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MÉTIS HOUSING NEED IN BC COSTING MODEL REPORT

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RÉSUMÉ

La Nation métisse de la Colombie-Britannique (NMCB) vise à réduire de 50 % sur cinq ans les besoins impérieux en matière de logement (BIL) des Métis dans la province. À cette fin, la NMCB entreprend une stratégie de recherche à plusieurs phases pour mesurer les progrès vers l'atteinte de son objectif. Elle vise aussi à élaborer des options, des initiatives et des programmes stratégiques fondés sur des données. Le présent rapport résume les résultats de la partie 2A de la phase 2 de cette stratégie et répond aux questions de recherche suivantes :

1. Combien en coûterait-il pour réduire les BIL des Métis de 50 % en Colombie-Britannique?
2. Quelles sont les interventions les moins coûteuses pour réduire de 50 % les BIL des Métis?
3. Combien en coûterait-il pour combler l'écart entre les Métis ayant des BIL et des populations non autochtones comparables?

Nous avons établi le coût de diverses interventions stratégiques. Nous avons comparé quatre scénarios qui réduisent de 50 % les BIL des Métis en Colombie-Britannique et un scénario qui comble l'écart des besoins en matière de logement entre les Métis et des populations non autochtones comparables. Ces scénarios sont présentés dans le tableau ES.1.

Chaque scénario présente efficacement le coût d'une option stratégique unique pour atteindre l'objectif global de la NMCB. Dans la plupart des scénarios, le nombre de ménages métis qui n'ont plus de BIL est le même : 3 440 ménages. Ce qui diffère, c'est le type de ménages ciblés et le coût total de l'initiative. Par exemple, le scénario 4 priorise les ménages qui éprouvent les trois types de besoins (c.-à-d. qui ont des BIL et qui ont un logement en deçà des trois normes). Le scénario 4 est une option stratégique plus coûteuse que le scénario 2. Il accorde la priorité aux ménages qui pourraient éprouver les plus graves BIL, même si une intervention plus coûteuse est nécessaire pour les aider à les surmonter. La valeur fondamentale de la NMCB, Kaa-Wiichihitoyaahk (nous prenons soin les uns des autres), peut servir de principe directeur à l'examen de ces options.

ES.1 : Coût total de la réduction des BIL des Métis selon différents scénarios

Scénario	Contrainte	Coût total (\$)	Nombre de ménages métis dont les BIL seraient comblés
1	Réduire de 50 % les BIL des Métis tout en veillant à ce que le nombre de ménages dans chaque catégorie de besoin soit également réduit de 50 %.	18 807 028	3 440
2	Réduire de 50 % les BIL des Métis	14 256 290	3 440
3	Réduire de 50 % les BIL des Métis tout en veillant à réduire de 50 % les BIL des Métis dans chaque région de la NMCB.	15 323 308	3 440

4	Réduire de 50 % les BIL des Métis et combler les BIL de tous les ménages occupant un logement en deçà des trois normes.	40 056 652	3 440
5	Comblent l'écart régional entre les BIL des ménages métis et des ménages non autochtones.	896 361	241

Selon la définition de la Société canadienne d'hypothèques et de logement (SCHL), un ménage a des BIL s'il répond à deux critères : i) le logement ne répond pas aux normes d'abordabilité (le ménage consacre plus de 30 % de son revenu avant impôt aux frais de logement), de qualité (il nécessite des réparations majeures) ou de taille (il n'y a pas assez de chambres compte tenu de la taille et de la composition du ménage); ii) le ménage devrait consacrer plus de 30 % de son revenu avant impôt pour accéder à un logement local conforme aux trois normes (SCHL, 2019). Ce rapport porte exclusivement sur les ménages métis ayant des BIL. Autrement dit, nous ne fournissons pas d'estimations pour les ménages de Métis qui ont un logement en deçà des normes d'abordabilité, de qualité ou de taille, mais qui pourraient consacrer tout au plus 30 % de leur revenu avant impôt pour accéder à un logement local qui respecte les trois normes. Dans le présent rapport, un ménage métis est considéré comme un ménage privé dans lequel au moins une personne du ménage s'identifie comme Métis.

Nous différencions davantage l'expérience des ménages ayant des BIL selon le type de besoin. Par exemple, nous désignons un ménage qui vit dans un logement de qualité insuffisante et qui a des BIL comme ayant un besoin lié à la qualité convenable. Nous désignons un ménage qui vit dans un logement de taille insuffisante et qui a des BIL comme ayant un besoin lié à la taille convenable. Nous pouvons donc estimer les coûts des interventions uniques qui redressent chaque type de norme de logement.

Nous utilisons une approche d'optimisation limitée pour estimer le coût de la réduction des BIL des Métis selon plusieurs critères. L'optimisation limitée est une méthode qui détermine le moyen le plus rentable d'atteindre des cibles précises (par exemple, une réduction de 50 % du nombre de ménages métis ayant des BIL en Colombie-Britannique et la satisfaction des contraintes ou limites supplémentaires imposées). L'approche d'optimisation limitée exige des estimations du nombre de ménages métis ayant des BIL selon le type de besoin. Elle exige aussi des estimations du coût par intervention pour répondre à ces besoins. Nous utilisons une totalisation personnalisée tirée du Recensement de la population de 2021 (Statistique Canada, 2023a) pour estimer le nombre de ménages métis dans chaque catégorie de besoin en matière de logement. Nous estimons les coûts des interventions à l'aide de l'Enquête sur les besoins en matière de logement de la NMCB, des estimations des coûts de construction compilées dans la base de données RSMMeans de Gordian (Gordian, 2023a) et des plafonds de revenu déterminant les besoins impérieux de la SCHL (PRBI; SCHL, 2023).

Dans le présent rapport, nous considérons que l'intervention visant à répondre aux besoins d'un ménage en matière d'abordabilité est un transfert annuel en espèces qui compense ses frais de

logement. Le coût moyen des interventions liées à l'abordabilité pour les ménages métis en Colombie-Britannique est de 4 419 \$. La construction de logements de taille convenable répond au besoin d'un logement de taille convenable d'un ménage propriétaire. Un transfert annuel en espèces permet à un ménage locataire de louer un logement abordable de taille convenable qui répond à son besoin en matière de taille. Nous estimons qu'une habitation neuve construite de façon ponctuelle à un prix moyen de 1 456 325 \$ répondrait au besoin en matière de taille d'un ménage métis propriétaire en Colombie-Britannique. Un transfert moyen de 7 823 \$ par année répondrait au besoin en matière de taille d'un ménage métis locataire en Colombie-Britannique. Enfin, les réparations au logement d'un ménage répondent à son besoin de qualité convenable. Nous estimons qu'en moyenne, des réparations de 8 788 \$ à 8 819 \$ seraient nécessaires pour répondre au besoin lié à la qualité convenable d'un ménage métis en Colombie-Britannique.

EXECUTIVE SUMMARY

Métis Nation British Columbia (MNBC) aims to reduce Métis core housing need in British Columbia by 50% over five years. To this end, MNBC is undertaking a multi-phase research strategy to measure progress toward its goal and to develop data-driven policy options, programs, and initiatives. This report summarizes the results of Phase 2 Part 2A of this strategy, and answers the following research questions:

1. What would it cost to reduce Métis core housing need in British Columbia by 50%?
2. What are the lowest cost interventions to reduce Métis core housing need by 50%?
3. What would it cost to close the gap between Métis core housing need and comparable non-Indigenous populations?

We cost various policy interventions and compare four scenarios that reduce Métis core housing need in British Columbia by 50% and one scenario that closes housing need gaps between Métis and comparable non-Indigenous populations. These scenarios are presented in Table ES.1.

Each scenario effectively presents the cost of a unique policy option to reach MNBC’s overarching goal. For most of the scenarios, the number of Métis households that are no longer in core housing need is the same: 3,440 households. What differs is which households are targeted and the total cost of the initiative. For example, Scenario 4 prioritizes first those households that are experiencing all three “types of need” (i.e., they are in core housing need and below all three housing standards). Scenario 4 is a more costly policy option than Scenario 2 because it prioritizes reaching households that could be in the most severe form of core housing need, even if supporting these households out of core housing need requires a more costly intervention. MNBC’s core value, Kaa-Wiichihitoyaahk (we take care of each other) can serve as the guiding principle in considering these options.

ES.1: Total Cost of Reducing Métis Core Housing Need Under Different Scenarios

Scenario	Constraint	Total Cost (\$)	Métis households no longer in Core Housing Need (#)
1	Reduce Métis core housing need by 50% while ensuring the number of households in each type of need is also reduced by 50%	18,807,028	3,440
2	Reduce Métis core housing need by 50%	14,256,290	3,440
3	Reduce Métis core housing need by 50% while ensuring Métis core housing need in each MNBC region is also reduced by 50%	15,323,308	3,440
4	Reduce Métis core housing need by 50% and remove from core housing need all households experiencing all three “types of need”	40,056,652	3,440
5	Close the regional core housing need gaps between Métis households and non-Indigenous households	896,361	241

As defined by the Canada Mortgage and Housing Corporation (CMHC), a household is deemed to be in core housing need if it meets two criteria: (i) it falls below standards for housing affordability (the household spends more than 30% of its pre-tax income on shelter costs), housing adequacy (the household's dwelling is in need of major repairs), and/or housing suitability (there are not enough bedrooms for the size and composition of the household), and (ii) if the household would need to spend more than 30% of its pre-tax household income to access local housing that meets all three standards (CMHC, 2019). This report is focused exclusively on Métis households in core housing need. In other words, we do not provide estimates for Métis households that are below standards for housing affordability, adequacy, and/or suitability, but that would not need to spend more than 30% of their pre-tax household income to access local housing that meets all three standards. In this report, a Métis household is defined as a private household in which at least one household member self-identifies as Métis.

We further differentiate the experiences of households in core housing need by "type of need." For example, we refer to a household that is below at least adequacy standards and in core housing need as being in "adequacy need," and a household that is below at least suitability standards and in core housing need as being in "suitability need." This allows us to estimate the costs of the unique interventions that redress each type of housing standard.

We use a constrained optimization approach to estimate the cost of reducing Métis core housing need according to several criteria. Constrained optimization is a method that determines the most cost effective way of achieving specific targets, such as, for example, a 50% reduction in the number of Métis households in core need in BC, and ensuring any additional constraints or limitations imposed are satisfied. The constrained optimization approach requires estimates of the number of Métis households in core housing need by type of need and estimates of the cost per intervention to address these needs. We use a custom tabulation from the 2021 Census of Population (Statistics Canada 2023a) to estimate the number of Métis households in each type of housing need. We estimate the costs of interventions using the MNBC Housing Needs Survey, construction cost estimates compiled in Gordian's RSMMeans data base (Gordian 2023a), and CMHC's core housing need income thresholds (CNIT; CMHC 2023).

In this report, we consider that the intervention to address a household's affordability need is an annual cash transfer that offsets its shelter costs. The average cost of affordability need interventions for Métis households in British Columbia is \$4,419. New construction of suitable housing addresses the suitability need of an owner household. An annual cash transfer allowing a renter household to affordably rent suitable housing addresses a renter household's suitability need. We estimate that a one-time average new residential construction of \$1,456,325 would satisfy the suitability need of a Métis owner household in British Columbia and that an average transfer of \$7,823 per year would address the suitability need of a Métis renter household in British Columbia. Finally, repairs to a household's dwelling address their adequacy need. We estimate that an average of between \$8,788 and \$8,819 in repairs would be required to address the adequacy need of a Métis household in British Columbia.

1.0 INTRODUCTION

1.1 BACKGROUND

As defined by the Canada Mortgage and Housing Corporation (CMHC), a household is deemed to be in core housing need if (i) it falls below standards for housing affordability (the household spends more than 30% of its pre-tax income on shelter costs), housing adequacy (the household's dwelling is in need of major repairs), and/or housing suitability (there are not enough bedrooms for the size and composition of the household), and (ii) if the household would need to spend more than 30% of its pre-tax household income to access local housing that meets all three standards (CMHC, 2019).

Métis Nation British Columbia (MNBC) aims to reduce Métis core housing need in British Columbia by 50% over five years. To measure progress towards this goal and to develop data-driven policy options, programs, and initiatives, MNBC is undertaking a multi-phase research strategy. This research strategy is summarized in Table 1.1.

Table 1.1: MNBC's Multi-Phase Research Strategy

Timeframe		Objectives
Phase 1	Housing Needs Assessment	Collect data and conduct preliminary analysis to understand Métis core housing need in BC at the regional, household, and individual levels.
Phase 2	Part 1	<ul style="list-style-type: none"> • Determine the key determinants of Métis core housing need in BC. • Determine the mechanisms by which determinants drive core housing need (by GBA+ category where appropriate). • Analyze the interdependence between core housing need indicators (affordability, adequacy, and suitability).
	Part 2A	<ul style="list-style-type: none"> • Determine the cost of achieving MNBC's goal of reducing Métis core housing need in BC by 50% under different scenarios and subject to various constraints. • Determine the cost of reducing Métis core housing need relative to comparable non-Indigenous populations.
	Part 2B	<ul style="list-style-type: none"> • Develop data-driven housing support program guidelines and eligibility criteria for two MNBC housing support programs.

