Draft Final Preliminary Engineering Report
Water Treatment Plant and Washeteria Facility
Tununak, Alaska

Prepared for:

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And

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December 26, 2017

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Abbreviations and Acronyms

ADEC	Alaska Department of Environmental Conservation
ANTHC	Alaska Native Tribal Health Consortium
AVCP	Association of Village Council Presidents
BGS	Below the Ground Surface
BIA	Bureau of Indian Affairs
GPCD	Gallons per Capita per Day
GPM	Gallons per Minute
LKSD	Lower Kuskokwim School District
MPH	Miles per Hour
NPV	Net present value
O&M	Operations and Maintenance
PER	Preliminary Engineering Report
PSF	Pounds per Square Foot
SWTR	Surface Water Treatment Rule
SHPO	State Historic Preservation Officer
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDA-RD	U.S. Department of Agriculture-Rural Development
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USPHS	U.S. Department of Health, Education & Welfare, Public Health Service
USPW	Uniform Series Present Worth
VSW	Village Safe Water
WST	Water Storage Tank
WTP	Water Treatment Plant
YKHC	Yukon-Kuskokwim Health Corporation

Cover page photo of Tununak Washeteria and Water Treatment Plant in 2010

SUMMARY

The Native Village of Tununak a.k.a. Tununak IRA Council (herein referred to as Tununak), in cooperation with the Alaska Department of Environmental Conservation (ADEC) Village Safe Water (VSW) has retained Stantec Consulting Service, Inc. (Stantec) to prepare this Preliminary Engineering Report (PER) with funding from the United States Department of Agriculture Rural Development (USDA-RD). The purpose of this PER is to identify, evaluate and recommend a washeteria and water treatment plant (WTP) that will best serve the community with a safe, reliable, and affordable laundry facility and potable water for hygiene use and drinking water for many years. Tununak would like to eventually have adequate sanitation in their homes. This PER has been prepared in accordance with USDA-RD Rural Utilities Services Bulletin 1780-2, dated April 4, 2013.

The preparation of this PER was based on review and use of existing documents and reports that are referenced herein. Stantec did not have an opportunity to conduct a site visit to confirm existing conditions of the washeteria and water treatment plant (WTP); however, Stantec and VSW did conduct several teleconferences with administrative representatives from Tununak and obtained current information on the operation of their existing washeteria/WTP. In addition, the community provided Stantec and VSW several photographs (see Appendix E) of the current conditions inside the existing washeteria.

At the present time, Tununak is served by a 40-year old washeteria/WTP that was constructed as a combined facility in one building by the U.S. Department of Health, Education & Welfare, Public Health Service (US PHS). This aged facility has experienced significant degradation and is in serious need for replacement and/or upgrade. The washeteria is marginally functional with limited laundry equipment and has no bathrooms. The water treatment plant needs to be replaced with a new treatment system that can produce finished water that meets the U.S. Environmental Protection Agency (USEPA) Surface Water Treatment Rule (SWTR), including filtration monitoring and reporting requirements for turbidity. Consequently, Tununak has been on long term “Boil Water” notice that was issued several years ago by the ADEC.

In addition, Stantec prepared Appendix F to provide a summary of auxiliary sanitary facility improvements associated with the washeteria/WTP. The VSW requested Stantec to prepare Appendix F to serve as a supplemental part of this PER. The auxiliary improvements presented in Appendix F were not included in the original scope of work for this PER. It is noted the auxiliary sanitary facilities should be addressed in the future as funding becomes available. These future sanitary improvements include the following topics: water supply source (currently consisting of a shallow infiltration gallery (well) in Unnamed Creek); upgrade of existing water treatment process; and adequacy of the existing wastewater disposal system (consisting of an off-site community septic tank and drainfield system).

In summary, the recommended alternative for Tununak is Alternative 3 – Modular Combined Washeteria and Water Treatment Plant. Alternative 3 will provide a reliable and affordable sanitation facility for Tununak. All cost estimates in this document are based on 2017 dollars.

1.0 PROJECT PLANNING

1.1 LOCATION

Tununak is located in western Alaska on the northwest coast of Nelson Island along the Bering Sea coast. The village is about 519 miles west of Anchorage and approximately 115 miles northwest of Bethel.

The community of Tununak is comprised of two residential areas: the “old” (original Townsite) part of the community is located on a narrow spit of land between the Tununak River and Tununak Bay (Bering Sea), and the “new” developed community area is located on higher ground on the east side of Tununak encompassing the 23 homes in the Association of Village Council Presidents (AVCP) subdivision. The “new” area of Tununak includes the Yukon-Kuskokwim Health Corporation (YKHC) health clinic, Lower Kuskokwim School District (LKSD) Paul Albert High School and the existing washeteria/WTP. The “new” area is located on the North Fork of the Tununak River at the base (foothills) of the Ugchirnak Mountains.

Figure 1 on the following page shows the Vicinity and Location Map for Tununak.

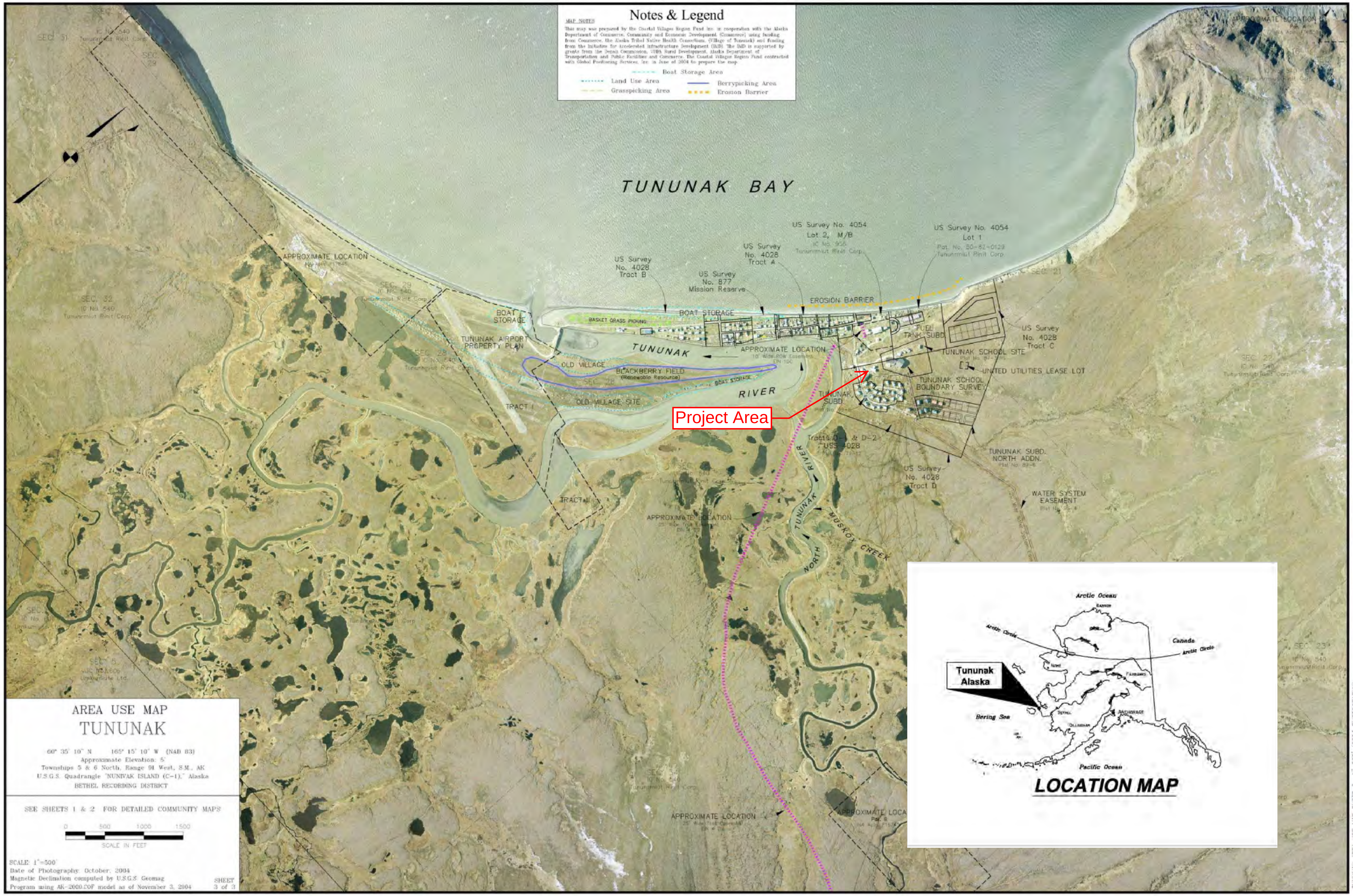

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Figure 1
Vicinity and Location (Inset)
Source: ADCRA Mapping

1.2 ENVIRONMENTAL RESOURCES PRESENT

1.2.1 Topography

The area surrounding Tununak is dominated by the Tununak Bay (Bering Sea) to the west, Tununak River to the south and Ugchirnak Mountain to the east. The washeteria/WTP are located on higher ground, approximately 30 feet above mean sea level, in the eastern portion of the community, overlooking the “old” village located on the sandspit a few feet above the sea level. The site is located on the edge of a ridge formed by the lower reaches of the Ugchirnak Mountain. Local topography surrounding the washeteria/WTP project area is relatively flat. The ground surface gently slopes upwards northeast towards the Lower Kuskokwim School District (LKSD) Paul Albert High School which is located approximately 140-feet north of the existing washeteria/WTP.

1.2.2 Geology and Soils

Soils in the Tununak area are underlain by discontinuous permafrost. Conditions vary considerably from the toe of the Ugchirnak Mountain foothills to the Tununak River. There is very high ice content in organic soils blanketing the area, and are susceptible to thaw-induced instability.[1]

In 1978, the US PHS completed a geotechnical investigation for the design of the existing washeteria/WTP. The US PHS noted the following subsurface soil conditions: silty sand and cobbles found from 1 to 2 feet below the ground surface (BGS); slightly silty sand and gravel found from 2 to 3 feet BGS; slightly silty sand from 3.1 to 4.3 feet BGS; bedrock was encountered in one of the test holes at a depth of 4.3 feet BGS while the other test holes did not encounter bedrock to a depth of 7 feet BGS. All of the soil test borings encountered frozen soil with evidence of ice in the entire soil strata which was indicative of permafrost since the extent of the frozen soil exceeded the depth of the annual seasonal frost.

In 1979, a geotechnical investigation was completed on LKSD’s proposed site for the Paul Albert High School. Three soil borings were drilled across the site. Ground water was not encountered in any of the soil borings to a maximum depth of 19.5 feet. The subsurface soils primarily consisted of ice rich silty gravel extending to a depth of 13 to 16.5 feet and was underlain with fractured bedrock.

In 1993, a sanitation feasibility study was completed for Tununak. The study described the general soil characteristics in the project area as consisting of mostly peat, silts, and clays, with

[1] CRW, *Tununak Piped Water and Sewer Assessment*, 4/27/2016

permafrost occurring between 2 and 7 feet below the surface.[2] The feasibility study noted a shallow ground water table was encountered within the active soil layer above the permafrost in the low lying areas located outside of the washeteria/WTP project area.

Prior to preparing the design of a foundation system for the selected proposed building(s), it is recommended test holes be completed in the proposed building footprint to confirm subsurface soil conditions.

1.2.3 Floodplains

No Flood Insurance Studies or Flood Insurance Rate Maps exist for Tununak. Longtime residents have reported flooding only occurs in the main village due to storm-driven waves in combination with high tides to a maximum height of approximately 6 inches.[3] The project area for the washeteria/WTP is approximately 400 feet away from the north fork of the Tununak River, and is located on higher ground that is approximately 20 to 25 feet above the river. According to local residents the project area has not been susceptible to flooding in the past. The U.S. Army Corps of Engineers (USACE) rates the flood hazard at Tununak as low average. [4]

1.2.4 Water Quality

The water source for the existing washeteria/WTP uses a shallow infiltration gallery (referrec locally as a well) that was installed in 1978 by the US PHS in Unnamed Creek. The well consists of a 9-foot deep, 24-inch diameter perforated steel culvert pipe, constructed in the middle of the creek. The well is located inside a small well house that is located approximately 900 feet east and downhill of the existing washeteria/WTP (Figure 2).

Some of the residents have expressed concern about the purity of the WTP's treated water from Unnamed Creek because of the well's close proximity to existing homes and dog yards. Future efforts to educate the residents about the operation of a properly functioning water treatment system may alleviate their concerns.

Due to inadequate and inconsistent treatment operation/performance of the existing WTP's disinfection system, the ADEC issued the community multiple "Boil Water" notices over the past several years.

1.2.5 Wetlands

Tununak is not in the U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory. Based on available aerial and ground photography provided by community members in 2009, the

[2] Phukan Consulting Engineers and Associates Inc, *Sanitation Feasibility Study and Environmental Review*,1993
[3] Phukan, 1993
[4] Alaskan Community Flood Hazard Pertinent Data, 1977

ground surrounding the existing washeteria/WTP appears to be disturbed. Evidence of saturated soil, hydrophytic vegetation, and hydrology are not visible. In lower areas outside and further west of the washeteria project area, vegetation appears to grow on tussocks. Snow machine tracks have left scars in undisturbed tundra, showing evidence of darker, possibly wet soils underneath. It is likely wetlands occur within undisturbed tundra outside the project area, but that areas immediately adjacent to the existing washeteria/WTP are highly disturbed, and appear to be better drained. The USACE will be consulted should any proposed activities occur outside of previously disturbed lands adjacent to existing structures within the project area.

1.2.6 Groundwater

The only groundwater source in the community is the U.S. Bureau of Indian Affair's (BIA) well, which was drilled to an approximate depth of 38 feet BGS by BIA Schools in 1964. The log for the well indicates that the unconfined groundwater is normally 10 feet below ground surface.[5] The ground surface at the BIA well is approximately 15 to 20 feet below the ground surface at the washeteria/WTP. This well was determined to be under the influence of surface water, and therefore, considered not to be a groundwater well.

The LKSD owns and operates the BIA well and associated water treatment plant which was recently upgraded. For many years the school district has provided a public watering point at their well house which is currently used by the community for their primary drinking water source. Users of the BIA well water haul water to their residences.

Shallow groundwater in the subsurface soil beneath the general area of the existing washeteria/WTP was not encountered in the soil test borings drilled in 1978 by the US PHS. Also, groundwater was not observed in in the 1993 exploratory test holes excavated by others in the washeteria/WTP project area.[6]

1.2.7 Endangered Species and Critical Habitats

The community of Tununak and the project area are within the potential breeding range of the Spectacled Eider; however, no critical habitat for this species has been designated in the area.[7] Consultation with the USFWS will take place to determine construction measures that may be implemented, if any, to avoid accidental takes of Eiders. Given the project area is surrounded by development and is actively used by the community on a daily basis, it is not likely Spectacled Eiders would use the area for nesting.

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[5] MWH, *Report on Site Conditions and Recommended Plan of Action*, 2010

[6] Phukan, 1993

[7] USFWS IPaC Information for Planning Conservation website https://ecos.fws.gov/ipac/

1.2.8 Cultural Resources

There is little available information regarding potential cultural and historic resources present within or adjacent to the proposed project area, that includes the property immediately surrounding the existing washeteria/WTP. While no visible surface resources were reported during a cultural resource survey conducted in 2000 immediately north of the proposed project area (resource confidential), there is no record of any subsurface investigations having been completed in the project area. Depending on level of disturbance proposed for foundations and utility installations, a cultural resource survey may be required prior to construction. The Alaska Department of Natural Resource Office of History and Archaeology will be consulted to determine measures to avoid impacts to cultural resources from construction of the preferred alternative.

1.3 GROWTH AREAS AND POPULATION TRENDS

1.3.1 Population Forecast

In 2010 Tununak's population was reported at 327. The population has steadily increased to a population of 387[8] as noted in the most recent estimate from the Alaska Department of Labor. This equates to a population growth rate of 2.4% per year.

Tununak's population fluctuated between 0 and 0.9% annual growth over the past several decades[9], with a notably increased growth rate since 2010. While the future growth rate for Tununak is challenging to forecast, it is reasonable to use the general Bethel Census Area population projections. Tununak currently comprises 2.1% of the Bethel Census Area population. The Bethel Census Area is currently projected to maintain a 0.9% growth rate until at least 2040. Using linear extrapolation of the State's population projections, the population of Tununak in the design year 2037 is estimated at 466 people. Population information and calculations are presented in Appendix C.

1.3.2 Growth Areas

Community growth will be probably predominantly residential. It will be most likely located on future building sites located to the east of the existing washeteria/WTP in the "new" part of Tununak.

[8] Alaska Department of Labor online database, accessed 3/17/2017
[9] Alaska Department of Labor and Workforce Development Research and Analysis website http://live.laborstats.alaska.gov/pop/index.cfm Accessed March 17, 2017

1.4 COMMUNITY ENGAGEMENT

The Tununak Traditional Council was awarded a grant in 2008 from USDA and the State of Alaska for the development of a sanitation facilities master plan. The master plan was to evaluate and assess the possible upgrade and/or replacement of the existing washeteria and associated facilities that included a water treatment plant, water storage tank, and a laundromat with bathroom and shower facilities. In 2010, MWH (now part of Stantec), was hired by the Tununak Traditional Council in cooperation with the VSW program to conduct an investigation to determine the condition of the existing sanitation facilities serving the community of the Tununak.

In December 2010 MWH completed a report on their preliminary findings, titled *Report on Site Conditions and Recommended Plan of Action for Sanitation Improvements in Tununak, Alaska* (See Appendix D). The report provides a photo log with captions of the site conditions observed during the MWH site visit. Additional photos of the existing washeteria/WTP and aboveground utilidors to the school and health clinic are provided in Appendix E.

As part of the on-site assessment of sanitation facilities in Tununak, MWH and VSW engaged with the community and conducted a two hour long public meeting in May 2010 that was attended by approximately 68 residents - 56 of them signed the meeting sign-up list and approximately a dozen other individuals who did not sign the list. The meeting attendance was noted to be one of the largest turnouts for a community meeting recorded in the Tununak. Valuable information concerning the residents' desires, experiences, and frustrations with the existing sanitation facilities was collected during the public meeting.

As a follow-up to the May 2010 public meeting, a sanitation questionnaire prepared by MWH with input from VSW was sent to all the households in Tununak. The results of the questionnaire provided valuable information on the community's response to sanitary issues. The questionnaire had an excellent return rate that represented nearly 75% of the residential population in over 60% of the housing units. Most of the respondents did not want an expanded Flush Tank Haul (FTH) system that served the homes in the "new" part of Tununak, nor did they want to pay more than about $60/month for piped water and sewer service. A majority of the residents favored a new community washeteria that included laundry and public bathrooms/shower facilities.

Since 2010 the VSW staff have maintained close communication with Tununak. In 2016, the Tununak Traditional Council signed a quitclaim deed that conveyed all its assets and liabilities with rights and titles to the Native Village of Tununak IRA Council. A copy of the quitclaim deed is provided in the Appendix D – Supporting Documents.

In 2017, Stantec participated in several teleconferences with VSW staff and key personnel from Tununak who included James James (Administrator), Xavier Post (Administrative Assistant), and Josephine Hooper (resident of Tununak). These individuals provided information on the current conditions of the washeteria/WTP. As part of this information gathering process, Tununak provided copies of their records on the cost of operating the washeteria/WTP from 2014-2016, and income from the washeteria from 2009-2016.

2.0 EXISTING FACILITIES

2.1 LOCATION MAP

Figure 2 provides a site plan that shows the layout of the existing washeteria/WTP with respect to surrounding developments in Tununak. Also, Figure 3 provides a survey plat of the Tununak 2007 Subdivision. The location of the washeteria/WTP facility is shown on the plat map on Tract D-1A-1 in U.S. Survey 4028, Tununak Townsite which is owned by Tununak as conveyed in 2016 in the Quitclaim Deed (see Appendix D).

2.2 HISTORY

The washeteria/WTP was constructed as a combined use, single building in 1977-1978 by the US PHS. The completed facility was based on a similar style to others designed and built by US PHS in that time period throughout rural Alaska. The washeteria/WTP consists of a single story building is 32-feet wide by 64-feet long (2,048 square foot area) designed with the following features:

- A laundromat with four washers and two hydronic dryers.
- Two public toilet/shower rooms, each with two showers, a toilet, and a lavatory.
- A mechanical room with two oil-fired boilers, a hydronic heating system, domestic hot water generators, and standby power generator.
- A water treatment room with a pressure filter, a backwash pump, pressure pumps, and a hydropneumatic tank.
- Treated water from the WTP is pumped into a 50,000-gallon water storage tank (WST). The WST was also constructed in 1978 and is connected to the washeteria/WTP building.
- A bunkhouse room.
- A kitchen/laboratory.
- The original water distribution system was designed and constructed to circulate water to several public watering points on a community distribution system that serves the “old” part of Tununak located along the sandspit. A public watering point was constructed on the south side of the Washeteria/WTP but has been abandoned and removed.

2.3 CONDITION OF FACILITIES

The existing water system and washeteria are aged (40 years of continued use) and in need of upgrades and/or replacement to sustain reasonable and reliable service. The WTP only provides water service to the health clinic and washeteria. The water piped to the nearby clinic is used only for non-drinking water purposes with a daily use of approximately 100 gallons or less.

A sanitary facility survey of the water system was completed in August 2010 by Brian Berube, a Sanitarian with the YKHC, for reporting to the ADEC Drinking Water Program. The sanitary survey identified several non-compliant items on the water system that were considered as potential health risks and safety concerns. Many of these water treatment deficiencies were also observed and documented during the site assessment work completed during the May 2010 site visit by the MWH investigation/design team of engineers. The following provides a summary of the deficiencies that were identified during the 2010 YKHC and MWH site visits:

- The operation of the WTP did not meet current SWTR drinking water regulations.
- The WTP was in poor physical condition and disrepair. Repair work on the building has been limited to occasional new coats of paint and replaced windows.
- The existing community watering points on the WTP's water distribution system were found to be non-functional.
- The toilet/shower facilities were not functional for public use and found to have water use fixtures and equipment removed due to apparent disrepair or possible vandalism.
- Only one of the two water supply pressure pumps were operational. The pump is used to deliver water to the inoperable community watering points, washeteria and the adjacent health clinic.
- The laundry equipment consisted of only two working washers and one dryer. The laundry equipment requires continuous maintenance and repair due to over-use by the residents.

The equipment in the washeteria/WTP building has deteriorated to a point that the facility can no longer serve its intended purpose with any reliability. The original water distribution system was designed and constructed to circulate treated water to several watering points located in the "old" part of Tununak. The watering points were found to be non-operational. Circulation was the main source of heating for the pipelines, with electrical heat tracing being a backup heat source. The heat trace controllers did not operate properly which makes the pipelines vulnerable to freezing and requires frequent maintenance during the winter operation. Also, the original public watering point located on the south exterior side of the washeteria/WTP building does not work and was abandoned several years ago.

The building exterior structure has deteriorated resulting in high heating fuel consumption due to the high heat losses. Contributing to high heat losses are:

- leaking window frames
- broken windows replaced with single panes of Plexiglas or plywood,
- roof leaks around the boiler stacks that have caused deterioration of insulation and finishes

In addition, numerous building code violations exist in the building that include the following:

- An exit door from the boiler room that has been sealed shut.
- An aboveground heating fuel tank (approximately 300 gallons) is located within 5 feet of the building.
- The standby heater stack is located too close to combustible materials.

In addition, backwash water from the operation of the existing water treatment filtration process discharges directly onto the ground surface along the southern exterior of the building. The discharge of backwash water has contributed to the erosion of the building's foundation system. The building has settled with a noticeable slope to the interior floors.

Also, the foundation platform for the 50,000 gallon WST is deteriorated and needs to be replaced. However, the WST is reported to be currently operational with no apparent problems. According to the operators, no known significant renovations or repairs have been made to the WST since it was constructed.

Wastewater from the existing washeteria is discharged into the existing sewer drain that is connected to the septic tank system that was previously shared with the LKSD Paul Albert High School. The school recently installed a new state of the art wastewater treatment system that discharges treated effluent into the Bering Sea, and no longer uses the septic tank system. The approximate location of the washeteria sewer line and septic tank system is shown on Figure 2.

2.4 FINANCIAL STATUS OF ANY EXISTING FACILITIES

Financial records provided by Tununak for the operation of the existing washeteria, water treatment plant and the flush haul system are included in Appendix D. These documents provide a breakdown of budgeted operating expenditures for the years 2014, 2015 and 2016. Currently, residents are charged a rate of $3.00 per clothes washer load and $3.00 per clothes dryer use.

2.5 WATER/ENERGY/WASTE AUDITS

In 2012 the Alaska Native Tribal Health Consortium (ANTHC) conducted an energy audit of the existing washeteria/WTP. The ANTHC prepared a report on its findings titled "Comprehensive Energy Audit for Tununak Water Treatment Plant Well House" dated June 12, 2012, which is included in Appendix D (this document is of public record).

The scope of the ANTHC report was a comprehensive energy study, which included an analysis of building shell, interior and exterior lighting systems, HVAC systems, and plug loads. Based on electricity and fuel oil prices at the time of the audit, the annual predicted energy costs for the building analyzed are $7,847 for electricity and $14,672 for fuel oil, for a total energy cost of $22,519 per year. The facility receives a power cost equalization subsidy from the State of Alaska.

The following energy efficiency measures were recommended in the ANTHC audit:

- disconnect heat tape on old watering point loop;
- lower the heating set point to 40° in the well house;
- fill the empty 2"x6" cavity in the cathedral ceiling of the WTP with R-19 fiberglass insulation;
- remove insulation in the posed floor of the water treatment plant and replace with R–21 insulation;
- remove existing glass windows and replace with double pane glass.

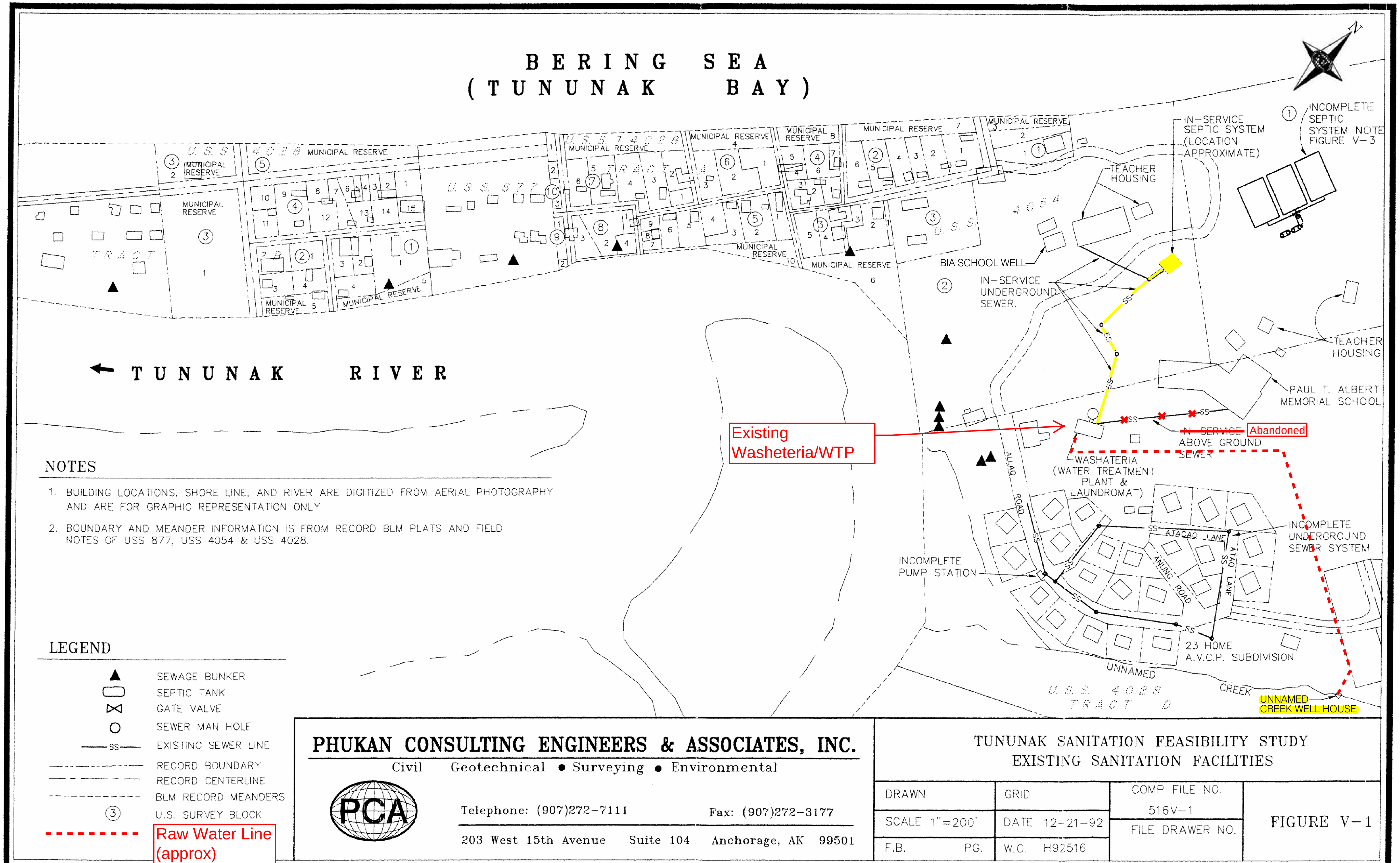

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Figure 2
Site Plan
Source: Phukan Consulting Engineers and Associates

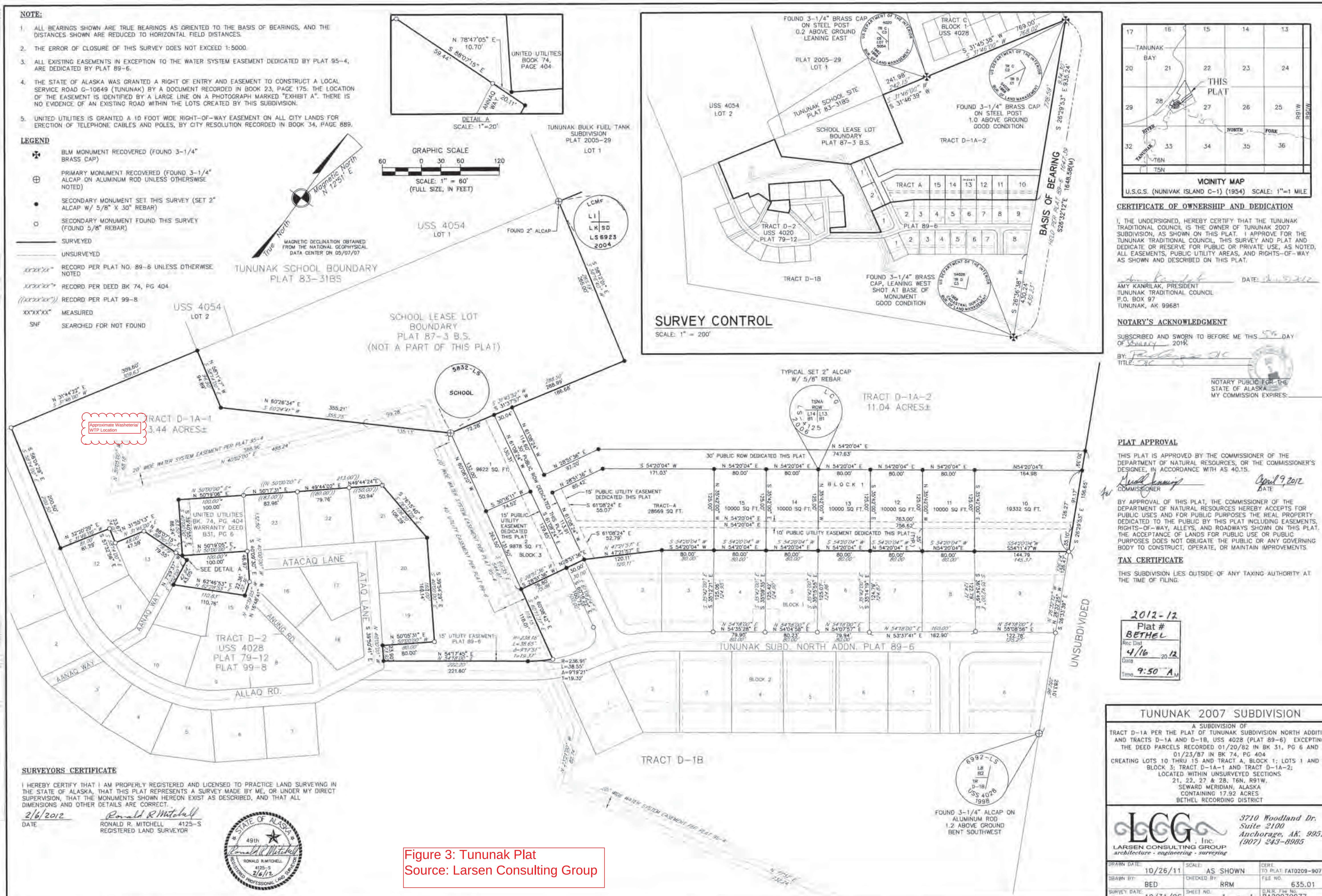

Figure 3: Tununak Plat
Source: Larsen Consulting Group

3.0 NEED FOR PROJECT

Tununak is actively seeking to improve the quality of life for its residents. A significant part of their effort is focused on improving their community sanitation facilities consisting primarily of the washeteria/WTP. In January 2015, Tununak passed Resolution #2015-02 (a copy is provided in Appendix D) that noted Tununak's highest priority sanitation need was for the development of a new washeteria and water treatment plant. The subject project under consideration will significantly improve health and safety conditions, and meet Tununak's growth for the 20-year planning period.

3.1 HEALTH, SANITATION, AND SECURITY

During the past decade, Tununak has been operating an aging 40-year-old washeteria/WTP. The WTP as designed 40 years ago does not produce potable drinking water that can meet the current state and federal drinking water regulations. In addition, the quality of the treated water is not reliable nor consistent due to operational difficulties with frequent breakdown of equipment in the WTP; hence, the residents do not trust the treated water and consequently seek alternative water sources. Many residents have historically expressed concern about possible contamination to the source water from Unnamed Creek due to the recent development of nearby residential structures.

Some of the more serious problems with the current washeteria/WTP facility, described in Section 2.3, may pose health and safety risks for the community. Most of the residents wash clothes and bathe in their homes with a limited amount of water that they haul from the school water well; consequently, the washing of clothes and bathing is probably minimal at best. Also, it is understood many residents rely on the use of graywater for washing their laundry.

The residents of Tununak strongly support and encourage their local government to provide a water treatment system that will deliver dependable and safe potable drinking water, and a modern washeteria for laundry and public showers that has the capacity to serve the entire community. Improving or replacing the existing WTP and the washeteria has clearly been identified as a critical sanitation need for Tununak.

3.2 AGING INFRASTRUCTURE

The existing washeteria/WTP facility was constructed in 1978 and has deteriorated past the point of routine maintenance. The entire building is in poor condition. The washeteria/WTP is substandard, and adversely impacts the health of the community. The current treatment process does not meet the USEPA SWTR requirements and ADEC drinking water regulations.

The WTP is in poor physical condition and lacks necessary equipment to consistently produce high quality water for the washeteria and health clinic. In addition, significant oversight is needed by an experienced operator who understands all the nuances associated with the treatment plant and its aging equipment. The majority of electrical equipment within the building has deteriorated past its useful life. The power distribution and utilization equipment shows signs of significant deterioration due to corrosion. Building code violations were found throughout the facility in the power distribution and lighting systems.

The washeteria portion of the building does not meet the need of the community for accessible toilets, showers, and laundry equipment. The equipment within the building has deteriorated to a point that the facility can no longer serve its intended purpose with any reliability. The laundry equipment is in poor condition with only two working washers and one working dryer. The showers and toilets in both public bathrooms are nonfunctional.

The upgrade and/or replacement of the existing washeteria/WTP facilities will have a major positive impact on the ability of Tununak to provide reliable and adequate treated water and washeteria facilities to the community.

3.3 REASONABLE GROWTH

The community of Tununak is expected to continue to grow for the next 20 years. The current dilapidated condition of the washeteria/WTP with its water treatment plant that is marginally operable and washeteria of limited capacity are not sufficient for the current population of the community let alone meet the projected future growth to provide for the sanitation needs of a healthy community.

4.0 ALTERNATIVES CONSIDERED

The alternatives presented in this PER were developed by considering the feasibility of the various washeteria/WTP options with Tununak's Administrator and staff. Given the limited resources available in Tununak and using good engineering judgment, three alternatives were selected for the PER. The first alternative is a no build choice while the other two alternatives were recommended as reasonable alternatives for providing a washeteria and a WTP that can serve the sanitation needs of the community, i.e., provide reliable, safe drinking water and potable water suitable for hygiene, laundry, and bathing uses. The following three alternatives were evaluated in this PER for the Tununak Washeteria/WTP:

- Alternative 1: No Build
- Alternative 2: Rehabilitate Existing Washeteria/WTP.
- Alternative 3: New Modular Combined Washeteria/WTP.

4.1 ALTERNATIVE 1 – NO BUILD

4.1.1 Description

This No Build (No Action) Alternative would result in the continued use of the existing 40-year old, inadequate, deteriorated washeteria/WTP facility. This alternative would result in the production of treated water that is only suitable for laundry and toilet flushing use but not for drinking, showering, hand washing, or consumption. The WTP would only be used to serve the existing washeteria and the neighboring health clinic. The existing washeteria, deficient in its current condition, would continue to be used, as is, without upgrades. The No Build Alternative 1 does not meet the purpose and need of the project.

Alternative 1 assumes the continuation of routine repairs and maintenance for the operation of the washeteria/WTP facility. During the past year the Tununak staff made cosmetic improvements (painting and minor repairs) to the interior of the washeteria which are shown in the photos in Appendix E.

The existing water supply source from Unnamed Creek would continue to be used and treated with the existing direct (pressure) filtration water treatment process that does not meet the standards of the SWTR.

Wastewater from the existing washeteria would continue to be discharged into the existing sewer line that flows to the off-site septic tank system that was previously shared with the high school.

Also, backwash water from the existing water filtration process in the WTP would continue to be discharged directly onto the ground surface along the exterior of the washeteria/WTP building.

4.1.2 Design Criteria

Since Alternative 1 proposes to continue the use of the existing washeteria/WTP for an indefinite period of time, the design life and other pertinent design criteria would not apply. There would be no changes to the current operation of the existing washeteria/water treatment plant facility.

4.1.3 Map

Figure 4 is an as-built drawing of the existing Washeteria/WTP that shows the floor plan and elevation view of Alternative 1.

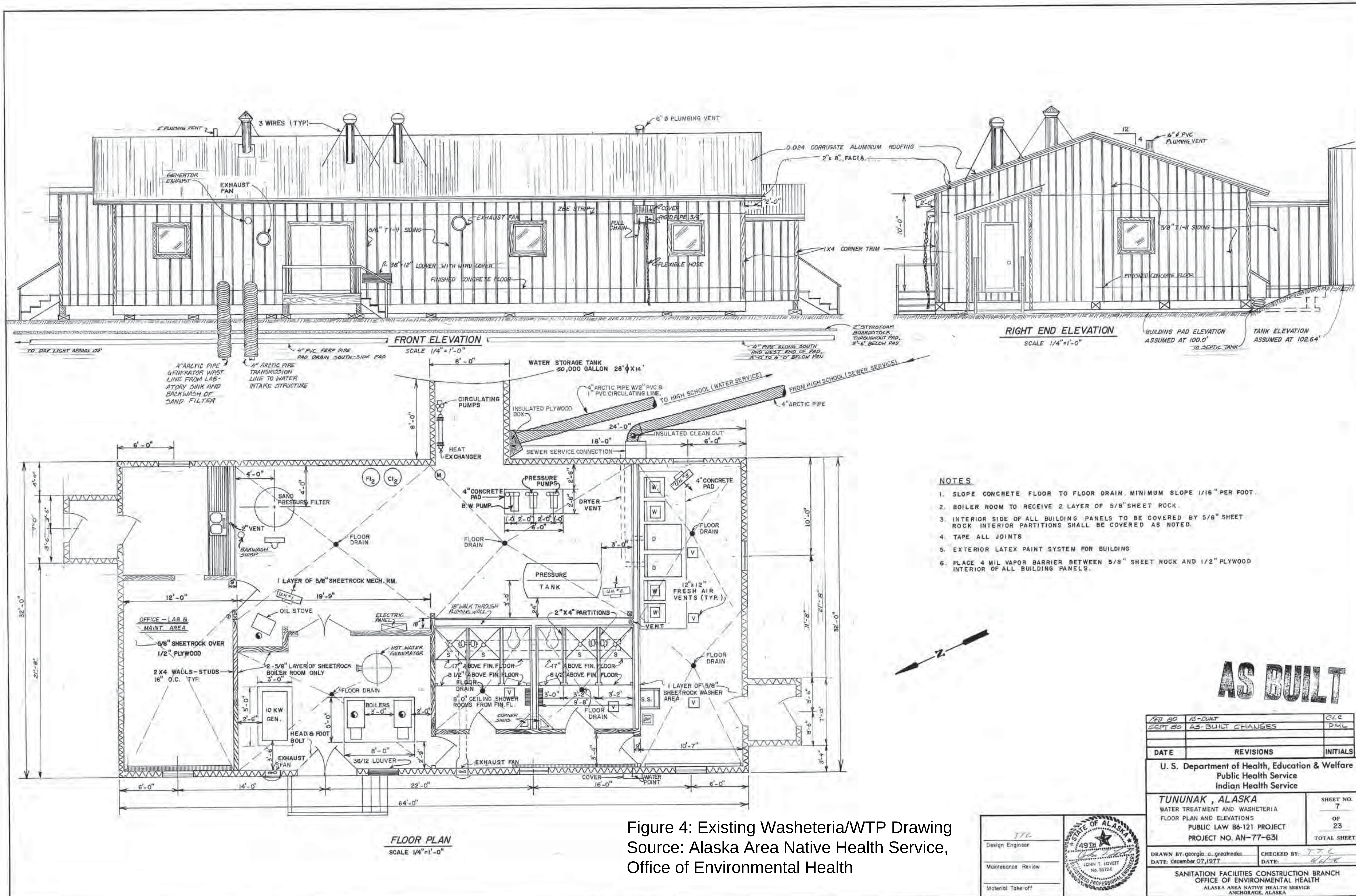

Figure 4: Existing Washeteria/WTP Drawing
Source: Alaska Area Native Health Service, Office of Environmental Health

4.1.4 Environmental Impacts

No environmental impacts are anticipated for Alternative 1 since it presents no new development.

4.1.5 Land Requirements

No additional land requirements are anticipated for Alternative 1.

4.1.6 Potential Construction Problems

No potential construction problems are anticipated for Alternative 1.

4.1.7 Sustainability Considerations

This No Build Alternative would not provide a reliable and affordable sanitation facility for the community. Over time, this alternative would require more operator attention and expertise due to the continued degradation of the existing equipment in the washeteria/WTP. The aging equipment has deteriorated to a point that the WTP can no longer serve its intended purpose with any reliability. In addition, the washeteria currently has 2 non-commercial grade washers and 1 dryer that would continue to deteriorate due to overuse.

4.1.7.1 Water and Energy Efficiency

Alternative 1 would result in the continued operation of an energy inefficient water treatment plant and washeteria.

4.1.7.2 Green Infrastructure

Green infrastructure is the management of stormwater runoff which is not applicable to this project.

4.1.7.3 Other

Alternative 1 does not address the critical sanitation need for providing treated water that meets current regulatory requirements for potable drinking water. The community will not experience the beneficial health and environmental effects associated with a properly functional WTP and washeteria.

4.1.8 Cost Estimates

No capital costs are expected for this No Build Alternative 1 as it features no new development. A summary of the estimated annual O&M expenses for Alternative 1 are presented below, and detailed cost estimates are provided in Appendix A. Tununak recently took over the operation of the existing washeteria/WTP, and consequently, does not have long term records for operational costs. Therefore the following costs were estimated from Tununak's limited records and include other costs from sources that have similar washeteria and water treatment plant operations in other communities in this general area of Alaska.

Table 1 - Alternative 1 Annual O&M Expenses

Category	Cost
Operator Labor	$13,595
Electricity and Utilities	$8,326
Heating Fuel	$15,567
Chemicals, Supplies, Freight, and Expendables	$5,000
Office and Administrative	$2,500
Equipment Replacement	$4,112
Total Estimated Annual O&M Cost	$49,100

The estimated life-cycle costs for Alternative 1, in 2017 dollars, assuming uniform series present worth based on a 20 year life is $4,932,095.

4.2 ALTERNATIVE 2 – REHABILITATE EXISTING WASHETERIA/WATER TREATMENT PLANT

4.2.1 Description

Alternative 2 would rehabilitate the existing washeteria/WTP facility and replace its foundation at its current location. Alternative 2 provides for the upgrade of the existing WTP facility to treat the current water source from Unnamed Creek to produce drinking water that complies with the SWTR for use at the rehabilitated washeteria and health clinic.

The rehabilitation alternative would correct building code violations that were identified at the existing facility and mitigate the current risk to the operators and public users. In addition, this alternative would upgrade/replace the washeteria and public bathrooms to meet the original operating conditions and functionality.

Alternative 2 consists of the following components:

- The existing wooden frame structure would be temporarily elevated to remove the 40-year old rotting post and pad foundation system. The water piping connections for the incoming water supply line, piping to the water storage tank, and water supply lines exiting the building would be temporarily disconnected. The sewer line connection would be temporarily disconnected while the building structure was raised to accommodate the removal and replacement of the foundation system. A multipoint foundation system, equivalent to the Triodetic type, would be used to replace the deteriorated wood foundation system. The building structure would be lowered and leveled onto the new Triodetic foundation. The plumbing system would be reconnected to the sewer drain lines and waterlines to the water storage tank and other waterlines entering and exiting the building.
- The existing structure would be rehabilitated to include replacement of the entire facility's electrical and mechanical components along with necessary structural components. It would also include new insulation and interior wall coverings (sheetrock) and painted as required to bring the facility to meet current applicable building codes and standards.
- The WTP equipment would be replaced with new equipment and be upgraded to meet the current SWTR drinking water requirements, and produce the equivalent flow of treated water as originally designed, i.e., 20 gallons per minute (gpm).
- The washeteria portion of the building would be reconstructed and refitted with 4 new commercial grade washers and 2 commercial grade dryers to match the number of laundry units that were originally installed in the washeteria. The washeteria would

be rehabilitated with new electrical wiring, wall surfaces with insulation and mechanical equipment as needed.

