

BERING LAND BRIDGE NATIONAL PRESERVE

Serpentine Hot Springs Transportation Access Report



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LIST OF ACRONYMS AND ABBREVIATIONS

ADOT&PF	Alaska Department of Transportation and Public Facilities
ANILCA	Alaska National Interest Lands Conservation Act
BELA	Bering Land Bridge National Preserve
EA	Environmental Assessment
EIS	Environmental Impact Statement
FAA	Federal Aviation Administration
GMP	General Management Plan
IRA	Indian Reorganization Act
KTP	Kawerak Transportation Program
MP	Milepost
NEPA	National Environmental Policy Act
NPCA	National Parks Conservation Association
NPS	National Park Service
O&M	Operations and Maintenance
ORV	off-road vehicle
RS	Revised Statute
URS	URS Group, Inc.
VERP	Visitor Experience and Resource Protection

INTRODUCTION

Purpose of the Report

The purpose of this report is to compile information about potential access improvements to Serpentine Hot Springs, a highly valued site in the Bering Land Bridge National Preserve (BELA). The community dialogues reported in this document were initiated by the National Park Service (NPS) in order to learn about community perspectives, potential access improvements, costs and impacts, before undertaking any more formal efforts to amend the BELA General Management Plan (GMP) with a Serpentine Hot Springs Site Management Plan.

Access to Serpentine Hot Springs was recognized as an important policy matter for the Preserve, both in the establishing legislation and in the first GMP. When BELA was established in 1980 in the Alaska National Interest Lands Conservation Act (ANILCA), Congress specified that one purpose of the new preserve was “to provide outdoor recreation and environmental education activities including public access for recreational purposes to the Serpentine Hot Springs area (Section 201[2]).” The first GMP for the new preserve adopted the guidance that Serpentine Hot Springs “will be maintained in its present condition” (NPS 1986). In the mid-1980s, the facilities at Serpentine Hot Springs included a bath house and lodging, as well as an unimproved airstrip. See Figure 1 for the site plan found in the GMP.

Since that time, many stakeholders have emphasized the importance of protecting the current rustic facilities and traditional healing values of Serpentine Hot Springs. Other stakeholders have urged improvements in access so that more people can enjoy the exceptional values of the site.

The NPS commissioned URS Group, Inc. (URS) in September 2010 to assist the Bering Land Bridge National Preserve in conducting pre-planning dialogue meetings in seven affected communities and to compile information about alternative transportation access improvements, costs, and potential effects on visitor experiences. A summary of the findings can be found in [TABLE 1](#).

Organization of the Report

The Serpentine Hot Spring Transportation Access Report is organized into seven sections to help present information gathered during public meetings, telephone conversations with local experts, and desktop research. The sections are color coded, as noted in the summary below, and these colors are used in the summary Table 1, to provide links to the more detailed treatment of information in the appropriate section.

SECTION 1 - Public Meeting Results summarizes the results of discussions held in the seven affected communities, including comments on historic and contemporary uses of Serpentine Hot Springs, ideas about transportation improvements, and concerns about future use. A complete set of meeting notes can be found in [Appendix A](#).

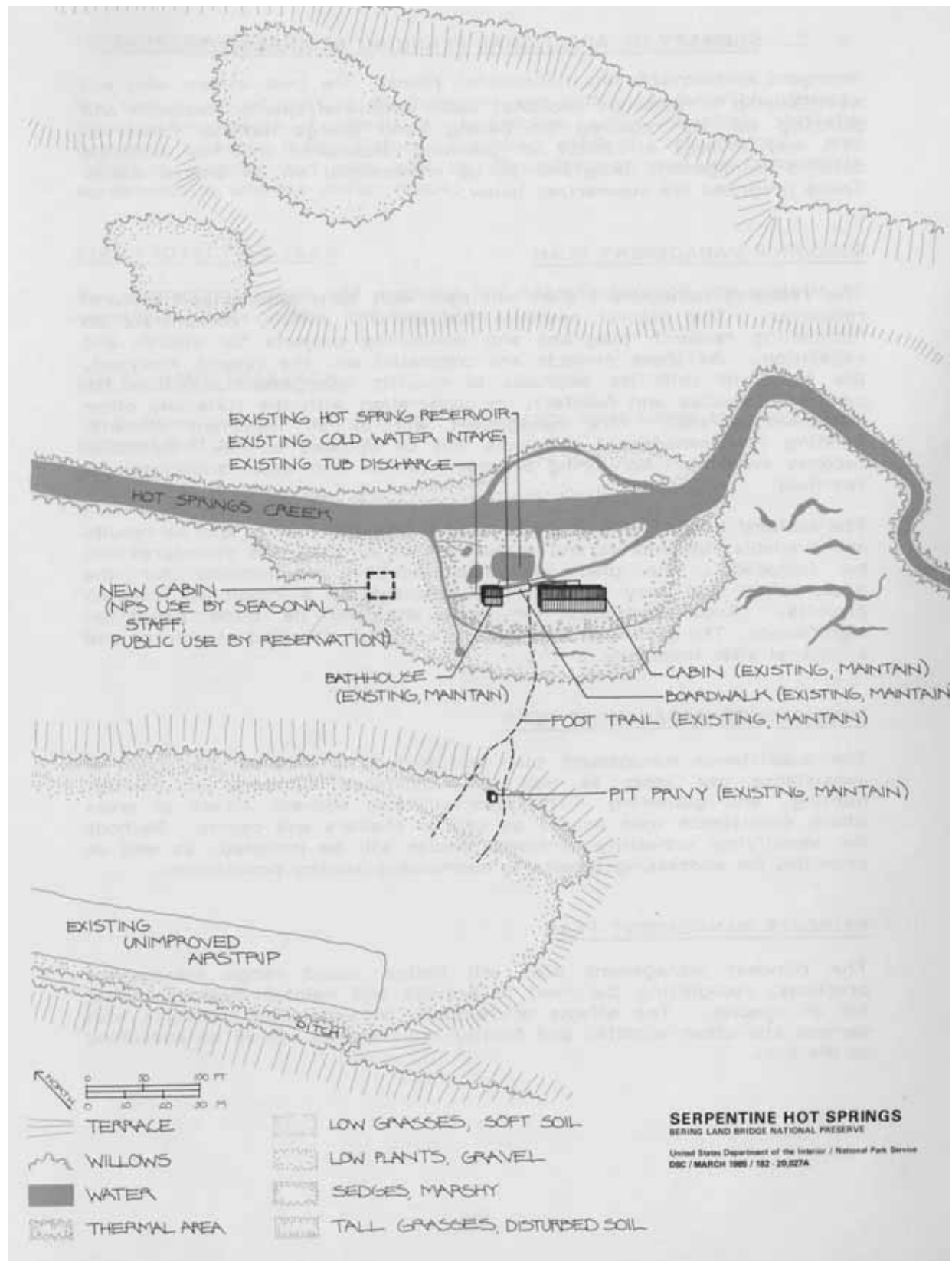
SECTION 2 – Potential Access Improvements describes potential transportation access improvements and “Class C” cost estimates which are based on very preliminary engineering analyses. The options that were examined in this report range from minimal upgrades (for safety purposes) to large-scale improvements (a new 3,400 foot air strip or a two-lane gravel road from the Nome-Taylor Highway to Serpentine Hot Springs). [Appendix B](#) provides more detailed spreadsheets of the construction and maintenance cost estimates.

SECTION 3 – Visitation Projections contains the methodology for estimating visitor projections to Serpentine Hot Springs under each potential transportation access improvement. For a summary of the estimated increases in visitation associated with each potential transportation improvement, see [TABLE 7](#).

SECTION 4 – Potential Impacts examines the potential impacts of the transportation improvements on visitor experience and Serpentine Hot Springs resources. The summary of impacts and costs by transportation mode can be found in **TABLE 1**.

Concluding comments in **SECTION 5 – Summary and Conclusions** focuses on how the NPS might monitor visitor use patterns, to support more rigorous estimates of visitation increases and to plan for and mitigate any impacts that might result.

Figure 1 – Site Plan for Serpentine Hot Springs from 1986 Bering Land Bridge National Preserve General Management Plan



History of Serpentine Hot Springs

Serpentine Hot Springs is widely recognized as a very special place within BELA. The Inupiat people of the Seward Peninsula see a legacy of centuries of traditional use as a place of healing, while many Seward Peninsula residents value the historic initiative of the post-World War II miners who built a rudimentary trail and developed rustic facilities at this site. Work by the people from Shishmaref in the 1970s improved the current bath house. While the site holds much meaning for regional residents, there have been many diverse views about how and whether to improve access.

An important overview of traditional Inupiat perspectives is found in *The Cultural Landscape Inventory of Iyat (Serpentine Hot Springs)* (NPS 2003). This study describes the religious, medicinal, subsistence, and recreational uses of Serpentine Hot Springs by Seward Peninsula Native people, dating back at least 3,500 years ago and possibly as early as 12,000 years ago. The traditional Inupiaq word for the site is "Iyat" meaning "cooking pot" or "a large bowl filled with food to provide for the community." The physical features of the Iyat Cultural Landscape identified in the inventory include the creek, valley, surrounding hills and tors, hot springs site, pool, cold-water diversion ditch, fresh water pond, and archeological sites.

Another important perspective reflects a subsequent set of users who arrived in the early 1900s. Miners began using the springs for rest and recreation. The current bunkhouse was reportedly hauled to the site after World War II using a tracked vehicle; the airstrip was bladed with a bulldozer before 1945. A wooden bathhouse possibly stood from the 1950s-70s before it was replaced by residents from Shishmaref, who built a new bathhouse in 1977.

Today, the majority of visitors to Serpentine Hot Springs originate from Shishmaref because it has a long history of involvement with the site, it is the closest community (approximately 52 miles), and winter and spring access by snowmobile is available. During the public meetings in November 2010, each Seward Peninsula community reported varying levels of use of Serpentine Hot Springs (see Section 1 for a summary and Appendix A for the complete notes). However, several communities (i.e. Wales, Brevig Mission, and Deering) reported that because of distances and lack of a marked trail, winter travel to the Serpentine Hot Springs has diminished in recent decades. Some communities also referred to other hot springs in close proximity, as with Buckland and Deering residents traveling to Granite Mountain Hot Springs south of their communities.

The traditional healing values of Serpentine Hot Springs remain important in the perspectives of the Inupiat residents of the Seward Peninsula. Many people recalled the occasional trips of elders from Kotzebue to the Serpentine Hot Springs organized by the health program of Maniilaq Association in Kotzebue through the early 1990s. While detailed documentation of this use is not presently available, the practice and the memories of the practice are still highly valued by local residents. Winter travel to Serpentine Hot Springs is by snowmobile. Summer travel is most commonly via small aircraft; hiking to the site is uncommon due to the distance and challenging terrain. Helicopter access and overland motorized summer travel are not currently authorized modes of access to the site.

Table 1 – Summary Findings

Transportation Modes	SECTION 2			SECTION 3		SECTION 4			Transportation Modes
	Transportation Mode Features	Construct- ion Cost Estimate	O&M Estimate	Expected Changes in Visitor Use		Visitor Experience Impacts	Cultural Resource Impacts	Environmental Resource Impacts	
A. Limited Improvements	Airstrip brush clearing and grading; windsock repair, and other limited improvements to facilities. Existing airstrip accommodates limited small aircraft of very experienced pilots.	\$40,000	\$12,000 per year	Negligible increase < 1% growth per year.		Rustic accommodations would not be improved. No notable change in visitor experience. Safety improvements to airstrip and winter trail markers.	Grading of airstrip could impact unidentified historic and pre-historic artifacts under airstrip.	On-going maintenance to stabilize airstrip and prevent stream erosion. On-going maintenance of non-permanent winter trail markers. Potential for spills and minor noise associated with aircraft.	A. Limited Improvements
	Policy change to allow helicopters to land at Serpentine Hot Springs. Helicopter pad would require construction of 3,600 square foot heliport.	\$1,500	\$500	Negligible increase > 1% growth per year. Current helicopter operators do not anticipate large demand due to expense.		Introduction of helicopters and associated noise.	Negligible additional damage to identify and unidentified cultural resources associated with current fixed-wing aircraft.	Impact to previously disturbed site for construction of heliport. Slight increase of short-term, high-intensity noise. Negligible risk for hazardous spills.	B. Helicopter Access
	Installation of winter trail markers to Deering, Wales, and Brevig Mission; Lost Butte Creek timbers crossing.	\$276,000	\$14,000	Minor increase in visitation; distance and weather are larger factors in determining whether local residents are willing to ride long distances		Potential increase in search & rescue with increased long-distance travel. Potential localized air quality and noise issues that impact visitor experiences. Increased likelihood facility capacity would be exceeded on some weekends.	No new damage to cultural resources associated with use of winter trail markers.	Negligible vegetative damage related to installation and maintenance of permanent markers.	C. Increased Winter Trails
D. Airstrip Expansion Options	1) 1500' airstrip in the existing location would accommodate small aircraft with more margins for safety.	\$1.2 million	\$20,000	Negligible increase; average annual growth to match population growth and few more trips from existing carriers		Increased likelihood facilities would be used more and parties could overlap. May lead to the need for visitors to "reserve" the facilities.	Continued use of the airstrip is associated with potential damage to cultural resources. Disturbance of new surfaces could disturb cultural resources.	Moderate disturbance of soils and vegetation associated with new airstrip surface clearing. Minor increases in noise associated with increased air traffic.	D. Airstrip Expansion Options
	2) 3,400' airstrip in new location could accommodate most small aircraft (up to 4 passengers) and medium-sized aircraft (9-12 passengers).	\$13.1 million	\$25,000 annual + \$100,000 ten-year reshaping	Moderate increase in visitors due to the frequency of medium-sized chartered planes.		Major change in character with the potential for small-tour day visits; facility capacity could be routinely exceeded in summer months. Decrease in rustic experience for independent travelers.	New site could disturb unidentified historic and pre-historic artifacts. Moderate to major increased access to lyat Cultural Landscape could increase potential for disrespectful behavior and artifact damage.	Minor disturbance soils, vegetation, and backcountry character associated with new airstrip clearing and new path to existing facilities. Minor increases in noise, localized air pollution, and dust associated with increased air traffic.	
E. Hardened Surface Options	1) Geogrid earthen trail constructed from end of the Nome-Taylor Highway to Serpentine Hot Springs for off-road vehicles (ORVs).	\$4.9 million	\$13,000	Moderate increase in both daytime and overnight visitors.		Moderate change in character with larger volumes of summer visitors. Facility capacity could be routinely exceeded in summer months.	Major increased access to lyat Cultural Landscape with ORVs could increase potential for disrespectful behavior and artifact damage.	Moderate disturbance to soils, vegetation, wetlands, and potentially fish habitat within road corridor. Potential for users to leave trail causing soils and vegetation (lundra damage).	E. Hardened Surface Options
	2) Single-lane gravel road with turnouts from the end of the Nome-Taylor Highway to Serpentine Hot Springs for ORVs.	\$29.7 million	\$65,000	Major increase in daytime users and over-capacity with overnight use.		Major change in character with higher volumes of traffic associated with road access. Facility capacity could be routinely exceeded in summer months.	Major increased access to lyat Cultural Landscape with ORVs could increase potential for disrespectful behavior and artifact damage.	Lower speeds than those appropriate to double-lane road. Moderate effects to wildlife, subsistence, and backcountry character particularly with potential for users to leave road. Noise, air pollution, spills associated with heavy machinery during construction.	
	3) Double-lane gravel road for ORVs and cars/trucks.	\$41.1 million	\$78,000	Major increase in daytime users and over-capacity with overnight use.		Major change in character with higher volumes of traffic associated with road access. Facility capacity could be routinely exceeded in summer months.	Major increased access to lyat Cultural Landscape with ORVs could increase potential for disrespectful behavior and artifact damage (approximately equal to single-lane).	Higher speeds traveled result in greater noise and dust. Moderate effects to wildlife, subsistence, and backcountry character particularly with potential for users to leave road.	

Definitions of the terms "major", "moderate", and "minor" and complete impacts descriptions can be found in Section 4.

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Section 1 – Public Meeting Results

Public and small group meetings were organized by NPS with assistance from URS in seven affected communities in November 2010. The purpose was to gather detailed, experiential accounts of uses, ideas, and concerns about the Serpentine Hot Springs resource. Given the diversity of views and strength of viewpoints, these meetings were structured to avoid debating the merits of formal “alternatives.” Alternatives will be developed in the process of updating or amending the GMP. Table 2 outlines the community meeting dates and times; a complete record of the meeting notes and photos can be found in Appendix A.

Generally, the meetings had very good attendance, with the Shishmaref and Nome public meetings characterized by very large groups participating. The Kotzebue meeting attendance was small, perhaps due to limited public notification. However, the landowners and air taxi operators that participated in the Kotzebue meeting provided detailed and specialized information. As demonstrated in the full meeting notes (Appendix A), there was a high level of interest among the participants. Several themes emerged at the public and small group meetings.

Table 2 – Transportation Access Public Meetings and Small Groups

Date	Meeting Location	Attendees	Date	Meeting Location	Attendees
Wed, Nov 3	Kotzebue Public Meeting 6:00pm at Northwest Alaska Heritage Center	6	Sun, Nov 7	Nome Small Group Meeting 3:30pm at NPS Office Conference Room	3
Thurs, Nov 4	Deering Public Meeting 1:00pm at Deering School	5 + entire school	Mon, Nov 8	Shishmaref Public Meeting 1:30pm at Friendship Center	23
Fri, Nov 5	Buckland Public Meeting Teleconference 1:00pm teleconference to Buckland Tribal Office	5	Tues, Nov 9	Wales Public Meeting 2:00pm at Multipurpose Building	8
Sat, Nov 6	Nome Public Meeting 2:30pm at Old St. Joseph's Church	27	Wed, Nov 10	Brevig Mission Public Meeting 11:00am at Multipurpose Building	11

Residents of Shishmaref (a predominantly Inupiat community) hold very strong feelings toward protecting their continued use of Serpentine Hot Springs for traditional spiritual and medical healing uses. In this role as “caretakers” of Serpentine Hot Springs, volunteers from Shishmaref constructed the current bathhouse in the 1977. One symbol of the way in which this site remains important is found in the annual school trips lead by Shishmaref teachers and elders to take young students to Serpentine Hot Springs to learn of the healing traditions. Shishmaref residents continue to access the site primarily by snowmobile and they receive assistance from the Kawerak Transportation Program (KTP). KTP installs and maintains winter trail markers to Serpentine Hot Springs. Other villages are familiar with this tradition and several expressed deference and support for what the community of Shishmaref decides.

In the Nome public meeting, there was vocal support for wider access to Serpentine Hot Springs, including improvements to the airstrip to accommodate air taxi service from Nome, changes in regulation to allow for helicopter access, and development of a gravel road to support summer access by trucks and off-road vehicles (ORVs). Several participants expressed frustration with policies that have limited access, and they urged the NPS to open up access to Serpentine Hot Springs. Some commenters recognized that new large-scale transportation projects would be

expensive; they nonetheless urged NPS to support such improvements. Some commenters discussed potential impacts of large-scale increases in access, and suggested that appropriate visitor amenities and management practices would be needed to avoid harm to resources and to ensure a quality visitor experience.

An important area of potential common ground emerged in the comments in nearly all communities about small-scale, near-term improvements that could be undertaken by the NPS to improve safety and promote a quality experience of a shared resource. It was recognized that the current condition of the airstrip was substandard and dangerous, and this was a contributing factor in the decision by the Nome air taxi operator to discontinue service to Serpentine Hot Springs and in the recent incident in involving a general aviation pilot who was stuck in the mud and required assistance.

There was much discussion about specific improvements that NPS could make to the Serpentine Hot Springs structures (bathhouse and tub, bunkhouse, outhouse, and boardwalk), and to the airstrip and winter trail markers. While there was near consensus that character of the visitors' experience should not change, there was no unity on the method to ensure this. The ideas discussed included: a reservation system to avoid overcrowding, ranger monitoring, emergency communication equipment, response capabilities, and volunteer or "friends" groups to assist on site and to advocate for funding.

Every community seemed to appreciate the opportunity to discuss their history and connection with Serpentine Hot Springs. There were no concrete "alternatives" to evaluate at the meetings, so all participants had an opportunity to speak their minds and to listen together as their neighbors discussed their hopes and concerns for the future of Serpentine Hot Springs.

Section 2 – Potential Access Improvements

This section describes eight potential access improvements or transportation modes to Serpentine Hot Springs, their technical feasibility, associated policy implications, and estimated costs for construction and maintenance. A summary was previously presented in [Table 1](#).

- A. Limited Improvements** at Serpentine Hot Springs
- B. Helicopter Access** to Serpentine Hot Springs
- C. Increased Winter Trails** in the Region – existing snowmobile tripods and new trail stakes
- D. Airstrip Expansion Options** at Serpentine Hot Springs
 - D1. 1,500' Airstrip in Existing Location
 - D2. 3,400' Airstrip in New Location
- E. Hardened Surface Options** from the end of the Nome-Taylor Highway to Serpentine Hot Springs
 - E1. Hardened Trail
 - E2. Single-lane Gravel Road
 - E3. Double-lane Gravel Road

Some proposed improvements, such as helicopter and ORV access on hardened trails are not allowed under current NPS regulations. However, these modes have been identified in the public discussions and are analyzed as a part of this report.

