Feasibility Assessment for Biomass Heating Systems
Clark's Point, Alaska

FINAL REPORT - 7/26/2013

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Abbreviations

ACF	Accumulated Cash Flow
ASHRAE	American Society of Heating, Refrigeration, and Air-Conditioning Engineers
AEA	Alaska Energy Authority
AFUE	Annual Fuel Utilization Efficiency
AHU	Air Handling Unit
ARCH	Architectural
B/C	Benefit / Cost Ratio
BAS	Building Automation System
BTU	British Thermal Unit
BTUH	BTU per hour
CCF	One Hundred Cubic Feet
CEI	Coffman Engineers, Inc.
CFM	Cubic Feet per Minute
CIRC	Circulation
CMU	Concrete Masonry Unit
CPVC	Clark's Point Village Council
CRAC	Computer Room Air Conditioning
CWCO	Cold Weather Cut Out
DDC	Direct Digital Control
ΔT	Delta T (Temperature Differential)
ECI	Energy Cost Index
ECM	Energy Conservation Measure
EF	Exhaust Fan
Eff	Efficiency
ELEC	Electrical
EPDM	Ethylene Propylene Diene Monomer
EUI	Energy Utilization Index
F	Fahrenheit
ft	Feet
GPM	Gallons Per Minute
HP	Horsepower
HPS	High Pressure Sodium
HVAC	Heating, Ventilating, and Air-Conditioning
IESNA	Illuminating Engineering Society of North America
in	Inch(es)
IPLC	Integrated Power and Load Circuit
IRC	Internal Revenue Code
kBTU	One Thousand BTUs
kWh	Kilowatt-Hour
LED	Light-Emitting Diode
MBH	Thousand BTUs per Hour
MECH	Mechanical
MH	Metal Halide
O&M	Operations and Maintenance
MMBTU	One Million BTUs
P	Pump
PC	Project Cost

PF	Power Factor
R	R-Value
PH	Phase
SC	Shading Coefficient
SAT	Supply Air Temperature
SF	Square Feet, Supply Fan
TEMP	Temperature
U	U-Value
V	Volts
VFD	Variable Frequency Drive
W	Watts

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I. Executive Summary

A preliminary feasibility assessment was completed to determine the technical and economic viability of biomass heating systems at five buildings in Clark's Point, Alaska. In the study, the proposed biomass system determined to be the most practical and cost effective for the Community Center, CPVC Office and City Office are high efficiency wood stoves. The proposed biomass system for the Water Treatment Plant and Clinic are Tarm Solo Plus wood boilers, located in an addition to each building.

The results of the economic evaluation for all five buildings are shown below. It was found that installing high efficiency wood stoves would be typically considered economically justified, due to the fact that the benefit to cost ratio of each project is greater than 1.0. However, installing the Tarm Solo Plus wood boilers would not be typically considered economically justified because the benefit to cost ratios are less than 1.0.

Economic Analysis Results			
Building	**Community Center**	**CPVC Office**	**Water Treatment Plant**
Proposed Biomass System	Two Blaze King Classic High Efficiency Wood Stoves	One Blaze King Classic High Efficiency Wood Stove	Tarm Solo Plus 40 Wood Boiler
Project Capital Cost	($25,774)	($12,887)	($193,754)
Simple Payback	4.3 years	4.3 years	46.3 years
Present Value of Project Benefits (20 year life)	$562,880	$281,440	$281,440
Present Value of Operating Costs (20 year life)	($397,122)	($198,732)	($149,444)
Benefit / Cost Ratio of Project (20 year life)	6.43	6.42	0.68
Net Present Value (20 year life)	$139,984	$69,821	($61,758)
Year Accumulated Cash Flow is Net Positive	First Year	First Year	First Year
Year Accumulated Cash Flow > Project Capital Cost	3.9 years	3.9 years	>20 years

Table 1.0 – Economic Analysis Results

Economic Analysis Results		
Building	**City Office**	**Clinic**
Proposed Biomass System	One Blaze King Classic High Efficiency Wood Stove	Tarm Solo Plus 30 Wood Boiler
Project Capital Cost	($12,887)	($193,754)
Simple Payback	5.9 years	46.3 years
Present Value of Project Benefits (20 year life)	$211,080	$281,440
Present Value of Operating Costs (20 year life)	($149,455)	($149,444)
Benefit / Cost Ratio of Project (20 year life)	4.78	0.68
Net Present Value (20 year life)	$48,738	($61,758)
Year Accumulated Cash Flow is Net Positive	First Year	First Year
Year Accumulated Cash Flow > Project Capital Cost	5.0 years	>20 years

Table 1.1 – Economic Analysis Results - Continued

II. Introduction

A preliminary feasibility assessment was completed to determine the technical and economic viability of biomass heating systems for five buildings in Clark's Point, AK. The study buildings include: 1) Council Community Center, 2) Clark's Point Village Council (CPVC) Office, 3) Water Treatment Plant, 4) City Office, and 6) Clinic. The first two buildings are located in the lower village and the remaining buildings are located in the upper village. The locations are shown in Figures 1 and 2.

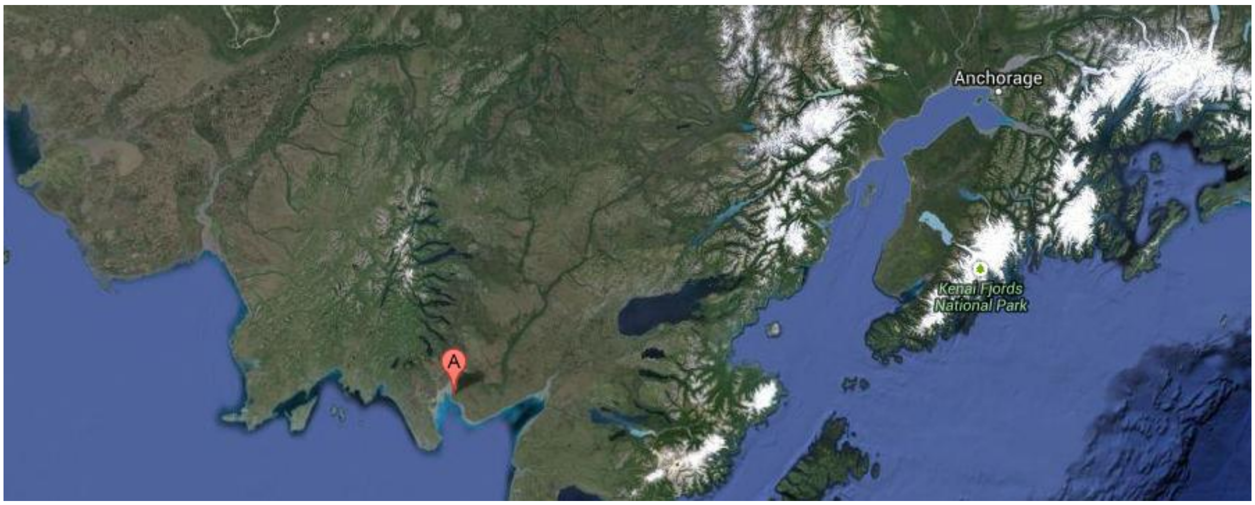


Fig. 1 – Clark's Point, Alaska – Google Maps

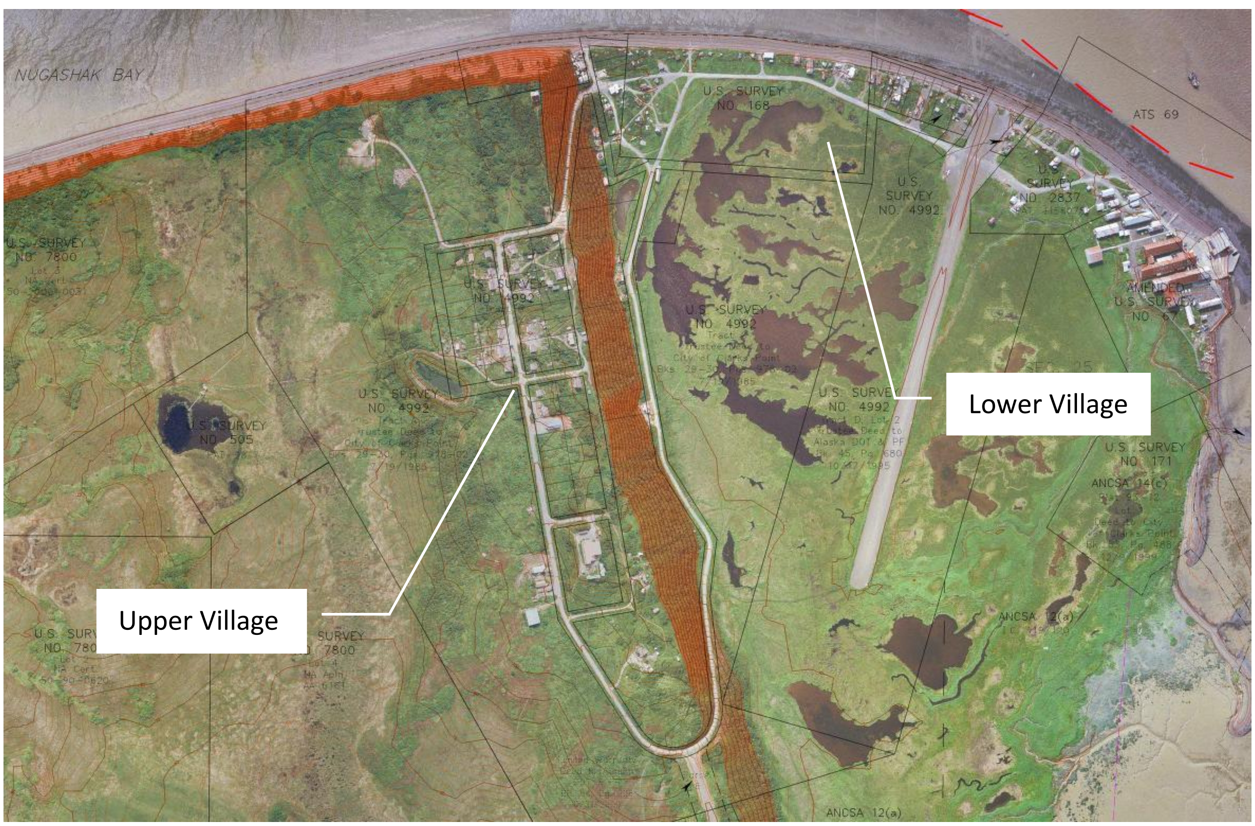


Fig. 2 – Clark's Point Upper and Lower Village – USGS

III. Preliminary Site Investigation – Community Center

Building Description

The Clark's Point Village Council Community Center is a 4,000 SF two story building, built in 1946. It has seen a variety of uses throughout its life. Currently, half of the upper floor is used as a community gathering place, approximately twice a month. The rest of the building is used as itinerant housing for commercial fishing crews in the summer, and is unheated and unoccupied the rest of the year. Its use during the winter is approximately 8 hours a month, and during the summer, it is used continuously. No energy audit has been conducted at the building.

Existing Heating System

Two heating systems are present in the building. The central boiler and existing baseboard heating is abandoned in place since the boiler system has corroded to the point where it is unusable in any form or function.

Toyo/Monitor oil-fired space heaters are present in general areas throughout the building to provide space heating. During the summer, the tenants operate the heaters as desired, but only the one in the Community Center Gathering Room is used throughout the winter. It is only used to warm up the space prior to a meeting, and otherwise the space is unheated.

A Toyostove Laser 73 (40,000 Btu/hr output) is located in Gathering Room. And there are three Monitor M-441 stoves (43,000 Btu/hr output) distributed throughout the rest of the building.

There is a large, abandoned in place, fuel tank outside the building behind the boiler room, which served the old boiler system. There are 55-gallon fuel tanks outside the wall for each Toyo/Monitor heater. Fuel is used for heating only.

Domestic Hot Water

Domestic hot water is provided with a 30-gallon electric water heater; however it is only in use in the summer. The building is drained and winterized through the off season to prevent damage to the plumbing system.

Building Envelope

The walls of the building are 2x4 wood stud construction that are estimated to have R-15 fiberglass batt insulation. The roof is a cold roof with a vented attic space, with an unknown amount and type of insulation because it could not be accessed. It is estimated that the roof insulation is R-19 fiberglass batt insulation. Most of the windows are double pane; however, 3 older windows left in the building are single pane.

Available Space

There is space inside the building for multiple residential style wood stoves, near each of the Toyo/Monitor stoves. However, an addition, modular boiler system, or new building would be needed to house any larger wood boiler type systems.

Street Access and Fuel Storage

The building is situated along a gravel road and a truck can easily access the front and sides of the building. There is adequate space around the building for a wood storage shed and/or wood boiler building. Brush may have to be removed and additional gravel may be necessary to situate any new structures.

Building or Site constraints

The site is flat, however, significant spring snowmelt pooling was observed throughout the area. Any new buildings or additions for a boiler system or wood sheds would need to be located on an elevated pad or on pile foundations to account for the wet site conditions.

Biomass System Integration

The building's abandoned hydronic system is in a serious state of disrepair and would require significant renovations to be brought into service. Installing a wood boiler system to integrate into this abandoned hydronic system would require significant costs. However, high efficiency wood stoves, used similar to the Toyo/Monitor stoves would be easily achievable.

Biomass System Options

There are two options for incorporating biomass systems into the Community Center:

1) Two high efficiency wood stoves, or
2) A high efficiency wood boiler system in a detached building.

Both systems would require a person to load and fire the wood heating systems by hand.

Two high efficiency wood stoves would be the cheapest and lowest tech option. The wood stoves would be easy to operate and would require minimal maintenance compared to a wood boiler system. The wood stoves would be used to provide a base heat load for the building during occupied times. Occupants would fire the stoves regularly to provide as much heating oil displacement as they wish. The Toyo/Monitor stove would still be used to make up for additional required heating during occupied times and as heaters when the building is unoccupied. For this study, two Blaze King Classic high efficiency wood stoves, each with an output of 48,065 BTU/hr for 12 hours, were selected as the proposed biomass system to evaluate.

The second option is a wood fired boiler system, which will be more expensive and require more maintenance than a wood stove. A wood fired boiler can be loaded and fired in batches, which heats up a large volume of water for space heating. This allows a wood fired boiler to be loaded less times throughout the day than a wood stove, which would need a higher loading frequency. The wood fired boiler system would be located in a detached boiler building or addition and heating pipes would be routed to the building. Pre-insulated heat pipes are typically installed below grade if it is in detached building a significant distance from heat load. However, due to the significant expense of integrating into the building's abandoned hydronic system, or installing a new hydronic system, and due to the fact that the building is regularly allowed to go cold during the winter, this option is not practical and was not evaluated in this study.

IV. Preliminary Site Investigation – CPVC Office

Building Description

The CPVC Office is a 1,200 SF, one story building, constructed around 1948. It is used as office space for the Clark's Point Village Council and also itinerant federal officials in Clark's Point as part of the summer fishing season. It has a large main room and two smaller ancillary rooms. The building has not had an energy audit. It is used 30 to 40 hours per week by up to 4 people.

Existing Heating System

The CPVC Office building is heated by a single Toyo stove located in the main room. There is no boiler or boiler room. The stove is a Toyo Laser 56, direct vented heating oil furnace with an output of 22,000 Btu/hr. The unit has its own controls and thermostat. Maintenance is performed as required to keep the unit operating, and it appears to be in good working order. The age of the unit is unknown. One 55 gal heating oil tank is located adjacent the exterior wall near the stove. The tank is elevated and supported by a wooden brace off of the wall. No spill containment is present around the tank and fuel in the tank is only used for heating.

Domestic Hot Water

No running water system is present in the building.

Building Envelope

The walls of the building are 2x4 wood stud construction that are estimated to have R-15 fiberglass batt insulation. The roof is a cold roof with a vented attic space, with an unknown amount and type of insulation because it could not be accessed. It is estimated that the roof insulation is R-19 fiberglass batt insulation. The windows are all double pane windows. There is an unheated arctic entry for the main entrance.

Available Space

There is space inside the building for a residential style high efficiency wood stove. There is no space for a wood boiler system in the building.

Street Access and Fuel Storage

The building is situated along a gravel road and a truck can easily access the front and sides of the building. There is adequate space around the building for a wood storage shed. Brush may have to be removed and additional gravel may be necessary to properly install the new structure.

Building or Site constraints

The site is flat, however, significant spring snowmelt pooling was observed throughout the area. Any new buildings or additions for a boiler system or wood sheds would need to be located on an elevated pad or on pile foundations to account for the wet site conditions.

Biomass System Integration

There currently is no hydronic system present in the building. Retrofitting the building to utilize a hydronic system would require significant renovations to route the piping and provide an adequate hydronic system. Also, water service would need to be provided to the building to properly operate a hydronic system, which adds additional expense. Due to these factors, a wood boiler system is not recommended for this building.

A wood stove system would be the most appropriate biomass heating system for the CPVC Office building.

Biomass System Options

The most reasonable method for incorporating biomass systems into the CPVC office is by using a residential style high efficiency wood stove. This would require a person to load and fire the stove by hand.

A small residential style wood stove is common in Clark's Point for auxiliary and back-up heating. The wood stove would be easy to operate and would require minimal maintenance compared to a wood boiler system. The wood stove would be used to provide a base heat load for the building during occupied times. Occupants would fire the stove regularly to provide as much heating oil displacement as they wish. The existing Toyo stoves would still be used to make up for additional required heating during occupied times and as heaters when the building is unoccupied. For this study, one Blaze King Classic high efficiency wood stove with an output of 48,065 BTU/hr for 12 hours, were selected as the proposed biomass system to evaluate.

V. Preliminary Site Investigation – Water Treatment Plant

Building Description

The Clark's Point Water Treatment Plant is an 800 SF single story building constructed in 1982. It is used to draw potable water out of a well, treat it, and pump it to the village.

It is only occupied when maintenance is required; however it is heated 24/7 to prevent the water system from freezing. There has been no energy audit of the building.

Existing Heating System

There are a total of four oil-fired space heaters in the building. Two stoves serve each half of the building, and are used as redundant backups to each other. The two original space heaters are Preway OVMs (56,600 Btu/hr output each) and are still functional. The newer space heaters are Monitor M-441's (40,000 BTU/hr output each). There is one each of the old and new heaters in each half of the building.

Domestic Hot Water

There is an electric instantaneous water heater providing water to a laundry sink. Otherwise, all potable water piping is to serve the Water Plant functions.

Building Envelope

The walls of the building are 2x6 wood stud construction that are estimated to have R-19 fiberglass batt insulation. The roof is a hot roof with an unknown amount and type of insulation. It is estimated that the roof insulation is R-19 fiberglass batt insulation. The windows are double pane windows. There is an unheated arctic entry for the main entrance.

Available Space

There appears to be space inside the building for a residential style wood stove. However, an addition would be needed to house a larger Garn wood boiler type system.

Street Access and Fuel Storage

The building is situated at the end of a gravel road, with a gravel pad surrounding the building. There is plenty of appropriate space around the building for additions or new boiler buildings, or wood storage sheds.

Building or Site constraints

No significant site constraints are present at the Water Plant.