- The building's heating and ventilation system would be upgraded and/or replaced as needed.
- The existing windows and doors would be replaced with thermally efficient doors and windows.
- The exterior siding of the building would be replaced as needed with a similar material (T1-11) as currently in place. The new siding would be painted.
- It is assumed the existing metal roof surface has deteriorated and would require replacement.
- The exterior stairs and entrances to the building would be replaced with new weather resistant material and new stairs and ramps meeting handicap access requirements including a parking space for a handicap vehicle.
- The bathrooms would be reconstructed as originally designed to provide 1 men's and 1 women's room, equipped with 2 showers, 1 sink and 1 toilet, each.
- The 10 KW standby generator would be replaced with a new equivalent diesel fueled generator.
- Wastewater from the existing washeteria would continue to be discharged into the existing sewer drain that is connected to the existing off-site septic tank system.
- Backwash water from the water treatment pressure granular filter would be plumbed to discharge to the existing sewer drain line that flows to the existing off-site septic tank system.

4.2.2 Design Criteria

All major system components in Alternative 2 would be constructed with materials and methods to provide a minimum 20-year life. Design criteria for the rehabilitation of the existing washeteria/water treatment plant includes the following:

- Current Population 387 (2017)
- Design Population 466 (2037)
- Freezing Index (Typical Year) 3,000 $^{\circ}$F days
- Thawing Index (Typical Year) 2,000 $^{\circ}$F days
- Heating Degree Days 13,000 $^{\circ}$F days
- Design Ground Snow Load
  - 10-year reoccurrence 74 pounds per square foot (PSF)
  - 25-year reoccurrence 93 PSF
  - 50-year reoccurrence 117 PSF
- Design Wind Speed
  - 10-year reoccurrence 90 miles per hour (MPH)
  - 25-year reoccurrence 100 MPH

  - 50-year reoccurrence — 110 MPH
- Design Snow Load — 30 PSF
- Design Live Load — 125 PSF
- Seismic Zone — Zone 1
- Water Demand — 20 GPM
- Water Treatment — Meet Regulatory SWTR Drinking Water Standards

4.2.3 Map

Figure 4, Existing Facilities Map, shows the location of Alternative 2. This location is the same as Alternative 1, No Build.

4.2.4 Environmental Impacts

No environmental impacts are anticipated for Alternative 2 since it presents no new ground disturbance. Minimal ground disturbance may occur during installation of the new foundation under the existing building, however, no excavation is anticipated. Should excavation be required to install the new foundation, the State Historic Preservation Officer (SHPO) will be consulted and measures to avoid adverse impacts to cultural resources will be implemented. In addition, the USFWS will be consulted to determine any proposed avoidance measures that can be incorporated into the project construction methods that would avoid accidental impacts to Spectacled Eiders during construction.

4.2.5 Land Requirements

No additional land requirements are anticipated for Alternative 2.

4.2.6 Potential Construction Problems

No potential construction problems are anticipated for Alternative 2.

4.2.7 Sustainability Considerations

Alternative 2 would provide an improvement in meeting the sanitation needs in Tununak. However, this alternative would probably not generate sufficient revenue to cover the estimated annual O&M costs presented below due to the limited number of laundry units and bathrooms. Also, the proposed renovation of the washeteria would probably be too small to meet sanitation needs expected from the future growth in Tununak.

4.2.7.1 Water and Energy Efficiency

The rehabilitated building including replacement of WTP equipment and washeteria laundry equipment will be energy efficient, thereby decreasing energy and resources currently used.

4.2.7.2 Green Infrastructure

Not applicable.

4.2.7.3 Other

A disadvantage to Alternative 2 is that the water treatment process would have to be temporarily shut down to allow for the replacement of the treatment equipment. However, the operators could treat a sufficient amount of water to store in the 50,000 gallon WST and continue to provide non-potable water to the health clinic. A temporary water line for the WST to the clinic may need to be provided in order to make this possible. In addition, the community would experience another disadvantage from Alternative 2 since they will not be able to have laundry services during the upgrade of the existing washeteria that may last for several months.

4.2.8 Cost Estimates

Estimated construction (capital) costs, annual O&M expenses (assuming 2037 water demands), and a life-cycle cost analysis for Alternative 2 are presented below. Detailed cost estimates calculations are provided in Appendix A.

Table 2 – Alternative 2 Capital Costs – Upgrade Existing

Construction Items	Cost
Mobilization and Demobilization	$75,000
Building Modifications/Rehabilitation, includes replacement of foundation	$1,515,000
Water Treatment System Equipment	$450,000
Washeteria Washers and Dryers and complete bath and shower materials	$98,000
Construction Subtotal	$2,138,000
18% Construction Contingency	$385,000
Subtotal with Contingency	$2,523,000
Non-Construction Items	
10% Design	$253,000
10% Construction Management	$253,000
8% Agency Admin	$202,000
Estimated Total Capital	$3,231,000

Table 3 – Alternative 2 Annual O&M Expenses

Category	Cost
Operator Labor – WTP and Washeteria	$20,392
Electricity and Utilities	$10,653
Heating Fuel	$13,222
Chemicals, Supplies, Freight, and Expendables	$18,000
Office and Administrative	$4,500
Equipment Replacement	$15,000
Other Line Items (Insurance, etc.)	$1,200
Short Lived Asset Reserve	$6,328
Total Estimated Annual O&M Cost	$89,205

The estimated life-cycle costs for Alternative 2, in 2017 dollars, assuming uniform series present worth based on a 20 year life as provided in Table 3 is $5,015,095.

4.3 ALTERNATIVE 3 – NEW MODULAR COMBINED WASHETERIA/WATER TREATMENT PLANT

4.3.1 Description

Alternative 3 would abandon in-place the existing washeteria/WTP and replace it with a new modular building that would house a combined washeteria and WTP. The existing washeteria/WTP would remain in operation until the new modular building is fully on-line and operational.

The modular building would be erected on a new foundation at a location immediately adjacent to the existing washeteria/WTP. In addition, a site map drawings (see Figure 5) with proposed locations for the alternative washeteria/WTP was faxed to the Tununak for their review and comment. The site plan showed three alternative locations in the immediate vicinity of the existing washeteria/WTP for the placement of a possible new replacement washeteria/WTP.

Alternative 3 consists of the following components:

- The new modular combined washeteria/WTP would be shipped by barge to Tununak and transported in sections overland from the barge site.
- The modular building would be erected on a new multipoint steel frame foundation.
- The modular building would consist of a 3,040 square foot (40' by 76') structure that would include a 1,600 square foot fully functional washeteria and a 1,440 square foot new WTP. Figure 6 shows the conceptual floor plan for the modular combined washeteria/WTP
- The WTP would use a treatment process similar to the process used in the existing WTP for the production of potable/drinking water that would comply with SWTR and produce a flow rate as originally designed (20 gpm).
- The new WTP would be plumbed via aboveground utilidor from the existing 50,000-gallon WST and neighboring health clinic. The utilidor would be approximately 100 feet in length.
- The modular washeteria would be designed to accommodate 5 commercial grade washers and dryers, and 2 bathrooms (separate men and women) equipped with 4 toilets, 2 sinks, and 4 showers that are designed for handicap access.
- The exterior stairs and entrances to the modular building would be constructed with new weather resistant material and include stairs and ramps meeting handicap access requirements and a parking space for a handicap vehicle.
- The wastewater from the modular washeteria would be plumbed to discharge into the existing sewer drain that flows to the existing off-site septic tank system.

- Backwash water from the water treatment pressure granular filter would be plumbed to discharge to the existing sewer drain line that flows to the existing off-site septic tank system.

4.3.2 Design Criteria

All major system components in Alternative 3 would be constructed with materials and methods to provide a minimum 20-year life. Design criteria for the new modular combined washeteria/water treatment plant are identical for the criteria for Alternative 2.

4.3.3 Map

Figure 5, Location Options for Alternative 3, shows the three proposed alternate locations for the new modular washeteria/WTP.

Figure 6 shows the conceptual floor plan for the modular combined washeteria/WTP.

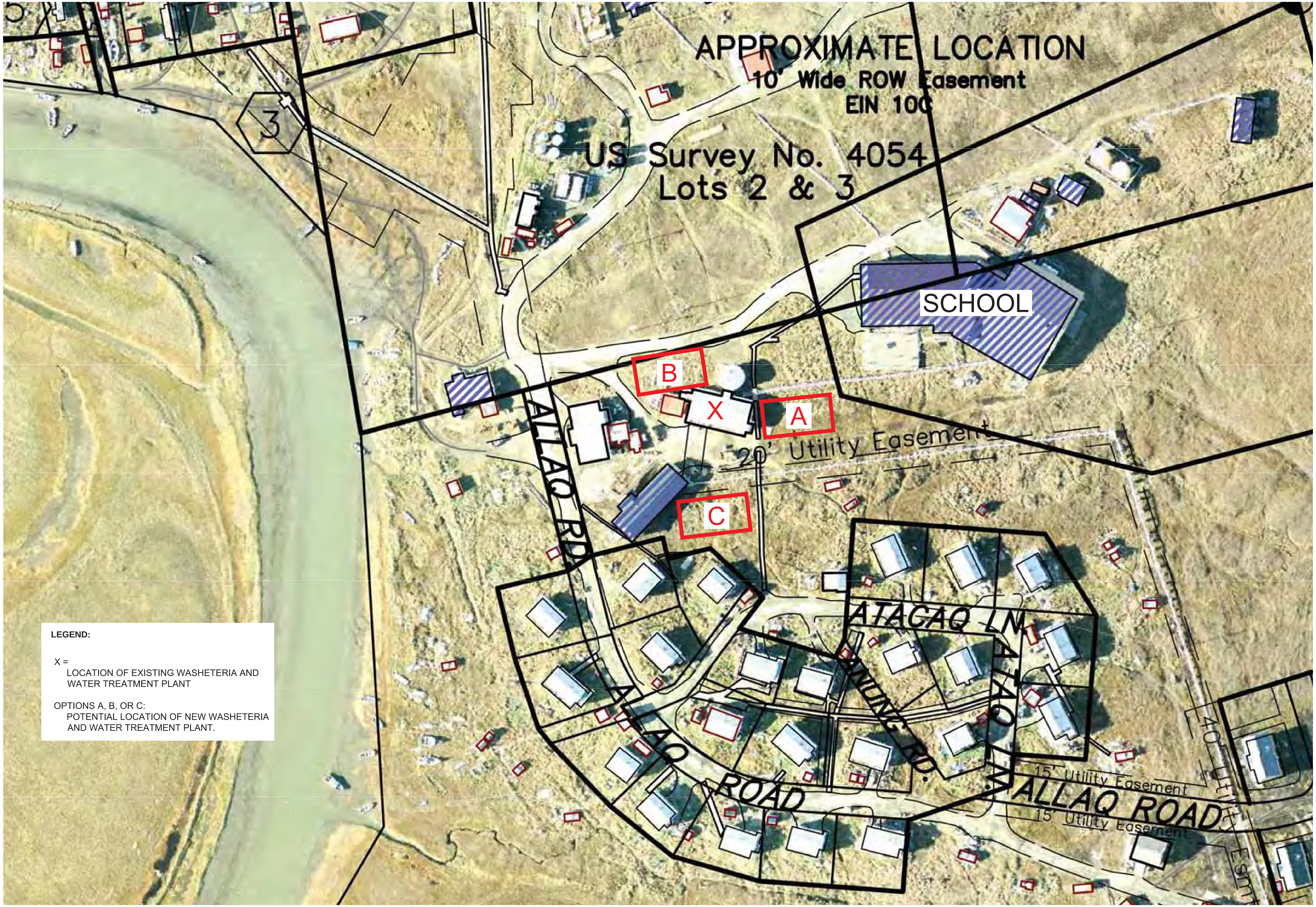

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Figure 5 - Location Options for Alternative 3 - Modular Washeteria

Client/Project
Alaska DEC, Village Safe Water Program
VSW Tununak PER and ER

Project No.:2047057401
File Name: N/A
Scale:

Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
			03/17/17

Title
WASHETERIA OPTIONAL LOCATIONS PLAN

Revision:

Drawing No.
G1

1 A1 **FIGURE 6 - Proposed Floor Plan for Alternative 3 - Modular Washeteria/WTP**
1/4" = 1'-0"

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Client/Project
Alaska DEC, Village Safe Water Program
VSW Tununak PER and ER

Project No.: 2047057401
File Name: N/A
Scale: 1/4" = 1'-0"

Author	Designer	Checker	2017/06/27
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Title
ALTERNATIVE 3 - FLOOR PLAN

Revision:
Drawing No.
A1

ORIGINAL SHEET - ANSI D

4.3.4 Environmental Impacts

No environmental impacts are anticipated for Alternative 3 since it presents minimal new ground disturbance. Minimal ground disturbance may occur during installation of the new foundation. Should excavation be required to install the new foundation, the SHPO will be consulted and measures to avoid adverse impacts to cultural resources will be implemented. In addition, the USFWS will be consulted to determine any proposed avoidance measures that can be incorporated into the project construction methods that would avoid accidental impacts to Spectacled Eiders during construction.

4.3.5 Land Requirements

Alternative 3 proposes to place the new modular washeteria building in very close proximity to the existing washeteria/WTP. According to the administrators of Tununak, they have site control (ownership) of all property surrounding the existing washeteria/WTP. This area is adequate in size to accommodate the placement of the new modular washeteria/WTP building.

4.3.6 Potential Construction Problems

No potential construction problems are anticipated for Alternative 3. Minimum ground surface preparation may be required for the construction of the foundation for the new modular washeteria/WTP building.

4.3.7 Sustainability Considerations

Alternative 3 would construct a reliable and affordable sanitation facility that will meet the current and future 20-year design life washeteria/WTP needs in Tununak. Alternative 3 is anticipated to generate enough revenue to cover the estimated annual O&M and repair and replacement costs presented in the table below.

4.3.7.1 Water and Energy Efficiency

The new modular building with new equipment for the washeteria/WTP would be energy efficient, thereby, significantly decreasing energy and resources currently used.

4.3.7.2 Green Infrastructure

Not applicable.

4.3.7.3 Other

The new modular washeteria/WTP would provide long life and be less expensive and easier to operate and maintain for the community of Tununak. When funding becomes available for the washeteria/WTP project, Tununak will select one of the three alternate locations shown on Figure 5 for the placement of the modular building. All three alternate locations are considered to be centrally located that are close to the community infrastructure and convenient for public use in the community. After the new modular washeteria/WTP is brought on line for use by the community, the abandoned washeteria/WTP building could be used for other purposes subject to meeting State Fire Marshal requirements.

4.3.8 Cost Estimates

Estimated construction (capital) costs, annual O&M expenses (assuming 2037 water demands), and a life-cycle cost analysis for Alternative 3 are presented below. Detailed cost estimates calculations are provided in Appendix A.

Table 4 – Alternative 3 Capital Costs

Construction Item	Cost
Mobilization and Demobilization	$50,000
Modular Building for new Washeteria/Water Treatment Plant with Foundation System and includes shipment/delivery and erection on new foundation. The modular building will include 2 completed finished bathrooms and showers.	$912,000
Water Treatment System Equipment	$450,000
Washeteria Equipment (Washers & Dryers)	$60,000
Aboveground utilidors to the existing 50,000 gallon water storage tank, clinic, and existing sewer system. Includes all other site work, mechanical, electrical, and other miscellaneous construction items	$543,000
Construction Subtotal	$2,015,000
Non—Construction Items	
15% Construction Contingency	$303,000
Subtotal with Contingency	$2,318,000
10% Design and Permitting	$232,000
8% Construction Management	$186,000
8% Agency Admin	$186,000
Estimated Total Capital	$2,922,000

Table 5 – Alternative 3 Annual O&M Expenses

Category	Cost
Operator Labor	$26,595
Electricity and Utilities	$12,500
Heating Fuel	$15,000
Chemicals, Supplies, Freight, and Expendables	$18,000
Office and Administrative	$4,500
Equipment Replacement	$15,000
Other Line Items (Insurance, etc.)	$1,200
Short Lived Asset Reserve	$7,301
Estimated Annual O&M Cost	$100,096

The estimated life-cycle costs for Alternative 3, in 2017 dollars, assuming uniform series present worth based on a 20 year life as shown in Table 8 is $4,923,910.

5.0 SELECTION OF AN ALTERNATIVE

5.1 LIFE CYCLE COST ANALYSIS

The following table presents a Life Cycle cost comparison of the three alternatives:

Table 6 - Comparison of Alternatives

Alternative	Capital Costs	Annual O&M Costs	Life Cycle Cost (Present Worth)
Alt 1 – No Build	$0	$49,100	$981,990
Alt 2 – Rehabilitate Existing Washeteria/WTP	$3,231,000	$89,205	$5,015,095
Alt 3 – New Modular Combined Washeteria/WTP	$2,922,000	$100,096	$4,923,910

Note: Uniform Series Present Worth is based on 20 year design life.

The No Build Alternative 1 has the lowest Life Cycle cost of the three alternatives, however, the No Build Alternative does not address any of the community's current nor needs its future sanitation. The remaining Alternatives 2 and 3 address the health, safety, and sanitation deficiencies of the current washeteria/WTP.

5.2 SELECTION MATRIX

Non-monetary factors, including social and environmental aspects (e.g. sustainability considerations, operator training requirements, permit issues, community desires and objections) should also be considered in determining which alternative is recommended and may be factored into the calculations. In order to attempt to quantify both the monetary and non-monetary factors of each alternative, a selection matrix was developed to compare them to each other.

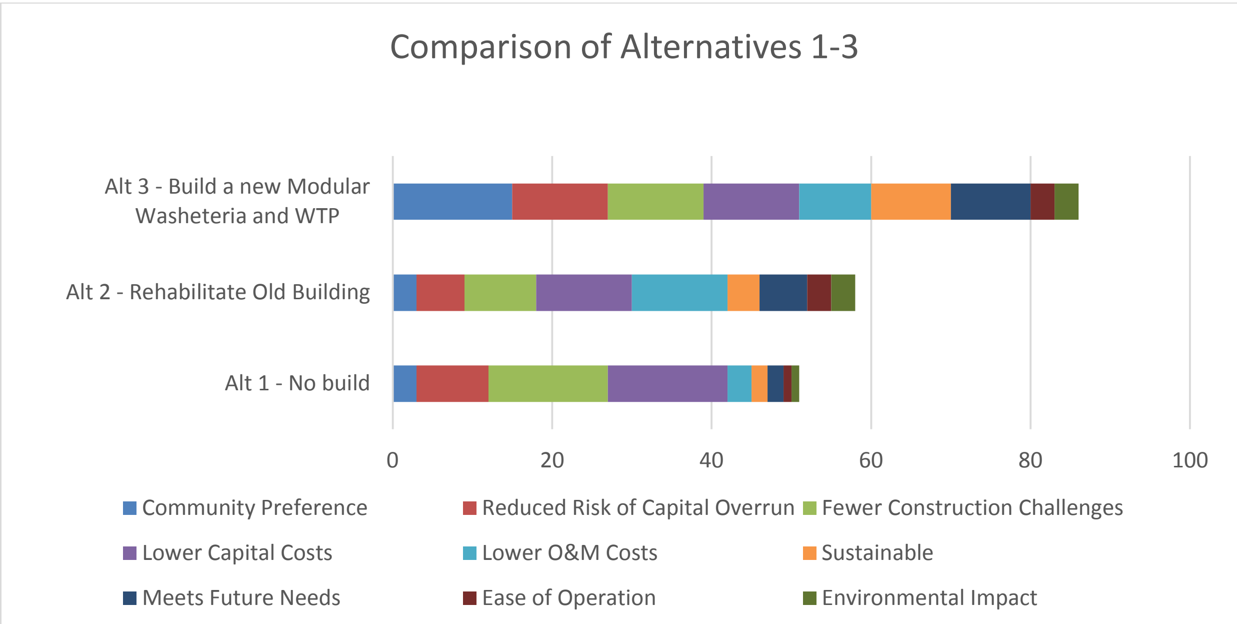
The selection matrix presented in Table 7 was prepared to assist the decision making process. The left column contains criteria considered to be important to making a decision between the alternatives. Next to each criterion is a "Weight" (importance) factor ranging from 1 (low) to 3 (high) that assigns a relative importance to each one. Each alternative was then given a "Score" from 1 (poor) to 5 (excellent) for each criterion. The "Weight" and "Score" were multiplied together to give a "Weighted Score" for each criterion and summed for each alternative to give the "Total Score".

Table 7 - Selection Matrix

		Alternative 1 No Build		Alternative 2 Rehabilitate Existing Washeteria/WTP		Alternative 3 Modular Building Combined Washeteria/WTP	
Criteria	**Weight**	Score	**Weighted Score**	Score	**Weighted Score**	Score	**Weighted Score**
Community Preference	**3**	1	**3**	1	**3**	5	**15**
Risk of Capital Cost Overruns	**3**	3	**9**	2	**6**	4	**12**
Construction Challenges	**3**	5	**15**	3	**9**	4	**12**
Capital Costs	**3**	5	**15**	4	**12**	4	**12**
O&M Costs	**3**	1	**3**	4	**12**	3	**9**
Sustainability	**2**	1	**2**	2	**4**	5	**10**
Future Needs	**2**	1	**2**	3	**6**	5	**10**
Operator Requirements	**1**	1	**1**	3	**3**	3	**3**
Environmental Impacts	**1**	1	**1**	3	**3**	3	**3**
Total Score			**51**		**58**		**86**

Based on the calculations provided in the Selection Matrix (Table 7), Alternative 3 has a Total Score of 86 which is the highest of the three alternatives considered. Alternative 3 far outweighs all of the other alternatives including the lower cost No Build when taking into account very important non-monetary factors that are listed in the Selection Matrix (Community Preferences, Construction Challenges, Sustainability, Future Needs, Operator Requirements, Environmental Impacts). In this regard, Alternative 3 - Modular Combined Washeteria/WTP is the recommended alternative to meet the current and future sanitation needs of Tununak. Another way of showing the comparison of the alternatives is provided below in Figure 8 that clearly shows Alternative 3 exceeding the other alternatives.

Figure 7 - Comparison of Alternatives 1-3



6.0 PROPOSED PROJECT (RECOMMENDED ALTERNATIVE)

6.1 PRELIMINARY PROJECT DESIGN

6.1.1 Drinking Water

6.1.1.1 Water Supply

The source of water for the recommended Alternative 3 (modular combined washeteria/WTP) will be the existing water source consisting of the surface water well (infiltration gallery) in Unnamed Creek. The source of water has been used for the past 40 years.

6.1.1.2 Treatment

The water treatment equipment will be located in the new water treatment plant inside the modular combined washeteria/WTP building. A conceptual layout for the water treatment process equipment is shown on Figure 6. This treatment process will utilize a granular pressure filter system (direct filtration). The direct filtration technology is the type of treatment process currently used in Tununak which is considered a robust and proven system. If a failure were to occur, it typically can be recovered and put back into operation. In addition, the operators of the current water treatment plant are very familiar with this method of water treatment technology.

The new water treatment plant will produce treated water that will meet the current SWTR regulatory requirements for drinking water. The treated filtered water will be disinfected with a hypochlorite solution and pumped to the WST for required chlorine contact time, storage and subsequent distribution to the new washeteria and health clinic.

6.1.1.3 Storage

Treated water from the new water treatment plant will be pumped into the existing 50,000 gallon WST.

6.1.1.4 Pumping Stations

Not applicable.

6.1.1.5 Distribution Layout

Not applicable.

6.1.2 Wastewater/Reuse

Not applicable – wastewater would continue to be discharged to the existing off-site septic tank system.

6.1.2.1 Collection System/Reclaimed Water System Layout

Not applicable.

6.1.2.2 Pumping Stations.

Not applicable.

6.1.2.3 Storage

Not applicable.

6.1.2.4 Treatment

Not applicable.

6.1.3 Solid Waste:

6.1.3.1 Collection

Not applicable.

6.1.3.2 Storage

Not applicable.

6.1.3.3 Processing

Not applicable.

6.1.3.4 Disposal

Not applicable.

6.1.4 Stormwater:

6.1.4.1 Collection System Layout

Not applicable.

6.1.4.2 Pumping Stations

Not applicable.

6.1.4.3 Treatment

Not applicable.

6.1.4.4 Storage

Not applicable.

6.1.4.5 Green Infrastructure

Not applicable.

6.2 PROJECT SCHEDULE

The schedule for the construction of the recommended alternative, Modular Combined Washeteria/WTP, is solely dependent upon the availability of funding. An important factor in the scheduling for this project is the continuation of current services that would not be disrupted to the community users during the construction of the proposed modular building, i.e., the existing washeteria/WTP would remain in operation until such time the new modular building is erected and put into operation. When funding becomes available, the design of the recommended alternative could take approximately 4 to 8 months. The construction, delivery and erection of the modular building could take approximately 12 months depending on the time of year and availability of barging services.

6.3 PERMIT REQUIREMENTS

Construction of the new water treatment system will require an Approval to Construct from the ADEC Drinking Water program. Engineering plans and specifications for the proposed treatment system will need to be submitted to the ADEC for review and approval. The project would anticipate receiving an approval to construct within 90 days of submittal of the 95% design. After installation of the treatment system, the ADEC will issue an interim approval to operate the treatment system for a period of one year and then a final approval to operate.

6.4 SUSTAINABILITY CONSIDERATIONS (IF APPLICABLE).

6.4.1 Water and Energy Efficiency

Alternative 3, a new modular WTP/washeteria, is expected to have an overall process efficiency of at least 95%. Power consumption is also expected to be lower than the current operation of the existing WTP.

6.4.2 Green Infrastructure

Not applicable.

6.4.3 Other

Direct filtration treatment process is a proven and robust system that the operators in Tununak are familiar with and understand how to work effectively with this treatment technology. The new washeteria will have modern equipment that should be a substantial improvement for the laundry facilities. Also, the operators of the existing washeteria are familiar with the routine maintenance of the laundry equipment. In addition, in consideration of the lack of piped water system in Tununak, the new public bathrooms/restrooms will be valued by the community residents.

6.5 TOTAL PROJECT COST ESTIMATE (ENGINEER'S OPINION OF PROBABLE COST)

Table 8 presents the anticipated construction and non-construction costs for the recommended alternative, a new modular WTP/washeteria. Based on the proposed schedule provided above, the project cost below are in 2017 dollars. Land and right-of-way costs are not included as a project is located within property owned by Tununak.

Table 8 - Alternative 3 Project Costs

Construction Items	Cost
Mobilization and Demobilization	$50,000
Modular Building for new Washeteria/Water Treatment Plant with Foundation System and includes shipment/delivery and erection on new foundation. The modular building will include 2 completed finished bathrooms and showers.	$912,000
Water Treatment System Equipment	$325,000
Washeteria Equipment (Washers & Dryers)	$60,000

Aboveground utilidors to the existing 50,000 gallon water storage tank, clinic, watering point and existing sewer system. Includes all other site work, mechanical, electrical, and other miscellaneous construction items	$668,000
Construction Subtotal	$2,015,000
Non—Construction Items	
15% Construction Contingency	$284,000
Subtotal with Contingency	$2,174,000
10% Design and Permitting	$218,000
8% Construction Management	$174,000
8% Agency Admin	$174,000
Estimated Total Capital	$2,922,000

6.5.1 Annual Operating Budget

6.5.1.1 Income

The estimated annual income for the proposed alternative is presented in Table 9. See Appendix A for a detailed breakdown and basis of the costs.

Table 9 - Estimated Income

Washeteria Revenue	Monthly Revenue	Annual Revenues
Washers	$3,600	$43,200
Dryers	$4,500	$54,000
Showers	$1,200	$14,400
Total Estimated Income	$9,300	$111,600

The estimated income is based on user fees of $4.00 per wash load, $5.00 per dryer load, and $2.00 per shower. Detailed calculations are provided in Appendix F.

6.5.1.2 Annual O&M Costs for Alternative

The annual operating budget for the selected Alternative 3 is presented in Table 10 and is estimated to be $100,690. See Appendix A for a detail breakdown and basis for the costs.

Table 10 - Annual O&M Expenses

Category	Cost
Operator Labor	$26,595
Electricity and Utilities	$12,500
Heating Fuel	$15,000
Chemicals, Supplies, Freight, and Expendables	$18,000
Office and Administrative	$4,500
Equipment Replacement	$15,000
Other Line Items (Insurance, etc.)	$1,200
Short Lived Asset Reserve	$7,301
Estimated Annual O&M Cost	$100,096

6.5.1.3 Debt Repayments

Tununak does not currently maintain debt.

6.5.1.4 Reserves

Debt Service Reserve

Tununak does not currently maintain debt.

Short-Lived Asset Reserve

Table 11 presents the detailed costs of the annual short lived reserve for the recommended alternative, Alternative 3 Combined Modular Washeteria and Water Treatment Plant. See Appendix A for a breakdown and basis for the costs.

Table 11 - Short Lived Asset Reserve

Short-Lived Assets	Life Span (yrs)	2017 Construction Cost	Existing Annual Cost for Asset Replacement	Annual Cost for Asset Replacement for Modular Washeteria/WTP
Washer	5	$3,482	$732	$2,929
Hydronic Dryer	5	$1,572	$331	$1,323
Oil-Fired Boiler	5	$5,000	$1,052	$1,052

Hot Water Generator	5	$3,000	$631	$631
Standby Power Generator	5	$2,500	$526	$526
Pressure Pumps	5	$4,000	$842	$841
		Totals	**$4,113**	**$7,302**

7.0 CONCLUSIONS AND RECOMMENDATIONS

Except for the No Build Alternative 1, the Modular Combined Washeteria and Water Treatment Plant – Alternative 3, has the lowest capital cost alternative. This alternative offers substantially more benefit for the welfare and health for the residents of Tununak compared to the other alternatives.

Based on these findings and conclusions as presented herein, Alternative 3 – Modular Combined Washeteria and Water Treatment Plant is the recommended alternative to serve the future drinking water and laundry/hygiene needs of Tununak.

8.0 REFERENCES

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Appendix A Cost Estimates

Description		No-Build	Rehabilitate Existing	New Washeteria/WTP	
BUDGET CHANGES - Increases					
Labor (WTP+Washeteria) Average from 2014-2016		$0	$6,797	$13,000.00	Labor (WTP+Washeteria) Average from 2014-2016
Electricity and Utilities		$0	$2,327	$4,174	Electricity and Utilities
Heating Fuel		$0	($2,345)	($567)	Heating Fuel
Chemicals, Supplies, Freight, Expendables		$0	$13,000	$13,000	Chemicals, Supplies, Freight, Expendables
Office and Administrative		$2,500	$4,500	$4,500	Office and Administrative
Equipment Replacement		$0	$15,000	$15,000	Equipment Replacement
Other Line Items (Insurance, etc.)		$0	$1,200	$1,200	Other Line Items (Insurance, etc.)
Short--Lived Asset Reserve		$0	$2,126	$3,189	Based on 5 year lifespan
Annual O&M Change		**$2,500**	**$42,605**	**$53,496**	

SYSTEM BUDGET	**Base Budget**				
Labor (WTP+Washeteria) Average from 2014-2	$13,595	$13,595	$20,392	$26,595	Labor (WTP+Washeteria) Average from 2014-2016
Electricity and Utilities	$8,326	$8,326	$10,653	$12,500	Electricity and Utilities
Heating Fuel	$15,567	$15,567	$13,222	$15,000	Heating Fuel
Chemicals, Supplies, Freight, Expendables	$5,000	$5,000	$18,000	$18,000	Chemicals, Supplies, Freight, Expendables
Office and Administrative	$0	$2,500	$4,500	$4,500	Office and Administrative
Equipment Replacement	$0	$0	$15,000	$15,000	Equipment Replacement
Other Line Items (Insurance, etc.)	$0	$0	$1,200	$1,200	Other Line Items (Insurance, etc.)
Short--Lived Asset Reserve	$4,112	$4,112	$6,238	$7,301	Short--Lived Asset Reserve
Annual O&M	**$46,600**	**$49,100**	**$89,205**	**$100,096**	Annual O&M

Short-Lived Assets	Annual Replacement Cost	No-Build	Rehabilitate Existing	New Washeteria/WTP	
Washer	$732.32	$0	$1,465	$2,197	Washer
Hydronic Dryer	$330.61	$0	$661	$992	Hydronic Dryer
Oil-Fired Boiler	$1,051.57	$0	$0	$0	Oil-Fired Boiler
Hot Water Generator	$630.94	$0	$0	$0	Hot Water Generator
Standby Power Generator	$525.79	$0	$0	$0	Standby Power Generator
Pressure Pumps	$841.26	$0	$0	$0	Pressure Pumps
Item7	$0.00	$0	$0	$0	Item7
Total	**$4,112**	**$0**	**$2,126**	**$3,189**	

	No-Build	Rehabilitate Existing	New Washeteria/WTP
Constants			
Total Project Cost, PC	$0	$3,231,000	$2,922,000
Annual O&M, first year	$49,100	$89,205	$100,096
Annual O&M Increase, for geometric gradient and arithmetic gradient	3.2%	3.6%	3.0%
Assuming Constant Costs			
Total Present Worth	$765,420	$4,621,627	$4,482,405
Total Cost at End of Lifecycle	$981,990	$5,015,095	$4,923,910
Assuming Arithmetic Growth			
Total Present Worth	$978,079	$5,056,286	$4,888,842
Total Cost at End of Lifecycle	$1,254,820	$5,572,737	$5,445,345
Assuming Geometric Growth			
Total Present Worth	$1,022,817	$5,161,001	$4,968,296
Total Cost at End of Lifecycle	$1,312,216	$5,707,080	$5,547,281

Capital Cost Estimate - Concept Level

PER Tununak Alternative #2 - Rehabilitate Existing Washeteria/Water Treatment

Construction

Item	Description	Unit	Quantity	Unit cost	Extended Cost (Roundup to the nearest $1,000)
1	Mob/Demob	LS	1	$ 75,000	$ 75,000
2	Sitework/Building utilities upgrades	LS	1	$ 100,000	$ 100,000
3	Selective demolition/disposal	LS	1	$ 125,000	$ 125,000
4	Building - Shell/Exterior Finish renovations	SF	2,048	$ 200	$ 410,000
5	Replace post and pad foundation with Triodetic Foundation	LS	1	$ 100,000	$ 100,000
6	Access ramp and handicap parking space	EA	1	$ 100,000	$ 100,000
7	Building - mechanical (heat/vent/HVAC) renovations	LS	1	$ 125,000	$ 125,000
8	Building - mechanical (plumbing) renovations	LS	1	$ 125,000	$ 125,000
9	Building - electrical and controls renovations	LS	1	$ 125,000	$ 125,000
10	Water treament equip. & piping	LS	1	$ 450,000	$ 450,000
11	Yard Piping Upgrades	LS	1	$ 75,000	$ 75,000
12	Standby generator auto transfer switch	EA	1	$ 75,000	$ 75,000
13	Bulk Fuel (5K gal) and Day (25 gal) Tanks	LS	1	$ 30,000	$ 30,000
14	Washers (includes shipment, install and train)	EA	4	$ 7,000	$ 28,000
15	Dryers (includes shipment, install and train)	EA	2	$ 5,000	$ 10,000
16	Bath/Shower Replacement	SF	200	$ 300	$ 60,000
17	Other equipment & furnishings	LS	1	$ 125,000	$ 125,000
				Subtotal:	**$ 2,138,000**
18	Construction Contingency	18%			$ 385,000
				Construction Total:	**$ 2,523,000**

Non Construction

Item	Description	Unit	Quantity	Unit cost	Extended Cost
1	Design/Permitting	10%			$ 253,000
2	Construction Management	10%			$ 253,000
3	Agency Admin	8%			$ 202,000
				Non Construction Total:	**$ 708,000**
				Project Total:	**$ 3,231,000**

Assumptions/Notes:

1 Assumes project will be designed and constructed under force account methods.

2 Costs shown above are based on typical costs for similar projects in rural Alaska.

Capital Cost Estimate - Concept Level
PER Tununak Alternative #3 - New Modular Washeteria/Water Treatment Plant

Construction

Item	Description	Unit	Quantity	Unit cost	Extended Cost (Roundup to the nearest $1,000)
1	Mob/Demob	LS	1	$ 50,000	$ 50,000
2	Modular Building (Inc shipment, erection and foundation)	SF	3,040	$ 300	$ 912,000
3	Sitework	LS	1	$ 15,000	$ 15,000
4	Access Ramp	EA	1	$ 50,000	$ 50,000
5	Mechanical - Heating and Ventilation	LS	1	$ 90,000	$ 90,000
6	Mechanical - Plumbing	LS	1	$ 50,000	$ 50,000
7	Electrical & Controls	LS	1	$ 100,000	$ 100,000
8	Water treament equip. & piping	LS	1	$ 450,000	$ 450,000
9	Yard piping upgrades/utilidor extensions/connections	LF	150	$ 250	$ 38,000
10	Standby generator auto transfer switch	EA	1	$ 75,000	$ 75,000
11	Bulk Fuel (5K gal) and Day (25 gal) Tanks	LS	1	$ 25,000	$ 25,000
12	Washers	EA	5	$ 7,000	$ 35,000
13	Dryers	EA	5	$ 5,000	$ 25,000
14	Other equipment & furnishings	LS	1	$ 100,000	$ 100,000
				Subtotal:	**$ 2,015,000**
15	Construction Contingency	15%			$ 303,000
				Construction Total:	**$ 2,318,000**

Non Construction

Item	Description	Unit	Quantity	Unit cost	Extended Cost
16	Design/Permitting	10%			$ 232,000
17	Construction Management	8%			$ 186,000
18	Agency Admin	8%			$ 186,000
				Non Construction Total:	**$ 604,000**
				Project Total:	**$ 2,922,000**

Assumptions/Notes:

1 Assumes modular building will be lump sum bid and remainder project scope items constructed under force account me
2 Costs shown above are based on typical costs for similar projects in rural Alaska.
3 Modular building includes finished bathrooms/showers

Appendix B Water Demand Estimates

Tununak Washeteria Water Demand

Base Water Demands

Clinic	100	gpd	Applies to all alternatives

Alternative 1: No Build

No design flow estimates necessary

Alternative 2:

Type	Use/Day	Gal/Use	Gal/Day	
Showers	10	10	100	
Washers	10	14.1	141	
Toilets/Sinks	20	2.5	50	
Backwash WTP*	150	1	150	
Clinic			100	
		Total	**541**	gpd

*Assumes 5 minutes per day at 30 gpm

Alternative 3:

Type	Use/Day	Gal/Use	Gal/Day	
Showers	20	10	100	
Washers	30	14.1	423	
Toilets/Sinks	20	2.5	50	
Backwash WTP*	150	1	150	
Clinic			100	
		Total	**823**	gpd

*Assumes 5 minutes per day at 30 gpm

Alternative 4:

Type	Use/Day	Gal/Use	Gal/Day	
Showers	20	10	100	
Washers	30	14.1	423	
Toilets/Sinks	20	2.5	50	
Backwash WTP*	150	1	150	
Clinic			100	
		Total	**823**	gpd

*Assumes 5 minutes per day at 30 gpm

Appendix C Population Growth Estimate

Bethel Census Area Population by Age and Sex, and Components of Change: 2015 to 2045

Return

Components of Population Change, 2015-2045

	Average Annual				
	Births	Deaths	Net Migration	Population Change	Growth Rate
2015-2020	463	122	-183	158	0.9%
2020-2025	471	131	-181	159	0.8%
2025-2030	482	142	-177	163	0.8%
2030-2035	498	153	-166	179	0.9%
2035-2040	530	161	-153	216	1.0%
2040-2045	570	166	-139	265	1.1%

Note: Average annual numbers are rounded to whole numbers.

Source: Alaska Department of Labor and Workforce Development, Research and Analysis Section

Tununak Population 2010-2017 Growth Calculation

2010 Population	327
2017 Population	387
% Growth	2.40%

Tununak Population Future Growth Calculation

2017 Population	387	
Bethel Census Area	18134	
% Tununak of BCA	2.1%	
Est. BCA 2037	21822	Sourced from AKDOL BCA Projections
Est. Tununak 2037	466	

Appendix D Supporting Documentation

After recording return to:
Native Village of Tununak IRA Council
Attn:. Tribal Council
P.O. Box 77
Tununak, Alaska 99681

Bethel Recording District

QUITCLAIM DEED

The GRANTOR, TUNUNAK TRADITIONAL COUNCIL, whose address is P.O. Box 97, Tununak, Alaska 99681, for and in consideration of the sum of Ten Dollars ($10.00) lawful money of the United States of America and other good and valuable consideration in hand paid, the receipt and sufficiency of which is hereby acknowledged, does hereby convey and quitclaim to NATIVE VILLAGE OF TUNUNAK IRA COUNCIL, a federally-recognized Indian tribe, whose address is P.O. Box 77, Tununak, Alaska 99681, GRANTEE, as successor to the assets and liabilities of the dissolved City of Tununak, all right, title, and interest it has, if any, in and to the following described real property located in the Bethel Recording District, Fourth Judicial District, State of Alaska:

> Lots 1, 2 and 3, Block 1; Lot 7, Block 2; Lots 1 and 6, Block 3; Lots 4, 5, 7 and 8, Block 4; Lots 2, 4, 5, 9 and 10, Block 5; Lots 1, 3 and 4, Block 6; Lots 3, 6 and 7, Block 7; Lots 1, 3, 4 and 5, Block 8; Lot 2, Block 9; Lots 1, 2 and 3, Block 10; of Tract "A" as shown on the official plat of U.S. Survey 4028, Tununak Townsite, as accepted by the Chief, Division of Cadastral Survey, for the Director, on February 3, 1972.
>
> Lots 1, 2, 3 and 5, Block 1; Lots 1, 2, 3, 4 and 5, Block 2; Lots 1, 2 and 3, Block 3; Lots 1 through 15, Block 4; All of Block 5; of Tract "B" as shown on the official plat of U.S. Survey 4028, Tununak Townsite, as accepted by the Chief, Division of Cadastral Survey for the Director on February 3, 1972.
>
> Lots 1 through 16, Block 1 and All of Blocks 2 and 3 of Tract "C", as shown on the official plat of U.S. Survey 4028, Tununak Townsite, as accepted by the Chief, Division of Cadastral Survey, for the Director on February 3, 1972.

All of Tract "D" as shown on the official plat of U.S. Survey 4028, Townsite of Tununak as accepted by the Chief, Division of Cadastral Survey, for the Director on February 3, 1972, excepting:

- Tract D-2 as shown on Plat No. 79-12 which was a deeded to the AVCP Housing Authority by quitclaim deed dated June 1, 1974 and recorded at Book 27, page 363, Bethel Recording District.

- A conveyance to United Utilities, Inc. dated August 11, 1981, and recorded in book 31, page 6, Bethel Recording office.

- Lots 1, 2, 3, 4 and 5 of Block 1; Lots 1, 2, 3, 4, 5 and 6 of Block 2, a subdivision of D-1, U.S. Survey 4028, according to the Tununak Subdivision North Addition plat filed under 89-6, Bethel Recording District which were deeded to the AVCP Housing Authority.

TOGETHER WITH all improvements currently located thereon, if any, and all rights, privileges, easements, tenements, hereditaments, and appurtenances of Grantor pertaining to such property, if any.

SUBJECT TO:

Conditions for public use specified in that certain "Memorandum of Agreement to Convey and Accept Assets and Liabilities of the Dissolved City of Tununak", between the State of Alaska and the Grantor, recorded January 28, 1997 in the Bethel Recording District, Fourth Judicial District, State of Alaska, as assigned to the Grantee, whereby the Grantee assumed the rights and obligations of the Grantor thereunder.

Easements and reservations of record.

Easements, if any, necessary to ensure to access to navigable or public waters pursuant to AS 38.05.127.

Valid existing rights, if any:

Excluding therefrom, however, all land underlying any navigable waters, if any, which may be located within the described real property.

Save and Except, those restrictions appearing in the Federal Patent or other conveyance by which this the State of Alaska acquired title.

To Have and To Hold the said land, together with the tenements, hereditaments and appurtenances thereunto appertaining, unto the Grantee, subject to the conditions and requirements of transfer said land to a future organized municipality, if any, or the State of Alaska, without consideration, upon request by a future organized municipality or the State of Alaska, for the reasons specified and agreed to in the "Memorandum of Agreement To Convey and Accept Assets and Liabilities of the Dissolved City of Tununak", referenced above.

A power of termination in the State, such that if Grantee or an agent or trustee acting for the Grantee ever restricts use of the property in a manner inconsistent with paragraph 1 of the "Memorandum of Agreement To Convey and Accept Assets and Liabilities of the Dissolved City of Tununak", then by operation of law, the State shall have the immediate right to terminate all of Grantee's right and interest in the property and to reenter and take possession of the property.

DATED this 15 day of April, 2016.

GRANTOR: **TUNUNAK TRADITIONAL COUNCIL**

By: [signature]
Amy Kanrilak
Its: president

STATE OF ALASKA)
) ss
___ JUDICIAL DISTRICT)

The foregoing Quitclaim Deed was acknowledged before me this 15 day of April, 2016, by Amy Kanrilak, President, of TUNUNAK TRADITIONAL COUNCIL, on behalf of the organization.

