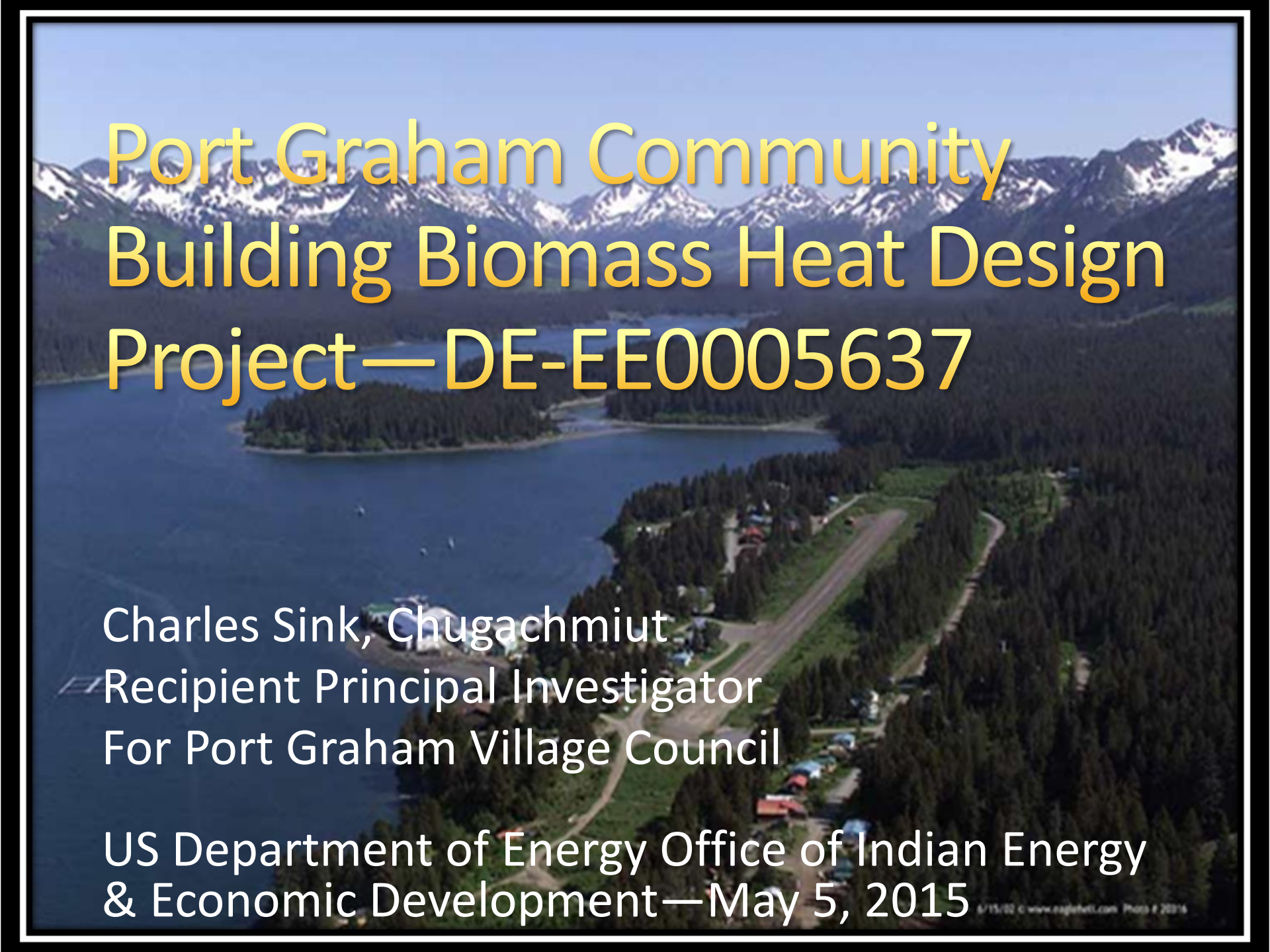


Port Graham Community Building Biomass Heat Design Project—DE-EE0005637

Charles Sink, Chugachmiut
Recipient Principal Investigator
For Port Graham Village Council

