PRELIMINARY ENGINEERING REPORT

for

CITY OF SAINT PAUL
WASTEWATER LIFT STATION
VSW PROJECT NUMBER 19ER33

FEBRUARY 16, 2020

Final

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ACRONYMS AND TERMINOLOGY

ACRONYMS

°F	degrees Fahrenheit
ADCED	Alaska Department of Community and Economic Development
ADEC	Alaska Department of Environmental Conservation
ADOT&PF	Alaska Department of Transportation and Public Facilities
AEC	Aleut Corporation
ACSPI	Aleut Community of St. Paul
ANTHC	Alaska Native Tribal Health Consortium
APIA	Aleutian - Pribilof Islands Association (A non-profit tribal organization of the Aleut people in Alaska providing services including cultural heritage, health, education, social, psychological, employment, vocational training, environment, natural resources and public safety.)
CDQ	Community Fishing Quota
CSP	City of Saint Paul, Alaska
DI	Ductile Iron
IBC	International Building Code
IFQ	Individual Fishing Quota
IHS	Indian Health Service
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
Ft/sec	Feet per second
gpcd	Gallons per Capita Day
HDPE	High Density Polyethylene
kW	kilowatt
MLLW	mean lower low water. Datum for 0 elevation sea level.
MSL	mean sea level
NCDC	National Climate Data Center
NEPA	National Environmental Policy Act

NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NPV	Net Present Value
NWS	National Weather Service
O&M	Operations and Maintenance
OMB	Office of Management and Budget
PCA	Polarconsult Alaska, Inc.
PHS	United States Public Health Service
POSS	Pribilof On-Shore Services
RAHSI	Rural Alaska Housing Sanitation Inventory
Report	Preliminary Engineering Report
SPPW	Single Payment Present Worth
TDX	Tanadgusix Corporation
USPW	Uniform Series Present Worth
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USDC	U.S. Denali Commission
USGS	U.S. Geological Survey
VSW	Village Safe Water

EXECUTIVE SUMMARY

The purpose of this report is to assess the condition of two existing sewer lift stations serving the City of Saint Paul, Alaska (CSP) that were constructed in 1988 and 1989, identify alternatives to address problems and deficiencies, and make a recommendation for a preferred alternative.

CSP, population approximately 390, is located on Saint Paul Island in the Bering Sea, approximately 750 air miles west-southwest of Anchorage Alaska and 250 air miles northwest of Dutch Harbor, Alaska.

The CSP's existing sewer collection system serves 100% of the village of Saint Paul. Facilities north of the townsite, including the airport, United States Coast Guard LORAN Station, and National Weather Service station are served by on-site septic systems.

Existing lift stations are drywell – wetwell configuration with steel tanks that are beyond their useful life. The steel construction is susceptible to corrosion failure, electrical controls are corroded and failing, and the dry well vault is a confined space with worker safety concerns. The drywell vault requires two personnel to safely access and maintain the equipment. Increased maintenance requirements due to system age and lack of parts, and adherence to the two-man rule cause undesirable and costly operation. Heightened risk of lift station failure (tank collapse or pump / controls failure) presents increased potential of service disruption and public health hazard / environmental impacts associated with a potential sewage surface discharge. For these reasons, CSP needs to improve the existing lift stations.

This report evaluates three upgrade options in addition to a do-nothing option. Upgrades A through C postpone the inevitable requirement to replace the steel vaults for 5-years. Option B provides new pumps and controls installed in the existing dry-well. Option C provides new submersible pumps, controls and an enclosure over the existing wet-well, and abandons the existing dry-well. Option D includes replacing the two existing lift stations with new lift stations with new concrete vault, pumps and controls and building over wet well to house controls and safe access for maintenance.

Construction cost estimates, annual O&M costs, and cost of future lift station replacement for each option follow.

Estimated Cost	**Option A** (Do-nothing)	**Option B** (New Pumps. Controls)	**Option C** (New Pumps, Controls, Enc)	**Option D** (New Lift Stations)
Option Construction	$ -	$ 464,300	$1,204,100	$1,702,000
Option Annual O&M	$ 83,050	$ 51,560	$ 32,160	$ 32,010
PV Future LS Const	$2,021,442	$2,021,442	$2,021,442	$ 0
Net Present Value	$3,201,782	$3,212,849	$3,682,613	$2,156,939

Upgrade Option D has an estimated capital cost of $1,702,000. With the upgrade, annual utility operations and maintenance (O&M) costs are estimated to be reduced by about $51,000 per year. The City Council has adopted a resolution supporting this project.

1. PROJECT PLANNING

A. LOCATION

Saint Paul Island is the largest island in the Pribilof Archipelago, located at 57°10'N 170°15'W in the Bering Sea, approximately 750 air miles west-southwest of Anchorage, Alaska. Saint Paul Island is approximately 11 miles long by 4 miles wide, with a maximum land surface elevation of about 665 feet above sea level. The City of Saint Paul (CSP) is located on a peninsula on the southern coast of the island. The CSP is a Second-Class City, organized in 1971 with a boundary encompassing the entire island to three miles off shore. A map of Saint Paul Island and its location is shown in Figure 1-1.

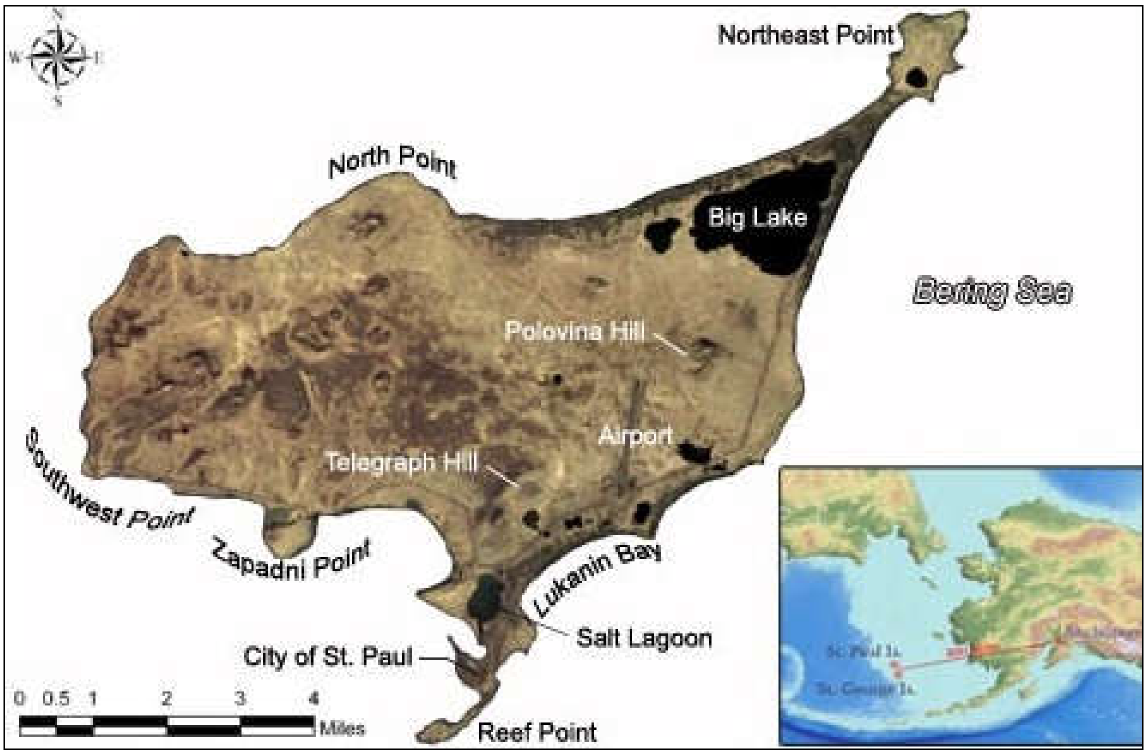


Figure 1-1: St. Paul Location Map

Saint Paul Island is accessible only by air or sea. The community is located about 3 miles from the Saint Paul Island Airport. The state-owned airport has a single 6,500-foot long paved, lighted runway with year-round passenger and cargo service through RavnAir and Alaska Central Express. The federally maintained harbor has deep draft commercial docks, a small boat harbor for local fishing fleet and boat launch ramp. Scheduled freighter service is available year-round from Seattle and Dutch Harbor.

The CSP provides sewer utility service through Certificate of Public Convenience and Necessity Number 690. The service area includes the entire island. CSP also provides water, electricity, solid waste, bulk fuel storage, law enforcement, fire protection, emergency medical, search and rescue, and harbor master services to the community, maintains community roads, and operates the community gas station.

Figure 1-2: St. Paul Location Map

The two lift stations addressed by this report are both within the town site, one at Ellerman Heights and the second at Sandy Lane. The Sandy Lane lift station has been identified as both "Old Town" and "Sandy Lane" in previous drawings and reports. For this report it will be identified as Sandy Lane lift station. Both lift stations are within existing utility easements provided to the CSP by the landowner.

The two lift stations are on flat developed pads adjacent to existing roadways in the community that have been partially overgrown with grass. The preliminary engineering drawings in the Appendix show topography, major geographic features, legal boundaries, and existing structures. Photos of the two lift stations are shown below.

Figure 1-3: Sandy Lane Lift Station Site

Figure 1-4: Ellerman Lift Station Site

Figure 1-5: Ellerman Lift Station Dry Well

B. ENVIRONMENTAL RESOURCES PRESENT

i) HISTORY AND CULTURAL SUMMARY

Saint Paul Island was discovered in 1786 by Russian sea captain Gavril Pribylov. Unangan (Aleuts) were forcibly relocated from their Aleutian Islands villages to Saint Paul Island starting in 1788 to hunt fur seals. After Alaska was purchased from Russia in 1867 sealing continued through leases to the Alaska Commercial company through 1910. The Company paid the Unangan residents per seal skin and provided housing, schooling, medical and fuel. After the Fur Seal Act of 1910, administration of the island was placed under the U.S. Bureau of Fisheries which continued fur sealing until the 1983 Fur Seal Act Amendments which ended Government control of the island. Commercial seal harvesting was discontinued in 1985.

Saint Paul Island residents are predominantly Unangan, with the Russian Orthodox Church playing a strong role in the community. The first Russian Orthodox Church was constructed in Saint Paul in 1810 and replaced with the current structure in 1905. The Priest from Unalaska visited the Island annually until a resident priest was assigned to the Island beginning in 1827.

In 1971 with the Alaska Native Claims Settlement Act, the CSP assumed responsibility of governance of the Island. The CSP employs a City Council / City Manager form of governance. The majority of the lands were transferred to the Tanadgusix Village Corporation (TDX), and subsurface rights transferred to the Aleut Corporation. Tribal Government was established in 1952 (Aleut Community of Saint Paul Island, ACSPI).

The community of Saint Paul Island is on the National Register of Historic Places. Many of the structures in the community are included. Any new buildings over lift stations should be designed and constructed to match existing architecture on the island. This includes higher pitch 6 in 12 roof and horizontal lap siding to be similar to historical buildings.

ii) CLIMATE

The climate of Saint Paul Island is classified as arctic maritime. The Bering Sea moderates air temperatures, resulting in cool weather year-round and a narrow range of mean temperatures. The maximum high temperature for Saint Paul Island is 66 degrees Fahrenheit (°F) (August 1987), and the minimum low temperature is minus 19°F (March 1971). The mean daily temperature varies from 18°F to 51°F.

Average annual precipitation on Saint Paul Island is 23.7 inches (period of record 1981 to 2010). August through November is typically the wet season, with average precipitation of approximately 3 inches per month. February through June is typically the dry season, with average precipitation of approximately 1.2 inches per month (NWS).

Saint Paul Island is windy; average wind speeds of 20 to 40 mph are not uncommon, and gale-force winds of 60+ mph frequently occur during storm events.

iii) TOPOGRAPHY, GEOLOGY AND SOIL CONDITIONS

Saint Paul Island is of recent volcanic origin, and is composed of a series of interconnecting cinder cones, lava flows, and volcanic debris fields. Major topographical features on the island are cinder cones, including Bogoslof Hill, Lake Hill, and Polovina Hill; sand dunes, located along portions of the southern, eastern, and northern coasts of the island; and rock sea cliffs, located on the western coast of the island and other areas.

Within the proposed project areas, both sites were excavated and filled for original lift station construction with moderate finish grades that slope away from the sites to original grades. Soils at the two lift stations consist of a thin layer of organics over scoria fill work pads. The Ellerman pad is estimated to be 2 to 3 feet thick scoria, and the Sandy Lane site is estimated to be 6 to 8 feet thick scoria.

Geotechnical test holes for prior road and utility projects show medium to dense sand underlying both sites to bottom of test holes at 12-feet. Both sites are presumed to be underlain at unknown depth by basaltic bedrock.

iv) FLOODING AND COASTAL EROSION

Historically, the major risk of flooding and erosion on Saint Paul Island is from storm surges and wave action on the low-lying areas adjacent to the village. The storms of note were in December 1966 and December of 2015 with storm driven water elevations of up to 9 feet elevation in the Salt Lagoon and the Pond adjacent to Bartlett Boulevard. Construction of the main harbor in 1988, and the extension of Polovina Turnpike in 2019 have reduced the impacts of these historical storm surge flood events.

The 1996 Corps of Engineers (USACE) design report for harbor improvements developed a design wave height of 25-feet due to offshore depth-limiting conditions with an expected flood tide elevation of +6 feet above MLLW. The report identified a higher estimated storm surge water elevation of 7.4 feet in the design report for the Salt Lagoon Entrance Channel after harbor construction. Design and construction of the Polovina Road extension was completed in 2019 to an elevation of 12 feet to provide protection from storm surge flooding from the East.

Tsunamis caused by either upthrust earthquakes, or submarine slides can and have produced run up waves in the Aleutians. A 1.5-foot marigram wave was measured in Saint Paul in 1872 from an estimated 7.2 magnitude Aleutian megathrust earthquake in the Fox Islands. The Geophysical Institute at the University of Alaska, Fairbanks (UAF) prepared tsunami risk assessment modeling for the Alaska based on a hypothetical worst-case event at maximum high tide. Their draft report, currently under pear review, shows a worst-case tsunami elevation of close to 30-feet above sea level at high tide from a greater than 9 magnitude earthquake north of the Aleutians.[1] This hypothetical earthquake epicenter is outside the major Aleutian earthquake zone, which is located along the south side of the Aleutian Island Chain.

Due to the inland project location and protection afforded by the harbor, roads and Island topography, the maximum water design elevation of 7.4 feet as found by the USACE 1996 report, with an additional 2 feet of water height for safety factor, is recommended for the project. Flooding and erosion are not considered an issue at the project sites.

v) GROUNDWATER

The maximum historical precipitation event in the past fifty years was 1.76 inches in a day, and annual average precipitation is 23.7 inches (NWS). Due to limited rainfall, local topography, and local surficial geology, stormwater erosion or flooding is not a major concern for either site.

Groundwater at both sites is slightly above sea level and likely fluctuates with the tides (NOAA, 2004). Groundwater elevations in excavations nearby have identified water at around 4 feet above sea level. With storm surge, as noted in section iv, a maximum ground water design level of 7.4 feet could be anticipated.

Ground surface elevations in the project area range from approximately 10 to 12 feet above sea level. The base of the existing Sandy Lane lift station and gravity piping are within the groundwater table at high tide. The base of the existing Ellerman lift station may be within the groundwater table at high tide.

vi) SEISMIC HAZARDS

Seismic maximum considered earthquake (MCE) design spectral response acceleration values for Saint Paul Island, from the currently adopted International Building Code, are 0.25 for a 0.2 second MCEr, and 0.15 for a 1.0 second MCEg.

vii) VEGETATION AND WETLANDS

Saint Paul is a treeless coastal Island covered sand dunes, grasses and vegetation. Both project sites are within mineral soil work pads constructed for the existing lift stations.

[1] Nicolsky, D.J., Suleimani, E.N., Freymueller, J.T., and Koehler, R.D., 2015, Tsunami inundation maps of Fox Islands communities, including Dutch Harbor and Akutan, Alaska: Alaska Division of Geological & Geophysical Surveys Report of Investigation 2015-5, 67 p., 2 sheets, scale 1:12,500. http://doi.org/10.14509/29414.

Sites are overlain with a thin layer of windblown organics and grasses that have accumulated since original construction.

Wetlands are present on the Island in nearby lower lying areas. There are no wetlands at either Lift Station project site.

viii) HISTORIC SITES

The village of Saint Paul is one of the oldest communities of European origin in the State of Alaska, and many of the older buildings in the village have been identified as having historic value. The area was designated the "Seal Island Historic District" in June 1962 and includes the original town site buildings with the St. Peter and St. Paul Russian Orthodox Church on the National Register of Historic Places (NPS, 2004).

Archeological Surveys of the area for Polovina Turnpike upgrade and extension identified cultural resources in the area. The Navy tennis court (XPI-00150) is adjacent to the Sandy Lane Lift station, and other sites were greater than 500 feet from the existing lift stations.[2,3] Existing lift stations were excavated and constructed in 1986 and 1988. This project is confined to the immediate area of the existing previously constructed lift stations, so it is unlikely that any unknown historic sites will be encountered by activities considered for this project.

ix) ENDANGERED SPECIES AND CRITICAL HABITATS

Saint Paul Island is a major nesting area for migratory birds, and is also a major breeding ground and habitat for the Northern Fur Seal and other marine mammals. Saint Paul Island is within the "Alaska Maritime National Wildlife Refuge." Numerous critical habitat areas have been defined around the coastal rookeries on the island which are protected. Seabird cliffs on the island were purchased in 1982 for inclusion in the refuge.

Threatened species found on and near to the St. Paul Island include the Red-legged kittiwake, Spectacled and Spotted Eiders, and Steller's Sea Lions. Project concept plans were reviewed by staff with the NMFS and USFWS, and projects submitted to the USFWS Information, Planning and Construction (IPaC) database.

Activities considered by this report are limited to the area of existing lift stations and developed portion of the community of Saint Paul, which is outside the refuge and protected areas. Agency review concluded that the project sites are outside habitat areas and should have no impact on threatened and endangered species or critical habitat on Saint Paul Island.

[2] National Park Service Alaska, September 2018, Archeological Survey – Polovina Road Extension.

[3] United States Department of the Interior, BIA, August 1996, Section 106 Review – Road Project #37.

C. POPULATION TRENDS

i) PRESENT AND PROJECTED POPULATION

The 2019 population of St. Paul is approximately 390 (ADCED, 2019). Population declined significantly after Crab stocks crashed in the early 90's and 2 of the 3 processors pulled out. Population and jobs have stabilized and a projected future increase of population at 3% was used for this report. St. Paul Island's historic population, and future population increase at 3% per year, is shown in Figure 1-6.