[signature] USPO
Notary Public for the State of Alaska
My Commission Expires: ________

TUNUNAK ALASKA
APR 15 2016
USPS 99681-9998

STATE CONSENT:
The State of Alaska, through the Alaska Department of Commerce, Community, and Economic Development, Division of Community and Regional Affairs (successor to the Alaska Department of Community and Regional Affairs), whose address is P.O. Box 110809, Juneau, Alaska 99811-0809, hereby consents to the execution and delivery of this Quitclaim Deed by the Tununak Traditional Council, and the conveyance of Tununak Traditional Council's right, title, and interest in and to the aforementioned property to the Native Village of Tununak IRA Council, to the extent set forth in therein.

Dated this 9th day of August, 2016.

STATE OF ALASKA
DEPARTMENT OF COMMERCE,
COMMUNITY, AND ECONOMIC
DEVELOPMENT

By: [signature]
Chris Hladick
Its: Commissioner of Commerce Community & Economic Development

STATE OF ALASKA)
) ss
________ JUDICIAL DISTRICT)

The foregoing consent to execution and delivery of Quitclaim Deed was acknowledged before me this 9th day of August, 2016, by Linda Mattson, Executive Administrator as an authorized representative and on behalf of the State of Alaska, Department of Commerce, Community, and Economic Development, for the uses and purposes set forth therein.

STATE OF ALASKA
OFFICIAL SEAL
Linda Mattson
NOTARY PUBLIC
My Commission Expires With Office

[signature] Linda Mattson
Notary Public for the State of Alaska
My Commission Expires: With office

NATIVE VILLAGE OF TUNUNAK
RESOLUTION # 2015-62

A Resolution requesting Planning Project Funding through the State of Alaska, Village Safe Water Program

WHEREAS: The Native Village of Tununak, hereinafter called the Council, is the governing body of Tununak, Alaska, and

WHEREAS: The Department of Environmental Conservation/Village Safe Water Program, hereinafter called VSW, may provide assistance necessary to address the following sanitation facility planning need in the community: *lack of a community laundromat and shower facility and advanced age of the water plant, and failing on-site system* and

WHEREAS: The Council desires to provide adequate sanitation facilities for residents of the community and has determined the following project to be the highest priority for sanitation facility planning for the community: Plan for a New Tununak Washeteria-Water Treatment Plant, including Wastewater Disposal,

NOW THEREFORE BE IT RESOLVED, that the Council hereby requests the Governor and Legislature to appropriate $75,000 through the VSW Program to complete the planning project identified above.

BE IT FURTHER RESOLVED, that Susie Walter (Chief, or President) is hereby authorized to negotiate, execute, and administer any and all documents, contracts and agreements required for granting funds to the Native Village of Tununak and managing funds on behalf of this entity, including any subsequent amendments to said agreements.

BE IT FURTHER RESOLVED that the Council hereby authorizes VSW or its representatives to enter upon or cross community land for the purposes of assisting the Council in carrying out this project.

BE IT FURTHER RESOLVED that the Council will cooperate with the provisions of needed agreements entered into between the Council and VSW, and that said provisions will be duly carried out.

I, the undersigned, hereby certify that the Council is composed of 5 members, of whom 5 constituting a QUORUM, were present and that the foregoing resolution was **PASSED AND APPROVED** by the Council this 9th day of January, ~~2014~~. 2015

Vote: 5 Yeas Ø Nays

Signed Susie Walter
Chief, or President

[signature]
ATTEST: City Clerk or Council Member

PHS/Water Sewer

2014

BUDGETED OPERATING EXPENDITURES *Administration and Planning*

Month:	Acctual Expense report	Budget	Current Expenditures	Prior Expenditures	Year to Date Expenditures	Balance
FY	Report #					
Personal Services:	Salaries		$ 25,573.25		$ 25,573.25	$ (25,573.25)
	Stipends		$ -		$ -	$ -
	Payroll Taxes		$ -		$ -	$ -
	Workmen Compensation				$ -	$ -
	Retirement/Pension				$ -	$ -
	Other:Mobilization				$ -	$ -
	Other:				$ -	$ -
	Total Personal Services:	$ -	$ 25,573.25	$ -	$ 25,573.25	$ (25,573.25)
Travel:	Airfare				$ -	$ -
	Per Diem				$ -	$ -
	Training, Workshops & Conference Fees				$ -	$ -
	Other:				$ -	$ -
	Other:				$ -	$ -
	Total Travel:	$ -	$ -	$ -	$ -	$ -
Facility Expenses:	Telephone	$ -	$ -		$ -	$ -
	Rent	$ -			$ -	$ -
	Electricity		$ 6,063.47		$ 6,063.47	$ (6,063.47)
	Water	$ -	$ -		$ -	$ -
	Sewage	$ -	$ -		$ -	$ -
	Repairs / Maintenance (buildings)				$ -	$ -
	Other:fuel oil		$ 4,642.35		$ 4,642.35	$ (4,642.35)
	Other:				$ -	$ -
	Total Facility Expenses:	$ -	$ 10,705.82	$ -	$ 10,705.82	$ (10,705.82)
Supplies	Office & Clerical Supplies				$ -	$ -
	Postage Supplies				$ -	$ -
	Copier Supplies				$ -	$ -
	Other:	$ -	$ 1,171.09		$ 1,171.09	$ (1,171.09)
	Other:				$ -	$ -
	Total Supplies	$ -	$ 1,171.09	$ -	$ 1,171.09	$ (1,171.09)
Equipment	Equipment				$ -	$ -
	Vehicle / Equipment Maintenance				$ -	$ -
	Other:				$ -	$ -
	Other:				$ -	$ -
	Total Equipment:	$ -	$ -	$ -	$ -	$ -
Other Operating Expenses:	Interest & Late Charges				$ -	$ -
	Insurance & Bonding				$ -	$ -
	Memberships Dues & Fees / Subcription				$ -	$ -
	Bank Charges				$ -	$ -
	Contractual: Legal Services				$ -	$ -
	Contractual: Accounting/Audit Services				$ -	$ -
	Other: Search And Rescue				$ -	$ -
	Other:Festival Donation				$ -	$ -
	Other:Youth Dontion				$ -	$ -
	Total Other:		$ -	$ -	$ -	$ -
TOTAL EDUCATION HOUSING						
	ASSISTANCE BUDGET:	$ -	$ 37,450.16	$ -	$ 37,450.16	$ (37,450.16)

PHS/Water Sewer

2015

BUDGETED OPERATING EXPENDITURES *Administration and Planning*

Month:	Acctual Expense report	Budget	Current	Prior	Year to Date	Balance
FY	Report #		Expenditures	Expenditures	Expenditures	
Personal	Salaries		$ 27,079.00		$ 27,079.00	$ (27,079.00)
Services:	Stipends		$ -		$ -	$ -
	Payroll Taxes		$ -		$ -	$ -
	Workmen Compensation				$ -	$ -
	Retirement/Pension				$ -	$ -
	Other:Mobilization				$ -	$ -
	Other:				$ -	$ -
	Total Personal Services:	$ -	$ 27,079.00	$ -	$ 27,079.00	$ (27,079.00)
Travel:	Airfare				$ -	$ -
	Per Diem				$ -	$ -
	Training, Workshops & Conference Fees				$ -	$ -
	Other:				$ -	$ -
	Other:				$ -	$ -
	Total Travel:	$ -	$ -	$ -	$ -	$ -
Facility	Telephone	$ -	$ -		$ -	$ -
Expenses:	Rent	$ -			$ -	$ -
	Electricity		$ 6,764.21		$ 6,764.21	$ (6,764.21)
	Water	$ -	$ -		$ -	$ -
	Sewage	$ -	$ -		$ -	$ -
	Repairs / Maintenance (buildings)				$ -	$ -
	Other:fuel oil		$ 6,116.00		$ 6,116.00	$ (6,116.00)
	Other:				$ -	$ -
	Total Facility Expenses:	$ -	$ 12,880.21	$ -	$ 12,880.21	$ (12,880.21)
Supplies	Office & Clerical Supplies				$ -	$ -
	Postage Supplies				$ -	$ -
	Copier Supplies				$ -	$ -
	Other:	$ -	$ 792.00		$ 792.00	$ (792.00)
	Other:				$ -	$ -
	Total Supplies	$ -	$ 792.00	$ -	$ 792.00	$ (792.00)
Equipment	Equipment				$ -	$ -
	Vehicle / Equipment Maintenance				$ -	$ -
	Other:				$ -	$ -
	Other:				$ -	$ -
	Total Equipment:	$ -	$ -	$ -	$ -	$ -
Other	Interest & Late Charges				$ -	$ -
Operating	Insurance & Bonding				$ -	$ -
Expenses:	Memberships Dues & Fees / Subcription				$ -	$ -
	Bank Charges				$ -	$ -
	Contractual: Legal Services				$ -	$ -
	Contractual: Accounting/Audit Services				$ -	$ -
	Other: Search And Rescue				$ -	$ -
	Other:Festival Donation				$ -	$ -
	Other:Youth Dontion				$ -	$ -
	Total Other:		$ -	$ -	$ -	$ -
TOTAL EDUCATION HOUSING						
	ASSISTANCE BUDGET:	$ -	$ 40,751.21	$ -	$ 40,751.21	$ (40,751.21)

PHS/Water Sewer

2016

BUDGETED OPERATING EXPENDITURES *Administration and Planning*

		Budget	Current Expenditures	Prior Expenditures	Year to Date Expenditures	Balance
Month:	**Acctual Expense report**					
FY	**Report #**					
Personal Services:	Salaries		$ 27,015.43		$ 27,015.43	$ (27,015.43)
	Stipends		$ -		$ -	$ -
	Payroll Taxes		$ -		$ -	$ -
	Workmen Compensation				$ -	$ -
	Retirement/Pension				$ -	$ -
	Other:Mobilization				$ -	$ -
	Other:				$ -	$ -
	Total Personal Services:	$ -	$ 27,015.43	$ -	$ 27,015.43	$ (27,015.43)
Travel:	Airfare				$ -	$ -
	Per Diem				$ -	$ -
	Training, Workshops & Conference Fees				$ -	$ -
	Other:				$ -	$ -
	Other:				$ -	$ -
	Total Travel:	$ -	$ -	$ -	$ -	$ -
Facility Expenses:	Telephone	$ -	$ -		$ -	$ -
	Rent	$ -			$ -	$ -
	Electricity		$ 4,109.00		$ 4,109.00	$ (4,109.00)
	Water	$ -	$ -		$ -	$ -
	Sewage	$ -	$ -		$ -	$ -
	Repairs / Maintenance (buildings)				$ -	$ -
	Other:fuel oil		$ 5,214.00		$ 5,214.00	$ (5,214.00)
	Other:				$ -	$ -
	Total Facility Expenses:	$ -	$ 9,323.00	$ -	$ 9,323.00	$ (9,323.00)
Supplies	Office & Clerical Supplies				$ -	$ -
	Postage Supplies				$ -	$ -
	Copier Supplies				$ -	$ -
	Other:	$ -	$ 2,058.45		$ 2,058.45	$ (2,058.45)
	Other:				$ -	$ -
	Total Supplies	$ -	$ 2,058.45	$ -	$ 2,058.45	$ (2,058.45)
Equipment	Equipment				$ -	$ -
	Vehicle / Equipment Maintenance				$ -	$ -
	Other:				$ -	$ -
	Other:				$ -	$ -
	Total Equipment:	$ -	$ -	$ -	$ -	$ -
Other Operating Expenses:	Interest & Late Charges				$ -	$ -
	Insurance & Bonding				$ -	$ -
	Memberships Dues & Fees / Subcription				$ -	$ -
	Bank Charges				$ -	$ -
	Contractual: Legal Services				$ -	$ -
	Contractual: Accounting/Audit Services				$ -	$ -
	Other: Search And Rescue				$ -	$ -
	Other:Festival Donation				$ -	$ -
	Other:Youth Dontion				$ -	$ -
	Total Other:		$ -	$ -	$ -	$ -
TOTAL EDUCATION HOUSING ASSISTANCE BUDGET:		$ -	$ 38,396.88	$ -	$ 38,396.88	$ (38,396.88)

Laundry money collected

November			
11/7/2009	$	35.00	*
11/6/2009	$	50.00	*
11/8/2009	$	80.00	*
11/10/2009	$	44.75	*
11/13/2009	$	19.25	*
11/14/2009	$	25.00	*
11/17/2009	$	40.00	*
11/18/2009	$	35.00	*
11/19/2009	$	50.25	*
11/20/2009	$	25.00	*
11/21/2009	$	40.00	*
11/22/2009	$	29.00	*
11/15.16/2009	$	79.25	*
11/18/2009	$	40.00	*
11/19/2009	$	35.00	*
11/20/2009	$	50.25	*
11/23/2009	$	25.00	*
11/23/2009	$	40.00	*
11/23/2009	$	29.00	*
11/27/2009	$	55.00	*
11/28/2009	$	75.00	*
11/29/2009	$	25.00	*
Total	$	926.75	
12/4/2009	$	20.00	*
12/14/2009	$	82.00	*
12/17/2009	$	70.00	*
12/18/2009	$	35.00	*
12/19/2009	$	70.00	*
12/20/2009	$	35.25	*
12/22/2009	$	60.00	*
12/26/2009	$	73.50	*
Total	$	445.75	
1/6/2010	$	85.25	*
Total	$	85.25	
2/23/2010	$	95.00	*
2/24/2010	$	25.25	*
2/25/2010	$	40.00	*
Total	$	160.25	
3/1/2010	$	55.00	*
3/3/2010	$	45.00	*
3/15/2010	$	55.00	*
3/19/2010	$	60.00	*
3/22/2010	$	95.00	*
Total	$	310.00	
6/3/2010	$	49.75	*
6/4/2010	$	39.75	*
6/4/2010	$	35.00	*
6/7/2010	$	115.00	*
6/8/2010	$	20.00	*
6/12/2010	$	20.50	*

Closed on Mondays

4/1/2013	$	125.00
4/2/2013	$	115.00
	$	270.00
	$	65.00
	$	335.00
	$	115.00
	$	190.00
	$	76.00
	$	300.00
	$	110.00
	$	40.00
	$	60.00
	$	50.00
	$	20.00
4/29/2013	$	1,871.00
5/1/2013	$	70.00
	$	175.00
	$	65.00
	$	120.00
	$	50.00
	$	220.25
	$	145.00
	$	145.00
	$	35.00
	$	125.00
	$	30.00
	$	90.00
	$	35.00
5/28/2013	$	95.00
5/29/2013	$	55.00
	$	1,455.25
6/4/2013	$	100.00
	$	35.00
	$	205.00
	$	30.00
	$	25.00
	$	130.00
	$	50.00
	$	30.00
	$	125.00
	$	70.00
	$	60.00
	$	50.00
	$	300.00
	$	35.00
6/30/2013	$	130.00
	$	1,375.00
7/6/2013	$	90.00
	$	330.00

12/8/2014
12/9/2014
12/15/2014
12/17/2014
12/21/2014
12/23/2014

1/8/2015
1/12/2015
1/14/2015
1/15/2015
1/23/2015
1/24/2015
1/27/2015
1/28/2015

2/6/2015
2/8/2015
2/9/2015
2/12/2015
2/16/2015
2/17/2015
2/19/2015
2/19/2015
2/22/2015
2/24/2015

3/2/2015
3/3/2015
3/5/2015
3/6/2015
3/9/2015
3/11/2015
3/15/2015
3/16/2015
3/17/2015
3/19/2015
3/23/2015
3/24/2015
3/26/2015
3/29/2015

4/1/2015
4/3/2015
4/6/2015
4/7/2015
4/8/2015
4/9/2015
4/10/2015
4/13/2015
4/14/2015

6/13/2010	$	100.00	*		$	220.00	4/15/2015
6/17/2010	$	95.00	*		$	430.00	4/16/2015
6/18/2010	$	45.00	*		$	390.00	4/18/2015
6/23/2010	$	107.25	*		$	80.00	4/21/2015
6/17/2010	$	125.00	*	7/28/2013	$	325.00	4/22/2015
6/25/2010	$	30.25	*		$	1,865.00	4/28/2015
6/26/2010	$	45.00	*	8/7/2013	$	150.00	4/29/2015
6/27/2010	$	70.00	*		$	359.50	4/29/2015
6/28/2010	$	54.00	*		$	204.00	
Total	$	951.50			$	165.00	5/4/2015
7/1/2010	$	60.00	*		$	228.00	5/5/2015
7/2/2010	$	75.00	*		$	120.00	5/7/2015
7/3/2010	$	59.00	*		$	85.00	5/11/2015
7/4/2010	$	45.00	*		$	110.00	5/14/2015
7/9/2010	$	64.75	*		$	225.00	5/15/2015
7/9/2010	$	85.25	*		$	330.00	5/16/2015
7/10/2010	$	35.50	*	8/29/2013	$	120.00	5/21/2015
7/12/2010	$	49.50	*		$	2,096.50	5/22/2015
7/13/2010	$	40.00	*	9/4/2013	$	375.00	5/28/2015
7/14/2010	$	60.00	*		$	100.00	
7/15/2010	$	20.00	*		$	65.50	6/2/2015
7/17/2018	$	157.75	*		$	120.00	6/4/2015
7/22/2010	$	93.25	*		$	130.00	6/10/2015
7/27/2010	$	115.00	*		$	75.00	6/11/2015
7/28/2010	$	69.75	*		$	226.00	6/15/2015
7/29/2010	$	65.00	*		$	115.00	6/16/2015
	$	1,094.75		9/29/2013	$	90.00	6/19/2015
8/4/2010	$	113.25	*		$	1,296.50	6/22/2015
8/10/2010	$	60.25	*	10/1/2013	$	150.00	6/23/2015
8/11/2010	$	60.00	*		$	145.00	6/25/2015
8/5/2010	$	30.00	*		$	175.00	6/28/2015
8/6/2010	$	30.25	*		$	130.00	
8/7/2010	$	55.00	*		$	295.00	7/1/2015
8/21/2010	$	119.75	*		$	175.00	7/6/2015
8/22/2010	$	40.00	*		$	95.00	7/6/2015
8/23/2010	$	82.25	*		$	190.00	7/8/2015
8/25/2010	$	24.25	*		$	350.00	7/9/2015
8/26/2010	$	40.00	*		$	143.00	7/13/2015
8/27/2010	$	30.00	*		$	220.00	7/16/2015
8/30/2010	$	124.25	*		$	305.00	7/19/2015
8/31/2010	$	34.25	*		$	190.00	7/20/2015
	$	843.50			$	105.00	7/22/2015
9/1/2010	$	50.25	*		$	205.00	7/23/2015
9/7/2010	$	28.50	*		$	115.00	
9/16/2010	$	45.00	*		$	125.00	8/2/2015
9/17,18/10	$	124.25	*	10/31/2013	$	85.00	8/3/2015
9/23/2010	$	65.00	*		$	3,198.00	8/4/2015
9/28/2010	$	109.50	*	11/4/2013	$	130.00	8/5/2015
	$	422.50	*		$	335.00	8/6/2015
11/12/2010	$	130.00	*		$	300.00	8/8/2015
11/15/2010	$	106.00	*		$	95.00	8/10/2015
11/22/2010	$	183.00	*		$	80.00	8/12/2015

11/26/2010	$	1.50			$	270.00	8/13/2015
11/27/2010	$	29.00			$	80.00	8/19/2015
11/28/2010	$	2.50			$	130.00	8/20/2015
11/29/2010	$	2.00			$	130.00	8/25/2015
11/30/2010					$	250.00	8/29/2015
					$	110.00	
	$	454.00	*		$	171.00	9/1/2015
12/8/2010	$	261.26	*	11/27/2013	$	206.00	9/3/2015
12/8/2010	$	178.15	*		$	2,287.00	9/10/2015
12/10/2010	$	120.00	*	12/3/2013	$	190.00	9/11/2015
12/12/2010	$	40.00	token		$	145.00	9/14/2015
12/16/2010	$	40.00	token		$	30.00	9/17/2015
12/16/2010	$	200.25	token		$	151.00	9/22/2015
12/17/2010	$	80.00	token		$	70.00	9/28/2015
12/20/2010	$	150.00	token		$	90.00	
12/20/2010	$	195.00	token		$	40.00	10/5/2015
12/21/2010	$	45.00	token		$	181.00	10/7/2015
12/22/2010	$	95.00	token		$	65.00	10/11/2015
12/27/2010	$	160.00	token		$	35.00	10/13/2015
					$	195.00	10/25/2015
8/31/2011	$	77.00		12/26/2013	$	40.00	10/27/2015
					$	1,232.00	
9/1/2011	$	50.00		1/7/2014	$	55.00	11/1/2016
9/3/2011	$	50.00			$	50.00	11/2/2016
9/4/2011	$	95.00			$	125.00	11/3/2016
9/6/2011	$	20.00			$	185.00	11/8/2016
9/9/2011	$	40.00			$	180.00	11/12/2016
9/10/2011	$	65.00			$	85.00	11/13/2016
9/11/2011	$	50.00			$	140.00	11/17/2016
9/16/2011	$	10.00			$	170.00	11/18/2016
9/20/2011	$	20.00			$	110.00	11/20/2016
9/22/2011	$	5.00		1/28/2014	$	45.00	11/23/2016
9/24/2011	$	15.00			$	1,145.00	
9/25/2011	$	40.00		2/3/2014	$	205.00	12/1/2016
9/28/2011	$	130.00			$	125.00	12/6/2016
9/29/2011	$	230.00			$	105.00	12/9/2016
	$	820.00	$ -		$	90.00	12/15/2016
10/3/2011	$	125.00			$	330.25	12/16/2016
10/5/2011	$	179.25			$	80.00	12/21/2016
10/6/2011	$	100.00			$	270.00	12/22/2016
10/11/2011	$	367.75			$	35.00	12/26/2016
10/12/2011	$	125.50			$	25.00	12/29/2016
10/13/2011	$	110.00			$	25.00	
10/18/2011	$	485.00			$	145.00	1/2/2016
10/19/2011	$	95.00			$	50.00	1/4/2016
10/22/2011	$	175.00			$	45.00	1/7/2016
10/26/2011	$	280.00			$	60.00	1/11/2016
10/27/2011	$	125.00		2/27/2014	$	35.00	1/13/2016
10/28/2011	$	265.25			$	1,625.25	1/19/2016
	$	2,432.75	$ -	3/2/2014	$	115.00	1/21/2016
11/1/2011	$	65.00			$	30.00	1/23/2016
11/3/2011	$	175.00			$	20.00	1/26/2016

11/6/2011	$ 280.25			$ 50.00	1/29/2016
11/11/2011	$ 155.25			$ 25.00	
11/15/2011	$ 120.58			$ 50.00	2/3/2016
11/16/2011	$ 329.75			$ 75.00	2/4/2016
11/17/2011	$ 25.00			$ 170.00	2/8/2016
	$ 1,150.83	$ -		$ 245.00	2/8/2016
12/30/2011	$ 391.75			$ 60.00	2/11/2016
[redacted]				$ 70.00	2/13/2016
1/4/2012	$ 174.50			$ 150.00	2/17/2016
1/5/2012	$ 175.25			$ 240.25	2/22/2016
1/12/2012	$ 195.00			$ 165.00	2/24/2016
1/17/2012	$ 273.25			$ 100.00	2/25/2016
1/18/2012	$ 35.00			$ 89.80	2/29/2016
1/26/2012	$ 135.00		3/27/2014	$ 90.00	
1/27/2012	$ 294.00			$ 1,745.05	3/2/2016
	$ 1,282.00	$ -	4/1/2014	$ 199.00	3/6/2016
2/3/2012	$ 240.00			$ 55.00	3/9/2016
2/10/2012	$ 554.25			$ 25.00	3/11/2016
2/17/2012	$ 535.00			$ 85.00	3/16/2016
2/24/2012	$ 355.00			$ 120.02	3/18/2016
2/28/2012	$ 215.25			$ 60.00	3/21/2016
	$ 1,899.50	$ -		$ 75.00	3/23/2016
3/9/2012	$ 565.53			$ 30.00	3/24/2016
3/15/2012	$ 155.00			$ 80.00	3/28/2016
3/16/2012	$ 380.00			$ 190.25	3/29/2016
3/23/2012	$ 319.25			$ 359.00	
3/30/2012	$ 339.50			$ 125.00	4/3/2016
	$ 1,759.28	$ -		$ 205.00	4/5/2016
4/10/2012	$ 80.00			$ 165.00	4/7/2016
4/12/2012	$ 352.75			$ 55.00	4/12/2016
4/20/2012	$ 20.00			$ 75.00	4/14/2016
4/27/2012	$ 338.75			$ 196.00	4/17/2016
4/30/2012	$ 183.75			$ 79.00	4/22/2016
	$ 975.25	$ -		$ 40.00	4/27/2016
5/1/2012	$ 259.75		4/31/2014	$ 20.00	
5/2/2012	$ 215.00			$ 2,238.27	5/8/2016
5/3/2012	$ 165.25		5/1/2014	$ 115.00	5/10/2016
5/7/2012	$ 85.00			$ 250.00	5/12/2016
5/8/2012	$ 145.00			$ 85.00	5/15/2016
5/9/2012	$ 60.00			$ 115.00	5/18/2016
5/10/2012	$ 135.00			$ 115.00	5/19/2016
5/15/2012	$ 511.25			$ 175.00	5/24/2016
5/18/2012	$ 215.00			$ 80.00	
5/23/2012	$ 80.00			$ 38.00	6/1/2016
5/24/2012	$ 225.50			$ 68.00	6/2/2016
5/29/2012	$ 144.00			$ 93.90	6/5/2016
5/30/2012	$ 276.75			$ 152.00	6/12/2016
5/31/2012	$ 119.55			$ 69.00	6/13/2016
	$ 2,637.05	$ -		$ 24.00	6/16/2016
6/1/2012	$ 130.00		5/30/2014	$ 115.00	6/27/2016
6/4/2012	$ 170.50			$ 1,494.90	6/28/2016
6/7/2012	$ 165.00		6/3/2014	$ 107.00	

6/15/2012	$	199.75				$	69.00	7/5/2016
6/16/2012	$	235.50				$	66.00	7/7/2016
6/11/2012	$	130.25				$	88.99	7/14/2016
6/20/2012	$	90.00				$	142.00	7/19/2016
	$	1,121.00	$	-		$	53.00	7/25/2016
7/13/2012	$	124.00				$	22.00	7/27/2016
7/23/2012	$	30.00				$	81.00	7/28/2016
	$	154.00	$	-		$	172.00	
8/1/2012	$	25.00				$	75.00	8/4/2016
8/30/2012	$	40.00			6/30/2014	$	310.00	
	$	65.00	$	-		$	1,185.99	
9/5/2012	$	30.00			7/6/2014	$	310.00	
9/9/2012	$	45.00				$	54.00	
9/21/2012	$	65.00				$	56.00	
	$	140.00	$	-	7/10/2014	$	101.00	
10/2/2012	$	465.00			7/13/2014	$	168.00	
10/3/2012	$	276.00			7/16/2014	$	198.00	
10/4/2012	$	345.25			7/20/2014	$	105.00	
10/10/2012	$	115.00			7/21/2014	$	96.00	
10/12/2012	$	303.00			7/22/2014	$	33.00	
10/15/2012	$	358.75			7/23/2014	$	57.00	
10/17/2012	$	198.00			7/27/2014	$	298.00	
10/18/2012	$	200.00			7/29/2014	$	72.00	
10/21/2012	$	360.00			7/31/2014	$	59.00	
10/25/2012	$	70.00				$	1,607.00	
10/24/2012	$	84.90			8/1/2014	$	212.00	
10/26/2012	$	150.00			8/10/2014	$	281.00	
	$	2,925.90	$	-	8/12/2014	$	30.00	
11/6/2012	$	280.00			8/13/2014	$	24.00	
11/8/2012	$	195.00			8/14/2014	$	32.00	
11/13/2012	$	350.00			8/17/2014	$	152.00	
11/14/2012	$	70.00			8/18/2014	$	30.00	
11/15/2012	$	225.00			8/19/2014	$	31.75	
11/20/2012	$	131.00			8/20/2014	$	99.25	
11/23/2012	$	125.00			8/24/2014	$	85.00	
11/28/2012	$	150.75			8/25/2014	$	33.50	
	$	1,526.75	$	-	8/26/2014	$	42.00	
12/11/2012	$	20.00			8/27/2014	$	24.00	
12/21/2012	$	55.00			8/28/2014	$	51.00	
12/31/2012	$	245.00				$	1,127.50	
	$	320.00	$	-	9/1/2014	$	93.00	
1/31/2013	$	60.00			9/2/2014	$	118.00	
1/14/2013	$	260.00			9/9/2014	$	156.10	
1/15/2013	$	130.00			9/10/2014	$	33.00	
1/17/2013	$	200.00			9/11/2014	$	20.60	
1/22/2013	$	99.75			9/12/2014	$	64.10	
1/24/2013	$	185.00			9/15/2014	$	75.00	
1/28/2013	$	165.00			9/17/2014	$	72.00	
1/29/2013	$	50.00			9/18/2014	$	50.00	
1/30/2013	$	135.00			9/24/2014	$	243.30	
1/31/2013	$	121.00			9/25/2014	$	24.00	
	$	1,405.75	$	-	9/28/2014	$	184.00	

2/3/2013	$	160.00		
2/4/2013	$	185.00		
2/5/2013	$	50.00		
2/6/2013	$	130.00		
2/7/2013	$	165.00		
2/10/2013	$	130.00		
2/13/2013	$	95.00		
2/12/2013	$	100.00		
2/20/2013	$	45.00		
2/21/2013	$	40.00		
2/25/2013	$	95.00		
2/28/2013	$	170.00		
	$	1,365.00	$	-
3/1/2013	$	120.00		
3/4/2013	$	326.00		
3/5/2013	$	79.00		
3/6/2013	$	155.00		
3/7/2013	$	130.00		
3/11/2013	$	94.00		
3/12/2013	$	135.00		
3/13/2013	$	110.00		
	$	45.00		
	$	235.00		
	$	120.00		
	$	120.00		
	$	215.00		
	$	50.00		
	$	245.00		
	$	140.00		
	$	185.00		
3/28/2013	$	105.00		
	$	2,609.00	$	-

9/28/2014	$	57.00
		$ 1,190.10
10/6/2014	$	427.00
10/8/2014	$	26.00
10/9/2014	$	68.00
10/12/2014	$	250.00
10/13/2014	$	30.00
10/14/2014	$	87.00
10/15/2014	$	50.00
10/16/2014	$	66.00
10/20/2014	$	306.00
10/21/2014	$	39.00
10/22/2014	$	9.00
10/26/2014	$	125.00
10/24/2014	$	27.00
10/27/2014	$	165.00
10/28/2014	$	106.00
10/29/2014	$	16.00
10/30/2014	$	60.00
		$ 1,857.00
11/2/2014	$	156.00
11/4/2014	$	166.00
11/5/2014	$	189.00
11/6/2014	$	87.00
11/11/2014	$	271.00
11/13/2014	$	179.00
11/16/2014	$	143.00
11/17/2014	$	93.00
11/18/2014	$	48.00
11/19/2014	$	78.00
11/23/2014	$	219.75
11/24/2014	$	70.11
11/25/2014	$	85.00
11/26/2014	$	143.95
11/27/2014	$	58.00
		$ 1,986.81

Native Village of Tununak
Transaction Detail By Account
January 1, 2014 through March 15, 2016

Type	Date	Num	Name	Memo	Class	Clr	Split	Amount	Balance
Miscellaneous Income									
Deposit	01/02/2014			Reg Deposit	Tununak ...		FNBA Water & ...	378.06	378.06
Deposit	01/30/2014			Reg Deposit	Tununak ...		FNBA Water & ...	1,334.93	1,712.99
Deposit	02/12/2014			Reg Deposit	Tununak ...		FNBA Water & ...	1,040.79	2,753.78
Deposit	02/18/2014			Reg Deposit	Tununak ...		FNBA Water & ...	376.36	3,130.14
Deposit	03/21/2014			Reg Deposit	Tununak ...		FNBA Water & ...	1,038.93	4,169.07
Deposit	04/11/2014			Reg Deposit	Tununak ...		FNBA Water & ...	1,525.43	5,694.50
Deposit	04/14/2014			Reg Deposit	Tununak ...		FNBA Water & ...	1,229.24	6,923.74
Deposit	04/24/2014			Reg Deposit	Tununak ...		FNBA Water & ...	2,093.45	9,017.19
Deposit	05/12/2014			Reg Deposit	Tununak ...		FNBA Water & ...	1,000.14	10,017.33
Deposit	06/04/2014			Reg Deposit	Tununak ...		FNBA Water & ...	327.00	10,344.33
Deposit	06/04/2014			Reg Deposit	Tununak ...		FNBA Water & ...	1,851.00	12,195.33
Deposit	06/04/2014			Reg Deposit	Tununak ...		FNBA Water & ...	830.92	13,026.25
Deposit	07/16/2014			Reg Deposit	Tununak ...		FNBA Water & ...	536.06	13,562.31
Deposit	07/25/2014			Reg Deposit	Tununak ...		FNBA Water & ...	933.02	14,495.33
Deposit	08/04/2014			Reg Deposit	Tununak ...		FNBA Water & ...	348.05	14,843.38
Deposit	08/22/2014			Reg Depost	Tununak ...		FNBA Water & ...	1,256.00	16,099.38
Deposit	09/08/2014			Reg Deposit	Tununak ...		FNBA Water & ...	946.00	17,045.38
Deposit	10/03/2014			Reg Deposit	Tununak ...		FNBA Water & ...	100.00	17,145.38
Deposit	10/17/2014			Reg Deposit	Tununak ...		FNBA Water & ...	545.00	17,690.38
Deposit	10/17/2014			Reg Deposit	Tununak ...		FNBA Water & ...	1,372.25	19,062.63
Deposit	10/27/2014			Reg Deposit	Tununak ...		FNBA Water & ...	253.06	19,315.69
Deposit	10/27/2014			Reg Deposit	Tununak ...		FNBA Water & ...	1,717.77	21,033.46
Deposit	11/10/2014			Reg Deposit	Tununak ...		FNBA Water & ...	974.00	22,007.46
Deposit	12/08/2014			Reg Deposit	Tununak ...		FNBA Water & ...	340.00	22,347.46
Deposit	12/08/2014			Reg Deposit	Tununak ...		FNBA Water & ...	1,464.67	23,812.13
Deposit	12/22/2014			Reg Deposit	Tununak ...		FNBA Water & ...	900.00	24,712.13
Deposit	02/02/2015			Reg Deposit	Tununak ...		FNBA Water & ...	327.33	25,039.46
Deposit	02/02/2015			Reg Deposit	Tununak ...		FNBA Water & ...	1,083.85	26,123.31
Deposit	02/17/2015			Reg Deposit	Tununak ...		FNBA Water & ...	417.00	26,540.31
Deposit	02/17/2015			Reg Deposit	Tununak ...		FNBA Water & ...	397.00	26,937.31
Deposit	03/02/2015			Reg Deposit	Tununak ...		FNBA Water & ...	340.00	27,277.31
Deposit	03/23/2015			Reg Deposit	Tununak ...		FNBA Water & ...	75.00	27,352.31
Deposit	03/23/2015			Reg Deposit	Tununak ...		FNBA Water & ...	1,078.68	28,430.99
Deposit	04/20/2015			Reg Deposit	Tununak ...		FNBA Water & ...	1,034.00	29,464.99
Deposit	05/13/2015			Reg Deposit	Tununak ...		FNBA Water & ...	411.00	29,875.99
Deposit	05/29/2015			Reg Deposit	Tununak ...		FNBA Water & ...	607.00	30,482.99
Deposit	06/03/2015			Reg Deposit	Tununak ...		FNBA Water & ...	765.00	31,247.99
Deposit	06/30/2015			Reg Deposit	Tununak ...		FNBA Water & ...	2,388.52	33,636.51
Deposit	07/17/2015			Reg Deposit	Tununak ...		FNBA Water & ...	733.22	34,369.73
Deposit	07/27/2015			Reg Deposit	Tununak ...		FNBA Water & ...	683.93	35,053.66
Deposit	08/10/2015			Reg Deposit	Tununak ...		FNBA Water & ...	577.00	35,630.66
Deposit	08/24/2015			Reg Deposit	Tununak ...		FNBA Water & ...	754.78	36,385.44
Deposit	09/08/2015			Reg Deposit	Tununak ...		FNBA Water & ...	1,050.00	37,435.44
Deposit	10/09/2015			Reg Deposit	Tununak ...		FNBA Water & ...	106.66	37,542.10
Deposit	10/09/2015			Reg Deposit	Tununak ...		FNBA Water & ...	2,350.21	39,892.31
Deposit	10/19/2015			Reg Deposit	Tununak ...		FNBA Water & ...	1,751.69	41,644.00
Deposit	11/09/2015			Reg Deposit	Tununak ...		FNBA Water & ...	850.00	42,494.00
Deposit	11/09/2015			Reg Deposit	Tununak ...		FNBA Water & ...	2,443.88	44,937.88
Deposit	11/09/2015			Reg Deposit	Tununak ...		FNBA Water & ...	10,794.00	55,731.88
Deposit	12/07/2015			Reg Deposit	Tununak ...		FNBA Water & ...	50.00	55,781.88
Deposit	12/07/2015			Reg Deposit	Tununak ...		FNBA Water & ...	1,266.71	57,048.59
Deposit	12/28/2015			Reg Deposit	Tununak ...		FNBA Water & ...	729.98	57,778.57
Deposit	01/08/2016			Reg Deposit	Tununak ...		FNBA Water & ...	1,183.07	58,961.64
Deposit	02/01/2016			Reg Deposit	Tununak ...		FNBA Water & ...	75.00	59,036.64
Deposit	02/01/2016			Reg Deposit	Tununak ...		FNBA Water & ...	912.00	59,948.64
Deposit	02/25/2016			Reg Deposit	Tununak ...		FNBA Water & ...	50.00	59,998.64
Deposit	02/25/2016			Reg Deposit	Tununak ...		FNBA Water & ...	931.00	60,929.64
Deposit	02/29/2016			Reg Deposit	Tununak ...		FNBA Water & ...	436.47	61,366.11
Total Miscellaneous Income								61,366.11	61,366.11
TOTAL								61,366.11	61,366.11

Comprehensive Energy Audit
For
Tununak Water Treatment Plant & Well House

Prepared For

Native Village of Tununak

June 12, 2012

Prepared By:

ANTHC-DEHE
1901 Bragaw Suite, Suite 200
Anchorage, Alaska 99508

Table of Contents

PREFACE

The Energy Projects Group at the Alaska Native Tribal Health Consortium (ANTHC) prepared this document for the Native Village of Tununak. The authors of this report are Carl Remley, Certified Energy Auditor (CEA) and Gavin Dixon.

The purpose of this report is to provide a comprehensive document that summarizes the findings and analysis that resulted from an energy audit conducted over the past couple months by the Energy Projects Group of ANTHC. This report analyzes historical energy use and identifies costs and savings of recommended energy efficiency measures. Discussions of site specific concerns and an Energy Efficiency Action Plan are also included in this report.

ACKNOWLEDGMENTS

The Energy Projects Group gratefully acknowledges the assistance of James James, Tribal Administrator, and Vincent, Water Plant Operator for the Native Village of Tununak.

1. EXECUTIVE SUMMARY

This report was prepared for the Native Village of Tununak. The scope of the audit focused on Tununak Water Treatment Plant & Well House. The scope of this report is a comprehensive energy study, which included an analysis of building shell, interior and exterior lighting systems, HVAC systems, and plug loads.

Based on electricity and fuel oil prices in effect at the time of the audit, the annual predicted energy costs for the buildings analyzed are $7,847 for Electricity and $14,672 for #1 Oil. The total energy costs are $22,519 per year.

It should be noted that this facility received the power cost equalization (PCE) subsidy from the state of Alaska last year. If this facility had not received PCE, total electrical costs would have been $18,309.

Table 1.1 below summarizes the energy efficiency measures analyzed for the Tununak Water Treatment Plant & Well House. Listed are the estimates of the annual savings, installed costs, and two different financial measures of investment return.

Table 1.1
PRIORITY LIST – ENERGY EFFICIENCY MEASURES

Rank	Feature	Improvement Description	Annual Energy Savings	Installed Cost	Savings to Investment Ratio, SIR[1]	Simple Payback (Years)[2]
1	Other Electrical - Controls Retrofit: Heat Tape	Disconnect hard wired heat tape on the old watering point loop.	$844	$10	522.19	0.0
2	Other Electrical - Controls Retrofit: Well House Electrical Load	Lower heating set point to 40 degrees in the well house.	$1,030	$500	17.34	0.5
3	HVAC And DHW	Clean and tune boilers to increase efficiency. This estimate assumes a technician travels from Anchorage and works with the water plant operator and teaches him how to clean the boiler.	$526	$4,000	2.29	7.6
4	Cathedral Ceiling: WTP	Fill empty 2x6 cavity with R-19 fiberglass batts.	$1,127	$12,230	2.18	10.9
5	Exposed Floor: WTP	Remove insulation from 2x6 cavity and replace with R-21 dense-pack blown-in insulation.	$663	$10,024	1.57	15.1
6	Window: WTP	Remove existing glass and replace with double pane,low-E,argon glass.	$51	$786	1.13	15.3
	TOTAL, cost-effective measures		**$4,241**	**$27,551**	**2.41**	**6.5**
	The following measures were *not* found to be cost-effective:					
7	Window/Skylight: WTP	Remove existing glass and replace with double pane,low-E,argon glass.	$85	$1,573	0.94	18.5

Table 1.1 PRIORITY LIST – ENERGY EFFICIENCY MEASURES						
Rank	Feature	Improvement Description	Annual Energy Savings	Installed Cost	Savings to Investment Ratio, SIR[1]	Simple Payback (Years)[2]
	TOTAL, all measures		$4,326	$29,123	2.33	6.7

Table Notes:

[1] Savings to Investment Ratio (SIR) is a life-cycle cost measure calculated by dividing the total savings over the life of a project (expressed in today's dollars) by its investment costs. The SIR is an indication of the profitability of a measure; the higher the SIR, the more profitable the project. An SIR greater than 1.0 indicates a cost-effective project (i.e. more savings than cost). Remember that this profitability is based on the position of that Energy Efficiency Measure (EEM) in the overall list and assumes that the measures above it are implemented first.

[2] Simple Payback (SP) is a measure of the length of time required for the savings from an EEM to payback the investment cost, not counting interest on the investment and any future changes in energy prices. It is calculated by dividing the investment cost by the expected first-year savings of the EEM.

With all of these energy efficiency measures in place, the annual utility cost can be reduced by $4,326 per year, or 19.2% of the buildings' total energy costs. These measures are estimated to cost $29,123, for an overall simple payback period of 6.7 years. If only the cost-effective measures are implemented, the annual utility cost can be reduced by $4,241 per year, or 18.8% of the buildings' total energy costs. These measures are estimated to cost $27,551, for an overall simple payback period of 6.5 years.

Table 1.2 below is a breakdown of the annual energy cost across various energy end use types, such as Space Heating and Water Heating. The first row in the table shows the breakdown for the building as it is now. The second row shows the expected breakdown of energy cost for the building assuming all of the retrofits in this report are implemented. Finally, the last row shows the annual energy savings that will be achieved from the retrofits.

Table 1.2 Annual Energy Cost Estimate										
Description	Space Heating	Space Cooling	Water Heating	Lighting	Refrigeration	Other Electrical	Cooking	Clothes Drying	Ventilation Fans	Total Cost
Existing Building	$6,638	$0	$2,771	$809	$0	$2,619	$5,769	$3,914	$0	**$22,519**
With All Proposed Retrofits	$4,428	$0	$2,528	$809	$0	$745	$5,769	$3,914	$0	**$18,193**
SAVINGS	$2,210	$0	$243	$0	$0	$1,873	$0	$0	$0	**$4,326**

2. AUDIT AND ANALYSIS BACKGROUND

2.1 Program Description

This audit included services to identify, develop, and evaluate energy efficiency measures at the Tununak Water Treatment Plant & Well House. The scope of this project included evaluating building shell, lighting and other electrical systems, and HVAC equipment, motors and pumps. Measures were analyzed based on life-cycle-cost techniques, which include the initial cost of the equipment, life of the equipment, annual energy cost, annual maintenance cost, and a discount rate of 3.0%/year in excess of general inflation.

2.2 Audit Description

Preliminary audit information was gathered in preparation for the site survey. The site survey provides critical information in deciphering where energy is used and what opportunities exist within a building. The entire site was surveyed to inventory the following to gain an understanding of how each building operates:

- Building envelope (roof, windows, etc.)
- Heating, ventilation, and air conditioning equipment (HVAC)
- Lighting systems and controls
- Building-specific equipment
- Water consumption, treatment (optional) & disposal

The building site visit was performed to survey all major building components and systems. The site visit included detailed inspection of energy consuming components. Summary of building occupancy schedules, operating and maintenance practices, and energy management programs provided by the building manager were collected along with the system and components to determine a more accurate impact on energy consumption.

Details collected from Tununak Water Treatment Plant & Well House enable a model of the building's energy usage to be developed, highlighting the building's total energy consumption, energy consumption by specific building component, and equivalent energy cost. The analysis involves distinguishing the different fuels used on site, and analyzing their consumption in different activity areas of the building.

Tununak Water Treatment Plant & Well House is classified as being made up of the following activity areas:

1) Water Plant, Washeteria & Well House: 2,048 square feet

In addition, the methodology involves taking into account a wide range of factors specific to the building. These factors are used in the construction of the model of energy used. The factors include:

- Occupancy hours

- Local climate conditions
- Prices paid for energy

2.3. Method of Analysis

Data collected was processed using AkWarm© Energy Use Software to estimate energy savings for each of the proposed energy efficiency measures (EEMs). The recommendations focus on the building envelope; HVAC; lighting, plug load, and other electrical improvements; and motor and pump systems that will reduce annual energy consumption.

EEMs are evaluated based on building use and processes, local climate conditions, building construction type, function, operational schedule, existing conditions, and foreseen future plans. Energy savings are calculated based on industry standard methods and engineering estimations.

Our analysis provides a number of tools for assessing the cost effectiveness of various improvement options. These tools utilize **Life-Cycle Costing**, which is defined in this context as a method of cost analysis that estimates the total cost of a project over the period of time that includes both the construction cost and ongoing maintenance and operating costs.

