SCHEDULE F – COMPLETION REPORT

GMF number	17005
Name of lead applicant (municipality or other partner)	Heiltsuk First Nation
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Date of the report	September 3rd, 2021

1. Introduction

a. Who was involved in doing the Feasibility Study, and what are their affiliations? Please include name, title and contact information. Those involved could include municipal staff, engineers and other consultants, a representative from a non-governmental organization, and others.

The core team involved in the Feasibility Study included the following individuals who formed the Heat Pump Working Group which met on a weekly basis throughout the project to ensure its success.

	Title	**Role & Responsibilities**
Pamela Wilson	Heiltsuk, Project Manager	Contractor and community coordination
Leona Humchitt	Heiltsuk, Councillor & Climate Coord	Governance and climate action connections
Leo Lawson	Heiltsuk, Capital Projects	Cross-departmental strategy, shipping
Geraldine Dixon	Heiltsuk, Housing Manager	Heat pump applications, labour staffing
Phil Climie	Ecotrust Canada, Project Manager	Funding and financing management
Dylan Heerema	Ecotrust Canada, P. Eng & Policy	Equipment and engineering guidance
Graham Anderson	Ecotrust Canada, Energy Director	Overall strategic energy planning

2. The Feasibility Study

a. Describe the process that you undertook to make this feasibility study a reality, from concept, to council approval, to RFP, to final deliverable.

In 2017 Heiltsuk Nation and Ecotrust Canada completed a study that identified air-source heat pumps as the most viable project opportunity to reduce household energy costs, reduce energy consumption and emissions, and improve household comfort. In 2018, a pilot project installed ductless (wall mounted) heat pumps in 37 homes. A 2019 review of the project found very high satisfaction levels with the heat pumps (93%), but with common feedback that heating throughout the entire home could be improved. With Heiltsuk's Chief and Council support and through funding from FCM and other sources, a feasibility project was initiated to test the effectiveness of ducted, central air-source heat pumps to meet the community's space heating and cooling needs. FCM's funding directly contributed to 53 oil furnaces and 5 electric furnaces being replaced with new high-efficiency, variable speed Samsung heat pumps. In total, all project funding resulted in 98 homes receiving new central air-source heat pumps.

b. What were the objectives of the Feasibility Study (what was it seeking to determine)?

The main objective of the Feasibility study is to evaluate the efficacy of central air-source heat pumps as a solution to residential space heating and cooling in Bella Bella. Ultimately, Heiltsuk Nation is seeking better space heating and cooling solutions for members who either don't have effective systems or have systems that are too costly or dangerous to operate. Household heating is a fundamental component of physical and mental wellbeing, as well as the most significant source of energy consumption and

emissions in a home. In the coming months, a formal heat pump performance evaluation will consider multiple factors including: feasibility and cost of installation, ongoing operational costs, operational C02equivalent emissions, occupant satisfaction, and local economic development and training opportunities. These factors will be considered when evaluating central air-source heat pumps as a solution to Bella Bella's home heating and cooling challenges.

c. What approach (or methodology) was used in the Feasibility Study to meet these objectives?

The approach used to achieve the above objectives was to install and evaluate the effectiveness of central air-source heat pumps in Bella Bella homes. The vast majority of homes in Bella Bella previously relied on diesel furnaces to heat their homes, with a smaller portion relying on traditional electric furnaces. The installation of 98 air-source heat pumps offers a representative sample of homes to evaluate their reliability as a leading HVAC system for the community.

The evaluation will employ a mixed-methods assessment of the systems after they have been operating over a period of time that covers high heating and cooling degree days (at least 12 months). This data will be cross-referenced with EnergGuide Evaluation data from 23 homes to further measure the cost and environmental benefits of the retrofits. Lastly, heating and cooling comfort and satisfaction levels will be evaluated by in-person word-of-mouth feedback and a digital survey.

Altogether, the evaluation will result in a comprehensive assessment of the performance of central air-source heat pumps in Bella Bella homes and allow Chief and Council to evaluate the benefits of scaling up the project to all remaining homes in the community.

d. Please describe any public consultations conducted as part of the Feasibility Study and their impact on the Study.

In addition to the very positive feedback from the 2019 review of ductless heat pumps, in early 2021 Heiltsuk's Climate Action Team completed the first stage of Community Energy Planning engagements. Responses from over 300 Heiltsuk members found that more than two thirds of respondents identified heat pumps as a strategic priority for Heiltsuk's clean energy future and 85% supported home energy efficiency in general. This support is encouraging and provides provided assurances that there is strong support for the project throughout the Nation.

