Point Lay Housing Survey

2023

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NREL

COLD CLIMATE
HOUSING RESEARCH CENTER

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Point Lay

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Summary

In April 2022, a team from the Cold Climate Housing Research Center, Inc., the National Renewable Energy Laboratory, and the University of Alaska Fairbanks traveled to Point Lay, Alaska to conduct a housing survey. With funding from the National Science Foundation, the survey aimed to create an inventory of houses and house foundations in the community, document housing issues with a focus on those related to permafrost thaw, and provide data to estimate the need for new housing. Together with a survey crew recruited from the community, the team collected information on occupied and unoccupied houses, their foundations, and issues the buildings were experiencing.

Fifty-four (54) of the 73 residential buildings in the community were surveyed, including multifamily and single-family residences. Well over half (64%) are in need major repairs. One quarter did not meet the accessibility needs of the occupants. The most common foundation type is piles, however, there were concerns noted across foundation types. The most common issues noted by surveyors include houses that shake in the wind, cracked windows, doors that do not shut properly, and winter drafts. Homeowner priorities for repairs are in alignment with these findings and the most common include fixing broken or inoperable windows and doors, improving or adding plumbing, fixing cracks in the walls, and stabilizing foundations.

Nearly half (49%) of surveyed houses are considered overcrowded year-round, with more experiencing seasonal overcrowding. Half of the surveyed, occupied houses contain people sleeping in rooms that are not designed as a bedroom. This, combined with the severe issues some houses are experiencing, indicates a need for new, efficient, quality housing of varying sizes that prioritizes replacement of the houses with the most severe issues as well as alleviating overcrowding.

These and other survey results reported here support the Native Village of Point Lay Tribal Council Resolution 2022-06 declaring a climate emergency and requesting immediate, streamlined, and accelerated action. They also complement data from a University of Alaska survey team that visited Point Lay in summer 2022 (Connor, et. al. 2023) It is the hope of the survey team that this data can be used to support funding allocations, either through grant applications or other means, to improve housing in Point Lay and help increase the climate resiliency of the community.

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List of Acronyms

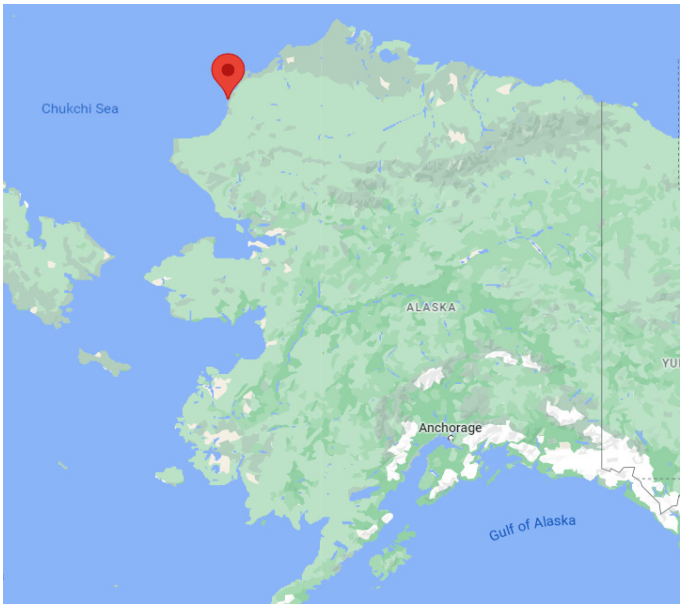
ACS	American Community Survey
ANCSA	Alaska Native Claims Settlement Act
ASRC	Arctic Slope Regional Corporation
CCHRC Inc.	Cold Climate Housing Research Center Inc.
HUD	United States Department of Housing and Urban Development
NF	Not Functioning
NREL	National Renewable Energy Lab
NSB	North Slope Borough
NSF	National Science Foundation
NVPL	Native Village of Point Lay
TNHA	Tagiugmiullu Nunamiullu Housing Authority
UAF	University of Alaska Fairbanks

1. Background

1.1 Point Lay

The Native Village of Point Lay (NVPL) is located on the shore of the Chukchi Sea in the northern part of the State of Alaska (Figure 1). It is a federally recognized tribe that is not incorporated under state law as a municipality. Its location puts the community under the regional government of the North Slope Borough (NSB). According to the State's employment statistics, the population is estimated at 287 residents as of 2018, with approximately 22% of the population being Iñupiaq (North Slope Borough, 2019).

Figure 1. Point Lay, Alaska Location. (Google Maps, 2022)



The community is also commonly referred to by its original Iñupiaq name: Kali. This word translates to "mound," as the community lies on an elevated mound of land (NSB, 2022).

1.1.1 Community History

The location of Point Lay has affected how the community lives in many ways. The community began as a trading post because of the convenient location for hunters and whalers. Today, Point Lay's economy is primarily based on subsistence hunting, fishing, and whaling, and its location has changed several times (Official Website Of The North Slope Borough, 2022). Figure 2 shows an aerial view of the community in 2022.

Originally, the community was located on a barrier island of the Kasegaluk lagoon. In the late 1970s, the community relocated to land at the mouth of the Kokolik River to escape flooding. Only five years after this initial relocation, Point Lay moved onto the high ground it sits on today. The continued flooding is attributed to coastal erosion and rising temperatures (Ahmaogak, 2004).

Figure 2. Aerial View of Point Lay. (NREL, 2022)

1.1.2 Permafrost Infrastructure in Point Lay

Historically, Point Lay has always rested atop a thick layer of permafrost, a feature that affects the community's infrastructure. By nature, permafrost remains frozen, but the upper portion, known as the active layer, freezes and thaws annually. This freeze-thaw cycle poses challenges to buried foundations and infrastructure. Water can expand up to 10% of its volume between its liquid and frozen states; this phase change can exert tremendous pressure, causing the ground to heave. Figure 3 shows a Point Lay home affected by ground heaving and subsidence.

Figure 3. Point Lay Home Tilting. (NREL, 2022)

Houses in Point Lay are subject to the ground heaving and subsiding in dramatic ways such as ectreme tilting.

As active layer deepens and thaws, water migrates away leading to ground subsidence. The permafrost layer becomes thinner and the active layer becomes thicker in the following year and more ice can thaw, as water drains away, it leads to more subsidence; and the cycle continues annually.

When water accumulates, it acts as a conductor and transfers more heat to the frozen ground below (Figure 4). This heat accelerates permafrost thaw and causes a positive feedback loop if not mitigated.

Thawing permafrost can also cause drastic coastal erosion, another ongoing concern for the Point Lay community and its infrastructure.

Figure 4. Frozen Pooled Surface Water Below Home. (NREL, 2022)

Water has accumulated under a house where subsidence has lowered the ground level. The water acts as a conductor, transferring more heat to the ground, and exacerbating the permafrost thaw.

Many reports have concluded that thawing permafrost is likely a contributor to the infrastructure issues that residences in Point Lay are facing (U.S. Army and Air Force, 2004; URS Corporation, 2005; North Slope Borough, 2016).

Tratitionally, the rule of thumb when building on permafrost has been to preserve it in its frozen state. Still, even with proven strategies that reduce the thermal effects of construction on permafrost, there will always be some effect on the site. One common technique constructing a pile foundation to apply the load of the house to the permafrost layer, which is more stable than the active layer. However, structural issues are still common with these homes. Figure 5 shows a Point Lay home built with piles tilting due to ground movement.

Figure 5. Point Lay Home Atop Pile Foundation. (NREL, 2022)

Even atop pile foundations homes are still susceptible to tilting due to subsidence.

1.2 Objectives

Researchers from the National Renewable Energy Laboratory (NREL), Cold Climate Housing Research Center (CCHRC), and the University of Alaska Fairbanks (UAF) worked with the NVPL and local crew members to conduct a housing survey in April 2022.

The housing survey listed three main objectives:

1. Create a complete list of the number of houses in Point Lay, their locations, and their foundation type.
2. Document the issues that houses in Point Lay are experiencing, especially those that can likely be attributed to permafrost thaw.
3. Provide data to estimate the number of new housing units needed due to the following:
    i. Overcrowding
    ii. High likelihood of inability to correct problems in a housing unit.

1.3 Methodology

This housing survey was completed as part of the National Science Foundation's (NSF) Navigating the New Arctic project: Ice-Rich Permafrost Systems, funded in 2019. Past reports and surveys guided the creation of questions to establish consistent data points to track the effects of permafrost thaw on housing infrastructure (Appendix A).

The Native Village of Point Lay tribal staff assisted NREL and UAF with outreach ahead of the survey by posting announcements on social media, posting flyers, broadcasting survey plans on local VHF radio, and recruiting local survey crew members. A community steering committee reviewed the survey plan and questions and helped to set dates and scope.

Researchers devoted one week in April 2022 to conducting surveys. The survey was scheduled in April due to the high likelihood of people being present, as it was after spring break but before whaling season. Seven project staff and three local crew members completed the survey. They set up a survey table in the tribal hall building, which also houses the post office, and the crew encouraged visitors to complete a survey. Other crew members walked door to door to collect photo documentation and interview residents. People could fill out the survey themselves or recieve assistance in completing the form from a survey crew member. Anyone who completed a survey received a $20 gift card to the Point Lay store and were entered into a raffle for other prizes. Each head of the household was asked permission for photos to be taken inside and outside their home, with the understanding that the photos might be released publicly.

2. Results

The April 2022 survey crew interviewed residents about the characteristics of their homes and collected demographic data to estimate overcrowding. The crew surveyed 54 residential buildings (74%) out of a total of 73; of those 54 buildings, six were vacant (Tables 1 and 2).

Surveyed vacant units may be included in some data sets but do not apply to others. Therefore, the sample size for each set of data varies and is stated in each section. Similarly, some of the subjective answers given by residents were consolidated or shortened by an analyst's best approximation in order to represent the aggregated data. Appendix B contains the template used in the survey.

2.1 Housing Characteristics

The survey team posed a range of questions, such as the year the house was built, its approximate square footage, and details about how it was built. The data gathered have been used to describe and depict trends in residential buildings in Point Lay.

Population

The survey counted 66 family units residing in 57 occupied residential units. Family units are two or more people related by birth, marriage, or adoption that are living together (Blake, Kellerson, Simic, 2007). The 66 family units represented 263 individuals. Two hundred-one individuals (76%) were year-round (permanent) occupants, and 62 (24%) were seasonal occupants. None of the 62 seasonal residents identified as having a disability, while eight (4%) of the 201 permanent occupants did.

Total Buildings and Units Surveyed

The survey crew visited both single-family and multifamily residential buildings. Single-family houses consist of one residential unit, whereas multifamily houses have two or more.

Table 1. Count of Residential Buildings Surveyed.

Total Residential Buildings	**73**	**-**
Surveyed	54	74%
Occupied	63	86%
Vacant	10	14%

Table 2. Occupancy of Surveyed Residential Units.

Total Residential Buildings - Surveyed	54	-
Occupied	48	89%
Vacant	6	11%

Table 3. Count and Occupancy of Residential Units Surveyed.

