3.11 COMPARISON OF ALTERNATIVE SITES

The planning team developed a site comparison matrix to help the community of Kivalina compare the strengths and weakness of the seven sites. The site comparison matrix is qualitative in nature and shows the relative strengths and weaknesses of each site. The 31 siting criteria that are being suggested for site comparison include physical environment factors, construction and utilities factors, social and access factors, and cost implications. These siting criteria are summarized in Section 1.5. These factors are included in a site comparison matrix shown in Appendix D. These factors have been presented to the community for initial consideration on the December 7, 2004 meeting, and were updated with their input from meetings on September 15, 2005 .

3.11.1 Criteria Values and Weighting

The planning team has assigned values to the siting criteria for each site. With the exception of estimated costs, it is not possible to assign a quantitative value to each criterion at this time. For each factor, under the four criteria factor, a qualitative value of 1 to 5 has been assigned. These values have been assigned given the relative strengths and weaknesses of each site; 5 as the highest value showing the greatest benefit/least risk and 1 having the least benefit greatest risk. A value of 3 is considered neutral.

Depending on the perspective of the public and agency stakeholder, not all criteria are of equal importance in selecting a relocation site. For example, subsistence access may not be as crucial to an agency responsible for public utilities as vulnerability to storm surges or erosion hazards. Local residents may feel that the impact of site location on everyday life, such as access to subsistence, cost of travel, and comfort with a site is equally as important as relocation costs.

In the case of some siting criteria, design measures and extra funding can mitigate potential concerns. Of the 31 siting criteria, 8 fall into this category:

- Soils and ice content,
- Sewage disposal availability
- Ease of water storage and distribution
- Solid waste disposal availability
- Gravel requirements to develop the site
- Site for an airport with a crosswind runway
- Site preparation costs
- Access road development costs

Six criteria have been identified as critical to site suitability, and may not be easily mitigated by design and funding. These criteria include:

- Storm surge vulnerability
- Shoreline erosion vulnerability
- Water supply source and quality
- Community expansion potential
- Land status
- Operation and maintenance costs

Finally, the importance of social and access factors to local residents should not be underestimated. Sites that result in higher transportation and utility costs can create economic hardships.

3.11.2 Siting Criteria

A summary of the 31 siting criteria are presented below:

3.11.2.1 Physical Environment

Storm Surge Vulnerability – whether the site is vulnerable to storm surge and flooding, based on the site location, site

elevation, and historic observations of flooding. This affects the safety of the site and site preparation/structural design costs.

River Flooding Vulnerability – whether the site is vulnerable to spring breakup and fall flooding, based on the site location, site elevation, and historic observations of flooding. This affects the safety of the site and site preparation/structural design costs.

Shoreline Erosion Vulnerability – whether the site is vulnerable to coastal or riverine erosion, based on the site location, site elevation, soil characteristics (fine grained, ice-rich), aerial photograph analysis, and historic observations of erosion. This affects the safety of the site and site preparation/structural design costs.

Site drainage and wetlands – whether the site has standing water when temperatures are above freezing, has particular drainage issues or problems, and whether the site has jurisdictional wetlands, based on aerial photograph analysis and historic observations of erosion. This affects the site preparation/structural design costs and permitting relocation.

Soils/Ice content – whether the site has soil characteristics such ice-rich, high organic, or water content, which affects the stability of the site given climate change. This affects the amount of gravel needed for site preparations and can affect the site preparation/ structural design costs.

Vulnerability to High Winds – whether the site has exposure to high winds, which can affect snow drifts around buildings and roads, and affect heating bills

Water Supply Source and Quality – location, quantity available, and quality of water supply. This affects the viability of a good town site, and costs involved in pumping, storing, and treating water.

3.11.2.2 Construction and Utilities Factors

Sewage Disposal Availability – whether the site has a pond or other suitable area for sewage disposal and treatment, and other factors such as soil and drainage conditions. This affects the site preparation/structural design costs, permitting, and health considerations

Ease of Water Storage and Distribution – whether site topography and soils lend themselves to water storage and distribution systems. This affects the site preparation/structural design costs.