A 2011 diagram showing the layout of existing facilities and the airstrip at Serpentine Hot Springs can be found in Figure 2. There have been numerous improvements to facilities and amenities since the mid-1990s.

NPS reports that it spends about \$15,000 per year on general maintenance at Serpentine Hot Springs with the majority used only for transportation of staff to the site. NPS only uses about \$2,000 per year on maintenance supplies for the buildings and airstrip. This level of spending does not add additional safety features to the existing airstrip. Table 3 contains a summary of estimated construction and maintenance costs for each potential access improvement option.

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THIS DRAWING IS BASED ON SURVEYS CONDUCTED IN 1996 AND HAND SKETCHES OF 2010 CHANGES TO THE SITE.

THE MAGNETIC BEARING OF THE AIRSTRIP IS $N\ 56\ W\ S\ 56\ E$.

THE AIRSTRIP SURFACE IS DIRT AND CAN BE SLIPPERY IN THE SPRING AND WET WEATHER.

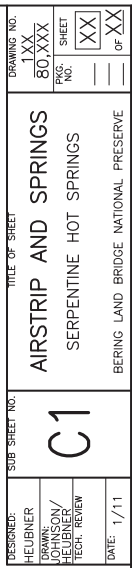
THE AVERAGE WIDTH OF THE AIRSTRIP IS 25 FEET.

THE LENGTH OF THE AIRSTRIP IS APPROXIMATELY 1,100 FEET.

THERE ARE NO LIGHTS AT THE AIRSTRIP.

THE CONCRETE BASE OF THE AIRSTRIP IS ON AN ELEVATION OF 506.2 FEET ABOVE MSL.

THE CONCRETE BASE OF THE WINDSOCK AND ACCURATE TO WITHIN 100 FEET.



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Table 3 – Summary of Cost Estimates for Access Improvements

Transportation Mode	Activities	Area or Distance	Estimated Construction Cost ^a	Estimated Maintenance Cost (per year)
A. Limited Improvements	Brush clearing, airstrip top resurfacing, drainage, stabilize windsock, replace airplane tie-downs	1,100'x 60' width airstrip resurfacing	\$40,000	\$12,000
	Maintain existing winter trails	Shishmaref to Serpentine Hot Springs = 52 miles Serpentine Hot Springs to Taylor = 13 miles	N/A	\$11,000/year (50% re-erecting and 10% replacement annually)
B. Helicopter Access	Construction helipad apron adjacent to existing airstrip	3,600 square feet	\$1,500	\$500
C. Increased Winter Trails	Adds new winter trail routes with carsonite on land; tripods on water at \$500/mile	*Deering to Serpentine = 77 mi	\$38,500	\$2,200
		*Wales to Serpentine = 107 mi	\$53,500	\$3,000
		Deering to Shishmaref = 100 mi	\$50,000	\$2,800
		Wales to Shishmaref = 77 mi	\$38,500	\$2,200
		Shishmaref to Brevig Mission to Teller = 81 miles	\$40,500	\$2,300
		National Environmental Policy Act (NEPA) Compliance	\$100,000	-
		TOTAL	\$326,000	\$14,200
D. Airstrip Expansion	D1. 1,500' Airstrip in Existing Location	1,500'x 60'	\$1.24 million	\$20,000
	D2. 3,400' Airstrip in New Location	3,400' x 120'	\$13.1 million	\$25,000 annually + \$100,000 reshaping at 10-years
E. Hardened Surface Options	E1. Geogrid	13 miles x 6'	\$4.9 million	\$13,000 first year + \$1,200 thereafter
	E2. Single-Lane Gravel Road	13 miles x 12'	\$29.7 million	\$65,000
	E3. Double-Lane Gravel Road	13 miles x 28'	\$41.1 million	\$78,000

Total construction cost estimates for airstrips and hardened trail include 15% contingency.

* Direct routes to Serpentine Hot Springs are prioritized above inter-village travel.

A. Limited Improvements

Upgrades to the existing airstrip could improve safety for summer fixed-wing access to Serpentine Hot Springs. Improvements would include brushing, improving the airstrip's top surface course and drainage, replacing airplane tie-downs and improving the existing wind sock. NPS could complete these improvements over the course of one summer season by flying-in a 4-wheeler with some specialized attachments.

- Brush has grown five feet tall at the ends and along the sides of the airstrip. Trimming brush 100 feet at each end of the airstrip would effectively increase the usable landing length.
- Improvement of the top surface would require importing small quantities of fine aggregate material from an alluvial deposit site ½ mile south of the airstrip.
- Subsurface drainage along the airstrip could be improved by creating a deeper ditch along the base of the ridge on the south side of the airstrip.
- Repairs to the wind sock include reinforcing or replacing the current pole with larger diameter steel pipe to withstand high wind forces.



Airstrip windsock (Kluwe, October 2010).

The use of vegetative surface cover (such as a dwarf tundra mat) on the airstrip was considered, but there is not enough data to support a recommendation that it should be utilized at this time. Soft conditions on the airstrip in spring (May and early June) would occur with a gravel or vegetative base unless the airstrip contained many feet of imported gravel (Barnes 2011).

Limited Improvements Policy Implications

The activities that stabilize and slightly improve the existing airstrip surface fall within the GMP guidelines to maintain Serpentine Hot Spring's current condition. The use of 4-wheeler attachments and the temporary delivery of a 4-wheeler by a fixed-wing aircraft are allowed under the discretion of the Superintendent. It is not likely the "limited improvements" would trigger National Environmental Policy Act (NEPA) analysis, unless a gravel borrow site is developed in the Preserve for material to improve the surface.

Limited Improvements Cost Estimate

The activities associated with limited improvements to the site include: clearing brush, resurfacing the airstrip top, maintaining existing winter trails, digging drainage, stabilizing the windsock, and replacing the airplane tie-downs. These activities could be done over the course of one to two weeks by flying in a 4-wheeler with specialized attachments (that can be left at the site) and other supplies. NPS estimates small aircraft can be chartered at \$600/hour with a regular maintenance trip for 2 to 3 workers costing \$4,600. Transportation alone to conduct "limited improvements" would be about half the total budget of \$40,000. The purchase of the four-wheeler backhoe, dump wagon, and attachments is estimated at \$10,000. A rise in fuel costs would have a substantial impact on the budget.

The plow and grading attachment are already at the site, as shown in the photos at the top of the next page. These improvements could be done in conjunction with some of NPS regular flights to the site. The "limited improvements" would not satisfy Federal Aviation Administration (FAA) requirements for side-slope clearance, therefore it is assumed that funding of limited strip improvements through FAA would be difficult to obtain.



Airstrip leveling device left at the site.



Airstrip gravel smoothing device at the site.

B. Helicopter Access

In order to accommodate helicopter access to Serpentine Hot Springs, a helipad (60 feet x 60 feet or 3,600 square feet) could be incorporated on the north side of the existing airstrip centered at least 100 feet from the centerline of the airstrip. The photo below (left) demonstrates existing aircraft parking; the helipad could be adjacent to this existing cleared area. The additional footprint of the helipad is considered necessary because a parked helicopter should not obstruct the clear zone of the airstrip required by an incoming plane.

Construction could be as simple as removing brush, grubbing out the roots, and flattening the surface with the four-wheeler/plow blade. Typical helicopters expected to use the site would be 4-passenger flightseeing type such as the Bell 206 or R-44 (see photo below right).



(left) A helipad could be cleared adjacent to the aircraft tiedowns.

(right) Typical 4-passenger helicopters. (Bell-206 image, care of www.isionairhelicopters.ca)

Helicopter Access Policy Implications

Helicopter access is not allowed in the preserve without a permit as specified in 43 CFR 36.11 (f) (4), which implements the access provisions found in ANILCA Section 1110. If a helicopter operator sought a permit to provide transportation to Serpentine Hot Springs, this would likely require NEPA compliance to assess impacts to resources, such as wilderness and noise. It would also need to be considered within the broader context of preserve planning depending on the nature of the request.

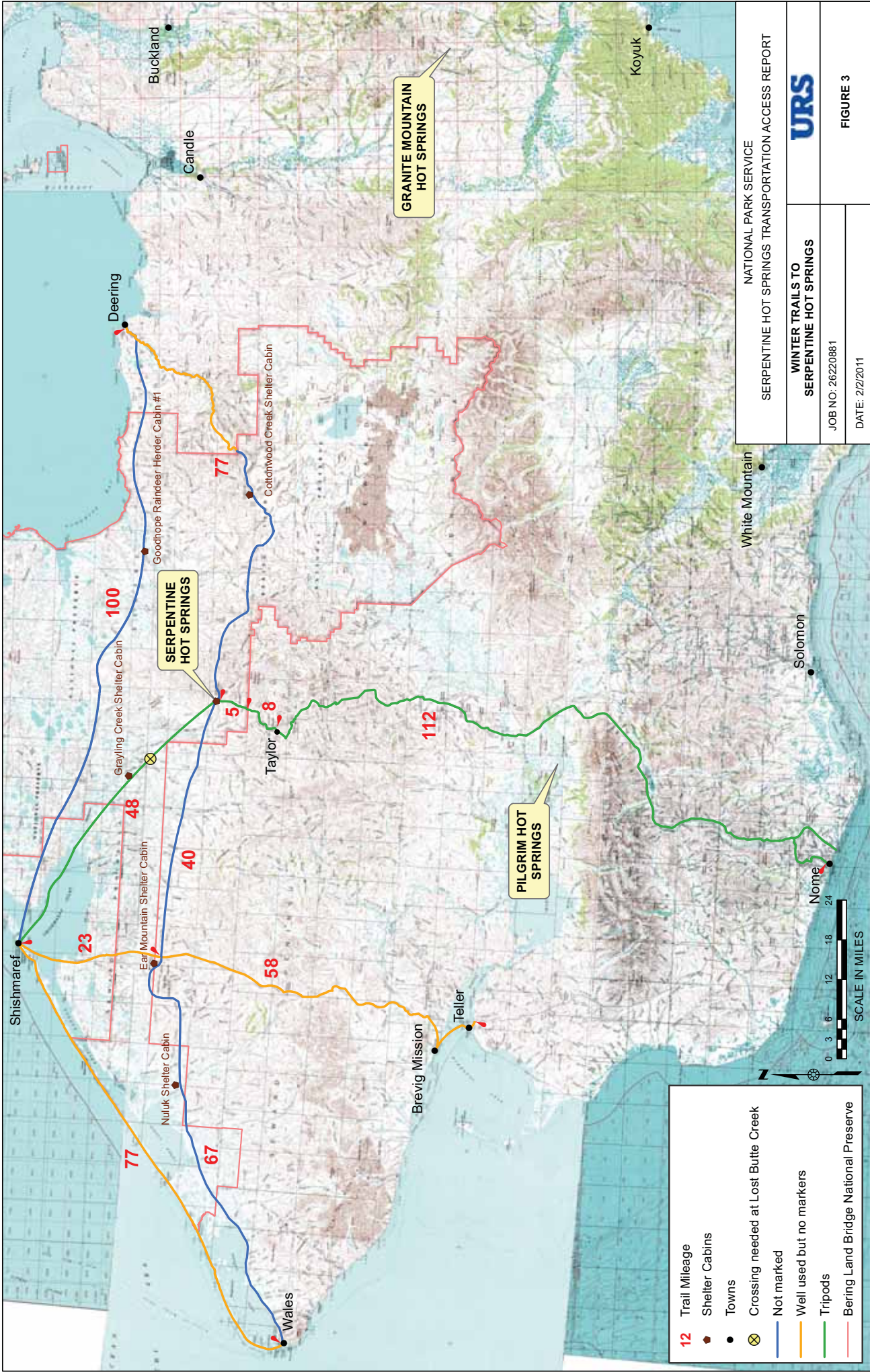
Helicopter Access Cost Estimate

The flat brushy area on the hot springs side of the airstrip (northeast of the apron and wind sock) should be an adequate space for the helipad, but it would require brushing and hand work to lift out the shrub roots to create a smooth surface on existing soils. Helipad markings painted on the ground would have to be repainted annually, with a cost estimated at \$1,500 and annual maintenance for supplies and labor estimated at \$500. Periodic trimming of brush for a few hours per year could be incorporated with the annual brush trimming associated with the existing or expanded airstrip.

C. Increased Winter Trails

All winter travel to Serpentine Hot Springs occurs by snowmobile with most traffic originating from Shishmaref. The existing and proposed winter trail network to Serpentine Hot Springs is shown in Figure 3. (Note: Figure 3 does not contain all intra-village trails, since many trails identified as part of the Kawerak Transportation Department Indian Reservation Roads program are kept confidential.)

The trails between Shishmaref and Serpentine Hot Springs, and between Serpentine Hot Springs and Nome, are marked with wooden tripod markers at 300 foot intervals (or approximately 18 per mile). These markers are typically installed during winter months by local crews on snowmobile. Maintenance could be accomplished by crews hiking in summer. Annually, many markers fall down or are knocked down by animals (see photo left on page 19). Wooden tripods are also used on lagoons and rivers; they are removed prior to spring thaw and replaced in the winter by Shishmaref IRA and Shishmaref Emergency Services to avoid losing them when the ice melts.



12	Trail Mileage
●	Shelter Cabins
●	Towns
⊗	Crossing needed at Lost Butte Creek
—	Not marked
—	Well used but no markers
—	Tripods
—	Bering Land Bridge National Preserve

SCALE IN MILES

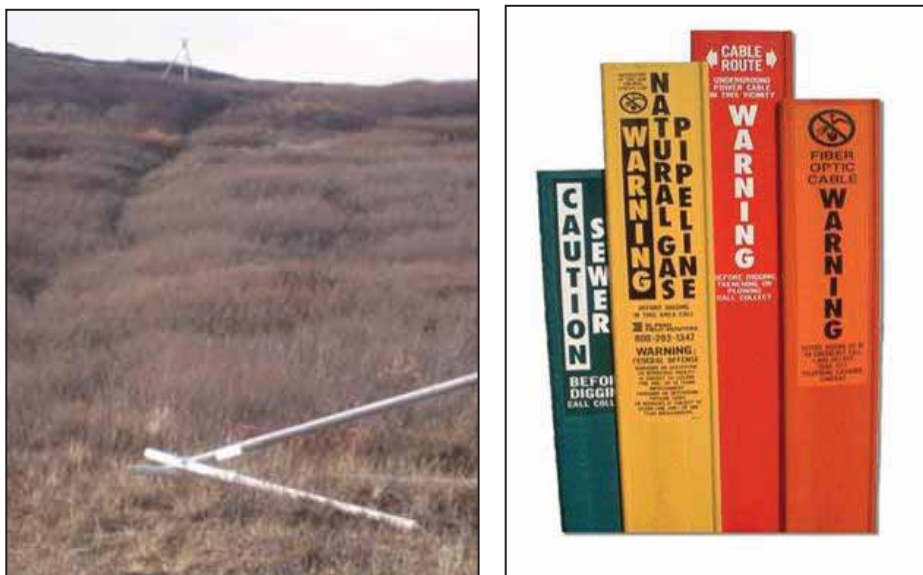
0 3 6 12 18 24

North Arrow

NATIONAL PARK SERVICE	
SERPENTINE HOT SPRINGS TRANSPORTATION ACCESS REPORT	
URS	
WINTER TRAILS TO SERPENTINE HOT SPRINGS	FIGURE 3
JOB NO: 26220881	
DATE: 2/2/2011	

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Alternatively, reflective carsonite (high-density fiberglass) road delineators could be installed every 300 feet for a price per unit comparable to the tripods (see sample in photo below right). The carsonite delineators have been used effectively on the North Slope on oil field roads and winter ice roads for thirty years. They have been proven to withstand arctic weather conditions, including extreme cold temperatures and high winds. The carsonite markers are more compact and lighter than wooden tripods, and could be installed during the winter using snowmobiles. The winter installation technique used successfully on the North Slope is to cut a slot into the tundra with a chain saw, insert the carsonite marker, and freeze in with water. For ease of mobility and lack of impact, installation of most markers should occur in winter. In the summer, a dark colored carsonite marker is nearly invisible, compared to the large wooden tripods. In winter, the dark carsonite markers stand out against the snow, and they can be manufactured with built in reflectors.



(left) One standing and one fallen wooden tripod for winter trail safety near Serpentine Hot Springs (Kluwe, October 2010). (right) Examples of carsonite posts that can be installed as semi-permanent winter trail markers (photo courtesy of www.prolinesafety.com).

Permanent installation of wooden tripods or carsonite markers would likely be more difficult on higher ridges where the underlying soil is rock and or gravel. Installation of markers into rock may be possible with a gas auger that can drill into rock with a special tip. These are estimated to take at least an hour to install (Nyokpuk 2011).

As a matter of comparison, wooden tripod and carsonite trail markers have nearly identical installation costs. Carsonite markers are highly wind and weather resistant, resulting in fewer replacements over the years. The low profile of the carsonite markers also means that they do not serve as animal scratch posts. However, their installation would require NEPA analysis, adding to the upfront costs, while the increased durability of the carsonite markers would result in a lower maintenance costs over time.

Increased Winter Trails Policy Implications

The current practice of installing tripods by snowmobile requires no policy change because wooden tripods are only minimally intrusive into the surface soils. However, the use of carsonite markers would likely require NEPA compliance, as the method of installation is more intrusive. A chainsaw would cut a hole through the tundra, followed by water to freeze it in place. The markers are more durable, so that long term impacts may need to be considered before installation.

Increased Winter Trails Cost Estimate

The following potential winter trail segments (442 miles total, shown in Figure 3) are calculated in Table 2 and can be found in Appendix B. NPS would prioritize direct routes to Serpentine Hot Springs before inter-village trails. For the purposes of comparing the costs of installing and maintaining new winter trails utilizing the wood tripods or the carsonite markers, the estimates are first based on the full set of proposed trails.

- Deering to Serpentine Hot Springs (77 miles, direct route)
- Wales to Serpentine (107 miles, direct route)
- Wales to Shishmaref (77 miles)
- Deering to Shishmaref (100 miles)
- Shishmaref to Brevig Mission to Teller (81 miles)

The estimated cost to install the existing wooden markers is \$28 each; there are 2,300 tripods currently installed for a total value of \$64,400 (Pomrenke 2010). If all of the new trail segments were marked, then the installation costs would be \$226,000. For estimating annual maintenance costs, it is assumed that 33 percent of the wooden tripods need to be re-set each year because wind conditions or animals knock them down. Tripods are removed from water bodies prior to the spring melt. The job to re-set and replace tripods is well-suited for local hire. On an annual basis, the estimated maintenance costs for the full set of trails would be \$87,412. If the new trails are designated with carsonite markers, the cost would be approximately \$15 each with an estimated \$13 each for installation. The total implementation cost of carsonite markers for all trails segments would be approximately \$326,000 (including NEPA compliance costs estimated at \$100,000). For estimating annual maintenance costs, it is assumed that 5 percent of carsonite markers would need to be replaced each year, a lower rate than that of the wooden tripods, because the carsonite markers are quite flexible, durable, and not enticing to animals. An annual replacement cost would be approximately \$14,200 if carsonite markers were used. Low replacement rates for carsonite markers assume they are embedded well enough into the tundra when initially installed that they resist permafrost heaving.

Comparing the two trail marking methods, the costs of NEPA compliance for the carsonite markers increasing the installation costs by \$100,000 compared to the wooden tripods. However, the annual maintenance cost of the carsonite marker method is lower than that for the wooden tripods by \$73,000. Thus after the second year of maintenance, the carsonite method would already be \$45,000 less than the comparable cost for the wooden tripods. For each additional year, the carsonite markers would involve a savings of an estimated \$73,000 when compared to the wooden tripod method.

D. Airstrip Expansion Options

Options for fixed wing access include the upgrade of the existing airstrip, or building a new airstrip west of the current site. The existing dirt air strip is 1,100 feet long and 60 feet wide. A tractor was used to construct the airstrip in 1945 or 1946, without the addition of imported gravel (Pomrenke 2011). Typical light aircraft that use the airstrip range from Super Cub to Cessna 206 and occasional Beavers. However, the current operator serving Serpentine Hot Springs, Northwestern Aviation, does not fly planes to the site fully-loaded so that the pilot can stop the plane in a shorter distance (Kincaid 2010). In addition, NPS employees report that the airstrip surface is soft after break up; therefore the airstrip is not functional through May and most of June.



The entire 1,100' Serpentine Hot Springs airstrip looking northwest (Crews, Oct 2010).

The existing Serpentine Hot Springs airstrip length of 1,100-foot is short compared to a typical rural Alaskan airstrip. It is nestled tight against the base of the ridge to the south of the site and is not compliant with FAA standards for both length and side-slope clearance (see photo above). The FAA requires side clearance (in an imaginary surface sloping at a ratio of 7 horizontal to 1 vertical) for a distance of 500 feet from the edge of the airstrip. The ridge is an obstruction which violates this side-slope clearance requirement (see photo below left).



