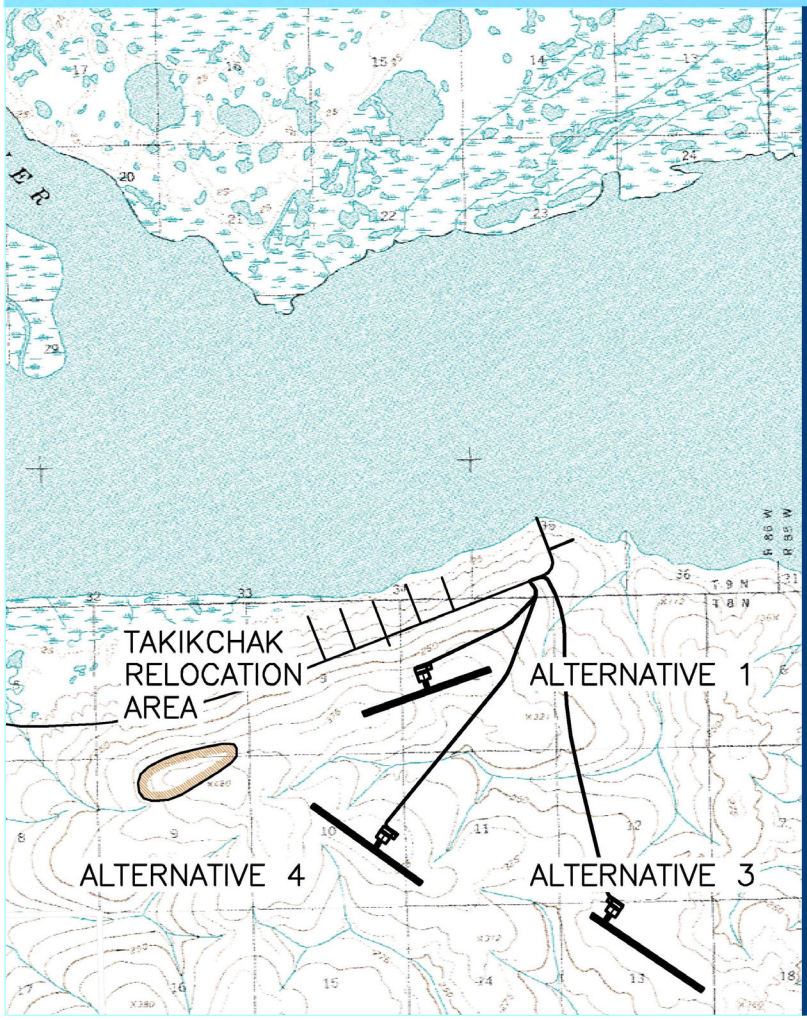
NEWTOK AIRPORT RELOCATION RECONNAISSANCE STUDY

PROJECT NO. 57405

March 2008



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ABBREVIATIONS AND ACRONYMS

AC ..... Advisory Circular
ADEC ..... State of Alaska Department of Environmental Conservation
ALP ..... Airport Layout Plan
ARC ..... Airport Reference Code
ASCG ..... Arctic Slope Consulting Group, Inc.
ATV ..... All-Terrain Vehicle
CBRS ..... Coastal Barrier Resource System
CPQ ..... Coastal Project Questionnaire
CRSA ..... Coastal Resource Service Area
DCCED ..... State of Alaska Department of Commerce, Community and Economic Development
DOL ..... State of Alaska Department of Labor
DOT&PF ..... State of Alaska Department of Transportation and Public Facilities
EA ..... Environmental Assessment
EIS ..... Environmental Impact Statement
ESA ..... Endangered Species Act
FAA ..... Federal Aviation Administration
FAR ..... Federal Aviation Regulation
GPS ..... Global Positioning System
IC ..... Interim Conveyance
LKSD ..... Lower Kuskokwim School District
NEPA ..... National Environmental Policy Act
NIS Plan ..... *Nelson Island Subregional Transportation Plan*
NPI ..... Non-Precision Instrument
PAPI ..... Precision Approach Path Indicator
PDC ..... PDC Inc. Engineers
R&M ..... R&M Consultants, Inc.
ROW ..... Right-of-Way
RPZ ..... Runway Protection Zone
RSA ..... Runway Safety Area
SHPO ..... State Historic Preservation Office
T&E ..... Threatened and Endangered [Species]
USACE ..... United States Army Corps of Engineers
USDA ..... United States Department of Agriculture
USFWS ..... United States Fish and Wildlife Service
USGS ..... United States Geological Service
USPS ..... United States Postal Service
VFR ..... Visual Flight Rules
Y-K ..... Yukon-Kuskokwim
Y-K Plan ..... *Yukon-Kuskokwim Delta Transportation Plan*
YKHC ..... Yukon-Kuskokwim Health Corporation

EXECUTIVE SUMMARY

The village of Newtok, located on the north bank of the Ninglick River near the Bering Sea coast, is threatened by continuing rapid erosion of the riverbank. Newtok's barge landing and landfill have already been washed away, and projections indicate the river will begin to erode village structures within the next ten years. Studies by the U.S. Army Corps of Engineers and others have determined that there is no cost-effective way to provide the village with permanent protection from the encroaching river. Plans are under way to relocate the village to a site nine miles to the south on nearby Nelson Island. This study examines potential locations for a new community airport close to the new townsite.

Newtok is a Yup'ik Eskimo village with a population of 321 at the time of the 2000 U.S. Census. Approximately 97% of the residents are Alaska Native, and the village maintains a traditional subsistence lifestyle. Year-round access to the village is by air, although barge service is available in the summer and several winter trails connect Newtok to other nearby villages and to hunting, ice fishing, and trapping grounds.

The existing community airport at Newtok consists of an unlit 2,200- by 35-foot gravel runway with an unpaved apron. The runway width, safety area dimensions, and separation distances from the apron and other land uses do not meet FAA's least demanding standards for a commercial airport (Airport Reference Code [ARC] A-I), and the 2002 *Yukon-Kuskokwim Delta Transportation Plan* (*Y-K Plan*) recommended an immediate upgrade to a 3,300-foot runway meeting ARC B-I standards.

Historically, Newtok's population has increased at a rate of 3.51% per year, which would result in a population of 640 by 2020. The relocation is not expected to result in a substantial change, upward or downward, to this projection. Annual enplanements are forecasted to reach 4,612 per year by 2025, and U.S. mail shipments (the majority of air freight) are forecasted to reach 989,000 pounds per year by 2025; however, these figures do not take into account temporary increases during the next five to ten years while the village relocation is occurring.

For the relocation site, a B-II facility with a 4,000-foot runway is recommended. The *Y-K Plan's* recommendation of 3,300 feet did not anticipate the need to relocate the village. While the long-term transportation demand at the new site will probably be similar to that forecast for the present location, over the next five to ten years the process of relocating the village will create a greater demand for passenger travel and shipment of cargo. Also, aircraft types already in service or planned for use at the surrounding communities require 4,000-foot runways, and all of the air carriers interviewed provided a rationale for at least occasional use of such aircraft at the Newtok village site.

Site alternatives were developed and analyzed in two steps. The first step, which included review of maps, agency and public meetings, and discussions with local residents and pilots, identified six potential locations for the new airport. Further information received from pilots, the public, and a field reconnaissance trip resulted in the elimination of three of these sites from consideration.

The remaining three potential sites, designated Alternatives 1, 3, and 4, were then evaluated based on the following criteria: 1) orientation for wind; 2) proximity to the community; 3) airspace penetrations; 4) environmental impacts; 5) bird and wildlife hazards; 6) topography and soils; 7) site development and maintenance costs; 8) proximity to material sources and the new barge landing. The general results of the evaluation are as follows. The sites ranged from 0.25 miles to 2 miles from the planned village site and were between one and three miles from both the planned barge landing and the most likely material source. All three sites allowed some flexibility of runway orientation to maximize wind coverage, although it is yet not known whether any could achieve 95% wind coverage and only Alternative 1 appears able to accommodate a crosswind runway. Based on the level of mapping detail available (4-foot contours for Alternative 1 and 50-foot contours for Alternatives 3 and 4), the sites appear to be in rolling hills (Alternative 1) or flat terrain with possible rolling hills (Alternatives 3 and 4), with no FAR Part 77 airspace penetrations identified. All three sites appear to have similar soil conditions, with preliminary investigation indicating that the foundation soils are moderately stable where unfrozen, relatively ice-poor where frozen, and only marginally susceptible to detrimental effects from seasonal frost. Overall environmental impacts for all three sites appear to be minimal, although all three would have unavoidable wetland impacts. Estimated construction costs range from $16 million to $20.5 million, with annual operation and maintenance costs ranging from $210,000 to $247,000.