Total Residential Units	**82**	**-**
Surveyed	63	77%
Surveyed - Occupied	57	70%
Surveyed - Vacant	6	7%

House Size

Of the 54 residential buildings surveyed, 70% (38 properties) were single-family homes, and 20% (11 properties) were tiny homes. To qualify as a "tiny home," the home's square footage needed to be less than 600 square feet. The remaining 10% (5 properties) were multifamily units (Figure 6). Vacant homes were included in this data since their building type was known or previously recorded. The average size of a single-family home was 1,140 square feet, and the average size for a tiny home was 468 square feet. The average number of residents in a single-family home was four. Most homes (43%) were 601-1,000 square feet (Figure 7). The square footage of one single-family residence was unknown.

Figure 6. Building Type of Surveyed Residential Buildings by Percentage. *n* = 54 Residential Buildings.

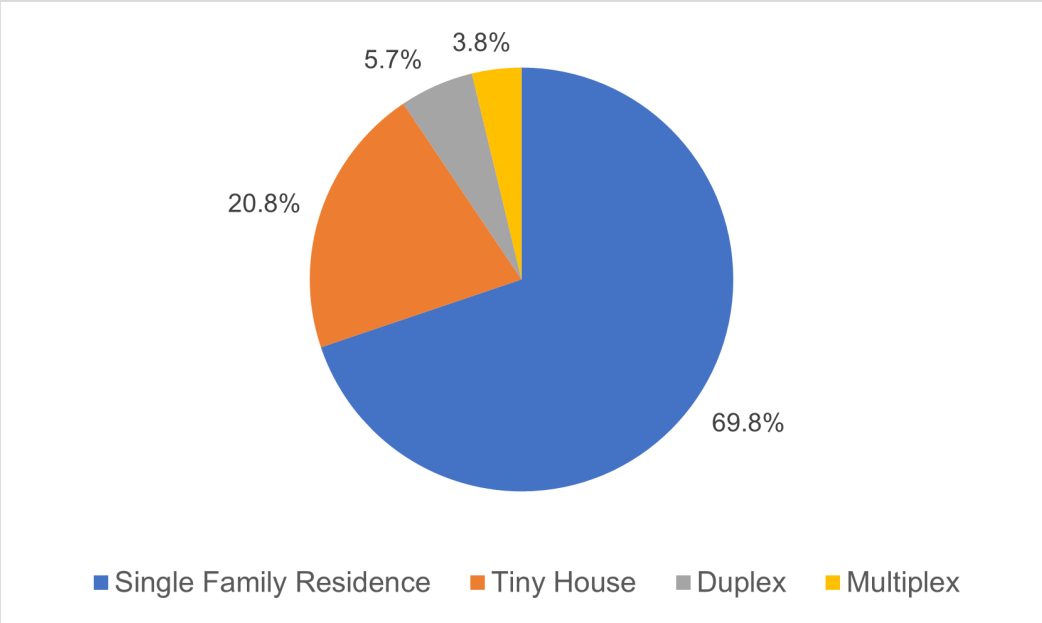
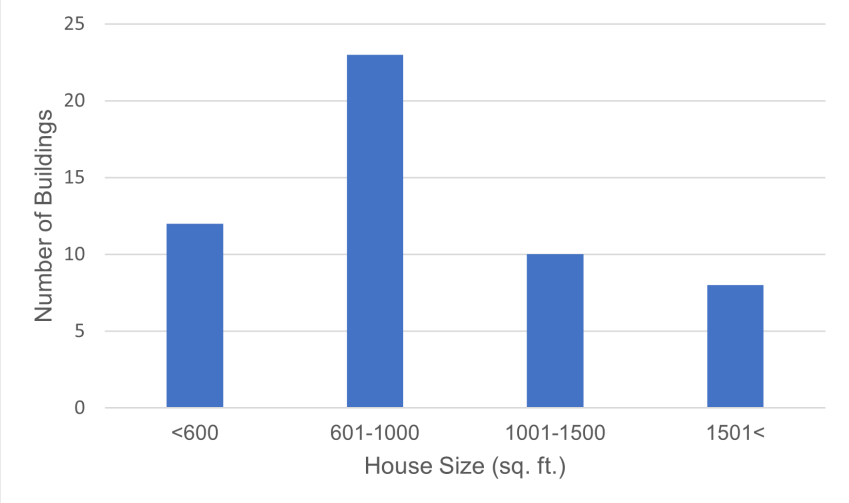


Figure 7. Home Sizes by Square Feet. *n* = 53 Residential Buildings.



Rooms

The survey crew collected information on how many rooms each residential unit had. Surveyors counted the total number of rooms, bathrooms, and bedrooms for 51 residential units. Thirty-five single-family units, 11 tiny homes, and five multiplexes gave information on rooms. To better understand the characteristics of an "average" home the researchers used median and mode for the number of rooms. The median is the middle value when a data set is ordered from the least to the greatest. The mode is the number that occurs most often in a data set.

The total number of rooms in a residential unit ranged between one and eight. The average number of total rooms in a single-family home was 4.7, and the median and mode were both five. The average of the total rooms in a tiny home was 2.3, and the median and mode were both one room. The average, median, and mode for total rooms for the multiplexes were four.

The average number of bedrooms in a single-family home was 2.6, and the median and mode were three. The number of bedrooms in a tiny home averaged one. The median number of bedrooms in a tiny homes was 0.5, and the mode was zero. For the multiplexes, the average number of bedrooms was two, as were the median and mode.

Single-family homes averaged 1.1 bathrooms per residential unit, while tiny homes and multiplexes averaged one bathroom. The median and mode for the number of bathrooms were one for all residential units.

Overcrowding

This analysis uses a definition of overcrowding set by the U.S. Department of Housing and Urban Development (HUD): The residence is overcrowded when there is more than one person per room (excluding bathrooms and kitchens) (Blake, Kellerson, and Simic, 2007).

The survey includes data for year-round and seasonal residents in Point Lay who took the survey, with 201 year-round and 62 seasonal occupants. According to the HUD definition, 49% of surveyed houses are overcrowded year-round, and 60% are overcrowded seasonally.

In order to better understand how occupants felt about overcrowding, two survey questions addressed sleeping locations and the number of family units. Out of the 46 surveyed residential buildings, including multifamily buildings, half (23) indicate that residents sleep in areas that are not bedrooms.When occupied residential units were surveyed, two out of the 48 (4%) units had more family units living there than would be desired.

Accessibility

One quarter (25%) of the 48 residential units that were surveyed are not meeting accessibility needs, which could include difficulty entering or moving around the house or difficulty performing tasks, regardless if an individual had a diagnosed disability. As reported by survey participants, 17% of (occupied) surveyed units had a resident with a disability, and half of those (8% of surveyed units) had a resident whose disability required a wheelchair or similar type of mobility aid. However, only one house in the community has a wheelchair ramp. Ten surveyed houses had a ramp, although most entered through a garage or storage area.

Maintenance-ownership

Of the surveyed occupied and vacant residential units that responded to this survey question (46), a majority (46%) were owned by someone in the household without a mortgage or loan. Twenty percent (20%) were owned by landlords (either a resident or nonresident of Point Lay). The regional housing authority, TNHA, owned 4%. Other owners included the Native Village of Point Lay (NVPL) (7%), the school district (7%), and the rest unknown or unspecified (Figure 8). A majority (85%) of the units that responded to this question are maintained by someone in the household, regardless of ownership (Figure 9).

Figure 8. Residence Ownership. *n* = 46 Residential Units.

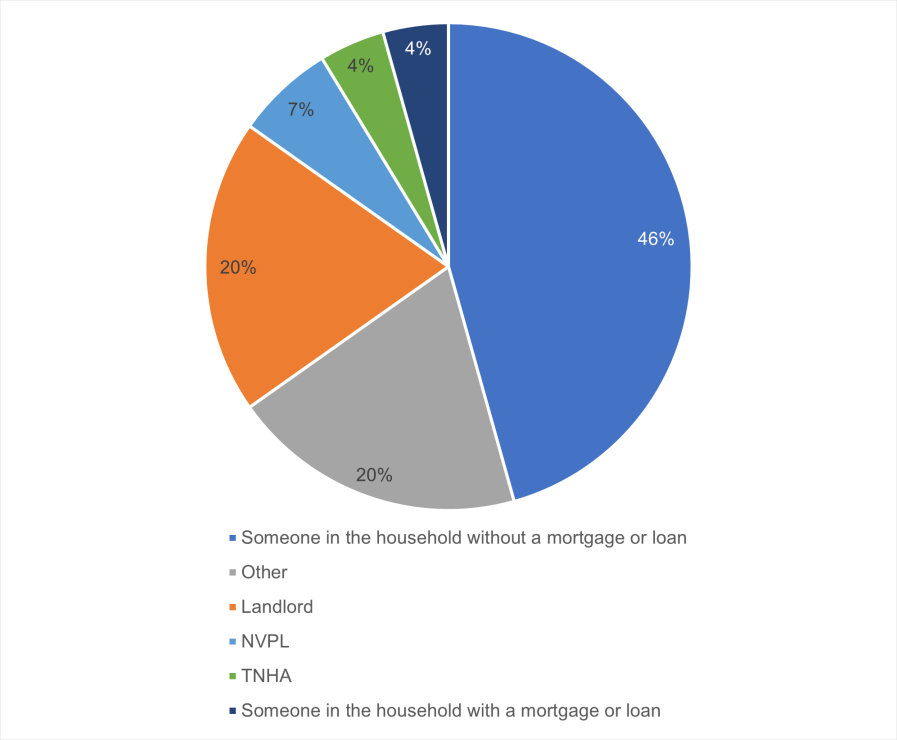
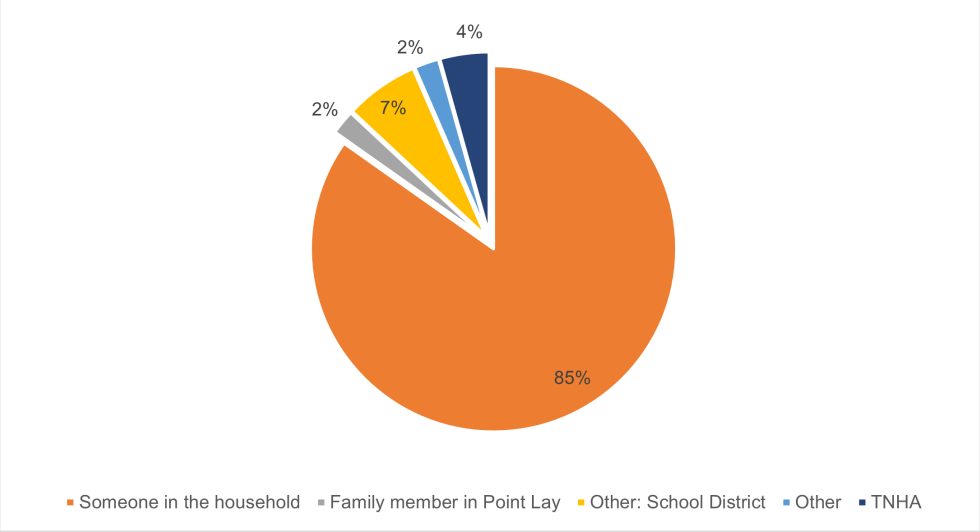