US Department of Energy Office of Indian Energy & Economic Development—May 5, 2015


EERC KL29978.AI
Mount
Susitna
Flat Horn Lake
Stephan Lake
Knik
A1
Eklutna Lake
Baker 13,176 ft
Little Susitna
Figure Eight Lake
Bashful Peak
Eagle
Mount Goode
Anchorage
Fire Island
Campbell Lake
Mount Muir
Tyonek
Turnagain Arm
Chugach National Forest
Hope
Port Wells
A L A S K A
Whittier
Prince William
Chugach State Park
Sterling
Cooper Landing
Moose Pass
Kalgin Island
Kenai
Soldotna
A1
Skilak Lake
Kenai Lake
Cohoe
Kasilof
Cooper Mountain
9
Chenega
Clam Gulch
Kenai National Wildlife Refuge
Cook Inlet
Tustumena Lake
Ninilchik
Seward
Happy Valley
Fox
Truuli Peak
Kenai Fjords N.P.
Anchor Point
Montague Island
Anchor
Kachemak City
Bligh Sound
Ioeworm Peak
Storm Mountain
Chiswell Islands
Homer
Halibut Cove
Delight Lake
Mount Diablo 3501 ft
Seldovia
Nanwalek
Port Graham
Nuka Bay
G u l f o f A l a s k a
Chugach Islands
P a c i f i c O c e a n
Barrow
Prudhoe Bay
Tsiigehtchic
Porcupine
Koyukuk
Yukon
Nome
Fairbanks
Tanana
UNITED STATES
A L A S K A
Anchorage
Valdez
Cordova
Bethel
G u l f
A l a s k a

Community Overview

- Port Graham population of 177 (2010 Census)
- Southern tip of Kenai Peninsula, about 28-miles off the road system from Homer, Alaska, accessible by air or water only
- Unemployment rate 22%; 44.6% out of labor force; Median household income $18,942

Executive Summary

- Heat 5-community buildings with cord wood biomass heating system
- Displace approximately 85% diesel heating fuel, approximately 5,365 gallons/ year displaced
- Use 125 bone dry tons woody biomass, equivalent to 100 cords wood from forest land averaging 85 bone dry tons per acre
- Use a GARN WHS 3200 Boiler with 700,000 Btu output for 648,000 Btu peak demand
- To be managed by Native Village of Port Graham

Port Graham Alaska
GARN Boiler Project Area and Community Buildings

1. Old Water Plant
2. Public Safety Building
3. NPRHA Building
4. Health and Dental Clinic
5. Tribal Council Building
6. Native Corp Office/Museum
7. NPRHA Duplexes

Completed Studies

Department of Energy Studies

- Port Graham Biomass Feasibility Study 2007
- Tribal Energy Resource Agreement 2008
- Port Graham Community Building Biomass Heat Project 2015

BIA and other studies

- Integrated Resource Management Plan for Nanwalek and Port Graham 2006-2009
- Alaska Energy Authority Port Graham Community Biomass Project 2014
- Chugachmiut Forest Management Plan 2014
- Port Graham Biomass Assessment 2014
- Port Graham Corporation Forest Stewardship Plan, USFS 2015

Tale of Two Grants

Alaska Energy Authority Grant--7040061

- Original Award—August 1, 2011
- Amendment #1
  - Approved January 10, 2013
  - Signed by AEA—February 4, 2013
- Chena Power, Inc. with Winters and Associates Company

Department of Energy Office of Energy Efficiency & Renewable Energy—DE-EE0005637

- Initial Notification—February 22, 2012
- Scope Revision Submitted—May 8, 2012
- Original Award—September 7, 2012
- Richmond Engineering with Winters & Associates, successor to Charles Nash Forestry Consulting

