

## TECHNICAL MEMORANDUM

TO: MEGGAN UECKER  
FROM: STACEY CLEAR, P.E.  
DATE: MAY 14, 2019  
SUBJECT: WASTEWATER ALTERNATIVES FOR THE  
SEKIU/CLALLAM BAY REGION  
CLALLAM COUNTY, WASHINGTON  
G&O #18486.00

---

In the fall of 2018, a grant/loan application was submitted to the Department of Ecology by Clallam County for the collection system capital improvement projects (CIPs) recommended in the October 2018 *Clallam Bay/Seki General Sewer/Wastewater Facilities Plan* (Plan). Ecology has earmarked \$6.2 million in grants and loans for the County to fund these collection system projects (see Attachment A for locations); however, Ecology has requested an additional evaluation of alternatives to the original capital projects to ensure that they are the most cost-effective and appropriate solutions. Clallam County has requested that Gray & Osborne assist them with preparing a technical memorandum that further evaluates wastewater conveyance alternatives for the Clallam Bay and Sekiu areas. This memorandum provides a discussion of the alternatives analyzed, the benefits/disadvantages for each, and a comparison of costs for the various alternatives.

### WASTEWATER CONVEYANCE ALTERNATIVES

The original Plan recommended replacement of sewer conveyance pipes within the Sekiu and Clallam Bay wastewater systems due to significant infiltration and inflow (I/I) and the fact that the pipes are beyond their useful life. Alternatives to replacing the pipes identified in the Plan were evaluated to determine if a more economical approach could be identified to solve the I/I issues. The alternatives reviewed for this analysis include grinder pumps, individual on-site septic systems, a large on-site sewage system with a drainfield, and trucking wastewater from a community tank. In addition, this memorandum provides a review of the potential for phasing the original conveyance replacement projects to: (1) allow time to determine if replacing or rehabilitating limited areas of the conveyance system contributed significantly to I/I reduction, and (2) to complete additional closed-circuit television (CCTV) inspection and flow monitoring to further define I/I issues in lieu of completing the CIP projects as defined. The following briefly discusses each alternative. It should be noted that this analysis assumes that each alternative is feasible (i.e., adequate soils are present for drainfields, there is sufficient



Technical Memorandum – Wastewater Alternatives  
for the Sekiu/Clallam Bay Region  
May 14, 2019

room on each lot for a drainfield, etc.). If one of the alternatives is chosen, additional research should be provided to ensure the alternative is truly feasible in the field.

### **On-Site Septic Systems**

One alternative to replacing conveyance systems includes abandoning the current system of gravity mains and lift stations and replacing them with individual on-site septic systems (OSS) at each household or business. OSS typically include a septic tank and either a gravity or pressure drainfield. OSS are appropriate for areas with well-draining soils and low groundwater tables. Based on soil conditions and wastewater strength, a mound system, sand filter system, biofilters, or an aerobic treatment unit may be required. OSS would require land for the tank and drainfield to be available on the existing properties. Maintenance of these systems is typically provided by the homeowner which would include pumping the septic tank every 3 to 5 years. It should be noted that soils within the region are typically silt loam and loam which can be considered “moderately well drained” per the USDA Natural Resources Conservation Service. However, the 1972 Comprehensive Plan noted that generally, the Clallam Bay and Sekiu regions were not conducive for septic systems.

### **Large On-Site Sewage System/Wastewater Trucking**

Large on-site sewage systems (LOSS) are similar to individual on-site septic systems, with the exception that the effluent from each individual septic tank is directed to one community treatment tank and dosing tank for drainfield disposal. An alternative to drainfield disposal includes trucking the effluent to a wastewater treatment plant located off site. LOSS with flows between 3,500 and 100,000 gallons per day (gpd) are regulated by the Department of Health. Similar to the OSS, a large amount of land would be necessary to site a drainfield. Adequate soil and groundwater conditions would need to be present as well. The drainfield should be sized for four segments; two would be necessary to treat the wastewater on a daily basis while the third would be in a resting condition. The fourth segment would be held in reserve in case one of the segments should fail. This analysis assumes approximately 2 acres would need to be acquired for a flow of 6,000 gpd. If effluent is trucked from a community tank instead of being pumped to a drainfield, a significant cost would need to be assigned to trucking the wastewater to a willing facility.

