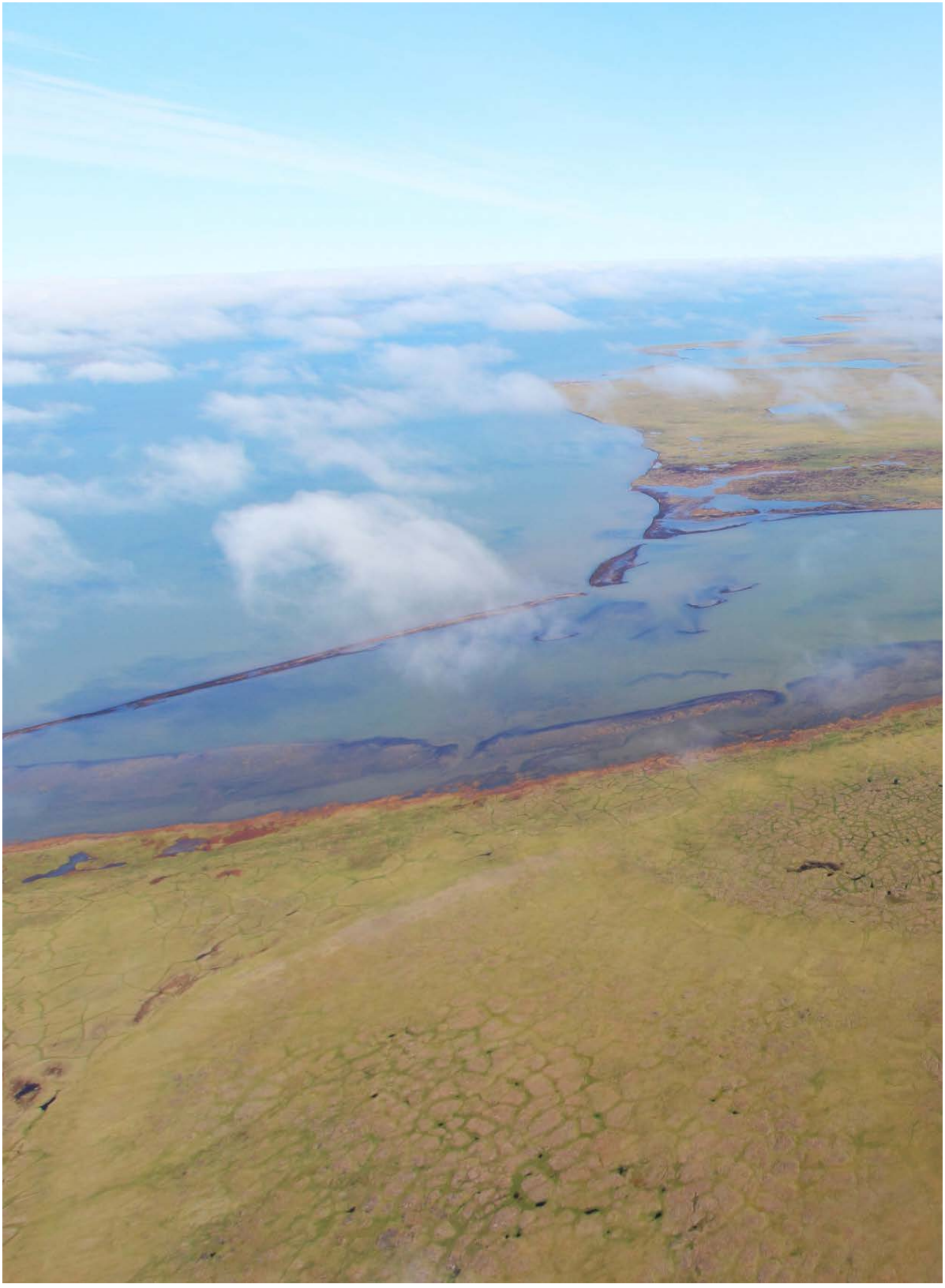

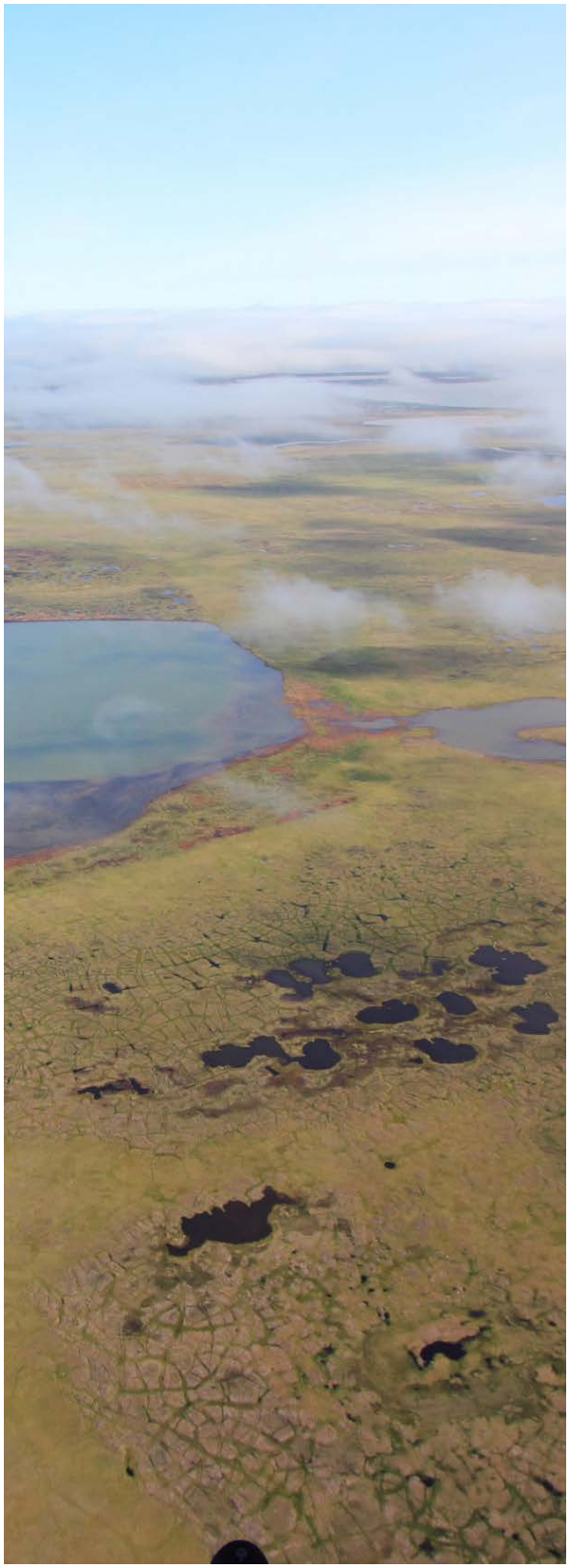

Chapter Seven
Public Facilities

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Chapter 7: Public Facilities

The North Slope Borough constructs and maintains much of the infrastructure within its boundaries, including water and wastewater systems, solid waste management, power generation and distribution, roads, airports, snow fences, heavy and light duty equipment, gravel resources, and communications.

The term "public facility" is inclusive of all capital assets the borough requires to provide essential services to its residents and businesses.

NSB Capital Program

The North Slope Borough owns and operates $4.2 billion in public facility assets. These assets are organized sections of a capital program that is funded for construction and upgrades separately from the borough's general fund for operations. The section titles and the value of assets in each section are detailed in Table 14.