Savings to Investment Ratio (SIR) = **Savings** divided by **Investment**

Savings includes the total discounted dollar savings considered over the life of the improvement. When these savings are added up, changes in future fuel prices as projected by the Department of Energy are included. Future savings are discounted to the present to account for the time-value of money (i.e. money's ability to earn interest over time). The **Investment** in the SIR calculation includes the labor and materials required to install the measure. An SIR value of at least 1.0 indicates that the project is cost-effective—total savings exceed the investment costs.

Simple payback is a cost analysis method whereby the investment cost of a project is divided by the first year's savings of the project to give the number of years required to recover the cost of the investment. This may be compared to the expected time before replacement of the system or component will be required. For example, if a boiler costs $12,000 and results in a savings of $1,000 in the first year, the payback time is 12 years. If the boiler has an expected life to replacement of 10 years, it would not be financially viable to make the investment since the payback period of 12 years is greater than the project life.

The Simple Payback calculation does not consider likely increases in future annual savings due to energy price increases. As an offsetting simplification, simple payback does not consider the need to earn interest on the investment (i.e. it does not consider the time-value of money). Because of these simplifications, the SIR figure is considered to be a better financial investment indicator than the Simple Payback measure.

Measures are implemented in order of cost-effectiveness. The program first calculates individual SIRs, and ranks all measures by SIR, higher SIRs at the top of the list. An individual measure must have an individual SIR>=1 to make the cut. Next the building is modified and re-simulated with the highest ranked measure included. Now all remaining measures are re-evaluated and ranked, and the next most cost-effective measure is implemented. AkWarm goes through this iterative process until all appropriate measures have been evaluated and installed.

It is important to note that the savings for each recommendation is calculated based on implementing the most cost effective measure first, and then cycling through the list to find the next most cost effective measure. Implementation of more than one EEM often affects the savings of other EEMs. The savings may in some cases be relatively higher if an individual EEM is implemented in lieu of multiple recommended EEMs. For example implementing a reduced operating schedule for inefficient lighting will result in relatively high savings. Implementing a reduced operating schedule for newly installed efficient lighting will result in lower relative savings, because the efficient lighting system uses less energy during each hour of operation. If multiple EEM's are recommended to be implemented, AkWarm calculates the combined savings appropriately.

Cost savings are calculated based on estimated initial costs for each measure. Installation costs include labor and equipment to estimate the full up-front investment required to implement a change. Costs are derived from Means Cost Data, industry publications, and local contractors and equipment suppliers.

2.4 Limitations of Study

All results are dependent on the quality of input data provided, and can only act as an approximation. In some instances, several methods may achieve the identified savings. This report is not intended as a final design document. The design professional or other persons following the recommendations shall accept responsibility and liability for the results.

3. Tununak Water Treatment Plant & Well House

3.1. Building Description

The 2,048 square foot Tununak Water Treatment Plant & Well House was constructed in 1982, with a normal occupancy of two people. The number of hours of operation for this building average 6 hours per day, considering all seven days of the week.

The water plant is servicing three washing machines and a small circulation loop to the nearby clinic. Circulation loops for village watering points and the washeteria are no longer used, the BIA in town provides those services. Water is sourced from an electrically heated well house on the edge of town.

Water is storage in a 50,000 gallon water storage tank with 5" of insulation in fair to good condition and metal siding.

<u>Description of Building Shell</u>

The exterior walls are 2x4 construction with 3.5 inches of fiberglass batt insulation.

The roof of the building is a warm roof with 3.5 inches of fiberglass batt insulation.

The floor of the building is built on pilings with 3.5 inches of fiberglass batt insulation.

Typical windows throughout the building are double paned glass windows, though there are several broken windows.

Exterior doors in the facility are of metal construction.

Description of Heating Plants

The Heating Plants used in the building are:

Burnham PF-35

Fuel Type:	#1 Oil
Input Rating:	375,000 BTU/hr
Steady State Efficiency:	80 %
Idle Loss:	1.5 %
Heat Distribution Type:	Glycol
Boiler Operation:	All Year

Space Heating Distribution Systems

The building is currently heated primarily by jacket losses off the boiler, however there are three unit heaters which do run occasionally. When the facility is cold in the winter, the operator will exhaust the dryers into the facility to provide heat.

Dryer exhaust air should always be exhausted to the exterior of the facility. Increased humidity will degrade insulation value and not result in energy savings as anticipated.

Domestic Hot Water System

An amtrol in line 55 gallon hot water tank is heated by the boilers. The facility only uses about 20 gallons of hot water per day in the washing machines.

Lighting

Lighting in the facility is made up of eleven T12 magnetic ballast, fluorescent fixtures, each with a mixture of 34 watt or 40 watt four foot bulbs.

Plug Loads

A radio, a microwave and an air blower make up the majority of the plug loads in the facility.

Major Equipment

Significant energy using equipment in the facility includes a one horsepower pressure pump running 3% of the time.

There are two smaller speed queen washing machines, and one large washing machine which are used more regularly.

There is an old heat tape in the facility that appeared to be disconnected and shut off that serviced the old watering points. The heat tape was actually hard wired and had not been shut off. This was repaired by the operator at the time of the audit.

The water storage tank is circulated with a Grundfos UP 15-42SF circulation pump which maintains the temperature of the storage tank at about 40 degrees.

The electric dryer in the facility are Speed Queen Model STO30EBCK4GZW02. The dryer uses about 13 kilowatts when it's on, which is about 20 hours per week.

3.2 Predicted Energy Use

3.2.1 Energy Usage / Tariffs

The electric usage profile charts (below) represents the predicted electrical usage for the building. If actual electricity usage records were available, the model used to predict usage was calibrated to approximately match actual usage. The electric utility measures consumption in kilowatt-hours (kWh) and maximum demand in kilowatts (kW). One kWh usage is equivalent to 1,000 watts running for one hour.

The fuel oil usage profile shows the fuel oil usage for the building. Fuel oil consumption is measured in gallons. One gallon of #1 Fuel Oil provides approximately 132,000 BTUs of energy.

The following is a list of the utility companies providing energy to the building and the class of service provided:

Electricity: AVEC-Tununak - Commercial - Sm

The average cost for each type of fuel used in this building is shown below in Table 3.1. This figure includes all surcharges, subsidies, and utility customer charges:

Table 3.1 – Average Energy Cost	
Description	**Average Energy Cost**
Electricity	$ 0.21/kWh
#1 Oil	$ 6.75/gallon

3.2.1.1 Total Energy Use and Cost Breakdown

At current rates, Native Village of Tununak pays approximately $22,519 annually for electricity and other fuel costs for the Tununak Water Treatment Plant & Well House.

Figure 3.1 below reflects the estimated distribution of costs across the primary end uses of energy based on the AkWarm© computer simulation. Comparing the "Retrofit" bar in the figure to the "Existing" bar shows the potential savings from implementing all of the energy efficiency measures shown in this report.

Figure 3.1
Annual Energy Costs by End Use

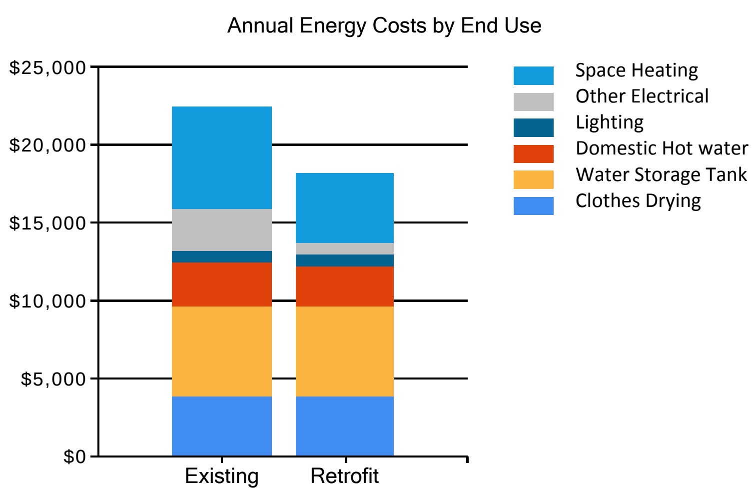


Figure 3.2 below shows how the annual energy cost of the building splits between the different fuels used by the building. The "Existing" bar shows the breakdown for the building as it is now; the "Retrofit" bar shows the predicted costs if all of the energy efficiency measures in this report are implemented.

Figure 3.2
Annual Energy Costs by Fuel Type

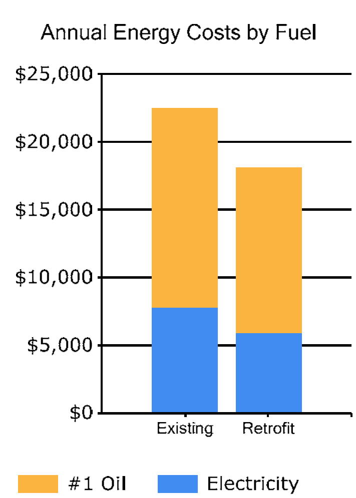
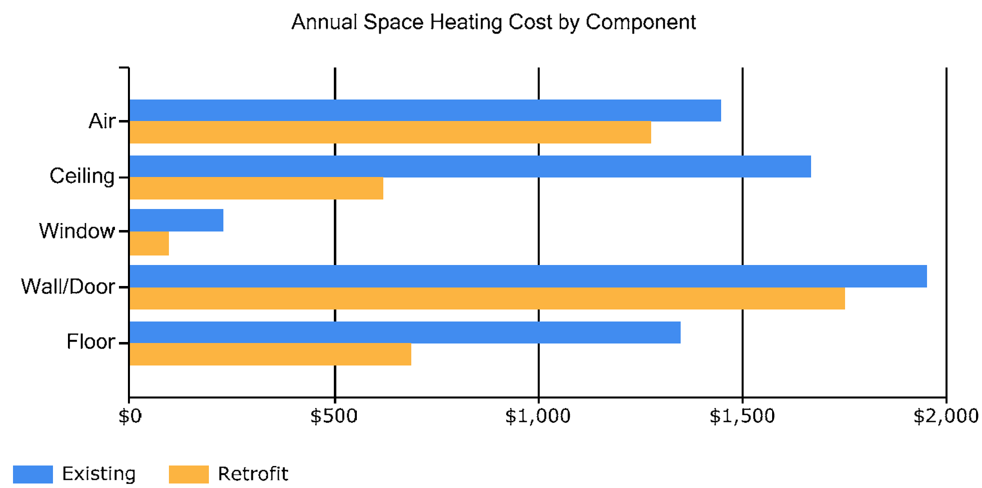


Figure 3.3 below addresses only Space Heating costs. The figure shows how each heat loss component contributes to those costs; for example, the figure shows how much annual space heating cost is caused by the heat loss through the Walls/Doors. For each component, the space heating cost for the Existing building is shown (blue bar) and the space heating cost assuming all retrofits are implemented (yellow bar) are shown.

Figure 3.3
Annual Space Heating Cost by Component



The tables below show AkWarm's estimate of the monthly fuel use for each of the fuels used in the building. For each fuel, the fuel use is broken down across the energy end uses. Note, in the tables below "DHW" refers to Domestic Hot Water heating.

Electrical Consumption (kWh)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Lighting	327	298	327	316	327	316	327	327	316	327	316	327
Other_Electrical	1342	1223	1342	1298	1342	478	494	494	478	1342	1298	1342
Water Storage Tank	160	146	160	155	160	155	160	160	155	160	155	160
Clothes_Drying	2102	1915	2102	2034	2102	36	37	37	2034	2102	2034	2102
DHW	2	1	2	3	7	7	7	7	7	4	2	1
Space_Heating	82	72	65	35	12	11	12	12	11	27	52	82

Fuel Oil #1 Consumption (Gallons)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Water Storage Tank	101	92	101	98	101	0	0	0	0	101	98	101
DHW	23	21	24	27	48	46	48	48	46	32	24	23
Space_Heating	190	167	149	73	6	6	6	6	6	51	117	191

3.2.2 Energy Use Index (EUI)

Energy Use Index (EUI) is a measure of a building's annual energy utilization per square foot of building. This calculation is completed by converting all utility usage consumed by a building for one year, to British Thermal Units (Btu) or kBtu, and dividing this number by the building square footage. EUI is a good measure of a building's energy use and is utilized regularly for comparison of energy performance for similar building types. The Oak Ridge National Laboratory (ORNL) Buildings Technology Center under a contract with the U.S. Department of Energy maintains a Benchmarking Building Energy Performance Program. The ORNL website determines how a building's energy use compares with similar facilities throughout the U.S. and in a specific region or state.

Source use differs from site usage when comparing a building's energy consumption with the national average. Site energy use is the energy consumed by the building at the building site only. Source energy use includes the site energy use as well as all of the losses to create and distribute the energy to the building. Source energy represents the total amount of raw fuel that is required to operate the building. It incorporates all transmission, delivery, and production losses, which allows for a complete assessment of energy efficiency in a building. The type of utility purchased has a substantial impact on the source energy use of a building. The EPA has determined that source energy is the most comparable unit for evaluation purposes and overall global impact. Both the site and source EUI ratings for the building are provided to understand and compare the differences in energy use.
The site and source EUIs for this building are calculated as follows. (See Table 3.4 for details):

Building Site EUI = $\dfrac{\textit{(Electric Usage in kBtu + Fuel Oil Usage in kBtu)}}{\textit{Building Square Footage}}$

Building Source EUI = $\dfrac{\textit{(Electric Usage in kBtu X SS Ratio + Fuel Oil Usage in kBtu X SS Ratio)}}{\textit{Building Square Footage}}$

where "SS Ratio" is the Source Energy to Site Energy ratio for the particular fuel.

Table 3.4
Tununak Water Treatment Plant & Well House EUI Calculations

Energy Type	Building Fuel Use per Year	Site Energy Use per Year, kBTU	Source/Site Ratio	Source Energy Use per Year, kBTU
Electricity	37,367 kWh	127,533	3.340	425,961
#1 Oil	2,174 gallons	286,928	1.010	289,797
Total		**414,461**		**715,758**
BUILDING AREA		2,048	Square Feet	
BUILDING SITE EUI		202	kBTU/Ft²/Yr	
BUILDING SOURCE EUI		349	**kBTU/Ft²/Yr**	
* Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued March 2011.				

3.3 AkWarm© Building Simulation

An accurate model of the building performance can be created by simulating the thermal performance of the walls, roof, windows and floors of the building. The HVAC system and central plant are modeled as well, accounting for the outside air ventilation required by the building and the heat recovery equipment in place.

The model uses local weather data and is trued up to historical energy use to ensure its accuracy. The model can be used now and in the future to measure the utility bill impact of all types of energy projects, including improving building insulation, modifying glazing, changing air handler schedules, increasing heat recovery, installing high efficiency boilers, using variable air volume air handlers, adjusting outside air ventilation and adding cogeneration systems.

For the purposes of this study, the Tununak Water Treatment Plant & Well House was modeled using AkWarm© energy use software to establish a baseline space heating and cooling energy usage. Climate data from Tununak was used for analysis. From this, the model was be calibrated to predict the impact of theoretical energy savings measures. Once annual energy savings from a particular measure were predicted and the initial capital cost was estimated, payback scenarios were approximated. Equipment cost estimate calculations are provided in Appendix D.

Limitations of AkWarm© Models

• The model is based on typical mean year weather data for Tununak. This data represents the average ambient weather profile as observed over approximately 30 years. As such, the gas and electric profiles generated will not likely compare perfectly with actual energy billing information from any single year. This is especially true for years with extreme warm or cold periods, or even years with unexpectedly moderate weather.
• The heating and cooling load model is a simple two-zone model consisting of the building's core interior spaces and the building's perimeter spaces. This simplified approach loses accuracy for buildings that have large variations in cooling/heating loads across different parts of the building.
• The model does not model HVAC systems that simultaneously provide both heating and cooling to the same building space (typically done as a means of providing temperature control in the space).

The energy balances shown in Section 3.1 were derived from the output generated by the AkWarm© simulations.

4. ENERGY COST SAVING MEASURES

4.1 Summary of Results

The energy saving measures are summarized in Table 4.1. Please refer to the individual measure descriptions later in this report for more detail. Calculations and cost estimates for analyzed measures are provided in Appendix C.

Table 4.1 Tununak Water Treatment Plant & Well House, Tununak, Alaska PRIORITY LIST – ENERGY EFFICIENCY MEASURES						
Rank	**Feature**	**Improvement Description**	**Annual Energy Savings**	**Installed Cost**	**Savings to Investment Ratio, SIR**	**Simple Payback (Years)**
1	Other Electrical - Controls Retrofit: Heat Tape	Disconnect hard wired heat tape on the old watering point loop.	$844	$10	522.19	0.0

Table 4.1 Tununak Water Treatment Plant & Well House, Tununak, Alaska PRIORITY LIST – ENERGY EFFICIENCY MEASURES						
Rank	**Feature**	**Improvement Description**	**Annual Energy Savings**	**Installed Cost**	**Savings to Investment Ratio, SIR**	**Simple Payback (Years)**
2	Other Electrical - Controls Retrofit: Well House Electrical Load	Lower heating set point to 40 degrees in the well house.	$1,030	$500	17.34	0.5
3	HVAC And DHW	Clean and tune boilers to increase efficiency. This estimate assumes a technician travels from Anchorage and works with the water plant operator and teaches him how to clean the boiler.	$526	$4,000	2.29	7.6
4	Cathedral Ceiling: WTP	Fill empty 2x6 cavity with R-19 fiberglass batts.	$1,127	$12,230	2.18	10.9
5	Exposed Floor: WTP	Remove insulation from 2x6 cavity and replace with R-21 dense-pack blown-in insulation.	$663	$10,024	1.57	15.1
6	Window: WTP	Remove existing glass and replace with double pane,low-E,argon glass.	$51	$786	1.13	15.3
	TOTAL, cost-effective measures		**$4,241**	**$27,551**	**2.41**	**6.5**
	The following measures were *not* found to be cost-effective:					
7	Window/Skylight: WTP	Remove existing glass and replace with double pane,low-E,argon glass.	$85	$1,573	0.94	18.5
	TOTAL, all measures		**$4,326**	**$29,123**	**2.33**	**6.7**

4.2 Interactive Effects of Projects

The savings for a particular measure are calculated assuming all recommended EEMs coming before that measure in the list are implemented. If some EEMs are not implemented, savings for the remaining EEMs will be affected. For example, if ceiling insulation is not added, then savings from a project to replace the heating system will be increased, because the heating system for the building supplies a larger load.

In general, all projects are evaluated sequentially so energy savings associated with one EEM would not also be attributed to another EEM. By modeling the recommended project sequentially, the analysis accounts for interactive affects among the EEMs and does not “double count” savings.

Interior lighting, plug loads, facility equipment, and occupants generate heat within the building. When the building is in cooling mode, these items contribute to the overall cooling demands of the building; therefore, lighting efficiency improvements will reduce cooling requirements in air-conditioned buildings. Conversely, lighting-efficiency improvements are anticipated to slightly increase heating requirements. Heating penalties and cooling benefits were included in the lighting project analysis.

4.3 Building Shell Measures

4.3.1 Insulation Measures

Rank	Location		Existing Type/R-Value		Recommendation Type/R-Value	
4	Cathedral Ceiling: WTP		Framing Type: Standard Framing Spacing: 24 inches Insulated Sheathing: None Bottom Insulation Layer: None Top Insulation Layer: R-11 Batt:FG or RW, 3.5 inches Insulation Quality: Damaged Modeled R-Value: 13.3		Fill empty 2x6 cavity with R-19 fiberglass batts.	
Installation Cost		$12,230	**Estimated Life of Measure (yrs)**	30	**Energy Savings (/yr)**	$1,127
Breakeven Cost		$26,654	**Savings-to-Investment Ratio**	2.2	**Simple Payback yrs**	11
Auditors Notes: Adding fiberglass batt insulation to the ceiling would reduce the heating load in the facility.						

Rank	Location		Existing Type/R-Value		Recommendation Type/R-Value	
5	Exposed Floor: WTP		Framing Type: 2 x Lumber Insulating Sheathing: None Top Insulation Layer: R-11 Batt:FG or RW, 3.5 inches Bottom Insulation Layer: None Insulation Quality: Damaged Modeled R-Value: 15.5		Remove insulation from 2x6 cavity and replace with R-21 dense-pack blown-in insulation.	
Installation Cost		$10,024	**Estimated Life of Measure (yrs)**	30	**Energy Savings (/yr)**	$663
Breakeven Cost		$15,694	**Savings-to-Investment Ratio**	1.6	**Simple Payback yrs**	15
Auditors Notes: Replacing the insulation in the floor would reduce the heating load in the facility.						

4.3.2 Window Measures

Rank	Location		Size/Type, Condition		Recommendation	
6	Window/Skylight: WTP		Glass: No glazing - broken, missing Frame: Wood\Vinyl Spacing Between Layers: Half Inch Gas Fill Type: Air Modeled U-Value: 0.94 Solar Heat Gain Coefficient including Window Coverings: 0.11		Remove existing glass and replace with double pane,low-E,argon glass.	
Installation Cost		$786	**Estimated Life of Measure (yrs)**	20	**Energy Savings (/yr)**	$51
Breakeven Cost		$891	**Savings-to-Investment Ratio**	1.1	**Simple Payback yrs**	15
Auditors Notes: Replacing broken windows with new double paned windows would reduce the heating load in the building.						

Rank	Location	Size/Type, Condition	Recommendation
7	Window/Skylight: WTP	Glass: No glazing - broken, missing Frame: Wood\Vinyl Spacing Between Layers: Half Inch Gas Fill Type: Air Modeled U-Value: 0.94 Solar Heat Gain Coefficient including Window Coverings: 0.11	Remove existing glass and replace with double pane,low-E,argon glass.

Installation Cost	$1,573	**Estimated Life of Measure (yrs)**	20	**Energy Savings (/yr)**	$85
Breakeven Cost	$1,477	**Savings-to-Investment Ratio**	0.9	**Simple Payback yrs**	19

Auditors Notes: Replacing broken windows with new double paned windows would reduce the heating load in the building. Though replacing the south facing windows that are broken doesn't pay back individually, if done at the same time as the other windows, it would be an acceptable payback period.

4.4 Mechanical Equipment Measures

4.4.1 Heating/Cooling/Domestic Hot Water Measure

Rank	Recommendation
3	Clean and tune boilers to increase efficiency. This estimate assumes a technician travels from Anchorage and works with the water plant operator and teaches him how to clean the boiler.

Installation Cost	$4,000	**Estimated Life of Measure (yrs)**	20	**Energy Savings (/yr)**	$526
Breakeven Cost	$9,145	**Savings-to-Investment Ratio**	2.3	**Simple Payback yrs**	8

Auditors Notes:

4.5 Electrical & Appliance Measures

4.5.1 Lighting Measures

The goal of this section is to present any lighting energy conservation measures that may also be cost beneficial. It should be noted that replacing current bulbs with more energy-efficient equivalents will have a small effect on the building heating and cooling loads. The building cooling load will see a small decrease from an upgrade to more efficient bulbs and the heating load will see a small increase, as the more energy efficient bulbs give off less heat.

4.5.3 Other Electrical Measures

Rank	Location	Description of Existing	Efficiency Recommendation
1	Heat Tape	Old Heat Tape for Watering Points with Manual Switching	Improve Manual Switching

Installation Cost	$10	**Estimated Life of Measure (yrs)**	7	**Energy Savings (/yr)**	$844
Breakeven Cost	$5,222	**Savings-to-Investment Ratio**	522.2	**Simple Payback yrs**	0

Auditors Notes: Heat Tape was repaired on site by the operator under the supervision of Chris Mercer of ANTHC. This heat tape is no longer needed since the watering point is no longer used.

Rank	Location		Description of Existing		Efficiency Recommendation	
2	Well House Electrical Load		Well House electrical Loads with Manual Switching		Improve Manual Switching	
Installation Cost		$500	**Estimated Life of Measure (yrs)**	10	**Energy Savings (/yr)**	$1,030
Breakeven Cost		$8,672	**Savings-to-Investment Ratio**	17.3	**Simple Payback yrs**	0
Auditors Notes: The well house facility only needs to be kept from freezing. The temperature set point on the electric heat should be set and locked to 40 degrees.						

5. ENERGY EFFICIENCY ACTION PLAN

Through inspection of the energy-using equipment on-site and discussions with site facilities personnel, this energy audit has identified several energy-saving measures. The measures will reduce the amount of fuel burned and electricity used at the site. The projects will not degrade the performance of the building and, in some cases, will improve it.

Several types of EEMs can be implemented immediately by building staff, and others will require various amounts of lead time for engineering and equipment acquisition. In some cases, there are logical advantages to implementing EEMs concurrently. For example, if the same electrical contractor is used to install both lighting equipment and motors, implementation of these measures should be scheduled to occur simultaneously.

Appendix A – Listing of Energy Conservation and Renewable Energy Websites

Lighting
Illumination Engineering Society - http://www.iesna.org/

Energy Star Compact Fluorescent Lighting Program - www.energystar.gov/index.cfm?c=cfls.pr_cfls

DOE Solid State Lighting Program - http://www1.eere.energy.gov/buildings/ssl/

DOE office of Energy Efficiency and Renewable Energy - http://apps1.eere.energy.gov/consumer/your_workplace/

Energy Star – http://www.energystar.gov/index.cfm?c=lighting.pr_lighting

Hot Water Heaters

Heat Pump Water Heaters -
http://apps1.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=12840

Solar Water Heating

FEMP Federal Technology Alerts – http://www.eere.energy.gov/femp/pdfs/FTA_solwat_heat.pdf

Solar Radiation Data Manual – http://rredc.nrel.gov/solar/pubs/redbook

Plug Loads

DOE office of Energy Efficiency and Renewable Energy – http:apps1.eere.energy.gov/consumer/your_workplace/

Energy Star – http://www.energystar.gov/index.cfm?fuseaction=find_a_product

The Greenest Desktop Computers of 2008 - http://www.metaefficient.com/computers/the-greenest-pcs-of-2008.html

Wind

AWEA Web Site – http://www.awea.org

National Wind Coordinating Collaborative – http:www.nationalwind.org

Utility Wind Interest Group site: http://www.uwig.org

WPA Web Site – http://www.windpoweringamerica.gov

Homepower Web Site: http://homepower.com

Windustry Project: http://www.windustry.com

Solar

NREL – http://www.nrel.gov/rredc/

Firstlook – http://firstlook.3tiergroup.com

TMY or Weather Data – http://rredc.nrel.gov/solar/old_data/nsrdb/1991-2005/tmy3/

State and Utility Incentives and Utility Policies - http://www.dsireusa.org

FINAL

Report on Site Conditions and Recommended Plan of Action For Sanitation Improvements in Tununak, Alaska

Prepared for the

TUNUNAK TRIBAL COUNCIL

and

VILLAGE SAFE WATER

Prepared by

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1835 South Bragaw Street, Suite 350
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MWH Job No. 1008675.040101

December 2010

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Acronyms and Abbreviations

%	percent
AAC	Alaska Administrative Code
ADCRA	Alaska Division of Community and Regional Affairs
ADEC	Alaska Department of Environmental Conservation
ADOT&PF	Alaska Department of Transportation and Public Facilities
AWWA	American Water Works Association
BIA	Bureau of Indian Affairs
Community	Tununak Tribal Council
DBP	disinfection byproduct
EPA	U.S. Environmental Protection Agency
FTH	Flush Tank and Haul
gpd	gallons per day
hp	horsepower
IBC	International Building Code
MCL	maximum contaminant level
MG	million gallons
MSL	mean sea level
MWH	MWH Americas, Inc.
PCA	Phukan Consulting Engineers & Associates, Inc.
SWTR	Surface Water Treatment Rule
VAC	volt alternating current
VSW	Village Safe Water
WST	water storage tank
WTP	water treatment plant

EXECUTIVE SUMMARY

The Tununak Tribal Council was awarded a grant in 2008 from the Alaska Department of Environmental Conservation Village Safe Water Program for the development of a sanitation facilities master plan to upgrade, replace, or abandon the existing washeteria and associated facilities (water treatment, water storage tank, and laundromat) and address problems associated with the all-season remote watering points. The community desired to make additional improvements to their community-wide water and wastewater facilities to improve the quality of life for Tununak residents. As a first step to identify needs and alternatives to meet these community goals, MWH Americas, Inc. (MWH) was requested in 2010 to prepare the *Report on Site Conditions and Recommended Plan of Action for Sanitation Improvements in Tununak, Alaska*. The report was prepared under the direction of the Tununak Tribal Council and the Village Safe Water Program.

During the spring of 2010, the MWH design team consisting of senior staff from MWH, EDC and GV Jones & Associates, Inc. completed a site visit with representatives from VSW to the village of Tununak. During the site visit, the MWH design team conducted an on-site assessment of the existing water and sewer systems serving Tununak and then met with the community residents at a project kick-off meeting. Several serious sanitary infrastructure deficiencies were identified. Resident dissatisfaction was consistent with our observations. Summarizing, persons neither trust nor drink Tununak water (they obtain water from the school), there is no community honey bucket haul system, even so, the honey bucket waste bunkers are full. And, as itemized herein, the washeteria, water treatment plant, water point distribution system, flush tank and haul system, and school and flush tank and haul wastewater disposal systems are antiquated, substandard, non-functional, and/or include significant health and safety code violations

Currently, the sanitation facilities operating in Tununak consist of a surface water source, washeteria, water treatment plant, water distribution system that delivers water to six community watering points used by residents to haul water to their homes, a small percentage of homes are served by a flush tank and haul system while most homes in the community use honey buckets that dispose waste in below grade sewage bunkers. The community's school has running water and flush toilets that are served by a shallow ground water well and on-site septic tank system. Nearly all the residents in Tununak haul their drinking water from a community watering point served by the school's well.

The site investigation completed by the MWH design team found the following serious and health threatening deficiencies in the existing sanitation facilities:

- <u>Water Source</u> (Un-named Creek) – The water source well house is in poor physical condition. It is located downgradient of nearby existing and potential future new residential structures and, therefore, subject to contamination from fuel and/or wastewater stored on those properties. Also, it is subject to seasonal burial from drifting snow and aufeis (ice overflows) formation in the creek immediately below the intake structure as well as flooding and immersion of the building structure components- the uncovered well casing was observed to be inundated by flood water during the site visit.

- Washeteria - The equipment within the building has deteriorated to a point that the facility can no longer serve its intended purpose with any reliability. Of the laundry equipment only one working washer remains and both dryers have been removed. The toilet/shower rooms have missing fixtures and are no longer usable. Control systems for the water storage tank and washeteria mechanical equipment appear to be non-functioning. Numerous building code violations exist. The heating boilers are deteriorated beyond economical repair.

- Water Treatment Plant - The treatment plant is in poor physical condition and disrepair. The treatment system does not meet current drinking water regulations for Cryptosporidium removal. The majority of electrical equipment within the building has deteriorated past its useful life. The power distribution and utilization equipment showed signs of significant deterioration due to corrosion. Numerous building code violations were found throughout the facility in the power distribution and lighting systems. These violations represent a significant hazard to maintenance personnel working in the facility.

- Water Storage Tank – It has been reported that the 50,000 gallon tank experiences leakage and its foundation is in very poor condition. The tank exterior has obvious signs of physical deterioration. The condition of the tank interior is unknown as it has not been inspected nor cleaned for many years. The water storage tank appears to be unsuitable for reconditioning or upgrade.

- Community Watering Points - Of the six watering points located in the village, only one was found to be usable. All of the watering points' enclosures were deteriorated, with damage to the access doors and floors. The water distribution lines serving the watering points appear to provide adequate flow to the watering points; however, the physical condition of the water lines is unknown and the water demand is very low due to the number of unusable watering points. Because of the non-operational circulation pumps and heat trace controls (both at the water treatment plant and watering points), the distribution piping has a high potential to freeze as winter weather progresses.

- Flush Tank and Haul System - The community currently has 18 homes that are served by the flush tank and haul system. The homeowners expressed their frustration and dissatisfaction with the current operation of the flush tank and haul system. They explained that many of the operational problems were primarily associated with the failure of valves and lack of adequate maintenance.

- Honey Bucket Usage - It is estimated 64 households currently rely on the use of honey buckets. Residents and businesses using honey buckets typically self-haul their water. The honey bucket waste is self-hauled and disposed of in several sewage bunkers that are located in near proximity to the homes throughout the community. Most of these bunkers appeared to be in a state of failure with overflow of raw sewage onto the surrounding ground surface which is accessible to contact by animals and humans.

- Septic Tank Systems – The septic tank system serving the school, teacher housing and washeteria was found to be in a state of failure. Based on discussions with the operators of the septic tank system, hydraulic failure occurs frequently and they temporarily relieve the hydraulic overload by pumping effluent from the drainfield observation pipes to the nearby failing septic tank system serving the flush tank and haul system. The septic tanks serving the flush tank and haul system are currently in a state of failure. Consequently, the operators dump their haul contents of raw sewage in an open trench located next to the septic tanks. The trench is accessible to the public and animals (especially loose dogs).

The recommended plan of action for future sanitation improvements in Tununak are based on a comparison of technical, health and cost benefits with a consideration of ease of operation. The following provides a list of the recommended sanitation improvements that should be further evaluated for future development to meet the goals of Tununak:

- Replace the Unnamed Creek well house with an upgradient (hillside) water source.
- Replace the water treatment plant.
- Replace the Washeteria.
- Replace the existing 50,000 gallon water storage tank with a 100,000-gallon tank.
- Replace all of the community watering points.
- Expand the flush tank and haul system to serve all households in the community. This recommendation involves the installation of interior plumbing to connect to the flush tank in existing households that currently use honey buckets. Also, the flush tank and haul system will need additional upgrades to the water and sewage haul equipment and expansion of the on-site septic tank/drainfield system.
- As an interim corrective action measure, until such time as the flush tank and haul system can be implemented throughout the community, it is recommended honey bucket waste transfer system and a waste disposal facility be installed at a suitable location outside of the residential area.
- Upgrade the septic tank system for the flush tank and haul system, new water treatment plant, new washeteria, school, and school housing.

As a sanitation deficiency stop gap measure, a honey bucket collection and disposal system is immediately warranted. Furthermore, it is recommended that development of a new “safe” water source be a priority. A site investigation to evaluate a suitable water source should be completed as the first step in addressing sanitation needs of Tununak.

1.0 INTRODUCTION

A contract was awarded to MWH Americas, Inc. (MWH) by the Tununak Tribal Council (TTC) on March 31, 2010, to provide a Phase I Engineering Design Services for the Washeteria and Water Treatment Facility for Tununak, Alaska. The Alaska Department of Environmental Conservation (ADEC), Village Safe Water (VSW) was assigned to act as TTC's agent in all matters concerning the VSW project. The MWH design team for the Phase I engineering design services included the subconsultants firms of GV Jones & Associates, Inc. and EDC.

Tununak is located in western Alaska on the northwest coast of Nelson Island along the Bering Sea coast. The village is about 519 miles west of Anchorage and approximately 115 miles northwest of Bethel. The community of Tununak is comprised of two residential areas: the "main" part of the community lies on a narrow spit of land between the Tununak River and Tununak Bay, and the "new" area consists of 23 homes in AVCP Subdivision located on the North Fork of the Tununak River at the base of the foot slope to Ugchirnak Mountains. According to an uncertified population estimate completed in 2009 reported by the Alaska Division of Community and Regional Affairs (ADCRA), Tununak has a population of 330 who are primarily Yup'ik Eskimo. The 2000 U.S. Census reported 93 households in the community of which 11 were vacant.

The scope of work for the Phase I Engineering Design Services included the following tasks:

- Compile and review existing project data and background reports
- Conduct site assessment of existing sanitation facilities and project kick-off meeting
- Prepare site conditions report with a recommended plan of action for future sanitation improvements

During the spring of 2010, the MWH design team compiled and reviewed the background reports in preparation for a site visit to the community. The site visit was completed on May 18 and 19, 2010. During the site visit the design team meet with the residents at a Project Kick-off Meeting held in the Paul T. Albert Memorial School and conducted an assessment of the existing water and sewer systems serving Tununak. Photographs of the existing sanitation facilities taken during the May 2010 site visit are provided here in Appendix B. The photo captions describe the sanitary deficiencies that were observed by the design team.

The preliminary findings of the May 2010 site visit were described in two field trip reports prepared by MWH and EDC that were submitted to TTC and VSW. The following bulleted list summarizes the significant sanitary issues and concerns were identified during the site visit which included community input during the Project Kick-off Meeting:

- The community residents do not trust the existing drinking water system that supplies water to the community watering points.
- During the Project Kick-Off Meeting, the community residents delivered a very clear message to the MWH team that … "No one who is on a flush tank and haul system likes it."

- The community residents strongly desire to have a new Washeteria facility with a new safe water source and new water treatment plant (WTP).
- During the kick-off meeting, there was a consensus that a new sanitary facility questionnaire should be completed by the residents as soon as possible to determine what improvements were needed to address the critical deficiencies in the sanitary facilities serving Tununak. Following the meeting, the new questionnaire was prepared by MWH and approved by VSW for distribution in the community. TTC assisted in the solicitation of input from the residents for the completion of the questionnaire.
- The Washeteria, 50,000-gallon water storage tank (WST), and WTP were found to be in very poor operating condition and appeared to be marginally (barely) functional and deficient in reliability.
- The condition of the abandoned Musk-Ox Creek water well, pump house, and arctic pipe transmission line appeared to be not suitable for upgrade and/or replacement with another source on Musk-Ox Creek. However, the arctic pipe appears to be in good enough condition to be used elsewhere in the community.
- The Unnamed Creek well and pump house were found to be in a flooded condition that prevented reasonable entry to hook up the well pump. The creek was overflowing the entire structure, which resulted in an unsanitary condition for a community drinking water source.
- The community watering points were found to be in very poor condition and appeared to be unsuitable for upgrade and should be replaced.
- The Lower Kuskokwim School District operates the Paul T. Albert Memorial School which was a former Bureau of Indian Affairs (BIA) school. The School has its own water source well (referred to as the old BIA well) and water treatment system. It was learned that the majority of the residents haul their drinking water from the watering point at the old BIA well house. Drinking water for the flush tank and haul (FTH) system is also obtained from the same watering point.
- The two septic tank/drainfield systems serving the Paul T. Albert Memorial School, teacher housing and WTP/Washeteria and the FTH system were determined to be in a state of failure and need substantial upgrade and/or replacement.
- The existing sewage bunkers located throughout the community all appeared to be in a state of failure and a serious health concern due to overflow of raw sewage from the dumping of honey-buckets.
- The community needs a new pumper truck for pumping the septic tanks and a new backhoe or excavator for underground utility repair work.

The final task of the Phase I Engineering Design Services is the preparation of this report (*Report on Site Conditions and Recommended Plan of Action*). The purpose of this report is to provide an assessment of the condition of the existing sanitary facilities serving Tununak. This report includes a summary of the findings of the 2010 Sanitary Facility Questionnaire and provides a recommended plan of action for addressing the deficiencies noted in the existing sanitary facilities.

2.0 DESCRIPTION OF EXISTING SANITATION FACILITIES

Community profile maps prepared by ADCRA are provided in Appendix A (Figures A-1 and A-2). The ADCRA maps provide a general overview of the layout of the community and show the locations of the creeks used for water sources. These profile maps are also helpful to note the locations of the community developments with respect to the surrounding physical terrestrial features such as the river, sea, and mountains.

A comprehensive description of the existing sanitation facilities was provided in the report titled *Tununak Sanitation Feasibility Study and Environmental Review,* dated March 22, 1993, prepared by Phukan Consulting Engineers & Associates, Inc. [PCA]). Although the report was prepared by PCA over 17 years ago, it is still a good overall guide to understanding the conditions of the sanitation facilities, many of which are still in operation and have since further degraded. PCA recommended the construction of a FTH system and new water transmission line to a proposed water well source on Muskox Creek. These improvements were installed during the mid-1990s. A drawing from the 1993 PCA report showing the locations of the sanitation facilities that currently exist in the community is shown on Figure A-3 in Appendix A.

The following provides a description of the existing sanitation facilities in Tununak:

2.1 WATER FACILITIES

The community operates a public water system that includes:

- A pair of surface water intake structures and pumping stations located on:
  - Unnamed Creek
  - Muskox Creek
- Raw water transmission mains
- A WTP designed to treat surface water
- A washeteria
- Treated WST
- Potable water distribution system:
  - Pressure and Circulation Pumps
  - Water Distribution System
    - Six community watering points
    - Service connection to the Village Clinic

The existing water system and washeteria is aged and in need of upgrades and/or replacement to sustain service. A sanitary survey of the water system was recently completed in August 2010 on behalf of the ADEC Drinking Water Program. The sanitary survey identified several non-compliance items on the water system that are potential health risks and safety concerns. Many of these deficiencies were noted during the site assessment work completed during the May 2010 site visit completed by the MWH design team and were described in the field trip reports. These deficiencies are addressed in this report, as well as recommendations for corrective action.

2.2 SEWAGE FACILITIES

The majority of the households in Tununak lack complete plumbing facilities, consequently most of the residents use honey buckets for disposal of their wastewater. It is estimated that approximately 64 households rely on the use of the honey bucket. The honey bucket waste is disposed by the residents in sewage disposal bunkers located in close proximity to the homes. These bunkers consist of buried timber cesspools that are located along the north and west banks of the Tununak River. The remainder of the community consisting of 18 households has interior plumbing facilities that are serviced with the FTH system.

Two on-site community septic tank systems and drainfields currently exist in Tununak. The community septic systems are located on the sand spit north of the old “main” village and northwest of the school and WTP/washeteria facility. These septic systems include:

- One septic tank system serves the School, teacher housing, and the WTP/washeteria.
- The second septic tank system is used for the disposal of wastewater collected from the flush tank and haul system.

3.0 OPERATIONAL ASSESSMENT OF SANITATION FACILITIES

3.1 WATER TREATMENT PLANT AND WASHETERIA

3.1.1 Mechanical

The WTP and washeteria were constructed in the mid-1970s based on a similar style to others built in that timeframe. The building is configured as:

- A washeteria with four washers and two hydronic dryers.
- Two toilet/shower rooms, each with two showers, a toilet and a lavatory.
- A mechanical room with two oil-fired boilers, a hydronic heating system, domestic hot water generators, and standby power generator.
- A water treatment room with a pressure filter, two bag filters, a backwash pump, pressure pumps, and a hydropneumatic tank.
- A bunkhouse room.
- A kitchen/laboratory.

A 50,000-gallon WST stands adjacent to the building.

The equipment within the building has deteriorated to a point that the facility can no longer serve its intended purpose with any reliability. Of the laundry equipment only one working washer remains and both dryers have been removed. The toilet/shower rooms have missing fixtures and are no longer usable. Drain piping where fixtures have been removed has been left open or is closed with makeshift materials – such as plastic bags stuffed in the opening. This has a potential to allow sewer gasses into the building and to create a health hazard if a drain were to clog and back up. Only one of the two pressure pumps work to deliver water to the washeteria, clinic, and watering points. The system designed to circulate water to the watering point distribution piping is no longer operational, because both pumps have been fully or partially removed. Circulation is the main source of heating for the pipelines, with electrical heat tracing being a backup heat source. The heat trace controllers do not appear to operate, so with no circulation or heat, the pipelines are vulnerable to freezing.

The building envelope is severely deteriorated, contributing to higher fuel consumption to offset high heat losses. Contributing to high heat losses are leaking window frames and broken windows replaced with single panes of Plexiglas or plywood, as well as roof leaks around the boiler stacks that have caused deterioration of insulation and finishes. The public watering point on the south side of the building has been abandoned, with the insulation value of the wall compromised.

Numerous building code violations exist, including an exit door from the boiler room that has been sealed shut and a fuel tank located within 5 feet of the building. The standby heater installation is not proper, with the stack located too close to combustible materials. It is unknown whether the heater is operational. The heat exchanger for the WST is a single-wall design, which is not allowed by current codes due to the possibility of contamination of the water from the glycol heating fluid in the event of leakage.

The heating boilers are both obsolete models (last produced 10 to 15 years ago) and are deteriorated beyond economical repair. Boiler 1 has jacket corrosion caused by acidic flue gasses leaking through firebox section gaskets. Boiler 2 is off-line with a disassembled burner, no expansion tank, and evidence of firebox leakage at the burner mounting plate. Direct combustion air piping to the boiler burners has been disconnected, and the plastic piping to the Boiler 2 burner housing has been melted. The boiler stack caps are missing and the stacks are dented above the roof line.

3.1.2 Electrical

The existing electrical service for the WTP/Washeteria building includes a 200 amp, 240 volt, alternating current (VAC), single-phase meter/main panel with an overhead drop from the adjacent village utility. The incoming service feeder is routed through a manual transfer switch connected to a 75 kilowatt (KW) diesel-fired engine generator. The main distribution for the building is provided from Panel ‘B’ at 100 amp, 240VAC, single-phase. Panel ‘B’ sub-feeds Panel ‘A’ with a 100 amp, 240VAC circuit breaker.

The majority of electrical equipment within the building has deteriorated past its useful life. Given the observed level of deterioration, the facility can no longer serve its intended purpose with any reliability.

Lighting fixtures were found to be in poor condition. A number of the fixtures were disconnected or deteriorated beyond repair. All of the code-required exit and emergency lighting fixtures were not functioning and present a hazard to life safety in the facility.

The power distribution and utilization equipment showed signs of significant deterioration due to corrosion, resulting in potential hazards to equipment and personnel.

The stand-by diesel-fired engine generator set was not functioning at the time of the May 2010 site visit. The system had not been maintained and tested in compliance with industry standards and showed signs of deterioration due to age and local environment.

Control systems for the WST/washeteria mechanical equipment appear to be non-functioning. Equipment enclosures and components show signs of deterioration due to corrosion.

Numerous building code violations were found throughout the facility in the power distribution and lighting systems. These violations represent a significant hazard to maintenance personnel working in the facility.

3.1.3 Structural

The WTP/washeteria building is approximately 30 feet by 60 feet (approximately 1,800 square feet in area). The building consists of a wood frame shell with T-11 plywood siding and metal roofing. The building has a poured concrete floor and sits on a post-pad foundation. The building is in very poor structural condition (see photos in Appendix B) due to severe weathering conditions, normal aging (nearly 40 years), deterioration, and apparent lack of maintenance.

