SECTION 1.0

EXECUTIVE SUMMARY

1.1 INTRODUCTION

This report demonstrates a multi-faceted, multi-disciplinary approach to determining viability of a multi-family affordable housing development for 100 Palliser Lane, Canmore, AB (located in sub-area 5 of the Palliser District). Our team approached the conceptual planning for the site through performance-based strategies, focusing on multiple performance factors, including cost, energy, greenhouse gas emissions, occupant comfort (defined by level of solar radiation, views, obstructions, and shadowing), and the level of alignment with local area policies and bylaws.

This approach allowed the team to be considerate of sustainability and fiscal responsibility to inform a potential investment by Canmore Community Housing into , but to illustrate the vitality and overall life span of the building through its operational lifecycle. Performance goals were informed by the Draft Area Structure Plan (ASP) for the Palliser district, a review of the Canmore Land Use Bylaw, and in discussions with Canmore Housing Corporation to identify applicable policies and organizational goals.

As a first step, the integrated team of architects, engineers, energy management experts, and sustainability professionals investigated a variety of massing models which were then narrowed down to two (2) scenarios. These scenarios were further assessed to identify urban design and architectural solutions, best aligned with policies and bylaws, while determining the operational and embodied carbon goals that would best align with funding/financing programs while informing potential updates to land use designations and the draft ASP.

Funding opportunities evaluated included provincial and federal grants and/or financing programs, all with differing performance targets associated with capital funding/financing in terms of energy, emissions, accessibility, and affordability. As a result of this analysis, three unique sets of performance focused building specifications (ie: envelope assemblies, windows, heating, cooling, and ventilation systems, and on-site power generation) were developed to inform a costing exercise and to illustrate the pathways to formulating a sustainability-focused financial strategy. Secondly, these pathways represent the level of optionality CCH or any other builder in the Palliser district may have in fully aligning with the current goals of the draft ASP.

In addition to the performance-based approach to analysis, more typical site, architectural and community categories were also assessed including: unit orientations, potentials for amenity space (indoor and outdoor), relationship to neighboring buildings and street frontage, parking and alternate modes of transportation, ease and efficiency of construction, and capacity to adhere to Section 11 of the Land Use Bylaw, etc.

Informed by the above noted assessment, the following are conclusions and recommendations to support CCH in developing a strategy to develop affordable housing in the Palliser district.

1.2 OVERALL RECOMMENDATION

Outlined in the key points below, Option B is the most aligned with the goals identified by Canmore Community Housing. Option B:

1. Accommodate the number of units targeted including the unit mix [164 units, 20 Studio, 84 1-Bedroom, 50 2-Bedrooms and 10 3-Bedrooms], slightly beyond the Maximum density in the ASP [150 units]
2. Integrate 20% [33 units] of universally designed units in alignment with the goals of the CMHC Co-Investment Fund;
3. Align with the performance goals of each of the potential incentive/financing programs, contingent on additional detailed energy performance analysis and cost/benefit analysis to evaluate whether incremental performance goals are justified by the incremental net-costs;

1.3 ENERGY PERFORMANCE: PATHWAYS TO UNLOCKING FUNDING AND PROVIDING FLEXIBILITY FOR AFFORDABLE HOUSING DEVELOPMENTS IN THE PALLISER DISTRICT

Both massing options have similar level of overall performance in comparison to the criteria noted above, however, compact massing is always preferred over multi-object massing to retain the envelope thermal bridging, which is also consistent with efficiency of construction; one building typology on site provides greater ease and efficiency of sequencing.

Out of the nine (9) energy performance targets evaluated (from energy code compliance on the low end to alignment with the near net-zero target of the draft ASP) , four (4) can be tackled with reasonable cost premiums, contributing to up to a 25% reduction in energy consumption from the National Energy Code for Buildings. This aligns with the performance targets outlined in the Mortgage & Housing Corporation's MLI Select and/or Co-Investment Program. This is costed as performance specification 1.

The ASP definition of near-net zero presents a challenge to developments, where, a Step 4 target (60% reduction from code) significantly limits the pathways a project can take address the target. Gas fired heating is no longer an option, significant investments in high performance ventilation is required, and projects would need to invest heavily in on-site solar. The fewer the pathways achieving a performance goal the greater the cost premium. This scenario was not costed but would be informed by third performance tier costed by Altus in addition to the integration of a 170 kW solar PV system, at an estimated cost of approximately $425,000. For both options, the roof areas exhibit substantial potential for solar power generation.