Table 14: NSB Capital Program Asset Value and Section

Year	Asset Value	Section Description
06	$779,107,133	Education Facilities
07	$393,779,060	Roads, Streets & Watercourses
08	–	Public Housing
09	$1,291,910,366	Water Facilities
10	$450,787,250	Sewer Facilities
11	$92,125,390	Airports
13	$507,863,265	Power & Light Facilities
14	$122,415,100	Public Safety Facilities
15	$28,148,240	Sanitary Facilities
17	$3,720,080	Communications
18	$228,697,300	General Capital Facilities
19	$134,201,000	Health Facilities
20	$36,211,100	Library & Cultural Facilities
22	$114,175,600	Administration Facilities
Total	$4,183,140,884	

Capital needs are forecast through the use of a Repair and Replacement Schedule. The Repair and Replacement Schedule evaluates the estimated useful life of all capital infrastructure, facilities, and equipment compared against installation dates. The Repair and Replacement Schedule indicates that more than $200 million in capital assets are being operated beyond their estimated useful life. The 2018 evaluation also suggested that capital spending needs would average $87 million per year for the next six years. In the 2018 6-Year Capital Plan, estimated needs were tempered with these observations:

> *"The useful life of building components, infrastructure, and equipment assets are estimated. Some assets require replacement before the end of their estimated useful life, however the replacement of many assets can be deferred when upon inspection the borough chooses to operate them beyond their estimated useful life. These decisions are made on a case-by-case basis and upgrades are only deferred when they are due. Assets being operated beyond their estimated useful life in 2018 are valued at $200 million. It is reasonable then to assume that the borough will always operate some assets beyond their useful life, therefore a capital upgrade plan is proposed that allows some deferment. The proposed annual budget allows the replacement of all assets estimated to reach the end of their useful life within the next six years to be replaced within 10 years."*[157]

These observations have not diminished the need for planning, but is instead tempering an asset management philosophy to accept some conditions it cannot change. Based on this, a *Proposed Minimum Annual Capital Upgrade Budget of $52.6 million* was recommended in the 2018 6-Year Capital Plan. Time will tell if this recommendation is sustainable.

Capital needs are solicited in February each year from every municipal service operating entity, city, and Tribal organization. Requests for upgrades and new construction often exceed $300 million. Through a review process led by the NSB Planning & Community Services Department, non-discretionary obligations and discretionary needs are evaluated by a committee selected by the NSB Mayor to recommend an affordable Capital Ordinance for approval action by the Planning Commission and the Assembly. Upon approval by the Assembly, General Obligation Bonds are sold to finance the Capital Program with the approval of the voters. In 2018, a $75 million capital program was recommended and approved for funding; requests for funding totaled more than $400 million. Current capital spending levels are lower than the borough's estimated needs.

The borough is beginning to finance some capital projects with general funds. Currently, general fund expenditures on capital needs are less than 10 percent of the capital program each year due to changes in the tax cap formula.

The 2018 6-Year Capital Plan introduced forecasting for funding sources other than General Obligation bond proceeds. The plan estimated that "other funding sources" would supplement General Obligation bond sales by more than 20 percent within five years.

The 6-Year Capital Plan also included some observations and recommendations for the NSB Administration to consider:

[157] North Slope Borough. 2018. *6 Year Capital Plan 2018 – 2023.*

- Reductions in facilities and equipment should be considered to accommodate programmatic expansion in other areas.

- Expansion of facilities and programs requiring new capital infrastructure should be avoided if possible.

- The current capital budgets for equipment are not adequate.

- The borough maintains over 1,000 pieces of light and heavy duty equipment.

  During consideration of new equipment purchases, the disposal method and cost of replaced equipment should also be considered.

- A long-term strategy to reduce the total square footage of borough offices and programs may be a consolidated NSB administrative facility.

- Repair/replace existing infrastructure and facilities through 2030 does not appear affordable.

- Replacement projects and Project Analysis Reports (PAR) for replacement projects should include recommendations and budgets for the repurposing, disposing, or demolition of existing assets.

- To optimize the useful lives of building systems, design standards should be developed.

- Bond sales for the next six years should include approximately $52.6 million each year to repair/replace the borough's existing infrastructure.

- Any program expansion will further strain the reliance of current asset upgrades or replacements on the capital program.

The NSB Department of Public Works is dedicated to the daily operations of essential municipal services and maintenance of the borough's infrastructure, facilities, and equipment. The operation and maintenance of the NSB's public facilities are largely funded by taxable infrastructure throughout the NSB, such as pipelines, roads, gravel pads, natural resource development equipment, and related infrastructure.

A borough typically operates outside incorporated cities to provide public facilities and services. Without exception, incorporated cities within the North Slope Borough have relinquished those powers to the borough. Community-specific information on public facilities is detailed in each community's respective village comprehensive plan. The information contained in this chapter details the services provided by the NSB to the residents of the North Slope as well as the regional holistic approach that the NSB applies towards the provision of these vital services.

In addition to the utility services provided to residents, the borough also provides utility services in the Deadhorse and Prudhoe Bay region. A discussion of these services are contained in Chapter 8 on Service Area 10 (SA-10). Services provided in SA-10 are not subsidized by the NSB.

WATER AND WASTEWATER SYSTEMS

Water and wastewater systems throughout the NSB consist of many interdependent operations including the provision of reliable and safe water sources, treatment, storage, and delivery as well as wastewater collection, treatment, and disposal. The North Slope Borough owns, operates, and maintains water and wastewater treatment facilities in the communities of Anaktuvuk Pass, Atqasuk, Kaktovik, Nuiqsut, Point Hope, Point Lay, and Wainwright. In Utqiaġvik, the water and wastewater treatment systems are owned by the NSB and operated by the Barrow Utilities and Electric Cooperative, Inc. (BUECI).

Service Subsidies

Due to the enormity of capital investments and the cost of operations, North Slope residents pay a very small share of the costs of receiving safe water and the treatment of wastewater.

Capital investments for water and wastewater infrastructure exceed $600,000 per household. If these expenses were amortized over 40 years and billed to the customers as a typical utility company or cooperative does, residents would pay $1,400 per month. General fund expenses to operate water and wastewater infrastructure exceed $800 per household per month. Yet household utility service rates are $69 per month. In Utqiaġvik, the largest community, customers are also charged $.02 per gallon for usage over 3,000 gallons per month.

The financial benefit to residents is equally significant in other heavily subsidized utilities such as electricity, home heating fuel, natural gas, and automotive gasoline. If at some point residents are willing or capable of paying more for these services, then more general fund dollars would be available for job creation and other programs.

The design, construction, and operation of water and wastewater utility systems in the arctic is not without challenges. Quality of service is another challenge that will ultimately determine the success or failure of providing this service, measured in two ways:

1. Percentage of households who experience service interruptions each year (October through September period) compared to the number who do not experience service interruptions.

2. For each household that experiences a service interruption, what percentage experienced service interruptions of five days or more that year?

The goal for any utility is zero service interruptions, however two out of ten households (20 percent) experiencing service interruptions is deemed acceptable when determining overall system integrity. Any more should consider if imminent failure is possible and if more investment or system replacement is needed. The number of service interruption days is also important to consider if an individual service requires more investment or if replacement is needed. Table 15 provides detailed information on service interruptions by village.

Table 15: 2017-2018 Service Interruptions

Community	Annual Service Interruption Rate*	Interruption days more than 5**
Anaktuvuk Pass	10%	36%
Atqasuk	5%	25%
Kaktovik	18%	14%
Nuiqsut	17%	32%
Point Hope	35% / 10%[1]	22%
Point Lay	26%	67%
Utqiaġvik	3%	3%
Wainwright	51% / 27%[2]	25%

*An annual service interruption rate of 20% means that 2 out of 10 homes experienced service interruptions. It also means that 80% of the community did not experience any service interruptions.
**An interruption day s rating of 30% means that out of all the service interruptions, 30% experienced a service interruption of 5 days or more.
[1] These communities experienced major events which affected a large number of services for a short time. The major events skew the data, so the Service Interruption Rate is shown with and without those events. More detail on the events is provided in the following paragraphs.
[2] Many homes in Point Lay are going to tanked service. With those homes removed, the service interruption rate has dropped from previous years.

