS <300m²", this increased the (supposed) feasible development capacity from 10,290 to 104,785 dwellings.

5.5 AT provided KB with a random sample of 500 MHS properties, for which KB has provided the ACAP (ACDC v1) and the ACAP (ACDC v2) outputs. It is through very closely evaluating these 500 sample outputs that PF and AT have carried out most of our peer review and sense checking.

5.5 Appendix E provides the relevant columns of the ACAP (ACDC v1) Results for the random sample of 500 MHS properties, showing the initial 46 properties. Of the 46 MHS properties, 2 have no dwelling, 42 have 1 dwelling and 2 have 2 dwellings,

making a total of 46 dwellings on the 46 properties. The ACAP (ACDC v1) results show that an additional 61 dwellings are shown as feasible to be built, on 22 of the 46 properties. (ie nearly half of all the MHS sites throughout Auckland (incl recently built subdivisions) feasible to be re-developed).

- 5.6 KB has confirmed to PF and AT that when Council ran the ACAP (ACDC v1) in August 2015, the Rules under ACAP were changed, but none of the LUT's were changed.
- 5.7 By viewing Appendix E you can see that this has had the effect of placing the same size house envisaged under PAUP Rules on a 400m² section, onto a circa 200m² section. What needed to happen is that under ACAP Rules and now considering 4 houses on a section rather than 2, that each of these 4 houses needed to be smaller so that they could fit (and comply with the PAUP and ACAP planning and urban design rules) on the site half the size.

6.0 Comparison of the ACAP Version 1 and Version 2 Results

- 6.1 ACAP (ACDC v2) has changed the LUT's to consider the effect of putting a smaller house onto the smaller section. i.e. A house that is able to comply with the planning and urban design rules under the PAUP and ACAP. The changes to the LUT's can be seen in Appendix C page 4. AT and PF proposed the changes of the LUT's which included changes of house sizes (when there are smaller sections such as under ACAP), which were then peer reviewed by the Property Development Expert Group (PDEG) established for the 013EG, during 30th Sept to 2nd Oct. The correspondence provided by the PDEG on the 2nd Oct has been provided to the IHP and Council, and Mr Hill highlights the process undertaken in Appendix C, Page 1.
- 6.2 PF, AT and the PDEG agreed that a "\$ Ceiling" factor was considered essential. This is an assessment which considers how much a purchaser is prepared to pay for an intensified property, relative to the sale price / value of other nearby properties. i.e. an assessment which considers the choice that a residential purchaser has in whether to buy a new large(r) home on a small(er) section, a duplex or terrace home or an apartment, compared to being able to buy an existing house on a larger section. This requires an assessment of a "\$ Ceiling" for any

given typology of dwelling, in comparison to the average sale price within that neighbourhood, or Census Area Unit (CAU). The PAUP (ACDC v1) had run reasonably well without the “\$ Ceiling” but the increased intensity under ACAP, on what are effectively suburban residential sites has highlighted that the “\$ Ceiling” issue needs addressing.

6.3 During the week from the 28th Sept to the 2nd Oct, PF, AT and the PDEG Members came up with what we thought were conservative “\$ Ceiling” figures. Some of the PDEG thought the “\$ Ceiling” numbers should be less conservative. These \$ Ceiling factors were distributed to the wider 013EG on Fri the 2nd Oct.

6.4 When the ACAP (ACDC v2) draft Computer runs were completed on the 8th October, this highlighted that many of the higher priced dwellings on small sites within the MHS areas, were not able to meet the \$ Ceiling threshold. This had the effect of substantially reducing the feasible development capacity viz the ACAP (ACDC v1).

6.5 The result highlighted in 6.4 above was expected, however the scale of the reduction was quite large. After consultation with David Hill, AT, PF and KB have agreed to “soften” the \$ Ceiling factors for this ACAP (ACDC v2) run, which will have the effect of passing as feasible development capacity, sites that are more than likely marginal. The change in the “\$ Ceiling” factor between the 2nd Oct and the 8th Oct is highlighted in Appendix F.

6.3 The Table in Appendix D shows that the **104,785** extra development capacity within the MHS <300m2 in ACAP (ACDC v1), has dropped to **24,922**. The Table in Appendix D shows the development capacity of **64,420** of the PAUP (ACDC v1), has increased to **92,657** under ACAP (ACDC v2) \$ Ceiling as the PDEG had agreed, or **128,608** with the Raised \$ Ceiling. A good increase showing the benefits of the ACAP modifications, but a long way away from the **181,182** additional development capacity envisaged by Council in ACAP (ACDC v1).

7.0 Reasons for the Difference in ACAP Version 1 and Version 2 Results

7.1 Examining in close detail the Table in Appendix E gives a good insight into the reasons for the vastly different development capacity numbers achieved between v1 and v2.

- 7.2 The main issue (as highlighted in CI 5.7) is that under ACAP the allowable house numbers on each site were affectively doubled, but by not changing the LUT's, the same (large) size house was considered to be placed on a site half the size. The original LUT's worked on a ratio of house size x sale price \$/m², so the ACAP v1 assumed that the large house could be sold on a really small section, for a very high price.
- 7.3 Some examples of the bizarre results that the ACAP v1 produced (see Appendix E) and that Auckland Council have provided in Evidence as showing robust development capacity.
- i. 13 Tyrian Close, Half Moon Bay (Row 2 in Appendix E). 1 existing house on a 854m² section, with a current CV of \$810,000. ACAP v1 "assumed" 4 No 220m² houses would be built, on 214m² sections (gross, therefore still need to allow for driveways etc), and that each of the 4 houses would be able to be sold for \$1.65m. Yes: \$810,000 current value for all the 854m² land and 1 house, but ACAP v1 assumed people would buy 4 houses on a quarter the land area. Within the MHS zone under PAUP and ACAP rules, there is no possible way that a 200m² house can fit on a gross site of 214m², when applying a height limit of 8-9m, and complying with all the front, side and rear yards, driveways, turning circles, urban design issues etc. Furthermore, from a sales viability perspective, most sensible people will just by the adjoining house and land for the circa \$810,000, rather than spend \$1.65m for a house on a ¼ site!
 - ii. 17 Deverell Pl, North Cross, North Shore (Row 14, in Appendix E). 1 House on a 631m² section, with a CV of \$690,000. ACAP v1 "assumed" 3 No 200m² houses would be built, on 210m² sections (gross, therefore still need to allow for driveways etc), and that each of the 3 houses would be able to be sold for \$1.30m. The \$1.3m is roughly twice the CV of the house on a full site!
 - iii. 96 Cowhead Rd, Manurewa (Row 44, in Appendix E and F). 1 House on a 684m² section, with a CV of \$355,000. ACAP v1 "assumed" 3 No 178m² houses would be built, on 228m² sections (gross, therefore still need to allow for driveways etc), and that each of the 3 houses would be able to be sold for \$850,000. The \$850k is roughly 2.4 times the CV of the house on a full site! Who in Manurewa would pay 2 to 2.5 times the value of a large site and existing house, to live in a new house on a very small (1/3 size) section?
 - iv. Many of the other examples in Appendix E show similar results.

- v. What is very evident from the Examples in Appendix E, is that the building sizes highlighted under ACAP (ACDC v1) have not been validated against Council's own submissions on Building form, as provided within the Nick Roberts Evidence. The big houses as shown in ACAP (ACDC v1) can't fit on the small sites, without changing the height limits or increasing the site coverage %!

- 7.5 The introduction of a "\$ Ceiling" allowance has been made into the ACDC. The "\$ Ceiling" inclusion was complicated, as the adjustment in future will probably need to be completed relative to each CAU, as the median price of some CAU's will be more effected by already intensified existing stock (as the Auckland CBD) and other CAU's where there is a predominance of single houses. In the meantime we have adopted a very conservative approach, which needs to be reviewed in great detail when the ACDC Model is further reviewed, (see Section 8).

- 7.6 The effect of the \$ ceiling with the PDEG approved numbers was to provide a feasible development capacity of **92,657** dwellings. By raising the \$ Ceiling amount (as also shown in Appendix D), KB has re-run the ACDC Model and highlights that this would make **128,608** feasible development capacity dwellings. This is in effect providing a Range of potential feasible dwellings, notwithstanding that some in the PDEG thought the \$ Ceiling conditions that led to the **92,657** were too conservative. The size of the Range highlights that more work is required to commission, test and review the ACDC fully. All these numbers are a long way short of the **181,182** that the ACAP (ACDC v1) showed.

8.0 Issues that will affect the reality of the forecast development capacity

- 8.1 It has been highlighted within the 013EG Report, that there are a series of factors which will reduce, or increase the forecast development capacity numbers. For completeness we will highlight these again below. There are many Members of the 013EG who have varying views on the effects of each issue.

1. Issues that will reduce the achieved reality from the ACDC results

- a. **Development chance** Over a 30 year time period, this will likely knock out 30-40% of the development feasible dwelling numbers. There are just so many property owners who are very content with the existing use of their property.

