DRAFT – s77 Evaluation of Sunlight Access Qualifying Matter

Section 77G of the RMA requires that specified territorial authorities incorporate the MDRS specified in Schedule 3A of the RMA into relevant residential zones. Section 77I allows for the territorial authority to apply building height or density requirements less enabling of development where a qualifying matter applies, which includes, at section 77I(j), any other matter that makes higher density, as provided for by the MDRS or Policy 3 of the NPS-UD, inappropriate in an area, provided that section 77L is satisfied.

Section 77J(3) sets out matters that a s32 evaluation report must contain when a qualifying matter is proposed. This requires a demonstration of why the territorial authority considers the area is subject to a qualifying matter and why the qualifying matter is incompatible with the level of development permitted by the MDRS or as provided for by Policy 3 for that area.

Section 77L sets out the requirements for what s32 evaluation reports must include in order for a matter to be a qualifying matter under s77I(j) of the RMA. This includes a requirement to identify any specific characteristic that makes the level of development provided by the MDRS inappropriate in the area identified (s77L(a)), and to justify why a specific characteristic makes the level of development provided by the MDRS inappropriate in light of the national significance of urban development and the objectives of the NPS-UD (s77L(b)). This also requires a site-specific analysis of the specific characteristic and where it applies (s77L(c)). The overarching direction to evaluate qualifying matters is captured in both the Act and the NPS-UD, which state that the section 32 report must also identify the specific characteristic that makes the level of development directed by MDRS or Policy 3 inappropriate in the area, justify why that is inappropriate in light of the national significance of urban development and the objectives of the NPS-UD; and include a site-specific analysis. The ability modify building heights is further reinforced through Policy 4 of NPS-UD, permitting district plans to modify building heights and densities to the extent necessary to accommodate a qualifying matter.

Issue & why the area is subject to a qualifying matter: 77J(3)(a)(i); 77L(a); 77L(c)(i)

In identifying matters under s77L, identification of the 'specific characteristic' that makes intensification inappropriate in a particular area. Council has considered that the latitude of Christchurch is a characteristic that is specific and relative to the Greater Christchurch context and the relative difference in sunlight access this provides when compared to Tier 1 Councils at a lesser latitude. To this end, the qualifying matter area is that with the applicable latitude of about -43.49°: being the entirety of the Greater Christchurch area.

Tier 1 Councils outside Greater Christchurch needing[1] to give effect to MDRS are those in: Greater Wellington; Greater Tauranga; Greater Hamilton; and Auckland Council. While geographically separated, that vast majority of councils where MDRS applies are located in the upper North Island in and between Waipa to Auckland councils. Based just on population, these councils represent about 70% of the total population affected by MDRS, with both greater Wellington and Christchurch at about 15%, respectively[2]. This cluster also has little latitudinal difference (~1°).

Whilst the variation of shading on sites throughout the upper North Island cluster is likely to be minimal, there is a far greater difference in the impact between those cities and Canterbury. No testing of this difference was undertaken in the drafting of the Enabling Housing Act.

However, adopting an approach reflective of where the majority of affected populations live does not consider the geographic spread of other Tier 1 Councils, their relative latitudinal difference (of nearly 7°), and consequently, changes in sunlight access. A difference in latitude also results in a difference in climate, influencing the relative importance of sunlight access between environs. The National Institute for Water and Atmospheric Research (NIWA) records long term climate information, captured through its CliFlo database[3], a national climate database. Evaluating temperature differences across the three latitudinal groups where MDRS applies demonstrates their unique characteristics:

Daily max/min weather data from 1972 to 2022

	Max C	Min C	Average Max C	Average Min C
Auckland	30.5	-1.2	19.1	12.0
Wellington	30.6	-1.1	16.7	10.8
Christchurch	40.0	-7.2	16.9	6.3

The above represents results taken over a 50-year time horizon, being the earliest common date records began for all three centres (from aero weather stations). Similar results can also be seen to just within the last 10 years:

Daily max/min weather data from 2012 to 2022

	Max C	Min C	Average Max C	Average Min C
Auckland	29.8	0.9	19.7	12.4
Wellington	29.6	-0.1	17.0	11.3

[1] As per s2 definition of 'tier 1 territorial authority', noting that Rotorua District Council has also voluntarily successfully petitioned the Minister and now too has MDRS applied, as a minimum.
[2] Based on StatsNZ Subnational population estimates at 30 June 2018–2022. Excludes Rotorua District Council.
[3] See https://cliflo.niwa.co.nz/.

Christchurch	37.1	-6.4	17.5	6.5

Results clearly indicate the climate differences between centres, with Christchurch often having both the maximum hottest and coldest days on record, while the average minimum temperature about half that of Auckland. Very recent changes to the Building Code[4] have also reflected these climatic differences, with the Code dividing New Zealand in about six different climatic areas – each requiring different insulation levels based on climatic conditions. Through this, the Building Code divides territorial authorities into different climate zones, Climate Zone 1 being the warmest, and Climate Zone 6 being the coldest. Under this, Auckland is a Climate Zone 1 and Christchurch is a Climate zone 5, the second coldest.

This means that an alternative MDRS standards across all relevant residential zone would be necessary as these standards to achieving an equitable outcome of MDRS standards in a Christchurch context.

Matteo (2019[5]) shows there is a strong correlation been building density, scale of vertical development, and the quality and thermal conditions of urban contexts, including their relationships with vegetation. This is supported by Donovan & Butry (2009[6]), who demonstrate that positive benefits trees have in reducing energy consumption in warmer climates. Increased intensification is therefore a threat to sustainable solar access, reducing the availability of sunlight and daylight in cities, and the relative importance of energy consumption, with cities and the urban areas consuming approximately 65% of the world's produced energy and generating the 70% of greenhouse emissions (IEA, 2013, as cited by Matteo (2019)). Recent climate change reporting[7] completed by NIWA shows that increases in temperature Canterbury is likely to experience, with increases of 0.5-1.5°C by 2040, and 0.5-3.5°C by 2090 anticipated. It shows the relative importance of creating space to counter climate change effects.

When it comes to the construction of cities, a correlation also exists between the density of cities and the heat island effect this has (Kolokotroni & Watkins, 2005[8]), increasing the importance of appropriate design controls to manage effects. Conversely, Strømann-Andersen & Sattrup (2011[9]) find that narrow 'urban canyons' raise modelled residential energy consumption to heat homes by approximately 19% relative to areas with open horizons. They find that

[4] See pages 103-104 under Building Code Update 2021: https://www.mbie.govt.nz/dmsdocument/13808-consultation-document-building-code-update-2021
[5] Matteo Iommi, M. - Energy effects of buildings density with solar access analysis. - Techne, Iss 17 (2019)
[6] Donovan, G., and Butry, D. 2009. The value of shade: Estimating the effect of urban trees on summertime electricity use. Energy and Buildings 41.6.
[7] NIWA. 2020. Climate change projections for the Canterbury Region. Prepared for Environment Canterbury. Available from: https://niwa.co.nz/sites/niwa.co.nz/files/ClimatechangeprojectionsfortheCanterburyRegionNIWA.PDF
[8] Kolokotroni, M., Zhang, Y. and Watkins, R. 2005 - The London heat island and building cooling design. International Conference "Passive and Low Energy Cooling for the Built Environment", May 2005, Santorini, Greece.
[9] Strømann-Andersen, J. and Sattrup, P.A. 2011. The urban canyon and building energy use: Urban density versus daylight and passive solar gains. Energy and Buildings, 43(8).

orientation of buildings can make a difference of up to 30% in energy consumption, demonstrating the value in having an oriented-adaptive approach to standards.

In conclusion, Council proposes to introduce Sunlight Access as a qualifying matter, thereby modifying density standards in a manner that best achieves an equitable outcome to sunlight access when compared to an Auckland context – the MDRS baseline. Such an outcome also provides for other benefits; by reducing bulk and massing, the adverse heat island effects of density are reduced and greater opportunities for tree planting to counter heating effects during summer months are made possible.