In Phase 1, we benchmarked the proportion of Métis in British Columbia living in core housing need in 2021. This baseline was established through the design and enumeration of the MNBC Housing Needs Survey and subsequent analysis of Métis housing affordability, adequacy, and suitability rates at the provincial, regional, household, and individual levels. The MNBC Housing Needs Survey was enumerated in 2021 by convenience sampling, collecting 2,059 complete responses.¹ The analysis in Phase 1 provided MNBC with preliminary information on the state of Métis core housing need in British Columbia, which is summarized in [The Voice of Métis: Housing Needs Assessment](#), a report produced for MNBC (Big River Analytics, 2022).

In Phase 2 Part 1, we used data collected through the MNBC Housing Needs Survey to dig deeper into the determinants of housing need for Métis in British Columbia, the mechanisms through which these determinants drive housing need, and the relationships between housing affordability, adequacy, suitability, and core housing need. The insights documented in this report contribute to our understanding of the best possible avenues to address core housing need for Métis in British Columbia.

Finally, this report presents the results of Phase 2 Part 2A, in which we cost various policy interventions and compare different pathways to reducing Métis core housing need in British Columbia by 50%. More specifically, our research objectives in Phase 2 Part 2A are to produce evidence-based cost estimates for MNBC to inform its policy, programming, and service development in the efforts of reducing Métis core housing need in British Columbia by 50%.

In short, this report answers the following research questions:

1. What would it cost to reduce Métis core housing need in British Columbia by 50%?
2. What are the lowest cost interventions to reduce Métis core housing need in British Columbia by 50%?
3. What would it cost to close the gap between Métis core housing need and comparable non-Indigenous populations?

1.2 APPROACH

This report is focused on Métis households in British Columbia in core housing need. A household is in core housing need when it is below affordability, suitability, and/or adequacy standards **and** it would have to pay 30% or more of its before-tax income to pay the median rent of local acceptable housing. We differentiate the experiences of households in core housing need by “type of need.” For example, we refer to a household that is below at least adequacy standards and in core housing need as being in “adequacy need,” and a household that is below at least suitability standards and in core housing need as being in “suitability need.” This allows us to estimate the costs of interventions that address each type of housing standard. Additionally, following

¹ Convenience sampling is a method of collecting survey responses by approaching individuals that are conveniently available in a particular location, internet service, or membership list (Stratton 2021).

Statistics Canada's definition of core housing need (2021a), certain households are not assessed for core housing need.² Appendix B2 provides a complete definition of core housing need and how it is implemented in this report.

We use a constrained optimization approach to estimate the cost of reducing Métis core housing need according to several criteria. In total, we present the results for five constrained optimization scenarios. Constrained optimization is a method that determines the most cost effective way of achieving specific targets, such as, for example, a 50% reduction in the number of Métis households in core need in BC, subject to a set of constraints. Appendix B7 provides a thorough description of our constrained optimization method. In our case, the constrained optimization approach requires estimates of the number of Métis households in core housing need by type of need (affordability, suitability, or adequacy) and estimates of the cost per intervention to address these needs. Appendices B4, B5, and B6 provide complete details on how the intervention costs are estimated.

The release of data from the 2021 Census of Population and the use of CNIT allows us to more accurately identify households in core housing need in the MNBC Housing Needs Survey. We use the 2021 Census custom tabulation to develop new survey weights for the MNBC Housing Needs Survey, which previously had to use weights developed from the 2016 Census of Population. Appendix B3 describes how we developed these new survey weights. Additionally, using CNIT allows us to identify accurate income cut-offs for households to be in core housing need.

² For example, households living in Reserve Census Subdivisions (CSDs) and households whose shelter costs exceed their income are not assessed for core housing need.

2.0 REVISITING THE HOUSING NEED ASSESSMENT

Comparison to *The Voice of Métis: Housing Needs Assessment*

In Phase 1, we used the MNBC Housing Needs Survey to estimate the percentage of Métis households in British Columbia in core housing need (Big River Analytics 2022). The MNBC Housing Needs Survey was enumerated through convenience sampling via MNBC social media channels and newsletters. As a result, the sample represented in the MNBC Housing Needs Survey cannot be guaranteed to be representative of the entire population of Métis households in British Columbia.

To address this sample bias issue, we weight the MNBC Housing Needs Survey sample against known population totals using the Census of Population. Unfortunately, the required data from the 2021 Census were not available during Phase 1, so we had to weight the survey using data from the 2016 Census. This required us to assume that the distribution of weighting variables was the same as it was in 2016, or in the case of income, that it grew for Métis households at the same rate as for the general population. Thus, the weights developed for use in Phase 1 were only approximate. Additionally, we did not have available the core need income thresholds (CNIT) during Phase 1, requiring us to use median rents estimated by CMHC as a proxy. The use of median rents instead of CNIT in Phase 1 introduced an additional potential source of error in the Phase 1 core housing need estimates.³

Recognizing these potential sources of inaccuracy, we proposed to treat the weights developed for Phase 1 as interim weights, to be updated with weights developed from the 2021 Census of Population. The results presented in this report use the updated weights, as well as CNIT instead of median rents. Details of the reweighting process can be found in Appendix B3. **The reweighting had a significant effect on the estimated rate of core housing need among Métis households, reducing it from the 17% estimated in Phase 1 to 12% in this report.** Comparing the 2016 Census to the 2021 Census, the percentage of all households in British Columbia in core housing need similarly declined (15% in 2016 to 13% in 2021), highlighting the effects of changing from the 2016 Census to the 2021 Census for weighting.

³ CMHC estimates the cost of acceptable local housing in each CSD using the median rents where available and otherwise estimating the monthly carrying cost of a newly constructed home (CMHC 2019). In Phase 1 estimates, when required, the median rent of nearby population centres was used as a proxy of the cost of acceptable local housing. The possibility of incorrectly estimating the cost of local acceptable housing (compared to the estimates by CMHC) introduced a potential source of error in core housing need estimates compared to those that would be constructed using CMHC's estimate of the cost of acceptable local housing.

Table 2.1 presents the share of Métis households in core housing need, both overall and with respect to each housing need standard, by MNBC region and in 2021. Figure 2.1 presents a map of MNBC regions and Table 2.2 shows the largest population centre by MNBC region. Core housing need is most prevalent in the Lower Mainland, where 16% of Métis households are in core housing need. Across all of British Columbia, 12% of Métis households are in core housing need. Core housing need is least prevalent in the Northeast, where only 4% of Métis households are in core housing need.

In all MNBC regions core housing need is largely attributable to affordability need: the share of Métis households in core housing need but *not* affordability need is never larger than 2%. In Kootenay, the Northwest, and the Northeast the share of households in affordability need is equal to the share of households in core housing need, indicating that (almost, up to rounding errors) every household in core housing need is in affordability need.

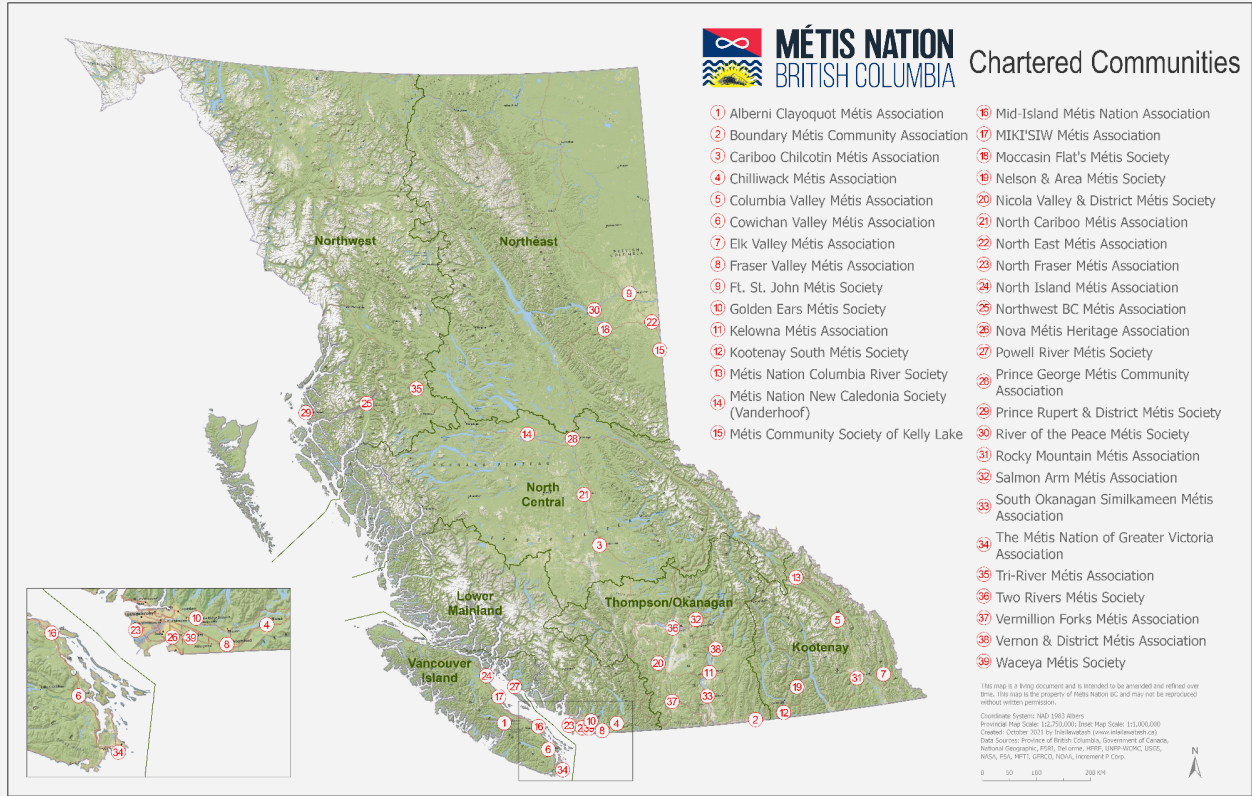
Vancouver Island & Powell River sees the largest share of Métis households in suitability need (4%), while the proportion of households in suitability need in the Northeast is less than 0.5%. Adequacy need is most prevalent in the Lower Mainland and the Northeast, where 3% of Métis households are affected, and least prevalent in Kootenay, North Central, and Northwest, where 1% of Métis households are affected.

Table 2.1: Share of Métis Households in Core Housing Need, Overall and With Respect to Each Housing Standard, by MNBC Region, 2021

Region #	MNBC Region Name	Core Housing Need	Affordability Need	Suitability Need	Adequacy Need
1	Vancouver Island & Powell River	14%	12%	4%	2%
2	Lower Mainland	16%	14%	3%	3%
3	Thompson & Okanagan	9%	8%	1%	2%
4	Kootenay	11%	11%	2%	1%
5	North Central	7%	5%	2%	1%
6	Northwest	12%	12%	3%	1%
7	Northeast	4%	4%	0%	3%
British Columbia		12%	11%	3%	2%

Source: MNBC Housing Needs Survey (2021). **Note:** Column labeled affordability (resp. suitability, adequacy) need contains the share of respondents in core housing need *and* below affordability (suitability, adequacy) standards.

Figure 2.1: Map of MNBC Regions



Source: Métis Nation British Columbia (2022)

Table 2.2: Largest Population Centre by Region

Region #	MNBC Region	Largest population centre in region
1	Vancouver Island & Powell River	Victoria
2	Lower Mainland	Vancouver
3	Thompson & Okanagan	Kelowna
4	Kootenay	Cranbrook
5	North Central	Prince George
6	Northwest	Prince Rupert
7	Northeast	Fort St. John

3.0 COST OF ADDRESSING CORE HOUSING NEED

3.1 AFFORDABILITY NEED

Housing is considered **unaffordable (below affordability standards)** when a household needs to spend 30% or more of before-tax income on housing costs (CMHC, 2019). For a household to be below affordability standards **and** in core housing need (i.e., in “**affordability need**”), the household’s shelter cost must be at least 30% and less than 100% of their before-tax income, and the household’s before-tax income must not exceed the core need income threshold (CNIT).⁴

A household’s affordability need can be addressed by a cash transfer to offset their shelter costs.⁵ A transfer equal to the lesser of the household’s shelter cost or 30% of CNIT, minus 30% of the household’s before-tax income, is sufficient to bring a household in affordability need out of affordability need:

- If the household’s shelter cost is less than 30% of CNIT, then the transfer is enough to reduce the shelter cost to below 30% of before-tax income, eliminating the household’s affordability need.
- Otherwise, since CNIT represents the minimum household before-tax income at which local acceptable housing is available, the transfer will allow the household to find acceptable housing at an affordable cost.