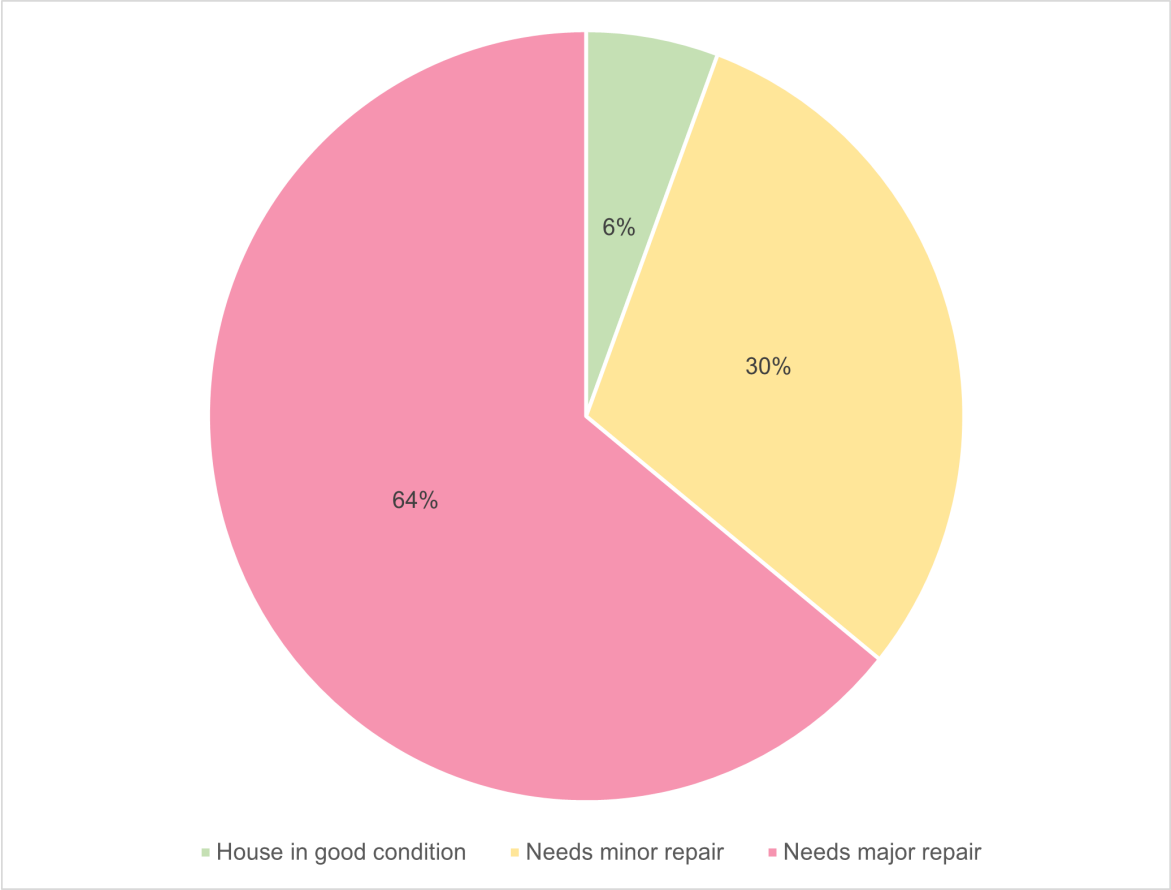
Figure 9. Residence Maintenance. *n* = 46 Residential Units.



Building Condition

The survey team asked homeowners to estimate if their dwelling needed major or minor repairs. A small percentage (6%) of homeowners reported their homes in good condition–no repairs needed–while a majority (64%) reported their homes needed major repairs (Figure 10). "Minor repairs" meant that a few hundred dollars and up to one contractor could accomplish the work. "Major repairs" meant anything more costly than this. Some minor repairs included fixing doors, windows and rooves while major repairs included total rebuild of houses, improving water and heating systems, as well as fixing doors, windows, rooves, and ceilings.

Figure 10. Home Conditions by Repair Needs. *n* = 53 Residential Buildings.

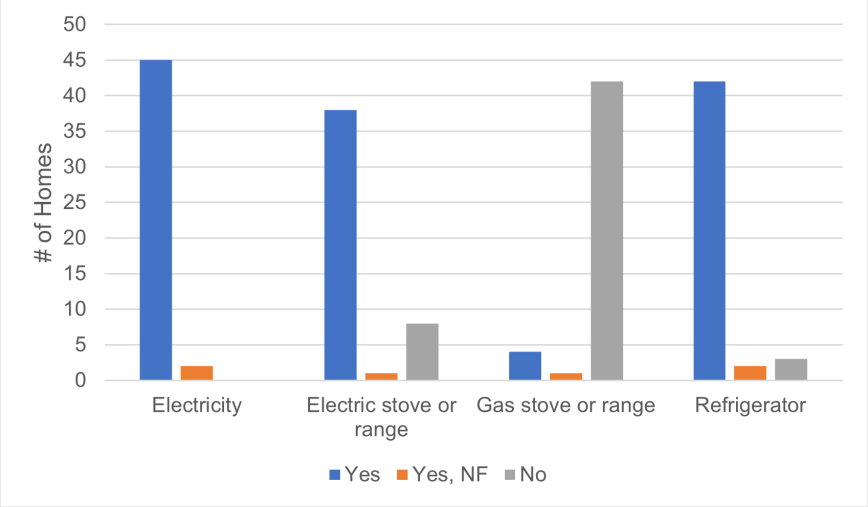


Functionality

The survey crew and participants assessed the functionality of different systems of each residential building. Questions asked if different features, such as plumbing, electricity, and ventilation, are present and functioning as intended (see Appendix B). The crew collected data on 47 occupied homes.

The survey crew collected data on the functionality of various appliances in 47 occupied residential units (Figure 11). Most residential units had functioning electricity (45 units or 96%), and the remaining units (two units or 4%) had the necessary equipment to have functioning electricity, but it was not functioning at the time of the survey. Thirty-eight (81%) residential units had a functioning electric stove or range, and four (9%) had a functioning gas stove. Five residential units (11%) had neither an electric nor gas stove, and two (4%) had a stove or range that was not functioning. Most residential units had a functioning refrigerator (45 units or 89%), while two units (4%) had one that was non-functional, and three units (6%) had none.

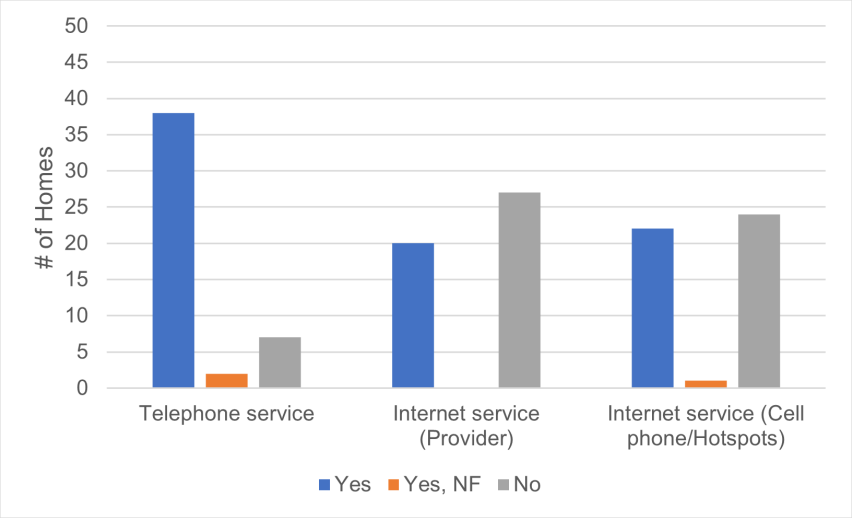
Figure 11. Functionality of Home Appliances. *n* = 47 Residential Units.



"Yes" indicates the amenity is both present and functioning
"Yes, NF" indicates that the amenity is present in the unit but was not functioning at the time of the survey
"No" indicates the amenity is not present in the unit

From the same 47 residential units, the survey crew also collected data on the functionality of communication technology, including telephones and internet service (Figure 12). Thirty-eight (81%) residential units had functioning telephone service, two (4%) had the availability of telephone service that was not functioning at the time of the survey, and seven residential units (15%) could not access telephone services. Most residential units (27 units or 57%) did not have access to the Internet.

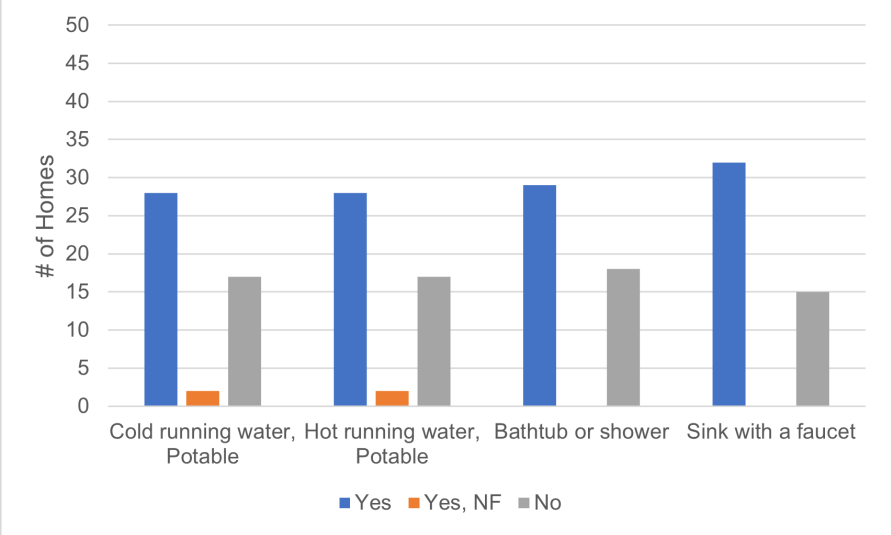
Figure 12. Functionality of Communication Technology. *n* = 47 Residential Units.



"Yes" indicates the amenity is both present and functioning
"Yes, NF" indicates that the amenity is present in the unit but was not functioning at the time of the survey
"No" indicates the amenity is not present in the unit

The survey team collected information about the availability of running water from 47 residential units (Figure 13). Twenty-eight (60%) of the surveyed residential units had access to hot and cold potable running water. Two units (4%) had the necessary appliances and infrastructure in their home to access running potable water (but it was not functioning at the time), and 17 residential units (36%) had no access to potable running water. Twenty-nine residential units (62%) reported having a functioning bathtub or shower, and 32 (68%) reported having access to a functioning sink with a faucet.