- b. **Capacity utilisation.** This will probably have a greater reduction effect in the lower sale price areas, where developers are likely to build lower cost terrace homes, than apartments. Many of the Pacifica cultures are also not likely to be attracted to apartment living, which will affect built typologies in their neighbourhoods.
- c. **Infrastructure constraints: utility providers stifle development.** This is just so important to resolve. Hopefully the utility providers will study the ACDC15 Maps very carefully and ensure sufficient infrastructure is provided in locations that show intensification is development feasible.
- d. **Development sites costing more than the CV.** As the current PAUP does not provide sufficiently upzoned brownfield land opportunity, until there is an increase in upzoned land, this issue will continue to be a problem. Site owners who have been “blessed” with a substantial upzoning, will feel that they are entitled to a windfall profit as a result. This can be substantially reduced, by providing developers with greater supply opportunities.

2. Issues that will increase the achieved reality from the ACDC results

- a. **Site amalgamation** Amalgamation is a time consuming and costly exercise, that only a limited number of developers have the patience to undertake. The low level of development feasible sites in the mixed housing zones, predominantly I believe due to the density restrictions, mean that only the THAB zoned sites will benefit substantially from amalgamation. My strong suggestion is to abolish the density rules in the mixed house zones, and focus on the design controls for these areas.
- b. **The effects of time improving viability on any chosen site.** There is no doubt that a number of areas that were developed 30-40 years ago (such as Farm Cove) that are not development feasible currently, will get closer to becoming development feasible in the 20-30 year timeframe of the Auckland Plan. However the converse could be said in that a land owner sitting on a site that is not development feasible today, would sit back and wait for his house to “deteriorate” for a 20-30 year period, so that in Year 28 he can under-take an intensified development. Many of these owners will choose to renovate and / or extend their property, such that unless a property is upzoned substantially, these sites will stay similar to what they are now. Countering this improvement in development viability, is that if a site is not up-zoned sufficiently to provide a near term feasible re-development alternative, the owner of the “tiring” house may choose to refurbish and extend his stand alone house on a full site. The extent of the refurbishments and extensions then often make future re-development to a more intense form, even more costly to purchase the land parcel.

- c. **Very effective developers being able to perform better than the “mid range” assumptions.**

9.0 Future Development of the ACDC Model and Concluding Comments

- 9.1 The work that PF, AT and KB have done with the ACDC Model during the last two weeks, give us all confidence on what an outstanding asset the ACDC Model will be for Auckland Council. The ACDC will work very well, but like any new piece of equipment, the owner (Auckland Council) will need to invest into the ACDC over the next 1-2 months, effectively commissioning the new piece of equipment, and investing into the further capability that the ACDC has, which has yet to be utilised.
- 9.2 The review requested by the IHP (as Appendix A) has taken PF, AT and KB a huge amount of time during the last two weeks. Much of this work has had to be carried out under substantial time pressures. What is now needed is for the ACDC to be effectively commissioned during the next 1-2 months, so that without time pressures all the issues can be considered, the PDEG can be involved, and all the scenarios going forward can be fully tested and reviewed.
- 9.3 During the commissioning stage of the ACDC Model, the ACDC should be used to test a range of dwelling sizes and prices, involving 15-20 model runs that test a range of sizes and prices for each parcel, so that the lowest possible price dwelling that is commercially feasible is determined, and the overall number of dwellings that can be built in the lower price ranges is known. This would be a very useful addition to the ACDC and allow a range of useful tables to be provided, including the number of dwellings that are commercially feasible at each price point range, \$300,000 - \$400,000, \$400,000 - \$500,000, etc., and broken down by dwelling type, location, zone, etc. This is the key to understanding whether a lot of new dwellings will actually be built under the PAUP, as for 10,000 plus dwellings to be built annually, a large proportion need to be priced under \$500,000, and ideally under \$400,000.
- 9.4 We all now agree that it has been essential for an accurate “\$ Ceiling” to be provided within the ACDC Model, as a “validator” of output results (see CI 7.5 and 7.6 above). Some of the PDEG and the 013EG were surprised to learn that a “\$ Ceiling” tool had not been included in the PAUP (ACDC v1). A realistic \$ Ceiling adjustment will be required in further iterations of the ACDC Model.

- 9.5 Once the commissioning envisaged in CI 8.1 to 8.4 is completed, when Council, the IHP or others want to make **locational changes of where zones are applied**, or when **considering the likely development capacity effect of increasing a height limit** within a Town Centre from (say) 4 storeys to 8 storeys, the ACDC will cope with this well, without or minimal peer review. LUT's will not need to change.

With effective commissioning, when **the rules of a zone are changed** (as this ACAP), then the LUT's will have to still be changed. This will still need to be peer reviewed, using property development professionals with expertise in this field, although future peer reviews, after CI 8.1 to 8.4 are completed, will not require the same length of time that this peer review has taken.

- 8.6 The ACAP (ACDC v2) Maps are provide in Appendices G, H and I. As can be seen from the Legend, the darker colours are the sites with feasible development capacity. It is interesting to note the mismatch of feasible development capacity within most parts of the Auckland Isthmus area, relative to the substantial intensification intended within the Auckland Plan. This is predominantly due to the height and other restrictions imposed in these areas.
- 8.7 The vast differences in feasible development capacity numbers between v1 and v2, highlight that the ACDC Model should only be used again after 8.1 – 8.4 above has been completed. PF, AT and KB all feel very strongly about this. Any Auckland Council ACDC Model use without 8.1 – 8.4 being completed will not be reliable.

Appendix A

AUCKLAND UNITARY PLAN INDEPENDENT HEARINGS PANEL

Te Paepae Kaiwawao Motuhake o te Mahere Kotahitanga o Tāmaki Makaurau

Memo

Friday 25 September 2015

To: Auckland Council, Patrick Fontein, Adam Thompson
CC: David Hill, 013 Expert Group (for information only)
From: Phill Reid, Hearing Manager

Subject: 059, 060, 062 and 063 Residential hearings topics - Panel direction for additional information on capacity forecasts

The 013 Expert Group developed the Auckland Council Development Capacity (ACDC) model dated July 2015 that was used to forecast developable residential capacity for the 013 Topic – RPS Urban Growth. This model was used to provide the Panel with capacity forecasts based on the notified PAUP. Subsequently in evidence the Council has proposed modified zone rules for a number of the residential zones and in particular has proposed modifying the density controls. As these proposed modifications to density controls are expected to significantly affect residential capacity the Council re-ran the ACDC model to reflect the modified density controls. The results of that modelling have been included in the Council's evidence on the residential topics due to be heard starting 14 October 2015.

Patrick Fontein and Adam Thompson (who were members of the 013 Expert Group) have filed evidence on the residential topics questioning the assumptions and judgements used in the re-run of the ACDC model. In their view, these issues are sufficient to call into question the reliance the Panel should place on the results of this modelling.

Given the importance of these capacity forecasts for the Panel's consideration of the residential topics the Panel wishes to have clarified the extent to which the assumptions and judgements critiqued by Patrick Fontein and Adam Thompson impact on the capacity forecasts. To have this point clarified the Panel directs that Patrick Fontein and Adam Thompson develop an agreed set of assumptions and judgements required to re-run the ACDC model to properly reflect the modified density controls proposed by the Council. The Panel directs the RIMU team to work with Patrick Fontein and Adam Thompson to achieve and report re-run ACDC model results prior to 14 October 2015 (commencement of the hearings).

The Panel requests Patrick Fontein and Adam Thompson to identify, compare and report the key differences in assumptions and judgements used in this re-run of the ACDC model relative to those used for the Kyle Balderston evidence dated 8 September 2015, and relative to those used in the initial ACDC modelling dated 22 July 2015.

The Panel requests Kyle Balderston to present the results of the re-run ACDC model in a manner that enables ready comparison with the results presented in his evidence dated 8 September 2015, and with the results from the initial ACDC model dated 22 July 2015.

For clarification, this direction is to identified parties involved in the 059, 060, 062 and 063 Residential Hearings Topics and does not call upon parties that were involved in the 013 RPS Urban Growth Hearings Topic to file further evidence or report to the Panel.

Memo capacity amended model additional information 2015-09-25

Appendix B

RE: Direction to Parties - Additional information on capacity forecasts



Phill Reid

Wednesday, 30 September 2015 6:19 pm

To: Crystal Chan; Adam Thompson; 'Richard Burton'; Corina Faesenkloet; Patrick Fontein

Cc: Celia Davison; Julie McKee; Vanessa Wilkinson; Kristen Wicks; 'David Hill'; and [21 more](#)

Good afternoon all,

Additional material from below has now been received from Richard Burton, Patrick Fontein and Council. All of these matters have now been considered by the Panel. It is also noted that Patrick Fontein has reviewed Nick Roberts 059 evidence and is in agreement with the bulk and location diagrams as being sensible and able to be utilised by the development community.

The following are additional directions to Parties to accompany the directions within the memo dated 25 September 2015 on this matter;

1. By Friday 2nd 5pm – changes to all Lookup Tables (inputs and any associated assumptions to model) to be circulated by Patrick Fontein and Adam Thompson to Property Development Expert Group (013EG)
2. The Panel provide IHP mediator David Hill to convene the EG (by e-mail) over this weekend with view to the 013EG reaching agreement to changes proposed to Lookup table inputs.
3. David Hill to report the outcome of this review to IHP and parties by 9am Monday 5 October.
4. All parties are to report to IHP on responsibilities contained within the 25 September 2015 IHP Memo by 4pm on Friday the 9th of October instead of the 14 October 2015 due date specified within the memo.