Note that this intervention may not necessarily bring the household out of core housing need in cases where the household is also below suitability or adequacy standards. Appendix B4 provides further details on the method used to estimate the costs of affordability need interventions.

Table 3.1.1 presents the average cost of affordability need interventions by MNBC region for Métis households in affordability need. Considering all regions, the average intervention cost for British Columbia as a whole is estimated at \$4,419. The affordability intervention cost varies significantly, from a low of \$3,200 in the Northeast region to a high of \$5,318 in the Lower Mainland region. Note that shelter costs and household incomes are annual rates. Therefore, assuming no change in a household’s income or shelter cost, a household would have to receive an annual transfer to remain out of affordability need.

⁴ Households with shelter costs at or above before-tax income are not assessed for core housing need, and households with incomes above CNIT are not in core housing need.

⁵ Due to the relative size of the Métis population, we anticipate that the proposed affordability intervention will have a negligible impact on the wider economy in BC. See Appendix B7.2 for further details.

Table 3.1.1: Average Cost of Affordability Need Interventions by MNBC Region

Region #	MNBC Region Name	Average Cost of Affordability Need Intervention (\$)
1	Vancouver Island & Powell River	3,837
2	Lower Mainland	5,318
3	Thompson & Okanagan	3,726
4	Kootenay	3,699
5	North Central	3,333
6	Northwest	3,585
7	Northeast	3,200
British Columbia		4,419

Source: MNBC Housing Needs Survey (2021); Statistics Canada (2021); (Statistics Canada (2023b)). **Note:** The estimates presented in this table are in terms of 2023 dollars. Data from the MNBC Housing Needs Survey were adjusted to account for the inflation in shelter costs between September 2021 (the month after the survey closed) and March 2023.

3.2 SUITABILITY NEED

Housing is considered **unsuitable (below suitability standards)** when there are not enough bedrooms for the size and composition of the household according to National Occupancy Standard (NOS) requirements (CMHC, 2022). In particular, the CMHC (2022) defines *enough* bedrooms via the following rules:

- There is one bedroom for each:
 - Cohabiting adult couple;
 - Unattached household member 18 years of age and over;
 - Same-sex pair of children under age 18; and
 - Additional boy or girl in the family.
- If there are two opposite sex children under 5 years of age, they can share a bedroom.
- A one-person household can occupy a bachelor unit with no bedroom.

A household is below suitability standards **and** in core housing need (i.e., in “**suitability need**”), if it lives in unsuitable housing and it would have to spend more than 30% of its before-tax income to live in acceptable housing. We estimate the number of Métis households in suitability need using

information on the household demographics, household income, and the number of bedrooms in their current dwelling; the process of determining suitability need is detailed in Appendix B5.

The cost of addressing a household's suitability need depends upon whether the household owns or rents their current dwelling. For owners, we assume that new residential construction is required. In particular, the proposed intervention is to build a new townhouse with the number of bedrooms required for the household according to the NOS.⁶ We recognize that the homes that are currently occupied by owner households in suitability need will become vacant once new suitable housing is built for those households. Further, the value of the vacated homes may offset some of the costs of new construction. However, data limitations constrain our ability to take into account the value of the vacated homes when estimating the cost of addressing the suitability need for owner households.

For renters, we assume that it is sufficient to provide a transfer equal to the difference between the household's current yearly shelter cost and the median cost of renting suitable housing in their region. It is worth noting that this intervention will only address core housing need if continued in future years, as a household which moves into more expensive but suitable housing will need to receive a similar transfer each year to avoid falling into affordability need. Note that the two interventions to address suitability need are such that neither intervention imposes a change in the tenure of the household.

After estimating the cost of addressing suitability need for each household living in unsuitable housing—a process described in Appendix B5—we take the average across all households in a given region to obtain the per intervention cost. For several MNBC regions, very few MNBC Housing Needs Survey respondents are living in unsuitable housing. In this situation, estimating costs by MNBC region would lead to estimates that rely heavily on the (possibly anomalous) particular circumstances of a small number of households, raising potential issues with both accuracy and precision. Therefore, we estimate per intervention costs of addressing suitability need over aggregated regions. For both renters and owners, we combine Kootenay, Thompson & Okanagan, North Central, Northeastern, and Northwestern into the aggregated region "Northern and Eastern BC." For owners we aggregate Lower Mainland and Vancouver Island & Powell River into "Southwestern BC," but such aggregation is not necessary for renters.

Table 3.2.1 presents the cost per intervention of addressing suitability need by aggregated region. For owners, the cost per intervention of addressing suitability need is the sum of the average cost of construction per housing unit, the average per unit cost of servicing a new lot, and the estimated price of land per housing unit. The cost of construction per housing unit is calculated using estimates available from RSMMeans data (Gordian 2023b) and does not include the cost of

⁶ Note that we consider only new residential construction and not renovations or additions to existing dwellings to make them suitable for their occupants. Estimating the cost of renovations would require data we do not have access to, such as the lot size of the home and whether there is room for additions to the existing dwelling.

site preparation. It is reasonable to anticipate that the cost of construction would be higher if we were to additionally take into account the cost of site preparation. Thus, construction costs estimates presented in Table 3.2.1 should be interpreted as conservative. Servicing a new lot refers to connecting a lot to water systems, wastewater systems, and other utilities (IFSD 2021). The average per unit cost of servicing a new lot presented in Table 3.2.1 is estimated for BC as a whole (IFSD 2021). Due to limitations on data availability, for calculations in all regions of BC, we use a conservative estimate of the price of land per housing unit in Vancouver. Appendix B5 provides further details on the method used to estimate the average cost of suitability need interventions.

The cost of suitability intervention is substantially larger for owners than it is for renters. However, this discrepancy is exaggerated by the fact that the intervention for owners represents a one-time cost whereas the intervention for renters represents a yearly cost. For owners, the per-intervention cost is lower in Southwestern BC than in Northern and Eastern BC despite the fact that construction costs are higher in Southwestern BC. This is because the number of bedrooms required tends to be larger in Northern and Eastern BC: whereas 11% of Northern and Eastern BC owners in suitability need require five or more bedrooms, this is true for only 5% of Southwestern BC owners in suitability need.

For renters, the cost of suitability intervention is largest in Vancouver Island & Powell River, although the rent for suitable housing tends to be higher in the Lower Mainland. This can also be described by differences in the number of bedrooms required: whereas 31% of Vancouver Island & Powell River renter households in suitability need require five or more bedrooms, this is true for only 11% of Lower Mainland renter households. It is unsurprising that the cost per intervention is lowest in Northern and Eastern BC given the fact that the cost of renting suitable housing in this region is substantially lower than the cost of renting suitable housing in either the Lower Mainland or Vancouver Island & Powell River.

Table 3.2.1: Average Cost of Suitability Need Interventions by MNBC Region

Owners				
Region Name	Average cost of construction per housing unit (\$)	Average per unit cost of servicing a new lot (\$)	Estimated price of land per housing unit (\$)	Average Cost of Suitability Need Intervention (\$)
Southwestern BC	138,328	52,514	1,265,088	1,455,930
Northern & Eastern BC	147,138			1,464,740
British Columbia	138,723			1,456,325

Renters	
Region Name	Average Cost of Suitability Need Intervention (\$)
Van. Isl. & Powell River	9,612
Lower Mainland	7,508
Northern and Eastern BC	5,757
British Columbia	7,823

Note: Southwestern BC consists of Lower Mainland and Vancouver Island & Powell River. Northern and Eastern BC refers to the combined regions of Kootenay, Thompson & Okanagan, North Central, Northwest and Northeast. Only a range of values for the average price of land in Vancouver was available. The estimate presented in this table is based on the lower end of the range. The estimates presented in this table are in terms of 2023 dollars. Where required, data from the MNBC Housing Needs Survey was adjusted to account for the inflation in shelter costs between September 2021 (the month after the survey closed) and March 2023. **Source:** MNBC Housing Needs Survey (2021); RSMMeans City Cost Indices (2023); BC Housing Design Guidelines and Construction Standards (2019); Private communication with CMHC (2023); (Statistics Canada (2023b).

3.3 ADEQUACY NEED

Housing is considered **inadequate (below adequacy standards)** when it is in need of major repairs. Major repairs include defective plumbing or electrical wiring, or structural repairs to walls, floors, or ceilings (CMHC, 2019). A household is considered to be below adequacy standards **and** in core housing need (i.e., in **“adequacy need”**) if its dwelling is in need of major repairs and if the household would have to spend 30% or more of its before-tax household income to access local acceptable housing.

An intervention to address adequacy need can take the form of a cash transfer that covers the cost of conducting major repairs to make the dwelling adequate. Our analysis covers both owners and renters. In the case of owner households, the cash transfer can be provided to the owners. In the case of renter households, the cash transfer can be provided to the landlord since it is their responsibility to ensure repairs are conducted in the dwelling as needed. Table 3.3.1 presents the share of owners and renters among Métis households in adequacy need. Since the intervention for addressing adequacy need for owners and renters is the same, the tenure shares in Table 3.3.1 provide an idea of how the total expenditure incurred to address adequacy need may be divided between owner and renter households.

In practical terms, it may be difficult to conceive providing landlords with a cash support to conduct major repairs as a way to address the adequacy need of Métis renter households. However, total expenditure to address adequacy need for Métis renters can instead be interpreted as investments to increase the supply of adequate housing in the British Columbia market.

**Table 3.3.1: Shares of Owners and Renters Among Métis Households
in Adequacy Need**

Region	Tenure Shares Among Métis Households in Adequacy Need	
	Owners	Renters
British Columbia	33%	67%

Source: Statistics Canada (2023a).

The MNBC Housing Needs Survey asked respondents to list the types of major repairs that their dwelling required. Respondents could make multiple selections from a list of 15 options that included choices such as defective plumbing and defective electrical or wiring. These options were grouped into seven broad types of repair, listed in Table B6.3 in Appendix B. We then calculated the cost of each type of repair based on estimates in existing literature, the RSMMeans repair cost database, and guidelines from the Government of Canada addressing repair needs such as lead and asbestos abatement. Appendix B6 provides further details on the method used to estimate the average cost of adequacy need interventions.

Table 3.3.2 presents two estimates of the average cost of adequacy need intervention by MNBC region for Métis households in adequacy need. Two estimates of repair costs are presented due to differences in the strength of the assumptions needed to calculate the repair costs. Estimate 1 is a more conservative estimate, and consists of the cost of mold remediation, and plumbing, heating, structural, and electrical repairs. The cost of these repairs was calculated following guidelines in existing literature on repair costs in the United States (Wallace, Divringi and Wardrip 2019; Divringi et al. 2019). Estimate 2 consists of the types of repairs included in Estimate 1, but also includes the cost of asbestos abatement and lead abatement. The cost of asbestos abatement and lead abatement were calculated based on Government of Canada guidelines (2021; 2023a; 2023b) and assumptions about the size of the area requiring lead or asbestos abatement.

For the Northern MNBC regions (North Central, Northeast, and Northwest), and Kootenay, very few of the MNBC Housing Needs Survey respondents are in adequacy need. Cost estimates by MNBC region would rely heavily on the particular circumstances of a few households, raising potential issues related to the precision of the estimates. Therefore, we combine certain regions and then estimate the cost of adequacy need intervention for these aggregated regions. We combine North Central, Northeast, and Northwest regions into “Northern BC,” and we combine Kootenay and Thompson and Okanagan into “Eastern BC.”

Considering all regions, the average cost of adequacy need intervention for British Columbia as a whole is estimated at \$8,788 (Estimate 1) and \$8,819 (Estimate 2). The adequacy intervention

cost varies across regions, from \$8,886 (\$8,894) in Northern BC to \$9,407 (\$9,460) in Vancouver Island & Powell River.

Table 3.3.2: Average Cost of Adequacy Need Interventions by MNBC Region

Region Name	Average Cost of Adequacy Need Intervention (\$)	
	Estimate 1	Estimate 2
Vancouver Island & Powell River	7,397	7,408
Lower Mainland	9,407	9,460
Eastern BC	8,945	8,963
Northern BC	8,886	8,894
British Columbia	8,788	8,819

Source: MNBC Housing Needs Survey (2021); Statistics Canada (2021); Gordian (2023a); Gordian (2023b). **Note:** Eastern BC consists of Thompson & Okanagan and Kootenay. Estimate 1 consists of the cost of: Plumbing, Heating, Structural, Electrical Repairs, and Mold Remediation. Estimate 2 consists of all the repairs included in Estimate 1 and the cost of asbestos abatement and lead abatement where applicable.

4.0 REDUCING MÉTIS CORE HOUSING NEED

This section presents estimates of the costs associated with different ways of reducing Métis core housing need in British Columbia. The costs are estimated using a constrained optimization approach. In the context of this study, constrained optimization is a method to minimize the total cost of housing need interventions, while achieving specific targets or subject to specific constraints. In other words, constrained optimization determines the most cost effective way of achieving different targets, for example, a 50% reduction in the number of Métis households in core housing need in BC.

