COLD CLIMATE HOUSING RESEARCH CENTER
CCHRC

SEA LION CORPORATION
P.O. Box 87
Hooper Bay, Alaska 99604
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Hooper Bay Housing Analysis and Energy Feasibility Report

Prepared for:
Sea Lion Corporation
Main Airport Road
Hooper Bay, AK
99604

December 30th, 2012

Prepared by:
Cold Climate Housing Research Center
1000 Fairbanks, AK 99708
907.457.3454
www.cchrc.org

In collaboration with:

Solutions for Healthy Breathing
PO Box 10918 Fairbanks AK
99710
and
Whitney Construction
PO Box 923
Bethel AK, 99559

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COLD CLIMATE HOUSING RESEARCH CENTER

CCHRC

The Cold Climate Housing Research Center is pleased to have been invited by the Sea Lion Corporation and residents of the Village of Hooper Bay to be a part of the Hooper Bay Housing Analysis and Energy Report. The Department of Energy's "Energy Efficiency Development and Deployment in Indian Country" program is an important step toward improving the lives of Native Americans through reduction of energy costs. The cost of energy in rural Alaskan communities is the highest in the nation. The burden placed on families and communities is certainly not economically sustainable and must be addressed. Until the last decade, most homes constructed in villages throughout Alaska were not designed to address the extreme climatic and environmental conditions experienced in our state. This has resulted in an aging housing stock that is expensive to heat, unhealthy to live in, uncomfortable for occupants and in many cases structurally compromised.

In our examination of a representative sample of homes in Hooper Bay, it became obvious that achieving the goal of a 30% reduction in energy costs could be realistically met using weatherization techniques currently practiced in Alaska. Payback on this weatherization investment is also realistic. However, the situation is much more complicated. In particular, any tightening of the envelope to reduce energy use must include a strategy for mechanically ventilating the building. If sufficient ventilation is not provided, poor indoor air quality (IAQ) concerns and its effects can have significant impact on the health of occupants. Rural Alaskans experience the highest levels of upper respiratory distress in the U.S. This has been directly attributed to the presence of molds, air borne pollutants and unhealthy humidity levels. In concert with air sealing and improvements to the thermal envelope, a whole-house ventilation system can dramatically improve IAQ and the occupant's quality of life.

The training of a local workforce is an essential component of a successful program. Creating a local skilled labor force further enhances the positive economic influence of lower energy costs. This labor force begins with the energy rater. Local individuals that understand the best approach for weatherization and ventilation strategies will ensure that the work done is effective. Likewise, those that do the recommended home improvements must have training to ensure effective and professional workmanship. Leadership in Hooper Bay certainly understands the importance of a trained local workforce.

Homeowner education must also be part of an overall effort to reduce energy use. Occupant behavior may be the single most important component of a successful program. It will take strong leadership at the Village and Regional level and a serious commitment by all of a community's residents if a sustainable future is to be realized.

The challenges facing Alaskan communities are significant and will require creative responses. It is the Cold Climate Housing Research Center's hope that our participation with the Sea Lion Corporation and the Village of Hooper Bay helps lead them toward tangible and positive progress to create more energy efficient, healthy and affordable housing for their people. The talent and will exist in this remarkable region of Alaska to create success. The Department of Energy's programs can certainly be a major resource in achieving that goal.

Sincerely,

1-07-2013

Jack Hèbert, President, CEO

P.O. Box 82489, Fairbanks, AK 99708 + 907.457.3454 + Fax: 907.457.3456
www.cchrc.org

The Hooper Bay Project

History

In early 2011, The Sea Lion Corporation (SLC), an Alaska Native Claims Settlement Act village corporation representing the community of Hooper Bay, set about organizing a Feasibility Study with the goal to create jobs by providing funding to train staff to be energy raters as well as weatherization/ energy conservation technicians that specialize in building construction and energy savings technologies; and an objective to fund a feasibility study that demonstrates a 30% reduction in residential/ commercial energy usage and identify the economic benefits of implementing energy efficiency measures to the Tribe.

Sea Lion applied for and received a grant from the Department of Energy (DOE) towards this end titled "Energy Efficiency Development and Deployment in Indian Country". The initial objectives of the Hooper Bay Energy Efficiency Feasibility Study were to demonstrate a **30% reduction in residential/commercial energy usage** and identify the economic benefits of implementing energy efficiency measures to the Tribe through:

(1) partnering with Association of Village Council Presidents Regional Housing Authority (AVCPRHA) in the training and hire of 2 local energy raters to conduct energy audits of twenty four (24) homes

(2) partnering with Cold Climate Housing Research Center to document current electrical and heating energy consumption and analyze data for a final feasibility report

(3) assessing the economics of electricity & heating fuel usage

(4) projecting energy savings or fossil fuel reduction by modeling of improvement scenarios and cost feasibility

(5) the development of materials lists for energy efficiency improvements; and

(6) identifying financing options for the follow-up energy efficiency implementation phase.

Updated Scope

After reviewing Certified Energy Auditor in Training (CEAIT) Eligibility Requirements, SLC elected to instead train local community members as Energy Assessors, with the possibility of becoming Certified Energy Auditors at a later date. This decision was made due to the CEAIT Eligibility Requirements of:

- A 4-year degree in engineering or experience
- Receipt of a passing score on the CEA examination

These requirements would be outside the timeline of the Feasibility Study. AVCP RHA was unable to

provide Energy Auditors for training, so SLC and CCHRC hired Whitney Construction of Bethel and Solutions for Healthy Breathing of Fairbanks to conduct the training. The updated objectives are:

(1) partnering with Whitney Construction and Solutions for Healthy Breathing in the training and hire of 2 local energy assessors to conduct energy audits of 9 representative housing models and 2 commercial units in the community. These homes are representative of 52 homes constructed across different eras.

(2) partnering with Cold Climate Housing Research Center to document current electrical and heating energy consumption and analyze data for a final feasibility report

(3) assessing the economics of electricity & heating fuel usage

(4) projecting energy savings or fossil fuel reduction by modeling of improvement scenarios and cost feasibility; and

The following two objectives will be completed after the publication of this report:

(5) the development of materials lists for energy efficiency improvements

(6) identifying financing options for the follow-up energy efficiency implementation phase.

Implementation

- In August 2011, Eric Whitney of Whitney Construction in Bethel flew to Hooper Bay and conducted energy audits on the nine representative homes as well as two commercial buildings in the community. 5 local community members took part in the energy rating training and blower door testing.
- In addition, five community members traveled to Anchorage for environmental training.
- CCHRC performed an in-depth review of the Energy Audit Reports. The initial recommendations of Whitney Construction and pre-inspection review of the homes is outlined in **MATRIX B** on pg. 82.
- CCHRC and Solutions for Healthy Breathing traveled to Hooper Bay for a supplemental inspection and documentation of the representative homes selected by the village and audited by Whitney Construction.
- CCHRC energy specialists modeled improvement scenarios and cost feasibility based on the original goal of 30% energy reduction.
- Solutions for Healthy Breathing issued a report outlining ventilation and mold analysis.
- CCHRC analyzed the complete set of data for the creation of the final feasibility report, and made prioritized recommendations for retrofit according outlined in **MATRIX C** on page 86.

Energy Audits

Blaze Tinker House

Field Notes:
(Harvey and Mary Tinker, Eunice Charlie homes also looked at on the second visit)
Constructed by: Alutiiq Corporation
Size: 16x32 approx
Era: 2005
Similar Houses: 10
Heat sources: Toyotami Laser 73
Ventilation: 2 Fresh 80's (closed) Put in afterwards
Indoor Temperature: 72°
Humidity: 59%
Occupants: 3, 2 adults 1 child
Weatherized: Unknown
Notes:

- This home, and the 9 homes like it, were built as temporary housing to replace units destroyed by a large fire in the community. Although meant to be temporary, it is unlikely that they will be replaced, and for all intents and purposes now serve as permanent homes.
- Made modularly in Anchor Point and transported over
- They cut transoms over the bedroom door so heat could flow to the rooms
- Ice builds up on the windows
- Recirc hoods above the stove
- The home is not level. There were originally only two stringers. The floors sag and most of the homes of this type have post-occupancy central stringers and post and pads along the center.
- Attic is closed off with OSB. The attics are accessible from the inside
- Blaze's granddaughter is experiencing respiratory problems
- There is a Fresh 80 air inlet vent. It is only opened by the occupant during summer
- High humidity/tight
- 10" Roof Overhangs on eaves, just facia width on gables
- 8" fiberglass in the roof
- Plywood under
- 250 gallon heating fuel per year approximately

Eunice Charlie's House

- Mold sample: #2803527
- Same as Blaze's but with no fresh 80's. Most of them don't have Fresh 80's. Blaze's were put in afterwards but are closed off.

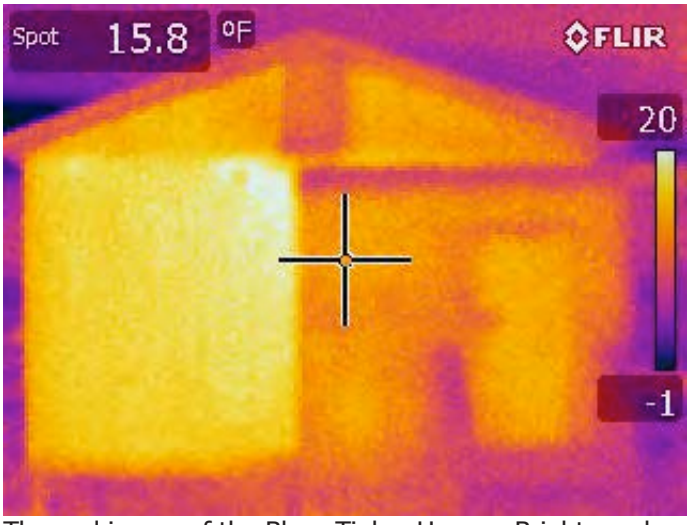
Harvey and Mary Tinker House

- Harvey sealed up the windows and caulked himself.
- Harvey also invented a type of two-season chup'luk, or passive vent.
- It's a tube with flex duct at the bottom. The flex duct sits on the floor in the winter, up high in the summer. Acts as a passive vent.
- They rotate their stored gear away from the walls

The Blaze Tinker House. Arctic Entry constructed by resident.

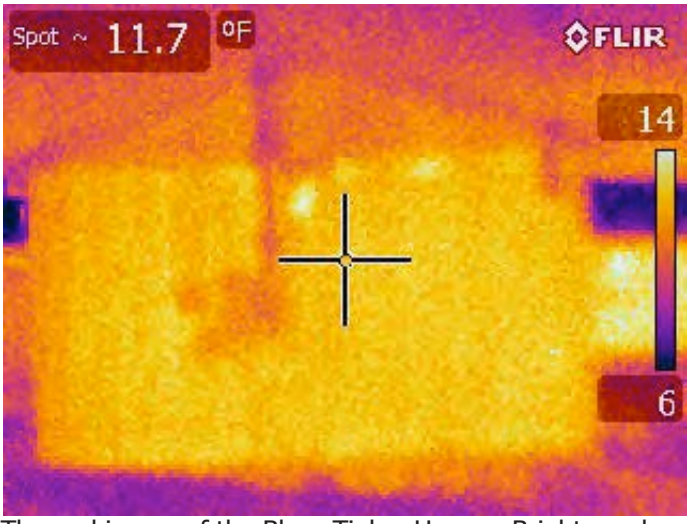
The cold roof with 8" of bat insulation and hatch into main living area

The Blaze Tinker House.



Thermal image of the Blaze Tinker House. Brighter yellow tones show locations of greatest heat flow.

The Blaze Tinker House.



Thermal image of the Blaze Tinker House. Brighter yellow tones show locations of greatest heat flow. Batting insulation seems to slump at the top of wall cavity.

Alaska Housing
FINANCE CORPORATION

HOME ENERGY RATING CERTIFICATE

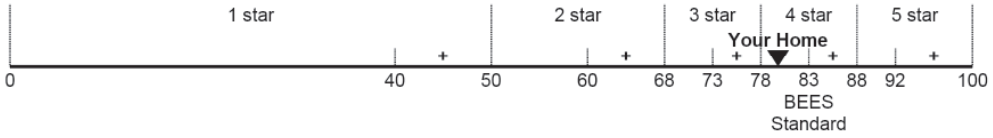
The Home Located At:
Blaise Tinker House
Hooper Bay, Alaska

Has Been Energy-Rated As:

★★★★

Four Star

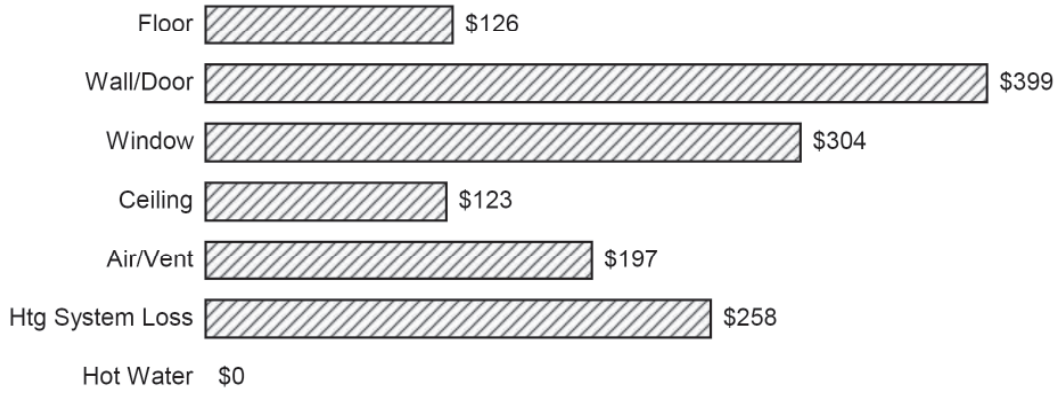
Overall Efficiency of Home
79.8 points



Projected Annual Energy Costs
$2,614 per year

Amount of CO2 Produced by the Home
13,900 pounds per year

BREAKDOWN OF HEATING COSTS, $ PER YEAR



Client: Sea Lion Corporation **Rater:** Eric Whitney, Whitney Construction **Date:** 7/16/2012

Rater's City: Bethel, AK 99559 **Contact:** 907 545-1309, e_whitney@mac.com
ver. 2.2.0.3, library: 5/18/2012, file: Sea Lion Blaise Tinker house.hm2, Rating Type: As-Is

I certify that this Rating is true and correct, to the best of my knowledge and belief: _____

Rater Signature

ENERGY COST AND FEATURES REPORT

Property: Sea Lion Corporation
Blaise Tinker House
Hooper Bay, Alaska

House: Single Family
Living Floor Area: 465 square feet
No Attached Garage

Rater: Eric Whitney
Whitney Construction
PO Box 923
Bethel, AK 99559

Rating: As-Is
ID: Hooper Bay Blaise Tinker

VENTILATION WARNING: The measured air tightness of this home indicates that it may not provide sufficient ventilation air (for acceptable indoor quality) as defined by ASHRAE 62.2 2004, without adequate mechanical ventilation equipment. If whole house mechanical ventilation equipment has been installed, it is recommended that it be properly maintained and operated. If no whole house mechanical ventilation equipment has been installed, it is strongly recommended that the homeowner consider an investment in this improvement. (A test of the building's ventilation air rate would help determine the importance of a mechanical ventilation system in this home.)

Envelope Efficiency

Floor Insulation	R-37.5
Wall/Door Insulation	R-16.5
Ceiling Insulation	R-38.5
Window R-Value	R-1.43
Window to Wall Ratio, Living Space	7.7%
South Facing Window Area	0 square feet
Air Leakage	3.3 Air Changes per Hour at 50 Pascals 0.22 Air Changes per Hour Natural

Space Heating System

System Efficiency	84%
Fuel Type	#1 Oil
Supplemental Fuel	None
Thermostat Setting	70.0 degrees F
Setback Thermostat	None

Water Heater
None Present

Space Cooling System None Present

Ventilation None

Other

Number of Occupants	3
Clothes Dryer Fuel	Electricity
Cooking Range Fuel	Electricity
Miscellaneous Lights/Appliance Use	Average

ESTIMATED ANNUAL ENERGY COST

Electricity = $0.2249/kWh, #1 Oil = $7.37/gallons

Space Heating	174 kWh of Electricity, 185 gallons of #1 Oil
Water Heating	
Space Cooling	
Lights and Appliances	5,373 kWh of Electricity

Actual use and costs may vary from these estimates depending upon weather conditions, occupant life styles and utility rates currently in effect.

ver. 2.2.0.3, library: 5/18/2012, file: Sea Lion Blaise Tinker house.hm2

Energy Efficiency Improvement Options

Property: Sea Lion Corporation
Blaise Tinker House
Hooper Bay, AK 99604

House: Single Family
Living Floor Area: 465 sq.ft

Initial Rating: Four Star, 79.8 points
Additional Rating Points needed to reach higher Rating Levels:
3.2 more points needed to reach **4+ Stars**
8.2 more points needed to reach **5 Stars**
12.2 more points needed to reach **5+ Stars**

Rater: Eric Whitney
Whitney Construction
PO Box 923
Bethel, AK 99559
907 545-1309
e_whitney@mac.com

ID: Hooper Bay Blaise Tinker

Fuel Prices used in this Analysis: Electricity = $0.2249/kWh, #1 Oil = $7.37/gallons

The maximum Carbon Monoxide (CO) leakage of a combustion appliance should be less than 25 ppm at steady state conditions.

The following are possible energy-saving improvements for your home.
Notes: The Rating points you receive for each improvement depend upon the other measures you install. In the report below, the points indicated for each measure assume that you install all prior measures on the list. The Break-Even cost is the *most* you could pay for the improvement and still have it be cost-effective based on energy savings over the life of the measure.

Improvement Description / Location	Annual Savings[1]	Break-Even Cost[2]	Rating Points Gained[3]	Rating, after all Improvements thru this one[4]	Design Heat Loss, Btu/hr[5]
Replace existing window with U-0.22 vinyl window Location - Window/Skylight: windows	$472	$8,159	7.8	87.6 points 4+ Stars Increase: 7.8 pts, 1 step	10,114
Install R-30 loose-fill insulation in attic with Energy Truss. Location - Ceiling w/ Attic: House	$103	$2,415	1.7	89.3 points 5 Stars Increase: 9.5 pts, 2 steps	9,562
Install R-14 rigid board insulation Location - Exposed Floor: House	$66	$1,564	1.1	90.4 points 5 Stars Increase: 10.6 pts, 2 steps	9,199
Install R-25 rigid foam board to exterior and cover with T1-11 siding or equivalent. Location - Above-Grade Wall: House	$377	$8,855	6.3	96.7 points 5+ Stars Increase: 16.9 pts, 3 steps	6,899
Remove existing door and install standard pre-hung U-0.16 insulated door, including hardware. Location - Exterior Door: House	$12	$271	0.2	96.9 points 5+ Stars Increase: 17.1 pts, 3 steps	6,820
Caulk and Seal so that Home Air Leakage is Reduced by 50 CFM at 50 Pascals.	$0	$0	0.0	96.9 points 5+ Stars Increase: 17.1 pts, 3 steps	6,322
Total, All Measures	**$1,029**	**$21,263**	**17.1**		

Annual CO2 Reduction after all improvements: 3,050 pounds per year

Notes:

1. *Annual Savings* is the potential savings in your home's energy cost per year.
2. *Break-Even Cost* is the most you could pay for this improvement and still have it be cost-effective based on energy savings over the life of the measure.
3. *Rating Points Gained* are the estimated rating points that would be added to your As-Is Rating score if the measure were installed. Actual points gained will only be determined by completing a post rating.
4. *Rating, after all Improvements thru this one:* This column shows the estimated energy rating that would result if all improvements prior to and including this one were done. As well as showing the estimated final rating, the column shows how much the rating will improve in terms of rating points and in terms of rating steps. For example, an increase from a 2 star rating to a 2 star plus rating is one step. The actual final rating will only be determined by completing a post rating.
5. *Design Heat Loss, Btu/hr:* This Design Heat Loss value shows the design heat loss in Btu/hour after this improvement and all before it are implemented. The Design Heat Loss is the amount of heat required to be delivered to the conditioned spaces during heating design conditions. If the heating system serves Domestic Hot Water loads in addition to space heating, you must increase this value to account for the domestic hot water load. When determining the size of the required heating system, you should also add capacity for distribution losses, pick-up requirements, and a safety margin. If you are determining the input rating of the heating system, you must also add capacity for the inefficiency of the furnace or boiler.

Bosco Olson House

Field Notes:

Constructed by: AVCP
Era: 70's
Similar Houses: 20
Size: 24' x 32'
Heat sources: Laser (night) and woodstove (day)
Ventilation: none
Indoor Temperature: 71°
Humidity: 50%
Occupants: 4 (including Thomas Olson, one of the energy assessor trainees)
Weatherized: Raised onto a Triodetic
Notes:

- In the winter there is frost along the walls
- Marion Olson tapes cardboard to the walls in the winter
- The crack drafts began with the triodetic lift
- At night it is cold in the bedrooms
- The ground is better in the upland areas of town. This house is on bad ground, poorly drained with boardwalks for circulation.
- No doors, only curtains, but warm air still has a difficult time getting to the bedrooms
- There are Alaska Windows triple pane with a plastic center pane. The windows need to be replaced
- The AKWarm file says the floor is R38. That seems unlikely. It would only make sense if they sprayed it with urethane foam when they made the triodetic
- HUD and AVCP Housing teamed up on this model early.
- They can't skirt the foundation because it's high and on uneven ground, but they would like to
- Originally had forced air heating. The ducting is still there but it has a laser space heater now. The woodstove was moved from the kitchen to a more central location

Bosco Olson House. The second entrance has been blocked off and is not used.

Bosco Olson House. The home was retrofitted with a triodetic foundation after experiencing differential settlement issues.

Bosco Olson House. The building has an interior arctic entry for cold storage. It is oriented so that no windows are on the south side to take advantage of solar gain.

Alaska Housing FINANCE CORPORATION

HOME ENERGY RATING CERTIFICATE

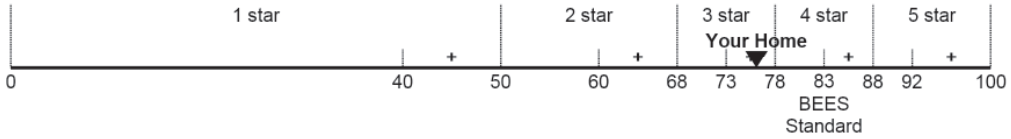
The Home Located At:
Bosco Olson
Hooper Bay, Alaska

Has Been Energy-Rated As:

★★★ +

Three Star Plus

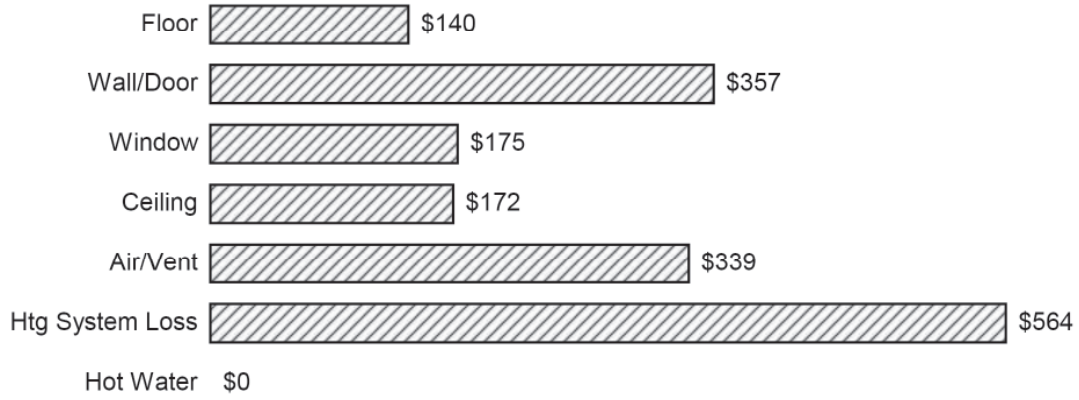
Overall Efficiency of Home
76.1 points



Projected Annual Energy Costs
$2,980 per year

Amount of CO2 Produced by the Home
13,839 pounds per year

BREAKDOWN OF HEATING COSTS, $ PER YEAR



Client: Sea Lion Corporation **Rater:** Eric Whitney, Whitney Construction **Date:** 7/16/2012

Rater's City: Bethel, AK 99559 **Contact:** 907 545-1309, e_whitney@mac.com
ver. 2.2.0.3, library: 5/18/2012, file: Sea Lion Bosco Olson.hm2, Rating Type: As-Is

I certify that this Rating is true and correct, to the best of my knowledge and belief: _____

Rater Signature

ENERGY COST AND FEATURES REPORT

Property: Sea Lion Corporation
Bosco Olson
Hooper Bay, Alaska

House: Single Family
Living Floor Area: 513 square feet
No Attached Garage

Rater: Eric Whitney
Whitney Construction
PO Box 923
Bethel, AK 99559

Rating: As-Is
ID: Sea Lion Bosco Olson

VENTILATION WARNING: The measured air tightness of this home indicates that it may not provide sufficient ventilation air (for acceptable indoor quality) as defined by ASHRAE 62.2 2004, without adequate mechanical ventilation equipment. If whole house mechanical ventilation equipment has been installed, it is recommended that it be properly maintained and operated. If no whole house mechanical ventilation equipment has been installed, it is strongly recommended that the homeowner consider an investment in this improvement. (A test of the building's ventilation air rate would help determine the importance of a mechanical ventilation system in this home.)