Point Hope's major event during 2017 – 2018 was a vacuum system failure in March 2018. Services were restored in one day. Since upgraded vacuum pumps have been installed, the vacuum system has been very reliable and the service interruption rate has dropped.

The service interruptions for 2017 – 2018 confirm that the water and wastewater system in Point Lay is not performing satisfactorily, even though there have been some improvement over the previous three years. Engineering studies have concluded that permafrost degradation has irreparably harmed the gravity sewer system; it is being abandoned in-place as waste holding tanks are installed and the community converts to a truck haul wastewater system. Wainwright service interruption rates have improved from 22 percent to 10.5 percent in 2017 - 2018 due to investments in mainline and lateral heat traces and service barrel upgrades. Increases to maintenance budgets are also reducing service interruption rates.

Wainwright's major event was a clogged sewer main caused by a large section of in-line heat trace which had come loose and blocked the main. Service was restored temporarily several times and the blockage was cleared within a week.

Planned repairs and maintenance activities which affect many services are not included in these rates. An example is a scheduled water main isolation to repair a leak. Residents are notified ahead of the short-term interruption. If such service interruptions were included in the rates, they would show that the infrastructure is in worse condition than it actually is.

Examining the rates on a quarterly basis shows that most interruptions happen during cold weather. Preventative maintenance efforts are

underway to make service better-insulated, heated, and air-tight. These efforts will reduce the overall number of service interruptions in the future.

Water Sources, Storage, and Operations

With the exception of Anaktuvuk Pass, which utilizes a well for its water supply, North Slope communities obtain water from nearby freshwater lakes. Anaktuvuk Pass and Utqiaġvik are able to treat water year-round while the remaining communities treat water seasonally because the freshwater sources are frozen during winter months.

Water treatment methods in the communities vary. Typically, a nanofiltration treatment process is utilized, with the raw water first pumped through a microfilter into an intermediate tank inside the facility, and then processed in stages through a nanofilter which removes molecular-sized contaminants. In some cases, water is further chemically treated prior to storage. Exceptions to this method are Anaktuvuk Pass, which treats well water with chlorine only, and Point Lay, which, in addition to a nanofiltration process, has a reverse osmosis treatment unit that can be relocated to other communities if needed. Point Lay processes Kokolik River water which can be tidally influenced and brackish late in the pumping season.

Anaktuvuk Pass and Utqiaġvik are able to produce potable water year round. The storage tanks must be sized to meet peak demand periods, firefighting needs, and occasional treatment plant downtime. All other communities must have treatment and storage capacity to make and store an adequate supply of potable water for community use to last through the winter and into the next treatment season. In addition to regular household and business use, there must be a sufficient supply of water for firefighting and to compensate for losses due to leaks and line breaks.

An alternative, year round water source would offer Point Hope, Point Lay, Atqasuk, Wainwright, Nuiqsut, and Kaktovik a stable and dependable water supply. Currently, the only alternative water sources that offer the potential for a year round water supply are deep water bodies that do not freeze during the winter or waterbodies with a high saline content. Even if wells could not be developed that meet peak system demands, a combination of well(s) and storage would provide a more stable and reliable system.[158]

While exploring the feasibility of alternative water sources, communities will continue to require major maintenance and upgrades to existing systems. These upgrades consist of: addressing short-term fresh water supply and storage issues; expanding distribution pipelines for homes not currently connected to the system; and converting homes back to truck haul service in locations where pipeline maintenance is no longer feasible. Additionally, updating water tank interior coatings and repairing pipeline leaks are critical to improving the overall system.

Operation, maintenance, and repair of the village systems are conducted by NSB employees or NSB representatives whose expertise is often utilized in multiple villages. However, the village

[158] North Slope Borough. 2018. *Project Analysis Report: Secondary Water Sources for Kaktovik, Point Hope, and Wainwright.* Prepared for the North Slope Borough by CH2MHill.

operating systems are not standardized, making repairs and personnel training more costly. Standardization of system equipment and controls would allow operators to be trained on one system to be utilized throughout the region. Standardization would also allow for parts and service inventories to be acquired in bulk, thereby reducing purchasing costs and repair times. With repair and maintenance training streamlined, service personnel could work on multiple systems without additional site specific training. This could increase local hire employment opportunities as well as save on the costs of importing trained service personnel from elsewhere in Alaska or U.S.

Standardized systems would also be better suited to centralized systems control. Centralized control could reduce costs and may also increase attention to system problems. The feasibility of a remote operation system or remote monitoring system coupled with onsite operation should be researched and vetted.

Water Delivery

In all NSB communities, a combination of underground (UG) piping and truck haul/storage tank systems are used to deliver potable water to end users. In Utqiaġvik, some water piping is also maintained in heated utilidors. These piped water systems typically consist of a closed loop pressure circulation distribution system with branches to service barrels at individual buildings. These distribution systems typically have fire hydrants interspersed through the service area. At the treatment plant, water temperature is maintained so that the looped distribution systems avoid freezing. Individual services also have built-in circulation systems to avoid freezing. The treatment facilities also provide water for truck haul to homes and businesses that are not connected to piped water systems. Water is stored in above-ground tanks (most often inside homes or businesses). Some homes still bail water for personal use from a large storage container; others, and businesses served by the water deliveries have individual pressurized plumbing systems.

In all communities, new subdivisions and newly constructed homes immediately adjacent to the water and sewer mains are connected to the system. The piped water and sewer system are not immediately expanded to provide service to residences that are not along an existing system. The NSB allocates its capital improvement program funds annually. Residents may wait many years to have their home connected to the piped water and sewer system. In lieu of underground connections, newer homes have holding tanks and truck haul service. Providing truck haul and holding tank service dramatically reduces the financial cost of the piped system.[159]

Wastewater Collection

In all NSB communities, wastewater (greywater and blackwater) is typically collected using a combination of below grade pipe, tank and truck haul, and honey bucket. In Utqiaġvik, some wastewater collection pipe is also maintained in utilidors. The piped wastewater systems are gravity, vacuum, forced main, or combinations of each, with branches to service barrels at individual buildings. The buried wastewater mains and service lines are heat traced to avoid freezing.

[159] North Slope Borough. 2012. *Areawide Subdivision Planning*.

Wastewater Treatment

Community wastewater systems are comprised of wastewater treatment plants (WWTP) to process waste delivered through the piped system as well as sewage lagoons to process truck haul and honey bucket waste.

Wastewater collected by the piped system is delivered to a wastewater treatment plant (WWTP), which typically utilizes sludge removal and an extended aeration process for primary treatment. Community systems vary for secondary treatment, using ultraviolet (UV), chemical, some other biologic method, or a combination of these. In some but not all communities, the WWTPs are equipped with an equalization (EQ) basin, which provides short-term storage of untreated waste to allow for more effective operation of the WWTPs during peak flow periods. Each of these systems is subject to a maximum treatment capacity, which differs in each community depending capacity of each plant's treatment volume. The NSB recognizes that in many communities, the WWTP capacities are not adequate to meet projected flows within the 20 year life of this plan, and is looking for funding streams and options to increase capacity and size to meet the projected population over the next several decades.