For the avoidance of doubt the scheduled hearing dates for Hearing topic 059, 060, 062 and 063 Residential hearing topics will proceed.

Kind regards
-Phill Reid

Phill Reid

Hearings Panel Planning Manager

Auckland Unitary Plan Independent Hearings Panel

Ph DDI 09 365 3931 Mob 027 217 2207

Level 15, 205 Queen St, Auckland Central

Visit our website www.aupihp.govt.nz

Appendix C, page 1

Memo: From David Hill (Facilitator)

To Phill Reid (Hearing Panel Planning Manager)

Re: 013 Expert Group – Lookup Tables ACAP

1. On 30 September 2015 the 013 expert group on developable capacity was directed as follows:

Additional material from below has now been received from Richard Burton, Patrick Fontein and Council. All of these matters have now been considered by the Panel. It is also noted that Patrick Fontein has reviewed Nick Roberts 059 evidence and is in agreement with the bulk and location diagrams as being sensible and able to be utilised by the development community.

The following are additional directions to Parties to accompany the directions within the memo dated 25 September 2015 on this matter;

1. *By Friday 2nd 5pm – changes to all Lookup Tables (inputs and any associated assumptions to model) to be circulated by Patrick Fontein and Adam Thompson to Property Development Expert Group (013EG)*
2. *The Panel provide IHP mediator David Hill to convene the EG (by e-mail) over this weekend with view to the 013EG reaching agreement to changes proposed to Lookup table inputs.*
3. *David Hill to report the outcome of this review to IHP and parties by 9am Monday 5 October.*
4. *All parties are to report to IHP on responsibilities contained within the 25 September 2015 IHP Memo by 4pm on Friday the 9th of October instead of the 14 October 2015 due date specified within the memo.*

For the avoidance of doubt the scheduled hearing dates for Hearing topic 059, 060, 062 and 063 Residential hearing topics will proceed.

2. Patrick Fontein advised the 013 expert group (the Group) that he would circulate the lookup table changes proposed after review by the PDEG on Friday as required under direction 1 above along with an explanatory statement. Ahead of that I advised all members of the Group by email on Thursday 1 October, among other things, that "Your review will not be of the fine detail of the revised lookup tables but the assumptions / principles behind the changes proposed by the PDEG as is to be explained in Patrick's paper to be circulated late tomorrow".
3. On Friday 2 October Patrick advised that the PDEG had agreed the changes, the only person unable to participate being Stephen Gracey, the MD of Rider Levett Bucknall (RLB).
4. On Friday 2 October Rodney Yeoman, a colleague of Dr Fairgray at Market Economics Ltd who had been working with him on the residential density issues requested inclusion in the Group on behalf of and as Dr Fairgray was overseas. Subject to a confidentiality clause I agreed and included him in the distribution list.
5. There followed some correspondence with Richard Burton the upshot of which was that it was agreed that comparison tables (original and as proposed to be amended) would be included with Patrick's material.

Appendix C, page 2

6. At 4.42pm on Friday 2 October Patrick distributed the following to the Group:

David and the 013EG Team

As the earlier email, please find attached proposed changes to some of the Data Look Up Tables (LUT's) that form the main thrust behind the ACDC Model

We confirm all the proposed changes have been peer reviewed by the PDEG and they are satisfied with what we have proposed. The correspondence has been passed via David, Phill and Council.

Some description on the changes to the LUT's:

Council have made a change to the ACDC base inputs, which is titled ACAP.

The main change that has been made with ACAP is taking away / reducing the dwelling density restrictions in the Mixed House Suburban (MHS) and the Mixed House Urban (MHU) zones.

The impact of this has been to increase the number of possible dwellings in the MHS and MHU, i.e. Less land per house

We have started off with the Nick Roberts submission on behalf of Council (re 059 and ACAP) and have accepted this Submission as reasonable and what the development community would likely follow.

We have then used Nick Robert's likely typologies. (see attached worksheet for guidance). We have then used these and provided a greater number of similar examples, so that we could effectively "smooth out" the examples across all the typology and site sizes.

The change in density rules has been to increase the number of dwellings into the D4 and E4 codes of the attached spreadsheet. When the ACDC assumptions were set up, under the PAUP Rules, there were very little dwelling numbers within the D4 and E4 Codes, but the ACAP change resulted in in excess of 110,000 extra dwellings within these areas.

Adam and I, with the peer review of the PDEG, have added greater detail into the Mixed House area, especially where we have a larger number of houses that have less than or circa 200m² of land per dwelling.

We have also added in the possibility of apartments being built in the MHU Zone, which will also increase potential development capacity numbers.

The other addition we have made, is to include a \$ Ceiling price for each typology. This provides a ceiling price for each Census Area Unit (CAU), by which each new build Typology, has a maximum feasibility threshold which it must be viable at, relative to that CAU's Median House Sales price. i.e. This draws a comparison of the typology sale price and the median sale price of property in that area, and restricts large units being potentially viable in areas we in the development market know will not sell. e.g. A 180m² apartment in (say) Glenfield for \$1.2m being considered (by the ACDC) as viable, when the median price in Glenfield is (say) \$800k.

The \$ Ceiling price had not had any real impact on the ACDC Model run under PAUP Rules, but is likely to be of greater necessity as intensification of higher density dwellings is proposed, in what are essentially residential stand alone house areas.

The \$ Ceiling for this initial ACDC Review, has purposely been set very conservatively. Members of the PDEG commented that the \$ Ceiling price for apartments should be 65% of the median price, where as we have adopted a more conservative 80%. In email exchange today, Kyle has suggested (and I agree with) that the \$ ceiling price should be varied for each CAU, as some CAU's will have predominantly apartments and others less so. So for now we have a conservative \$ Ceiling number, but in future iterations of ACDC review, this can be reviewed to accurately reflect market conditions for each CAU.

You will note from the attachments that there are only 2 Lookup Tables that are

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proposed to be Amended. Adam and I have worked closely with Kyle throughout this week to ensure that the proposed LUT changes are sensible and able to be incorporated into the ACDC. In the latest review today, Kyle is happy with what is proposed so far.

Kyle, Adam and I have also reviewed why there were less Terrace Homes in the initial PAUP Model run and a greater number of stand alone homes. We have tuned the classification of a house and terrace home. Any attached dwelling will now be considered a terrace home (e.g. Including duplexes). Houses are stand alone. We have also tweaked the LUT's slightly which will likely increase the number of terrace home typologies. This should have an overall effect of increasing development capacity, but be consistent with the provisions of the ACAP changes.

Please note that there have been no changes whatsoever on the development or construction costs, nor any of the sale prices.

The intention for here, is for Kyle at 9am Monday to re-run the ACDC with these slight changes to the Lookup Tables.

When the Model run results become available, Kyle, Adam and I will work together on Tues-Wed to sense check the results and ensure the Results are realistic and have not produced any "un-intended consequences", i.e. Changes to some of the LUT's having an un-intended effect on another issue. Kyle will then be able to release the re-run Model results to the IHP, as intended on Thursday the 8th October.

As part of the 8th October release, Kyle, Adam and I have also agreed that we will together write a brief description of how the ACDC works, and what changes can be made relatively easily by Council and what changes are considered more material and will require future peer review.

What this Review has identified is that when Council, the IHP or others want to make **locational changes of where zones are applied**, or when **considering the likely development capacity effect of increasing a height limit** within a Town Centre from 4 storeys to 8 storeys, the ACDC will cope with this very well, without or minimal peer review. LUT's don't need changing for this.

It is when **the rules of a zone are changed** (as this ACAP), then the LUT's have to also be changed. When LUT's are changed, the consequences of each change have to very carefully be reviewed on the likely impact. This will be when a peer review is likely to be required.