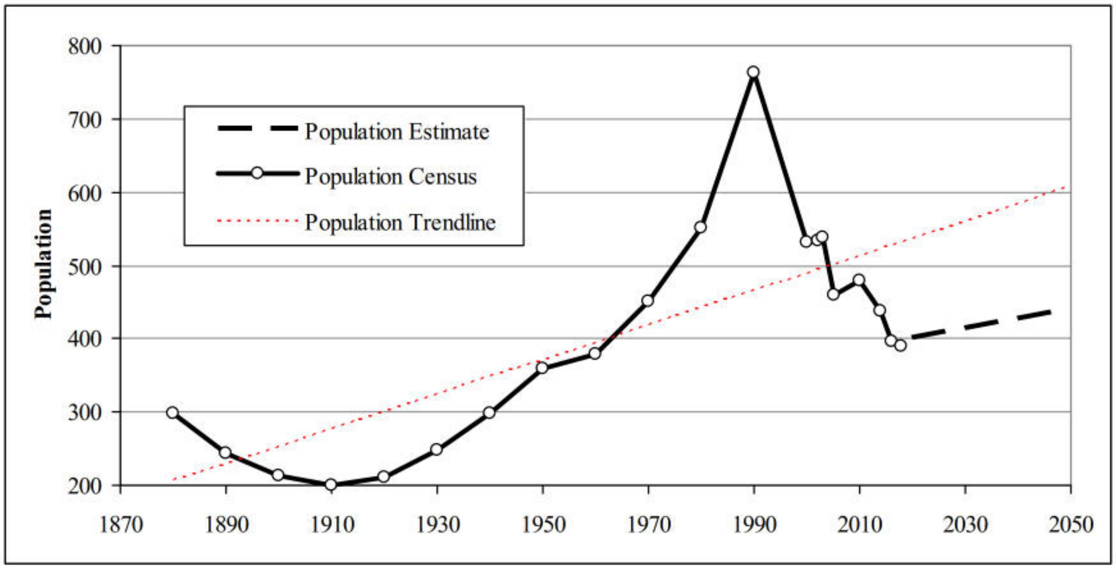


Figure 1-6: Historical Population for St. Paul

Saint Paul Island also has a large seasonal population centered around the winter King Crab and Opilio Crab seasons during November through March, Halibut season during June through August, and summer bird watchers that is not included in the historical, or future, population trend. Trident brings in around 300 workers during the winter crab season, and 30 to 60 workers during the Halibut season.[4] Summer bird watchers historically have been around 10 to 15 per week during the spring through fall.

ii) NUMBER OF HOUSEHOLDS TO BE SERVED

According to the 2010 U.S. census, St. Paul Island has 214 households, 97.8% (209 households) of which are served by the sewer system (ADCED, 2004). Since 2010, three additional clinic staff houses were constructed in 2011, and three additional duplex's were constructed in 2012 by the Tribal Government of St. Paul which are all served by the sewer system. Another three new duplex's are scheduled for construction during the summer of 2020. The current number of households in the community is thus estimated at 223 households of which 218 are served by CSP's sewer system. The number of households served by the sewer system will not change under the proposed project.

[4] Email correspondence with Trident Seafoods, Dean Fasnacht. Feb 7, 2020.

iii) POTENTIAL GROWTH AREAS

The economy of St. Paul Island is dominated by commercial fishing and fish processing which generates about 85% of local economic activity. The CSP, TDX and ACSPI are all significant employers on the Island. Federal Government operations include; NWS manned weather station; seasonal NOAA scientific operations; and seasonal USCG search and rescue operations. Tourism provides a small number of tourists annually to observe the fur seals, migratory birds and other wildlife. Currently two to three cruise ships stop annually and conduct Island tours.

The major sectors of potential growth in the St. Paul Island economy include: Additional fish revenue and value-added processing, including on-island multi-species processing, and increased tourism.

D. COMMUNITY ENGAGEMENT

The CSP holds monthly Council meetings where public attendance and input is allowed. Meetings are also broadcast on the local radio station (KUHB). The City Manager and staff present reports at each meeting on utilities and proposed projects to update the council and public and receive comments.

The CSP prepared a new Capital Improvement Plan in 2016-17. Project planning was completed by the City Manager, Public Works Director, Engineer and utility personnel. Project construction and operation budgets were developed, and projects scored to determine priority rankings. Draft plans and processes were presented by the City Manager at each Council meeting to obtain comments. Comments were incorporated into the plan at each step. This lift station project was the highest ranked sewer utility project in the final plan dated March 5, 2017.

The Community developed an Island Comprehensive Economic Development Strategy in 2017. The plan was developed collaboratively by the ACSPI, CSP, Central Bering Sea Fisherman's Association (CBSFA), and TDX. Public participation was encouraged through workshops and during public meetings of the entities. This project was included as the highest ranked sewer utility project in the final plan dated April 2017.

2. EXISTING FACILITIES

A. LOCATION MAP

The proposed project area is shown on Figure 1-2 on page 2, and the 35% design drawings for the selected option in Appendix B. The existing sewer system consists of gravity sewer collection, lift stations, septic tank primary treatment, and septic effluent ocean outfall. The system collects sewage from three general service areas within the community including Old Town, Harbor District, and Ellerman. The Old Town and Harbor District utilize black water lift stations and force mains to transport black water to septic tanks at East Landing. The Ellerman area has septic tanks installed in two locations and utilizes a common septic effluent lift station and force main to transport septic effluent to the East Landing control manhole. Septic effluent from all of the septic tanks come together at the East Landing control manhole and gravity flows into an ocean outfall. The system 1-line diagram in shown in Figure 2-1.

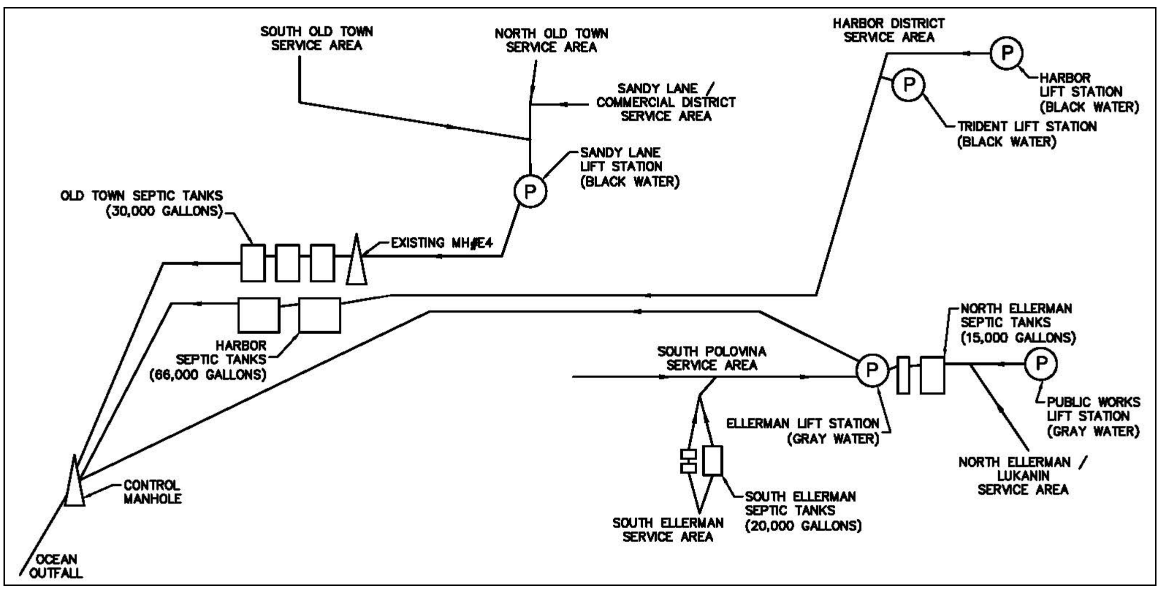


Figure 2-1: Sewer System 1-Line Process Diagram

B. HISTORY OF WASTEWATER IMPROVEMENTS

The first sewer system was installed in the community of St. Paul prior to the 1950s. This sewer system served what is now called Old Town, located on the eastern slopes of Village Hill.

In 1951, a sewer expansion and upgrade project was completed. The modified system discharged untreated sewage onto the shore of Gorbatch Bay (Zolotoi Bay) on the southern coast of the village. Two separate outfalls discharged sewage from the north and south portions of Old Town.

Sometime between the 1950s and 1970s, these two blackwater outfalls were abandoned and replaced with a septic tank and leachfield located near the intersection of Lakeside Road and Rimrock Drive.

During this period, a separate collection system was installed to serve the commercial buildings in the harbor area. Septic tanks and a leachfield for the harbor sewer were located north of Sandy Lane in the coastal dunes on the south side of Village Cove.

In 1969, sewer was installed in Ellerman Heights. This sewer system was separate from the Old Town sewer, and consisted of a gravity collection system, a single 10,000-gallon septic tank, and a leachfield located east of Polovina Turnpike.

In 1978, the Ellerman Heights collection system was expanded. Two 5,000-gallon septic tanks in series and a second leachfield were added to the treatment system, with a diverter in the upstream manhole. Diverter allowed for alternate use of the existing and new septic tanks and leach fields. These improvements were completed under PHS Project No. AN-78-202.

In 1985, the Ellerman Heights collection system was expanded by to serve new houses in North Ellerman. This gravity sewer flowed to septic tanks constructed near Polovina Turnpike, a new lift station (the Ellerman Lift Station addressed in this study) that pumped septic effluent via force main to East Landing, and a new 740-foot long ocean outfall into the Bering Sea. As part of the same project, the existing leachfields serving South Ellerman were abandoned, and a gravity septic effluent line was extended from the South Ellerman septic tanks to the new lift station. These improvements were completed under PHS Project No. 84-285.

In 1988, the leachfield serving Old Town was abandoned. The Old Town and Sandy Lane sewers were rerouted to gravity flow into a new lift station constructed along Bartlett Boulevard (The Sandy Lane Lift Station addressed in this study). This new lift station conveyed blackwater via a force main to a series of three 10,000-gallon septic tanks at East Landing. Septic effluent from the new tanks combined with existing septic effluent flows from Ellerman Heights into the ocean outfall. These improvements were completed under PHS Project No. 86-340.

In 1994, a new harbor sewer collection system was installed to serve the Harbor District. This system collected blackwater from the processors facilities, and conveyed it to two 20,000-gallon septic tanks at East Landing via a force main. Effluent from the harbor septic tanks were combined with flows from Old Town and Ellerman Heights into the ocean outfall. These improvements were completed under ADEC Permit 9425-WW-334-023.

In 1994, three force mains for were installed from crab processors at the Harbor to East Landing, and into individual ocean outfalls into the Bering Sea parallel to the sewer utility ocean outfall. These three force mains and outfalls were built to dispose of fish process waste.

In 1995, sewer service was extended to the new city public works facility north of the village via gravity collection to a 2,000-gallon septic tank with a lift station and septic discharge force main flowing into the North Ellerman Heights gravity collection system.

In 1995, Lukanin Hills subdivision was developed north of Ellerman Heights. The gravity sewer collection system for Lukanin Hills was tied into the existing North Ellerman Heights collection system. These improvements were completed under ADEC Permit 9525-WW-406-27.

In 1997, the city sewer outfall at East Landing failed at the ductile iron (DI) mechanical joints and was abandoned. A temporary bypass line was constructed to tie into the then-unused Unisea process waste outfall under an ADEC permit.

In 1999, the gravity sewer collection system in the northern portion of Old Town and Sandy Lane was rebuilt. The existing vitrified clay collection piping was prone to pipe collapse and plugging causing surface discharges, and gravity sewer mains along Sandy Lane ran under the existing homes. The upgrade included new manholes and gravity mains within road rights-of-way and utility easements acquired for the project. These improvements were completed under ADEC Grant 74904.

In 2006 the remaining vitrified clay collection piping in the southern portion of Old Town was rebuilt. The project included new manholes and gravity mains built within road rights-of-way. Service laterals were also partially replaced as needed to tie into the new sewer mains. Construction was completed under ADEC Grants 06RI25, and 12RN57, And Archeological Monitoring completed under ADEC Grant 09-S32. These improvements were completed under ADEC Plan Approval 7295.

In 2015 a new dedicated sewer ocean outfall was constructed to alleviate permitting concerns with co-mingling of gray water primary sewage effluent and fish processing waste. The new outfall and control manhole were constructed to collect the three septic system discharges at a common point to allow for maintenance, inspection and testing of effluent. Heavy duty steel outfall was installed to 1,100-feet offshore to discharge point at a depth of greater than -30 MLLW through multiple diffuser ports into the Bering Sea. Discharge provided increased separation from the existing processor fish waste outfalls. The project was permitted through the Alaska Department of Environmental Conservation (ADEC) and application for discharge permit renewal on file with ADEC was updated with new project information. These improvements were completed under ADEC Plan Approval 25110.

C. CONDITION OF EXISTING FACILITIES

i) OLD TOWN

Sewers in Old Town on the southeastern slopes of Village Hill were replaced with new DI or PVC mains/services and precast concrete manholes in 2002 and 2016. The new collection ties into DI gravity mains, the black water Old Town lift station (subject of this study) and HDPE force main to aluminum septic tanks at East Landing constructed in 1988. Piping and septic tanks are in excellent to good condition. Section of original collection piping, thought to be vitrified clay, serving the Church and Museum in Old Town remains in service but has not had previous maintenance problems. Old Town septic tanks at East Landing are aluminum construction that appear to be in good condition.

ii) SOUTH ELLERMAN

Sewers in South Ellerman Heights date to the late 1960s and 1970s and consist of asbestos cement, DI or PVC with precast concrete manholes. This gravity collection system appears to be in good condition. Most sewer mains in South Ellerman Heights are within road rights-of-way, but some mains run diagonally through private property.

The South Ellerman septic tanks consist of a 10,000-gallon concrete tank installed in 1969 and two 5,000-gallon steel septic tanks in series installed in 1978. These tanks operate in parallel. The tanks lack baffles, and floating debris bypassing these tanks cause numerous maintenance problems in the downstream septic effluent lift station (the Ellerman Lift Station that is the subject of this study). New lift station should utilize black water grinder pumps to limit outages. Addition of baffles to these tanks should be investigated.

Sewer service along South Polovina Turnpike is provided by the shallow gradient septic effluent gravity main from the South Ellerman septic tanks to the Ellerman Lift Station. The main is in good condition, but is an impediment to development in this area. New sewer services along this corridor require an on-site septic tank, and line has limited flow capacity due to its shallow gradient.

iii) NORTH ELLERMAN

Sewers in North Ellerman were constructed in 1985 with DI pipe and precast manholes to Ellerman septic tanks and are in good condition. Sewer collection was expanded to Lukanin Hills in the 1990s with DI, PVC or HDPE pipe with precast concrete manholes and are in good condition. All are located within road rights-of-way or utility easements. Ellerman septic tanks feed into the Ellerman Lift Station (subject of this study).

Sewer in the Public works area was installed in the 1990s with PVC and DI gravity collection to a dual compartment 3,000-gallon septic tank and Orenco lift station and HDPE force main to North Ellerman. Facilities are within road rights-of-way and in good condition. Lift station pumps and controls are in poor condition and should be scheduled for replacement. A temporary repair on the force main at a culvert crossing remains to be replaced with a permanent repair.

iv) HARBOR

The Harbor sewer currently consists of a lift station for the harbor master office, a lift station serving the Trident Plant, and service line connections for two floating processors with on board lift stations that are no longer staged in St. Paul. Black water lift stations feed into a HDPE force main to Harbor septic tanks at East Landing. This collection system configuration will not easily support future development in the harbor area.

The harbor force main plugged downstream of the Trident Plant in July 2019 causing Trident lift station pumps to dead head against the obstruction. The plug was cleared through snaking and pressure pumping from multiple cleanouts, and the force main flushed by pumping clear water through Trident Lift Station for a full day. Two of the original three force main customers, Icicle and Unisea, are no longer in-service leaving Trident as the single main connection. Smaller Trident pumps and fewer services cause a significant decrease in total throughput and fluid velocity through the force main, making it more susceptible to settlement of solids and eventual plugging. Increased annual flushing by the CSP is required to keep the force main operable.

The 2017 Island Comprehensive Economic Development Strategy includes a gravity collection system for the Harbor with a lift station discharging through the existing force main to better support future growth opportunities in the Harbor District. The existing harbor septic tanks at East Landing are former fuel tanks installed by the processors under ADEC temporary permit 9425-WW-334-023, which requires replacement with approved septic tanks. Condition of the tanks is assumed to be fair, but their baffles appear to have corroded away, or not installed during original installation.

v) LIFT STATIONS

The existing lift stations that are the focus of this report are wet well - dry well configuration with steel vaults built in 1988 and 1989. Their configuration requires two personnel to safely access and maintain the equipment. Steel vaults are susceptible to corrosion failure in the marine environment. Lift station power and controls have significant corrosion problems and replacement parts are no longer available. Pump replacement and overhaul parts are also no longer available and pump impellers are worn, decreasing pump efficiency. This preliminary engineering report addresses the condition of these original PHS lift stations and address worker safety concerns.

vi) OCEAN OUTFALL

The existing ocean outfall was constructed in 2015 with heavy duty steel outfall pipe with sacrificial anodes to increase system life. Last dive inspection indicated outfall is in good condition.

D. FINANCIAL STATUS OF EXISTING FACILITIES

The sewer and water utilities operate at a zero-net revenue within the CSP annual budget, with any utility costs in excess of revenue covered by the CSP general fund. Currently water and sewer have a combined budget. The CSP has split the utilities into separate budgets in the proposed 2020 budget. Utility rates are reviewed annually to determine if adjustments to rates are required to keep the utilities operating on a revenue-neutral basis. The sewer utility does not have any existing outstanding debts. Reserve account for the sewer utility has been included in the proposed 2020 budget, and the City Council is working towards restructuring the sewer rate schedule and budget to fund the new sewer utility reserve account.

The existing sewer utility rate schedule is shown in Figure 2-2.

Figure 2-2: Current Rate Schedule

Consumer Classification	2019 Rate
Residential/Domestic	$33.00 per month
Small Business	$52.80 per month
Commercial Tier I	$178.20 per month
Commercial Tier II	$310.20 per month
Commercial Tier III	$442.20 (plus $2.20 per seat)
Commercial Tier IV	$574.20 (plus $4.40 per bed)
Sewer Truck Labor	$79.20 (plus $2.20 per seat)
Sewer Truck Rental	$222.26 (plus $1.65 per lb)
Sewer Truck per day	$2000.34 (plus $4.40 per bed)

The historical budget for the previously combined water – sewer utilities is shown in Figure 2-3.