The building appears to lack adequate insulation and is not weather tight. Overall, the building shows obvious signs of serious exterior deterioration, with a foundation system that has not been adjusted to compensate for building movement due to frost heave and permafrost degradation. The watering point and backwash waste discharge have contributed to erosion of the building foundation, which has settled along the south side of the building.

3.2 WATER SOURCE AND TREATMENT PROCESS

The existing community water treatment system is operated on a periodic basis to maintain a reserve of treated water in the 50,000 gallon WST. These intermittent operations include pumping source water from the Unnamed Creek Intake Structure to the WTP located at the washeteria, source water treatment, and filling the WST with treated water.

From the WST, treated water is withdrawn, pressurized, and distributed to the clinic, washeteria, and community watering points.

The WTP is comprised of the following unit processes:

- Granular Media Filtration
- Bag Filtration, nominal 5 and 1.5 micron bags
- Hypochlorination
- Storage and Disinfection Contact Time
- Distribution System Pressure and Circulation Pumping

The WTP is in poor physical condition and disrepair. The WTP does not meet current drinking water regulations for Cryptosporidium removal.

At the time of this report, the WTP only provides service to the clinic and washeteria. The community watering points are frozen and/or otherwise non-functional.

3.3 WATER STORAGE TANK

The WST consists of a steel-bolted, insulated, aboveground WST. The tank has a reported capacity of 50,000 gallons – apparently the tank volume is sufficient for the current limited water production rate for the WTP, but may be inadequate in size to accommodate future demand.

The tank is located adjacent to the WTP/washeteria building with a “dog house” attachment between the tank and the WTP that accommodates the insulated water supply and discharge lines. It has been reported that the tank experiences leakage (unknown rate), which was not visible during the May 2010 site visit.

The foundation for the WST is in very poor condition as noted in the photos presented in Appendix B. The tank exterior has obvious signs of physical deterioration. The WST appears to be unsuitable for reconditioning or upgrade. The condition of the tank interior is unknown, but the current operator noted the tank's interior has not been inspected nor cleaned for many years.

3.4 WATER SOURCES

3.4.1 Muskox Creek Intake Structure

The Muskox Creek Intake Structure is:

- In poor physical condition.
- Located over a drainage swale, presumably Muskox Creek that appeared to be very nearly dry during the May 2010 visit to the community.
- No longer used by community.

The raw water pipeline connecting the Muskox Creek Intake Structure to the Unnamed Creek Intake Structure is:

- An above-grade Arctic pipe system.
- Subject to freezing.
- No longer used by the community.
- The water pipeline appeared to be salvageable for possible reuse.

3.4.2 Unnamed Creek Intake Structure

The Unnamed Creek Intake Structure is:

- In poor physical condition.
- Located downgradient of nearby existing and potential future new residential structures and, therefore, subject to contamination from fuel and/or wastewater stored on those properties.
- Subject to seasonal burial from drifting snow.
- Subject to infrastructure freezing from:
  - Breaches in the integrity of the existing building structure.
  - Inability to add heat to the existing structure.
- Subject to aufeis formation in the creek immediately below the intake structure
- Subject to flooding and immersion of the building structure components

The raw water pipeline connecting the Unnamed Creek and the washeteria is:

- An above-grade Arctic pipeline.
- Subject to seasonal movement and realignment of support cribbing.

- Currently functional.

TTC has applied for funding assistance from the Coastal Villages Regional Funds (CVRF) for possible relocation of the intake structure further upstream on Unnamed Creek in order to be upgradient of residential contamination sources.

3.5 WATERING POINTS

3.5.1 Mechanical

The watering point design included buried Arctic piping, with a valve pit at each watering point location. The enclosures were designed with electric heaters in the aboveground portion and also in the valve pit. Heat tracing power points and controls were also included at each watering point location. Of the six watering points located in the village, only one showed signs of being usable. All of the watering points' enclosures were deteriorated, with damage to the access doors and floors, including:

- Watering Point #1 nearest the Tribal Council Store #1 was boarded up due to vandalism.
- Watering Point #2 was accessible with non-operational heaters and heat trace controllers.
- Watering Point #3 had snow and ice inside the enclosure and valve pit, indicating possible freeze-up of the piping. The electrical panel face had been removed and heat trace controls had been disconnected. The enclosure heater had failed.
- Watering Point #4 could not be entered because of snow and ice built up inside.
- Watering Point #5 could not be entered because of snow and ice built up inside. The bottom of the door was severely corroded, which let blowing snow inside.
- Watering Point #6 had been boarded up and was not inspected.

Because of the non-operational circulation pumps and heat trace controls (both at the WTP and watering points), the distribution piping has a high potential to freeze as winter weather progresses.

3.5.2 Electrical

The existing services for the watering point buildings/enclosures include an overhead drop from the adjacent village utility pole to an interior 100 amp, 240VAC, single-phase main disconnect switch. The incoming service feeder is routed through the disconnect switch to an interior 100 amp, 240VAC, single-phase branch circuit panel.

The majority of electrical equipment within the watering point enclosures has deteriorated past its useful life. Given the observed level of deterioration, the facility can no longer serve its intended purpose with any reliability and safety. See mechanical for a list of watering point enclosures available for inspection.

The watering point enclosures interior and exterior lighting fixtures were found to be in poor condition. A number of the fixtures were disconnected or damaged beyond repair.

The power distribution and utilization equipment at the watering point enclosures showed signs of significant deterioration due to corrosion, resulting in potential hazards to equipment and personnel. Many of the dead-front panel board covers have been removed, exposing live parts to personnel entering the building/enclosure. This represents a significant life safety hazard and the covers that should be replaced as soon as possible. Exposed wiring was also present within the enclosures and should be re-installed in the existing junction boxes for safety.

Heat tracing power points and controls at the enclosures were found to be in very poor condition. A number of the units were disconnected or damaged beyond repair.

3.6 WATER DISTRIBUTION LINES

The treated water distribution lines from the WTP to the six community watering points that serve the community consists of buried circulating water lines. These circulating water lines are reported to be 3-inch diameter and have been in continuous use for the past 40 years. The water distribution piping consists of high-density polyethylene (HDPE) insulated Arctic pipe that is heat traced; however, the heat tracing appeared to be non-functional during the time of the May 2010 site visit.

According to verbal comments from the WTP operator, the water distribution lines appear to be functioning as originally designed and provide adequate flow to the downstream watering points. The physical condition of the water lines is unknown and assumed to be adequate for the current water demand conditions; however, the water demand is very limited due to the defective watering points. The community hauls most of its drinking water from the school well watering point. Consequently, additional investigation work is needed to determine the physical condition of the water lines. The investigative work should include line leakage testing and measurement of flow rate.

3.7 WASTEWATER DISPOSAL SYSTEMS

3.7.1 Septic Tank System Serving the Washeteria and School

The septic tank and soil absorption system serving the Paul T. Albert School, teacher housing complex and washeteria consists of a 4,000-gallon septic tank and a 30-foot by 30-foot drainfield. The septic tank system is located down-slope of the washeteria and school in a level area a few feet above the high water mark along Tununak Bay.

According to the findings reported in the 1993 *Tununak Sanitation Feasibility Study*, the records available from the U.S. Public Health Service on the original installation of the septic tank system are of questionable accuracy. The septic tank system is approximately 30 years old and appears to be undersized to handle the typical daily wastewater flow.

The operation of the septic tank system was assessed during the May 2010 site visit. The liquid levels in the septic tank pump out pipes and drainfield observation pipes were measured. All of the liquid levels were found to be at or near the surrounding ground surface. These measurements indicated the drainfield was in hydraulic failure. Depending on the rate of incoming sewage, the hydraulic overload could cause blockage of the upstream sewer lines and/or discharge of raw sewage onto the ground surface via the pump-out pipes and drainfield observation pipes.

Apparently, based on discussions with the operators of the septic tank system, hydraulic failure occurs frequently. The operators temporarily relieve the hydraulic overload by pumping effluent from the drainfield observation pipes to the nearby septic tank system serving the FTH system.

3.7.2 Septic Tank System Serving Flush Tank and Haul System (Co-Water System)

The community currently has 18 homes that are served by the FTH system installed by Co-Water. The septic tank system that handles the sewage effluent collected by the FTH system consists of an “In-complete Septic System”. This descriptive term “in-complete” was used in the 1993 *Tununak Sanitation Feasibility Study*, because the septic tanks were originally to be connected to the non-operational sewer system serving the 23 homes in the U.S. Department of Housing and Urban Development subdivision. However, the sewer line from the non-functional sewage pump station was never connected to septic tanks; hence, the term “in-complete” was used to describe the condition of the septic system.

The “In-complete Septic System” is located approximately 100 feet north of the septic tank system serving the washeteria and school and consists of two 6,000-gallon septic tanks, siphon operated dosing tanks, and three 60-foot by 100-foot drainfields. The septic tanks are not connected to an incoming community sewer line, except for the gravity discharge line from the FTH dumping station that is located a few feet from the septic tanks.

During the May 2010 site visit, MWH assessed the operation of the “In-complete Septic System.” The following site observation comments on the operation of the FTH septic tank system were provided in the MWH site visit trip report dated June 3, 2010:

> *We met on-site with Christopher, the current operator of the flush haul system. Christopher informed us of the problem that occurred this morning where the community tank trailer had gotten stuck in the mud while attempting to discharge its effluent at the septic tank system.*
>
> *A second issue that was brought to our attention was that septic tank system for the flush haul system failed last fall due to blockage in one or both septic tanks. We learned the septic tanks had not been pumped because of the lack of a pumper truck. In checking the septic tanks, it was noted that the tanks’ contents were frozen. Consequently, the operator has been disposing the flush tank haul effluent for the past several months directly into a shallow trench located next to the septic tank.*

The site observations reported above confirmed the septic tanks are currently in a state of failure. Consequently, the operators of FTH system have been dumping their haul contents of raw sewage in an open trench located next to the septic tanks. The trench was observed to be easily accessible to the public and animals (especially loose dogs) in the community.

During the project kick-off meeting that was held on May 18, 2010, comments were received from homeowners who are served by the FTH system. According to information provided by Co-Water, the FTH operates as follows:

> *Fresh water is collected from a watering point and delivered to the home by a water haul tank and "pumped" into the in-house holding tank. Each house or building is supplied with an indoor fresh water storage tank. Inside the home, the water is delivered around the house through normal water pipes by a pressure system consisting of a small pump, filter, and pressure tank. This system provides water to various connected plumbing fixtures, including toilet, hand basin, bath/shower, and kitchen sink.*
>
> *The sanitation system consists of the sewer piping and venting system that collects the wastewater from the various plumbing fixtures, including the toilet, and delivers the sewage to a specially designed sewage holding tank that is located outside the home. When the holding tank is full, the sewage is evacuated into the sewage haul tank using the sewage vacuum blower, which puts a vacuum on the haul tank to draw the sewage into the haul tank.*

The homeowners attending the Project Kick-Off Meeting expressed their frustration and dissatisfaction with the current operation of the FTH system. They explained that many of the operational problems were primarily associated with the failure of valves. Overall, the community was overwhelmingly opposed to continued use and expansion of the FTH system. These issues and concerns necessitate further investigation to determine the extent and nature of the operational problems with the FTH system.

3.7.3 Honey Bucket Disposal Bunkers

With the exception of the 18 homes served by the FTH system and the piped water and sewer system serving the school and associated teacher housing, the remainder of homes and businesses in the community use honey buckets. It is estimated 64 households currently rely on the use of honey buckets.

Residents and businesses using honey buckets typically self-haul their water. The honey bucket waste is self-hauled and disposed of in several sewage bunkers that are located in near proximity to the homes throughout the community.

The bunkers consist of buried wooden structures with open bottoms – basically the bunkers serve as cesspools. Most – if not all – of these bunkers are overflowing with raw sewage. It was noted that every bunker observed during the 2010 site visit appeared to be functioning improperly, i.e., in a state of failure. Nearly all of them had sewage overflowing the bunker's manhole openings and accessible to direct contact by animals and humans.

4.0 SANITARY FACILITY QUESTIONNAIRE

During the May 2010 Project Kick-off Meeting, residents expressed a lack of trust in the quality of water produced in the existing WTP. During the meeting's discussion it was noted that the last sanitary questionnaire conducted in the community was nearly 20 years ago. The MWH design team suggested a new questionnaire be conducted to update the old questionnaire and obtain current information from the residents regarding their current water supply and sewage disposal methods. Also, the questionnaire would be used to obtain feedback from the residents on their desire for future improvements to the sanitary facilities serving Tununak.

Subsequent to the kick-off meeting, MWH prepared a new questionnaire that requested residents provide information on the following sanitary issues:

- Present water source (broken down for seasons and source type).
- Present water consumption.
- Present sewage disposal method.
- Preference for future sewage disposal (allowed for ranking of preferences).
- Preference for future water improvements (allowed for ranking of preferences).
- Use of home washing machine.
- Use of the existing Washeteria.
- Desired user fees for piped water and sewer services, use of new washeteria and new watering point.

The questionnaire was reviewed by VSW and then sent out to the community for distribution. TTC arranged for the solicitation of questionnaire input from the residents during the early summer months of 2010. A copy of a blank questionnaire, housing survey map, and a spreadsheet summary of the questionnaire data are provided in Appendix C.

Overall, the questionnaire was successful in obtaining valuable information on the community's response to the above listed sanitary issues. Most important, the questionnaire had an excellent return rate that represented nearly 75 percent (%) of the residential population and over 60% of the housing units.

The following provides a summary of the questionnaire findings:

- Average water use per person per day — 2.3 gallons/day
- Total water use per day (represents 226 persons surveyed) — 395 gallons/day
- Percent of residents using BIA School Well — 100%
- Total number of honey bucket users — 40 households
- Total number of households served by the FTH system — 11 households
- Percentage desiring honey buckets — 8%
- Percentage desiring FTH system — 8%

• Percentage desiring sewer lines	81%
• Percentage desiring new washeteria	52%
• Percentage desiring piped water	33%
• Percentage desiring new watering points	13%
• Percentage current users of existing washeteria	75%
• Average desired user fee for piped water and sewer	\$42.30 per month
• Average desired user fee for new washeteria washer	\$4.68 per wash load
• Average desired user fee for new washeteria shower	\$1.69 per shower
• Average desired user fee for new watering point	\$22.18 per month

One of the most important findings of the questionnaire was that 100% of the residents obtain their drinking water from the BIA school well rather than the water produced by the existing WTP. Given the numerous issuances of “boil water” notices, the residents apparently do not have confidence in the quality of water provided at the community watering points. Future upgrades to the community’s water supply system need to be done so that the water system gains respect and trust by the public. A safe and reliable year-round source of water needs to be developed that is protected from contamination and has good natural water quality.

After reviewing the above questionnaire findings, an adjustment was made to account for the “reasonable cost” residents were willing to pay for new services, i.e., many respondents indicated they wanted piped water and sewer, but listed unreasonable low monthly user fees (less than \$100 per month). The respondents that indicated their first choice was a piped water and sewer system but submitted very low (unreasonable) user rates were replaced with their second choice – a new washeteria. The <u>adjusted percentage</u> of those who favor a new washeteria increased from 52% to 77%.

It is recommended that a follow up questionnaire be completed during the next phase of design work to solicit input from residents on their preferred choice of future sanitation facility improvements. The questionnaire needs to provide detailed estimates on the associated costs for operation and maintenance of the proposed improvements.

5.0 RECOMMENDED PLAN OF ACTION

5.1 WATER SOURCE

5.1.1 Candidate Sources of Potable Water

Candidate sources of water for Tununak are reviewed below.

5.1.1.1 Surface Fresh Water Sources

Fresh (non-saline) surface waters in the vicinity of Tununak include Muskox Creek, Un-named Creek, the Tununak River, and local artesian spring water. These are reviewed below.

Muskox Creek. This is a small creek to the east of the community with drainage basin of approximately 0.5 to 0.75 square miles on the south side of Ugchirnak Mountain. It is up-gradient of the community, but as previously noted, it appeared to be virtually dry during the May 2010 visit.

Un-named Creek. Like Muskox Creek, the drainage basin for Un-named Creek is also on the south side of Ugchirnak Mountain, but is somewhat larger – perhaps on the order of 1 to 1.5 square miles. During the May 2010 site visit, this creek was flowing both at the existing intake structure near existing community housing, as well as further up in the drainage basin.

Upper Tununak River. The Tununak (spelling per U.S. Geological Survey [USGS] Mapping) River is the largest, most productive source of fresh water in the area, but tidally influenced and potentially brackish near the community. Tide extremes in the area reported for Nome and St. Paul are between -1 and 4 feet mean sea level (MSL). Topographic mapping for the region shows the rivers' forks flow through a 25-foot elevation contour between 1.3 and 3.4 miles from the community's existing washeteria site. This suggests fresh water extraction would require an extended transmission pipeline across relatively flat and marshy terrain.

Local Spring Water. Reports received during the May 2010 site visit suggested the occurrence of one or more natural springs originating out of the hillside to the northeast of the community. However, no springs were encountered during a limited reconnaissance of the hillside during the May 2010 visit, nor was there evidence of a spring found on aerial photography recorded in 2004 for the region. It may be that such springs are limited to only seasonal flows.

5.1.1.2 Groundwater Sources

Groundwater resources developed within the community are limited to the BIA's well, which was drilled for the community school in 1964. The log for the well indicates the well to be shallow, cased to 31 feet, and screened to a total depth of 36.5 feet. Static water was reported to be 10 feet below ground surface with a well yield of 6 gallons per minute (gpm).

The well, located on the northeastern end of the spit below a bluff, is subject to potential contamination from the septic systems, sewage haul disposal system, and fuel oil storage tanks.

It is also a likely candidate for classification as a groundwater under the influence of surface water. As such this well, or others within its vicinity, are not good candidates for a community water source.

Similarly, on the southeast end of the spit across the bridge from the community, is an area that may have groundwater reserves similar to those tapped by the existing school well. However, this area is currently used as the community landfill and, as such, would potentially be subject to unacceptable levels of contamination.

Developing groundwater from upland locations within the area may be successful. However, upland areas that would provide physical separation from existing sources of contamination are likely underlain by permafrost and, as such, may not yield the quantities of fresh water required by the community.

5.1.1.3 Brackish or Sea Water Sources

The lower reaches of the Tununak River offer plentiful quantities of water with relative close proximity to water consumers within the community. However, the water quality is expected to be influenced by sea water salinity, as well as contaminants leaching into the water from nearby honey bucket bunkers located along the banks of the river.

Bearing Sea water is similar to the lower reaches of the Tununak River, in that it too is conveniently close to the community. However, intake structures to collect it, whether open ocean submerged diffusers or sub-seabed intake galleries, would all be subject to physical damage from sea ice floe movements along the nearshore areas of tidewater.

Desalination of brackish and/or marine source waters is common enough, but energy intensive, and therefore usually adopted only if freshwater sources cannot be developed or are temporarily unavailable.

5.1.2 Source Water Regulatory Issues

Regulatory issues regarding candidate source water development for the community are addressed below.

5.1.2.1 Source Water Protection

The 1996 Amendments to the Safe Drinking Water Act included requirements to establish a Source Water Protection Program to protect the quality of waters used to produce potable water, including both groundwater and surface water sources. The U.S. Environmental Protection Agency’s (EPA’s) requirements of the program include:

1. Identification of a source water protection boundary suitable for protection of the community’s water supply source.
2. Inventory of known or potential sources of contamination for the community source water within the boundaries established for the protected area.

3. Determination of whether the source water is susceptible to these sources of contamination.
4. Development of public involvement program that involves public notification of:
   - Limits of the source water protection area.
   - Identified sources of contamination within protected area.
   - Steps needed for protection of water from identified contaminants.
5. Implementation of local management plans to reduce the risks of source water contamination.
6. Development of contingency plans for implementation in the event of source water contamination.

The State of Alaska is responsible for implementation of local source water protection programs. Under 18 Alaska Administrative Code (AAC) 80.015(c), public water systems are required to report data to the State related to Items 1 through 3 above.

Under 18 AAC 80.020, the State requires water wells used as a public water source be separated from sources of contamination according to distances published in that regulation. Generally, this distance is 200 feet, and applies to wastewater storage, conveyance, treatment and disposal infrastructure, and landfills.

5.1.2.2 Regulatory Requirements for Treatment of Source Water

New water sources must be tested for quality and, after treatment, found to be in compliance with the maximum contaminant levels (MCLs) referenced in 18 AAC 80.300 and 40 Code of Federal Regulations (CFR) 141. To facilitate achieving this goal, and to satisfy State plan review requirements for use of new sources, the water quality parameters listed in Table B of 18 AAC 80.205 must be identified, including:

- Total coliform bacteria
- Inorganic chemicals
- Nitrate
- Nitrite
- Volatile organic chemicals
- Secondary contaminants

In addition to source water testing required by 18 AAC 80, the Groundwater Rule as published in the Federal Register on November 8, 2006, also requires new groundwater systems brought on line after November 30, 2009, to monitor and report the microbial quality of the water produced by the well. Under the Groundwater Rule, testing is to include evaluation for microbial organisms that are indicators of fecal contamination including *E. coli*, Enterococci, or Coliphage. If the source is found to have a positive response to one of these tests, one of several steps must be taken. These include removing the source of contamination and/or providing a minimum of 4 log inactivation of viruses in the well water treatment system.

Similar to groundwater sources, under EPA regulations, new surface water sources are also to be tested for their microbial quality. Those sources with a higher concentration of target pathogens are required to provide more extensive treatment for microbial quality control.

In particular, the Long Term 2 Enhanced Surface Water Treatment Rule (Federal Register, January 5, 2006) requires systems using surface water as their source water to collect 24 samples for microbial analysis. Smaller, filtered systems serving less than 10,000 people must monitor for *E. coli* every 2 weeks for 12 months. For source waters that are lakes or impoundments, if the monitoring results in an annual mean *E. coli* concentration of less than 10 per 100 milliliters, no further monitoring is required and the treatment system must only meet 2-log Cryptosporidium reduction requirements. If annual *E. coli* monitoring results equal or exceed 10 per 100 milliliters, the system must begin source water monitoring for Cryptosporidium, which may lead to higher microbial removal treatment requirements for the treatment system.

In addition to monitoring source waters for microbial quality, EPA regulations require treated water quality distributed by public water systems meet MCLs for contaminants referred to as disinfection byproducts (DBPs). While these rules do not require source water monitoring, they do address minimum requirements for treated water quality, and therefore should be evaluated as part of the source water quality evaluations noted below.

5.1.3 Work Plan for Developing a Water Source

The following sections identify recommendations for advancing the planning, design, and development of upgrades to the community water source system.

5.1.3.1 Hydrologic and Geotechnical Evaluations

It is our understanding that Tununak is scheduled for a relocation of its airfield. The Alaska Department of Transportation and Public Facilities (ADOT/PF) has a year 2012 line item budget for this of $24 million. It would seem that with this project, a gravel source borrow pit could be developed that, upon completion of gravel extraction efforts, could serve as an impoundment for collection and supply of surface water for the community. Such an effort would, necessarily, have to be coordinated with ADOT/PF, including soils investigations to assess upland bedrock deposits for suitability as airfield embankments, and hydrologic investigations to assess runoff and yield of drainage basins upgradient of the borrow pit.

The community is located within a region of Alaska that is subject to a significant degree of snow drifting. As a result, snow fencing would be an option to improve capture of snow in upland drainage basins for purposes of improving yields of seasonal runoff.

5.1.3.2 Source Water Schematics

Possible source water developments on the upland areas northeast of the community are discussed in the following paragraphs. This area of development is selected because:

- It avoids crossing the Tununak River with a pipeline.
- It minimizes crossing wetland marsh areas of the Tununak River with water system infrastructure.
- It has relatively close proximity to the existing community's existing water system infrastructure.
- It would be relatively easy to serve additional development planned for this area of the existing community.

One alternative source water configuration (Appendix D, Figure D-1) is an impoundment with a free water surface elevation of 300 feet MSL. This could enable a gravity supply of treated water to flow to the community, supplying a minimum static pressure of 50 pounds per square inch to housing at elevation 50 feet MSL, which is approximately the elevation of the highest, newest housing within the community.

The size of the impoundment would depend upon several factors, including:

- Demands for potable water in the community:
  - Domestic use for a new washeteria and hauling of drinking water is assumed to be 50 gallons per person per day for a population of 500 people, or 25,000 gallons per day in 30 years, which yields an estimated annual demand of 9.1 million gallons (MG).
  - Commercial use (fish processing plant), currently estimated to be 15,000 gallons per season, and possibly increased to 100,000 gallons per season in 30 years.
  - Total annual demand of 9.2 MG in 30 years.
- Characteristics of precipitation, and runoff in the drainage basin. Preliminary estimates might include:
  - Five (5) feet average snow depth with the use of catchment basin snow fencing.
  - One (1) square mile drainage basin area.
  - Thirty percent (30%) snow conversion to water.
  - Sixty percent (60%) loss to evaporation and infiltration.
  - Annual net runoff of 125 MG.

To accommodate an impoundment with a water surface elevation of 300 MSL, and sustain projected demands, the impoundment would need to contain approximately 40 MG. With a 15-foot average water depth, and width of 50 feet, the impoundment would be an average of 6,500 feet long at mid-depth of the water column. Available drainage basin area above the 300-foot contour on existing topographic mapping presented on Figure D-2 (Appendix D).

An alternative source water impoundment configuration is presented in Appendix D, Figure D-3. In this alternative, the impounded water supply is lower in elevation and provides only a gravity flow of water to a community WTP, watering point, and washeteria, but does not include a gravity-fed piped water distribution system. For this alternative, a continuous flow of source water would be delivered to the WTP, as needed, for both potable water demands and year-round water supply freeze protection. Un-treated source water used for raw water transmission main freeze protection would be shunted to the existing creek for natural drainage to the Tununak River.

5.2 WATER TREATMENT PROCESS

Should the project advance adopting the concept of developing an upland surface water impoundment, the quality of surface water runoff from the drainage basin should be evaluated for the following parameters:

- pH
- Alkalinity
- Total dissolved solids
- Total organic carbon
- Dissolved organic carbon
- Ultra-violet absorption
- Inductively-coupled plasma/mass spectrometry scan for metals
- Nitrates/Nitrites (NO2/NO3)
- Volatile organic compounds

In addition, bench or pilot scale testing should be conducted to simulate performance of candidate treatment alternatives, especially as applies to achieving compliance with the DBP rules, using a simulated distribution system DBP evaluation for the source water.

Based on past water quality analyses collected in the past for Unnamed Creek Well House, it appears a direct filtration treatment system with hypochlorination may be suitable for the upland water source. However, this needs to be confirmed during the next phase of water source investigation. A conceptual sketch of the water treatment process is provided in Appendix D, Figure D-4.

5.3 WATER TREATMENT PLANT AND WASHETERIA

The existing WTP/washeteria building and water system have severely deteriorated and would be extremely expensive to repair. In addition, any repairs would add little additional functional life to the facility. Its current operation is limited to one washer, delivery of water to the clinic, and (possibly) delivery of water to the public watering points – assuming that the pipelines have not suffered freezing damage.

Assuming that a good quality water source could be connected to the WTP and washeteria, extensive repairs, including installation of functioning circulating pumps, checkout and rehabilitation of the pipeline heat tracing systems, replacement of non-functioning watering point heaters, and repairs to the WTP boilers would be required to be able to supply water to the public watering points. The washeteria function would still be limited to one washer, unless additional machines were purchased and installed.

These improvements or repairs do not seem justified given the existing condition of the facility. The recommended course of action is to abandon the existing facility and construct a new WTP and washeteria facility. The watering point piping should be checked for freeze damage, and if none is found, the aboveground portion of the watering points should be demolished and reconstructed – with emphasis on weather-tightness of the structures and security from vandalism.

For preliminary consideration purposes, two sketches of conceptual WTP/Washeteria building floor plans are provided in Appendix D, Figures D-5 and D-6. Given the 20-year population projection, it is assumed a new building with an interior area of approximately 3,000 square feet will be sufficient to accommodate a WTP and washeteria for the community. The conceptual floor plans show the following items:

- Five (5) washers
- Five (5) dryers
- A clothes folding counter
- A waiting area
- An office/laboratory
- Two (2) women showers and bathrooms (including handicap accommodations)
- Two (2) men showers and bathrooms (including handicap accommodations)
- Mechanical, plenum/maintenance, and storage rooms
- A WTP (direct filtration treatment system with hypochlorination)
- A community watering point on building exterior

The two conceptual floor plans provide two different layouts of the same items listed above.

The building foundation is undetermined at this time, and will require geotechnical consideration to identify issues of permafrost and thaw possibly. It is assumed the new WTP/washeteria will be located in the same footprint area of the existing WTP building. A possible design approach for the building's foundation may include the use of sleepers and beams similar to that used for the existing building. An alternative design is one that incorporates the use of thermal piles with gravel pads, geofabric and board insulation.

The new building service will be approximately 200 to 300 amp, 240VAC, single-phase served from an adjacent, overhead utility pole. The main distribution for the building will be provided from a 240VAC, single-phase main distribution panelboard (MDP) which will sub-feed 100-amp, 240VAC branch panels within the facility.

Lighting will be provided in accordance with the Illuminating Engineering Society of North America (IESNA) Lighting Handbook and industry standards. The majority of interior lighting will be provided with energy-saving fluorescent fixtures. Exterior fixtures will be High Pressure Sodium (HPS) type. All fluorescent ballasts will have less than 10% Total Harmonic Distortion (THD). Interior lighting will be controlled through manual and automatic means. Where practical, occupancy sensor lighting control will be provided to improve energy efficiency.

Manual switches will be used in areas where the above techniques do not provide an economical or practical solution.

Emergency lighting will be provided to comply with the National Electrical Code, International Building Code (IBC), and the National Fire Protection Association (NFPA) 101 and will use wall mounted units with batter backup. Exit signs will be the energy-saving type with integral battery backup.

Receptacle devices include general receptacles, special receptacles, and other components required to provide convenient points for connection of appliances and/or equipment to power sources. A maximum of six receptacles per circuit will be provided.

Mechanical equipment serving the heating, ventilation, and air conditioning systems will include disconnects, motor starters, and/or thermal manual motor starters to meet the needs of the equipment and sequence of operations. Motor control centers, or stand alone starter units, will be incorporated to suit the physical layout of spaces and number of motors within the space. Motors over 1/2-horsepower (hp) will be served from individual branch circuits or motor control center modules. Unless special considerations require selection of other types of starters, starters will be FVNR (Full Voltage, Non-Reversible) hp-rated and will consist of toggle-type manual starters for fractional hp motors and full NEMA size units sized for those motors greater than 1/2-hp in size or of 3-phase configuration. Variable speed or frequency drives, or reduced voltage starting equipment complying with utilities requirements, will be provided for mechanical system motor loads exceeding 20-hp or as required by mechanical sequences.

A stand-by, diesel-fired engine generator set will be used to provide power to the facility during the loss of normal utility power.

5.4 WATER STORAGE TANK

It is proposed that a bolted steel WST will be provided for Tununak. Current design anticipates that a 100,000-gallon tank will be required. The materials, accessories, and design incorporated into the WST should comply with American Water Works Association (AWWA) D103 and the following specifications:

- Design Loads
  - Specific Gravity: 1.0
  - Wind velocity per International Building Codes/AWWA
  - Shape Factor: 0.6
  - Allowable Soil: to be determined
  - Roof Snow Load: 25 pounds per square foot
  - Seismic per IBC/AWWA

The WST would be prefabricated at a manufactures facility what would incorporate fusion bond coatings for resistance to internal and external tank corrosion. Insulation and an aluminum jacket protective cover would also be specified. A bolted tank is selected for ease of shipping and construction, with assistance of a local force account.

The foundation for the WST is undetermined at this time and will require geotechnical consideration to identify issues of permafrost and, possibly, thaw. A ring wall is anticipated. However, thermal piles may need to be incorporated into the foundation design, along with gravel pads, geofabric, and board insulation. Another design approach for the tank's foundation may include the use of sleepers and beams similar to that used for the existing WST.

5.5 WATER DISTRIBUTION AND WATERING POINTS

It is assumed the existing water distribution system from the existing WTP to the watering points will remain, subject to satisfactory findings of a future investigation. The new WTP will provide a means for adequate pumping for recirculation purposes and heat-add for thermal protection.

The existing watering points are currently inadequate and need replacement. The new watering points are assumed to be located at the same locations as the existing watering points, which are located strategically throughout the community.

The replacement watering points will be designed to ensure ease of operation and safety for residential use. The same design features will be incorporated in the community watering point proposed for the new WTP/washeteria building.

The new watering point enclosure services will be similar to the existing and include an overhead drop from the adjacent village utility pole to an interior 100 amp, 240VAC single-phase main disconnect switch. An interior 100 amp, 240VAC, single-phase branch panelboard will provided. The panel will feed all loads within the enclosure, including lighting, heaters, receptacles, heat trace, etc.

Exterior lighting will be high pressure sodium wall packs. Interior lighting will be incandescent industrial type fixtures with guards.

5.6 WASTEWATER DISPOSAL SYSTEMS

5.6.1 On-Site Septic Tank System for School, Teacher Housing and Washeteria

The existing septic tank system serving the school, teacher housing, and washeteria was found to be in a state of failure during the May 2010 field trip visit completed by MWH. The septic tank and drainfield is approximately 30 years old and appears to be beyond repair. It is recommended the existing septic system be abandoned in-place and the sewer line re-routed to flow by gravity to the proposed upgraded septic tank system that currently serves the FTH system as described below.

A conceptual sketch for the proposed sewer improvements is provided in Appendix D, Figure D-7. Flow from the proposed new WTP/washeteria, school, and teacher housing would flow by gravity through Manhole #1 to Manhole #2, located at the toe of the hillside west of the School.

Manhole #2 would be modified to accommodate a new, 8-inch diameter sewer line that would take flow northerly along the base of the hillside by gravity to the upgraded septic tanks for the FTH drainfield system. The new sewer line would include a new manhole midway between Manhole #2 and the FTH septic tanks.

5.6.2 On-Site Septic System for Co-Water FTH System

It was noted by MWH during the May 2010 site visit, that the existing septic tank system used for the disposal of tank pumping from the Co-Water FTH system was in a state of failure. The failure is apparently caused by a blockage in the multi-compartment septic tanks. Based on the limited field observations, there is a possibility that the blockage could be corrected and the septic tanks placed back into operation.

However, it is essential that a more comprehensive site investigation be conducted in order to accurately assess the structural condition of the septic tanks to ensure their continued use. Also, the hydraulic adequacy of the existing drainfield needs to be determined. Apparently, the drainfield has had limited use over the years, and may be capable of handling the flow of clarified sewage discharged from the septic tanks. Given the size of the drainfield according to VSW records, the drainfield may be adequate in absorption area to handle the combined flow from the FTH system and the effluent from the school, teacher housing, and new washeteria. The assessment of the hydraulic capacity of the drainfield needs to be completed as soon as possible.

5.6.3 Honey Bucket Disposal and Conversion to a Community-Wide FTH System

All of the existing honey bucket disposal bunkers in the community are filled to capacity. Their continued use is an obvious and serious health hazard to the residents, including their pets. It is understandable that the residents who are currently using honey buckets desire a piped sewer system, but due to funding constraint, the continued use of honey buckets appears to be a necessity for the near term.

Unless significant funding for a piped sewer system is obtained in the immediate future, it is recommended for the interim that an alternative, cost-effective method of disposing the honey bucket wastes in a sanitary method be developed in the immediate future – subject to the availability of funding. However, as a practical long term alternative, MWH recommends the expansion of the FTH system to serve all of the households in Tununak currently on the honey bucket system. These households would be upgraded to accommodate interior plumbing improvements that are compatible to accommodate the use of FTH system.

Until funding is provided for expansion of the FTH system, it is recommended that honey bucket waste is disposed of in new transfer stations that are located in convenient and strategic locations throughout the community where honey buckets are used. Residents would self-haul their honey bucket waste to in “sanitary bags” to special hoppers that are contained in the waste transfer stations. The hoppers would be equipped with sealed covers to contain the bags for temporary storage.

A service would be set up by TTC to routinely inspect the waste transfer stations and empty the hoppers into a transport container that would haul the contents by an all-terrain vehicle to a community-wide disposal facility. This facility would be located at an approved site, possibly near the current landfill (dump) located south of the airfield. The honey bucket disposal site would consist of a large, fenced-in sewage bunker similar to ones used in other remote villages. The bunker would be designed to allow for sequential expansion as portions of the bunker are filled and properly buried.

In addition, the existing honey bucket bunkers need to be properly closed out and limed for final burial. It is recommended the bunkers that are currently overflowing be properly abandoned immediately.

6.0 COST ESTIMATE FOR RECOMMENDED SANITATION IMPROVEMENTS

The following provides a breakdown of the estimated costs for the construction of the proposed sanitation improvements that were recommended in Section 5.0 of this report. Given the limited scope of the investigation completed by the MWH design team, the cost estimates are qualified as conceptual and should only be used for preliminary planning and scoping purposes. It is understood the cost estimates will be used for requesting initial funding to provide a financial means to pursue the development of these urgently needed sanitation improvements for the community.

As recommended in Section 5.0, a more comprehensive investigation on the site conditions should be conducted in order to verify the cost estimates. On the other hand, the future investigation(s) and studies may discover favorable site conditions that could reduce the cost estimates, especially in regard to the development of the water source. It is noted due to project scope limitations that the following cost estimate does not include the estimated cost to expand the FTH system to serve the households currently using the honey bucket disposal system.

Proposed Sanitation Improvements	Construction Cost
New Water Source (Hillside Impoundment)	$1,000,000
New WTP and Washeteria (includes demolition of existing structures)	$3,050,000
100,000-gallon WST	$550,000
Watering Points (five community Locations)	$150,000
Honey Bucket Collectors and Disposal Facility	$350,000
Upgraded Septic Tank System (For School, WTP/Washeteria and FTH System, and Includes Septic Tank Pumper Truck)	$350,000
Total Construction Cost Estimate	$5,450,000
Design and Construction Management (20%)	$1,090,000
Contingency (20%)	$1,308,000
TOTAL COST ESTIMATE	**$7,848,000**

7.0 RECOMMENDATIONS AND CONCLUSIONS

The recommended plan of action presented herein provides a simplistic, yet useable, preliminary "guide" for the development of the proposed water and sewer improvements. These improvements were shown in conceptual sketches and drawings to depict fundamental features of the design components. This plan of action included two conceptual floor plans for the replacement WTP and washeteria that show configurations of laundry equipment, bathrooms, showers, mechanical, water treatment equipment and offices. These sketches serve as points of reference for planning and discussion purposes.

Potential water sources were identified, screened, and evaluated. Screening criteria considerations for the candidate sources included: community perception of the source as a supply of public water, the potential for contamination from past or current development, individual source water quality and quantity, and rough cost estimates for complying with applicable rules/requirements for treatment.

The community's sanitation problems identified in this investigation are considered by the MWH design team to be an imminent risk to the health and welfare of its residents. All of the essential components of the water and sewer systems currently serving the community, with the exception of the BIA school well, were found to be in extremely poor operational condition.

In summary, the design team recommends the following sanitation improvements be further evaluated for development as soon as practical:

- Replace the Unnamed Creek water intake with an upgradient (hillside) water source.
- Replace the WTP.
- Replace the washeteria.
- Replace the existing WST with a 100,000-gallon tank.
- Replace the community watering points.
- Expand the FTH system to serve all households in the community. This recommendation involves the installation of interior plumbing to connect to the FTH tank in existing households that currently use honey buckets. Also, the FTH system will need additional upgrades to the water and sewage haul equipment and expansion of the on-site septic tank/drainfield system.
- As an interim corrective action measure until such time the honey bucket use homes are upgraded with interior plumbing to accommodate the use of the FTH system, we recommend the installation of honey bucket transfer stations and construct disposal facility at a suitable location outside of the residential area.
- Upgrade the septic tank system for the FTH system, new WTP, new washeteria, school, and school housing.

It is recommended the <u>first priority</u> is to develop a new "safe" water source. A site investigation for evaluating alternative, suitable water sources should be completed as the first step in addressing sanitation needs of Tununak. The design of a new WTP will depend on the quality and flow capability of the new water source.

Concurrent with the water source investigation, it is recommended a site investigation be conducted to evaluate the condition of the septic tanks and drainfield at the “In-complete septic system” for upgrade to use in the immediate future.

APPENDIX A

ADCRA Community maps of Tununak

FILE: D:\CAD\Proj\VSW - village safe water\TUNUNAK\Washeteria-Water Treatment Facility\draft\FIG A-1 ADCRA Tununak area map.dgn

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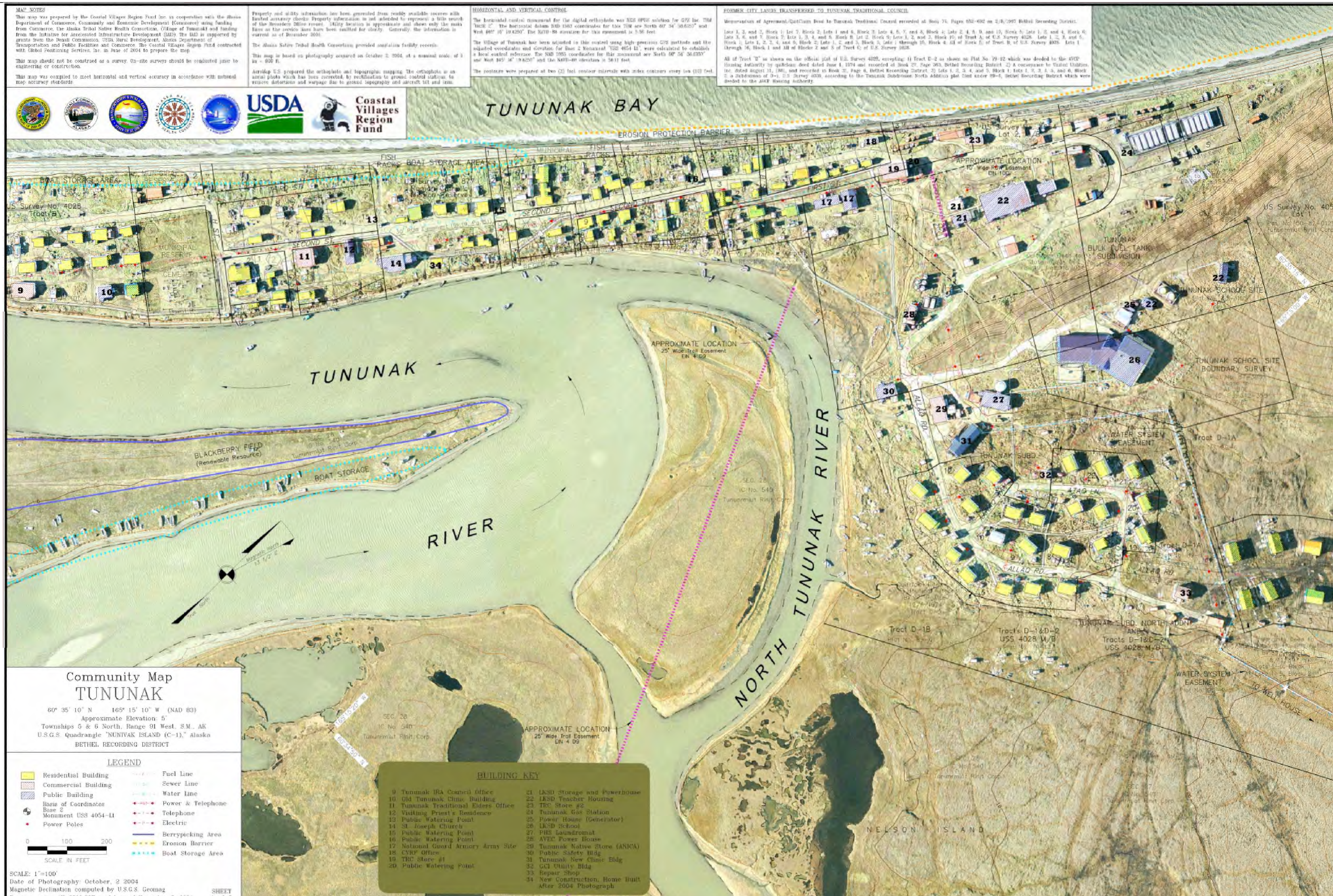
MWH
Anchorage, Alaska

FIGURE A-1

VILLAGE SAFE WATER
TUNUNAK - WASHETERIA/ WATER TREATMENT FACILITY DESIGN

ADCRA TUNUNAK AREA MAP



FILE: D:\CAD\Proj\VSW - village safe water\TUNUNAK\Washeteria-Water Treatment Facility\draft\FIG A-2 ADCRA Tununak community map.dgn

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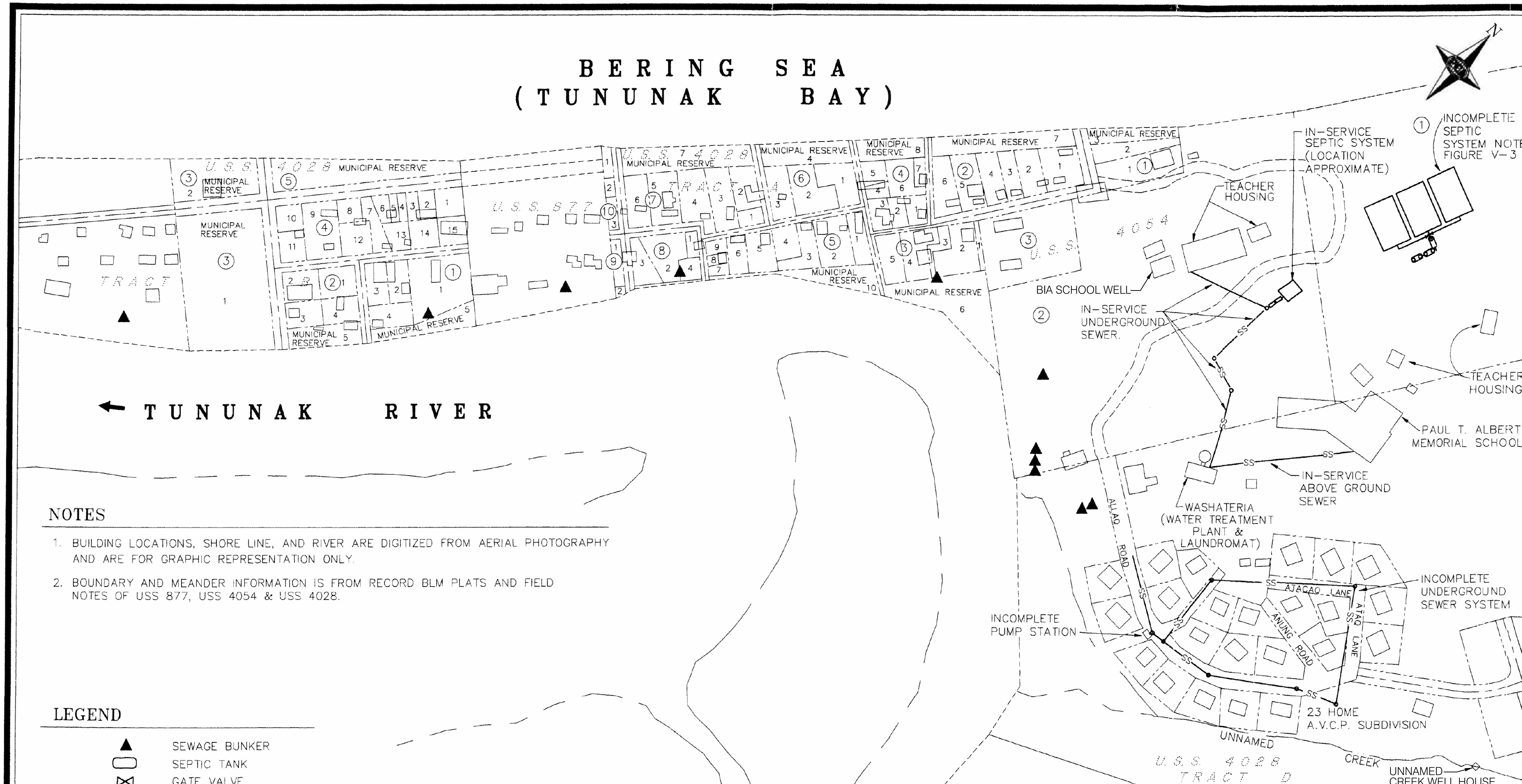
MWH
Anchorage, Alaska

FIGURE A-2

VILLAGE SAFE WATER
TUNUNAK - WASHETERIA/ WATER TREATMENT FACILITY DESIGN

ADCRA TUNUNAK COMMUNITY MAP



NOTES

1. BUILDING LOCATIONS, SHORE LINE, AND RIVER ARE DIGITIZED FROM AERIAL PHOTOGRAPHY AND ARE FOR GRAPHIC REPRESENTATION ONLY.
2. BOUNDARY AND MEANDER INFORMATION IS FROM RECORD BLM PLATS AND FIELD NOTES OF USS 877, USS 4054 & USS 4028.