3. **Feasibility Study Findings and Recommendations**

a. What were the environmental findings related to the options explored in the Feasibility Study? Please provide quantitative results and summary tables of these results (or the page numbers from the Feasibility Study report).

The environmental benefits of the project are very strong. Due to significant increases in both funding and rebates for the project, the total environmental benefits of the project vastly surpassed the project's initial targets. While electricity consumption data is yet to be gathered, the elimination of oil use in 93 homes establishes a significant decrease in emissions attributable to household heating. The community's primary electricity generation is via a nearby hydroelectric dam.

		Annual Reduction per home	Lifetime Reduction per home****	Total Homes	Project Lifetime Reduction
Oil to Heat Pump Conversion*	Consumption (L)	1,771	26,565	93	2,470,545
	Emissions (tC02e)	5**	75	93	6,975
Electric to Heat Pump Conversion***	Consumption (kWh)	*Pending evaluation*	*Pending evaluation*	5	*Pending evaluation*
	Emissions (tC02e)	*Pending evaluation*	*Pending evaluation*	5	*Pending evaluation*

* Total oil consumption and corresponding emissions eliminated; after the project evaluation, this data will be combined with changes in electricity consumption to identify net cost, consumption, and emissions metrics.
** Application estimates identified emissions reductions of 5.4tC02eq, based on eliminating 2,000L of oil consumption; preliminary emissions reductions estimates are revised to 5tC02eq based on 28 accounts of homes eliminating an average 1,771L.
*** Forms have been gathered from the 98 heat pump recipients to anonymously access their electricity consumption and cost data over a 5-year period to assess a year-over-year data of total home energy use. One early report from a household upgrading from an electric furnace showed a 28% reduction in consumption (11kWh) over the same time in the previous year.
**** Using a conservative lifetime estimate of the installed heat pumps of 15 years.

b. What were the financial findings related to the options explored in the Feasibility Study (for example, results of a cost-benefit analysis, financial savings identified, and so on)? Please provide quantitative results and summary tables of these results (or the page numbers from the Feasibility Study report).

		Reported Annual Cost	Lifetime Reduction per home	Total Homes	Project Lifetime Reduction
Oil to Heat Pump Conversion	Oil Cost Change ($)*	$ 2,657	$39,855	93	3,706,515
	Electricity Cost Change ($)**	*Pending evaluation*	*Pending evaluation*	93	*Pending evaluation*
	Total Cost Change ($)**			93	*Pending evaluation*
Electric to Heat Pump Conversion	Total Cost Change ($)**	*Pending evaluation*	*Pending evaluation*	5	*Pending evaluation*

* Accounts from 28 homes; oil charged at $1.52/L
** Electricity cost data to be gathered during formal project evaluation

Because homes switching from primarily oil heating to heat pumps are increasing their reliance on electricity for heating it is possible that some homes will see increases in electricity consumption and corresponding costs. However, with heat pumps operating at least three times the efficiency of their previous oil systems, it is very unlikely that any increases in electricity costs will come close to offsetting the avoided annual oil costs of $2,657.

Because the installed heat pumps operate at efficiencies three times greater than traditional electric furnaces, baseboard heaters, and plug-in heaters, it is expected that heating related costs will be reduced by approximately two thirds. With space heating contributing to 50% or more of a homes total energy use,

total electricity bill reductions are projected to be reduced by around one third. This aligns with one early report from a household that showed a 28% reduction in consumption (11kWh) over the previous year.

c. Based on the environmental and financial findings above, what does the Feasibility Study recommend?

After a more thorough review of the system performance is complete, indications are that the Heat Pump Working Group will strongly recommend to Heiltsuk Nation (and other rural and remote communities that deal with high heating costs and have existing ducting in their homes) that installing central air-source heat pumps can offer strong environmental and affordability benefits, along with high quality heating and cooling. Preliminary data on costs and consumption benefits, as well as word-of-mouth accounts of improved household comfort (one elder said they had forgot what it was like to have a warm home) embolden the likelihood that central air-source heat pumps are a resoundingly positive solution to improving space heating and cooling in Bella Bella homes.