7. In addition the following tables were attached:

a) Nick Roberts 059 Submission Sizes, areas etc

Example	Zone	Typology	Land m2	Units	Land/Dwell	Un1m2	Un2m2	Un3m2	Un4m2	Un5m2	Un6m2	Average	Frontage	Depth
1	MH Sub	Duplex	400	2	199.8	127	127					127	17	23.5
2	MH Sub	Duplex	650	3	216.7	152	139	120				137	17	38.15
3	MH Sub	Duplex	1,000	6	166.7	77	78	78	78	78	111	83.3	17	58.8
4	MH Urb	Duplex	400	2	200.0	190	190					190	17	23.5
5	MH Urb	Duplex	650	3	216.7	260	207	160				209	17	38.15
6	MH Urb	Duplex	1,000	6	166.7	127	127	127	127	127	127	127	17	58.8

b) Dwelling floor area by typology and floorspace typology code adjustment

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Dwelling Floor Area by Typology and Location (Update)

Typology	Code	FAR	1	2	3	4	5	6	7	8	9	10	
Single Hs: 500m2+	A1	0.5	1.4	1.70	180	190	200	210	220	230	240	250	260
MHS: Hs 400m2+	B1	0.6	1.3	160	165	170	180	190	200	210	220	230	240
MHS: Hs 300-400m2	B2	0.7	1.2	130	140	150	160	170	180	190	200	200	200
MHS: Hs 200-300m2	B3	0.75	1.1	110	120	130	140	150	155	160	165	170	175
MHS: Hs <200m2	B4	0.8	1	85	90	95	100	105	110	115	120	125	130
MHU: Hs 400m2+	C1	0.7	1.3	165	170	175	185	195	205	215	225	235	245
MHU: Hs 300-400m2	C2	0.8	1.2	130	140	150	160	170	180	190	200	210	220
MHU: Hs 200-300m2	C3	0.85	1.1	120	130	140	150	160	165	170	175	180	185
MHU: Hs <200m2	C4	0.9	1	95	100	105	110	115	120	125	130	135	140
MHS: Tce 400m2+	D1	0.7	1.2	170	180	190	200	210	220	230	240	250	260
MHS: Tce 300-400m2	D2	0.8	1.1	130	140	150	160	170	180	190	200	200	200
MHS: Tce 200-300m2	D3	0.9	1	110	120	130	140	150	155	160	165	170	175
MHS: Tce <200m2	D4	1	0.9	85	90	95	100	105	110	115	120	125	130
MHU: Tce 400m2+	E1	0.9	1.2	170	180	190	200	210	220	230	240	250	260
MHU: Tce 300-400m2	E2	1	1.1	130	140	150	160	170	180	190	200	210	220
MHU: Tce 200-300m2	E3	1.1	1	120	130	140	150	160	165	170	175	180	185
MHU: Tce <200m2	E4	1.2	0.9	95	100	105	110	115	120	125	130	135	140
MHU: Apmt <200m2	Z1	1.2	0.8	90	95	100	105	110	115	120	125	130	140
THAB 3 Level Tce	F1	1.2	1	98	106	114	122	130	138	90	100	115	140
THAB 4 Level Tce	F2	1.5	1	98	106	114	122	80	84	90	100	115	140
THAB 5 Level Tce	F3	1.7	1	98	106	69	72	75	79	85	95	110	135
MU 3 Level Tce	G1	2	1	97	104	111	118	125	132	90	100	115	140
MU 4 Level Tce	G2	2.4	1	97	104	111	118	80	84	90	100	115	140
MU 5 Level Tce	G3	2.8	1	97	104	69	72	75	79	85	95	110	135
TC 3 Level Tce	H1	1.6	1	96	102	108	114	120	126	90	100	115	140
TC 4 Level Tce	H2	2	1	96	102	108	114	80	84	90	100	115	140
TC 5 Level Tce	H3	2.1	1	96	102	67	71	75	79	85	95	110	135
THAB 3 Level Apmt	I1	1.2	0.8	98	106	114	122	130	138	90	100	115	140
THAB 4 Level Apmt	I2	1.6	0.8	98	106	114	122	80	84	90	100	115	140
THAB 5 Level Apmt	I3	2	0.8	98	106	65	70	75	79	85	95	110	135
THAB 6 Level Apmt	I4	2.4	0.8	50	55	60	65	70	75	80	90	105	130
MU 3 Level Apmt	J1	2.2	0.8	97	104	111	118	125	132	90	100	115	140
MU 4 Level Apmt	J2	2.8	0.8	97	104	111	118	80	84	90	100	115	140
MU 5 Level Apmt	J3	3.4	0.8	97	104	65	70	75	79	85	95	110	135
MU 6 Level Apmt	J4	4	0.8	50	55	60	65	70	75	80	90	105	130
TC 3 Level Apmt	K1	2.2	0.8	96	102	108	114	120	126	90	100	115	140
TC 4 Level Apmt	K2	2.8	0.8	96	102	108	114	70	80	90	100	115	140
TC 5 Level Apmt	K3	3.4	0.8	96	102	57	61	68	77	87	97	112	135

Dwelling Floor Area by Typology and Location (original)

Typology	Code	FAR	1	2	3	4	5	6	7	8	9	10
Single-500m2	A1	0.5	1.70	180	190	200	210	220	230	240	250	260
MH Sub: 400m2+	B1	0.5	1.70	180	190	200	210	220	230	240	250	260
MH Sub: 300-400m2	B2	0.7	1.50	160	170	180	190	200	210	220	230	240
MH Sub: 200-300m2	B3	0.8	1.40	160	170	180	190	200	210	220	230	240
MH Sub: <200m2	B4	0.8	1.30	140	150	160	170	180	190	200	210	220
MH Urb: 400m2+	C1	0.5	1.70	180	190	200	210	220	230	240	250	260
MH Urb: 300-400m2	C2	0.7	1.40	150	160	170	180	190	200	210	220	230
MH Urb: 200-300m2	C3	0.8	1.30	140	150	160	170	180	190	200	210	220
MH Urb: <200m2	C4	1	1.20	130	140	150	160	170	180	190	200	210
MH Suburban Tce	D1	1	1.18	126	134	142	150	158	166	174	182	190
MH Urban Tce	E1	1.3	1.08	116	124	132	140	148	156	164	172	180
THAB 3 Level Tce	F1	1.2	98	106	114	122	130	138	90	100	115	140
THAB 4 Level Tce	F2	1.5	98	106	114	122	80	84	90	100	115	140
THAB 5 Level Tce	F3	1.7	98	106	69	72	75	79	85	95	110	135
MU 3 Level Tce	G1	2	97	104	111	118	125	132	90	100	115	140
MU 4 Level Tce	G2	2.4	97	104	111	118	80	84	90	100	115	140
MU 5 Level Tce	G3	2.8	97	104	69	72	75	79	85	95	110	135
TC 3 Level Tce	H1	1.6	96	102	108	114	120	126	90	100	115	140
TC 4 Level Tce	H2	2	96	102	108	114	80	84	90	100	115	140
TC 5 Level Tce	H3	2.1	96	102	67	71	75	79	85	95	110	135
THAB 3 Level Apmt	I1	1.2	98	106	114	122	130	138	90	100	115	140
THAB 4 Level Apmt	I2	1.6	98	106	114	122	80	84	90	100	115	140
THAB 5 Level Apmt	I3	2	98	106	65	70	75	79	85	95	110	135
THAB 6 Level Apmt	I4	2.4	50	55	60	65	70	75	80	90	105	130
MU 3 Level Apmt	J1	2.2	97	104	111	118	125	132	90	100	115	140
MU 4 Level Apmt	J2	2.8	97	104	111	118	80	84	90	100	115	140
MU 5 Level Apmt	J3	3.4	97	104	65	70	75	79	85	95	110	135
MU 6 Level Apmt	J4	4	50	55	60	65	70	75	80	90	105	130
TC 3 Level Apmt	K1	2.2	96	102	108	114	120	126	90	100	115	140
TC 4 Level Apmt	K2	2.8	96	102	108	114	70	80	90	100	115	140
TC 5 Level Apmt	K3	3.4	96	102	57	61	68	77	87	97	112	135

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Newly Proposed Floorspace Typology Code Adjustment Table