-3:

	Fund 320 - Water/Sewer Utility			Budget
Revenue	CY 2016	CY 2017	CY 2018	CY 2019
Grant Revenue	$147,782	$1,762	$0	$0
Water Revenue	$290,415	$225,879	$233,435	$220,000
Sewer Revenue	$117,069	$116,026	$111,167	$102,575
Equip/Labor Revenue	$2,431	$1,428	$2,557	$2,100
Total Revenues	**$557,697**	**$345,095**	**$347,159**	**$324,675**
Personnel				
Salaries	$56,418	$50,424	$57,340	$88,660
Fringe	$50,171	$29,393	$17,980	$39,981
Total	$106,589	$79,817	$75,320	$128,641
Operating				
Supplies	$4,879	$6,341	$4,028	$5,000
Fuel (Diesel & Gas)	$4,796	$3,888	$3,677	$3,600
Parts	$2,343	$22,585	$14,004	$11,000
Shipping/Air Frt	$3,702	$8,005	$2,040	$2,000
Bldg/Equip/Vehicle Maint	$149	$12,349	$0	$10,000
Safety Equip/Tools	$98	$855	$87	$0
Sample Testing	$2,518	$2,450	$731	$700
Electric Useage	$63,198	$46,182	$41,856	$46,182
Heavy Equip	$3,786	$920	$3,625	$0
Depreciation	$338,745	$402,718	$0	$0
Total	$424,214	$506,293	$70,048	$78,482
Gen/Admin				
Engineering	$8,337	$2,236	$365	$1,500
Office/Phone/Comms	$42	$1,920	$1,461	$1,448
Postage/Airfreight	$801	$459	$241	$300
Dues & Subscriptions	$135	$2,125	$2,391	$2,538
Insurance	$4,467	$5,794	$6,276	$6,277
Training	$0	$0	$460	$1,390
Travel/PerDiem	$192	$0	$0	$3,500
Lease	$0	$0	$701	$150
Licence/Permits	$100	$250	$133	$793
Admin Allocation	$37,948	$33,102	$60,671	$87,222
Disposal/Writedown	-$521	$270	$0	$0
Bad Debt Expense	$70	-$45	$0	$0
Total	$51,571	$46,111	$72,700	$105,118
Capital Asset Inv				
Plant & Equip	$0	$0	$0	$100,000
Vehicles	$0	$0	$0	$37,300
Total	$0	$0	$0	$137,300
Total Outflows	**$582,374**	**$632,221**	**$218,068**	**$449,541**
Net Budget	**($24,677)**	**($287,126)**	**$129,091**	**($124,866)**

As the existing water-sewer utility budgets were historically combined, an estimate of just the sewer utility portion of the historical budgets was made. Sewer revenue is tracked separately so actual values were used. Previous rate studies for the CSP found assets allocated at 63% water utility, and 37% sewer utility. Discussions with the utility operator indicate personnel time is split about evenly between the water and sewer utility. It is assumed that the actual sewer utility costs lie between these two percentages. Follows is summary with range of estimated net budget for the sewer utility.

Figure 2-4: Estimated Sewer Utility Historical Budget

Estimated Sewer Portion of W/S Budget				
Revenue	CY 2016	CY 2017	CY 2018	CY 2019
Sewer Rate Revenue	$117,069	$116,026	$111,167	$102,575
Septic Pump Revenue	$2,431	$1,428	$2,557	$2,100
Total Sewer Revenue	$119,500	$117,454	$113,724	$104,675
Sewer Costs (37% Total)	$215,478	$233,922	$80,685	$166,330
Sewer Costs (50% Total)	$291,187	$316,111	$109,034	$224,771
Net Budget (37% Split)	-$95,978	-$116,468	$33,039	-$61,655
Net Budget (50% Split)	-$171,687	-$198,657	$4,690	-$120,096

The CSP is currently in the process of completing the budget for 2020. The water and sewer utilities are split into separate budgets in the new proposed budget.

E. WATER/ENERGY/WASTE AUDITS

No audits have been done for the existing lift stations. Estimated changes in pump efficiency and power usage have utilized the original manufacturers pump and motor curves compared to typical more modern replacement units.

3. NEED FOR PROJECT

A. HEALTH, SANITATION, AND SECURITY

Existing lift stations are of wet well / dry well configuration constructed with steel vaults. The dry well is a confined space which is a risk to workers, and requires two persons to access and operate. One to go into the lift station dry well, and a second to remain on the surface for safety precautions. Additionally, ventilation and other safety measures are necessary. This practice is difficult for the Public Works Department to follow due to personnel limitations, and the ‘two-man rule’ is not strictly followed. Steel vaults are prone to corrosion in the tidally influenced water table and corrosive soils which could lead to leakage or collapse discharging raw sewage to surface lands.

Redesign of these lift stations with a small pump building over the wet well would eliminate the confined space requirements and the need for the ‘two-man rule.' This would greatly increase the efficiency of public works personnel and more importantly, would increase personnel safety. This modification would also simplify and streamline lift station maintenance and reduce maintenance costs.

B. AGING INFRASTRUCTURE

Existing wet well and dry well structures are constructed of coated steel vaults set within the tidally influenced ground water table. There is significant concern with the condition of the exterior of these structures in the corrosion rich environment of Saint Paul. Corrosion could increase infiltration rates, allow for discharge of sewer to the surrounding soils, and ultimately lead to structural failure and collapse of the dry well and/or wet well. Limited corrosion is visible in the dry well interior, but inspection of the dry well exterior or the wet well interior or exterior was not possible for this report.

Existing mechanical and electrical equipment within the corrosion rich environment of the underground enclosure has increased the maintenance requirements. There is limited availability of replacement parts for the ca. 1980s pumps and controls. Newer pump and motor efficiencies require less electricity to operate than the existing equipment.

C. REASONABLE GROWTH

Prior to the collapse of the Opilio Crab Stock in the late 1990s the population of Saint Paul was approximately 760. When these crab stocks collapsed, two of the three on-island processors closed, resulting in a significant decrease in the seasonal and permanent population. Crab stocks have slowly been recovering, although there is still only a single processor on Island. The current population is approximately 390 with a large seasonal workforce of 30 to 60 for summer halibut and about 300 for winter crab harvest and processing. A 3% growth factor for existing population and commercial development is used in this analysis, with 5% growth factor for the Harbor area to account for projects currently being constructed, or already funded.

Currently, the Old Town area of St Paul Island is close to fully developed. New Town, which includes North Ellerman Heights, South Ellerman Heights, Lukanin Heights and the Polovina Turnpike Corridor are not fully developed. Most future residential and small commercial growth in the community is expected to occur in the New Town area. Fisheries support development is expected to occur in the Harbor area.

The existing sewer system flow is collected and treated in 5 separate sets of septic tanks. Tankage is installed at South Ellerman; North Ellerman; Public Works; and two installations at East Landing for Old Town and Harbor area. Follows is summary of septic tankage locations and loading.

i) SOUTH ELLERMAN AREA

The septic tanks serving South Ellerman are adequate for existing load and reasonable future growth. The tanks operate in parallel with one concrete tank, and a set of steel tanks in series. Tanks do not have baffles to limit solids overflow into the downstream gray water line. Effluent from septic tanks is through a shallow gradient gravity line to the Ellerman Lift Station. This line is sized to accommodate existing septic effluent flows only. The new Clinic and Post Office have onsite septic tanks to connect to the shallow gradient sewer effluent line along Polovina. Upgrade of the gravity septic effluent main along Polovina Turnpike would be required to accommodate blackwater flows. Any new development along Polovina would require on-site septic tanks.

ii) NORTH ELLERMAN AREA

The septic tanks for North Ellerman are adequate for existing load and reasonable future growth. Any significant future development of this area will require increased tank capacity adjacent to, or upstream of the existing tanks. The Ellerman lift station is adequately sized, but has limitations due to age, safety concerns, and corrosion.

iii) PUBLIC WORKS AREA

The septic tanks for the Public Works area are adequately sized for existing and reasonable development. The lift station pumps have not been analyzed to determine if upgrade would be required for increased flow as part of this analysis.

iv) OLD TOWN AREA

The Old Town sewer collection system, lift stations, and septic tanks are adequately sized to accommodate wastewater flows for reasonable development. The Old Town lift station is adequately sized, but has limitations due to age and safety concerns.

v) HARBOR AREA

Currently the Harbor area is minimally developed with a single processor, a boat repair building, and an office building. Any future development in this area would require new construction for gravity collection and a lift station to move sewage to East Landing. The existing Harbor septic tanks are adequately sized for future growth but will require replacement due to advanced age, non-compliant design, and difficulty of maintenance.

vi) SEPTIC TANKAGE SUMMARY

Future upgrade of existing facilities to accommodate growth or increased treatment requirements is limited by existing tank sizes, non-centralized location of existing infrastructure, and limited area for expansion. A previous study in 2005 looked at the option of consolidated treatment at East Landing for increased treatment options. This lift station project will not affect that future alternative. Tank adequacy under existing and reasonable growth conditions are shown in Figure 2-4. EPA recommended minimum detention time for septic tanks is 24 hours.

	units	Old Town	Harbor Area	South Ellerman	North Ellerman	Public Works	Total
Residential Population	Persons	159	0	120	110	0	390
Commercial Population	Persons	30	15	30	10	20	105
Plant Worker Population	Persons	0	300	0	0	0	300
Exist Est Daily Flow	gpd	18,488	15,762	14,171	13,180	1,081	61,600
Reasonable Growth Factor		3%	5%	3%	3%	3%	
Estimated Reasonable Growth Daily Flow	gpd	19,043	16,550	14,596	13,575	1,113	63,764
Existing Tank Sizes	gal	30,000	46,000	20,000	15,000	3,000	114,000
Existing Detention Time	hours	38.9	70.0	33.9	27.3	66.6	
Reasonable Growth Detention Time	hours	37.8	66.7	32.9	26.5	64.7	

Figure 2-4: Wastewater System Loading

vii) OCEAN OUTFALL

The existing ocean outfall gray water line was upgraded in 2015 and designed for 150,000 gpd capacity to meet historical and future growth requirements, and is permitted for an average of 92,000 gpd and peak of 122,000 gpd.

viii) FUTURE DEVELOPMENT

The ACSPI and CBSFA started construction of a Vessel Repair and Supply Store adjacent to the small boat harbor in 2017 with scheduled completion in 2020. New water main extension to the building and small boat harbor is permitted and scheduled for construction in spring 2020. A septic tank and lift station is proposed to tie the building to the main harbor force main. A gravity collection system in the harbor, to a new lift station near the Vessel Repair and small boat harbor will be required in the future.

Three additional duplex housing units are scheduled for 2020 construction in South Old Town by the ACSPI. A short section of gravity main will tie these new housing units into the South Ellerman septic tanks.

CBSFA is in the planning stages for a small support building at the small boat harbor to provide bathroom and communications support to the local fishing fleet. This will require extension of water and wastewater utilities to the new small boat harbor.

TDX is in the planning stages for the construction of a new hotel in the harbor area, or adjacent to Old Town. Either location will require extension of wastewater utilities to provide service.

The City of Saint Paul Ataqan permitted landfill is southeast of the airport, with an estimated useful capacity of 15 to 18 years. Existing septic sludge disposal is provided at the landfill. A landfill at the Aalax subdivision north of Polovina Hill four miles beyond the airport is proposed in the future.

The current and proposed developments lead to the selection of an annual growth rate of 3% across the community, and 5% in the harbor area for this report. A longer life cycle is recommended for selection of the buried lift station vault size as they have a longer useful life, and a higher replacement cost than pumps.

4. ALTERNATIVES CONSIDERED

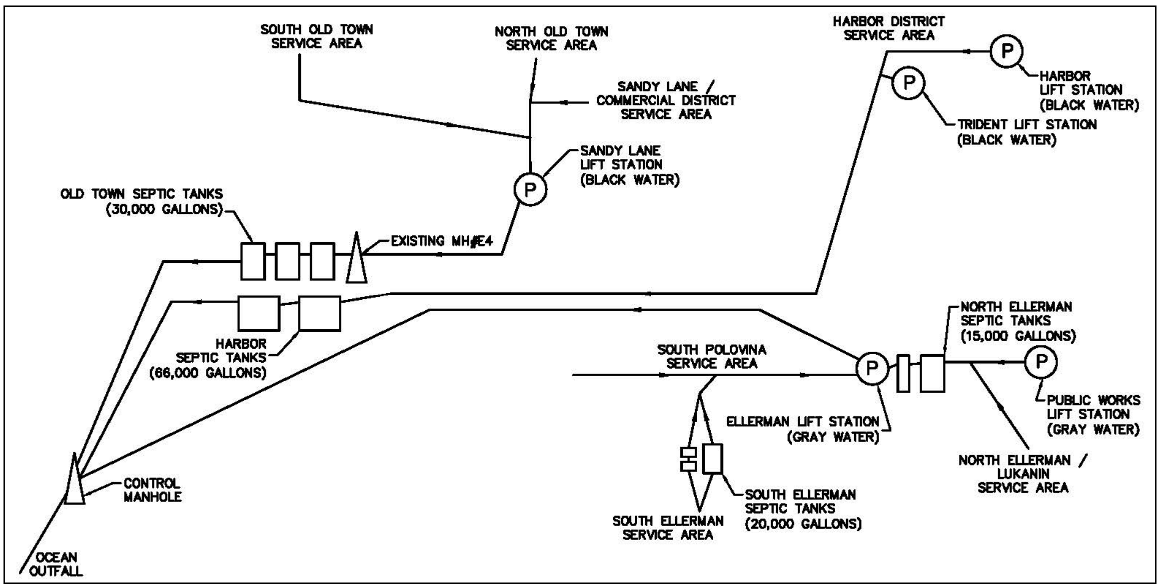
A. DESCRIPTION

Four options were evaluated for lift stations. The options are progressive in their scope, with each option being more comprehensive.

i) OPTION A – 'DO NOTHING'

The 'do-nothing' alternative would retain the existing lift stations in their current configuration. Pumps and controls are at the end of their useful life and condition of the steel vaults is not known. Future failures of either the vaults, pumps and/or controls will eventually cause surface backup of sewer, loss of community sewer service in the affected area, and force the utility to implement temporary repairs on an emergency basis. This alternative is not deemed an acceptable option as does not address any of the safety or maintenance problems with the existing lift stations.

Figure 4-1: Existing System Layout



ii) OPTION B – UPGRADE EXISTING LIFT STATION PUMPS AND CONTROLS

Existing wet well/dry well configurations would remain in service and new blackwater pumps and controls retrofitted into the existing dry wells. This option would not address the safety concerns for Public Works operations and staff, or risk of loss of service and environmental impacts when the steel vaults fail. Steel vaults would need to be changed in the future, and installed pumps and controls would have limited salvage value.

iii) UPGRADE OPTION C – UPGRADE EXISTING LIFT STATIONS

Existing Sandy Lane and Ellerman Lift Stations would be upgraded by abandoning the dry wells, and installing above-grade pump buildings on top of the existing wet wells. New blackwater submersible pumps and controls would be installed. This modification would be more consistent with Public Works operations and staffing, resulting in safer and more cost-effective operations. This option would also not address the condition of the steel wet well vaults. Steel vaults would need to be changed in the future, and only installed pumps and controls would be reusable.

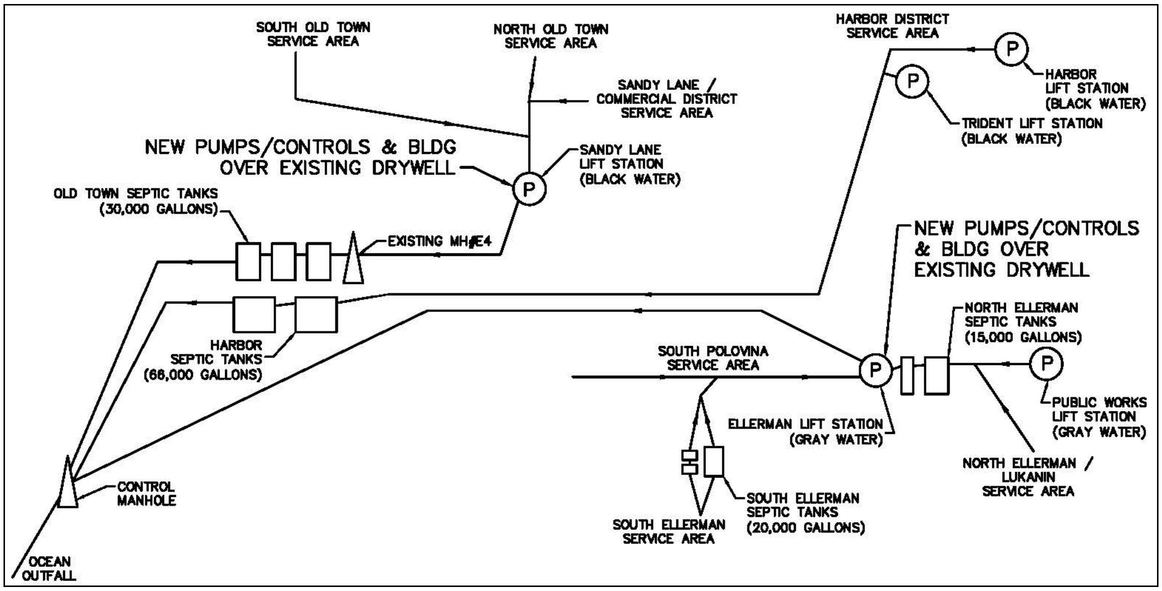


Figure 4-2: Conceptual Layout, Upgrade Option 'B' and 'C'

iv) UPGRADE OPTION D – REPLACE EXISTING LIFT STATIONS

Existing Sandy Lane and Ellerman Lift Stations would be replaced with new wet wells constructed adjacent to the existing dry wells with above-grade pump buildings on top. New submersible blackwater pumps and controls would be installed and existing piping rerouted from old to new lift stations. This modification would provide safer and more cost-effective operations, and solve the concern with existing steel vaults condition. New installation adjacent to existing limits time required for temporary sewer flow bypass during construction.

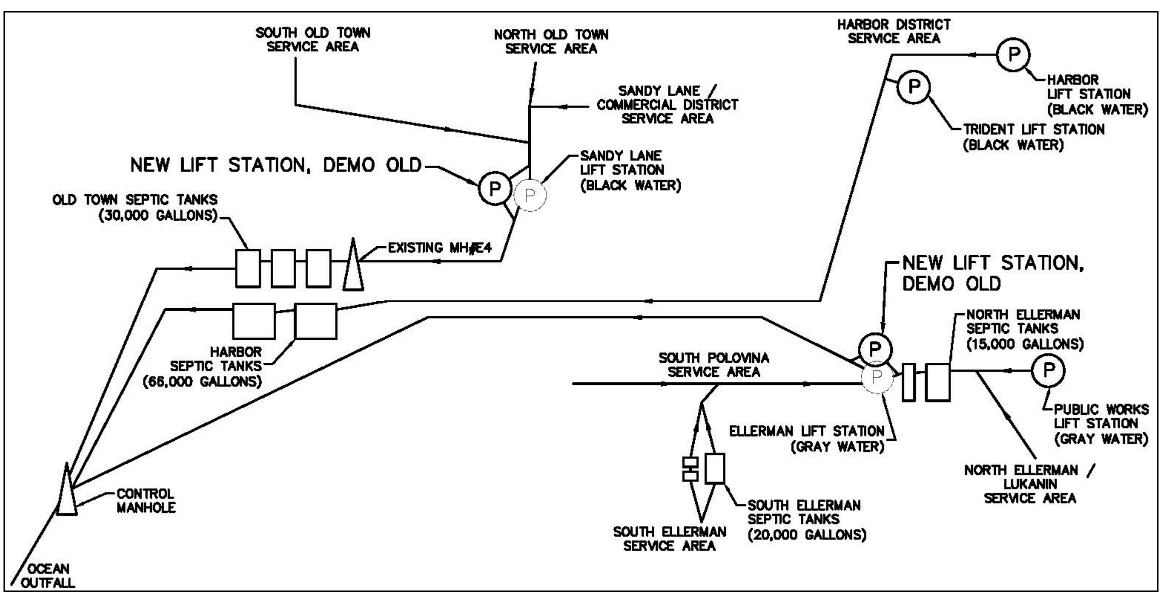


Figure 4-3: Conceptual Layout, Upgrade Option 'D'

B. DESIGN CRITERIA

Lift stations would be designed as a wet well with submersible pumps mounted on rails for increased operational safety, ease of maintenance, more easily accommodate future capacity changes, and avoid anaerobic conditions or excessive odors at the lift station. Wet wells would be sized to handle wastewater flow at full development. Pumps would be sized to match wastewater type and quantity with reasonable growth of the existing system load. Lift station would be designed with an enclosed building to allow for servicing the pumps and controls in inclement weather, with enclosed controls room with separate access to protect equipment from corrosive environments. Design would be in accordance with currently adopted International Building Code, International Fire Code, State and Federal Requirements. Lift station would be an IBC Group U occupancy classification. ADEC and Alaska State Fire Marshal permits would be required.