Project Objectives & Goals

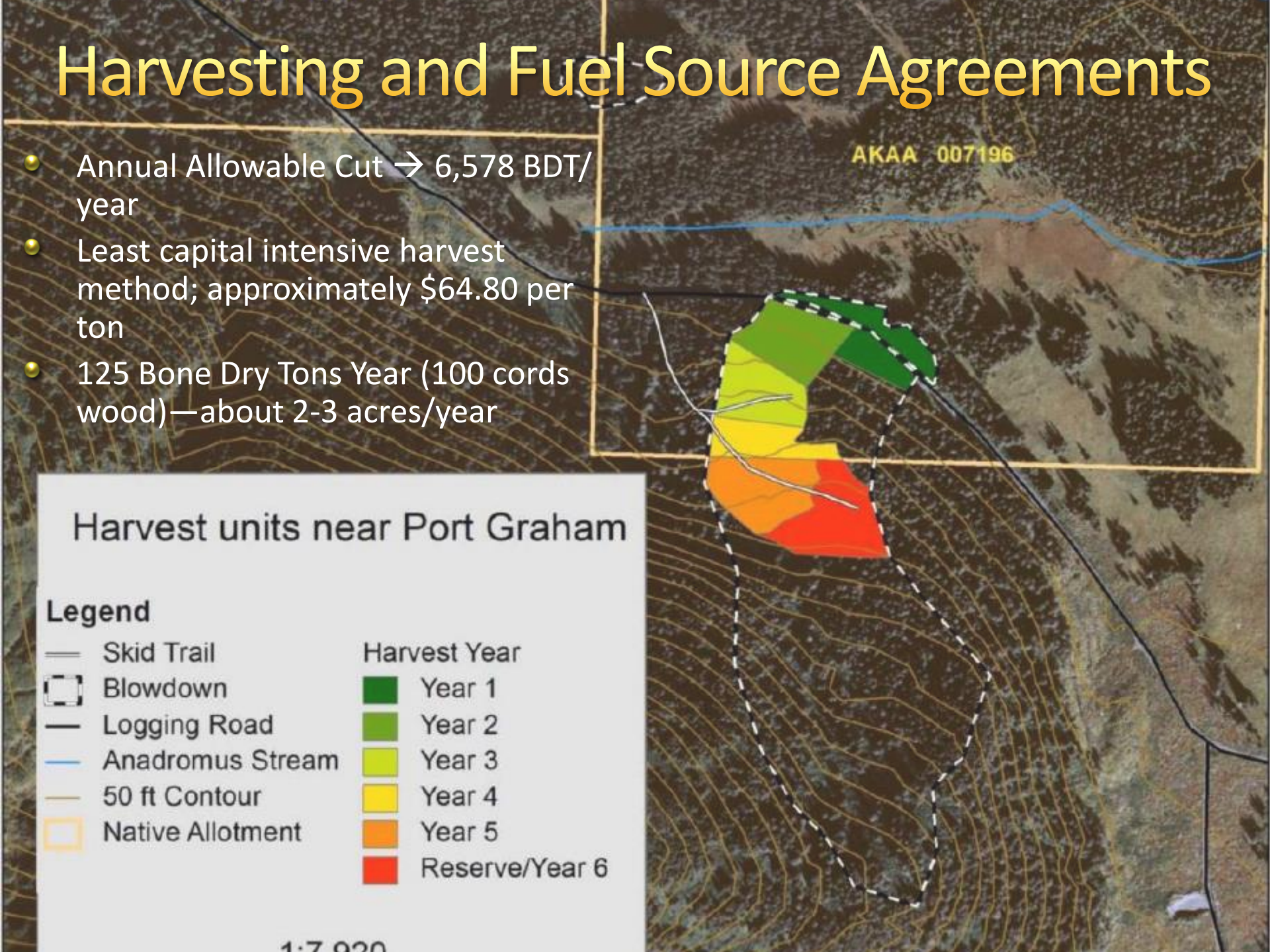
1. **Develop Renewable Energy Resource Supply**
2. **Finalize Preliminary Heating System Design**
3. **Finalize Preliminary Project Costs**
4. **Acquire Revenue Stream Agreement and Develop Financial Management Plan**
5. **Acquire Site Agreements**
6. **Acquire Permits**
7. **Develop Business and Operating Plan**