Envelope Efficiency

Floor Insulation	R-37.7
Wall/Door Insulation	R-14.0
Ceiling Insulation	R-30.8
Window R-Value	R-2.94
Window to Wall Ratio, Living Space	12.9%
South Facing Window Area	0 square feet
Air Leakage	7.1 Air Changes per Hour at 50 Pascals 0.46 Air Changes per Hour Natural

Space Heating System

System Efficiency	84%
Fuel Type	#1 Oil
Supplemental Fuel	Birch Wood
Thermostat Setting	70.0 degrees F
Setback Thermostat	Yes, Controls Entire Home

Water Heater
None Present

Space Cooling System None Present

Ventilation None

Other

Number of Occupants	4
Clothes Dryer Fuel	Electricity
Cooking Range Fuel	Electricity
Miscellaneous Lights/Appliance Use	Average

ESTIMATED ANNUAL ENERGY COST

Electricity = $0.2261/kWh, #1 Oil = $7.37/gallons, Birch Wood = $350/cords

Space Heating	165 kWh of Electricity, 177 gallons of #1 Oil, 1.17 cords of Birch Wood
Water Heating	
Space Cooling	
Lights and Appliances	5,449 kWh of Electricity

Actual use and costs may vary from these estimates depending upon weather conditions, occupant life styles and utility rates currently in effect.

ver. 2.2.0.3, library: 5/18/2012, file: Sea Lion Bosco Olson.hm2

Energy Efficiency Improvement Options

Property: Sea Lion Corporation
Bosco Olson
Hooper Bay, AK 99604

House: Single Family
Living Floor Area: 513 sq.ft

Initial Rating: Three Star Plus, 76.1 points
Additional Rating Points needed to reach higher Rating Levels:
1.9 more points needed to reach **4 Stars** (a minimum 3 point increase is required to receive an AHFC rebate)
6.9 more points needed to reach **4+ Stars**
11.9 more points needed to reach **5 Stars**
15.9 more points needed to reach **5+ Stars**

Rater: Eric Whitney
Whitney Construction
PO Box 923
Bethel, AK 99559
907 545-1309
e_whitney@mac.com

ID: Sea Lion Bosco Olson

Fuel Prices used in this Analysis: Electricity = $0.2261/kWh, #1 Oil = $7.37/gallons, Birch Wood = $350/cords

The maximum Carbon Monoxide (CO) leakage of a combustion appliance should be less than 25 ppm at steady state conditions.

The following are possible energy-saving improvements for your home.
Notes: The Rating points you receive for each improvement depend upon the other measures you install. In the report below, the points indicated for each measure assume that you install all prior measures on the list. The Break-Even cost is the *most* you could pay for the improvement and still have it be cost-effective based on energy savings over the life of the measure.

Improvement Description / Location	Annual Savings[1]	Break-Even Cost[2]	Rating Points Gained[3]	Rating, after all Improvements thru this one[4]	Design Heat Loss, Btu/hr[5]
Caulk and Seal so that Home Air Leakage is Reduced by 100 CFM at 50 Pascals.	$148	$1,349	2.2	78.3 points 4 Stars Increase: 2.2 pts, 1 step	15,663
Install R-30 loose-fill insulation in attic with Standard Truss. Location - Ceiling w/ Attic: House	$158	$3,582	2.4	80.7 points 4 Stars Increase: 4.6 pts, 1 step	14,794
Remove existing door and install standard pre-hung U-0.16 insulated door, including hardware. Location - Exterior Door: House	$38	$853	0.5	81.2 points 4 Stars Increase: 5.1 pts, 1 step	14,577
Install R-25 rigid foam board to exterior and cover with T1-11 siding or equivalent. Location - Above-Grade Wall: House	$429	$9,709	6.5	87.7 points 4+ Stars Increase: 11.6 pts, 2 steps	12,060
Install R-10 rigid board insulation Location - Exposed Floor: House	$61	$1,386	0.9	88.6 points 5 Stars Increase: 12.5 pts, 3 steps	11,699
Replace existing window with U-0.22 vinyl window Location - Window/Skylight: Windwows	$169	$2,822	2.6	91.2 points 5 Stars Increase: 15.1 pts, 3 steps	10,635
Install a Heat Recovery Ventilation system	$0	$0	0.0	91.2 points 5 Stars Increase:	10,635

Improvement Description / Location	Annual Savings[1]	Break-Even Cost[2]	Rating Points Gained[3]	Rating, after all Improvements thru this one[4]	Design Heat Loss, Btu/hr[5]
				15.1 pts, 3 steps	
Total, All Measures	**$1,004**	**$19,700**	**15.1**		

Annual CO2 Reduction after all improvements: 2,283 pounds per year

Notes:

1. *Annual Savings* is the potential savings in your home's energy cost per year.
2. *Break-Even Cost* is the most you could pay for this improvement and still have it be cost-effective based on energy savings over the life of the measure.
3. *Rating Points Gained* are the estimated rating points that would be added to your As-Is Rating score if the measure were installed. Actual points gained will only be determined by completing a post rating.
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5. *Design Heat Loss, Btu/hr:* This Design Heat Loss value shows the design heat loss in Btu/hour after this improvement and all before it are implemented. The Design Heat Loss is the amount of heat required to be delivered to the conditioned spaces during heating design conditions. If the heating system serves Domestic Hot Water loads in addition to space heating, you must increase this value to account for the domestic hot water load. When determining the size of the required heating system, you should also add capacity for distribution losses, pick-up requirements, and a safety margin. If you are determining the input rating of the heating system, you must also add capacity for the inefficiency of the furnace or boiler.

Leonard Bell House

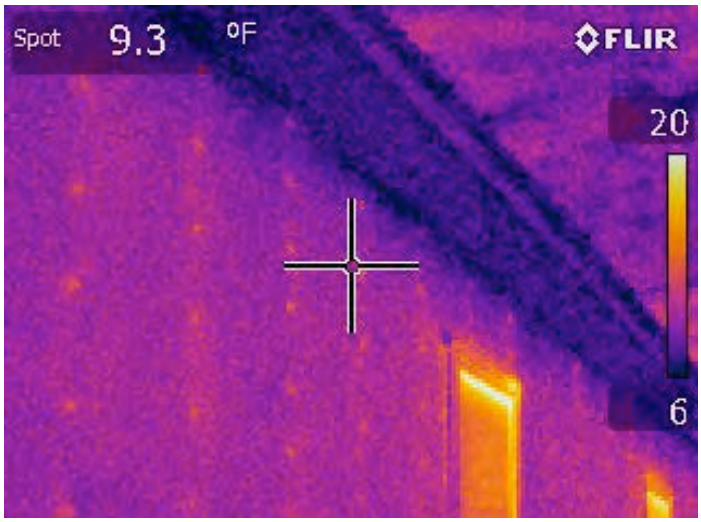
Field notes:
Constructed by: BIA
Similar Houses: 5
Era: 90s
Heat sources: one Toyotami laser (no secondary heat source)
Ventilation: RurAL CAP fan in the living and one in the bathroom
Indoor Temperature: 72°
Humidity: 37%
Occupants: 7
Weatherized: yes 2004
Notes:

- Leonard turns the living room fan off when it's windy but leaves the bathroom fan on always
- 6 drums of fuel for winter (330 gallons)
- He sealed the attic entrance
- There's one fresh 80 but it's closed
- Mold sample taken #28006781
- Wife has asthma
- During weatherization they blew in 12" of cellulose on top of the existing fiberglass
- The weatherization seems to be effective and he uses the ventilation system.
- Windows are a remaining concern. They are poorly sealed

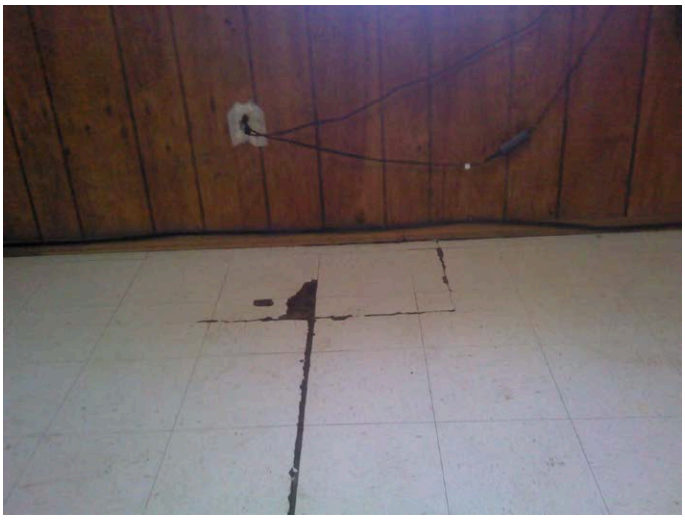
Leonard Bell House. Exterior view.

Leonard Bell House. The home has an interior arctic entry.

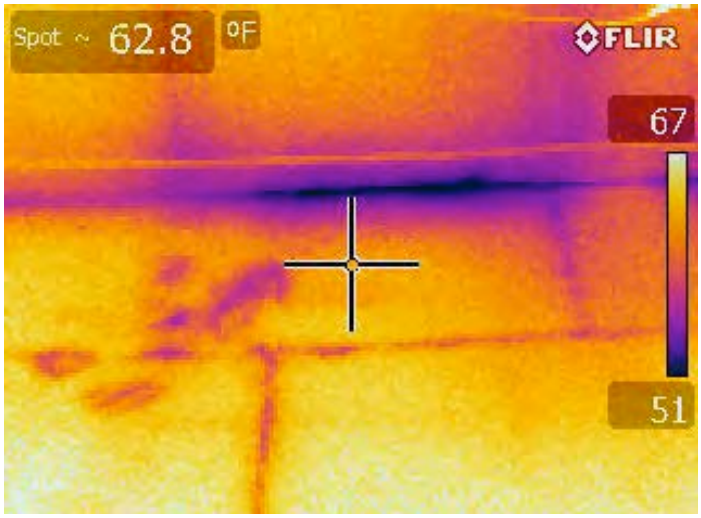
Leonard Bell House. View of eaves.



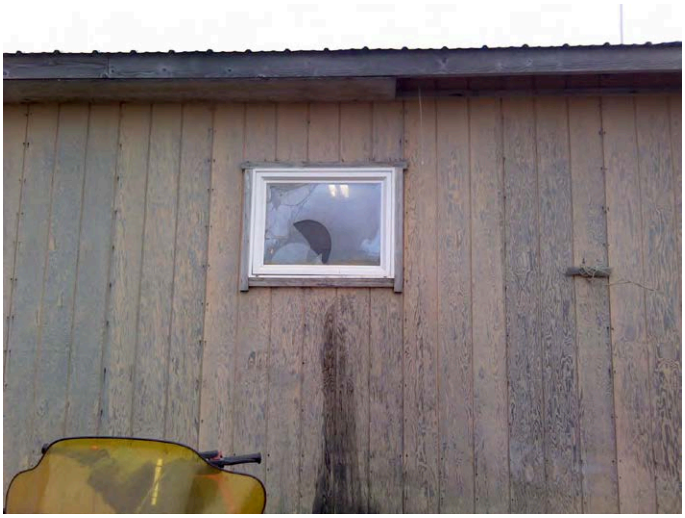
Thermal imaging reveals that the prior retrofit of the attic was effective, but that the windows still leak heat.



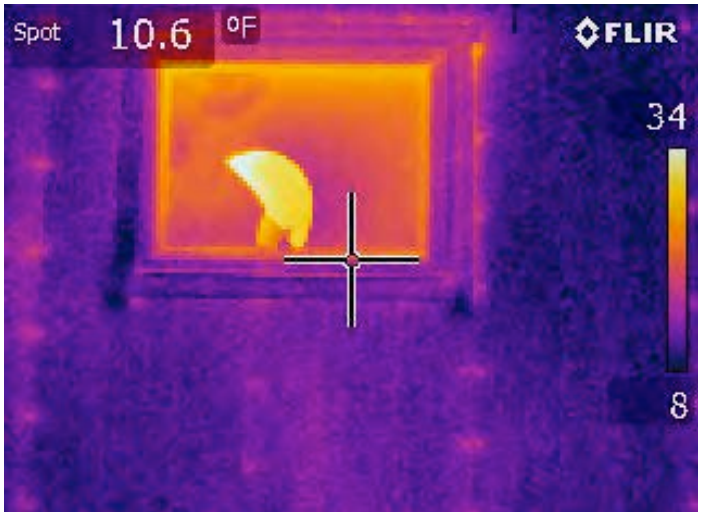
Leonard Bell House. View of floor where it meets an exterior wall



Thermal imaging reveals poor sealing or a cold spot where the wall meets the floor, possibly at the rim joist.



Leonard Bell House. View of window



Although the breakage is obvious, also of note is the poor sealing along the frame of the window.

Alaska Housing
FINANCE CORPORATION

HOME ENERGY RATING CERTIFICATE

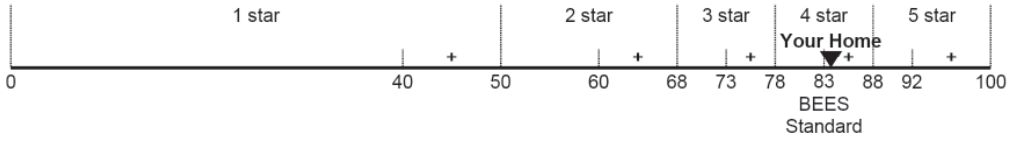
The Home Located At:
Lenard Bell
Hooper Bay, Alaska

Has Been Energy-Rated As:

★★★★ +

Four Star Plus

Overall Efficiency of Home
83.7 points



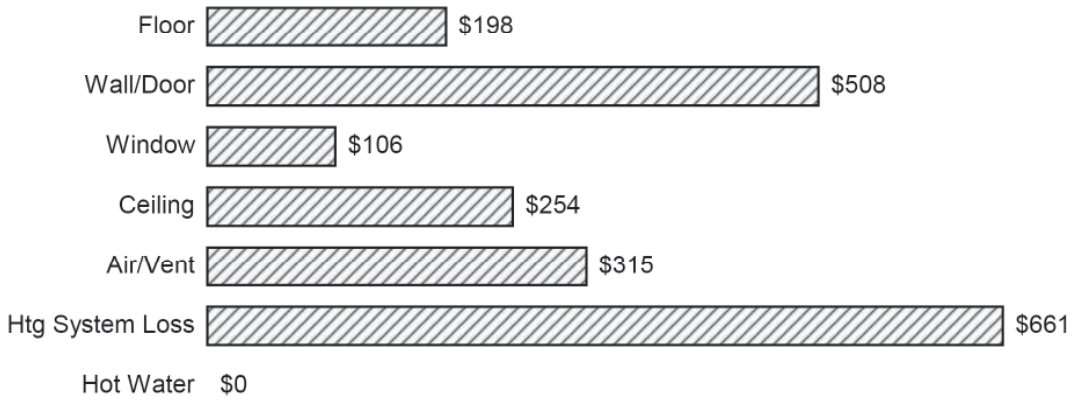
Projected Annual Energy Costs

$3,488 per year

Amount of CO2 Produced by the Home

15,476 pounds per year

BREAKDOWN OF HEATING COSTS, $ PER YEAR



Client: Sea Lion Corporation **Rater:** Eric Whitney, Whitney Construction **Date:** 7/16/2012

Rater's City: Bethel, AK 99559 **Contact:** 907 545-1309, e_whitney@mac.com
ver. 2.2.0.3, library: 5/18/2012, file: Sea Lion Lenord Bell.hm2, Rating Type: As-Is

I certify that this Rating is true and correct, to the best of my knowledge and belief: _____

Rater Signature

ENERGY COST AND FEATURES REPORT

Property: Sea Lion Corporation
Lenard Bell
Hooper Bay, Alaska

House: Single Family
Living Floor Area: 849 square feet
No Attached Garage

Rater: Eric Whitney
Whitney Construction
PO Box 923
Bethel, AK 99559

Rating: As-Is
ID: Sea Lion Lenord Bell

VENTILATION WARNING: The measured air tightness of this home indicates that it may not provide sufficient ventilation air (for acceptable indoor quality) as defined by ASHRAE 62.2 2004, without adequate mechanical ventilation equipment. If whole house mechanical ventilation equipment has been installed, it is recommended that it be properly maintained and operated. If no whole house mechanical ventilation equipment has been installed, it is strongly recommended that the homeowner consider an investment in this improvement. (A test of the building's ventilation air rate would help determine the importance of a mechanical ventilation system in this home.)

Envelope Efficiency

Floor Insulation	R-37.5
Wall/Door Insulation	R-14.8
Ceiling Insulation	R-29.3
Window R-Value	R-2.38
Window to Wall Ratio, Living Space	5.0%
South Facing Window Area	6 square feet
Air Leakage	4.2 Air Changes per Hour at 50 Pascals 0.27 Air Changes per Hour Natural

Space Heating System

System Efficiency	84%
Fuel Type	#1 Oil
Supplemental Fuel	Birch Wood
Thermostat Setting	70.0 degrees F
Setback Thermostat	Yes, Controls Entire Home

Water Heater
None Present

Space Cooling System None Present

Ventilation None

Other

Number of Occupants	4
Clothes Dryer Fuel	Electricity
Cooking Range Fuel	Electricity
Miscellaneous Lights/Appliance Use	Average

ESTIMATED ANNUAL ENERGY COST

Space Heating		$2,041
Water Heating	$0	
Space Cooling	$0	
Lights and Appliances		$1,447

Electricity = $0.2417/kWh, #1 Oil = $7.37/gallons, Birch Wood = $350/cords

Space Heating	193 kWh of Electricity, 206 gallons of #1 Oil, 1.36 cords of Birch Wood
Water Heating	
Space Cooling	
Lights and Appliances	5,987 kWh of Electricity

Actual use and costs may vary from these estimates depending upon weather conditions, occupant life styles and utility rates currently in effect.

ver. 2.2.0.3, library: 5/18/2012, file: Sea Lion Lenord Bell.hm2

Energy Efficiency Improvement Options

Property: Sea Lion Corporation
Lenard Bell
Hooper Bay, AK 99604

House: Single Family
Living Floor Area: 849 sq.ft

Initial Rating: Four Star Plus, 83.7 points
Additional Rating Points needed to reach higher Rating Levels:
4.3 more points needed to reach **5 Stars**
8.3 more points needed to reach **5+ Stars**

Rater: Eric Whitney
Whitney Construction
PO Box 923
Bethel, AK 99559
907 545-1309
e_whitney@mac.com

ID: Sea Lion Lenord Bell

Fuel Prices used in this Analysis: Electricity = $0.2417/kWh, #1 Oil = $7.37/gallons, Birch Wood = $350/cords

The maximum Carbon Monoxide (CO) leakage of a combustion appliance should be less than 25 ppm at steady state conditions.

The following are possible energy-saving improvements for your home.
Notes: The Rating points you receive for each improvement depend upon the other measures you install. In the report below, the points indicated for each measure assume that you install all prior measures on the list. The Break-Even cost is the *most* you could pay for the improvement and still have it be cost-effective based on energy savings over the life of the measure.

Improvement Description / Location	Annual Savings[1]	Break-Even Cost[2]	Rating Points Gained[3]	Rating, after all Improvements thru this one[4]	Design Heat Loss, Btu/hr[5]
Install R-30 loose-fill insulation in attic with Standard Truss. Location - Ceiling w/ Attic: House	$249	$5,608	2.3	86.0 points 4+ Stars Increase: 2.3 pts, 0 steps	16,881
Caulk and Seal so that Home Air Leakage is Reduced by 100 CFM at 50 Pascals.	$44	$395	0.4	86.4 points 4+ Stars Increase: 2.7 pts, 0 steps	15,900
Install a Mechanical Ventilation system without heat recovery	$84	$1,116	0.8	87.2 points 4+ Stars Increase: 3.5 pts, 0 steps	15,900
Install R-25 rigid foam board to exterior and cover with T1-11 siding or equivalent. Location - Above-Grade Wall: House	$663	$14,953	6.2	93.4 points 5+ Stars Increase: 9.7 pts, 2 steps	12,170
Install R-10 rigid board insulation Location - Exposed Floor: House	$88	$1,982	0.8	94.2 points 5+ Stars Increase: 10.5 pts, 2 steps	11,673
Replace existing window with U-0.22 vinyl window Location - Window/Skylight: Windwows	$128	$2,135	1.2	95.4 points 5+ Stars Increase: 11.7 pts, 2 steps	10,866
Remove existing glass and replace with triple pane, 2 low-E, argon glass. Location - Window/Skylight: House	$9	$155	0.1	95.5 points 5+ Stars Increase:	10,792

Improvement Description / Location	Annual Savings[1]	Break-Even Cost[2]	Rating Points Gained[3]	Rating, after all Improvements thru this one[4]	Design Heat Loss, Btu/hr[5]
				11.8 pts, 2 steps	
Remove existing door and install standard pre-hung U-0.16 insulated door, including hardware. Location - Exterior Door: House	$13	$295	0.1	95.6 points 5+ Stars Increase: 11.9 pts, 2 steps	10,712
Total, All Measures	**$1,278**	**$26,639**	**11.9**		

Annual CO2 Reduction after all improvements: 2,834 pounds per year

Notes:

1. *Annual Savings* is the potential savings in your home's energy cost per year.
2. *Break-Even Cost* is the most you could pay for this improvement and still have it be cost-effective based on energy savings over the life of the measure.
3. *Rating Points Gained* are the estimated rating points that would be added to your As-Is Rating score if the measure were installed. Actual points gained will only be determined by completing a post rating.
4. *Rating, after all Improvements thru this one:* This column shows the estimated energy rating that would result if all improvements prior to and including this one were done. As well as showing the estimated final rating, the column shows how much the rating will improve in terms of rating points and in terms of rating steps. For example, an increase from a 2 star rating to a 2 star plus rating is one step. The actual final rating will only be determined by completing a post rating.
5. *Design Heat Loss, Btu/hr:* This Design Heat Loss value shows the design heat loss in Btu/hour after this improvement and all before it are implemented. The Design Heat Loss is the amount of heat required to be delivered to the conditioned spaces during heating design conditions. If the heating system serves Domestic Hot Water loads in addition to space heating, you must increase this value to account for the domestic hot water load. When determining the size of the required heating system, you should also add capacity for distribution losses, pick-up requirements, and a safety margin. If you are determining the input rating of the heating system, you must also add capacity for the inefficiency of the furnace or boiler.

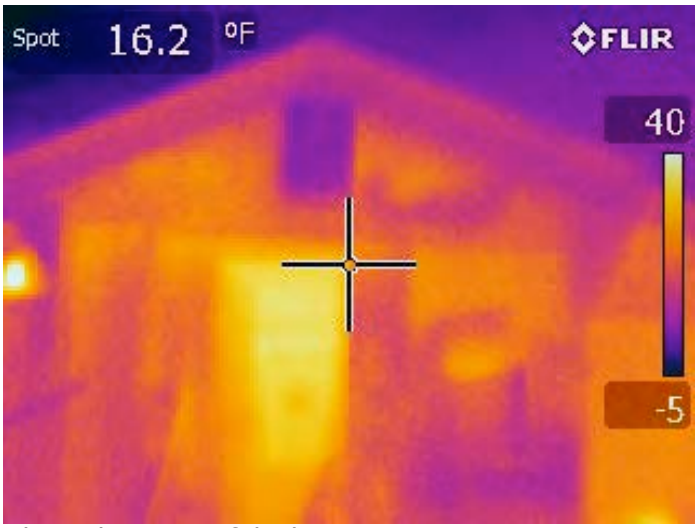
Charlie and Linda Wilson House

Field notes:
Constructed by: Samaritan's Purse
Era: 2005
Similar Houses: 5
Heat sources: 2 Toyotami Laser heaters
Ventilation: Venmar HRV (Disabled)
Indoor Temperature: 77°
Humidity: 47%
Occupants: 7
Weatherized: By occupant. He took the windows and doors out, insulated, and re-installed

- Only runs the HRV in the summer
- Bedrooms get cold. Can't move the air
- The attic access is outside
- The North wind has a big effect. The house is oriented broadside the wind.
- He's most concerned about leveling the house. The house is quite large and he doesn't have the equipment
- Mold sample: #803513
- Duct tape floor
- 2-pane vinyl windows
- They haul water and bring honey buckets to the dump
- The foundation is well-braced but difficult to adjust

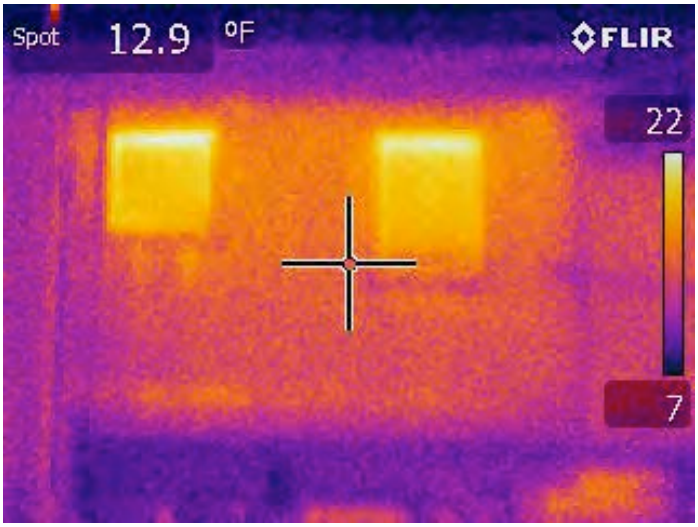
The house has experienced some settlement, but the foundation is not adjustable by occupant.

Large arctic entry



Thermal imaging of the home.

Wilson Home.



Thermal imaging of the home. Note the effective cold roof and the area of leakage at the base of the wall.