New Typology Update	1	2	3	4	5	6	7	8	9	10
A1	Single Hs: 500m2+	A1	A1	A1	A1	A1	A1	A1	A1	A1
B1	MHS: Hs 400m2+	B1	B1	B1	B1	B1	B1	B1	B1	B1
B2	MHS: Hs 300-400m2	B2	B2	B2	B2	B2	B2	B2	B2	B2
B3	MHS: Hs 200-300m2	B3	B3	B3	B3	B3	B3	B3	B3	B3
B4	MHS: Hs <200m2	D4	D4	D4	D4	D4	D4	D4	D4	D4
C1	MHU: Hs 400m2+	C1	C1	C1	C1	C1	C1	C1	C1	C1
C2	MHU: Hs 300-400m2	C2	C2	C2	C2	C2	C2	C2	C2	C2
C3	MHU: Hs 200-300m2	C3	C3	C3	C3	C3	C3	C3	C3	C3
C4	MHU: Hs <200m2	E4	E4	E4	E4	E4	E4	E4	E4	E4
D1	MHS: Tce 400m2+	B1	B1	B1	B1	B1	B1	B1	B1	B1
D2	MHS: Tce 300-400m2	B2	B2	B2	B2	B2	B2	B2	B2	B2
D3	MHS: Tce 200-300m2	B3	B3	B3	B3	B3	B3	B3	B3	B3
D4	MHS: Tce <200m2	D4	D4	D4	D4	D4	D4	D4	D4	D4
E1	MHU: Tce 400m2+	C1	C1	C1	C1	C1	C1	C1	C1	C1
E2	MHU: Tce 300-400m2	C2	C2	C2	C2	C2	C2	C2	C2	C2
E3	MHU: Tce 200-300m2	C3	C3	C3	C3	C3	C3	C3	C3	C3
E4	MHU: Tce <200m2	E4	E4	E4	E4	E4	E4	E4	E4	E4
Z1	MHU: Apt. <200m2	E4	E4	E4	E4	E4	E4	E4	E4	E4
F1	THAB 3 Level Tce	F1	F1	F1	F1	F1	F1	F1	F1	F1
F2	THAB 4 Level Tce	F2	F2	F2	F2	F2	F2	F2	F2	F2
F3	THAB 5 Level Tce	F3	F3	F3	F3	F3	F3	F3	F3	F3
G1	MU3 Level Tce	G1	G1	G1	G1	G1	G1	G1	G1	G1
G2	MU4 Level Tce	G2	G2	G2	G2	G2	G2	G2	G2	G2
G3	MU5 Level Tce	G3	G3	G3	G3	G3	G3	G3	G3	G3
H1	TC 3 Level Tce	H1	H1	H1	H1	H1	H1	H1	H1	H1
H2	TC 4 Level Tce	H2	H2	H2	H2	H2	H2	H2	H2	H2
H3	TC 5 Level Tce	H3	H3	H3	H3	H3	H3	H3	H3	H3
H4	THAB 3 Level Apt	F1	F1	F1	F1	F1	F1	F1	F1	F1
I2	THAB 4 Level Apt	F2	F2	F2	F2	F2	F2	F2	F2	F2
I3	THAB 5 Level Apt	F3	F3	F3	F3	F3	F3	F3	F3	F3
I4	THAB 6 Level Apt	J4	J4	J4	J4	J4	J4	J4	J4	J4
J1	MU 3 Level Apt	G1	G1	G1	G1	G1	G1	G1	G1	G1
J2	MU 4 Level Apt	G2	G2	G2	G2	G2	G2	G2	G2	G2
J3	MU 5 Level Apt	G3	G3	G3	G3	G3	G3	G3	G3	G3
J4	MU 6 Level Apt	J4	J4	J4	J4	J4	J4	J4	J4	J4
K1	TC 3 Level Apt	H1	H1	H1	H1	H1	H1	H1	H1	H1
K2	TC 4 Level Apt	H2	H2	H2	H2	H2	H2	H2	H2	H2
K3	TC 5 Level Apt	H3	H3	H3	H3	H3	H3	H3	H3	H3
K4	TC 6 Level Apt	K4	K4	K4	K4	K4	K4	K4	K4	K4
K5	TC 7 Level Apt	K5	K5	K5	K5	K5	K5	K5	K5	K5
K6	TC 8 Level Apt	K6	K6	K6	K6	K6	K6	K6	K6	K6
K7	TC 9 Level Apt	K7	K7	K7	K7	K7	K7	K7	K7	K7
K8	TC 10 Level Apt	K8	K8	K8	K8	K8	K8	K8	K8	K8
K9	TC 11 Level Apt	K9	K9	K9	K9	K9	K9	K9	K9	K9
K10	TC 12 Level Apt	K10	K10	K10	K10	K10	K10	K10	K10	K10
K11	TC 13-15 Level Apt	K11	K11	K11	K11	K11	K11	K11	K11	K11
K12	TC 16-18 Level Apt	K12	K12	K12	K12	K12	K12	K12	K12	K12
K13	TC 18-25 Lev Apt	K13	K13	K13	K13	K13	K13	K13	K13	K13
K14	TC 25-30 Lev Apt	K14	K14	K14	K14	K14	K14	K14	K14	K14
K15	TC 30+ Lev Apt	K15	K15	K15	K15	K15	K15	K15	K15	K15

Original Floorspace Typology Code Adjustment Table

Initial Typology	1	2	3	4	5	6	7	8	9	10
A1	Single-500m2	A1	A1	A1	A1	A1	A1	A1	A1	A1
B1	MH Sub: 400m2+	B1	B1	B1	B1	B1	B1	B1	B1	B1
B2	MH Sub: 300-400m2	B2	B2	B2	B2	B2	B2	B2	B2	B2
B3	MH Sub: 200-300m2	B3	B3	B3	B3	B3	B3	B3	B3	B3
B4	MH Sub: <200m2	B4	B4	B4	B4	B4	B4	B4	B4	B4
C1	MH Urb: 400m2+	C1	C1	C1	C1	C1	C1	C1	C1	C1
C2	MH Urb: 300-400m2	C2	C2	C2	C2	C2	C2	C2	C2	C2
C3	MH Urb: 200-300m2	C3	C3	C3	C3	C3	C3	C3	C3	C3
C4	MH Urb: <200m2	C4	C4	C4	C4	C4	C4	C4	C4	C4
D1	MH Suburban Tce	D1	D1	D1	D1	D1	D1	D1	D1	D1
E1	MH Urban Tce	E1	E1	E1	E1	E1	E1	E1	E1	F1
F1	THAB 3 Level Tce	F1	F1	F1	F1	F1	F1	F1	F1	F1
F2	THAB 4 Level Tce	F2	F2	F2	F2	F2	F2	F2	F2	F2
F3	THAB 5 Level Tce	F3	F3	F3	F3	F3	F3	F3	F3	F3
G1	MU3 Level Tce	G1	G1	G1	G1	G1	G1	G1	G1	G1
G2	MU4 Level Tce	G2	G2	G2	G2	G2	G2	G2	G2	G2
G3	MU5 Level Tce	G3	G3	G3	G3	G3	G3	G3	G3	G3
H1	TC 3 Level Tce	H1	H1	H1	H1	H1	H1	H1	H1	H1
H2	TC 4 Level Tce	H2	H2	H2	H2	H2	H2	H2	H2	H2
H3	TC 5 Level Tce	H3	H3	H3	H3	H3	H3	H3	H3	H3
I1	THAB 3 Level Apt	F1	F1	F1	F1	F1	F1	F1	F1	F1
I2	THAB 4 Level Apt	F2	F2	F2	F2	F2	F2	F2	F2	F2
I3	THAB 5 Level Apt	F3	F3	F3	F3	F3	F3	F3	F3	F3
I4	THAB 6 Level Apt	J4	J4	J4	J4	J4	J4	J4	J4	J4
J1	MU 3 Level Apt	G1	G1	G1	G1	G1	G1	G1	G1	G1
J2	MU 4 Level Apt	G2	G2	G2	G2	G2	G2	G2	G2	G2
J3	MU 5 Level Apt	G3	G3	G3	G3	G3	G3	G3	G3	G3
J4	MU 6 Level Apt	J4	J4	J4	J4	J4	J4	J4	J4	J4
K1	TC 3 Level Apt	H1	H1	H1	H1	H1	H1	H1	H1	H1
K2	TC 4 Level Apt	H2	H2	H2	H2	H2	H2	H2	H2	H2
K3	TC 5 Level Apt	H3	H3	H3	H3	H3	H3	H3	H3	H3
K4	TC 6 Level Apt	K4	K4	K4	K4	K4	K4	K4	K4	K4
K5	TC 7 Level Apt	K5	K5	K5	K5	K5	K5	K5	K5	K5
K6	TC 8 Level Apt	K6	K6	K6	K6	K6	K6	K6	K6	K6
K7	TC 9 Level Apt	K7	K7	K7	K7	K7	K7	K7	K7	K7
K8	TC 10 Level Apt	K8	K8	K8	K8	K8	K8	K8	K8	K8
K9	TC 11 Level Apt	K9	K9	K9	K9	K9	K9	K9	K9	K9
K10	TC 12 Level Apt	K10	K10	K10	K10	K10	K10	K10	K10	K10
K11	TC 13-15 Level Apt	K11	K11	K11	K11	K11	K11	K11	K11	K11
K12	TC 16-18 Level Apt	K12	K12	K12	K12	K12	K12	K12	K12	K12
K13	TC 18-25 Lev Apt	K13	K13	K13	K13	K13	K13	K13	K13	K13
K14	TC 25-30 Lev Apt	K14	K14	K14	K14	K14	K14	K14	K14	K14
K15	TC 30+ Lev Apt	K15	K15	K15	K15	K15	K15	K15	K15	K15

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8. By the afternoon of Sunday 4 October responses had been received from Prof Richard Bedford, Richard Burton, Fraser Colegrave, Dr Doug Fairgray, David Gibbs, Jon Maplesden, Adam Thompson (and replies from Patrick Fontein).
9. Comments from Richard Burton and Dr Fairgray identified a number of substantive matters.
10. Not all matters raised by members fell within the immediate scope of the lookup table review (and are therefore not discussed further).
11. Nil responses were received from Phil Osborne, Robert Philpott, Dr Michael Rehm, and the Council and Government representatives.
12. Patrick provided clarification to a number of queries, relating to:
 - Amalgamation of sites – the importance of this issue is not disputed but the “how” and “when” remains unresolved;
 - Apartment construction costs;
 - Floor area for Cat 10 high quality apartments;
 - THAB upzoning of apartment developments currently in MHS and MHU.
13. Some 013 members wanted to record reservations including:
 - While Nick Roberts’ typology diagrams may well be fit for purpose in many circumstances, there are equally many others where they would be impractical and result in unfortunate and perhaps unforeseen outcomes.
 - The **\$Ceiling** is a new addition, which is a ‘penalty’ factor on the sale price to take into account higher density. Example, D4 has a penalty factor of 0.9, so this dwelling can only receive 90% of the average sale price. This will need good validation, given the average margin between existing dwelling prices and new dwelling prices. Patrick agreed this will need more work but considers the figures sufficiently conservative at this point because the average sales price of “land and building” properties will have a much larger land component than “intensified new dwellings”;
 - Uncertainty as to whether all the changes in floorspace by typology make sense – and need to be double-checked;
 - The issue of feasibility at lower price points is not well articulated / represented in the lookup tables – i.e. these represent the question of “expensive” house feasibility. Adam proposes to undertake a sample run post-next output with changes to dwelling sizes and price data for sensitivity testing purposes; Richard Burton seeks a similar outcome with reduced dwelling sizes; Patrick thinks this is a necessary second step for subsequent detailed ACDC review.
14. No specific changes to the lookup table values were suggested – although that cannot be interpreted as agreement with those values given the very tight turnaround timeline provided.