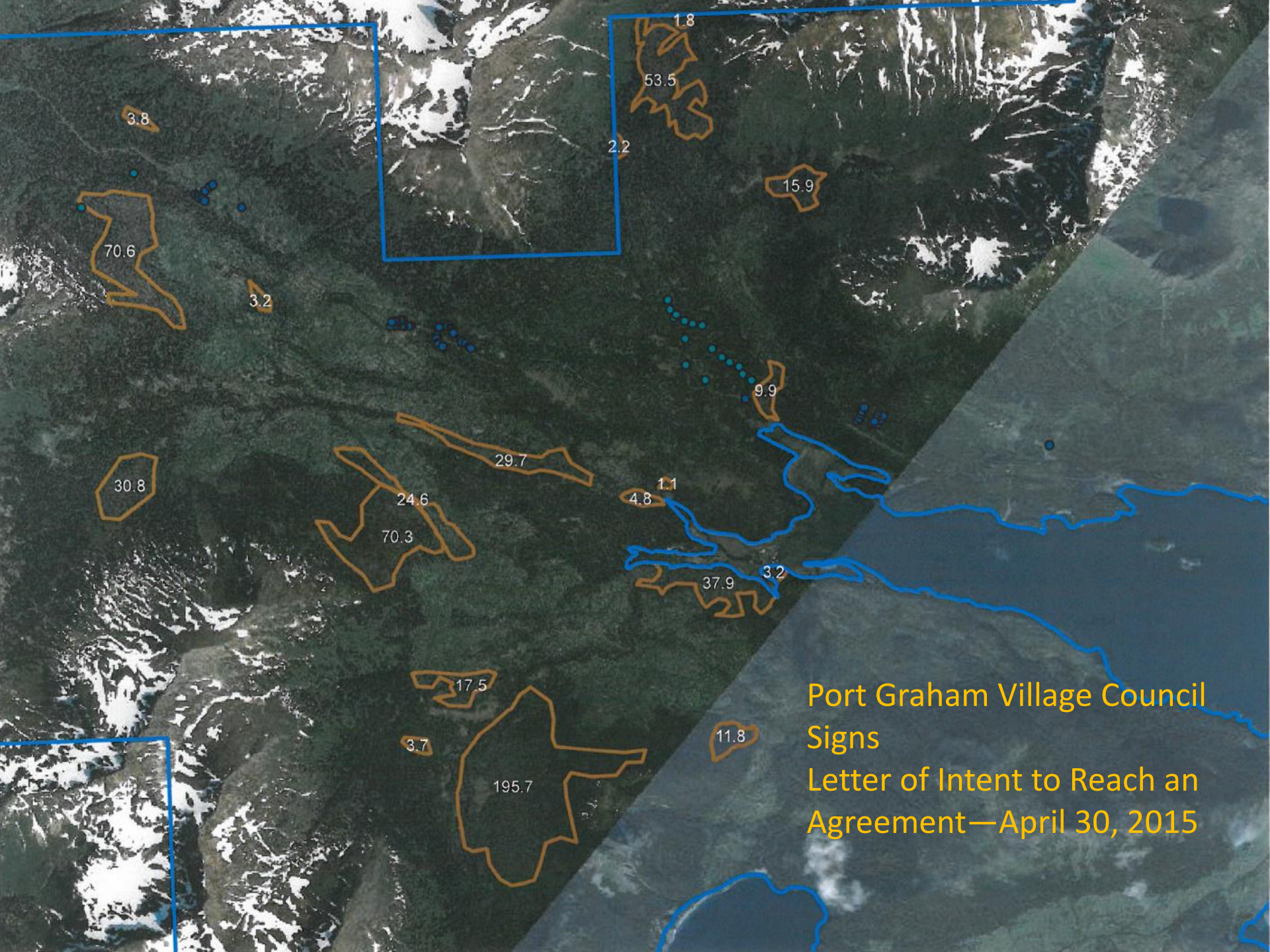
Task 1 – Develop Renewable Energy Resource Supply