Alaska Housing
FINANCE CORPORATION

HOME ENERGY RATING CERTIFICATE

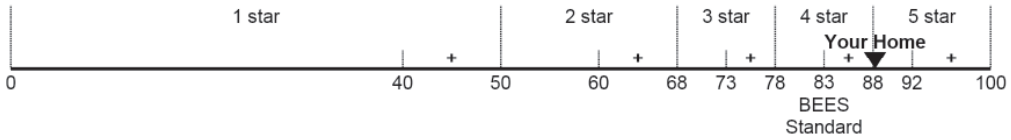
The Home Located At:
Charlie and Linda Wilson house
Hooper Bay, Alaska

Has Been Energy-Rated As:

★★★★★

Five Star

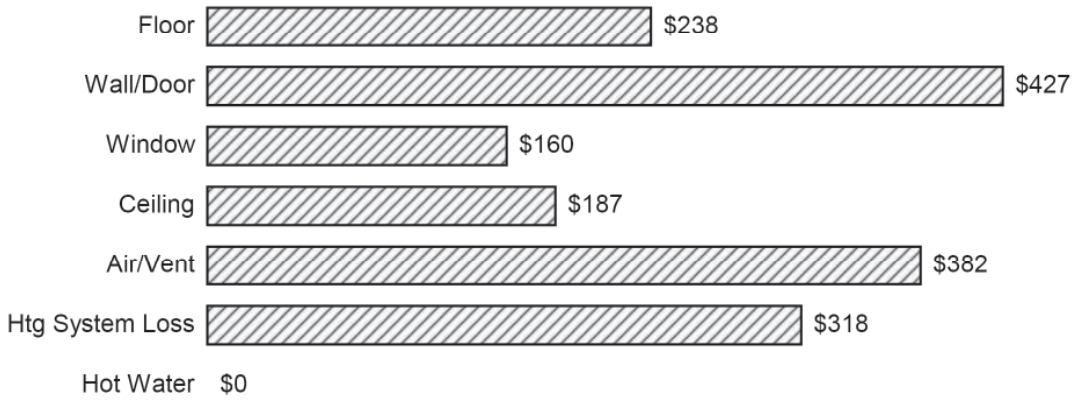
Overall Efficiency of Home
88.2 points



Projected Annual Energy Costs
$3,277 per year

Amount of CO2 Produced by the Home
16,352 pounds per year

BREAKDOWN OF HEATING COSTS, $ PER YEAR



Client: Sea Lion Corporation **Rater:** Eric Whitney, Whitney Construction **Date:** 7/16/2012

Rater's City: Bethel, AK 99559 **Contact:** 907 545-1309, e_whitney@mac.com
ver. 2.2.0.3, library: 5/18/2012, file: Sea Lion Charlie Wilson.hm2, Rating Type: As-Is

I certify that this Rating is true and correct, to the best of my knowledge and belief: _____
Rater Signature

ENERGY COST AND FEATURES REPORT

Property: Sea Lion Corporation
Charlie and Linda Wilson house
Hooper Bay, Alaska

House: Single Family
Living Floor Area: 1,003 square feet
No Attached Garage

Rater: Eric Whitney
Whitney Construction
PO Box 923
Bethel, AK 99559

Rating: As-Is
ID: Sea Lion Charlie Wilson

VENTILATION WARNING: The measured air tightness of this home indicates that it may not provide sufficient ventilation air (for acceptable indoor quality) as defined by ASHRAE 62.2 2004, without adequate mechanical ventilation equipment. If whole house mechanical ventilation equipment has been installed, it is recommended that it be properly maintained and operated. If no whole house mechanical ventilation equipment has been installed, it is strongly recommended that the homeowner consider an investment in this improvement. (A test of the building's ventilation air rate would help determine the importance of a mechanical ventilation system in this home.)

Envelope Efficiency

Floor Insulation	R-37.5
Wall/Door Insulation	R-18.9
Ceiling Insulation	R-47.8
Window R-Value	R-2.47
Window to Wall Ratio, Living Space	8.3%
South Facing Window Area	45 square feet
Air Leakage	3.9 Air Changes per Hour at 50 Pascals 0.26 Air Changes per Hour Natural

Space Heating System

System Efficiency	84%
Fuel Type	#1 Oil
Supplemental Fuel	None
Thermostat Setting	70.0 degrees F
Setback Thermostat	Yes, Controls Entire Home

Water Heater
None Present

Space Cooling System None Present

Ventilation None

Other

Number of Occupants	8
Clothes Dryer Fuel	Electricity
Cooking Range Fuel	Electricity
Miscellaneous Lights/Appliance Use	Average

ESTIMATED ANNUAL ENERGY COST

Electricity = $0.2511/kWh, #1 Oil = $7.37/gallons

Space Heating	211 kWh of Electricity, 225 gallons of #1 Oil
Water Heating	
Space Cooling	
Lights and Appliances	6,232 kWh of Electricity

Actual use and costs may vary from these estimates depending upon weather conditions, occupant life styles and utility rates currently in effect.

ver. 2.2.0.3, library: 5/18/2012, file: Sea Lion Charlie Wilson.hm2

Energy Efficiency Improvement Options

Property: Sea Lion Corporation
Charlie and Linda Wilson house
Hooper Bay, AK 99604

House: Single Family
Living Floor Area: 1,003 sq.ft

Initial Rating: Five Star, 88.2 points
Additional Rating Points needed to reach higher Rating Levels:
3.8 more points needed to reach **5+ Stars**

Rater: Eric Whitney
Whitney Construction
PO Box 923
Bethel, AK 99559
907 545-1309
e_whitney@mac.com

ID: Sea Lion Charlie Wilson

Fuel Prices used in this Analysis: Electricity = $0.2511/kWh, #1 Oil = $7.37/gallons

The maximum Carbon Monoxide (CO) leakage of a combustion appliance should be less than 25 ppm at steady state conditions.

The following are possible energy-saving improvements for your home.
Notes: The Rating points you receive for each improvement depend upon the other measures you install. In the report below, the points indicated for each measure assume that you install all prior measures on the list. The Break-Even cost is the *most* you could pay for the improvement and still have it be cost-effective based on energy savings over the life of the measure.

Improvement Description / Location	Annual Savings[1]	Break-Even Cost[2]	Rating Points Gained[3]	Rating, after all Improvements thru this one[4]	Design Heat Loss, Btu/hr[5]
Add R-25 rigid foam to interior or exterior of existing wall; cost does not include siding or wall coverings. Location - Above-Grade Wall: House	$475	$11,120	3.7	91.9 points 5 Stars Increase: 3.7 pts, 0 steps	16,188
Install R-10 rigid board insulation Location - Exposed Floor: House	$102	$2,397	0.8	92.7 points 5+ Stars Increase: 4.5 pts, 1 step	15,601
Install R-21 loose-fill insulation in attic with Energy Truss. Location - Ceiling w/ Attic: House	$114	$2,676	0.9	93.6 points 5+ Stars Increase: 5.4 pts, 1 step	14,933
Replace existing window with U-0.22 vinyl window Location - Window/Skylight: South facing windows	$127	$2,196	1.0	94.6 points 5+ Stars Increase: 6.4 pts, 1 step	14,068
Replace existing window with U-0.22 vinyl window Location - Window/Skylight: Remaining windows	$102	$1,752	0.8	95.4 points 5+ Stars Increase: 7.2 pts, 1 step	13,379
Caulk and Seal so that Home Air Leakage is Reduced by 100 CFM at 50 Pascals.	$27	$251	0.2	95.6 points 5+ Stars Increase: 7.4 pts, 1 step	12,385
Install a Heat Recovery Ventilation system	$91	$1,256	0.9	96.5 points 5+ Stars Increase: 8.3 pts, 1 step	12,385

Improvement Description / Location	Annual Savings[1]	Break-Even Cost[2]	Rating Points Gained[3]	Rating, after all Improvements thru this one[4]	Design Heat Loss, Btu/hr[5]
Remove existing door and install standard pre-hung U-0.16 insulated door, including hardware. Location - Exterior Door: House	$12	$274	0.1	96.6 points 5+ Stars Increase: 8.4 pts, 1 step	12,305
Total, All Measures	**$1,050**	**$21,923**	**8.4**		

Annual CO2 Reduction after all improvements: 3,001 pounds per year

Notes:

1. *Annual Savings* is the potential savings in your home's energy cost per year.
2. *Break-Even Cost* is the most you could pay for this improvement and still have it be cost-effective based on energy savings over the life of the measure.
3. *Rating Points Gained* are the estimated rating points that would be added to your As-Is Rating score if the measure were installed. Actual points gained will only be determined by completing a post rating.
4. *Rating, after all Improvements thru this one:* This column shows the estimated energy rating that would result if all improvements prior to and including this one were done. As well as showing the estimated final rating, the column shows how much the rating will improve in terms of rating points and in terms of rating steps. For example, an increase from a 2 star rating to a 2 star plus rating is one step. The actual final rating will only be determined by completing a post rating.
5. *Design Heat Loss, Btu/hr:* This Design Heat Loss value shows the design heat loss in Btu/hour after this improvement and all before it are implemented. The Design Heat Loss is the amount of heat required to be delivered to the conditioned spaces during heating design conditions. If the heating system serves Domestic Hot Water loads in addition to space heating, you must increase this value to account for the domestic hot water load. When determining the size of the required heating system, you should also add capacity for distribution losses, pick-up requirements, and a safety margin. If you are determining the input rating of the heating system, you must also add capacity for the inefficiency of the furnace or boiler.

Herietta Naneng

Field Notes:
Constructed by: Naneng Brothers
Era: 1998
Similar Houses: unique
Heat sources: Toyotami in bedroom and living, woodstove in living
Ventilation: 2" passive vent in closet, RurAL Cap-style fan over stove
Indoor Temperature: 69°
Humidity: 66%
Occupants: Unknown
Weatherized: yes
Notes:

- They cover the windows with plastic in the winter
- Floor joists 24" OC
- William tried to skirt the building since the floor is cold but there is uneven freezing in the ground so it is too difficult
- The doorframe is very drafty and uncaulked or trimmed
- They wipe mold away from the windows each winter
- The house is privately owned. Henrietta was the station agent for many years and didn't qualify for assistance. Now she is retired and may qualify for more weatherization or for the rebate program
- The house is atypical in that it has drywall. Most of the other houses we see in Hooper Bay do not
- The is an interior vertical extension on the laser due to snow drift, but the intake is still below and is no longer sealed combustion. The entry air is passive
- Henrietta's preference is to apply to the rebate program, change the stove (they won't get credit for that since it's a secondary heating appliance), change the door and windows.
- Karl suggests that adding insulation to the attic and replacing windows would get close to applying for the rebate.

Ventilation fan installed above stove.

Henrietta Naneng House. Exterior view.

Existing arctic entry of home.

The windows are poorly caulked and drafty. The occupant covers them with plastic in the winters.

The windows are poorly caulked and drafty. The occupant covers them with plastic in the winters.

Alaska Housing FINANCE CORPORATION

HOME ENERGY RATING CERTIFICATE

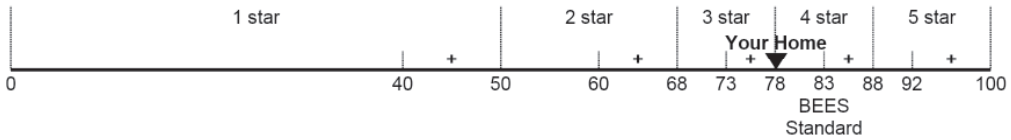
The Home Located At:
Henrietta Naneng
Hooper Bay, Alaska

Has Been Energy-Rated As:

★★★★

Four Star

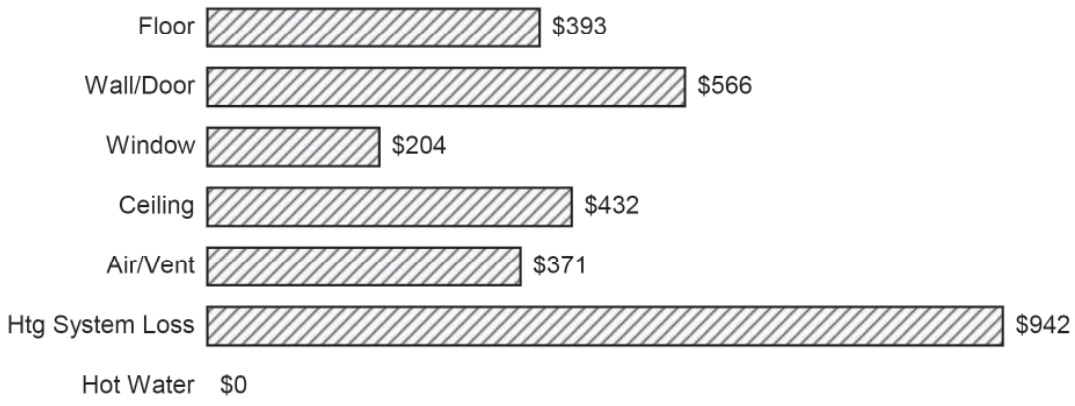
Overall Efficiency of Home
78.1 points



Projected Annual Energy Costs
$4,409 per year

Amount of CO2 Produced by the Home
17,604 pounds per year

BREAKDOWN OF HEATING COSTS, $ PER YEAR



Client: Sea Lion Corporation **Rater:** Eric Whitney, Whitney Construction **Date:** 7/16/2012

Rater's City: Bethel, AK 99559 **Contact:** 907 545-1309, e_whitney@mac.com
ver. 2.2.0.3, library: 5/18/2012, file: Sea Lion Henrietta Naneng.hm2, Rating Type: As-Is

I certify that this Rating is true and correct, to the best of my knowledge and belief: _____
Rater Signature

ENERGY COST AND FEATURES REPORT

Property: Sea Lion Corporation
Henrietta Naneng
Hooper Bay, Alaska

House: Single Family
Living Floor Area: 897 square feet
No Attached Garage

Rater: Eric Whitney
Whitney Construction
PO Box 923
Bethel, AK 99559

Rating: As-Is
ID: Sea Lion Henrietta Naneng

VENTILATION WARNING: The measured air tightness of this home indicates that it may not provide sufficient ventilation air (for acceptable indoor quality) as defined by ASHRAE 62.2 2004, without adequate mechanical ventilation equipment. If whole house mechanical ventilation equipment has been installed, it is recommended that it be properly maintained and operated. If no whole house mechanical ventilation equipment has been installed, it is strongly recommended that the homeowner consider an investment in this improvement. (A test of the building's ventilation air rate would help determine the importance of a mechanical ventilation system in this home.)

Envelope Efficiency

Floor Insulation	R-23.1
Wall/Door Insulation	R-15.4
Ceiling Insulation	R-21.1
Window R-Value	R-2.38
Window to Wall Ratio, Living Space	8.2%
South Facing Window Area	15 square feet
Air Leakage	3.6 Air Changes per Hour at 50 Pascals 0.24 Air Changes per Hour Natural

Space Heating System

System Efficiency	84%
Fuel Type	#1 Oil
Supplemental Fuel	Birch Wood
Thermostat Setting	70.0 degrees F
Setback Thermostat	None

Water Heater
None Present

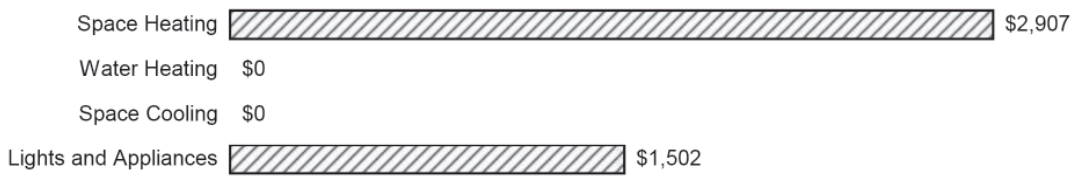
Space Cooling System None Present

Ventilation None

Other

Number of Occupants	4
Clothes Dryer Fuel	Electricity
Cooking Range Fuel	Electricity
Miscellaneous Lights/Appliance Use	Average

ESTIMATED ANNUAL ENERGY COST



Electricity = $0.2477/kWh, #1 Oil = $7.37/gallons, Birch Wood = $350/cords

Space Heating	275 kWh of Electricity, 293 gallons of #1 Oil, 1.94 cords of Birch Wood
Water Heating	
Space Cooling	
Lights and Appliances	6,063 kWh of Electricity

Actual use and costs may vary from these estimates depending upon weather conditions, occupant life styles and utility rates currently in effect.

ver. 2.2.0.3, library: 5/18/2012, file: Sea Lion Henrietta Naneng.hm2

Energy Efficiency Improvement Options

Property: Sea Lion Corporation
Henrietta Naneng
Hooper Bay, AK 99604

House: Single Family
Living Floor Area: 897 sq.ft

Initial Rating: Four Star, 78.1 points
Additional Rating Points needed to reach higher Rating Levels:
4.9 more points needed to reach **4+ Stars**
9.9 more points needed to reach **5 Stars**
13.9 more points needed to reach **5+ Stars**

Rater: Eric Whitney
Whitney Construction
PO Box 923
Bethel, AK 99559
907 545-1309
e_whitney@mac.com

ID: Sea Lion Henrietta Naneng

Fuel Prices used in this Analysis: Electricity = $0.2477/kWh, #1 Oil = $7.37/gallons, Birch Wood = $350/cords

The maximum Carbon Monoxide (CO) leakage of a combustion appliance should be less than 25 ppm at steady state conditions.

The following are possible energy-saving improvements for your home.
Notes: The Rating points you receive for each improvement depend upon the other measures you install. In the report below, the points indicated for each measure assume that you install all prior measures on the list. The Break-Even cost is the *most* you could pay for the improvement and still have it be cost-effective based on energy savings over the life of the measure.

Improvement Description / Location	Annual Savings[1]	Break-Even Cost[2]	Rating Points Gained[3]	Rating, after all Improvements thru this one[4]	Design Heat Loss, Btu/hr[5]
Add R-13 Dense-pack to partially filled 2x10 cavity. Location - Exposed Floor: House	$306	$6,899	2.6	80.7 points 4 Stars Increase: 2.6 pts, 0 steps	20,666
Install R-38 loose-fill insulation in attic with Standard Truss. Location - Ceiling w/ Attic: House	$502	$11,333	4.2	84.9 points 4+ Stars Increase: 6.8 pts, 1 step	18,217
Install a Mechanical Ventilation system without heat recovery	$56	$738	0.5	85.4 points 4+ Stars Increase: 7.3 pts, 1 step	18,217
Caulk and Seal so that Home Air Leakage is Reduced by 60 CFM at 50 Pascals.	$40	$365	0.4	85.8 points 4+ Stars Increase: 7.7 pts, 1 step	17,626
Install R-30 rigid foam board to exterior and cover with T1-11 siding or equivalent. Location - Above-Grade Wall: House	$710	$16,004	6.0	91.8 points 5 Stars Increase: 13.7 pts, 2 steps	13,871
Replace existing window with U-0.22 vinyl window Location - Window/Skylight: Windwows	$218	$3,646	1.8	93.6 points 5+ Stars Increase: 15.5 pts, 3 steps	12,603
Replace existing window with U-0.22 vinyl window Location - Window/Skylight: south facing	$45	$748	0.4	94.0 points 5+ Stars Increase:	12,315

Improvement Description / Location	Annual Savings[1]	Break-Even Cost[2]	Rating Points Gained[3]	Rating, after all Improvements thru this one[4]	Design Heat Loss, Btu/hr[5]
kithcen window				15.9 pts, 3 steps	
Remove existing door and install standard pre-hung U-0.16 insulated door, including hardware. Location - Exterior Door: House	$14	$319	0.1	94.1 points 5+ Stars Increase: 16.0 pts, 3 steps	12,235
Total, All Measures	**$1,890**	**$40,051**	**16.0**		

Annual CO2 Reduction after all improvements: 4,204 pounds per year

Notes:

1. *Annual Savings* is the potential savings in your home's energy cost per year.

2. *Break-Even Cost* is the most you could pay for this improvement and still have it be cost-effective based on energy savings over the life of the measure.

3. *Rating Points Gained* are the estimated rating points that would be added to your As-Is Rating score if the measure were installed. Actual points gained will only be determined by completing a post rating.

4. *Rating, after all Improvements thru this one:* This column shows the estimated energy rating that would result if all improvements prior to and including this one were done. As well as showing the estimated final rating, the column shows how much the rating will improve in terms of rating points and in terms of rating steps. For example, an increase from a 2 star rating to a 2 star plus rating is one step. The actual final rating will only be determined by completing a post rating.

5. *Design Heat Loss, Btu/hr:* This Design Heat Loss value shows the design heat loss in Btu/hour after this improvement and all before it are implemented. The Design Heat Loss is the amount of heat required to be delivered to the conditioned spaces during heating design conditions. If the heating system serves Domestic Hot Water loads in addition to space heating, you must increase this value to account for the domestic hot water load. When determining the size of the required heating system, you should also add capacity for distribution losses, pick-up requirements, and a safety margin. If you are determining the input rating of the heating system, you must also add capacity for the inefficiency of the furnace or boiler.

Paul Moses House

Field Notes:
Constructed by: State of Alaska
Era: Early 70's
Similar Houses: 8
Heat sources: woodstove and Toyotami Laser
Ventilation: 2 fresh 80's as part of retrofit (disabled) . One fan (RurAL CAP) (disabled)
Indoor Temperature: 69°
Humidity: 50%
Occupants: 9
Weatherized: RurAL CAP 5 years ago
Notes:

- Overcrowded
- Respiratory problems reported in children of the house
- This was one of the 1st houses built by the State of Alaska. Originally had a tin roof and no plywood. Ceiling put in later.
- Has woodstove backdrafting issues because the electric drier vents out
- Added Blown Cellulose to the ceiling in retrofit
- No Tyvek under foam
- Mold sample taken #2807097

Paul Moses House. Exterior view

Ventilation system from a prior weatherization attempt has been disabled.


Interior walls are cut short of floor and ceilings to allow heat to move from room to room.

Alaska Housing
FINANCE CORPORATION

HOME ENERGY RATING CERTIFICATE

The Home Located At:
Paul Moses
Hooper Bay, Alaska

Has Been Energy-Rated As:

★★+

Two Star Plus

Overall Efficiency of Home
64.4 points

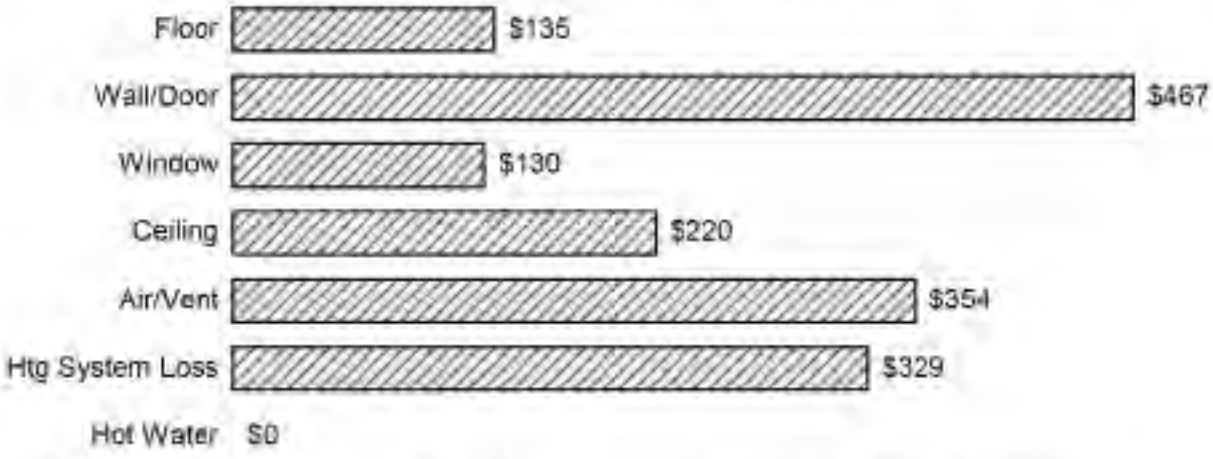
Projected Annual Energy Costs

$2,870 per year

Amount of CO2 Produced by the Home

14,255 pounds per year

BREAKDOWN OF HEATING COSTS, $ PER YEAR



Client: Sea Lion Corporation **Rater:** Eric Whitney, Whitney Construction **Date:** 7/16/2012

Rater's City: Bethel, AK 99559 **Contact:** 907 545-1309, e_whitney@mac.com

ver. 2.2.03, library: 5/18/2012, file: Sea Lion Paul Moses.am2, Rating Type: As-Is

ENERGY COST AND FEATURES REPORT

Property: Sea Lion Corporation
Paul Moses
Hooper Bay, Alaska

House: Single Family
Living Floor Area: 513 square feet
No Attached Garage

Rater: Eric Whitney
Whitney Construction
PO Box 923
Bethel, AK 99559

Rating: As-Is
ID: Sea Lion Paul Moses

Envelope Efficiency

Floor Insulation	R-33.5
Wall/Door Insulation	R-10.6
Ceiling Insulation	R-20.6
Window R-Value	R-2.38
Window to Wall Ratio, Living Space	9.1%
South Facing Window Area	20 square feet
Air Leakage	8.9 Air Changes per Hour at 50 Pascals 0.57 Air Changes per Hour Natural

Space Heating System

System Efficiency	84%
Fuel Type	#1 Oil
Supplemental Fuel	Birch Wood
Thermostat Setting	70.0 degrees F
Setback Thermostat	Yes, Controls Entire Home

Water Heater
None Present

Space Cooling System None Present

Ventilation None

Other

Number of Occupants	4
Clothes Dryer Fuel	Electricity
Cooking Range Fuel	Electricity
Miscellaneous Lights/Appliance Use	Average

ESTIMATED ANNUAL ENERGY COST

Space Heating		$1,635
Water Heating	$0	
Space Cooling	$0	
Lights and Appliances		$1,235

Electricity = $0.2266/kWh, #1 Oil = $7.37/gallons, Birch Wood = $350/cords

Space Heating	182 kWh of Electricity, 195 gallons of #1 Oil, 0.45 cords of Birch Wood
Water Heating	
Space Cooling	
Lights and Appliances	5,449 kWh of Electricity

Actual use and costs may vary from these estimates depending upon weather conditions, occupant life styles and utility rates currently in effect.

ver. 2.2.0.3, library: 5/18/2012, file: Sea Lion Paul Moses.hm2

Energy Efficiency Improvement Options

Property: Sea Lion Corporation
Paul Moses
Hooper Bay, AK 99604

House: Single Family
Living Floor Area: 513 sq.ft

Initial Rating: Two Star Plus, 64.4 points
Additional Rating Points needed to reach higher Rating Levels:
3.6 more points needed to reach **3 Stars** (a minimum 5 point increase is required to receive an AHFC rebate)
8.6 more points needed to reach **3+ Stars**
13.6 more points needed to reach **4 Stars**
18.6 more points needed to reach **4+ Stars**
23.6 more points needed to reach **5 Stars**
27.6 more points needed to reach **5+ Stars**

Rater: Eric Whitney
Whitney Construction
PO Box 923
Bethel, AK 99559
907 545-1309
e_whitney@mac.com

ID: Sea Lion Paul Moses

Fuel Prices used in this Analysis: Electricity = $0.2266/kWh, #1 Oil = $7.37/gallons, Birch Wood = $350/cords

The maximum Carbon Monoxide (CO) leakage of a combustion appliance should be less than 25 ppm at steady state conditions.

The following are possible energy-saving improvements for your home.
Notes: The Rating points you receive for each improvement depend upon the other measures you install. In the report below, the points indicated for each measure assume that you install all prior measures on the list. The Break-Even cost is the *most* you could pay for the improvement and still have it be cost-effective based on energy savings over the life of the measure.