Based on these results, all three alternatives studied appear to be viable and should be carried forward for further investigation. This future work should include:

- Ongoing communication with the Village and other agencies to confirm the planned locations of other community facilities relative to the airport alternatives
- Completion of the wind data collection and analysis now in progress
- Coordination with U.S. Army Corps of Engineers and U.S. Fish & Wildlife Service to obtain the results of their planned wetlands, wildlife, and bird hazard assessments
- Acquisition of aerial mapping for Alternatives 3 and 4
- Meteorological observations of ceiling (overcast) conditions
- Reconnaissance-level geotechnical investigations of the viable airport sites and potential material sources
- Determination of improvements needed at the planned barge landing site, and associated impacts
- Environmental documentation for remaining viable alternatives and selection of a preferred alternative

This reconnaissance study also considered a transition strategy with key issues to be addressed during the village relocation, along with an optimal set of implementation benchmarks to serve as a guidepost for the State and the Village of Newtok. First, the community will need to establish basic infrastructure such as a drinking water source, a source for and access to construction materials, a power supply for construction, and a landfill to dispose of construction waste. Once these basic facilities are in place, it will be important to begin constructing new housing and community support structures and begin moving residents over in sufficient numbers to demonstrate the community's commitment to the move. This demonstrated commitment will be important as the community seeks grant funding for the next phase of building, which will include schools, sanitary waste systems, and the community airport.

1.0 INTRODUCTION

The village of Newtok is faced with a serious, long-term erosion problem. Approximately 735 feet to the south of Newtok, the encroaching Ninglick River is eroding towards the village at a rate of 64 to 110 feet per year (ASCG, 2004). Studies conducted by the U.S. Army Corps of Engineers (USACE) and others have determined that there is no permanent and cost-effective means of protecting the village in its current location.

This study focuses on finding potential relocation sites for the Newtok airport that will be more practical for the community once the village is relocated. The relocation area is near the expected village relocation site (referred to as Takikchak). The new village site is approximately nine miles south of Newtok on the north end of Nelson Island (Figure 1.1). Initially six potential airport relocation sites were identified and considered, of which three were eliminated during preliminary evaluations. After further evaluation of the remaining three sites (shown on Figure 1.2), this study recommends three alternatives for more detailed study.

1.1 Scope

The Alaska Department of Transportation and Public Facilities (DOT&PF) contracted PDC Inc. Engineers to conduct a reconnaissance level relocation study, with support from R&M Consultants for geotechnical services. The scope of this study includes:

- Establish and document the Purpose and Need for the project
- Determine facility needs by reviewing transportation issues in the Newtok area
- Identify and document facility requirements
- Identify the issues and concerns of the State, the Federal Aviation Administration (FAA), and the community relative to selection of reasonable alternatives
- Identify possible alternatives
- Evaluate alternatives (based on engineering, cost and environmental conditions) to determine those reasonable for further consideration
- Outline a transition strategy with key issues to be addressed during the village relocation
- Determine an optimal set of implementation benchmarks to serve as a guidepost for the State and the Village of Newtok

1.2 Background

Newtok is a traditional Yup'ik Eskimo village with an active subsistence lifestyle. Relative isolation from outside influences has enabled the area to retain its traditions and customs, more so than other parts of Alaska. The sale or importation of alcohol is banned in the village.

The people of Newtok share a heritage with Nelson Island communities; their ancestors have lived on the Bering Sea coast for at least 2,000 years. The people from the five villages are known as Qaluyaarmiut, or "dip net people."

In the late 1950s, the village of Newtok was relocated from Old Kealavik ten miles away to its present location to escape flooding. A school was built in 1958, although high school students had to travel to Bethel, St. Mary's, Sitka, or Anchorage. A high school was constructed in Newtok in the 1980s.

Figure 1.1 – Location and Vicinity Map

1.3 Purpose and Need

The purpose of the study is to identify the potential airport site(s) in support of an effort by the village of Newtok to relocate to Nelson Island, and to develop a plan for the transition of services from the old village site to the new location on Nelson Island.

The village is under threat of erosion by the Ninglick River. As of 2005, the barge and landfill areas have eroded away. As discussed in the *Newtok Background for Relocation Report* (ASCG, 2004), the erosion is projected to impact the village structures by 2015 and the airport by 2022.

Photo 1.1: Sewage by fish racks after flood waters overflowed the sewage lagoon

Because of the severe erosion and continuous seasonal sea surges that threaten the health and welfare of the community, plans to relocate have been underway for a number of years. The community has selected a site called "Takikchak." The Takikchak site is approximately nine miles southeast of Newtok, on the north end of Nelson Island, adjacent to Baird Inlet (see Figure 1.1). Land has been secured for the relocation site, and the U.S. Army Corps of Engineers (USACE) is currently preparing studies to support Federal funding to aid in the community relocation efforts.

Relocation of the airport is an essential component of the village relocation plan. An airport facility is needed at the new village site to support the initial village development as well as long term community functions and growth. As with most rural Alaskan communities, neither Newtok nor Takikchak has a road system connecting the village to other communities. The community relies almost exclusively upon air transportation for travel, medevac services, and much of the cargo transport, as air travel is the only year-around means of transportation.

Photo 1.2: Remains of barge landing

2.0 EXISTING CONDITIONS

2.1 Community Characteristics

Newtok was incorporated as a second class city within the unorganized borough in 1976. In 1997, the city government was dissolved, and the village is now governed by the BIA-recognized Newtok Traditional Council. The Newtok Native Corporation and the Calista Regional Native Corporation also serve the village. The following characteristics of the Newtok community are taken from the Alaska Department of Commerce, Community and Economic Development's (DCCED) online database of community profiles.

The school, clinic, village services, government, commercial fishing, and retail trade and services provide employment. Subsistence activities and trapping supplement income. Twenty-seven residents hold commercial fishing permits.

The Newtok Health Clinic, completed in 2004, provides local health care. It is owned by the village and leased to the U.S. Public Health Service. The Yukon-Kuskokwim Health Corporation (YKHC) operates the clinic.

The village school is in the Lower Kuskokwim School District (LKSD). A new modular school was built in 2001. The school serves kindergarten through 12th grade, has approximately 122 students and is staffed by eight teachers.

Electricity is provided by the Ungusraq Power Company. Fuel oil is barged to Newtok in the summer and stored in tank farms owned by the Newtok Corporation's store (52,200 gallons), Newtok Corporation Electric (55,955 gallons) and LKSD (121,070 gallons). A few smaller tanks are also available to the community.

Water is pumped from a lake into a water treatment plant and then transferred to a storage tank. Residents supplement their water by collecting rainwater in the summer and by melting ice in the winter, when water in the storage tank runs dry or freezes. Residences are not plumbed. Honey buckets are used and then dumped along the Newtok River. The health clinic uses flush/haul tanks.

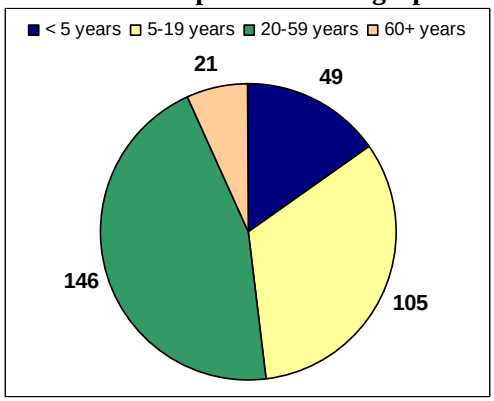
Erosion washed the community landfill into the Ninglick River in 1996. A new dump site was established, but DOT&PF has determined that it is too close to the airport.

2.2 Population

According to the 2000 census, the population of Newtok was 321, with 174 males and 147 females. Chart 2.1 shows the population by age. Of the total population, 31% are in poverty, 24.6% are unemployed, and 96.9% are Alaska Native or part Native, mostly Yup'ik Eskimo. There were 63 households, with an average size of 5.1 people.

The average household income in Newtok is $32,188. There were 101 people employed and 33 people seeking work, or 24.6% unemployment. Adding in the able-bodied adults not in the work force equals a total unemployment rate of 52.1%.

Chart 2.1 – Population Demographics



The village population is not expected to substantially increase or decrease due to immigration/ emigration as a result of the relocation. Table 2.1 presents Newtok population projections based on Alaska Department of Labor (DOL) projected low, middle, and high growth rates for 2003 of the Bethel Census Area of the Yukon-Kuskokwim Delta Region of Alaska. The 2003 rates have been applied to the 2000 census population.

Table 2.1 – Newtok Population Projection

	Population			
	DOL Census Area Projections			Projection Based on Historical Population Growth
Year	Low 1.30%	Middle 1.72%	High 2.42%	3.51%
2000	321	321	321	321
2005	342	350	362	381
2010	365	381	408	453
2020	416	451	518	640

Historically Newtok has grown at a rate higher then the DOL projections. According to the *Newtok Background for Relocation Report* (ASCG, 2004) and U.S. Census data in the DCCED community profile, the population of Newtok has increased from 114 in 1970 to 321 in 2000. The average annual growth rate for this period was 3.51%. If this rate continues, the population would grow to approximately 640 by 2020.