A wastewater flow rate analysis for the two lift stations was included in a July 2005 Ellerman Heights Sewer System Improvement Study by PCA. Instrumentation was installed in the Ellerman and Sandy Lane Lift stations in May 2004 to determine actual lift station flows and pump discharge rates. Follows is summary Table from that report:

Table 4-1: Operating Data for Sewer Lift Stations (2005 report)

Lift Station	**Ellerman Heights**		**Sandy Lane / Old Town**	
	Existing Development	Full Development	Existing Development	Full Development
Liquid	Gray Water		Blackwater	
Average Inflow (gpm) [1]	15.0	28.7	17.2	20.9
Peak Inflow (gpm) [1]	**46.4**	88.9	**51.6**	64.9
Inflow Peaking Factor [2]	3.09	3.1	3.0	3.1
Period of Record (days)	5.8	-	1.04	-
Pump Run Time [1]	29.30%	56.04%	12.40%	15.09%
Average Pump Rate (gpm) [1]	46.1	46.1	121.1	121.1
Peak Pump Rate (gpm)	128.4	-	203.7	-

1. Wastewater flows for full development scaled from existing development, with constant per capita wastewater generation, to full development under current zoning.
2. Peaking factor of 3.1 times average flow was observed in Ellerman Lift Station and used for estimating flows in all service areas due to significantly longer period of record.

New onsite flow measurements were not included in this report. The wastewater flow rates were adjusted for the reduced population and usage distribution. The per capita wastewater flow of residential 100 gpcd, and commercial 50 gpcd from the 2005 report was maintained for a total system flow reduction. Distribution to service areas were adjusted by number of houses served in each area, and actual commercial operation locations. The adjusted wastewater design flow and recommended wet well and pump sizing are shown in Table 4-2.

Table 4-2: Wastewater Design Flow and Lift Station Sizing Table

Description	units	Lift Stations: Old Town	Harbor	Ellerman	Public Wks	Total[1]
Residential Population Dist.	pers	159	0	231	0	390
Commercial Population Est.	pers	30	15	60	20	105
Appx Population at Plants	pers	0	300	0	0	300
Existing Est Daily Flow	gpd	18,488	15,762	27,351	1,081	61,600
Existing Average Flow	gpm	12.8	10.9	19.0	0.8	42.8
Peaking Factor		3.1	3.1	3.1	4.0	
Existing Peak Flow	gpm	39.8	33.9	58.9	3.0	
Future Daily Flow	gpd	19,043	16,550	28,171	1,113	63,764
Future Average Lift Sta Flow	gpm	13.2	11.5	19.6	0.8	44.3
Future Peak Lift Sta Flow	gpm	41.0	35.6	60.6	3.1	

1. Wastewater flow from Public Works Lift Station discharges into Ellerman Lift Station and included in Ellerman total flow. Total is sum of Old Town, Harbor, and Ellerman.

C. SCHEMATIC LAYOUT MAP

System layout map is presented in Figure 1.2 showing location of project features on the aerial photo of the community. Existing wastewater process diagram is presented in Figure 2.1, and alternate process diagrams and narratives in Section 4.A. Scale drawings of the site and project features are included in the 35% design drawings in Appendix B.

D. ENVIRONMENTAL IMPACTS

Alternatives A, B and C would not address the existing increased risk of future raw sewage discharges to the ground surface in the immediate vicinity of either lift station due to failure of the pumps, controls, or vaults.

Alternative B, C and D would generate construction debris that would be disposed of in the CSP’s existing permitted landfill.

Alternative C will require excavation of surface materials around the existing wet wells, and installation and compaction of granular soils for the building foundation.

Alternative D will require excavation close to, or below, the water table for installation of the new wet wells. Construction of the original wet wells used temporary sheet piling around the excavation perimeter to allow for excavation below the water table. A similar method may be required for the new lift stations. Pumped ground water at the Sandy Lane site can be directed into the adjacent surface drainage ditch that flows into the nearby wetland at Seal Beach. Pumped ground water at the Ellerman site would need to be directed to either the adjacent undeveloped lowland area, or across Polovina towards the Salt Lagoon. Excavation would be backfilled with borrow sand/scoria materials to surface grade, and suitable granular soils installed for the building foundation.

No alternatives would have direct or indirect impacts on floodplains, wetlands, or other land resources, endangered species, historical or archaeological properties.

E. LAND REQUIREMENTS

TDX owns the land at the Ellerman and Sandy Lane lift station sites. The Aleut Corporation (AEC), the regional native corporation, owns subsurface rights to the land underlying both the Sandy Lane and Ellerman lift station sites. Both existing lift stations are within easements provided to the CSP by TDX.

The Sandy Lane lift station site is within an easement provided to the CSP by TDX dated November 24, 1987, Aleutian Recording District Book 27, page 391. All proposed alternates would fit within the existing easement area and no new lands would be required.

Easements for utilities, not within previously recorded easements, inside the CSP townsite were provided in Section 3.2 of the "Final Settlement Agreement" between the CSP and TDX dated September 12, 2013. Existing utilities, including the Ellerman lift station, are shown in Exhibit 26, dated March 29, 2013, of the agreement.

The Ellerman lift station and existing easement encroaches into Lot 9 to the south. In 1981, TDX provided the federal government a 99-year lease for a building to be constructed on the vacant Lots 7 through 9, Block 28, USS 4943, Tract A just south of the Ellerman Lift Station. The building was never constructed, so it is unknown if an alternate building was/would be provided and this land lease has been canceled, or what impact a lease may have on the existing utility easement provided by the FSA.

Two locations for alternate D are possible pending resolution of the above. Option D1 (shown in the 35% design drawings on sheet C-5) is inside Lot 9 south of the exiting dry well, and option D2 would be in the footprint of the existing dry well outside Lot 9. Both options should be within the existing utility easement provided by the FSA.

A final determination on the status of the lease for Lot 9 should be obtained to determine if option D1 is an acceptable alternative as it fits the system layout better than option D2.

A boundary description of the easement at Ellerman Heights lift station should be secured prior to final planning, as the existing easement in the FSA is not specific. An easement in the form of Exhibit 25 of the FSA, with the final boundary description, should be acquired from TDX in accordance with section 3.2.4.3 of the agreement to better describe the existing easement provided by the FSA.

No other entities are known to have rights to land within the project footprint.

Existing and proposed facilities are consistent with land use as defined by the current CSP Zoning Ordinance 10-07, dated September 29, 2010 and shown on current zoning map adopted through Ordinance 13-02, dated June 12, 2013.

F. POTENTIAL CONSTRUCTION PROBLEMS

Both project areas were previously excavated for construction of the existing lift stations. Soils in the area are mineral fill over insitu sand and are not anticipated to be difficult to excavate with locally available equipment. Depth of excavation required for the lift stations will be below the tidally influenced water table, estimated to be from 1 to 4 feet above MLLW at both sites. Construction may require sheet piling or other methods to control groundwater inflow and maintain stability of the excavation side slopes to allow for vault construction to be completed safely.

Site layout for the Sandy Lane lift station allows for full construction and testing of the new lift station prior to switching existing gravity collection and force mains to the new lift station.

Site layout for the Ellerman lift station option D1 requires the existing force main to be temporarily relocated to allow for full construction and testing of the new lift station prior to switching existing gravity collection and force mains to the new lift station.

Site layout for the Ellerman lift station option D2 requires demolition of the existing dry well and pumping system prior to construction of the new lift station. This would require a temporary submerged lift station pumping system in the existing wet well with a temporary connection to the existing force main to allow for construction of the new lift station.

G. SUSTAINABILITY CONSIDERATIONS

i) WATER AND ENERGY EFFICIENCY

A formal audit of CSP's water and wastewater systems has not been performed. Review of data from CSP's prior water and sewer study reports indicate both water and sewer per capita volumes are consistent with typical industry practice.

The 2003 CSP aquifer study found water production was approximately 150 to 225 gallons per capita per day (gpcd) (PCA 2003), excluding large metered commercial accounts. This production volume is consistent with industry guidance of approximately 160 gpcd for U.S. municipal water supply systems (Lin 2001). Anchorage Water and Wastewater Utility reported per capita delivery of 127 gpcd in 2002 (USGS 2005).

The CSP has been upgrading water service lines in areas as needed where freezing has been a problem in the past. This and community outreach have been utilized to minimize the existing practice of running water to keep pipes from freezing. Community outreach through newsletters has been utilized to educate the community on the cost of pumping water from the Island aquifer and reduction in water consumption to help extend the life of the valuable resource.

Industry guidance for domestic wastewater volumes is 60 to 85% of per capita water consumption (Lin 2001). Total wastewater throughput volumes measured in 2005 at the Sandy Lane and Ellerman Heights Lift Stations with population distributed evenly through housing occupancy levels in each lift station's respective service area yield an estimated per capita wastewater volume of just over 100 gpcd (PCA 2005). Per capita wastewater volume of 100 gpcd was approximately 45 to 67% of estimated per capita water demand, which is generally consistent with industry guidance.

Existing force mains were installed with larger HDPE pipe diameter to minimize head loss in mains which reduces pump horsepower requirements. This will be helpful in the selection of replacement pumps, although adequate flow velocity is required to keep solids from settling out in mains and causing clogging problems.

Three phase power is available at both locations allowing the use of more efficient 3-phase pumps. High efficiency pumps should be specified for the project to minimize pumping costs.

Topography of the Island and location of housing requires lift stations for safe transport of sewage to septic tanks and control manhole to marine outfall at East Landing. Other alternatives such as gravity transport are not practical.

ii) GREEN INFRASTRUCTURE

Island topography, project location, and small project footprint serve to minimize stormwater impacts to the site. Final site will be graded to match existing conditions which direct stormwater runoff to existing ditching. Sandy Lane and Ellerman site grading and ditching both direct stormwater flow into the Seal Beach pond area.

New lighting should be specified with LED fixtures with photo-cells to minimize electric power usage.

iii) OTHER

The above-ground options C and D will both provide safer access for maintenance and operation of the lift stations. Option D will address the existing and future risks of steel vault corrosion and eventual collapse.

H. COST ESTIMATES

i) CONSTRUCTION COST ESTIMATES

Construction cost estimates for the four options are included in Appendix C. Construction cost summaries are shown in the following table.

Table 4-3: Construction Cost Estimates for Sewer Upgrades

	Option B	Option C	Option D
Labor Costs	$ 154,800	$ 367,200	$ 483,600
Travel, Per Diem, Misc	$ 34,700	$ 106,300	$ 127,300
Materials and Freight	$ 71,600	$ 188,500	$ 301,100
Equipment	$ 16,200	$ 57,100	$ 99,000
Contractor OH, Profit, and Inflation	$ 58,000	$ 152,000	$ 212,000
Construction Est Contingency	$ 42,000	$ 108,000	$ 152,000
Project Design	$ 34,000	$ 88,000	$ 124,000
Project Administration	$ 34,000	$ 88,000	$ 124,000
Ellerman Easement Documents	$ -	$ -	$ 10,000
City Administration	$ 19,000	$ 49,000	$ 69,000
Total Estimated Project Cost	$ 464,300	$ 1,204,100	$ 1,702,000

ii) OPERATION AND MAINTENANCE COST ESTIMATES

Estimates for Operation and Maintenance of the four options to allow for Life Cycle Analysis is included in Appendix C. Replacement of short-lived assets are included in Maintenance/Replacement. Options A, B and C include replacement of the lift stations within 5-years which is included in Section 5. Summary of analysis for differences in operation and maintenance costs for the proposed options are included in the following table.

Table 4-4: Operation and Maintenance Costs for Sewer Upgrade Options

Description	Option A	Option B	Option C	Option D
Personnel and Fringe	$ 22,000	$ 20,800	$ 5,200	$ 5,200
Administration	$ 3,720	$ 3,200	$ 1,900	$ 1,900
Insurance	$ 1,800	$ 1,500	$ 1,200	$ 1,050
Energy Costs	$ 2,630	$ 2,260	$ 2,260	$ 2,260
Maintenance/Replacement	$ 46,800	$ 19,200	$ 18,600	$ 18,600
Professional Services	$ 5,100	$ 3,400	$ 2,300	$ 2,300
Miscellaneous	$ 1,000	$ 800	$ 700	$ 700
Total Annual O&M Estimate	$ 83,050	$ 51,160	$ 32,160	$ 32,010

5. SELECTION OF AN ALTERNATIVE

A. LIFE CYCLE COST ANALYSIS

Life cycle present worth cost analysis was completed to allow comparison of options. The analysis included the capital cost, annual O&M, salvage value and non-monetary factors. Costs were converted to present value using a uniform series present worth calculation with discount rate from OMB Circular A-94, Appendix C. Design life of 15 years was used for pumps, and 30 years for all other system components. For options A, B and C that retain the existing steel vaults, future replacement of these steel vaults in 5 years is included using the estimated construction cost estimate. Analysis is included in Appendix C, and summarized in Table 5-1.

Capital costs refer to the estimated cost to complete engineering design, permitting and bid contractor construction of the proposed facilities. Construction costs include materials, equipment, labor, contractor overhead and profit, bonding and insurance cost, project management, administrative costs, and contingency.

O&M costs are the estimated costs for operation of the described option, including: labor; repair and replacement of failed or worn-out components; electrical power; annual facility maintenance; administration; and insurance. Non-monetary worker safety is not included in O&M. Total does not include O&M for the entire sewer utility.

Future replacement of the steel vaults uses the estimated cost for Option D escalated at 3.5% for 5 years for the estimated future replacement cost.

Net present value (NPV) combines capital costs and present worth value of 20-year uniform series of annual O&M costs at an interest rate of 3.5% and present worth of future replacement. Salvage value of lift station facilities is assumed to be zero.

Table 5-1: Life Cycle Costs for Wastewater Options

	Option A	Option B	Option C	Option D
	No Change	Replace Pumps & Controls	New LS over existing wet well	New LS and wet well
Capital Cost	$ 0	$ 464,300	$1,204,100	$1,702,000
Annual O&M Cost	$ 83,050	$ 51,160	$ 32,160	$ 32,010
PV Future LS Replacement	$2,021,442	$2,021,442	$2,021,442	$ 0
NPV of Costs	$3,201,782	$3,212,849	$3,382,613	$2,156,939

Option A, has the lowest initial cost of $0 but is not considered a viable option due to reduced system operation efficiency, worker safety, and risk of failure of pumps/controls or wet well to this critical portion of the sewer system. Ongoing annual maintenance costs of the system cause this option to have the highest O&M cost.

Option B and C have the next lowest initial costs and the highest NPV costs due to requirement for future replacement of lift station steel vaults. Installed equipment and materials under these options have limited to no salvage value.

Option D has the highest capital cost, and the lowest (most favorable) NPV with replacement of the critical steel vaults and equipment reducing future O&M costs.

Table 5-2: Non-monetary criteria

DESCRIPTION	A	B	C	D
Solve worker safety issues with buried vaults			✓	✓
Accommodate future development			✓	✓
Eliminate vault corrosion system failure concerns				✓

Solution to non-monetary concerns from the utility and work force for increased worker safety and system operation ease can only be accomplished through Options C and D.

6. PROPOSED PROJECT (RECOMMENDED ALTERNATIVE)

Based on safety, reliability, and life cycle analysis, option D is recommended by the engineer. This option meets the requirements of the community to provide long term safe, efficient and economic operation of the sewer utility.

The recommended option includes replacement of the existing Sandy Lane and Ellerman Heights lift stations with a new wet well, a new pump building, new submerged pumps on access rails for ease of maintenance and increased operational efficiency, and new power and controls in isolated area for increased safety and equipment life.

A. PRELIMINARY PROJECT DESIGN

Proposed project would replace the existing lift stations with the same function adjacent to existing lift stations. No change to the existing permitted treatment system would be included. New lift stations should be located to allow for construction of the new facility and stub out piping without disturbing the existing system operation during construction. This would allow for new lift stations to be completed and tested prior to switching piping over from the old lift station to the new, and limit the requirement for temporary pumping of wastewater during construction for reduced construction cost.

New lift stations should be constructed as a wet-well with duplex submersible pumps and controls and include a building constructed over the top to house equipment, and provide maintenance access to pumps. Building should include separation wall between pump access and electrical equipment and controls, with a separate exterior access. Building exterior should include high pitch roof, architectural shingles and horizontal lap siding mimic historical buildings. Lift station pumps should be mounted on rails to allow ease of maintenance access from inside the building through a sealed hatch to limit odors within the building. Lift station would be classified by the IBC as a Group U Occupancy.

Finish floor of wet wells should be set at a minimum of 13-feet elevation to provide adequate height above possible storm surge run-up events. Existing site grading at the site should be further developed to allow for adequate off-street parking adjacent to the lift stations, and provide positive surface drainage away from new structures.

New wet well should be precast concrete sections to be combined on site for ease of construction with available local equipment. Vault should be coated internally and externally to reduce water infiltration and long-term corrosion of reinforcement. Vault should be sized to provide adequate volume to allow a larger volume of the existing force main to be pumped through on each cycle than current operation. Resulting pump cycle time would be slightly higher than typical recommendations for odor elimination but would better manage buildup of sediment/solids in the force main.

The Ellerman Lift Station should be designed to allow for future operation as a black water lift station in case septic tankage is relocated to East Landing for future combined community treatment.

Existing Sandy Lane and Ellerman lift stations have 120/208v 3-phase electric service. New conduit and service cable should be installed to both lift stations to replace existing 30- year old service conductors to new service meters.

Water service through a back flow preventor should be included to both lift stations to provide a source of clean water for pump and facility cleaning and maintenance.

New piping would consist of approximately 20-feet of 8-inch diameter PVC pipe to connect to existing Sandy Lane and Ellerman gravity manholes, 20-feet of 8-inch diameter PVC to connect to existing Ellerman septic tanks, and 40-feet of 6-inch diameter HDPE to connect to existing Sandy Lane and Ellerman force mains. Relocation of existing Ellerman force main shut-off valves may be required depending on the final location of the new lift station.

The capacity of the new lift stations should meet the following minimum requirements for the existing system flow plus anticipated growth:

Table 6-1: Lift Station Design Flows

Lift Station	Sandy Lane		Ellerman	
Recommended Wet Well Dia:	8	feet	9	feet
Pumped Depth Reasonable Growth	3.7	feet	4.0	feet
Cycle Time (Avg / Peak), Reasonable Growth	105	minutes	97	minutes
Static Head	19	feet	14	feet
Recommended Pump Size	123	gpm	121	gpm
Pump Run %, Reasonable Growth	11%		16%	
Force Main Dia	6	inches	6	inches
Force Main Length	1,195	feet	2,601	feet
Volume Pumped	1,391	gallons	1,903	gallons
% of Line Vol Pumped	100%		63%	
Force Main Liquid Velocity	1.76	ft/sec	1.73	ft/sec

Existing lift station pumps provide force main flow velocities of 1.45 ft/sec (Sandy Lane black water) and 0.91 ft/sec (Ellerman septic effluent) which is less than the typical recommended force main flow of 2 ft/sec. The existing force mains have not historically had problems with plugging although both pumps run during high system loading which would create flows of 2 to 3 ft/sec in the force mains. Proposed pump sizes recommended provide higher flow velocity in the force main than the existing installation but still less than the typical recommendation.