Why the qualifying matter is incompatible with MDRS & how the matter considers the national significance of urban development and objectives of the NPS-UD: 77J(3)(a)(i) & 77L(b)

Direct comparisons have been undertaken to evaluate the difference in effects of applying a MDRS-enabled development scenario between Auckland and Christchurch. In doing so, consideration was given for achieving all the other density standards for a permitted activity and achievement of the MDRS objectives and policies.

The intended outcome of these is that three storey development can be completed as of right across all relevant residential zones. Density standards prescribe a variety of specific standards to readily provide for this, namely:

Density Standard	**Summary controls**
Clause 11 – Building Height	11m building height + 1m roof at >15° slope
Clause 12 – height in relation to boundary	Recession plane at 4m at 60°
Clause 13 - setbacks	Front: 1.5m Side & Rear: 1m

The above represent the primary standards enabling three storey typologies, recognising that others also mange bulk and site occupation, which ultimately do affect development potential. These outcomes are enhanced through subdivision controls under Clause 8 of MDRS. It is also noted that density

standards do not require residential units to be in separate buildings and that the enabled three residential units per site can be developed in a flats scenario, whereby every level is a separate residential unit. Sunlight access at every floor is therefore an important consideration.

The table below summarises the costs and benefits of modifying each of these controls as a means to address the Sunlight Access QM:

Density Standard	**Costs**	**Benefits**
Clause 11 – Building Height	• Potentially limits design outcomes • Provides for little leniency in areas with differing topography • Does not recognise the importance of proximity, with two storey buildings able to give a similar effect when close to internally boundaries	• Simple to apply • Likely to still provide for most intensified housing typologies, as 12m height is unnecessary to achieve three storeys (see below)
Clause 12 – height in relation to boundary	• Potentially introduces some complication with an orientation-based angle – when compared to MDRS	• Continues the orientation-based angle approach in the operative District Plan • Provides for both a height and setback approach, relative to internal boundaries • Still provides for construction along the plane, increasing the overall building envelop, in comparison
Clause 13 - setbacks	• The setback necessary may overly restrain the ability to achieve scale site development of the site to a point where three storey development is not feasible • Does not suitably respond to the height component of sunlight access	• Would address the proximity component needed to provide greater sunlight access, without reducing enabled building heights

The conclusion of the above is that only addressing the height in relation to boundary MDRS density standard is the most appropriate option because it:

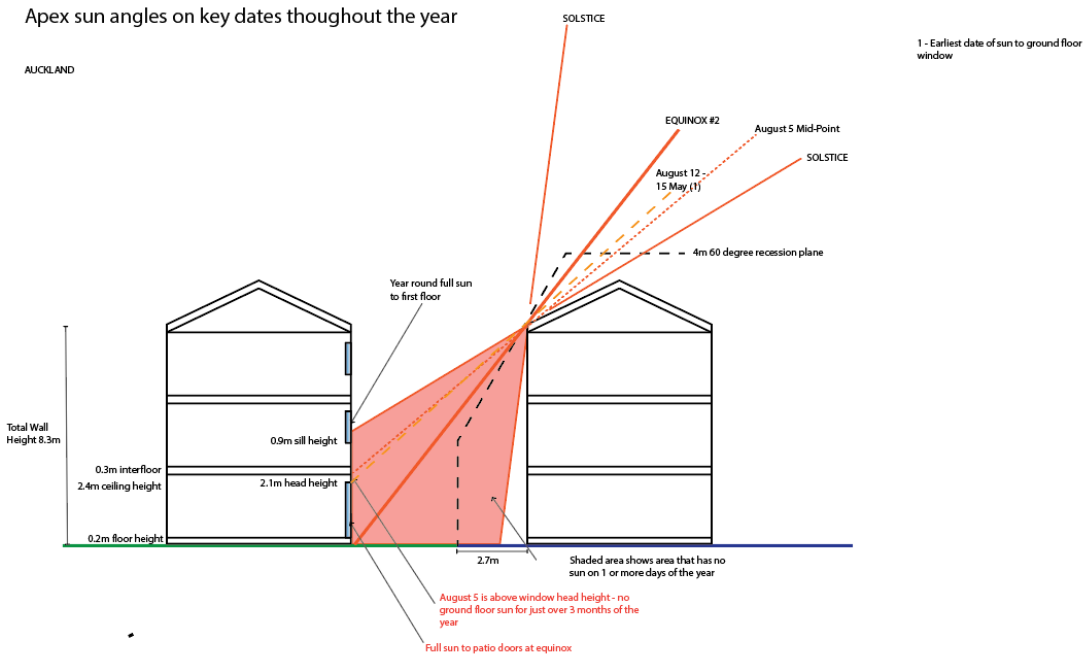
- responds to the dynamic relationship between proximity and height to provide sunlight access;
- would likely result in greater setbacks from side boundaries, providing additional climate resilience; and
- does not overly restrain site development: construction is possible along the plane and three storey development is still possible.

In testing controls, Council has also tested the assumptions in the MDRS that 12m building heights needed to achieve a three storey typology. Drafting of building height controls to enable greater heights to give effect to Policy 3 of the NPS-UD have been built on the basis of 3m per level, plus 2m for roof

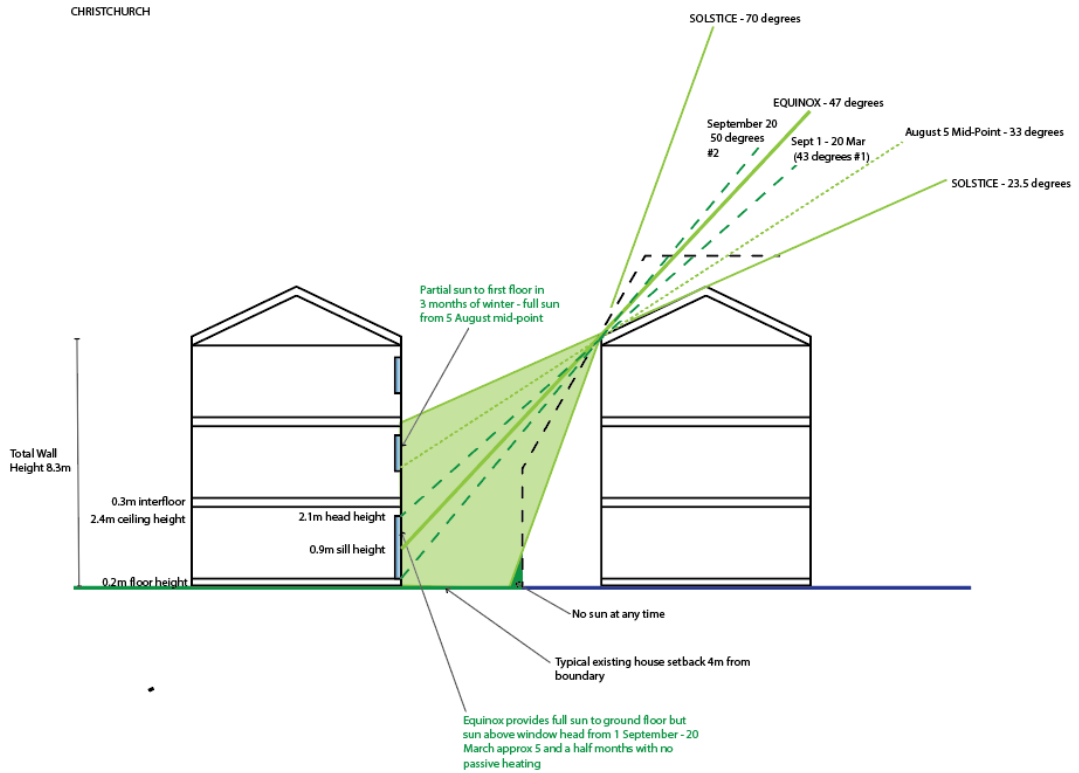
height. This is on a generous application of a 2.7m ceiling height and 0.3m between floors for coverings, insulation, and structural elements. On this basis, a building height of 9m would be enabled for three storeys, with a further 2m for roof height: 11m in total. This is 2m less than MDRS building height controls and 1m less overall.