2.3 Airport Facilities

Based on the 2005 ALP (see Appendix A) the Newtok Airport is a substandard A-I facility consisting of a 35-foot by 2,202-foot runway and the characteristics summarized below in Table 2.2. In addition to the deficiencies listed below, the airport has no lighting system. Although the *Yukon-Kuskokwim Delta Transportation Plan* (*Y-K Plan*) recommends immediate upgrade to 3,300 feet (see Section 3.5), major improvements have been delayed due to the threat of erosion to the village. A seaplane facility is also available, but not widely used.

Photo 2.1: Existing Newtok Airport and community
Source: FAA (http://www.alaska.faa.gov/fai/airports.htm#YK)

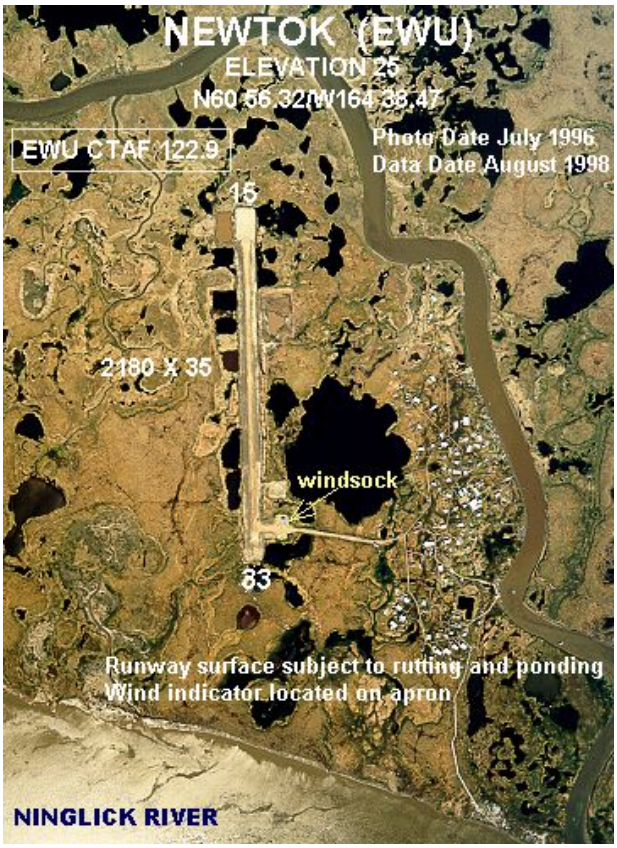


Table 2.2 – Existing Airport Deficiencies

Description	Standards for ARC A-I	Existing
Runway Width	60’	35’
Runway Centerline to Apron	250’	180’
Runway Centerline to Wind Cone/ Segmented Circle	250’	200’
RSA Length (33 end)	240’	191’
Runway Centerline to Wind Cone (15 end)	250’	232’
Landfill Separation Distance	5,000’	~2,800’

The Newtok Airport has had two AIP-funded projects; the first in 1994 and the second for the current development of the Master Plan Study. The 1994 project constructed a new apron, rehabilitated the runway, acquired land for development, improved the access road, acquired snow removal equipment, extended the runway, and improved the Snow Removal Equipment Building.

2.4 Land Use

Newtok is located in the Bethel Recording District. The existing airport is located in Township 10 North, Range 87 West, Sections 23, 24, and 25 of the Seward Meridian.

DOT&PF owns approximately 100 acres of airport property and has Avigation and Hazard Easements over an additional 9 acres. Known land ownership in the vicinity of the airport property consists of the City of Newtok, Newtok Corporation, U.S. Fish and Wildlife Service (USFWS), Alaska Department of Natural Resources, and private homeowners (townsite lots). The existing Airport Property Plan is included in Appendix A.

The Takikchak village relocation site consists of land conveyed to the Newtok Native Corporation, under Interim Conveyance (IC) numbers 602, 603 and 1876. The three alternatives discussed in Section 5.0 are within the boundary of lands conveyed.

2.5 Vicinity Transportation

Newtok can be reached only by air and water. Access by water is seasonal; barges deliver cargo twice a month throughout the summer. The State-owned airport provides chartered or private air access year-round.

There are no roads in the village. Approximately 1.5 miles of wooden boardwalks provide routes for foot, bicycle, and ATV transportation throughout the community and to the airport. Most of the boardwalks were built between 1976 and 1981, and these are approaching the end of their useful service life. Residents use boats, skiffs, and all-terrain vehicles (ATV's) as transportation and for subsistence activities during the summer, while snow machines are the principal means of transportation during the winter. Boat and skiff use is often limited to periods of high tide. Winter trails connect Newtok to the villages of Chevak, Tununak, Toksook Bay and Nightmute. Other winter trails also provide travel to hunting, ice fishing and trapping. (ASCG, 2004)

Trail systems from the village relocation site to the nearby village and traditional use areas have already been identified by the community and are shown in the ASCG *Background for Relocation Report.* (ASCG, 2004)

Photo 2.2: Bicyclists on boardwalk

Photo 2.3: Aerial view of boardwalk system

The *Nelson Island Subregional Transportation Plan* (*NIS Plan*) evaluates the development of roads connecting Nightmute, Toksook Bay, Tununak, and Umkumiut and provision of a port facility to serve the area. Currently these villages use rudimentary trails that connect them, traveling by four wheelers in the summer and snow machines in the winter. Since the trails are challenging even to the most skilled traveler, transportation between the communities is limited even though they are relatively close to each other (Kuskokwim Architects & Engineers, Inc., 2003).

The transportation system in Nightmute, Toksook Bay, and Tununak consists of an airport; roads to the airport, landfill, lagoon, and/or water sources; and local streets and boardwalks. Umkumiut is currently used as a summer subsistence camp; however, residents of other communities on Nelson Island are planning on inhabiting the community year-round.

The *NIS Plan* shows connection these four communities with 26 miles of road. An additional 23 miles of road would be needed to connect Takikchak. With Takikchak being nearly twice the distance from the other communities as any of the others, even if a road were constructed the need for air service would likely still exist, especially during winter conditions. People would still travel via air to the hub community of Bethel and points beyond for medical reason, school events, and social functions.

2.6 Climate

Newtok and Nelson Island lie within the transitional climate zone along Alaska's western coast and between the coastal mountains and the Alaska Range. The area has an annual precipitation between 15 and 30 inches. Summer temperatures range from 42°F to 59°F; winter temperatures vary from 2°F to 19°F.

Newtok is in the Yukon-Kuskokwim (Y-K) Delta Region along the Newtok and Ninglick Rivers in southwest Alaska (Figure 1.1), about 94 miles northwest of Bethel. It lies at approximately 60°57'N and 164°38'W within Section 24, Township 10 North, Range 87 West, Seward Meridian).

2.7 Geology and Soils/Potential Material Sites

R&M Consultants performed a reconnaissance level geotechnical review of the sites on Nelson Island in the summer of 2005 (Appendix B, and summarized below). The report cites four visits to the north side of Nelson Island performed by others, since 1975, for the purpose of reconnoitering the general surface conditions and/or potential material sources (soil, aggregate and rock):

- DOT&PF, 1977
- Woodward-Clyde Consultants, 1984
- USACE, 2002
- USACE, 2005

During the 2005 site visit, R&M reviewed the surface and subsurface conditions at Takikchak (see Appendix B for trip report). The engineering geologist visited two of the initial six alternative sites under consideration, while members from PDC visited two other alternatives. Two alternatives (2 and 5) were not visited due to time constraints and because these sites were likely to be eliminated.

2.7.1 Regional Geology

Newtok Island is mainly composed of quaternary and tertiary volcanic rock. The lowlands are poorly draining flat terrain with numerous lakes, marshes, and meandering streams. The highlands are rolling terrain with gentle slopes. The region is underlain by permafrost.

Permafrost at the site appeared to range from discontinuous on the lower benches near Baird Inlet, to sporadic on the ridges and hilltops. Ice-rich soils, including ice wedges, may occur along the lower elevations in the coastal areas; particularly in the general vicinities of Alternatives 2 and 5.

2.7.2 Hydrology

Nelson Island lies between the Yukon and the Kuskokwim Rivers in the Y-K Delta. The island borders the Ninglick River to the northwest and the Baird Inlet to the north, both of which are highly influenced by tides. There is also an unnamed stream located on the western side of the relocation area.

Several small springs were noted along the shore of Baird Inlet. One of the springs was reportedly used for obtaining drinking water for people traveling through the area. The Takikchak River may also be at least partially spring-fed. These springs were interpreted to be fed by the swales and small ponds observed on the ridges above. The water appeared to percolate down through unfrozen fractured bedrock. The flow from these springs may vary seasonally or depend on rainfall.

2.7.3 Potential Material Sites

A massive rock outcrop exists on top of the ridge, hereafter designated “Hill 460,” just south of the proposed village relocation site (Figure 5.1). This bedrock exposure was the only significant outcrop observed in the immediate vicinity of the proposed village relocation site that appeared capable of providing sufficient quantities of borrow and aggregate materials potentially suitable for construction of the new airport and access road.