LEGEND

- ▲ SEWAGE BUNKER
- SEPTIC TANK
- GATE VALVE
- SEWER MAN HOLE
- —SS— EXISTING SEWER LINE
- RECORD BOUNDARY
- RECORD CENTERLINE
- BLM RECORD MEANDERS
- (3) U.S. SURVEY BLOCK

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TUNUNAK SANITATION FEASIBILITY STUDY
EXISTING SANITATION FACILITIES

DRAWN	GRID	COMP FILE NO. 516V-1	FIGURE V-1
SCALE 1"=200'	DATE 12-21-92	FILE DRAWER NO.	
F.B. PG.	W.O. H92516		

FILE: D:\CAD\Proj\VSW - village safe water\TUNUNAK\Washeteria-Water Treatment Facility\draft\FIG A-3.dgn
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MWH
Anchorage, Alaska

FIGURE A-3
VILLAGE SAFE WATER
TUNUNAK - WASHETERIA/ WATER TREATMENT FACILITY DESIGN
EXISTING SANITATION FACILITIES

APPENDIX B

Site Photographs Taken During the May 2010 Field Trip

Photo 1: South side of the Water Treatment Plant Washeteria Abandoned watering point drainage area (circled). Boarded-up door to boiler room. Arctic pipeline to clinic in background.

Photo 2: Detail of undermined building cribbing below abandoned watering point.

Photo 3: Abandoned watering point showing erosion of building footings. Arctic pipe from water source previously buried has been exposed.

Photo 4: Another footing eroded along south wall of water treatment plant building.

Photo 5: Discharge from filter backwash above Arctic pipes.

Photo 6: Deteriorated tank foundation.

Photo 7: Rotted window frames and replaced glass with single pane Plexiglas or plywood.

Photo 8: Rotted window frames and replaced glass with single pane Plexiglas or plywood.

Photo 9: Rotted window frames and replaced glass with single pane Plexiglas or plywood.

Photo 10: Showing disconnected drainage piping improperly sealed.

Photo 11: Boiler 2 burner showing firebox leakage and melting of combustion air inlet piping.

Photo 12: Building fuel supply tank located too close to building. Piping is not properly connected. Fill access is at rear contributes to fuel spill potential.

Photo 13: Backwash pump (foreground) and pressure pumps (only one serviceable).

Photo 14: Abandoned watering point at south side of WTP showing deterioration of insulation and building envelope. Exterior siding is visible from building interior.

Photo 15: Watering point distribution piping circulation pumps (foreground) dismantled and inoperative.

Photo 16: Exterior of Watering Point #2. Typical of all watering points.

Photo 17: Interior of Watering Point # 2. Inoperative heater at bottom of photo.

Photo 18: Valve pit of Watering Point #3. Snow packed with heat trace power and sensor wiring connections exposed.

Photo 19: Valve Pit heater for Watering Point #2.

**Photo 20: Valve pit of Watering Point #2.
Heat trace power and sensor wiring.**

Photo 21: Bottom of Watering Point #5 door.
Corrosion is typical of most watering points.

Photo 22: Interior condition of flooded well casing in Un-Named Creek well house.

Photo 23: Flood conditions around Un-Named Creek well house.

Photo 24: Water transmission line from Un-Named Creek well through HUD subdivision, with Paul T. Albert Memorial School in background.

Photo 25: Honey bucket bunker.

Photo 26: Overflowing honey bucket bunker.

Photo 27: Snow drifts around community watering point.

Photo 28: Musk Ox Creek Well House and water transmission line.

Photo 29: Frost heave damage to Musk Ox Well House.

Photo 30: FTH holding tank at HUD subdivision home.

Photo 31: Open stream channel upstream of existing well house on Un-Named Creek drainage near 100 feet MSL elevation.

Photo 32: Upland drainage area of exposed rock debris on Un-Named Creek drainage basin near 300 feet MSL elevation.

Photo 33: Stream channel on Un-Named Creek drainage near 150 feet MSL elevation.

Photo 34: Deteriorated 50,000-gallon bolted steel water storage tank on timber foundation.

Photo 35: WTP/Washeteria connection to water storage tank.

Photo 36: Frozen outlet in dosing tank on the In-Complete septic system.

Photo 37: FTH trailer stuck in mud at off-loading ramp on In-Complete septic system.

Photo 38: Ice blocked outlet baffle in septic tank #1 on the In-Complete septic system.

Photo 39: Open trench used for disposal of FTH hauled waste located near off-loading ramp on the In-Complete septic system.

Photo 40: Overflowing sewage in observation pipe on the drainfield serving the Washeteria, teacher housing, and school.

Photo 41: Overflowing sewage in manhole on septic tank serving the Washeteria, teacher housing, and school.

Photo 42: Exposed section of 4-inch steel well serving the former BIA school water system. Note the duct tape well cover.

Photo 43: Tununak Washeteria interior.

Photo 44: Tununak water treatment plant.

APPENDIX C

Sanitary Facility Questionnaire

MWH
BUILDING A BETTER WORLD

Sanitary Facility Survey
Tununak, Alaska 2010

House # ______

Household Owner Name ____

Number of Household Occupants ______

I. Present Water Source (Check all that Apply):

WINTER

____ Haul from BIA Well
____ Haul from Washeteria
____ Haul from River, Creek, or Lake
____ Delivered by Flush Tank & Haul
____ Other, please describe:
____

SUMMER

____ Haul from BIA Well
____ Haul from Washeteria
____ Haul from River, Creek, or Lake
____ Delivered by Flush Tank & Haul
____ Collect Rain Water
____ Other, please describe:
____

II. Present Water Consumption:

Average number of gallons per week used in household: _______ gallons

III. Present Sewage Disposal Method:

____ Flush Tank & Haul
____ Sewage Bunker
____ Other, please describe: ______________________
____

IV. Preference for Future Sewage Disposal (Prioritize: 1 for highest, 3 for lowest):

____ Flush Tank & Haul ____ Sewer Lines ____ Honey Buckets with New Bunkers

V. Preference for Future Water Improvements (Prioritize: 1 for highest, 3 for lowest):

____ New Washeteria ____ Piped Water ____ New Community Watering Point

---

Do you use a washing machine in your home? Circle: YES NO

Do you use the washeteria for clothes washing? Circle: YES NO

How much are you willing to pay monthly for piped water & sewer? $______ per month

How much are you willing to pay to use a Washeteria? $ ______ per load, $ ______ per shower

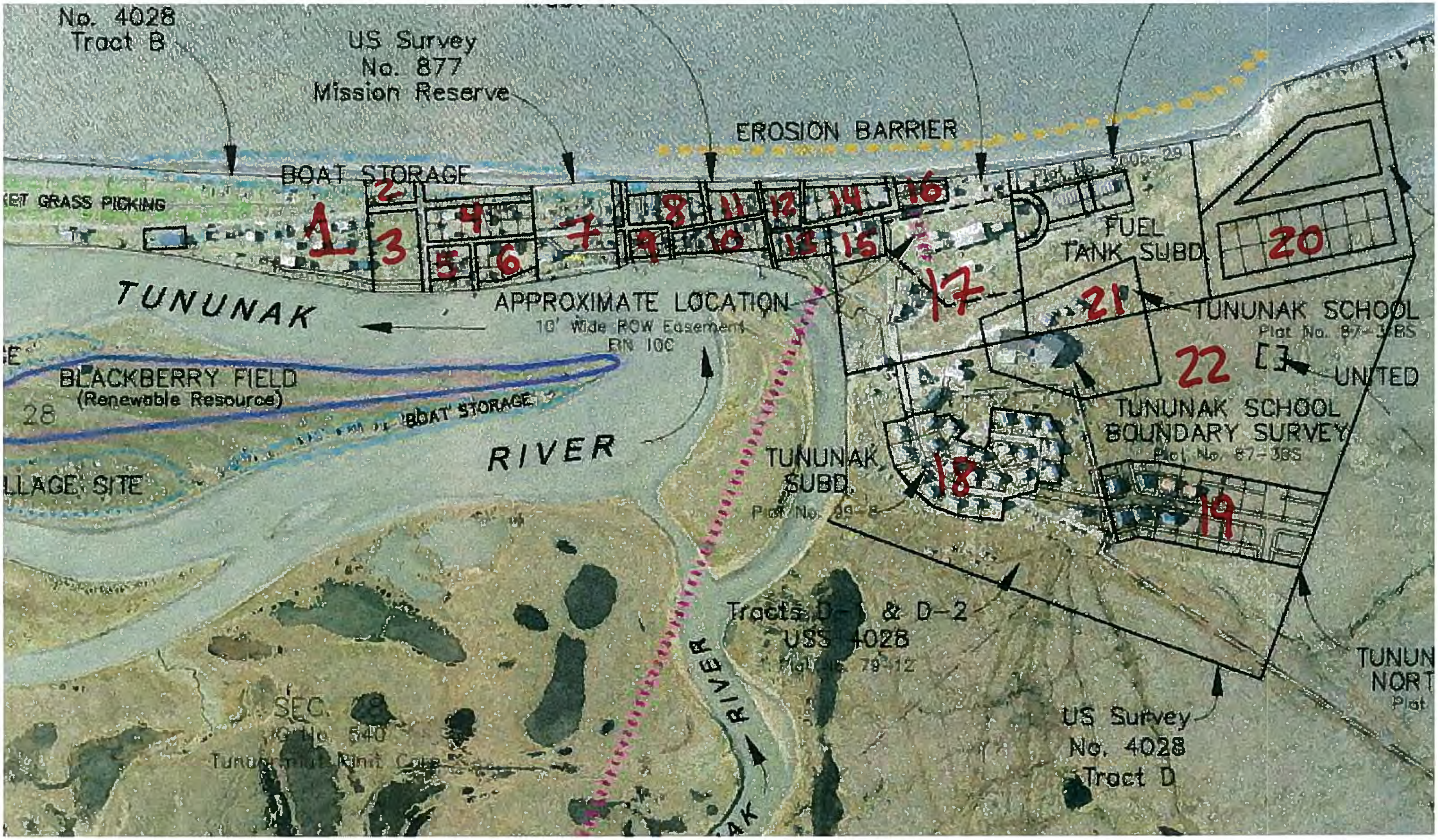
How much are you willing to pay monthly for a new watering point? $ ______ per month

Sanitary Facility Questionnaire for Tununak, Alaska 2010

Household Location (Refer to Housing Area Map)	Number of Household Occupants	Current Water Source	Household Weekly Water Use (gal/week)	Water Use Per Person (gal/day)	Current Sewage Disposal Method	Future Sewage Disposal Method (1st choice)	Future Water Improvement (1st choice)	Use Washing Machine in Home	Use Existing Washeteria	Willing to Pay Piped Water and Sewer Per Month	Willing to Pay Washeteria per Wash Load	Willing to Pay Washeteria Per Shower	Willing to Pay New Watering Point per Month	Comments
1	1	BIA Well	40	5.7	Honeybucket	Sewer Lines	New Washeteria	No	Yes	$ 50.00	$ 2.50	$ 2.00	$ 25.00	
4	1	BIA Well	20	2.9	Honeybucket	Flush Tank Haul	New Washeteria	No	Yes	open	$ 5.00	?	?	Only use creek in summer
1	8	BIA Well	20	0.4	Honeybucket	Sewer Lines	Piped Water	Yes	Yes	$ 25.00	$ 5.00	?	$ 25.00	Also use creek in summer
1	6	BIA Well	200	4.8	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	$ 100.00	$ 5.00	?	?	
1	4	BIA Well	300	10.7	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	$ 80.00	$ 2.50	?	$ 10.00	Also use rain water
1	7	BIA Well	65	1.3	Honeybucket	Sewer Lines	New Washeteria	No	Yes	$ 20.00	$ 3.00	$ 1.00	?	Also use creek in summer
1	1	BIA Well	5	0.7	Honeybucket	Honeybucket	New Water Point	Yes	Yes	?	$ 5.00	$ 5.00	?	
1	7	BIA Well	70	1.4	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	$ 50.00	$ 5.00	$ 2.00	$ 50.00	Equal Priority of New H2O
1	4	BIA Well	150	5.4	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	$ 25.00	$ 3.00	$ 1.00	$ 0.50	Equal Priority H2O/Sewer
1	7	BIA Well	12	0.2	Honeybucket	Honeybucket	New Washeteria	Yes	Yes	?	?	?	?	Equal Priority of New H2O
1	4	BIA Well	64	2.3	Honeybucket	Flush Tank Haul	New Water Point	Yes	Yes	?	?	?	?	Use creek & rain in summer
4	6	BIA Well	?	?	Honeybucket	Sewer Lines	New Water Point	Yes	No	?	$ 5.00	$ 1.00	?	
4	4	BIA Well	70	2.5	Honeybucket	Sewer Lines	New Washeteria	Yes	No	$ 100.00	?	?	$ 50.00	Equal Priority of New H2O
4	4	BIA Well	25	0.9	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	$ 25.00	$ 3.00	$ 1.00	$ 25.00	Also use rain water
4	8	BIA Well	65	1.2	Honeybucket	Flush Tank Haul	New Water Point	Yes	Yes	$ 25.00	$ 5.00	$ 3.00	$ 25.00	Also use rain water
5	1	BIA Well	3	0.4	Honeybucket	Flush Tank Haul	New Water Point	Yes	No	$ 50.00	$ 2.00	?	$ 25.00	Also use rain water & creek
7	4	BIA Well	21	0.8	Honeybucket	Honeybucket	Piped Water	No	Yes	$ 100.00	$ 3.00	$ 1.50	$ 25.00	Also use creek in winter
7	8	BIA Well	30	0.5	Flush Tank Haul	Sewer Lines	New Washeteria	Yes	Yes	?	$ 10.00	?	$ 20.00	
10	6	BIA Well	60	1.4	Honeybucket	Honeybucket	New Washeteria	Yes	Yes	?	$ 5.00	$ 1.75	?	
10	5	BIA Well	20	0.6	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	$ 25.00	$ 3.00	$ 1.75	$ 20.00	Also use rain water
10	2	BIA Well	20	1.4	Flush Tank Haul	Sewer Lines	New Washeteria	No	No	$ 25.00	?	?	?	Also favors Piped Water
10	2	BIA Well	50	3.6	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	$ 25.00	$ 5.00	?	$ 25.00	Also favors Piped Water
13	1	BIA Well	25	3.6	Honeybucket	Sewer Lines	Piped Water	Yes	No	$ 100.00	?	?	$ 50.00	
14	7	BIA Well	32	0.7	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	$ 25.00	$ 2.00	$ 1.00	?	Also uses creek & rain H2O
14	2	BIA Well	20	1.4	Honeybucket	Sewer Lines	Piped Water	Yes	Yes	?	?	?	?	Also uses rain water
15	9	BIA Well	40	0.6	Honeybucket	Sewer Lines	Piped Water	Yes	Yes	?	?	?	?	
?	2	BIA Well	5	0.4	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	?	$ 5.00	$ 5.00	$ 5.00	
6	2	BIA Well	20	1.4	Honeybucket	Sewer Lines	Piped Water	Yes	?	?	?	?	?	
11	3	BIA Well	40	1.9	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	$ 25.00	$ 2.50	?	?	
?	1	BIA Well	15	2.1	Honeybucket	Sewer Lines	Piped Water	Yes	No	$ 25.00	$ 1.50	$ 0.50	$ 5.00	
?	2	BIA Well	15	1.1	Honeybucket	Sewer Lines	Piped Water	Yes	Yes	$ 1.00	$ 5.00	$ 1.00	?	Also uses creek & rain H2O
?	2	BIA Well	12	0.9	Honeybucket	Sewer Lines	Piped Water	Yes	No	?	$ 5.00	$ 2.00	$ -	Also uses rain water
?	8	BIA Well	200	3.6	Honeybucket	Sewer Lines	Piped Water	Yes	Yes	$ 70.00	$ 30.00	?	$ 25.00	Also uses rain water
?	8	BIA Well	110	2.0	Flush Tank Haul	Sewer Lines	New Washeteria	Yes	Yes	$ 20.00	$ 10.00	?	$ -	Also uses rain water
?	3	BIA Well	50	2.4	Flush Tank Haul	Sewer Lines	New Washeteria	Yes	Yes	$ 25.00	$ 3.00	$ 1.00	?	Also uses creek & rain H2O
14	7	BIA Well	?	?	Flush Tank Haul	Sewer Lines	New Washeteria	Yes	Yes	?	$ 1.00	$ 0.50	?	Also uses rain water
?	3	BIA Well	35	1.7	Honeybucket	Sewer Lines	Piped Water	Yes	Yes	?	$ 2.00	$ 1.00	$ 5.00	Also uses creek & rain H2O
19	3	BIA Well	40	1.9	Flush Tank Haul	Sewer Lines	Piped Water	Yes	Yes	$ 70.00	$ 5.00	$ 2.00	$ 35.00	Also uses rain water
?	7	BIA Well	60	1.2	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	$ 25.00	$ 3.00	$ 1.00	$ 20.00	Also uses creek & rain H2O
?	1	BIA Well	10	1.4	Honeybucket	Honeybucket	New Water Point	No	No	?	?	?	?	
21	2	BIA Well	350	?	Septic Tank Sys	Sewer Lines	New Water Point	Yes	No	$ 50.00	$ 3.00	$ 1.50	$ 50.00	
?	3	BIA Well	20	25.0	Honeybucket	Sewer Lines	Piped Water	Yes	Yes	$ 50.00	$ 5.00	$ 2.00	$ 20.00	Also uses all sources
?	1	BIA Well	12	1.7	Honeybucket	Sewer Lines	New Washeteria	Yes	No	?	?	?	?	Only use rain H2O in summer
9	4	BIA Well	25	0.9	Honeybucket	Sewer Lines	New Washeteria	Yes	Yes	?	$ 5.00	?	$ 75.00	
?	5	BIA Well	55	1.6	Honeybucket	Sewer Lines	Piped Water	Yes	No	$ 15.00	$ 3.00	$ 0.75	$ -	Also uses rain water
6	5	BIA Well	15	0.4	Honeybucket	Sewer Lines	Piped Water	Yes	Yes	$ 100.00	$ 3.00	$ 1.50	$ 15.00	Also uses rain water
?	6	BIA Well	10	0.2	Flush Tank Haul	Sewer Lines	New Washeteria	Yes	Yes	$ 25.00	$ 5.00	$ 1.00	$ 20.00	
?	2	BIA Well	30	2.1	Honeybucket	Sewer Lines	Piped Water	Yes	Yes	$ 20.00	$ 5.00	?	$ 15.00	
?	6	BIA Well	60	1.4	Flush Tank Haul	Sewer Lines	New Water Point	Yes	No	$ 25.00	$ 1.00	$ 3.00	?	Also uses creek & rain H2O
?	5	BIA Well	20	0.6	Flush Tank Haul	Sewer Lines	Piped Water	No	Yes	?	?	?	?	
?	8	BIA Well	30	0.5	Flush Tank Haul	Sewer Lines	New Washeteria	Yes	Yes	$ -	$ 5.00	$ 1.50	$ -	Also uses creek & rain H2O
?	8	BIA Well	100	1.8	Flush Tank Haul	Sewer Lines	New Washeteria	Yes	Yes	?	$ 5.00	?	?	Also uses creek & rain H2O

Summary of Tununak 2010 Sanitary Facility Questionnaire

Number of Househo	52
Total Persons Serve	226
Average Water Use Per Person Per Day (gal/cap/day)	2.3
Total Water Use Per Day (gal/day)	395
Well	100%
Total Honeybucket Users	40
Total Flush Tank Haul Users	11
% Desires Honeybucket	8%
% Desires Flush Tank Haul	8%
% Desires Sewer Lines	81%
% Desires New Washeteria	52%
% Desires Piped Water	33%
% Desires New Water Point	13%
% Users of Washeteria	75%
Average Monthly Cost for Willing to pay for piped water & sewer	$ 42.30
Average Cost for Willing to pay for washer load at washeteria	$ 4.68
Average Cost for Willing to pay for shower at washeteria	$ 1.69
Average Cost for Willing to pay for new watering point	$ 22.18
Adjusted % Favor New Washeteria based on lack of willingness to pay at least $100 per month for piped water system	77%


No. 4028
Tract B
US Survey
No. 877
Mission Reserve
EROSION BARRIER
BOAT STORAGE
GRASS PICKING
TUNUNAK
RIVER
APPROXIMATE LOCATION
10' Wide ROW Easement
BLACKBERRY FIELD
(Renewable Resource)
BOAT STORAGE
28
LLAGE SITE
FUEL
TANK SUBD.
TUNUNAK SCHOOL
UNITED
TUNUNAK SCHOOL
BOUNDARY SURVEY
Plat No. 87-38S
TUNUNAK
SUBD.
Tracts D-1 & D-2
USS 4028
RIVER
SEC. 28
US Survey
No. 4028
Tract D
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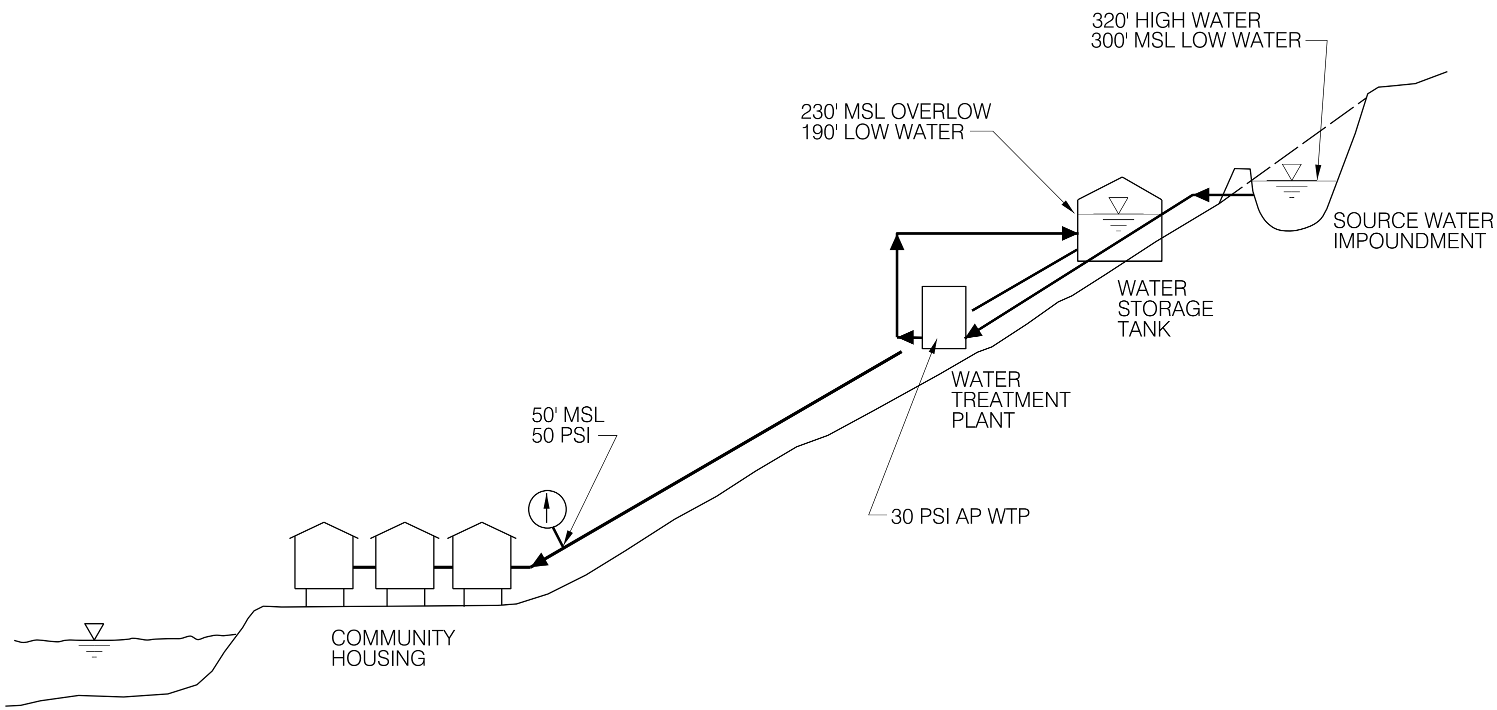
APPENDIX D

Figures

JOB No. 1008675.040101 TIME: 11-NOV-2010 14:30 FILE: D:\CAD\Proj\VSW - village safe water\TUNUNAK\Washeteria-Water Treatment Facility\draft\FIG D-1_water impoundment.dgn

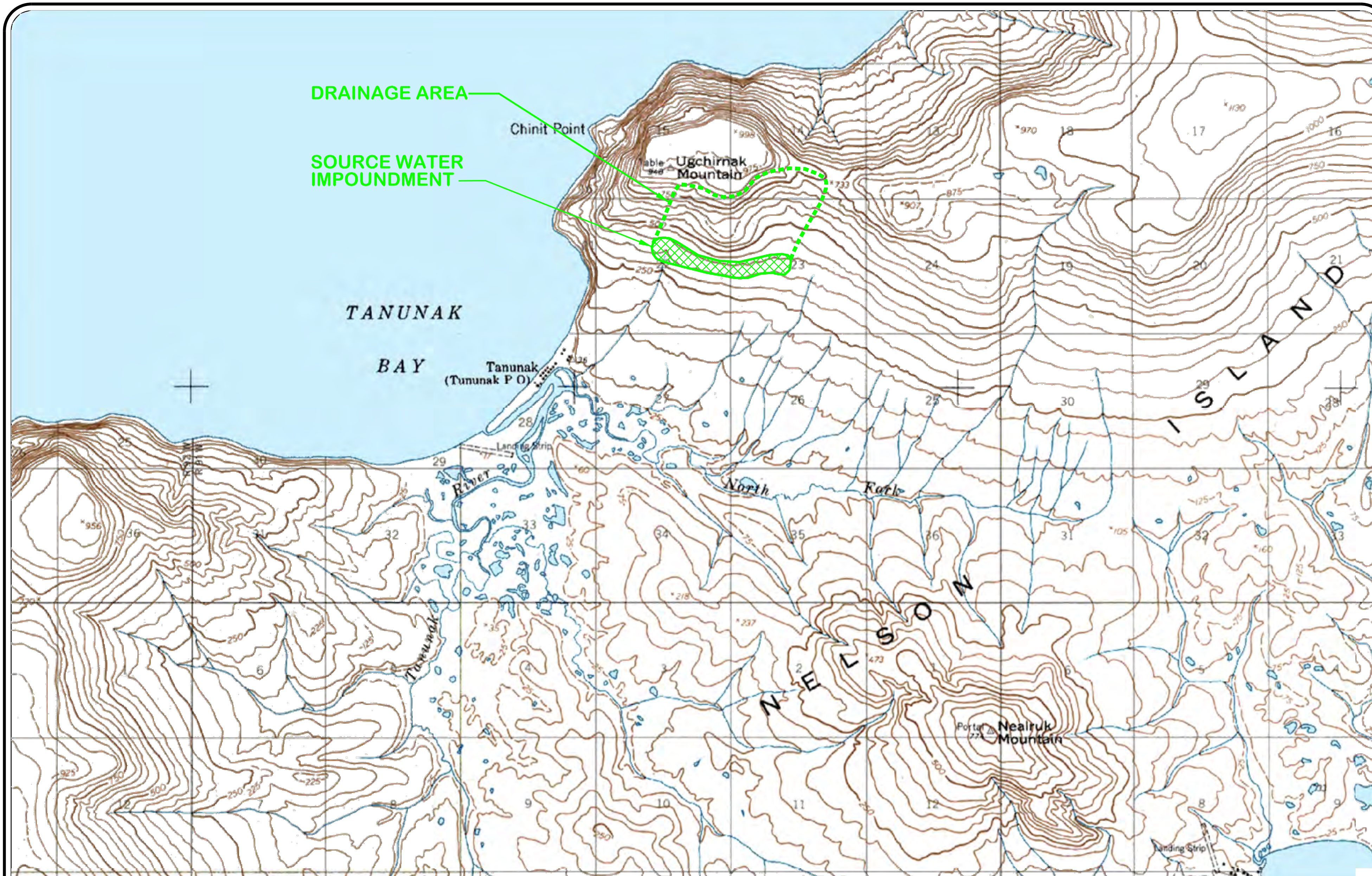


MWH
Anchorage, Alaska

FIGURE D-1

VILLAGE SAFE WATER
TUNUNAK - WASHETERIA/ WATER TREATMENT FACILITY DESIGN

PROPOSED SURFACE WATER IMPOUNDMENT AT 300 FEET MSL



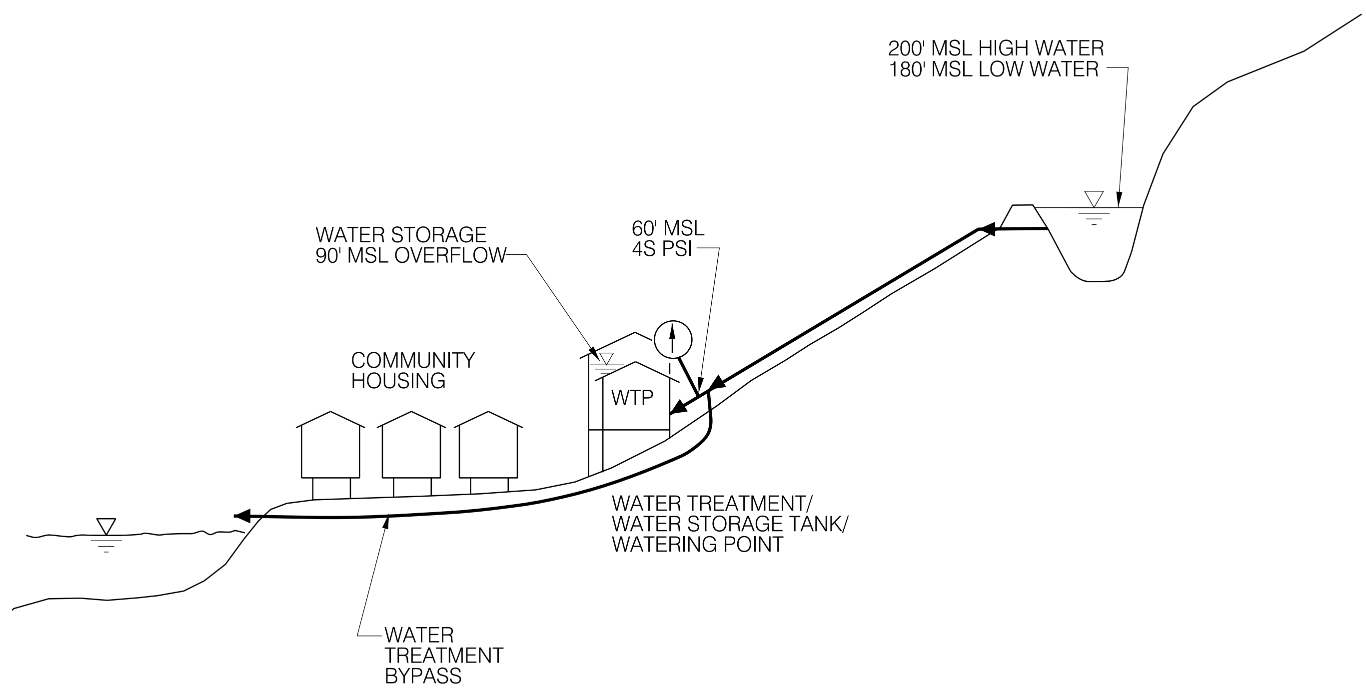
MWH
Anchorage, Alaska

FIGURE D-2

VILLAGE SAFE WATER
TUNUNAK - WASHETERIA/ WATER TREATMENT FACILITY DESIGN

TOPOGRAPHIC MAP OF PROPOSED SURFACE WATER IMPOUNDMENT

JOB No. 1008675.040101 TIME: 11-NOV-2010 14:31 FILE: D:\CAD\Proj\VSW - village safe water\TUNUNAK\Washeteria-Water Treatment Facility\draft\FIG D-3_water source upstream.dgn



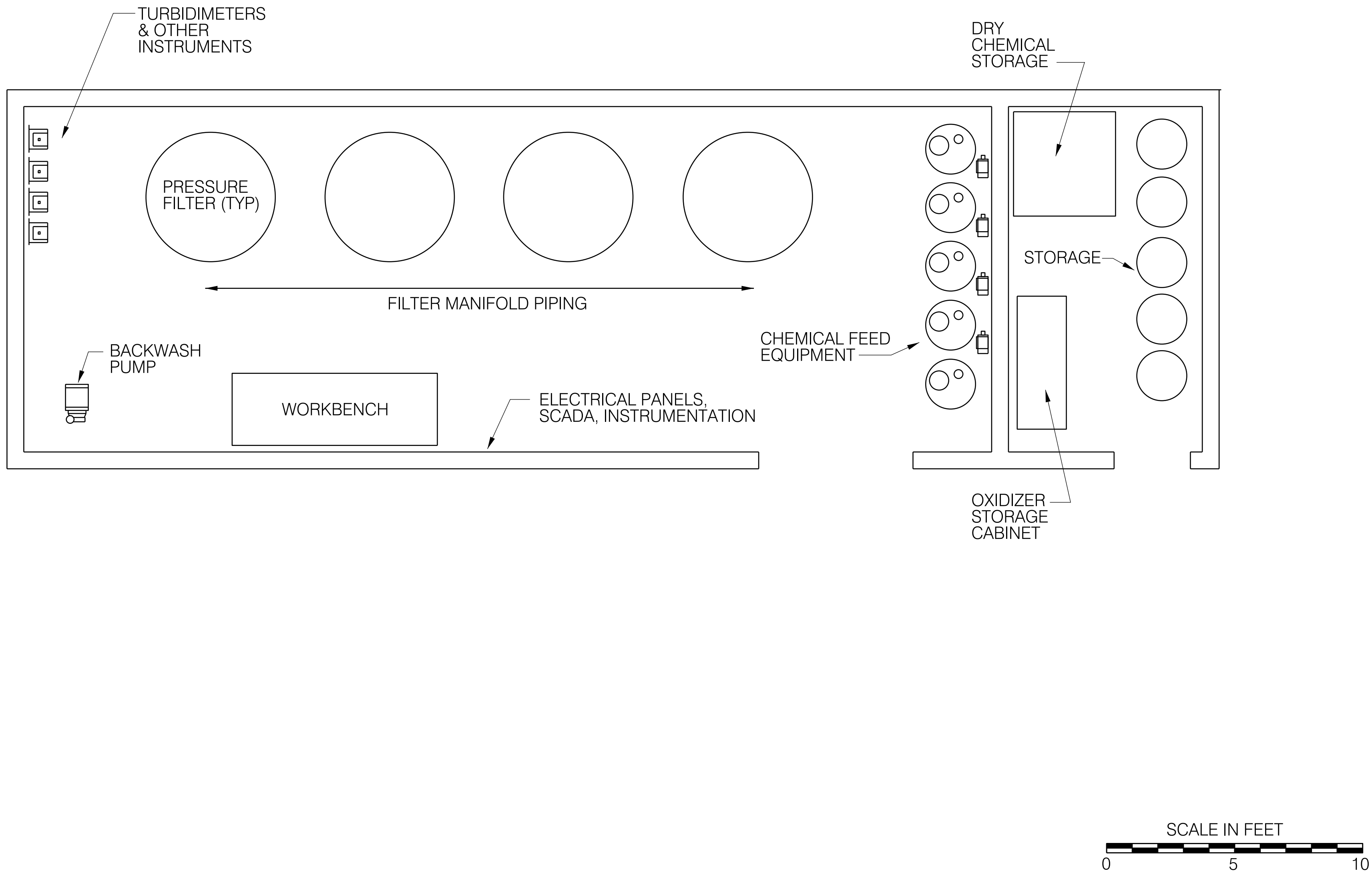
MWH
Anchorage, Alaska

FIGURE D-3

VILLAGE SAFE WATER
TUNUNAK - WASHETERIA/ WATER TREATMENT FACILITY DESIGN

PROPOSED SURFACE WATER SOURCE UPSTREAM ON UN-NAMED CREEK

JOB No. 1008675.040101 TIME: 11-NOV-2010 14:31 FILE: D:\CAD\Proj\VSW - village safe water\TUNUNAK\Washeteria-Water Treatment Facility\draft\FIG D-4_filtration treatment.dgn



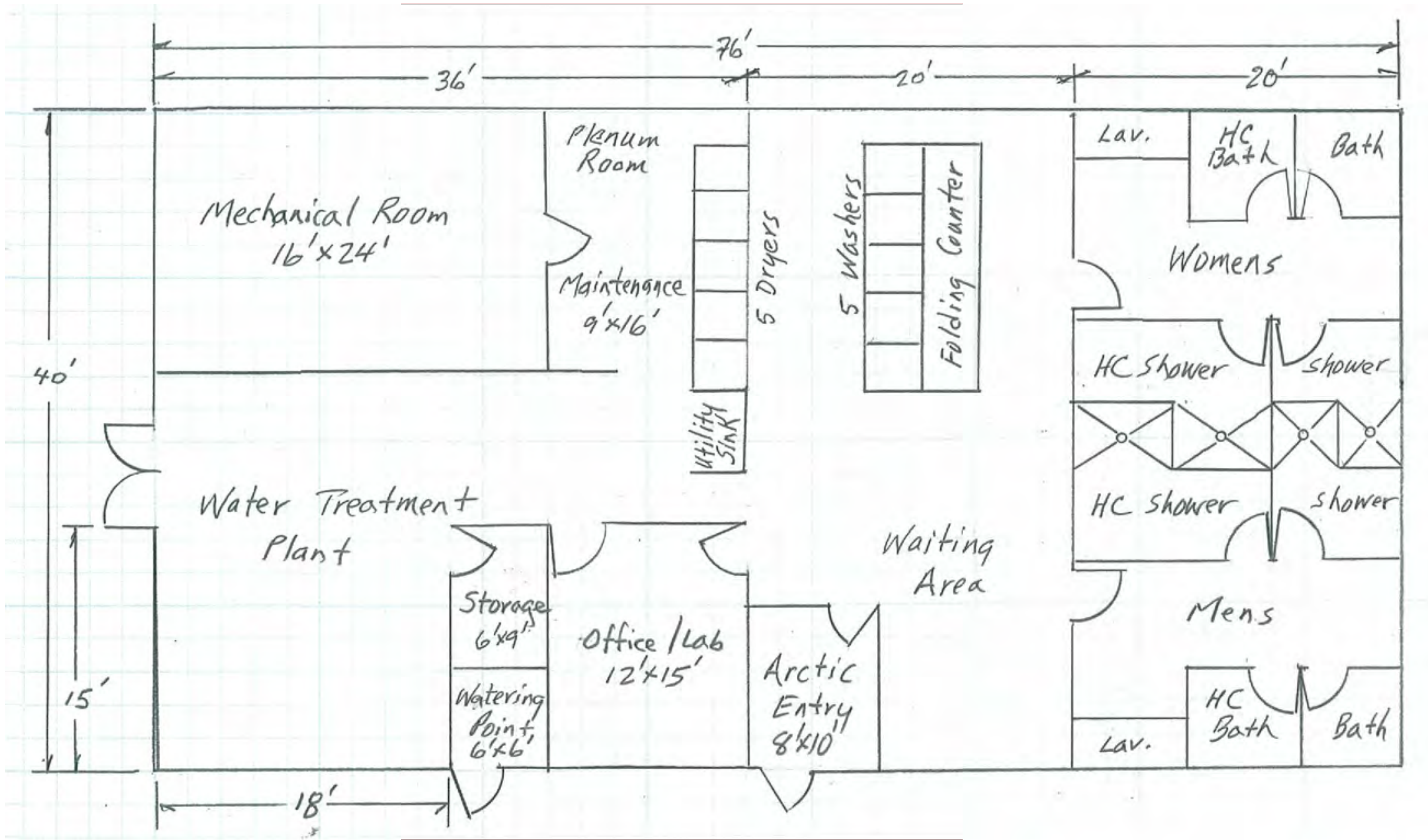
MWH
Anchorage, Alaska

FIGURE D-4

VILLAGE SAFE WATER
TUNUNAK - WASHETERIA/ WATER TREATMENT FACILITY DESIGN

CONCEPTUAL LAYOUT OF DIRECT FILTRATION TREATMENT SYSTEM

JOB No. 1008675.040101 TIME: 11-NOV-2010 14:31 FILE: D:\CAD\Proj\VSW - village safe water\TUNUNAK\Washeteria-Water Treatment Facility\draft\FIG D-5_waheteria - alt 1.dgn

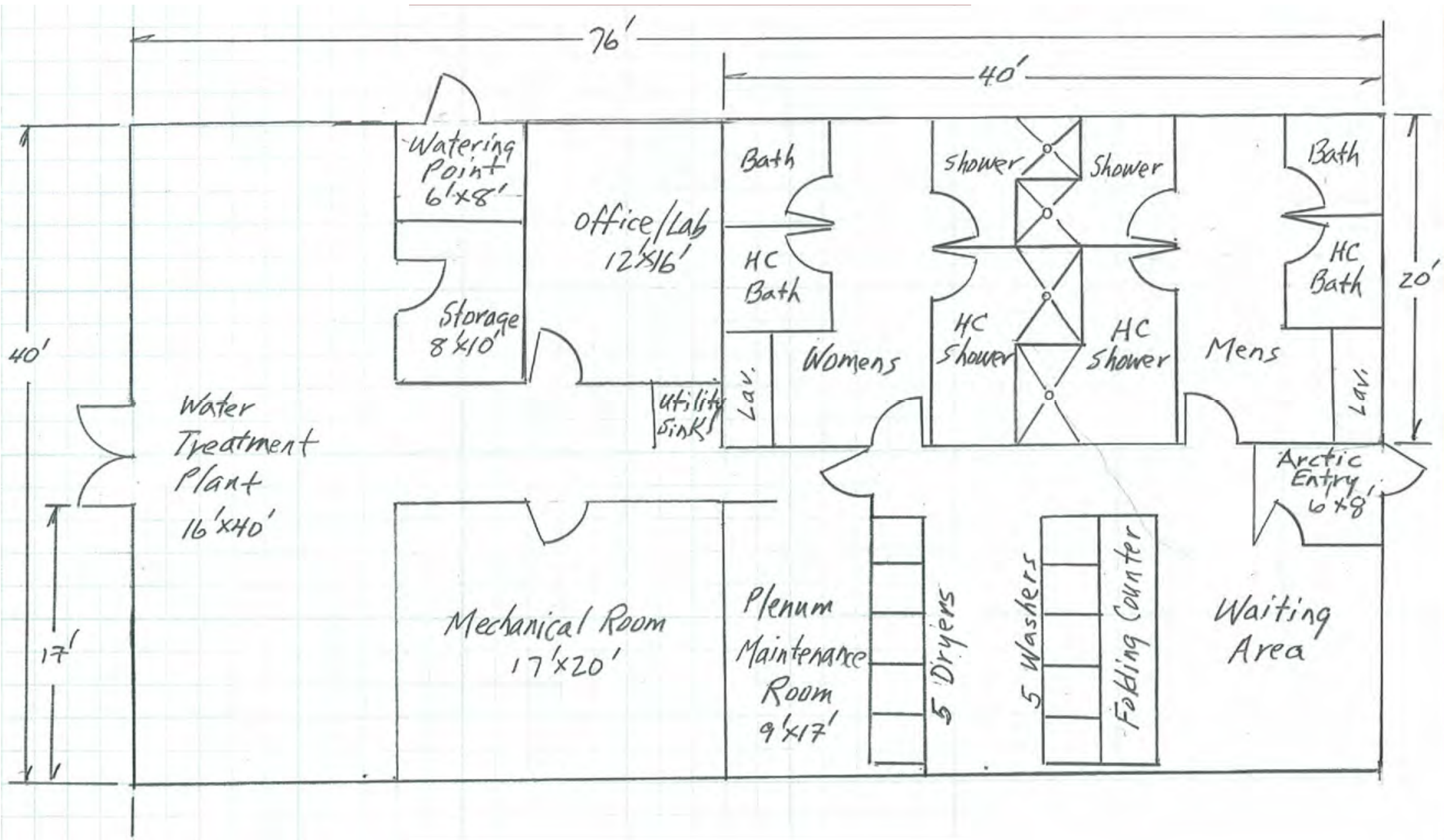


WASHETERIA = 3,040 SF

MWH
Anchorage, Alaska

FIGURE D-5

VILLAGE SAFE WATER
TUNUNAK - WASHETERIA/ WATER TREATMENT FACILITY DESIGN
WATER TREATMENT PLANT & WASHETERIA (ALTERNATIVE #1)