B. PROJECT SCHEDULE

A recordable final easement, in accordance with the FSA, should be secured for the Ellerman Lift Station site to clarify existing easement. Final design should be completed by May 2020. Permit application and processing should be submitted by May 2020. Final bid documents can be assembled after permit is secured for advertising during June 2020. This will allow for construction of the project during the late fall of 2020 pending acquisition of construction funding.

C. PERMIT REQUIREMENTS

A CSP land use permit, ADEC permit to construct, and Alaska State Fire Marshal building permit will be required for the project. No other permits are anticipated to be required.

D. SUSTAINABILITY CONSIDERATIONS

i) WATER AND ENERGY EFFICIENCY

High energy costs are a large portion of the operational cost of the facility. To help minimize energy costs, all new pumps should be equipped with high efficiency motors and all new lighting should utilize LED fixtures with photocells on exterior fixtures.

Increased vault diameter would allow for a higher elevation for the vault base for decreased ground water pressure and possible reduced groundwater infiltration and pumping needs.

ii) GREEN INFRASTRUCTURE

Existing surface grading directing stormwater flow around and away from the site should be maintained. Existing organic layer should be stockpiled for reuse during site excavation to reestablish natural vegetation around the site to blend into the surrounding terrain.

iii) OTHER

Duplex pumping system for redundancy under normal operating procedures should be utilized to minimize pump sizes, and provide backup. Programming for operation of both pumps in case of seasonal or rare peak loading. Provision of fixed rail systems to allow for simple and efficient pump maintenance should be included in final design.

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

Construction cost estimate for the project is shown in the following table. Detailed capital cost estimates are provided in Appendix C.

Table 6-2: Estimated Project Cost

Construction Item	Upgrade Option D
Construction	$1,375,000
Design and Permitting	$134,000
Construction Administration	$124,000
Project Administration	$69,000
Total Estimated Project Cost	**$1,702,000**

F. ANNUAL OPERATING BUDGET

i) INCOME

No additional revenues are expected to result from the recommended alternative. Three additional service connections for the new housing units will be added in 2020. Current utility rate Schedule is shown in Figure 2-2.

Existing revenue for the utility has averaged about $114,000 for the last 3 years at the current rates. Future rate revisions are being discussed by the City Council and Administration as part of separate water and sewer budgets to fund new reserve account for future maintenance and net $0 revenue utility operations.

ii) ANNUAL OPERATING BUDGET

Existing utility operating budget has averaged between $105,000 and $142,000 for the last 3 years depending on what percentage of combined water-sewer budget is allocated to the sewer utility. The annual O&M costs for the proposed improvements is anticipated to decrease the annual operating cost of the system from $10,000 to $15,000. The reduction in costs includes reduced labor for access and maintenance to dry well enclosed space, more efficient pumps for lowered power costs, and reduced labor for required maintenance of aging pumps and controls.

CSP City Council is currently working on developing the new 2020 sewer budget. Savings from proposed improvements will assist in funding of reserve account for sewer utility.

iii) DEBT REPAYMENTS

The sewer utility has no existing current loan obligations. Were funds available from commercial sources at a reasonable interest rate, they could be secured for this project. Loans would require an increase in utility service rates to cover the costs. For a debt-funded $1,702,000 project on terms of 3.5% for a 20-year term, existing rates would be required to be increased by approximately 100%. Annual payment on a construction loan would be about equal to existing revenue.

iv) RESERVES

The City has no loans or other debts outstanding for the existing sewer collection, treatment, and disposal system. The system is funded on a revenue-neutral basis through user fees, with excess operation and maintenance expenses paid from the City's general budget. The sewer utility has revised their current budget to include a reserve account and is the process of revising rates to fund the reserve account.

7. CONCLUSIONS AND RECOMMENDATIONS

A. OVERVIEW AND ALTERNATIVE SELECTED BY THE COMMUNITY

Options for replacement or upgrade of the existing lift stations were studied in 2017 by the CSP during development of a new Capital Improvement Plan, and by the Community during development of the Island Comprehensive Economic Development Strategy. Both plans selected the complete replacement of these two lift stations as the highest ranked sewer utility project, and the best alternative to provide safe and efficient wastewater service in the community.

This report has been reviewed by the City Administration and Water/Wastewater Utility Personnel.

Based on these prior plans, and during review of this report, the community has selected Option D as their preferred approach for sewer upgrades in the project study area to solve worker safety concerns and loss of sewer service due to failure of existing facilities. Text of a community resolution adopted by the Saint Paul City Council is attached in Appendix D.

B. COMMUNITY CONTACTS

All project contacts should be directed to the City Manager, Phillip A. Zavadil.

City Manager	Phillip A. Zavadil	(907) 546-3110
Finance Manager	Stephanie Mandregan	(907) 546-3126
Public Works Director	Edward Paulus	(907) 546-3171
Water/Wastewater Operator	Mark Rukovishnikoff	(907) 546-3176

C. BUSINESS PLAN SUMMARY

The selected sewer upgrade alternative will be managed in the same manner as the existing city sewer utility infrastructure. The sewer utility operates at a zero-net revenue within the CSP annual budget with any utility costs in excess of revenue covered by the CSP general fund.

D. LAND REQUIREMENTS

It is recommended that an easement description be prepared for the Ellerman Lift Station and provided to Tanadgusix Corporation to establish a specific description for the existing Ellerman Lift Station Easement as provided in the Final Settlement Agreement. This will allow for the final selection of either Option D1 or D2, and project definition.

APPENDIX A – WASTEWATER PUMPING DATA

Existing and future wastewater system flows for the community, and lift station sizing for existing and future flows are tabulated in Table A-1. Recommended design data for lift stations included in Table A-2.

Table A-1: Existing and Future Wastewater system flows

Table A-2: Sewer Lift Station Design Data

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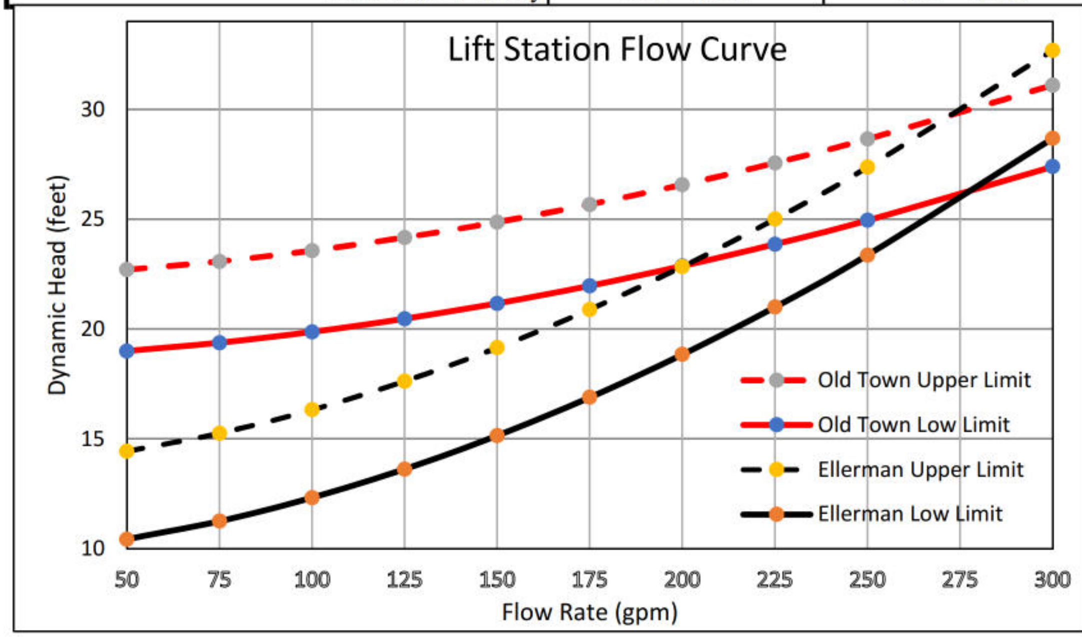
Existing and Future Wastewater System Flows — Table A-1

St. Paul Sewage Treatment								12/31/2019	
Wastewater Distribution	Residential	Commercial							
Population	390	Current Population (ADEC 2019)							
Occupied Homes	191			Sewage Generation Rate:		residential	100	(gal/per/day)	
Pop. density (per/house)	2.0					commercial	50	(gal/per/day)	
	Old Town	Harbor	S Ellerman	N Ellerman	Lukanin	N Lukanin	Public Wks	Total	
Housing lots in subdivision	103	0	70	36	56	12	0	277	lots
Commercial Lots in subdivision	22	18	20	0	1	2	7		each
Houses in subdivision	86	0	63	28	28	0	0	205	houses
Vacant houses in subdivision	8	0	4	2	0	0	0	14	houses
Commercial buildings in subd	11	7	3	0	0		6		each
Residential Buildout	83%	N/A	90%	78%	50%	0%	N/A	60%	
Commercial Buildout	50%	39%	15%	N/A	0%	0%	86%	16%	
Residential Population Distribution	159	0	120	53	57	0	0	390	pers
Commercial Population Est.	30	15	30	10	0	0	20	105	pers
Appx Population at Plants		300						300	pers
Existing Manholes	53	0	26	10	10	0	3	102	each
Existing Collection Piping	9,552	117	5,716	2,696	2,633	0	749	21,463	ft
Flow = (per/house)*(sewage gen rate)*(bldg lots)	15,927	0	12,047	5,309	5,717	0	0	39,000	gpd
Flow = (Comm + Plant population) * (comm sewage gen rate)	1,500	15,750	1,500	500	0	0	1,000	20,250	gpd
Infiltration = (Manholes) * (2 gpd) + (Length Piping) * (0.1 gpd/ft)	1,061	12	624	290	283	0	81	2,350	gpd
Est. Existing daily flow	18,488	15,762	14,171	6,099	6,001	0	1,081	61,600	gpd
Est existing Average Flow	12.8	10.9	9.8	4.2	4.2	0.0	0.8	43	gpm
Est existing Average Lift Station Flow	12.8	10.9		19.0			0.8	43	gpm
Peaking Factor	3.1	3.1		3.1			4.0		
Est existing Peak Lift Station Flow	39.8	33.9		58.9			3.0	133	gpm
	Sandy Lane	Harbor		Ellerman					
Reasonable Growth Factor	3%	5%	3%	3%	3%	3%	3%		
RG Estimated Area Daily Flow	19,043	16,550	14,596	6,281	6,181	0	1,113	63,764	gpd
RG Average Area Flow	13.2	11.5	10.1	4.4	4.3	0.0	0.8	44	gpm
RG Average Lift Sta Flow	13.2	11.5		19.6			0.8	45	gpm
RG Peak Lift Sta Flow	**41.0**	**35.6**		**60.6**			**3.1**	**140**	**gpm**
	Old Town	Harbor		N Ellerman			Public Wks	Total	
Existing Lift Sta Wet Well Size	6.0			6.0					feet
Pump 1 On float	-2.4			2.4					mllw
Pump 2 On float	-1.9			2.9	4.5				mllw
Pumps Off float	-6.4			-1.6	4.0				mllw
Existing Lift Sta Pumped Vol depth	4.0			4.0					feet
Existing Pump	7.5	HP		1.5	HP				HP
	208v 3-Ph			208v 3-Ph					
Static Head	18.7	22.7		13.9	17.9				feet
Existing Lift Sta Pump Flow	101.9			64.2					gpm
Force Main Velocity	1.454			0.916					ft/sec
Pump Run %	13%			30%					
Reasonable Growth Lift Station									
Recomm Wet Well Dia:	**8.0**			**9.0**					**feet**
Pump 1 On float	-2.4			2.4					mllw
Pump 2 On float	-1.9			2.9					mllw
Pumps Off float	-6.1			-1.6					mllw
Pumped Depth Reasonable Growth	3.7			4.0					feet
Reasonable Growth Cycle Time (Avg / F	105.2			97.3					min
Recomm Pump Size	**143.5**	**3.5x Peak Flow**		**142.5**	**2.3x Peak Flow**				**GPM**
Static Head	18.7	22.4		9.7	17.9				feet
Dynamic Losses (Pump Off to On)	21.1	24.8		31.0	35.0				feet
Pump Run %, Resonable Growth	9%			14%					
Force Main Dia	6.0	5.35	ID Dr11	6.0	5.35	ID Dr11			inches
Force Main Length	1,195			2,601					feet
Force Main Volume	1,395			3,037					gallons
Volume Pumped	1,391	100%	of line vol	1,903	63%	of line vol			gallons
Force Main Velocity	**2.048**			**2.034**					**FT/Sec**

Lift Station	Sandy Lane	Ellerman
Recomm Wet Well Dia:	8 feet	9 feet
Pumped Depth Reasonable Growth	3.7 feet	4.0 feet
Reasonable Growth Cycle Time (Avg / Peak)	105 minutes	97 minutes
Static Head	18.7 feet	9.7 feet
Recomm Pump Size	143 gpm	143 gpm
Pump Run %, Resonable Growth	9%	14%
Force Main Dia	6 inches	6 inches
Force Main	HDPE DR 17?	HDPE DR 17?
Force Main Length	1,195 feet	2,601 feet
Volume Pumped	1,391 gallons	1,903 gallons
% of Line Vol Pumpmed	100%	63%
Force Main Velocity	2.05 ft/sec	2.03 ft/sec



Code Information	
Applicable Code:	International Building Code
Occupancy Classification:	U
Type of Construction:	V-B
Allowable Building Area:	5,000 sq. ft., 1-story (IBC Table503)
Proposed Building Area:	180 sq. ft., 1-story - Conforms
Occupant Load:	1 (168 sq. ft. / 300 sq. ft. per occ)
Exits Required:	1
Parking Provided:	2 Spaces, No Local Requirements
Yard Requirements:	No Local Requirements

Design Criteria	
Wind Load:	160 MPH, Exposure C
Snow Load:	30 psf
Seismic 0.2-Second Spectral Resp Acc.:	25
Seismic1.0-Second Spectral Resp Acc.:	15
Site Classification:	C
Soils:	Dense Sand
Vertical Foundation Capacity:	2000 psf (IBC Table 1806.2)
Lateral Bearing Pressure:	150 psf/ft (IBC Table 1806.2)

APPENDIX B – DRAFT DESIGN PLANS

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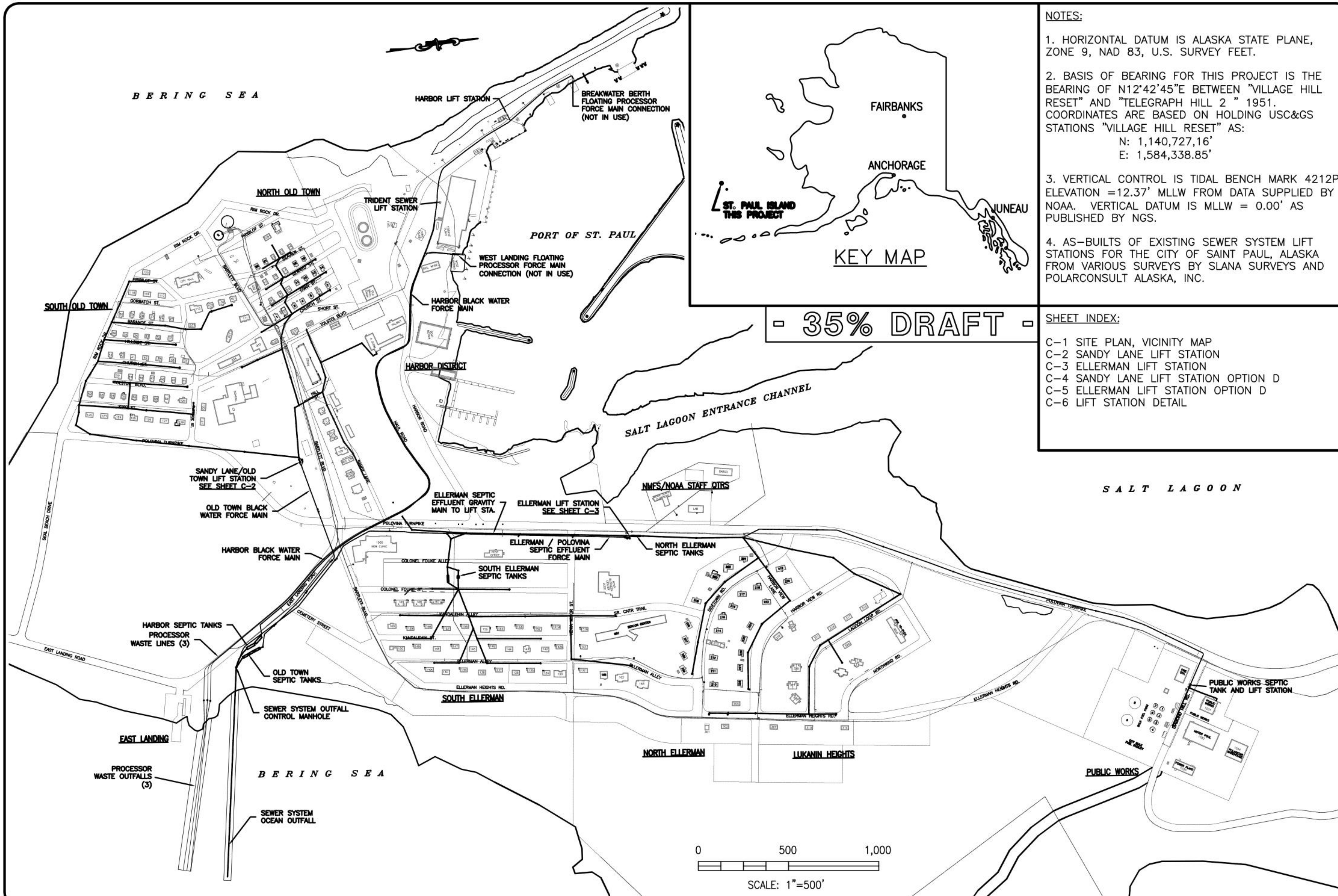


NOTES:

1. HORIZONTAL DATUM IS ALASKA STATE PLANE, ZONE 9, NAD 83, U.S. SURVEY FEET.

2. BASIS OF BEARING FOR THIS PROJECT IS THE BEARING OF N12°42'45"E BETWEEN "VILLAGE HILL RESET" AND "TELEGRAPH HILL 2 " 1951. COORDINATES ARE BASED ON HOLDING USC&GS STATIONS "VILLAGE HILL RESET" AS:
N: 1,140,727,16'
E: 1,584,338.85'

3. VERTICAL CONTROL IS TIDAL BENCH MARK 4212P, ELEVATION =12.37' MLLW FROM DATA SUPPLIED BY NOAA. VERTICAL DATUM IS MLLW = 0.00' AS PUBLISHED BY NGS.

4. AS-BUILTS OF EXISTING SEWER SYSTEM LIFT STATIONS FOR THE CITY OF SAINT PAUL, ALASKA FROM VARIOUS SURVEYS BY SLANA SURVEYS AND POLARCONSULT ALASKA, INC.