The bedrock exposure ranged in height from approximately 30 to 100 feet along the northern flank. The depth of overburden may be greater than 10 feet across portions of the hill. Boulders and rubble along the top of the ridge generally appeared be a hard, massive dark gray to black vesicular basalt. Basalt is often formed in layers, called flows, one laid on top of another; these flows may have different composition, structure, and weathering characteristics. Thus, the rock may become softer and more weathered with depth.

Further investigation of Hill 460 as a material site would be needed to establish the quantity and quality of material available. The apparent hardness of the rock indicates that blasting may be required to mine the material.

3.0 AVIATION ACTIVITY AND FORECAST

3.1 Route Structure and Activity Overview

The village of Newtok is located in the Lower Middle Coastal zone of the Yukon-Kuskokwim Delta and serviced from the hub airport at Bethel. According to the *Y-K Plan* and verified by interviews with air service providers, Newtok is served as part of a cluster of seven villages (Cluster 10), each served from Bethel.

3.2 Enplanements

The *Y-K Plan* provides comprehensive forecasts for the entire Y-K Delta considering elements of airport classification, population, economics, and intra- and inter-village travel. The historic and forecasted enplanements presented in the *Y-K Plan* are shown in Table 3.1. The forecasted enplanements calculate to a 3.95% average annual growth rate. This growth rate is higher than population growth mainly because of the trend that people are flying more and more; the cap on enplanement growth is based on expendable income.

Table 3.1 – Enplanement Data

	Actual										Forecast				
Year	1990	1995	1996	1997	1998	1999	2000	2001	2002	2003	2005	2010	2015	2020	2025
Enplanements	1,429	2,178	2,119	1,557	1,419	1,500	1,754	1,908	3,127	2,552	2,320	2,830	3,300	3,800	4,612

Source: *Yukon-Kuskokwim Delta Transportation Plan,* March 2002, Table 3-4, with Years 2001-2003 based on the FAA Air Carrier Activity Information System (ACAIS). The forecasted year of 2025 is extrapolated from the *Y-K Plan* assuming the same growth rate as for the previous years.

3.3 Mail

The U.S. Postal Service (USPS) is the major agency transporting air freight in rural Alaska. Because villagers are becoming more reliant on supplies from outside of the village and they have the advantage of subsidized postage, the volume of mail per capita is increasing. The *Y-K Plan* forecasts a 3.45% average annual growth rate for mail. The forecast volumes for Newtok are listed in Table 3.2.

Table 3.2 – USPS Non-Priority and Bypass Mail

	Forecast				
Year	2005	2010	2015	2020	2025*
Pounds	491,600	586,100	700,000	835,000	989,000

Source: *Yukon-Kuskokwim Delta Transportation Plan,* March 2002, Table 3-11, except for Year 2025, which is forecasted based on same growth rate as previous years.

3.4 Operations

Aircraft operations are defined as either takeoff or landing of an aircraft (a single plane landing and then taking off constitutes two operations). The FAA Master Record (July 7, 2005) lists 1,000 air taxi operations and 150 general aviation itinerant operations, for a total of 1,150 operations.

Without a change in the aircraft fleet, the number of operations would grow at a rate similar passenger and mail growth rates. Applying a growth rate of 3.45% (mail) and 3.95% (passengers) results in Year 2025 operations ranging from 4,095 to 4,620. Depending on the distribution of the population between Newtok and Takikchak during the transition period, these operations may be exceeded. After relocation from Newtok to Takikchak is complete, the number of aircraft operations may fall below the forecast, because with an improved facility it is likely that larger capacity aircraft will be used.

3.5 Current Fleet Mix

Pilots identified the following aircraft (Table 3.3) as those they typically fly to Newtok.

Table 3.3 – Current Aircraft Fleet Mix

Aircraft	Airport Reference Code (ARC) Designation	Aircraft Use
Cessna 207	A-I	Air Taxi & Charter
Twin Otter Cessna 208 Caravan	A-II	Air Taxi
Piper PA31 Navajo	B-I	Air Taxi
Sherpa/Shorts SD330	B-II	Cargo

3.6 Design Aircraft and Runway Length

The *Y-K Plan* proposed upgrading the airport to 3,300 feet to support the nine-passenger Piper Navajo Chieftain as the design aircraft. Although providing a comprehensive forecast for the existing Newtok Airport, the *Y-K Plan* did not anticipate relocation of the village.

The *Y-K Plan's* long-term proposal to provide the community of Newtok with a 3,300-foot runway to support operations by an aircraft providing nine seats and a cargo capacity around 2,200 pounds would likely be sufficient. However, with the prospect of village relocation, a substantially higher volume of cargo will be shipped, and passenger travel to support the construction would also be greater.

Air Carrier Interviews

- Arctic Circle Air, one of Newtok's main air cargo providers, says that the current runway length limits the fleet serving the village. Arctic Circle typically flies the Cessna 207 and 208 Caravan to Newtok. Occasionally, when they have enough cargo, they use the Sherpa/Shorts SD330. A 3,000-foot or longer runway is needed for going in heavy but coming out light. If cargo or equipment were coming out of Newtok, they would need 3,800 to 4,000 feet, especially in the summer.
- Lynden Air Cargo noted the need for a 4,000-foot runway to operate the Herc C-130. They fly by charter only, for fuel and cargo. Their questionnaire response indicated that they feel the State is unrealistic in only building 3,300-foot-long runways.
- Hageland provides scheduled service twice daily and generally carries 8-10 passengers per day. They currently use the Cessna 207 and 208, but would use the Beech 1900 for charters if the runway were long enough (4,000 feet).

- Grant Aviation provides medical evacuation services with the Caravan. They also fly a Cessna 207 and the Navajo PA31 to Newtok to carry mail and up to 6-8 passengers daily. They are looking to fly larger planes (Beech 1900 or King Air). They could use these aircraft at Newtok if the runway were longer.
- ERA services Newtok with at least one flight per day. They fly Twin Otters and could continue to do so if the airport were relocated. They would prefer a 3,500-foot-long runway, but 3,300 feet is okay.

The Beech 1900 and Sherpa/Short SD 330 have been selected as the design aircraft. Based on pilot questionnaires and the expectation of substantial air cargo traffic during the community relocation, a design runway length of 4,000 feet would be advantageous.

4.0 FACILITY REQUIREMENTS

The ultimate airport facility for Newtok should be a 4,000-foot runway with FAA standard dimensions meeting Airport Reference Code B-II.

- Aircraft servicing this area (Cluster 10) require 4,000-foot runways, and 4,000-foot runways are planned at three of the seven airfields in the cluster.
- Over the next five to ten years, Newtok will receive larger than normal volumes of cargo and fuel to support the village relocation. The *Y-K Plan* did not account for these extra passenger and cargo volumes.
- The air carriers feel longer is better, each providing a rationale for at least occasional use by aircraft requiring 4,000-foot-long runways.
- When considering a major investment such as relocation of an airport, it is prudent to consider longer-than-20-year plans.

This area is also known for a high percentage of poor weather days; therefore, each alternative should support non-precision instrument (NPI) approach minimums. Furthermore, adequate apron area should be provided to allow maneuvering by the occasional large cargo aircraft as well as off-loading of the smaller daily service aircraft.

4.1 Airport Design Criteria

The design standards for the ARC are specified in the FAA Advisory Circular (AC) 150/5300-13B, Change 9, *Airport Design*. Airspace criteria are established in Federal Aviation Regulation (FAR) Part 77, *Objects Affecting Navigable Airspace.* Table 4.1 presents design criteria proposed for development of a Newtok Airport on Nelson Island. The approach visibility design criteria were established for not lower than one-mile visibility for non-precision GPS approaches. Some criteria shown are for an airport facility larger than ARC B-II. Although a B-II facility is currently planned, occasional operations by larger aircraft should be expected. The larger Runway Protection Zone is suggested for additional land use control on the approaches to the runway.

Table 4.1 – Design Criteria

Airport Feature	Proposed for Recon Study
Design Aircraft	Sherpa/Short SD330 or Beech 1900
Airport Reference Code	B-II
Airport Facility Designation	Community
Runway Length	4,000'[1], 3,300' minimum
Runway Width	75'
Runway Safety Area	4,600' x 150'[1], 3,900' x 150' minimum
Taxiway Width	50'[2]
Taxiway Safety Area	118'[2]
Approach Visibility Minimums	Non-Precision and Not Lower than One Mile
Runway Protection Zone (RPZ)	1,700' length, 500' inner width, 1,010' outer width[3]
Primary Surface	4,400' x 500'[4], 3,300' x 500' minimum
Horizontal Surface	10,000' radius
Approach Slope (NPI)	34:1
Parking Apron	250' x 400'
Aviation Support Area (Lease Lots)	4 lots 150' x 100' each (includes 50' apron frontage)
Parking Apron Offset from Runway Centerline	400'
Airport Lighting	Runway and Taxiway Lighting, Threshold Lighting
Navigation Aids	Rotating Beacon, Wind Cone & Segmented Circle

[1] Length required to accommodate the Beech 1900 and Sherpa/Short SD 330. Also will accommodate occasional operations by DC-3, DC-6, or C-130 flying in loaded and leaving empty. Considered prudent based on pilot questionnaires and substantial air cargo traffic for community relocation.