Since introduction of the Replacement District Plan in 2017, three storey development has been possible in select locations across the city. Appendix 1 shows an example of three storey developments consented in Christchurch. Evaluating designed three storey developments heights shows realistically what three storey building heights are in practice. In most cases, development seek to adopt a ceiling height of the minimum prescribed by the Building Code of 2.4m (about 2.455m). In some cases, instances of about 2.55m ceiling heights are also created (typical for more up-market units), and sometimes a mix of the two is also done. In no cases was a 2.7m ceiling height observed. Overall, observations of three storey developments show that a building height of about 8.3m above ground level is sufficient to realistically provide for a three-storey typology (excluding roof). This informs the basis of comparable assessments between Auckland and Christchurch.

The diagram below shows the sum shaded area in an Auckland MDRS development scenario. Under this scenario, the total shade experienced at ground floor is 3.5 month in the year and the window on the second storey receives year-round sun access.



Applying the same development scenario in a Christchurch context result in 2 extra months of no sunlight access at the ground floor, being 5.5 months of no sunlight access. The below also shows that sun access on the second for is reduced from little to none. This forces outdoor living on the top floor.



This shows that applying the same development scenario across cities results in an additional two months of lost sunlight access, demonstrating incompatibility of the height in relation to boundary MDRS density standard.

More importantly, in the Auckland scenario the ground level enjoys full sun exposure and sunlight to the second level. As above, this is important as MDRS means that each level can contain a separate residential unit. By comparison, the same typology in Christchurch only achieves partial sunlight access on the ground floor, with the ground floor window in shade for about 5.5 months of the year, and partial sun to the second level over a three-month period. This would limit sunlight access for residents on each level and any passive solar gains.

Proposed alternative and development impacts

The objective of the Sunlight Access qualifying matter is to provide a more comparable sunlight access outcome and to still readily enable three storey developments across relevant residential zones (subject to any other applicable qualifying matters).

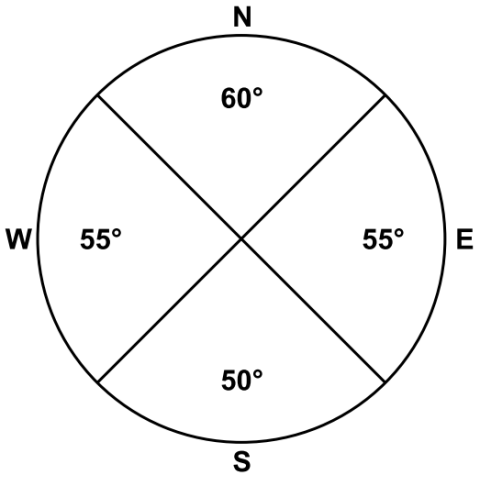
The impact on solar access is explored in some detail in the accompanying report (Technical Report – Residential Recession Planes in Christchurch). For the above examples, the new MDRS compliant building is located to the north. However, the effect on solar access varies with the site orientation. North-South oriented sites receive some direct sunlight all year round (which can be measured in hours). East-West oriented sites may receive no direct winter sun, with the number of days without sun increasing further south.

- Sites orientated roughly north to south can expect around 2 hours of mid-winter sun to the ground floor in Auckland, but sites in Christchurch generally receive 20-25 minutes less.
- Sites oriented east-west can expect 131 days without ground floor solar access in Auckland under an MDRS scenario, but 170 days in Christchurch

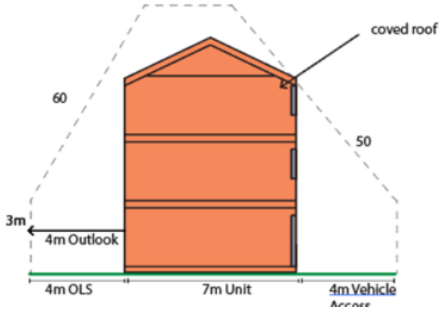
Reporting shows that the current operative District Plan recession plane controls are largely inappropriate, and an alternative recession plane is needed. It shows that the following approach best delivers a more comparable sunlight access outcome, whilst also delivering three storeys:

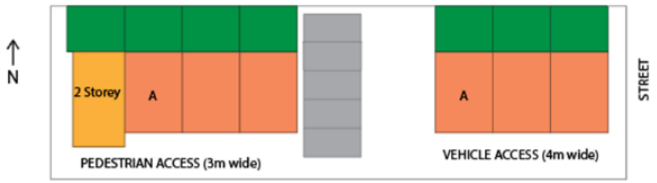
	MDRS	**Council Sunlight Access QM**
Height	Taken at 4m above ground level	Taken at 3m above ground level
Northern boundary angle	60°	60°
Southern boundary angle	60°	50°
East-west boundary angle	60°	55°

The approach creates an orientation-based response, with three different angles based on the orientation to boundaries. The methodology is similar to the current operative District Plan controls whereby a compass dial is placed within the site and the applicable angle is that which is tangential to the site boundary:



With reference made to the Technical Report[10], the below example tests the proposed alternative recession plane, based on a 15 x 50m site (750m2 site), typical of single-lot development sites. Based on this, the alternative recession plane achieves 96% of the building footprint MDRS would provide.





[10] Technical Report – Recession Planes in Christchurch

This shows that achieving a more comparable sunlight access outcome only results in a slight change in development outcomes. Using the above example, the only loss of capacity is that one unit is reduced by one storey..

The impact of this qualifying matter has also been assessed at scale using computer modelling. This process is carried out by estimating the floor area available in the building envelope provided with the MDRS and the alternative QM MDRS. A sample of sites was selected based on current site boundaries and zoned under the Operative Christchurch District Plan as Residential Suburban (RS), and between 300m2 and 2000m2 in size, providing a sample size of 76,000 sites (approximately 98% of RS zoned site).

The building envelope is calculated based on the MDRS and the QM MDRS. Some assumptions are required for the typology outcomes, specifically:

- Three storeys, with a floor height of three meters.
- A minimum floor width of five meters.

Summary of results:

- The sum total floor area, levels 1 to 3, calculated across all sites for the QM MDRS is ~96% of that for the MDRS.
- The total floor area for levels 1 and 2 for the QM MDRS is >99% of that for the MDRS.
- The total floor area for level 3 for the QM MDRS is ~88% of that for the MDRS.

How this translates to the outcome for dwelling capacity is uncertain. The modified MDRS allows for a multitude of potential development outcomes and a development typology can be substituted for another if by necessity it is a better fit for a site. For example, building two storey townhouses rather than three storey townhouses. The actual dwellings may be individually smaller and of a different typology but the dwelling yield may not necessarily be changed.

Considering the existing sufficiency of housing supply in Christchurch and the limited effect the qualifying matter has on development capacity, it is considered that this adequately responds to the national importance of urban development, being limited to residential development, only.

Assessment of relevant objectives of the NPS-UD

Relevant Objective	***Qualifying matter compatibility***

Objective 1: *New Zealand has well-functioning urban environments that enable all people and communities to provide for their social, economic, and cultural wellbeing, and for their health and safety, now and into the future.*	There is only a slight change made to MDRS height in relation to boundary controls (on average, 1m less and 5° less). Modelling shows that this is unlikely to have a significant impact on developments across Christchurch given its residential parcel make-up (see below), with greater sunlight access having a positive influence on property values, overall improving the functioning of development throughout the city. Consultation that Council has undertaken as part of PC14 pre-notification shows that sunlight access is likely the greatest concern across responders to date. Better providing for sunlight access is likely to improve overall wellbeing and health.
Objective 2: *Planning decisions improve housing affordability by supporting competitive land and development markets.*	The alternative recession plane the Sunlight Access QM proposes still readily provides for three storey development across MRZ (subject to other QMs) and may have a positive benefit to property values, meeting the outcomes set by Objective 2 of the NPS-UD.