Improvement Description / Location	Annual Savings[1]	Break-Even Cost[2]	Rating Points Gained[3]	Rating, after all Improvements thru this one[4]	Design Heat Loss, Btu/hr[5]
Caulk and Seal so that Home Air Leakage is Reduced by 100 CFM at 50 Pascals.	$127	$1,167	2.9	67.3 points 2+ Stars Increase: 2.9 pts, 0 steps	16,641
Install R-30 loose-fill insulation in attic with Standard Truss. Location - Ceiling w/ Attic: House	$209	$4,840	4.8	72.1 points 3 Stars Increase: 7.7 pts, 1 step	15,315
Install R-25 rigid foam board to exterior and cover with T1-11 siding or equivalent. Location - Above-Grade Wall: House	$547	$12,666	12.5	84.6 points 4+ Stars Increase: 20.2 pts, 4 steps	11,555
Install R-10 rigid board insulation Location - Exposed Floor: House	$53	$1,216	1.2	85.8 points 4+ Stars Increase: 21.4 pts, 4 steps	11,186
Replace existing window with U-0.22 vinyl window Location - Window/Skylight: Windwows	$100	$1,704	2.3	88.1 points 5 Stars Increase: 23.7 pts, 5 steps	10,429
Replace existing window with U-0.22 vinyl window Location - Window/Skylight: south facing kithcen window	$45	$768	1.1	89.2 points 5 Stars Increase: 24.8 pts, 5 steps	10,046
Remove existing door and install standard pre-hung U-0.16 insulated door, including	$10	$242	0.2	89.4 points 5 Stars	9,966

Improvement Description / Location	Annual Savings[1]	Break-Even Cost[2]	Rating Points Gained[3]	Rating, after all Improvements thru this one[4]	Design Heat Loss, Btu/hr[5]
hardware. Location - Exterior Door: House				Increase: 25.0 pts, 5 steps	
Install a Heat Recovery Ventilation system	$0	$0	0.0	89.4 points 5 Stars Increase: 25.0 pts, 5 steps	9,966
Total, All Measures	**$1,091**	**$22,602**	**25.0**		

Annual CO2 Reduction after all improvements: 2,920 pounds per year

Notes:

1. *Annual Savings* is the potential savings in your home's energy cost per year.
2. *Break-Even Cost* is the most you could pay for this improvement and still have it be cost-effective based on energy savings over the life of the measure.
3. *Rating Points Gained* are the estimated rating points that would be added to your As-Is Rating score if the measure were installed. Actual points gained will only be determined by completing a post rating.
4. *Rating, after all Improvements thru this one:* This column shows the estimated energy rating that would result if all improvements prior to and including this one were done. As well as showing the estimated final rating, the column shows how much the rating will improve in terms of rating points and in terms of rating steps. For example, an increase from a 2 star rating to a 2 star plus rating is one step. The actual final rating will only be determined by completing a post rating.
5. *Design Heat Loss, Btu/hr:* This Design Heat Loss value shows the design heat loss in Btu/hour after this improvement and all before it are implemented. The Design Heat Loss is the amount of heat required to be delivered to the conditioned spaces during heating design conditions. If the heating system serves Domestic Hot Water loads in addition to space heating, you must increase this value to account for the domestic hot water load. When determining the size of the required heating system, you should also add capacity for distribution losses, pick-up requirements, and a safety margin. If you are determining the input rating of the heating system, you must also add capacity for the inefficiency of the furnace or boiler.

Francis Naneng

Field notes:
Constructed by: Owner
Era: 1996
Similar Houses: Unique
Heat sources: woodstove and laser
Ventilation: Fresh 80's (closed off)
Indoor Temperature: 67°
Humidity: 67%
Occupants: 11
Weatherized: yes
Notes:

- Mold sample taken #2806908
- 2x4 studs 24" OC.
- 2 x 2" sheets of rigid foam under the floor
- Interior walls don't meet the ceiling, 2x2 partitions
- 9 children
- lazer set at 73°
- William is interested in the rebate program for Francis
- No eaves. Exterior insulation will call for eave extension.
- 2" of exterior foam added to the north side. Occupant intends to plant willows as a wind break.
- RurAL CAP did some work but it's not clear what
- Fiberglass 8" + 12" at different points in the home.

Ventilation system from a prior weatherization attempt has been disabled.

Interior walls are cut short of floor and ceilings to allow heat to move from room to room.

Exterior walls exhibit mold and rot at floor connection.

Alaska Housing
FINANCE CORPORATION

HOME ENERGY RATING CERTIFICATE

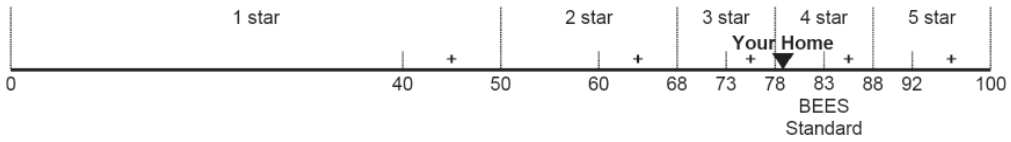
The Home Located At:
Francis Naneng
Hooper Bay, Alaska

Has Been Energy-Rated As:

★★★★

Four Star

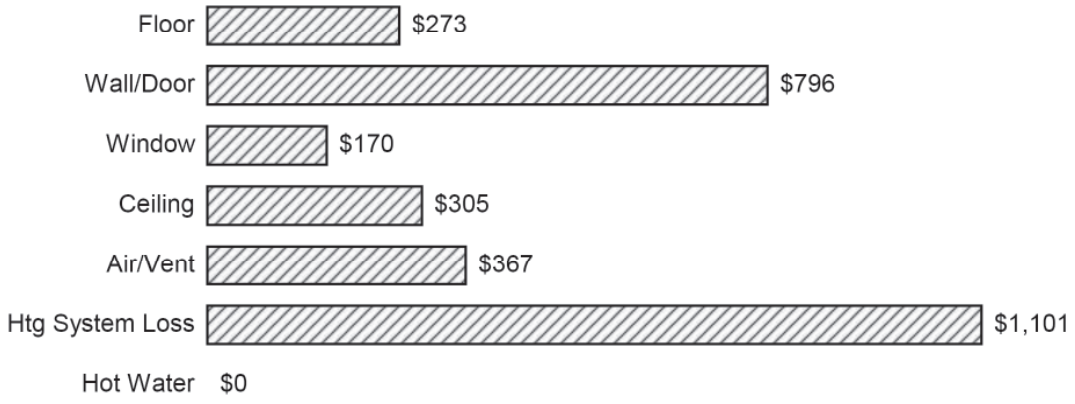
Overall Efficiency of Home
78.8 points



Projected Annual Energy Costs
$4,508 per year

Amount of CO2 Produced by the Home
17,206 pounds per year

BREAKDOWN OF HEATING COSTS, $ PER YEAR



Client: Sea Lion Corporation **Rater:** Eric Whitney, Whitney Construction **Date:** 7/16/2012

Rater's City: Bethel, AK 99559 **Contact:** 907 545-1309, e_whitney@mac.com
ver. 2.2.0.3, library: 5/18/2012, file: Sea Lion Francis Naneng.hm2, Rating Type: As-Is

I certify that this Rating is true and correct, to the best of my knowledge and belief: _____
Rater Signature

ENERGY COST AND FEATURES REPORT

Property: Sea Lion Corporation
Francis Naneng
Hooper Bay, Alaska

House: Single Family
Living Floor Area: 894 square feet
No Attached Garage

Rater: Eric Whitney
Whitney Construction
PO Box 923
Bethel, AK 99559

Rating: As-Is
ID: Sea Lion Francis Naneng

VENTILATION WARNING: The measured air tightness of this home indicates that it may not provide sufficient ventilation air (for acceptable indoor quality) as defined by ASHRAE 62.2 2004, without adequate mechanical ventilation equipment. If whole house mechanical ventilation equipment has been installed, it is recommended that it be properly maintained and operated. If no whole house mechanical ventilation equipment has been installed, it is strongly recommended that the homeowner consider an investment in this improvement. (A test of the building's ventilation air rate would help determine the importance of a mechanical ventilation system in this home.)

Envelope Efficiency

Floor Insulation	R-31.9
Wall/Door Insulation	R-10.8
Ceiling Insulation	R-28.5
Window R-Value	R-2.38
Window to Wall Ratio, Living Space	6.6%
South Facing Window Area	0 square feet
Air Leakage	3.8 Air Changes per Hour at 50 Pascals 0.25 Air Changes per Hour Natural

Space Heating System

System Efficiency	84%
Fuel Type	#1 Oil
Supplemental Fuel	Birch Wood
Thermostat Setting	70.0 degrees F
Setback Thermostat	Yes, Controls Entire Home

Water Heater
None Present

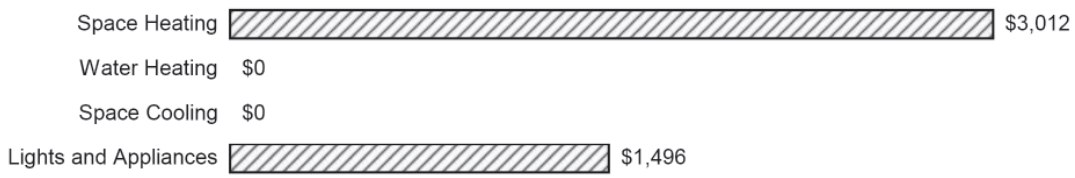
Space Cooling System None Present

Ventilation None

Other

Number of Occupants	5
Clothes Dryer Fuel	Electricity
Cooking Range Fuel	Electricity
Miscellaneous Lights/Appliance Use	Average

ESTIMATED ANNUAL ENERGY COST



Electricity = $0.2469/kWh, #1 Oil = $7.37/gallons, Birch Wood = $500/cords

Space Heating	259 kWh of Electricity, 276 gallons of #1 Oil, 1.82 cords of Birch Wood
Water Heating	
Space Cooling	
Lights and Appliances	6,058 kWh of Electricity

Actual use and costs may vary from these estimates depending upon weather conditions, occupant life styles and utility rates currently in effect.

ver. 2.2.0.3, library: 5/18/2012, file: Sea Lion Francis Naneng.hm2

Energy Efficiency Improvement Options

Property: Sea Lion Corporation
Francis Naneng
Hooper Bay, AK 99604

House: Single Family
Living Floor Area: 894 sq.ft

Initial Rating: Four Star, 78.8 points
Additional Rating Points needed to reach higher Rating Levels:
4.2 more points needed to reach **4+ Stars**
9.2 more points needed to reach **5 Stars**
13.2 more points needed to reach **5+ Stars**

Rater: Eric Whitney
Whitney Construction
PO Box 923
Bethel, AK 99559
907 545-1309
e_whitney@mac.com

ID: Sea Lion Francis Naneng

Fuel Prices used in this Analysis: Electricity = $0.2469/kWh, #1 Oil = $7.37/gallons, Birch Wood = $500/cords

The maximum Carbon Monoxide (CO) leakage of a combustion appliance should be less than 25 ppm at steady state conditions.

The following are possible energy-saving improvements for your home.
Notes: The Rating points you receive for each improvement depend upon the other measures you install. In the report below, the points indicated for each measure assume that you install all prior measures on the list. The Break-Even cost is the *most* you could pay for the improvement and still have it be cost-effective based on energy savings over the life of the measure.

Improvement Description / Location	Annual Savings[1]	Break-Even Cost[2]	Rating Points Gained[3]	Rating, after all Improvements thru this one[4]	Design Heat Loss, Btu/hr[5]
Remove existing door and install standard pre-hung U-0.16 insulated door, including hardware. Location - Exterior Door: House	$89	$1,988	0.6	79.4 points 4 Stars Increase: 0.6 pts, 0 steps	21,992
Install R-30 loose-fill insulation in attic with Standard Truss. Location - Ceiling w/ Attic: House	$306	$6,814	2.4	81.8 points 4 Stars Increase: 3.0 pts, 0 steps	20,582
Install R-30 rigid foam board to exterior and cover with T1-11 siding or equivalent. Location - Above-Grade Wall: House	$1,152	$25,676	9.0	90.8 points 5 Stars Increase: 12.0 pts, 2 steps	14,835
Install R-14 rigid board insulation Location - Exposed Floor: House	$157	$3,491	1.2	92.0 points 5+ Stars Increase: 13.2 pts, 3 steps	14,049
Install R-14 rigid board insulation Location - Exposed Floor: Addition	$27	$598	0.2	92.2 points 5+ Stars Increase: 13.4 pts, 3 steps	13,913
Replace existing window with U-0.22 vinyl window Location - Window/Skylight: Windwows	$226	$3,736	1.8	94.0 points 5+ Stars Increase: 15.2 pts, 3 steps	12,635
Install R-20 rigid foam board to exterior and cover with T1-11 siding or equivalent. Location - Above-Grade Wall: Wall with pink	$38	$846	0.3	94.3 points 5+ Stars Increase:	12,429

Improvement Description / Location	Annual Savings[1]	Break-Even Cost[2]	Rating Points Gained[3]	Rating, after all Improvements thru this one[4]	Design Heat Loss, Btu/hr[5]
foam				15.5 pts, 3 steps	
Install a Mechanical Ventilation system without heat recovery	$25	$329	0.2	94.5 points 5+ Stars Increase: 15.7 pts, 3 steps	12,429
Caulk and Seal so that Home Air Leakage is Reduced by 100 CFM at 50 Pascals.	$78	$706	0.7	95.2 points 5+ Stars Increase: 16.4 pts, 3 steps	11,435
Total, All Measures	**$2,096**	**$44,184**	**16.4**		

Annual CO2 Reduction after all improvements: 4,240 pounds per year

Notes:

1. *Annual Savings* is the potential savings in your home's energy cost per year.
2. *Break-Even Cost* is the most you could pay for this improvement and still have it be cost-effective based on energy savings over the life of the measure.
3. *Rating Points Gained* are the estimated rating points that would be added to your As-Is Rating score if the measure were installed. Actual points gained will only be determined by completing a post rating.
4. *Rating, after all Improvements thru this one:* This column shows the estimated energy rating that would result if all improvements prior to and including this one were done. As well as showing the estimated final rating, the column shows how much the rating will improve in terms of rating points and in terms of rating steps. For example, an increase from a 2 star rating to a 2 star plus rating is one step. The actual final rating will only be determined by completing a post rating.
5. *Design Heat Loss, Btu/hr:* This Design Heat Loss value shows the design heat loss in Btu/hour after this improvement and all before it are implemented. The Design Heat Loss is the amount of heat required to be delivered to the conditioned spaces during heating design conditions. If the heating system serves Domestic Hot Water loads in addition to space heating, you must increase this value to account for the domestic hot water load. When determining the size of the required heating system, you should also add capacity for distribution losses, pick-up requirements, and a safety margin. If you are determining the input rating of the heating system, you must also add capacity for the inefficiency of the furnace or boiler.

Patrick Hale

Wednesday, July 18, 2012
12:08 PM

Patric Hale

Field notes:
Constructed by: Owner-built
Era: 90's
Similar Houses: unique
Heat sources: two Toyotami Lasers
Ventilation: 2 fresh 80's and a RurAL CAP fan
Indoor Temperature: 67°
Humidity: 54%
Occupants: unknown
Weatherized: unknown
Notes:

- When they did the blower door the vinyl came up
- Used to have a woodstove but they took it out
- No bedroom doors (curtains)
- 2x6 wall
-

Patrick Hale House. Exterior view.

Patrick Hale House. Exterior view.

Patrick Hale House. Exterior view.

Alaska Housing
FINANCE CORPORATION

HOME ENERGY RATING CERTIFICATE

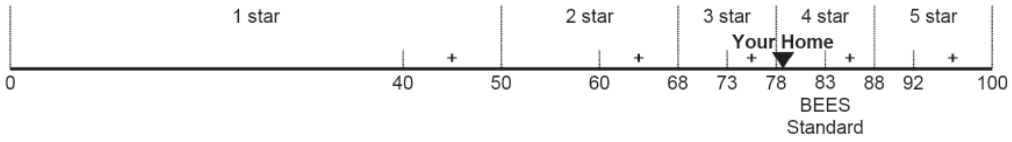
The Home Located At:
Patrick Hale House
Hooper Bay, Alaska

Has Been Energy-Rated As:

★★★★

Four Star

Overall Efficiency of Home
78.7 points



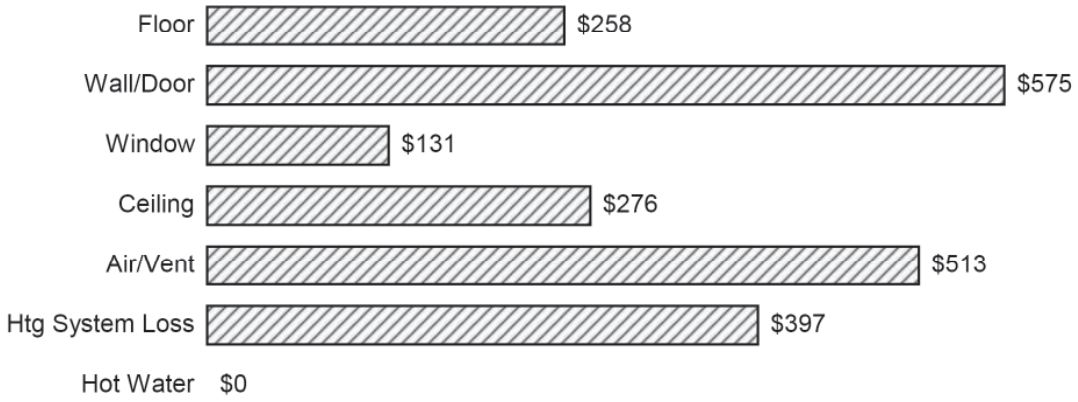
Projected Annual Energy Costs

$3,528 per year

Amount of CO2 Produced by the Home

16,842 pounds per year

BREAKDOWN OF HEATING COSTS, $ PER YEAR



Client: Sea Lion Corporation **Rater:** Eric Whitney, Whitney Construction **Date:** 7/16/2012

Rater's City: Bethel, AK 99559 **Contact:** 907 545-1309, e_whitney@mac.com
ver. 2.2.0.3, library: 5/18/2012, file: Sea Lion Patrick Hale.hm2, Rating Type: As-Is

I certify that this Rating is true and correct, to the best of my knowledge and belief: _____

Rater Signature

ENERGY COST AND FEATURES REPORT

Property: Sea Lion Corporation
Patrick Hale House
Hooper Bay, Alaska

House: Single Family
Living Floor Area: 713 square feet
No Attached Garage

Rater: Eric Whitney
Whitney Construction
PO Box 923
Bethel, AK 99559

Rating: As-Is
ID: Sea Lion Patrick Hale House

VENTILATION WARNING: The measured air tightness of this home indicates that it may not provide sufficient ventilation air (for acceptable indoor quality) as defined by ASHRAE 62.2 2004, without adequate mechanical ventilation equipment. If whole house mechanical ventilation equipment has been installed, it is recommended that it be properly maintained and operated. If no whole house mechanical ventilation equipment has been installed, it is strongly recommended that the homeowner consider an investment in this improvement. (A test of the building's ventilation air rate would help determine the importance of a mechanical ventilation system in this home.)

Envelope Efficiency

Floor Insulation	R-30.6
Wall/Door Insulation	R-14.4
Ceiling Insulation	R-28.5
Window R-Value	R-2.38
Window to Wall Ratio, Living Space	6.1%
South Facing Window Area	15 square feet
Air Leakage	6.4 Air Changes per Hour at 50 Pascals 0.42 Air Changes per Hour Natural

Space Heating System

System Efficiency	84%
Fuel Type	#1 Oil
Supplemental Fuel	None
Thermostat Setting	70.0 degrees F
Setback Thermostat	Yes, Controls Entire Home

Water Heater
None Present

Space Cooling System None Present

Ventilation None

Other

Number of Occupants	4
Clothes Dryer Fuel	Electricity
Cooking Range Fuel	Electricity
Miscellaneous Lights/Appliance Use	Average

ESTIMATED ANNUAL ENERGY COST

Space Heating		$2,150
Water Heating		$0
Space Cooling		$0
Lights and Appliances		$1,378

Electricity = $0.2389/kWh, #1 Oil = $7.37/gallons

Space Heating	265 kWh of Electricity, 283 gallons of #1 Oil
Water Heating	
Space Cooling	
Lights and Appliances	5,769 kWh of Electricity

Actual use and costs may vary from these estimates depending upon weather conditions, occupant life styles and utility rates currently in effect.

ver. 2.2.0.3, library: 5/18/2012, file: Sea Lion Patrick Hale.hm2

Energy Efficiency Improvement Options

Property: Sea Lion Corporation
Patrick Hale House
Hooper Bay, AK 99604

House: Single Family
Living Floor Area: 713 sq.ft

Initial Rating: Four Star, 78.7 points
Additional Rating Points needed to reach higher Rating Levels:
4.3 more points needed to reach **4+ Stars**
9.3 more points needed to reach **5 Stars**
13.3 more points needed to reach **5+ Stars**

Rater: Eric Whitney
Whitney Construction
PO Box 923
Bethel, AK 99559
907 545-1309
e_whitney@mac.com

ID: Sea Lion Patrick Hale House

Fuel Prices used in this Analysis: Electricity = $0.2389/kWh, #1 Oil = $7.37/gallons

The maximum Carbon Monoxide (CO) leakage of a combustion appliance should be less than 25 ppm at steady state conditions.

The following are possible energy-saving improvements for your home.
Notes: The Rating points you receive for each improvement depend upon the other measures you install. In the report below, the points indicated for each measure assume that you install all prior measures on the list. The Break-Even cost is the *most* you could pay for the improvement and still have it be cost-effective based on energy savings over the life of the measure.

Improvement Description / Location	Annual Savings[1]	Break-Even Cost[2]	Rating Points Gained[3]	Rating, after all Improvements thru this one[4]	Design Heat Loss, Btu/hr[5]
Caulk and Seal so that Home Air Leakage is Reduced by 100 CFM at 50 Pascals.	$163	$1,503	1.7	80.4 points 4 Stars Increase: 1.7 pts, 0 steps	17,940
Remove existing door and install standard pre-hung U-0.16 insulated door, including hardware. Location - Exterior Door: House	$77	$1,800	0.9	81.3 points 4 Stars Increase: 2.6 pts, 0 steps	17,531
Install R-30 loose-fill insulation in attic with Standard Truss. Location - Ceiling w/ Attic: House	$219	$5,122	2.4	83.7 points 4+ Stars Increase: 5.0 pts, 1 step	16,406
Install R-14 rigid board insulation Location - Exposed Floor: House	$151	$3,538	1.6	85.3 points 4+ Stars Increase: 6.6 pts, 1 step	15,620
Install R-25 rigid foam board to exterior and cover with T1-11 siding or equivalent. Location - Above-Grade Wall: House	$547	$12,823	6.0	91.3 points 5 Stars Increase: 12.6 pts, 2 steps	12,554
Replace existing window with U-0.22 vinyl window Location - Window/Skylight: Windwows	$116	$1,997	1.3	92.6 points 5+ Stars Increase: 13.9 pts, 3 steps	11,843
Replace existing window with U-0.22 vinyl window Location - Window/Skylight: House	$40	$693	0.4	93.0 points 5+ Stars Increase: 14.3 pts, 3 steps	11,555

Improvement Description / Location	Annual Savings[1]	Break-Even Cost[2]	Rating Points Gained[3]	Rating, after all Improvements thru this one[4]	Design Heat Loss, Btu/hr[5]
Install a Heat Recovery Ventilation system	$0	$0	0.0	93.0 points 5+ Stars Increase: 14.3 pts, 3 steps	11,555
Total, All Measures	**$1,312**	**$27,475**	**14.3**		

Annual CO2 Reduction after all improvements: 3,812 pounds per year

Notes:

1. *Annual Savings* is the potential savings in your home's energy cost per year.

2. *Break-Even Cost* is the most you could pay for this improvement and still have it be cost-effective based on energy savings over the life of the measure.

3. *Rating Points Gained* are the estimated rating points that would be added to your As-Is Rating score if the measure were installed. Actual points gained will only be determined by completing a post rating.

4. *Rating, after all Improvements thru this one:* This column shows the estimated energy rating that would result if all improvements prior to and including this one were done. As well as showing the estimated final rating, the column shows how much the rating will improve in terms of rating points and in terms of rating steps. For example, an increase from a 2 star rating to a 2 star plus rating is one step. The actual final rating will only be determined by completing a post rating.

5. *Design Heat Loss, Btu/hr:* This Design Heat Loss value shows the design heat loss in Btu/hour after this improvement and all before it are implemented. The Design Heat Loss is the amount of heat required to be delivered to the conditioned spaces during heating design conditions. If the heating system serves Domestic Hot Water loads in addition to space heating, you must increase this value to account for the domestic hot water load. When determining the size of the required heating system, you should also add capacity for distribution losses, pick-up requirements, and a safety margin. If you are determining the input rating of the heating system, you must also add capacity for the inefficiency of the furnace or boiler.

Moses Night House

Field notes
Constructed by: AVCP
Era: 90's
Similar Houses: 26
Heat sources: Toyotami Laser and woodstove
Ventilation: HRV (disabled) also Fresh 80's (disabled)
Indoor Temperature: 75°
Humidity: 55%
Occupants: 7
Weatherized: yes, by AVCP 5 years ago
Notes:

- Before the retrofit they would close off half the house in the winter and move everything into the living room
- Weatherized by AVCP in 2010 and foundations also updated
- Moses says it's a little better after the retrofit
- They covered plywood underneath the homes
- Put foam on the outside. Pink XPS. Likely 1" of it
- Probably 2x8 walls. Hard to see
- Uses 120 gallons/month
- Did not change out the windows; they're original
- They have Fresh 80's but the residents cover them
- The infrared camera shows the windows are leaky
- Originally they had OSB or T-111 exteriors. The retrofit put the foam over the original sheathing and then vinyl siding over that
- Andy Abraham says RurAL CAP has been doing full-house wraps with 2" added insulation or less
- They also have a Burnham boiler and baseboard but it has a CO leak so he's been told not to use it.
- They're on the rent-to-but program
- Drifts come in through the windows
- Closed combustion under stove

Moses Night House. Exterior view.

Moses Night House. Windows exhibit air leakage and condensation.

Moses Night House. Windows exhibit air leakage and condensation.

Moses Night House. Occupant has disabled ventilation system but moves warm air through house with fans.

Moses Night House. Exterior rigid insulation was applied during a prior retrofit.