In addition to the installation of heat pumps, 23 EnerGuide Evaluations were completed to ensure that the heating system retrofits were considered within the broader context of the house-as-a-system concept. The most significant findings from the Evaluations were that, after heat pump installations, the most beneficial energy efficiency improvement to the homes would be to complete air-sealing. Heiltsuk is already taking action on this and has deployed a local team to complete air-sealing activities in all homes that received heat pumps. Completing this work will result in significant improvements to the energy performance of the homes, with potential energy savings benefits of 15.4GJ/home/year. As such, air-sealing is another important recommendation.

4. Lead Applicant's Next Steps

a. Taking the Feasibility Study's recommendations into account, what next steps do you as the municipality plan to take? What potential benefits or internal municipal improvements would result from these next steps?

Next steps for Heiltsuk Nation are to identify ways to continue to retrofit the remaining homes in the community with heat pumps, as well as continue to make other energy efficiency upgrades. Heiltsuk Nation will also continue to complete EnerGuide Evaluations throughout the housing stock, including training a member to become a certified Energy Advisor. Together, these Evaluations, high efficiency retrofits, and skills development initiatives can lay a strong foundation for improving the overall energy efficiency, security, and resiliency of Heiltsuk homes.

5. Lessons Learned

In answering the questions in this section, please consider all aspects of undertaking the Study — from the initial planning through each essential task until the Final Study was prepared.

a. What would you recommend to other municipalities interested in doing a similar Feasibility Study? What would you do differently if you were to do this again?

A top recommendation to other communities would be to place a significant emphasis on equipment and contractor selection. Being confident in the quality of technology and installations ensures the expected benefits of the work are realized. This means taking time to evaluate different technologies and identify trustworthy and experienced contractors who are as committed to a successful long-term project. This includes getting both internal and external input in the evaluation of the equipment where possible and then using that work to inform a thorough analysis of interested contractors.

Secondly, the success of this project was contingent on excellent project management for the work that took place in the community. The responsibilities of this work ranged from assessing heat pump applications, establishing needs-based criteria, liaising across numerous departments, contractor travel and accommodations, organizing of local labour, communications, and information collection from

participating households. These responsibilities proved to be critically important to the success of the project and should be important considerations for communities looking to fill a similar role.

Lastly, due to COVID-19, visiting, purchasing, procurement, and accommodation limitations meant the 98 installations were spread across multiple installations phases. While the numerous phases increased costs overall, the phased approach allowed for cost and process efficiencies to be improved from one phase to the next.

b. What barriers or challenges (if any) did you encounter in doing this Feasibility Study? How did you overcome them?

The biggest barrier for the project was the presence of COVID-19 and the community-level challenges that posed. While it did not prevent the project from moving forward, it certainly required making accommodations that resulted in some cost inefficiencies. Additionally, Bella Bella's remote nature meant that organizing and coordinating equipment deliver and contractor and local labour was a costly and logistically challenging process. Considering these barriers, this project moved forward very positively and was highly successful in achieving the goals outlined in the timelines that were planned.

6. **Knowledge Sharing**

a. Is there a website where more information about the Feasibility Study can be found? If so, please provide the relevant URL.

More information on this project can be found on the Heiltsuk Climate Action Page or on Ecotrust Canada's website:

- https://heiltsukclimateaction.ca/heat-pump-project
- https://ecotrust.ca/latest/video/heiltsuk-heat-pump-project/

b. In addition to the Feasibility Study results, has your Feasibility Study led to other activities that could be of interest to another municipality (for example, a new policy for sustainable community development, a series of model by-laws, the design of a new operating practice, a manual on public consultation or a measurement tool to assess progress in moving toward greater sustainability)? If so, please list these outcomes, and include copies of the relevant documents (or website links).

This feasibility study is aligned with Heiltsuk's broader Climate Action work. With multiple energy-related initiatives ongoing, this feasibility study has contributed to a collective momentum within the Nation that is leading to transformative energy and climate projects and planning. As an example, one member of Heiltsuk Nation is training to become a Certified Energy Advisor so that the local knowledge, skills, and profession are continuously available to Heiltsuk and nearby communities. The success of the project is having spillover effects into other areas of home energy efficiency, security, sovereignty, and generation as well. With household energy efficiency becoming an increasingly strategic direction for Federal, Provincial, and Indigenous Governments, access to multiple levels of funding, rebate, and financing programs are accelerating a market transition of Bella Bella's homes to cleaner, safer, more affordable, and climate resilient solutions.

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