Objective 3: *Regional policy statements and district plans enable more people to live in, and more businesses and community services to be located in, areas of an urban environment in which one or more of the following apply:* *(a) the area is in or near a centre zone or other area with many employment opportunities* *(b) the area is well-serviced by existing or planned public transport* (c) *there is high demand for housing or for business land in the area, relative to other areas within the urban environment.*	The Sunlight Access QM is likely to have the greatest effect in MRZ. The fundamental NPS-UD response is captured in HRZ, which contains several incentives through more lenient MDRS controls to better deliver the outcomes of the NPS-UD encouraging scale development within and near larger commercial centres. More lenient height in relation to boundary controls are uneffaced through this QM. Overall, this may help to better achieve the outcomes of Objective 3, as when compared to the QM approach, the more lenient controls in HRZ are more pronounced than compared to when not applying the Sunlight Access QM.
Objective 4: *New Zealand's urban environments, including their amenity values, develop and change over time in response to the diverse and changing needs of people, communities, and future generations.*	The QM better assists in providing for improved sunlight access across all levels of an MDRS-style development. The QM only influences the Clause 12 controls, with more lenient controls proposed by Council in HRZ being unaffected. This provides for a dynamic mix of development opportunities across the city, assisting in providing for multigenerational housing needs.
Objective 6: *Local authority decisions on urban development that affect urban environments are:* *(a) …* *(b) strategic over the medium term and long term; and* *(c) …*	The introduction of a QM on Sunlight Access is strategic in nature and better supports the delivery of scale MDRS development across the relevant residential zones.

Objective 8: *New Zealand's urban environments:* *(a) support reductions in greenhouse gas emissions; and* *(b) are resilient to the current and future effects of climate change.*	Providing for improved sunlight access better responds to Christchurch's climatic conditions by providing improved passive heating options. This approach has shown to reduce energy consumption for urban environments, enhancing the city's resilience to the current and future effects of climate change. Climate change reporting for Canterbury shows how average temperatures are likely to increase until at least 2090. A more restrictive recession plane reduces bulk at the boundary, reducing heat island effects and increasing opportunities for tree planning to reduce heating effects on dwellings.

The impact that limiting development capacity: 77J(3)(b)

As above, the Sunlight Access Qualifying Matter is limited to modifying Clause 12 of the MDRS density standards. Reporting testing this the building form outcomes has shown that about 96% of what MDRS would otherwise provide for is achievable under the qualifying matter.

It is noted that the qualifying matter is only seeking to modify the permitted standard. Any additional changes that Council is proposing to make recession planes more lenient under specific circumstances (see proposed HRZ controls) would still apply.

Council's feasibility model has assessed the impact of this qualifying matter at scale as previously described above.

Broader impacts of proposed qualifying matter: 77J(3)(c)

The Act directs how MDRS can be restricted using qualifying matters, including the implications at notification under s86BA. It states that:

(1) A rule in a proposed plan has immediate legal effect if the rule meets all of the following criteria:

(a) the rule is in an IPI prepared using the ISPP:

(b) the rule authorises as a permitted activity a residential unit in a relevant residential zone in accordance with the density standards set out in Part 2 of Schedule 3A:

(c) the rule does not apply to either of the following areas:

(i) a new residential zone:

(ii) *a qualifying matter area.*

…

As a result, MDRS density standards do not have immediate legal effect upon notification and operative zone controls will apply. Their legal status, including other density standards, will be dependent on s86F of the Act:

(1) A rule in a proposed plan must be treated as operative (and any previous rule as inoperative) if the time for making submissions or lodging appeals on the rule has expired and, in relation to the rule,—

(a) no submissions in opposition have been made or appeals have been lodged; or

(b) all submissions in opposition and appeals have been determined; or

(c) *all submissions in opposition have been withdrawn and all appeals withdrawn or dismissed.*

…

Changes made to Schedule 1 through the Enabling Housing Act mean that the Independent Hearing Panel can make decisions on elements of the plan change[11]. A possibility therefore exists that the IHP release an interim decision before the hearing concludes, to provide clarity to applicants and consenting staff.

However, generally, the operative Plan controls will prevail (subject to s86F). As shown earlier in reporting and the 2021 HBA update, Christchurch is in an advantageous position regarding the sufficiency of housing supply under current Plan controls, with many areas where medium density development able to be progressed near the city centre and other larger commercial centres. Between 2021 and 2022, approximately 75% of all building consents issued were for multi-unit developments – a continuing increase in multi-unit development over the last few years[12]. Together, this shows that in the absence of MDRS

[11] See Clause 100, Schedule 1 of the Resource Management Act 1991.

[12] Results were up from 2021, in which 62% of consents were for multiunit developments. See: https://ccc.govt.nz/culture-and-community/statistics-and-facts/built-environment-reporting/

applying upon notification, existing Plan settings are likely to be able to provide for an adequate degree of housing development before IHP recommendations on the IPI are released.

When MDRS and the Sunlight Access qualifying matter becomes fully operative, there is potential for a more commercially viable development framework to be in effect. Work completed by Motu Research[13] test the financial impacts of sunlight loss in a New Zealand housing market context. They show that features that block sunlight led to a loss in property values, with each hour of daily sunshine adding on average 2.4% to a dwelling's market value[14].

The example provided considered the effect of a multi-storey development on two houses, each valued at $1M, which block three hours of direct sunlight per day. From an economic perspective, this would result in $144,000 of property value loss across dwellings. Wider to the implications of scale MDRS development, the inverse is likely also true: better enabling sunlight access for new developments generates high values (returns to the developer) and better guarantees that prospective adjoining MDRS development do not further excessively reduce sunlight access.

At a parcel level, there could therefore be a positive economic benefit where greater sunlight access means units are more likely to sell, having greater returns to developers, and assisting in the transition to a more intensified urban form. Anecdotally, this appears true, with developers generally being in favour of oriented-adapted recession planes as it means they can better market northern facing units. A more restrictive recession plane also means greater chances for views, a value commonly associated with increased property values[15].

How modification to the MDRS are applied and the site-specific characteristics

The Sunlight Access QM will only modify the Clause 12 – height in relation to boundary – MDRS density standard. MRZ and HRZ have been used as the relevant residential zones and the QM will only apply to these zones.

Whereas other QMs are geographically isolated and captured in either area specific controls within the zone chapter, or within district-wide controls through Chapters 5 and 6, the vast scope of this QM means that it is more efficient and clearer to Plan users for this to simply apply within zone Build Form standards. No spatial layers will be required.

Area and site assessment

[13] Fleming, D., Grimes, A., Lebreton, L., Maré, D., Nunns, P. 2017. Valuing Sunshine. *Motu Working Paper 17-13, Motu Economic and Public Policy Research.*
[14] Authors acknowledge that the value is 'naturally context-specific' and may increase or decrease based on the likes of relative differences in climate, topography, city size, and incomes.
[15] Nunns, P. and Denne, T. 2016. The costs and benefits of urban development: A theoretical and empirical synthesis. Paper presented at the 2016 New Zealand Association of Economists Conference.

The analysis above has demonstrated how the area this qualifying matter influences is at a district-wide level, as it pertains to the latitude of Christchurch and its consequential differing sun plane. This means that the appropriate area that reflects this characteristic is all sites within relevant residential zones.

A geospatial analysis has been completed to summarise what the parcel make up is of residential parcels where MDRS would otherwise apply. This has been completed to address the site-specific characteristic assessment required under the Act to provide an overview of sites should be tested to be statistically representative of sites across Christchurch.

For MRZ sites, it shows that almost two-thirds of parcels are between 500 to 900m^2, with most being between 500 to 700m^2. Across the full MRZ extent, the average road frontage is about 21m in length. It is important to remember that Council is also proposing a Public Transport QM. This QM only reduces MRZ extent, reducing this by about 40,000 parcels, or about 31% of total parcels captured as relevant residential zones. Within the enabled area, the overall parcel size in MRZ is reduced by 15.4% to 886m^2.