(left) - View of Serpentine Hot Springs airstrip looking southeast. The proposed alignment of the 1,500-foot airstrip would rotate the southeast 40 feet to avoid the side-slope on the right side of the airstrip (Crews, Oct 2010). (right) - Clearing vegetation at each end of the airstrip could lengthen the usable airstrip (Crews, Oct 2010).

D1. 1,500-Foot Airstrip in Existing Location

The 1,500-foot alignment option assumes vegetation would be cleared 200 feet on both ends of the airstrip, with an extension of the airstrip on the southeast end, and surfacing with a crushed rock surfacing course (see photo above right). Extension of the northwest end is blocked by a tributary of the creek. The southeast end extension would require shifting the airstrip alignment 40 feet away from the side-slope (see photo above left), or about a 2 degree shift. The northwest end would

remain in its current location. This could achieve a longer, safer airstrip without diverting the current location of the creek (shown in Figure 4).

The 1,500-foot design includes 18 inches of pit run gravel under the 400 foot extension as well as a 6 inch aggregate base course over the length of the 1500 foot runway. This would accommodate the weight of aircraft that normally access Serpentine Hot Springs. A fully-loaded Cessna 206 could weigh 4,000 lbs.

D1. 1,500-Foot Airstrip Policy Implications

All federal lands within BELA are open to authorized aircraft uses. However, the use of motorized tools to conduct improvements to airstrips requires a permit from the Superintendent. The construction of a 1,500-foot airstrip would avoid the diversion of a stream; however, the footprint of the new airstrip surface would trigger NEPA compliance due to the potential for impacts. There are no other policy implications for the construction of a 1,500-foot backcountry airstrip because pilots use them at their own risk (Barnes 2011).

D1. 1,500-Foot Airstrip in Existing Location Cost Estimate

The estimated cost to construct a 1,500-foot airstrip assumes availability of gravel within a few miles of the site. A construction contractor would have to haul in fuel, equipment, and a small construction camp during late winter before the snow melts. The quantity of material needed to fill and resurface the 1,500-foot airstrip contributes over \$500,000 to the overall \$1.2 million construction cost. (For details, see Appendix B.) Other large cost items include field investigations (\$75,000), construction contingency (\$129,000), and engineering and permitting administrative support (\$112,000).

Annual maintenance costs are expected to be modest (\$20,000). They would involve the transport of blading and brush-clearing equipment to keep the airstrip surface clear and level (EBA 2011). The majority of maintenance cost would be associated with the transport of staff and equipment.

D2. 3,400-Foot Airstrip in New Location

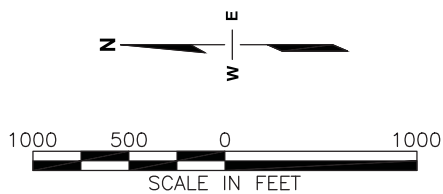
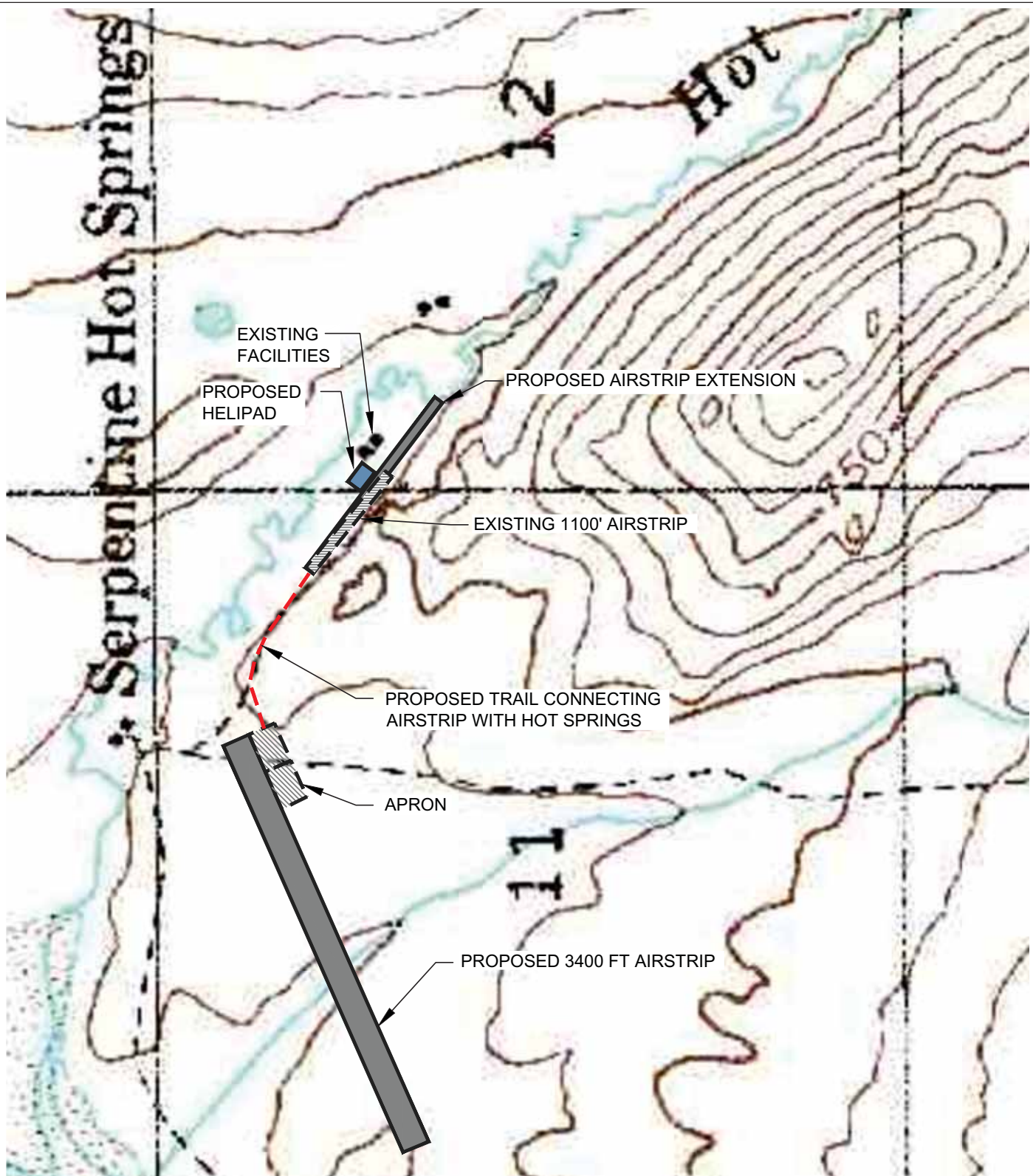
According to FAA Circular 150/5325-4B, a 3,400-foot long airstrip is the minimum standard for the construction of new airstrips serving small aircraft with approach speeds of 50 knots or more (FAA 2005). Other important siting and design considerations include the orientation towards prevailing winds and the maximum weight-bearing surface requirements.

A new 3,400-foot airstrip could be located further to the west away from the hills and ridges, in an adjacent open valley, oriented into the prevailing winds (see Figure 4). This location is preliminary and could be revised depending on results of follow-up engineering and field investigations. The 3,400-foot airstrip would be designed to accommodate the type of aircraft that would typically fly to Serpentine Hot Springs (e.g. Cessna 180, 185, 206) and the 9-12 passenger commuter-type aircraft that typically serve local communities in this area (e.g. Cessna 207, Navajo, or Caravan that can weigh 12,000 lbs. fully-loaded). The 3,400-foot airstrip fill and base course are the same depths as the 1,500-foot airstrip because this would provide an adequate weight-bearing surface.

Due to the placement of an airstrip southwest of the existing site, nearly one half-mile of hardened trail would need to be constructed to bring visitors to the lodging and bathhouse facilities.

D2. 3,400-Foot Airstrip Expansion Policy Implications

As with the 1,500-foot airstrip, the 3,400-foot airstrip falls within federal guidelines for authorized aircraft uses. However, construction of the airstrip would not only require motorized tools, but the disturbance of such a large, new footprint would require full NEPA compliance, likely an Environmental Impact Statement (EIS).



**NATIONAL PARK SERVICE
SERPENTINE HOT SPRINGS
TRANSPORTATION ACCESS REPORT**

**AIRSTRIP EXPANSION
OPTIONS AT SERPENTINE
HOT SPRINGS**

SEWARD PENINSULA, ALASKA

JOB NO: 26220881

DRAWN: S.J.

DATE: 1/24/11



FIGURE 4

D2. 3,400-Foot Airstrip in New Location Cost Estimate

Similar to the 1,500-foot option, the cost estimate assumes availability of gravel close to the BELA preserve boundary, at least five miles away. A construction contractor would have to haul in fuel, equipment, and a temporary construction camp during winter before the snow melts. The cost estimate assumes the contractor would have to build a temporary ice road to effectively haul the massive amounts of gravel material needed for the runway.

The quantity of gravel material needed for a 3,400-foot airstrip would contribute \$5 million to the overall \$13 million cost of construction (see Appendix B). Other substantial cost items would include: trail construction (\$1 million), engineering and permitting administrative support (\$1.2 million), and an EIS (\$1 million).

Annual maintenance requirements of a 3,400-foot airstrip would be similar to a 1,500 airstrip. However, the same staff and equipment would be needed for a longer period of time; Appendix B indicates an estimate of approximately \$25,000 annually for maintaining the longer airstrip. Airstrip “reshaping” is a maintenance effort estimated at \$100,000. Runway reshaping is needed approximately every fifteen years (Milne 2011b).

E. Hardened Surface Options

The existing maintained road ends at Milepost (MP) 84 of the Nome-Taylor Highway, 13 miles south of Serpentine Hot Springs. The existing road from MP 84 to Taylor Creek is in very poor condition. Some sections of road in lowland areas have subsided to the point of being impassible. Portions of the road on the high ridges are reportedly in fair condition. A recent \$1.2 million grant provided to the Alaska Department of Transportation and Public Facilities (ADOT&PF), as part of previously funded Serpentine Hot Springs Access Project, enabled ADOT&PF maintenance crews to rebuild a portion of the road north of MP 84. The project addressed washouts and sections of road that had subsided. Although there will be an upcoming project to improve the approaches to Kougaruk Bridge, there is no further work planned for the road at this time.

Improvements of the road between Kougaruk Bridge and Taylor Creek would be required in areas where the road has subsided into the tundra.

ORV travel from Taylor Creek to the BELA boundary (8 miles) is primarily over tundra. Aerial views show a number of routes from Taylor Creek to the preserve boundary (including the ridge above the Tweets mining claim), but for the purposes of discussion, the route shown in Figure 5 is based on an old tractor trail.

A hardened ORV trail between the BELA boundary and Serpentine Hot Springs would be about five miles in length. The trail could be constructed by either importing gravel or placing geogrid materials (synthetic reinforcement structures that increase soil stability and enhance surface drainage) over the tundra surface.

E1. Geogrid Hardened Trail

The damage from multiple ORVs “braiding” damp permafrost soils can be extensive and long-lasting. The photo (next page right) shows an NPS geologist standing at the beginning of 40 feet of an experimental installation of 2-inch geogrid after four years. The hardened trail section supported vegetation cover and provided a good surface to drive, while the unhardened, sensitive permafrost soils at both ends show damage from the recent pass of a heavy ORV (FHWA 2000).

There are numerous techniques to harden trail for ORV use, but for the purposes of this report, geogrid materials will be discussed in general characteristics without an on-site feasibility study

and assessment. The photo (below left) shows an example of an unhardened trail in Wrangell-St. Elias National Park & Preserve (NPS 2010), the Suslota Trail.

The hardened trail to Serpentine Hot Springs could follow the old tractor trail from the end of the Nome-Taylor Highway at Taylor Creek to the preserve boundary (8 miles), and then from the boundary to the Serpentine Hot Springs (5 miles) for a total of 13 miles (see Figure 3). A 6-foot wide path of geogrid could be installed in one summer with a crew of 12 persons. Minimal maintenance of geogrid is needed, usually only an annual inspection and repositioning of blocks as necessary for joint failure or thermodynamic shifts (Meyer 2011).



(left) - An example of ORV use in without hardened trail technology (NPS 2010). (right) - An experimental 40 foot section of hardened trail constructed with GeoBlock brand geogrid five years after installation (FHWA 2000).

E1. Hardened Surface Policy Implications

The construction of a hardened trail or road for motorized access to BELA would require an amendment the GMP.

NPS Trails Specialist Kevin Meyer (2011) explained an on-site assessment and prescription for a sustainable design would be needed to select an appropriate technology and route for the geogrid-hardened trail. Thus, the description of a potential access improvement based on geogrid may imply that this is an appropriate material, but this cannot be concluded on the basis of a desktop survey.

Figure 4 demonstrates the change of ownership of the tractor trail (from state to federal) starting at Taylor and heading north to the BELA boundary. The State of Alaska asserts that the old tractor trail corridor is a public right of way under the Revised Statute (RS) 2477, a 19th century federal statute repealed in 1976 by the Federal Land Policy and Management Act. However, in regard to the portion of the trail within BELA, RS 2477 is not recognized on NPS lands.

Any connection from Nome to Serpentine Hot Springs would require coordination and cooperation with ADOT&PF to maintain the Nome-Taylor Highway. First, there are improvements needed between the Kougarok Bridge and Taylor Creek. Second, ADOT&PF would need to fund improvements to the 8 mile portion of state-owned road corridor between Taylor Creek and the BELA boundary. NPS would collaborate with planning and design, but would not commit to a trail improvement for the 5 mile trail portion within BELA if the State were not adopting a similar design. In other words, NPS policy would not allow a gap in hardened trail or road improvements between Taylor Creek and the BELA boundary because off-road use in that corridor could cause damage to land and resources.

E1. Hardened Surface Technological Feasibility

There are several features of remote, northern sites that complicate the design, feasibility and cost of transportation projects: permafrost, construction logistics, and material sourcing.

Permafrost Considerations: As with most of the Seward Peninsula, the soils in the Serpentine Hot Springs area are permafrost rich. The site is characterized by two distinct geological zones: the rocky ridges typical of the tundra, and the flat to gently rolling tundra areas east of the rocky ridge. The tundra areas are underlain with permafrost rich silty-soils, which when thawed are “thaw unstable.” These soils generally subside when thawed. Roads and building foundations subside when permafrost thaws in these unstable soils. Gravel surfaces on roads and airstrips allow solar heating to penetrate up to 7 feet deep by the end of summer. Therefore, construction of new roads and airstrips over thaw unstable soils requires installation of gravel to a depth of seven feet or more.

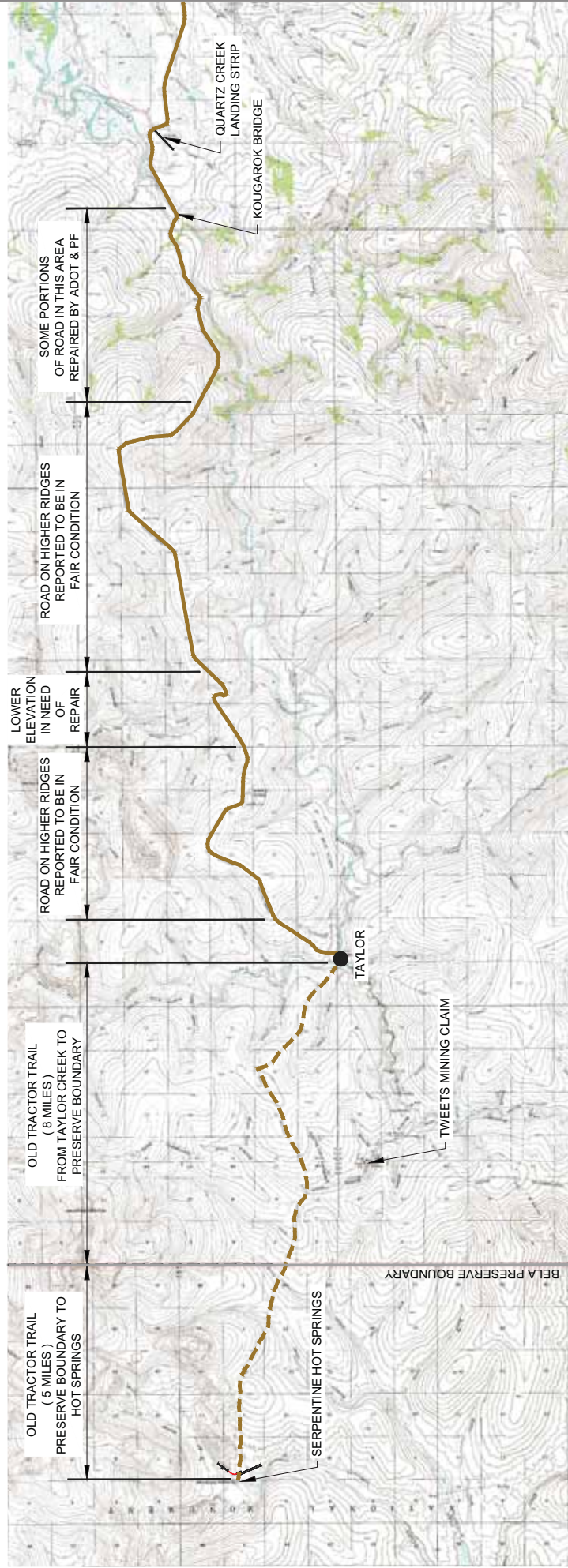
Remote Construction Considerations: A large construction project at Serpentine Hot Springs would require the transport of equipment, fuel, and living quarters for workers. This would most likely be done in late winter before breakup when the tundra is frozen. The logistical challenges of remote jobs increase the cost of construction substantially.

Material Sources for Construction: In a location ½ mile due south of the Serpentine Hot Springs, there is a moderately sized alluvial deposit of finely graded gravel that could yield an estimated 500 cubic yards of material. Larger potential gravel deposits exist in an alluvial wash about a mile to the northwest of the Serpentine Hot Springs. These potential material sources warrant further investigation. Quantities and quality of the gravel would have to be more precisely evaluated to verify these are reliable for construction projects. An EIS would be required to develop the larger gravel source.

E1. Geogrid Hardened Trail Cost Estimate

The installation/construction of geogrid is labor intensive. In order to install a trail of 6-foot wide geogrid mats across the tundra, the ground surface requires some leveling and the reinforcement of joints at every meter. The old tractor trail *outside* BELA may require fewer joint reinforcements because this is a well-used trail with an entrenched wheel track. The cost assumes that a local labor crew of twelve could be used to construct the trails over the course of four months totaling approximately \$4.9 million. Costs detailed in Appendix B include three stream crossings, labor, meals and lodging, field investigations, engineering and permitting, and an EIS. This assumes the trail would be constructed in the summer with ORV support; a temporary permit to drive ORVs on the tundra would be required.

Annual maintenance would involve inspection and repair as needed. NPS experience with geogrid indicates that the annual maintenance costs are very low (Meyer 2011). The first year, a maintenance crew of two local people would drive the route at a rate of one mile per day to repair joint failure or thermodynamic issues (at an estimated cost of \$14,000). Subsequent years would only require one crew of two people approximately one day to drive the 13-mile route (estimated at \$1,200).



LEGEND:

- PROPOSED HARDENED TRAIL
- EXISTING ROAD



NATIONAL PARK SERVICE
SERPENTINE HOT SPRINGS
TRANSPORTATION ACCESS REPORT



HARDENED SURFACE
OPTIONS TO SERPENTINE
HOT SPRINGS

SEWARD PENINSULA, ALASKA

JOB NO: 26220881
DRAWN: S.J.
DATE: 1/24/11

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E2. Single-Lane Gravel Road Access

A single lane gravel road between Taylor Creek and Serpentine Hot Springs could follow the old tractor trail. The cost estimate for the gravel road assumes a 12-foot wide, one-lane, two-way road with periodic turnouts. Turnouts would be placed approximately every 500 feet to allow opposing vehicles to pass one another. The road section over thaw unstable tundra would have to be built up to seven feet thick to prevent thermal degradation of underlying permafrost rich soils. The thickness could be as little as four feet where the road would traverse higher ground that is underlain by thaw-stable soils. Design and construction would require a complete geotechnical investigation of soils along the existing corridor.

E2. Single-Lane Gravel Road Policy Implications

Similar to construction of a hardened trail access, the construction of a road for car and truck access to the BELA boundary and on to Serpentine Hot Springs would require an amendment the GMP.

E2. Single-Lane Gravel Road Cost Estimate

An itemized list of cost factors for a single-lane gravel road can be found in Appendix B. The single lane road option assumes a gravel source south of the BELA boundary. The gravel haul distance would be three miles or less from the source to the BELA boundary. Cut and fill road options include not only the cost to mine and transport fill material, but also the design and construction of culverts and bridges totaling \$29.7 million or more. This includes engineering, field investigations, permitting, and NEPA compliance costs.

Annual maintenance costs for a northern region single-lane gravel road are estimated at \$4,000 to \$6,000 per mile or approximately \$65,000 per year (Milne 2011a). This assumes labor by a Nome contractor and a motor grader rented from June through October.

ADOT&PF Northern Region estimates winter maintenance (plowing) costs an average \$1,500 per mile near Nome (Milne 2011a). However, this report assumes no winter maintenance of the hardened surface options would occur. Thus, only snowmobile access would be available along this route pending weather and snow conditions.