WASHETERIA = 3,040 SF

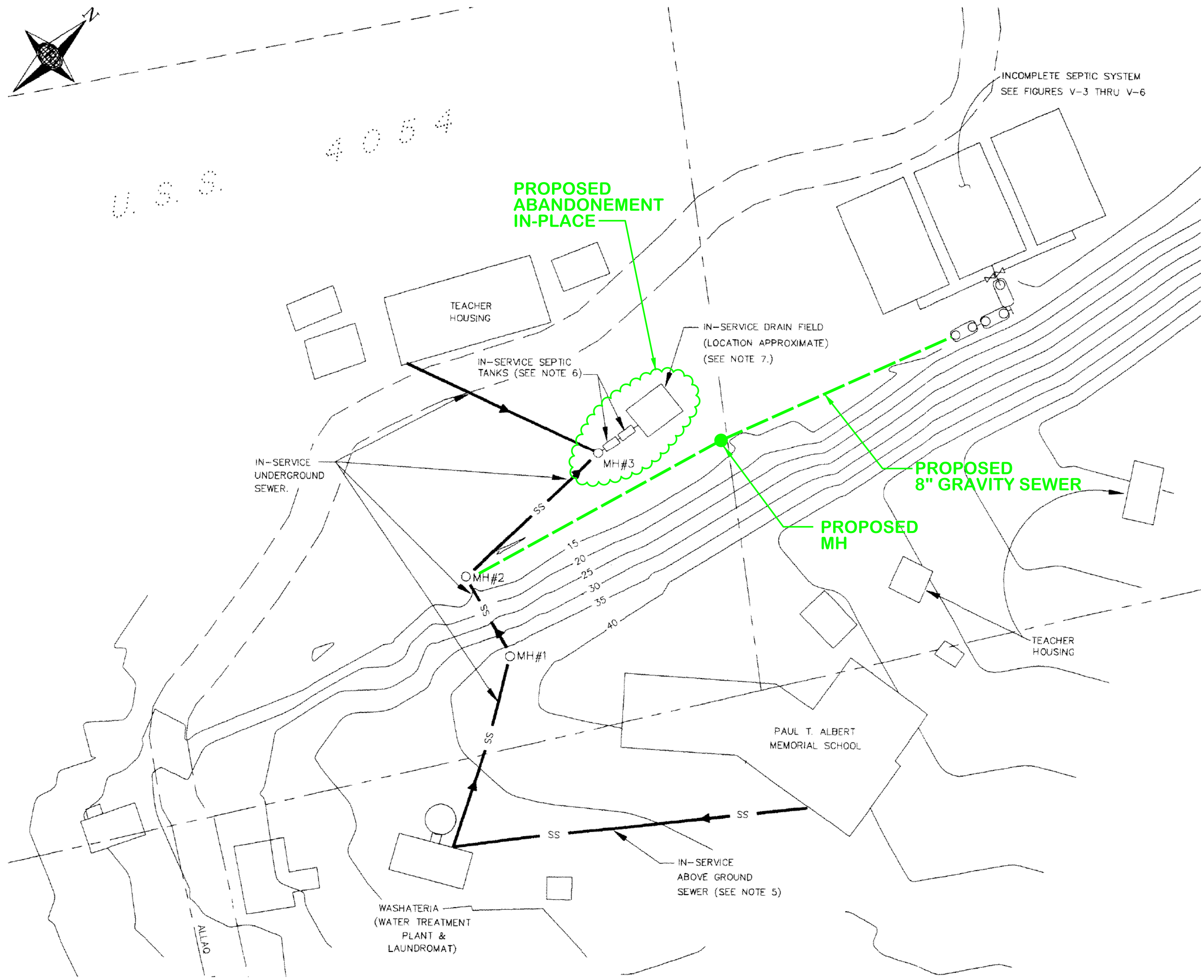
SCALE IN FEET
0 10

MWH
Anchorage, Alaska

FIGURE D-6

VILLAGE SAFE WATER
TUNUNAK - WASHETERIA/ WATER TREATMENT FACILITY DESIGN

WATER TREATMENT PLANT &
WASHETERIA (ALTERNATIVE #2)



NOT TO SCALE

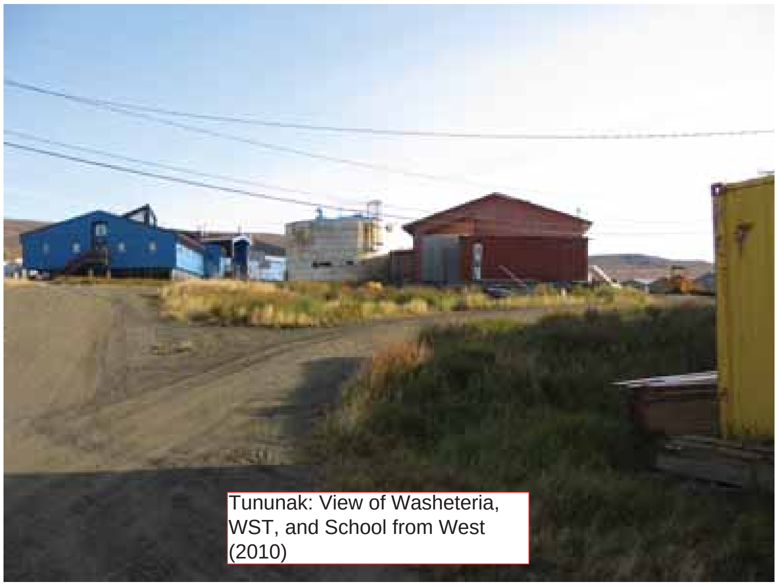
MWH
Anchorage, Alaska

FIGURE D-7

VILLAGE SAFE WATER
TUNUNAK - WASHETERIA/ WATER TREATMENT FACILITY DESIGN

PROPOSED SEWER IMPROVEMENTS FOR ON–SITE SEPTIC SYSTEM

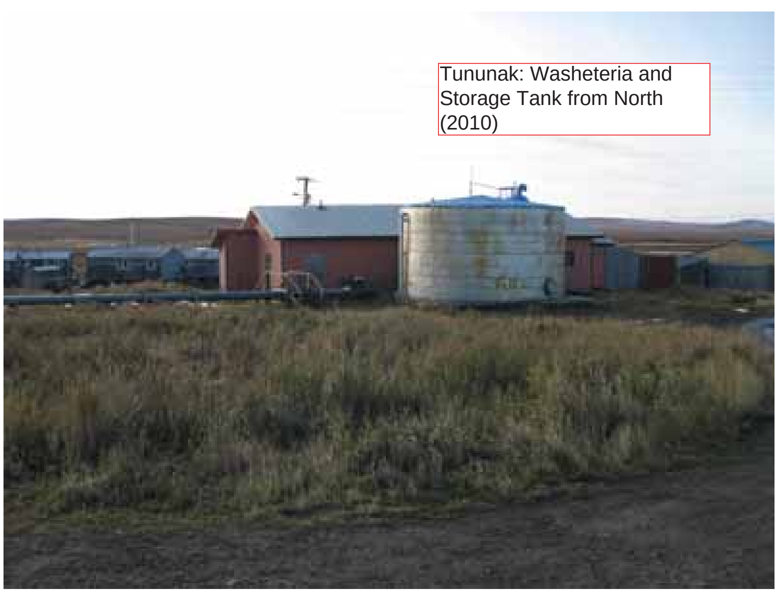
Appendix E Additional Photos by Tununak and MWH


Tununak: View of Washeteria, WST, and School from West (2010)


Tununak: Utilidor from Washeteria to School (2010)


Tununak: Aerial from West (2010)


Tununak: Washeteria from South (2010)


Tununak: Washeteria and Storage Tank from North (2010)


Tununak: Utilidor from Washeteria to Clinic (2010)

Tununak Washeteria. Photo shows decay of the door and flooring, and peeling of the wall.

Tununak Washeteria - Speed Queen SWRX7 18 pound capacity washers and 30 pound electric dryers.

Tununak Washeteria - boarded up window.

Tununak Washeteria - space behind machines. Note the wall splitting, and corrosion.

Tununak Washeteria. Speed Queen Multi-housing commercial dryer bought with assistance from AVCP.

Tununak Washeteria - laundry equipment, table, carts, and chair.

Appendix F Supplemental Report on Auxiliary Sanitation Facilities

TO BE ADDED IN FINAL PRELIMINARY ENGINEERING REPORT

APPENDIX F

SUPPLEMENTAL REPORT ON ANCILLARY SANITATION FACILITIES

Appendix F provides a supplemental report for the 2017 PER for the Tununak Washeteria and Water Treatment Plant. This supplemental report was requested by the VSW to provide a narrative summary of existing ancillary sanitation appurtenances that are critical components for the long term operation of the proposed new washeteria/WTP. These ancillary appurtenances were not included in the original scope of work for the preparation of the PER.

The following sections describe the appurtenances (ancillary sanitation facilities) for the new washeteria/WTP. It is understood these appurtenances would be upgraded or replaced in the future when funding becomes available:

I Water Supply Source for the Existing Water Treatment Plant

The water source for the existing washeteria/WTP uses a shallow water well that consists of an infiltration gallery located in Unnamed Creek that was constructed in 1978 by the USPHS. The infiltration gallery will be referred to as the "Unnamed Creek well" for the remainder of this report, to be consistent with historical documents. The structure would normally be called an infiltration gallery.

<u>Original Condition of Unnamed Creek Well</u>:

The well (infiltration gallery) remains in the same configuration as it did when it was installed in Unnamed Creek nearly 40 years ago. The well consists of a 9-foot deep, 24-inch diameter perforated (slotted) steel culvert pipe, that was installed vertically in the middle of the Unnamed Creek. The top of the well's culvert pipe is approximately 3.5-feet above the surface of the creek. The creek is approximately 10 to 15 feet wide with a shallow depth of approximately 2 to 4 feet that varies in flow depending on the time of year. The drainage basin for Unnamed Creek is on the south side of Ugchirnak Mountains and has a drainage area of approximately 1 to 1.5 square miles.

The well is located inside an 8-foot by 8-foot wooden well house structure. **Attachment F1** shows the well house on the as-built plan sheet number 19, titled "Infiltration Gallery and Pumping Facility" prepared by USPHS for the Construction Plans for Sanitation Facilities, Tununak, Alaska, dated September 1980. The well house is located approximately 900 feet east and downhill of the existing washeteria/WTP. The raw water from the well house is pumped via a 2-inch diameter HDPE pipe inside a 4-inch diameter arctic pipe in an aboveground utilidor to the washeteria/WTP. The alignment of the utilidor is shown on **Attachment F2** that provides an as-built plan sheet titled "Water Transmission Line and Tank Foundation" prepared by USPHS for the Construction Plans for Sanitation Facilities, Tununak, Alaska, dated September 1980.

Current Condition of Unnamed Creek Well:

- The well house is in very poor structural condition.
- The top of the 24-inch diameter well casing (culvert pipe) is not covered and is at risk to inundation by seasonal flood waters and foreign debris falling into the well.
- During the winter, the well house occasionally is buried with drifting snow and often requires access via the roof of the building.
- The well house is subject to freezing from breaches in the integrity of the existing building structure and lack of heat in the existing structure.
- The well house is subject to structural damage from aufeis (overflow ice) formation in the creek.

The well is located approximately 100-feet from existing residential structures, and subject to potential contamination from fuel and/or waste material stored on those properties. The ADEC requires water wells used for a public water source be separated by 200-feet from sources of contamination. It is recommended for the protection of the well that community action be taken to ensure there are no releases or spread of contaminants from these nearby residences.

Recommended Upgrade of the Existing Well and Well House:

As future funding becomes available, the well and well house should be upgraded and/or replaced. It is recommended a site visit be conducted by a qualified inspector/engineer to check the current site conditions to determine if the following improvements/upgrades could be made to the well and well house:

- The sanitary condition of the well could be improved by installing a watertight vertical extension on the existing 24 inch diameter well casing. The casing should extend a minimum of 36 inches above the high water mark in Unnamed Creek.
- A secure adaptive well cover should be installed to seal the top of the well. This would require the use of a special fabrication of a sanitary well seal, unique for this size of well, that would protect the top of the well casing from foreign debris entering the well.
- The existing dilapidated well house should be removed and replaced with a larger, structurally sound building. The building should be constructed with a raised foundation system to bridge over the creek and have a finished floor elevation that is a minimum of 4-feet above the creek's high water level. The well house should be equipped with adequate electrical controls for pump operation and auxiliary heating of the building to provide for year round use.
- An adequately sized submersible pump should be permanently installed in the well to allow year round use of the well. The pump should be installed at a depth that is several feet below the seasonal low water level of the creek. The discharge piping from the well pump to the water supply line in the aboveground utilidor should be insulated and heat traced.

Alternative for the Replacement of the Water Source:

It is recommended a hydrogeological investigation be conducted to determine the feasibility of replacing the existing 24-inch culvert well with a new 6-inch diameter steel cased well located on the stream bank or adjacent to Unnamed Creek. The replacement well should be located upstream of the existing well. The hydrogeological investigation would include several exploratory soil borings that would be used for the installation of ground water piezometers (monitoring wells), drilled at strategic locations adjacent to and along the stream bank. The hydrogeological investigation would provide valuable subsurface information on the potential of a groundwater aquifer that may be associated with the creek's permafrost "thaw bulb" as well as the presence of possible bedrock. The investigation could also evaluate the possibility of installing a slant/diagonal well beneath the bed of the creek or a horizontal large diameter screened well/infiltration galley buried in the stream bed.

The hydrogeological investigation could provide information on the subsurface soil and groundwater conditions adjacent to the creek that could provide aquifer protection through the natural stream bank soil formation. Stream bank protection is recognized by the USEPA and ADEC that provides protection to the water source and often times provide better quality raw water. Subject to ADEC review and approval, these favorable conditions could reduce the water treatment requirements in meeting the conditions of SWTR.

If sufficient funding becomes available, the hydrogeological investigation could be expanded to provide exploratory drilling for the construction of a deep water supply well. This new well alternative would include a new well house located in a more secure and accessible location on higher ground, outside of the active watercourse for Unnamed Creek. Also, the new well and well house would be more convenient and safer for the water plant operators to maintain on a year round basis.

II Water Treatment System

The existing WTP was constructed nearly 40 years ago by the USPHS, and is currently in poor physical condition and disrepair. The treated water produced by the WTP does not meet current ADEC drinking water regulations for SWTR (see requirements described below). During the past several years, the ADEC drinking water program regulators noted multiple serious deficiencies with the existing water treatment system, and therefore, had issued a long-term boil water orders to the community of Tununak that remain in effect to this day.

Primary Treatment Processes of the Existing Water Plant:

- Granular Media Filtration
- Bag Filtration (installed in 1995 but currently not used/inoperable)
- Injection of Fluorine (the system was in original design but apparently is no longer in use)
- Disinfection by Hypochlorination
- Water Storage and Disinfection Contact Time (see discussion below on WST)

- Distribution System Pressure and Circulation Pumping

Treatment Equipment in the Existing Water Plant:

The following water treatment equipment currently is inside the existing WTP and is arranged in the same configuration when it was installed as shown on the as-built plan sheets 11 & 12 titled "Plumbing Schematic" prepared by USPHS for the Construction Plans for Sanitation Facilities, Tununak, Alaska, dated September 1980.

- 4-foot diameter pressure granular media filter
- backwash sump for discharge water
- "Upstream" bag filter, nominal 5 microns (3M 500 LP Series filter, product #525A). The bag filter was installed by others in 1995.
- "Downstream" bag filter, nominal 1 to 3 microns (Wetco Filter HE Series filter, product #4200PYLOO555). The bag filter was installed by others in 1995.
- circulation pumps
- pressure filter backwash pump
- 2 pressure pumps
- 620 gallon hydropneumatic pressure tank
- 80 gallon hydropneumatic pressure tank (Well X Trol)
- 325 gallon hot water heater
- water distribution circulating pumps with heat exchanger
- 2 boilers and hydronic water lines
- 2 water meters
- Fluoride and chlorine injection systems equipped with chemical pumps and mixing tanks

In June 2012, the ADEC reclassified the community water treatment system to a non-public water system, because the system no longer served 25 customers a day, i.e., the operation of water systems serving under 25 people is not regulated by the federal government, nor under 18 AAC 80. In making their determination, the ADEC noted the existing water treatment plant does not supply drinking water to 25 people. A copy of the ADEC letter on reclassification of Tununak water system is provided in **Attachment F3**. The WTP serves the washeteria for laundry use only (no bathrooms exist and no water distribution is available for human consumption). Also the WTP serves water to the nearby health clinic that is used only for toilets and flushing/cleaning purposes and not for drinking water use.

At such time in the future when the existing washeteria/WTP is replaced with a new modular washeteria/WTP, the new water treatment plant would then be reclassified to a public water system by the ADEC since the treated water served to the new washeteria would be used by more than 25 customers per day. The water treatment plant would be required to meet the drinking water requirements given in 18 AAC 80 which requires compliance with the regulatory requirements described below that may be applicable to the nature of the source water from the Unnamed Creek well.

Regulatory Requirement

The design, operation and monitoring of public drinking water systems is regulated by federal and state agencies. The USEPA has granted the State of Alaska the authority to administer these regulations and the ADEC has been designated the state agency responsible for enforcement and compliance. The State has adopted the federal regulations pertaining to water system operation, monitoring and reporting requirements which are presented in the following regulations: Drinking Water Regulations in 18 AAC 80; and Water and Wastewater Operator Certification and Training regulations in 18 AAC 74. The regulations in 18 AAC 80 stipulate primary and secondary maximum contaminant levels (MCLs) for selected water contaminants.

The primary standards protect public health by limiting the levels of contaminants in drinking water. The contaminants addressed in the primary standards include microorganisms, disinfectants, disinfection byproducts, inorganic chemicals, organic chemicals and radionuclides. The secondary standards are non-enforceable guidelines regulating contaminants that may cause cosmetic and aesthetic effects - such as odor, taste, or color.

New water sources must be tested for quality, and after treatment, found to be in compliance with the maximum contaminant levels (MCLs) referenced in 18 AAC 80.300 and 40 Code of Federal Regulations (CFR) 141. To facilitate achieving this goal, and to satisfy State plan review requirements for use of new sources, the water quality parameters listed in Table B of 18 AAC 80.205 must be identified, including:

- *Total coliform bacteria*
- *Inorganic chemicals*
- *Nitrate*
- *Nitrite*
- *Volatile organic chemicals*
- *Secondary contaminants*

Surface Water Treatment Rule (SWTR)

The use of Unnamed Creek as Tununak's water source requires treatment in accordance with the *Federal Surface Water Treatment Rule (SWTR)* established by EPA in 1989 which sets the maximum contaminant levels for specific pathogenic microbial contaminants. *The SWTR requires the use of filtration and disinfection that will result in a prescribed level of contaminant removal or inactivation in accordance with Long-Term Stage 1 Enhanced variation of the SWTR to achieve the following treatment levels:*

- *2-Log (99%) removal or inactivation of Cryptosporidium*
- *3-log (99.9%) removal or inactivation of Giardia*
- *4-log (99.99%) removal or inactivation of viruses*

Under the SWTR, the filtration system must provide a maximum of 0.3 Nephelometric Turbidity Units (NTU) in 95% of monthly turbidity measurements with no excursions above 1 NTU. In addition, the disinfectant residual for chlorine at the distribution system entry point may not be less than 0.2 milligrams/liter (mg/L) for four hours and trace chlorine residual must be maintained in more than 95% of samples collected throughout the distribution system.

Total Coliform Rule

Tununak is also under the Total Coliform Rule (TCR) that was established by EPA in 1989. The TCR sets MCLs and monitoring requirements for coliforms in drinking water which includes periodic collection and testing of a number of samples based on size of the water system. Also, the TCR requires Sanitary Surveys be completed every 3 years.

Interim Enhanced Surface Water Treatment Rule and Long-Term 1 Enhanced Surface Water Treatment Rule

Critically important to Tununak is the presence of naturally occurring dissolved organic materials in their source water. When exposed to chlorine as a disinfectant, these naturally occurring organic substances form disinfection by-products (DBPs) that include total trihalomethanes (TTHMs), five haloacetic acids (HAA5s), chlorite, bromate and other compounds. EPA has found evidence that when these compounds are consumed in drinking water at elevated levels over a period of time, they can cause cancer and other illnesses. Consequently, in 1999 EPA promulgated the Stage 1 and Stage 2 Disinfectants and Disinfection By-Products Rule (D/DBPR) that set a maximum residual disinfectant level for chlorine at 4.0 mg/L and established an MCL for TTHM and HAA5s of 0.080 mg/L and 0.060 mg/L, respectively. Compliance with the MCL is based on a running annual average (RAA) of samples taken quarterly from the distribution system.

Lead and Copper Rule

The Lead and Copper Rule (LCR) promulgated by USEPA in 1991 set limits of lead and copper at consumers' drinking water taps. The source water may be aggressive or corrosive that causes lead and copper to leach out from water piping materials. When water systems exceed the "action levels" for lead (0.015 mg/L) and copper (1.3 mg/L) in more than 10% of samples taken, then EPA requires a three step mitigation approach be implemented. The first step involves collecting and testing representative samples for specific parameters to determine the characteristics of the water with regard to its reactivity to the piping/plumbing materials. The next step involves performing a "desk-top" study to identify a corrective action program which is submitted to ADEC for approval. As the final step, the approved corrective action program is implemented and evaluated to determine its effectiveness.

Long-Term 2 Enhanced Surface Water Treatment Rule

The EPA under the 1996 reauthorization of the 1986 Safe Drinking Water Act developed a set of interrelated regulations to strengthen the control of microbial and DBP contaminants which are referred to as the "Microbial/Disinfection By-Products Rules". Currently, the rules which became effective on March 6, 2006, consist of the Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) and Stage 2 D/DBPR. Basically, these rules require source water monitoring for microbial quality, and improved treatment for microbial inactivation.

The LT2ESWTR addresses the control of the occurrence of Cryptosporidium in samples from surface water sources. The water systems using surface water will need to establish the microbial quality of their source waters unless their treatment system processes provide for better than 5.5 log removal/inactivation of Cryptosporidium found. Water systems serving less than 10,000 persons, will sample for E. coli in lieu of Cryptosporidium every two weeks for 12 months beginning in October 2008 as determined by the State. Tununak needs to complete the routine E-coli samples of their source water and demonstrate they would remain below the trigger level of 100 col/100 mL. These findings would determine if Tununak would be exempt from being required to treat for Cryptosporidium.

Filter Backwash Recycling Rule

The Filter Backwash Recycling Rule (FBRR) was promulgated in 2001 and requires public water systems operating direct and conventional filtration plants to review their backwash water recycling practices and make approved changes as necessary to ensure they do not compromise pathogenic microbial control, particularly by passing Cryptosporidium oocysts through the filter. Generally, the FBRR requires that impacted systems introduce waters to be recycled to the head of the water treatment plant, treat recycled waters through all existing unit processes, report to the ADEC the configuration and operation of the system, and maintain records of recycle operations. This rule may affect the design and implementation of future upgraded treatment systems for Tununak.

Future Water Treatment Process

The design of the future water treatment process for the proposed new modular combined washeteria/WTP is to meet all of the current federal and state drinking water regulations applicable to surface water requiring filtration as discussed above. The water testing records in the ADEC Drinking Water Program's database for water samples collected for the past 20 years from the Unnamed Creek water source indicate the water quality is acceptable for conventional water treatment methods. For design purposes, it is recommended the water source be sampled and tested for the following parameters to determine seasonal variation, if any:

- Alkalinity
- Total dissolved solids

- Total organic carbon
- Dissolved organic carbon
- pH
- Ultra-violet absorption
- Inductively-coupled plasma/mass spectrometry scan for metals
- Nitrates/Nitrites
- Volatile organic compounds

In addition, it is recommended water treatment bench and/or pilot scale testing be conducted to simulate performance of candidate treatment alternatives, especially as applies to achieving compliance with the DBP rules, using a simulated distribution system DBP evaluation for the source water. The purpose of the testing is to identify a water treatment process for Tununak that can produce aesthetically pleasing treated water meeting all regulatory requirements in the SWTR and have an overall process efficiency greater than 95%.

Based on the past water quality analyses for the Unnamed Creek water source, a direct filtration treatment system with hypochlorination, similar to what is currently used but substantially upgraded, may be suitable to meet the ADEC drinking water regulations. Based on the findings of a future pilot scale testing program, the water treatment process may include coagulation with polymers and pressure filtration using two dual-media filters followed by hypochlorination disinfection.

The granular media pressure filters will require backwashing whenever the system is shut down to prevent captured organic material from going septic. The system will typically be shut down based on turbidity breakthrough. The backwash procedure will be preceded by an air scour cycle. The purpose of the air scour cycle is to break up the caked organic material which will improve backwash efficiency and increase the useful service life of the media.

The water treatment process would include a streaming current detector and an on-line turbidimeter. An online turbidity meter will continuously monitor the turbidity of the filtered water and be configured to shut off the raw water pumps when the filtered water turbidity exceeds regulatory requirements.

III Water Storage Tank

The existing 50,000 gallon water storage tank is located adjacent to the WTP/washeteria building with a “dog house” attachment between the tank and the WTP that accommodates the insulated water supply and discharge lines. The foundation for the WST is in poor condition as noted in the photos presented in Appendix B. The tank exterior has obvious signs of physical deterioration. **Attachment F4** provides an as-built plan sheet titled “50,000 Gallon AWWA Water Tank & Details” prepared by USPHS for the Construction Plans for Sanitation Facilities, Tununak, Alaska, dated February 1980.

Based on a 2007 sanitary survey inspection, the interior of tank has noticeable interior corrosion with a poor interior coating condition and recommended the interior of the tank should be inspected to determine if the tank is structurally sound and assess the interior coating needs to be recoated to prevent further corrosion. Also, it is understood the interior of the tank has never been cleaned.

According to the findings of a Sanitary Survey of the WTP that was completed for ADEC on August 17, 2010, there were several deficiencies noted with the WST. The tank's overflow line and air vent at the top of the tank were not properly screened and needed to be turned downward a minimum distance of 2.5 times the line diameter above the tank surface.

The WST needs to be evaluated to determine if it can function properly as a chlorine disinfection vessel or if baffling modifications would be required. It is recommended a site visit be conducted by a qualified inspector/engineer to check the structural integrity of the tank. The tank's foundation system should be assessed to determine its condition and evaluate the possibility of replacing the foundation with sleepers and beams similar to the current foundation system or an alternative foundation system.

Subject to the findings of the site inspections recommended above, it may be necessary to evaluate an alternative of replacing the existing WST. One alternative to consider is the construction of a bolted steel tank. Also, dependent on hydraulic calculations for future water demand flow rates and baffling requirements for chlorine contact time, the new tank may have a larger volume compared to the existing tank. The materials, accessories, and design incorporated into the new WST would comply with American Water Works Association (AWWA) D103 and the following specifications:

- Design Loads
    - Specific Gravity: 1.0
    - Wind velocity per International Building Codes/AWWA
    - Shape Factor: 0.6
    - Allowable Soil: to be determined
    - Roof Snow Load: 25 pounds per square foot
    - Seismic per IBC/AWWA

The WST could be prefabricated at a manufactures facility and incorporate fusion bond coatings for resistance to internal and external tank corrosion. Insulation and an aluminum jacket protective cover would also be specified. A bolted tank is recommended for ease of shipping and construction. The design of the foundation for the new WST would require a geotechnical investigation to assess the competency of subsurface soil and permafrost.

IV Septic Tank System Serving the Washeteria and Water Treatment Plant

Wastewater generated from the operation of the existing washeteria/WTP is discharged by gravity via a 4-inch diameter arctic pipe to an off-site septic tank system. The septic tank system was installed in 1978 by the USPHS and was recorded to consist of a pair of septic tanks arranged in series flow that discharged to an adjacent drainfield (soil absorption system). The first septic tank has a capacity of 4,000-gallons and is followed by a second tank sized at 2,000 gallons. The drainfield is approximately 70-feet by 100-feet in size. The septic tank system is located down-slope of the washeteria in a level area that is approximately 25-feet lower than the finished floor elevation of the washeteria/WTP as shown on **Attachment F5** that provides a copy of the as-built plan sheets titled "PHS Sewer Line" dated September 1979. **Attachment F6** provides an as built plan sheet titled "Sewer Line" dated September 1979 prepared by USPHS. **Attachment F7** provides an as built plan sheet titled "Tununak, Alaska Septic Tank & Drainfield Details" dated September 1979 prepared by USPHS.

The septic tank system was originally designed to treat the wastewater flow from the washeteria/WTP and the Paul T. Albert School and the nearby teacher housing facility. In 2010 MWH, now part of Stantec, noted the septic tank system to be in a state of hydraulic failure based on high effluent levels observed in the drainfield observation pipes. At that time, the septic tank system was receiving peak flow from the school and teacher housing which was in full operation, and a much smaller flow contribution from the operation of the 2 washers in the washeteria. In addition, it was understood many of the students including their family members used the school shower facilities at a nominal charge. MWH estimated the daily flow being handled by the septic system in 2010 was probably 4,000 to 5,000 gallons per day (gpd).

In 2015, the school district replaced the sewage disposal system for the school and teacher housing complex with a new off-site treatment plant that discharges the treated effluent directly to the ocean. The sewer line from the school and housing facility was disconnected from the septic tank system. As a result, the daily wastewater flow treated by the septic tank system had decreased significantly - perhaps on the order of 90%.

Since 2015, the septic tank system has been in the state of "hydraulic recovery" due to the reduced daily flow of a less than 200 to 300 gpd from the operation of the existing washeteria. The drainfield is expected to continue recovery for the next year or so until a new washeteria is constructed. Research studies have found that reduced loads and/or resting of the drainfield can significantly improve drainfield adsorptive capacity and its overall operation. The resting state allows the native soil microbe population to degrade the organic clog matt that naturally formed from previous operations.

The estimated daily wastewater flow for the proposed new laundromat, public bathrooms and backwash water from the WTP's direct filtration granular media filters is approximately 825 gpd. The daily flow rate for the new facility is 15 to 20% of the flow rate estimated in 2010. The septic tank system should be capable of handling the projected future flows of 825 gpd from the new washeteria/WTP.

To assess the adequacy of the existing septic tank/drainfield system, it is recommended a field investigation be conducted by a qualified professional who is proficient in the assessment of septic tank systems. The investigation would monitor/measure the actual hydraulic absorptive capacity of the drainfield. An adequacy test would provide adsorptive capacity data for the hydraulic assessment of the drainfield, as well as determine compliance with ADEC operational requirements for serving the proposed new washeteria/WTP.

APPENDIX F

LIST OF ATTACHMENTS

<u>Attachment F1</u>: As-built plan sheet number 19, titled “Infiltration Gallery and Pumping Facility” prepared by USPHS for the Construction Plans for Sanitation Facilities, Tununak, Alaska, dated September 1980.

<u>Attachment F2</u>: As-built plan sheet titled “Water Transmission Line and Tank Foundation” prepared by USPHS for the Construction Plans for Sanitation Facilities, Tununak, Alaska, dated September 1980.

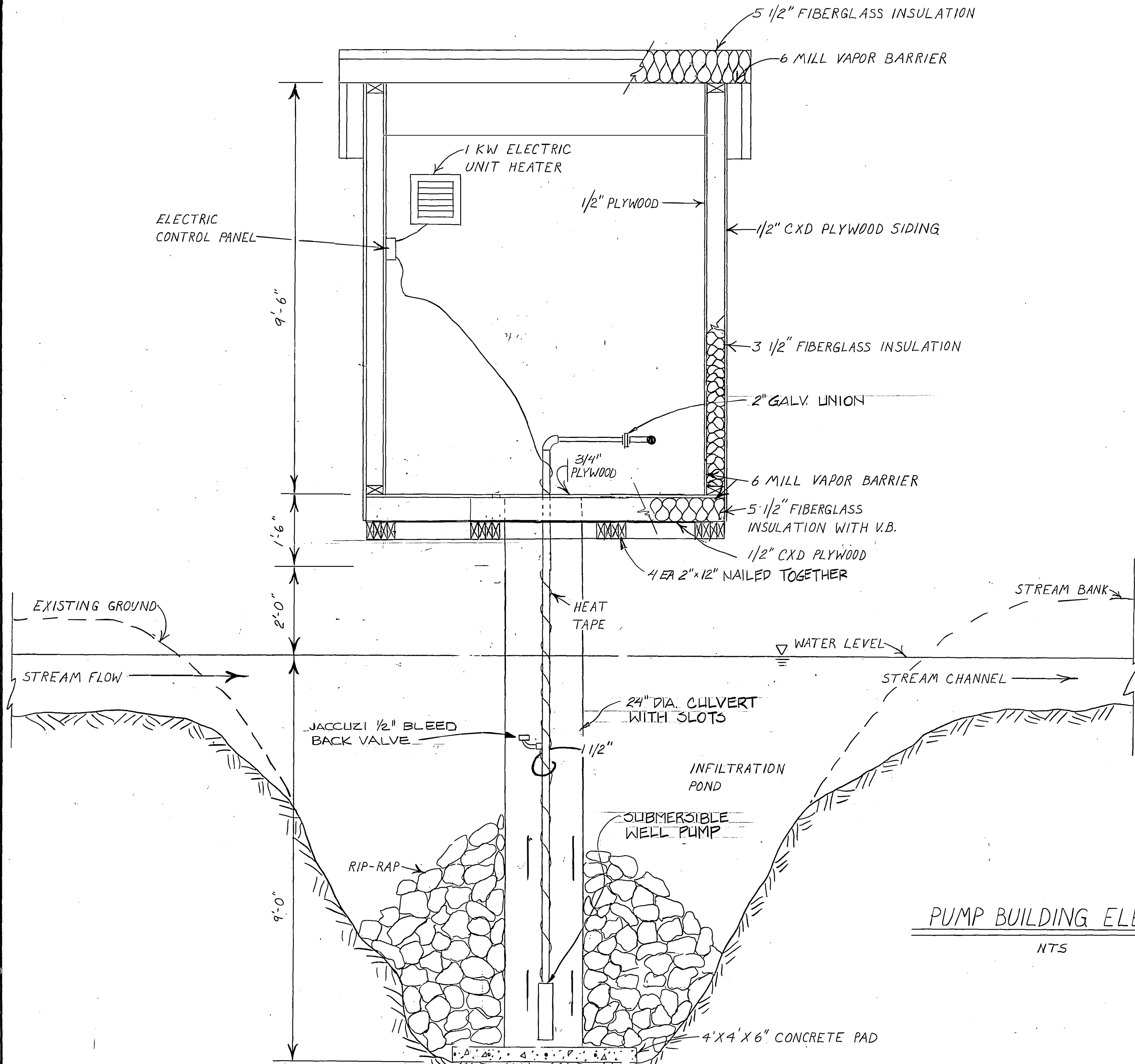
<u>Attachment F3</u>: ADEC letter dated June 14, 2012, reclassifying Tununak water system.

<u>Attachment F4</u>: As-built plan sheet titled “50,000 Gallon AWWA Water Tank & Details” prepared by USPHS for the Construction Plans for Sanitation Facilities, Tununak, Alaska, dated February 1980.

<u>Attachment F5</u>: As-built plan sheet titled “Tununak, Alaska - PHS Sewer Line”, dated September 1979, prepared by USPHS.

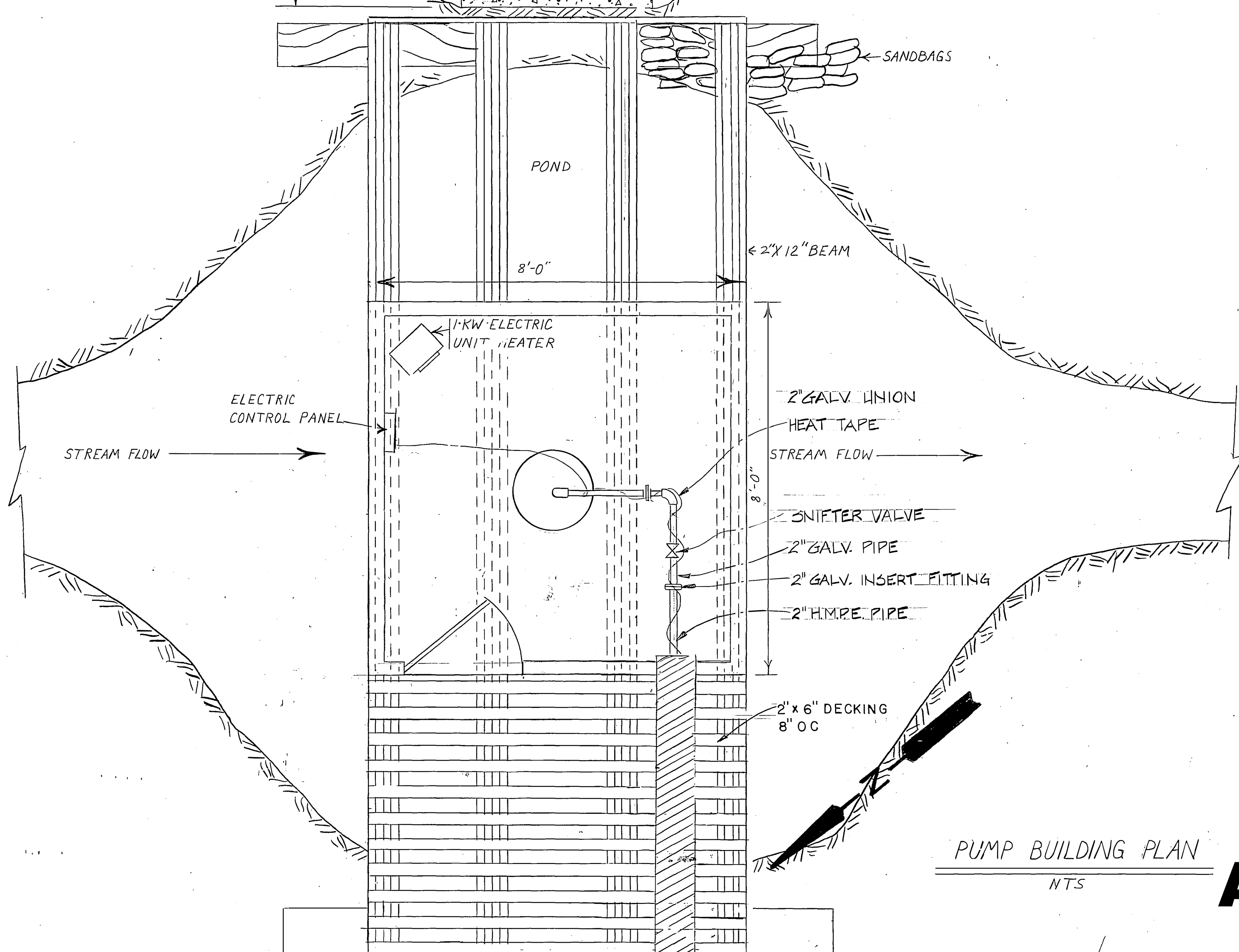
<u>Attachment F6</u>: As built plan sheet titled “Tununak, Alaska – Sewer Line”, dated September 1979, prepared by USPHS.

<u>Attachment F7</u>: As built plan sheet titled “Tununak, Alaska Septic Tank & Drainfield Details” dated September 1979 prepared by USPHS.