Households in core housing need differ from each other in the combination of housing needs they experience. For instance, some households in core housing need may be living below one housing standard, whereas others may be living below two or three standards. The type and combination of interventions required to remove a household from core housing need, and the associated cost, will depend on the combination of housing needs experienced by the household. In trying to minimize the total cost of housing need interventions, the constrained optimization approach will choose to remove those households that require the lowest cost interventions for their housing needs to be addressed, while also ensuring that any targets or constraints imposed are achieved.

For example, to minimize the total cost of housing need interventions while reducing the number of Métis households in core housing need in BC by 50%, the constrained optimization approach

would suggest using as many of the lowest-cost interventions as possible, progressively moving to higher-cost interventions as the number of Métis households requiring the lowest cost interventions are exhausted. Under the constrained optimization approach, this process would continue until the number of Métis households in core housing need in BC is reduced by 50%. Thus, the constraints or targets imposed play a critical role in determining the manner in which Métis core housing need in British Columbia is reduced, and the total cost associated with the reduction in core need. Appendix B7 provides a detailed description of the constrained optimization model.

Section 3 discussed four main types of interventions: the intervention to address affordability need, the intervention to address adequacy need, and two types of interventions to address suitability need (one for owners and one for renters). Table B7.1 in Appendix B7 describes the combination of interventions that will be used depending on the combination of housing needs a household is experiencing. The four interventions differ not only in terms of the type of housing need they address, but also in terms of the duration for which they address the household's need.

The affordability need intervention is a cash support to ensure a household needs to spend less than 30% of its income on shelter costs for a year. The suitability need intervention for renters is a cash support to allow households to rent suitable and adequate local housing without increasing the shelter costs they currently incur for one year. The suitability intervention for owners and the adequacy intervention are longer term. The suitability need intervention for owners is new residential construction, while the adequacy need intervention is a cash transfer that covers the cost of conducting major repairs to make the dwelling adequate. While there may be wear and tear in a dwelling over time, repairs, when conducted and maintained properly, can last at least a few years. Thus the cost of affordability interventions, suitability interventions, and adequacy interventions described in Sections 4.1 and 4.2 should be interpreted while considering that interventions vary in terms of the duration over which they are effective.

4.1 SCENARIO 1: REDUCE MÉTIS CORE HOUSING NEED BY 50% AND REDUCE EACH TYPE OF NEED BY 50%

This section presents the estimated cost of reducing the incidence of core housing need among Métis households in British Columbia by 50% while also reducing by 50% the number of Métis households in BC experiencing each type of housing need - affordability, suitability, and adequacy (Scenario 1). No preference is given to reducing the incidence of core housing need in any MNBC region and the costs of interventions are fixed. More specifically, the objectives of Scenario 1 are:

- Reduce the number of Métis households in British Columbia in core housing need by 50%, from 6,880 to 3,440 households, in such a way that:

- The number of Métis households in British Columbia in affordability need is reduced by 50%, from 5,819 to 2,910 households; and
- The number of Métis households in British Columbia in suitability need is reduced by 50%, from 906 to 453 households; and
- The number of Métis households in British Columbia in adequacy need is reduced by 50%, from 1,471 to 736 households.

The total cost of reducing Métis core housing need by 50% while ensuring the reduction of the number of Métis households in each type of need by 50% is **\$18,807,028**. Of this total, \$10,958,888 is allocated to affordability interventions, \$3,065,031 is allocated to suitability interventions, and \$4,783,110 is allocated to adequacy interventions (Figure 4.1.1). The optimal allocation in Scenario 1 reaches households **experiencing multiple types of housing need**, including a \$1,229,529 allocation for 103 Métis households **experiencing all three types of housing need (affordability, adequacy, and suitability need)**.⁷

The optimal allocation model uses a combination of various types of interventions to reduce the number of Métis households in each type of housing need. For instance, under the optimal allocation, 47% of the total expenditure is allocated to affordability interventions to address the need of Métis households that are experiencing only affordability need (\$8,874,215). **Métis households experiencing only affordability need account for approximately 68% of all Métis households in core housing need in BC (4,675 out of 6,880 households)**. Any endeavor to reduce the number of Métis households in core need will involve addressing the need of a large number of Métis households that are experiencing only affordability need.

The optimal allocation indicates that in certain cases, it is more cost effective to address the need of households experiencing multiple types of housing need than to address the need of households experiencing only one type of housing need. For instance, it is on average less expensive to address the need of renter households experiencing both suitability and adequacy need (\$7,823 per intervention) than it is to address the need of renter households experiencing only adequacy need (\$8,788 per intervention). Recall that the suitability intervention for renters is a cash transfer that would allow households to move to an acceptable (suitably sized and adequate dwelling) without increasing their shelter costs, thereby removing them from both suitability need and adequacy need.

⁷ Consequently, the number of households no longer in each type of need (given in Figure 4.1.1) do not sum to the total number of households no longer in core housing need.

Figure 4.1.1: Summary of Optimal Allocation to Reduce Métis Core Housing Need by 50% while Reducing Each Type of Need by 50% (Scenario 1)

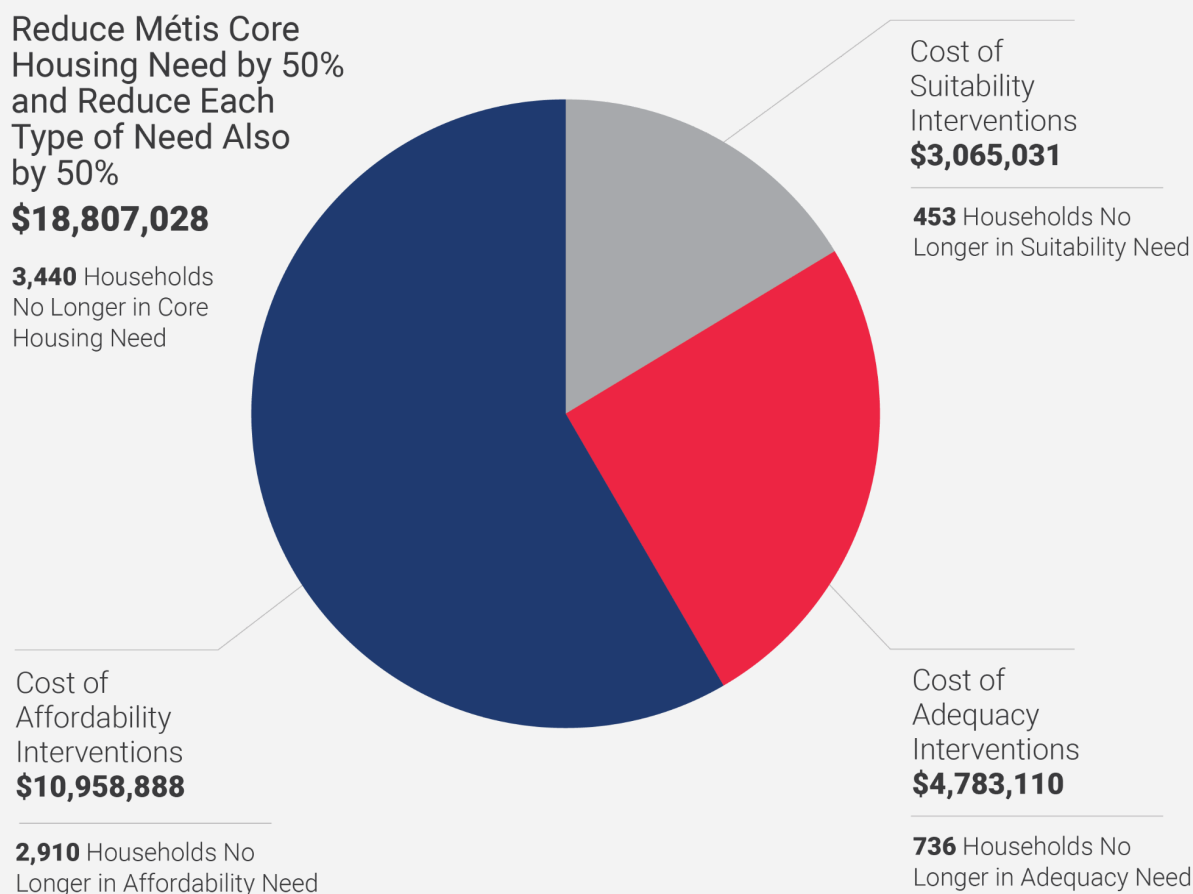


Table 4.1.1 shows the number of households removed from core housing need and the associated cost by region in Scenario 1. The most households removed from core housing need, and the correspondingly largest cost, are in Vancouver Island & Powell River (1,336 households; \$6,850,228) and Thompson & Okanagan (980 households; \$4,957,460).

Table 4.1.1: Households Removed from Core Housing Need by MNBC Region (Scenario 1)

Region #	MNBC Region Name	Number of Households No Longer In Core Housing Need	Region Level Cost of Addressing Core Housing Need (\$)
1	Vancouver Island & Powell River	1,336	6,850,228
2	Lower Mainland	185	2,082,877
3	Thompson & Okanagan	980	4,957,460
4	Kootenay	301	1,598,845
5	North Central	319	1,655,203
6	Northwest	132	715,797
7	Northeast	186	946,616

Source: MNBC Housing Needs Survey (2021); Statistics Canada (2023a); Gordian (2023a); Gordian (2023b); Big River Analytics Calculations

4.2 DISCUSSION: ALTERNATIVE SCENARIOS TO REDUCE MÉTIS CORE HOUSING NEED

This section describes how the total associated cost and the manner in which the constrained optimization approach reduces Métis core housing need in British Columbia by 50% varies with the constraints or targets imposed.

Table 4.2.1 presents the total costs associated with four additional scenarios and the number of Métis households no longer in core housing need under each one. Scenario 2 estimates the cost of reducing the incidence of core housing need among Métis households in British Columbia by 50%. No additional constraints are imposed and no preference is given to reducing the incidence of core need in any MNBC region. The total cost of reducing Métis core housing need by 50% in BC is **\$14,256,290**. Since there are no additional constraints imposed in this scenario, the entire amount is allocated to affordability interventions to address the need of Métis households in core need that are experiencing only affordability need because this is identified as the most cost-effective intervention option.

Scenario 3 estimates the cost of reducing Métis core housing need by 50% in British Columbia while ensuring the reduction of Métis core housing need in each MNBC region by 50%. The total cost under this scenario is **\$15,323,308** and once again the entire amount is allocated to

affordability interventions, addressing the need of Métis households in core need that are experiencing only affordability need. However, due to the additional constraint of reducing Métis core housing need in each MNBC region by 50%, the distribution of affordability interventions across MNBC regions is different under Scenario 3 than under Scenario 2.

Table 3.1.1 indicates that the cost of the affordability need intervention is lowest in the Northeast (\$3,200 per intervention) and highest in the Lower Mainland (\$5,318). The optimal allocation under Scenario 2 first uses as many of the lowest cost affordability interventions as possible before moving to regions where the cost of affordability intervention is higher. Scenario 3, on the other hand, utilizes the lowest cost affordability intervention (in the Northeast) only to the extent that it reduces the number of households in core need in the Northeast by 50%, before moving to regions where the cost of affordability intervention is higher.

Scenario 4 estimates the cost of reducing Métis core housing need by 50% in British Columbia and additionally removing from core housing need those Métis households that experience all three types of needs - affordability, suitability, and adequacy. The total cost of the optimal allocation under this scenario is **\$40,056,652**, significantly larger than the total cost of any of the scenarios previously discussed. The largest component (\$25,210,783) is the cost of addressing the need of owners experiencing all three types of need (17 households in British Columbia) because the intervention to address the need of owner households experiencing all three types of need is new residential construction. The total cost of addressing the need of all 103 Métis renter households in BC that are experiencing the most severe form of housing need (i.e. all three types of need) is \$1,229,529, much lower than the cost of addressing the need of owners experiencing all three types of need. Once the households experiencing all three types of need are removed from core housing need, the optimal allocation spends \$13,616,340 to address the need of 3,320 Métis households that are experiencing only affordability need, thereby achieving the target of reducing Métis core housing need by 50% in BC.

Lastly, Scenario 5 estimates the cost of closing the gap in core housing need between Métis and non-Indigenous households in all MNBC regions in British Columbia. Across all MNBC regions, a total of 241 Métis households need to be removed from core housing need in order to equalize the regional core housing need rate for Métis and non-Indigenous households. Table C1.1 in Appendix C presents the regional core housing need gap between Métis and non-Indigenous households in British Columbia. The total cost of closing the regional gap in core housing need between Métis and non-Indigenous households is **\$896,361**. Once again, the entire amount is allocated to affordability interventions to address the need of Métis households in core need that are experiencing only affordability need.

The five scenarios in Table 4.2.1 indicate that the total cost and manner of addressing Métis core housing need depend crucially on the policy objectives set alongside the overarching goal of reducing Métis core housing need in BC by 50%. MNBC's core value, Kaa-Wiichihitoyaahk (we take care of each other) can serve as the guiding principle in considering these options.