Figure 13. Functionality of Water Systems. *n* = 47 Residential



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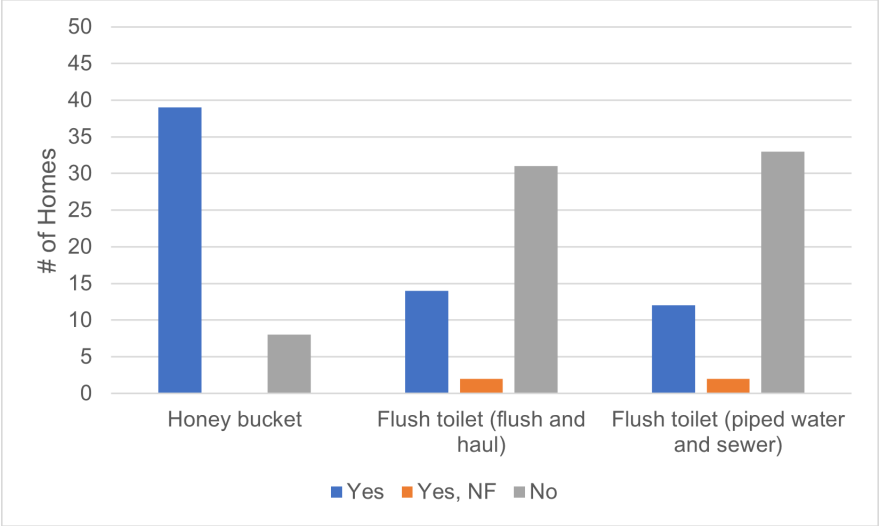
"No" indicates the amenity is not present in the unit

The survey team collected information about the functionality of the plumbing infrastructure of 47 residential units (Figure 14). The types of plumbing units included in the survey questions were honey bucket, flush toilet (flush and haul), and flush toilet (piped water and sewer).

Households that utilize honey buckets use one or more five-gallon buckets for wastewater. The buckets are lined with garbage bags and placed under a sink or combined with a seat for use as a toilet. When the buckets are full, occupants must haul the bags to a collection point, typically located on each block, and Public Works collects the bags. These households rely on centralized locations, such as the school or dedicated facility, for laundry and bathing needs.

Flush and haul systems are a type of self-contained wastewater system in a single residential building. Occupants are responsible for keeping a tank inside their homes filled with water. In Point Lay, an on-demand water delivery truck operated by North Slope Borough Public Works fills tanks via a hose and outdoor access point. This water goes to everyday uses like sinks, toilets, and baths that drain to an outdoor, above-ground wastewater tank located next to or underneath the house. The wastewater tanks must be emptied regularly. In Point Lay, a resident can schedule a time by calling Public Works.

Figure 14. Functionality of Plumbing. *n* = 47 Residential Units.



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"Yes, NF" indicates that the amenity is present in the unit but was not functioning at the time of the survey
"No" indicates the amenity is not present in the unit

Thiry-nine residential units (83%) reported having a functioning honey bucket system, and 8 units (17%) reported not having a honey bucket system in the home. Of the 39 homes that had honey buckets 19 (49%) did not have another plumbing system and 2 (5%) had other systems that were not functioning. Fourteen units (30%) reported having a functioning flush and haul system. Thirty-one units (66%) did not have a flush and haul system, and 2 units (4%) reported having a flush and haul system that was not functioning at the time of the survey.

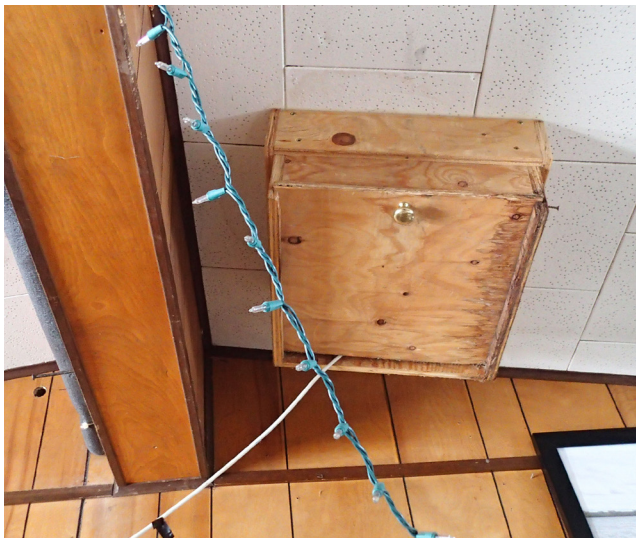
Twelve units (26%) had a functioning flush toilet system connected by pipes to a sewer system, two units (4%) had the appliances and infrastructure present in the home that was not functioning at the time of the survey, and 33 units (70%) did not have a flush toilet system. The houses on piped water and sewer systems still experience non-functioning periods, during which they use honey buckets and haul fresh water. These periods occur when the pipes inside the residential unit have an issue or if the underground pipes are frozen.

The survey crew collected information on the functionality of ventilation systems for 47 residential units (Figure 15). Options for ventilation systems included three types of passive ventilation systems: Fresh 80, kingaqs, and operable windows. Mechanical options included bathroom fans, range hoods, and balanced mechanical ventilation.

Fresh 80 refers to a passive ventilation product that creates an opening in the wall of a home. Outside, a vent is usually covered with a screen and a small hood, protecting it from weather events and animals. Inside is a mechanism that allows the opening size to vary from small to large, enabling different amounts of air to enter the home. The exact configuration is dependent on the brand. Fresh 80s require occupants to change the size of the opening by hand and do not require electricity.

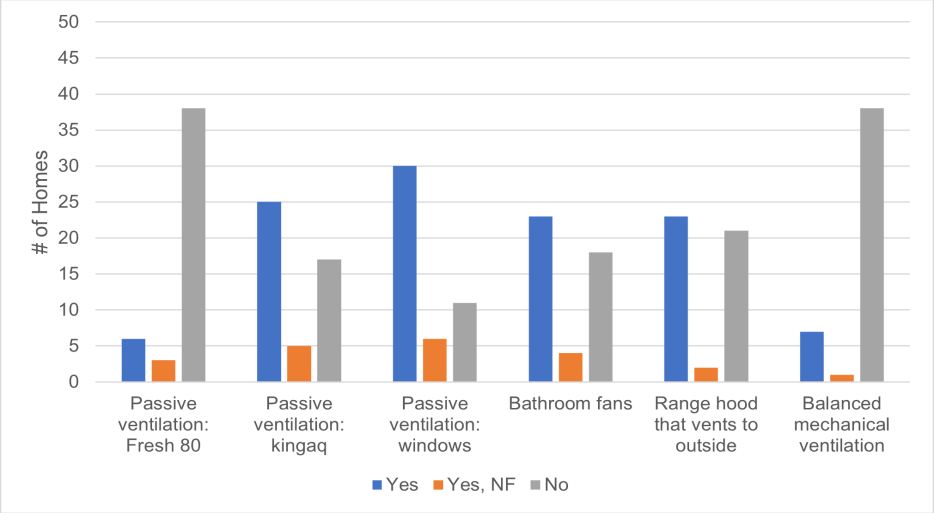
Figure 15. Example of a Fresh 80 System Installed on a Wall. (NREL, 2022)

Figure 16. Example of a Kingaq Installed on a Ceiling. (NREL, 2022)



Kingaqs are a traditional, passive ventilation strategy used in many houses in the North. It consists of a hole in the roof of a house that can be opened and closed. This ventilation strategy relies on the principle that warm air rises, and thus an opened kingaq allows air to flow up and out of the house, while cooler, fresh air is drawn in through openings or cracks in the walls or around windows and doors.

Figure 17. Functionality of Ventilation Systems. *n* = 47 Residential Units.



"Yes" indicates the amenity is both present and functioning
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"No" indicates the amenity is not present in the unit

Six residential units (13%) reported having a functioning Fresh 80 ventilation system, and three units (6%) reported having one that was not functioning. Twenty-five residential units (53%) reported having a functioning kingaq, and five units (11%) reported having a kingaq that was not functioning. In many cases, a non-functioning passive ventilation system is one where the residents have used items such as a plastic bag or towel to block the ventilation openings and prevent cold air from entering the home. Thirty residential units (64%) reported having functioning windows for passive ventilation. Six units (13%) reported having windows that did not function as passive ventilation because they could not open and 11 units (23%) reported not having windows in the home. There may be some homes that reported not having windows that have windows and reported "no" on the survey question because they do not use them as ventilation.

It is important for residential buildings to have mechanical ventilation, especially if they have airtight envelopes, to provide air exchange and exhaust pollutants and high humidity. In cold climates, a heat recovery ventilator is often a good choice, because it provides balanced mechanical ventilation while recovering heat from outgoing air. Twenty-three residential units (49%) reported having a functioning bathroom fan, four (9%) reported having a bathroom fan that was not functioning, and 18 units (38%) reported not having a bathroom fan in their home. Twenty-three units (49%) reported having a functioning range hood that vents to the outside and two units (4%) reported having a non-functioning range hood. Seven units (15%) reported having a functioning, balanced mechanical ventilation system, and one unit (2%) reported having a balanced mechanical ventilation system in the home, but it was not functioning. One unit reported having no ventilation system present in the home.

Foundation

The survey crew collected data on the foundation type for all surveyed residential buildings. A majority (83%) of buildings had a pile foundation, and of these, most had 8x8 lumber piles (84%), were nonadjustable (98%), and were fastened to the building (89%). The length of the 8x8 piles averaged to 16.3 feet and the median was 15 feet.

Table 4. Count of Building Foundation Types. *n* = 54 Residential Buildings.

Foundation Type	
Piles	45
Skiddable	4
Post and Pad	2
Blocks	1
Grounded Logs	1
Foam	1
Slab on Grade	0
Triodetic	0

Table 5. Count of Pile Sizes in Foundations. *n* = 45 Residential Buildings with Pile Foundaitons.

Pile Size	
8x8	38
12x12	2
10x10	2
4x4	1
Multiple	1
Unknown	1

Table 6. Count of Adjustability in Pile Foundations. *n* = 45 Residential Buildings with Pile Foundations.

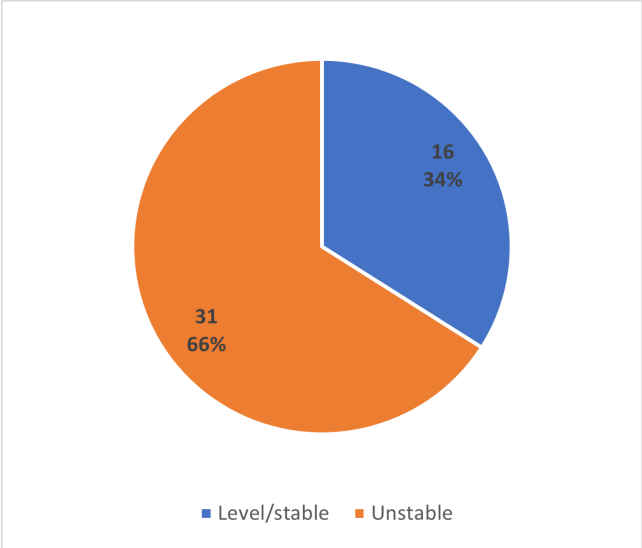
Piling Adjustability	
Non-adjustable	44
Adjustable	1

Table 7. Count of Pile Foundations Fastened to the Building. *n* = 45 Residential Buildings with Pile Foundations.

Piling Fastened to Building	
Fastened	40
Unfastened	2
Unknown	3

The survey crew also collected data on the stability of foundations through a question in the survey posed to the home representative. Most foundations were reported to be unstable (66%) (Figure 18).