- 35% DRAFT -

SHEET INDEX:

C-1 SITE PLAN, VICINITY MAP
C-2 SANDY LANE LIFT STATION
C-3 ELLERMAN LIFT STATION
C-4 SANDY LANE LIFT STATION OPTION D
C-5 ELLERMAN LIFT STATION OPTION D
C-6 LIFT STATION DETAIL

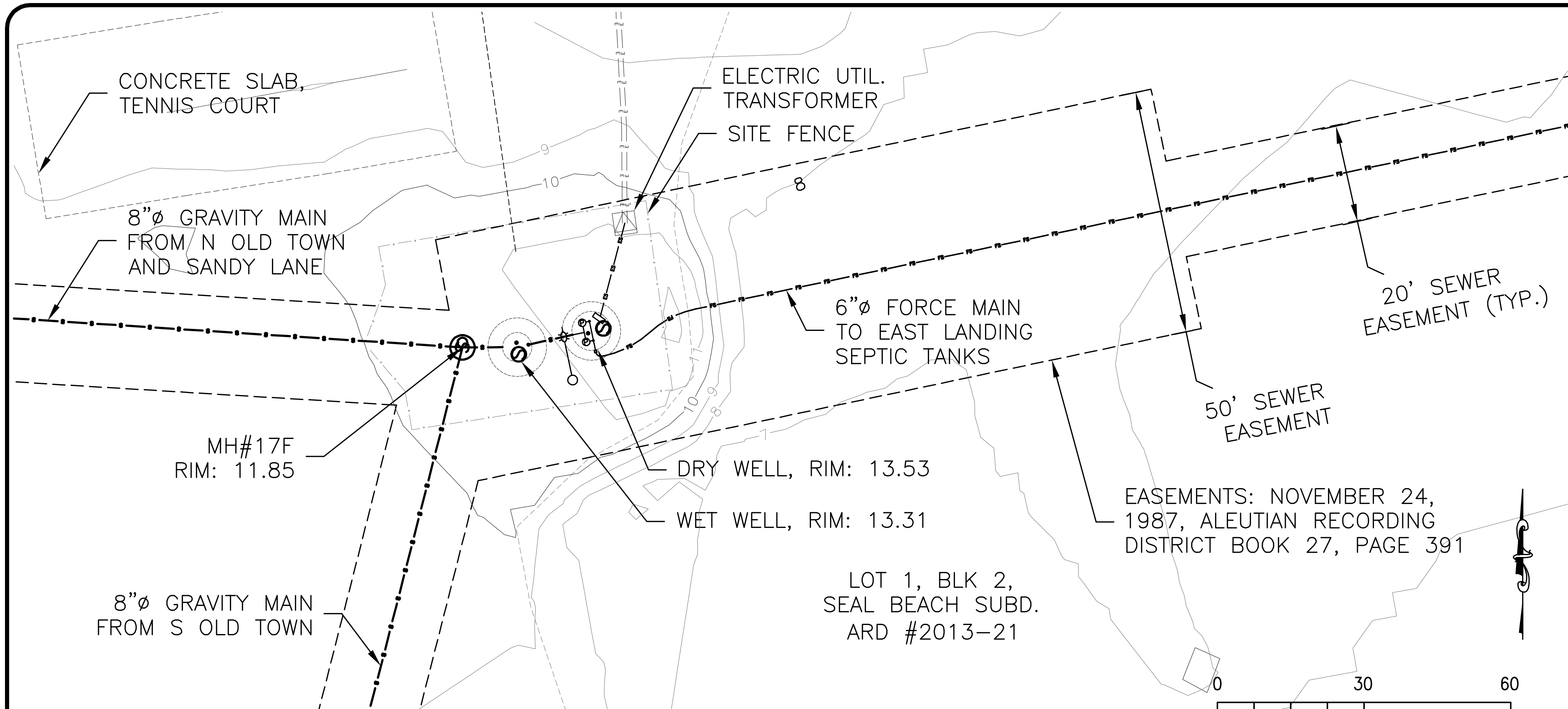
SHEET C-1 OF 6

PROJECT
WASTEWATER LIFT STATION
PRELIMINARY ENGINEERING REPORT
VSW PROJECT # 19ER33
SAINT PAUL ISLAND, ALASKA

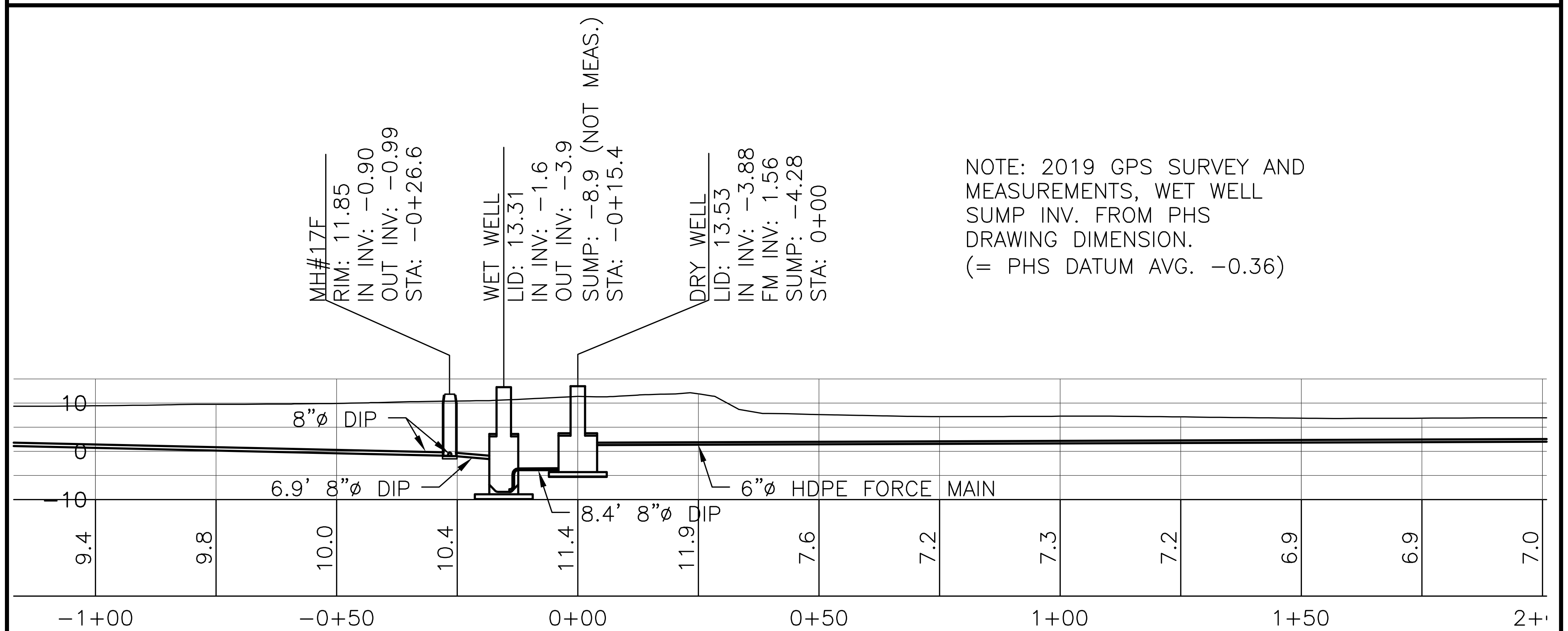
DRAWING
SITE PLAN

polarconsult alaska, inc.
ENERGY SYSTEMS • ENVIRONMENTAL SERVICES • ENGINEERING DESIGN
1503 WEST 33RD AVE, SUITE 310 PHONE (907) 258-2420
ANCHORAGE, ALASKA 99503 FAX (907) 258-2419

DATE: 2/14/20
DESIGNED:
DRAWN:
CHECKED:
SCALE: AsNoted
FILE: LiftStoPER



1 PLAN – SANDY LANE / OLD TOWN LIFT STATION
SCALE: 1"=30'



2 PROFILE – SANDY LANE / OLD TOWN LIFT STATION
SCALE: 1"=30'

NOTES:

1. EXISTING LIFT STATION:
   PUMP FLOW: 102 GPM EA PUMP
   ELECTRIC: 120/208V 3-PHASE
   DISCHARGE INV.: 16.34 FEET
   STATIC HEAD: 18.7 FEET
   PUMP CONTROL: -2.4 FEET PUMP 1 ON
   -1.9 FEET PUMP 2 ON
   -6.4 FEET PUMPS OFF
   SUMP STORAGE: 211 GAL/FT
   FORCE MAIN: 1,195 FT, 6"ø HDPE

- 35% DRAFT -

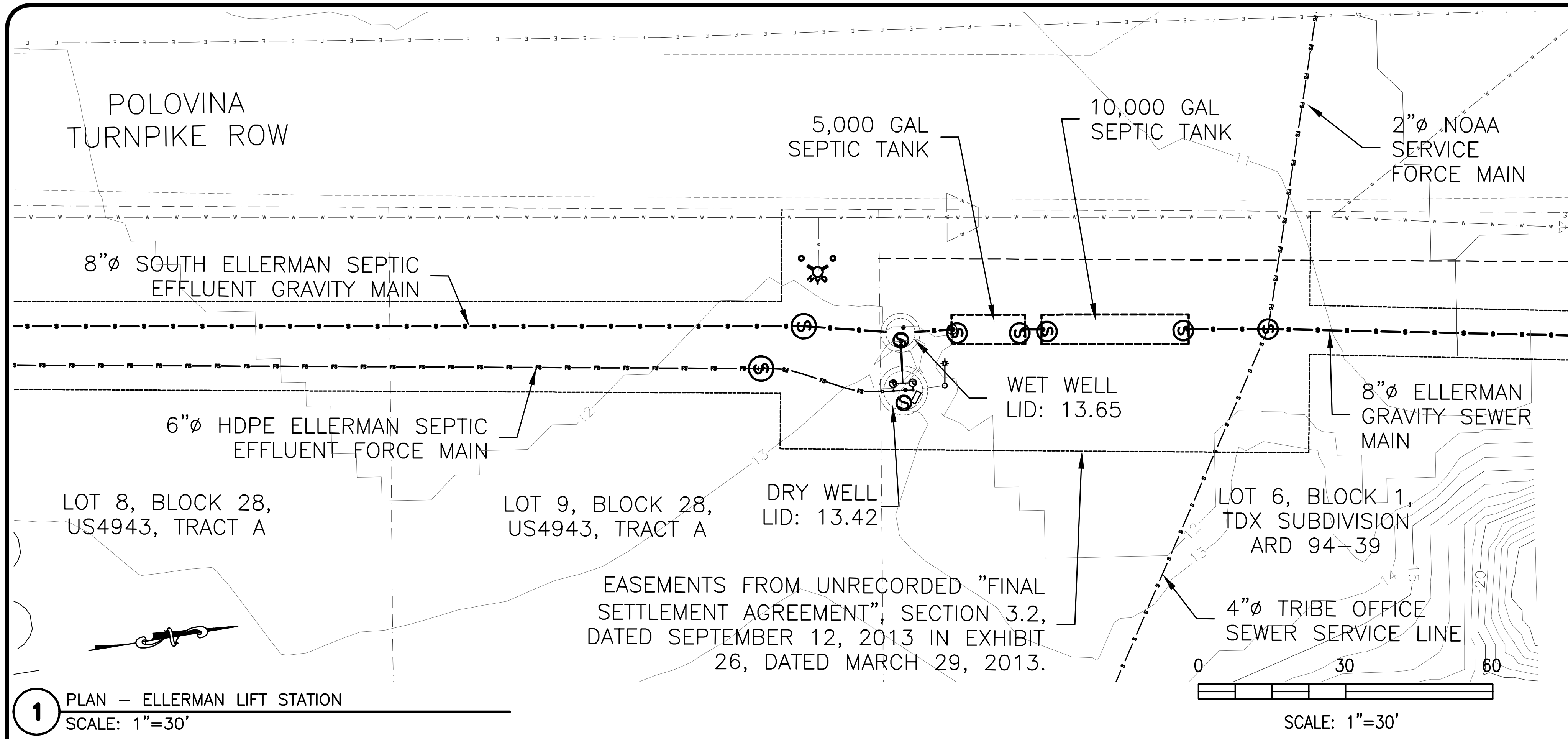
SHEET C-2 OF 6

PROJECT
WASTEWATER LIFT STATION
PRELIMINARY ENGINEERING REPORT
VSW PROJECT # 19ER33
SAINT PAUL ISLAND, ALASKA

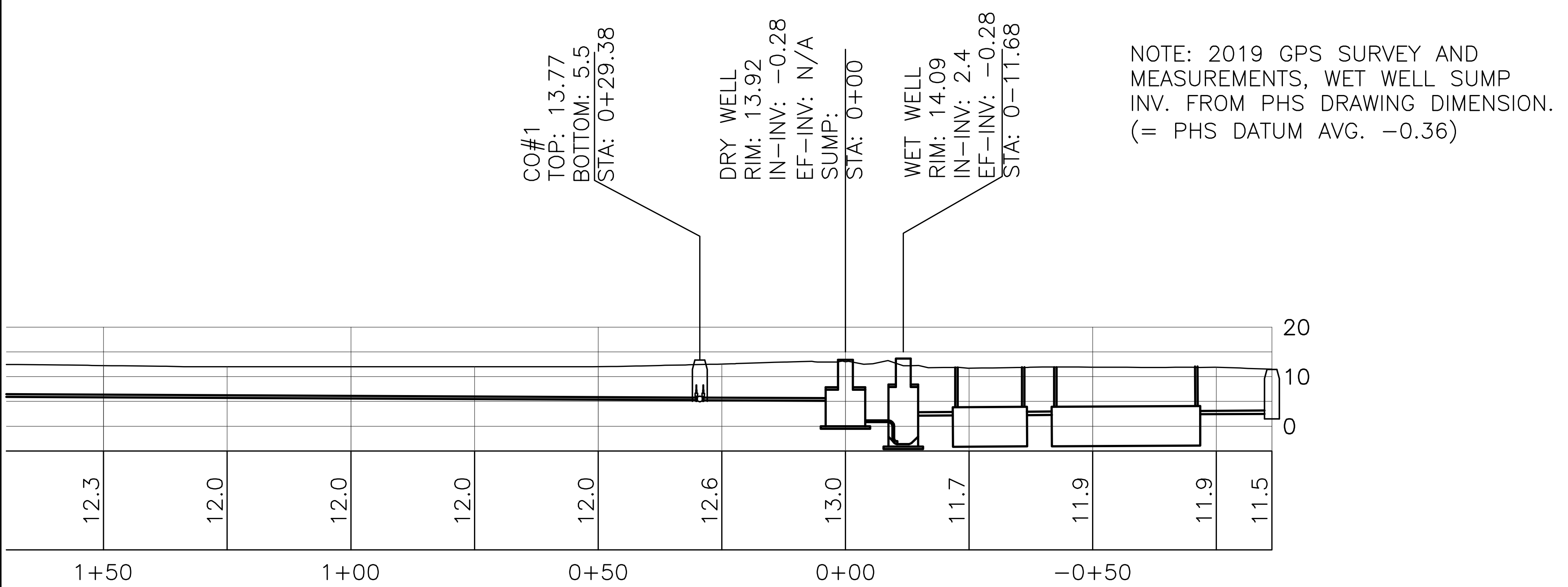
DRAWING
SANDY LANE LIFT STATION – PLAN & PROFILE

polarconsult alaska, inc.
ENERGY SYSTEMS • ENVIRONMENTAL SERVICES • ENGINEERING DESIGN
1503 WEST 33RD AVE, SUITE 310 PHONE (907) 258-2420
ANCHORAGE, ALASKA 99503 FAX (907) 258-2419

DATE: 2/14/20
DESIGNED:
DRAWN:
CHECKED:
SCALE: AsNoted
FILE: LiftStoPER



1 PLAN – ELLERMAN LIFT STATION
SCALE: 1"=30'



2 SECTION – ELLERMAN LIFT STATION
SCALE: 1"=30'

NOTES:

1. EXISTING LIFT STATION:
   PUMP FLOW: 64 GPM EA PUMP
   ELECTRIC: 120/208V 3–PHASE
   DISCHARGE INV.: 11.86 FEET
   STATIC HEAD: 13.9 FEET
   PUMP CONTROL: 2.4 FEET PUMP 1 ON
   2.9 FEET PUMP 2 ON
   –1.6 FEET PUMPS OFF
   SUMP STORAGE: 211 GAL/fT
   FORCE MAIN: 2,601 FT, 6"ø HDPE