Biomass System Integration

The building has no hydronic piping, boiler, or fin-tube baseboard. Thus to implement a wood fired boiler system, new hydronic piping and baseboards would need to be installed.

A residential style high efficiency wood stove could easily be installed in the building. However, due to the continuous heating requirement and low occupancy of the building, it is not practical to utilize a wood stove. Due to these factors, a wood stove was not evaluated for this building.

Biomass System Options

The only practical option for incorporating biomass systems into the Water Plant is a wood boiler system in an addition or detached building. The systems would require a person to load and fire the wood heating systems by hand.

A wood fired boiler can be loaded and fired in batches, which heats up a large volume of water for space heating. This allows a wood fired boiler to be loaded less times throughout the day then a wood stove, which would need a higher loading frequency. The wood fired boiler system would be located in an addition or detached boiler building and heating pipes would be routed to the building. Since there is no existing hydronic system, several fan coil units would need to be installed to exchange heat from the wood boiler system to the building. For this study, one Tarm Solo Plus 40 wood boiler with an output of 140,000 Btu/hr was used. The Tarm wood boiler would be located in an attached addition to the building and would house a 500 gal thermal storage tank for the boiler system. New fan coil units would deliver heat to the building from the boiler system. The Tarm system is smaller than a typical Garn system. Please refer to the General Biomass Technology Information at the end of the report for more information on the Tarm units.

VI. Preliminary Site Investigation – City Office

Building Description

The City of Clark's Point Office, or City Office, is a 900 SF one story building, constructed in approximately 1987. It is used as the office space for the Mayor of Clark's Point. The building is used from Monday to Friday each week. An addition was added to the building at some point in the last 10 years; however, it is unfinished and blocked off. The building has not had an energy audit.

Existing Heating System

The building is provided with two oil-fired furnaces; however at the time of inspection neither furnace was in working order. Significant maintenance will be required to return the furnaces to service. Comfort heating was provided with electric unit heaters.

A 640 gallon fuel tank was located immediately outside the mechanical closet, but has advanced corrosion and is of questionable reliability. Significant overhaul, and most likely replacement, would be required to return the fuel tank to proper operating conditions. The fuel was used only for heating.

Domestic Hot Water

The building is plumbed, however it was winterized due to the out-of-service furnaces. Should heating be restored, an electric instantaneous water heater provides hot water to the lavatory.

Building Envelope

The walls of the building are 2x6 wood stud construction that are estimated to have R-19 fiberglass batt insulation. The roof is a cold roof with a vented attic space, with an unknown amount and type of insulation because it could not be accessed. It is estimated that the roof insulation is R-25 fiberglass batt insulation. The windows are double pane windows. There is an unheated arctic entry for the main entrance. The building foundation is on piles and the floor of the building is not level, due to foundation settlement. It is estimated that there is R-19 fiberglass batt insulation in the floor, as this space was not accessible.

Available Space

There appears to be space inside the building for a residential style high efficiency wood stove. There is no space within the building for a wood boiler. An addition or a central boiler building would be required.

Street Access and Fuel Storage

The building is situated on a gravel road, with a gravel pad extending around the sides of the building, suitable for access by truck. An addition or a wood storage shed would best work on the sides of the building.

Building or Site constraints

No significant site constraints are present at the City Office.

Biomass System Integration

The building has no hydronic piping, boiler, or fin-tube baseboard. Thus to implement a wood fired boiler system, new hydronic piping and baseboards would need to be installed.

A residential style high efficiency wood stove could easily be installed in the building.

Biomass System Options

There are three options for incorporating biomass systems into the City Office:

1) A high efficiency wood stove,
2) A wood boiler system in a detached building, or
3) A large central plant wood boiler system that would serve the City Office, the Post Office, and the Clinic.

All systems would require a person to load and fire the wood heating systems by hand.

A small residential style wood stove is common in Clark's Point for auxiliary and back-up heating. The wood stove would be easy to operate and would require minimal maintenance compared to a wood boiler system. The wood stove would be used to provide a base heat load for the building during occupied times. Occupants would fire the stove regularly to provide as much heating oil displacement as they wish. The existing Toyo stoves would still be used to make up for additional required heating during occupied times and as heaters when the building is unoccupied. For this study, one Blaze King Classic high efficiency wood stove with an output of 48,065 BTU/hr for 12 hours was selected as the proposed biomass system to evaluate.

The second option is a wood fired boiler system, which will be more expensive and require more maintenance than a wood stove. A wood fired boiler can be loaded and fired in batches, which heats up a large volume of water for space heating. This allows a wood fired boiler to be loaded less times throughout the day then a wood stove, which would need a higher loading frequency. The wood fired boiler system would be located in a detached boiler building and heating pipes would be routed to the building, and connect to a heating coil in the existing furnace. However, due to the significant expense of integrating into the building's broken furnace system or installing a new hydronic system this option is not practical at this time and was not evaluated in this study.

The third option is a large central plant wood boiler system that could serve multiple buildings. The central plant could serve the City Office, the Post Office, and the Village Clinic. All of these buildings are within 100 yards of each other. The buildings could be connected to a buried glycol heating loop that is connected to a central wood fired boiler plant. This option would be the most expensive, but would have the biggest ability to offset heating oil consumption. However, the Clinic, Post Office, and City Office are owned by different entities, which may prove difficult to organize. A central plant system of this size and complexity would also require a maintenance staff to properly operate and maintain the system. The systems would utilize pumps, glycol, heat exchangers, boilers and a control system. Skilled maintenance personnel would be needed to operate and maintain the system. Finally, it appears that the only available land for a central plant facility would be south of the Clinic, which would be approximately 75 yards away from the City Office. This option could be viable, but would require skilled maintenance personnel and buy in from all of the building owners. This option was not evaluated in this study because it is outside the scope of the project. If this option is desired, we recommend a more detailed feasibility study. For this type of central plant, we would recommend a garn system as it has a large water storage capacity, simple operation, and stores heat for a significant amount of time (so freeze up is not an issue over a weekend or infrequent firing).

VII. Preliminary Site Investigation – Clinic

Building Description

The Clark's Point Village Clinic is a 2,000 SF single story building constructed in 2004. The building is used as a first aid and telemedicine facility, and has one regular occupant. It is kept heated 24/7. The health aide is present for a regular 40-hour work week. No energy audit has been conducted at the facility.

Existing Heating System

The building is heated with an oil-fired boiler and a hydronic system. The boiler is a Weil-McLain P-WGO-2, with an input rating of 0.7 GPH of fuel oil (75,000 But/hr Net I=B=R output). The system is well maintained and is in good working order. A 550 gallon fuel oil tank sits behind the facility and serves only the heating system. No spill containment is present around the tank and the fuel is used only for heating.

Domestic Hot Water

The domestic hot water is provided through an Amtrol WH7ZDW sidearm water heater, and is maintained in good working order. It serves lavatories, a shower/bathtub combination valve, medical and dental sinks, and a break room sink.

Building Envelope

The walls of the building are 2x8 wood stud construction that are estimated to have R-28 fiberglass batt insulation. The roof is a cold roof with a vented attic space, with an unknown amount and type of insulation because it could not be accessed. It is estimated that the roof insulation is R-40 fiberglass batt insulation. The windows are double pane windows. There is an unheated arctic entry for the main entrance. The building foundation is on piles.

Available Space

There is no available space within the building for wood fired heating appliances. An addition or standalone building would have to be constructed in order to be connected.

Street Access and Fuel Storage

The building is situated on a gravel road, with a gravel pad extending around the sides of the building, suitable for access by truck. An addition or a wood storage shed would best work on the sides of the building.

Building or Site constraints

No significant site constraints are present at the Village Clinic.

Biomass System Integration

The building utilizes hydronic baseboard heat, and integration with a wood fired boiler system would be relatively uncomplicated compared to other facilities inspected at Clark's Point.

Biomass System Options

There are two options for incorporating biomass systems into the community:

1) A wood boiler system in a detached building, or
2) A large central plant wood boiler system that would serve the City Office, the Post Office, and the Clark's Point Village Clinic. All systems would require a person to load and fire the wood heating systems by hand.

The first option is a wood fired boiler system. A wood fired boiler can be loaded and fired in batches, which heats up a large volume of water for space heating. This allows a wood fired boiler to be loaded perhaps once or twice throughout the day. The wood fired boiler system would be located in a detached boiler building and heating pipes would be routed to the building. The system would be connected to the Clinic's existing hydronic system. For this study, one Tarm Solo Plus 30 wood boiler with an output of 102,000 Btu/hr was used. The Tarm wood boiler would be located in an attached addition to the building and would house a 500 gal thermal storage tank for the boiler system. The boiler system would be connected to the existing hydronic system.

The third option is a large central plant wood boiler system that could serve multiple buildings. Please refer to the City Office section on Biomass System Options for the description of the central plant system.

VIII. Preliminary Site Investigation – Post Office

Building Description

Evaluating the Post Office was not part of the project scope. However, during the site visit, there was additional time available, and a walk through of the Post Office was completed. Per the scope, no economic analysis was completed for the post office.

The Clark's Point Post Office is a 1,000 SF single story building that was constructed in the 1980s. It is used to receive and distribute the mail to Clark's Point residents. Staff is present at the building for a period after mail flights come through, until mail has finished sorting. The postal lobby is available to the public at all hours. No energy audit has been conducted at the facility.

Existing Heating System

The building is heated primarily with an oil-fired furnace. At the time of inspection, the furnace was out of service due to lack of maintenance. A Reznor oil-fired unit heater heats the garage, but at the time of inspection it was also out of service due to lack of maintenance. Proper maintenance is not provided to the building's heating appliances to keep them in working order. The single postal office employee utilizes electric, plug-in heaters to provide comfort heat. However, due to the size of the building, the electric heaters cannot maintain appropriate building temperatures on cold days.

There is a 330 gallon fuel oil tank located behind the building within a gated, fenced enclosure, and was replaced in the last 5 years due to failure of the previous fuel oil tank. No spill containment is present around the tank and the fuel is used only for heating.

Domestic Hot Water

A point of use electric water heater is provided in the mechanical room to supply hot water to the lavatory. However, all the plumbing in the building has been drained and winterized due to the lack of heating in the building.

Building Envelope

The walls of the building are 2x6 wood stud construction that are estimated to have R-19 fiberglass batt insulation. The roof is a cold roof with a vented attic space, with an unknown amount and type of insulation because it could not be accessed. It is estimated that the roof insulation is R-25 fiberglass batt insulation. The windows are double pane windows. There is an unheated arctic entry for the main entrance. The building foundation is on piles.

Available Space

There appears to be space inside the building for a residential style wood stove. There is no space within the building for a wood boiler. An addition or a central boiler building would be required.

Street Access and Fuel Storage

The building is situated on a gravel road, with a gravel pad extending around the sides of the building, suitable for access by truck. An addition or a wood storage shed could be located on the sides of the building.

Building or Site constraints

No significant site constraints are present at the Post Office.

Biomass System Integration

The building has no hydronic piping, boiler, or fin-tube baseboard. Thus to implement a wood fired boiler system, new hydronic piping and baseboards would need to be installed.

A residential style wood stove could easily be installed in the building.

Biomass System Options

Due to the fact that the existing Post Office mechanical equipment is not maintained and dysfunctional, it does not make practical sense to install an expensive wood boiler system. A wood boiler system will require maintenance and will likely breakdown at this building due to lack of maintenance, similar to the existing mechanical equipment. Due to this factor, a wood boiler system is not appropriate for the Post Office.

The recommended biomass system option is a high efficiency wood stove. The wood stove would be easy to operate and would require minimal maintenance compared to a wood boiler system. The wood stove would be used to provide a base heat load for the building during occupied times. Occupants would fire the stove regularly to provide as much heating oil displacement as they wish. The existing electric heaters would still be used to make up for additional required heating during occupied times and when the building is unoccupied.

Another option for the Post Office would be to connect it to a central plant system. Please refer to the City Office section on Biomass System Options for the description of the central plant system.

IX. Energy Consumption and Costs

Wood Energy

The gross energy content of a cord of wood varies depending on tree species and moisture content. Black spruce, white spruce and birch at 20% moisture content have respective gross energy contents of 15.9 MMBTU/Cord, 18.1 MMBTU/cord and 23.6 MMBTU/cord, according to the UAF Cooperative Extension. Wet or greenwood has higher moisture contents and require additional heat to evaporate moisture before the wood can burn. Thus, wood with higher moisture contents will have lower energy contents. Seasoned or dry wood will typically have 20% moisture content. For this study, cord wood was estimated to have 16.0 MMBTU/cord. This is a conservative estimate based on the fact that the community has access to both spruce and birch. To determine the delivered $/MMBTU of the biomass system, a 75% efficiency for the high efficiency wood stoves and Tarm wood boilers was assumed. This is a conservative estimate based on manufacturer documentation.

Energy Costs

Clark's Point has a unique energy pricing situation due to the flat rate electricity price throughout the village. Currently, residences pay a $250/month flat rate for electricity. Electricity is not charged per kWh and a building can consume as much electricity as can be produced by the village's generators and distributed by the small electric grid. This scenario can make electricity the cheapest heating source (to the consumer, but not for utility) if the building consumes enough electricity. For example, two 3kW space heaters operating 24/7 for one month will cost approximately $16.90 per MMBTU, which is approximately 60% cheaper than heating with heating oil and 40% cheaper than heating with wood. Due to this flat rate, most residences use electric resistance heaters as their primary heat source. Toyo/Monitor stoves are used as back up heaters when the electric heaters cannot provide full heating. This unique situation should be considered when deciding to implement wood heating systems, as electricity can be the cheapest heat source to consumers in the village. In this study, all of the five buildings evaluated utilize fossil fuel as their primary heat source. Therefore, the proposed biomass system is compared to fossil fuel in this study. If the Utility/City changes the electricity payment situation to be per kWh (like most villages), electricity would most likely not be the cheapest heating source.

Fuel oil is shipped into Clark's Point by barge and currently costs $6.00/gal. For this study, the energy content of fuel oil is based on 134,000 BTU/gal, according to the UAF Cooperative Extension.

Cord wood is sold in Clark's Point for approximately $330 per cord.

The table below shows the energy comparison of different fuel types. The system efficiency is used to calculate the delivered MMBTU's of energy to the building. The delivered cost of energy to the building, in $/MMBTU, is the most accurate way to compare costs of different energy types. As shown below, cord wood is approximately half the cost of heating oil based on the $/MMBTU delivered to the building heat load.

Fuel Type	Units	Gross BTU/unit	System Efficiency	$/unit	Delivered $/MMBTU
Cord Wood	cords	16,000,000	75%	$330	$27.50
Fuel Oil	gal	134,000	80%	$6.00	$55.97
Electricity	kWh	3,413	99%	$250/month Flat Rate	Not Comparable

Table 2 – Energy Comparison

Existing Fuel Oil Consumption

Complete heating oil bills were not provided for the five Clark's Point buildings evaluated. The heating oil consumption for each building was estimated based on interviews with Mr. Mariano Floresta. The heating oil consumption for each building is shown below.

Building Name	Fuel Type	Avg. Annual Consumption	Net MMBTU/yr	Annual Fuel Cost
Community Center	Fuel Oil	4,000 gal	428.8	$24,000
CPVC Office	Fuel Oil	2,000 gal	214.4	$12,000
Water Treatment Plant	Fuel Oil	2,000 gal	214.4	$12,000
City Office	Fuel Oil	1,500 gal	160.8	$9,000
Clinic	Fuel Oil	2,000 gal	214.4	$12,000

Table 3 – Existing Fuel Oil Consumption

Biomass System Consumption

The proposed biomass system for each building is shown in the table below.

<u>High Efficiency Wood Stoves:</u> While wood stoves are capable of providing the majority of the space heat for each building, a conservative estimate of 50% heating oil offset was used for the study. Due to the fact that the buildings are not occupied constantly and that the wood stoves are hand fired, a 50% heating oil offset is a realistic estimate for this study (as wood stoves would not be used when building is unoccupied). If the building tenants wish to offset more heating oil, the wood stove can be fired on a more frequent schedule.

Building Name	Fuel Type	% Heating Source	Net MMBTU/yr	Annual Consumption	Energy Cost	Total Energy Cost
Community Center	Cord Wood	50%	214.4	17.9 cords	$5,896	$17,896
	Fuel Oil	50%	214.4	2,000 gal	$12,000	
CPVC Office	Cord Wood	50%	107.2	8.9 cords	$2,948	$8,948
	Fuel Oil	50%	107.2	1,000 gal	$6,000	
City Office	Cord Wood	50%	80.4	6.7 cords	$2,211	$6,711
	Fuel Oil	50%	80.4	750 gal	$4,500	

Table 4 – High Efficiency Wood Stove Fuel Consumption

High Efficiency Wood Boilers: For this study it is estimated that the Tarm wood boiler systems will offset 85% of heating oil consumption for the building. The remaining 15% of the heat for the building will come from the existing heating oil-fired units. Annual energy costs include wood and fuel oil costs. Since the community is on a flat electric rate, there is no additional cost for the additional electricity required to operate the Tarm boiler heating system.

Building Name	Fuel Type	% Heating Source	Net MMBTU/yr	Annual Consumption	Energy Cost	Total Energy Cost
Water Treatment Plant	Cord Wood	85%	182.2	15.2 cords	$5,012	$6,812
	Fuel Oil	15%	32.2	300 gal	$1,800	
	Electricity	N/A	N/A	2,190 kWh	$0	
Clinic	Cord Wood	85%	182.2	15.2 cords	$5,012	$6,812
	Fuel Oil	15%	32.2	300 gal	$1,800	
	Electricity	N/A	N/A	2,190 kWh	$0	

Table 5 – High Efficiency Wood Boiler Fuel Consumption

X. Preliminary Cost Estimating

An estimate of probable costs was completed for the proposed biomass system for each building. The estimate includes general conditions and overhead and profit for the general contractor. A 10% remote factor was used to account for increased shipping and installation costs in Clark's Point. Engineering design and permitting was estimated at 15% and a 10% contingency was used. Note that the material costs for the Tarm Solo Plus 30 and 40 are approximately the same, resulting in identical project capital costs for these two options.