HRZ parcel make-up is more diverse, with most (27%) being between 500m^2 to 700m^2, followed closely by parcels less than 300m^2 at about a quarter of all parcels (this demonstrates the uptake of RMD medium density to date). Across the fill HRZ extent, the average road frontage is about 20m in length.

Determining the effect of recession planes is governed by the site's width, dictating the ultimate building envelope that can be constructed. It is therefore important that development models use realistic site widths to determine the implications of the QM. To address this, a geospatial query has evaluated the frontages[16] of parcels outside of the QM extent. The results for various site sizes are as follows:

Medium Density	**Average road frontage**
Average Road Frontage in Medium Density (All Parcels)	20.3
Average Road Frontage in Parcels 700-900	20.4
Average Road Frontage in Parcels Greater than 900	19.9

[16] To avoid capturing accessways for rear lots, the analysis has ignored values less than 6 metres. The assessment has also only focused on larger sites that are commonly seen as being feasible to develop, ensuring results relate to real development situations.

High Density	Average road frontage
Average Road Frontage in High Density (All Parcels)	19.8
Average Road Frontage in Parcels 500-700	20.2
Average Road Frontage in Parcels 700-900	19.8
Average Road Frontage in Parcels Greater than 900	19.2

Overall, there is not a great degree of variation in average road frontages across the spectrum of site sizes that would likely be open to greater intensification. Broadly, an assumed frontage of 19m appears to be an appropriate test case. However, to ensure that that the sensitivity of provisions and analysis outputs are addressed, a lesser frontage is thought to be suitable, because a wider site is less constrained. It is also noted that 15m was a common dimension for sites, particularly those created before approximately 1970, and there are a very large number of these sites throughout the city.

So far in reporting, testing has focused on a hypothetical site of 750m^2 with a 15m frontage. As shown in the outcomes of the analysis above, this is a more restrictive site size than the typical parcel make-up of residential parcels. The outcomes of testing this site size still show the high degree to which MDRS development is achievable, indicating that testing according to the above is likely to result in a similar result.

Options to achieve the greatest heights and densities while managing specific characteristics: 77L(c)(ii)

Analysis of the capacity of different recession planes on a typical narrow development site has been carried out (Technical Report – Residential Recession Planes in Christchurch). This shows the results of testing 10 different scenarios, as summarised below:

Group	Scenario	Summary	Units	Floor space	% of MDRS
1	1	MDRS - 4m+60	7	735	100
	2	4m+60	7	735	100
	3	4m+60	7 (inc. 1 2-storey)	700	95
2	4	4m+50	7	735	100
	5	3m+50	7 (inc. 1 2-storey)	700	95
3	6	Variable – 4m+ 60-45	7 (inc. 1 2-storey)	700	95
	7	Variable – 3m+ 60-45	7 (inc. 1 2-storey)	670	91
	8	Variable – 3m+ 60-50	7 (inc. 1 2-storey)	700	95
4	9	RCC – 2.3m+ 65-50	7 (inc. 1 2-storey)	670	91

	10	RMD – 2.3m+ 55-35	7 2-storey, 1 1-storey	385	52

The purpose of this reporting was to test the suitability of operative District Plan controls and any other alternative, in terms of their ability to provide of an MDRS typology. It shows that operative controls are largely unsuitable to provide for an MDRS typology, especially for the RMD zone, which was only able to provide for 52% of what MDRS controls would otherwise provide for.

The above also shows the little influence dropping the MDRS recession plane angle by 10° has on development capacity, with Scenario 4 showing that 100% of an MDRS three storey typology can be constructed under a plane of 4m and 50°.

Scenario 8 was selected because:

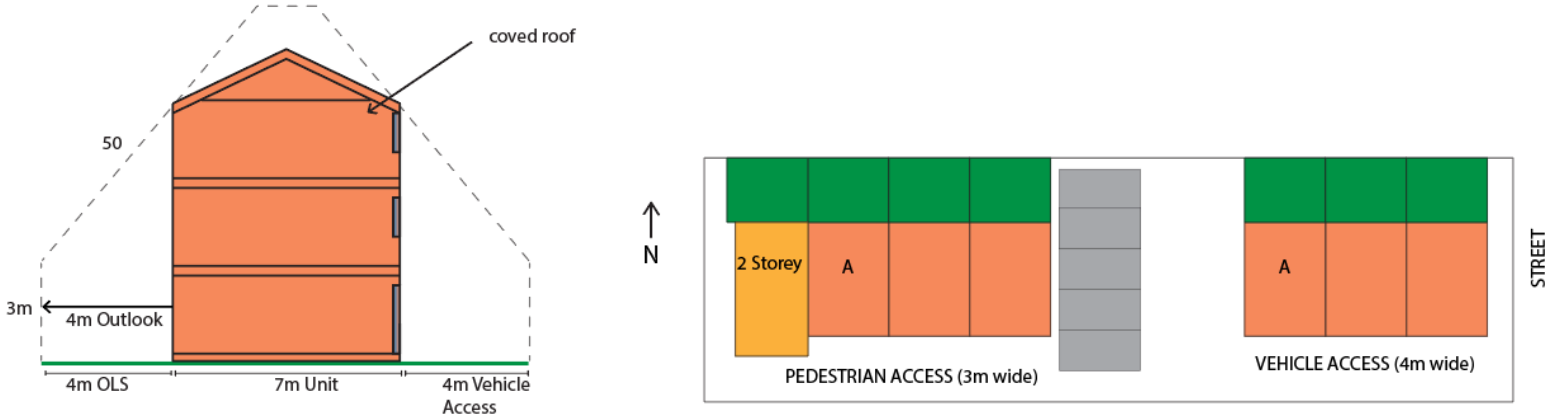
- It provides for a level of sunlight access in Christchurch similar to that in the upper north island cities for most site orientations.
- It has a relatively small impact on development capacity (for instance compared to scenario 7 or 9).
- It manages the impact from both two- and three-storey development in the winter months.

Reasonable practical options for provisions

The below considers options to address the intended outcome of the QM. As previous, existing Plan controls for RMD have shown not to provide for a three-storey typology and is therefore not reasonably practical.

OPTION 1 – Reducing all height and angle metrics: 3m and 50°

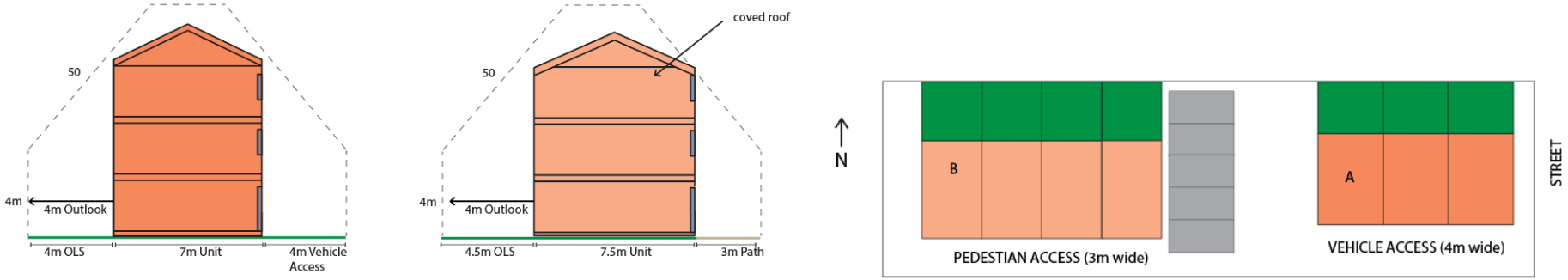
- In this option, height is reduced by 1m and the plane angle is reduced by 10° to increase sun exposure. The angle remains fixed, in a similar fashion to MDRS height in relation controls. This Option is scenario 5 in the above table.



Above: Development envelope showing a 3 storey unit and possible site layout on a typical development site

OPTION 2 – Reducing angle only: maintaining 4m and 50°. This is Option is scenario 4 in the above table.