The use of sewage lagoons was the traditional method of safe septage disposal until the NSB transitioned to piped wastewater systems and WWTPs. They are still used for septage disposal by those not on the piped wastewater system. Exceptions to the use of sewage lagoons are Utqiaġvik, which receives and treats truck haul and honey bucket waste at the WWTP, and Point Lay, where renovations are underway so that it will be capable of receiving and treating truck haul and honey bucket waste.

For those homes and businesses served by truck haul or honey bucket, septage is collected and transported to sewage lagoons, typically located within each community's landfill area. Sewage lagoon design and discharge events are strictly regulated by the Alaska Department of Environmental Conservation (ADEC). The truck haul waste, which contains anaerobic[160] biological waste, is typically unloaded directly into a sewage lagoon provide biologic treatment prior to the NSB conducting controlled seasonal effluent discharge. The lagoons serve as a septage storage system during frozen conditions.

Sewage lagoons are a permitting and monitoring problem for the borough. Sewage lagoon operations can be extremely problematic as they are directly impacted by seasonal conditions, such as early freeze-up events, high snow years, and late thaw cycles. All of these conditions can increase the potential for uncontrolled discharges of sewage waters onto the tundra or nearby environment, potentially creating human/wildlife heath impacts. In contrast, WWTPs can provide year round treatment of wastewater, including truck haul and honey bucket, if they are properly engineered for this purpose.

Current status, recommended upgrades to the water supply, treatment, storage capacity, or delivery systems for all communities within the North Slope Borough are detailed in Appendix D, Table 40. More expansive information and

[160] Anaerobic bacterial action is when bacteria that do not live or grow when oxygen is present. Comparatively aerobic bacterial action requires oxygen to survive, grow and in the case of WWTP's break down other media

explanations of the information contained in this table are available within the individual communities' comprehensive plan.

Wastewater Upgrades and Improvements

WWTP Fixed Media

WWTPs are utilized in all NSB communities but are, in some of the North Slope communities, they are undersized for the current demand and are operating overcapacity. Upgrading or replacing WWTPs is expensive. The WWTP in Kaktovik is currently undergoing an upgrade that installs fixed media into the plant, with the anticipated outcome of increasing plant efficiency by 40 percent.[161] If this pilot upgrade project proves to be a cost effective alternative to a WWTP upgrade and expansion, it can be used in other WWTPs across the North Slope.

Interim Upgrades

Many of the village wastewater treatment systems have deferred maintenance on aging infrastructure. While exploring the feasibility of eliminating sewage lagoons and implementing fixed media upgrades, communities will continue to require major maintenance and upgrades to existing systems. Upgrades could also include converting homes back to truck haul service in locations where pipeline maintenance is no longer feasible and addressing pipeline leaks. Pipeline expansion to accommodate homes not currently on the system could also be considered, although this option is often cost prohibitive.

Periodic Inspections

Many village WWTPs have been operating without periodic NSB or ADEC treatment system inspections, potentially compromising operator safety and operational dependability and efficiency. Periodic inspections would proactively identify system issues that are able to be repaired through normal repair and maintenance. Without regular inspections, issues are more likely to go unnoticed, increasing the chances of a major system repair or total system failure that increase the potential for significant public health issues. While routine inspections carry an initial high cost for the borough, there is also potential for findings operational efficiencies, creating standardized operation and training procedures, and increasing maintenance actions that are low cost, in turn reducing overall operational costs.

Independent Utility Systems

In many villages, independent wastewater treatment systems are being installed in lieu of sewage holding tanks as part of a Cold Climate Housing Research Center initiative to promote off the grid design concepts. Effluent is discharged directly onto tundra. The effluent cannot percolate into the soil because of the permafrost, causing ponding on neighboring properties and environmental issues like odor, erosion, and permafrost degradation. In most cases, these systems have proven to be undesirable for North Slope communities. Due to these environmental concerns, operational requirements for these systems should be developed and incorporated into the borough's code of ordinances with requirements for meeting village operational and discharge standards. Systems that do not meet these standards should be prohibited.

[161] Robbins, David. 2017. WHPacific. *Letter to Brett Goodwin, North Slope Borough. Free-Moving Large Media IFAS – Recommendation for Kaktovik Wastewater Plant Upgrades*. October 16.

POWER GENERATION AND DELIVERY

The North Slope Borough owns and maintains power generation facilities in all of its communities except Utqiaġvik, where BUECI operates the power generation facility. Like water and wastewater system, the NSB highly subsidizes power generation, connections, operating costs. Power is managed through the Power and Light Fund. This fund includes the power-generating activities for the North Slope communities of Anaktuvuk Pass, Kaktovik, Nuiqsut, Point Hope, Point Lay, Wainwright, and Atqasuk.

During the 2017 calendar year, expenses to generate and distribute power in the seven North Slope villages were $26,839,423. Residents were charged $8,363,574. The borough also received an operating grant for $132,138. These figures demonstrate that the 2017 subsidy across seven villages was $18,363,574 – the amount that it cost the borough to provide power to residents above the amount received for the service.[162] The approximate 2017 power subsidy per village resident was $6,365. The exact amount depends on the cost of generation and providing service within each village; the cost of operating power plants and distributing power differs between communities. Table 16 provides an overview of eight years of expenses, revenues, and resident subsidies for power service.[163, 164]

Table 16: Power and Light Subsidies

Calendar Year	Expenses	Charges for Services	Total Subsidy	Approximate Per Resident Subsidy
2010	$20,228,358	$6,660,172	$13,568,186	$4,476
2011	$21,537,042	$6,303,426	$15,233,616	$5,026
2012	$25,914,894	$7,946,206	$17,968,688	$5,928
2013	$27,220,964	$8,702,015	$18,518,949	$6,110
2014	$27,650,153	$8,685,325	$18,964,828	$6,257
2015	$26,570,359	$8,467,243	$18,103,116	$6,281
2016	$27,456,216	$8,459,696	$18,996,520	$6,591
2017	$26,839,423	$8,363,574	$18,363,574	$6,365

[162] North Slope Borough. 2017. *North Slope Borough Comprehensive Annual Financial Report July 1, 2016 – June 30, 2017.* www.north-slope.org/assets/images/uploads/NSB_FY2017_Final_Issued_CAFR.pdf.
[163] For all years except 2017, the approximate subsidy does not include operating grants or contributions that may offset the cost to provide services.
[164] The per resident subsidy is calculated from adding the seven village populations from the 2010 NSB Census for the years 2010 through 2015 and the 2015 NSB Census for the years 2015 through 2017.

Power Plants

Within each community, electricity is produced using generators housed in power plants. Anaktuvuk Pass, Atqasuk, Kaktovik, Point Hope, Point Lay, and Wainwright produce power using diesel fired generators. Nuiqsut utilizes natural gas transported via the Nuiqsut Natural Gas Pipeline (NNGP) for primary power generation;[165, 166] diesel generation serves as back-up source of power. Utqiaġvik utilizes only natural gas from the Barrow Gas Fields southwest of the community.

NSB-owned power plants are configured with load-sensing switchgear and multiple generators so that electrical demand is met using the most efficient generator or combination of generators. Community power plants are routinely analyzed for efficiency improvements, such as matching generator sizing to demand, to increase operating efficiencies and lower operating costs. These types of improvements are considered a normal part of ongoing operation and maintenance. In some, but not all villages, waste heat from the generators is recovered and used to heat buildings or to maintain water temperature for the distribution loops.

After a set number of hours of operation on each generator, they are rotated for regular service. With continuous maintenance and recommended intermittent major overhauls, the generator life is expected to be well over 100,000 hours of operation, or approximately 11 years.

Distribution Systems

All NSB communities have overhead electric distributions systems. Utqiaġvik also has some electrical distribution lines within the utilidor system. Distribution systems in all communities except Utqiaġvik are appropriately sized to accommodate projected growth for the 20-year period in this plan, and overhead power is simply a maintenance and repair issue.