Estimate of Probable Costs for one High Efficiency Wood Stove in Clark's Point						
Category		**Description**	**Unit**	**Unit Cost**	**Quantity**	**Cost**
High Efficiency Wood Stove		Wood Stove	Each	$2,500.00	1	$2,500
		Blower Fan	Each	$500.00	1	$500
		Stack	Each	$500.00	1	$500
					Subtotal	**$3,500**
Installation		Area Prep	hrs	$150.00	8	$1,200
		Stove and Chimney Install	hrs	$150.00	8	$1,200
		Additional Parts Allowance	Each	$1,000.00	1	$1,000
					Subtotal	**$3,400**
Shipping		600 lbs Shipping	Job	$1,500.00	1	$1,500
					Subtotal	**$1,500**
Subtotal Material and Installation Cost						**$8,400**
General Conditions	5%					$420
					Subtotal	**$8,820**
Overhead and Profit	5%					$441
					Subtotal	**$9,261**
Remote Factor	10%					$926
					Subtotal	**$10,187**
Design Fees and Permitting	15%					$1,528
					Subtotal	**$11,715**
Contingency	10%					$1,172
Total Project Cost						**$12,887**

Table 6 – Estimate of Probable Costs for one High Efficiency Wood Stove in Clark's Point

Estimate of Probable Costs for Tarm Solo Plus 30 or 40 in Clark's Point					
Category	**Description**	**Unit**	**Unit Cost**	**Quantity**	**Cost**
Site Work	NFS Fill	SF	$3.38	500	$1,690
	Site Grading	Job	$3,500.00	1	$3,500
				Subtotal	**$5,190**
Wood Boiler and Boiler Addition	Tarm Solo Unit	Job	$12,885.00	1	$12,885
	500 gal Storage Tank	each	$10,000.00	1	$10,000
	Installation	Job	$17,000.00	1	$17,000
	Boiler Addition	each	$40,000.00	1	$40,000
	Shipping	Job	$5,000.00	1	$5,000
					$84,885
Interior Mechanical & Electrical	HX, Piping & Materials	Bldg	$25,000.00	1	$25,000
				Subtotal	**$25,000**
Subtotal Material and Installation Cost					**$115,075**
General Conditions	10%				$11,508
				Subtotal	**$126,583**
Overhead and Profit	10%				$12,658
				Subtotal	**$139,241**
Remote Factor	10%				$13,924
				Subtotal	**$153,165**
Design Fees and Permitting	15%				$22,975
				Subtotal	**$176,140**
Contingency	10%				$17,614
Total Project Cost					**$193,754**

Table 7 – Estimate of Probable Costs for Tarm Solo Plus 30 or 40 in Clark's Point

XI. Economic Analysis

The following assumptions were used to complete the economic analysis for the proposed biomass systems in Clark's Point.

Inflation Rates	
Discount Rate for Net Present Value Analysis	3%
Wood Fuel Escalation Rate	3%
Fossil Fuel Escalation Rate	5%
Electricity Escalation Rate	3%
O&M Escalation Rate	2%

Table 8 – Inflation rates

The real discount rate, or minimum attractive rate of return, is 3.0% and is the current rate used for all Life Cycle Cost Analysis by the Alaska Department of Education and Early Development. This is a typical rate used for completing economic analysis for public entities in Alaska. The escalation rates used for the wood, heating oil, electricity and O&M rates are based on rates used in the Alaska Energy Authority funded 2012 biomass pre-feasibility studies. These are typical rates used for this level of evaluation and were used so that results are consistent and comparable to the 2012 studies.

O&M Costs

Non-fuel related operations and maintenance costs (O&M) were estimated at $500 and $50 per year, for the Tarm Boilers and Blaze King Classic Wood Stoves, respectively. For the first two years of service, an additional $500 and $50 per year were added to the Tarm Boilers and Blaze King Classic Wood Stoves, respectively, to account for maintenance staff getting used to operating the new system.

Definitions

There are many different economic terms used in this study. A listing of all of the terms with their definition is provided below for reference.

Economic Term	Description
Project Capital Cost	This is the opinion of probable cost for designing and constructing the project.
Simple Payback	The Simple Payback is the Project Capital Cost divided by the first year annual energy savings. The Simple Payback does not take into account escalated energy prices. $$Simple\ Payback = \frac{Installed\ Cost\ of\ ECM}{First\ Year\ Energy\ Savings\ of\ ECM}$$
Present Value of Project Benefits (20 year life)	The present value of all of the heating oil that would have been consumed by the existing heating oil-fired heating system, over a 20 year period.

Economic Term	Description
Present Value of Operating Costs (20 year life)	The present value of all of the proposed biomass systems operating costs over a 20 year period. This includes wood fuel, additional electricity, and O&M costs for the proposed biomass system to provide 85% of the building's heat. It also includes the heating oil required for the existing oil-fired boilers to provide the remaining 15% of heat to the building.
Benefit / Cost Ratio of Project (20 year life)	This is the benefit to cost ratio over the 20 year period. A project that has a benefit to cost ratio greater 1.0 is economically justified. It is defined as follows: $$Benefit\ /\ Cost\ Ratio = \frac{PV(Project\ Benefits) - PV(Operating\ Costs)}{Project\ Capital\ Cost}$$ Where: PV = The present value over the 20 year period. Reference Sullivan, Wicks and Koelling, "Engineering Economy", 14th ed., 2009, pg. 440, Modified B-C Ratio.
Net Present Value (20 year life)	This is the net present value of the project over a 20 year period. If the project has a net present value greater than zero, the project is economically justified. This quantity accounts for the project capital cost, project benefits and operating costs.
Year Accumulated Cash Flow > Project Capital Cost	This is the number of years it takes for the accumulated cash flow of the project to be greater than or equal to the project capital cost. This is similar to the project's simple payback, except that it incorporates the inflation rates. This quantity is the payback of the project including escalating energy prices and O&M rates. This quantity is calculated as follows: $$Installed\ Cost \leq \sum_{k=0}^{J} R_k$$ Where: J = Year that the accumulated cash flow is greater than or equal to the Project Capital Cost. R_k = Project Cash flow for the kth year.

Table 9 – Economic Definitions

Results

The economic analysis was completed in order to determine the simple payback, benefit to cost ratio, and net present value of the proposed biomass system at each building. The results are shown in the table below. Note that due to the fact that many of the buildings have similar heating oil consumption estimates and similar project costs, the results for the CPVC Office, Water Treatment Plant and Clinic have similar numbers.

Based on the economic analysis it was determined that high efficiency wood stoves for the Community Center, CPVC Office and City Office have benefit to cost ratios above 1.0, and would typically be considered economically justified. The driving factors that make these projects cost effective are their relatively low project capital cost, combined with the high price of heating oil. A high efficiency wood stove is much cheaper than utilizing a high efficiency wood boiler because all the necessary hydronic piping required integrating into the building and building additions are not needed.

The Tarm wood boiler systems for the Water Treatment Plant and the Clinic have benefit to cost ratios less than 1.0, and would not be typically considered economically justified at this time. This is due to relatively high project capital costs together with limited heating oil displacement. A sensitivity analysis for these two buildings is shown in the next section.

Economic Analysis Results			
Building	**Community Center**	**CPVC Office**	**Water Treatment Plant**
Proposed Biomass System	Two Blaze King Classic High Efficiency Wood Stoves	One Blaze King Classic High Efficiency Wood Stove	Tarm Solo Plus 40 Wood Boiler
Project Capital Cost	($25,774)	($12,887)	($193,754)
Simple Payback	4.3 years	4.3 years	46.3 years
Present Value of Project Benefits (20 year life)	$562,880	$281,440	$281,440
Present Value of Operating Costs (20 year life)	($397,122)	($198,732)	($149,444)
Benefit / Cost Ratio of Project (20 year life)	6.43	6.42	0.68
Net Present Value (20 year life)	$139,984	$69,821	($61,758)
Year Accumulated Cash Flow is Net Positive	First Year	First Year	First Year
Year Accumulated Cash Flow > Project Capital Cost	3.9 years	3.9 years	>20 years

Table 10 – Economic Analysis Results

Economic Analysis Results		
Building	**City Office**	**Clinic**
Proposed Biomass System	One Blaze King Classic High Efficiency Wood Stove	Tarm Solo Plus 30 Wood Boiler
Project Capital Cost	($12,887)	($193,754)
Simple Payback	5.9 years	46.3 years
Present Value of Project Benefits (20 year life)	$211,080	$281,440
Present Value of Operating Costs (20 year life)	($149,455)	($149,444)
Benefit / Cost Ratio of Project (20 year life)	4.78	0.68
Net Present Value (20 year life)	$48,738	($61,758)
Year Accumulated Cash Flow is Net Positive	First Year	First Year
Year Accumulated Cash Flow > Project Capital Cost	5.0 years	>20 years

Table 11 – Economic Analysis Results - Continued

Sensitivity Analysis

A sensitivity analysis was completed for the Tarm wood boiler systems at the Water Treatment Plant and Clinic to show how changing heating oil costs and wood costs affect the B/C ratios of these projects. As heating oil costs increase and wood costs decrease, the project becomes more economically viable. Note that results of these two buildings are identical because they have the same heating oil consumption and project capital costs.

Water Treatment Plant and Clinic B/C Ratios		Wood Cost ($/cord)		
		$264/cord	$330/cord	$396/cord
Heating Oil Cost ($/gal)	$4.80/gal	0.53	0.43	0.33
	$6.00/gal	0.78	0.68	0.58
	$7.20/gal	1.03	0.93	0.83

Table 12 – Water Treatment Plant and Clinic Analysis

XII. Forest Resource and Fuel Availability Assessments

Forest Resource Assessments

Fuel availability assessments were not available for the Clark's Point area. During the site visit it was found that the land surrounding the Clark's Point village has few trees. Wood harvesting is typically accomplished 10 to 15 miles outside of the village where the wood resource exists. There are limited roads in the village and the wood resource can only be accessed by snow machine during the winter months. It typically takes one full day by snow machine to gather a cord of wood, according to locals. Most wood currently being used by the village is for personal steam baths. Due to the effort involved with gathering wood, wood is not used heavily to supplement heating oil consumption for space heating.

Per Coffman's discussions with Mr. Will Putman with the State Forestry Service, most of the permits for wood harvesting are owned and controlled by village corporations within the state. If harvesting is to take place in these areas, permission will need to be obtained from the village corporation prior to harvesting. If more than 40 acres per year or 50 cords of wood are collected per year, the harvesting is classified as a commercial operation. For a commercial harvest, the practices outlined in the Forest Resources and Practices Act will need to be followed. The Forest Resource and Practices Act protects the water and habitat within the harvesting site and applies to state, federal, and native corporation land. If less than 40 cords of wood are used per year, the use is considered as a personal use and a commercial permit is not required.

Air Quality Permitting

Currently, air quality permitting is regulated according to the Alaska Department of Environmental Conservation Section 18 AAC 50 Air Quality Control regulations. Per these regulations, a minor air quality permit is required if a new wood boiler or wood stove produces one of the following conditions per Section 18 AAC 50.502 (C)(1): 40 tons per year (TPY) of carbon dioxide (CO2), 15 TPY of particulate matter greater than 10 microns (PM-10), 40 TPY of sulfur dioxide, 0.6 TPY of lead, 100 TPY of carbon monoxide within 10 kilometers of a carbon monoxide nonattainment area, or 10 TPY of direct PM-2.5 emissions. These regulations assume that the device will operate 24 hours per day, 365 days per year and that no fuel burning equipment is used. If a new wood boiler or wood stove is installed in addition to a fuel burning heating device, the increase in air pollutants cannot exceed the following per AAC 50.502 (C)(3): 10 TPY of PM-10, 10 TPY of sulfur dioxide, 10 TPY of nitrogen oxides, 100 TPY of carbon monoxide within 10 kilometers of a carbon monoxide nonattainment area, or 10 TPY of direct PM-2.5 emissions. Per the Wood-fired Heating Device Visible Emission Standards (Section 18 AAC 50.075), a person may not operate a wood-fired heating device in a manner that causes black smoke or visible emissions that exceed 50 percent opacity for more than 15 minutes in any hour in an area where an air quality advisory is in effect.

From Coffman's discussions with Patrick Dunn at the Alaska Department of Environmental Conservation, these regulations are focused on permitting industrial applications of wood burning equipment. In his opinion, it would be unlikely that an individual wood boiler would require an air quality permit unless several boilers were to be installed and operated at the same site. If several boilers were installed and operated together, the emissions produced could be greater than 40 tons of CO2 per year. This would require permitting per AAC 50.502 (C)(1) or (C)(3). Permitting would not be required on the residential wood fired stoves unless they violated the Wood-fired Heating Device Visible Emission Standards

(Section 18 AAC 50.075). The current similar systems installed in Alaska do not require and did not obtain air quality permits.

XIII. General Biomass Technology Information

Heating with Wood Fuel

Wood fuels are among the most cost-effective and reliable sources of heating fuel for communities adjacent to forestland when the wood fuels are processed, handled, and combusted appropriately. Compared to other heating energy fuels, such as oil and propane, wood fuels typically have lower energy density and higher associated transportation and handling costs. Due to this low bulk density, wood fuels have a shorter viable haul distance when compared to fossil fuels. This short haul distance also creates an advantage for local communities to utilize locally-sourced wood fuels, while simultaneously retaining local energy dollars.

Most villages in rural Alaska are particularly vulnerable to high energy prices due to the large number of heating degree days and expensive shipping costs. For many communities, wood-fueled heating can lower fuel costs. For example, cordwood sourced at $250 per cord is just 25% of the cost per MMBTU as #1 fuel oil sourced at $7 per gallon. In addition to the financial savings, the local communities also benefit from the multiplier effect of circulating energy dollars within the community longer, more stable energy prices, job creation, and more active forest management.

In all of the Lake and Peninsula Communities studied, the community's wood supply and demand are isolated from outside markets. The local cordwood market is influenced by land ownership, existing forest management and ecological conditions, local demand and supply, and the State of Alaska Energy Assistance program.

Types of Wood Fuel

Wood fuels are specified by energy density, moisture content, ash content, and granulometry. Each of these characteristics affects the wood fuel's handling characteristics, storage requirements, and combustion process. Higher quality fuels have lower moisture, ash, dirt, and rock contents, consistent granulometry, and higher energy density. Different types of fuel quality can be used in wood heating projects as long as the infrastructure specifications match the fuel content characteristics. Typically, lower quality fuel will be the lowest cost fuel, but it will require more expensive storage, handling, and combustion infrastructure, as well as additional maintenance.

Projects in rural Alaska must be designed around the availability of wood fuels. Some fuels can be harvested and manufactured on site, such as cordwood, woodchips, and briquettes. The economic feasibility of manufacturing on site is determined by a financial assessment of the project. Typically, larger projects offer more flexibility in terms of owning and operating the wood harvesting and manufacturing equipment, such as a wood chipper, splitter, or equipment to haul wood out of forest, than smaller projects.

Due to the limited wood fuel demand, large financial obligations and operating complexities, it is unlikely that the Lake and Peninsula communities in this study will be able to manufacture pellets. However, some communities may be able to manufacture bricks or fire logs made from pressed wood material. These products can substitute for cordwood in woodstoves and boilers, while reducing supply pressure on larger diameter trees that are generally preferred for cordwood.

High Efficiency Cord Wood Boilers

High Efficiency Low Emission (HELE) cordwood boilers are designed to burn cordwood fuel cleanly and efficiently. The boilers use cordwood that is typically seasoned to 25% moisture content (MC) or less and meet the dimensions required for loading and firing. The amount of cordwood burned by the boiler will depend on the heat load profile of the building and the utilization of the fuel oil system as back up. Three HELE cordwood boiler suppliers include Garn (www.garn.com), Greenwood (www.greenwoodusa.com) and TarmUSA (www.woodboilers.com). All three of these suppliers have units operating in Alaska. Greenwood and TarmUSA have a number of residential units operating in Alaska and have models that range between 100,000 to 300,000 BTU/hr. Garn boilers, manufactured by Dectra Corporation, are used in Tanana, Kasilof, Dot Lake, Thorne Bay, Coffman Cove and other locations to heat homes, washaterias, schools, and community buildings.

The Garn boiler has a unique construction, which is basically a wood boiler housed in a large water tank. Garn boilers come in several sizes and are appropriate for facilities using 100,000 to 1,000,000 BTUs per hour. The jacket of water surrounding the fire box absorbs heat and is piped into buildings via a heat exchanger, and then transferred to an existing building heating system, infloor radiant tubing, unit heaters, or baseboard heaters. In installations where the Garn boiler is in a detached building, there are additional heat exchangers, pumps and a glycol circulation loop that are necessary to transfer heat to the building while allowing for freeze protection. Radiant floor heating is the most efficient heating method when using wood boilers such as Garns, because they can operate using lower supply water temperatures compared to baseboards.

Garn boilers are approximately 87% efficient and store a large quantity of water. For example, the Garn WHS-2000 holds approximately 1,825 gallons of heated water. Garns also produce virtually no smoke when at full burn, because of a primary and secondary gasification (2,000 ^{o}F) burning process. Garns are manually stocked with cordwood and can be loaded multiple times a day during periods of high heating demand. Garns are simple to operate with only three moving parts: a handle, door and blower. Garns produce very little ash and require minimal maintenance. Removing ash and inspecting fans are typical maintenance requirements. Fans are used to produce a draft that increases combustion temperatures and boiler efficiency. In cold climates, Garns can be equipped with exterior insulated storage tanks for extra hot water circulating capacity. Most facilities using cordwood boilers keep existing oil-fired systems operational to provide heating backup during biomass boiler downtimes and to provide additional heat for peak heating demand periods.

Low Efficiency Cord Wood Boilers

Outdoor boilers are categorized as low-efficiency, high emission (LEHE) systems. These boiler systems are not recommended as they produce significant emission issues and do not combust wood fuels efficiently or completely, resulting in significant energy waste and pollution. These systems require significantly more wood to be purchased, handled and combusted to heat a facility as compared to a HELE system. The Alaska Department of Environmental Conservation has issued nuisance abatement orders for air pollution for outdoor wood boilers in Fairbanks. Fairbanks is ranked number four on Time Magazine's list of most air polluted cities in America. Additionally, several states have placed a moratorium on installing LEHE boilers because of air quality issues (Washington). These LEHE systems can have combustion efficiencies as low as twenty five (25%) percent and produce more than nine times the emission rate of standard industrial boilers. In comparison, Garns can operate around 87% efficiency.

High Efficiency Wood Stoves

Newer high efficiency wood stoves are available on the market that produce minimal smoke, minimal ash and require less firewood. New EPA-certified wood stoves produce significantly less smoke than older uncertified wood stoves. High efficiency wood stoves are easy to operate with minimal maintenance compared to other biomass systems. The Blaze King Classic high efficiency wood stove (www.blazeking.com) is a recommended model, due to its built-in thermostats that monitor the heat output of the stove. This stove automatically adjusts the air required for combustion. This unique technology, combined with the efficiencies of a catalytic combustor with a built-in thermostat, provides the longest burn times of any wood stove. The Blaze King stove allows for optimal combustion and less frequent loading and firing times.

Bulk Fuel Boilers

Bulk fuel boilers usually burn wood chips, sawdust, bark or pellets and are designed around the wood resources that are available from the local forests or local industry. Several large facilities in Tok, Craig, and Delta Junction (Delta Greely High School) are using bulk fuel biomass systems. Tok uses a commercial grinder to process woodchips. The chips are then dumped into a bin and are carried by a conveyor belt to the boiler. The wood fuel comes from timber scraps, local sawmills and forest thinning projects. The Delta Greely High School has a woodchip bulk fuel boiler that heats the 77,000 square foot facility. The Delta Greely system, designed by Coffman engineers, includes a completely separate boiler building which includes chip storage bunker and space for storage of tractor trailers full of chips (so handling of frozen chips could be avoided). Woodchips are stored in the concrete bunker and augers move the material on a conveyor belt to the boilers. The automated fuel handling requirements for bulk fuel systems are not cost-effective for small and medium sized structures due to higher maintenance costs and complexities. Due to these reasons, a bulk fuel boiler system is not recommended for small rural communities in Alaska with limited financial and human resources.

Grants

There are many grant opportunities for biomass work state, federal, and local for feasibility studies, design and construction. If a project if determined to be pursued, a thorough search of websites and discussions with the AEA Biomass group would be recommended to make sure no possible funding opportunities are missed. Below are some funding opportunities and existing past grants that have been awarded.