**Table 4.2.1: Total Cost of Reducing Métis Core Housing Need
Under Different Scenarios**

Scenario	Constraint	Total Cost (\$)	Households no longer in Core Housing Need (#)
1	Reduce Métis core housing need by 50% while ensuring the number of households in each type of need is also reduced by 50%	18,807,028	3,440
2	Reduce Métis core housing need by 50% in British Columbia	14,256,290	3,440
3	Reduce Métis core housing need by 50% in British Columbia and reduce Métis core housing need in each MNBC region by 50%	15,323,308	3,440
4	Reduce Métis core housing need by 50% and remove from core housing need all those experiencing all three types of need	40,056,652	3,440
5	Close the regional core housing need gaps between Métis households and non-Indigenous households	896,361	241

TERMS AND DEFINITIONS

Adequate Housing: Housing is considered adequate when it isn't in need of major repairs. Major repairs include defective plumbing or electrical wiring, or structural repairs to walls, floors, or ceilings (CMHC, 2019).

Affordable Housing: Housing is considered to be affordable when housing costs less than 30% of before-tax household income (CMHC, 2019).

Constrained Optimization: Constrained optimization is a method of optimizing an objective function with respect to certain variables while imposing constraints on the values the variables can take. In the context of this study, constrained optimization is a method to minimize the total cost of housing need interventions, while achieving specific targets or subject to specific constraints. The constrained optimization method selects quantities of certain interventions addressing the affordability, suitability, and adequacy needs of Métis households that minimize the total cost while also reducing the core housing need to certain targets.

Core Housing Need: A household is considered to be in core housing need if it meets two criteria: (i) the household is below one or more of the adequacy, suitability, and affordability standards, and (ii) the household would have to spend more than 30% of its before-tax household income to access local housing that meets all three standards (CMHC, 2019).

Core Need Income Threshold (CNIT): For every Census Subdivision (CSD), the Canadian Housing and Mortgage Corporation estimates the yearly before-tax income a household would need to earn in order to spend at most 30% of its income on suitable housing, based on local housing costs and updated yearly. This income level is the Core Need Income Threshold for the given CSD, year, and number of bedrooms. A household earning more than the Core Need Income Threshold is not considered to be in core housing need because they could afford to move to acceptable housing without spending more than 30% of their income on housing (Claveau, 2020).

Dwelling: (or 'Private Dwelling' in Statistics Canada's Census of Population) Refers to a separate set of living quarters with a private entrance either from outside the building or from a common hall, lobby, vestibule or stairway inside the building. The entrance to the dwelling must be one that can be used without passing through the living quarters of some other person or group of persons (Statistics Canada, 2019a).

Dwelling Type: One of (i) single family dwelling, (ii) semi-detached (i.e. duplex), (iii) mobile home (i.e. trailer or manufactured home), (iv) apartment (condominium), (v) apartment (rental), (vi) student housing (residences), (vii) basement suite, (viii) garden cottage or coach house, (ix)

temporary housing (e.g. shelter, group home, etc.). There was an additional option for those who are currently homeless.

Family Household: (or 'Census Family' in the Census of Population) Refers to a married or common-law couple and the children, if any, of either or both partners; a lone parent of any marital status with at least one child; or, grandchildren living with their grandparent(s) but with no parents present living in the same dwelling. A couple may be of opposite or same sex. Children may be related by birth, marriage, or adoption regardless of their age or marital status but must live in the dwelling without their own married/common-law partner or child (Statistics Canada, 2021b).

Household: Refers to a person or group of persons who occupy the same dwelling and do not have a usual place of residence elsewhere in Canada or abroad (Statistics Canada, 2021b).

Household Income: The combined incomes of all members within a dwelling. Income includes, but is not limited to, salaries, wages and pensions earned by an individual.

Housing Tenure: Tenure refers to whether the household owns or rents their dwelling. A household is considered to own their dwelling if some member of the household owns the dwelling even if it is not fully paid for, for example if there is a mortgage or some other claim on it. A household is considered to rent their dwelling if no member of the household owns the dwelling. A household is considered to rent that dwelling even if the dwelling is provided without cash rent or at a reduced rent, or if the dwelling is part of a cooperative (Statistics Canada, 2021b).

Reserve Census Subdivision (CSD): A CSD that is one of the types legally affiliated with First Nations or Indian Bands. A CSD is considered a Reserve CSD if it is one of the following eight types of CSDs - Indian reserve (IRI), Indian settlement (S-É) (except for the two Indian settlements of Champagne Landing 10 and Kloo Lake, located in Yukon), Indian government district (IGD), Terres réservées aux Cris (TC), Terres réservées aux Naskapis (TK), Nisga'a Land (NL), Tsawwassen Lands (TWL), and Tla'amin Lands (TAL) (Statistics Canada 2021a). A household is considered as living on-reserve if its residence is in a reserve CSD.

Major Repair: Problems with a dwelling that require expertise, and additional time and financing to fix, including lead abatement, structural repairs to walls, foundations, ceilings and roofing, and environmental restorations.

Métis Household: A private household in which at least one household member self-identifies as Métis.

Shelter Costs: The sum of mortgage, rent, or condo fees, property taxes, and utilities paid by a household over a given period of time in order to live in a unit (Statistics Canada, 2019a).

Suitable Housing: Housing is considered suitable when there are enough bedrooms for the size and make-up of resident households according to National Occupancy Standard requirements (CMHC, 2019). Enough bedrooms means one bedroom for each: cohabiting adult couple; unattached household member 18 years of age and over; same-sex pair of children under age 18; and additional boy or girl in the family (CMHC, 2019). If there are two opposite sex children under 5 years of age, they can share a bedroom. A one-person household can occupy a bachelor unit with no bedroom.

APPENDICES

A. Data Sources

This section provides an overview of the data sources used in the study.

Data from the 2021 Census of Population is used to develop weights for the MNBC Housing Needs Survey, calculate the share of Métis households in core housing need at the provincial level, and calculate the housing needs gaps between Métis households and non-Indigenous households in British Columbia at the provincial and regional levels.

Data from the MNBC Housing Needs Survey is used to calculate the per-intervention cost of addressing affordability need, suitability need, and adequacy need among Métis households in British Columbia.

This study uses data on the Core Need Income Threshold (CNIT) provided by the CMHC in order to assess whether households in the MNBC Housing Needs Survey are in core housing need. The CNIT is the income at which a household would have to spend exactly 30% to access local acceptable housing. Thus, a household with income below the threshold would not be able to access suitable and adequate local housing that is also affordable. In other words, a household would have to spend more than 30% of its income to access suitable and adequate local housing. The CMHC derives income thresholds at the Census subdivision level (Statistics Canada 2020). The income threshold also depends on the number of bedrooms in the dwelling.

The mapping between the number of bedrooms and average size of the dwelling (in square feet) used in this study is based on the guidelines for new construction standards in British Columbia provided by BC Housing (BC Housing 2019).

In order to estimate the cost of addressing suitability and adequacy needs among Métis households in British Columbia, the study uses cost data from the RSMeans database. The RSMeans database, maintained by a private company Gordian, contains a range of cost data for residential and commercial construction, maintenance and repair (Wallace, Divringi and Wardrip 2019; Gordian 2022). The RSMeans database provides city-specific cost estimates that take into account local costs of labor and materials. In British Columbia, cost estimates are available for Kamloops, Prince George, Victoria, and Vancouver. We map the four locations to MNBC regions based on proximity as shown in Table A1.1 below.

Table A1.1: MNBC Regions and RSMMeans Locations

Region #	MNBC Region Name	RSMMeans Location
1	Vancouver Island & Powell River	Victoria
2	Lower Mainland	Vancouver
3	Thompson & Okanagan	Kamloops
4	Kootenay	Kamloops
5	North Central	Prince George
6	Northwest	Prince George
7	Northeast	Prince George

To estimate the per-intervention cost of addressing suitability need, this study uses the RSMMeans square foot estimator that provides the total cost and cost per square foot of constructing residential units of varying quality and sizes.

The study estimates the per-intervention cost of addressing adequacy need using residential repair cost data available from RSMMeans (Gordian 2023a) and repair cost estimates built by Wallace, Divringi, and Wardrip (2019). Wallace, Divringi, and Wardrip (2019) use repair cost data from RSMMeans and data on housing problems from the American Housing Survey to estimate the cost of repairs needed per household for various geographic levels in the United States of America. Thus this study translates these estimates to the Canadian context using RSMMeans' Construction Cost Index.

B. Methodology

B1. Probabilistic Framework for Income

The MNBC Housing Needs Survey collects income data in the form of binned counts. Although this is a good survey design choice for many reasons—for example, income is considered by many people to be sensitive personal information and collection of exact values greatly increases disclosure risk—the exact value of a household’s yearly before-tax income is needed to determine whether it is in core housing need. To deal with this mismatch between data and analytical goals, we adopt a probabilistic approach in which we estimate the income distribution in each MNBC region and treat each household’s income as a random variable conditioned on the income they select in the survey.

The problem of estimating income distributions from binned income data is commonly encountered by researchers in the social sciences and there are many approaches presented in the literature. We use the method underlying the Multimodel Generalized Beta (MGB) Estimator introduced by von Hippel et al. (2016) because it works particularly well when there are fewer than eight bins and the MNBC Housing Needs Survey uses seven bins. The generalized beta prime distribution is a four parameter distribution which contains as special or limiting cases many of the distributions suggested by economists as descriptive models of real world income distributions, such as the lognormal, Pareto, and Singh-Maddala distributions (MacDonald & Xu, 1995). The MGB Estimator uses a collection of ten such distributions, which they refer to as the *GB2 family*, to estimate the value of a given statistic of an empirical binned income distribution. We modify the MGB method to end with a distribution, rather than an estimate, as follows:

1. Fit each distribution in the GB2 family to the binned data;
2. Discard any fitted distribution with undefined variance;
3. Select the fitted distribution with the smallest Bayesian Information Criterion (BIC).

Throughout this report we use data from Statistics Canada’s 2021 Census of Population when possible due to its more comprehensive coverage. In this case, we use binned income counts for Métis households in each MNBC region, obtained from Statistics Canada via a Custom Tab Request, to estimate each income distribution.

Table B1.1 gives the estimated income distribution, obtained via the MGB method, for Métis households in each MNBC region. For each region, the best fit is either a gamma, log-normal, or Weibull distribution. Each of these distributions has a parameterization in terms of shape and scale, allowing for easy representation of the fitted distributions. However, these parameters are not directly comparable across different types of distributions. For the gamma distribution, the shape parameter is inversely proportional to the heaviness of the distribution’s tail. Thus, the Lower Mainland has the largest share of households with exceptionally high income among the four regions with a gamma distribution whereas Vancouver Island and Powell River has the

smallest share of high income households among these four regions. For the log-normal distribution, the scale parameter is equal to the median income, so we see that the estimated median income in the Northeast (\$96,895) is larger than the estimated median income in Thompson & Okanagan (\$88,234). While there is no simple closed form for the median value of a gamma distribution, we can compute the median value of Weibull distribution as a function of the shape and scale⁸ to see that the Northwest has a larger median income (\$100,986) than both the Northeast and Thompson & Okanagan

Table B1.1: Estimated Income Distributions, by MNBC Region

Region #	MNBC Region Name	Distribution	Shape	Scale
1	Vancouver Island & Powell River	Gamma	2.483	40,518
2	Lower Mainland	Gamma	2.119	52,909
3	Thompson & Okanagan	Log-normal	0.740	88,234
4	Kootenay	Gamma	2.173	50,163
5	North Central	Gamma	2.271	48,736
6	Northwest	Weibull	2.014	121,142
7	Northeast	Log-normal	0.844	96,895

Source: Custom tabulation, based on the 2021 Census of Population.

Given a household in region number i with yearly before-tax income in bin B , we treat their income as a random variable $X = X_{i,B}$. The distribution of $X_{i,B}$ is determined by conditioning the estimated income distribution in region i on the fact that X is in bin B . For example, consider a household in the Lower Mainland that indicated their income lies in bin B in the MNBC Housing Needs Survey. Throughout the analysis described below, we treat this households income as a random variable with distribution

$$X_{2,B} \sim \frac{I_{X \in B} \cdot \Gamma(2.119, 52909)}{\Pr(X \in B)}.$$

B2. Assessing Core Housing Need

A household is in core housing need if they are in affordability need, suitability need, or adequacy need, and would have to spend 30% or more of their before-tax total household income to pay the median rent of local acceptable housing (housing that meets the suitability and adequacy criteria). This last criterion is expressed through a core need income threshold (CNIT). For each Census subdivision (CSD) and number of bedrooms required to meet suitability need, CMHC

⁸ In particular, if we denote the shape parameter by a and the scale parameter by b , then the median is $b(\log 2)^{1/a}$.

estimates the minimum income required for a household not to be in core housing need, based on the median rent of local acceptable housing. Additionally, households where shelter costs exceed before-tax total household income, households living in reserve CSDs, farm households, and non-family households in which at least one household maintainer is aged 15 to 29 years and attends school are not assessed for core housing need (Statistics Canada 2021a). According to Statistics Canada (2021a), a household is considered as living on-reserve if the residence is in a Census Subdivision that is one of the types legally affiliated with First Nations or Indian Bands.