Appendix C, page 7

15. A number of 013 members expressed concern about the process from this point, requesting that the next re-run outputs and proposed further refinements are circulated to all 013 members for confirmation to avoid the risk that further important uncorroborated changes are made. Patrick suggests that this be undertaken on Wednesday afternoon (7 October) following re-run by Kyle on Monday/Tuesday, review by Patrick and Adam on Tuesday/Wednesday, so that the final run can be provided for the IHP on Thursday 8 October as directed.

Recommended Next Steps

16. The recommended follow-up steps are as follows:
 - (a) Run the ACDC model with the revised lookup tables and values;
 - (b) Council to consider a process for running reduced dwelling sizes and price points based on the outputs of (a);
 - (c) The proposed output (a) modifications should be provided to the 013 EG for 12hr review Wednesday 7 October (pm) prior to the final run for the IHP on Thursday 8 October 2015.



David Hill
Facilitator
5 October 2015

Appendix D: Output Tables Comparing the PAUP with ACAP v1 and v2, Pg. 1

Feasible Developable Capacity Comparison: PAUP, ACAP v1 and ACAP v2

UP Base Zone	Floorspace Typology Code	Floorspace Typology Description	Capacity Enabled (ACAP (ACDC V2))	Feasible Capacity PAUP (ACDC v1)	Feasible Capacity ACAP (ACDC v1)	Feasible Capacity ACAP (ACDC v2) PDEG Ceiling	Feasible Capacity ACAP (ACDC v2) Raised Ceiling
SH, LL R&CS	A1	Single Hs: 500m2+	19,353	9,413	6,144	-	-
	B1	MHS: Hs 400m2+	6,550	2,535	778	-	13
MHS	B2	MHS: Hs 300-400m2	18,740	1,085	4,312	-	9,261
	B3	MHS: Hs 200-300m2	82,064	10,290	104,785	24,922	27,946
MHU	C1	MHU: Hs 400m2+	2,312	2,325	1,342	-	-
	C2	MHU: Hs 300-400m2	4,967	565	1,036	-	2,414
	C3	MHU: Hs 200-300m2	10,006	-	8,123	-	5,969
MHS	D2	MHS: Tce 300-400m2	3,632	in B2	in B2	-	942
	D3	MHS: Tce 200-300m2	191,430	in B3	in B3	2,048	14,292
	D4	MHS: Tce <200m2	10,382	-	4,965	370	370
MHU	E2	MHU: Tce 300-400m2	415	in C2	in C2	-	-
	E3	MHU: Tce 200-300m2	22,692	in C3	in C3	-	2,084
	E4	MHU: Tce <200m2	99,949	2,309	4,270	7,732	7,732
THAB	F1	THAB 3 Level Tce	265	in I1	in I1	67	67
	F3	THAB 5 Level Tce	18,910	in I3	in I3	-	-
MU	G1	MU 3 Level Tce	3,333	in J1	in J1	800	800
	G2	MU 4 Level Tce	53,943	in J2	in J2	6,988	6,988
TC	H1	TC 3 Level Tce	16,147	in K1	in K1	2,106	2,106
	H2	TC 4 Level Tce	27,404	in K2	in K2	655	655
THAB	I1	THAB 3 Level Apmt	2,879	73	2,986	2,612	2,612
	I3	THAB 5 Level Apmt	175,543	4,997	11,613	13,628	13,628
	I4	THAB 6 Level Apmt	3,095	-	-	-	-
MU	J1	MU 3 Level Apmt	950	7	7	33	33
	J2	MU 4 Level Apmt	34,445	5,270	5,270	6,186	6,186
	J3	MU 5 Level Apmt	975	165	165	301	301
	J4	MU 6 Level Apmt	3,925	536	536	1,528	1,528
Centre Zones	K1	TC 3 Level Apmt	5,345	150	150	198	198
	K2	TC 4 Level Apmt	16,307	639	639	901	901
	K3	TC 5 Level Apmt	2,983	707	707	175	175
	K4	TC 6 Level Apmt	36,225	1,784	1,784	990	990
	K5	TC 7 Level Apmt	4,134	1,324	1,324	1,084	1,084
	K6	TC 8 Level Apmt	11,360	3,533	3,533	3,770	3,770
	K7	TC 9 Level Apmt	2,290	1,237	1,237	243	243
	K8	TC 10 Level Apmt	12,424	1,047	1,047	1,384	1,384
	K9	TC 11 Level Apmt	938	455	455	608	608
	K10	TC 12 Level Apmt	8,985	578	578	612	612
	K11	TC 13-15 Level Apmt	9,725	3,398	3,398	4,029	4,029
	K12	TC 16-18 Level Apmt	162,920	3,647	3,647	3,646	3,646
	K13	TC 18-25 Lev Apmt	1,490	322	322	351	351
	K14	TC 25-30 Lev Apmt	1,145	19	19	103	103
	K15	TC 30+ Lev Apmt	18,235	6,010	6,010	4,587	4,587
Grand Total			1,108,812	64,420	181,182	92,657	128,608

Appendix D: Output Tables Comparing the PAUP with ACAP v1 and v2, Pg. 2

ACAP (ACDC v2) Feasible Developable Capacity, using the PDEG \$ Ceiling.

Dwelling Typology	House			Terrace			Apartment			TOTAL		
	Plan Enabled	Feasible Under PDEG Ceiling	% Feasible Under PDEG Ceiling	Plan Enabled	Feasible Under PDEG Ceiling	% Feasible Under PDEG Ceiling	Plan Enabled	Feasible Under PDEG Ceiling	% Feasible Under PDEG Ceiling	Plan Enabled	Feasible Under PDEG Ceiling	% Feasible Under PDEG Ceiling
Local Board Name	1,212	-	0%	20,452	336	2%	24,973	5,561	22%	46,637	5,897	13%
Albert Eden	1,080	-	0%	22,529	1,794	8%	11,040	1,209	11%	34,649	3,003	9%
Devonport Takapuna	18,078	5,309	29%	13,197	927	7%	172	78	45%	31,447	6,314	20%
Franklin	16,748	2,240	13%	40,997	1,868	5%	89,781	80	0%	147,526	4,188	3%
Henderson Massey	5,435	32	1%	37,152	6,024	16%	8,144	575	7%	50,731	6,631	13%
Hibiscus & Bays	3,266	128	4%	59,664	2,165	4%	31,956	4,374	14%	94,886	6,667	7%
Howick	5,752	349	6%	35,911	1,341	4%	14,612	2,172	15%	56,275	3,862	7%
Kaipatiki	22,200	3,271	15%	19,421	-	0%	3,774	-	0%	45,395	3,271	7%
Manurewa	10,601	2,819	27%	24,459	207	1%	8,022	-	0%	43,082	3,026	7%
Mangere Otahuhu	3,973	885	22%	29,561	1,379	5%	63,135	6,735	11%	96,669	8,999	9%
Maungakiekie Tamaki	2,316	3	0%	29,021	2,016	7%	12,807	4,591	36%	44,144	6,610	15%
Orakei	19,018	5,453	29%	13,350	25	0%	38,846	-	0%	71,214	5,478	8%
Otara Papatoetoe	14,408	2,831	20%	16,547	12	0%	15,421	1,392	9%	46,376	4,235	9%
Papakura	1,675	-	0%	16,807	526	3%	13,388	848	6%	31,870	1,374	4%
Puketepapa	3,984	18	0%	12,717	189	1%	17	-	0%	16,718	207	1%
Rodney	2,518	-	0%	22,318	1,780	8%	43,592	1,630	4%	68,428	3,410	5%
Upper Harbour	4,575	756	17%	6,525	-	0%	13,788	-	0%	24,888	756	3%
Waitakere Ranges	154	-	0%	1,956	57	3%	68,297	17,724	26%	70,407	17,781	25%
Waitemata	6,999	828	12%	25,918	120	0%	54,553	-	0%	87,470	948	1%
Whau	143,992	24,922	17%	448,502	20,766	5%	516,318	46,969	9%	1,108,812	92,657	8%
Total												

ACAP (ACDC v2) Feasible Developable Capacity, using the Raised \$ Ceiling.