E3. Double-Lane Gravel Road

The double-lane design is a “cut-and-fill” road option similar to the single-lane. A single lane road top width would be 12 feet wide while the double-lane would be 20 feet. As with the single lane road, areas over thawed, unstable tundra would have to be built up to seven feet thick.

E3. Double-Lane Policy Implications

The policy implications of the double-lane road do not differ from that of the single-lane road. Completing the EIS for this option would be a major endeavor.

E3. Double-Lane Gravel Road Cost Estimate

An itemized list of cost factors for construction of a double-lane gravel road can be found in Appendix B. This road option assumes an adequate gravel source can be found within three miles or less outside of the BELA boundary; gravel haul distances can increase construction costs greatly. The double-lane road would require greater quantities of fill material than the single-lane option, which must be mined and transported. In addition, more time and greater costs would be associated with design and construction of culverts and bridges, engineering, permitting, field investigations, and the EIS. The total design and construction cost is estimated at \$41.1million or more based on further field investigations. The total cost includes estimates for field investigations and NEPA compliance.

A double-lane rural gravel road would be estimated to cost \$5,000 to \$7,000 per mile to maintain or \$78,000 per year (Milne 2011a). Similarly, this assumes labor by a Nome contractor and a motor grader rented from June through October.

A summary of the cost estimates by mode can be found in Table 3. They include an estimate of three simple bridges for stream crossings of the hardened surface options. Complete Class “C” estimates for each mode can be found in Appendix B.

Section 3 – Visitation Projections

This section examines projections of increased visitation under the potential access improvements, including a discussion of the methods used. It starts with a description of current visitation patterns to Serpentine Hot Springs, followed by discussion of regional dynamics that may affect visitor patterns in the future. An expert judgment method is then employed to provide visitation projections.

Visitor Projection Methodology

Conventional methods for projecting changes in visitation patterns usually rely on detailed quantitative information regarding current patterns. Many national parks and preserves count visitors via entrance gates or permit purchases. This allows managers to track historic visitor use and to analyze growth rates and trends. There is no precise visitor tracking system for BELA or Serpentine Hot Springs because there is no single entrance point, no entry fee or registration, and few opportunities for on-site contact with NPS staff.

For the current report, all available sources of information concerning visitation at Serpentine Hot Springs were examined, including commercial use authorizations, backcountry registration, and other survey data. However, these data sources are very limited for BELA and they have limited specific information on Serpentine Hot Springs. As part of a more qualitative assessment, historical events and factors, demographics, and foreseeable future activities were examined for their potential effects on future visitor use (see Table 6).

Visitor Trends

The NPS logbooks from Serpentine Hot Springs (1982 to present) indicate visitors come not only from adjacent communities but also from across the state and country. In general, winter and spring visitors come by snowmobile, predominantly from Shishmaref. This includes families that pull sleds with children and hunting parties that rest after a successful hunt. Summer visitors use personal aircraft and chartered air taxi services. Helicopters are not allowed except in cases of emergency or other permitted reasons. Serpentine Hot Springs appears to attract repeat visitors, many of whom stop writing in the logbooks over time.

The NPS Public Use Statistics Office maintains a national database which includes estimates of visitors to BELA, shown in Table 4. While Table 4 captures the number of visitors to BELA as a whole (not Serpentine Hot Springs exclusively), this does help indicate the relatively low volume of visitors that travel to BELA.

**Table 4 – Visitor Estimates for Bering Land Bridge National Preserve
(BELA) 1998-2009**

	BELA Rec ^a Visits Winter	BELA Rec Visits Summer	Backcountry winter	Backcountry summer (Jun- Aug)	Total Overnight Stays
1998	1,540	2,200	-	-	-
1999	1,300	1,700	-	-	-
2000	1,325	1,700	-	-	-
2001	2,105	1,420	-	-	-
2002	1,475	1,300	-	-	-
2003	1,350	1,075	-	-	-
2004	1,550	1,160	-	-	-
2005 ^b	1,270	1,158	-	-	-
2006	506	759	270	162	1,732
2007	360	436	146	137	925
2008	641	378	276	99	1,533
2009	488	566	361	495	1,986
AVG	1,159	1,154	263	223	1,544

Source: National Park Service Public Use Statistics Office <http://www.nature.nps.gov/stats/park.cfm?parkid=103>

a) Recreation visit is defined as “the entry of a person onto lands or water, administered by the NPS for recreational purposes, excluding government personnel, through-traffic (commuters), trades persons, and a person residing within park boundaries”.

b) Backcountry visits started to be recorded at the end of 2005.

Figure 6 shows the number of estimated visitors at the Serpentine Hot Springs bunkhouse for one year. This data are drawn from a door counter, which tracks the total number of times the bunkhouse doors opened or closed. The total counts were divided by an average daily door use per person. The absolute quantities of visitors may not be accurate from the new counters, but it is a good representation of the peaks in visitor traffic during spring and summer months.

Figure 6 – 2009-10 Bunkhouse Door Counter Visitor Estimates

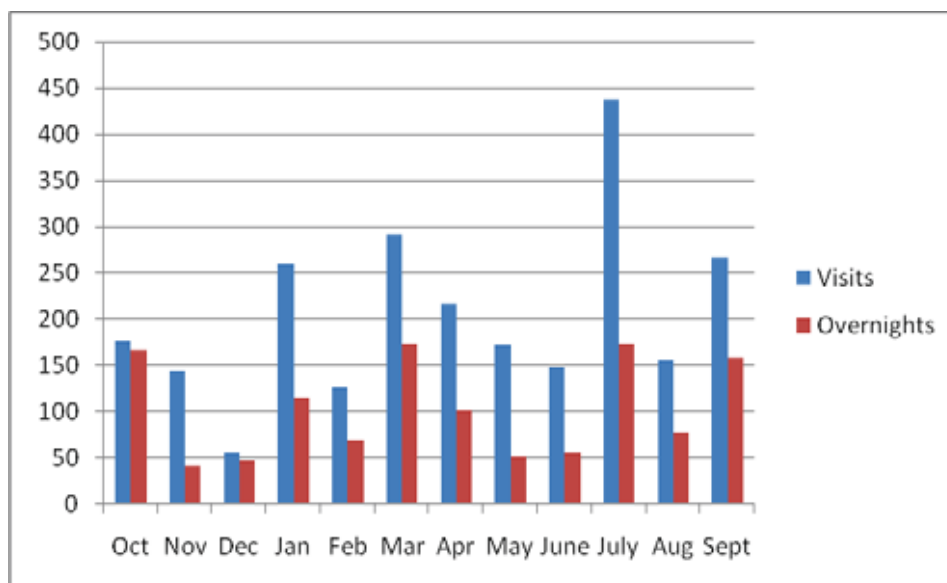


Table 5 contains the new data for 2010 shown in Figure 6, but with additional information regarding transportation mode. There are several explanations included in the notes section that give context for the number of visitors each month related to condition of the airstrip and the large archeological group that conducted research for 18 days in July 2010.

Table 5 – 2010 Serpentine Hot Springs Visitor Estimates by NPS Nome Office

Month	Snowmobiles ^a	Trail or Plane Use ^b	Overnights ^c	Day Use	Total Visits
Jan	44 ^f	0	115	145	260
Feb	27	0	70	30	100
Mar	44	0	174	74	248
Apr	70	0	102	44	146
May	98	0	52	22	74
Jun	0	68 ^b	56	24	80
Jul ^d	0	136 ^e	174	264	438
Aug	0	136 ^e	78	78	156
Sep	0	136 ^e	158	108	266
Oct	7	68 ^b	166	10	176
Nov	44 ^f	0	42	103	145
Dec	27	0	47	9	56
TOTAL	361	544	1,234	911	2,145

a) Counter is located along the trail.

b) Counter is located along the airstrip. Plane access is from mid-June through mid-October

c) Estimated using a counter on the door of the bunkhouse and estimating the number of door uses per person per day.

d) This month's visitor numbers are high because a crew of 15 archeologists stayed for 18 days totaling 270 of this month's 438 visits.

e) Summer plane access to Serpentine Hot Springs is estimated to be fairly consistent.

f) Winter use in January and November are estimated to be higher than Dec and Feb.

Population trends represent a form of comparative data that helps estimate visitor trends based on regional population patterns. The Alaska Department of Labor and Workforce Development reports that the Northern Region of the state has experienced gradual increases in birth rates in small villages and a lack of major economic opportunities in its hubs (ADLWD 2010). Together these reduce in-migration to population hubs. In other words, small villages in the Seward Peninsula appear to be retaining their populations unlike other regions of the state.

Table 6 provides a simple linear projection of population growth, recognizing that this may result in a simplified growth estimate, since regional economic and demographic patterns are more variable than expressed in a linear curve. For the purposes of this analysis, an average annual growth rate of 0.9 percent was estimated for Seward Peninsula communities through 2030 (Alaska Department of Labor and Workforce Development 2010). The total population within the region that could visit Serpentine Hot Springs in 2009 is about 8,200 and it could grow to about 9,800 by 2030.

Table 6 - Population Estimates for Select Seward Peninsula Communities

Community	1990	2000	2009 ^a	2015 Projection ^c	2020 Projection	2030 Projection
Nome	3,500	3,505	3,468 ^b	3,627	3,793	4,149
Wales	161	152	153	160	167	183
Shishmaref	456	562	566 ^b	634	663	725
Brevig Mission	198	276	278	291	304	333
Deering	157	136	140	146	153	167
Kotzebue	2,751	3,082	3,150	3,294	3,445	3,768
Buckland	318	406	419	438	458	501
Seven Affected Villages	7,541	8,119	8,214	8,984	8,590	9,826

a) 2010 U.S. Census Bureau data are not available at the time of this report.

b) Alaska Department of Community, Commerce and Economic Development estimates use permanent fund data. These are considered more accurate than 2009 Census American Community Survey estimates.

c) Using 0.9% average annual growth rate 2009-2034 (Alaska Department of Labor and Workforce Development *Economic Trends* December 2010).

Nome visitation patterns offer another comparative benchmark for trends in regional visitation. The Nome Chamber of Commerce estimates 7,500 to 8,000 people visit Nome each year with peaks in March for Iditarod and in mid-May-through mid-June for the summer season (Cavin 2011). (This is as nearly equivalent to the total population for Nome and Kotzebue.) “Discovery” type cruise ships that cater to smaller groups are starting to dock in Nome, representing approximately 240 passengers per docking. The first year there were 5 ships and 3 ships are expected in 2011. One Nome company that takes clients into the backcountry of the Seward Peninsula by helicopter and plane estimated they serve 50 clients per year, although they do not currently serve Serpentine Hot Springs (Cavin 2011). It is reasonable to believe this could increase as they market to wealthy cruise ship patrons. Kotzebue has a company that provides backcountry drop-off services, but likely at a lower volume because Nome is a larger hub with a more active visitor industry. A portion of the total backcountry enthusiasts beginning a trip from Nome would go to BELA and a smaller part would travel to Serpentine Hot Springs. However, the importance of Nome as a visitor hub does influence the relative volume of visitors in the region that may want to visit Serpentine Hot Springs if the transportation modes expand.

Limitations of Existing Data

As mentioned in the beginning of this section, the logbooks at Serpentine Hot Springs provide valuable anecdotal and contextual information about visitor volume and experience. However, the logbooks do not provide complete or precise quantitative data. NPS collects authorized commercial transporter activity reports, but these numbers represent a small proportion of total visitation.

Up until 2010, the Western Arctic National Parklands office reported on BELA public use estimates in the national database (Table 4). BELA started reporting its own estimates in 2010 and therefore would have a better opportunity to make expert judgment on public use numbers. The methods used by BELA to track visitors in 2009-2010 are also a combination of best judgment and interpretation of counter data, and resulted in the overall estimate of 2,145 visits per year to Serpentine Hot Springs. Note that this is nearly equal to the 2,313 winter and summer visitors to the entirety of BELA (with 1,544 overnights) as estimated in the national database (Table 4).

Expert Judgment Estimates by Mode

Utilizing all of the data sources described in the sections above, visitor estimates were assigned to each transportation mode in Table 7. Due to the long lead time required for implementation, the baseline year does not apply to modes that require extensive environmental impact analysis, extensive funding horizons, or construction time.

Table 7 – Expert Judgment Estimates of Visitation Increases

	Transportation Modes	Baseline + 1 year to implement [visitors/year]	Visitor Projection 2015	Visitor Projection 2025	Visitor Projection 2040
<div> <div>← Increasing Cost</div> <div>← Increasing Impact</div> </div>	Baseline with 0.9% population growth	2,100	2,200	2,300	2,500
	Limited Improvements	2,200	2,300	2,400	2,600
	Helicopter Access	2,150	2,270	2,380	2,600
	Increased Winter Trails	2,140	2,250	2,350	2,560
	Expand to 1500' Airstrip	N/A	2,320	2,430	2,600
	New 3,400' Airstrip	N/A	2,360	2,500	2,640
	Geogrid Hardened Trail	N/A	2,730	2,830	3,030
	Single-Lane Gravel Road	N/A	3,180	3,280	3,480
	Double-Lane Gravel Road	N/A	3,180	3,280	3,480

There is anecdotal information that one could find 30 people at Serpentine Hot Springs on busy spring weekends. However, the maximum bunkhouse capacity for Serpentine Hot Springs is 12 people per night without the use of outdoor tents. The maximum capacity of Serpentine Hot Springs, assuming an even distribution of visitors all year is:

$$365 \text{ nights} \times 12 \text{ people} = 4,380 \text{ overnight visits.}$$

This level of use may not represent a “good experience” for users who are expecting some privacy or solitude as part of the experience.

Prime weekends to visit Serpentine Hot Springs in the winter/spring are from January through May (20 weekends). A more reasonable peak during this use season is:

$(30 \text{ people on Friday} + 30 \text{ people on Saturday}) \times 20 \text{ weekends} = 1,200 \text{ overnight visits.}$

In summer, there is more room for visitors to camp outside the bunkhouse, but more people could not enjoy the current amenity of a single pool. There are 16 weekends at Serpentine Hot Springs in summer from June through September. A summer peak could include:

$(30 \text{ people on Friday} + 30 \text{ people on Saturday}) \times 16 \text{ summer weekends} = 960 \text{ overnight visits.}$

Modes of travel that would accommodate high volumes of traffic (the hardened surfaces) are expected to bring many more day-use visitors because there are not enough facilities to house them or suitable ground for camping. The implementation of modes of travel that would result in major increases in visitors would lead to a reassessment of lodging and sanitation facilities at the site. Estimates of new visitor amenities and facilities were not included as part of the present study.

A. Limited Improvements

If limited improvements were made to the existing airstrips. The expected level of visitation would be nearly the same as current visitation. An average annual increase of less than 1 percent per year would be expected, which would reflect population growth for the area. If annual visitation is currently approximately 2,100 per year, an application of the average annual growth rate would result in approximately 2,500 visits per year by 2030.

B. Helicopter Access

Current helicopter operators in Nome and Kotzebue do not anticipate large demand to access Serpentine Hot Springs due to the expense of the flight. Assuming the existing helicopter operators would receive 2 parties of customers (4 people per party) per summer weekend to fly to the site in the first season. As word got out and other helicopters advertised the opportunity on their menu, the number of parties could increase each year. The number of visitors is limited by the summer season (June-September) totaling about 16 weekends. The maximum estimate is up to 4 helicopter operators providing one trip per day every summer weekend. Thus, the maximum summer visits via helicopter would be:

$4 \text{ operators} \times 4 \text{ people} \times 2 \text{ days} \times 16 \text{ weekends} = 512 \text{ day visits.}$

The National Parks Conservation Association (NPCA) director described a trend of wealthy, independent travelers who desire experiences in remote, safe locations (Stratton 2011). The demand for helicopter access to Serpentine Hot Springs may not be very high, but there could be an annual increase in interest as information about the opportunity becomes more widespread.

C. Increased Winter Trails

Distance and weather are larger factors in whether local residents can take longer distance trips on snowmobiles. There is a small pool of experienced hunters in Wales and Brevig Mission that are comfortable making the trip to Serpentine Hot Springs with the use of GPS. It is more common for Deering residents to snowmobile to the site.

Curtis Nayokpuk, Board Member of Shishmaref Search and Rescue, estimates that while ridership from Wales and Brevig Mission is very small (only a couple riders per year), this could increase from two to four riders per year with the installation of markers. The number of riders from

Deering is slightly higher, and markers are estimated to increase ridership by a similar amount. After the installation of markers and continued marker maintenance, the number of visitors would remain relatively steady because of the limits of the accommodations at Serpentine Hot Springs and the small population base in each community.

D. Airstrip Expansion Options

D1. 1,500-Foot Airstrip in its Existing Location

Upgrading the existing airstrip to 1,500 feet would make landing Cessna 206-style aircraft safer and more reliable. The existing 1,100-foot airstrip provides a very small margin for pilot error. The 1,500-foot airstrip would be safer, but it would not open Serpentine Hot Springs to more types and larger size aircraft from Nome or other regional communities. The 1,500-foot airstrip is still too short to be listed on FAA-certified charts and would likely not meet commercial air carrier insurance requirements.

There are currently no fixed-wing aircraft owned by residents in Shishmaref (Nayokpuk 2011). There would be little to no fixed-wing travel by small villages to Serpentine Hot Springs in summer because few village residents have the means to afford a general aviation plane. It is not likely that local people would travel to a hub (Nome or Kotzebue) to charter an aircraft when Serpentine Hot Springs visits could continue in winter/spring in an affordable, traditional manner by snowmobile.

There was discussion during the public meetings that Maniilaq Association in Kotzebue would want to reinstate elders' flights for traditional healing. Safety and budget reductions were factors in the discontinuation of this program. While it would be cheaper for Maniilaq to charter directly from Kotzebue, this is not likely at the 1,500-foot airstrip length, but it would be more likely at the 3,400-foot airstrip length. This would not notably impact visitor numbers, but this would be a very highly valued traditional use in the perspective of the predominantly Inupiat communities.

The trend in general aviation indicates a steady decrease in the number of registered pilots and airplanes because the costs are very high. However, Alaska continues to have the highest percentage of airplane ownership per capita. As word travels that the airstrip was improved to safely accommodate a Cessna 206 aircraft, a small number of private pilots may bring friends and families for overnight stays.

D2. 3,400-Foot Airstrip in New Location

A 3,400 foot airstrip would accommodate small private and medium-sized commercial commuter fixed-wing aircraft. Upgrading the existing airstrip to 3,400-foot would accommodate more types of aircraft and receive a listing on FAA-certified charts. If the airstrip were safe for the Cessna 207, Bering Air from Nome said they would have four to five trips to Serpentine Hot Springs per summer (Olsen 2010).

The greater safety associated with a 3,400-foot airstrip would likely increase the number and frequency of small fixed-wing aircraft, especially because commercial air carriers based in Nome would likely provide this service, in addition to the small carrier in Kotzebue that has been flying to Serpentine Hot Springs for many years. It is likely that less than 100 visits per year would occur by tourists chartering flights out of Nome according to available visitor data.

It is likely more general aviation pilots from Fairbanks and Southcentral Alaska would visit because it would not take the specialized knowledge of wind and topographic conditions that is currently required to land safely. The new 3,400-foot airstrip would not likely draw private pilots originating from area villages, because under existing economic conditions, it is unlikely that residents in these communities would acquire small planes.

E. Hardened Surface Summer Access

Although expensive to construct and maintain, a hardened surface is the most accessible and affordable mode of transportation from the perspective of visitors. At first, the mere construction of the trail would be a factor that attracts visitors because recreational off-road travel is a popular activity for the area. Serpentine Hot Springs may experience more day trips due to the long daylight hours in summer and limited sleeping accommodations available at the site.

Hardened surface access from the south would reintroduce summer access by ORV, which has not been authorized since the creation of BELA. (Prior to the creation of BELA in 1980, visitors may have utilized an old tractor trail that was created by miners to get to Serpentine Hot Springs.) This would re-establish ground travel as an option for Nome residents and select tourists that are interested in a rustic hot springs experience. As an indicator of the popularity of a hot springs experience, Bering Strait Native Corporation estimated about 200 visitors to Pilgrim Hot Springs in 2010 which is accessible from Nome by the road system. However, this number may be low because the site has not had consistent public access with a recent change in land ownership.

The limiting factor for visitor access to Serpentine Hot Springs under the scenario including a new hardened trail or road is that the number of facilities (e.g. bunkhouse, bathhouse) would not grow and there is no mechanism to create other accommodations along the road corridor. Therefore, more people could travel to Serpentine Hot Springs than could experience the hot tub and interest could drop.

E1. Geogrid Hardened Trail

A hardened trail made with geogrid material would be appropriate for motorized ORV (e.g. 4-wheelers) or non-motorized (hiking, mountain biking) travel. This hardened surface would increase access for new user groups to Serpentine Hot Springs. A large percentage of households in the Nome area own at least one ORV, and there are approximately 1,300 households in Nome (Occupied Housing Units from 2009 American FactFinder, Census). The new trail would be desirable for pleasure-riding and for visiting and/or camping at the hot springs.

If 25 percent of the Nome households drove an ORV to the hot springs from Taylor once in the summer, that would represent 325 trips. In the winter, the geogrid may experience snowmobile traffic at about the same level as a well-marked winter trail. However, it would not improve the surface for snowmobiling like a gravel road.