Solid waste disposal availability – whether the site has a suitable area for landfill, and other factors such as soil, drainage conditions, and separation from an airport site. This affects the site preparation/structural design costs, permitting, wildlife nuisance, and health considerations

Gravel Requirements to Develop the Site – how much gravel the site requires for community development, including soil conditions and need to insulate permafrost, and elevation needs to get out of flood areas. This is one of the primary cost factors in site preparation/structural design costs.

Barge Access Distance to the Site – whether the site has good barge access for unloading construction material, fuel, and freight, and whether an access road to deep water along the coast is required**.** This affects site preparation costs and operation and maintenance costs for a community.

Site for an Airport with Crosswind Runway – whether the site has a suitable location for an airport with a crosswind runway, including orientation to prevailing winds and adequate separation from a community landfill. This affects overall site relocation costs.

Community Expansion Potential – whether the community has an adequate and suitable area for community growth and expansion. Lack of adequate space for community expansion may not solve many of the problems that the community is currently facing.

Ease of Maintaining Two sites during Construction/relocation – whether a site can be easy accessed during construction and for moving facilities between the existing and new town site. This affects relocation costs and schedule.

Permitting Obstacles – whether a site has issues affecting obtaining state and federal permits, including wetlands and sensitive fish and wildlife species. This affects relocation costs and schedule.

3.11.2.3 Social and Access Factors

Distance from Current Village Site – The distance between the community and a subsistence harvest site is both an economic and safety factor. An increase in distance increases fuel cost for ATV, snowmachine, and boat access. An increase in distance also increases travel time, which can be a safety issue in bad weather.

Access to the Ocean – Kivalina residents utilize the ocean for hunting marine mammals and access to traditional use areas. Proximity is a factor in people's comfort with a new town site, and has implications for fuel costs and safety

Access to the Wulik River – the Wulik River is an important area for subsistence fishing, access, and traditional camps. Proximity is a factor in people's comfort with a new town site, and has implications for fuel costs and safety.

Access to the Kivalina River – the Kivalina River is an important area for subsistence access, and traditional camps. Several families have Native Allotments and traditional camp sites along the Kivalina River, and use them for subsistence and cultural purposes.

Proximity is a factor in people's comfort with a new town site, and has implications for fuel costs and safety.

Access to Kivalina Lagoon – the Kivalina Lagoon provides protected boat access for subsistence activities. Proximity is a factor in people's comfort with a new town site.

Access to Subsistence Camps and Traditional Use Areas – whether a site has easy and safe access to subsistence camps and traditional use areas, and has implications for fuel costs and safety**.**

Location of Boat and Gear Storage – whether a site has nearby, adequate, and safe storage areas for boats and subsistence gear. Proximity is a factor in people's comfort with a new town site.

Potential for Ice Cellar Construction – Ice cellars have traditionally been used for food storage. The ability to use existing or construct new ice cellars is a factor in people's comfort with a new town site.

General Comfort with Site – whether the site is one where people would be comfortable living. A site where people are uncomfortable may not make a successful relocation site.

Land Status – whether the site has appropriate ownership availability of land for relocation. A site with native allotments of other potential encumbrances may complicate relocation and add to cost.

3.11.2.4 Cost Implications

Site Preparation – site preparation is potentially the highest cost associated with relocation. A site that requires a substantial amount of gravel may be extremely costly for relocation.

Access Road Development Costs – a site may need access roads to airports, boat access areas, landfills, and to a barge landing. The length of access roads required for a new community site are a factor in construction and O&M costs

O&M Costs – Operations and maintenance costs can affect the viability of a relocation site. Typical costs are associated with roads, utilities and public facilities.

Fuel Costs – Fuel costs can affect the viability of a relocation site. Higher fuel costs are associated with access roads, and increased power generation and space heating needs due to climate.

3.11.3 Preliminary Site Ranking

Of the seven alternative sites, Tatchim Isua receives the highest overall point value, and highest value in all four categories except for Physical Environment (primarily due to uncertainty regarding water supply). Imnakuk Bluff scores relatively high in second place, with resolution of land status being the primary outstanding issue. Simiq scores in the middle range, but there are many unknowns regarding the site, and the community has not previously considered it. The four southern sites, and particularly the two coastal sites (Kiniktuuraq and Existing) receive lower values primarily due to continued long-term vulnerability to flooding and erosion, construction and utility factors. However, these sites score much higher with regard to social and access factors.