To the extent possible given the information in the MNBC Housing Needs Survey, we identify Métis households that are in core housing need and restrict our estimates to this subset of the sample. Because the survey does not ask about farm status of households or the school attendance of household members, we cannot account for this aspect of the core housing need definition.

The MNBC Housing Need Survey contains sufficient information to identify households with suitability and adequacy need. Identifying households with affordability need, and whether a household's total before-tax income is above its shelter cost and below CNIT, is complicated by the fact that incomes in the survey are binned. We use the regional income distributions described in Appendix B1 to estimate the probability that a randomly-selected Métis household in the same region, in the same income group, and with the same CNIT and shelter cost is in affordability need, has total household before-tax income below CNIT, and has total household before-tax income above shelter cost.

Thus, we assign to each household a probability π_{CHN} of being in core housing need:

1. If the household lives in a reserve CSD, then $\pi_{CHN} = 0$.
2. Otherwise, we compute π_A and π_{CNIT} :
 - a. π_A is the probability that the household's total income is above its shelter cost and below CNIT, and that the household is in affordability need.
 - b. π_{CNIT} is the probability that the household's total income is above its shelter cost and below CNIT.
3. We then set $\pi_{CHN} = \pi_A + (\pi_{CNIT} - \pi_A) \max\{I_S, I_Q\}$, where $I_S = 1$ if the household is in suitability need and $I_S = 0$ if not, and I_Q is analogously defined for adequacy need.

The left-hand term in the equation defining π_{CHN} is the probability that the household is in affordability need and core housing need, while the right-hand term is the probability that the household is in core housing need but not affordability need.

B3. Developing Survey Weights

The MNBC Housing Needs Survey was enumerated through convenience sampling; the survey was advertised through MNBC social media channels and email newsletters, and any self-identified Métis household could participate. As a result, the sample in the MNBC Housing Needs Survey cannot be assumed to be representative of the entire population of Métis households in British Columbia. To mitigate this sample selection bias, we develop weights to use in analyzing the MNBC Housing Needs Survey. All results presented in this paper are weighted using the weights described here.

We use the raking method to develop survey weights. The raking method iteratively post-stratifies the sample against a set of population margins until the weighted survey estimates match each of the margins (Kalton and Flores-Cervantes 2003). Raking thereby allows us to correct for the over- or under-representation of certain characteristics in the sample compared to the population.

To implement raking, we thus require population margins to calibrate against. We use the following counts, all for Métis households in British Columbia, obtained from a custom tabulation of the 2021 Census of Population:

1. residence by MNBC region;
2. household total income group;
3. presence of an MNBC member in the household;
4. tenure, including presence of mortgage and subsidized housing;
5. adequacy need; and
6. suitability need.

The income groups in the custom tabulation differ slightly from those in the MNBC Housing Needs Survey. We adjust the income groups in the custom tabulation to agree with those in the survey using the estimated income distributions described in Appendix B2. Specifically, for an income group in the survey with lower bound a and upper bound b , we use the estimated cumulative distribution function F of income to estimate the proportion of Métis households in the income group as $p = F(b) - F(a)$. We then multiply p by the count of all Métis households to estimate the population size of the income group. Since the estimated income distribution varies by region, we carry out this procedure separately for each MNBC region.

B4. Estimating the Per-Intervention Cost of Addressing Affordability Need

This section describes how we estimate the per-intervention cost of addressing affordability need for Métis households. A household is considered to be living in unaffordable housing if they spend more than 30% of their before-tax household income on shelter costs. In other words, a household is in affordability need if the shelter-cost-to-income ratio (STIR) is greater than 30%. Shelter cost is the “average monthly total of all shelter expenses paid by the household” (Statistics Canada 2021a).

The per-intervention cost of addressing housing affordability is the average cost of reclassifying a household from living in unaffordable housing to living in affordable housing. The “intervention” required to address housing affordability need can be thought of as a cash support that ensures that a household needs to spend less than 30% of its income on shelter costs for current housing or to access local acceptable housing. Since shelter cost and household income are annual rates, the intervention cost represents the cost of addressing a household’s affordability need for a single year. That is, if a household’s shelter cost and before-tax income remain unchanged, the household will need to receive the affordability intervention transfer each year to remain out of affordability need.

A household’s core income need threshold (CNIT) represents the minimum household income at which local acceptable housing is affordable, and a household is in core housing need only if its income is below CNIT. A transfer equal to the lesser of the household’s shelter cost or 30% of CNIT, minus 30% of the household’s before-tax income, is therefore sufficient to bring a household in affordability need and core housing need out of affordability need:

- If the household’s shelter cost is less than 30% of CNIT, then the transfer is enough to reduce the shelter cost to below 30% of before-tax income, eliminating the household’s affordability need.
- Otherwise, since CNIT represents the minimum household before-tax income at which local acceptable housing is available, the transfer will allow the household to find acceptable housing at an affordable cost.

That household incomes in the MNBC Housing Needs Survey are interval-censored, as noted in Appendix B1, which complicates the estimation of the affordability intervention cost. Note that a household’s required intervention to address affordability depends on four characteristics of the household:⁹

1. Whether the household lives in a reserve CSD. Households living in reserve CSDs are not assessed for core housing need, so the transfer is zero for such households.
2. The household’s CNIT.
3. The household’s shelter cost.
4. The household’s before-tax income.

Since all of these characteristics are observed except for income, we can regard the household’s required affordability transfer as a function of its before-tax income. For households in reserve CSDs, the transfer is simply zero for all levels of income, since such households are never

⁹ As noted in Appendix B4, core housing need status also depends on whether the household is a farm household and on whether it is a non-family household with a maintainer aged 15 to 29 years attending school. These characteristics are not observed in the MNBC Housing Needs Survey, so for the purposes of estimating affordability need and core housing need, we only consider the characteristics listed here.

assessed for core housing need. For all other households, the transfer is zero when income is below shelter cost (the household is not assessed for core housing need) or above CNIT (the household is not in core housing need). Otherwise, the required transfer is the lesser of the household's shelter cost or 30% of CNIT, minus 30% of the household's income.

Having expressed the affordability cost as a function of a household's income, we use the household's estimated income distribution (see Appendix B1) and income bin to calculate the expected value of the affordability transfer for a household in the same region and income bin and with the same residence in or out of a reserve CSD, CNIT, and shelter cost. We then calculate the expected value of the affordability transfer in 2023 dollars by using the shelter cost component of the Consumer Price Index for Canada to account for the inflation between September 2021 (the month after the survey closed) and March 2023. We then estimate the total cost of affordability need interventions within a region by estimating the total of the expected affordability need interventions for households in the region.

To estimate the average per-intervention cost of addressing affordability need, we divide the estimated total affordability need intervention costs by an estimate of the number of households in the region in affordability need and core housing need. To estimate the number of households in affordability need and core housing need, we assign an affordability and core housing need probability to each household. This probability depends on the household's before-tax income, shelter cost, CNIT, and residence in or out of a reserve CSD. In particular, a household is in affordability need and core housing need when they:

1. Reside outside of a reserve CSD,
2. Have before-tax income below CNIT, and
3. Have shelter cost of at least 30% but less than 100% of before-tax income.

Thus, a household's affordability and core housing need probability is 0 if it resides on reserve CSD, and otherwise is equal to the probability that the household's before-tax income is between their shelter cost and the minimum of the relevant CNIT and their shelter cost divided by 0.3.

B5. Estimating the Per-Intervention Cost of Addressing Suitability Need

A household is considered to be living in unsuitable housing if their dwelling does not have enough bedrooms for the size and composition of the household, according to the National Occupancy Standards (Statistics Canada, 2021). Data on household composition gathered in the MNBC Housing Needs Survey is used to determine how many bedrooms are "enough" for each household. A household is considered to be in suitability need if the required number of bedrooms is greater than the actual number of bedrooms in the household's dwelling. However, some household respondents to the MNBC Housing Needs Survey chose not to share the number of bedrooms in their dwelling, so that it is not possible to determine definitively whether these

respondents are in suitability need. For these households, we impute values of the binary `suitability_need` variable using logistic regression.

Because the CMHC defines a zero bedroom house (i.e. a studio apartment) as suitable for an individual living alone (CMHC, 2022), we set `suitability_need = FALSE` for all single-member households and do not include such households in the set of training observations for the Suitability Imputation Model (SIM). The covariates in the SIM are:

- Household income group (x_g);
- Number of people in household (x_n);
- Core need income threshold, which depends on the MNBC region of and number of bedrooms required by the household (x_t);
- Whether the household rents or owns their home (x_r);
- Whether there is a single parent in the household (x_s); and
- The household shelter cost (x_c).

Letting $\underline{x} = (1, x_g, x_n, x_t, x_r, x_s, x_c)$ and S denote the event that a household is in suitability need, we specify the SIM via the equation:

$$\Pr(S | \underline{x}) = (1 + \exp(-\underline{\beta} \cdot \underline{x}))^{-1},$$

where $\underline{\beta}$ is the vector of model parameters.

Because only a small proportion of Métis households in British Columbia are in suitability need (see Section 4.2), only a small proportion of the SIM training observations satisfy `suitability_need = TRUE`. This biases the probabilities produced by the SIM towards 0. Therefore, some care is needed in determining the threshold value θ such that we assign:

$$\text{suitability_need} = \text{TRUE} \text{ if and only if } \Pr(S | \underline{x}) \geq \theta.$$

The SIM threshold is set by value of θ between 0 and 1 for which the value of Youden's J-statistic (Youden, 1950), applied to the resulting binary classifier via cross-validation, is maximized. Once the threshold is set, all households for which `suitability_need` is known from the survey are used to train the SIM, and the SIM is used to impute `suitability_need` for all remaining households.

Once the suitability need of each household is determined, it is possible to estimate the per intervention cost of addressing this need. The intervention method depends upon whether the housing tenure of each household:

- For owners, suitability need is addressed via new residential construction;

- For renters, suitability need is addressed through a cash support that allows households to rent suitable and adequate local housing without increasing the shelter cost they currently incur. Note that the suitability need intervention for renters would be required annually, and assumes no change in the receiving household's incomes, shelter costs, or composition.

In both cases, there are few households with unsuitable housing in most MNBC regions, raising the possibility of small sample bias. To avoid such bias, we aggregate regions before computing the suitability need per intervention cost. For both renters and owners, we combine data from Thompson & Okanagan, Kootenay, North Central, Northwest, and Northeast. We also combine data from the Lower Mainland and Vancouver Island & Powell River when computing per intervention costs for owners, but leave these regions separate for renters.

The per intervention cost by aggregated region and tenure is determined in four steps (we use the term "relevant households" to describe households in suitability need with the given tenure and a nonzero probability of being in core housing need):

1. For each relevant household, estimate the *expected intervention cost*:
 - a. For owner households, multiply the cost of suitably sized new residential construction in their MNBC region by the probability that they are in core housing need;
 - b. For renter households, multiply the difference between their current yearly shelter cost from 30% of the CNIT (with respect to the region and number of bedrooms required) by the probability that they are in core housing need; We calculate the expected intervention cost for renters in 2023 dollars by using the shelter cost component of the Consumer Price Index for Canada to account for the inflation between September 2021 (the month after the survey closed) and March 2023.
2. For each aggregated region, sum the expected intervention costs over all relevant households in the region to estimate the *expected total intervention cost*;
3. For each aggregated region, estimate the *expected number of households in need* by taking the weighted sum, over all relevant households in the region, of each household's probability of being in core housing need;
4. For each aggregated region, divide the expected total intervention cost by the expected number of households in need to obtain the *cost per intervention*.

All data used in this procedure is obtained from the MNBC Housing Needs Survey except the cost of suitably sized new residential construction, which is estimated using data from the RSMMeans database (Gordian 2023b) and BC Housing (2019).

For each household we use available data on household composition to calculate the total number of bedrooms the household requires to be considered as living in a suitably-sized dwelling. We then use guidelines from BC Housing (2019) provided in Table B5.1 on the

recommended square footage of a townhouse based on the number of bedrooms. Some of the households in the MNBC Needs Survey that are in suitability and core housing need require homes with more than four bedrooms. To get the square footage of these households, we assume that the size of the common living area for these households is the same as that of a four bedroom townhouse, and add 120 square feet for each additional bedroom needed.¹⁰

Table B5.1: Mapping Between Number of Bedrooms and Square Footage of a Townhouse

Townhouse: Number of bedrooms	Net Unit Area (square feet)
0	400
1	600
2	969
3	1,195
4	1,345

Source: Table 5.2 BC Housing (2019). Big River Analytics Calculations. **Note:** The net unit area for a townhouse with zero bedrooms was not directly available from BC Housing (2019). It was calculated based on BC Housing (2019) guidelines on the size of a studio apartment relative to the size of a one bedroom apartment.