The current status and future needs or opportunities for the power distribution networks within NSB communities are detailed within the individual comprehensive plans. Table 43, provided in Appendix D, contains an overview of each community's power generation and delivery system as well as a summary of the pertinent details of the NSB power demands and forecasts.

Waste Heat Recovery Systems and Expansion

Several NSB communities are experiencing issues with overheating in power plants. There are projects are underway for expansion of cooling systems. Recovering waste heat and utilizing it for heating buildings and maintaining water temperature in delivery systems is a cost effective alternative to expanding power plant cooling systems. In some cases, existing waste heat recovery systems are not being used due to operational maintenance issues. Expanding waste heat recovery systems, and upgrading existing systems will provide economic benefit from both the offsetting effect of substituting heat recovery for other sources of energy and by reducing costs associated with expansion of cooling systems.

[165] The NNGP was designed to provide a maximum flowrate of 3,500,000 cu ft/day of natural gas from the Alpine Development Project (ADP) facilities to the village of Nuiqsut.
[166] North Slope Borough. 2014. *Nuiqsut Natural Gas Pipeline Annual Comprehensive Report*. February 26, 2014. http://dog.dnr.alaska.gov/Documents/SPCS/Publications/LesseeAnnualReports/2013/2013AnnualReport-Nuiqsut.pdf.

Public/Private Collaboration Potential for a Regional Power Center

As oil development pushes west of Prudhoe Bay, and if exploration resumes in the outer continental shelf of the Chukchi Sea, opportunities for partnering with industry and government to foster expansion of roads and infrastructure may arise. Several entities, both public and private, have conducted research into development of transportation and infrastructure corridors within the NSB. A result of any of these potential developments could be road access to communities. Interconnecting roadway development would potentially make the cost of energy interties more feasible.

Standardization of Utilities

The NSB owns and manages electric utilities in all communities except Utqiaġvik. Operation, maintenance, and repair of the village systems are conducted by NSB employees or NSB representatives whose training is often utilized in multiple villages. However, the villages' operating systems are not standardized, making repairs and personnel training more costly. Standardization of system equipment and controls would allow operators to be trained on one system and thus be utilized throughout the communities. Standardization would also allow for parts and service inventories to be acquired in bulk, thereby reducing purchasing costs and repair times. With repair and maintenance training streamlined, service personnel could work on multiple systems without additional site specific training. This could increase local hire employment opportunities as well as save on the costs of importing trained service personnel from elsewhere in the state or U.S.

Standardized systems would also be better suited to centralized systems control. While a centralized control could reduce costs, it could also potentially increase attention to system problems. The feasibility of a remote operation system or remote monitoring system coupled with onsite operation should be researched and vetted.

As-Build Underground Utilities around Power Plants

Upgrades to systems (power and waste heat recovery) in and around power plants often requires exposing and/or placing buried infrastructure. In many cases, underground utilities from and around power plants have not been as-built, leading to costs relating to damaged utilities from excavation, and costs that come from impacts to design and construction costs to allow for unknowns. As-built utilities should be included in future projects for both new construction and upgrades.

SOLID WASTE

The North Slope Borough owns and maintains solid waste landfill facilities in all of its communities. Like other public services, the NSB subsidizes solid waste disposal. Landfills are regulated under Alaska Administrative Code (ACC) 18.60.300, and all facets of operation (solid waste collection, burning, septage collection, etc.) require a permit. Each community has a Class III solid waste landfill, with the exception of Utqiaġvik, which has a Class II landfill. The NSB offers different sized dumpsters[167] to all entities free of charge as a way to promote good waste disposal practices

[167] Oily waste bin/dumpster (20 cubic yards with a liner), landfill bin/dumpster (27 cubic yards), haul all (bear proof) bin/dumpster (6 cubic yards with a lid).

and to help keep the community and surrounding tundra free of refuse and mitigate against any inadvertent health impacts (human or wildlife) through the improper disposal of solid waste.

For fiscal year (FY) 2018 – 2019, the NSB budgeted a total of $5,274,022 for sanitation services for all communities.[168] Residents are not charged for trash pick-up or disposal. The subsidy for providing these services is the total annual budget. The subsidy for this service is approximately $684 per North Slope resident.

The actual cost of providing solid waste services differs by village. The average cost and subsidy per resident is highest in Atqasuk at $1,436 annually. The lowest is Wainwright, at $628 per resident. Solid waste subsidies do not include the substantial cost of constructing and maintaining the landfill or the heavy equipment needed for picking up solid waste and delivering it to the landfill. These costs are bonded through the capital improvements program.

Table 17 provides the cost per village to provide solid waste services.

Table 17: Solid Waste Subsidies

Village	FY 2018-19 Budget	Charge for Service	Total Subsidy	Approximate Annual Per Resident Subsidy
Anaktuvuk Pass	$350,495	$0	$350,495	$892
Atqasuk	$356,138	$0	$356,138	$1,436
Kaktovik	$360,185	$0	$360,185	$1,375
Nuiqsut	$356,742	$0	$356,742	$795
Point Hope	$2,000	$0	$2,000	Not available
Point Lay	$270,633	$0	$270,633	$1,006
Utqiaġvik	$3,232,389	$0	$3,232,389	$670
Wainwright	$345,440	$0	$345,440	$628

Class II Landfills

In Utqiaġvik, the NSB operates a Class II Landfill approximately nine miles outside of town, as well as a thermal oxidation system (TOS) waste incinerator along Stevenson Street. The Utqiaġvik landfill is permitted to accept the following:

- Municipal solid waste;
- Non-radioactive materials;
- Inert wastes;
- Construction & Demolition (C&D) waste; and
- Ash and sludge.

The TOS waste incinerator facility allows incineration of municipal, domestic, and commercial waste prior to landfilling. This process provides for approximately 30 percent reduction in landfill requirements. In recent years, the TOS has been subject of large scale shutdowns and maintenance overhauls as a

[168] North Slope Borough. 2018. *North Slope Borough Annual Budget FY 2018 – 19.* www.north-slope.org/assets/images/uploads/Public_Works_Section_O_FY_18-19.pdf.

result of material disposal placed in dumpster bins that are not permitted to go through the TOS process.

Class III Landfills

A Class III Landfill accepts less than an annual average of five tons of municipal waste.[169] Each Class III Landfill is typically configured with one or more landfill cells for solid waste, cells and/or sewage lagoons for septage, a burn cage (for reducing landfill volume by burning appropriate materials prior to disposal in the landfill), and a storage area for equipment fluids and hazardous waste. Landfill areas are required to be surrounded by a security fence with locked access gates. Typically, the following municipal waste is permitted for disposal:

- Municipal solid waste;
- Inert or Construction & Demolition waste;
- Non-Regulated Asbestos Containing Material (non-RACM); and
- Honey bucket waste or septage.

Community landfills generally do not accept petroleum saturated soils. Those that do must be licensed Class II landfills with ADEC prior to waste placement. None of the village landfills are designed or permitted to accept hazardous waste. The NSB is required to haul large volumes of petroleum-based contaminated soils out of the North Slope Borough to licensed disposal facilities near Fairbanks, Alaska, or the Lower 48.

A general permit (GP) was recently granted by ADEC that allows NSB to permit all of the Class III village landfills under one general or master permit with standardized expiration dates, closure plans, and reporting procedures.