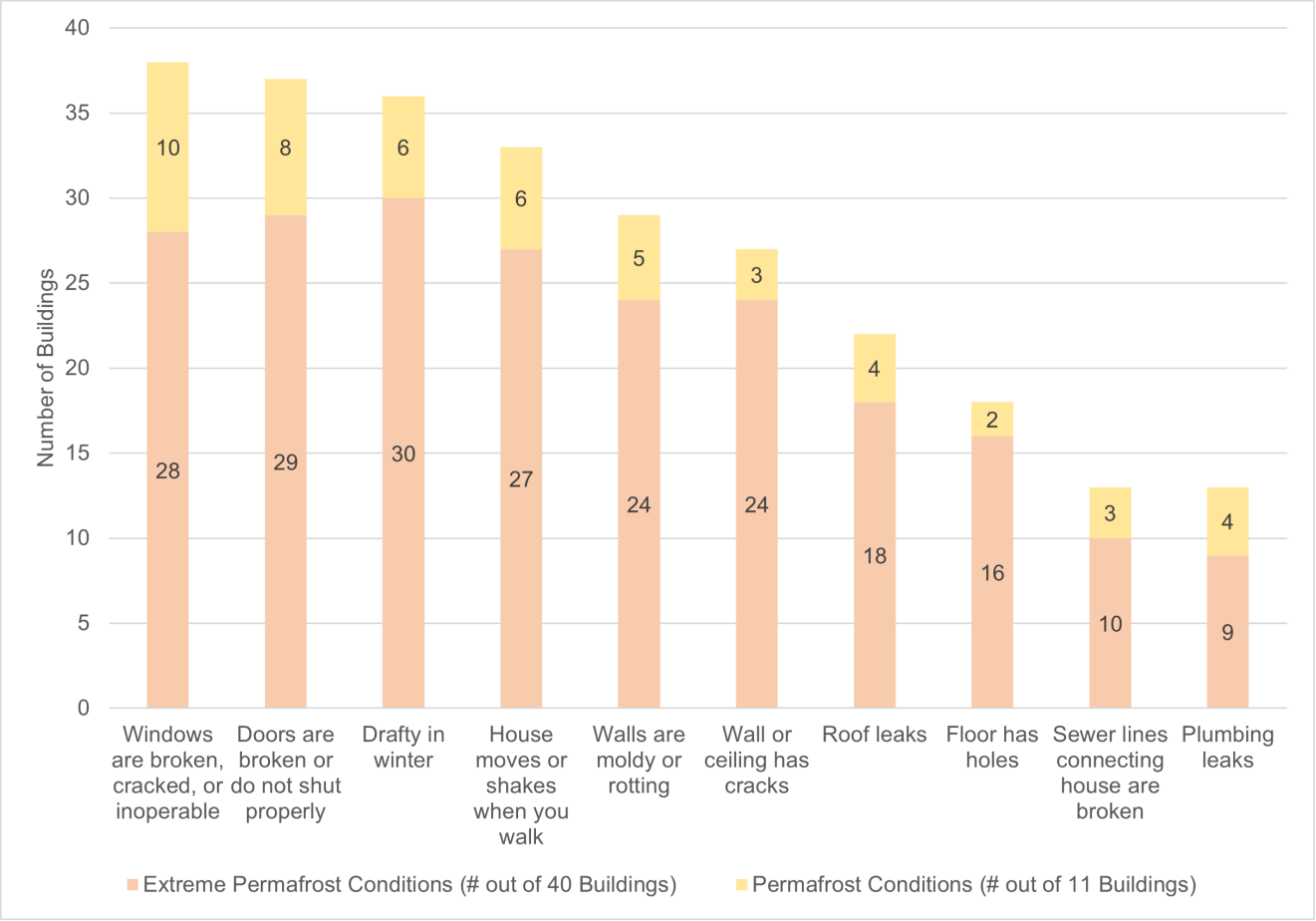
Figure 18. Stability of Foundation. *n* = 47 Residential Buildings.



Permafrost Issues

Thawing permafrost is a major underlying cause of infrastructure problems in Point Lay. The foundation of a structure built on permafrost plays a significant role in how a building responds to the shifting ground (Figure 18). Post and pad foundations are likely to have more severe issues since they are not designed for significant movement or shifting, whereas the design of pile foundations allows the structure to be less affected by shallow ground movement. Of the 54 surveyed homes, 51 (94%) have issues associated with changes in permafrost conditions. Figure 19 shows various home functionality issues that residential buildings are experiencing and whether the building is experiencing permafrost behavior that may be impacting the structure.

Figure 19. Home Functionality Issues Related to Permafrost Conditions. *n* = 51 Residential Buildings.



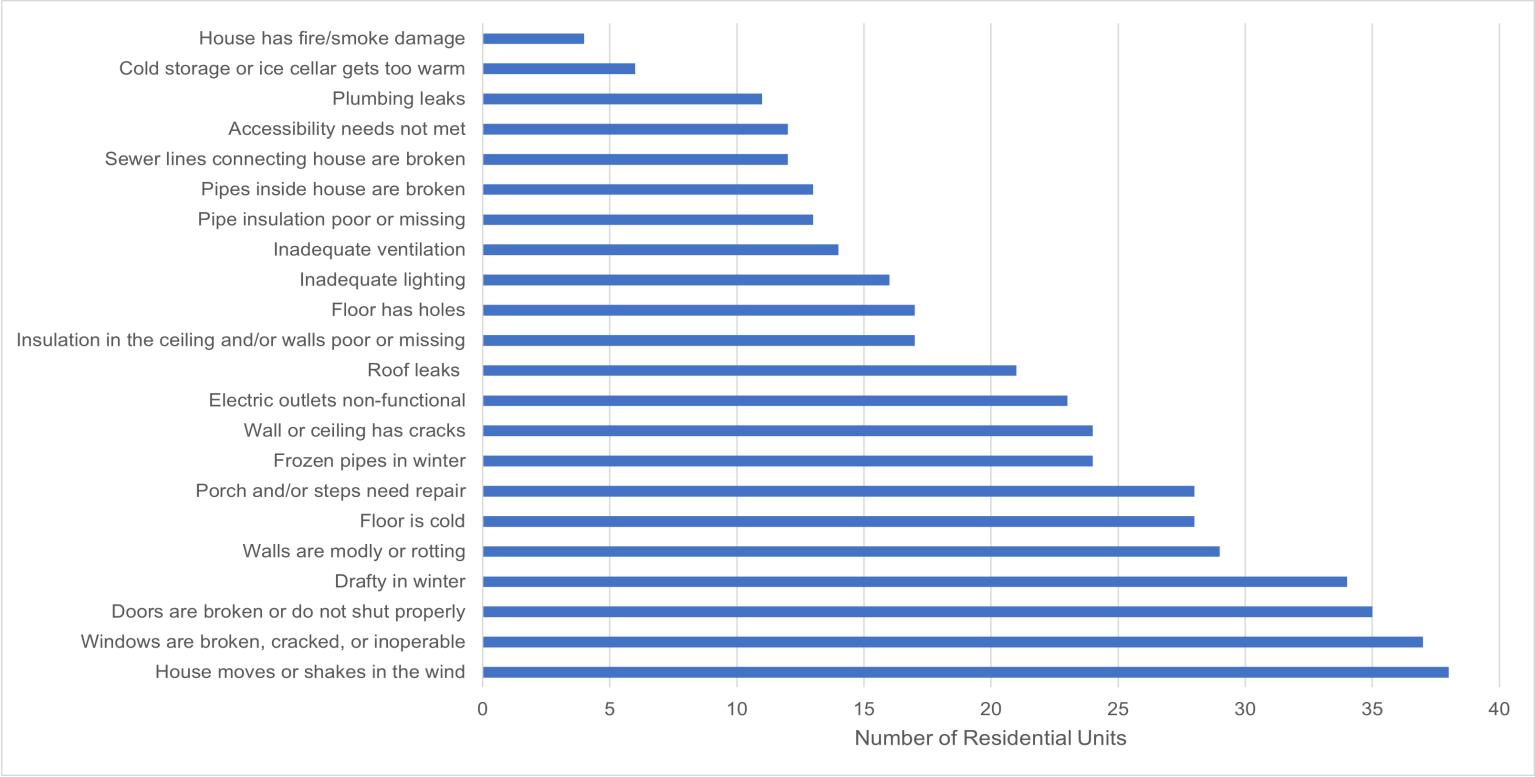
Residents of 11 homes reported minor permafrost issues, while residents of 40 homes reported major permafrost issues (Figure 20). Permafrost issues included water accumulation around piles or posts, the jacking up of piles, sinking or piles of posts, soil subsidence around the home, surface ponding of water under or around the house, sinkholes under or aound the house, and soil heaving under or around the house. Any issue that was found to affect the foundation's stability was considered "major" and any other issue was considered "minor".

Figure 20. Functionality Issues Related to Foundation Types and Permafrost Conditions. *n* = 51 Residential Buildings.

Concerns

The survey included questions on permafrost and non-permafrost-related issues the house was experiencing to help researchers understand the specific repairs needed in different buildings. The survey asked residents to identify concerns with the roof, walls, flooring, pipes, and other aspects of each home. Forty-eight residences responded with existing issues, including some vacant houses which a survey crew member could gain indoor access. Each residential unit could give as many responses as they saw necessary to understand the home's condition. Figure 21 shows the number of residential units that reported various issues. Table 7 shows a table of the frequency of the reported concerns.

Figure 21. Home Issue Count. *n* = 48 Residential Units.



Pipes freezing in the winter affected half (24) of the houses that reported this concern, which was the most common issue with the plumbing. "Moldy walls" was the most reported response of damage to the house, with 60% of homes reporting damage. Seventy-one percent (34 homes) reported concerns with cold and drafty homes in winter.

The most reported categories were windows, doors, and other structural issues. Over 70% of homes that reported concerns that their house moves or shakes in the wind (79%), has windows that are broken/cracked/inoperable (77%), or has doors that do not shut properly (73%).