Currently, there is a funding opportunity for tribal communities that develop clean and renewable energy resources through the U.S. Department of Energy. On April 30, 2013, the Department of Energy announced up to $7 million was available to deploy clean energy projects in tribal communities to reduce reliance on fossil fuel and promote economic development on tribal lands. The Energy Department's Tribal Energy Program, in cooperation with the Office of Indian Energy, will help Native American communities, tribal energy resource development organizations, and tribal consortia to install community or facility scale clean energy projects.

http://apps1.eere.energy.gov/tribalenergy/

The Department of Energy (DOE), Alaska Native programs, focus on energy efficiency and add ocean energy into the mix. In addition the communities are eligible for up to $250,000 in energy-efficiency aid. The Native village of Kongiganak will get help strengthening its wind-energy infrastructure, increasing energy efficiency and developing "smart grid technology". Koyukuk will get help upgrading its energy infrastructure, improving energy efficiency and exploring biomass options. The village of Minto will explore all the above options as well as look for solar-energy ideas. Shishmaref, an Alaska Native village faced climate-change-induced relocation, will receive help with increasing energy sustainability and building capacity as it relocates. And the Yakutat T'lingit Tribe will also study efficiency, biomass and ocean energy. This DOE program would be a viable avenue for biomass funding.

http://energy.gov/articles/alaska-native-communities-receive-technical-assistance-local-clean-energy-development

The city of Nulato was awarded a $40,420 grant for engineering services for a wood energy project by the United States Department of Agriculture (USDA) and the United States Forest Service. Links regarding the award of the Woody Biomass Utilization Project recipients are shown below:

http://www.fs.fed.us/news/2012/releases/07/renewablewoods.shtml

http://www.usda.gov/wps/portal/usda/usdahome?contentid=2009/08/0403.xml

Delta Junction was awarded a grant for engineering from the Alaska Energy Authority from the Renewable Energy Fund for $831,203. This fund provides assistance to utilities, independent power producers, local governments, and tribal governments for feasibility studies, reconnaissance studies, energy resource monitoring, and work related to the design and construction of eligible facilities.

http://www.akenergyauthority.org/re-fund-6/4_Program_Update/FinalREFStatusAppendix2013.pdf

http://www.akenergyauthority.org/PDF%20files/PFS-BiomassProgramFactSheet.pdf

http://www.akenergyauthority.org/RenewableEnergyFund/RFA_Project_Locations_20Oct08.pdf

The Alaska Wood Energy Development Task Group (AWEDTG) consists of a coalition of federal and state agencies and not-for-profit organizations that have signed a Memorandum of Understanding (MOU) to explore opportunities to increase the utilization of wood for energy and biofuels production in Alaska. A pre-feasibility study for Aleknagik was conducted in 2012 for the AWEDTG. The preliminary costs for the biomass system(s) are $346,257 for the city hall and health center system and $439,096 for the city hall, health center, and future washeteria system.

http://www.akenergyauthority.org/biomasswoodenergygrants.html

http://www.akenergyauthority.org/BiomassWoodEnergy/Aleknagik%20Final%20Report.pdf

The Emerging Energy Technology Fund grand program provides funds to eligible applicants for demonstrations projects of technologies that have a reasonable expectation to be commercially viable within five years and that are designed to: test emerging energy technologies or methods of conserving energy, improve an existing energy technology, or deploy an existing technology that has not previously been demonstrated in Alaska.

http://www.akenergyauthority.org/EETFundGrantProgram.html

Appendix A
Site Photos

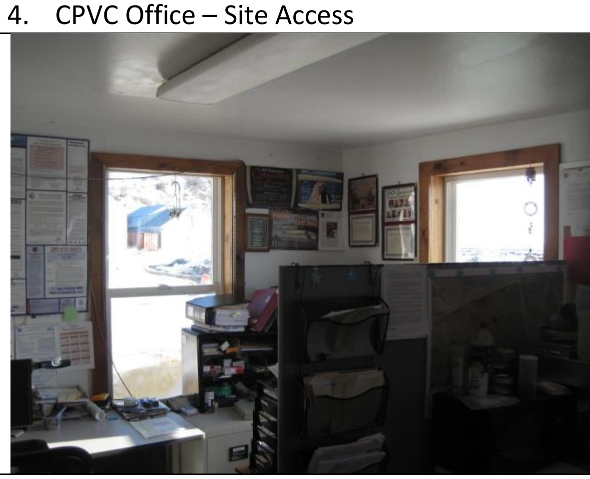
1. CPVC Office - Elevation

2. CPVC Office - Elevation

3. CPVC Office - Elevation

4. CPVC Office – Site Access

5. CPVC Office - Toyostove



6. CPVC Office - Office

	
7. Community Center - Elevation	8. Community Center - Elevation
	
9. Community Center - Elevation	10. Community Center - Elevation
	
11. Community Center - Toyostove	12. Community Center – Abandoned boiler system

	
13. Water Treatment Facility - Elevation	14. Water Treatment Facility - Elevation
	
15. Water Treatment Facility - Elevation	16. Water Treatment Facility – Heating oil furnaces
	
17. Community Building – Electric hot water heater	18. Community Building – Electric heater

19. City Office - Elevation

20. City Office - Elevation

21. City Office - Elevation

22. City Office - Site access

23. City Office – Heating oil furnace #1

24. City Office – Heating oil furnace #2

25. Post Office - Elevation

26. Post Office - Elevation

27. Post Office - Elevation

28. Post Office – Electric hot water heater

29. Post Office –Heating oil unit heater

30. Post Office –Heating oil furnace

31. Clinic – Elevation

32. Clinic – Elevation

33. Clinic – Elevation

34. Clinic – Boiler room

35. Clinic – Heating oil boiler

36. Clinic – Radiant heating manifold

Appendix B
Economic Analysis Spreadsheet

Clarks Point - City Office
Clarks Point, Alaska

Economic Analysis Results	
Project Capital Cost	($12,887)
Simple Payback = Total Project Cost / First Year Cost Savings	5.9 years
Present Value of Project Benefits (20 year life)	$211,080
Present Value of Operating Costs (20 year life)	($149,455)
Benefit / Cost Ratio of Project (20 year life)	4.78
Net Present Value (20 year life)	$48,738
Year Accumulated Cash Flow is Net Positive	First Year
Year Accumulated Cash Flow > Project Capital Cost	5.0 years

Inflation Rates	
Discount Rate for Net Present Value Analysis	3%
Wood Fuel Escalation Rate	3%
Fossil Fuel Escalation Rate	5%
Electricity Escalation Rate	3%
O&M Escalation Rate	2%

Description	Unit Cost	Heating Source Proportion	Annual Energy Units	Energy Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Existing Heating System Operating Costs																								
Existing Heating Oil Consumption	$6.00		1,500	gal	**$9,000**	**$9,450**	**$9,923**	**$10,419**	**$10,940**	**$11,487**	**$12,061**	**$12,664**	**$13,297**	**$13,962**	**$14,660**	**$15,393**	**$16,163**	**$16,971**	**$17,819**	**$18,710**	**$19,646**	**$20,628**	**$21,660**	**$22,743**
Biomass System Operating Costs																								
Wood Fuel (Delivered to site)	$330.00	50%	6.7	cord	($2,211)	($2,277)	($2,346)	($2,416)	($2,488)	($2,563)	($2,640)	($2,719)	($2,801)	($2,885)	($2,971)	($3,061)	($3,152)	($3,247)	($3,344)	($3,445)	($3,548)	($3,654)	($3,764)	($3,877)
Fossil Fuel	$6.00	50%	750	gal	($4,500)	($4,725)	($4,961)	($5,209)	($5,470)	($5,743)	($6,030)	($6,332)	($6,649)	($6,981)	($7,330)	($7,697)	($8,081)	($8,485)	($8,910)	($9,355)	($9,823)	($10,314)	($10,830)	($11,371)
Electricity	$0.00		0	kWh	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operation and Maintenance Costs					($50)	($51)	($52)	($53)	($54)	($55)	($56)	($57)	($59)	($60)	($61)	($62)	($63)	($65)	($66)	($67)	($69)	($70)	($71)	($73)
Additional Operation and Maintenance Costs for first 2 years					($50)	($51)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Operating Costs					**($6,811)**	**($7,104)**	**($7,359)**	**($7,678)**	**($8,012)**	**($8,362)**	**($8,727)**	**($9,109)**	**($9,508)**	**($9,926)**	**($10,362)**	**($10,819)**	**($11,297)**	**($11,797)**	**($12,320)**	**($12,867)**	**($13,440)**	**($14,039)**	**($14,665)**	**($15,321)**
Annual Operating Cost Savings					$2,189	$2,346	$2,564	$2,740	$2,927	$3,125	$3,334	$3,555	$3,789	$4,036	$4,298	$4,574	$4,866	$5,174	$5,499	$5,843	$6,206	$6,590	$6,994	$7,421
Accumulated Cash Flow					$2,189	$4,535	$7,098	$9,838	$12,766	$15,891	$19,225	$22,780	$26,569	$30,605	$34,903	$39,477	$44,342	$49,516	$55,016	$60,859	$67,065	$73,655	$80,649	$88,071
Net Present Value					**($10,762)**	**($8,551)**	**($6,205)**	**($3,770)**	**($1,245)**	**$1,372**	**$4,083**	**$6,889**	**$9,794**	**$12,797**	**$15,902**	**$19,110**	**$22,423**	**$25,843**	**$29,373**	**$33,015**	**$36,769**	**$40,640**	**$44,629**	**$48,738**

Clarks Point - Clinic
Clarks Point, Alaska

Economic Analysis Results	
Project Capital Cost	($193,754)
Simple Payback = Total Project Cost / First Year Cost Savings	46.3 years
Present Value of Project Benefits (20 year life)	$281,440
Present Value of Operating Costs (20 year life)	($149,444)
Benefit / Cost Ratio of Project (20 year life)	0.68
Net Present Value (20 year life)	($61,758)
Year Accumulated Cash Flow is Net Positive	First Year
Year Accumulated Cash Flow > Project Capital Cost	>20 years

Inflation Rates	
Discount Rate for Net Present Value Analysis	3%
Wood Fuel Escalation Rate	3%
Fossil Fuel Escalation Rate	5%
Electricity Escalation Rate	3%
O&M Escalation Rate	2%

Description	Unit Cost	Heating Source Proportion	Annual Energy Units	Energy Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Existing Heating System Operating Costs														
Existing Heating Oil Consumption	$6.00		2,000	gal	**$12,000**	**$12,600**	**$13,230**	**$13,892**	**$14,586**	**$15,315**	**$16,081**	**$16,885**	**$17,729**	**$18,616**
Biomass System Operating Costs														
Wood Fuel (Delivered to site)	$330.00	85%	15.2	cord	($5,016)	($5,166)	($5,321)	($5,481)	($5,646)	($5,815)	($5,989)	($6,169)	($6,354)	($6,545)
Fossil Fuel	$6.00	15%	300	gal	($1,800)	($1,890)	($1,985)	($2,084)	($2,188)	($2,297)	($2,412)	($2,533)	($2,659)	($2,792)
Electricity	$0.00		2,190	kWh	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operation and Maintenance Costs					($500)	($510)	($520)	($531)	($541)	($552)	($563)	($574)	($586)	($598)
Additional Operation and Maintenance Costs for first 2 years					($500)	($510)	$0	$0	$0	$0	$0	$0	$0	$0
Total Operating Costs					**($7,816)**	**($8,076)**	**($7,826)**	**($8,095)**	**($8,375)**	**($8,664)**	**($8,965)**	**($9,276)**	**($9,599)**	**($9,935)**
Annual Operating Cost Savings					$4,184	$4,524	$5,404	$5,796	$6,211	$6,651	$7,117	$7,609	$8,130	$8,681
Accumulated Cash Flow					$4,184	$8,708	$14,111	$19,907	$26,119	$32,770	$39,886	$47,495	$55,626	$64,307
Net Present Value					**($189,692)**	**($185,428)**	**($180,483)**	**($175,333)**	**($169,975)**	**($164,405)**	**($158,618)**	**($152,612)**	**($146,381)**	**($139,921)**

Description	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Existing Heating System Operating Costs										
Existing Heating Oil Consumption	**$19,547**	**$20,524**	**$21,550**	**$22,628**	**$23,759**	**$24,947**	**$26,194**	**$27,504**	**$28,879**	**$30,323**
Biomass System Operating Costs										
Wood Fuel (Delivered to site)	($6,741)	($6,943)	($7,152)	($7,366)	($7,587)	($7,815)	($8,049)	($8,291)	($8,539)	($8,796)
Fossil Fuel	($2,932)	($3,079)	($3,233)	($3,394)	($3,564)	($3,742)	($3,929)	($4,126)	($4,332)	($4,549)
Electricity	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operation and Maintenance Costs	($609)	($622)	($634)	($647)	($660)	($673)	($686)	($700)	($714)	($728)
Additional Operation and Maintenance Costs for first 2 years	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Operating Costs	**($10,283)**	**($10,644)**	**($11,018)**	**($11,407)**	**($11,811)**	**($12,230)**	**($12,665)**	**($13,116)**	**($13,585)**	**($14,073)**
Annual Operating Cost Savings	$9,264	$9,880	$10,532	$11,221	$11,948	$12,717	$13,530	$14,388	$15,294	$16,251
Accumulated Cash Flow	$73,571	$83,451	$93,983	$105,204	$117,152	$129,870	$143,400	$157,787	$173,081	$189,332
Net Present Value	**($133,228)**	**($126,299)**	**($119,127)**	**($111,709)**	**($104,039)**	**($96,114)**	**($87,929)**	**($79,477)**	**($70,755)**	**($61,758)**

Clarks Point - Community Center
Clarks Point, Alaska

Economic Analysis Results	
Project Capital Cost	($25,774)
Simple Payback = Total Project Cost / First Year Cost Savings	4.3 years
Present Value of Project Benefits (20 year life)	$562,880
Present Value of Operating Costs (20 year life)	($397,122)
Benefit / Cost Ratio of Project (20 year life)	6.43
Net Present Value (20 year life)	$139,984
Year Accumulated Cash Flow is Net Positive	First Year
Year Accumulated Cash Flow > Project Capital Cost	3.9 years

Inflation Rates	
Discount Rate for Net Present Value Analysis	3%
Wood Fuel Escalation Rate	3%
Fossil Fuel Escalation Rate	5%
Electricity Escalation Rate	3%
O&M Escalation Rate	2%

Description	Unit Cost	Heating Source Proportion	Annual Energy Units	Energy Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Existing Heating System Operating Costs														
Existing Heating Oil Consumption	$6.00		4,000	gal	**$24,000**	**$25,200**	**$26,460**	**$27,783**	**$29,172**	**$30,631**	**$32,162**	**$33,770**	**$35,459**	**$37,232**
Biomass System Operating Costs														
Wood Fuel (Delivered to site)	$330.00	50%	17.9	cord	($5,907)	($6,084)	($6,267)	($6,455)	($6,648)	($6,848)	($7,053)	($7,265)	($7,483)	($7,707)
Fossil Fuel	$6.00	50%	2,000	gal	($12,000)	($12,600)	($13,230)	($13,892)	($14,586)	($15,315)	($16,081)	($16,885)	($17,729)	($18,616)
Electricity	$0.00		0	kWh	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operation and Maintenance Costs					($50)	($51)	($52)	($53)	($54)	($55)	($56)	($57)	($59)	($60)
Additional Operation and Maintenance Costs for first 2 years					($50)	($51)	$0	$0	$0	$0	$0	$0	$0	$0
Total Operating Costs					**($18,007)**	**($18,786)**	**($19,549)**	**($20,399)**	**($21,289)**	**($22,218)**	**($23,191)**	**($24,208)**	**($25,271)**	**($26,383)**
Annual Operating Cost Savings					$5,993	$6,414	$6,911	$7,384	$7,884	$8,412	$8,972	$9,563	$10,188	$10,849
Accumulated Cash Flow					$5,993	$12,407	$19,318	$26,702	$34,585	$42,998	$51,969	$61,532	$71,720	$82,569
Net Present Value					**($19,956)**	**($13,910)**	**($7,585)**	**($1,025)**	**$5,776**	**$12,821**	**$20,116**	**$27,665**	**$35,473**	**$43,545**

Description	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Existing Heating System Operating Costs										
Existing Heating Oil Consumption	**$39,093**	**$41,048**	**$43,101**	**$45,256**	**$47,518**	**$49,894**	**$52,389**	**$55,008**	**$57,759**	**$60,647**
Biomass System Operating Costs										
Wood Fuel (Delivered to site)	($7,939)	($8,177)	($8,422)	($8,675)	($8,935)	($9,203)	($9,479)	($9,763)	($10,056)	($10,358)
Fossil Fuel	($19,547)	($20,524)	($21,550)	($22,628)	($23,759)	($24,947)	($26,194)	($27,504)	($28,879)	($30,323)
Electricity	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operation and Maintenance Costs	($61)	($62)	($63)	($65)	($66)	($67)	($69)	($70)	($71)	($73)
Additional Operation and Maintenance Costs for first 2 years	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Operating Costs	**($27,546)**	**($28,763)**	**($30,036)**	**($31,367)**	**($32,760)**	**($34,217)**	**($35,742)**	**($37,338)**	**($39,007)**	**($40,754)**
Annual Operating Cost Savings	$11,547	$12,285	$13,065	$13,888	$14,758	$15,677	$16,647	$17,671	$18,752	$19,893
Accumulated Cash Flow	$94,116	$106,402	$119,466	$133,355	$148,113	$163,790	$180,437	$198,108	$216,860	$236,752
Net Present Value	**$51,887**	**$60,504**	**$69,401**	**$78,583**	**$88,055**	**$97,825**	**$107,896**	**$118,276**	**$128,970**	**$139,984**

Clarks Point - CPVC Office
Clarks Point, Alaska

Economic Analysis Results	
Project Capital Cost	($12,887)
Simple Payback = Total Project Cost / First Year Cost Savings	4.3 years
Present Value of Project Benefits (20 year life)	$281,440
Present Value of Operating Costs (20 year life)	($198,732)
Benefit / Cost Ratio of Project (20 year life)	6.42
Net Present Value (20 year life)	$69,821
Year Accumulated Cash Flow is Net Positive	First Year
Year Accumulated Cash Flow > Project Capital Cost	3.9 years

Inflation Rates	
Discount Rate for Net Present Value Analysis	3%
Wood Fuel Escalation Rate	3%
Fossil Fuel Escalation Rate	5%
Electricity Escalation Rate	3%
O&M Escalation Rate	2%