[2] Taxiway and Taxiway Safety Area widths increased to the next higher Aircraft Design Group (III) to provide more snow storage area and to support occasional use by larger aircraft.

[3] RPZ dimension shown for Aircraft Approach Categories of C and D to provide on-ground and airspace protection to support occasional use by larger aircraft, such as the DC-3, DC-6, or C-130, for fuel or cargo operations.

[4] Draft Part 77 dimensional changes for NPI approaches will increase the primary surface from 500 feet to 1,000 feet.

4.2 Runway Orientation

FAA standards require 95% wind coverage for the crosswind component, which is determined by the airport approach category (15 mph for this facility). If 95% coverage cannot be obtained on a single runway, a crosswind runway would be needed to meet this requirement. There is no wind data available for Newtok or Takikchak. To help evaluate the runway orientation for the initial alternatives, we interviewed pilots to obtain anecdotal information and reviewed wind data from surrounding airports.

User and Air Taxi Information

Pilots indicate that the north side of Nelson Island has prevailing winds from the southeast in the fall and north-northeast to east in the winter. These winds can be 20 knots or higher, especially in the fall/winter season, coinciding with the storms from Japan.

A pilot who has been flying the Y-K area out of Bethel for several years reported that the typical weather for the island is breezy from June through August, foggy in August through November, and fairly nice with some rain from December to May. This pilot reported the

low ceiling cloud cover occurs 40 percent of the time and can be as low as 200 feet in the Toksook Bay and Newtok area. When the ceiling is this low, clouds cover the tops of the hills.

A different pilot, also familiar with the area, stated whiteout conditions are not uncommon, especially during winter. This pilot felt an east–west oriented runway would be best for the strong northeast winds in the area. He stated the strongest winds occur during break-up and freeze-up.

Both pilots cautioned that winds vary between communities and are influenced by local topography.

University of Alaska Anchorage Climate Center and Nearby Villages
The UAA Climate Center has no data for the Newtok Airport, but the following data is available from nearby villages.

Table 4.2 – Wind Data for Airports near Newtok

Airport	Distance from Newtok	Dates of Available Wind Data
Toksook Bay	24 miles SW	August 1993 through March 1995
Chevak	57 miles NW	August 1995 through June 1996
Nightmute	23 miles S	August 1995 through December 1996
Tununak	26 miles SW	January 1996 through March 1996
Bethel	90 miles E	Tuntutuliak ALP presents a wind rose using Bethel data from January 1984 through December 1993. More recent data (since installation of the AWOS) has been collected but not compiled.

The wind data used for the Toksook Bay ALP shows high winds predominantly from the northwest. The Bethel wind rose (shown on the Tuntutuliak ALP) shows high winds predominantly from the northeast. These two data sources show that the predominant winds are crosswind to each other, which supports the pilot reports (above).

Review of the Toksook Bay and Bethel wind roses suggests a need for two runways to achieve FAA's recommended wind coverage of 95 percent.

We recommend wind data be collected from a location on the north side of Nelson Island, near the proposed community, prior to selection of a final airport site or orientation. Based on the USGS maps and our field reconnaissance, Alternative 1 would be a good site for wind data collection.

4.3 Other Meteorological Conditions

This region of Alaska is known for its low clouds and fog. Pilots operating under Visual Flight Rules (VFR) must be able to see the ground at all times. In many cases, in order to provide service to communities in the Bethel region, pilots fly under the ceiling from their origin to the destination airport. Newtok's existing airport lies in a low area (elevation 46 feet), but the

potential relocation sites are on higher ground (elevations between 300 and 375 feet). If the ceiling is often below these elevations, it could impact the reliability of air service or the need to install navigational aids to support NPI approach capabilities with low minimums. Consultation with FAA to determine possible approach minimums for the specific sites, as well as additional studies to determine ceiling heights, would be prudent.

Collection of overcast data can be both low- and high-tech, from working with the school or pilots to collect data using meteorological ceiling balloons or providing visual observations, to installation of automated laser ceilometers. Factors to consider in determining the best collection method for Newtok include:

- Accuracy (human vs. automated observation)
- Reliability (use of human observers vs. village power supply and potential for damage to electronic equipment)
- Timing/Schedule
- Cost

5.0 ALTERNATIVES

5.1 Evaluation Criteria

The alternative development process involved multiple steps.

- **Step 1:** Initial review of U.S. Geological Service (USGS) maps, agency and public meetings, site reconnaissance, and discussion with locals and pilots to identify general areas for consideration. Based on a cursory review of the USGS maps, six alternatives were identified. Information learned from pilot questionnaires, the public and the site visit reduced the alternatives to three. Step 1 also identified the facility requirements and criteria for further evaluation of the remaining alternatives. For more detail on eliminated alternatives, refer to Section 5.4 and Technical Memorandum No. 1 (Appendix C).
- **Step 2:** Layouts of Alternatives 1, 3, and 4 were prepared and overlaid on contour mapping, and engineering and environmental evaluations were completed. Results of this evaluation are documented below.

Sites were evaluated based on the following criteria:

1. **Orientation for Wind** – Although no wind data for Newtok is presently available, pilot interviews indicated the stronger winds are from the northeast and a more east-west orientation would be best. Further, it seems from other data in the area that two runways may be needed. Thus, sites that allow for flexibility in runway orientation and/or crosswind runways are preferred.
2. **Proximity to Community** – The location of the airport needs to be coordinated with the community layout of roads, utilities, and other infrastructure and to meet separation requirements of landfills and sewage lagoons. The airport should be near the community, but far enough away to avoid being a safety concern, preventing ground traffic crossing and children playing on or near the runway. Further, the location should allow for future expansion of the community and airport.
3. **FAR Part 77 Airspace** – The airport should be clear of terrain penetrations of the primary, transitional, approach, conical and horizontal surfaces. The Precision Approach Path Indicator (PAPI) Obstruction Clearance Slopes should be clear of terrain penetrations.
4. **Environmental Overview** – Impacts to known or potential resources should be minimized.
5. **Bird and Wildlife Hazards** – The USFWS recommends avoidance of direct flight paths over the Baird Inlet Island to prevent disturbances to birds at critical stages in their life cycle as well as an increased risk of wildlife and aircraft collisions.
6. **Suitable Topography and Soils** – Contour mapping from the USACE, which covers most of the Alternative 1 site, was used to evaluate the compatibility of the existing topography for the required facilities at this site. Topographic information from USGS mapping was used to evaluate the compatibility of the existing topography for the required facilities at Alternatives 3 and 4. Soil conditions identified from the office and field reconnaissance work were considered.
7. **Costs** – Site development and maintenance costs were be developed and compared.
8. **Proximity to Materials and Barge Landing** – The borrow material for the runway, taxiway, apron, and road embankments is likely to come from a source near the airport, while the surface course may come from farther away. Access to the community, to the material site, and to a barge landing for the construction equipment and materials was considered.

5.1.1 Site Alternatives

Tech Memo #1 recommended that Sites 1/1A, 3, and 4 be further evaluated based on the criteria listed above. Based upon the design criteria, airport layouts were developed for the runway, apron, taxiway, and access routes at each site. These sites and layouts (shown on Figure 5.1) were then evaluated as discussed below.

Table 5.1 presents a comparison matrix for evaluation of the alternatives, showing a summary of features for each alternative. Discussion of the alternatives and the considerations that formed the basis of their evaluation follows.

Table 5.1 – Alternative Comparison Matrix

EVALUATION CRITERIA	ALTERNATIVES		
	Alternative 1/1A	**Alternative 3**	**Alternative 4**
Range of Orientation for Wind Coverage	Runway orientations of approximately 61° to 71° (NE-SW) and approximately 115° to 130° (NW-SE)	Runway orientation of approximately 113° to 173°, or a NW-SE to a N-S orientation	Runway orientations of approximately 120° to 135° (NW-SE) and approximately 17° (NE-SW)
Proximity to Community	Approximately 0.25 miles south of the community, atop the hillside Approximately 1 mile of airport access road from the NE end of Main Street	Roughly 2 miles south of the community Approximately 2.5 miles of airport access road from the NE end of Main Street	About 0.85 miles south of the community Approximately 1.75 miles of airport access road from the NE end of Main Street
FAR Part 77 Airspace	No penetrations based on 4' contour mapping	No penetrations based on 50' USGS mapping	No penetrations based on 50' USGS mapping
Environmental Overview	Minimal impacts	Minimal impacts	Minimal impacts
Bird and Wildlife Hazards	Approximately 3 miles SE of Tunuirun Island and 300' higher in elevation	Approximately 5 miles SE of Tunuirun Island and 300' higher in elevation	Approximately 3.25 miles SE of Tunuirun Island and 350' higher in elevation
Suitable Topography and Soils	Aerial mapping indicates rolling hills and, depending on final orientation, a possible drainage area Soil conditions same for all three alternatives	50' USGS mapping indicates fairly flat with possible rolling hills Soil conditions same for all three alternatives	50' USGS mapping indicates fairly flat with possible rolling hills and a low drainage point Soil conditions same for all three alternatives
Costs	Construction cost approximately $16 million Annual maintenance cost approximately $210,000	Construction cost approximately $19.5 million Annual maintenance cost approximately $247,000	Construction cost approximately $20.5 million Annual maintenance cost approximately $236,000
Proximity to Material Source and Barge Landing	Hill 460 approximately 1 mile west (3.75 miles by road) Barge landing 1 mile northeast (1.5 miles by road)	Hill 460 approximately 2.75 mile west (5.25 miles by road) Barge landing 2.25 miles northeast (3 miles by road)	Hill 460 approximately 0.75 mile west (5.75 miles by road) Barge landing 2.5 miles northeast (3.5 miles by road)

Figure 5.1 – Relocation Area

5.2 Alternative 1

5.2.1 Orientation for Wind

Alternative 1 site allows for a runway orientation of approximately 60 to 70 degrees (northeast-southwest) and/or an orientation of approximately 115 to 130 degrees (northwest-southeast). This site will not accommodate a true east-west runway as the pilot questionnaires indicated would be needed for the area. Figure 5.2 shows Alternative 1 in its preferred location based on available contours as well as the range of alignments to adjust for prevailing winds.