- 35% DRAFT -

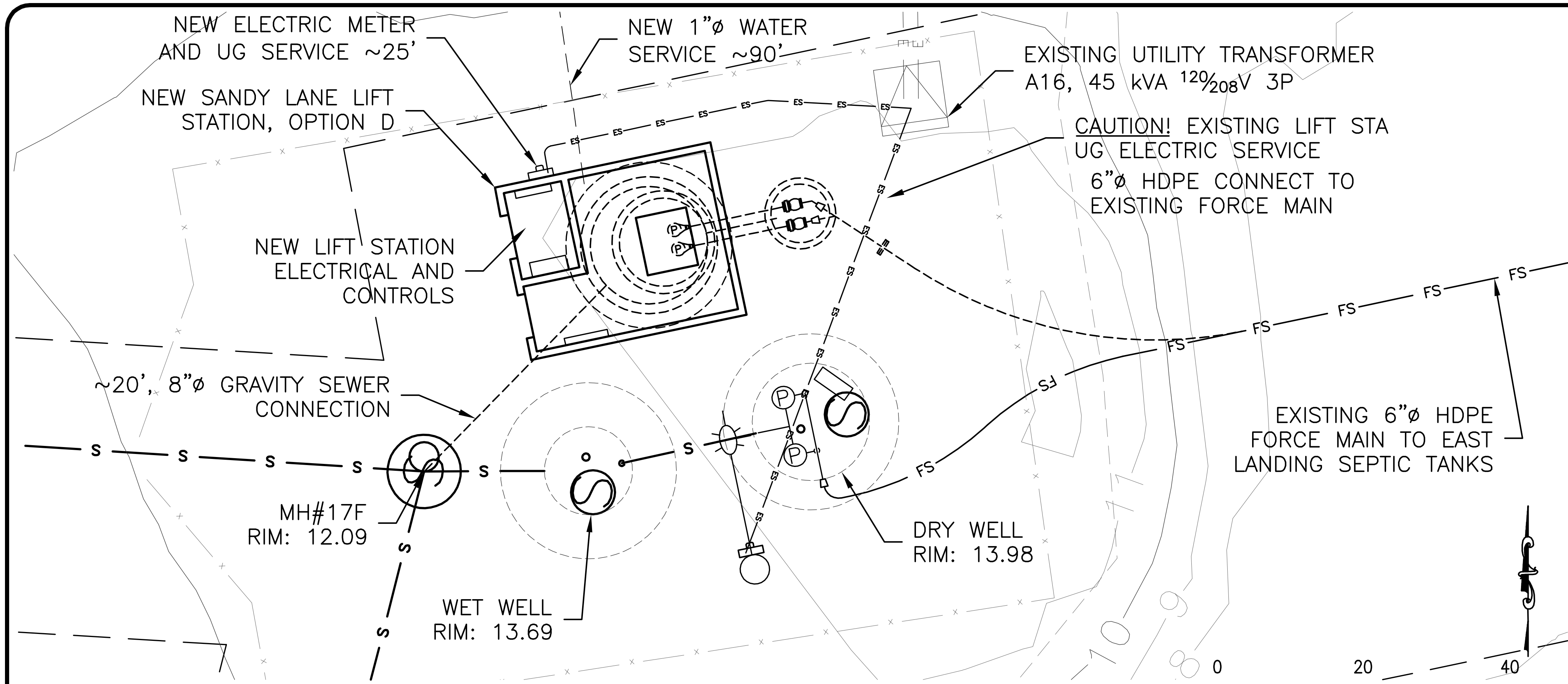
SHEET C–3 OF 6

DRAWING
ELLERMAN LIFT STATION – PLAN & PROFILE

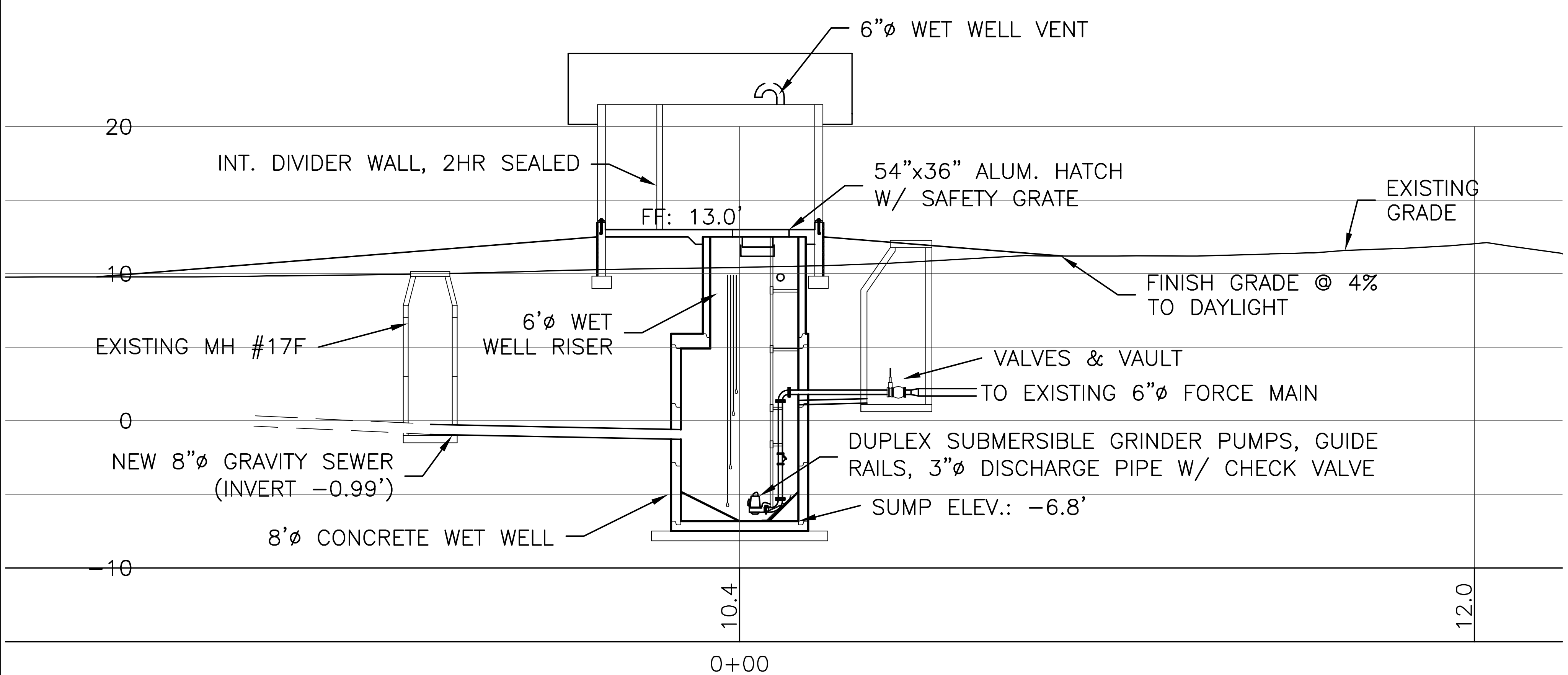
PROJECT
WASTEWATER LIFT STATION
PRELIMINARY ENGINEERING REPORT
VSW PROJECT # 19ER33
SAINT PAUL ISLAND, ALASKA

polarconsult alaska, inc.
ENERGY SYSTEMS • ENVIRONMENTAL SERVICES • ENGINEERING DESIGN
1503 WEST 33RD AVE, SUITE 310
ANCHORAGE, ALASKA 99503
PHONE (907) 258–2420
FAX (907) 258–2419

DATE: 2/14/20
DESIGNED:
DRAWN:
CHECKED:
SCALE: AsNoted
FILE: LiftStoPER



1 PLAN – SANDY LANE / OLD TOWN LIFT STATION
SCALE: 1"=10'



2 PROFILE – SANDY LANE / OLD TOWN LIFT STATION
SCALE: 1"=10'

NOTES:
1. LIFT STATION BUILDING INTENDED FOR LIMITED PERIODIC USE BY SERVICE OR MAINTENANCE PERSONNEL.
2. BUILDING IBC OCCUPANCY: GROUP U
3. MAIN ROOM INTERIOR SPACE NEC CLASS 1, DIVISION 1. ELECTRICAL ROOM: NEC UNCLASSIFIED

BUILDING DESIGN LOADS:
GROUND SNOW LOAD: 40 PSF
BASIC WIND SPEED (NOM. 3 SECOND GUST): 130 MPH
INWD EXPOSURE CATEGORY: D
WIND TOPOGRAPHIC FACTOR: 1.0
SEISMIC DESIGN: IMPORTANCE FACTOR 1
Ss = 0.25
S1 = 0.25
SITE CLASS = D

LIFT STATION DESIGN LOADS:
DESIGN FLOW: 123 GPM EA PUMP
ELECTRIC: 120/208V 3-PHASE
DISCHARGE INV.: 16.34 FEET
STATIC HEAD: 18.7 FEET
PUMP CONTROL: –1.9 FEET PUMP 2 ON
–2.4 FEET PUMP 1 ON
–6.1 FEET PUMPS OFF
SUMP STORAGE: 8'ø 376 GAL/FT
FORCE MAIN: 1,195 FT, 6"ø HDPE

– 35% DRAFT –

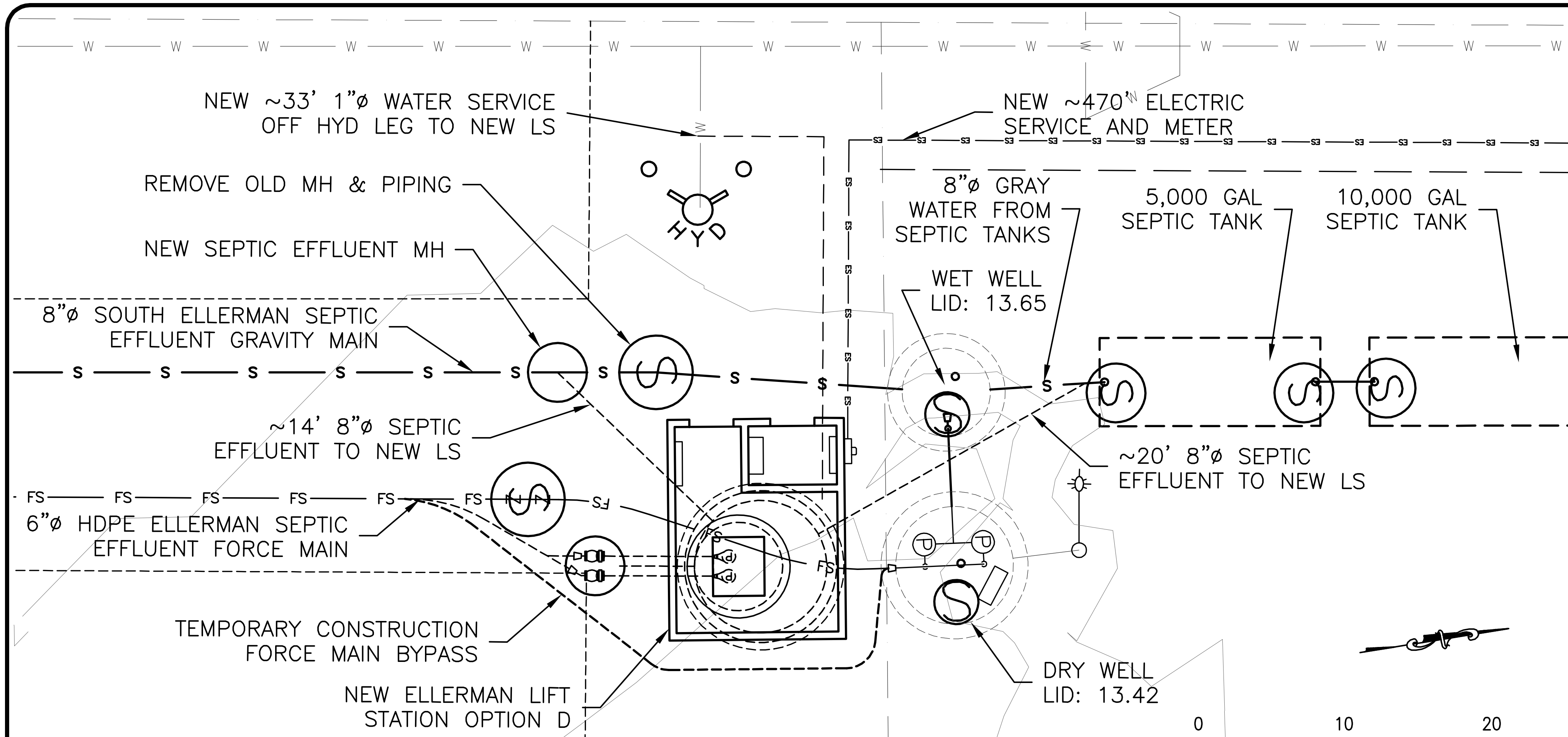
SHEET C–4 OF 6

PROJECT
WASTEWATER LIFT STATION
PRELIMINARY ENGINEERING REPORT
VSW PROJECT # 19ER33
SAINT PAUL ISLAND, ALASKA

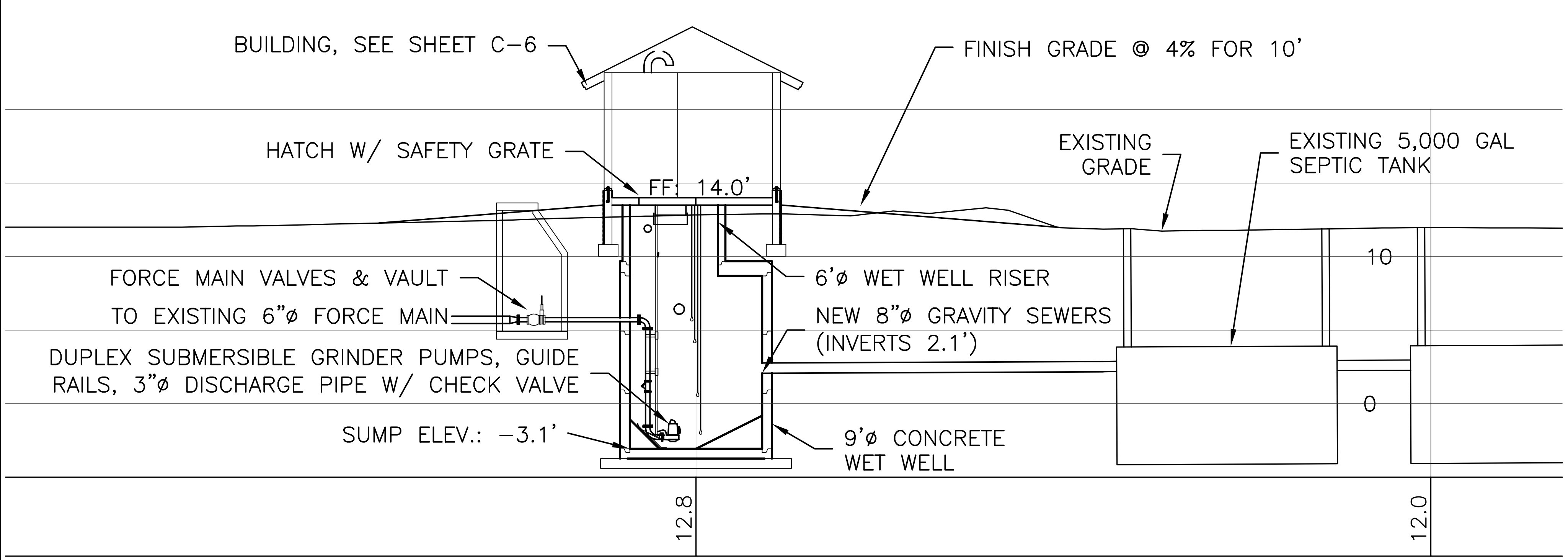
DRAWING
NEW SANDY LANE LIFT STATION – PLAN & PROFILE

polarconsult alaska, inc.
ENERGY SYSTEMS • ENVIRONMENTAL SERVICES • ENGINEERING DESIGN
1503 WEST 33RD AVE, SUITE 310 PHONE (907) 258-2420
ANCHORAGE, ALASKA 99503 FAX (907) 258-2419

DATE: 2/14/20
DESIGNED:
DRAWN:
CHECKED:
SCALE: AsNoted
FILE: LiftStaPER



1 PLAN – ELLERMAN LIFT STATION
SCALE: 1"=10'



2 SECTION – ELLERMAN LIFT STATION
SCALE: 1"=10'

NOTES:

1. LIFT STATION BUILDING INTENDED FOR LIMITED PERIODIC USE BY SERVICE OR MAINTENANCE PERSONNEL.
2. BUILDING IBC OCCUPANCY: GROUP U
3. MAIN ROOM INTERIOR SPACE NEC CLASS 1, DIVISION 1. ELECTRICAL ROOM: NEC UNCLASSIFIED

BUILDING DESIGN LOADS:

GROUND SNOW LOAD: 40 PSF
BASIC WIND SPEED (NOM. 3 SECOND GUST): 130 MPH
INWD EXPOSURE CATEGORY: D
WIND TOPOGRAPHIC FACTOR: 1.0
SEISMIC DESIGN: IMPORTANCE FACTOR 1
Ss = 0.25
S1 = 0.25
SITE CLASS = D

LIFT STATION DESIGN LOADS:

DESIGN FLOW: 121 GPM
ELECTRIC: 120/208V 3–PHASE
STATIC HEAD: 13.9 FEET
PUMP CONTROL: 2.9 FEET PUMP 2 ON
2.4 FEET PUMP 1 ON
–1.6 FEET PUMPS OFF
SUMP STORAGE: 9'ø 476 GAL/FT
FORCE MAIN: 2,601 FT, 6"ø HDPE

35% DRAFT

SHEET C–5 OF 6

PROJECT
WASTEWATER LIFT STATION
PRELIMINARY ENGINEERING REPORT
VSW PROJECT # 19ER33
SAINT PAUL ISLAND, ALASKA

DRAWING
NEW ELLERMAN LIFT STATION – PLAN & PROFILE

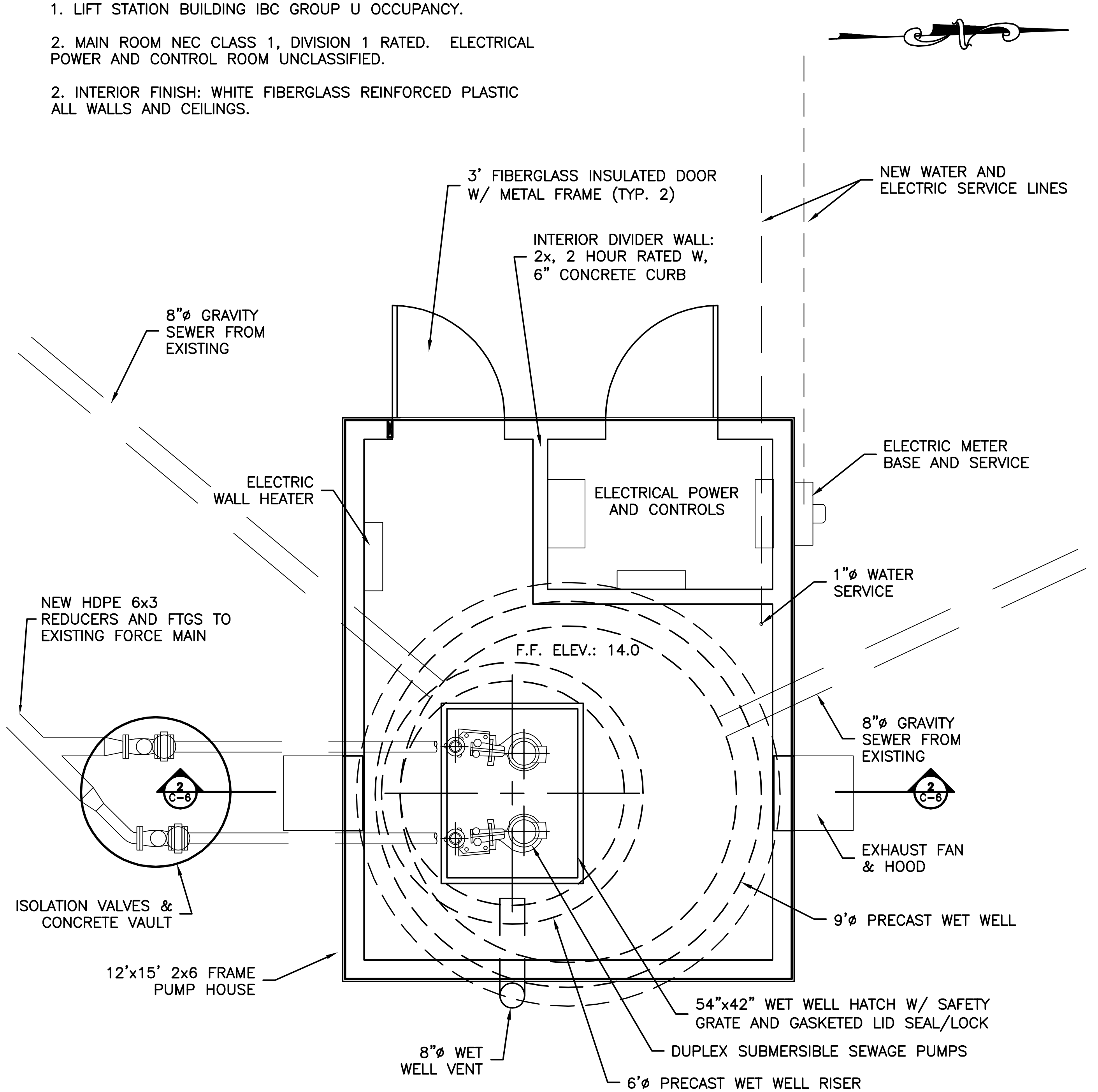
polarconsult alaska, inc.
ENERGY SYSTEMS • ENVIRONMENTAL SERVICES • ENGINEERING DESIGN
1503 WEST 33RD AVE, SUITE 310 PHONE (907) 258–2420
ANCHORAGE, ALASKA 99503 FAX (907) 258–2419

DATE: 2/14/20
DESIGNED:
DRAWN:
CHECKED:
SCALE: AsNoted
FILE: LiftStaPER

NOTE:
1. LIFT STATION BUILDING IBC GROUP U OCCUPANCY.