Description	Unit Cost	Heating Source Proportion	Annual Energy Units	Energy Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Existing Heating System Operating Costs																								
Existing Heating Oil Consumption	$6.00		2,000	gal	**$12,000**	**$12,600**	**$13,230**	**$13,892**	**$14,586**	**$15,315**	**$16,081**	**$16,885**	**$17,729**	**$18,616**	**$19,547**	**$20,524**	**$21,550**	**$22,628**	**$23,759**	**$24,947**	**$26,194**	**$27,504**	**$28,879**	**$30,323**
Biomass System Operating Costs																								
Wood Fuel (Delivered to site)	$330.00	50%	8.9	cord	($2,937)	($3,025)	($3,116)	($3,209)	($3,306)	($3,405)	($3,507)	($3,612)	($3,721)	($3,832)	($3,947)	($4,065)	($4,187)	($4,313)	($4,442)	($4,576)	($4,713)	($4,854)	($5,000)	($5,150)
Fossil Fuel	$6.00	50%	1,000	gal	($6,000)	($6,300)	($6,615)	($6,946)	($7,293)	($7,658)	($8,041)	($8,443)	($8,865)	($9,308)	($9,773)	($10,262)	($10,775)	($11,314)	($11,880)	($12,474)	($13,097)	($13,752)	($14,440)	($15,162)
Electricity	$0.00		0	kWh	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operation and Maintenance Costs					($50)	($51)	($52)	($53)	($54)	($55)	($56)	($57)	($59)	($60)	($61)	($62)	($63)	($65)	($66)	($67)	($69)	($70)	($71)	($73)
Additional Operation and Maintenance Costs for first 2 years					($50)	($51)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Operating Costs					**($9,037)**	**($9,427)**	**($9,783)**	**($10,208)**	**($10,653)**	**($11,118)**	**($11,604)**	**($12,112)**	**($12,644)**	**($13,200)**	**($13,781)**	**($14,390)**	**($15,026)**	**($15,692)**	**($16,388)**	**($17,117)**	**($17,879)**	**($18,677)**	**($19,511)**	**($20,385)**
Annual Operating Cost Savings					$2,963	$3,173	$3,447	$3,683	$3,933	$4,198	$4,477	$4,773	$5,086	$5,416	$5,765	$6,134	$6,524	$6,936	$7,371	$7,831	$8,316	$8,828	$9,368	$9,939
Accumulated Cash Flow					$2,963	$6,136	$9,583	$13,266	$17,200	$21,397	$25,875	$30,648	$35,733	$41,149	$46,915	$53,049	$59,573	$66,510	$73,881	$81,711	$90,027	$98,854	$108,223	$118,162
Net Present Value					**($10,010)**	**($7,020)**	**($3,865)**	**($592)**	**$2,801**	**$6,316**	**$9,957**	**$13,724**	**$17,622**	**$21,652**	**$25,817**	**$30,120**	**$34,562**	**$39,148**	**$43,879**	**$48,759**	**$53,790**	**$58,975**	**$64,318**	**$69,821**

Clarks Point - Water Treatment Plant
Clarks Point, Alaska

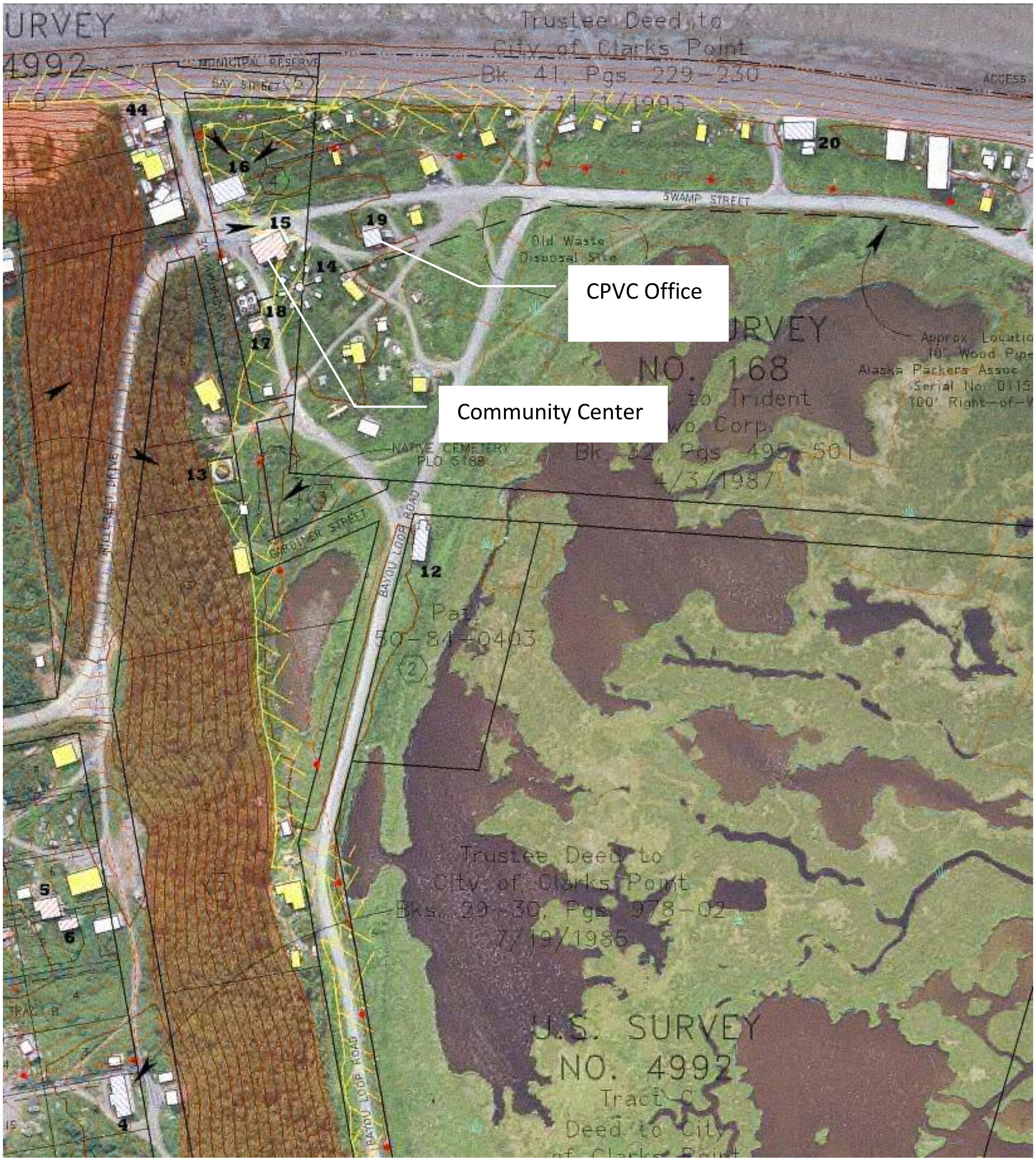
Economic Analysis Results	
Project Capital Cost	($193,754)
Simple Payback = Total Project Cost / First Year Cost Savings	46.3 years
Present Value of Project Benefits (20 year life)	$281,440
Present Value of Operating Costs (20 year life)	($149,444)
Benefit / Cost Ratio of Project (20 year life)	0.68
Net Present Value (20 year life)	($61,758)
Year Accumulated Cash Flow is Net Positive	First Year
Year Accumulated Cash Flow > Project Capital Cost	>20 years

Inflation Rates	
Discount Rate for Net Present Value Analysis	3%
Wood Fuel Escalation Rate	3%
Fossil Fuel Escalation Rate	5%
Electricity Escalation Rate	3%
O&M Escalation Rate	2%

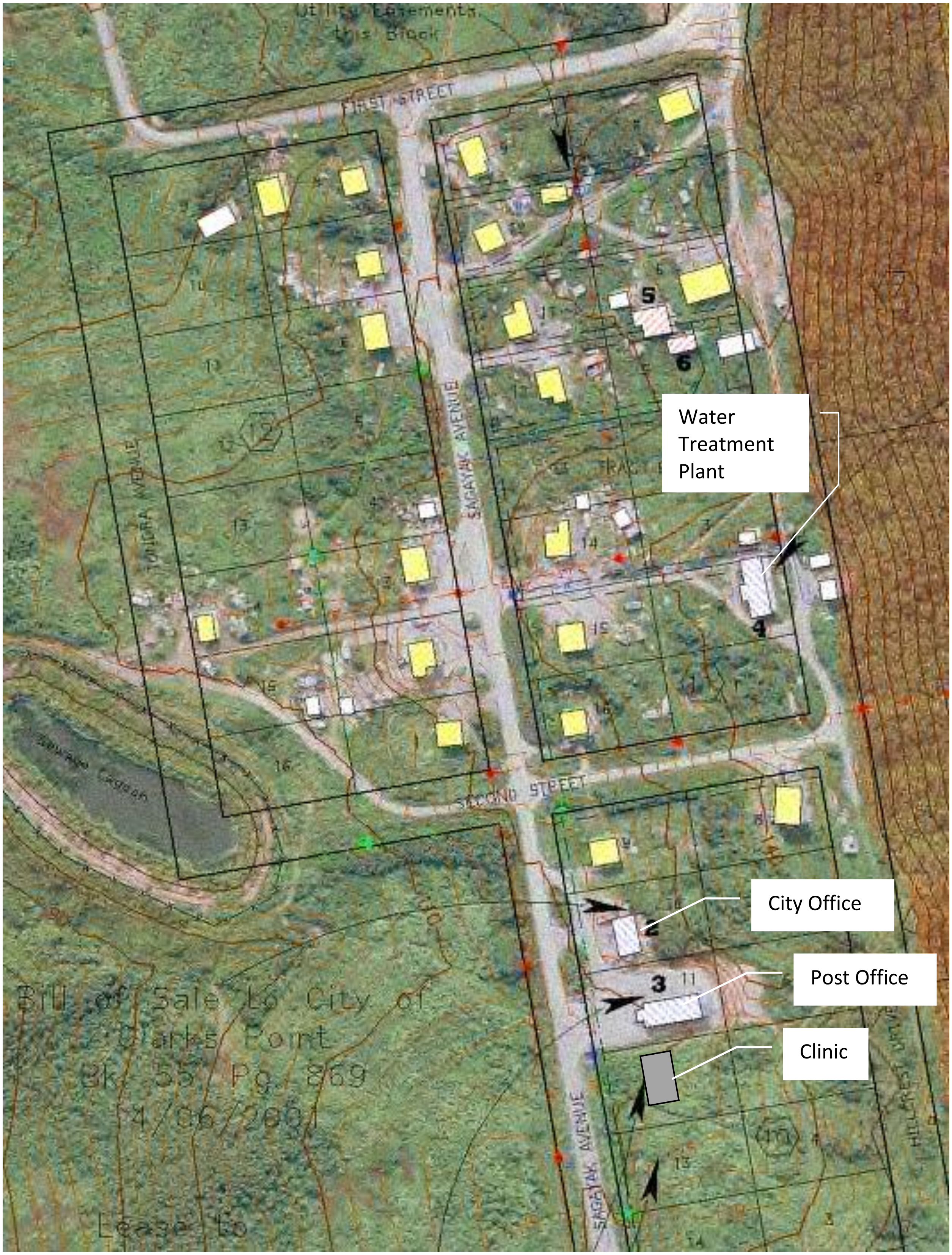
Description	Unit Cost	Heating Source Proportion	Annual Energy Units	Energy Units	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Existing Heating System Operating Costs														
Existing Heating Oil Consumption	$6.00		2,000	gal	**$12,000**	**$12,600**	**$13,230**	**$13,892**	**$14,586**	**$15,315**	**$16,081**	**$16,885**	**$17,729**	**$18,616**
Biomass System Operating Costs														
Wood Fuel (Delivered to site)	$330.00	85%	15.2	cord	($5,016)	($5,166)	($5,321)	($5,481)	($5,646)	($5,815)	($5,989)	($6,169)	($6,354)	($6,545)
Fossil Fuel	$6.00	15%	300	gal	($1,800)	($1,890)	($1,985)	($2,084)	($2,188)	($2,297)	($2,412)	($2,533)	($2,659)	($2,792)
Electricity	$0.00		2,190	kWh	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operation and Maintenance Costs					($500)	($510)	($520)	($531)	($541)	($552)	($563)	($574)	($586)	($598)
Additional Operation and Maintenance Costs for first 2 years					($500)	($510)	$0	$0	$0	$0	$0	$0	$0	$0
Total Operating Costs					**($7,816)**	**($8,076)**	**($7,826)**	**($8,095)**	**($8,375)**	**($8,664)**	**($8,965)**	**($9,276)**	**($9,599)**	**($9,935)**
Annual Operating Cost Savings					$4,184	$4,524	$5,404	$5,796	$6,211	$6,651	$7,117	$7,609	$8,130	$8,681
Accumulated Cash Flow					$4,184	$8,708	$14,111	$19,907	$26,119	$32,770	$39,886	$47,495	$55,626	$64,307
Net Present Value					**($189,692)**	**($185,428)**	**($180,483)**	**($175,333)**	**($169,975)**	**($164,405)**	**($158,618)**	**($152,612)**	**($146,381)**	**($139,921)**

Description	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Existing Heating System Operating Costs										
Existing Heating Oil Consumption	**$19,547**	**$20,524**	**$21,550**	**$22,628**	**$23,759**	**$24,947**	**$26,194**	**$27,504**	**$28,879**	**$30,323**
Biomass System Operating Costs										
Wood Fuel (Delivered to site)	($6,741)	($6,943)	($7,152)	($7,366)	($7,587)	($7,815)	($8,049)	($8,291)	($8,539)	($8,796)
Fossil Fuel	($2,932)	($3,079)	($3,233)	($3,394)	($3,564)	($3,742)	($3,929)	($4,126)	($4,332)	($4,549)
Electricity	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operation and Maintenance Costs	($609)	($622)	($634)	($647)	($660)	($673)	($686)	($700)	($714)	($728)
Additional Operation and Maintenance Costs for first 2 years	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Operating Costs	**($10,283)**	**($10,644)**	**($11,018)**	**($11,407)**	**($11,811)**	**($12,230)**	**($12,665)**	**($13,116)**	**($13,585)**	**($14,073)**
Annual Operating Cost Savings	$9,264	$9,880	$10,532	$11,221	$11,948	$12,717	$13,530	$14,388	$15,294	$16,251
Accumulated Cash Flow	$73,571	$83,451	$93,983	$105,204	$117,152	$129,870	$143,400	$157,787	$173,081	$189,332
Net Present Value	**($133,228)**	**($126,299)**	**($119,127)**	**($111,709)**	**($104,039)**	**($96,114)**	**($87,929)**	**($79,477)**	**($70,755)**	**($61,758)**

Appendix C
Site Plan



Site Plan of Clark's Point Lower Village



Site Plan of Clark's Point Upper Village

Appendix D
AWEDTG Field Data Sheet

ALASKA WOOD ENERGY DEVELOPMENT TASK GROUP (AWEDTG)

PRE-FEASIBILITY ASSESSMENT **FIELD DATA SHEET**

APPLICANT:	Clarks Point Village Council
Eligibility: (check one)	☐ Local government ☐ State agency ☐ Federal agency ☐ School/School District ☒ Federally Recognized Tribe ☐ Regional ANCSA Corp. ☐ Village ANCSA Corp. ☐ Not-for-profit organization ☐ Private Entity that can demonstrate a Public Benefit ☐ Other (describe):
Contact Name:	Mariano Floresta
Mailing Address:	PO Box 90
City:	Clarks Point
State:	AK **Zip Code:** 99 569
Office phone:	(907) 236 1479 **Cell phone:** ( )
Fax:	(907) 236 1428
Email:	florestamariano@gmail.com

Facility Identification/Name:	Clarks Point Clinic
Facility Contact Person:	Mariano Floresta
Facility Contact Telephone:	(907) 236 1479 ( )
Facility Contact Email:	florestamariano@gmail.com

SCHOOL/FACILITY INFORMATION (complete separate Field Data Sheet for each building)

SCHOOL FACILITY (Name: ______________________________)

School Type: (check all that apply)	[ ] Pre-School [ ] Elementary [ ] Middle School	[ ] Junior High [ ] High School [ ] Campus	[ ] Student Housing [ ] Pool [ ] Gymnasium	[ ] Other (describe):

Size of facility (sq. ft. heated):		Year built/age:		
Number of floors:		Year(s) renovated:		
Number of bldgs.:		Next renovation:		
# of Students:		Has en energy audit been conducted?:		If Yes, when? *

OTHER FACILITY (Name: Clarks Point Clinic **)**

Type:	[X] Health Clinic [ ] Public Safety Bldg. [ ] Community Center	[ ] Water Plant [ ] Washeteria [ ] Public Housing	[ ] Multi-Purpose Bldg [ ] District Energy System [ ] Other (list):

Size of Facility (sq. ft. heated)	2000	Year built/age:	2004
Number of floors:	1	Year(s) renovated:	
Number of bldgs.:	1	Next renovation:	
Frequency of Usage:	M-F, wkends if needed	# of Occupants	1
Has an energy audit been conducted?	No	If Yes, when? *	

* If an Energy Audit has been conducted, please provide a copy.