5.2.2 Proximity to Community

The airport access road would be approximately 1 mile and would connect to the proposed community road system. This airport location is approximately 0.25 miles south of the community and parallels the heart of the community. Although the airport would be atop the hillside from the community this alternative has the easiest access and could provide greater potential for conflict between airport operations and community activities such as hunting, berry picking, children playing. Dust control may also be a concern. This was voiced as a potential issue related to contaminating fish while drying in the open air.

5.2.3 FAR Part 77 Airspace

Based on the 4-foot interval mapping and an assumed all-fill section, there are no airspace penetrations. The fill section used to establish the airspace elevations assumed a minimum of 5 feet of fill, with an average fill height closer to 8 feet. Primary, transitional, and approach surface penetrations may be encountered if new geotechnical recommendations allow for excavation. Any such penetrations should be cleared.

5.2.4 Environmental Overview

Alternative 1 would be expected to cause minimal overall environmental impacts. Although a fair amount of disturbance to the natural environmental the positive benefits to the human environment help to balance the overall impacts. Wetland impacts are anticipated to be the single greatest impact as the entire area is wet. Section 6.0 provides an initial analysis of the environmental conditions and potential impacts associated with the alternatives. In general each alternative are relatively similar. However because this site is the closest to the community, in addition to the potential for conflicts and dust discussed in Section 5.1.2 above, it would have the greatest construction impacts. Also, small, deep ponds near this location have the potential to attract small numbers of birds such as diving ducks (USACE, 2005).

5.2.5 Bird and Wildlife Hazards

Concern was raised by USFWS related to the importance of the Tunuirun Island for nesting habitat (see Section 6.1.3). Alternative 1 is approximately 3 miles southeast of the island, and the elevations at this proposed site are nearly 300 feet higher than the highest point on the island. Aircraft flying over or near the island on their way to or from the airport would exceed this height. Surveys would be needed during different seasons to determine the potential for impacts due to construction and use of an airport. It is understood that the USACE is planning additional wildlife studies associated with the community development, coordination with them to combine efforts should be considered.

Figure 5.2 – Alternative 1

5.2.6 Suitable Topography and Soils

Of the three locations under consideration, Alternative 1 has the most precise survey data available. The 4-foot aerial mapping indicates rolling hills and, depending on final orientation, a possible drainage area. Hand auger probes at this site suggested the presences of sporadic permafrost. There was no evidence of thermokarst features; which suggests the shallow soil column may not be ice rich. The preliminary interpretation of the geotechnical conditions suggest that the foundation soils may be, moderately stable where unfrozen, relatively ice-poor where frozen, and only marginally susceptible to the detrimental effects of seasonal frost action. For concept planning the embankment thickness could be minimized and controlled by the minimum grade and profile required for aircraft operations and to keep the surface free of drifting snow, versus geotechnical concerns pertaining to foundation soils (R&M, 2005, Appendix B).

5.2.7 Cost

The estimated costs of construction for Alternative 1 are approximately $16 million. M&O costs are estimated at $210,000 per year, and are the least compared to Alternative 3 and 4 due to the shorter access road length. Other costs such as right-of-way (ROW) acquisition are not known at this time but should be considered.

5.2.8 Proximity to Materials and Barge Landing

The Hill 460 material site is approximately 1 mile west of Alternative 1 (3.75 miles by road). The barge landing is approximately 1 mile northeast of Alternative 1 (1.5 miles by road).

5.3 Alternative 3

5.3.1 Orientation for Wind

The terrain limits this site from accommodating a true east-west runway, but does offer approximately 60 degrees mobility to maximize wind coverage. The location allows for a runway orientation of approximately 113 to 173 degrees, or a northwest-southeast to a north-south orientation. Figure 5.3 shows Alternative 3 in its optimal location based on terrain, as well as the range of available alignments.

5.3.2 Proximity to Community

The airport access road is approximately 2.5 miles from the northeast end of the proposed community road system. This airport location is roughly 2.25 miles south of the community. This site will allow a greater separation between airport operations and community activities, as compared to Alternative 1.

5.3.3 FAR Part 77 Airspace

Based on 50-foot interval USGS mapping, there appear to be no airspace penetrations. With the lack of contour information available at this site, the same fill heights used for Alternative 1 were assumed uniform for all sites and used to establish the airspace elevations to determine whether there would be penetrations. Primary, transitional, and approach surface penetrations may be encountered when better mapping data becomes available or if new geotechnical recommendations allow for excavation. Any such penetrations should be cleared.

Figure 5.3 – Alternative 3

5.3.4 Environmental Overview

This site was not reviewed during our field visit, nor had the USACE environmental surveys extended to this area. However, it is reasonable to believe the natural environment there is similar to Alternatives 1 and 4, so impacts should be similar (and thus minimal with the exception of wetlands). Because Alternative 3 is farthest from the new village site, it should have the least construction impacts.

5.3.5 Bird and Wildlife Hazards

Alternative 3 is approximately 5 miles southeast of Tunuirun Island, and the elevations at this proposed site are near 300 feet higher than the highest point on the island in the inlet. The aircraft flying over or near the island would exceed this height. In addition, the aircraft flying to and from the area would have space to avoid flying directly over or near the island. Alternative 3 is anticipated to have the least potential impact on nesting birds or potential for bird/aircraft conflicts, however surveys may still be needed to document the absence of impacts.

Coordination with the USACE field surveys is recommended (see Section 1.1.5 above).

5.3.6 Suitable Topography and Soils

Alternative 3 has 50-foot USGS mapping available to establish the terrain. Based on this mapping, the topography appears to be fairly flat with the possibility of rolling hills. Soil conditions are anticipated to relatively similar to Alternative 1.

5.3.7 Cost

The costs of construction and maintenance for Alternative 3 are approximately $19.5 million and $247,000 per year, respectively. Other costs such as ROW acquisition, while unknown at this time, should be considered. It would be anticipated that the cost for ROW acquisition will be the same or similar for each site.

5.3.8 Proximity to Materials and Barge Landing

Alternative 3 would have the longest hauls to transport construction materials from the Hill 460 material site, which is approximately 2.75 miles to the northwest (approximately 5.25 miles by road). The barge landing is approximately 2.25 miles northeast of Alternative 3 (3 miles by road).

5.4 Alternative 4

5.4.1 Orientation for Wind

This location allows for a main and crosswind runway with orientations between 120 to 135 degrees (northwest-southeast) and 15 to 20 degrees (northeast-southwest). This could allow for a crosswind runway to provide the minimum 95% wind coverage that FAA requires. Figure 5.4 shows Alternative 4 in its optimal location based on the terrain, as well as the range of available alignments.

Figure 5.4 – Alternative 4

5.4.2 Proximity to Community

The airport access road is approximately 1.75 miles from the northeast end of the proposed community road system. This airport location is about 0.85 miles south of the community.

Although this alternative is not much farther from the community than Alternative 1, it is out at the west end, whereas Alternative 1 lies parallel to the community center. Community activities described under Alternative 1 could impact this alternative as well, but Alternative 4 is farther in distance and elevation, reducing the potential conflicts.

5.4.3 FAR Part 77 Airspace

As with Alternative 3, based on 50-foot interval USGS mapping, there appear to be no airspace penetrations. With the lack of contour information available at this site, the same fill heights used for Alternative 1 were assumed uniform for all sites and used to establish the airspace elevations to determine whether there would be penetrations. Primary, transitional, and approach surface penetrations may be encountered when better mapping data becomes available or if new geotechnical recommendations allow for excavation. Any such penetrations should be cleared.

5.4.4 Environmental Overview

Alternative 4 is expected to be similar to Alternative 3, causing minimal overall environmental impacts.