As a mid-tier of performance specifications, these specifications were developed to explore the pathway for defining a more applicable, recognized, and commonly used green building standard of near-net zero or net-zero ready. The Zero Carbon Buildings Standard is a national reference with a large body of

practice to support it and looks at embodied carbon, total energy use, and the airtightness of a building, to ensure a Balanced Approach to addressing energy efficiency and carbon reductions.

Taking a balanced approach that focuses on a high-performance envelope and energy efficient approaches to heating, cooling, and ventilation ensures a building is enabled to invest, over time, in achieving a net-zero energy and emissions target. That is, as on-site generation like solar PV reduce in costs, or grants/incentives can be secured, housing developments ready to integrate power generation over time.

Utilizing natural gas-based heating systems will impact the ability to achieve alignment with funding programs, while fully limiting the ability to align with the definition of near net-zero in the ASP. As an alternative to natural gas, electrically driven, heat pump based mechanical systems will likely generate the greatest optimality in terms of pathways to unlocking funding, financing and a nationally recognized definition of near net-zero (energy).

As per the above, the costing that was carried out (included in the report) utilized the following recommended performance specifications for both massing Options:

1. Performance Level 1 Assembly (Up to 25% improvement from Code) : R15 Walls, R30 Roof, R3 Windows (high-efficiency double pane), 30% window to wall ratio, standard foundations, 4-Pipe fan coil terminal units for each unit, heat recovery ventilation unit, 80% efficient boiler and a chiller unit.
2. Performance Level 2 Assembly (Net Zero Ready / 40% improvement from Code): R30 Walls, R50 Roof, R5 Windows (high-efficiency, triple pane), 30% window to wall ratio, standard foundations, 4-Pipe fan coil terminal units for each unit, heat recovery ventilation unit, 80% efficient boiler and a chiller unit.
3. Performance Level 3 Assembly (Near Net Zero/60% improvement from Code): R30 Walls, R50 Roof, R5 Windows (high-efficiency, triple pane), 30% window to wall ratio, standard foundations, 4-Pipe fan coil terminal units for each unit. In this case, we would replace the heating/plant with a central air source heat pump plant.

1.4 MASSING AND OCCUPANT COMFORT CONSIDERATIONS

Both massing options can achieve a minimum of 70% of daylight access to the residential suites but also yield excessive glare across the year on 20% of the residential suites. This analysis was conducted without any assumption of balconies which will ultimately mitigate this condition.

Massing Option B performs slightly better than Option A in terms of providing a less obstructed view from the neighbors. Within both options, approximately 30% of the units of the neighboring buildings have windows with at least 25% obstructed views.

By evaluating 60 different time conditions for each option, we found that option B provides less shadow coverage compared to option A. The simulation reveals that option B casts shadows on neighboring buildings in a more randomized pattern, reducing the overall shadow coverage by 15 percent. This results in a more favorable light distribution and less overall shadowing effect.

Through the division of the main building into 2 separate blocks in option B we are able to split the massing into a 4-storey building and 6-storey building which step down the hill and ultimately generate a higher unit density. Option A is less slope adaptive in nature but creates more of a wall to the highway for the overall community.

When considering occupant comfort and noise, Option A approaches close to 50% of the units facing directly on the highway, while Option B reduces this percentage to 25%

While Street frontage in Option A presents itself as a better urban interface it excludes the main building from interaction with its neighboring buildings, Option B has greater potential to weave all units into the fabric of the street and community as well as the overall amenities.

1.5 ASSESSMENT OF CONCEPTUAL DESIGN OPTIONS

	Owner Requirements	ASP Alignment	Section 11 of the Land Use Bylaw (Architectural and Urban Design Standards)	Unit Cost ($/door) *May require updates	Building Energy Performance Alignment with Funding Programs	Construction Efficiency	Other Performance Criteria (Views, Shadow, Occupant Comfort)	Future Flexibility through Universal Design
OPTION A	✓✓✓	✓✓	✓✓ Building should be design to be attractive from all directions (11.6.2.5). A single building form presents a challenge to this guideline, creating a wall and fronting 50% of units on highway.	$$$	Both building massing options represent multiple pathways to achieving alignment with performance goals outlined in all funding programs.	Reduced efficiency due to the townhomes being a different mass and form.	Views Shadow ✓✓ Occupant comfort	
OPTION B	✓✓✓	✓✓	✓✓✓ Reduction in massing due to two buildings (Section 11.6.3) while also reducing unit count exposed to highway (25%)	$$	Both building massing options represent multiple pathways to achieving alignment with performance goals outlined in all funding programs.	Due to increased efficiency in replicating floor plate between two buildings.	Views Shadow ✓✓✓ Occupant comfort	