Solid Waste Upgrades and Improvements

Transloading System from Garbage Trucks to Burncages

The village landfill burncages are used sporadically because waste must be manually sorted and then placed in the cages. This practice can be labor intensive and can (when the proper Personal Protective Equipment (PPE) is not worn) expose the individual to unsanitary conditions. By unloading directly on to a transloading belt or other system, waste material is transported directly into the burncage, with sorting taking place during the transload. This would create a system that has the use of the burncage incorporated into offloading operations, and allows for a more time efficient/less labor intensive method. This process of effectively utilizing burncages would reduce waste volume and increase landfill life.

Fence Repairs

Security fencing around landfills is for public safety and is required by regulation. However, many of the landfills are unsecure due to damaged fencing. Fences should be repaired to prohibit access for public safety and for regulatory compliance. The fence repair work should be in conjunction with a snow fencing program so that further damage is mitigated.

Hazardous Material Disposal

Hazardous materials are not permitted in Class III landfills. Hazardous materials can be stored in-village for up to 180 days, and longer with preapproval. Proper disposal methods and locations are reviewed and approved by ADEC. Some hazardous materials can be disposed of in

[169] Alaska Administrative Code. *18.AAC. 60.300 Purpose, Scope, and Applicability: Classes of Landfills.* www.touchngo.com/lglcntr/akstats/aac/title18/chapter060/section300.htm.

Utqiaġvik's Class II landfill upon approval from ADEC.

Landfill Cover

Cover must be placed over new waste daily. The cover is typically gravel, however snow is used when available and when gravel is in short supply. Gravel is also required for construction and maintenance of landfill operational pads, landfill access, and for the thicker cap required for closure. In most villages, gravel supplies are insufficient to meet community needs and not available for landfill cover.

Snow Fences

The North Slope Borough maintains snow fences in all its communities except Nuiqsut. These fences provide barriers to prevailing winds to prevent drifting on or near roads, airports, and other community infrastructure.

There are some concerns about the tundra degradation caused by the accumulated snow on the downwind side of fences:[170]

- The weight of the snowdrifts compresses the vegetative tundra mat, reducing the insulation protecting the underlying permafrost.
- The snowdrifts do not melt away until mid-summer, reducing the growing season for the vegetative tundra mat within the area of the built up snow drifts. Large concentrations of snow melt can also occur in areas surrounding a snow fence, creating larger bodies of water during the summer that can impact nearby roads, runways or buildings.
- The snowdrifts insulate the permafrost during winter months such that the permafrost does not freeze as cold as adjacent soils.
- Surface permafrost slowly melts and subsides because of the lack of insulation, and depressions form in the tundra. Tundra ponds form in the depressions with poor drainage.
- The snowdrifts reroute melt water into focused drainages that accelerate ice wedge melting, thus deepening drainage channels.

Through careful review and placement evaluation, the NSB can ensure that snow fences are placed in locations and configurations that mitigate impacts. Portable fences that can be relocated to minimize snow accumulations can also be used as needed. Locating snow fences to keep roads landfill entrances clear will improve access. Placing snow fences to generally reduce drifting within the landfill areas will also reduce lagoon flooding and minimize the potential for leaching contaminates into groundwater and reduce fence damage.

Easements for Existing Snow Fences

Land fences should be placed in easements with access. New snow fence designs should include site control and access for the entire impact area.

[170] North Slope Borough. 2011. *Project Analysis Report: Areawide Snow Fence and Tundra Degradation*. Prepared for the North Slope Borough by UMIAQ. Feb. 9, 2011.

Damage from Existing Snow Fences

Operational measures such as cutting snow drifts with bulldozers prior to breakup will reduce the impact to the tundra. Other remediation measures such as placing fill and/or tundra mat in damaged areas have been shown to work.

GRAVEL

Gravel and a reliable gravel source is a necessity for all North Slope villages. All aspects of community life depend on gravel: road construction, gravel pads for homes and other buildings, airport runway maintenance, and landfill cover. Without dedicated gravel supplies or source, a community's ability to grow and expand to meet the needs of its residents is impacted.

The North Slope Borough attempts to maintain stockpiles of gravel in each community. Options for obtaining material, and the quality of material available, varies widely by community. Maintaining an adequate supply of usable gravel is often problematic and expensive.

In all communities, the preferred and most cost effective option for a gravel supply is to mine material from a local source. In some cases, local sources are relatively accessible and sustainable.[171] In the other communities where gravel has historically been mined from locally developed sites, access to gravel is becoming more and more problematic. Mining methods required to extract local material may have simply become too expensive to be feasible. Also, land use regulations have become more and more stringent to prevent environmental degradation. The increased regulatory burden has made material sites either unavailable or unfeasible. Additionally, exploration costs are becoming more and more prohibitive.

In the past, in communities with less accessible and sustainable sources, large-scale gravel extraction operations such as dredging were used to help mitigate mining and stockpiling costs by providing enough material to a community for 20 or more years of demand. The high costs were spread over time to justify the initial capital expenditure. However, these methods are often no longer economically feasible due to the extreme cost of mobilization, operation, and regulatory processes. The need for gravel in communities is so great that gravel utilizing from abandoned activities such as no longer used gravel pads is now considered a viable option. However, this increases the potential for reuse of previously contaminated gravels. Communities throughout the North Slope have various military and federal government infrastructure that is in varying degrees of abandonment. These locations can have vast amounts of gravel, but also have the potential for that gravel to be contaminated from historical spills. The NSB does not allow the use of contaminated gravels or material sources as building materials, significantly reducing the option of re-using already in place gravel supply. Every year, the NSB is being required to transport tons of gravel out of the communities due to contamination from large and small spills in every community. While small amounts are able to be reused for alternative activities such as landfill cover, or containerized contaminated gravel used for building landfill cell walls, the majority of the contaminated gravel and soil is backhauled to the Lower 48 or to approved

[171] North Slope Borough. 2014. *Project Analysis Report: Areawide Gravel Resources.* Prepared for the North Slope Borough by UMIAQ. Feb. 14, 2014.

disposal facilities near Fairbanks. The cost to the NSB is extremely high, as is the cost to haul clean replacement gravel into the community. The ongoing challenge for the NSB is for ways to reduce spills (large, small, drips and drops) from its operations and from residents, so that the amount of contaminated gravel that is in each community is reduced. One way in which to keep the valuable commodity in the communities is through a dirt burner which would enable gravel to be cleaned onsite and reusable to the community. While the startup costs of such an operation are high, a North Slope-based dirt burner would be the most cost effective manner to address petroleum contaminated gravel and soils over the long term.

The cost of developing gravel sites or transporting gravel to a community without a viable source is considerable. A 2014 NSB PAR estimated that transporting gravel from Utqiaġvik to Atqasuk via ice road cost between $450 and $600 per cubic yard. Exploration efforts are also costly. In contrast, the cubic yard cost of gravel in Kaktovik was between $19.00 and $42.50; $50.00 in Wainwright; and $4.00 in Anaktuvuk Pass.[172]

Village residents have often expressed the need to purchase gravel for private use - to shore up driveways, pilings, or other construction needs. Unfortunately, due to the limitations of capital funding through general obligation bonds, the borough is unable to make its gravel available for private use.

The NSB is engaging in partnerships with third party entities to oversee operations of existing gravel mines and/or known mineable gravel deposits within the Prudhoe Bay oil fields. Such mines as PUT 23, Mine Site 3, and Mine Site F afford or will afford the NSB the option of available gravel sources for short term overland gravel hauls. Mines are also within proximity to industry activities that can provide a source of direct income from gravel sales.

Generally, NSB communities need gravel sources that are more reliable and sustainable than what currently exist. Specific details and community needs and the status of gravel sources for each community are discussed in the individual community comprehensive plans.[173] Table 45 in Appendix D provides a summary NSB community gravel needs and availability.