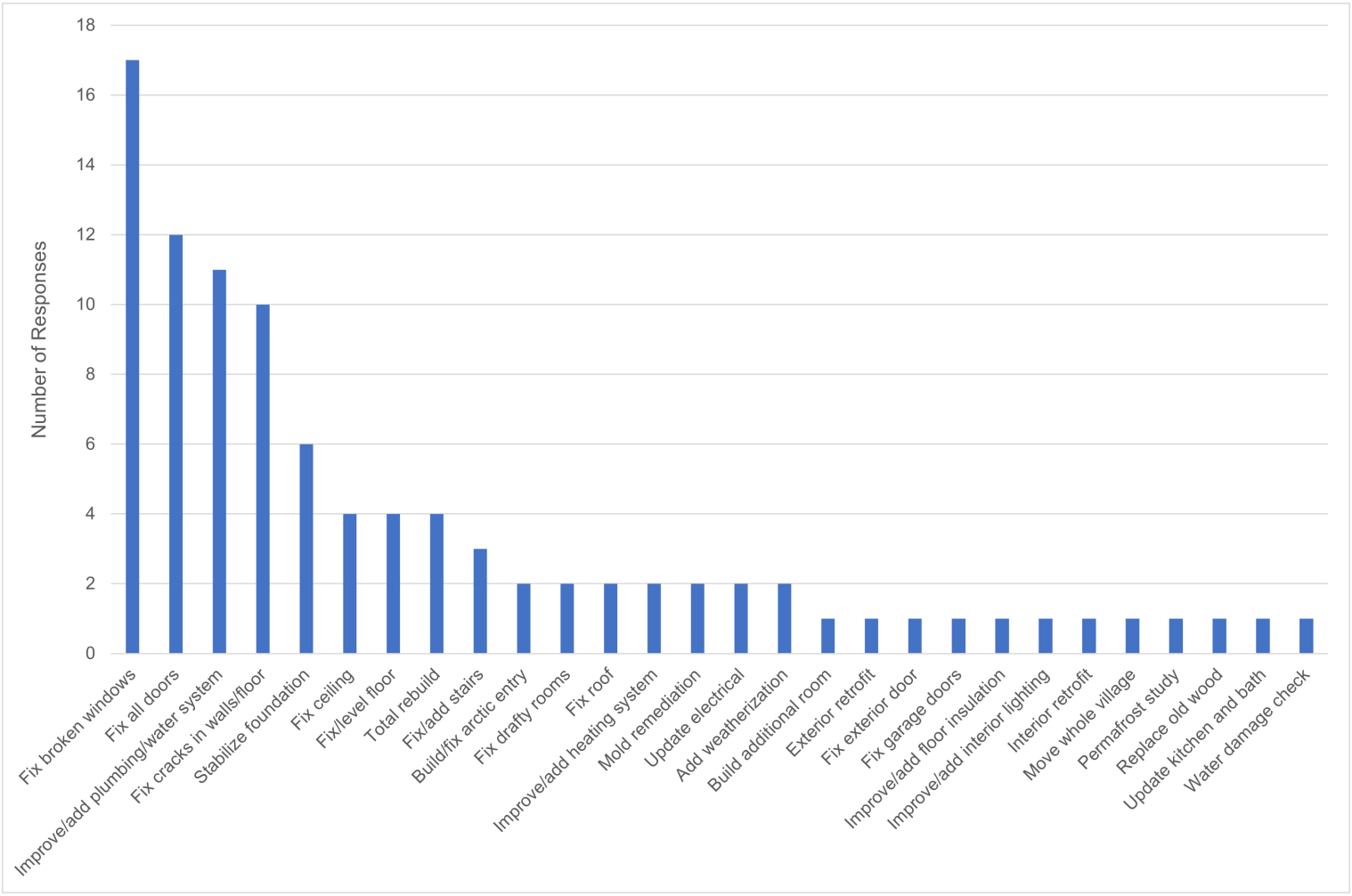
Table 8. Frequency of All Concerns. *n* = 456 responses.

Issue	Group	Percent	Count
House moves or shakes in the wind	60-80%	79%	38
Windows are broken, cracked, or inoperable		77%	37
Doors are broken or do not shut properly		73%	35
House is drafty in the winter		71%	34
Walls are moldy or rotting	40-60%	60%	29
Floors are cold		58%	28
Porch and/or steps need repair		58%	28
Frozen pipes in the winter		50%	24
Walls or ceilings have cracks		50%	24
Electrical outlets are non-functional		48%	23
Roof leaks		44%	21
Insulation in the ceiling and/or walls insufficient	20-40%	35%	17
Floors have holes		35%	17
Lighting inadequate		33%	16
Ventaliation inadequate		29%	14
Pipes broken (interior)		27%	13
Pipe insulation insufficient		27%	13
Sewer lines connecting house are broken		25%	12
Accessibility needs not met		25%	12
Plumbing leaks		23%	11
Cold storage or ice cellar gets too warm	0-20%	13%	6
House has fire/smoke damage		8%	4

Priorities

The heads of the household were asked to state their top two priorities for repairs in their own words. The survey crew did not collect answers to this question for vacant homes. Because each homeowner could give multiple answers, the total number of answers given was 97. Analysts simplified or shortened some answers to group them with others. Figure 22 shows the frequency of concerns raised by the residents.

Figure 22. Homeowner Priority Count *n* = 97 Responses.



The five most common issues that homeowners wish to be addressed are 1) fixing broken windows (18%), 2) fixing broken doors (12%), 3) improving or adding plumbing/water systems (11%), 4) fixing the cracks in walls and floors (10%), and 5) stabilizing the foundation (6%).

Table 9. Frequency of Prioritized Concerns. *n* = 97 Responses.

Issue to Prioritize	Group	Percent	Count
Fix broken windows	10-20%	18%	17
Fix all doors		12%	12
Improve/add plumbing/water system		11%	11
Fix cracks in walls/floors		10%	10
Stabilize foundation	4-6%	6%	6
Fix ceiling		4%	4
Fix/level floor		4%	4
Total rebuild		4%	4
Fix/add stairs	2-3%	3%	3
Fix/add arctic entry		2%	2
Fix drafty rooms		2%	2
Fix roof		2%	2
Improve/add heating system		2%	2
Mold remediation		2%	2
Update electrical		2%	2
Build additional room	1% or less	1%	1
Exterior retrofit		1%	1
Fix exterior doors		1%	1
Fix garage doors		1%	1
Improve/add floor insulation		1%	1
Improve/add interior lighting		1%	1
Interior retrofit		1%	1
Move whole village		1%	1
Permafrost study		1%	1
Replace old wood		1%	1
Update kitchen and bath		1%	1
Water damage check		1%	1

2.2 Building Attachments, Outbuildings, and Driveways

The survey crew collected information on the entrance to the house, including the stairs, porch, and arctic entry (kunichuk). Just as the residential building can be affected by various factors, there has been notable damage to the stairs, porches, arctic entries, outbuildings, and driveways of homes.

Stairs

Forty-four out of the 54 residential buildings (81%) reported the conditions of the stairs. Seventeen (39%) reported they were in good shape, 15 (34%) needed minor repairs, and 12 (27%) needed major repairs. These repairs could be varying degrees of damage or non-functioning aspects of the home, such as the stairs not meeting the ground, the materials being in bad shape, or something else that renders parts of the home dysfunctional or unsafe.

Figure 23. Example of Stair Conditions and Damage. (Point Lay Resident Bill Tracey, 2022)

Porch

Residents in 21 (38%) out of 54 residential buildings answered questions about the condition of the porch: 52% were reported to be in good condition, 19% needed minor repairs, and 29% needed major repairs.

Figure 24. Example of Porch Conditions. (Point Lay Resdient Bill Tracey, 2022)

Arctic Entry

Residents in 44 (81%) out of 54 residential buildings answered questions about the arctic entry, a vestibule or mud room that acts as a buffer between the outside and the living area. Eighteen arctic entries (41%) were reported to be in good condition, 4 (9%) needed minor repairs, and 22 (50%) needed major repairs. Figure 25 shows an example of an arctic entry.

Figure 25. Example of Arctic Entry. (NREL, 2022)

Outbuilding

Residents of 20 out of 54 homes reported the presence of 31 outbuildings. Some homes kept multiple outbuildings, sometimes multiples of each type. Not all homes that reported maintaining an outbuilding included information about the condition of its foundation. Most buildings (14) were reported as enclosed, unheated sheds. Eight outbuildings were reported with some degree of instability or access issues. One family unit specifically reported that their shed was in good condition. Six family units reported a garage: five were level and stable, and one needed minor repair. Other reported instances of an outbuilding can be found below (Table 9).

Table 10. Outbuilding Conditions. *n* = 31 Outbuildings.

	Cold Storage	Garage	Ice Cellar	Shed*	Woodshed
# of reported outbuildings	5	6	2	14	4
# reported with poor conditions	0	1	0	8	1

*Shed, enclosed, not heated

Driveways / roads

Forty-two residential units reported a driveway, road, or walkway on the property. Thirty-two (74%) reported having driveways, seven (13%) reported having a walkway, and only one reported a road (two did not answer the type but reported a material and/or a condition). Gravel was the only answer for the type of material used, although 6 homes did not report a material.

Twenty-eight residential units reported subsidence that had required major maintenance. Thirteen (46%) reported that it has required major maintenance and 15 (53%) reported that it has not. Thirty-six homes reported the status of water pooling near driveways/roads. Twenty-six (72%) reported water pooling, often seasonally, and 10 reported no pooled water.

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Appendix A. Past Housing Needs Assessments

Several research groups have previously assessed housing conditions in Point Lay. Each report is listed below in chronological order.

1. North Slope Borough: Point Lay Village Profile

United Research Services (URS) Corporation compiled this profile for the North Slope Borough in 2005 as a part of its comprehensive plan for the entire NSB. It summarizes the physical and built environment of the community, including population, land use, infrastructure, issues, and priorities. Various tables are also provided with supplemental information on potentially contaminated sites, the economic condition of the community, and heating fuel usage. Although the report was published in 2005, the data sets are primarily from 2003.

URS, Comparison of Housing Unit Types in Point Lay, 2005

Type of Household	1998		2003	
	Number	Percent	Number	Percent
Mobile Home/Trailer	2	3.9%	12	20.0%
Single-family House	44	86.3%	38	63.3%
Building for 2 Families	0	0.0%	4	6.7%
Building for 3 or 4 Families	1	1.9%	4	6.7%
Building for 5 or More Families	4	7.9%	1	0.0%
Other	0	0.0%	2	3.3%
Total	51	100.0%	61	100.0%

*Results include only those households participating in the census survey.
Source: (Shepro et al. 2003)

2. 2014 Alaska Housing Assessment: Arctic Slope Regional Corporation

This document aims to understand the current housing situation and the estimated housing needs for the entire Alaska Native Claims Settlement Act (ANCSA) region. The document includes data specific to Point Lay within the Arctic Slope region.

Wiltse et al., Point Lay Data, 2014

Average Home Size	1,013 square feet
Average Annual Energy Cost	$4,293
Average Annual Energy Use	185 MMBTU
Average Energy Cost Index	$3.72 per square foot per year
Average Energy Use Index	179 thousand BTUs per square foot per year
Space Heating Fuel	Predominantly fuel oil with a small amount of electric
Mechanical Ventilation	30% of homes
Median Income	$42,188

3. 2014 Alaska Housing Assessment: North Slope Borough

This report was conducted in the same housing assessment as the project listed above, but the data are focused on the North Slope Borough area. They are broken down into community profiles, providing a more detailed understanding of housing in Point Lay.

The North Slope Borough (NSB) found that most houses in Point Lay were built before 1990. According to a 2014 housing survey, 20 (30%) of 69 occupied housing units in Point Lay fall within the "severely overcrowded" category. Of the 69 housing units, 41 were renter-occupied, 28 were owner-occupied, and four vacant houses were up for rent. The same survey also reported that 33% of the houses lacked complete plumbing, and 26% lacked a complete kitchen (Wiltse et al., 2014).

Wiltse et al., 2014, Point Lay Housing Data

Housing Stock Estimates	Number of Units
Population	189
All Housing	79
All Occupied Housing	69
All Vacant Housing	10
Vacant Housing for Sale or Rent	4

Houses Lacking Complete Plumbing or Kitchen Facilities	Households	
	Number	Percent
Lacking complete plumbing	23	33%
Lacking complete kitchen	18	26%

Housing Information	Avg. Household Size (# of people)
All-occupied	4.6
Owner-occupied	5.7
Renter-occupied	3.8

Housing Occupancy	
Renter-occupied	41
Owner-occupied	28
Vacant, for rent	4
Vacant, Other	6

Percent of Total Residential Space Heating Energy by Fuel Type	
Electricity	2%
Fuel Oil	98%

Severely overcrowded units	20

4. North Slope Borough: All-Hazard Mitigation Plan (2016)

The information in this plan was observed and recorded in 2015 and then adopted by the NSB in 2016. The plan recommends hazard mitigation actions to protect people and property affected by natural hazards and reduce disaster response and recovery costs. The Calculated Priority Risk Index for Point Lay also ranks severe winter storms high on the Priority Risk Index.