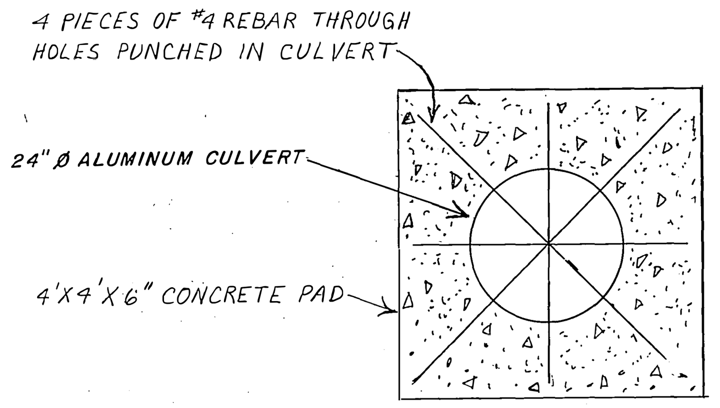
PUMP BUILDING ELEVATION

NTS



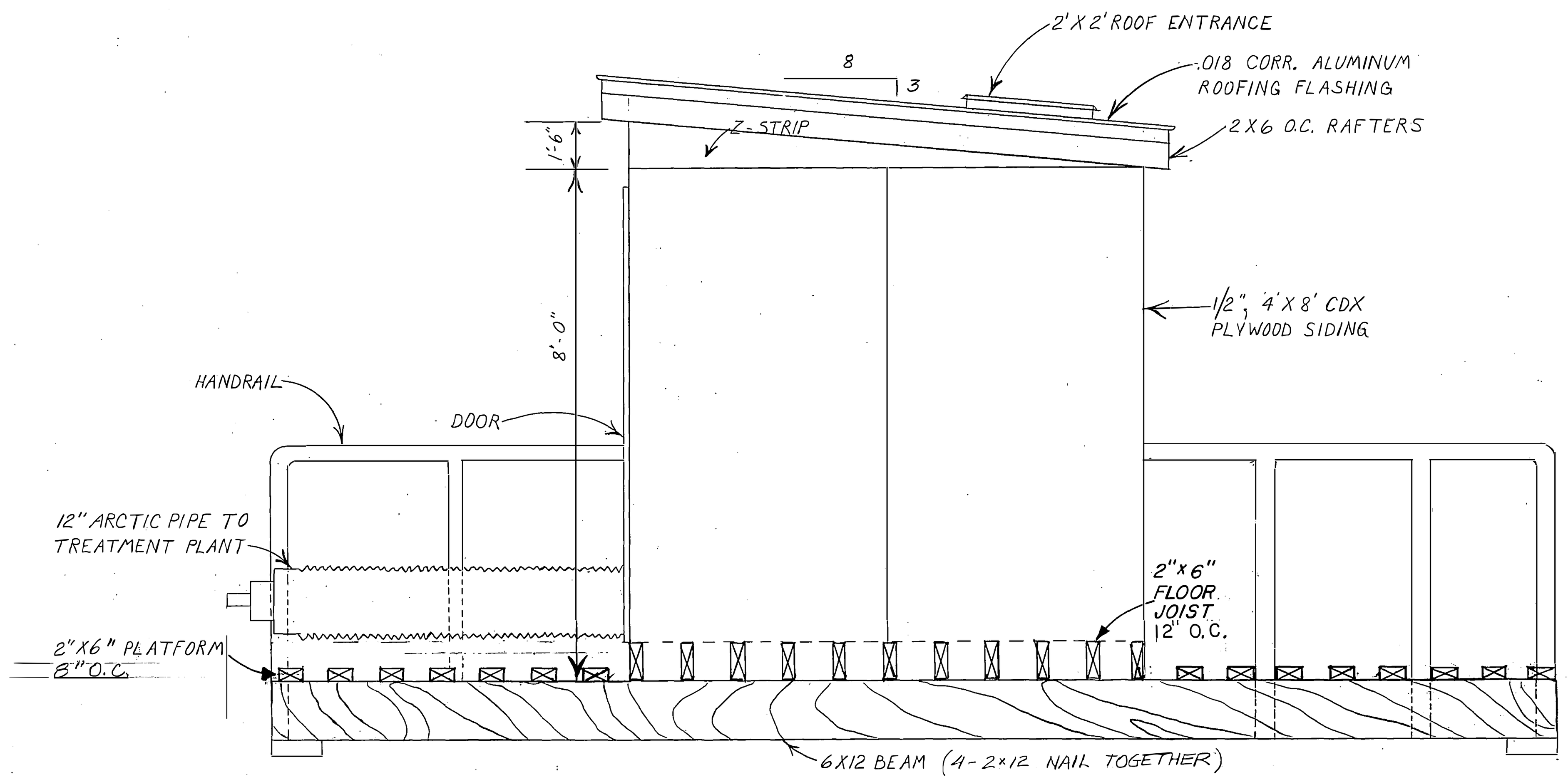
PUMP BUILDING PLAN

NTS



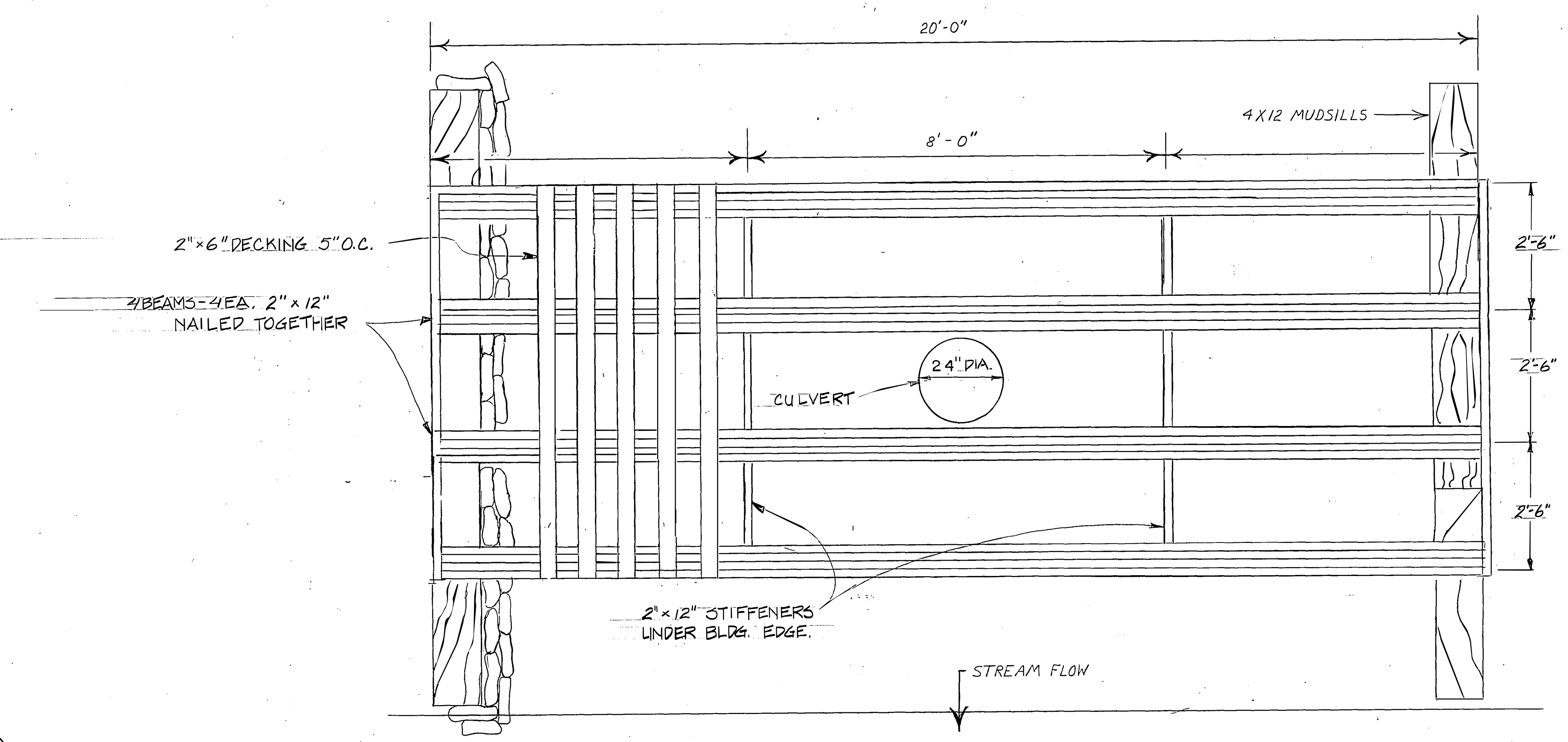
CULVERT PAD DETAIL

NTS



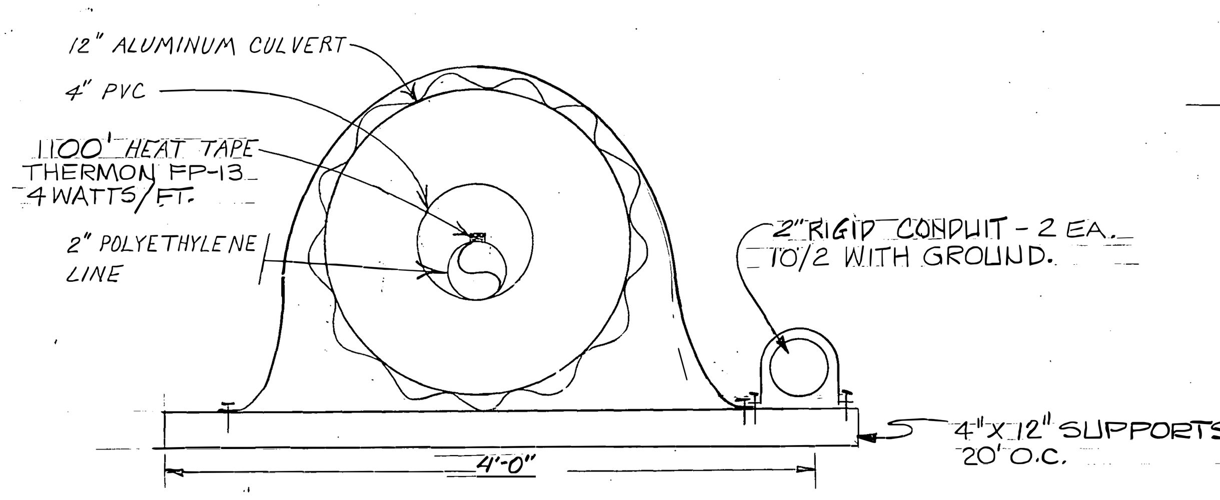
SIDE VIEW - PUMP BUILDING

SCALE: 1/2" = 1'



BEAM AND JOIST DETAIL

SCALE: 1/2" = 1'



4" ARCTIC PIPE DETAIL

TRANSMISSION LINE SECTION A-A

NOT TO SCALE

AS BUILT

DATE	REVISIONS	INITIALS
FEB 80	AS BUILT	CLC
MARCH 80	AS BUILT CHANGES	D.L.
SEPT 80	AS-BUILT CHANGES	PML

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA
INFILTRATION GALLERY & PUMPING FACILITY
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-77-631

SHEET NO. 19 OF TOTAL SHEETS

Design Engineer
Maintenance Review
Material Take-off

DRAWN BY: GGA. DATE: JULY 1978
CHECKED BY: DATE:

SANITATION FACILITIES CONSTRUCTION BRANCH
ENVIRONMENTAL HEALTH BRANCH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

Appendix F - Attachment F1

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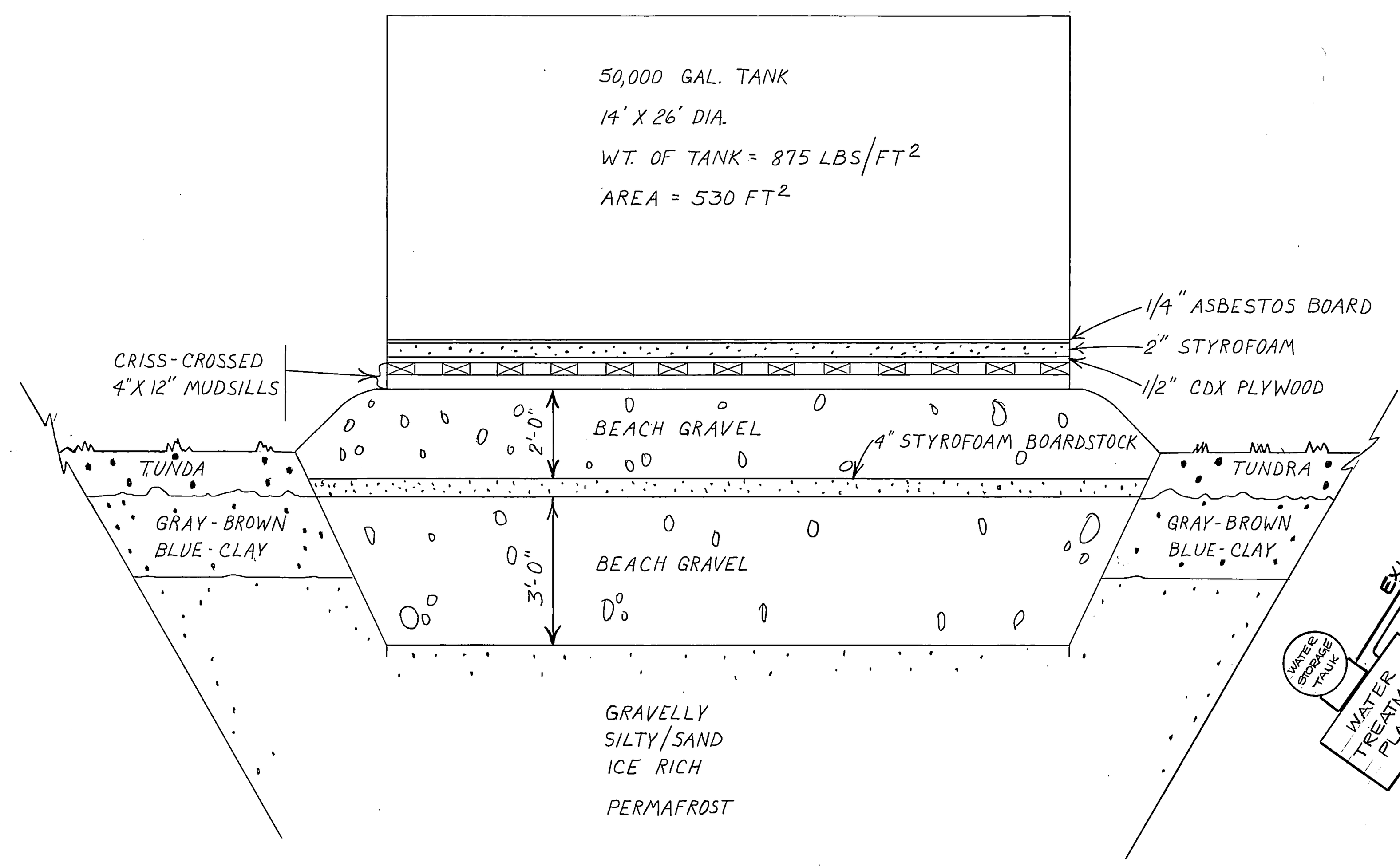
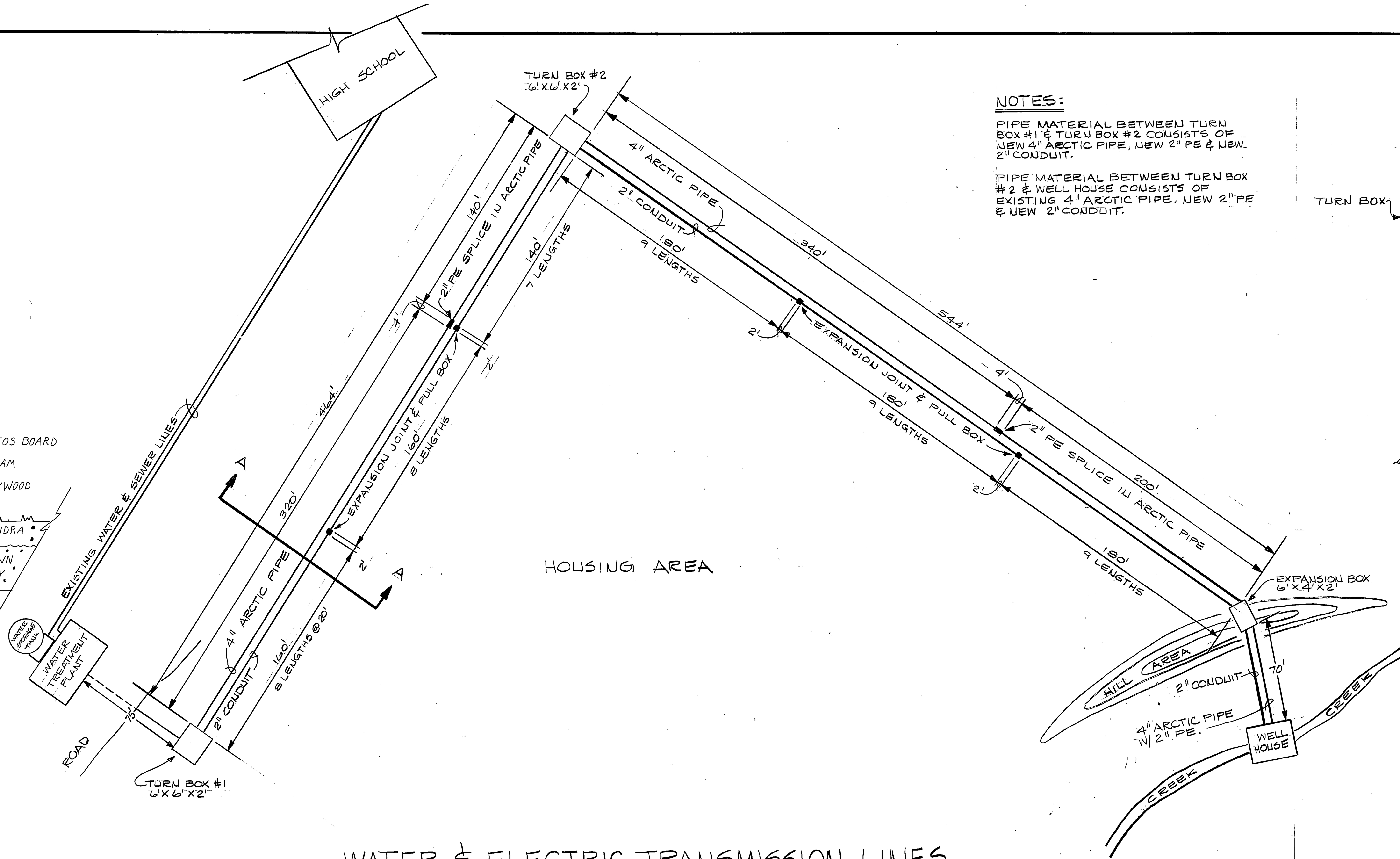


WATER TANK FONDATION PAD DETAIL

NTS



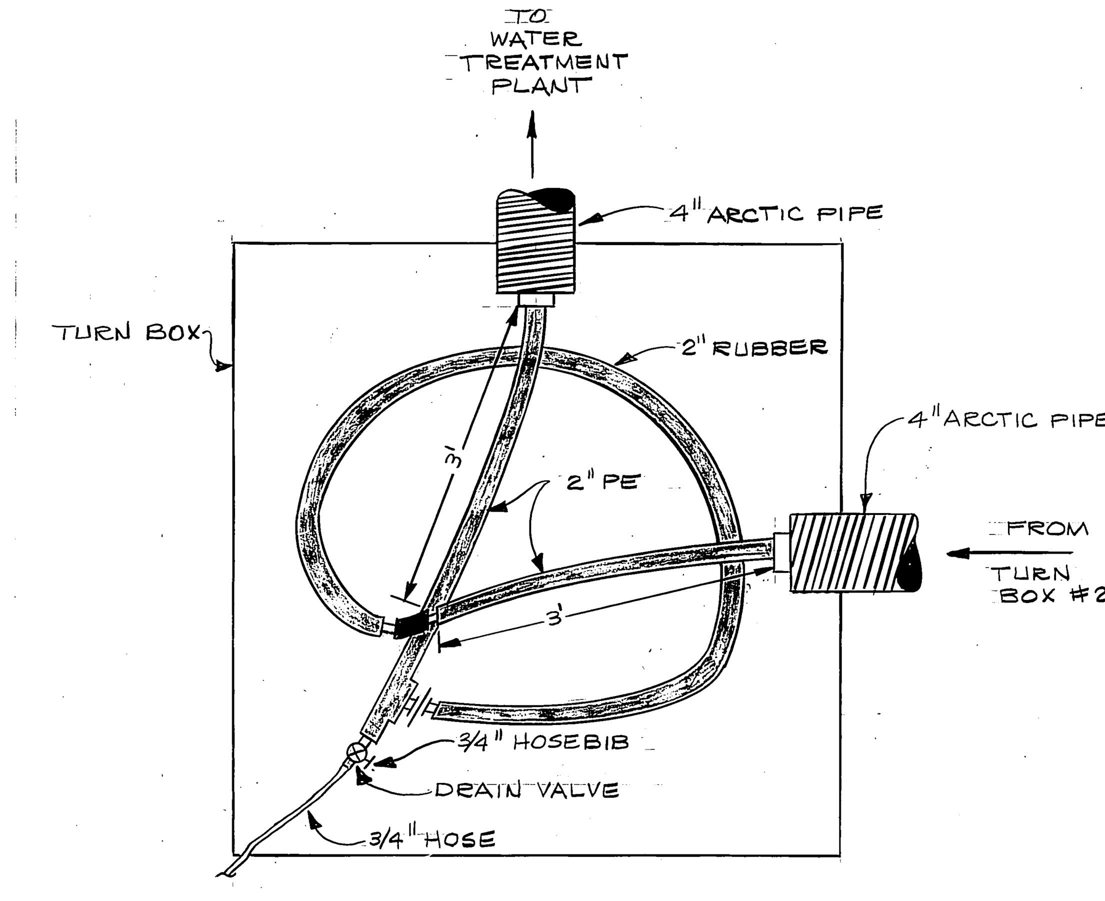
WATER & ELECTRIC TRANSMISSION LINES

NOT TO SCALE

NOTES:

PIPE MATERIAL BETWEEN TURN BOX #1 & TURN BOX #2 CONSISTS OF NEW 4" ARCTIC PIPE, NEW 2" PE & NEW 2" CONDUIT.

PIPE MATERIAL BETWEEN TURN BOX #2 & WELL HOUSE CONSISTS OF EXISTING 4" ARCTIC PIPE, NEW 2" PE & NEW 2" CONDUIT.



TURN BOX #1

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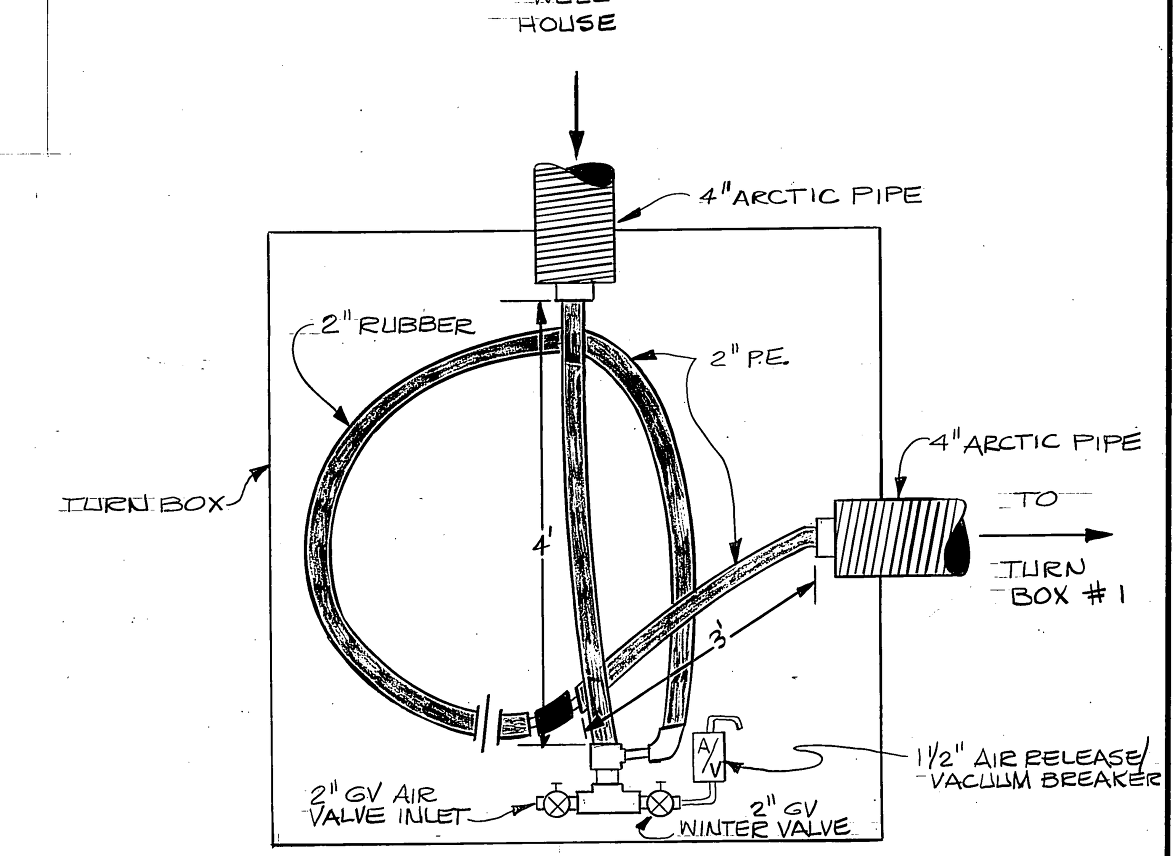

TURN BOX #2

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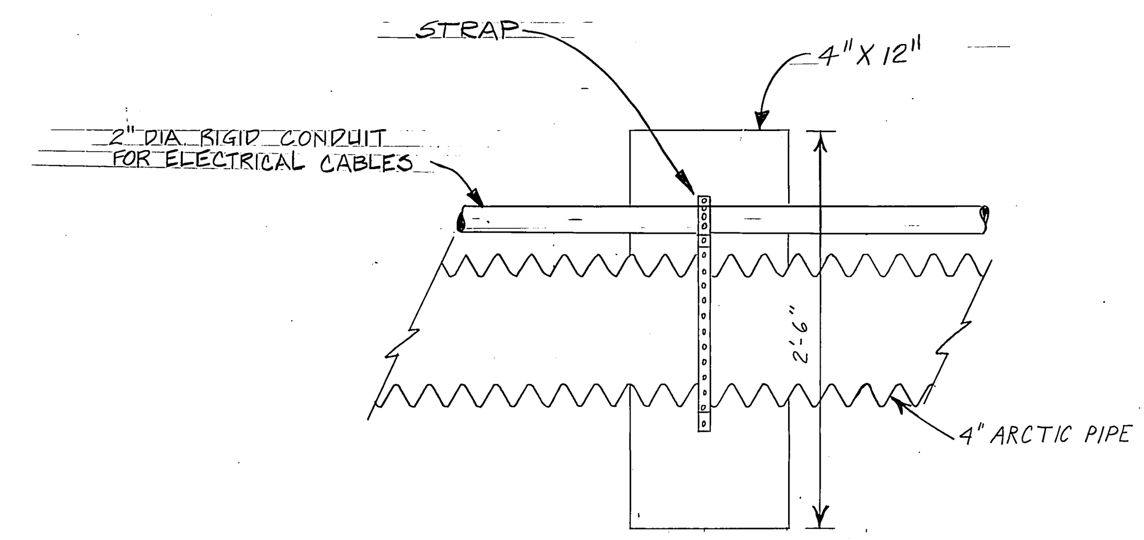
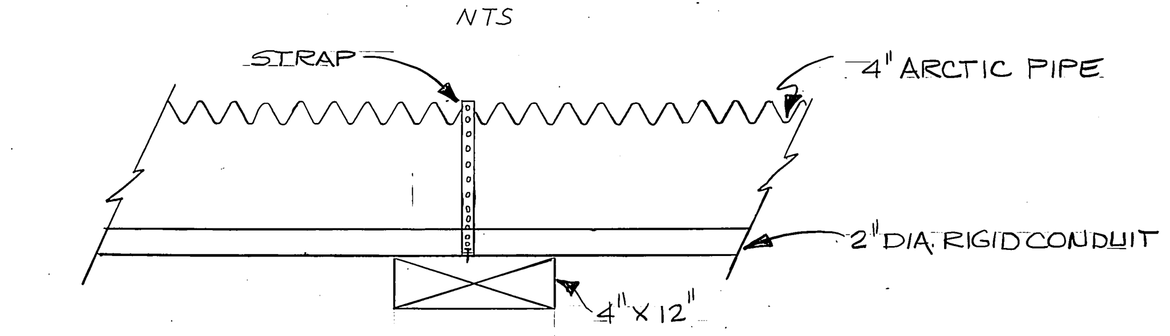


TRANSMISSION LINE SUPPORT PAD PLAN

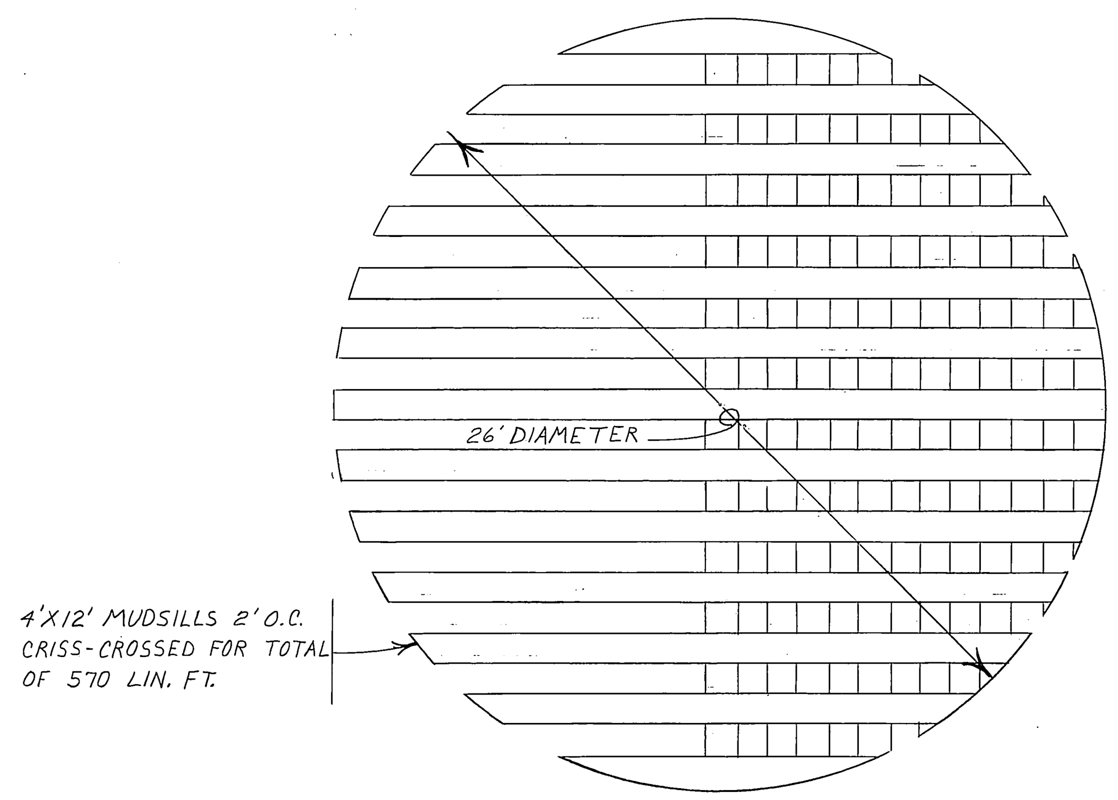
NTS



LUMBER SUPPORTS FOR TRANSMISSION LINE SPACED 10 FT. O.C.

TRANSMISSION LINE SUPPORT PAD ELEVATION

NTS



MUDSILL LAYOUT FOR TANK FONDATION

NTS

AS BUILT

DATE	REVISIONS	INITIALS
~~SEPT~~ 80	AS-BUILT	CLC
SEPT 80	AS-BUILT CHANGES	PML

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA
WATER TRANSMISSION LINE & TANK FOUNDATION
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-77-631

SHEET NO. ____ OF ____ TOTAL SHEETS

Design Engineer
Maintenance Review
Material Take-off

DRAWN BY: GGA
DATE: JULY 1978
CHECKED BY:
DATE:

SANITATION FACILITIES CONSTRUCTION BRANCH
OFFICE OF ENVIRONMENTAL HEALTH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

Appendix F - Attachment F2

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STATE OF ALASKA

DEPT. OF ENVIRONMENTAL CONSERVATION
DIVISION OF ENVIRONMENTAL HEALTH
DRINKING WATER PROGRAM

SEAN PARNELL, GOVERNOR

555 Cordova Street
Anchorage, AK 99501
PHONE: (907) 269-7518
FAX: (907) 269-7650
http://www.dec.state.ak.us/

June 14, 2012

Mr. James James
Tribal Administrator
P.O. Box 77
Tununak, AK 99681

Re: Reclassification of Tununak, PWSID AK2270231, to Non-Public Water System
Source: Surface Water

Dear James,

Following our meeting on June 13, 2012, this letter is to confirm that the water system for the Native Village of Tununak is being reclassified from community water system to Non-public (NP) water system. This reclassification is effective June 13, 2012.

Under the DEC drinking water regulations, *a public water system* means an intake works, collection system, water treatment works, storage facility, constructed conveyance, distribution main, or vehicle that provides water for human consumption to one or more multi-family dwellings; a factory, office building, restaurant, school, or similar facility; or two or more duplexes or single-family residences; and does not include a private water system (18 AAC 80.1990 (111) (A) and (B)). Furthermore, a *community public water system* is defined as a public water system that serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents (18 AAC 80.1990 (a) (21)).

During the meeting, the following were confirmed:

1. The Native Village of Tununak water plant provides water to the community washeteria.
2. The water in the washeteria is only used for washing clothes in the washing machines. There is no bathroom or toilet inside the washeteria.
3. The watering point immediately outside of the washeteria is deteriorated, the hose is disconnected, and the operation is shut down. The watering point is not accessed by the public.
4. All of the other watering points previously served by the village's water treatment plant are in the same state of non-operation and are currently not accessed by the public.
5. The residents of the Native Village of Tununak are collecting their drinking water from the school's watering point served by the school's public water system, LKSD Tununak Paul Albert HS, PWSID# AK2270613.
6. Both the Native Village of Tununak tribal administrator (you) and the remote water operator for the Lower Kuskokwim School District (LKSD), Bob Miller, agreed that the school's public water system will provide the drinking water to the school, the teacher housing, and the school's watering point. The school's watering point will primarily serve the residents of Tununak.
7. The LKSD will be responsible for the operations and maintenance of the school's public water system.

Based on all these information, our Department reclassifies the water system for the Native Village of Tununak as **non-public water system**.

Appendix F - Attachment F3

With the exception of the 2011 Consumer Confidence Report requirement that is due to our DEC office by July 1, 2012, your water system is no longer subject to the monitoring and reporting requirements based on your previous water system classification.

Please note that any change(s) in the future that will impact your reclassification as non-public water system, your administration needs to notify our Department as soon as possible for further review and approvals.

If you have further questions regarding this letter, please contact me at phone 907-269-7518 or email Leah.guzman@alaska.gov.

Sincerely,

Leah Guzman

Leah A. Guzman
Environmental Program Specialist

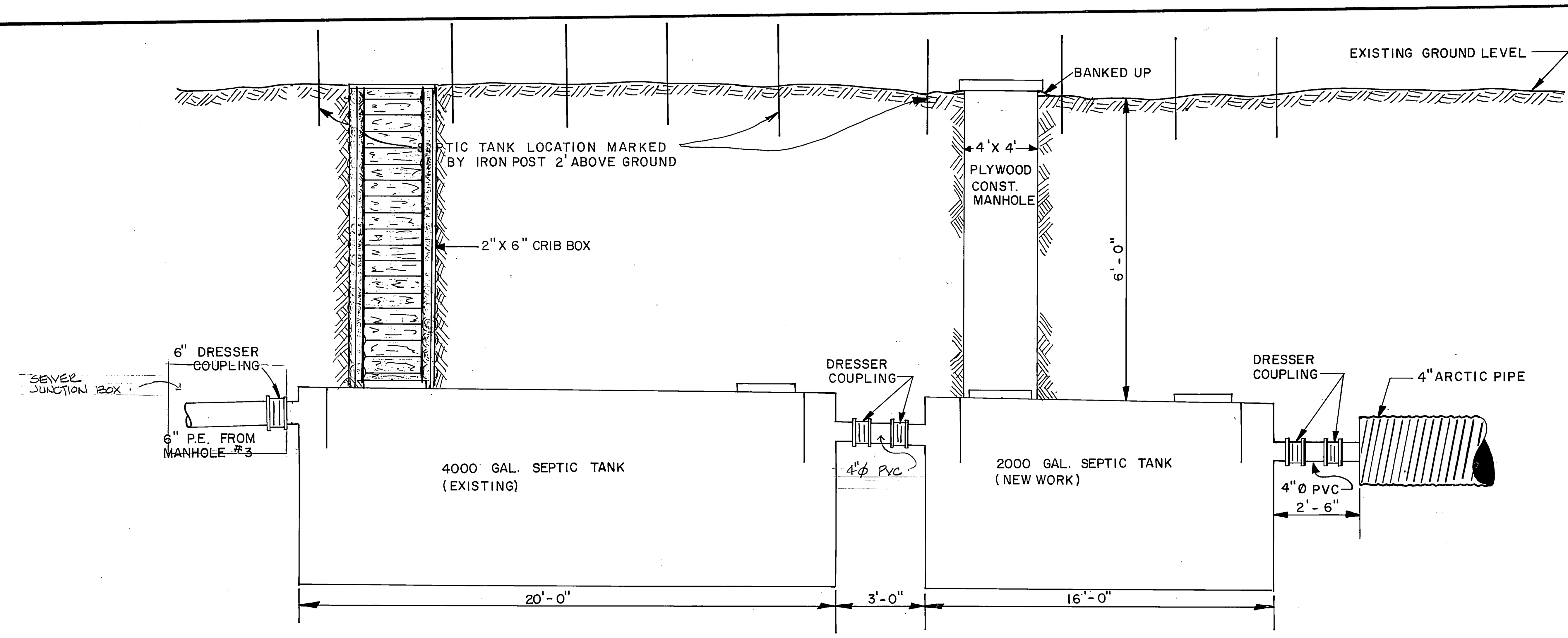
Cc: Bob Miller, Remote Water Operator, Lower Kuskokwim School District, via email
Brian Berube, Environmental Health Officer, YKHC, via email
Allan Paukan, Remote Maintenance Worker, YKHC, via email
Dan Reichardt, P.E, DEC, Drinking Water Program
Susan Randlett, P.E., DEC, Village Safe Water Program
Heather Newman, Southcentral Program Coordinator, DEC, Drinking Water Program
Hannah Drake, Environmental Program Specialist, DEC, Drinking Water Program
Jeanine Oakland, Environmental Program Specialist, DEC, Drinking Water Program
Kenneth Smith, Environmental Program Specialist, DEC, Drinking Water Program

Appendix F - Attachment F4

Appendix F - Attachment F5

K+E PLATE 1, PLAN-PROFILE
KEUFFEL & ESSER CO.
48 7024 MADE IN U.S.A.

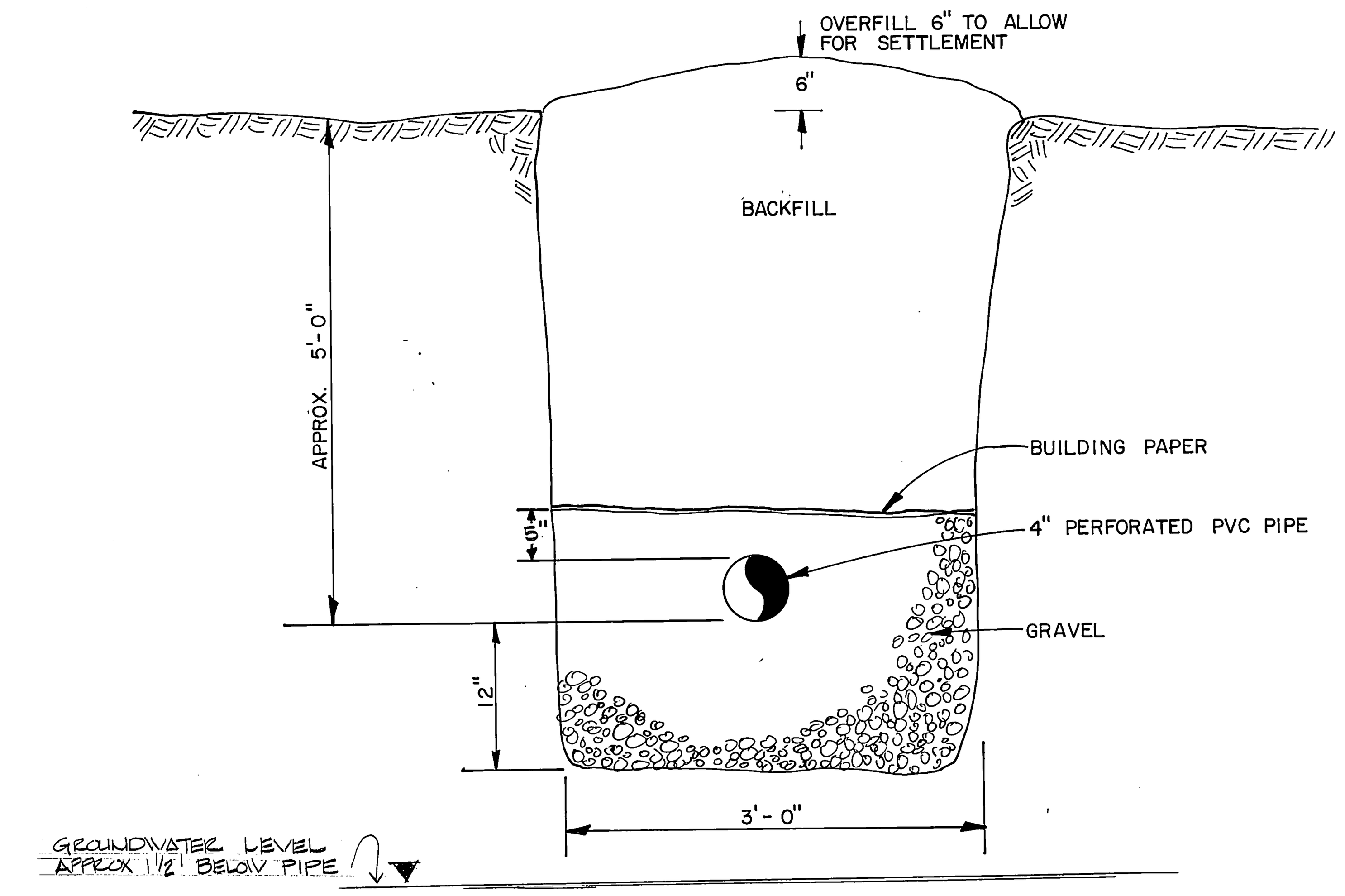
Appendix F - Attachment F6



NOTE: TANK BOTTOM LEVEL ON BOTH TANKS.

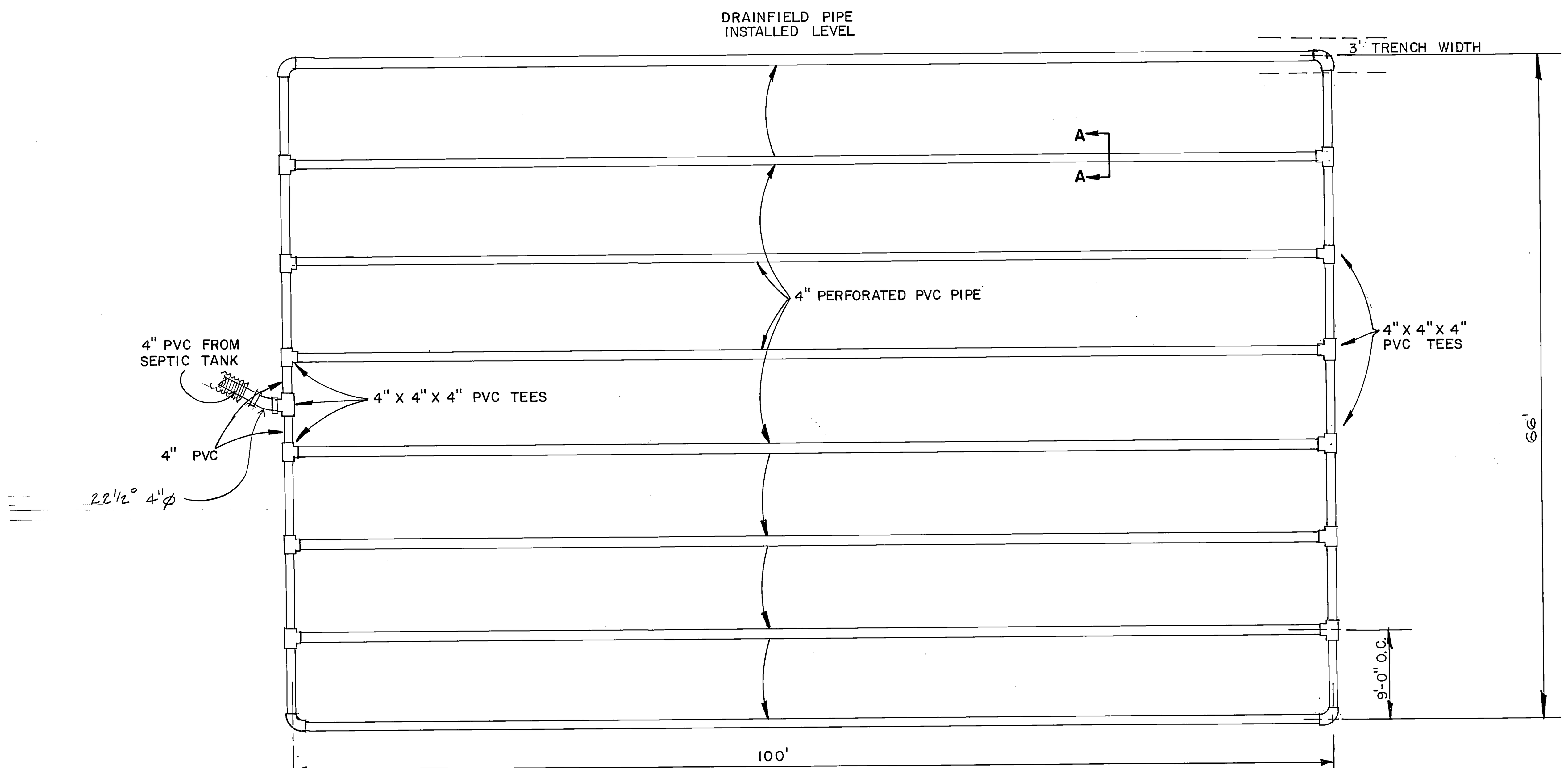
SEPTIC TANK INSTALLATION

NTS



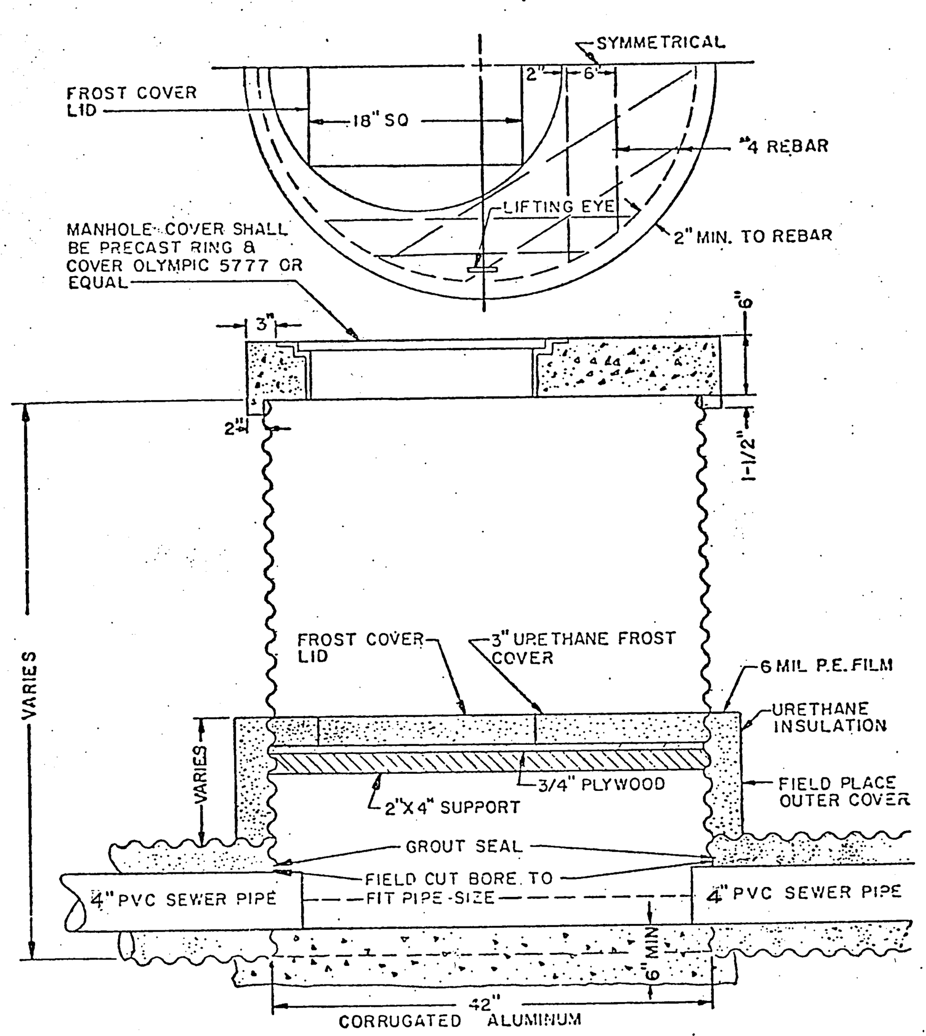
DRAINFIELD CROSS-SECTION A-A

NTS



DRAINFIELD - PLAN VIEW

NTS



STANDARD ARCTIC MANHOLE

NO SCALE

AS BUILT

DATE	REVISIONS	INITIALS
SEPT 80	AS-BUILT CHANGES	PML

U. S. Department of Health, Education & Welfare
Public Health Service
Indian Health Service

TUNUNAK, ALASKA
SEPTIC TANK & DRAINFIELD DETAILS
PUBLIC LAW 86-121 PROJECT
PROJECT NO. AN-77-631

SHEET NO. ____ OF ____ TOTAL SHEETS

Design Engineer
Maintenance Review
Material Take-off

DRAWN BY: K. GROFF
DATE: SEPTEMBER 1979
CHECKED BY:
DATE:

SANITATION FACILITIES CONSTRUCTION BRANCH
ENVIRONMENTAL HEALTH BRANCH
ALASKA AREA NATIVE HEALTH SERVICE
ANCHORAGE, ALASKA

Appendix F - Attachment F7

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