E2. Single-Lane Gravel Road

A single-lane gravel road would also represent a new mode of access for motorized transportation (from 4-wheelers to 4-wheel drive trucks) to Serpentine Hot Springs. Every household with access to the Taylor Road would have the opportunity to drive approximately 3 hours to reach Serpentine Hot Springs. Although the entire trip would represent a long drive with an average gas price of \$5.00 per gallon in 2010, anecdotal evidence shows that pleasure driving in rural communities is a popular pastime for residents with vehicles and steady incomes to support the costs.

If 50 percent of the 1,300 Nome households drove to Serpentine Hot Springs once in the summer (a 3 hour drive each way), this would be a maximum of 650 trips. This summer-only, travel for pleasure would be high when the road was first completed. However, the lack of facilities may deter many visitors from making another trip after they have traveled once. Therefore, the estimated visitors to Serpentine Hot Springs after the first couple years would level-off. Summer tourists that rent vehicles in Nome could contribute around 200 visits per year.

Although the gravel road would not be plowed in the winter, it may facilitate an increase in snowmobile travel because it could create a faster, smoother surface. A family pulling a sled would

take three to four hours to drive 125 miles from Nome under good conditions. If 10 percent of the 1,300 Nome households snowmobiled to Serpentine Hot Springs once during the winter, this would represent a maximum of 130 trips

Combining additional summer and winter trips, an estimated 980 additional visitors to Serpentine Hot Springs would be anticipated with this transportation improvement.

E3. Double-Lane Gravel Road

A double-lane gravel road that originated from the Nome-Taylor Highway would be a popular destination for summer leisure driving by cars and ORVs in Nome and along the highway. This new road would likely experience high proportions of snowmobile traffic in winter too.

If half of the Nome households visited Serpentine Hot Springs once a summer, that would represent 650 trips. If 10 percent of the Nome households visited Serpentine Hot Springs once a winter, that would represent 130 trips. As with the single-lane mode, summer tourists renting vehicles in Nome could contribute 200 visits per year.

Combining additional summer and winter trips, an estimated 980 additional visitors to Serpentine Hot Springs would be anticipated with this transportation improvement.

Another factor that would affect visitor numbers on the hardened surface is the availability of a commercial hot springs, which is much closer to Nome. Pilgrim Hot Springs may undergo improvements in the next five years, reducing some interest in Serpentine Hot Springs (Smetzer 2010). Bering Strait Native Corporation received about 200 visitors in 2010 (Cavin 2011). It is accessible by an 8-mile gravel road that connects to the Nome-Taylor road at Cottonwood. Although it would have an entrance fee, it may satisfy a local demand for hot spring rest and relaxation with a more full-service atmosphere. University of Alaska received a grant from the Department of Energy to explore geothermal potential at Pilgrim Hot Springs which may have the potential to support future tourism and agriculture in this region.

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Section 4 – Potential Impacts

The following section assessed impacts of potential access improvements on visitor experience and natural and cultural resources of the Serpentine Hot Springs area. The terminology used to describe the effects of impacts to resources is:

- *Negligible* effects may or may not cause observable changes to natural conditions. Also represents a small, barely noticeable increase in visitors or change in visitor experience.
- *Minor* effects cause observable and short-term changes to natural conditions. Also represents a small, noticeable increase in visitors or change in visitor experience.
- *Moderate* effects cause observable and short-term changes to natural conditions that reduce the integrity of a resource for a short-term. Also represents a noticeable increase in visitors, particularly at peak periods.
- *Major* effects cause observable and long-term changes to natural conditions and reduce the integrity of a resource for the long-term. Also represents a noticeable increase in visitors, exceeds facility capacity at peak and non-peak periods.

A. Limited Improvements

Visitor Experience

As described in Section 1, the remote location, limited facilities, and rustic nature of the accommodations at Serpentine Hot Springs limits the total number of visitors. Since the current visitation level involves a smaller group of users, the traditional uses valued by the residents of Shishmaref and the other predominantly Inupiat communities would not notably be altered. Limited improvements to existing modes of transportation would not change visitation levels, and Serpentine Hot Springs would continue to appeal to the local residents who currently use the site, and to the independent travelers who can afford to go to this unique place.

Minimal upkeep to the structures at Serpentine Hot Springs (e.g. replacement of bathtub timbers, and mitigation of foundation erosion) will eventually lead to excessive deterioration and the need for complete reconstruction. To help alleviate some overcrowding of the bunkhouse, NPS started construction of tent platforms to be used by NPS maintenance staff (and other visitors, as desired).

Although the number of annual visitors is estimated at 2,100 per year, during peak weekends visitor experience can be impacted. Popular spring and summer weekends can bring more visitors to the site than can be accommodated by the existing facilities.

During the public meetings, participants noted that the visitors to Serpentine Hot Springs generally adhere to a set of social norms about respectful use of the facilities, but that a small number of visitors do not respect these norms. The bad behavior of a few users has created issues of sanitation, alcohol abuse, and occasional presence of squatters. These behavior issues continue to occur sporadically and could continue with each new mode of transportation introduced.

Sanitation: There is the potential for the spread of bacteria and diseases with unsanitary conditions at the bathhouse and the bunkhouse. There were several verbal accounts of honey buckets used inside the bunkhouse, fatty residue left on the bunkhouse floor from someone butchering animals indoors, and animal carcasses butchered and left near the Serpentine Hot Springs facilities. (Bacterial contamination in the cold water supply to the bathhouse from a nearby creek has recently been resolved, since NPS redirected the creek and it no longer supplies cold water to the tub.)

Alcohol Abuse: Participants in the public meetings described infrequent occasions in which some groups misuse alcohol while at Serpentine Hot Springs or fail to clean-up their litter,

placing the burden on later visitors. There are currently no regulations or enforcement to minimize this behavior aside from social norms.

Squatters: There was anecdotal and logbook information about squatters who stayed for an extended period at the Serpentine Hot Springs bunkhouse and that made visitors uncomfortable.

Visitor Safety

Brushing and grading the airstrip would have moderate positive safety implications for visitors because the brushing would marginally improve the useable airstrip length, which would provide better safety margins to pilots. On-going replacement of tripods or the use of carsonite markers along the winter trail would have moderate benefits for snowmobile riders from Shishmaref because they provide guidance in bad weather conditions and supplement GPS technology.

Cultural Resource Impacts

The *Cultural Landscape Inventory of Iyat* reports that the cultural landscape elements at Serpentine Hot Springs are the creek, valley, surrounding hills and tors, hot springs site, pool, cold-water diversion ditch, fresh water pond, and adjacent archeological sites. In that study, historic-era features like the bunkhouse, bathhouse, outdoor privy, and airstrip are not considered part of the cultural landscape. Gold Rush mining artifacts may also be found at Serpentine Hot Springs and the adjacent historic site of Arctic Hot Springs (no longer in use). The issues of tor degradation, artifact disturbance, erosion, and the depletion of medicinal plants could continue with each new mode of transportation introduced.

Degradation of the Tors: The current number of summer visitors seems to have resulted in negligible impact on the tors. There is evidence that visitors climb on and around the tors, but there are no signs of graffiti, gunshots, or the removal of rock. Regardless of physical damage to the tors, climbing on or around the tors may be culturally offensive in the perspective of traditional Inupiat users.

Artifact Disturbance: There are ongoing issues of potential disturbance of cultural resources under and adjacent to the airstrip. Any grading, brush-clearing, or major airstrip disturbance due to rain and runoff has the potential to disturb the un-catalogued site. However, before ground-disturbing activities take place, as a matter of routine practice, NPS would ensure that adequate cultural resource surveys are conducted to avoid damage to cultural resources.

Erosion: As beavers modify the current creek course, this could erode land that contains cultural resources. There is anecdotal information that climate change is increasing snow in the region, which results in greater melt and potential for erosion (Hild 2011).

Environmental Resource Impacts

There are no new environmental impacts associated with these limited improvements; however NPS management and maintenance are necessary for human health and sanitation, structure stabilization, and aircraft safety. Redirection of the creek which formerly supplied cold water to the bathhouse was effective in eliminating a source of *Escherichia coli* and other fecal coliform bacteria in the cold water supply.

The proposed limited improvements would mitigate erosion and reduce rutting on the airstrip that currently contributes to dangerous aircraft landing conditions. NPS education for pilots about airstrip conditions and safe landings practices would also reduce safety risks. The current levels of aircraft transportation to Serpentine Hot Springs, for visitors and NPS maintenance crews, represent an ongoing potential for minor petrochemical spills.

NPCA commented in a letter to NPS that invasive species are already present in the region. The limited improvements would result in very minor increases in visitors and a very minor increase in the likelihood of invasive species introduction (NPCA 2009).

B. Helicopter Access

Visitor Experience

Helicopter noise and visual impacts can irritate visitors and diminish their recreation experience. Jim Stratton of the NPCA described how he does not register the sounds of airplanes, while helicopters, in his view, are more jarring. “People traveling in rural Alaska recognize that airplanes are the taxi cab. There’s a certain level of acceptance and reassurance that they could be flagged-down if something was wrong.” However, when he hears or sees a helicopter, he thinks someone is drilling for minerals or oil or there is an emergency.

The effect of helicopter traffic into Serpentine Hot Springs would likely be minor because the number of visitors that can afford or desire to pay a premium for this mode of transportation is very limited.

Visitor Safety

Helicopters are presently allowed in BELA for emergency purposes. A regulatory change to allow them into the preserve may accommodate more minor emergency assistance. Regular visits by helicopter into BELA may increase perceived safety to visitors.

Cultural Resource Impacts

The helicopter pad would be installed on a previously disturbed site. Any increase in visitors would be minor due to the addition of helicopter access. The probability for additional impacts to cultural resources could be negligible.

Environmental Resource Impacts

The construction of a 10,000 square foot helipad would constitute a minor impact on soils and vegetation because the helipad would likely be located on a previously disturbed site. The minor increase in high intensity noise associated with very infrequent helicopter traffic could affect wildlife, but only for a short duration. The impacts of noise on wildlife would likely be negligible.

C. Increased Winter Trails

Visitor Experience

The increase in winter trail markers would facilitate access for some villages that have considered Serpentine Hot Springs too distant or unsafe to travel. The increased presence of snowmobile travelers at Serpentine Hot Springs would affect visitor experience if the increase in visitors overcrowded the facilities. In the summer, it is possible to circle Serpentine Hot Springs by plane and count the number of visitors before landing or deciding to go elsewhere. However, snowmobile travelers arriving to find a large group on-site would not have the opportunity to leave because of limited light and long travel distances.

According to NPCA, snowmobile noise and associated air emissions could diminish visitor experience. An aggregation of idling snowmobiles during a period of cold air inversion in the valley could result in localized poor air quality for up to a few days duration. While NPCA voiced this concern, travelers arriving at Serpentine Hot Springs by snowmobile may not find that snowmobile noise and emissions diminishes their experience because it is a traditional use for the area.

Visitor Safety

There is a minor potential for increased use of search and rescue if the expansion of trail markers to Brevig Mission, Wales, and Deering encourages long-distance riding during periods of bad weather. Most residents of the affected communities have extensive familiarity with snowmobile travel on the Seward Peninsula, so the new trails do not introduce a completely new level of risk. However, several communities (i.e., Brevig and Wales) have not traveled to Serpentine Hot Springs on a regular basis in recent decades. In addition, villages have weather stations to report on local conditions, but there are none at Serpentine Hot Springs and very few remote sensors in the interior of the Seward Peninsula.

Cultural Resource Impacts

With increases in visitor use, there could be an increase in modifications to existing structures or cultural landscape elements. The potential to damage cultural resources with the installation and maintenance of permanent markers is considered negligible. Potential damage to cultural resources (e.g. artifacts, hot springs) would be considered negligible in the winter because artifacts are typically buried. The tors would still be visible and accessible, but the likelihood of damage to these features would be negligible. With increases in visitor use, there could be an increase in modifications to existing structure or cultural landscape elements.

Environmental Resource Impacts

Damage to vegetation related to the installation and maintenance of permanent markers is considered negligible.

Increases in visitor use could contribute to unauthorized construction of additional structures, or increases in site compacts due to additional camping.

Although snowmobiles carry comparatively small quantities of fuel, increase snowmobile traffic does bring a potential for very small fuel spills. Additionally, the NPCA was concerned the presence of large numbers of snowmobiles that idle may result in localized and temporary air quality issues.

D. Airstrip Expansion Options

D1. 1,500-Foot Airstrip in Existing Location

Visitor Experience

The expansion of the airstrip would result in a minor increase in the number of airplanes that could land at Serpentine Hot Springs. This would affect visitor experience if this caused overuse of the facilities on an ongoing basis. It is possible to circle Serpentine Hot Springs and count the number of planes and tents before landing or deciding to go elsewhere, however, this would be disappointing to the people who chartered the plane. The moderate increase in the number of planes is not likely to impact the backcountry experience because fixed-wing aircraft is the usual form of travel for backcountry visitors in the summer.

Visitor Safety

The expanded airstrip would provide a minor increase safety features to pilots. It would provide a margin of error and flexibility for pilots during changes of weather and/or wind. However, if the expansion of the airstrip drew inexperienced pilots to the area it could cause aviation incidents. The improved surface material would reduce safety concerns related to the spring thaw conditions.

Cultural Resource Impacts

NPS would ensure sufficient cultural resource survey information is obtained before undertaking ground disturbing activities, so that the construction of the airstrip extension would not damage

cultural resources adjacent to the airstrip. The 1,500-foot airstrip extension has the potential to cause a small increase in summer visitors because the aircraft that land now may be able to land fully-loaded. However, this does not represent a substantial change in visitor use so the impacts associated are similar to the Limited Improvements mode.

Environmental Resource Impacts

The airstrip expansion would remove soils and vegetation in addition to the area cleared for the existing airstrip and existing facilities. Moderate increases in visitation would be expected in the summer months which would result in minor increases in noise associated with the aircraft.

The larger volume of visitors in summer may result in the spread of “informal trails” in close proximity to the facilities. This would damage plants and compact soils. While minor in scale, the degradation of vegetation and soils could result in erosion and other long-term impacts such as the introduction of invasive plants.

D2. 3,400-Foot Airstrip in New Location

Visitor Experience

A new airstrip of this dimension would support larger and more frequent aircraft arrivals to bring new visitors to Serpentine Hot Springs. New air taxi service from Nome to Serpentine Hot Springs would be likely with an expanded airstrip. The anticipated increase in visitation could affect visitor experience because the existing facilities could be overused at peak use periods. The character of the backcountry experience could change with the presence of larger groups and/or increase in day use visitors.

In order to accommodate the increase in visitation and to provide a quality visitor experience, new lodging and hot tub facilities could be required. Without new amenities, the presence of additional daytime visitors would overwhelm the bathhouse and make the independent travelers who are camping feel like they are being crowded or displaced.

Visitor Safety

The 3,400-foot airstrip would meet FAA standards to serve small aircraft with approach spreads of 50 knots or more (FAA 2005). The expanded airstrips would support larger aircraft than presently use the site. This option would provide greater safety features than other aviation options considered in this study.

Cultural Resource Impacts

Building a new 3,400-foot airstrip would disturb new land within a cultural landscape which has the potential to impact unidentified cultural resources (although surveys would occur before ground-disturbing activities). The presence of the new airstrip would add a large new modern feature to the historic cultural landscape.

- The increase in visitors associated with group tours of Serpentine Hot Springs would potentially add several impacts to cultural resources: Degradation of the tors
- Artifact disturbance (at the historic site of Arctic Hot Springs or around Serpentine Hot Springs)
- Erosion related to increased airplane use of the airstrip and increased off-trail hiking with risk to cultural landscape features

Environmental Resource Impacts

The new 3,400-foot airstrip would eliminate more vegetation and impact more soils than other airstrip options. In addition, a path would be needed to connect the new airstrip to the

bunkhouse/bathhouse. This mode of access would constitute a large localized disturbance, compared to the overall footprint of the current site and amenities.

A summary of moderate impacts likely to be associated with increased visitation:

- Potential to compromise human health and sanitation with the increased number of users at the limited facilities (e.g. restroom and tub)
- Increased risk of introduction of invasive species
- Increased noise associated with additional aircraft traffic could affect wildlife for a short duration; it is not likely the effects of noise on wildlife would be noticeable in the long term
- Short-term dust events associated with aircraft
- Small fuel spills associated with aircraft
- Increased localized air pollution

E. Hardened Surface Options

All three of the hardened surface options would potentially impact visitor experience, visitor safety, cultural resources, and environmental resources.

Visitor Experience

The major increase in visitors traveling by ORV or vehicle from Nome would affect visitor experience because the existing facilities would be inadequate to meet the new level of demand. Due to the long summer daylight hours and limited facilities, many of the new visitors arriving by road might choose to stay for just the day. This would overwhelm the current bathhouse and without new amenities, the independent travelers would likely feel overcrowded.

Visitor Safety

The increase in the number of cars on the Nome-Taylor Highway, traveling to access Serpentine Hot Springs on a new hardened surface, could contribute to more vehicle-related accidents. The use of ORVs within the preserve has the potential to contribute to ORV-related accidents that require search and rescue for emergency medical assistance.

Cultural Resource Impacts

Building a hardened trail to Serpentine Hot Springs from the south would disturb land within the Iyat cultural landscape. This may be considered less intrusive for some regional residents, since the new road would largely build on an historic pathway for access. However, for those with a more traditional Inupiat perspective on the site, the new road might be seen as a jarring intrusion.

Prior to ground disturbing activities, NPS would require sufficient cultural resource survey information to be obtained to identify locations and to avoid damage to cultural resources. Increased access to Serpentine Hot Springs with ORVs in the summer could increase the potential for disrespectful behavior and could result in artifact damage or removal. A major increase in visitation may result in disturbance of cultural features (including hills and tors, hot springs site, pool, and archeological sites) by off-trail travel. This may disrupt the traditional cultural healing attributes of Serpentine Hot Springs.

Environmental Resource Impacts

A study on the effects of ORV use in the Nabesna area of Wrangell-St. Elias National Park and Preserve can be found in the *Draft EIS on Nabesna Off-Road Vehicle Management Plan* (NPS 2010). A few excerpts are included here to explain how the infrequent, but inevitable off-trail travel that occurs after the construction of a hardened trail results in long-term, major impacts to wetlands and vegetation:

Trail Braiding:

“The level of trail use by ORVs would affect the degree of impact that could occur to the wetland communities found along the trails. A single pass by an ORV within wetlands can result in a permanent impact to the wetlands vegetation and soil. Trails through emergent and low shrub wetlands are typically highly visible, as rutted tracks made by ORVs soon fill in with water, resulting in permanent standing water along the trails. In addition, as the number of passes by ORVs increases, the probability that large muck-holes would be created along these trails also increases. . . . [M]uck-holes can become impassable by ORVs. Drivers often move onto adjacent lands in order to bypass these muck-holes, resulting in the expansion of trail widths (trail braiding). As the number of passes by an ORV increases, the likelihood of trail braiding increases, the vegetative cover and biodiversity decreases, and the vegetative structure is simplified. The cover, biodiversity, and structure of vegetative communities are not affected further once the number of passes exceeds 100 (Happe et al. 1998) (NPS 2010:4-36).”

Soils and Vegetation:

Direct effects of ORV use on vegetation include abrasion, crushing, and breakage of plant tissues, as well as disruption of root systems and plant mortality. Indirect effects would include increased fugitive dust, increased erosion, reduced plant growth or vigor, altered biodiversity and community composition, reduction in vegetative cover, and the potential for increase invasion by exotic species. Outside of the footprint of the new trail, short-term construction disturbance would be mitigated with vegetation. Soil disturbance can include soil compaction, shearing, abrasion, displacement, and horizon mixing, changes in the rate of soil or thermal erosion and soil function (NPS, 2010).

This study did not include a vegetation survey therefore the characterization of the presence of shallow or deep permafrost is not assumed (using the Happe et al 1998 method to correlate between permafrost and vegetation types).

Wetlands:

In the long-term, wetland vegetation and wetland function would be lost within the road corridor due to road construction and hardening. The indirect effects would include localized increased sediment loads to aquatic wetlands, reduced plant growth or vigor, altered biodiversity and community composition (including the invasion of exotic plant species), vegetative cover reduction and the potential for increased invasion by exotic species (NPS, 2010).

E1. Geogrid Hardened Trail

Motorists would likely drive a trailer with ORVs from Nome to Taylor before starting the 13 mile hardened trail to Serpentine Hot Springs. The number of visitors this mode would attract would be smaller in volume than the gravel road modes, but still represent a major, noticeable increase in visitors. This would exceed facility capacity at peak weekends and also non-peak periods.

It should be noted that if ORV use was allowed into the preserve *without* an improved trail like the geogrid trail, the damage of soils would be greater in extent and duration because numerous routes would be chosen by travelers instead of maintaining the majority of travel within the improved corridor.

Visitor Experience: The major increase in visitors traveling by ORV to Serpentine Hot Springs would affect visitor experience because the existing facilities would be inadequate

to meet the new level of demand. Even if increased visitors do not use the bunkhouse, the bath house could not accommodate larger numbers of visitors.