Alaska Housing
FINANCE CORPORATION

HOME ENERGY RATING CERTIFICATE

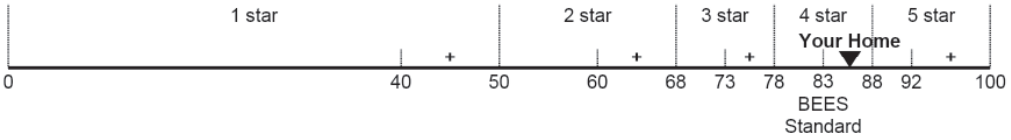
The Home Located At:
Moses Night House
Hooper Bay, Alaska

Has Been Energy-Rated As:

★★★★ +

Four Star Plus

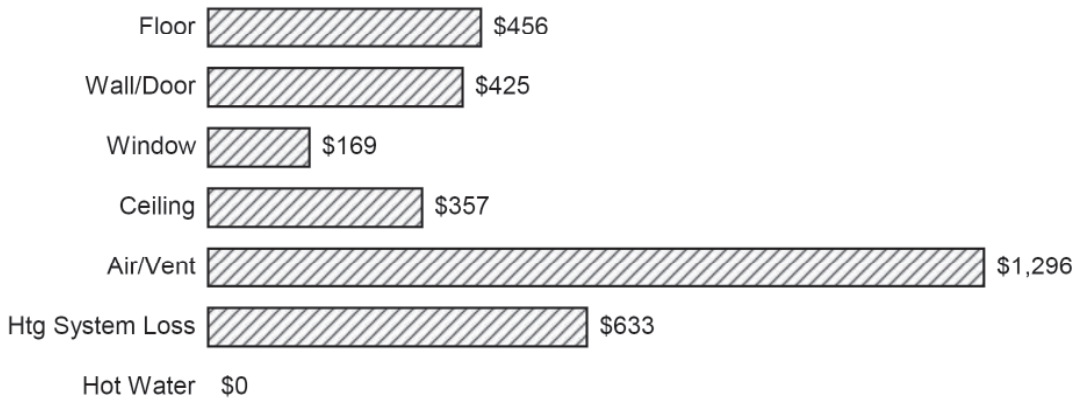
Overall Efficiency of Home
85.7 points



Projected Annual Energy Costs
$5,335 per year

Amount of CO2 Produced by the Home
22,408 pounds per year

BREAKDOWN OF HEATING COSTS, $ PER YEAR



Client: Sea Lion Corporation **Rater:** Eric Whitney, Whitney Construction **Date:** 7/16/2012

Rater's City: Bethel, AK 99559 **Contact:** 907 545-1309, e_whitney@mac.com
ver. 2.2.0.3, library: 5/18/2012, file: Sea Lion Moses Night House.hm2, Rating Type: As-Is

I certify that this Rating is true and correct, to the best of my knowledge and belief: _____

Rater Signature

ENERGY COST AND FEATURES REPORT

Property: Sea Lion Corporation
Moses Night House
Hooper Bay, Alaska

House: Single Family
Living Floor Area: 1,431 square feet
No Attached Garage

Rater: Eric Whitney
Whitney Construction
PO Box 923
Bethel, AK 99559

Rating: As-Is
ID: Sea Lion Moses Night House

VENTILATION WARNING: The measured air tightness of this home indicates that it may not provide sufficient ventilation air (for acceptable indoor quality) as defined by ASHRAE 62.2 2004, without adequate mechanical ventilation equipment. If whole house mechanical ventilation equipment has been installed, it is recommended that it be properly maintained and operated. If no whole house mechanical ventilation equipment has been installed, it is strongly recommended that the homeowner consider an investment in this improvement. (A test of the building's ventilation air rate would help determine the importance of a mechanical ventilation system in this home.)

Envelope Efficiency

Floor Insulation	R-37.5
Wall/Door Insulation	R-31.4
Ceiling Insulation	R-47.8
Window R-Value	R-2.94
Window to Wall Ratio, Living Space	7.4%
South Facing Window Area	43 square feet
Air Leakage	7.4 Air Changes per Hour at 50 Pascals 0.49 Air Changes per Hour Natural

Space Heating System

System Efficiency	84%
Fuel Type	#1 Oil
Supplemental Fuel	None
Thermostat Setting	70.0 degrees F
Setback Thermostat	Yes, Controls Entire Home

Water Heater
None Present

Space Cooling System None Present

Ventilation Heat Recovery Ventilator

Other

Number of Occupants	5
Clothes Dryer Fuel	Electricity
Cooking Range Fuel	Electricity
Miscellaneous Lights/Appliance Use	Average

ESTIMATED ANNUAL ENERGY COST

Electricity = $0.289/kWh, #1 Oil = $7.37/gallons

Space Heating	409 kWh of Electricity, 437 gallons of #1 Oil
Water Heating	
Space Cooling	
Lights and Appliances	6,918 kWh of Electricity

Actual use and costs may vary from these estimates depending upon weather conditions, occupant life styles and utility rates currently in effect.

ver. 2.2.0.3, library: 5/18/2012, file: Sea Lion Moses Night House.hm2

Energy Efficiency Improvement Options

Property: Sea Lion Corporation
Moses Night House
Hooper Bay, AK 99604

House: Single Family
Living Floor Area: 1,431 sq.ft

Initial Rating: Four Star Plus, 85.7 points
Additional Rating Points needed to reach higher Rating Levels:
2.3 more points needed to reach **5 Stars** (a minimum 3 point increase is required to receive an AHFC rebate)
6.3 more points needed to reach **5+ Stars**

Rater: Eric Whitney
Whitney Construction
PO Box 923
Bethel, AK 99559
907 545-1309
e_whitney@mac.com

ID: Sea Lion Moses Night House

Fuel Prices used in this Analysis: Electricity = $0.289/kWh, #1 Oil = $7.37/gallons

The maximum Carbon Monoxide (CO) leakage of a combustion appliance should be less than 25 ppm at steady state conditions.

The following are possible energy-saving improvements for your home.
Notes: The Rating points you receive for each improvement depend upon the other measures you install. In the report below, the points indicated for each measure assume that you install all prior measures on the list. The Break-Even cost is the *most* you could pay for the improvement and still have it be cost-effective based on energy savings over the life of the measure.

Improvement Description / Location	Annual Savings[1]	Break-Even Cost[2]	Rating Points Gained[3]	Rating, after all Improvements thru this one[4]	Design Heat Loss, Btu/hr[5]
Caulk and Seal so that Home Air Leakage is Reduced by 100 CFM at 50 Pascals.	$166	$1,532	0.9	86.6 points 4+ Stars Increase: 0.9 pts, 0 steps	29,594
Install R-14 rigid board insulation Location - Exposed Floor: House	$224	$5,241	1.1	87.7 points 4+ Stars Increase: 2.0 pts, 0 steps	28,478
Install R-19 loose-fill insulation in attic with Standard Truss. Location - Ceiling w/ Attic: House	$147	$3,431	0.8	88.5 points 5 Stars Increase: 2.8 pts, 1 step	27,739
Replace existing window with U-0.22 vinyl window Location - Window/Skylight: Windwows	$115	$1,973	0.5	89.0 points 5 Stars Increase: 3.3 pts, 1 step	27,128
Add R-10 rigid foam to interior or exterior of existing wall; cost does not include siding or wall coverings. Location - Above-Grade Wall: House	$157	$3,678	0.8	89.8 points 5 Stars Increase: 4.1 pts, 1 step	26,290
Replace existing window with U-0.22 vinyl window Location - Window/Skylight: House	$84	$1,455	0.5	90.3 points 5 Stars Increase: 4.6 pts, 1 step	25,795
Remove existing door and install standard pre-hung U-0.16 insulated door, including hardware. Location - Exterior Door: House	$11	$260	0.0	90.3 points 5 Stars Increase: 4.6 pts, 1 step	25,735

Improvement Description / Location	Annual Savings[1]	Break-Even Cost[2]	Rating Points Gained[3]	Rating, after all Improvements thru this one[4]	Design Heat Loss, Btu/hr[5]
Total, All Measures	**$903**	**$17,569**	**4.6**		

Annual CO2 Reduction after all improvements: 2,606 pounds per year

Notes:

1. *Annual Savings* is the potential savings in your home's energy cost per year.
2. *Break-Even Cost* is the most you could pay for this improvement and still have it be cost-effective based on energy savings over the life of the measure.
3. *Rating Points Gained* are the estimated rating points that would be added to your As-Is Rating score if the measure were installed. Actual points gained will only be determined by completing a post rating.
4. *Rating, after all Improvements thru this one:* This column shows the estimated energy rating that would result if all improvements prior to and including this one were done. As well as showing the estimated final rating, the column shows how much the rating will improve in terms of rating points and in terms of rating steps. For example, an increase from a 2 star rating to a 2 star plus rating is one step. The actual final rating will only be determined by completing a post rating.
5. *Design Heat Loss, Btu/hr:* This Design Heat Loss value shows the design heat loss in Btu/hour after this improvement and all before it are implemented. The Design Heat Loss is the amount of heat required to be delivered to the conditioned spaces during heating design conditions. If the heating system serves Domestic Hot Water loads in addition to space heating, you must increase this value to account for the domestic hot water load. When determining the size of the required heating system, you should also add capacity for distribution losses, pick-up requirements, and a safety margin. If you are determining the input rating of the heating system, you must also add capacity for the inefficiency of the furnace or boiler.

Glen Joe Sr. (not rated in original visit)

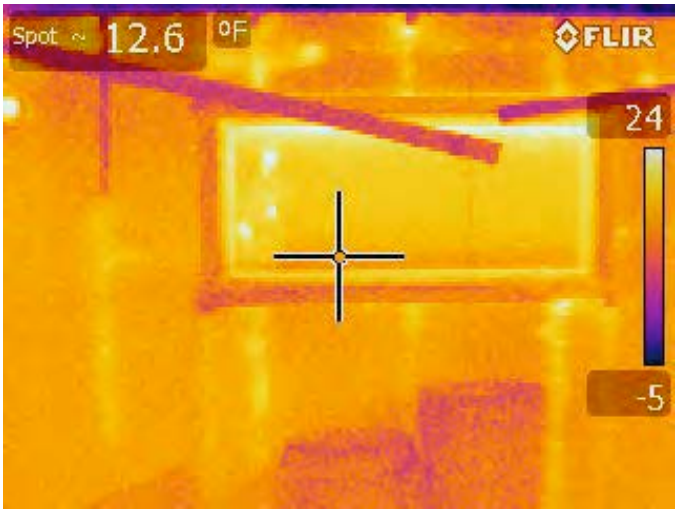
Field notes
Constructed by: Owner-built
Era: 80's
Similar Houses: unique
Heat sources: 2 Toyotami Lasers and a woodstove
Ventilation: fresh 80's and a RurAL CAP fan (activated sometimes)
Indoor Temperature: 71°
Humidity: 26%
Occupants: 13
Weatherized:
Notes:

- Mold sample taken #2810012
- 4" fiberglass in the attic
- No seal on hatch from the inside
- 2x6 +1/2" rigid insulation
- Residents have experienced frequent respiratory problems
- They got a new roof and a RurAL CAP fan (activated)
- They have fresh air inlets
- 13 people live here
- Occupants use a passive fan on top of the woodstove that moves air
- Occupant has applied for aid but he was employed and not eligible
- Of the 13 only his wife works now
- They use the whole house all year
- They use about a drum of fuel a month
- The house shifts seasonally, but moisture is the primary concern of the residents
- RurAL CAP supplied the family with a humidity monitor that beeps at them when humidity is high, and they turn the fan on. This seems to be effective in balancing ventilation with heating costs.
- Glenn put Ice&Water Shield on the roof because he was worried about leaking but it was definitely condensation that caused it
-

The attic hatch has no seal and is not insulated above the hatch.

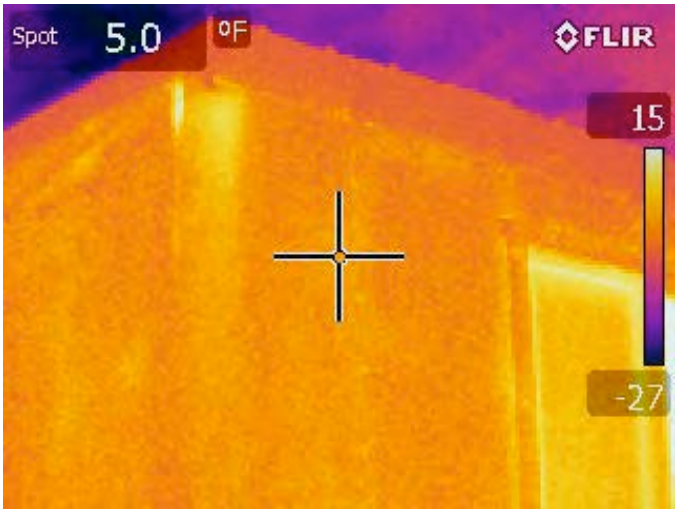
A passive fan atop the woodstove moves heat laterally into the living area.

Glen Joe Sr. Home. Exterior view.



Glen Joe Sr. Home. Exterior view. Thermal imaging shows heat leakage both at windows and along studs.

Glen Joe Sr. Home. Exterior view.



Glen Joe Sr. Home. Exterior view. Corner cold spot due to poor air sealing and/or slumping insulation.

Indoor Air Quality

Background

In 2010 Sea Lion Corporation completed a door-to-door survey of residents to discuss housing issues related to economy, heating, durability and health. 140 households responded to the survey. Interestingly, although 77% reported having adequate ventilation in their home, a much larger than average amount of respondents (27) reported that they had a severe health problem or disability, asthma and pneumonia being the most common ailments (See Appendix I). Prior retrofits have attempted to address this concern, including efforts by AVCP RHA and RurAL CAP. Both organizations have implemented strategies aimed to increase ventilation and improve indoor air quality in homes in Hooper Bay. AVCP RHA has included Heat Recovery Ventilation systems in many of their newer homes. These systems allow incoming fresh air to be warmed by outgoing stale air without mixing the two streams, saving energy and improving indoor air quality. RurAL CAP has implemented exhaust fans and passive inlet 'Fresh 80' systems, that allow for air exchange with minimal capital investment. Both of these strategies are considered viable and common solutions to problems associated with indoor air quality.

During the energy audits and follow-up inspections by in the current study, it was found that though many houses did indeed have ventilation systems, a great many were disabled by the occupant. Residents displayed a wide spectrum of attitudes and education regarding the relationship between healthy indoor air quality and ventilation. Some residents opened ventilation systems in the summer but closed them in the winter. Others disabled their ventilation systems because of the high cost of fuel and heating concerns. Still other residents lived in homes without proper ventilation and invented their own systems for providing fresh air without losing valuable heat.

Sea Lion Corporation deemed respiratory health problems resulting from poor indoor air quality to be of great concern for the community. Student absences from school, medivacs to regional hospitals, and days missed from work all affect members of the community. Sea Lion Corporation requested that Solutions for Healthy Breathing take air samples in many of the representative homes visited. What follows are the narrative of that process and the results of those samples.

Indoor air quality concerns are compounded by snowdrifting, which can bury homes entirely and seal up natural ventilaion paths and trap exhaust from heating appliances. The picture at left is the view from the front door of a home in Hooper Bay. The entrance has been dug out of a snow drift and the roof of the neighboring house is visible from the entry.

P.O. 10918 Fairbanks Alaska 99710
907-457-4568 subsistencepro@aol.com

Client Information Sea Lion Corp.
Address Hooper Bay AK. 99559
Phone 907-758-4415

Solutions for Healthy Breathing was requested to participate in an analysis of nine residential homes in Hooper Bay. This analysis was done by Cold Climate Housing Research Center of Fairbanks and Solutions for Healthy Breathing was contracted to help by assessing the indoor air quality of the homes.

These nine homes had been selected as representative of several types of housing construction, and AHFC energy ratings had been done on them prior to our arrival.

William Naneg of Sea Lion Corporation met with us on our arrival and presented us with some of his goals and expectations. Energy costs in Hooper bay are very high and one of his goals was a targeted 30% reduction in heating costs for these sample homes. Another goal was the training of local residents to do energy assessments and retrofits to help with the cost of importing labor. As our discussion progressed another area came to light and that was health and safety as a result of poor indoor air quality.

One of the unique features of Hooper Bay is its remoteness and isolation. For much of the year the community is only accessible by air or snow machine. This makes access to medical help in Bethel or Anchorage very expensive and often impossible on short notice. William explained to us that several of the families we would be visiting had members with respiratory illnesses either directly related to or aggravated by poor indoor air quality. This pointed out the need to balance energy saving measures, such as air tightening and added insulation, with proper ventilation to maintain good indoor air quality. It seemed very necessary to study these homes not only for ways to reduce heating costs but also from the perspective of ventilation and indoor air quality. It also seemed valuable to train some local residents to monitor and explain the dynamics of indoor air quality to residents. To this end we took air samples in several of the homes to check for mold spore levels, and measured humidity and CO (carbon monoxide) levels in all of them. Thomas Olsen and George Moses Jr. went with us and not only introduced us to the homeowners, but practiced the taking of air samples and measuring of humidity and CO, and became very proficient at the use of these tools.

CARBON MONOXIDE

Although no elevated CO levels were found in any of the homes it is important to note that these visits took place in “early” winter before temperatures were extreme and there was very little snow. Much of the typical sealing of leaks had not been done yet and the snow drifting that was described by most residents had not yet occurred. Most residents we spoke to described times of the year when their entire home would be covered in snow up to, and sometimes over the roof. Although this probably creates an insulating factor and shields the home from the high winds, it also creates a high potential for heating exhausts and other pollutants created in the home to be trapped inside. Not only do ventilation systems need to be designed with this in mind, but residents need to be educated on the importance of keeping ventilation open and operating during these extreme conditions.

HUMIDITY

In spite of the fact that outdoor temperatures were well below freezing (approx. 20F) and the outdoor air was very dry, all but two of the homes on our list of nine measured indoor humidity levels of greater than 50%. Only one was below 40%. When outdoor temperatures are below freezing and indoor humidity is above 40% there is a high potential for condensation on windows and doors and any other surfaces that become cool enough to cause the moisture in the indoor air to reach the “dew point” (the temperature at

which the moisture in the air condenses). These homes were generally small. All but two were under 1000 sq. ft. of floor space and all were less than 1500 sq. ft.. This combined with high occupancy (3-11 people) and little or no mechanical ventilation created high humidity (over 60% in two homes). All homes showed signs of moisture damage around windows and doors and several entryways were structurally damaged from moisture.

VENTILATION

Some of these homes had mechanical ventilation systems consisting of vent fans and passive inlets and two had HRV systems, however, both HRV systems and all but one of the other systems had been disabled at the time of our inspections “to save heat”. This, again, points to the need for homeowner education on the importance of ventilation for maintaining healthy indoor air quality. As William pointed out in our initial meeting, many of the homeowners we visited reported family members that were either currently experiencing or had recently experienced illnesses related to indoor air quality. This was confirmed by statements of the homeowners as we visited their homes.

Since the nine homes we concentrated on had received AHFC certified energy ratings it was possible to calculate the “Building Airflow Standards” for these homes. This is a calculation designed to determine the need for mechanical ventilation in a home so that a recommendation can be made to the homeowner before retrofitting is begun. It takes into account the climate zone of the home, the exposure, the number of occupants and the “natural” air leakage of the home (determined by the blower door test). All but one of these homes fell in the category of “**mechanical ventilation required**”. One fell in the range of “**mechanical ventilation recommended”**. To meet ASHRAE ventilation standards, a constant ventilation rate of between 55cfm and 75cfm would be required for all of these homes, depending on occupancy. This requires a mechanical vent fan capable of discharging at least 55cfm (cubic feet per minute) and balanced with one or more passive inlets capable of replacing that many cfm. This could also be done with HRV (heat recovery ventilation) systems. Some of these homes were designed with such systems and some had been retrofitted with ventilation systems but, as noted earlier, all but one of these systems had been disabled.

MOLD

Since mold sampling was not part of the original scope of this project, we did not take samples in every home. We did, however, feel that it was important to take enough samples to familiarize Thomas and George with the equipment and procedures for taking air samples. We took samples in five of the nine homes on our list and three of those showed levels of Penicilliun/Aspergillus (a very common category of indoor molds) that would generally be considered above average. This grouping of molds grows on nearly everything if moisture is present. Only one of these three had a spore level that would be unusual outdoors in summer. However, since outdoor spore levels in winter, when temperatures are below freezing and ground is covered with snow, are generally very low, these indoor levels likely indicate a mold growth situation in the home. A more telling sign was the fact that all but one of these samples indicated a “background debris” level that was either “Heavy” or “Too heavy for accurate count”. This is a measure of the “non-spore” debris that may include cellulose, plant fibers, insect parts, pet dander, combustion particulates and many other types of general dust. This is likely due to a combination of high occupancy and the constant wind and once again points to the need for ventilation and, ideally, filtered ventilation.

CONCLUSIONS AND SUGGESTIONS

As energy costs have escalated there has been an increased focus on making homes more energy efficient. This can be seen on every level from National government to State government and all the way down to homeowners and occupants. Intuitively, the first focus was on not wasting energy; more efficient lighting, more efficient heating systems, better insulated homes. As part of the learning process we became aware that some of the things we were doing to make our homes less costly to heat were creating indoor air quality problems that made them less safe to live in. This does not require a CHANGE of focus but rather a BROADENING of focus. Homes need to be viewed not just as structures that protect us from the elements but as environments that keep us safe and healthy.

This project has very good goals and objectives as presented to us by William Naneng in our initial meeting. I feel that the exposure and training of Thomas Olsen and George Moses Jr. to identifying and testing potential indoor air quality problems fit very well within those goals and objectives. I see a need for broader teaching and training of homeowners and occupants on the importance of maintaining good indoor air quality to promote good health.

In addition to identifying ways to reduce heating and overall energy costs I see a need to develop new and dynamic ways to provide good reliable ventilation to homes such as these that not only have unique requirements but requirements that change radically with the seasons. We saw in one home (not on our list of nine) a humidity monitor that was helping the homeowner to keep his ventilation in balance without over ventilating. I think this kind of monitoring for CO and humidity and even CO2 would allow residents to adjust their ventilation systems day-to-day as needed rather than simply disabling them, as we saw in most cases.

It seems that funding for installation of ventilation systems and indoor air quality monitoring tools as well as education on the importance of indoor air quality could be sought from sources other than those typically used for energy retrofits. This would fit within the “objectives” of identifying financing options.

Providing affordable, energy efficient, safe and comfortable housing in a hostile environment is a very complicated task. It is a problem shared by Hooper Bay and nearly every other community in Alaska. As a life-long Alaskan resident I am honored to have been included in this project and hope to continue contributing to solutions in the future.

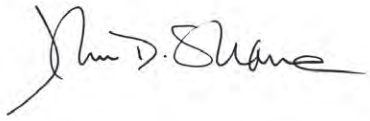
The preceding information is true and correct to the best of my knowledge. -
Karl Hough - Indoor Air Quality Consultant -

PRO-LAB®
1675 North Commerce Parkway, Weston, FL 33326 (954) 384-4446

SOLUTIONS FOR HEALTHY BREATHING
PO BOX 10918
FAIRBANKS, AK 99710

Certificate of Mold Analysis

Prepared for:	SOLUTIONS FOR HEALTHY BREATHING
Phone Number:	(907)378-4108
Fax Number:	(907)457-4568
Project Name:	SEA LION CORP.
Test Location:	HOOPER BAY AK
	HOOPER BAY, AK 99559
Chain of Custody #:	622903
Received Date:	November 14, 2012
Report Date:	November 15, 2012



John D. Shane Ph.D., Technical Manager

Currently there are no Federal regulations for evaluating potential health effects of fungal contamination and remediation. This information is subject to change as more information regarding fungal contaminants becomes available. For more information visit http://www.epa.gov/mold or www.nyc.gov/html/doh/html/epi/mold.shtml. This document was designed to follow currently known industry guidelines for the interpretation of microbial sampling, analysis, and remediation. Since interpretation of mold analysis reports is a scientific work in progress, it may as such be changed at any time without notice. The client is solely responsible for the use or interpretation. PRO-LAB/SSPTM Inc. makes no express or implied warranties as to health of a property from only the samples sent to their laboratory for analysis. The Client is hereby notified that due to the subjective nature of fungal analysis and the mold growth process, laboratory samples can and do change over time relative to the originally sampled material. PRO-LAB/SSPTM Inc. reserves the right to properly dispose of all samples after the testing of such samples are sufficiently completed or after a 7 day period, whichever is greater.

For more information please contact PRO-LAB at (954) 384-4446 or email info@prolabinc.com

PRO-LAB®
1675 North Commerce Parkway, Weston, FL 33326 (954) 384-4446

Prepared for : SOLUTIONS FOR HEALTHY BREATHING **Test Address :** SEA LION CORP.
HOOPER BAY AK
HOOPER BAY, AK 99559

ANALYSIS METHOD	Spore trap analysis	Spore trap analysis	Spore trap analysis	Spore trap analysis
LOCATION	EUNICE CHARLES HOUSE	CLARANCE WILSON HOUSE	FRANCIS NANEG HOUSE	HENRIETTA NANEG HOUSE
COC / LINE #	622903-1	622903-2	622903-3	622903-4
SAMPLE TYPE & VOLUME	Z5 - 25L	Z5 - 25L	Z5 - 25L	Z5 - 25L
SERIAL NUMBER	Z803527	Z803513	Z809987	Z806908
COLLECTION DATE	**Nov 12, 2012**	**Nov 12, 2012**	**Nov 12, 2012**	**Nov 12, 2012**
ANALYSIS DATE	**Nov 15, 2012**	**Nov 15, 2012**	**Nov 15, 2012**	**Nov 15, 2012**
CONCLUSION				

IDENTIFICATION	Raw Count	Spores per m^3	Percent of Total	Raw Count	Spores per m^3	Percent of Total	Raw Count	Spores per m^3	Percent of Total	Raw Count	Spores per m^3	Percent of Total
Cladosporium	2	80	40	6	240	1	2	80	50			
Other Basidiospores							2	80	50			
Penicillium/Aspergillus	3	120	60	500	20,000	99				63	2,500	100
TOTAL SPORES	5	200	100	506	20,240	100	4	160	100	63	2,500	100
MINIMUM DETECTION LIMIT*	1	40		1	40		1	40		1	40	
BACKGROUND DEBRIS	Heavy						Heavy			Heavy		
Cellulose Fiber	11	440		4	160		4	160		4	160	
Insect Fragments							2	80				
Plant Fragments										1	40	
OBSERVATIONS & COMMENTS				Pen/ Asp too heavy for accurate count. Counts are estimated. Actual numbers of spores probably much higher.								