2. MAIN ROOM NEC CLASS 1, DIVISION 1 RATED. ELECTRICAL POWER AND CONTROL ROOM UNCLASSIFIED.

2. INTERIOR FINISH: WHITE FIBERGLASS REINFORCED PLASTIC ALL WALLS AND CEILINGS.

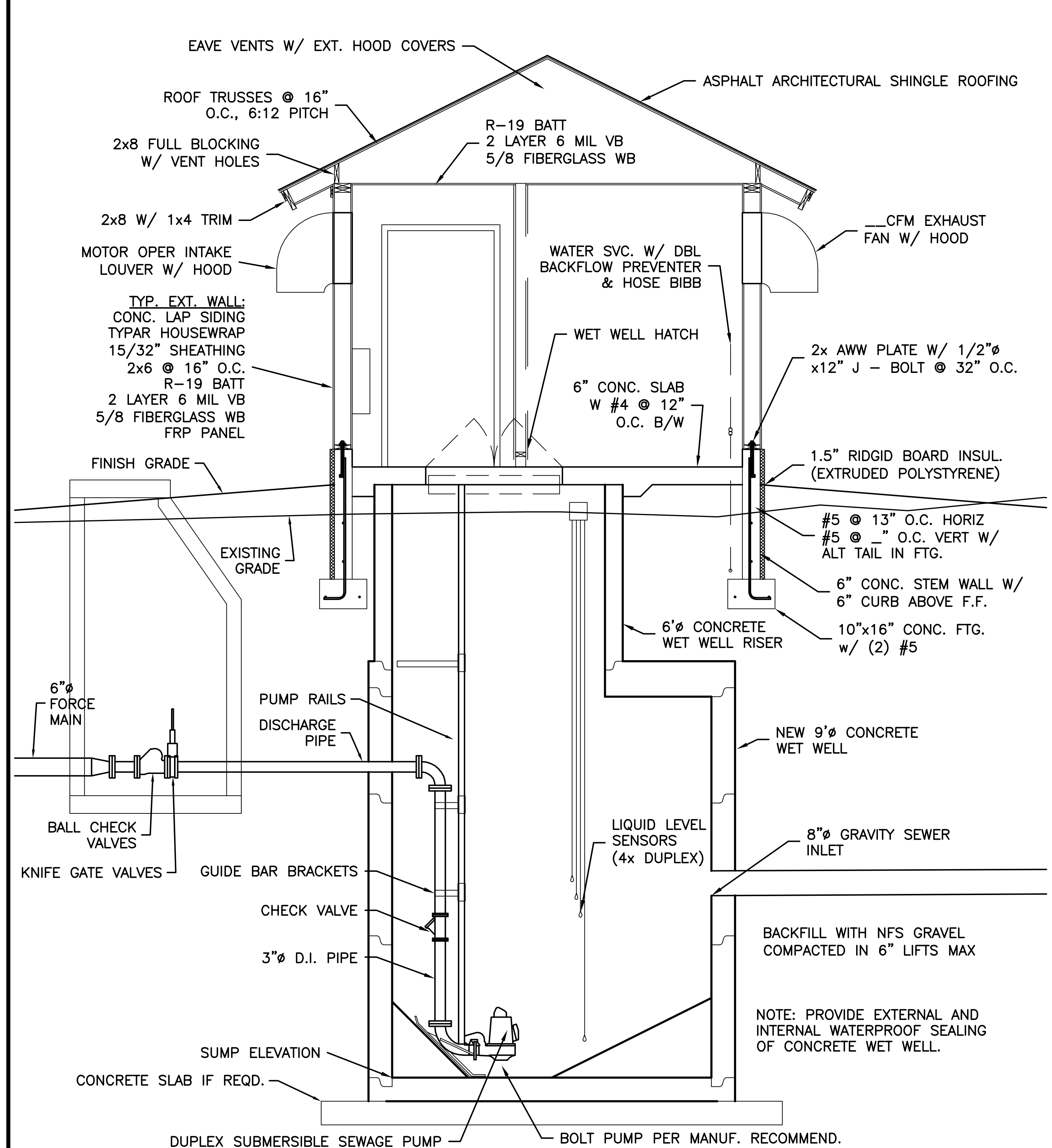


NOTE: PROVIDE SUPPORT IN ROOF ASSEMBLY FOR 300# CHAIN HOIST CENTERED ON PUMP OPENING

0 4'–0" 8'–0"
SCALE: 1"=4'–0"

1 PLAN – ELLERMAN LIFT STATION
SCALE: 1"=4'–0"

NOTE: PROVIDE SUPPORT IN ROOF ASSEMBLY FOR 300# CHAIN HOIST CENTERED ON PUMP OPENING



2 SECTION – ELLERMAN LIFT STATION
SCALE: 1"=4'–0"

SHEET C–6 OF 6

PROJECT
WASTEWATER LIFT STATION
PRELIMINARY ENGINEERING REPORT
VSW PROJECT # 19ER33
SAINT PAUL ISLAND, ALASKA

DRAWING
NEW ELLERMAN LIFT STATION – BUILDING PLAN & SECTION

polarconsult alaska, inc.
ENERGY SYSTEMS • ENVIRONMENTAL SERVICES • ENGINEERING DESIGN
1503 WEST 33RD AVE, SUITE 310 PHONE (907) 258-2420
ANCHORAGE, ALASKA 99503 FAX (907) 258-2419

DATE: 2/14/20
DESIGNED:
DRAWN:
CHECKED:
SCALE: AsNoted
FILE: LiftStoPER

APPENDIX C – COST / OPERATION & MAINTENANCE ESTIMATES

Sewer Lift Stations Cost Estimate - VSW Template

Engineers Cost Estimate

Short Lived Asset Schedule for Replacement

Operations and Maintenance Estimate – Options Only

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Sewer Lift Stations
City of Saint Paul, Alaska
Cost Estimate
Prepared by Polarconsult Alaska, Inc.

	Description	Code	Unit	Quantity	Unit Cost	Total Cost
1	Site Clearing and Grubbing	S-SO	AC	2	$19,900	$ 39,800
2	Site Excavation - Lift Station Site	S-SO	AC	2	$69,900	$ 139,800
3	Concrete Wet Well	S-SO	EA	2	$143,200	$ 286,400
4	;ewer Collection System Tie In - Force Main	S-SO	EA	2	$43,900	$ 87,800
5	Rails, Hoist, Ladders	S-SO	EA	2	$15,900	$ 31,800
6	Pumps and Plumbing	S-SO	EA	2	$36,300	$ 72,600
7	Electrical Systems and Power Connection	S-SO	EA	2	$57,000	$ 114,000
8	ft Station Building - Foundation, Walls, Roof	S-SO	SF	360	$915	$ 329,400
9	Mechanical Ventilation System	S-SO	EA	2	$30,397	$ 60,794
10	ɔntrol Panels - Installation and Programming	S-SO	EA	2	$31,700	$ 63,400
11	Signage	S-SO	EA	2	$5,000	$ 10,000
12	Freight	S-SO	LB	146000	$0.88	$ 128,480
13	O&M Manual and Training	S-SO	LS	1	$7,900	$ 7,900
		Construction Cost				$ 1,372,174
		Contingencies			15%	$ 205,826
		Total Construction Cost				$ 1,578,000
		Design Services**				$ 124,000.00
					Total Project Cost	**$ 1,702,000**

Notes: Construction line items include labor, materials, equipment rental, per diem and crew lodging costs, contractor overhead and profit. Detailed project estimate prepared and allocated to the standard line Project adjacent to existing lift station and roads. All equipment anticipated available on Island. Island has deep water port with regularly scheduled freighter service from Seattle. Precast concrete lift station vaults proposed. Excavataion will require sheet piling enclosure to control ground water to allow placement of wet well bases on concrete leveling slab.

Project layout allows for full construction and testing of lift station prior to switching over existing gravity and force main piping. New electrical underground service conductors and water service stub-outs requried at both sites. New scada system to tie in to public works system required.

Industry standard 15% contingency utilized for estimate based on 35% conceptual design drawings and information.

**Design Servies are being shown because this is a State of Alaka Village Safe Water lead community, and design services will be contracted for this project.

Engineers Cost Estimate St. Paul Wastewater Lift Station PER VSW Proj #19ER33 15-Aug-19

							Option B	Option C	Option D
Project Construction Duration per Lift Station (wks)							2	4	6
	Option B	Option C	Option D				Option B	Option C	Option D
Labor	Qty	Qty	Qty	units	Unit Cost	# LS's	Ext Cost	Ext Cost	Ext Cost
Proj Manager	2	2	2	wks	$ 7,200	2	$ 28,800	$ 28,800	$ 28,800
Superintendent	3	5	7	wks	$ 7,200	2	$ 43,200	$ 72,000	$ 100,800
Foreman	2	4	6	wks	$ 7,500	2	$ 30,000	$ 60,000	$ 90,000
Surveyor	0	1	1	wks	$ 6,000	2	$ -	$ 12,000	$ 12,000
Expeditor	1	2	2	wks	$ 4,800	2	$ 9,600	$ 19,200	$ 19,200
Operator	0	4	6	wks	$ 4,800	2	$ -	$ 38,400	$ 57,600
Laborer (2 ea)	2	8	12	wks	$ 4,800	2	$ 19,200	$ 76,800	$ 115,200
Carpenter	0	3	3	wks	$ 6,000	2	$ -	$ 36,000	$ 36,000
Electrician	2	2	2	wks	$ 6,000	2	$ 24,000	$ 24,000	$ 24,000
						Total, Labor	$ 154,800	$ 367,200	$ 483,600
							Option B	Option C	Option D
General	Qty	Qty	Qty	units	Unit Cost	# LS's	Ext Cost	Ext Cost	Ext Cost
RT Airfares	3	7	7	ea	$ 1,100	2	$ 6,600	$ 15,400	$ 15,400
PerDiem	11	29	39	wks	$ 1,050	2	$ 23,100	$ 60,900	$ 81,900
Misc AirFreight	0.5	1	1	ls	$ 5,000	2	$ 5,000	$ 10,000	$ 10,000
Erosion Control	0	1	1	ls	$ 10,000	2	$ -	$ 20,000	$ 20,000
						Total, General	$ 34,700	$ 106,300	$ 127,300
							Option B	Option C	Option D
Materials	1 LS Qty	1 LS Qty	1 LS Qty	units	Unit Cost	# LS's			Ext Cost
Sheet Piling, 20' L	0	0	100	lf	$ 100	2	$ -	$ -	$ 20,000
Precast 8'Øx4' Base	0	0	1	ea	$ 2,800	2	$ -	$ -	$ 5,600
Precast 8'Øx4' Sections	0	0	2	ea	$ 1,600	2	$ -	$ -	$ 6,400
Precast 8'Ø Lid x5'Ø	0	0	1	ea	$ 1,200	2	$ -	$ -	$ 2,400
Precast 5'Øx5' Section	0	0	1	ea	$ 1,100	2	$ -	$ -	$ 2,200
D-1	0	20	20	cyd	$ 75	2	$ -	$ 3,000	$ 3,000
Scoria Borrow	0	20	50	cyd	$ 10	2	$ -	$ 400	$ 1,000
Sand Borrow	0	20	240	cyd	$ -	2	$ -	$ -	$ -
Concrete Ftg & Slabs	0	10	10	cyd	$ 225	2	$ -	$ 4,500	$ 4,500
Concrete Wet Well Misc	0	0	4	cyd	$ 225	2	$ -	$ -	$ 1,800
Lift Station Pump & Controls	1	1	1	ea	$ 25,000	2	$ 50,000	$ 50,000	$ 50,000
SCADA System	1	1	1	ea	$ 10,000	2	$ 20,000	$ 20,000	$ 20,000
Building Packages, two	0	168	168	sq ft	$ 100	2	$ -	$ 33,600	$ 33,600
Building Elec/Mech	0	168	168	sq ft	$ 75	2	$ -	$ 25,200	$ 25,200
Water Pipe & Ftgs	0	80	80	ft	$ 20	2	$ -	$ 3,200	$ 3,200
Water Hydrant	0	1	1	ea	$ 1,500	2	$ -	$ 3,000	$ 3,000
Sewer Gravity Pipe & Ftgs	0	20	20	ft	$ 20	2	$ -	$ 800	$ 800
Sewer Force Main P&F	0	40	40	ft	$ 20	2	$ -	$ 1,600	$ 1,600
Shipping	2000	54000	146000	lbs	$ 0.40	2	$ 1,600	$ 43,200	$ 116,800
						Total Materials Cost	$ 71,600	$ 188,500	$ 301,100
							Option B	Option C	Option D
Equipment	Qty	Qty	Qty	units	Unit Cost	# LS's			Ext Cost
Pickup (2 each)	2	4	6	wks	$ 300	2	$ 1,200	$ 2,400	$ 3,600
Flatbed	1	2	3	wks	$ 1,000	2	$ 2,000	$ 4,000	$ 6,000
Hydraulic Excavator, Large	0	0	3	wks	$ 3,100	2	$ -	$ -	$ 18,600
Hydraulic Excavator, Medium	0	2	3	wks	$ 1,850	2	$ -	$ 7,400	$ 11,100
Loader	0	1	3	wks	$ 2,600	2	$ -	$ 5,200	$ 15,600
Dump Truck (2 ea)	0	1	1	wks	$ 2,150	2	$ -	$ 4,300	$ 4,300
Forklift	1	2	3	wks	$ 3,000	2	$ 6,000	$ 12,000	$ 18,000
Cement Truck	0	1	1	wks	$ 5,400	2	$ -	$ 10,800	$ 10,800
Fusion Machine	0	1	1	wks	$ 2,000	2	$ -	$ 4,000	$ 4,000
Sewer Pumper Truck	1	1	1	wks	$ 3,500	2	$ 7,000	$ 7,000	$ 7,000
						Total Equipment	$ 16,200	$ 57,100	$ 99,000
							Option B	Option C	Option D
						Subtotal Direct Costs	$ 277,300	$ 719,100	$ 1,011,000
					General Contractor Profit	15%	$ 42,000	$ 108,000	$ 152,000
					Bond & Insurance	3%	$ 8,000	$ 22,000	$ 30,000
					Estimating Contingency	15%	$ 42,000	$ 108,000	$ 152,000
					Inflation	3%	$ 8,000	$ 22,000	$ 30,000
						Construction Subtotal	$ 377,300	$ 979,100	$ 1,375,000
					Project Design and Permitting	9%	$ 34,000	$ 88,000	$ 124,000
					Ellerman Easement Documents		$ -	$ -	$ 10,000
					Construction Administration	9%	$ 34,000	$ 88,000	$ 124,000
					City Administration	5%	$ 19,000	$ 49,000	$ 69,000
							Option B	Option C	Option D
						Estimated Total Cost	$ 464,300	$ 1,204,100	$ 1,702,000

Short Lived Asset Schedule St. Paul Wastewater Lift Station PER VSW Proj #19ER33 31-Dec-19

Five Year Replacements	Opt A	Opt B	Opt C	Opt D			Option A	Option B	Option C	Option D
Equipment	Qty	Qty	Qty	Qty	Units	Unit Cost	Total Cost	Total Cost	Total Cost	Total Cost
Controls & Pump Replace	2	0	0	0	ls	$50,000	$100,000	$0	$0	$0
Mechanical Blowers	2	1	0	0	ea	$3,000	$6,000	$3,000	$0	$0
Lift Sta Pump Rebuild Kits	4	0	0	0	ea	$5,000	$20,000	$0	$0	$0
Controls Rebuild	1	0	0	0	ea	$15,000	$15,000	$0	$0	$0
Portable Submersible Pump	1.25	1.25	1	1	ea	$6,000	$7,500	$7,500	$6,000	$6,000
Computers and Software	1	1	1	1	ea	$3,000	$3,000	$3,000	$3,000	$3,000
Copier/Printer	1	1	1	1	ea	$1,000	$1,000	$1,000	$1,000	$1,000
							$152,500	$14,500	$10,000	$10,000
						Annual Contribution	$30,500	$2,900	$2,000	$2,000

Ten Year Replacements	Opt A	Opt B	Opt C	Opt D						
Equipment	Qty	Qty	Qty	Qty	Units	Unit Cost	Total Cost	Total Cost	Total Cost	Total Cost
Lift Sta Pump Rebuild Kits	4	4	4	4	ea	$5,000	$20,000	$20,000	$20,000	$20,000
Building Int/Ext Paint	104	104	312	312	sq ft	$2.50	$260	$260	$780	$780
Building Heater	2	2	3	3	ea	$2,500	$5,000	$5,000	$7,500	$7,500
SCADA Radios	1	1	1	1	ea	$2,500	$2,500	$2,500	$2,500	$2,500
Pick-Up Truck	1	1	1	1	ea	$35,000	$35,000	$35,000	$35,000	$35,000
Pumper Truck	1	1	1	1	ea	$50,000	$50,000	$50,000	$50,000	$50,000
							$112,760	$112,760	$115,780	$115,780
						Annual Contribution	$11,300	$11,300	$11,600	$11,600

Fifteen Year Replacements	Opt A	Opt B	Opt C	Opt D						
Equipment	Qty	Qty	Qty	Qty	Units	Unit Cost	Total Cost	Total Cost	Total Cost	Total Cost
Lift Station Duplex Pumps	3	3	3	3	ea	$25,000	$75,000	$75,000	$75,000	$75,000
							$75,000	$75,000	$75,000	$75,000
						Annual Contribution	$5,000	$5,000	$5,000	$5,000
Total Annual Contribution, 5, 10, 15 Yr Asset Needs							$46,800	$19,200	$18,600	$18,600

Five Year LS Replacements	Opt A	Opt B	Opt C	Opt D			Option A	Option B	Option C	Option D
Equipment	Qty	Qty	Qty	Qty	Units	Unit Cost	Total Cost	Total Cost	Total Cost	Total Cost
Wet Well Vault Replacement	2	2	2	0	ls	$311,000	$2,021,442	$2,021,442	$2,021,442	$0
5% @ 5 Yrs						Annual Contribution	$404,288	$404,288	$404,288	$0
Total Annual Contribution, 5, 10, 15 Yr Asset Needs (W/ Lift Sta Replacement)							$451,088	$423,488	$422,888	$18,600

Operations and Maintenance Estimate - Options Only 31-Dec-19

Description	Option A	Option B	Option C	Option D
Personnel and Fringe	$ 22,000	$ 20,800	$ 5,200	$ 5,200
Administration	$ 3,720	$ 3,200	$ 1,900	$ 1,900
Insurance	$ 1,800	$ 1,500	$ 1,200	$ 1,050
Energy Costs	$ 2,630	$ 2,260	$ 2,260	$ 2,260
Maintenance/Replacement	$ 46,800	$ 19,200	$ 18,600	$ 18,600
Professional Services	$ 5,100	$ 3,400	$ 2,300	$ 2,300
Miscellaneous	$ 1,000	$ 800	$ 700	$ 700
Total Annual O&M Estimate	$ 83,050	$ 51,160	$ 32,160	$ 32,010

Future Lift Station Replacement Requirement

Description	Option A	Option B	Option C	Option D
Lift Station Replacements (5yr)	$ 404,288	$ 404,288	$ 404,288	$ -
Total Annual W LS Replacement	$ 487,338	$ 455,448	$ 436,448	$ 32,010

APPENDIX D – CITY COUNCIL RESOLUTION IN SUPPORT OF SEWER UPGRADE