Winter visitation is not expected to notably change due to this transportation access because of the distance between Nome and Serpentine Hot Springs and the challenging weather conditions for snowmobile travel.

Visitor Safety: As discussed in Section E, the use of ORVs within the preserve has the potential to contribute to ORV-related accidents that require search and rescue or emergency medical assistance.

Cultural Resource Impacts: Increased access to Serpentine Hot Springs with ORVs in the summer could increase the potential for disrespectful behavior and could result in artifact damage or removal. Increased potential for cultural feature disturbance is previously described in Section E.

Environmental Resource Impacts: A new geogrid trail corridor would directly displace a 6-foot wide corridor of soils, vegetation, and wetlands, much of which serves as fish and wildlife habitat.

E2. Single-Lane Gravel Road

The single-lane and double-lane road access improvements represent the largest potential for visitor access to Serpentine Hot Springs; they would connect the largest population hub for the region (Nome) with the more affordable form of transportation (car/truck). Visitation projections in Section 3 indicate at least a 25 percent increase in summer visitors due to a new road access option.

The construction of a single-lane road from Taylor to Serpentine Hot Springs would contribute similar, yet a greater magnitude of impacts to visitor experience, cultural resources, and the environment as described in the Geogrid Trail access mode. The changes are described briefly below.

Visitor Experience: The increase in summer visitors by road would change the experience for repeat summer visitors that normally arrive by airplane. There would be potential for the capacity of the existing facilities to be routinely exceeded. The hardened trail improvements would likely result in a negligible increase in winter visitors by snowmobile. However, damage incurred to the facilities in the summer due to overuse would also diminish the experience of winter visitors. The NPS currently has a limited budget for maintenance work at the site.

Visitor Safety: As described previously, the increase in summer visitors on the Nome-Taylor Highway would increase the potential for vehicle-related accidents.

Cultural Resource Impacts: Major increases in access to Serpentine Hot Springs by car or truck could increase the potential for disrespectful behavior and artifact damage.

Environmental Resource Impacts: Construction of a single-lane gravel road would impact a greater surface area of wetlands, soils, and vegetation than the geogrid trail. The various cars, trucks and ORVs that would travel this road would generate noise and dust, which is known to disturb wildlife behavior. There is the potential for small-scale petrochemical spills. These impacts could ultimately affect subsistence activities. Dust can coat vegetation on the sides of the road, rendering plants and berries adjacent to the road corridor inedible. In contrast with the geogrid trail option, a single-lane road would increase the construction footprint to a 14-foot wide corridor.

E3. Double-Lane Gravel Road

As discussed previously, the road options would have the greatest potential for increase in visitation to Serpentine Hot Springs. Visitation projections in Section 3 indicate at least a 25 percent increase in summer visitors due to a new road access option.

The construction of a double-lane road from Taylor to Serpentine Hot Springs would contribute similar, yet a greater magnitude of impacts to visitor experience, cultural resources, and the environment as described in the single-lane road option.

Visitor Experience: As described previously, the existing facilities could exceed capacity during the majority of the summer, diminishing the backcountry experience. Due to the long distance from Nome to Serpentine Hot Springs, the hardened trail improvements would likely result in a negligible increase in winter visitors by snowmobile.

Visitor Safety: Higher travel speed associated with wider roads has the potential to contribute to vehicle accidents.

Cultural Resource Impacts: Major increases in access to the Serpentine Hot Springs by car or truck could increase the potential for disrespectful behavior and artifact damage.

Environmental Resource Impacts: During construction of the double-lane gravel road, there could be short-term, high intensity impacts associated with noise, air pollution, and spills associated with heavy construction machinery. The impacts associated with the maintenance of the double-lane road would be negligible in contrast to the impacts associated with the daily use of the road in the summer. The higher speeds of vehicles associated with a wide flat gravel road would result in more noise and dust than generated on a single-lane gravel road. This would impact wildlife and potentially subsistence activities.

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Section 5 - Summary and Conclusions

Improving Visitor Use Data

Existing visitor use data for Serpentine Hot Springs are limited. Remote sites that are not monitored by a ranger or volunteer have limited options to count visitors. As was shown in Table 4, visitor estimation methods have changed over time and the office responsible for making the estimates also changed. Therefore, analysis of existing data to determine trends has several drawbacks because the data do not represent a complete and consistent longitudinal set.

The new remote counter technique employed at Serpentine Hot Springs on a test basis in 2010 provides an interesting starting point for analysis. However, it is a tool for estimates only, since the method for converting the total number of “clicks” to visitors has not been thoroughly verified in the field. To assist in future monitoring efforts, the NPS should document the methodology for employing the field counters and for analyzing the data.

On-site recording of visitors by NPS staff is not feasible due to the expense associated with staffing a remote site, even during the most intensive seasons of use.

Expanding Monitoring Efforts

Environmental resource monitoring at BELA was started recently through the *Arctic Network Vital Signs Monitoring Plan* (Lawler 2009). The intent of the monitoring program is to “track a subset of physical, chemical, and biological elements and processes of park ecosystem...to represent the overall health or condition of park resources...or elements that have important human values.” These resources and processes are termed “vital signs” have a primary focus on physical and biological data; social data is limited to consumptive uses/subsistence harvests. The *Vital Signs Monitoring Plan* does not monitor visitor experiences or recreation site quality.

BELA should consider expanding monitoring efforts to include visitor use, experiences, and recreation site quality. This could occur over time by the gradual implementation of the following activities:

- Consider identifying and monitoring experience indicators (via stakeholder processes or surveys as well as internal review);
- Consider requesting support from the NPS Social Science Division and/or Cooperative Studies Units;
- Consider initiating the *Visitor Experience and Resource Protection Framework* for the site and/or the park, which includes public processes, identifying values, selecting indicators, and monitoring conditions (NPS 1997).

Mitigating Impacts

Section 4 provides a very preliminary summary of potential impacts related to each access improvement transportation mode. After the management goals for Serpentine Hot Springs are updated in the BELA GMP, the following items could be considered as mitigation measures:

- Complete a survey of cultural resources in the vicinity of the existing airstrip so further improvements do not damage unknown resources.
- Consider installation of a weather camera or sensor at Serpentine Hot Springs to assist winter travel from remote villages and aircraft travel in summer.

- Organize workshops with stakeholders on reservation system techniques that could minimize conflicts associated with the limited number of facilities, but address concerns with rangers, monitoring, etc.
- Increase education to private pilots about Serpentine Hot Springs airstrip conditions in order to prevent landings during soft airstrip conditions.
- Promote the creation of a “Friends of Serpentine Hot Springs” group that could promote funding for facility maintenance, emergency communication equipment, and communicate suggestions and issues with the Superintendent for continued use and preservation of the site.

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Appendix A – Complete Public Meeting Notes

Attached are the complete notes from public meetings and small groups held in seven Seward Peninsula Communities with a history of use at Serpentine.

Date	Meeting Location
Wed, Nov 3, 2010	Kotzebue Public Meeting 6:00pm at the National Park Service, Northwest Alaska Heritage Center
Thurs, Nov 4, 2010	Deering Public Meeting 1:00pm at the Deering School
Fri, Nov 5, 2010	Buckland Public Meeting Teleconference 1:00pm teleconference to Buckland Tribal Office
Sat, Nov 6, 2010	Nome Public Meeting 2:30pm at Old St. Joseph's Church
Sun, Nov 7, 2010	Nome Small Group Meeting 3:30pm at the National Park Service Office
Mon, Nov 8, 2010	Shishmaref Public Meeting 1:30pm at the Friendship Center
Tues, Nov 9, 2010	Wales Public Meeting 2:00pm at the Multipurpose Building
Wed, Nov 10, 2010	Brevig Mission Public Meeting 11:00am at the Multipurpose Building



The bunkhouse and bathhouse at Serpentine Hot Springs (Kluwe, October 2010)

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Kotzebue Public Meeting Notes

6:00pm November 3, 2010



Attendees at the National Park Service Kotzebue Office:

Planning Team - Jeannette Pomrenke and Fred Tocktoo (NPS), Taylor Brelsford and Kim Wetzel (URS)
Public - Walter Samson (NANA), Jim Craik and Jim Kincaid (Northwest Aviation), Percy Ballot (President, Buckland IRA), Alfred Weyiovanna, Robert Igatunguk

Stories about Historic and Current Uses:

- My brother visited Serpentine Hot Springs by dog sled for medical reasons.
- Young people don't desire the old-fashioned bath houses. We should burn them in their place.
- Illegal hunting is occurring.
- Serpentine has received very limited care from NPS.
- It is a place you really want to go pretty bad; either on snow machine or spend a lot of money to use an airplane.
- He used to pick up trail stakes on his own time; there may be missing stakes. It is so easy to get lost when it's stormy. The system goes from Deering to Shishmaref; it also goes from Quartz Creek to Shishmaref that goes right by the Serpentine.
- It is only the method to get there that's changed over time. It has the same spiritual affect.

Estimating Visitation:

- NPS should ask people what Serpentine is used for: Medical purposes? Recreation?
- Problems with the current tracking system:

- During the busy summer, people tend not to write, unless something exciting happened like a muddy runway or muskox on the runway.
- Visitor logs don't tell who is a repeat visitor.
- Visitor log does not track from where the community visitors come from.
- Maybe July numbers appear so high because that was when the archeologists were there.
- Hageland and Northwest Aviation have aviation reports that may be used to estimate numbers.

Stories/Perspectives in Access Improvements:

- What are the FAA/ADOT Runway minimum requirements? It is an unsafe runway right now? *NPS is interested what the criteria are to get the runway listed at a certain status.* An air taxi's interest is that is a runway is listed so that their insurance will cover incidents there. There was an accident he had with a 207 airplane that insurance did not cover most of.
- ADOT&PF did not consult with NANA about the Taylor Road. Eventually it will reach Wales. This would affect Wales' way of life. Over time, offshoots will go to Shishmaref. Eventually an offshoot will go to Serpentine whether we want it or not. Concern that young people will want easy way to get to Serpentine

Concerns about Future Uses:

- Protect Serpentine from big lodges.
- Runway needs to be safe.
- If you're using public dollars (ex. for safety), the public will challenge you on the allowed uses (ex. guides will desire to drop-off clients there).
- If it's going to be developed, it needs to have the least impact to subsistence (resources).
- Do not change its character - The runway is primitive, but it is suitable for his equipment so he is unintentionally has a monopoly. It could be smoother. But if you make it longer, you can invite more accidents because you'll have more liabilities due to these factors:
 - Gradient
 - Wind (can be wrong for the gradient, when judgment calls are needed)
 - Inexperienced pilots from FBX and ANC; currently pilots may rule it out as a place they can safely land
- *What improvements would you like?*
 - Safety measures for winter travel are good; we cannot think of downsides (ex. trail stakes [tripods usually with reflectors] from the end of Taylor Road). Jeanette described the way Kawerak maintains trail stakes, which is quite costly. They use Shishmaref BIA road dollars. NPS would have a difficult time finding funding to do this work. Funding is an issue; but trail stakes are a priority.
 - Water quality – the ditch was the main contributor of e-coli. *NPS may have solved this issue.*
 - Beavers – Hunters should remove them; eight dams have been counted.

- The runway is just over 1,000' and is adequate. A 1,500' runway would work better because it provides a little more safety, but it still would not be adequate for a lot more airplanes.
 - Windsock – it needs to be vertical (not a bent pipe). It is the simplest thing you can do to improve safety.
 - Fly-in a 4-wheeler with a blade smooth the runway. The GMP calls for hand tools only, but the Superintendent can probably approve this logical exception.
 - Cut brush at ends of runway. The brush grows each season.

Making Good Decisions:

- A plan needs to be designed by the people. If they're not included, they will dismiss the plan because "it's just Park Service/Federal Government".
- Improvements will have unintended consequences. Consultation with all relevant folks needs to occur (particularly those with an historic interest), so they can understand all the consequences.
- NANA will not give a position on what improvements we recommend until NPS has visited all the villages.
- We [Kotzebue] are "second hand users" so we'd like to know what Shishmaref thinks first. It is really their spot so their opinion should have more weight. Shishmaref is the caretakers because they go there most.

Summary:

- All communities with a history of use need to have a voice. Shishmaref has a special relationship and stewardship of Serpentine so Shishmaref should have a big voice.
- This is a place of traditional healing; the character of the place should be maintained.
- Improve the airstrip, but don't go too far. If the extension is too big, a lot of new users could come in and "overuse" the place.
- Keep future road projects (ADOT&PF) in mind when planning for Serpentine.

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Deering Public Meeting Notes

1:00 pm November 4, 2010



Attendees at Deering School:

Name

Jeanette Pomrenke, NPS
Taylor Brelsford, URS

Fred Tocktoo, NPS
Kimberly Wetzal, URS

Name

Bonita Barr
Michael Jones
Gilbert Barr
Marlene Moto-Karl
Delores Iyatunguk
18 K-12 students

Address

PO Box 89, Deering, AK 99736

Stories about Historic and Current Uses:

- We think the general consensus is to keep it the way it is; make no improvements to it because it's spiritual. The more access, the less likely you would be able to preserve.
- There was a school trip of five middle school students and six staff in April 2009. The trail was a little soft, but the wind blew them off the trail (they were traveling on four snow machines and three sleds). "It was cool." Sledding down the hills. We saw a lot of caribou, fox. It was the first time Deering students went because the idea came from teachers that used to work in Buckland and knew how to get there.
- One young girl went on the school trip and with an auntie and uncle.

- I used to go with my wife. It is spiritual. I had to pick up people's booze bottles. The booze did not come from Deering. Some of us would consider this place a church. Disrespectful uses could increase with improvements.
- A NPS Summer crew repaired the cabin in ~1996 July/August. We watched aircraft come daily. We've seen 5 tied-down at a time.
- About a dozen people would go to Serpentine in the 1980s for healing purposes with traditional healing doctors.

Estimating Visitation:

- The July spike is from people with their privately owned aircraft. This is not local Deering people. Villages cannot afford to go in the summer.
- The ability of villagers to go in the winter depends on whether there is enough snow.

Concerns about Future Uses:

- Other school trips should go annually for 7th grade and older.
- Keep it the way it is. If you extended the Taylor Road, just anybody could go.
- If there had to be improvements, I would like to see more safety on the runway. No more trails or anything.

Making good Decisions:

- If there are access improvements, what are the projected increased visits (doubling, tripling) and what would those impacts be?
- Are there healing uses for it? Are there geothermal future uses?
- The preserve is supposed to preserve, protect. All the land to the east has been taken. My feeling is to save the land for the future.
- When can we discuss the findings from the other villages? I consider this the opening round.

Other:

Q: What is the status of the archeological dig, the findings from the last 2 summers? We've seen the preliminary report and it seems they are historically significant.

A: *Carbon dating is taking a long time. NPS will share the results with the IRA, hopefully in December. The 3rd year of the project (summer 2011) will be the last year. The spear points are probably older than 13,000 years old.*

Q: Who do we talk to about funding sources for preservation of a cemetery? IRA has gotten the school district to help redo cemetery signs and protect the bluff.

Summary:

- This is a traditional healing site. This needs to be preserved and protected. Do not create a big new user influx that would harm the traditional focus.
- Maniilaq tribal doctors would take elder patients to visit, but this budget was cut. This is desired to resume again in the future.

- Students enjoyed their first visit to Serpentine. There is a desire to continue this tradition.
- There is an interest in understanding what impacts to the site would be if more people use the site; Deering people have already experienced the impact of alcohol use there.

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Buckland Teleconference Meeting Notes

1:30pm November 5, 2010

Attendees:

Planning Team - Jeanette Pomrenke and Fred Tocktoo (NPS), Taylor Brelsford and Kim Wetzel (URS)

IRA Council - Ernie Barber, [Fred, *inaudible*], Gary Hadley, Nathan Hadley, Tina Swan (IRA Coordinator)

Stories about Historic and Current Uses:

- A very limited number of people go there to utilize its healing process because Buckland is closer to Granite Mountain Hot Springs which is not as far west as SHS. I also have to learn more about traveling there.
- NANA regional people go to Granite Mountain. We support Shishmaref's use of Serpentine Hot Springs for their health.

Making Good Decisions:

- Maniilaq of Kotzebue is part of Buckland. Percy is the Buckland representative for Maniilaq. Whatever your plans are, please send us a memo that allows us to sign and lend our support.

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Nome Public Meeting Notes

11:00am November 6, 2010



Attendees at Old St. Joe's Church:

Name	Address
Jeannette Pomrenke, NPS	Ken Adkisson, NPS
Taylor Brelsford, URS	Kimberly Wetzel, URS

Name	Address	Email
Judy Martinson	PO Box 52, Nome, AK 99762	
Mike Wade, ADF&G	PO Box 1623, Nome, AK 99762	
Tony Parsons	PO Box 1713, Nome, AK 99762	
Douglas Martinson	PO Box 52, Nome, AK 99762	
Lynn Johnson	PO Box 1798, Nome, AK 99762	
Larry Eggart	PO Box 1861, Nome, AK 99762	
Darlene Whitney	PO Box 1861, Nome, AK 99762	
Vic Olsen	PO Box 1924, Nome, AK 99762	
Jim Stimpfle	PO Box 729, Nome, AK 99762	
Rose Fosdick	PO Box 948, Nome, AK 99762	
Homer Hoogendorn	PO Box 84, Nome, AK 99762	
Daniel Martinson	PO Box 1424, Nome, AK 99762	
Roy Ashenfelter	PO Box 1969, Nome, AK 99762	
L. Bullard	PO Box 1969, Nome, AK 99762	
Kevin Busk	PO Box 1953, Nome, AK 99762	
Ben Matheson	PO Box 1847, Nome, AK 99762	
Bernadette Alvanna-Stimpfler	PO Box 729, Nome, AK 99762	
Kris Busk	PO Box 592, Nome, AK 99762	
Tyler & Erika Rhodes	PO Box 993, Nome, AK 99762	
Matt Ganley	BSNC, Nome, AK 99762	
Wesley Jessup	PO Box 948, Nome, AK 99762	
Nichole Andler	PO Box 1576, Nome, AK 99762	

Megs Testarmata
Mike Irwin
Patrick Kelliher
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PO Box 2135, Nome, AK 99762 akfisherwoman@yahoo.com
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PO Box 216, Nome, AK 99762
PO Box 27, Nome, AK 99762

Stories about Historic and Current Uses:

- The airstrip is dangerous. This summer, one aviator was stuck in the middle of the runway and couldn't get helicopter assistance. He was fined for dropping the "come along" rescue device. This was not forthcoming or user-friendly. No one wants retribution.
- It is a world-class hot spring that everyone should have the chance
- I've been going my own life. I don't want to see something like Denali with road access that is limited. I think people leave it better than how they found it. I don't want big infrastructure or permanent rangers. I want it to be clean. I don't it to be "managed" by an outside corporation. I want it to be an intimate experience.
- Out-of-state park rangers have been there. They ate the food left behind for emergencies. There were walking around with guns and park ranger hat, expecting to see polar bears.
- I've felt safer with the ranger there.
- Kotzebue Tribal Doctor used helicopters from Quartz Creek to get a lot of people out there.
- We already cut through Tweets' private land to get there in the winter. This is a safer way to travel.
- The trail markers were set to avoid private property to minimize risks or potential vandalism
- The buildings are old military buildings and metal military cots.
- Spring is when it's horrid for visitors. Spring hunters leave honey buckets in the cabin rather than use the outhouse.
- I've been flying up there since 1970s. Prior to the NPS designation, people took better care of the site. For example, there was always leftover food. During air taxi days, he used to drop-off wood when he had an empty ride. Now it seems it is not taken as good care of.

Stories/Perspectives on Access improvements:

- It should be made available to everyone. There are old people in Nome who can't snowmobile.
- Consequences of too much access?
 - It seems to be positive. The downside is human nature. It's not as though we can't address large crowds like they do in the parks in the Lower-48. This isn't something they haven't dealt with before.
 - The Park does not maximize its economic resource to Nome or the people who live here to enjoy it, particularly summertime access. To get there involves a long drive, a long 4-wheeler ride, and then a long 8 mile hike.
 - Serpentine is a limited resource. 2 bunk houses with now only 4 beds each. You have to do a reservation system like some other parks. He's apprehensive about this kind of system. Is it any better than status quo? Do you allow unlimited day passes and reserve overnights? I can admit that I'm selfish and want this resource for myself.

Concerns about Future Uses:

- If there was a road built, it would need to be adequate; it can't be dangerous and cause accidents.
- Devise a way to tell whether the place is busy so that special groups (e.g. student group, medical group) can go by themselves.
- Would like it to stay the same as it is now.
- The road we're discussing is only 15 extra miles after the road from Nome to Taylor. *[URS will conduct a Class 3 estimate of this alternative.]*
- Build shelter cabin(s) at the NPS border to prevent people from breaking into Taylor buildings
- Website (ex. Supercub) or brochure with tips on good times to go
- Utilize student volunteers
- Consider the needed accommodations for the older people who don't have airplanes or who can't sit on snowmachines. It is an enlightening opportunity for them.
- Improve the route from the Taylor Hill; get permission from the Tweets for winter access-only so as not to disturb their mining activities.
- [Add winter markers or build?] a trail from Quartz Creek to Deering

Table 1 - Suggested Physical Improvements at Serpentine	
Add picnic tables	Improve the runway.
Add tie-downs	Leave a wind-up radio. <i>(Past ones have been broken or stolen.)</i>
Use glycol/geothermal to prevent people from hauling fuel	Put a hot water tube under the bathhouse landing to melt the ice that forms around the tub
Put directional points on the trail markers	Wind sock is broken.
A meat shed/cache away from the cabins	Webcam that faces the runway so you can see conditions & # tie-downs
Build a camping area	Create the GPS points for the snowmachine trail markers
Helicopter landing spot	Put the repeater system out there.