Dwelling Typology	House			Terrace			Apartment			TOTAL		
	Plan Enabled	Feasible Under Raised Ceiling	% Feasible Under Raised Ceiling	Plan Enabled	Feasible Under Raised Ceiling	% Feasible Under Raised Ceiling	Plan Enabled	Feasible Under Raised Ceiling	% Feasible Under Raised Ceiling	Plan Enabled	Feasible Under Raised Ceiling	% Feasible Under Raised Ceiling
Local Board Name												
Albert Eden	1,212	19	2%	20,452	473	2%	24,973	5,561	22%	46,637	6,053	13%
Devonport Takapuna	1,080	71	7%	22,529	4,112	18%	11,040	1,209	11%	34,649	5,392	16%
Franklin	18,078	8,852	49%	13,197	927	7%	172	78	45%	31,447	9,857	31%
Henderson Massey	16,748	7,606	45%	40,997	2,284	6%	89,781	80	0%	147,526	9,970	7%
Hibiscus & Bays	5,435	295	5%	37,152	8,693	23%	8,144	575	7%	50,731	9,563	19%
Howick	3,266	868	27%	59,664	4,785	8%	31,956	4,374	14%	94,886	10,027	11%
Kaipatiki	5,752	1,091	19%	35,911	2,410	7%	14,612	2,172	15%	56,275	5,673	10%
Manurewa	22,200	5,979	27%	19,421	139	1%	3,774	-	0%	45,395	6,118	13%
Mangere Otahuhu	10,601	3,294	31%	24,459	693	3%	8,022	-	0%	43,082	3,987	9%
Maungakiekie Tamaki	3,973	1,172	29%	29,561	2,207	7%	63,135	6,735	11%	96,669	10,114	10%
Orakei	2,316	29	1%	29,021	2,658	9%	12,807	4,591	36%	44,144	7,278	16%
Otara Papatoetoe	19,018	6,868	36%	13,350	25	0%	38,846	-	0%	71,214	6,893	10%
Papakura	14,408	4,566	32%	16,547	232	1%	15,421	1,392	9%	46,376	6,190	13%
Puketapapa	1,675	218	13%	16,807	585	3%	13,388	848	6%	31,870	1,651	5%
Rodney	3,984	18	0%	12,717	189	1%	17	-	0%	16,718	207	1%
Upper Harbour	2,518	544	22%	22,318	5,040	23%	43,592	1,630	4%	68,428	7,214	11%
Waitakere Ranges	4,575	1,979	43%	6,525	90	1%	13,788	-	0%	24,888	2,069	8%
Waitemata	154	-	0%	1,956	84	4%	68,297	17,724	26%	70,407	17,808	25%
Whau	6,999	2,134	30%	25,918	410	2%	54,553	-	0%	87,470	2,544	3%
Total	143,992	45,603	32%	448,502	36,036	8%	516,318	46,969	9%	1,108,812	128,608	12%

Appendix E: 46 Random MHS Properties, run through ACAP Version 1

ID	Address	Suburb	Feas Dwell	Profit %	Exist Hs	Site Area	New Build	New m2	New Typology	Max FAR	New Land n	Req Sale \$	New Sale \$	Sale Loc	CV Now
4694150	16 Lillian Place Farm Cove	Farm Cove	0	0.19241199	1	634.26	House	210	MH Sub-300m2	0.8	211.42	1295075.82	1470000	7	780000
5178924	13 Tyrian Close Half Moon Bay	Farm Cove	3	0.26900046	1	854.34	House	220	MH Sub-300m2	0.8	213.59	1363278.4	1650000	8	810000
4736819	3 Stapleford Crescent Browns Bay	Browns Bay	0	0.14180442	1	675.56	House	200	MH Sub-300m2	0.8	225.19	1196731.04	1300000	6	880000
4727124	3 Wayne Drive Mangere	Mangere	0	0.19050011	1	682.26	House	160	MH Sub-300m2	0.8	227.42	639762.67	720000	2	435000
4830526	3 Justin Place Te Atatu Peninsula	Te Atatu Peni	2	0.27046514	1	886.69	House	190	MH Sub-300m2	0.8	228.9	945002.3	1140000	5	555000
5192023	7 Hurstwood Place Glen Innes	Tamaki	3	0.36572612	1	682.1	House	210	MH Sub-300m2	0.8	220.52	1129658.83	1470000	7	425000
5050077	21 Feasegood Street Manurewa	Manurewa	0	0.17954400	1	942.56	House	140	MH Sub-300m2	0.8	235.64	501911.94	560000	1	450000
4856150	8 Hazelme Road Sandringham	Mt Albert	0	0.10132636	1	621.85	House	190	MH Sub-300m2	0.8	207.28	1088800.23	1140000	5	920000
4830512	342 Roscommon Road Manurewa	Manurewa	0	0.16413451	1	612.79	House	140	MH Sub-300m2	0.8	204.26	510639.2	560000	1	340000
5137621	39 Tripoli Road Panmure	Tamaki	0	0.17851266	1	649.05	House	170	MH Sub-300m2	0.8	216.35	761287.33	850000	3	590000
5029781	25 Onemana Way Te Atatu Peninsula	Te Atatu Peni	0	-0.1232681	1	661.46	House	190	MH Sub-300m2	0.8	220.49	1365497.39	1140000	5	1570000
4767739	10 Treeway Sunnyhills	Farm Cove	3	0.21362456	2	1674.38	House	220	MH Sub-400m2	0.7	334.88	1423883.63	1650000	8	1100000
4729991	20 Tainpi Road Hill Park	Manurewa	2	0.25226437	1	682.47	House	170	MH Sub-300m2	0.8	227.49	716962.8	850000	3	460000
4976826	17 Deverell Place Northcross	Browns Bay	2	0.22489674	1	630.97	House	200	MH Sub-300m2	0.8	210.32	1116138.2	1300000	6	690000
6700979	68 Glenmore Road Sunnyhills	Farm Cove	0	0.18650074	1	1761.69	Terrace	166	MH Suburban T	1	195.74	1052942.96	1195200	7	1475000
5131615	78 Stanniland Street Sunnyhills	Farm Cove	0	0.18620338	1	619.48	House	210	MH Sub-300m2	0.8	206.49	1301808.84	1470000	7	800000
4819956	2 Winsford Street Manurewa	Manurewa	0	0.12397536	1	655.65	House	140	MH Sub-300m2	0.8	218.55	528573.97	560000	1	365000
4764837	27 Mcannally Street Manurewa	Manurewa	3	0.24526783	1	813	House	140	MH Sub-300m2	0.8	203.25	475765.21	560000	1	345000
4982584	753 Massey Road Mangere	Mangere	3	0.31388102	1	836.79	House	160	MH Sub-300m2	0.8	209.2	578331.16	720000	2	390000
4779396	28 Orams Road Manurewa	Manurewa	4	0.30805334	1	1012.63	House	160	MH Sub-300m2	0.8	202.53	579576.66	720000	2	500000
4776092	19 Fontenoy Street Mount Albert	Mt Albert	0	0.14456009	1	1078.24	House	190	MH Sub-300m2	0.8	215.65	1044529.28	1140000	5	1360000
5119958	81A Gloucester Road Manurewa	Manurewa	4	0.23412880	1	1188.08	House	140	MH Sub-300m2	0.8	237.62	478698.53	560000	1	440000
5036115	27 Elstree Avenue Glen Innes	Tamaki	3	0.32528011	1	806.83	House	210	MH Sub-300m2	0.8	201.71	1163936.01	1470000	7	650000
5060196	51 Wordsworth Road Manurewa	Manurewa	0	0.15044904	1	606.77	House	140	MH Sub-300m2	0.8	202.26	516610.38	560000	1	355000
4703386	250 Mount Albert Road Sandringham	Mt Albert	0	0.12312663	1	673.44	House	190	MH Sub-300m2	0.8	224.48	1067834.73	1140000	5	860000
6657427	27 Karemoana Drive Te Atatu Peninsula	Te Atatu Peni	0	-0.1139652	1	647.47	House	190	MH Sub-300m2	0.8	215.82	1351250.52	1140000	5	1540000
5182942	4 Kohiwi Road Manurewa	Manurewa	0	-0.2208411	0	374.45	House	160	MH Sub-400m2	0.7	374.45	990292.49	720000	2	420000
4711142	4 Kohiwi Road Manurewa	Manurewa	3	0.21879064	1	840.48	House	140	MH Sub-300m2	0.8	210.12	485959.37	560000	1	360000
4895874	101 Taniwha Street Glen Innes	Tamaki	2	0.27018061	1	696.71	House	180	MH Sub-300m2	0.8	232.24	821984.57	990000	4	530000
4911336	31 Fairmount Road Titirangi	Glen Eden	0	0.10101753	1	1347.82	Terrace	142	MH Suburban T	1	192.55	729059.33	766800	4	570000
4971028	6 Highland Road Mount Albert	Mt Albert	0	-0.0398270	1	766.41	House	200	MH Sub-300m2	0.8	255.47	1421469.12	1300000	6	1425000
4807309	32 Rowandale Avenue Manurewa	Manurewa	0	0.16465058	1	600.86	House	140	MH Sub-300m2	0.8	200.29	510416.77	560000	1	340000
4902401	41 Casuarina Road Highland Park	Farm Cove	2	0.25112429	1	600.96	House	200	MH Sub-300m2	0.8	200.32	1092922.36	1300000	6	630000
4702451	37 Roseanne Road Manurewa	Manurewa	2	0.33646562	1	607.32	House	170	MH Sub-300m2	0.8	202.44	672398.95	850000	3	375000
5192309	35 Tidal Road Mangere	Mangere	4	0.39492112	1	1014.52	House	170	MH Sub-300m2	0.8	202.9	641055.46	850000	3	510000
4922402	150 Arran Road Browns Bay	Browns Bay	0	0.08679627	2	951.84	House	210	MH Sub-300m2	0.8	237.96	1424429.03	1470000	7	1310000
4706175	49 Bramley Drive Farm Cove	Farm Cove	0	0.08475425	1	649.13	House	210	MH Sub-300m2	0.8	216.38	1422745.65	1470000	7	1100000
5114733	12 Paddington Street Glen Innes	Tamaki	3	0.34298053	1	849.65	House	210	MH Sub-300m2	0.8	212.41	1148681.2	1470000	7	590000
4776720	42D Redwing Street Browns Bay	Browns Bay	3	0.26857764	1	966.27	House	200	MH Sub-300m2	0.8	241.57	1075835.43	1300000	6	760000
4847049	11 Birman Close Half Moon Bay	Farm Cove	2	0.22835243	1	701.55	House	220	MH Sub-300m2	0.8	233.85	1410345.12	1650000	8	700000
4958235	23 Palliser Lane Browns Bay	Browns Bay	0	0.12158112	1	689.99	House	200	MH Sub-300m2	0.8	230	1218152.86	1300000	6	930000
4710394	27 The Crest Sunnyhills	Farm Cove	0	0.17357051	1	673.96	House	220	MH Sub-300m2	0.8	224.65	1475774.44	1650000	8	860000
4774044	61 Athena Drive Totara Vale	Unsworth He	0	0.12374182	1	631.12	House	180	MH Sub-300m2	0.8	210.37	927969.15	990000	4	800000
4711980	96 Coxhead Road Manurewa	Manurewa	2	0.34635775	1	684.39	House	170	MH Sub-300m2	0.8	228.13	667462.84	850000	3	355000
4875160	18 Kestrel Place Wai O Taiki Bay	Tamaki	2	0.20676290	1	792.26	House	180	MH Sub-300m2	0.8	264.09	864725.28	990000	4	640000
4744247	48 Anderson Avenue Point England	Tamaki	4	0.36049134	0	809.29	House	180	MH Sub-300m2	0.8	202.32	765826.94	990000	4	590000