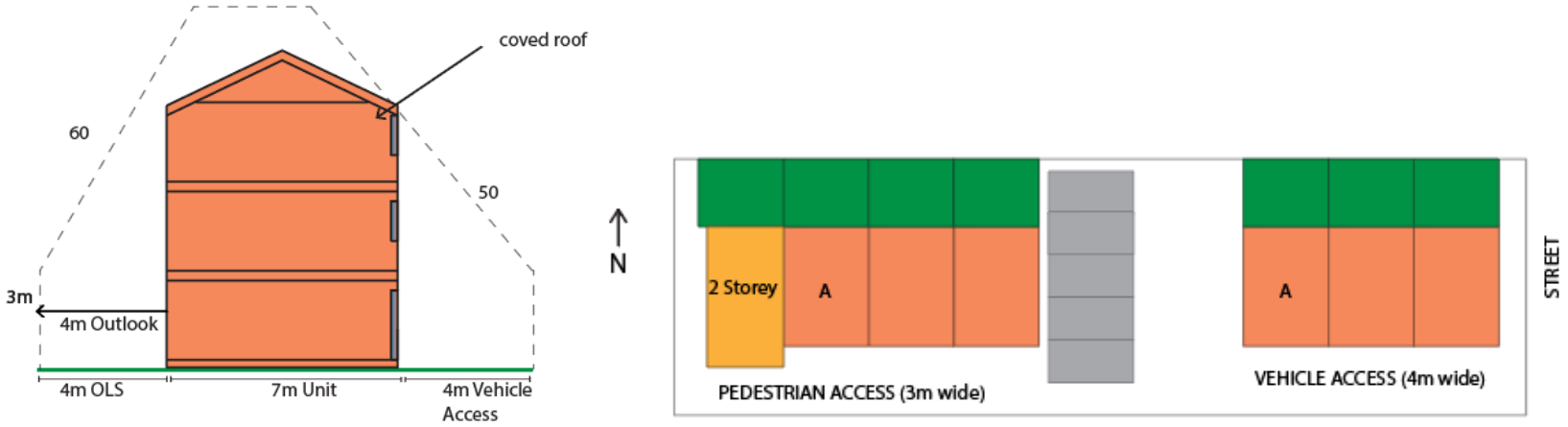
- In response to the outcomes of testing, the height of the plane is retained in this option, with a 10° drop in the plane. Again, this option affixes the angle.



Above: Development envelope showing options for 3 storey unit typologies and a possible site layout on a typical development site

OPTION 3 – Reducing height and introducing oriented-based approach: 3m and 60° at north, 55° at east/west, and 50° only along southern boundary

- The plane height is reduced by 1m and an oriented-based approach provides for an adaptive recession plane angle to respond to the relative importance of the building's aspect. Here, the east/west boundary angle is reduced by 5° and the southern boundary angle by 10°. No change is applied along the northern boundary, which is retained at 60°.



Above: Development envelope showing a 3 storey unit and possible site layout on a typical development site

Evaluation of options for provisions

The following provides an evaluation of the practical options to address the qualifying matter.

Option 1 – Reducing all height and angle metrics relative to MDRS

Benefits	**Appropriateness in achieving the objectives/ higher order document directions**
Environmental: This option is for a more restrictive recession plane that will increase sunlight access along boundaries and provide the greatest opportunity for increased sunlight along the northern plane. This will also increase the proxy setback that buildings need to be constructed to, vertically, ensuring greater opportunity to manage heat island effects and options for additional tree planting to manage increased heating effects anticipated as the climate changes in Canterbury.	Efficiency: Modifying the MDRS height to boundary control through modifying the height and angle will be more restrictive, which is less necessary on the northern boundary (because it does not affect the level of winter sun received). It is therefore less efficient than option 3. It may give rise to unnecessary resource consents, although the number of such consents is likely to be quite small because consent is expected to be required for a large proportion of medium density developments. Effectiveness: Reducing the height and plane angle of the recession plane is an effective means of improving sunlight access, as this influences both setback and building height. This has been shown to be an effective means of improving sunlight access to neighbouring housing units. The option still achieves 95% of capacity otherwise enabled by MDRS. In the scenario presented above, it enables 7 units on a site, which is comparable to MDRS, albeit one unit having 2 storeys rather than 3. In the context of Objective 2 in Schedule 3A of the enabling housing legislation, this option therefore provides for a variety of housing types and sizes that respond to needs and demand as well as the neighbourhood's planned urban built character. However, it is to a lesser extent than the alternatives on the basis that it is more restrictive.
Economic: New Zealand research shows that each extra hour of sunlight increases the value of property. This indicates the value that people place on sunlight access, and this option may therefore positively influence the feasibility of development on neighbouring sites, with greater returns possible on sites with certainty of better solar access; This option provides for sunlight access on each floor, including the ground floor,, increasing opportunities for vertical stacking of residential units with improved appeal.	
Social: Increasing sunlight access positively increases people's wellbeing, particularly in the winter. Providing a level of sunlight across each level of a residential unit ensures greater social equity across a building block, potentially reducing conflict.	
Cultural: While no direct cultural benefits have been considered, Ngāi tahū have expressed support for QMs that seek to reduce greenhouse gas emissions and respond to the current and future effects of climate change.	
Costs	

Environmental: No environmental costs have been identified.	
Economic: There is anticipated to be a reduction of the development capacity MDRS density standards would otherwise collectively provide for. Modelling shows that this may result in 7 units on a typical site, which is comparable to MDRS, albeit one unit having 2 storeys rather than 3. Three storey units are relatively uncommon in Christchurch at present, in part due to higher construction costs, so this reduction will not affect the majority of developments in the short term.	
Social: The proxy effect of this QM is that there will be no immediate legal effect of MDRS controls upon notification of the IPI. This potentially delays development in areas that may have otherwise seen development.	
Cultural: No cultural costs have been identified.	
Risk of acting/not acting: Not applying a Sunlight Access QM results in significant additional shading of neighbouring sites in Christchurch compared to cities in the upper north island. The impact depends on site orientation but can be an extra two months without ground floor sun for some sites (being almost half the year) and risks reducing community wellbeing and resilience to the current effects of climate change, increasing the potential for greenhouse gas emissions.	
Recommendation: This option is the most restrictive of those evaluated. It is effective but similar levels of sunlight access can be obtained by other options and as a result it is not the preferred option.	

Option 2 – Reducing plane angle only relative to MDRS

Benefits	**Appropriateness in achieving the objectives/ higher order document directions**
Environmental: This option is less effective than option 1 because it does not manage the effects from two storey units, which could still be placed 1m from the boundary where they would create significant shading impacts.	Efficiency: This option is the least restrictive of the three options, but does not manage the issue for the majority of developments anticipated. As a result it is not the most efficient option. Effectiveness: This option is not effective because it does not manage the issue of shading for the majority of developments anticipated. In the context of Objective 2 in Schedule 3A of the enabling housing legislation, this option therefore provides for a variety of housing types and sizes that respond to needs and demand as well as the neighbourhood's planned urban built character. However, it is not effective at managing shading effects on neighbouring properties.
Economic: Benefits would be similar to option 1.	
Social: Benefits would be similar to option 1 but the option is less effective because it would only manage the impact from three storey buildings (and would not manage the impact from two storey units which are more common in Christchurch at present).	
Cultural: While no direct cultural benefits have been considered, Ngāi tahū have expressed support for QMs that seek to reduce greenhouse gas emissions and respond to the current and future effects of climate change.	
Costs	
Environmental: Shading effects will arise from two storey units, which could be 1m from the boundary.	
Economic: There is anticipated to be a level of capacity comparable to MDRS density standards with a similar amount of floorspace.	
Social: The proxy effect of this QM is that there will be no immediate legal effect of MDRS controls upon notification of the IPI. This potentially delays development in areas that may have otherwise seen development.	