Table 2 - Preserve Policy Discussion & Suggestions	
Resident rangers can keep their eyes on the area and report the weather, however the public didn't like them being there in the past.	Let the Superintendent utilize her power until its prohibited by statute
Create an advisory body for the Preserve – local perspectives could improve management.	Bring the Secretary of the DOI (not just the Western Arctic NPS Superintendent) to talk to us during the General Management Plan (GMP) rewrite.
Move Serpentine ownership to the State [move the park boundary]	Give a blanket permit to Bering Air since they're the only ones with helicopters. (NPS does not have its own aircraft.)
Create a procedure so USFWS can assist NPS.	Give permission for helicopters to be there.
Superintendent should be able to provide 4-wheeler safety permits	NPS develop appropriate response procedures.
Maybe NPS needs a community board.	

Making Good Decisions:

Comment (C): The aviation community is well-represented here today.

C: Subsistence should not be inhibited by whatever improvements are done.

Other Questions:

Q: Is growth realistic? Or are we spinning our wheels with this discussion?

Q: Hasn't this type of meeting happened before? I would like to see results from past meetings and tie them to the current work.

Q: What does NPS already think it wants to do?

How will RS2477 be incorporated into this plan? If it's an established road before it was a park, this access is already granted to individuals.

A: The federal government's interpretation is that RS2477 is not recognized within all federal lands.

Q: Could you explain the funding from the Federal Highway Administration?

Q: What did ADOT use with the \$1million?

Stevens says that access to the park is mandated; the only exclusion is Wrangell St.-Elias. The original purpose of the \$1mil was for landing strip improvements.

Q: What legislation drives this discussion?

A: ANILCA describes the provision of reasonable access. This is a challenge to interpret.

Q: What is the process for changing things, tell us.

A: *Regulations can't be changed at the park level, maybe some things can. NPS can post current regulations on the website.*

Q: Explain the Compendium.

A: *It is a normal language interpretation of the Code of Federal Regulations.*

Discussion of gravel:

- Winter freight the gravel in to improve the runway.
- Gravel in the riverbed

Q: What does the Historic Site designation prohibit? Does it prohibit Serpentine from being changed from the way it functioned/looked in 1970s?

C: What about Don Young's Federal policy? Local people can take over the inherently non-governmental functions. In other words, you can do some of the work (not law enforcement) ex. Maniilaq wants to take over the NPS Visitor Center in Kotzebue

Q: If there are too many people there, what do you?

A: You move-on or you can you tent camp on the airstrip. This would be sad if you chartered a plane and you can't go to Serpentine.

Q: What is the legal way to get there in the summer?

A: Walking from the boundary of the preserve, pedal a bike, or fly a fixed-wing aircraft. From Shishmaref, you could take a boat, then walk a while.

Q: Is there an advisory body made of local people [for BELA]? Preserve regulations are common sense for the Lower 48, not for Alaska.

A: There is no standing advisory body. Preserves do not convene groups on a regular basis.

Q: What are the budget constraints for this project? Can you make additional shelters?

A: *There is a small annual maintenance budget. For larger projects, we have to compete at the state or national level. We constantly try to apply for other funding sources to make improvement. NPS visits Serpentine four times in summer and two times in winter. The finishing of the boardwalk may encourage people to shovel a nice path to the outhouse instead of using honey buckets.*

C: The FAA is the example of a federal agency that has made exceptions of local interpretation of regulations.

Summary:

- Transportation adequacy:
 - Improve airstrip
 - Improve trail markers
- Safety:
 - Make NPS available 7 days/week for emergency situations; permits may be needed on the weekends
- Law Enforcement
 - Archeological features were looted in the summer
 - There is ATV use in the summer
 - Hunting guides using Serpentine
- Increased Visitation – Split of opinions on how to manage additional people and of the condition of the facilities. Desires to understand the policies and funding that drive NPS management decisions.

Nome Small Group Meeting Notes

11:00am November 6, 2010



Attendees at the National Park Service Nome Office:

Planning Team

Jeanette Pomrenke, NPS

Taylor Brelsford, URS

Kimberly Wetzel, URS

Name

Address

Ken Adkisson, National Park Service

Peter Bente, Alaska Department of

Fish & Game

Mike Wade, US Fish & Wildlife Service PO Box 1623, Nome, AK 99762

Use Stories about Historic and Current Uses:

- I've been there a number of times where the bunks were full so I camped on the airstrip. It is a bit overrun with bears. I do take my wife berry picking there, but it's the only place where I've been charged! *Food left in the cabins and human fecal matter attracts bears.*
- ADF&G pilot Tony Gorn is out doing a survey today and has landed and been there many times. He's in the air over it many times in the last 15 years. In the late 60s/1970s, there were other UAF students doing contaminants of birds of prey. They talked about how great it is. "If you ever have a chance, you have to go because of the beauty of the scenery, the novelty of the geology." The Nome Road is known as a special place for bird watchers
- Serpentine is a squirrely place to land. In theory, it's good to land uphill and take-off downhill. I've waited there 4 days until the winds shifted alright.
- There are some large user-groups that go (e.g. Nome firemen), but he did not witness too much alcohol abuse.
- There is a squatter. It makes you uncomfortable as a visitor. I know who they are.

Stories/Perspectives on Access Improvements:

- Nome does not have an air taxi that can run to Serpentine, so this is a limiting factor. Insurance is too high to fly in there.
- Scenario Questions:
 - Tie-downs: I don't like the ones that exist so I don't use them.
 - Reservations: Locals will not like them.
 - Outhouse: It is not in an unsafe place. People's objection to it does not make sense to me.
 - Surface Transportation: We have 4-wheelers in there now. It is the nature of the beast that a new road will bring in more illegal use.
 - Emergency Phones: Could one be left at Serpentine? What about use of a system just like the roadside emergency phone technology. They are useful for people to call-out and just communicate that they're stuck due to weather.
 - # Bunks: Seems appropriate. The more beds made available, the more people would come.

Concerns about Future Uses:

- If you have visitors, you should preserve the sense that it is wilderness or not overly used. A measure of cleanliness (hygiene, waste removal). Important to preserve the minimal level of use that probably occurred in the 60s-70s.
- The existing airstrip could be a decent for 206 planes. It will never be a Navajo airstrip.
- Would people use an airstrip in a different location?
- Consider a Memorandum of Understanding between NPS and ADF&G.
 - USFWS has great resources that should be used. One pilot's personal plane is a 180; the ADF&G plane is a 185; and the Supercub is on skis. The pilot lands on the side of the hill, not the runway.
 - NPS needs a big work-horse plane to get in and out of Serpentine.
- *What do you think of the weather camera?*
 - People say the Lake Clark pass camera makes a big difference.
 - Pilot or agency guys would like it. Cost savings for them. Pilots love the RAWS reports.
 - The Superintendent heard people think it is "big brother".
 - Tourists would save grief when booking flights.

Making Good Decisions:

- Are there any trends in visitation? I read the log books, but I've stopped signing the book many years ago.
- Consideration of ATVs:
 - ATV access is a double-edged sword. At Anaktuvuk Pass I was astounded at what happened after 3 years. When 3-wheelers were used, they had minimal impact on landscape. Then came better quality 4-wheelers with heavier chassis, then came Argos...these created amazing damage to the landscape. The hardened trail encourages

people to go off trail. Without strict control/enforcement...it's not the wrong thing to do, but it will be go beyond your conception of what the trails will look like in 5 years.

- Spread of invasive plants
 - Change to drainage
- Impacts to the environment and costs will rule out a lot of transportation options to Serpentine. Consider use of Quartz Creek to shuttle helicopter passengers.

Summary:

- Future collaboration between NPS, ADF&G and USFWS.
- The use of ATVs in BELA would have tremendous environmental impacts; the costs of installing hardened trail would be cost prohibitive too.
- Any safety improvements to Serpentine would be helpful because the geography makes it so difficult to land planes; consider the use of cameras.
- It seems the number of visits from Serpentine trends upwards. NPS will need to invest in the ongoing cleaning and maintenance of the site.

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Shishmaref Public Meeting Notes

2:00pm November 8, 2010



Attendees at the Friendship Center:

Planning Team

Jeannette Pomrenke, NPS

Fred Tocktoo, NPS

Taylor Brelsford, URS

Kimberly Wetzel, URS

Name

Tommy Obruk, SNC/Elder Committee

Albert Ningeulook

Suzie Kokeok, Elders Committee

Cliff Weyiouanna

Jennifer Demir

Annie Koreow Kokeok

Delano Barr

Curtis Nayokpuk, Board Member of
Shishmaref Emergency Services

Richard A Kuzuguk

Tony A Weyiouanna

Stanley Tocktoo

Fred Goodhope, Jr.

Karla Nayokpuk

Fred Weyiouanna

Donna Barr

Carol Ningeulook

Edwin J. Weyiouanna

Darlene Turner, SHH Corporation/IRA

Keith Weyiouanna

Contact

(907) 649-3651

Box 33 Shishmaref, AK 99772

Morris Kiyutellyk, Native Corporation
Larry Kuzuguk
Jimmy Weyionanna

Stories about Historic and Current Uses:

- There is a state-identified easement; a few areas with marginal snow (you guys don't want use to drive on the tundra) sometimes it's hard to cross at Lone Butte Creek for a place to cross.
- We try to use the same trail our ancestors. *The marked trails are the traditional trails.*
- School Trip:
 - April 2010 for 7 adults, 13 children.
 - We almost conflicted with the Nome Fire Department to avoid conflicting on times, but NPS helped avoid this.
 - They learned about caribou hunting & dressing, survival skills and wellness
 - Fundraising occurred to send the group via snowmachine. If they find funding, they might do it again.
 - It was very beneficial for the youth. It is done with high school senior trip in the past.
- Maniilaq has taken large groups of elders and people with arthritis and other ailments in July. Maybe this is a trend where Native Corporations take more group trips.
- Growing up our parents would tell us the warm would be good for arthritis and skin problems. My dad would come back from a hunting trip with a few gallons of water, mud and moss. I go there for a remedy for my skin problem. I know other people who do the same thing.
- It is a traditional gathering and hunting area.
- The North Fork Trail is an alternative trail for a shorter trail to the hot spring, but it does not have a shelter cabin.
- When Bering Land Bridge NP was formed, we were promised no big game guides. We were taught, whatever you bring into the country, bring it home. Don't leave it there. When we subsistence camp, you wouldn't know we were there or returned there. Keep the country pristine. There are instances where hunters are butchering directly at Serpentine. I've heard of bootlegging going on there, drinking activity. Road access would make this worse.
- Animal carcasses are being left at Serpentine. Hunters need to haul their carcasses out of there. Some animals are coming more inland because of climate change, so if hunting does occur there, they can only leave the guts. We found the whole head and hide of the muskox left there.
- Serpentine is used as a base camp for subsistence use. We may be too tired to go back home and stay a day or two.
- Spring break we take our kids there in March for their vacation. Kids look forward to this.
- About 1.5 years ago, the e. coli came with the increase of visitors and hunters butchering on-site at the hot springs. In the future, if we improved airport and road, it would open hot springs even more. We need to address sanitation problems we're having now. Maybe things are unsanitary and we don't know it.
- We didn't see beavers in the past.

- MOUs between Shishmaref IRA and Maniilaq to express that the healing purposes are still open to their elders in Kotzebue.
- Shishmaref only go there by snowmachine from March to May. It should be reserved or a priority for Shishmaref people, not the guides who use it for profit. Just last week it was kind of crowded. Maybe there is a way to subsidize our elders to fly in there in the summer, it is really beautiful. A lot of people here don't know that.
- We can't stop modernization. We're getting more recreational use of the hot springs. 50% traditional 50% recreational. We need to keep it clean and pristine. When the modern medicine does not work, we need to go to hot spring.
- Going back 3 generations or so, Shishmaref had 70% use of Serpentine. There have been skirmishes with the inland river people. The "Arctic Hot Springs" (the downstream spot, the first name for the hot spring) was used earlier than Serpentine. It was a training ground for shamans [unclear which hot spring has more healing powers] but their spirits are still there. Sometimes people disappeared (poof!) and all they left behind was a bead.
- I remember going to the bathtub when I was a kid and seeing these guys with dark faces and white skin [miners].
- We have unique situation where we can preserve it the way it is. We can maintain it provided there is consensus between the user groups. Guidelines or limitations on how much we want it to expand or preserve.
- We are 95% Inupiat who rely on subsistence all 4 seasons on land and water.
- Huslia Indians had their own bathhouse/tub and the Chukchi Eskimos has their own bath houses. We need to avoid ethnic conflicts like these!

Estimating Visitation:

- *July's numbers might be higher due to the archeological project that was occurring.*
- Gas prices are able to limit travel to some extent.

Concerns about Future Uses:

- Elders concerned about a road from Taylor to the Serpentine because a road would bring contaminants, sanitation, and trash. We don't want it to look like a city dump up there.
- A timber bridge (~6' wide by 4' long) at Lost Butte Creek (see map) would be helpful because when snow cover is inadequate, snowmachiners are forced to cross the larger river and potentially cause more tundra damage.
- The place is a main meeting place for their spiritual sharing and healing regionally including Deering and Buckland. Communities do not want further modernization. Recognition of traditional use should be the main priority.
- Keep what's there because there's already congestion and conflict of use.
- Prevent alcohol and drugs from being there. Who would be authorized to restrict them?
NPS can prohibit alcohol within those public buildings, therefore it would take a Compendium Rule by the Superintendent. Some people may feel unhappy NPS is telling them what they can or cannot do. (Shishmaref could consider a joint resolution about what is appropriate behavior in

the buildings and improvement to the buildings.) There is not very much enforcement; it would be hard to do. Nome would have significant issues with it. It is a good thing to think about for the GMP update coming up.

- Public notification or broadcast to prevent conflicts at Serpentine for scheduling (ex. KOTZ radio broadcasts or permits like Pilgrim for the large groups).
- Search & Rescue: We have the responsibility of maintaining the trail stakes. There are a few permanent ones that constantly need repair because musk ox use them as scratching posts. These are expensive to maintain, especially the permanent ones. It would help if we can make them more permanent during summer using ATVs. However, ATVs are prohibited from maintaining trail stakes [in summer]. We consider these to be lifesaving. He would like an easement to access them via ATV in summer.
- Timbers to cover the creek between the outhouse and the cabin.
- It needs a better trash barrel. Can we call you when they're full? *NPS wants to put in a new burn box.*
- Can you construct another bath tub? *It's not that we can't, but it's a long process. We are looking for funding to keep the red wood tub, but fix it. Redo the current structure with better building materials.* An open air tub would be good for kids in the winter and good for Nome adults in the summer. There are always a lot of kids on the weekends or you have to wake-up early/stay-up late to avoid the conflict with kids.
- Can the tin roof be replaced? *NPS wants to get money for repair/rehab.*
- He's been smoked-out in the past [clean the stove]?
- We've seen the 55 gallon tank for the oil stove drips.
- Big Game Guides:
 - It seems guides are pushing us out those who use it for healing purposes. Maybe create an area designated for butchering and is a certain distance from the bunkhouse?
 - If guides are allowed, they should make reservations and pay a fee and only be there to rest. *There would be no on-site storage of meat or hides and no butchering.*
- We should try voluntary measures to improve things before NPS does more improvements. Pilgrim Hot Springs is privately owned and attracts visitors that are further from Serpentine. However, people who go there now might come to ours instead if we did a lot of improvements.
- Tub replacement.

Making Good Decisions:

- If NPS using public money to build and maintain facilities, I do not think they can discriminate who can use the facility.
- They would like copies of these minutes.
- The fact that a group pops out of nowhere, "Friends of the Kougarok Road" and gets \$1 million for a study from Kougarok Road to Serpentine. This makes me think that something big will happen in the near future.

Wales Public Meeting Notes

3:00pm November 9, 2010



Attendees at the Wales Multipurpose Room:

Planning Team

Jeanette Pomrenke, NPS
Taylor Brelsford, URS

Fred Tocktoo, NPS
Kimberly Wetzel, URS

Name

Winton "Spuk" Weyapuk Jr., Wales Native Corporation & IRA Council
Larry Sereadlook, WNC Board
Lucy Kitchen, WNC Finance
David Ongtawasruk
Frank K. Oxereok, Jr., Area Council
Clade E Oxereok
Christine Komonaseck
Jason Oxereok, came later, former student NPS worker

Address

PO Box 541 Wales, AK 99783

PO Box 491 Wales, AK 99783
PO Box 545 Wales, AK 99783

Stories about Historic and Current Uses:

- A large group of native and village corporations got together and purchased Pilgrim Hot Springs because they didn't want it to be commercialized. That was a good decision by us because it kept the use in the region. It obviously needs some repairs and improvements, but it is in good condition.
- I went once on a school trip when I was 11. They choose a few students from different villages. This was before there was two buildings, just one modest building. We camped in tents for a week. The teacher boiled coffee using the spring. It was very eye-opening for me. She also went to Haycock, AK. They taught us a lot, including how to keep the place clean.
- If you got turned-around on the Serpentine River you would be very lost

- Young people don't know the down-river pass from here.
- The weather dictates everything that we do here.
- I hear Serpentine is really good for you. I hear it really helps.
- A few other men went to Serpentine in high school- starting from Shishmaref (because they went to school in Shishmaref).

Stories/Perspectives about Access Improvements:

- Wales does not really have a trail to get there, so wouldn't really know how to get there. We could go to Shishmaref and they could bring us there. Once you get to the east of our lagoon, it becomes foreign to us.
- If you put in a road, you better put a ranger station in there too. You'd have more trash, traffic. NPS took a lot of time cleaning it up in 1997 while I was there.
- One person experienced Pilgrim Hot Springs trashed inside and out.

Concerns about Future Uses:

- Safety:
 - Communications - They need a repeater system closer to Wales; if they used one of Wales' five peaks, it would cover several communities. The use of Cape Mountain was, but it is a conflict with something regarding homeland security?
 - Trail Improvements – Do the trail markers all have to be on NPS land? New trail markers would give the added benefit of further range.
 - Trail improvements would help with hunting. 19 bears were found here. They're following the caribou herd, but we could not find moose. We have to travel further for moose.
 - GPS – publicize the coordinates to get to Serpentine from Wales.

Q: What other money does NPS provide to Search & Rescue?

A: *NPS does donate, for instance, by opening up gasoline accounts and providing life-suits. NPS does not have a lot of money, but can help make small improvements.*

- More educational trips where students from different communities all meet.
- Health:
 - Elder Trip - *We described how Maniilaq brought elders a decade ago.* No objection to the idea of Kawerak funding elder trips.
 - Traditional healing is a real solution, not just taking a couple pill bottles.
- Energy: Is there any interest in future power generation there?

Summary:

- Interest in NPS assistance with the Search & Rescue technology.
- Interest is sharing the archeology results from the site.
- Wales does not use Serpentine a lot. Weather is a factor as well as distance; many people would not know the safest route to travel there.

- There are no trail markers from Wales to get to Serpentine. Publication of GPS coordinates may help.
- Interest in student opportunities to go there again.
- Lessons from Pilgrim Hot Springs may be applicable to Serpentine.

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Brevig Mission Public Meeting Notes

11:00am November 11, 2010



Attendees at Brevig Mission Multipurpose Room:

Name

Fred Tocktoo, NPS

Taylor Brelsford, URS

Kimberly Wetzel, URS

Address

Walter Seetot

Robert Tocktoo

Elmer Seetot Jr.

Stewart "Raymond" Tocktoo

Rita Olanna

Delores Kakoona

Leonard Adams

Henry Olanna Jr.

Henry Olanna Sr.

Reggie Barr

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PO Box 86 Brevig Mission, AK 99785

Email

sulook@gci.net

Stories about Historic and Current Uses:

- Elders use it in March/April to soak or try to get a little better from their sicknesses over the past winter; arthritis, limbering the joints.
- I've only been twice in the last 15 years. People here probably choose Pilgrim Hot Springs more often, but even that is not frequent.
- We go there to soak. It is good for our sickness. It is nice in there. After you soak, then you can put a blanket on and sweat.

- I have not been there before, but people say, “Serpentine Hot Springs will help people more” [than Pilgrim Hot Springs]. Pilgrim was in private ownership at one time. It is questionable who owns Pilgrim.
- People leave bottles up there and mess-up the place. I am concerned people do not respect the place. I have gone there 3-4 times, many years ago.
- Auntie Stella Hensley used to be a traditional healer. They went by snowmachine and were flown down a time or two.
- I know Shishmaref Search & Rescue has used it as a base.