- 2013 fuel oil price $5.95
- More than 500,000 green tons biomass accessible from existing roadway or 10,758 BDT/year harvestable
- 99% Native corporation and Native allotment owned lands/ 1% owned by Port Graham Tribal Council

Harvesting and Fuel Source Agreements

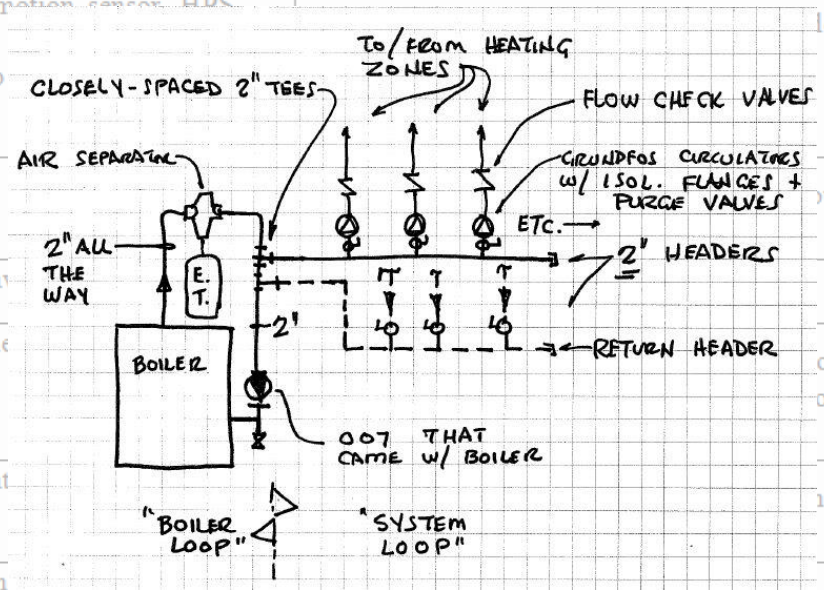
- Annual Allowable Cut → 6,578 BDT/ year
- Least capital intensive harvest method; approximately $64.80 per ton
- 125 Bone Dry Tons Year (100 cords wood)—about 2-3 acres/year