HEATING SYSTEM INFORMATION

CONFIGURATION (check all that apply)

- ☒ Heat plant in one location: ☒ on ground level ☐ below ground level ☐ mezzanine ☐ roof ☒ at least 1 exterior wall
- ☐ Different heating plants in different locations: How many? ______ What level(s)? ______
- ☐ Individual room-by-room heating systems (space heaters)
- ☐ Is boiler room accessible to delivery trucks? ☐ Yes ☐ No

HEAT DELIVERY (check all that apply)

- ☒ Hot water: ☒ baseboard ☐ radiant heat floor ☐ cabinet heaters ☐ air handlers ☐ radiators ☐ other: ______
- ☐ Steam: ______
- ☐ Forced/ducted air
- ☐ Electric heat: ☐ resistance ☐ boiler ☐ heat pump(s)
- ☐ Space heaters

HEAT GENERATION (check all that apply)

						Heating capacity (Btuh / kWh)	Annual Fuel Consumption	Cost
☒ Hot water boiler:	☐ natural gas	☐ propane	☐ electric	☒ #1 fuel oil	☐ #2 fuel oil	132,000 BTU/gal	2000 gal/yr	$6/gal
☐ Steam boiler:	☐ natural gas	☐ propane	☐ electric	☐ #1 fuel oil	☐ #2 fuel oil			
☐ Warm air furnace:	☐ natural gas	☐ propane	☐ electric	☐ #1 fuel oil	☐ #2 fuel oil			
☐ Electric resistance:	☐ baseboard	☐ duct coils						
☐ Heat pumps:	☐ air source	☐ ground source	☐ sea water					
☐ Space heaters:	☐ woodstove	☐ Toyo/Monitor	☐ other: ______					

TEMPERATURE CONTROLS (type of system; check all that apply)

- ☐ Thermostats on individual devices/appliances; no central control system
- ☐ Pneumatic control system Manufacturer: ______ Approx. Age: ______
- ☐ Direct digital control system Manufacturer: ______ Approx. Age: ______

8 ZONE THERMOSTATS & VALVES

Record Name Plate data for boilers (use separate sheet if necessary):

1x Weil-McLain P-WGO-2 (Series 3)

Describe locations of different parts of the heating system and what building areas are served:

Boiler serves whole building with baseboard and CUHs

Describe age and general condition of existing equipment:

9 yrs old - well maintained

Who performs boiler maintenance? persons available Describe any current maintenance issues:

Where is piping or ducting routed through the building? (tunnels, utilidors, crawlspace, above false ceiling, attic, etc.):

Through walls and above drop ceilings

Describe on-site fuel storage: Number of tanks, size of tanks, location(s) of tanks, condition, spill containment, etc.:

1 550 gal storage tank

If this fuel is also used for other purposes, please describe:

No

DOMESTIC HOT WATER

USES OF DOMESTIC HOT WATER
Check all that apply:

- ☒ Lavatories
- ☒ Kitchen
- ☒ Showers
- ☒ Laundry
- ☐ Water treatment
- ☒ Other: service sink

TYPE OF SYSTEM
Check all that apply:

- ☐ Direct-fired, single tank
- ☐ Direct fired, multiple tanks
- ☒ Indirect , using heating boiler with separate storage tank
- ☐ Hot water generator with separate storage tank
- ☐ Other: ______

What fuels are used to generate hot water? (Check all that apply): ☐ natural gas ☐ propane ☐ electric ☒ #1 fuel oil ☐ #2 fuel oil

Describe location of water heater(s): in boiler room

Describe on-site fuel storage: number of tanks, size of tanks, location(s) of tanks, condition, spill containment, etc.:

BUILDING ENVELOPE

Wall type (stick frame, masonry, SIP, etc.): Stick Insulation Value: R-28

Roof type: Metal Insulation Value: R-40

Windows: ☐ single pane ☒ double pane ☐ other: ______

Arctic entry(s): ☐ none ☒ at main entrance only ☐ at multiple entrances ☐ at all entrances

Drawings available: ☐ architectural ☐ mechanical ☐ electrical

Outside Air/Air Exchange: ☐ HRV ☐ CO_2 Sensor

ELECTRICAL

Utility company that serves the building or community: City of Clarks Point

Type of grid: ☐ building stand-alone ☒ village/community power ☐ railbelt grid

Energy source: ☐ hydropower ☒ diesel generator(s) ☐ Other: ______

Electricity rate ~~per kWh: ______ Demand charge: ______~~ $ 250/mo

Electrical energy phase(s) available: ☐ single phase ☐ 3-phase

Back-up generator on site: ☐ Yes ☒ No If Yes, provide output capacity: ______

Are there spare circuits in MDP and/or electrical panel?: ☐ Yes ☐ No

Record MDP and electrical panel name plate information:

WOOD FUEL INFORMATION

- Wood pellet cost delivered to facility $ – /ton Viable fuel source? Yes (No) NO LOCALLY AVAILABLE SUPPLY
- Wood chip cost delivered to facility $ – /ton Viable fuel source? Yes (No) NO LOCALLY AVAIL. SUPPLY
- Cord wood cost delivered to facility $ 330 /cord Viable fuel source? Yes No SEE REPORT
- Distance to nearest wood pellet and wood chip suppliers? FAIRBANKS OR JUNEAU
- Can logs or wood fuel be stockpiled on site or at a nearby facility? SEE REPORT

Who manages local forests? Village Native Corp, Regional Native Corp, State of Alaska, Forest Service, BLM, USF&WS, Other: SEE REPORT

FACILITY SITE CONSIDERATIONS

Is there good access to site for delivery vehicles (trucks, chip vans, etc)? Yes

Are there any significant site constraints? (Playgrounds, other buildings, wetlands, underground utilities, etc.)? No

What are local soil conditions? Permafrost issues? Tundra

Is the building in proximity to other buildings with biomass potential? If so, Which ones and How close? Yes CP Post office & CP City office

Can building accommodate a biomass boiler inside, or would an addition for a new boiler be necessary? Where would addition go? Addition

Where would potential boiler plant or addition utilities (water/sewer/power/etc.) come from? City

If necessary, can piping be run underground from a central plant to the building? Where would piping enter boiler room? Yes

OTHER INFORMATION

Provide any other information that will help describe the space heating and domestic hot water systems, such as

- Is heat distribution system looping or branching? looping
- For baseboard hydronic heat, what is the diameter of the copper tubing? Size of fins? Number of fins per lineal foot?
- Any other energy using systems (kitchen equipment, lab equipment, pool etc)? Fuel or energy source? No
- Any systems that could be added to the boiler system? No
- Are heating fuel records available? Yes

PICTURE / VIDEO CHECKLIST

Exterior

Main entry
Building elevations
Several near boiler room and where potential addition/wood storage and/or exterior piping may enter the building
Access road to building and to boiler room
Power poles serving building
Electrical service entry
Emergency generator

Interior

Boilers, pumps, domestic water heaters, heat exchangers – all mechanical equipment in boiler room and in other parts of the building.
Boiler room piping at boiler and around boiler room
Piping around domestic water heater
MDP and/or electrical panels in or around boiler room
Pictures of available circuits in MDP or electrical panel (open door).
Picture of circuit card of electrical panel
Picture of equipment used to heat room in the building (i.e. baseboard fin tube, unit heaters, unit ventilators, air handler, fan coil)
Pictures of any other major mechanical equipment
Pictures of equipment using fuel not part of heating or domestic hot water system (kitchen equip., lab equip., pool, etc.)
Pictures of building plans (site plan, architectural floor plan, mechanical plan, boiler room plan, electrical power plan)

Wood

How much local wood availability is there?

Difficult

Will additional wood demand cause issues?

No

Where would wood storage and wood drying occur:

we need to build a shed

Typical Wind Direction at Storage Area:

Along SW/NE

Local Wood Species (Birch, Spruce):

SEE REPORT

Moisture Content of Wood (Wet, dry, MC%):

SEE REPORT

Domestic Hot Water

Avg DHW Usage (ASHRAE Daily Avg for Office Bldg is 1.0 gal/day): 5gal/day

Logistics

How are construction materials shipped to Village (barge company):

Via barge

Is there local gravel or fill? How far away?

No

ALASKA WOOD ENERGY DEVELOPMENT TASK GROUP (AWEDTG)

PRE-FEASIBILITY ASSESSMENT **FIELD DATA SHEET**

APPLICANT:	Clarks Point Village Council
Eligibility: (check one)	☐ Local government ☐ State agency ☐ Federal agency ☐ School/School District ☒ Federally Recognized Tribe ☐ Regional ANCSA Corp. ☐ Village ANCSA Corp. ☐ Not-for-profit organization ☐ Private Entity that can demonstrate a Public Benefit ☐ Other (describe):
Contact Name:	Mariano Floresta
Mailing Address:	PO Box 90
City:	Clarks Point
State:	AK **Zip Code:** 99569
Office phone:	(907) 236 1479 **Cell phone:** ( )
Fax:	(907) 236 1428
Email:	florestamariano@gmail.com

Facility Identification/Name:	Clarks Point Village Council Community Center	
Facility Contact Person:	Mariano Floresta	
Facility Contact Telephone:	(907) 236 1479	( )
Facility Contact Email:	florestamariano@gmail.com	

SCHOOL/FACILITY INFORMATION (complete separate Field Data Sheet for each building)

SCHOOL FACILITY (Name: ______________________________)

School Type: (check all that apply)	[ ] Pre-School [ ] Elementary [ ] Middle School	[ ] Junior High [ ] High School [ ] Campus	[ ] Student Housing [ ] Pool [ ] Gymnasium	[ ] Other (describe):

Size of facility (sq. ft. heated):		Year built/age:			
Number of floors:		Year(s) renovated:			
Number of bldgs.:		Next renovation:			
# of Students:		Has en energy audit been conducted?:		If Yes, when? *	

OTHER FACILITY (Name: Clarks Point Village Council Community Center)

Type:	[ ] Health Clinic [ ] Public Safety Bldg. [ ] Community Center	[ ] Water Plant [ ] Washeteria [ ] Public Housing	[ ] Multi-Purpose Bldg [ ] District Energy System [ ] Other (list):

Size of Facility (sq. ft. heated)	4000	Year built/age:	1946
Number of floors:	2	Year(s) renovated:	≈2000?
Number of bldgs.:	1	Next renovation:	None
Frequency of Usage:	Summers 100%, Winter Occ	# of Occupants	4 to 30
Has an energy audit been conducted?	No	If Yes, when? *	

* If an Energy Audit <u>has</u> been conducted, please provide a copy.

HEATING SYSTEM INFORMATION

CONFIGURATION (check all that apply)

- ☐ Heat plant in one location: ☐ on ground level ☐ below ground level ☐ mezzanine ☐ roof ☐ at least 1 exterior wall
- ☐ Different heating plants in different locations: How many? ____________ What level(s)? ____________
- ☒ Individual room-by-room heating systems (space heaters)
- ☐ Is boiler room accessible to delivery trucks? ☐ Yes ☐ No

HEAT DELIVERY (check all that apply)

- ☐ Hot water: ☐ baseboard ☐ radiant heat floor ☐ cabinet heaters ☐ air handlers ☐ radiators ☐ other: ____________
- ☐ Steam: ____________
- ☐ Forced/ducted air
- ☐ Electric heat: ☐ resistance ☐ boiler ☐ heat pump(s)
- ☒ Space heaters

HEAT GENERATION (check all that apply)

						Heating capacity (Btuh / kWh)	Annual Fuel Consumption	Cost
☐ Hot water boiler:	☐ natural gas	☐ propane	☐ electric	☐ #1 fuel oil	☐ #2 fuel oil			
☐ Steam boiler:	☐ natural gas	☐ propane	☐ electric	☐ #1 fuel oil	☐ #2 fuel oil			
☐ Warm air furnace:	☐ natural gas	☐ propane	☐ electric	☐ #1 fuel oil	☐ #2 fuel oil			
☐ Electric resistance:	☐ baseboard	☐ duct coils						
☐ Heat pumps:	☐ air source	☐ ground source	☐ sea water					
☒ Space heaters:	☐ woodstove	☒ Toyo/Monitor	☐ other: #1			132,000 BTU/gal	480gal/yr	$6/gal

TEMPERATURE CONTROLS (type of system; check all that apply)

- ☒ Thermostats on individual devices/appliances; no central control system
- ☐ Pneumatic control system Manufacturer: ____________ Approx. Age: ________
- ☐ Direct digital control system Manufacturer: ____________ Approx. Age: ________

Record Name Plate data for boilers (use separate sheet if necessary):

4x Toyostove Laser 73 or similar

Describe locations of different parts of the heating system and what building areas are served:

Space heating

Describe age and general condition of existing equipment:

≈ 10 yrs old, well maintained

Who performs boiler maintenance? persons available Describe any current maintenance issues:

Where is piping or ducting routed through the building? (tunnels, utilidors, crawlspace, above false ceiling, attic, etc.):

Ceilings, Walls

Describe on-site fuel storage: Number of tanks, size of tanks, location(s) of tanks, condition, spill containment, etc.:

3x 55 gallon drums in use. 1x 500gal tank abandoned in place.

If this fuel is also used for other purposes, please describe:

N/A

DOMESTIC HOT WATER

USES OF DOMESTIC HOT WATER
Check all that apply:

- ☒ Lavatories x 3
- ☒ Kitchen x 2
- ☒ Showers x 1
- ☒ Laundry x 1
- ☐ Water treatment
- ☐ Other: ______

TYPE OF SYSTEM
Check all that apply:

- ☐ Direct-fired, single tank
- ☐ Direct fired, multiple tanks
- ☐ Indirect , using heating boiler with separate storage tank
- ☐ Hot water generator with separate storage tank
- ☒ Other: Electric tanked

What fuels are used to generate hot water? (Check all that apply): ☐ natural gas ☐ propane ☒ electric ☐ #1 fuel oil ☐ #2 fuel oil

Describe location of water heater(s): In basement storage room

Describe on-site fuel storage: number of tanks, size of tanks, location(s) of tanks, condition, spill containment, etc.:

N/A

BUILDING ENVELOPE

Wall type (stick frame, masonry, SIP, etc.): stick Insulation Value: R-12

Roof type: Metal Insulation Value: R-20

Windows: ☒ single pane (3) ☒ double pane (most) ☐ other: ______

Arctic entry(s): ☐ none ☒ at main entrance only ☐ at multiple entrances ☐ at all entrances

~~Drawings available: ☐ architectural ☐ mechanical ☐ electrical~~ N/A

~~Outside Air/Air Exchange: ☐ HRV ☐ CO_2 Sensor~~ N/A

ELECTRICAL

Utility company that serves the building or community: City of Clarks Point

Type of grid: ☐ building stand-alone ☒ village/community power ☐ railbelt grid

Energy source: ☐ hydropower ☒ diesel generator(s) ☐ Other: ______

Electricity rate per ~~kWh: ______ Demand charge: ______~~ $250.00/mo flat rate

Electrical energy phase(s) available: ☐ single phase ☐ 3-phase

Back-up generator on site: ☐ Yes ☐ No If Yes, provide output capacity: ______

Are there spare circuits in MDP and/or electrical panel?: ☐ Yes ☐ No

Record MDP and electrical panel name plate information:

WOOD FUEL INFORMATION

- Wood pellet cost delivered to facility $ — /ton Viable fuel source? Yes (No) NO LOCALLY AVAIL. SUPPLY
- Wood chip cost delivered to facility $ — /ton Viable fuel source? Yes (No) NO LOCALLY AVAIL. SUPPLY
- Cord wood cost delivered to facility $ 330 /cord Viable fuel source? Yes No SEE REPORT
- Distance to nearest wood pellet and wood chip suppliers? FAIRBANKS OR JUNEAU
- Can logs or wood fuel be stockpiled on site or at a nearby facility? SEE REPORT

Who manages local forests? Village Native Corp, Regional Native Corp, State of Alaska, Forest Service, BLM, USF&WS, Other: SEE REPORT, SECTION VII

FACILITY SITE CONSIDERATIONS

Is there good access to site for delivery vehicles (trucks, chip vans, etc)? Yes

Are there any significant site constraints? (Playgrounds, other buildings, wetlands, underground utilities, etc.)?
Significant spring snowmelt pools

What are local soil conditions? Permafrost issues?
tundra

Is the building in proximity to other buildings with biomass potential? If so, Which ones and How close?
yes - CPVC office

Can building accommodate a biomass boiler inside, or would an addition for a new boiler be necessary? Where would addition go?

Where would potential boiler plant or addition utilities (water/sewer/power/etc.) come from?
No water, Sewer, yes, electric, yes

If necessary, can piping be run underground from a central plant to the building? Where would piping enter boiler room?
yes

OTHER INFORMATION

Provide any other information that will help describe the space heating and domestic hot water systems, such as

- Is heat distribution system looping or branching? looping
- For baseboard hydronic heat, what is the diameter of the copper tubing? Size of fins? Number of fins per lineal foot? Abandoned in Place don't recommend reuse
- Any other energy using systems (kitchen equipment, lab equipment, pool etc)? Fuel or energy source? NO
- Any systems that could be added to the boiler system? No
- Are heating fuel records available? Yes

PICTURE / VIDEO CHECKLIST

Exterior

Main entry
Building elevations
Several near boiler room and where potential addition/wood storage and/or exterior piping may enter the building
Access road to building and to boiler room
Power poles serving building
Electrical service entry
Emergency generator

Interior

Boilers, pumps, domestic water heaters, heat exchangers – all mechanical equipment in boiler room and in other parts of the building.
Boiler room piping at boiler and around boiler room
Piping around domestic water heater
MDP and/or electrical panels in or around boiler room
Pictures of available circuits in MDP or electrical panel (open door).
Picture of circuit card of electrical panel
Picture of equipment used to heat room in the building (i.e. baseboard fin tube, unit heaters, unit ventilators, air handler, fan coil)
Pictures of any other major mechanical equipment
Pictures of equipment using fuel not part of heating or domestic hot water system (kitchen equip., lab equip., pool, etc.)
Pictures of building plans (site plan, architectural floor plan, mechanical plan, boiler room plan, electrical power plan)

Wood

How much local wood availability is there?

Difficult

Will additional wood demand cause issues?

No

Where would wood storage and wood drying occur:

we need to build a shed

Typical Wind Direction at Storage Area:

Along SW/NE

Local Wood Species (Birch, Spruce):

SEE REPORT

Moisture Content of Wood (Wet, dry, MC%):

SEE REPORT

Domestic Hot Water

Avg DHW Usage (ASHRAE Daily Avg for Office Bldg is 1.0 gal/day): 40gal/day in summer only

Logistics

How are construction materials shipped to Village (barge company):

via Barge

Is there local gravel or fill? How far away?

No

ALASKA WOOD ENERGY DEVELOPMENT TASK GROUP (AWEDTG)

PRE-FEASIBILITY ASSESSMENT **FIELD DATA SHEET**

APPLICANT:	Clarks Point Village Council
Eligibility: (check one)	☐ Local government ☐ State agency ☐ Federal agency ☐ School/School District ☒ Federally Recognized Tribe ☐ Regional ANCSA Corp. ☐ Village ANCSA Corp. ☐ Not-for-profit organization ☐ Private Entity that can demonstrate a Public Benefit ☐ Other (describe):
Contact Name:	Mariano Floresta
Mailing Address:	PO Box 90
City:	Clarks Point
State:	AK **Zip Code:** 99569
Office phone:	(907) 236 1479 **Cell phone:** ( )
Fax:	(907) 236 1428
Email:	florestamariano@gmail.com

Facility Identification/Name:	Clarks Point Village Council Office	
Facility Contact Person:	Mariano Floresta	
Facility Contact Telephone:	(907) 236 1479	( )
Facility Contact Email:	florestamariano@gmail.com	

SCHOOL/FACILITY INFORMATION (complete separate Field Data Sheet for each building)

SCHOOL FACILITY (Name: ______________________________)

School Type: (check all that apply)	[ ] Pre-School [ ] Elementary [ ] Middle School	[ ] Junior High [ ] High School [ ] Campus	[ ] Student Housing [ ] Pool [ ] Gymnasium	[ ] Other (describe):

Size of facility (sq. ft. heated):		Year built/age:		
Number of floors:		Year(s) renovated:		
Number of bldgs.:		Next renovation:		
# of Students:		Has en energy audit been conducted?:		If Yes, when? *

OTHER FACILITY (Name: Clarks Point Village Council Office)

Type:	[ ] Health Clinic [ ] Public Safety Bldg. [*] Community Center	[ ] Water Plant [ ] Washeteria [ ] Public Housing	[ ] Multi-Purpose Bldg [ ] District Energy System [X] Other (list): Council Office

Size of Facility (sq. ft. heated)	1200	Year built/age:	1948
Number of floors:	1	Year(s) renovated:	
Number of bldgs.:	1	Next renovation:	
Frequency of Usage:	M-F, some weekends	# of Occupants	4
Has an energy audit been conducted?	No	If Yes, when? *	

* If an Energy Audit has been conducted, please provide a copy.