The hazard profiles of the mitigation plan indicate that coastal erosion and subsidence posed the greatest threat to the community of Point Lay. The plan's authors highlight observations of moderate coastal erosion and raise concerns about continued erosion that allows the sea to reclaim the Kasegaluk lagoon. The document notes further reports of subsidence and other major issues during the unusually warm summer of 2004, during which residents observed "the ground beneath their feet drop on the average of four inches. Residents had to place gravel under their stairways as subsidence caused steps to snap and tilt. The floors of homes and businesses also sagged unevenly as evidence of subsidence in their permafrost foundations."

NSB, Point Lay Hazard Data, 2016

Native Village of Point Lay					
Hazard	Probability	Magnitude/ Severity	Warning Time	Duration	Priority Risk Index
Earthquake	Remote	Negligible	Under 6 Hours	Under 6 Hours	1.45
Coastal Erosion	High	Critical	24+ Hours	1 Week	3.25
Flooding	High	Critical	12-24 Hours	1 Week	3.3
Severe Winter Storm	High	Critical	24+ Hours	1 Week	3.15
Ivu (Ice Override)	Credible	Limited	6 Hours	6 Hours	2.2
Wildfires	Remote	Limited	12-24 Hours	1 Week	1.65
Ground Failure	Likely	Limited	24+ Hours	1 Week	2.5

5. Denali Commission: 2019 Statewide Threat Assessment

This document was compiled from publicly available data and data volunteered by agencies or the private sector, including UAF and the U.S. Army Corps of Engineers. Results focused on categorizing communities around Alaska at individual and combined risk for various threats, including erosion, flooding, and thawing permafrost. Group One is characterized as the highest risk for a certain threat, and Group Three is defined as low risk. The assessment also provides guidance to develop mitigation or adaptation strategies based on the results.

UAF, Point Lay Threat Designation, 2019

Threat	Point Lay Group Designation	Point Lay Ranking*
Erosion	Group 3	55th, tied with 8 other communities
Flooding	Group 3	53rd, tied with 7 other communities
Thawing Permafrost	Group 1	2nd, tied with Utqiaġvik (Barrow)
Combined (highest to lowest)	N/A	72nd, tied with Chalkyitsik

*Out of 187 rural Alaskan communities, from highest to lowest

The ranking process often results in communities with equal ratings, meaning that the numbered position on the list does not necessarily indicate its position amongst all 187 communities. The assessment also provided localized maps of the communities in the study relative to their threat rating. Thawing permafrost was found to be the most threatening to the public infrastructure of Point Lay.

6. North Slope Borough: 2019 Economic Profile & Census Report

The NSB Economic Profile and Census Report is a running series that describes and visualizes data across population, education, household income, language use, employment, and education. The survey is repeated about every five years. The nearly 500 pages document contains much information about Point Lay; a snapshot (page 40 of the report) condenses Point Lay's numerical data. The table below shows relevant information from the snapshots from 2010, 2015, and 2019.

NSB, Point Lay Housing Data, 2019

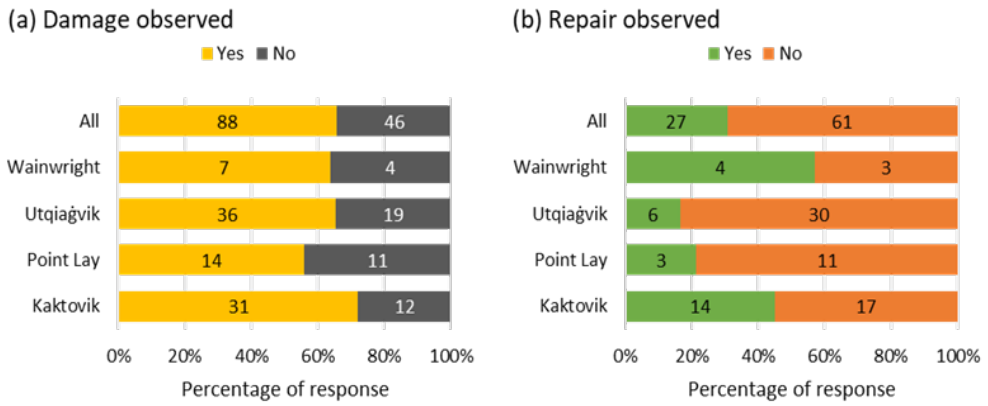
	2010	2014	2019
Total Population	274	242	287
Total Number of Dwelling Units	73	77	80
Number of Vacant Units	2 (3%)	3 (4%)	12 (15%)
Total Number of Occupied Households	73	74	68
Total Number of Households Surveyed	50	70	66
Average Number of People per Household	3.7	3.3	4.2

7. People Infrastructure Permafrost Resilience (NNA-PIPER) Community Survey (2022)

The authors of this academic paper collaborated with students in Point Lay, Wainwright, Utqiagvik, and Kaktovik to conduct community surveys to understand the effects of permafrost degradation and coastal erosion on civil infrastructure. The paper was published in March 2022 and presents the surveyed data as various graphs, charts, and tables. Below is the information provided about Point Lay.

At the time of the survey, Point Lay had a population of 227 (119 adults, 108 minors). Twenty-six people (22%) started the survey, and 23 (19%) completed it. Survey respondents reported permafrost-thaw-induced ground surface changes, including surface water ponding (33% of respondents) and sinkholes (24%). These surface changes ranged from less than six months prior to taking the survey to as much as 10 years prior. There were reports of permafrost-thaw-induced ground surface changes affecting residences. Twenty-one percent of the homes that reported damage also reported repairs.

Liew et al., Used with permission. Observations of damages and repairs to residential houses caused by permafrost thawing, 2022.

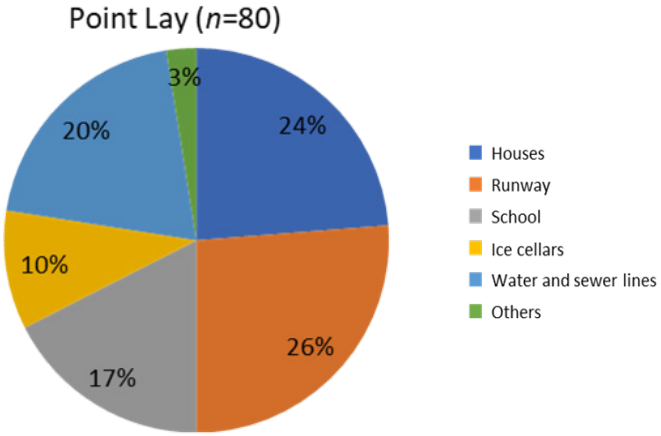


The survey respondents indicated that permafrost thaw also affected infrastructure such as the runway, school, ice cellars, and water and sewer lines. As with residences, these effects occurred between six months and more than 10 years before the survey was conducted.

Modified from Liew et al., Used with permission. Types of damage to residential buildings reported by residents from PIPER Community Survey. 2022.

Types of Damage	Point Lay (*n* = 72)
Cracked walls	11%
House Tilting	11%
Doors that could not close	14%
Surrounding water accumulation	10%
Broken windows	7%
Nearby ground subsidence	8%
Jacked-up piles	4%
Sinkings piles or post-on-pad	4%
Broken pipes	6%
Failure of adjustable supports for elevated foundation	1%
Breaking of post-on-pad for elevated foundation	8%
Heaving or sinking of soil underneath slab-on-grade	14%
Others	1%

Liew et al., Used with permission. Types of civil infrastructure that area affected by permafrost thaw. 2022.



Appendix B. Survey Template

Point Lay Housing Survey - April 2022

Objectives

This survey is to collect information that can be used for applying for grants to fix housing issues and inform future tribal decisions.

1. Create a complete list of the number of houses in Point Lay, their locations, and their foundation types.
2. Document the issues that houses in Point Lay are experiencing, especially those that can likely be attributed to permafrost thaw.
3. Estimate the number of new housing units needed due to:
    a. Overcrowding
    b. High likelihood of inability to retrofit issues in a housing unit.

Questions

Introduction

Date:
Address:
Lat/Long (use the map app on your phone):
Interviewer names:
Interviewee name(s):

Photo Permissions

Can we take photos of the inside and outside of your house? Photos would not be linked to an address but might be included in the report on the website.

- ❑ No
- ❑ Yes, photos are ok even when they may contain identifying information about the house, such as being zoomed out enough that you could identify which house it is in Point Lay
- ❑ Yes, photos are ok only when they are sufficiently zoomed in so as the house is not recognizable (such as a zoomed in photo of a cracked window or a zoomed in photo of a foundation)

Population

Number of people living in the home year-round:

Number of people living in the home including seasonal occupants:

Number of distinct “family units” living in the home, where a family unit is a person or group of people that could potentially live in a separate residence: (Example: A family consisting of 2 grandparents, a family of parents plus 5 kids with one over 18, plus a cousin might be 4 units – grandparents, family, child over 18, cousin)

How many distinct housing units and types would the occupants prefer to live in (for instance, would the family prefer to live in two units of the same duplex, 3 separate single-family homes, one single family home and one apartment unit, etc.)?

Number of permanent residents that have a disability:

Number of total residents (including seasonal) that have a disability:

What year did the current residents move into the building?
First residents:
Additional residents if they moved later:

Do any of these residents have a disability that requires a wheelchair or other type of accessibility features: *Yes* *No*

Who owns the residence?

- ❑ *Someone in the household with a mortgage or loan*
- ❑ *Someone in the household without a mortgage or loan*
- ❑ *Landlord (resident of Point Lay)*
- ❑ *Landlord (not a resident of Point Lay)*
- ❑ *TNHA*
- ❑ *Other:*

Who maintains the residence?

- ❑ *Someone in the household*
- ❑ *Landlord (resident of Point Lay)*
- ❑ *Landlord (not a resident of Point Lay)*
- ❑ *TNHA*
- ❑ *Other:*

Who owns the land?

- ❑ *Someone in the household*
- ❑ *Landlord (resident of Point Lay)*
- ❑ *Landlord (not a resident of Point Lay)*
- ❑ *Cully Corporation*
- ❑ *Native Village of Point Lay*

- ❑ *North Slope Borough*
- ❑ *TNHA*
- ❑ *Other:*

Housing characteristics

Which best describes this building?

- ❑ *Single family residence*
- ❑ *Duplex*
- ❑ *Multiplex / building with more than 2 apartments*
- ❑ *Manufactured home*
- ❑ *Tiny house*
- ❑ *Boat/RV/van/etc.*
- ❑ *Other:*

Which best describes the building construction type?

- ❑ *Log*
- ❑ *Steel*
- ❑ *Wood frame*
- ❑ *Other:*

What is the approximate size of the building in square feet? You can just write the approximate dimensions, and we can calculate this later.