We use data on the cost per square foot of living area available from the RSMeans database. We calculate the cost per square foot for a townhouse as follows. We first use the cost per square foot of an economy quality, one-story, single family home with wood siding and a wood frame. The cost per square foot varies with the total size of the home. We generate separate cost per square foot estimates for each size of home. Following RSMeans guidelines, we multiply the cost per square foot of a single family home by 0.95 to get the cost per square foot of an end-unit townhouse. We then multiply the cost per square foot of an end-unit townhouse to get the total cost of constructing a townhouse with a given number of bedrooms.

Table 2.3.1 also presents the average per unit cost of servicing a new lot based on estimates from a 2021 report on housing gaps (IFSD 2021). Servicing a new lot refers to connecting a lot to water systems, wastewater systems, and other utilities (IFSD 2021). The IFSD (2021) report uses data from the Assembly of First Nations’ (AFN) 2018 First Nations On-Reserve Housing and Related Infrastructure Needs survey.

The IFSD (2021) report presents, in 2021 dollars, the total cost of servicing new lots in British Columbia, and the cost per unit of servicing new lots for three geographic zones, with Zone 1

¹⁰ BC Housing (2019) guidelines recommend a minimum floor area of 120 square feet for bedroom type A, which is the largest of the three bedroom types listed in their report.

being the least remote and Zone 3 being the most remote. We use these data, presented here in Table B5.1, to calculate the number of units serviced in each Zone. We divide the total cost of servicing new lots in British Columbia by the total number of units serviced to get the average per unit cost of servicing a lot in British Columbia. We utilize the Historical Cost Index from RSMMeans to get the average per unit cost of servicing a lot in British Columbia in 2023 Canadian dollars.

Table B5.1: Cost of Servicing Lots in British Columbia

Geographic Zone	Total Cost of Servicing New Lots (million \$)	Cost per unit (\$)
Zone 1	409.3	42,457
Zone 2	242.9	40,487
Zone 3	75.2	36,115

Source: IFSD (2021).

The estimate for the average price of land per housing unit presented in Table B5.2 is a conservative estimate of the price of land in Vancouver. Due to limitations on data availability, we utilize this estimate to calculate the cost of addressing suitability need among owners for all regions of British Columbia. The average price of land per housing unit is calculated as follows. A CMHC report on house prices estimates the price per square foot of land in Vancouver in 2016 to be between \$400 and \$450 per square foot (CMHC 2018). We utilize the land component of the New Housing Price Index for British Columbia (Statistics Canada 2023c) to get land price per square foot in 2023 Canadian dollars. We obtain estimates from Pavlov and Summerville (2018) for the minimum lot size of single family homes based on their examination of data from BC Assessment. We use the minimum instead of the average lot size, since the estimate of the average lot size would be influenced by very large lots. Since we are using the land price in Vancouver for the entire province, it would be reasonable to err on the side of underestimating the lot size. The price per square foot and lot size estimates used are presented in Table B5.2. We multiply the price per square foot by the lot size to get the average price of land per housing unit. Given the data available, Table 2.3.1 presents a conservative estimate of the average price of land per housing unit calculated using the lower end of the price per square foot.

Table B5.2: Land price per square foot and lot size

Estimate	Value
Land price per square foot (\$) [2023 dollars]	479 - 539
Lot size (square feet)	2,640

Source: CMHC (2018); Pavlov and Summerville (2018); Statistics Canada (2023c). **Note:** The land price per square foot values presented in this table are rounded to the nearest whole number.

B6. Estimating the Per-Intervention Cost of Addressing Adequacy Need

A household is considered to be living in inadequate housing if their dwelling requires any major repairs (Statistics Canada 2021). This section describes how we estimate the per-intervention cost of addressing the housing adequacy need of Métis households in core housing need in a particular region. The “intervention” required to address housing adequacy need can be thought of as a cash support to cover the cost of conducting repairs. For owner households, the cash support can be provided to the owners directly and for renter households the cash support can be provided to the landlord, since it is their responsibility to conduct repairs.

The MNBC Housing Needs Survey asked respondents about the condition of their dwelling. When describing the condition of their dwelling, respondents were asked to choose from one of the following options:

1. Major repairs needed (eg: defective plumbing or electrical wiring; structural repairs to walls, floors or ceilings, etc.)
2. Minor repairs needed (e.g. missing floor tiles, bricks or shingles, defective steps, railing or siding, etc.)
3. Regular maintenance needed (e.g. painting, furnace cleaning, etc).

Respondents who described their dwelling as needing either major or minor repairs were asked to specify the types of repairs required. Respondents were presented with a list of 15 options and asked to select all the types of repairs that were needed in their dwelling.¹¹ Table B6.1 provides the full list of options presented.

¹¹ Respondents were also able to write in responses if their dwelling needed repairs other than those listed. We do not consider the written responses when estimating the cost of repairing inadequate housing.

Table B6.1: MNBC Housing Needs Survey: Types of Repairs Needed

Options of Types of Repairs
Defective plumbing
Septic system
Water heater
Defective electrical or wiring
HVAC system
Defective windows or doors
Structural problems in floors, roofs, and ceilings
Structural problems in roof or end-of-life roofing material
Structural problems in foundation
Asbestos abatement
Lead abatement
Mold remediation
Other environmental (e.g.: flooding risk, external fire hazard, ground instability, etc)
Other life and safety (e.g. fire hazard, carbon monoxide, etc)
Radon gas remediation

Source: MNBC Housing Needs Survey (2021).

While survey respondents were able to indicate broadly the types of repairs needed in their dwelling, the data collected were not detailed enough to construct reliable estimates of repair costs. For instance, respondents could indicate their dwelling was in need of plumbing repairs, but it isn't possible to use the MNBC Housing Needs Survey to ascertain whether respondents need piping replaced or their toilet repaired.

Consequently, this study calculates the cost of each type of repair using estimates from Wallace, Divringi, and Wardrip (2019) and data from RSMMeans. Wallace, Divringi, and Wardrip (2019) use cost data from RSMMeans and detailed data on housing problems from the American Housing Survey to estimate the total cost of repairs needed at various geographic levels in the United States of America. Wallace, Divringi, and Wardrip (2019) present, for each type of housing problem, the aggregate repair costs (in billion \$) and the number of units in need of that type of

repair (in million \$), presented here in Table B6.2. For each type of housing problem, we calculate the average repair costs by dividing the aggregate repair costs by the number of units in need of repair. We then utilize the Historical Cost Index and the City Cost Index from RSMMeans to get the average cost of repairing each type of housing problem in each MNBC region in terms of 2023 Canadian dollars.

Note that Wallace, Divringi, and Wardrip (2019) construct estimates of average repair costs by taking into account all repairs needed, not just major repairs. Thus the average repair cost estimates from this paper may be lower than can be reasonably expected when focusing only on major repairs.

Table B6.2: Repair Costs by Type of Housing Problem

Type of Housing Problem	Number of units in need of repair (millions)	Aggregate Repair Costs (billion 2018 USD)
Electrical	6.7	8.9
Heating	6.1	5.4
Plumbing	4.7	5.9
Structural	19.1	72.1
Pests	6.0	2.8
Leaks and Mold	20.3	31.7

Source: Wallace, Divringi, and Wardrip (2019).

Table B6.3 describes how we map the repair options in the MNBC Housing Needs Survey to the housing problems listed in Wallace, Divringi and Wardrip (2019) and Divringi et al. (2019). Table B6.3 also describes how we estimate the cost of the repair options from the survey that cannot be directly mapped to one of the housing problems in Wallace, Divringi and Wardrip (2019) and Divringi et al. (2019).

With respect to asbestos abatement, guidelines from the Government of Canada (2023a) suggest that there are no significant health risks if materials containing asbestos in the home are left undisturbed. Guidelines from the US government (US CPSC; Accessed 2023) suggest that if the material is in good shape, then sealing (encapsulation) or covering should be considered first, before removal. We assume that the cost of asbestos abatement for each household is the cost of encapsulating the asbestos ceiling of the house.¹²

¹² Asbestos may be commonly found in the plaster or ceiling tiles in the home (Government of Canada 2023b).

The Government of Canada (2021) recommends either encapsulation or chemical removal of lead-based paint. We assume that the cost of lead abatement for each household is the cost of encapsulating the lead-based paint in the ceiling of the house.¹³

The options “other environmental” and “other life and safety” are quite open-ended compared to the remaining options provided in the MNBC Housing Needs Survey. Since the categories are so open-ended, we would need to make strong assumptions about the repair needs included under these categories. This in turn would call into question the reliability of any estimates we make of the cost of conducting repairs associated with these options. Due to these limitations, we do not consider “other environmental” and “other life and safety” options when constructing the cost of repairs.

Radon gas remediation is another option provided in the MNBC Housing Needs Survey that we do not consider when constructing the cost of repairs due to limited data available on the cost of radon gas remediation. The RSMMeans database does not include the cost of radon gas remediation. The cost of radon reduction in Canada is reported in the Radon Reduction Sweepstakes report from Take Action on Radon, a national initiative funded by Health Canada to encourage Canadians to reduce radon gas in their homes. However, we did not include this as the estimated cost of radon reduction was based on 16 cases across all of British Columbia,¹⁴ and may not be very reflective of the average cost of radon reduction in British Columbia.

Table B6.3: Repair Cost Categories and a description of Cost Estimates

Repair options in MNBC Housing Needs Survey	Repair Cost Categories	Detailed Description
Defective plumbing	Plumbing problems	Type of housing problem in Wallace, Divringi and Wardrip (2019) and Divringi et al. (2019).
Septic system		
Water heater		
Defective electrical or wiring	Electrical problems	Type of housing problem in Wallace, Divringi and Wardrip (2019) and Divringi et al. (2019).
HVAC system	Heating problems	Type of housing problem in Wallace, Divringi and Wardrip (2019) and Divringi et al. (2019).

¹³ Lead in paint and lead in plumbing are two common sources of lead in the home (Government of Canada 2016).

¹⁴ The report also lists the average cost of radon gas reduction in Canada based on 445 entries across the country. However, a report by Health Canada suggests that radon levels vary significantly across the country (Health Canada, 2012). Therefore, Canada-wide estimates of the cost of radon reduction may also not be very reflective of the average cost of radon reduction in British Columbia.

Repair options in MNBC Housing Needs Survey	Repair Cost Categories	Detailed Description
Defective windows or doors Structural problems in floors, roofs, and ceilings Structural problems in roof or end-of-life roofing material Structural problems in foundation	Structural problems	Type of housing problem in Wallace, Divringi and Wardrip (2019) and Divringi et al. (2019).
Mold remediation	Leaks and mold	Type of housing problem in Wallace, Divringi and Wardrip (2019) and Divringi et al. (2019).
Asbestos abatement	Asbestos abatement	Cost per square foot of encapsulating asbestos ceiling. To be multiplied by the square footage of the home. Square footage of the home calculated based on the number of bedrooms (See Table B5.1). Source: Gordian (2023b).
Lead abatement	Lead abatement	Cost per square foot to encapsulate lead-based paint. To be multiplied by the square footage of the home. Square footage of the home calculated based on the number of bedrooms (See Table B5.1). Source: Line item 028319230250 under residential new construction. Cost per square foot to encapsulate lead-based paint on ceiling (Gordian 2023b).

Source: MNBC Housing Needs Survey (2021); Wallace, Divringi, and Wardrip (2019); Divringi et al. (2019); Gordian (2023a; 2023b).

For each repair option, building a cost estimate requires making certain assumptions. For repair cost categories such as plumbing problems, electrical problems, heating problems, structural problems, and mold remediation, this study relies on the assumptions made by Divringi et al. (2019), that the authors finalized in consultation with construction industry experts from RSMMeans. For lead and asbestos abatement, cost estimates were built based on federal documents noting where lead and asbestos are commonly found in the home.

For each household in adequacy need, we calculate the total cost of repairs by summing over the cost of all the repairs needed in the dwelling. We build two estimates of household repair costs that include different repair needs based on the strength of the assumptions required to construct the repair cost estimate for the particular repair need. The repair options included in each estimate of household repair costs are:

1. Estimate 1: Electrical problems, Plumbing problems, Heating Problems, Structural Problems and Mold remediation;
2. Estimate 2: All repair options in Estimate 1, as well as Asbestos Abatement, and Lead Abatement.

As is the case for suitability need (see Appendix B5), there are several MNBC regions in which the number of respondents with inadequate housing is too small to generate reliable estimates. Therefore, our estimates of adequacy need intervention cost use aggregated regions. In particular, we combine Kootenay and Thompson & Okanagan into “Eastern BC” and we combine North Central, Northeast, and Northwest into “Northern BC;” the number of respondents in Lower Mainland and Vancouver Island & Powell River is large enough that no such aggregation is necessary for these regions.