Appendix F: \$ Ceiling factor, adjusted to more conservative on the 8th Oct

Dwelling Floor Area by Typology and Location (\$ Ceiling Adjust), 8th Oct

Typology	Code	FAR	\$Ceiling Fri 2 Oct	\$Ceiling Thu 8 Oct	1	2	3	4	5	6	7	8	9	10
Single Hs: 500m2+	A1	0.5	1.4	1.5	170	180	190	200	210	220	230	240	250	260
MHS: Hs 400m2+	B1	0.6	1.3	1.4	160	165	170	180	190	200	210	220	230	240
MHS: Hs 300-400m2	B2	0.7	1.2	1.3	130	140	150	160	170	180	190	200	200	200
MHS: Hs 200-300m2	B3	0.75	1.1	1.2	110	120	130	140	150	155	160	165	170	175
MHS: Hs <200m2	B4	0.8	1.0	1.2	85	90	95	100	105	110	115	120	125	130
MHU: Hs 400m2+	C1	0.7	1.3	1.4	165	170	175	185	195	205	215	225	235	245
MHU: Hs 300-400m2	C2	0.8	1.2	1.3	130	140	150	160	170	180	190	200	210	220
MHU: Hs 200-300m2	C3	0.85	1.1	1.2	120	130	140	150	160	165	170	175	180	185
MHU: Hs <200m2	C4	0.9	1.0	1.2	95	100	105	110	115	120	125	130	135	140
MHS: Tce 400m2+	D1	0.7	1.2	1.3	170	180	190	200	210	220	230	240	250	260
MHS: Tce 300-400m	D2	0.8	1.1	1.2	130	140	150	160	170	180	190	200	200	200
MHS: Tce 200-300m	D3	0.9	1.0	1.2	110	120	130	140	150	155	160	165	170	175
MHS: Tce <200m2	D4	1	0.9	1.2	85	90	95	100	105	110	115	120	125	130
MHU: Tce 400m2+	E1	0.9	1.2	1.2	170	180	190	200	210	220	230	240	250	260
MHU: Tce 300-400m	E2	1	1.1	1.2	130	140	150	160	170	180	190	200	210	220
MHU: Tce 200-300m	E3	1.1	1.0	1.2	120	130	140	150	160	165	170	175	180	185
MHU: Tce <200m2	E4	1.2	0.9	1.2	95	100	105	110	115	120	125	130	135	140
MHU: Apmt <200m2	Z1	1.2	0.8	1.0	90	95	100	105	110	115	120	125	130	140
THAB 3 Level Tce	F1	1.2	1.0	1.2	98	106	114	122	130	138	90	100	115	140
THAB 4 Level Tce	F2	1.5	1.0	1.2	98	106	114	122	80	84	90	100	115	140
THAB 5 Level Tce	F3	1.7	1.0	1.2	98	106	69	72	75	79	85	95	110	135
MU 3 Level Tce	G1	2	1.0	1.2	97	104	111	118	125	132	90	100	115	140
MU 4 Level Tce	G2	2.4	1.0	1.2	97	104	111	118	80	84	90	100	115	140
MU 5 Level Tce	G3	2.8	1.0	1.2	97	104	69	72	75	79	85	95	110	135
TC 3 Level Tce	H1	1.6	1.0	1.2	96	102	108	114	120	126	90	100	115	140
TC 4 Level Tce	H2	2	1.0	1.2	96	102	108	114	80	84	90	100	115	140
TC 5 Level Tce	H3	2.1	1.0	1.2	96	102	67	71	75	79	85	95	110	135
THAB 3 Level Apmt	I1	1.2	0.8	1.0	98	106	114	122	130	138	90	100	115	140
THAB 4 Level Apmt	I2	1.6	0.8	1.0	98	106	114	122	80	84	90	100	115	140
THAB 5 Level Apmt	I3	2	0.8	1.0	98	106	65	70	75	79	85	95	110	135
THAB 6 Level Apmt	I4	2.4	0.8	1.0	50	55	60	65	70	75	80	90	105	130
MU 3 Level Apmt	J1	2.2	0.8	1.0	97	104	111	118	125	132	90	100	115	140
MU 4 Level Apmt	J2	2.8	0.8	1.0	97	104	111	118	80	84	90	100	115	140
MU 5 Level Apmt	J3	3.4	0.8	1.0	97	104	65	70	75	79	85	95	110	135
MU 6 Level Apmt	J4	4	0.8	1.0	50	55	60	65	70	75	80	90	105	130
TC 3 Level Apmt	K1	2.2	0.8	1.0	96	102	108	114	120	126	90	100	115	140
TC 4 Level Apmt	K2	2.8	0.8	1.0	96	102	108	114	70	80	90	100	115	140
TC 5 Level Apmt	K3	3.4	0.8	1.0	96	102	57	61	68	77	87	97	112	135
TC 6 Level Apmt	K4	4	0.8	1.0	52	53	55	59	66.5	75	85	95	110	130
TC 7 Level Apmt	K5	4.5	0.8	1.0	51	52	54	57.5	65	73	83	93	108	128
TC 8 Level Apmt	K6	5	0.8	1.0	50	51	53	56.5	63.5	71	81	91	106	125
TC 9 Level Apmt	K7	5.4	0.8	1.0	49	50	52.5	56	62	69	79	89	104	123
TC 10 Level Apmt	K8	5.8	0.8	1.0	48	50	52.5	55.5	60.5	67	77	87	102	120
TC 11 Level Apmt	K9	6.2	0.8	1.0	48	50	52	55	59	65	75	85	100	118
TC 12 Level Apmt	K10	6.6	0.8	1.0	48	49.5	51	53.5	57.7	63	73	83	98	115
TC 13-15 Level Apmt	K11	7.2	0.8	1.0	48	49	50	52.5	56	61.5	71	81	96	113
TC 16-18 Level Apmt	K12	8	0.8	1.0	48	49	50	52	55	60	69	79	94	110
TC 18-25 Lev Apmt	K13	9.5	0.8	1.0	48	49	50	52	54	58.5	67	77	92	108
TC 25-30 Lev Apmt	K14	11	0.8	1.0	48	49	50	51.5	53	57	65	75	90	105
TC 30+ Lev Apmt	K15	12	0.8	1.0	48	49	50	51	52	55.5	63	73	88	103

Appendix G: ACDC v2 Model Output Map: Regional Tested Typology

Appendix H: ACDC v2 Model Output Map: Profitability of Sites

Appendix I: ACDC v2 Model Output Map: Capacity on a Site Basis