5.4.5 Bird and Wildlife Hazards

Alternative 4 is approximately 3.25 miles southeast of Tunuirun Island. Elevations at this proposed airport site are nearly 350 feet higher than the highest point on the island in the inlet, so aircraft flying over or near the island would exceed this height. Because of its location and elevation, potential impacts to nesting birds would be expected to be only slightly greater than for Alternative 3 but less than Alternative 1. As with the other alternatives, surveys would be needed during different seasons to determine the potential for impacts due to construction and use of an airport.

5.4.6 Suitable Topography and Soils

Alternative 4 has 50-foot USGS mapping available to establish the terrain. Based on this mapping, the topography appears to be fairly flat, with the possibility of rolling hills and a low drainage point. Soils are anticipated to be similar to Sites 1 and 3.

5.4.7 Cost

The costs of construction and maintenance for Alternative 4 are approximately $20.5 million and $236,000 per year, respectively. Other costs such as ROW acquisition, while not known at this time, should be considered.

5.4.8 Proximity to Materials and Barge Landing

The Hill 460 material site is approximately 0.75 miles west of Alternative 4 (approximately 4.25 miles by road). The barge landing is approximately 2.5 miles northeast of Alternative 4 (3.5 miles by road).

5.5 No-Build Alternative

This alternative would not provide a new runway at the Takikchak relocation area. This would cause great inconvenience to the residents, who would have to boat the 9 miles between old Newtok and the relocated Newtok. In addition, the community could only rely on the existing airport for a short period of time, since the erosion that is driving the village relocation will eventually reach the existing airport as well.

5.6 Eliminated Alternatives

5.6.1 Initial Alternative Identification and Analysis

Six initial airport relocation alternatives, shown on Figure 1 in Technical Memorandum No. 1 (Appendix B), were identified using transparent airport overlays on USGS mapping and applying the following principles:

- Select relatively flat topography to minimize earthwork for construction
- Avoid fill into lakes or ponds
- Minimize airspace penetrations caused by surrounding hills – especially within the approach surfaces
- Locate the airport near the community relocation site

These initial alternatives were evaluated based upon information gathered during the office study, pilot interviews, and the field reconnaissance conducted on July 28 (see Trip Report, August 8, 2005). The goal of this preliminary screening was to identify sites that were reasonable for refinement and more detailed evaluation. Of the six initial sites, three (Alternatives 2, 5, and 6) were eliminated for the reasons discussed below.

5.6.2 Alternative 2

- Pilots in Bethel expressed concern with the nearby hills and approach up the valley. There are terrain penetrations of the FAR Part 77 Horizontal, Conical, and 34:1 Approach Surfaces.
- The airport would require property from Native allotments. Acquisition of Native allotments could prolong the project schedule and should be avoided.
- Topographically, there is little flexibility in the runway orientation for improving wind coverage.
- The runway overlays a drainage that would have to be either conveyed through a culvert under the runway or diverted to the end of the runway.

5.6.3 Alternative 5

- As with Site 2, the Bethel pilots expressed concern with the nearby hills. There are terrain penetrations of the FAR Part 77 Horizontal and Conical Surfaces.
- Land acquisition would be more difficult than for the three options being carried forward. The airport would require property from the Yukon Delta National Wildlife Refuge for the runway, taxiway, and apron and from the Newtok Native Corporation for an access road to the community. The access road would have to either go through the Native allotments or climb the hill and cross to the south of them.
- This location is farther from the community than any of the other alternatives.

- This alternative has the lowest approach from the north over Tunuirun Island. Depending on the exact location of the runway, the approach could be directly over the island, which is a concern of the U.S. Fish and Wildlife Service. Field investigation indicates that the island's shape has changed from what is shown on the 1954 USGS map.
- Topographically, the runway orientation is constrained by lakes and a parallel steep hillside, providing little flexibility for improving wind coverage.

5.6.4 Alternative 6

- The topography of this site would require either deep fills at each end of the runway or cutting out the hill near the center portion of runway to obtain the line of sight requirements and clearance of the FAR Part 77 primary surface.
- The site is not well-suited for lengthening the runway in the future, as each end drops off considerably.
- Following the ridge offers little flexibility in the orientation of the runway for improving wind coverage.
- Flat terrain for apron and aviation support areas is limited and would require deep fills.

5.7 Alternatives Recommended for Additional Study

Based on public input, engineering considerations, and environmental factors, it is recommended that Alternatives 1, 3, 4 and the No-Build Alternative be carried forward for further study. See Section 7.1 for discussion of the additional study work anticipated to be required.

6.0 INITIAL ENVIRONMENTAL ANALYSIS

6.1 Environmental Scoping

The initial environmental analysis included review of available environmental documents, office and online research, a field visit, and coordination with agencies and the public. Table 6.1 summarizes the results of this work and indicates anticipated impacts from the three build alternatives and the No-Build Alternative. To date, several field and office surveys have been conducted in preparation for the community relocation:

- Wetland delineation fieldwork and archaeological surveys (USACE, September 2002 and August 2005)
- Fish sampling (USACE, June 2005)
- Field reconnaissance, including biological and wetland survey (USACE, June 2005)
- Fish habitat survey (USACE, August and September 2005)
- Hydraulic survey (USACE, September 2005)
- Soil survey (R&M, October 2005)

Table 6.1 – Environmental Checklist

Environmental Impact Category *(based on FAA 5050.4B)*	**Potential Environmental Impacts**			
	Non-Issue	**Negligible**	**Minimal**	**Substantial**
Air Quality	ALL			
Coastal Barriers	No-Build	Alts 1, 3, & 4		
Coastal Zone	No-Build	Alts 1, 3, & 4		
Compatible Land Use	No-Build	Alt 3	Alts 1 & 4	
Construction Impacts	Alts 3 &4 No-Build	Alt 1		
Section 4(f)	ALL			
Farmlands	ALL			
Fish, Wildlife, and Plants	No-Build		Alts 1, 3, & 4	
Floodplains	ALL			
Hazardous Materials	ALL			
Historical, Architectural, Archaeological, and Cultural	ALL			
Light Emissions and Visual Effects	ALL			
Natural Resources and Energy Supply	ALL			
Noise	ALL			
Socioeconomic, Environmental Justice, and Children's Health and Safety Risks	Alts 1, 3, & 4			No-Build
Solid Waste	ALL			
Water Quality	ALL			
Wetlands	No-Build			Alts 1, 3, & 4
Wild and Scenic Rivers	ALL			

6.1.1 Coastal Barriers

Coastal barriers are landscape features that shield the mainland from the full force of wind, wave, and tidal energies.

The U.S. Fish and Wildlife Service is the oversight agency for the Federal statute regulating coastal barriers. USFWS was consulted (Telephone Log, 7/5/06 and 7/12/06) to determine if Nelson Island was part of the Coastal Barrier Resource System (CBRS). Alaska was not found on the USFWS website's "List of CBRS units," nor did the CBRS maps section on the USFWS website have any maps for Alaska.

6.1.2 Coastal Zone

Takikchak is in the northwest coastal zone and falls within the boundaries of the Ceñaliulriit Coastal Resource Service Area (CRSA). Coordination with the CRSA manager will be required to assure activities associated with the project comply with the coastal management plan. The submission of a Coastal Project Questionnaire (CPQ) will be required during the preparation of the environmental document. The CPQ will identify permits subject to a consistency review, determine State and Federal permitting requirements, and determine which State agency will coordinate the consistency review.

6.1.3 Compatible Land Use

The potential for bird strikes will likely require an assessment by the U.S. Department of Agriculture (USDA). Based on the surveys conducted to date by the USACE, Alternatives 1 and 4 have small, deep ponds around them that attract diving ducks; the USACE biologist said the sites have the potential to attract small numbers of birds. Alternative 3 has not been surveyed for birds, but it is reasonable to believe the natural environment there is similar (Telephone Log, 6/21/06).

Nearby Tunuirun Island is an important nesting area for waterfowl. According to consultation with the USACE biologist, potential impacts to the birds and their nests will require detailed documentation. Surveys would be needed during different seasons to determine the potential for impacts to nesting activities and likelihood of bird strikes due to operation of an airport at the proposed alternatives (Telephone Log, 6/21/06).

Tunuirun Island rises only a few feet above the river's surface at its highest point, low enough that high tides can occasionally submerge it. Elevations for all of the airport alternatives exceed 300 feet, so aircraft approaching or departing near or over the Tunuirun Island would be at least 300 feet above the island's surface. However, actual flight patterns would vary depending on the location and alignment of each airport alternative. Alternative 1 is both close and angled in alignment with the island such that aircraft may have to fly directly over the island. For Alternative 4, aircraft may have to fly alongside the island in a worst case scenario. Alternative 3 is far enough away that aircraft should have sufficient maneuvering space to avoid the island altogether.

The proposed location of the lagoon and landfill is to the east of the airport alternatives and more than 5,000 feet away, meeting FAA's separation distance requirement. Originally other sites were proposed, but they did not meet the 5,000 feet separation from the airport relocation Alternatives 1 and 4. Coordination among the agencies prompted selection of the site meeting FAA's criteria.

Although all airport alternatives are not expected to exceed noise thresholds, it is recognized that Alternative 1 has the most potential for impact to the community because it is the closest.