Continuing the parallels with the suitability need intervention cost methodology, the per intervention cost by aggregated region is determined in four steps:

1. For each household and $i = 1, 2$ estimate the i^{th} *expected intervention cost* by multiplying the households Estimate i value by the probability that the household is in core housing need;
2. For each aggregated region and $i = 1, 2$ sum the i^{th} expected intervention costs over all households in the region to estimate the i^{th} expected total intervention cost;
3. For each aggregated region, estimate the *expected number of households in need* by taking the weighted sum, over all households in the region with inadequate housing, of each such household’s probability of being in core housing need;
4. For each aggregated region and $i = 1, 2$ divide the expected i^{th} total intervention cost by the expected number of households in need to obtain the i^{th} *cost per intervention*.

B7. Constrained Optimization

This section describes the constrained optimization approach we employ to estimate the cost of reducing Métis core housing need according to various criteria. Formally, constrained optimization is a method of optimizing an objective function with respect to certain variables while imposing constraints on the values the variables can take.

In the context of this report, constrained optimization selects the number of interventions of each type needed to reduce Métis core housing need according to certain criteria such that the total cost of interventions is minimized. The total cost of interventions is calculated as follows:

1. The number of interventions for each “need type” in a region is multiplied by the cost per intervention of each need type in the region.
2. The total intervention cost is calculated by summing the results of these multiplications across all regions and intervention types.

Thus, in order to utilize constrained optimization to determine the minimum cost of reducing Métis core need subject to various criteria, we need to know the cost per intervention of each need type in a region and the number of households in each need type in a region.

B7.1 Identifying Costs and Counts for Complex Need Types

The specific type of intervention required to remove a household from core housing need depends on the combination of housing needs that the household experiences. A household in core housing need can be experiencing any one of seven different combinations of housing needs. The possible types of need that a household in core need may be in are listed below:

1. Affordability need only
2. Suitability need only
3. Adequacy need only
4. Affordability and adequacy need
5. Affordability and suitability need
6. Adequacy and suitability need
7. All three housing needs - affordability, adequacy, and suitability need.

It is important to consider each of these need types separately as the intervention required to remove a household from core housing need depends on the combination of housing needs a household is experiencing. For example, a household experiencing only affordability need will require only an affordability intervention to be removed from core housing need.¹⁵ On the other hand, a household experiencing adequacy need and affordability need would need both an affordability intervention and an adequacy intervention to be removed from core housing need.

We use the estimates of the cost of affordability need interventions, suitability need interventions, and adequacy need interventions presented in Section 3 to estimate the cost of addressing each need type in a region. The cost of addressing each need type, along with an explanation where needed, is provided in Table B7.1. Note that since the suitability intervention described in Section 3.2 depends on the tenure of the household, for need types involving suitability, we separate need types based on the household's tenure.

¹⁵ Recall that the affordability intervention is essentially a cash transfer provided to offset the household's shelter costs. Section B4 provides details of how the per-intervention cost of affordability interventions is estimated.

Table B7.1: Cost of Addressing Each Need Type

Need type	Cost	Notes
Households in affordability need only	Cost of affordability intervention	
Households in adequacy need only	Cost of adequacy intervention	
Owner households in suitability need only	Cost of suitability intervention for owners	
Households in affordability and adequacy need	Cost of affordability intervention + Cost of adequacy intervention	
Owner households in suitability and affordability need	Cost of suitability intervention for owners	The suitability intervention for owners is new, suitably-sized residential construction. We assume for households in this needs type the suitability intervention for owners is sufficient as new residential construction essentially eliminates a large portion of the shelter costs incurred by the household.
Owners households in suitability and adequacy need	Cost of suitability intervention for owners	The suitability intervention for owners indicates that households will essentially be provided with newly constructed dwellings that will not be in need of any major repairs, thereby removing them from adequacy need.
Owners in suitability, affordability, adequacy need	Cost of suitability intervention for owners	Recall that the suitability intervention for owners is new, suitably-sized residential construction. Under the suitability intervention for owners, households will be provided with newly constructed dwellings, thereby removing them from being in affordability and adequacy need.
Renter households in suitability need only	Cost of suitability intervention for renters	
Renter households in suitability and affordability need	Cost of suitability intervention for renters + Cost of affordability intervention	The suitability intervention for renters is the difference between the cost of suitable housing and the current shelter cost while the affordability transfer is the difference between the current shelter cost and 30% of income. Together these add up to the difference between the cost of acceptable housing and 30% of income.
Renter households in suitability and adequacy need	Cost of suitability intervention for renters	The suitability intervention for renters is a cash transfer that would allow households to move to an acceptable dwelling without increasing their shelter costs, thereby removing them from both suitability need and adequacy need.

Need type	Cost	Notes
Renter households in suitability, affordability, and adequacy need	Cost of suitability intervention for renters + Cost of affordability intervention	The suitability need and affordability need interventions together cover the cost for a renter household to move to acceptable housing without spending more than 30% of their income on housing cost, thereby eliminating all three needs.

As noted, the total cost of interventions depends both on the cost per intervention of each need type in a region and the number of interventions for each need type in a region. In order to determine the number of interventions for each need type required to minimize total cost subject to various criteria, we first need to know the total number of interventions possible for each need type. That is, we need to know the number of Métis households in a region in core housing need that are experiencing each combination of suitability, affordability and adequacy needs.

While we can use the MNBC Housing Needs Survey to derive the share of Métis households in each need type, using the Census data as much as possible yields the most accurate estimates. We use data from a custom tabulation of the 2021 Census of Population (Statistics Canada 2023a) and MNBC Housing Needs Survey data where needed to calculate the number of Métis households in core housing need in British Columbia that experience each combination of suitability, affordability, and adequacy needs.

The Census data does not contain information about the number of households in each combination of suitability, affordability, and adequacy needs. We only have the following data from the 2021 Census:

1. Number of Métis households in affordability need
2. Number of Métis households in adequacy need
3. Number of Métis households in suitability need
4. Number of Métis households in core housing need that are experiencing at least one of affordability, adequacy, and suitability need.

However, we can calculate the number of households in each need type using data from the MNBC Housing Needs Survey. Let A , S , and Q denote, respectively, the set of households in core housing need and (respectively) affordability need, suitability need, and adequacy need and let $\Omega = \{A, S, Q\}$. Given the different need types a household can be in, we know that:

$$|\bigcup_{X \in \Omega} X| - \sum_{X \in \Omega} |X| = |(A \cap Q) \setminus S| + |(A \cap S) \setminus Q| + |(S \cap Q) \setminus A| + 2|\bigcap_{X \in \Omega} X|$$

That is,

$$\begin{aligned}
 & \text{The number of households in core housing need -} \\
 & \quad (\text{the number of households in affordability need +} \\
 & \quad \quad \text{the number of households in adequacy need +} \\
 & \quad \quad \text{the number of households in and suitability need}) \\
 & \quad = \\
 & \text{The number of households in affordability and adequacy need only +} \\
 & \text{the number of households in affordability and suitability need only +} \\
 & \text{the number of households in adequacy and suitability need only +} \\
 & \quad 2 \times (\text{the number of households in all three types of need}).
 \end{aligned}$$

Using the equation above, and data from the MNBC Housing Needs survey, we calculate, at the provincial level, the size of each set of households described on the right hand side of the equation relative to the number on the left hand side of the equation. For example, we can calculate the *number of households in affordability and adequacy need but not in suitability need* as a **share** of the *number of households in core housing need overall minus the sum of the number of households in individual type of need*.

We then assume that the shares that we derived from the MNBC Housing Needs Survey data are similar to those we might have observed in the Census data if that were available. We apply these shares to the Census data to calculate the number of Métis households in British Columbia that are experiencing only two types of need for all combinations of needs and the number of Métis households in British Columbia that are experiencing all three types of need.

Finally, for each type of need we calculate the number of households in only that type of need. For instance, in the case of affordability need we can calculate the number of households in affordability need as follows:

$$|A \setminus (S \cup Q)| = |A| - |(A \cap Q) \setminus S| - |(A \cap S) \setminus Q| - \sum_{X \in \Omega} |A \cap X|$$

That is,

$$\begin{aligned}
 & \text{The number of households in affordability need only} \\
 & \quad = \\
 & \text{The number of households in at least affordability need (from Census)} \\
 & \quad - \text{The number of households in affordability and adequacy need} \\
 & \quad - \text{The number of households in affordability and suitability need} \\
 & \quad - \text{The number of households in all three types of need.}
 \end{aligned}$$

Thus we use estimates from the MNBC Housing Needs Survey and the data from 2021 Census of Population to derive the number of Métis households in British Columbia in each need type. Under our approach for Métis households in suitability need, the intervention required to remove a

household from suitability need depends on the tenure of the household. Thus, for need types involving suitability need, we calculate the number of owner and renter Métis households in each need type using the the share of renters and owners in suitability need from the Census data.

B7.2 Constrained Optimization Problem: Formulation and Solution

Once we calculate the per intervention cost of addressing each need type described in Table B7.1 and the number of Métis households in each need type, we can set up the constrained optimization problem to estimate the minimum cost of reducing Métis core housing need according to several criteria. In this report, we consider five scenarios, as outlined in Section 4.0. In all scenarios, we solve the constrained optimization problems using the ECOSolveR package in R (Fu & Narasimhan, 2021).

Under Scenario 1, presented in Section 4.1, we estimate the minimum cost of reducing Métis core housing need by 50% and reducing the number of Métis households experiencing each type of need by 50%. Formally we can represent the problem as follows:

1. Let $N_{i,r}$ be the number of Métis households that are removed from need type i in region r
2. Let $C_{i,r}$ be the per intervention cost of addressing need type i in region r
3. Let \bar{N}_i be the number of Métis households initially in need type i in region r
4. Let A be the set of need types i that include affordability need.
5. Let S be the set of need types i that include suitability need.
6. Let Q be the set of need types i that include adequacy need.

Under Scenario 1 we choose $N_{i,r}$ to minimize the total intervention cost, such that

- $\sum_{i,r} N_{i,r} \geq 0.5 \cdot \sum_{i,r} \bar{N}_{i,r}$: at least 50% of Métis households initially in core housing need are removed from core housing need.
- $\sum_{i,r} N_{i,r} \geq 0.5 \cdot \sum_{i,r} \bar{N}_{i,r}$ for all $i \in A$: at least 50% of Métis households initially in affordability need are removed from affordability need.
- $\sum_{i,r} N_{i,r} \geq 0.5 \cdot \sum_{i,r} \bar{N}_{i,r}$ for all $i \in S$: at least 50% of Métis households initially in suitability need are removed from suitability need.
- $\sum_{i,r} N_{i,r} \geq 0.5 \cdot \sum_{i,r} \bar{N}_{i,r}$ for all $i \in Q$: at least 50% of Métis households initially in adequacy need are removed from adequacy need.

- For each needs type i in region r , $0 \leq N_{i,r} \leq \bar{N}_{i,r}$: the number of Métis households removed from needs type i in region r cannot be negative and cannot be greater than the number of Métis households initially in needs type i in region r .

The total intervention cost, which is the objective function to be minimized by the constrained optimization, is

$$C(N_{1,1}, N_{1,2}, \dots, N_{11,7}) = \sum_{i,r} C_{i,r} \cdot N_{i,r}.$$

The objective function multiplies the number of Métis households that are removed from need type i in region r by the per intervention cost of addressing need type i in region r , then sums those products to obtain the total intervention cost across all regions and intervention types.

Note that the constrained optimization problem set up here is partial equilibrium analysis. That is, it does not consider the impact on the wider economy in British Columbia of proposed interventions to address Métis core housing need. Métis households account for approximately 3% of all households in British Columbia. The share of Métis households in the total population varies across MNBC regions, but remains low - from 2% in the Lower Mainland to 9% in the Northeast. While we do not know the geographic concentration of the Métis population within each MNBC region, since the size of the Métis population in British Columbia is small compared to the total population, we anticipate that it is reasonable to assume that proposed interventions to address Métis housing need in British Columbia will have a negligible impact on the wider economy of the province.

C. Regional Core Housing Need Gap

Table C1.1: Regional Core Housing Need Gap between Métis and Non-Indigenous Households in British Columbia

Region #	MNBC Region Name	Core Housing Need Rate		Core Housing Need Gap (percentage points)	Number of Métis Households Needed to Close the Gap
		Métis Households	Non-Indigenous Households		
1	Van. Isl. & Powell River	12%	11%	0.8	116
2	Lower Mainland	16%	16%	-0.1	0
3	Thompson & Okanagan	9%	8%	0.3	39
4	Kootenay	11%	9%	2.1	64
5	North Central	6%	7%	-0.8	0
6	Northwest	8%	8%	-0.4	0
7	Northeast	8%	7%	0.9	23
British Columbia		12%	13%	-1.7	0

Source: Statistics Canada (2023a). **Note:** The core housing need rate is the number of households in core housing need divided by the number of households examined for core need. The column “Number of households needed to close the gap” refers to the number of Métis households in a region that need to be removed from core housing need in order to close the core need rate gap between Métis and non-Indigenous households in the region.

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