HEATING SYSTEM INFORMATION

CONFIGURATION (check all that apply)

- ☐ Heat plant in one location: ☐ on ground level ☐ below ground level ☐ mezzanine ☐ roof ☐ at least 1 exterior wall
- ☐ Different heating plants in different locations: How many? ______ What level(s)? ______
- ☒ Individual room-by-room heating systems (space heaters)
- ☐ Is boiler room accessible to delivery trucks? ☐ Yes ☐ No

HEAT DELIVERY (check all that apply)

- ☐ Hot water: ☐ baseboard ☐ radiant heat floor ☐ cabinet heaters ☐ air handlers ☐ radiators ☐ other: ______
- ☐ Steam: ______
- ☐ Forced/ducted air
- ☐ Electric heat: ☐ resistance ☐ boiler ☐ heat pump(s)
- ☒ Space heaters

HEAT GENERATION (check all that apply)

						Heating capacity (Btuh / kWh)	Annual Fuel Consumption	Cost
☐ Hot water boiler:	☐ natural gas	☐ propane	☐ electric	☐ #1 fuel oil	☐ #2 fuel oil			
☐ Steam boiler:	☐ natural gas	☐ propane	☐ electric	☐ #1 fuel oil	☐ #2 fuel oil			
☐ Warm air furnace:	☐ natural gas	☐ propane	☐ electric	☐ #1 fuel oil	☐ #2 fuel oil			
☐ Electric resistance:	☐ baseboard	☐ duct coils						
☐ Heat pumps:	☐ air source	☐ ground source	☐ sea water					
☒ Space heaters:	☐ woodstove	☐ Toyo/Monitor	☐ other: #1			132,000 Btu/gal	2000 gal/yr	$6/gal

TEMPERATURE CONTROLS (type of system; check all that apply)

- ☒ Thermostats on individual devices/appliances; no central control system
- ☐ Pneumatic control system Manufacturer: ______ Approx. Age: ______
- ☐ Direct digital control system Manufacturer: ______ Approx. Age: ______

Record Name Plate data for boilers (use separate sheet if necessary):

1x Toyostove Laser 56

Describe locations of different parts of the heating system and what building areas are served:

In office

Describe age and general condition of existing equipment:

≈ 10 yrs old, well maintained

Who performs boiler maintenance? persons available Describe any current maintenance issues:

Where is piping or ducting routed through the building? (tunnels, utilidors, crawlspace, above false ceiling, attic, etc.):

N/A

Describe on-site fuel storage: Number of tanks, size of tanks, location(s) of tanks, condition, spill containment, etc.:

1 55gallon drum

If this fuel is also used for other purposes, please describe:

N/A

DOMESTIC HOT WATER NONE

USES OF DOMESTIC HOT WATER
Check all that apply:

- ☐ Lavatories
- ☐ Kitchen
- ☐ Showers
- ☐ Laundry
- ☐ Water treatment
- ☐ Other: ____________________

TYPE OF SYSTEM
Check all that apply:

- ☐ Direct-fired, single tank
- ☐ Direct fired, multiple tanks
- ☐ Indirect , using heating boiler with separate storage tank
- ☐ Hot water generator with separate storage tank
- ☐ Other: ____________________

What fuels are used to generate hot water? (Check all that apply): ☐ natural gas ☐ propane ☐ electric ☐ #1 fuel oil ☐ #2 fuel oil

Describe location of water heater(s): ____________________

Describe on-site fuel storage: number of tanks, size of tanks, location(s) of tanks, condition, spill containment, etc.:

BUILDING ENVELOPE

Wall type (stick frame, masonry, SIP, etc.): Stick Insulation Value: R-12

Roof type: metal Insulation Value: R-20

Windows: ☐ single pane ☒ double pane ☐ other: ____________________

Arctic entry(s): ☐ none ☒ at main entrance only ☐ at multiple entrances ☐ at all entrances

~~Drawings available: ☐ architectural ☐ mechanical ☐ electrical~~ None

~~Outside Air/Air Exchange: ☐ HRV ☐ CO_2 Sensor~~ None

ELECTRICAL

Utility company that serves the building or community: City of Clarks Point

Type of grid: ☐ building stand-alone ☒ village/community power ☐ railbelt grid

Energy source: ☐ hydropower ☒ diesel generator(s) ☐ Other: ____________________

Electricity rate ~~per kWh:~~ ________ ~~Demand charge:~~ ________ $250.00/mo

Electrical energy phase(s) available: ☐ single phase ☐ 3-phase

Back-up generator on site: ☐ Yes ☒ No If Yes, provide output capacity: ____________________

Are there spare circuits in MDP and/or electrical panel?: ☐ Yes ☐ No

Record MDP and electrical panel name plate information:

WOOD FUEL INFORMATION

- Wood pellet cost delivered to facility $ – /ton Viable fuel source? Yes (No) NO LOCALLY AVAIL SUPPLY
- Wood chip cost delivered to facility $ – /ton Viable fuel source? Yes (No) NO LOCALLY AVAIL SUPPLY
- Cord wood cost delivered to facility $ 330 /cord Viable fuel source? Yes No SEE REPORT
- Distance to nearest wood pellet and wood chip suppliers? FAIRBANKS OR JUNEAU
- Can logs or wood fuel be stockpiled on site or at a nearby facility? SEE REPORT

Who manages local forests? Village Native Corp, Regional Native Corp, State of Alaska, Forest Service, BLM, USF&WS, Other:
SEE REPORT, SECTION VII

FACILITY SITE CONSIDERATIONS

Is there good access to site for delivery vehicles (trucks, chip vans, etc)? Yes

Are there any significant site constraints? (Playgrounds, other buildings, wetlands, underground utilities, etc.)?
Significant spring snowmelt pools

What are local soil conditions? Permafrost issues?
tundra

Is the building in proximity to other buildings with biomass potential? If so, Which ones and How close?
Yes - CPVC Community Center

Can building accommodate a biomass boiler inside, or would an addition for a new boiler be necessary? Where would addition go?
Addition/Central Plant

Where would potential boiler plant or addition utilities (water/sewer/power/etc.) come from?
No water. Sewer & electric, yes

If necessary, can piping be run underground from a central plant to the building? Where would piping enter boiler room?
Yes

OTHER INFORMATION

Provide any other information that will help describe the space heating and domestic hot water systems, such as

- Is heat distribution system looping or branching? N/A
- For baseboard hydronic heat, what is the diameter of the copper tubing? Size of fins? Number of fins per lineal foot? N/A
- Any other energy using systems (kitchen equipment, lab equipment, pool etc)? Fuel or energy source? No
- Any systems that could be added to the boiler system? No
- Are heating fuel records available?
  Yes

PICTURE / VIDEO CHECKLIST

Exterior

Main entry
Building elevations
Several near boiler room and where potential addition/wood storage and/or exterior piping may enter the building
Access road to building and to boiler room
Power poles serving building
Electrical service entry
Emergency generator

Interior

Boilers, pumps, domestic water heaters, heat exchangers – all mechanical equipment in boiler room and in other parts of the building.
Boiler room piping at boiler and around boiler room
Piping around domestic water heater
MDP and/or electrical panels in or around boiler room
Pictures of available circuits in MDP or electrical panel (open door).
Picture of circuit card of electrical panel
Picture of equipment used to heat room in the building (i.e. baseboard fin tube, unit heaters, unit ventilators, air handler, fan coil)
Pictures of any other major mechanical equipment
Pictures of equipment using fuel not part of heating or domestic hot water system (kitchen equip., lab equip., pool, etc.)
Pictures of building plans (site plan, architectural floor plan, mechanical plan, boiler room plan, electrical power plan)

Wood

How much local wood availability is there?

Difficult

Will additional wood demand cause issues?

No

Where would wood storage and wood drying occur:

we need to build a shed

Typical Wind Direction at Storage Area:

Along SW/NE

Local Wood Species (Birch, Spruce):

SEE REPORT

Moisture Content of Wood (Wet, dry, MC%):

SEE REPORT

Domestic Hot Water

Avg DHW Usage (ASHRAE Daily Avg for Office Bldg is 1.0 gal/day): N/A

Logistics

How are construction materials shipped to Village (barge company):

Via Barge

Is there local gravel or fill? How far away?

No

ALASKA WOOD ENERGY DEVELOPMENT TASK GROUP (AWEDTG)

PRE-FEASIBILITY ASSESSMENT **FIELD DATA SHEET**

APPLICANT:	Clarks Point Village Council
Eligibility: (check one)	☐ Local government ☐ State agency ☐ Federal agency ☐ School/School District ☐ Federally Recognized Tribe ☐ Regional ANCSA Corp. ☐ Village ANCSA Corp. ☐ Not-for-profit organization ☐ Private Entity that can demonstrate a Public Benefit ☐ Other (describe):
Contact Name:	Mariano Floresta
Mailing Address:	PO Box 90
City:	Clarks Point
State:	AK — **Zip Code:** 99569
Office phone:	(907) 236 1479 — **Cell phone:** ( )
Fax:	(907) 236 1428
Email:	floresta.mariano@gmail.com

Facility Identification/Name:	Clarks Point City Office	
Facility Contact Person:	Mariano Floresta	
Facility Contact Telephone:	(907) 236 1479	( )
Facility Contact Email:	floresta.mariano@gmail.com	

SCHOOL/FACILITY INFORMATION (complete separate Field Data Sheet for each building)

SCHOOL FACILITY (Name: ______________________________)

School Type: (check all that apply)	[ ] Pre-School [ ] Elementary [ ] Middle School	[ ] Junior High [ ] High School [ ] Campus	[ ] Student Housing [ ] Pool [ ] Gymnasium	[ ] Other (describe):
Size of facility (sq. ft. heated):		Year built/age:		
Number of floors:		Year(s) renovated:		
Number of bldgs.:		Next renovation:		
# of Students:		Has en energy audit been conducted?:		If Yes, when? *

OTHER FACILITY (Name: City of Clarks Point Office **)**

Type:	[ ] Health Clinic [ ] Public Safety Bldg. [ ] Community Center	[ ] Water Plant [ ] Washeteria [ ] Public Housing	[ ] Multi-Purpose Bldg [ ] District Energy System [X] Other (list): City office
Size of Facility (sq. ft. heated)	400	Year built/age:	1983
Number of floors:	1	Year(s) renovated:	
Number of bldgs.:	1	Next renovation:	
Frequency of Usage:	M-F	# of Occupants	1
Has an energy audit been conducted?	No	If Yes, when? *	

* If an Energy Audit has been conducted, please provide a copy.

HEATING SYSTEM INFORMATION

CONFIGURATION (check all that apply)

☒ Heat plant in one location: ☒ on ground level ☐ below ground level ☐ mezzanine ☐ roof ☒ at least 1 exterior wall

☐ Different heating plants in different locations: How many? ____________ What level(s)? ______________

☐ Individual room-by-room heating systems (space heaters)

☐ Is boiler room accessible to delivery trucks? ☐ Yes ☐ No

HEAT DELIVERY (check all that apply)

☐ Hot water: ☐ baseboard ☐ radiant heat floor ☐ cabinet heaters ☐ air handlers ☐ radiators ☐ other: ____________

☐ Steam: ______________________________

☒ Forced/ducted air

☐ Electric heat: ☐ resistance ☐ boiler ☐ heat pump(s)

☐ Space heaters

HEAT GENERATION (check all that apply)

						Heating capacity (Btuh / kWh)	Annual Fuel Consumption	Cost
☐ Hot water boiler:	☐ natural gas	☐ propane	☐ electric	☐ #1 fuel oil	☐ #2 fuel oil			
☐ Steam boiler:	☐ natural gas	☐ propane	☐ electric	☐ #1 fuel oil	☐ #2 fuel oil			
☒ Warm air furnace:	☐ natural gas	☐ propane	☐ electric	☒ #1 fuel oil	☐ #2 fuel oil	132000 BTU/gal	1500 gal/yr	$6/gal
☐ Electric resistance:	☐ baseboard	☐ duct coils						
☐ Heat pumps:	☐ air source	☐ ground source	☐ sea water					
☐ Space heaters:	☐ woodstove	☐ Toyo/Monitor	☐ other: ________					

TEMPERATURE CONTROLS (type of system; check all that apply)

☐ Thermostats on individual devices/appliances; no central control system

☐ Pneumatic control system Manufacturer: ______________ Approx. Age: ________

☐ Direct digital control system Manufacturer: ______________ Approx. Age: ________

x zone thermostat

Record Name Plate data for boilers (use separate sheet if necessary):

2x York P/UF D12F055 01A furnaces

Describe locations of different parts of the heating system and what building areas are served:

Two furnaces serve whole building

Describe age and general condition of existing equipment:

Old, not functioning, requires overhaul

Who performs boiler maintenance? persons available Describe any current maintenance issues:

Where is piping or ducting routed through the building? (tunnels, utilidors, crawlspace, above false ceiling, attic, etc.):

Ducts through ceiling

Describe on-site fuel storage: Number of tanks, size of tanks, location(s) of tanks, condition, spill containment, etc.:

1x 640 gal fuel tank, Requires replacement/overhaul

If this fuel is also used for other purposes, please describe:

N/A

DOMESTIC HOT WATER

USES OF DOMESTIC HOT WATER
Check all that apply:

- ☒ Lavatories
- ☐ Kitchen
- ☐ Showers
- ☐ Laundry
- ☐ Water treatment
- ☐ Other: ____________

TYPE OF SYSTEM
Check all that apply:

- ☐ Direct-fired, single tank
- ☐ Direct fired, multiple tanks
- ☐ Indirect , using heating boiler with separate storage tank
- ☐ Hot water generator with separate storage tank
- ☐ Other: ____________

x instant electric

What fuels are used to generate hot water? (Check all that apply): ☐ natural gas ☐ propane ☒ electric ☐ #1 fuel oil ☐ #2 fuel oil

Describe location of water heater(s): under lavatory

Describe on-site fuel storage: number of tanks, size of tanks, location(s) of tanks, condition, spill containment, etc.:

BUILDING ENVELOPE

Wall type (stick frame, masonry, SIP, etc.): Stick Insulation Value: R-20

Roof type: metal Insulation Value: R-30

Windows: ☐ single pane ☒ double pane ☐ other: ____________

Arctic entry(s): ☐ none ☒ at main entrance only ☐ at multiple entrances ☐ at all entrances

~~Drawings available: ☐ architectural ☐ mechanical ☐ electrical~~

~~Outside Air/Air Exchange: ☐ HRV ☐ CO_2 Sensor~~

ELECTRICAL

Utility company that serves the building or community: City of Clarks Point

Type of grid: ☐ building stand-alone ☒ village/community power ☐ railbelt grid

Energy source: ☐ hydropower ☒ diesel generator(s) ☐ Other: ____________

Electricity rate ~~per kWh~~: ________ ~~Demand charge~~: ________ $250/month

Electrical energy phase(s) available: ☐ single phase ☐ 3-phase

Back-up generator on site: ☐ Yes ☒ No If Yes, provide output capacity: ____________

Are there spare circuits in MDP and/or electrical panel?: ☐ Yes ☐ No

Record MDP and electrical panel name plate information:

WOOD FUEL INFORMATION

- Wood pellet cost delivered to facility $ — /ton Viable fuel source? Yes (No) NO LOCALLY AVAIL. SUPPLY
- Wood chip cost delivered to facility $ — /ton Viable fuel source? Yes (No) NO LOCALLY AVAIL. SUPPLY
- Cord wood cost delivered to facility $ 330 /cord Viable fuel source? Yes No SEE REPORT
- Distance to nearest wood pellet and wood chip suppliers? FAIRBANKS OR SUNCHU
- Can logs or wood fuel be stockpiled on site or at a nearby facility? SEE REPORT

Who manages local forests? Village Native Corp, Regional Native Corp, State of Alaska, Forest Service, BLM, USF&WS, Other: SEE REPORT, SECTION VII

FACILITY SITE CONSIDERATIONS

Is there good access to site for delivery vehicles (trucks, chip vans, etc)? Yes

Are there any significant site constraints? (Playgrounds, other buildings, wetlands, underground utilities, etc.)?
No

What are local soil conditions? Permafrost issues?
tundra

Is the building in proximity to other buildings with biomass potential? If so, Which ones and How close?
Yes - Post office & clinic

Can building accommodate a biomass boiler inside, or would an addition for a new boiler be necessary? Where would addition go?
addition

Where would potential boiler plant or addition utilities (water/sewer/power/etc.) come from?
City

If necessary, can piping be run underground from a central plant to the building? Where would piping enter boiler room?
Yes

OTHER INFORMATION

Provide any other information that will help describe the space heating and domestic hot water systems, such as

Is heat distribution system looping or branching? N/A
For baseboard hydronic heat, what is the diameter of the copper tubing? Size of fins? Number of fins per lineal foot? N/A
Any other energy using systems (kitchen equipment, lab equipment, pool etc)? Fuel or energy source? No
Any systems that could be added to the boiler system? No
Are heating fuel records available?
Yes

PICTURE / VIDEO CHECKLIST

Exterior
Main entry
Building elevations
Several near boiler room and where potential addition/wood storage and/or exterior piping may enter the building
Access road to building and to boiler room
Power poles serving building
Electrical service entry
Emergency generator

Interior
Boilers, pumps, domestic water heaters, heat exchangers – all mechanical equipment in boiler room and in other parts of the building.
Boiler room piping at boiler and around boiler room
Piping around domestic water heater
MDP and/or electrical panels in or around boiler room
Pictures of available circuits in MDP or electrical panel (open door).
Picture of circuit card of electrical panel
Picture of equipment used to heat room in the building (i.e. baseboard fin tube, unit heaters, unit ventilators, air handler, fan coil)
Pictures of any other major mechanical equipment
Pictures of equipment using fuel not part of heating or domestic hot water system (kitchen equip., lab equip., pool, etc.)
Pictures of building plans (site plan, architectural floor plan, mechanical plan, boiler room plan, electrical power plan)

Wood

How much local wood availability is there?

Difficult

Will additional wood demand cause issues?

No

Where would wood storage and wood drying occur:

We need to build a shed

Typical Wind Direction at Storage Area:

Along NE/SW

Local Wood Species (Birch, Spruce):

SEE REPORT

Moisture Content of Wood (Wet, dry, MC%):

SEE REPORT

Domestic Hot Water

Avg DHW Usage (ASHRAE Daily Avg for Office Bldg is 1.0 gal/day): approx 1 gal/day

Logistics

How are construction materials shipped to Village (barge company):

via barge

Is there local gravel or fill? How far away?

No

ALASKA WOOD ENERGY DEVELOPMENT TASK GROUP (AWEDTG)

PRE-FEASIBILITY ASSESSMENT **FIELD DATA SHEET**

APPLICANT:	Clarks Point Village Council
Eligibility: (check one)	☐ Local government ☐ State agency ☐ Federal agency ☐ School/School District ☑ Federally Recognized Tribe ☐ Regional ANCSA Corp. ☐ Village ANCSA Corp. ☐ Not-for-profit organization ☐ Private Entity that can demonstrate a Public Benefit ☐ Other (describe):
Contact Name:	Mariano Floresta
Mailing Address:	PO Box 90
City:	Clarks Point, AK
State:	AK — **Zip Code:** 99569
Office phone:	(907) 236 1479 — **Cell phone:** ( )
Fax:	(907) 236 1428
Email:	florestamariano@gmail.com

Facility Identification/Name:	Post Office of Clarks Point	
Facility Contact Person:	Mariano Floresta	
Facility Contact Telephone:	(907) 236 1479	( )
Facility Contact Email:	florestamariano@gmail.com	

SCHOOL/FACILITY INFORMATION (complete separate Field Data Sheet for each building)

SCHOOL FACILITY (Name: ____________________________________)

School Type: (check all that apply)	[ ] Pre-School [ ] Elementary [ ] Middle School	[ ] Junior High [ ] High School [ ] Campus	[ ] Student Housing [ ] Pool [ ] Gymnasium	[ ] Other (describe):
Size of facility (sq. ft. heated):		Year built/age:		
Number of floors:		Year(s) renovated:		
Number of bldgs.:		Next renovation:		
# of Students:		Has en energy audit been conducted?:		If Yes, when? *

OTHER FACILITY (Name: Post Office **)**

Type:	[ ] Health Clinic [ ] Public Safety Bldg. [ ] Community Center	[ ] Water Plant [ ] Washeteria [ ] Public Housing	[ ] Multi-Purpose Bldg [ ] District Energy System [X] Other (list): Post Office
Size of Facility (sq. ft. heated)	1000	Year built/age:	
Number of floors:	1	Year(s) renovated:	
Number of bldgs.:	1	Next renovation:	
Frequency of Usage:	M-F	# of Occupants	
Has an energy audit been conducted?	No	If Yes, when? *	

* If an Energy Audit has been conducted, please provide a copy.