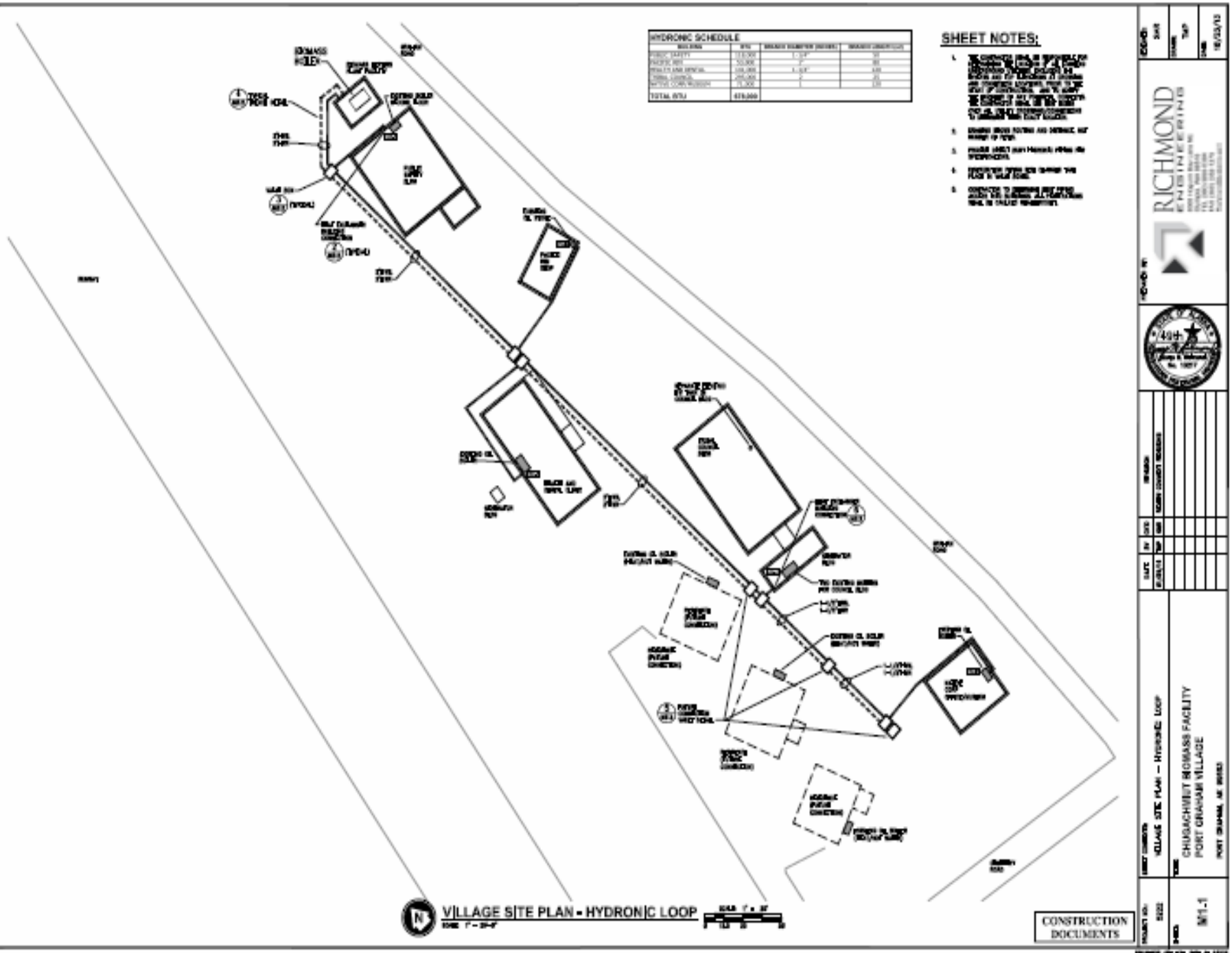



1.8
53.5
3.8
2.2
15.9
70.6
3.2
9.9
29.7
30.8
1.1
24.6
4.8
70.3
3.2
37.9
17.5
11.8
3.7
195.7
Port Graham Village Council Signs
Letter of Intent to Reach an Agreement—April 30, 2015

Task 2—Finalize Preliminary Heating System Design—Richmond Engineering

- High energy low emission (HELE) hydronic heating system
- START Program NREL Review—Colton Heaps, Chris Gaul, PE, Levi Kilcher, Brian Hirsch
- John Siegenthaler, P.E.—Planning & Installing Bioenergy Systems, March 3-4, 2014, Anchorage, Alaska




HYDRONIC SCHEDULE
SHEET NOTES:
VILLAGE SITE PLAN - HYDRONIC LOOP
CONSTRUCTION DOCUMENTS
CHUGACHMIUT BIOMASS FACILITY
PORT GRAHAM VILLAGE
M1.1

Task 3 – Finalize Preliminary Project Costs

AEA Port Graham Biomass Project Report

- NPV $31,467
- Benefit Cost Ratio 1.16
- Simple Payback 15.4 years
- @ $210,634 construction cost
- $18,468 building renovation cost

Richmond Engineering—Port Graham Community Building Biomass Heating Design Project

- NPV ($8,074)
- Benefit Cost Ratio 0.70
- Simple Payback 25.6 years
- @ $349,522 construction cost
- $97,829 new WHS 3200 GARN boiler building cost

Task 4 – Acquire Revenue Stream Agreements and Develop Financial Management Plan

- Hot Water Sales = Percent of Fuel Costs = 1 building historic fuel oil cost/ 5 building historic fuel cost based on estimated cost of fuel wood

- Tough financial planning—would require at least a partial grant to go with a low interest loan
  - DOE, USDA, SBA, AEA (Alaska Energy Authority), private financing, other