What year (or approximate year) was the building built?

Who built the house?

- ❑ *Self*
- ❑ *Relative*
- ❑ *TNHA*
- ❑ *BIA*
- ❑ *Other:*

How many separate rooms are in this building? Do not count bathrooms, utility rooms, closets, or halls.

How many bathrooms are in this building? (It must be a separate room.)

How many bedrooms are in this building? (Efficiency style is 0.)

Are there living areas other than bedrooms that are used as a sleeping area at night?
Yes *No*

If yes, how many:

How many stories is the building?
Check yes, functional; yes, not functional; or no for the following features the building may have:

Feature	**Yes, functional**	**Yes, not functional *add length of time it did not function***	**No**
Cold running water, potable			
Hot running water, potable			
Cold running water, Non-potable			
Hot running water, Non- potable			
Flush toilet (flush and haul)			
Flush toilet (piped water and sewer)			
Bathtub or shower			
Sink with a faucet			
Electricity			
Electric stove or range			
Gas stove or range			
Refrigerator			
Telephone service (includes cell phones)			
Internet service (does not include cell phone hot spots)			
Internet service from cell phone hot spot or data services			
Passive ventilation such as a Fresh 80			
Passive ventilation such as a kingaq (hole, often with a sliding cover, near or in the roof)			
Passive ventilation from opening and closing windows			
Bathroom fans			
Range hood that vents to outside			

Balanced mechanical ventilation (HRV or ERV)(Vanee)			
Smoke / CO detector that works			
Accessible entrance such as a wheelchair ramp			
Gutters			
Egress in bedrooms and living space			
Honey bucket			

What is the primary fuel used for heating?

- ❑ *Fuel oil*
- ❑ *Wood*
- ❑ *Coal*
- ❑ *Electricity*
- ❑ *Renewable:*
- ❑ *Other:*

What is the secondary fuel(s) used for heating?

- ❑ *Fuel oil*
- ❑ *Wood*
- ❑ *Coal*
- ❑ *Electricity*
- ❑ *Renewable:*
- ❑ *Other:*

Building condition

What is the general condition of the building?

- ❑ *Good*
- ❑ *Needs minor repair (can be fixed with a few hundred dollars in supplies, and 1 or no contractors)*
- ❑ *Needs major repair*

What issues exist in the house? Give reasons (such as timing or age) they may or may not be related to permafrost thaw if the issue exists. If more space is needed use blank area at end of survey.

- ❑ *Roof leaks and needs repaired or replaced*
- ❑ *Insulation in the ceiling and/or walls is poor or nonexistent (house is hard to heat, feels cold)*
- ❑ *Holes in the floor*
- ❑ *Cold floor*
- ❑ *Insulation around pipes is poor or nonexistent*
- ❑ *Frozen pipes in winter*
- ❑ *Broken pipes inside house*
- ❑ *Broken sewer lines connecting to house*
- ❑ *Porch and/or steps need repair*
- ❑ *Plumbing leaks*
- ❑ *Broken, cracked, or inoperable windows*
- ❑ *Doors are broken or do not shut properly*
- ❑ *Cracks in wall or ceiling*
- ❑ *Drafty, cold air in winter*
- ❑ *Fire/smoke damage in portions of the house*
- ❑ *Mold on walls or rotting walls*
- ❑ *Electrical outlets do not work*
- ❑ *Warming cold storage area / ice cellar*
- ❑ *Lack of adequate ventilation / smells linger for a long time*
- ❑ *Inadequate lighting*
- ❑ *Accessibility needs not being met*
- ❑ *House moves or shakes when you walk*

- ❑ *House moves or shakes in the wind*

Has the house ever undergone retrofits?

- ❑ *Self*
- ❑ *TNHA*
- ❑ *NSB (RELI or Weatherization)*
- ❑ *Other (please specify program):*

If yes, please include which retrofits occurred and the approximate year:

What are the homeowners #1 and #2 priorities for repairing the house:

Foundation

What type of foundation does the building have?

- ❑ *Piling*
    - *8X8 ----------Fill in #:*
    - *10X10 ----------Fill in #:*
    - *12X12 ----------Fill in #:*
    - *Steel pipe----------Fill in #:*
    - *Wooden pole----------Fill in #:*
    - *Other: _____Fill in #:*
    - *Is it designed to be adjustable? Circle yes or no.*
    - *Are the pilings fastened to the building? Circle yes or no.*

- ❑ *Post and pad----------Fill in #:*
    - *Is it designed to be adjustable? Circle yes or no.*
    - *Are the posts fastened to the building? Circle yes or no.*
    - *What are the pads made of?*
        - *Cement*
        - *Wood / cribbing*
        - *Other:*

- ❑ *Blocks----------Fill in #:*
    - *Is it designed to be adjustable? Circle yes or no.*
    - *What are the blocks made out of?*
        - *Concrete*
        - *Wood / cribbing*

        - *Other*
    - *What is underneath the blocks?*
        - *Gravel*
        - *Soil*
        - *Foam*
        - *Other*
    - *Are the blocks fastened to the building? Circle yes or no.*
- ❑ *Slab on grade*
- ❑ *Built up gravel pad*
    - *Can you see the pad?*
- ❑ *Grounded logs*
- ❑ *Foam*
    - *Foam raft on the ground*
    - *Foam, floating, gravel base*
    - *Foam pad with jack stand*
    - *Other: _____*
- ❑ *Skids*
    - *Skid on pad----------fill in # of skids:*
    - *Skid & Sled, thin pad----------fill in # of skids:*
    - *Skid/Sled "on Tundra"----------fill in # of skids:*
    - *Other: _____*
- ❑ *Perimeter 8X8 with floating slab*
- ❑ *Triodectic*
- ❑ *Other:*

If the building is on pilings or posts, how deep did they extend below the ground surface when the house was built?

Measurements:
What is the distance between the bottom of the house and the ground?

If apparent, note the distance of exposed piling/post due to subsidence (net vertical distance change due to subsidence). ***DO NOT GO UNDERNEATH THE HOUSE*** *– measure from a corner post.*

What is the condition of the foundation and surrounding soil? Mark all that apply / add details and timelines if information exists.

- ❑ *Good*
- ❑ *Level / stable*
- ❑ *Out of level*
- ❑ *Unstable*
- ❑ *Foundation parts are broken*
- ❑ *Needs minor adjustment annually*
- ❑ *Needs major adjustment*
- ❑ *Can be adjusted easily*
- ❑ *Very difficult or impossible to adjust*
- ❑ *Water accumulation around piles or posts*
- ❑ *Jacking up of piles*
- ❑ *Sinking of piles or posts*
- ❑ *Minor (less than 1 foot) soil subsidence around house*
- ❑ *Major (more than 1 foot) soil subsidence around house*
- ❑ *Minor surface ponding of water underneath house; goes away with few days of sun*
- ❑ *Minor surface ponding of water around (not underneath but within 10 feet or in yard) house; goes away with few days of sun*
- ❑ *Major surface ponding of water underneath house; does not go away in the summer*
- ❑ *Major surface ponding of water around (not underneath) house; does not go away in the summer*
- ❑ *Sinkholes underneath house*
- ❑ *Sinkholes around house*
- ❑ *Heaving of soil underneath house*
- ❑ *Heaving of soil around house*

Has the foundation ever been repaired (add descriptions and timelines):

- ❑ *No repair – not needed*
- ❑ *No repair in past but it is needed*
- ❑ *Minor repair in the past*
- ❑ *Major repair in the past*

- ❑ *Currently needs repair*

Describe any maintenance performed on the foundation:

Does the foundation have a skirt?

Yes- good condition *Yes- poor condition/allows air through* *No* *N/A*

Does the foundation have X bracing?

Yes-installed during construction *Yes-installed as retrofit* *No* *N/A*

Stairs, Porch, and Arctic Entry

Are there stairs? Circle yes or no.

- ❑ *What is the distance from the original stairs to the ground?*

- ❑ *What is the current condition of the stairs?*
    - *Good*
    - *Needs minor repair (<$100, day of labor)*
    - *Needs major repair*

- ❑ *If the stairs have broken from the main structure of the house or porch, what is the width of the gap?*

Is there a porch? Circle yes or no.

- ❑ *What is the current condition of the porch?*
    - *Good*
    - *Needs minor repair (<$100, day of labor)*
    - *Needs major repair*

- ❑ *If the porch has broken from the main structure of the house or porch, what is the width of the gap?*

Is there an Arctic Entry? Circle yes or no.

- ❑ *What is the current condition of the Arctic Entry?*
    - *Good*
    - *Needs minor repair (<$100, day of labor)*
    - *Needs major repair*

- ❑ *If the Arctic Entry has broken from the main structure of the house or porch, what is the width of the gap?*

Outbuildings

What outbuildings does this residence have? Fill in the rows for all that apply:

Outbuilding	Condition of building (good, needs minor repair, needs major repair, unusable)	Type and condition of building foundation (stable and level, unstable and unlevel)
Cold storage (dedicated aboveground building for storing items that need to be cold year-round)		
Garage		
Ice cellar (near the house)		
Ice cellar (located somewhere further away)		
Outhouse		
Steamroom		
Shed, enclosed, not heated		
Shed, enclosed, heated		
Wood shed		

Driveways/Roads/Walking trail (circle option)

When was the original driveway/road/walking trail placed?

Was material placed directly on tundra? How thick was the original layer of material?

Has thaw subsidence required major maintenance (more than general grading and minor material placement of less than 6 inches)?

Year(s) of major maintenance and estimated thickness of material added:

Is water pooling on either side of the driveway/road/walking trail?

Ground temperature sensor placement

University of Alaska Fairbanks researchers are planning to place ground temperature sensors below the ground surface around Point Lay in August. Would you be willing to have ground temperature sensors below or near your house?

Researchers would come and with very minimal disturbance drill or punch a half inch hole to the depth of 5 or 6 feet below the surface and install a string of temperature sensors along with a data logger (an 8-inch x 8-inch x 6-inch box) connected by a conduit pipe to the borehole. The temperature sensors would collect data for one year or longer, and researchers would then return to read out the data. After the project is completed, the researchers can remove the conduit, data logger, or keep everything as-is and train you how to operate the instrumentation. The data would help to understand how quickly the ground temperature is changing over time, how stable the foundation is, and what might happen in the future.

Video interview

CCHRC and TNHA are working on two videos about permafrost foundations and climate change. These videos will cover existing techniques for building on permafrost, the effect of permafrost thaw on foundations, and new projects and plans after the Council's declaration of a climate emergency at the March Council meeting. Would you be willing to have your house shown up close in a video and/or be interviewed for the video?

If yes -> CCHRC's videographer will be in town until Thursday and would stop by before then for the interview and/or footage. What is a good time for this to happen?

Photo checklist (if permissions are given and photos are easy to obtain)

- ❑ Property – Frame with house and outbuildings if possible
- ❑ Front of house
- ❑ Back of house
- ❑ Sides of house
- ❑ A few photos of the foundation
- ❑ Photos of outbuildings
- ❑ A few photos of issues (such as a cracked window, etc)

Extra credit

Sketch the property (house/outbuildings/roads, paths) below.