HEATING SYSTEM INFORMATION

CONFIGURATION (check all that apply)

- ☒ Heat plant in one location: ☒ on ground level ☐ below ground level ☐ mezzanine ☐ roof ☒ at least 1 exterior wall
- ☐ Different heating plants in different locations: How many? ____________ What level(s)? ____________
- ☐ Individual room-by-room heating systems (space heaters)
- ☐ Is boiler room accessible to delivery trucks? ☐ Yes ☐ No

HEAT DELIVERY (check all that apply)

- ☐ Hot water: ☐ baseboard ☐ radiant heat floor ☐ cabinet heaters ☐ air handlers ☐ radiators ☐ other: ____________
- ☐ Steam: ____________
- ☒ Forced/ducted air
- ☐ Electric heat: ☐ resistance ☐ boiler ☐ heat pump(s)
- ☐ Space heaters

HEAT GENERATION (check all that apply)

						Heating capacity (Btuh / kWh)	Annual Fuel Consumption	Cost
☐ Hot water boiler:	☐ natural gas	☐ propane	☐ electric	☐ #1 fuel oil	☐ #2 fuel oil			
☐ Steam boiler:	☐ natural gas	☐ propane	☐ electric	☐ #1 fuel oil	☐ #2 fuel oil			
☒ Warm air furnace:	☐ natural gas	☐ propane	☐ electric	☒ #1 fuel oil	☐ #2 fuel oil	132000 BTU/gal	N/A	
☐ Electric resistance:	☐ baseboard	☐ duct coils						
☐ Heat pumps:	☐ air source	☐ ground source	☐ sea water					
☐ Space heaters:	☐ woodstove	☐ Toyo/Monitor	☐ other: ____________					

TEMPERATURE CONTROLS (type of system; check all that apply)

- ☐ Thermostats on individual devices/appliances; no central control system
- ☐ Pneumatic control system Manufacturer: ____________ Approx. Age: ________
- ☐ Direct digital control system Manufacturer: ____________ Approx. Age: ________

x ZONE THERMOSTAT

Record Name Plate data for boilers (use separate sheet if necessary):

1 furnace - name plate missing/damaged

Describe locations of different parts of the heating system and what building areas are served:

Serves all but garage

Describe age and general condition of existing equipment:

Old and out of service/not functioning

Who performs boiler maintenance? persons available Describe any current maintenance issues:

Electrical service damaged, may have damaged/broken the furnace

Where is piping or ducting routed through the building? (tunnels, utilidors, crawlspace, above false ceiling, attic, etc.):

Ducting through ceiling

Describe on-site fuel storage: Number of tanks, size of tanks, location(s) of tanks, condition, spill containment, etc.:

1 x 550 gallon tank

If this fuel is also used for other purposes, please describe:

N/A

DOMESTIC HOT WATER

USES OF DOMESTIC HOT WATER
Check all that apply:

- ☒ Lavatories
- ☐ Kitchen
- ☐ Showers
- ☐ Laundry
- ☐ Water treatment
- ☐ Other: ____________________

TYPE OF SYSTEM
Check all that apply:

- ☐ Direct-fired, single tank
- ☐ Direct fired, multiple tanks
- ☐ Indirect , using heating boiler with separate storage tank
- ☐ Hot water generator with separate storage tank
- ☐ Other: ____________________

x instant electric

What fuels are used to generate hot water? (Check all that apply): ☐ natural gas ☐ propane ☒ electric ☐ #1 fuel oil ☐ #2 fuel oil

Describe location of water heater(s): in mechanical room

Describe on-site fuel storage: number of tanks, size of tanks, location(s) of tanks, condition, spill containment, etc.:

N/A

BUILDING ENVELOPE

Wall type (stick frame, masonry, SIP, etc.): stick Insulation Value: R-20

Roof type: metal Insulation Value: R-30

Windows: ☐ single pane ☒ double pane ☐ other: ____________________

Arctic entry(s): ☐ none ☒ at main entrance only ☐ at multiple entrances ☐ at all entrances

~~Drawings available: ☐ architectural ☐ mechanical ☐ electrical~~

~~Outside Air/Air Exchange: ☐ HRV ☐ CO_2 Sensor~~

ELECTRICAL

Utility company that serves the building or community: City of Clarks Point

Type of grid: ☐ building stand-alone ☒ village/community power ☐ railbelt grid

Energy source: ☐ hydropower ☒ diesel generator(s) ☐ Other: ____________________

Electricity rate ~~per kWh:~~ ________ ~~Demand charge:~~ ________ $250/month

Electrical energy phase(s) available: ☐ single phase ☐ 3-phase

Back-up generator on site: ☐ Yes ☐ No If Yes, provide output capacity: ____________________

Are there spare circuits in MDP and/or electrical panel?: ☐ Yes ☐ No

Record MDP and electrical panel name plate information:

WOOD FUEL INFORMATION

- Wood pellet cost delivered to facility $ – /ton Viable fuel source? Yes (No) NO LOCALLY AVAIL. SUPPLY
- Wood chip cost delivered to facility $ – /ton Viable fuel source? Yes (No) NO LOCALLY AVAIL. SUPPLY
- Cord wood cost delivered to facility $ 330 /cord Viable fuel source? Yes No SEE REPORT
- Distance to nearest wood pellet and wood chip suppliers? FAIRBANKS OR JUNEAU
- Can logs or wood fuel be stockpiled on site or at a nearby facility? SEE REPORT

Who manages local forests? Village Native Corp, Regional Native Corp, State of Alaska, Forest Service, BLM, USF&WS, Other: SEE REPORT, SECTION VII

FACILITY SITE CONSIDERATIONS

Is there good access to site for delivery vehicles (trucks, chip vans, etc)? Yes

Are there any significant site constraints? (Playgrounds, other buildings, wetlands, underground utilities, etc.)?
No

What are local soil conditions? Permafrost issues?
tundra

Is the building in proximity to other buildings with biomass potential? If so, Which ones and How close?
Yes - Clinic & City office

Can building accommodate a biomass boiler inside, or would an addition for a new boiler be necessary? Where would addition go?
addition/central plant

Where would potential boiler plant or addition utilities (water/sewer/power/etc.) come from?
City

If necessary, can piping be run underground from a central plant to the building? Where would piping enter boiler room?
Central plant

OTHER INFORMATION

Provide any other information that will help describe the space heating and domestic hot water systems, such as

- Is heat distribution system looping or branching? N/A
- For baseboard hydronic heat, what is the diameter of the copper tubing? Size of fins? Number of fins per lineal foot? N/A
- Any other energy using systems (kitchen equipment, lab equipment, pool etc)? Fuel or energy source? No
- Any systems that could be added to the boiler system?
- Are heating fuel records available? No

PICTURE / VIDEO CHECKLIST

Exterior
Main entry
Building elevations
Several near boiler room and where potential addition/wood storage and/or exterior piping may enter the building
Access road to building and to boiler room
Power poles serving building
Electrical service entry
Emergency generator

Interior
Boilers, pumps, domestic water heaters, heat exchangers – all mechanical equipment in boiler room and in other parts of the building.
Boiler room piping at boiler and around boiler room
Piping around domestic water heater
MDP and/or electrical panels in or around boiler room
Pictures of available circuits in MDP or electrical panel (open door).
Picture of circuit card of electrical panel
Picture of equipment used to heat room in the building (i.e. baseboard fin tube, unit heaters, unit ventilators, air handler, fan coil)
Pictures of any other major mechanical equipment
Pictures of equipment using fuel not part of heating or domestic hot water system (kitchen equip., lab equip., pool, etc.)
Pictures of building plans (site plan, architectural floor plan, mechanical plan, boiler room plan, electrical power plan)

Wood

How much local wood availability is there?

Difficult

Will additional wood demand cause issues?

No

Where would wood storage and wood drying occur:

We need to build a shed

Typical Wind Direction at Storage Area:

Along SW/NE

Local Wood Species (Birch, Spruce):

SEE REPORT

Moisture Content of Wood (Wet, dry, MC%):

SEE REPORT

Domestic Hot Water

Avg DHW Usage (ASHRAE Daily Avg for Office Bldg is 1.0 gal/day): 1gal/day

Logistics

How are construction materials shipped to Village (barge company):

via barge

Is there local gravel or fill? How far away?

No

ALASKA WOOD ENERGY DEVELOPMENT TASK GROUP (AWEDTG)

PRE-FEASIBILITY ASSESSMENT FIELD DATA SHEET

APPLICANT:	Clarks Point Village Council
Eligibility: (check one)	☐ Local government ☐ State agency ☐ Federal agency ☐ School/School District ☒ Federally Recognized Tribe ☐ Regional ANCSA Corp. ☐ Village ANCSA Corp. ☐ Not-for-profit organization ☐ Private Entity that can demonstrate a Public Benefit ☐ Other (describe):
Contact Name:	Mariano Floresta
Mailing Address:	PO Box 90
City:	Clarks Point
State:	AK
Zip Code:	99569
Office phone:	(907) 236 1479
Cell phone:	( )
Fax:	(907) 236 1428
Email:	florestamariano@gmail.com

Facility Identification/Name:	Water Plant	
Facility Contact Person:	Mariano Floresta	
Facility Contact Telephone:	(907) 236 6020	( )
Facility Contact Email:	florestamariano@gmail.com	

SCHOOL/FACILITY INFORMATION (complete separate Field Data Sheet for each building)

SCHOOL FACILITY (Name: ____________________)

School Type: (check all that apply)	[ ] Pre-School [ ] Elementary [ ] Middle School	[ ] Junior High [ ] High School [ ] Campus	[ ] Student Housing [ ] Pool [ ] Gymnasium	[ ] Other (describe):

Size of facility (sq. ft. heated):		Year built/age:		
Number of floors:		Year(s) renovated:		
Number of bldgs.:		Next renovation:		
# of Students:		Has en energy audit been conducted?:		If Yes, when? *

OTHER FACILITY (Name: Water Plant)

Type:	[ ] Health Clinic [ ] Public Safety Bldg. [ ] Community Center	[X] Water Plant [ ] Washeteria [ ] Public Housing	[ ] Multi-Purpose Bldg [ ] District Energy System [ ] Other (list):

Size of Facility (sq. ft. heated)	800	Year built/age:	1982
Number of floors:	1	Year(s) renovated:	
Number of bldgs.:	1	Next renovation:	
Frequency of Usage:	Always heated	# of Occupants	1
Has an energy audit been conducted?	No	If Yes, when? *	

* If an Energy Audit has been conducted, please provide a copy.

HEATING SYSTEM INFORMATION

CONFIGURATION (check all that apply)

☐ Heat plant in one location: ☐ on ground level ☐ below ground level ☐ mezzanine ☐ roof ☐ at least 1 exterior wall

☐ Different heating plants in different locations: How many? ______ What level(s)? ______

☒ Individual room-by-room heating systems (space heaters)

☐ Is boiler room accessible to delivery trucks? ☐ Yes ☐ No

HEAT DELIVERY (check all that apply)

☐ Hot water: ☐ baseboard ☐ radiant heat floor ☐ cabinet heaters ☐ air handlers ☐ radiators ☐ other: ______

☐ Steam: ______

☐ Forced/ducted air

☐ Electric heat: ☐ resistance ☐ boiler ☐ heat pump(s)

☒ Space heaters

HEAT GENERATION (check all that apply)

							Heating capacity (Btuh / kWh)	Annual Fuel Consumption	Cost
☐ Hot water boiler:	☐ natural gas	☐ propane	☐ electric	☐ #1 fuel oil	☐ #2 fuel oil				
☐ Steam boiler:	☐ natural gas	☐ propane	☐ electric	☐ #1 fuel oil	☐ #2 fuel oil				
☐ Warm air furnace:	☐ natural gas	☐ propane	☐ electric	☐ #1 fuel oil	☐ #2 fuel oil				
☐ Electric resistance:	☐ baseboard	☐ duct coils							
☐ Heat pumps:	☐ air source	☐ ground source	☐ sea water						
☒ Space heaters:	☐ woodstove	☐ Toyo/Monitor	☐ other: #1				132000 BTU/gal	2000 gal/yr	$6/gal

TEMPERATURE CONTROLS (type of system; check all that apply)

☒ Thermostats on individual devices/appliances; no central control system

☐ Pneumatic control system Manufacturer: ______ Approx. Age: ______

☐ Direct digital control system Manufacturer: ______ Approx. Age: ______

Record Name Plate data for boilers (use separate sheet if necessary):

2x Preway 75 MBH input #1 oil space heaters, 2x Monitor 441

Describe locations of different parts of the heating system and what building areas are served:

2 space heaters per space

Describe age and general condition of existing equipment:

Preways are old & marginally functional. Monitors used as backup.

Who performs boiler maintenance? persons available Describe any current maintenance issues:

Where is piping or ducting routed through the building? (tunnels, utilidors, crawlspace, above false ceiling, attic, etc.):

N/A

Describe on-site fuel storage: Number of tanks, size of tanks, location(s) of tanks, condition, spill containment, etc.:

1x 500gal fuel tank

If this fuel is also used for other purposes, please describe:

N/A

DOMESTIC HOT WATER

USES OF DOMESTIC HOT WATER
Check all that apply:

- ☐ Lavatories
- ☐ Kitchen
- ☐ Showers
- ☐ Laundry
- ☐ Water treatment
- ☒ Other: service sink

TYPE OF SYSTEM
Check all that apply:

- ☐ Direct-fired, single tank
- ☐ Direct fired, multiple tanks
- ☐ Indirect , using heating boiler with separate storage tank
- ☐ Hot water generator with separate storage tank
- ☒ Other: point of use electric

What fuels are used to generate hot water? (Check all that apply): ☐ natural gas ☐ propane ☒ electric ☐ #1 fuel oil ☐ #2 fuel oil

Describe location of water heater(s): next to service sink

Describe on-site fuel storage: number of tanks, size of tanks, location(s) of tanks, condition, spill containment, etc.:

BUILDING ENVELOPE

Wall type (stick frame, masonry, SIP, etc.): Stick Insulation Value: R-19

Roof type: Metal Insulation Value: R-30

Windows: ☐ single pane ☒ double pane ☐ other:

Arctic entry(s): ☐ none ☒ at main entrance only ☐ at multiple entrances ☐ at all entrances

~~Drawings available: ☐ architectural ☐ mechanical ☐ electrical~~

~~Outside Air/Air Exchange: ☐ HRV ☐ CO_2 Sensor~~

ELECTRICAL

Utility company that serves the building or community: City of Clarks Point

Type of grid: ☐ building stand-alone ☒ village/community power ☐ railbelt grid

Energy source: ☐ hydropower ☒ diesel generator(s) ☐ Other:

Electricity rate ~~per kWh:~~ ~~Demand charge:~~ $280/month

Electrical energy phase(s) available: ☐ single phase ☐ 3-phase

Back-up generator on site: ☒ Yes ☐ No If Yes, provide output capacity: Not in service/not going to be

Are there spare circuits in MDP and/or electrical panel?: ☐ Yes ☐ No

Record MDP and electrical panel name plate information:

WOOD FUEL INFORMATION

- Wood pellet cost delivered to facility $ – /ton Viable fuel source? Yes (No) NO LOCALLY AVAIL. SUPPLY
- Wood chip cost delivered to facility $ – /ton Viable fuel source? Yes (No) NO LOCALLY AVAIL. SUPPLY
- Cord wood cost delivered to facility $ 330 /cord Viable fuel source? Yes No SEE REPORT
- Distance to nearest wood pellet and wood chip suppliers? FAIRBANKS OR JUNEAU
- Can logs or wood fuel be stockpiled on site or at a nearby facility? SEE REPORT

Who manages local forests? Village Native Corp, Regional Native Corp, State of Alaska, Forest Service, BLM, USF&WS, Other: SEE REPORT, SECTION VII

FACILITY SITE CONSIDERATIONS

Is there good access to site for delivery vehicles (trucks, chip vans, etc)? Yes

Are there any significant site constraints? (Playgrounds, other buildings, wetlands, underground utilities, etc.)?
No

What are local soil conditions? Permafrost issues?
tundra

Is the building in proximity to other buildings with biomass potential? If so, Which ones and How close?
No

Can building accommodate a biomass boiler inside, or would an addition for a new boiler be necessary? Where would addition go?
Addition required

Where would potential boiler plant or addition utilities (water/sewer/power/etc.) come from?
City utilities

If necessary, can piping be run underground from a central plant to the building? Where would piping enter boiler room?
Yes

OTHER INFORMATION

Provide any other information that will help describe the space heating and domestic hot water systems, such as

- Is heat distribution system looping or branching? N/A
- For baseboard hydronic heat, what is the diameter of the copper tubing? Size of fins? Number of fins per lineal foot? N/A
- Any other energy using systems (kitchen equipment, lab equipment, pool etc)? Fuel or energy source? No
- Any systems that could be added to the boiler system? No
- Are heating fuel records available? Yes

PICTURE / VIDEO CHECKLIST

Exterior
Main entry
Building elevations
Several near boiler room and where potential addition/wood storage and/or exterior piping may enter the building
Access road to building and to boiler room
Power poles serving building
Electrical service entry
Emergency generator

Interior
Boilers, pumps, domestic water heaters, heat exchangers – all mechanical equipment in boiler room and in other parts of the building.
Boiler room piping at boiler and around boiler room
Piping around domestic water heater
MDP and/or electrical panels in or around boiler room
Pictures of available circuits in MDP or electrical panel (open door).
Picture of circuit card of electrical panel
Picture of equipment used to heat room in the building (i.e. baseboard fin tube, unit heaters, unit ventilators, air handler, fan coil)
Pictures of any other major mechanical equipment
Pictures of equipment using fuel not part of heating or domestic hot water system (kitchen equip., lab equip., pool, etc.)
Pictures of building plans (site plan, architectural floor plan, mechanical plan, boiler room plan, electrical power plan)

Wood

How much local wood availability is there?

Difficult

Will additional wood demand cause issues?

No

Where would wood storage and wood drying occur:

we need to build a shed

Typical Wind Direction at Storage Area:

Along SW/NE

Local Wood Species (Birch, Spruce):

SEE REPORT

Moisture Content of Wood (Wet, dry, MC%):

SEE REPORT

Domestic Hot Water

Avg DHW Usage (ASHRAE Daily Avg for Office Bldg is 1.0 gal/day): N/A

Logistics

How are construction materials shipped to Village (barge company):

via Barge

Is there local gravel or fill? How far away?

No