Background debris qualitatively estimates the amount of particles that are not pollen or spores and directly affects the accuracy of the spore counts. The categories of Light, Moderate, Heavy and Too Heavy for Accurate Count, are used to indicate the amount of deposited debris. Increasing amounts of debris will obscure small spores and can prevent spores from impacting onto the slide. The actual number of spores present in the sample is likely higher than reported if the debris estimate is 'Heavy' or 'Too Heavy for Accurate Count'. All calculations are rounded to two significant figures and therefore, the total percentage of spore numbers may not equal 100%.

*Minimum Detection Limit. Based on the volume of air sampled, this is the lowest number of spores that can be detected and is an estimate of the lowest concentration of spores that can be read in the sample. **NA** = Not Applicable.

Spores that were observed from the samples submitted are listed on this report. If a spore is not listed on this report it was not observed in the samples submitted.

Interpretation Guidelines: A determination is added to the report to help users interpret the mold analysis results. A mold report is only one aspect of an indoor air quality investigation. The most important aspect of mold growth in a living space is the availability of water. Without a source of water, mold generally will not become a problem in buildings. These determinations are in no way meant to imply any health outcomes or financial decisions based solely on this report. For questions relating to medical conditions you should consult an occupational or environmental health physician or professional.

CONTROL is a baseline sample showing what the spore count and diversity is at the time of sampling. The control sample(s) is usually collected outside of the structure being tested and used to determine if this sample(s) is similar in diversity and abundance to the inside sample(s).

ELEVATED means that the amount and/or diversity of spores, as compared to the control sample(s), and other samples in our database, are higher than expected. This can indicate that fungi have grown because of a water leak or water intrusion. Fungi that are considered to be indicators of water damage include, but are not limited to: *Chaetomium*, *Fusarium*, *Memnoniella*, *Stachybotrys*, *Scopulariopsis*, *Ulocladium*.

NOT ELEVATED means that the amount and/or the diversity of spores, as compared to the control sample and other samples in our database, are lower than expected and may indicate no problematic fungal growth.

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NORMAL means that no presence of current or former growth was observed in the analyzed sample. If spores are recorded they are normally what is in the air and have settled on the surface(s) tested.

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Prepared for : SOLUTIONS FOR HEALTHY BREATHING **Test Address :** SEA LION CORP.
HOOPER BAY AK
HOOPER BAY, AK 99559

ANALYSIS METHOD	Spore trap analysis	Spore trap analysis	Spore trap analysis	Spore trap analysis
LOCATION	PAUL MOSES HOUSE	PATRICK HALE HOUSE	GLEN JOE SR HOUSE	LEONARD BELL HOUSE
COC / LINE #	622903-5	622903-6	622903-7	622903-8
SAMPLE TYPE & VOLUME	Z5 - 25L	Z5 - 25L	Z5 - 25L	Z5 - 25L
SERIAL NUMBER	Z807097	Z792050	Z810012	Z806781
COLLECTION DATE	**Nov 12, 2012**	**Nov 12, 2012**	**Nov 12, 2012**	**Nov 12, 2012**
ANALYSIS DATE	**Nov 15, 2012**	**Nov 15, 2012**	**Nov 15, 2012**	**Nov 15, 2012**
CONCLUSION				

IDENTIFICATION	Raw Count	Spores per m^3	Percent of Total	Raw Count	Spores per m^3	Percent of Total	Raw Count	Spores per m^3	Percent of Total	Raw Count	Spores per m^3	Percent of Total
Cladosporium	1	40	2				3	120	16			
Other Basidiospores							1	40	5	2	80	100
Penicillium/Aspergillus	44	1,800	98	15	600	100	15	600	79			
TOTAL SPORES	45	1,840	100	15	600	100	19	760	100	2	80	100
MINIMUM DETECTION LIMIT*	1	40		1	40		1	40		1	40	
BACKGROUND DEBRIS	Heavy			Heavy			Heavy			too heavy for accurate count.		
Cellulose Fiber	9	360		8	320		4	160		2	80	
Insect Fragments										2	80	
Plant Fragments												
OBSERVATIONS & COMMENTS										Counts are estimated. Actual numbers of spores probably much higher.		

Background debris qualitatively estimates the amount of particles that are not pollen or spores and directly affects the accuracy of the spore counts. The categories of Light, Moderate, Heavy and Too Heavy for Accurate Count, are used to indicate the amount of deposited debris. Increasing amounts of debris will obscure small spores and can prevent spores from impacting onto the slide. The actual number of spores present in the sample is likely higher than reported if the debris estimate is 'Heavy' or 'Too Heavy for Accurate Count'. All calculations are rounded to two significant figures and therefore, the total percentage of spore numbers may not equal 100%.

Minimum Detection Limit. Based on the volume of air sampled, this is the lowest number of spores that can be detected and is an estimate of the lowest concentration of spores that can be read in the sample. **NA** = Not Applicable.

Spores that were observed from the samples submitted are listed on this report. If a spore is not listed on this report it was not observed in the samples submitted.

Interpretation Guidelines: A determination is added to the report to help users interpret the mold analysis results. A mold report is only one aspect of an indoor air quality investigation. The most important aspect of mold growth in a living space is the availability of water. Without a source of water, mold generally will not become a problem in buildings. These determinations are in no way meant to imply any health outcomes or financial decisions based solely on this report. For questions relating to medical conditions you should consult an occupational or environmental health physician or professional.

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NOT ELEVATED means that the amount and/or the diversity of spores, as compared to the control sample and other samples in our database, are lower than expected and may indicate no problematic fungal growth.

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Prepared for : SOLUTIONS FOR HEALTHY BREATHING **Test Address :** SEA LION CORP.
HOOPER BAY AK
HOOPER BAY, AK 99559

ANALYSIS METHOD	Spore trap analysis	INTENTIONALLY BLANK	INTENTIONALLY BLANK	INTENTIONALLY BLANK
LOCATION	GEORGE MOSES JR HOUSE			
COC / LINE #	622903-9			
SAMPLE TYPE & VOLUME	Z5 - 25L			
SERIAL NUMBER	Z746359			
COLLECTION DATE	**Nov 12, 2012**			
ANALYSIS DATE	**Nov 15, 2012**			
CONCLUSION				

IDENTIFICATION	Raw Count	Spores per m^3	Percent of Total	Raw Count	Spores per m^3	Percent of Total	Raw Count	Spores per m^3	Percent of Total	Raw Count	Spores per m^3	Percent of Total
Cladosporium	4	160	14									
Other Basidiospores												
Penicillium/Aspergillus	26	1,000	86									
TOTAL SPORES	30	1,160	100									
MINIMUM DETECTION LIMIT*	1	40										
BACKGROUND DEBRIS	too heavy for accurate count.											
Cellulose Fiber	2	80										
Insect Fragments												
Plant Fragments												
OBSERVATIONS & COMMENTS	Counts are estimated. Actual numbers of spores probably much higher.											

Background debris qualitatively estimates the amount of particles that are not pollen or spores and directly affects the accuracy of the spore counts. The categories of Light, Moderate, Heavy and Too Heavy for Accurate Count, are used to indicate the amount of deposited debris. Increasing amounts of debris will obscure small spores and can prevent spores from impacting onto the slide. The actual number of spores present in the sample is likely higher than reported if the debris estimate is 'Heavy' or 'Too Heavy for Accurate Count'. All calculations are rounded to two significant figures and therefore, the total percentage of spore numbers may not equal 100%.

*__Minimum Detection Limit__. Based on the volume of air sampled, this is the lowest number of spores that can be detected and is an estimate of the lowest concentration of spores that can be read in the sample. **NA** = Not Applicable.

Spores that were observed from the samples submitted are listed on this report. If a spore is not listed on this report it was not observed in the samples submitted.

Interpretation Guidelines: A determination is added to the report to help users interpret the mold analysis results. A mold report is only one aspect of an indoor air quality investigation. The most important aspect of mold growth in a living space is the availability of water. Without a source of water, mold generally will not become a problem in buildings. These determinations are in no way meant to imply any health outcomes or financial decisions based solely on this report. For questions relating to medical conditions you should consult an occupational or environmental health physician or professional.

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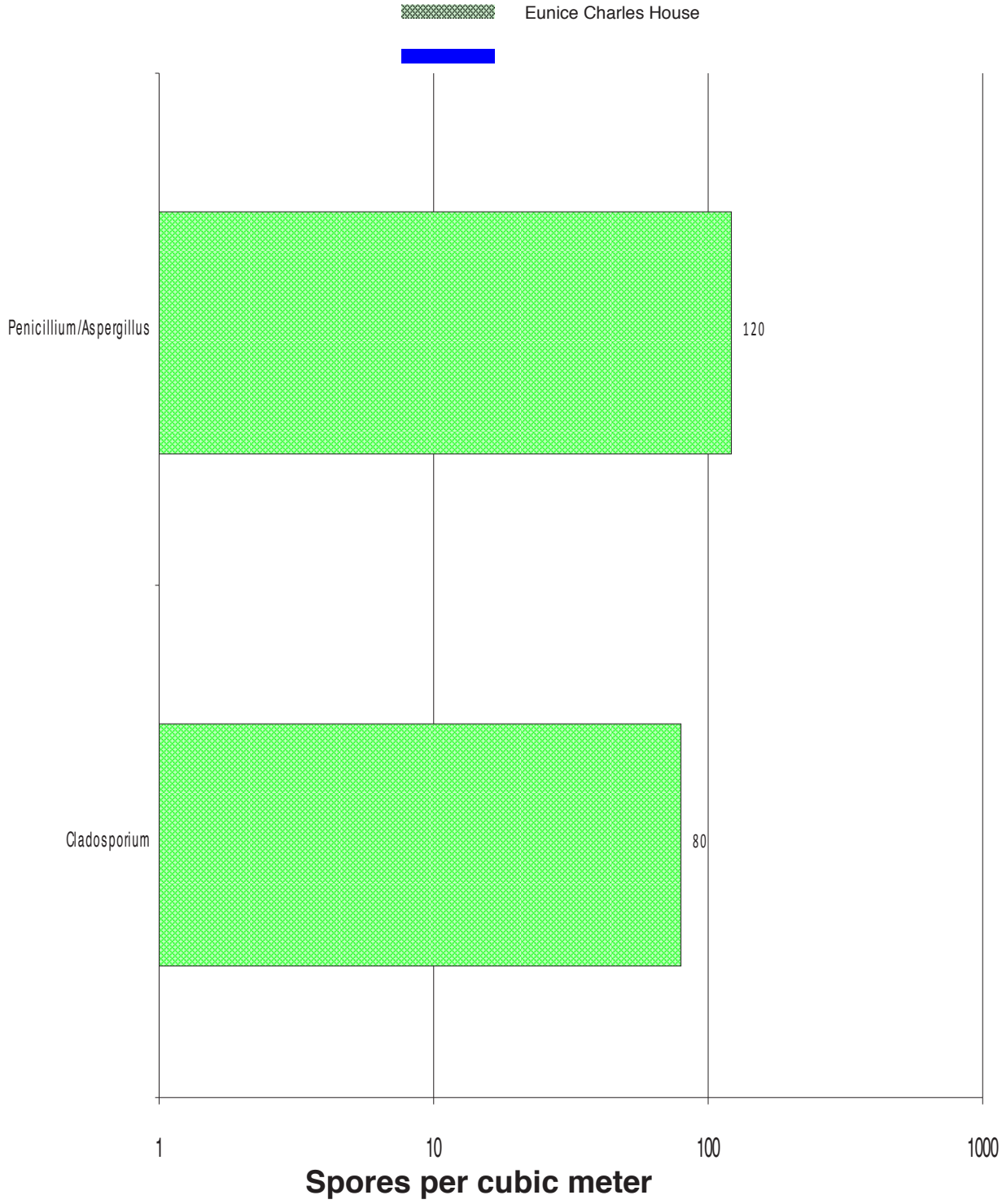

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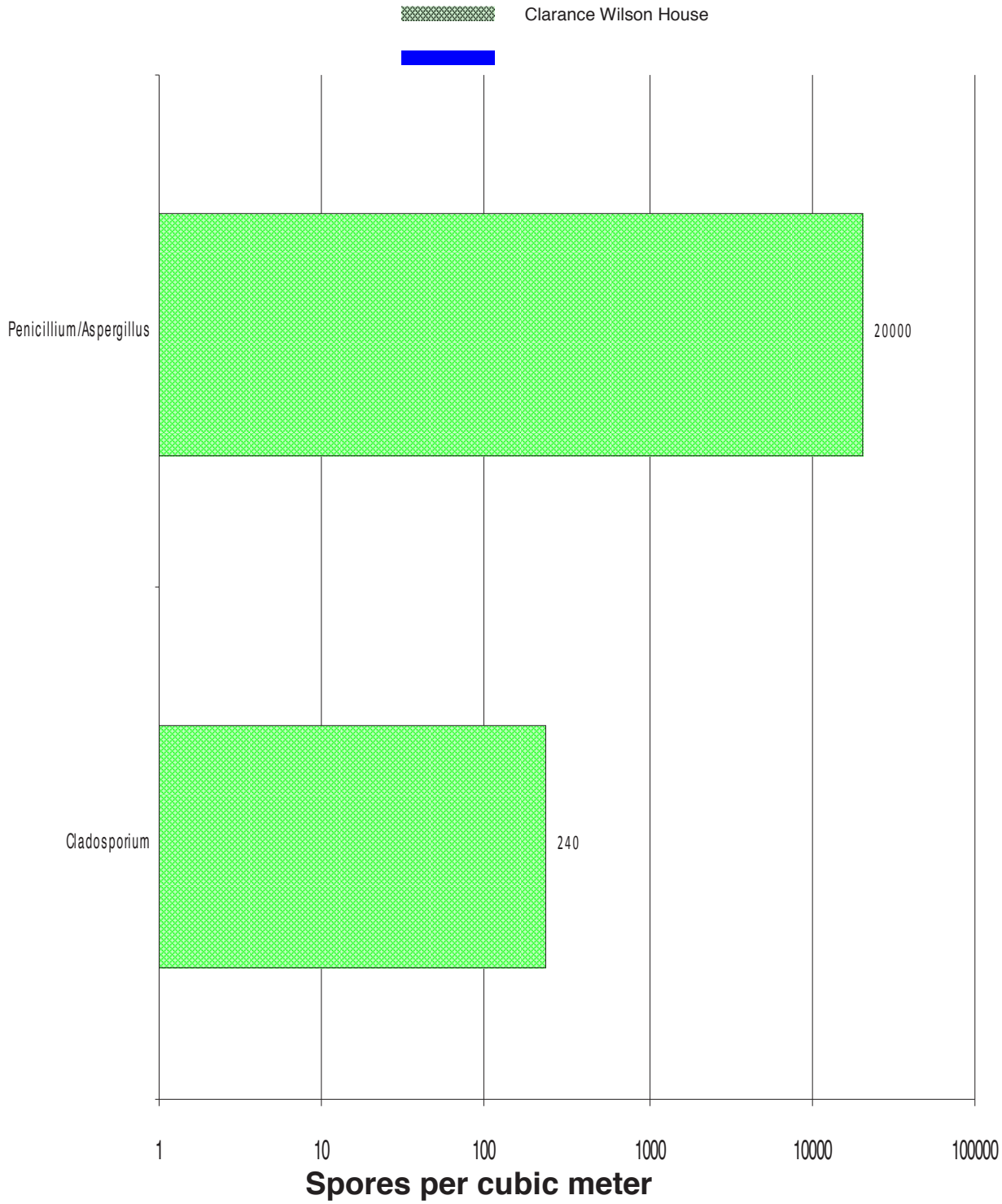

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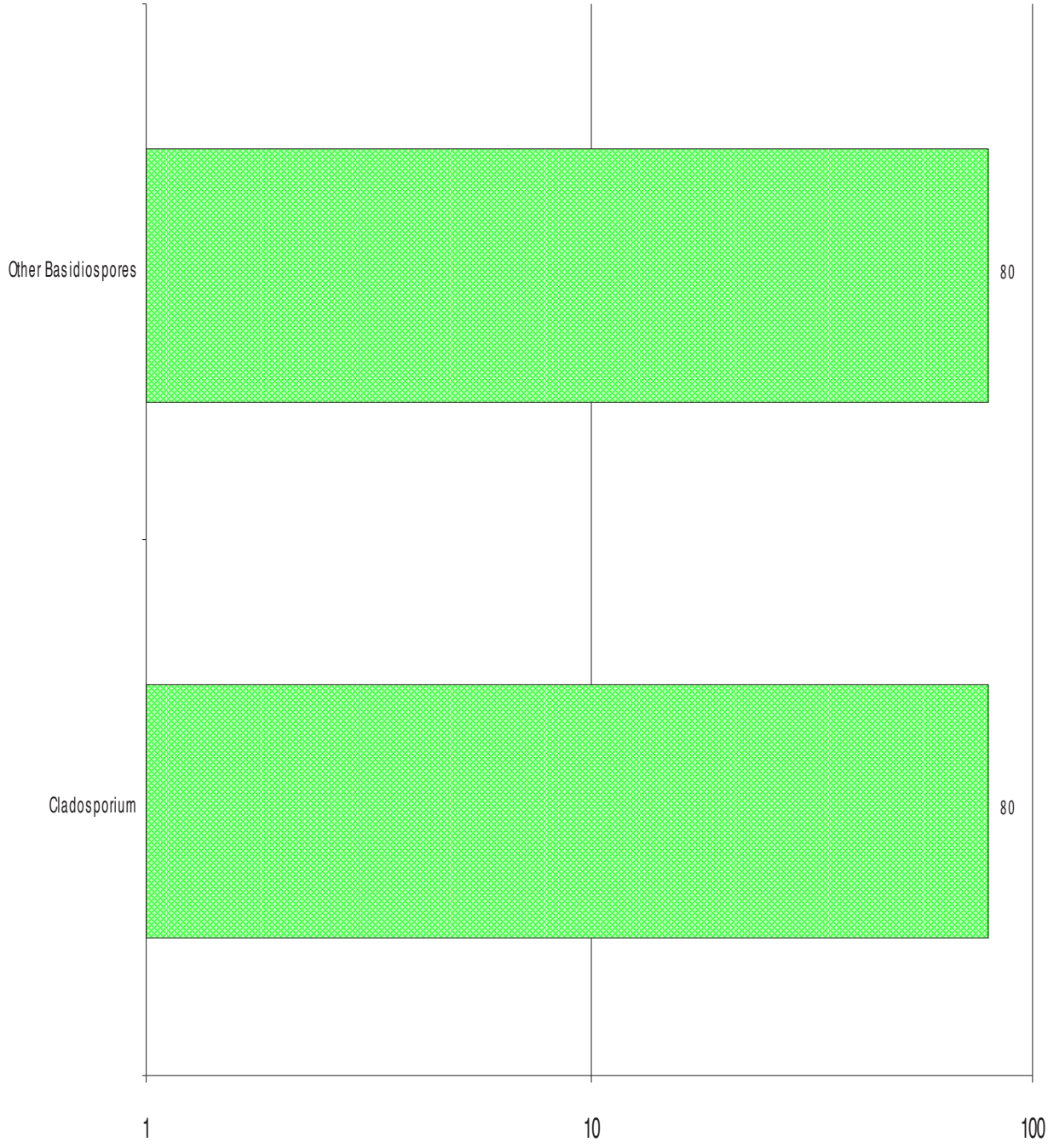
Chain of Custody # 622903

Francis Naneg House



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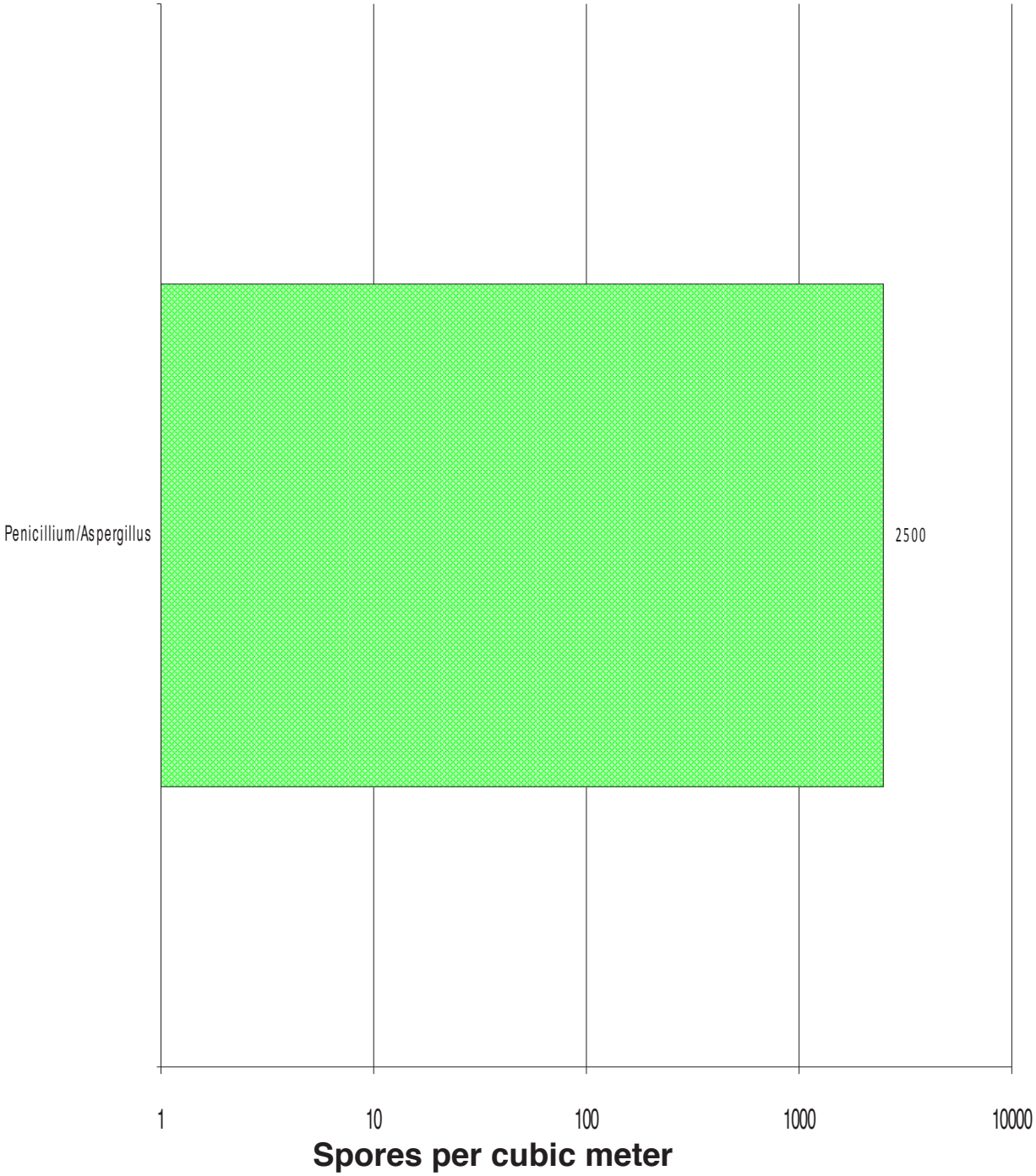
Henrietta Naneg House



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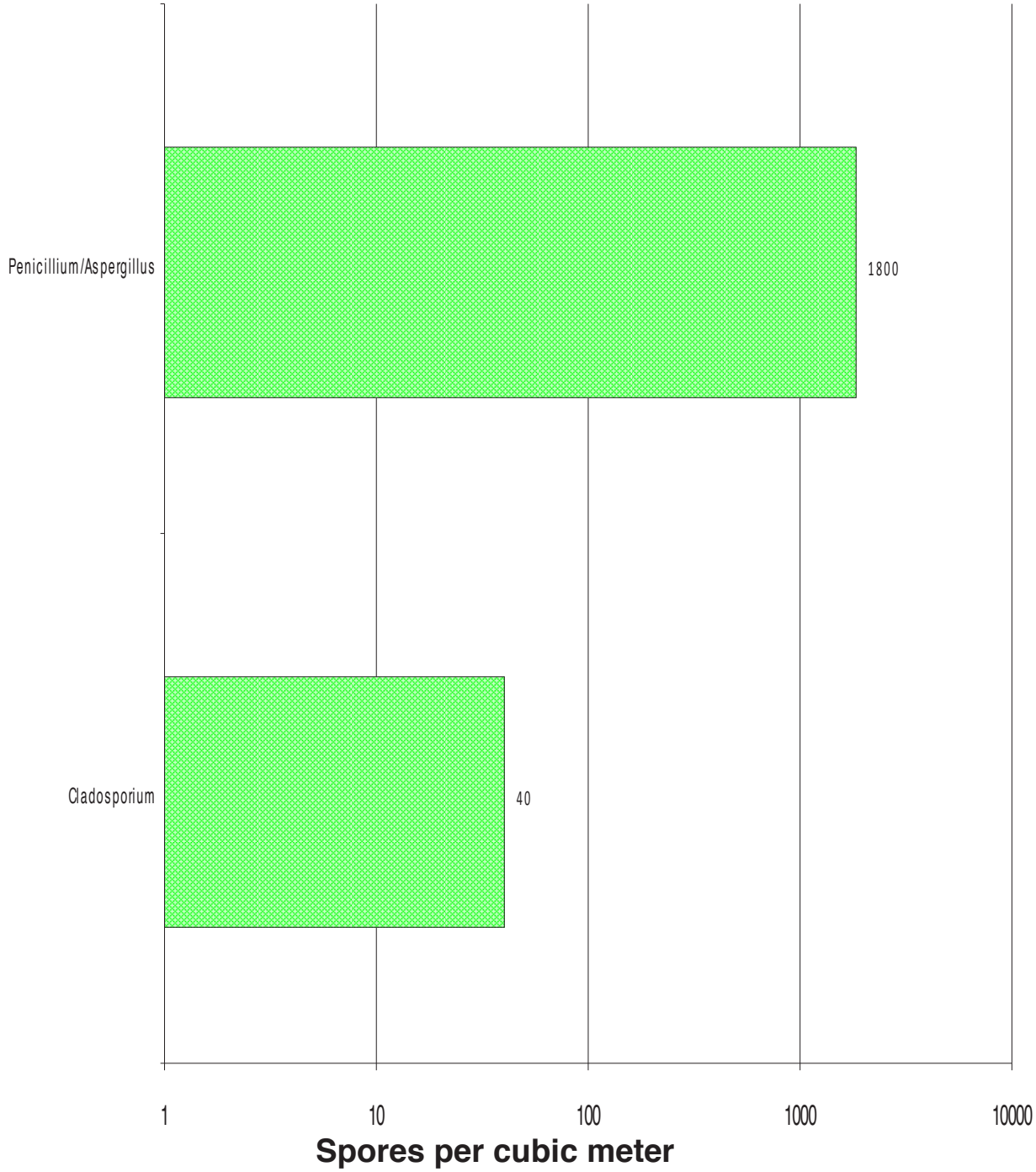
Chain of Custody # 622903