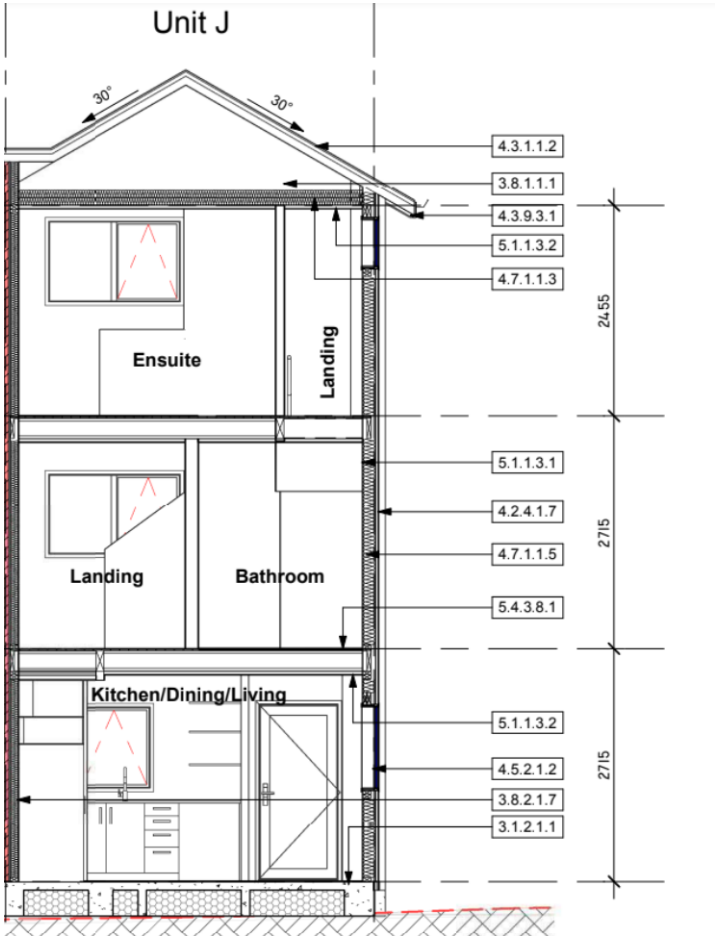
Cultural: No cultural costs have been identified.	
Risk of acting/not acting: Not applying a Sunlight Access QM results in significant additional shading of neighbouring sites in Christchurch compared to cities in the upper north island. The impact depends on site orientation but can be an extra two months without ground floor sun for some sites (being almost half the year) and risks reducing community wellbeing and resilience to the current effects of climate change, increasing the potential for greenhouse gas emissions.	
Recommendation: It is not recommended to proceed with Option 2 because it would be ineffective at addressing the QM for two storey developments.	

Option 3 –Reducing height and introducing oriented-based approach relative to MDRS

Benefits	**Appropriateness in achieving the objectives/ higher order document directions**
Environmental: This option preserves the most of the environmental benefits outlined in option 1 and achieves a similar level of solar access to upper North Island cities. Whilst the recession plane angles are reduced for some boundary orientations, they are tailored to that orientation.	Efficiency: Modifying the MDRS height to boundary control through modifying the plane will be adapt the plane in a way similar to the operative Plan method, only applying a more restrictive angle over orientations with greatest sun exposure, thereby increasing efficiency of land use. Effectiveness: Reducing the plane angle is an effective means of improving sunlight access, as this influences both setback and building height. This has been shown to be the most effective means of improving sunlight access Taking into account the orientation of the site. The option still achieves 95% of capacity otherwise enabled by MDRS. It enables 7 units on a site, which is comparable to MDRS, albeit one unit having 2 storeys rather than 3.
Economic: Benefits would be similar to option 1 as a similar scale of access is provided.	
Social: Benefits would be similar to option 1.	

Increasing sunlight access positively increases people's wellbeing. Providing a level of sunlight across each level of a residential unit ensures greater social equity across a building block, potentially reducing conflict.	This option effectively manages the issue of sunlight access to neighbouring units of the expected (planned) typologies, and reduces capacity only where necessary. In the context of Objective 2 in Schedule 3A of the enabling housing legislation, this option therefore provides for a variety of housing types and sizes that respond to needs and demand as well as the neighbourhood's planned urban built character.
Cultural: While no direct cultural benefits have been considered, Ngāi tahū have expressed support for QMs that seek to reduce greenhouse gas emissions and respond to the current and future effects of climate change.	
Costs	
Environmental: No environmental costs have been identified.	
Economic: There is anticipated to be a small reduction of the development capacity MDRS density standards would otherwise collectively provide for, but less than for option 1. Modelling shows that this may result in 7 units on a typical site, which is comparable to MDRS, albeit that sometimes (depending on site orientation) one unit may be reduced to 2 storeys rather than 3.	
Social: The proxy effect of this QM is that there will be no immediate legal effect of MDRS controls upon notification of the IPI. This potentially delays development in areas that may have otherwise seen development.	
Cultural: No cultural costs have been identified.	
Risk of acting/not acting: Not applying a Sunlight Access QM results in an extra two months of shaded area associated with complying MDRS units and risks reducing community wellbeing and resilience to the current effects of climate change, increasing the potential for greenhouse gas emissions.	
Recommendation: Option 3 provides more capacity than option 1 and is more effective than option 2 at managing the issue of shading, in a wider range of circumstances. It is therefore considered the most efficient and effective option and it is recommended to progress with Option 3 to address the Sunlight Access QM.	

Appendix 1 – Three storey consented examples

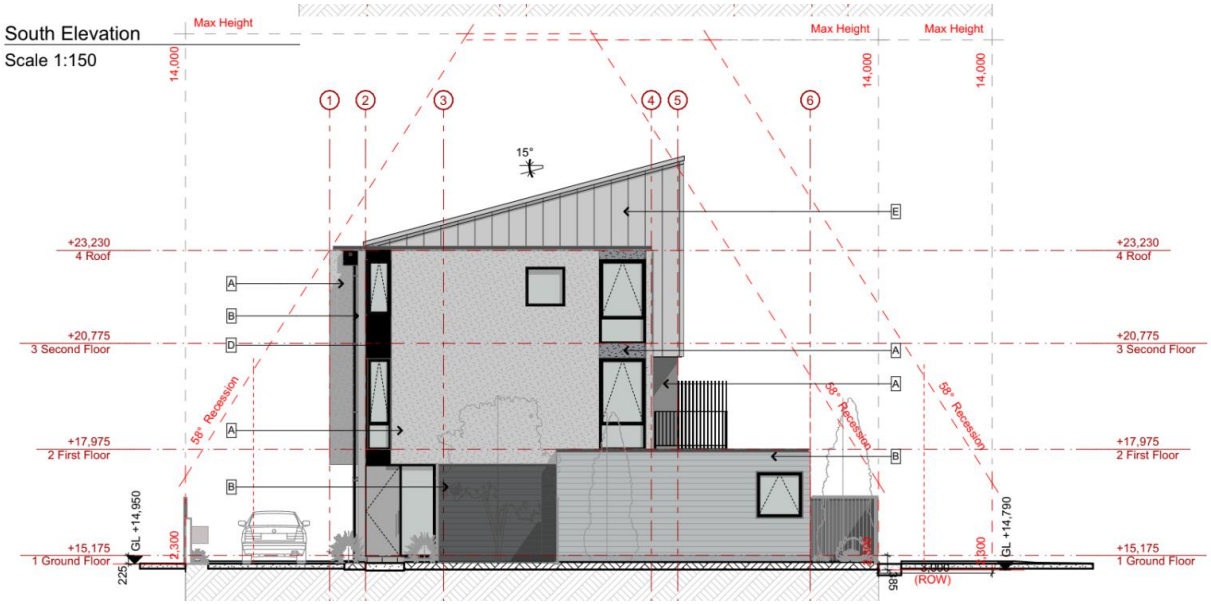


RMA/2021/2644 – 338-342 Cashel Street – Williams Corporation

Floor separations are: 2.715 – 2.715 – 2.455 (excludes ceiling)