Task 5 – Acquire Site Agreements & Permits

- Native Village of Port Graham already has control of Old Pump House Site and Right-of-Way between community buildings and does not require NEPA, necessarily
- State of Alaska Application for Fire and Life Safety Plan; Kenai Borough has no requirements
- Fuel Source Harvest Plans
  - Port Graham Village Corporation Lands follows Alaska Forest Practices Act
  - Native allotment timber sales greater than $25,000 follow NEPA requirements per BIA Handbook

Task 7 – Develop Business and Operating Plan

INPUTS

General Project Description	
Project Title	Port Graham Biomass Project
Project Description	
Renewable Energy Technology	Biomass
Client Name	Port Graham Tribal Council
Community	Port Graham

Heating Oil Input Overrides		
Nearest Fuel Community (Heating Oil)	Kenai	
2015 Base Fuel Price ($/gal)	$	5.98
2015 Heating Fuel Premium ($/gal)	$	1.14
Override Fuel Community Fuel Price?	Yes	
Override Includes Heating Fuel Premium?	Yes	
User Override Fuel Price - Heating Oil ($/gal)	$	5.98
Crude Oil Price Escalation ($/barrel)	EIA Low	
Use Fuel Price Escalation Factor?	Yes	
Override Fuel Price Escalation Factor?	No	
User Override Fuel Price Escalation Factor (%)		

Wood Inputs Overrides	
Year 1 Base Wood Price ($/ton)	
Second Base Wood Price ($/ton)	
Start Year Second Base Wood Price ($/ton)	

Proposed System Overrides		
Project Start (Year 1)		2015
Project Life (Years)		25
Displaced Heating Oil (gal/year)		5,365
Renewable Fuel Use (green tons/year)		125
Capital Costs ($)	$	210,634
Cost of Scheduled Repairs ($)	$	300
Cost of Scheduled Rapairs - Rate of Cost Increase (%)		1%
Operations & Maintenance (Year 1)	$	10,512
O&M - Years to First Cost Increase (years)		5
O&M - Rate of Cost Increase (%)		1%

OUTPUTS

Annual Displaced Petroleum Fuel (gal/year)	5,365
Total Lifetime Displaced Petroleum Fuel (gal)	134,125
Annual Avoided CO2 (tonnes/year)	54.5
Total Lifetime Avoided CO2 (tonnes)	1,361.4

NPV Benefits	$	230,010
NPV Capital Costs	$	198,543
NPV Net Benefit	$	31,467

Net Profit (All dollars)	$	130,814
Funds to Community (All dollars)	$	38,381
Benefit / Cost Ratio (B/C)		1.16
Simple Payback (Avg annual savings)		15.4

Scenario 1: Single Wood Price, Life of the Project.	Price of Wood ($/green ton)			
	Current Model ($65)	$70	$75	$80
Net Profit	$ 130,814	$ 113,874	$ 97,586	$ 81,298
Funds to Community	$ 38,381	$ 41,461	$ 44,422	$ 47,384
B/C Ratio	1.16	1.10	1.05	0.99
Simple Payback (Avg annual savings)	15.4	16.2	17.1	18.0

Scenario 2: Blowdown Price for First 10 years.	Price of Wood ($/green ton)			
	$5 / $65	$5 / $70	$5 / $75	$5 / $80
Net Profit	$ 209,500	$ 199,801	$ 190,102	$ 180,403
Funds to Community	$ 24,074	$ 25,837	$ 27,601	$ 29,364

Closing Remarks & Next Steps

- Project does not seem viable
  - AEA Round VIII funding applied for October 2014
  - Turned down December 2014—added in planning grants and estimated a B/C ratio of 0.36
- Native Village of Port Graham is continuing to plan to implement project
  - Move North Pacific Rim Housing Authority Warehouse; make it the new GARN boiler building
  - Add new Headstart Building in its place; share construction costs

Questions

- "It is the Energy Policy of Port Graham and Nanwalek to find and implement innovative options to reduce energy costs, to reduce fossil fuel emissions, to improve quality of power, and to provide greater opportunity for jobs that will attract members back to our communities." *Chugachmiut Facilitated Integrated Resources Management Plan Phase 2 for Nanwalek and Port Graham, March 2009.*