Paul Moses House



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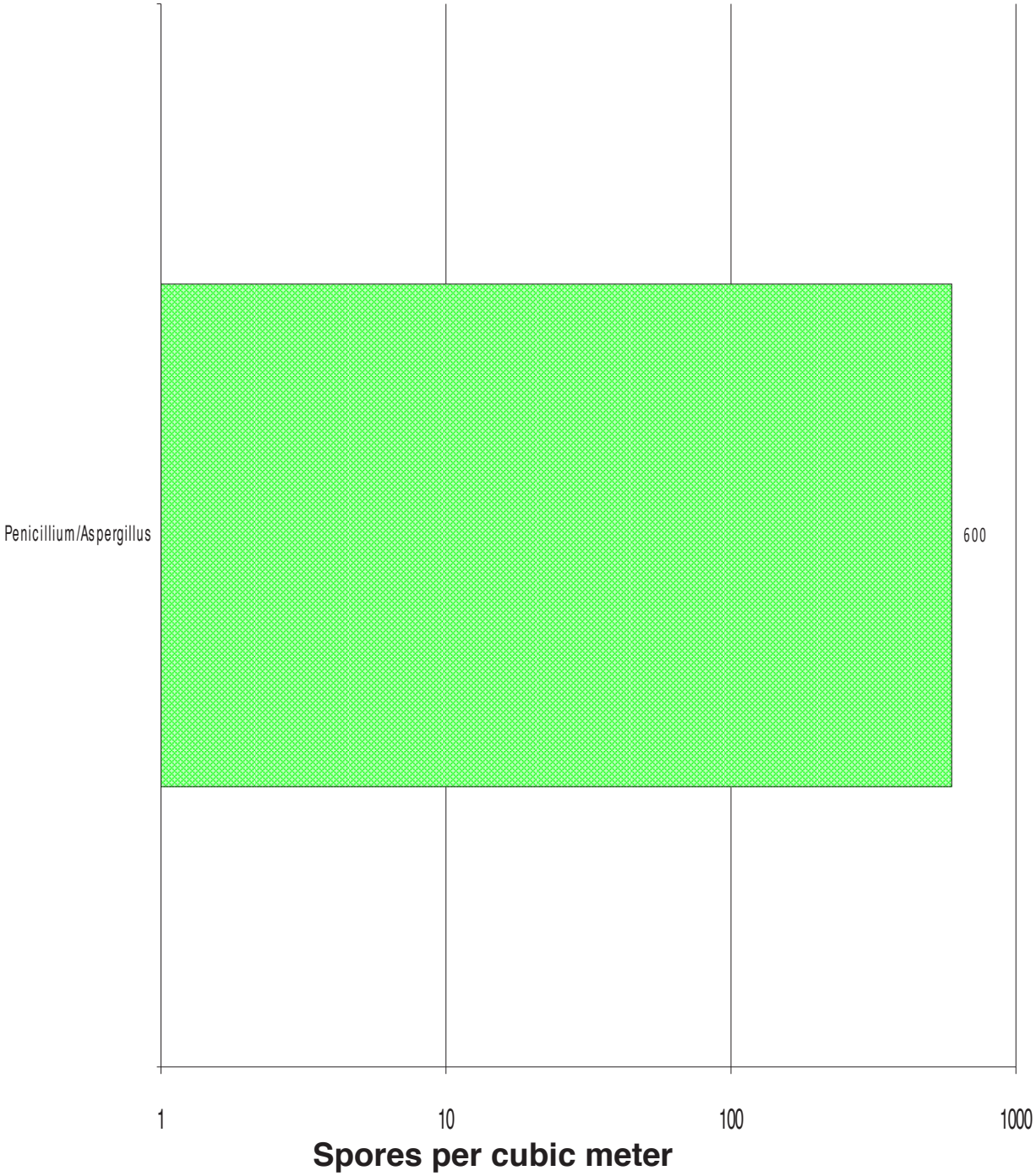
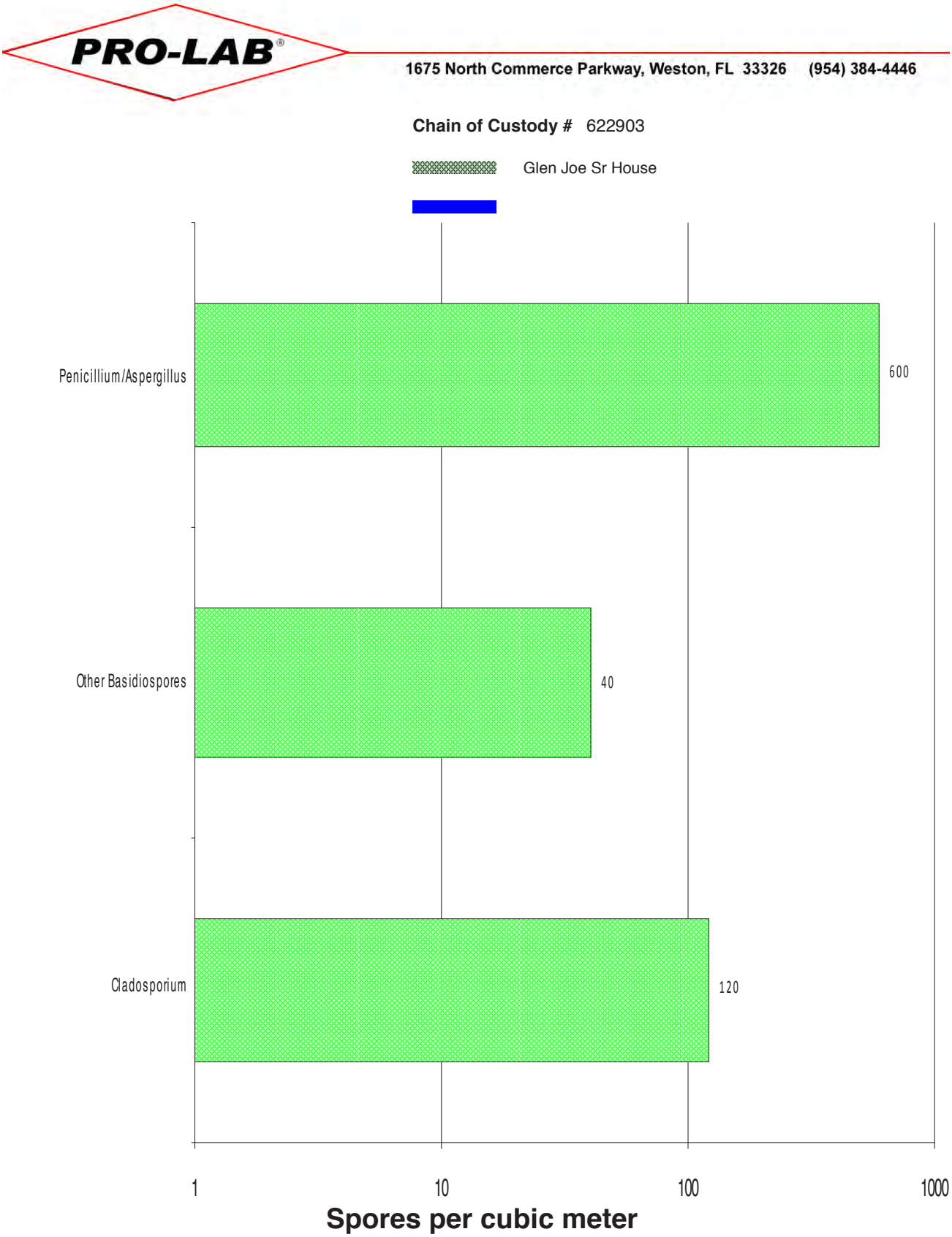
Chain of Custody # 622903

Patrick Hale House

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Glen Joe Sr House
Penicillium/Aspergillus
600
Other Basidiospores
40
Cladosporium
120
1
10
100
1000
Spores per cubic meter

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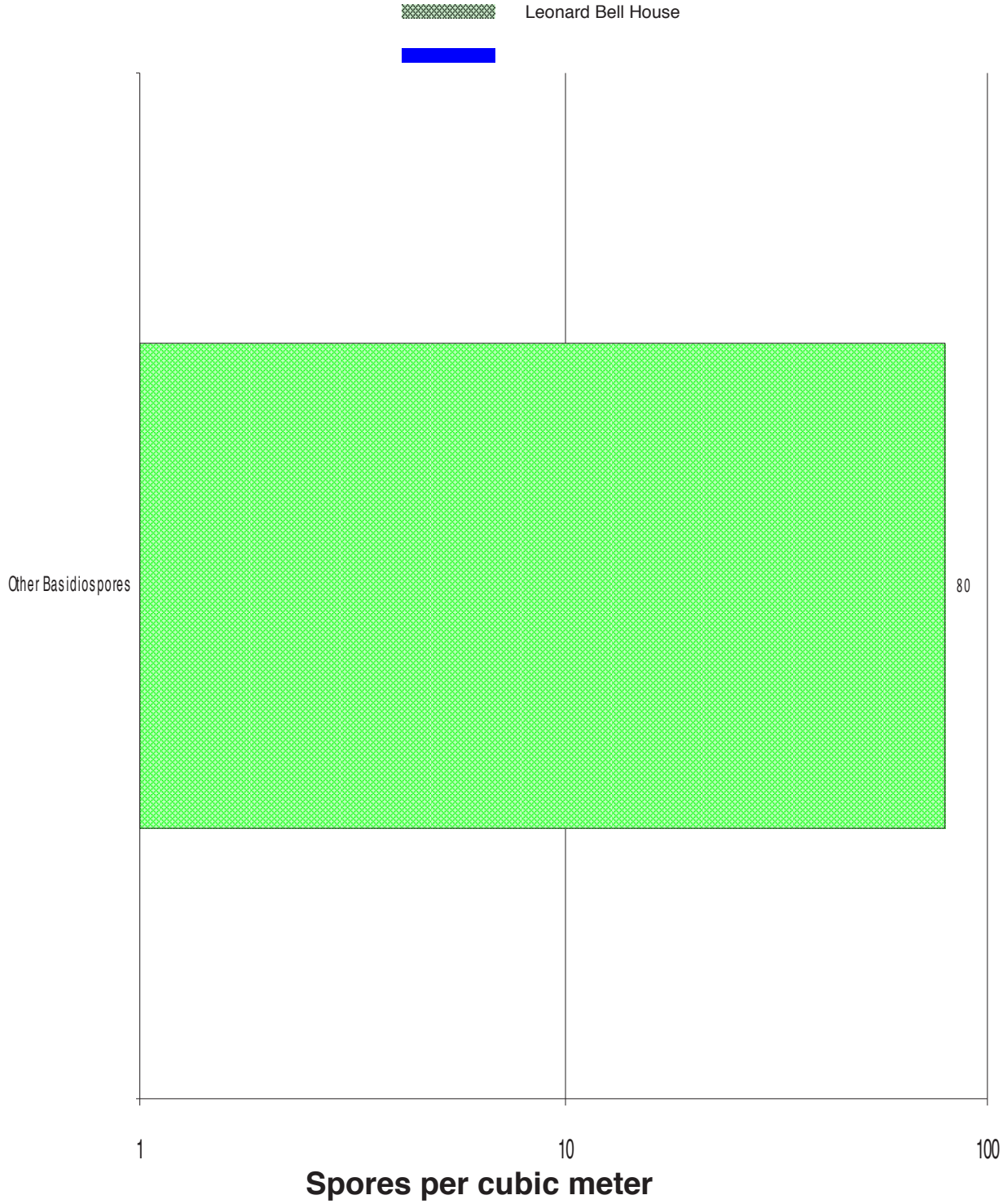

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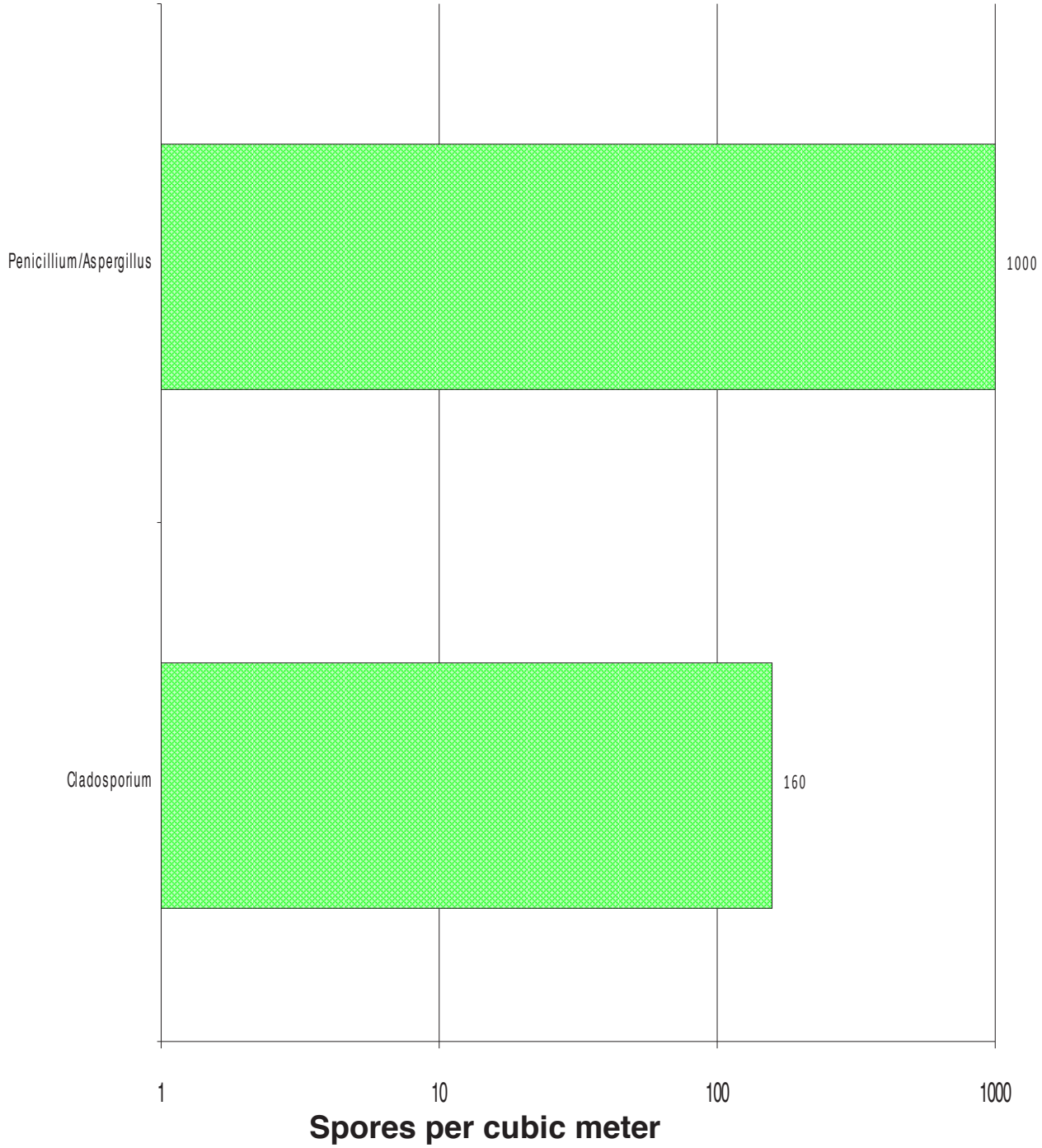
Chain of Custody # 622903

George Moses Jr House



Identification	Outdoor Habitat	Indoor Habitat	Allergic Potential	Comments
Cladosporium	The most common spore type reported in the air worldwide. Found on dead and dying plant litter, and soil.	Commonly found on wood and wallboard. Commonly grows on window sills, textiles and foods.	Type I (hay fever and asthma), Type III (hypersensitivity pneumonitis) allergies.	A very common and important allergen source both outdoors and indoors.
Basidiospores	Commonly found everywhere, especially in the late summer and fall. These spores are from Mushrooms.	Mushrooms are not normally found growing indoors, but can grow on wet lumber, especially in crawlspaces. Sometimes mushrooms can be seen growing in flower pots indoors.	Some allergenicity reported. Type I (hay fever, asthma) and Type III (hypersensitivity pneumonitis).	Among the group of Mushrooms (Basidiomycetes) are dry rot fungi Serpula and Poria that are particularly destructive to buildings.
Penicillium/Aspergillus	Common everywhere. Normally found in the air in small amounts in outdoor air. Grows on nearly everything.	Wetted wallboard, wood, food, leather, etc. Able to grow on many substrates indoors.	Type I (hay fever and asthma) allergies and Type III (hypersensitivity pneumonitis) allergies.	This is a combination group of Penicillium and Aspergillus and is used when only the spores are seen. The spores are so similar that they cannot be reliably separated into their respective genera.

Economic Analysis

After the initial AHFC energy audit process conducted by Whitney Construction, CCHRC economic analysts took the AKWarm reports and constructed an initial matrix of observations and recommendations that would be typical of owner-occupied residences hoping to apply to the AHFC rebate or weatherization programs. This MATRIX B (Page 82) takes into account square footage, air leakage, ventilation, occupancy, heat source, construction type, and appliances. Matrix B also notes overcrowding conditions in some homes (according to State standards for overcrowding based on amount of square footage per occupant) and makes recommendations based on the AHFC rebate program.

Many of the homes in Hooper Bay are not owner-occupied, but are rented, leased, or provided through tribal or other sources. The follow-up visit by CCHRC aimed at supplementing the energy audits by prioritizing interventions to each of the housing types common to Hooper Bay according to initial capital investment and return on energy usage. This second matrix, MATRIX C (Page 86) assumes that not all interventions recommended will be able to be performed, due to funding and logistical realities.

Matrix A (below) states for reference the percentage reduction possible in energy usage if all improvements suggested by the team are completed. Sea Lion Corporation's initial goal of 30% energy reduction is attainable, with three important caveats:

1. A 30% reduction in energy usage will be more easily attainable in some of the housing models in

MATRIX A

The **Percent Reduction Matrix** displays the percent reduction in energy usage if all improvements suggested are done.

Description:	Area (sqft):	Rating:	Current Fuel Use (MMBtu/yr)
Sea Lion AC	3111	star+ 64.4	294.1
Traditional Counci Building	2088	star 88.0	113
Blaise Tinker House	465	star 79.8	43.4
Bosco Olso House	513	Star+ 76.1	73
Charli Wilso House	1003	star 88.2	51.7
Francis Naneng	894	star 78.8	105.8
Henrietta Naneng	897	star 78.1	111.1
Lenord Bell	849	star+ 83.7	83.9
Mose Night House	1431	star+ 85.7	82.6
Patrick Hale	713	star 78.7	58
Paul Moses	513	star+ 64.4	56.7
Totals	12,477		1,073

NOTE: Post-Improvement Fue Us assumes that al recommended improvements are done.

the community that in others.

2. In certain models, the funds necessary to attain this level of reduction may not be easily attainable.

3. In many of the housing models, air sealing and caulking are recommended to reduce energy usage. These steps should NOT be implemented in households where ventilation does not exist, nor in households where ventilation systems will not be used by the occupant. Energy efficiency should not be improved at the expense of indoor air quality and the health of the occupants.

The three matrices below are meant to be used as a tool for the Sea Lion Corporation to make decisions on where energy savings are most easily attainable. With the current electrical and heating fuel loads, SLC will be able to compare the cost of energy to the average income per household to determine not only the percentage of disposable income that is consumed by energy usage but also what gains may be made in that area.

From this point forward, the task would be to decide to what degree these improvement scenarios can be implemented, and along what timeline. Additionally, it is hoped that information regarding indoor air quality will factor heavily into the decisions made by the community to retrofit existing homes.

Post-Imp Fue Us (MMBtu/yr)	reduction	Current Fue Use	Current Electrical
172.8	41%	1480 gal	Kwh/year 28950
79.4	30%	40 gal	17601
25.3	42%	18 gal	5547
42.2	42%	17 gal+1.2 c Birch	5614
33.5	35%	22 gal	6443
47.8	55%	27 gal + 1. Birch	6317
53.6	52%	29 gal + 1. Birch	6338
45.2	46%	20 gal + 1.4 c Birch	6180
56.3	32%	43 gal	7327
35.4	39%	28 gal	6034
31.7	44%	19 gal + 0.5 c Birch	5631
623	42%		

MATRIX B

Energy Audit Matrix compiled after AHFC energy audits, recommendations of Eric Whitney of Whitney Construction.
Text in red denotes areas where there is room for rapid gains in efficiency

Description:	Area (sqft):	Rating:	Eric top recommend.:	Ai Leakage: (BEES 2009 reqs 7)
Sea Lion AC	3,111	**star+ 64.4**	Ad insulatio to floor, ai seal, ad insulatio to attic	**6.4 ACH50 estimate**
Traditional Council Building	2,088	star 88.0	replace entry door, ad insulatio to floor, ad insulatio to attic	3. ACH50
Blaise Tinker House	465	4 star 79.8	Replace windows, Ad Insulatio to attic, ad insulatio to floor	3. ACH50
Bosco Olson House (3 similar)	513	**3 Star+ 76.1**	Ai sealing, ad insulatio to attic, replace entry door	**7.1 ACH50**
Charlie Wilson House	1,003	5 star 88.2	ad insulatio to walls, add insulatio to floor, ad insulatio to attic	3. ACH50
Francis Naneng	894	4 star 78.8	replace entry door, ad insulatio to attic, ad insulatio to walls	3. ACH50
Henrietta Naneng	897	4 star 78.1	ad insulatio to floor, add insulatio to attic, add mechanical ventilation	3. ACH50
Lenord Bell (similar)	849	4 star+ 83.7	Ad insulatio to attic, ai sealing, ad mechanical ventilation	4. ACH50
Mose Night House (31 similar)	1,431	4 star+ 85.7	air sealing, ad insulation to floor, ad insulatio to attic	**7.4 ACH50**
Patrick Hale	713	4 star 78.7	ai sealing, replace entry door, ad insulation to attic	6. ACH50
Paul Mose (3 similar)	513	**2 star+ 64.4**	ai seal, ad insulatio to attic, ad insulatio to walls	**8.9 ACH50**

Existing vent?	Vent. Req?	Vent Recom. (cfm)	Floor:	Ceiling:	Walls:
none	Not as-is		**R1 batts**	**R1 batts**	R19 1 PISO
none	Yes		R3 batts	R3 batts	R21 2"PISO
none	Yes	4 cfm	R3 batts	R3 batt	R2 batts
yes, not working	Not as-is		R1 batt + 2"PISO	R3 batts	R19 batts
bath fan, non-working HRV	Yes	60-115 cfm	R3 batts	R3 ba + 3"blownFG	R2 (2"x8")
none	Yes	75-165 cfm	R3 / R2 + 2"XP in addition	R1 ba + 3"blownFG	**R1 (2"x4") + wall w/ 2"XPS**
none	Yes	6 cfm	**R1 batts**	**R1 batt**	R19
none	Yes	55-9 cfm	R3 batts	R3 batts	R1 batts
5 cfm HRV, not working	Not as-is	60-115 cfm	R3 batts	R3 batt+ 3"blownFG	R2 2"PISO
exhaust only	Not as-is		R3 batts	R1 ba + 3"blownFG	R1 batts
none	Not as-is	5 cfm	R1 + 2"XPS	**R1 ba + 3"blownFG**	**R1 (2"x4")**

MATRIX B

Energy Audit Matrix compiled after AHFC energy audits, recommendations of Eric Whitney of Whitney Construction.
Text in red denotes areas where there is room for rapid gains in efficiency

Description:	Walls:	Windows:	Heating Sys:	Modeled Fue Use:	Occ	Beds	Dry
Sea Lion AC	R1 1 PISO	2xpane, wood/vinyl	Toyo + Furnac (82 afue)	**1,48 gal**	5	4	Elec
Traditional Council Building	R2 2"PISO	2xpane, wood/vinyl	Toyo	40 gal	5	4	Elec
Blaise Tinker House	R2 batts	2xpane, aluminum	Toyo	18 gal	3	2	Elec
Bosco Olson House (3 similar)	R1 batts	3 pane, wood/vinyl	Toyo wood	17 gal + 1.2 Birch	4	3	Elec
Charlie Wilson House	R2 (2"x8")	2 pane, wood/vinyl	Toyo	22 gal	**8**	4	Elec
Francis Naneng	**R11 (2"x4") + wall w/ 2"XPS**	2 pane, wood/vinyl	Toyo wood	**27 gal + 1. c Birch**	5	4	Elec
Henrietta Naneng	R19	2 pane, wood/vinyl	Toyo wood	**29 gal + 1. c Birch**	4	3	Elec
Lenord Bell (similar)	R1 batts	2 pane, wood/vinyl	Toyo wood	20 gal + 1.4 Birch	4	3	Elec
Mose Night House (31 similar)	R2 2"PISO	3 pane, wood/vinyl	Toyo	**43 gal**	5	4	Elec
Patrick Hale	R1 batts	2 pane, wood/vinyl	Toyo	28 gal	4	3	Elec
Paul Mose (3 similar)	**R11 (2"x4")**	2 pane, wood/vinyl	Toyo wood	19 gal + 0.5 Birch	4	3	Elec

Range	DHW	Description:	Overcrowding (HUD defition <165 sqft/person)	Floor	Wall	Roof	NSB
Elec	Yes; Semi-cond; Elec	**Sea Lio AC**	622.2	Pilings	2x6	E Truss	All
Elec	No	**Traditional Council Building**	417.6	Pilings	2x6	E Truss	All
Elec	No	**Blaise Tinker House**	155	Pilings	2x6	E Truss	No
Elec	No	**Bosco Olson House (3 similar)**	128.25	Pilings	2x6	Std	All
Elec	No	**Charlie Wilson House**	125.375	Pilings	2x8	E Truss	All
Elec	No	**Francis Naneng**	178.8	Pilings	2x4	Std	All
Elec	No	**Henrietta Naneng**	224.25	Pilings	2x6	Std	No
Elec	No	**Lenord Bell (similar)**	212.25	Pilings	2x6	Std	All
Elec	No	**Moses Night House (31 similar)**	286.2	Pilings	2x6	E Truss	All
Elec	No	**Patrick Hale**	178.25	Pilings	2x6	Std	all
Elec	No	**Paul Moses (3 similar)**	128.25	Pilings	2x4	Std	All

MATRIX C

Improvement Options Matrix lists from top to bottom improvement options in order of **priority**, assuming not all improvements will be able to be completed.