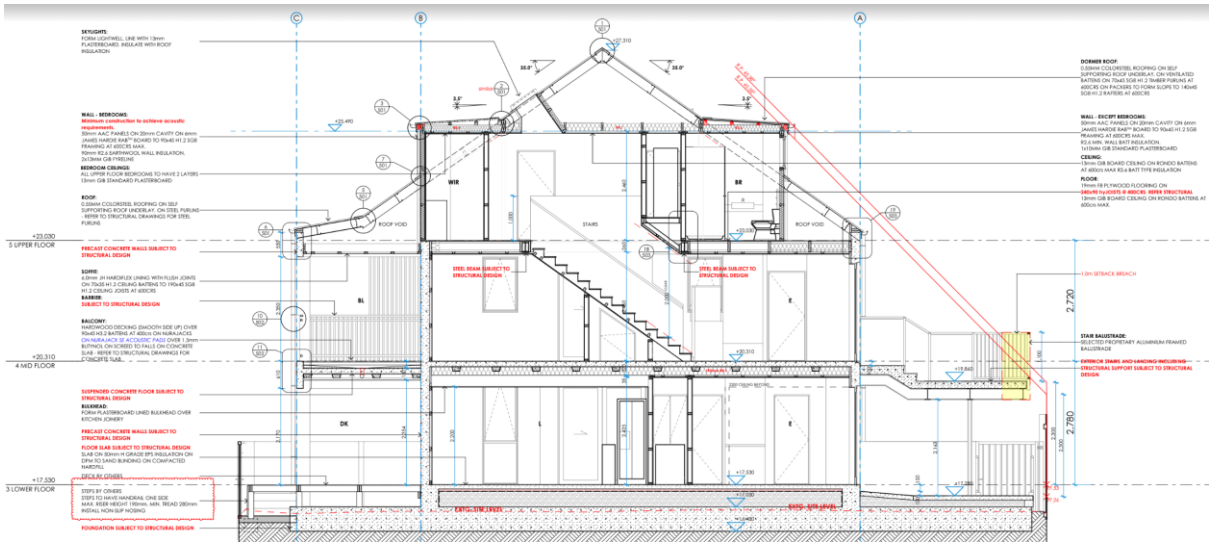
RMA/2021/3144 – 7 Spencer Street – Williams Corporation

Floor separations are: 2.715 – 2.455 (excludes ceiling) – 2.715



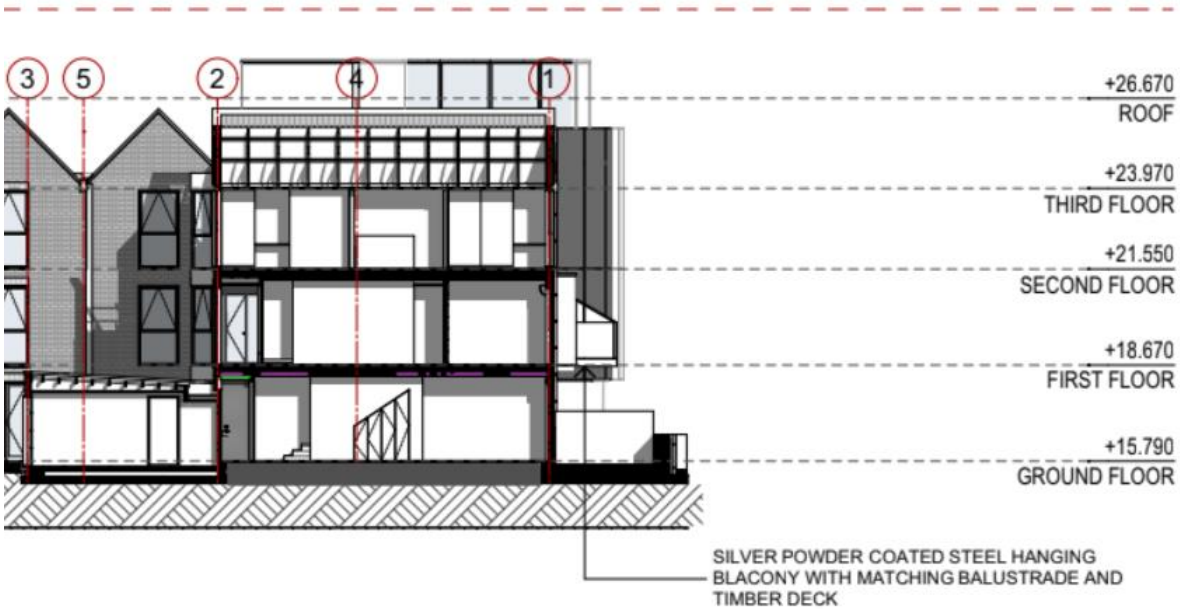
RMA/2021/4202 – 240 Worcester Street – 240 Ltd

Floor separations are: 2.8 - 2.8 - 2.445 (excludes ceiling)



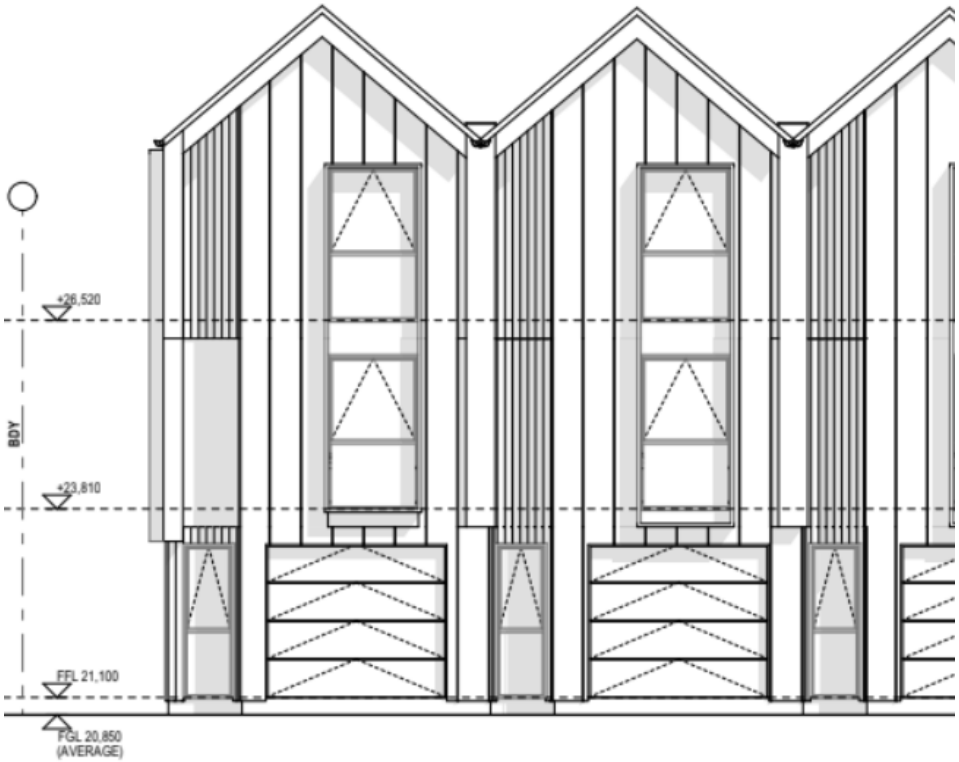
RMA/2019/1746 – 27 Carlton Mill Road – Aria Apartments Limited

Floor separations are: 2.72 – 2.72 – [ceiling height not stated]



RMA/2021/2180 – 33 Kilmore Street - Cranmer Gardens Limited

Average= 2.72m for each floor. Floor separations are: 2.88 – 2.88 – 2.42 – 2.7



Block A - South Elevation

SCALE: 1:100@A1

RMA/2021/4173 – 16-20 Church Square - Growcott Freer Property

Floor separations are: 2.71 – 2.71 – [top ceiling not stated]