Gravel Demand and Inventory

There is a need for singular management of the borough's gravel sources, inventories, and demand. As departmental responsibility for gravel sources and inventories (supply) differs from responsibility for usage (demand), there tends to be a lag between demand and supply, especially in locations where local material is not readily available. As a result, gravel exploration has tended to be in reaction to shortage, as opposed to being in anticipation of shortage. The planning window required to locate, fund, and mine material is a multi-year process that should begin well in advance of a shortage. By combining responsibility for supply with demand, there is potential for a more forward looking management of gravel resources.

[172] North Slope Borough. 2014. *Project Analysis Report: Areawide Gravel Resources.* Prepared for the North Slope Borough by UMIAQ. Feb. 14, 2014.
[173] North Slope Borough. 2014. *Wainwright Comprehensive Plan*. Prepared for the North Slope Borough by UMIAQ. www.north-slope.org/assets/images/uploads/2014_Wainwright_Comp_Plan_Final.pdf.

Regional Gravel Sources

In accordance with Title 19 of the NSBMC, which aims to consolidate and reduce habitat pockmarking when mining for gravel, the NSB Planning & Community Services Department has initiated a program to develop regional gravel sites. The purpose of the program is to minimize environmental impacts that are caused by creating multiple project-specific material sources, including mining in active river channels. The concept of regional gravel sources holds potential for minimizing the financial, environmental, and administrative impacts associated with ongoing exploration and development of local area sources. A regional site which is pre-permitted would have in-situ material available as needed, and could also have gravel materials stockpiled for immediate availability so that communities can access supply when cost effective opportunities arise.

Local and Regional Gravel Supply Partnerships

As oil development pushes west of Prudhoe Bay, and if exploration resumes in the outer continental shelf of the Chukchi Sea, opportunities may open up for partnering with industry and government to foster expansion of roads and infrastructure. Entities, both public and private, have conducted research into development of transportation and infrastructure corridors within NSB. A result of potential North Slope industry development could be regionalized material sources and/or road access to communities. Either of these could result in substantially lower costs for gravel source, and improved sustainability.

Gravel Alternatives

There are potential alternatives to gravel that would lower gravel demand and potentially lower overall costs of operation. For example, using polyethylene sheets to meet daily cap requirements at landfills would certainly reduce gravel consumption and may actually be more cost effective than a gravel cap. Also, the availability and cost of gravel should be incorporated into capital project designs with an evaluation of gravel alternatives.

COMMUNICATIONS

Telecommunication reliability and services throughout the North Slope can be challenging and are dependent on weather and environmental factors including wind and snow storms, sun spots, and sun flare activity, all of which have the capacity to interrupt satellite signals and reception needed for communication throughout the North Slope.

Telecommunications facilities serving the North Slope include a fully digital local exchange telephone service, local dial-up internet, cellular telephone, cable television, public radio broadcast, and teleconferencing centers. Interconnection with the regional and global telecommunications network is via satellite circuits. The Arctic Slope Telephone Association Cooperative (ASTAC) provides in-state and long-distance telephone service to residents throughout the North Slope Borough. AT&T Alascom, Alaska Cellular Service (ACS), and GCI (General Communication, Inc.) provide long-distance telephone service. The Alaska Teleconferencing Network provides NSB and City of Utqiaġvik teleconferencing services to the villages, thereby facilitating greater real-time interaction between NSB offices in Utqiaġvik and area communities, while providing cost savings on travel needed over the course of business activities.

In February 2018, Quintillion announced that its subsea fiber optic cable system was in service in five northern Alaska communities: Prudhoe Bay/Oliktok Point, Utqiaġvik, Wainwright, Point Hope, Kotzebue, and Nome. ASTAC has also recently upgraded its internet services and capacity in Point Hope, Wainwright, Utqiaġvik, and Nuiqsut to fiber optic cable, the fastest internet medium that exists today. In addition to their subsea fiber optic cable system, Quintillion completed installation of their new terrestrial fiber optic system between Fairbanks and Prudhoe Bay, thereby providing a fiber optic connection for the first time for some North Slope communities. Future fiber optic plans for the North Slope include connections to Asia and to Western Europe via the Northwest Passage. The North Slope Borough is also closely following the development of satellite-based broadband internet providers such as OneWeb and SpaceX that are competing to be the first in providing seamlessly integrated global data at fiber optic comparable speeds, through a constellation of micro-satellites that may provide improved connectivity.

Although existing communications systems in the NSB appear to be adequate to meet emergency communication needs, telephone, cellular telephone, and internet systems are substandard when compared to communities in southcentral Alaska and beyond.

Terrestrial High-Speed Fiber Optic Networks to Inland Communities

Quintillion connected the coastal communities of Point Hope, Wainwright and Utqiaġvik to the fiber optic network available at Prudhoe Bay. Opportunities for funding to connect additional North Slope communities to high-speed fiber optic internet. Such funding opportunities and guidance may exist through the Statewide Broadband Task Force or the Alaska Department of Commerce, Community and Economic Development (DCCED).

Improved Communications Systems

There are continuous advancements in providing inexpensive and stable high-speed connectivity. The feasibility of implementing new technologies to improve connectivity on the North Slope should be a priority.

ROADS AND AIRPORTS

These very important public facility capital assets are detailed in the transportation chapter of the Comprehensive Plan.

SUBDIVISION DEVELOPMENT

In 2012, the NSB compiled the costs to extend connections to vacant residential parcels and expand roads and services to platted subdivisions in each community. This evaluation documented the costs associated with road construction, utility installation, water/sewer connections, and gas and electric connections costs along with anticipated gravel needs. This information is vital to informed decisionmaking when expanding public services. Through this evaluation, the NSB determined that to extend roads into already platted subdivisions and provide service connections for water, sewer, gas, and electricity cost an average of $491,923 per lot in 2012. Adding an escalation cost of 2 percent per year since 2012 results in a 2018 average cost of providing road access, water, sewer, electricity, and natural gas to vacant parcels and platted subdivisions in North Slope communities' costs approximately $553,985 per

lot. Overall, extending roads and installing underground water and sewer systems are the largest costs associated with developing subdivisions on the North Slope.

The cost to extend infrastructure varies by community; the most expensive per lot cost in 2012 was Point Lay at $820,891 per lot and the least expensive was Kaktovik at $317,203 per lot. There are several reasons for the variations in cost by community. Some communities already have extended roads to new subdivision(s) and the cost to extend some residential roads and utilities is the only consideration in this study, such as in Kaktovik. The number of platted lots available for expansion in some communities is low; therefore the total cost of extending roads and other utilities is averaged over only a few lots which increases the per lot cost, such as the case for Point Lay.[174] Other communities, like Utqiaġvik, have many platted lots to average the potential cost of infrastructure expansion. Other communities, like Atqasuk, have a shortage of gravel that must be considered when calculating the costs to extend services. Table 18 provides an overview of the cost for subdivision development in each North Slope community.

Local residents and businesses are charged the same fee for services as non-residents. For example, contractors, working on behalf of NSB, state or federal agencies, or private interests are authorized to dispose of contaminated materials in community landfills that are owned and operated by the North Slope Borough. A potential source to offset the high costs for the NSB to provide services is through a resident/non-resident and/or usage fee schedule.