Stories/Perspectives on Access Improvements:

- There are a lot of things going on. A lot of the elders’ information gets passed on. A select few only know about the hot springs. Pilgrim is used more in the springtime. It has showers there.
- Snow conditions were optimal a few years ago, at least to Kougatok Mountain. With the snow coming late in Jan/Feb, it does not accumulate enough snow for travel. The snow will smooth out the bumps. You have to take longer routes or find a route that will take you there. We don’t know the country that well going up in that country.
- We can only use snowmachine to get to it now.
- Q: Are the hot spring temperatures going up and down? *Fred discussed the original location may have been further downstream, but it was moved when the temperatures cooled. NPS is monitoring the temperatures now- there is anecdotal information about the temperatures fluctuating, but it is generally about 170 degrees.*

Concerns about Future Uses:

- Safety:
 - Trail Improvements – We go to Davidson Landing, then up and down to Serpentine. You should share the snow machine trail on a map with people. Ask people whether trail-staking would be wanted. Another route is to go half-way to Shishmaref, then towards Serpentine.
 - Repeaters – We need one nearby for our search and rescues.
 - Trail Stakes – They need reflectors.
 - Runway – Improve this because I’ve been in a crash and it is no fun.
- Is there interest in educational trips for students? – *Some interest from the group.*
- Can we get there in one day on snowmachine? What if there is stormy weather?
- Road:
 - It would be easier for the elders to go if there was a road. It seems very far for us.
 - If you build a road, it means the public can go anywhere, do anything. My mother grew up there, she would not want anything else going in there or else the traditional use would change.
 - A road from Nome would bring a lot of traffic.

Making good Decisions:

- Shishmaref/Kawerak wants to meet with Brevig to talk about transportation. They could discuss Serpentine too.
- Weigh comments from Shishmaref, Kotzebue, and Deering more. We only use Serpentine from time to time.
- Fred Tocktoo wants to talk to Walter Seetot IRA Council to ask about trail/staking specifics.

Summary:

- High value placed in the historic use of healing at Serpentine
- There is an interest in bringing elders to hot springs for healing purposes, but improving access for them to go there would bring too many other visitors and change the character of the place.
- The communities that use Serpentine more should be weighed greater.
- Agreement on improvements to aviation safety.

Appendix B – Class C Cost Estimate Spreadsheets

Attached are a series of Class C cost estimates for each transportation mode. A summary can be found in Table 2.



Summer air service to Serpentine Hot Springs by Northwestern Aviation of Kotzebue (Kluwe, October 2010)

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A. Limited Improvements

Opinion of Probable Costs

Construction of Limited Improvements

Activities	Cost \$	Comments
Brush clearing	\$ 1,160	Two people two days with portable brush cutter: Labor = 16hrs x \$60=\$960 : equipment & gas = \$200
Ditching	\$ 10,180	Four wheeler backhoe and * attachments \$7300 Labor, assume operate four wheeler excavator and laborer, excavate 3 foot deep ditch x 100 ft long over 3 days (24 hrs x 2 x \$69 per hr) =\$2880 Park Service would purchase equipment - Four wheeler backhoe (490 lb) \$6,399 and Dump wagon (323 lb) \$899
Windsock	\$ 2,200	Replace pipe with larger diameter pipe: Pipe cost,\$200, transportation \$1000, labor 16 man-hours = \$960
Airplane Tie-downs	\$ 480	Replace rebar; Labor 8hrs x \$60
Fill in soft spots with fine aggregate from existing deposit 1/2 mile south of hot springs	\$ 960	Two people one day with four wheeler and wagon \$960
Transport 10 yards of fine aggregate material from site 1/2 mile south of hot springs	\$ 2,000	Labor costs associated with 2 people for 2 days transporting material by ATV or snow machine. ATV would require permit, snowmachine would require pre-bagging previous summer and hauling by snowmachine sled in winter.
Transport - Cessna 206	\$ 15,000	15 round-trips, \$500/hour flying to transport equipment and staff
Travel Time, 2 days - 2 people	\$ 960	Travel to Serpentine from Nome
Lodging, 2 people - 10 days	\$ 500	
Sub Total	\$ 33,440	
20% Contingency	\$ 6,688	
TOTAL	\$ 40,128	

Annual Operations & Maintenance

Item Description	Estimated Annual Cost	Comment
Annual runway fill	\$ 960	Two people one day with four wheeler and wagon \$960
Annual brush clearing	\$ 1,160	Two people two days with portable brush cutter: Labor = 16hrs x \$60=\$960 : equipment & gas = \$200
Travel/Transport/Lodging	\$ 10,000.00	10 round-trips
TOTAL	\$ 12,120.00	

B. Helicopter Access
Opinion of Probable Costs

Construction of Heliport next to Runway

Item Description	Area (Ft ²)	Cost \$		Comments
Clearing	3,600	\$	1,000.00	60x60' helipad adjacent to runway
Helipad paint markings		\$	500.00	Paint & labor
Total		\$	1,500.00	

Annual Operations & Maintenance

Estimated	
Item Description	Annual Cost
Annual brush clearing	0
Semi-annual paint markings	500
Total	\$ 500.00

Opinion of Probable Costs

Maintain Existing Winter Trails

Trail Segments with Tripods	Distance (mile)	Tripod Costs per mile	Value of Existing Tripods System	Re-standing	Replacement	Comments
						TRIPOD BROAD ASSUMPTIONS Replacement of 2 tripods per mile (10% rate) Restand 6 markers per mile (33% rate) at 2 miles per hour at \$120/labor hour
Shishmaref to Serpentine	52	\$ 500	\$ 26,000	\$ 3,120	\$ 2,688	
Taylor to Serpentine	13	\$ 500	\$ 6,500	\$ 780	\$ 728	5 of the 13 miles are within the Preserve boundary; the entire distance to Nome is a state maintained road.
	65	Total Value	\$ 32,500	\$ 3,900	\$ 3,416	
				Total Maintenance	\$ 7,316	

Potential Winter Trail Segments	Distance [mile]	Tripod Costs			Carsonite \$ per mile	Total Carsonite costs	Comments
		per mile	Total tripod costs				
* Deering to Serpentine	77	\$	500	\$	38,500	\$	See Figure 3 for map trail segments Assumption that carsonite system is on land with tripod use on lagoons.
* Wales to Serpentine	107	\$	500	\$	53,500	\$	
Deering to Shishmaref	100	\$	500	\$	50,000	\$	
Wales to Shishmaref	77	\$	500	\$	38,500	\$	
Shishmaref to Brevig Mission to Teller	81	\$	500	\$	40,500	\$	
		442	TOTAL	\$	221,000	Subtotal	\$ 221,000
Construct modest 4x6' crossing at Lost Butte Creek							
			\$	5,000		\$	5,000
							10-(8x8') 12' length treated timbers & bolts plus freight (\$2000)
							Barge timbers in summer; haul timbers in winter. 2-
							local staff, 2 days labor to construct. Assumes it
							would stand for 15 years.
		NEPA Compliance EA		\$	-	\$	100,000
		TOTAL		\$	226,000	TOTAL	\$ 326,000

* Direct routes to Serpentine Hot Springs are prioritized over inter-village travel.

C. Increased Winter Trails

Opinion of Probable Costs

Annual Operations & Maintenance of New Winter Trails

Item Description		miles	Tripod refurbish/re- standing rate			Tripod Replacement rate		Carsonite Replacement rate
Annual Maintenance of Existing Trail Segments		65	\$	32,500	\$	3,640	\$	1,820
Annual Maintenance of New Trail Segments		442	\$	26,520	\$	24,752	\$	12,376
Comments								
TRIPOD BROAD ASSUMPTIONS								
Replacement of 2 tripods per mile (10% rate)								
Restand 6 markers per mile (33% rate) at 1 mile per hour at \$120/labor hour								
Includes inspection of Lost Butte Creek crossing.								
CARSONITE BROAD ASSUMPTIONS								
Replacement of 1 marker per mile (5% rate)								
\$13/mile replacement rate								

Tripod Total \$ 87,412 \$ 14,196 Carsonite Total

D. Airstrip Expansion Options

D1. 1,500' Airstrip in Existing Location

Opinion of Probable Costs

*Unit costs from ADOT&PF Bid tabs for similar projects in Nome area. Assumes suitable gravel and rock products can be produced near Serpentine and similar costs to haul and place material.

Item Description	Length (ft)	Crossectional		*Unit	Cost \$	Comments
		Area (Ft ²)	Vol cu yd			
Unclassified excavation	400	154	2,281	20	45,630	18" Thick
Borrow (Pit Run Gravel)	400	154	2,281	60	136,889	
Aggregate Base Course	400	50	741	110	81,481	6", assume 2" minus made from jaw crusher
Stock Pile for Future maintenance			100	110	11,000	
<i>Resurface Airstrip</i>					<i>Subtotal</i> \$	275,000

Resurface Airstrip

Item Description	Length (ft)	Area (Ft ²)		*Unit	Cost \$	Comments
			Vol cu yd			
E-1 Aggregate Base Course	1,100	50	2,037	110	224,074	6" Thick
<i>General Costs</i>					<i>Subtotal</i> \$	224,074

General Costs

Item Description	Cost \$	Comments
Meals & Lodging	100,000	8 People for 1 month
Mobilization/Demobilization	200,000	
Construction Surveying	30,000	
Erosion Sediment Control (SWPPP)	30,000	

Total Estimated Construction Cost \$ 859,074

Construction Cost Estimate Contingency 15% \$ 128,861

Field Investigations \$ 75,000

NEPA Compliance EA \$ 50,000

Engineering, Permitting, Bid & Construction Administration Support 13% \$ 111,680

Total \$ 1,224,615

Annual Operations & Maintenance

Item Description	Cost per meter			Estimated Annual Cost	Comments
	sq	square meter	square ft		
Patrolling/blading	\$	0.05	47398	510000	Estimate from www.eba.ca
Annual brush-clearing				\$ 1,160	Two people two days with portable brush cutter: Labor = 16hrs x \$60=\$960 : equipment & gas = \$200
Transport - Cessna 206				\$ 15,000	Transport of equipment (4-wheelers) via several trips
Travel Time				\$ 960	2 days - 2 people
Lodging				\$ 200	2 people - 2 days
<i>TOTAL</i>				\$ 19,690	

D. Runway Expansion Options

D2. 3,400' Runway in New Location

Opinion of Probable Costs

*Unit costs from Alaska Department of Transportation Bid tabs for projects in Nome & Kotzebue area. Assumes suitable gravel products hauled from outside Serpentine Hot Springs boundary, haul distance 5 to 10 miles over winter ice road.

3400' Runway - Item Description	Length (ft)	Area (Ft ²)	Vol cu yd	Unit Cost \$	Cost \$	Comments
Borrow unclassified-permafrost area	3400	238	29970	50	1,498,519	5' Thick
Borrow (Pit Run Gravel)	3400	256	32,237	70	2,256,593	18" Thick
E-1 Aggregate Base Course	3400	76	9,507	83	789,115	6" Thick
Culverts	1700			150	255,000	Approximately 10 pipes, 170' ea.
<i>Subtotal</i>				\$	4,799,226	

X-Sect

Apron - Item Description	Length (ft)	Area (Ft ²)	Vol cu yd	Unit Cost \$	Cost \$	Comments
Borrow unclassified-permafrost area	200	238	1,763	50	88,148	5' Thick
Borrow (Pit Run Gravel)	200	256	1,896	70	132,741	18" Thick
E-1 Aggregate Base Course	200	76	563	83	46,726	6" Thick
<i>Subtotal</i>				\$	267,615	

Trail to Hot Springs - Item

X-Sect

Description	Length (ft)	Area (Ft ²)	Vol cu yd	*Unit Cost \$	Cost \$	Comments
Borrow unclassified-permafrost area	3,000	130	14,444	50	722,222	5' Thick
Borrow (Pit Run Gravel)	3,000	20	2,167	70	151,667	18" Thick
E-1 Aggregate Base Course	3,000	5	500	83	41,500	6" Thick
Culverts	450			150	67,500	Cross pipes @ 300 feet interval
<i>Subtotal</i>				\$	982,889	

General Costs - Item Description

Ice Road, assume winter construction	Cost \$	1,500,000
Meals & Lodging for 16-18 people May-Sept		650,000
Mobilization/Demobilization		750,000
Construction Surveying		100,000
Erosion Sediment Control (SWPPP)		250,000

Assume \$100,000 per mile for 14 miles and for unpassable portions of Nome Taylor Hwy

Total Estimated Construction Cost	\$	9,299,730
Construction Cost Estimate Contingency 15%	\$	1,394,959
Field Investigations	\$	200,000
NEPA Compliance Environmental Impact Statement	\$	1,000,000
Engineering, Permitting, Bid & Construction Administration Support 13%	\$	1,208,965
Total	\$	13,103,654

D. Airstrip Expansion Options

D2. 3,400' Airstrip in New Location

Opinion of Probable Costs

Annual Operations & Maintenance

Item Description	Cost per		meter	square	ft	Estimated		Comments
	meter	square				Annual	Cost	
Patrolling/blading	\$	0.05	47398		510,000	\$	2,370	Estimate from www.eba.ca
Annual brush-clearing						\$	6,000	Two people two days with portable brush cutter: Labor = 80hrs x \$60=\$4800 : equipment & gas = \$1200
Transport - Cessna 206						\$	15,000	Transport of equipment (4-wheelers) via several trips
Travel Time						\$	960	2 days - 2 people
Lodging						\$	500	2 people - 10 days
TOTAL						\$	24,830	

10-Year Maintenance

Airstrip Reshaping	TOTAL	\$	100,000	Includes transport of light-weight road grader via C-17, labor or overland travel
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E1. Geogrid Hardened Trail

Opinion of Probable Costs

*Unit costs from 'Managing Degraded Off-Highway Vehicle Trails in Wet, Unstable, and Sensitive Environments' by Federal Highway Administration and National Park Service.

From Taylor Creek To Boundary 8.0 Mi. (42,240 ft)

Item Description	Length (ft)	Width (ft)	Area (Ft ²)	Vol cu yd	*Unit Cost \$	Cost \$	Comments
Leadblock	42,240	6	253,440		2.15	544,896	Assume 6' wide
Gravel	42,240			4,969	48.00	238,532	Assume 1 cu yd per 8.5' of trail
2x6 lumber	5,000			0	7.00	35,000	1-2x6 lumber every 8'
Screws				0		30,000	18 screws per lineal foot
Labor	42,240				27.55	1,163,712	
Bridge						100,000	Approximately 9 pipes, 45" each

Subtotal \$ 2,112,140

Boundary to Serpentine Hot Springs 5.0 miles (26,400 ft)

Item Description	Length (ft)	Width (ft)	Area (Ft ²)	Vol cu yd	Unit Cost \$	Cost \$	Comments
Leadblock	26,400	6	158,400		2.15	0	Assume 6' wide
Gravel	26,400			3,106	48	149,082	Assume 1 cu yd per 8.5' of trail
2x6	2,580				7	18,060	1 2x6 every 8'
Screws						20,000	18 screws per lineal foot
Labor	26,400				27.55	727,320	
Small Bridges	3					200,000	

Subtotal \$ 1,114,462

General Costs

Item Description	Cost \$	Comments
Meals & Lodging	400,000	12 people for 4 months
Mobilization/Demobilization	100,000	

Subtotal

Total Estimated Construction Cost \$ 500,000

Construction Cost Estimate Contingency 15% \$ 3,726,602

Field Investigations \$ 558,990

NEPA Compliance EIS \$ 20,000

NEPA Compliance Support \$ 500,000

Bridge Engineering, Permitting, Bid & Construction Administration Support \$ 100,000

Total \$ 4,905,592

Annual Operations & Maintenance

Item Description	Cost \$	Comments
Drive-through inspection (first year)	\$ 13,000	2 people for 13 days Labor = 208hrs x \$60=\$12,480: equipment & gas = \$500
Drive-through inspection (annually, after first-year)	\$ 1,200	2 people for 1 day

E. Summer Use Hardened Surface Options

E2. Single-Lane Gravel Road

Opinion of Probable Costs

*Unit costs from Alaska Department of Transportation Bid tabs for projects in Nome & Kotzebue area.
Assumes suitable gravel from outside Serpentine Hot Springs boundary, haul distance 5 to 10 miles.

From Taylor Creek To Boundary 8.0 Mi. (42,240 ft)

Item Description	Length (ft)	Area (Ft ²)	Vol cu yd	*Unit Cost \$	Cost \$	Comments
Borrow unclassified-permafrost area	26,420	150	146,778	40	5,871,111	5' Thick
Borrow unclassified-no permafrost	15,820	48	28,124	40	1,124,978	2' Thick
Borrow (Pit Run Gravel)	42,240	26	39,893	54	2,154,240	18" Thick
E-1 Aggregate Base Course	42,240	7	10,169	67	681,316	6" Thick
Turnouts, 50 ft long every 500'	-	-	-	8,000	680,000	85 Turnouts
Culverts	5,250	-	-	150	787,500	Cross pipes @ 300 feet interval
3 Small Bridges	-	-	-		300,000	Includes guard rail & bin walls
Subtotal					11,599,144	

Boundary to Serpentine Hot Springs 5 miles (26,400 ft)

Item Description	Length (ft)	Area (Ft ²)	Vol cu yd	Unit Cost \$	Cost \$	Comments
Borrow unclassified	26,400	150	146,667	40	5,866,667	
Borrow (Pit Run Gravel)	26,400	26	24,933	54	1,346,400	Type A 18"
E-1 Aggregate Base Course	26,400	7	6,356	67	425,822	6" Thick
Turnouts, 50 ft long every 500'	-	-	-	8,000	424,000	53 Turnouts
3 Small Bridges	-	-	-	-	300,000	Includes guard rail & bin walls
Culverts	3,383	-	-	150	507,450	Cross pipes @ 300 feet interval
Subtotal					8,870,339	

General Costs

Item Description	Cost \$
Meals & Lodging for 16- 18 People	
May -Sept	650,000
Mobilization/Demobilization	
Construction Surveying	750,000
Erosion Sediment Control (SWPPP)	170,000
	210,000

Total Estimated Construction Cost \$		22,249,483
Construction Cost Estimate Contingency 15%		3,337,423
Field Investigations		200,000
NEPA Compliance EIS		1,000,000
Engineering, Permitting, Bid & Construction Administration Support 13%		2,892,433
Total		29,679,339

E. Summer Use Hardened Trail Options

E2. Single-Lane Gravel Road

Opinion of Probable Costs

Annual Operations & Maintenance

Item Description		Miles			Cost per mile		Total Cost	Comments
Grading				13	\$	5,000	\$ 65,000	ADOT&PF estimate \$4-6,000/mile for Nome contractor to drive up the road weekly for a couple days' work (Milne 2011)

E. Summer Use Hardened Surface Options

E3. Double-Lane Road

Opinion of Probable Costs

*Unit costs from Alaska Department of Transportation Bid tabs for similar projects in
Assumes suitable gravel and rock products can be produced near Serpentine, and
and place material.

From Taylor Creek To Boundary 8.0 Mi. (42,240 ft)

Item Description	Length (ft)	Area (Ft ²)	Vol cu yd	Unit Cost \$	Cost \$	Comments
Borrow unclassified-permafrost area	26420	190	185,919	40	7,436,741	5' Thick
Borrow unclassified-no permafrost	15820	64	37,499	40	1,499,970	2' Thick
Borrow pit Run	42240	37.5	58,667	54	3,168,000	18" Thick
E-1Aggregate Base Course	42240	11	16,427	67	1,100,587	6" Thick
Culverts	6750			150	1,012,500	Cross pipes @ 300 feet interval
Bridge					500,000	Includes guard rail & riprap
<i>Subtotal</i>					14,717,798	

Boundary to Serpentine Hot Springs 5.0 miles (26,400 ft)

Item Description	Length (ft)	Area (Ft ²)	Vol cu yd	Unit Cost \$	Cost \$	Comments
Borrow unclassified	26,400	190	185,778	40	7,431,111	5' Thick
Borrow pit Run	26,400	64	62,578	54	3,379,200	18" Thick
E-1 Aggregate Base Course	26,400	38	36,667	67	2,456,667	6" Thick
Small Bridges (3)					600,000	
Culverts	4,350			150	652,500	Cross pipes @ 300 feet interval
<i>Subtotal</i>					\$ 14,519,478	

General Costs

Item Description	Cost \$	Comments
Meals & Lodging	650,000	16-18 people May-Sept
Mobilization/Demobilization	750,000	
Construction Surveying	300,000	
Erosion Sediment Control (SWPPP)	250,000	
Total Estimated Construction Cost		\$ 31,187,276

Construction Cost Estimate Contingency 15%
Field Investigations 4,678,091
NEPA Compliance 200,000
NEPA Compliance 1,000,000
4,054,346
Total 41,119,713

Engineering, Permitting, Bid & Construction Administration Support 13%

E. Summer Use Hardened Trail Options

E3. Double-Lane Road

Opinion of Probable Costs

Annual Operations & Maintenance

Item Description	Cost per			Total Cost	Comments
	Miles	mile			
Annual fill	13	\$	6,000	\$ 78,000	ADOT&PF estimate \$5-7,000/mile for Nome contractor to drive up the road weekly for a couple days' work (Milne 2011)