6.1.4 Construction Impacts

Constructing the airport would have temporary impacts on noise, air quality, and water quality. Construction impacts would primarily affect residents who move to the site before or during the construction of the airport. The extent of the impacts would be determined by the location chosen for the airport and its proximity to the people.

6.1.5 Fish, Wildlife, and Plants

The village (and consequently the airport) would be surrounded by the Yukon Delta National Wildlife Refuge. In June 2005, the USACE conducted a site survey to assess potential impacts. The survey included the locations of Alternatives 1 and 4. According to communication with the USACE, it is reasonable to assume that similar conditions exist at Alternative 3 (Telephone Log, 6/21/06).

The USFWS website indicates that spectacled and Steller's eiders, both listed as threatened species under the Endangered Species Act (ESA), migrate coastally in the vicinity of Takikchak. According to the website, these are the only threatened and endangered (T&E) species in the refuge. According to the USACE, no eiders or their nests were observed during their initial wildlife survey. These birds inhabit low-lying tundra ponds and not hillsides; construction and operation of any of the alternatives would not likely disturb eider habitat or nesting areas (Telephone Log, 6/21/06).

The USACE biologist observed geese on hillsides, but not at the specific proposed airport alternatives. Further documentation may be needed to substantiate their absence (Telephone Log, 6/21/06).

Because Tunuirun Island is an important nesting area for waterfowl, there is potential for disturbance by low-flying aircraft, as discussed in Section 6.1.3 above.

Nelson Island has sufficient area to sustain any species affected by the build alternatives. The USACE survey found no unique habitat or species (Telephone Log, 6/21/06). Fish and essential fish habitat are not anticipated to be affected by the project (Telephone Log, 6/21/06).

The USACE plans to conduct another wildlife survey of the community relocation site. At that time, the biologist is willing to survey any areas needed to further the understanding of potential impacts due to the construction and operation of an airport at any of the proposed sites (Telephone Log, 6/21/06).

6.1.6 Historical, Architectural, Archaeological, and Cultural

According to the survey work conducted by the USACE, the recommended alternatives for the airport and the gravel source have "extremely low probability" to contain any cultural resources. The USACE will be recommending to the State Historic Preservation Office (SHPO) that all sites be cleared (Telephone Log, 6/21/06).

6.1.7 Socioeconomic, Environmental Justice, and Children's Health and Safety Risks

The No-Build Alternative would likely have a substantial negative impact on the community. It would leave the community without an airport at the new community site. This would leave the residents without access to emergency services outside of their community. During winter essential supplies (food, medicine, fuel, mail, etc.) could only be shipped in by snowmachine and this would be very limited. Without an airport, the commercial fishermen in the community would have an added expense and time constraint to get their fish to market.

6.1.8 Wetlands

For this reconnaissance study, PDC completed a preliminary wetland delineation covering Alternatives 1, 3, and 4 (Appendix B). It is based on photo interpretation by PDC and field observations by the USACE (Alaska District Trip Report, 2005). A USACE wetland delineation is currently under way and will supersede this document when completed.

Based on PDC's wetland delineation all of the potential relocation sites are dominated by wetlands. Preliminary observations indicate a majority of the relocation site appears to have palustrine wetlands. The typical subclasses include scrub-shrub and emergent persistent. No uplands were identified within the delineation boundaries. Willow/grass drainage areas in the vicinity of Alternative 4 classify as intermittent streams, which are considered Waters of the U.S. and thus under USACE jurisdiction.

According to a 2005 USACE report, the potential gravel source appears to be uplands.

6.2 Environmental Summary

Based on this preliminary environmental analysis, no distinguishable environmental conditions exist that would eliminate any of the build alternatives proposed (1, 3, and 4) from consideration. The No-Build Alternative would have a substantial negative effect on the community. The anticipated level of environmental documentation required for the project under the National Environmental Policy Act (NEPA) is an Environmental Assessment (EA). It is understood however, that the USACE is preparing a programmatic Environmental Impact Statement (EIS) for the community relocation, in which the airport relocation is considered. FAA may allow reference to certain aspects of that document, somewhat lessening the level of detail needed in the FAA document.

7.0 RECOMMENDATIONS

This reconnaissance study is the initial study to determine the purpose and need, the facility requirements, and the optimal location for a community airport to support the relocation of the Village of Newtok to Nelson Island. This study worked toward this objective by determining the facility requirements for the relocated airport and identifying reasonable site alternatives to carry forward for further evaluation.

7.1 Facility Requirements

A B-II facility with a 4,000-foot runway is recommended. The Sherpa 330 and the Beech 1900 were identified as the design aircraft. Over the next five to ten years the process of relocating the village will create a greater demand for passenger travel and shipment of cargo. Aircraft that require a 4000-foot runway already service this region of the state, and all of the air carriers interviewed provided a rationale for at least occasional use of such aircraft at the Newtok village site. (Also see Section 4.0.)

7.2 Relocation Alternatives

Based on public input, engineering considerations, and environmental factors, it is recommended that Alternatives 1, 3, 4 and the No-Build Alternative be carried forward for further study (see Section 5.0 above).

The following sections recommend additional studies to aid in selection of an optimal airport location, as well as an outline of a transition strategy to guide DOT&PF's efforts to develop the new airport facility in concert with the Village's efforts to relocate.

7.3 Additional Airport Location Study Work

Further evaluation of the reasonable alternatives identified in this study is needed before a preferred alternative can be selected. This work is anticipated to include:

- Maintain ongoing communication with the Village, the USACE, and other supporting agencies to confirm the planned locations of other community facilities relative to the airport alternatives.
  - As of January 2008, it is understood that VSW and DCCED have identified a village site that conflicts with the use of Alternative 1 for the airport. Whether it would be more advantageous for the airport or the village to occupy this site will need further study and coordination.
- Complete a wind study (in progress as of February 2007), to be finished prior to selection of a final site.
- Acquire the USACE wetlands delineations for Sites 1 and 4 once complete. Complete additional wetlands assessment at Site 3 if it is still viable based on the wind analysis.
- Acquire additional mapping of Alternatives 3 and 4 if they are still considered viable based on the wind analysis. The mapping will allow more detailed comparison of how the airport layouts fit with the terrain, which could have substantial impact on the comparative costs.

- Coordinate further with the USFWS to determine specific requirements for study of Tunuirun Island in order to determine potential impacts related to overflight of approaching and departing aircraft. In addition to considering potential impacts to nesting birds, bird/aircraft conflicts should also be considered. The USACE plans to conduct additional wildlife surveys of the relocation site, and information gathered from this study would be beneficial to the airport assessment.
- Conduct reconnaissance-level geotechnical exploration of the viable airport sites and investigate potential material sites.
- Perform the necessary observations (manual or electronic) of ceiling/overcast conditions that may affect aviation operations.
- Determine improvements (dredge or fill), whether associated with the village relocation or the airport project, to the planned barge landing site in order to identify associated impacts.
- Based on the results of the additional studies above, identify any remaining viable alternatives, complete the necessary environmental documentation, and select a preferred alternative.

7.4 Facilities Implementation Plan (Transition Strategy)

As part of the community relocation project, basic infrastructure must be developed. Initial development is expected to include:

- Establish a reliable water source for drinking water
- Develop a material source for roads, pads, and airport construction
- Construct landfill
- Construct an access road to material source and landfill from the new town site
- Provide a temporary power supply for construction

After these basic facilities are in place:

- Construct new housing and move enough residents to show commitment to the new townsite. In these early stages of relocation, moving or constructing a store and new offices for the City, Tribal Council, and Corporation would demonstrate this commitment.
- Seek funding for schools, sanitary waste systems, and the community airport.

The airport project would consist of a new runway and access road to the airport, and possibly to the barge landing area for surfacing material transport. Most rural airports in Alaska are sponsored by DOT&PF and funded by the FAA Airport Improvement Program (AIP). In order to receive a Federal grant under the AIP, the airport must be included in the National Plan of Integrated Airport Systems (NPIAS). The FAA Alaskan Region Airports Division will evaluate an airport's inclusion into the NPIAS based on:

- Whether an airport is considered a public-use airport
- The number of enplanements the airport has or is forecast to have
- The number of aircraft based at the airport
- Whether the airport receives U.S. mail service
- Whether there is a component of the U.S. Military, Reserves, or National Guard permanently based on or adjacent to the airport
- Special justification, such as the isolation of the community being served and/or whether the airport serves the needs of an Indian tribe, supports recreation areas, or is needed to develop or protect important national resources

The planning and design process of airport projects is detailed in the DOT&PF Alaska Aviation Preconstruction Manual and the FAA Alaskan Region Airports Division "Airport Sponsor's Guide." Some major airport project milestones include:

- CIP data sheet
- Legislative authority
- Environmental document
- Airport Layout Plan
- Airport Property Plan
- Plans, Specifications, & Engineer's Estimate assembly
- Authority to Advertise
- Construction

When the airport is complete, a U.S. Post Office should be established.

The State of Alaska has contractual obligations to the FAA to maintain the Newtok Airport until 2014. If the community has moved prior to this time, the airport should be closed.

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