NOTE: If any outside insulation is applied or if caulking and sealing reduces air leakage, the house MUST BE VENTILATED.

House Description:	Blaise Tinker House	Bosco Olson House
Number of Similar Houses:	10	20
CCHRC Ranking of Improvement Options:	Caulk and Seal so that Home Air Leakage is Reduced by 50 CFM at 50 Pascals.	Caulk and Seal so that Home Air Leakage is Reduced by 100 CFM at 50 Pascals.
	Blow in the maximum amount of loose-fill insulation that will fit in the attic. Location - Ceiling w/ Attic: House	Blow in the maximum amount of loose-fill insulation that will fit in the attic. Location - Ceiling w/ Attic: House
	Install R-14 rigid board insulation Location - Exposed Floor: House	Install R-10 rigid board insulation Location - Exposed Floor: House
	Replace existing window with U-0.22 vinyl window Location - Window/Skylight: windows	Remove existing door and install standard pre-hung U-0.16 insulated door, including hardware. Location - Exterior Door: House
	Install R-25 rigid foam board to exterior and cover with T1-11 siding or equivalent. Location - Above-Grade Wall: House	Install R-25 rigid foam board to exterior and cover with T1-11 siding or equivalent. Location - Above-Grade Wall: House
	Remove existing door and install standard pre-hung U-0.16 insulated door, including hardware. Location - Exterior Door: House	Replace existing window with U-0.22 vinyl window Location - Window/Skylight: Windwows
		Install a Heat Recovery Ventilation system

Charlie Wilson House	Francis Naneng	Henrietta Naneng
5	1	1
Repair Heat Recovery Ventilation system	Install R-14 rigid board insulation Location - Exposed Floor: Addition	Add R-13 Dense-pack to partially filled 2x10 cavity. Location - Exposed Floor: House
Caulk and Seal so that Home Air Leakage is Reduced by 100 CFM at 50 Pascals.	Install R-14 rigid board insulation where not already applied. Location - Exposed Floor: House	Install R-38 loose-fill insulation in attic with Standard Truss. Location - Ceiling w/ Attic: House
Install R-21 loose-fill insulation in attic with Energy Truss. Location - Ceiling w/ Attic: House	Install R-30 loose-fill insulation in attic with Standard Truss. Location - Ceiling w/ Attic: House	Caulk and Seal so that Home Air Leakage is Reduced by 60 CFM at 50 Pascals.
Install R-10 rigid board insulation Location - Exposed Floor: House	Replace existing window with U-0.22 vinyl window Location - Window/Skylight: Windwows	Replace existing window with U-0.22 vinyl window Location - Window/Skylight: Windows
Replace existing window with U-0.22 vinyl window Location - Window/Skylight	Remove existing door and install standard pre-hung U-0.16 insulated door, including hardware. Location - Exterior Door: House	Remove existing door and install standard pre-hung U-0.16 insulated door, including hardware. Location - Exterior Door: House
Remove existing door and install standard pre-hung U-0.16 insulated door, including hardware. Location - Exterior Door: House	Install R-30 rigid foam board to exterior and cover with T1-11 siding or equivalent. Location - Above-Grade Wall: House	Install R-30 rigid foam board to exterior and cover with T1-11 siding or equivalent. Location - Above-Grade Wall: House
Add R-25 rigid foam to interior or exterior of existing wall; cost does not include siding or wall coverings. Location - Above-Grade Wall: House	Install a Heat Recovery Ventilation system	Install a Heat Recovery Ventilation system
	Caulk and Seal so that Home Air Leakage is Reduced by 100 CFM at 50 Pascals.	

MATRIX C

Improvement Options Matrix lists from top to bottom improvement options in order of **priority**, assuming not all improvements will be able to be completed.

NOTE: If any outside insulation is applied or if caulking and sealing reduces air leakage, the house MUST BE VENTILATED.

House Description:	Lenord Bell	Moses Night House
Number of Similar Houses:	5	Unknown
CCHRC Ranking of Improvement Options:	Install R-30 loose-fill insulation in attic with Standard Truss. Location - Ceiling w/ Attic: House	Caulk and Seal so that Home Air Leakage is Reduced by 500 CFM at 50 Pascals. (NOTE: should only be done if HRV is fixed)
	Caulk and Seal so that Home Air Leakage is Reduced by 100 CFM at 50 Pascals.	Install R-19 loose-fill insulation in attic with Standard Truss. Location - Ceiling w/ Attic: House
	Install R-10 rigid board insulation Location - Exposed Floor: House	
	Replace existing window with U-0.22 vinyl window Location - Window/Skylight: Windwows	Replace existing window with U-0.22 vinyl window Location - Window/Skylight: Windows
	Remove existing glass and replace with triple pane, 2 low-E, argon glass. Location - Window/Skylight: House	Remove existing door and install standard pre-hung U-0.16 insulated door, including hardware. Location - Exterior Door: House
	Remove existing door and install standard pre-hung U-0.16 insulated door, including hardware. Location - Exterior Door: House	Repair Heat Recovery Ventilation system
	Install a Heat Recovery Ventilation system	Install R-14 rigid board insulation Location - Exposed Floor: House
	Install R-25 rigid foam board to exterior and cover with T1-11 siding or equivalent. Location - Above-Grade Wall: House	

Patrick Hale	Paul Moses
1	8
Caulk and Seal so that Home Air Leakage is Reduced by 100 CFM at 50 Pascals.	Install a Heat Recovery Ventilation system
Install R-30 loose-fill insulation in attic with Standard Truss. Location - Ceiling w/ Attic: House	Caulk and Seal so that Home Air Leakage is Reduced by 100 CFM at 50 Pascals.
Install R-14 rigid board insulation Location - Exposed Floor: House	Install R-30 loose-fill insulation in attic with Standard Truss. Location - Ceiling w/ Attic: House
Replace existing window with U-0.22 vinyl window Location - Window/Skylight: Windows	Install R-10 rigid board insulation Location - Exposed Floor: House
Remove existing door and install standard pre-hung U-0.16 insulated door, including hardware. Location - Exterior Door: House	Replace existing window with U-0.22 vinyl window Location - Window/Skylight: Windows
Install R-25 rigid foam board to exterior and cover with T1-11 siding or equivalent. Location - Above-Grade Wall: House	Remove existing door and install standard pre-hung U-0.16 insulated door, including hardware. Location - Exterior Door: House
Install a Heat Recovery Ventilation system	Install R-25 rigid foam board to exterior and cover with T1-11 siding or equivalent. Location - Above-Grade Wall: House

MATRIX C

Improvement Options Matrix lists from top to bottom improvement options in order of **priority**, assuming not all improvements will be able to be completed.

ı:	Sea Lion AC	Traditional Council Building
CCHRC Ranking of Improvement Options:	Install R-14 rigid board insulation Location - Exposed Floor: House	Remove existing door and install standard pre-hung U-0.16 insulated door, including hardware. Location - Exterior Door: House
	Caulk and Seal so that Home Air Leakage is Reduced by 1000 CFM at 50 Pascals.	Install R-30 rigid board insulation Location - Exposed Floor: House
	Install R-38 loose-fill insulation in attic with Energy Truss. Location - Ceiling w/ Attic: House	Install R-30 loose-fill insulation in attic with Standard Truss. Location - Ceiling w/ Attic: House
	Remove existing door and install standard pre-hung U-0.16 insulated door, including hardware. Location - Exterior Door: House	Replace existing window with U-0.22 vinyl window Location - Window/Skylight: House
	Replace existing window with U-0.22 vinyl window Location - Window/Skylight: House	Add R-10 rigid foam to interior or exterior of existing wall; cost does not include siding or wall coverings. Location - Above-Grade Wall: House
	Install R-20 rigid foam board to exterior and cover with T1-11 siding or equivalent. Location - Above-Grade Wall: House	Replace existing window with U-0.22 vinyl window Location - Window/Skylight: Windwows
	Replace existing window with U-0.22 vinyl window	Caulk and Seal so that Home Air Leakage is Reduced by 100 CFM at 50 Pascals.
		Install a Heat Recovery Ventilation system

Workforce Training

The initial goal of the Sea Lion Corporation was to have certified energy raters trained in their home community by experienced raters from AVCP RHA. This proved to be challenging for two reasons. First, AVCP RHA lost some raters due to turnover and did not have enough certified raters available during the grant period. Second, Certified Energy Rater Requirements are stringent and often call for four years of experience or study before being accepted into established programs such as the Alaska Housing Finance Corporation weatherization/rebate programs. The logistics of holding this training in a rural setting such as Hooper Bay proved to be too challenging.

However, The process of becoming Energy Assessors, and the training in the tools commonly used by both energy assessors and certified energy auditors, is attainable in this case. Trainees from Hooper Bay were instructed by certified energy auditors and by CCHRC building science staff how to conduct blower door tests, ventilation tests, mold and indoor air quality sampling, thermal imaging, and in the use of equipment relevant to those tests and procedures. The following people took part in Blower door test equipment training: George Moses, Jr., Thomas Olson, William Tinker, Paul Moses, and Jay Bell. These are the trainees that took part in energy assessments of Hooper Bay homes.

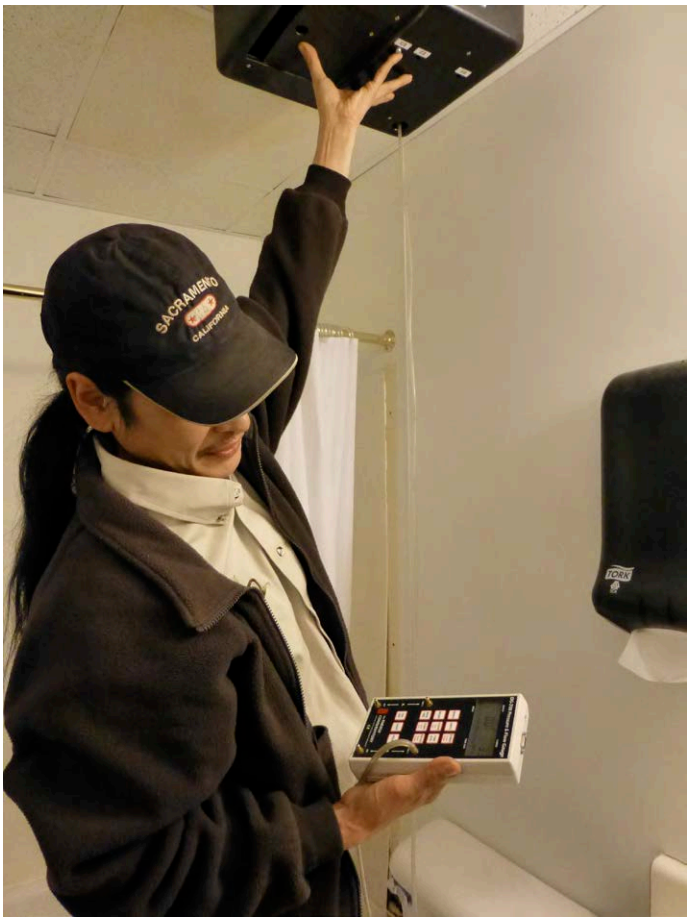
Additionally, AVCP RHA and the Alaska Works Partnership (AWP) were able to contribute by providing weatherization training for five community members. The training took place in Anchorage. a group Also went to environmental training in Anchorage: David O'Brien, Ronald Friday, Victor Murran, Henry Smith and Julius Bell.

Finally, Thomas Olson and George Moses, Jr. took part in mold sampling, ventilation testing, thermal imaging training, and a holistic assessment of homes with CCHRC staff.

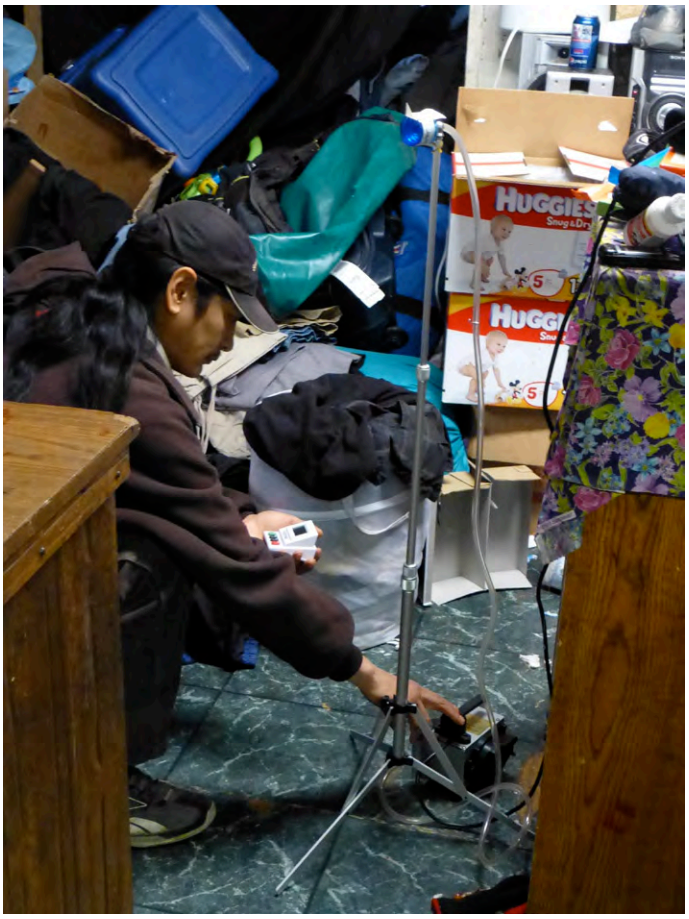
The need for local energy assessors in rural Alaska is apparent. In order to qualify for energy rebate and weatherization funding, rural communities often must import trained staff at great expense to document need in the community. Combining air fare, per diem, lodging, and billable hours, significant funds must be expended just to properly apply for existing programs. Additionally, most certified energy auditors may be unfamiliar with the physical environment, language, and culture of local inhabitants. This can lead to solutions that work on paper, but are ultimately unsuccessful in improving the performance of the home due to human factors.

In larger communities like Hooper Bay, there are enough human resources to have local energy assessors that are not only educated in building science and energy efficiency, but are also much more likely to be able to communicate those concepts to their friends and neighbors within the community in a manner that is likely to affect human behavior and awareness of key concepts. In the housing analysis of Hooper Bay, CCHRC staff noted that communication was a key factor: when the energy assessors were able to communicate building science concepts in the Yup'ik language, elder residents often became more engaged in the exchange of ideas and strategies. Sharing a culture and language are important facets of the relationship between advisor and client. In communities where the introduction of HRVs and Fresh 80's have experienced mixed success in improving indoor air quality due to occupant acceptance, local teachers can potentially play a vital role in encouraging occupant education and changing behavior.

Workforce Training



Thomas Olson performs a ventilation test at the Sea Lion Building as part of his energy assessor training.



Thomas Olson gathers air samples for mold and indoor air quality data analysis as part of his energy assessor training.

Local trainees received training in performing a blower door test. Eric Whitney of Bethel was the instructor.

George Moses, Jr. shows the images from a thermal imaging camera to a resident.

Occupant Strategies

In homes where the occupants were well-informed of the ill effects of poor ventilation in a home, residents created unique, low-cost solutions that allowed for fresh air even in the winter months. One home was supplied a humidity monitor during a former RurAL CAP weatherization effort. When the resident heard the monitor beep, he would open the fresh 80 vent and turn on the fan for a period of time, closing it when the humidity went down.

Another resident created a passive heat exhaust with an adjustable tube that could lay on the floor and exhaust the cooler air in the winter, then placed high in the home to exhaust the warmer air in the summer.

As in much of rural Alaska, a modern take on a passive vent called a 'qingok' in Northern Alaska and a chup'luk in Western Alaska was installed in some homes.

The greatest variable in the proper ventilation of a home in Hooper Bay did not depend on equipment, but on the education and behavior of the occupant.

Glen Joe Sr. House. In a prior weatherization application the family was provided with a humidity monitor that beeps at them when humidity is high, and they turn the fan on to create air exchanges.

Henrietta Naneng House. A traditional passive vent has been installed in the closet for moist stale air to exit. The building depends on make-up air from the inherent lack of airtightness in the home.

Harvey and Mary Tinker House. The resident has constructed a passive air exit vent that can be moved to the floor or higher in the home during the winter and summer, respectively. The intake air is through a Fresh 80 vent.

Conclusions

The initial goals for the project were:

(1) partnering with Association of Village Council Presidents Regional Housing Authority (AVCP RHA) in the training and hire of 2 local energy raters to conduct energy audits of twenty four (24) homes

(2) partnering with Cold Climate Housing Research Center to document current electrical and heating energy consumption and analyze data for a final feasibility report

(3) assessing the economics of electricity & heating fuel usage

(4) projecting energy savings or fossil fuel reduction by modeling of improvement scenarios and cost feasibility

(5) the development of materials lists for energy efficiency improvements; and

(6) identifying financing options for the follow-up energy efficiency implementation phase.

Steps 2, 3, and 4 were completed at the time of publication of this report. Steps 5 and 6 may begin in earnest using this document as a guide.

Step 1 proved problematic, in that certification for energy auditors is intensive and based on certain prerequisites not available to the candidates selected from the community. Additionally, it was difficult to find energy auditors to visit the community to hold training there. Most training in energy assessment takes place in the urban centers of the state.

The local energy assessor trainees selected by the community were able to receive valuable training from experienced energy auditors, building scientists and indoor air quality specialists. This training included:

(1) blower door testing

(2) thermal imaging

(3) mold sampling

(4) ventilation testing

(5) in-depth discussions with experienced professionals on strategies for improving energy efficiency and indoor air quality.

SLC has purchased a thermal imaging camera, and may purchase a blower door kit in the future. With these tools in Hooper Bay, the community will be one step closer to documenting energy usage and weatherization/retrofit needs without having to pay for expensive outside consultants.

SLC's strategy to inspect representative homes made this feasibility study applicable to a large section of the housing stock in the community. While some homes are owner-occupied and would qualify for programs such as the Alaska Housing and Finance Company (AHFC)'s energy rebate program, many others are occupied by low-income families or renters that would be unable to pay the initial cost of improvements and await reimbursement. Additionally, many of the homes in the village were models that were replicated multiple times, and can be retrofitted using similar strategies.

This feasibility study found that SLC's goal of 30% energy reduction is attainable in the majority of the homes they selected. CCHRC has quantified in this report a prioritized list of improvement scenarios towards this goal. With limited resources to improve the performance of these homes, SLC is empowered to choose the actions that would most affect energy usage.

One of the first steps in improving performance of an existing home is often air sealing and caulking. However, sealing a house requires careful attention to ventilation. Lack of proper ventilation in a sealed home replaces the problem of energy usage with a problem with indoor air quality. Hooper Bay and the Wade-Hampton Census Area of Alaska have some of the highest rates of respiratory infection in children in the nation. Weatherization and retrofit programs have been implemented in the past, but many of the ventilation systems in retrofitted homes have been disabled by the occupant. Here it becomes imperative that local energy assessors be in a position to educate their friends and neighbors in the absolute necessity of proper ventilation in their homes, while helping them formulate strategies for improving energy performance.

Next steps

This is not the first feasibility report for weatherization conducted in Hooper Bay, nor is it the first time retrofits have been implemented on existing homes in the community. In inspecting homes in the community, it was found that many of them had already been weatherized or retrofitted in some way. However, some of those retrofits proved ineffective; not due to misunderstandings in building science, but due to occupant behavior. With this in mind, the education of local energy assessors that can communicate concerns and strategies for balancing energy efficiency with indoor air quality should be a primary goal. In order for this feasibility study to be effective, it must rely on trained members of the community communicating key concepts in home operation and efficiency to their friends and neighbors, in their own language.

In selecting proper heating and ventilation systems for existing homes in the village, it is important to consider those systems that residents have found effective in monitoring both energy and indoor air quality. The residents who are educated on the importance of healthy indoor air have sometimes adopted, sometimes invented, low-cost solutions in their own homes. These solutions are important models for retrofits that are more likely to be successful in future retrofits.

The follow-up energy implementation phase of this project will consist of SLC selecting prioritized improvement scenarios and work with CCHRC or other consultants to create a materials list for implementation. This materials list can be paired with current labor costs to make a preliminary budget for energy improvements, which will allow SLC to go after funding for the project.

Appendix I

Hooper Bay Housing Survey

Sea Lion Corporation fielded a door-to-door survey of Hooper Bay households between November 2009 and March 2010; 140 households responded to the survey.

Highlights from Results

- Over 52% of homes have problems with insulation around walls and floors.
- All homes suffer from poor insulation, mold, heating issues, or a combination of these.
- Around 45-60% of homes experience heating issues in living areas and bedrooms. (Kitchens rated lower in terms of heating issues, and this could be exemplary of William's mention that families use the electric range to heat homes.)
- Approximately 61% of roofs leak.
- The majority (77%) have adequate ventilation.
- 95% of respondents pay less than $300 per month in rent or mortgage.
- Most homes (63%) heat with Toyotomi/monitor. Nearly half of homes use heat fuel instead of or in addition to the Toyo. Most (70%) of heating systems need repair.
- 100% use electric range for food preparation. A limited number use propane or wood in addition.
- Five respondents noted handicap accessibility issues to be addressed.
- 45% own their homes, 27% rent, and 29% live with family members or in AVCP housing.
- Utilities costs usually vary between $100-$800 per month. Forty-one respondents (32%) reported paying $500 or more per month in utilities.
- 39% (53 households) have more than one family living in the household.
- Eleven respondents indicated losing their home in the fire.
- Twenty-seven respondents indicated they had a severe health problem or disability - and asthma and pneumonia were common ailments.
- 86% indicated that they would be willing to participate in a "self-help" program where to help with the construction of their own homes
- The biggest barrier to housing is "No available housing" (58% of respondents). Respondents indicated that the next greatest barriers were "Income is too low" (42%) and "Lack of stable income" (30%)
- Over half of respondents, 54%, reported an annual household incomes of less than $20,000
- Thirty two respondents, 30%, reported annual household incomes of less than $10,000
- Average household size is 4.3 people. 40% of respondents (53) reported more than one family living in the household.
- **See end of document summary of greatest housing needs according to respondents**

Notes from Summary Discussion on March 12, 2010

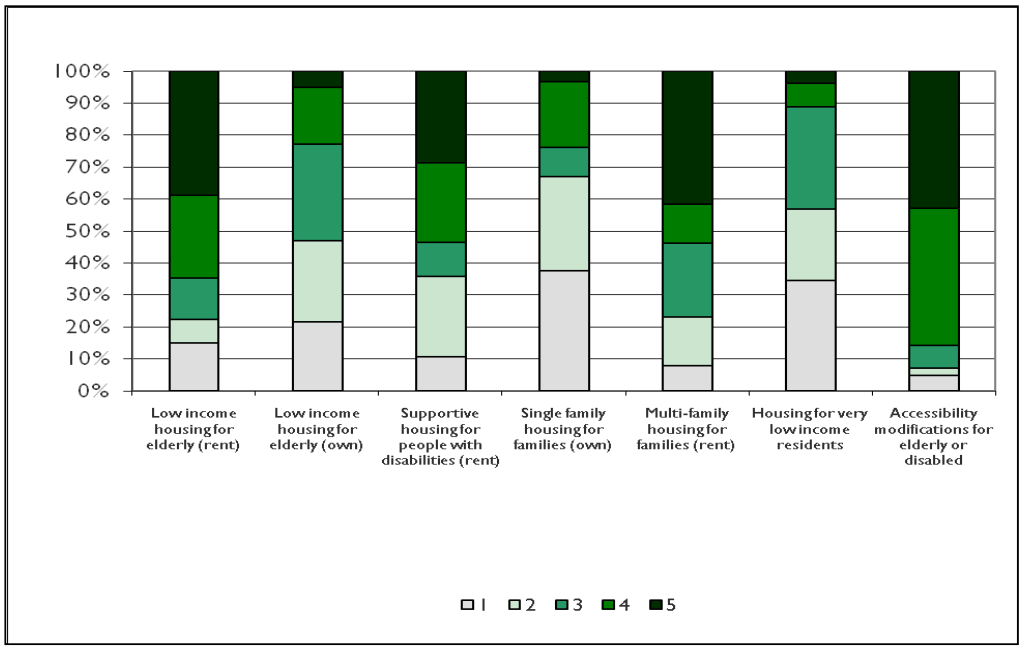
Present: William Naneng, Maria Friday, Thea Agnew Bemben, Michael Howard

- There is an ongoing issue with the tribe not being in good standing since 2002, so all project funding must go through AVCP. Sealion Corporation has an agreement with the tribe to be responsible for funds that were mismanaged. Maria has put in hours as part of that agreement.

- The tribe cannot receive funding because of the 15% tax lien
- Regarding AVCP homes: some of those living in AVCP homes have signed a contract to garnish their Permanent Fund Dividends
- Ideas:
  - In the old town site: develop housing for elders
  - In the short-term: work on weatherization for as many homes as possible, prioritize according to the biggest band for the buck
  - AVCP has expertise in weatherization and local individuals can be contracted to perform the work
  - Suggestion: do the "easy stuff" first
- Action:
  - Piggyback on AVCP weatherization work to happen in Summer 2010
  - This can begin simultaneously while working on a plan to develop elder housing
  - AVCP NAHASDA training: Maria will attend and use the chance to meet with Abe, Joseph and discuss how the village corporation can contribute and how to leverage funding with AVCP work this summer
  - Need to get clarity on how the current $182,000 (?) in stimulus funding can be used

Recommendation #1 – Short Term: Weatherization and Repair

Recommendation #2 – Long Term: Elder Housing



Respondent rankings (1-5) of most important housing needs by category.