Table 18: 2012 NSB Subdivision Development Costs by Community

Community	No. of Lots	Street Front (mi.)	Road & Utility Infrastructure (per lot)	Water / Sewer Service (per lot)	Natural Gas Service (per lot)	Electric Service (per lot)	Subtotal Cost (per lot)
Anaktuvuk Pass	40	0.86	$521,248	$108,000	–	$2,100	$631,348
Atqasuk	63	1.21	$275,967	$108,000	–	$2,100	$386,067
Kaktovik	129	1.75	$207,103	$108,000	–	$2,100	$317,203
Nuiqsut	174	2.81	$449,033	$108,000	$5,000	$2,100	$339,617
Point Lay	4	0.15	$710,791	$108,000	–	$2,100	$820,891
Point Hope	24	0.61	$384,818	$108,000	–	$2,100	$494,918
Utqiaġvik	640	7.87	$249,699	$108,000	$5,000	$2,100	$364,799
Wainwright	14	0.36	$470,442	$108,000	–	$2,100	$580,542

[174] North Slope Borough. 2012. *Areawide Subdivision Planning*.

COMMUNITY INPUT, FINDINGS, NEEDS, AND CHALLENGES

Residents rely heavily on public services provided the North Slope Borough. There are not competing organizations to provide service to residents if the borough was unable to provide it. The borough also highly subsidies many of the services provided to residents, including water and wastewater service, energy, and solid waste disposal. In addition to subsidizing services, the borough also finances the cost of construction, upgrades, renovations, and maintenance of all public facilities.

Public facility issues and concerns identified by workshop participants are provided in Chapter 2 and listed below:

- Dependence on fossil fuels and logistics of fuel delivery
- Too much reliance on borough services
- Lack of redundancy
- Aging infrastructure
- Aging health infrastructure
- Abandoned infrastructure
- Deferred maintenance
- Shortfall in capital funding
- Bond expense eligibility / bond rating and capacity; tax vs debt capacity
- Revenue is not keeping up with cost of capital maintenance or replacement
- Lack of renewable / alternative energy sources
- Lack of standardization in current construction and in technology
- Lack of current technology and technology standardization in infrastructure
- Infrastructure is sometimes over capacity and needs to expand but there is a lack of funding
- The existing access to piped water and sewer system is not being fully utilized
- Engineering difficulties due to climate change, the inability to adapt in a timely manner, and insufficient funding
- Continued change in maintenance software programs; consistency is needed
- Lack of search and rescue facility space in villages
- Need for a regional power plant
- It is expensive to construct roads to lots and connect homes to services
- Building design standards for the Arctic are yet to be implemented and enforced
- Utilize existing vacant or underutilized lots that already have road access and proximity to piped water/sewer
- Coastal erosion
- Distance between villages and communication system
- Many [education] buildings and other infrastructure need to be updated and renovated due to their age

Findings
NSB owns and operates $4.2 billion in public facility assets.
The cost to provide services across the North Slope is substantial and the cost to residents is highly subsidized.
Much of utility and road expansions are cost restrictive / prohibitive.
There is a need to develop alternative/secondary water sources
There is a lack of utility standardization.
Independent utility systems are problematic and should be restricted until regulations are developed
Upgrades and deferred maintenance needs to be addressed systemwide.
Wastewater treatment plans must have regular system inspections.

Needs & Challenges
Maintaining borough assets is a priority and capital expansion should be limited.
The borough highly subsidizes services for its residents.
Implementing a system of standardized equipment and controls and a centralized system control could be beneficial.
Streamlined training for personnel operating and maintaining public infrastructure.
Water and wastewater system expansions to connect additional homes are needed.
Subsidence has greatly affected the integrity of the underground water and sewer systems.
WWTP capacities are not always sufficient and may need expansion depending on the success the mixed media pilot project in Kaktovik.
Potentially abandon failing piped systems and return to truck haul service where appropriate.

PRIMARY PUBLIC FACILITIES GOALS

Goal Seven: Provide essential public infrastructure and services.

Objective 1: Seek program improvements to better maintain infrastructure and consolidate and share services.

7.1.1. Implement a program for consistency and standardization of utilities in general, and utility technology, construction, and maintence software programs specifically, for easier maintenance and upgrades.

7.1.2. Focus oversight of gravel inventories and demand within NSB to a single department or division to better coordinate inventories and needs.

7.1.3. Investigate consolidating facilities that provide similar or the same operations or services, such as NSB and NSBSD maintenance and operations facilities and general office space.

7.1.4. Facilitate shared use of village facilities to benefit all village residents, such as community use of school swimming pools and other recreational space.

7.1.5. Avoid expanding the borough's services and infrastructure until deferred capital maintenance and replacement needs are met.

7.1.6. Regularly update and maintain the NSB Repair and Replacement Schedule to better understand and plan for maintenance and replacement needs.

7.1.7. Seek innovative ways to coordinate or consolidate infrastructure, such as constructing one ice road and accessing a toll for industry use.

7.1.8. Research potential ramifications of climate change on the region's infrastructure and plan accordingly.

7.1.9. Emphasize compactness in community development during project planning to minimize operations, maintenance, and expansion costs of community infrastructure.

7.1.10. Prohibit independent utility systems and connections to municipal utility systems until guidelines are in place for local service area development.

7.1.11. Develop a program to confirm easements in place for existing snow fences and other public infrastructure.

7.1.12. Evaluate alternative options to gravel to aid in fulfill community gravel needs.

Objective 2: Address current critical infrastructure needs and plan for future needs.

7.2.1. Develop alternative/secondary water sources to ensure continued availability.

7.2.2. Proactively maintain roads that provide access to critical infrastructure, such as the landfill, water source, or natural gas facilities.

7.2.3. Proactively protect critical infrastructure from unforeseen events, such as flooding and storm events.

7.2.4. Renovate or demolish NSB-owned facilities and infrastructure that are beyond their useful life and coordinate with other agencies to renovate or remove dilapidated infrastructure where needed.

7.2.5. Seek equity in village infrastructure and facilities.

7.2.6. Invest in heavy equipment repairs and replacement and transport replaced equipment out of villages.

7.2.7. Assist local efforts to secure search and rescue facility space in the villages.

7.2.8. Investigate alternative technologies for supplying improved communications systems.

7.2.9. Enhance current communications networks within villages to maximize improved subsea fiber optic connections.

7.2.10. Seek funding for development of terrestrial high-speed fiber optic networks to inland communities.

7.2.11. Coordinate with educational institutions on technology needs.

Goal Eleven: Increase education and employment opportunities for all residents.

Objective 3: Evaluate future capital needs to meet educational demand.

11.3.1. Assist Iḷisaġvik College in seeking funding to construct a new facility in Utqiaġvik to better meet their needs.

11.3.2. Assess village educational space equity and future needs and plan accordingly.

11.3.3. Improve Native language fluency through partial or full immersion programs from pre-kindergarten through high school.

11.3.4. Seek funding and opportunities to assist fluent Iñupiaq speakers to become certified teachers.

11.3.5. Encourage the North Slope Borough School District and educators to further incorporate traditional and cultural values throughout the school curricula.

11.3.6. Integrate Elders into school activities through shared lunches, invitations to speak with classes, and involvement in student projects.

11.3.7. Teach traditional values to new generations by highlighting local success stories and how traditional and cultural values assisted in their success.

Goal Thirteen: Ensure government efficiency and accountability.

Objective 1: Revaluate state and federal obligations in community health, social services, and security.

13.1.1. Keep up with advancement of technology.

13.1.2. Pursue funding from Bureau of Indian Affairs, State of Alaska, Denali Commission, Housing and Urban Development, and federal transportation funds for housing and transportation needs.

13.1.3. Continue effective hazard planning to protect the North Slope community and subsistence resources from natural disasters.

Objective 2: Rediscover our founders' intent as a home rule borough.

13.2.1. Measure government performance and make information available to the public.

13.2.2. Focus on consistent and effective enforcement of borough laws and regulations.

13.2.3. Review options to ensure that local resources are deployed in the most cost effective manner to help achieve the community's vision and goals for the future.