For the purpose of this analysis, conveyance between the homeowner’s septic tank and the community drainfield was assumed to be a small-diameter pressurized high-density polyethylene (HDPE) pipe. It is presumed that the use of this fused pipe would allow for a large reduction in I/I in comparison to using the existing gravity conveyance system. A vacuum system could also be utilized; however, it was presumed that this type of



Technical Memorandum – Wastewater Alternatives  
for the Sekiu/Clallam Bay Region  
May 14, 2019

conveyance system would be cost prohibitive for the region and therefore was dismissed from this analysis. Maintenance of a LOSS would include pumping of solids from the individual septic tanks as well as maintenance of the drainfield dosing pumps, small-diameter service lines, and equipment located within the public right-of-way.

### **Grinder Pumps**

The grinder pump alternative presumes the use of individual grinder pump tanks located at each property and a small-diameter pressure line that would convey effluent downstream. Each homeowner would have a small, approximately 1-horsepower, grinder pump in a 100- to 237-gallon storage tank located on their property. The use of grinder pumps may help minimize the use of existing lift stations by pumping wastewater from each house to a gravity system located in a sewer basin downstream, thereby eliminating the need for intermediate lift stations. The use of an HDPE pressure line would help minimize I/I issues as well. Maintenance of grinder pump systems would potentially include maintenance of the pumps, replacement of the pumps at the end of their useful life (approximately 20 years), and pump control panel problems. During a significant power outage, each tank may need to be individually pumped or run with a portable generator.

### **Phased Conveyance Replacements**

In addition to looking at new septic-related systems, a review of phasing the previous CIPs recommended in the Plan was conducted for the purpose of determining a potential economic benefit by taking a monitored, phased approach. The CIP replacement projects were initially recommended due to the age of pipe and the potential for high I/I. The phased approach would include prioritizing the projects by the basins with the highest I/I rates and replacing only the pipes/manholes presumed to have the highest related I/I. Post-construction flow monitoring would then follow to determine if a significant I/I reduction resulted. If successful, the County could then defer other pipe replacements (necessary eventually due to their age) to subsequent years when additional funding might be available. The phased approach includes the following phases listed in Table 1.



Technical Memorandum – Wastewater Alternatives  
for the Sekiu/Clallam Bay Region  
May 14, 2019

**TABLE 1**  
**Phased Approach to Original CIPs**

<b>Basin <sup>(1)</sup></b>	<b>Original CIP ID</b>	<b>Conveyance Description</b>
General Sekiu/Clallam Bay Region	CIP 1	<b>Phase I:</b> Replace 81 cleanout caps.
Sekiu Airport Road Basin (Contributes 31% I/I to WWTP)	CIP 2 CIP 9	<b>Phase I:</b> Repair two side sewers, disjointed pipe, remove connected downspouts, post-project flow monitoring. <b>Phase II:</b> CCTV 3,475 feet pipe on Sekiu Airport Road. <b>Phase III:</b> Replace 1,340 feet pipe.
Sekiu Lift Station Basin (Contributes 35% I/I to WWTP)	CIP 6 CIP 8	<b>Phase I:</b> 3 manhole replacements, replace pipe between MH 7.05 and MH 7.03; post-project flow monitoring downstream at MH 7.03. <b>Phase II:</b> Replace remaining 3,020 feet pipe.
Snob Hill Lift Station Basin (Contributes 16% I/I to WWTP)	CIP 3 CIP 10	<b>Phase I:</b> Replace 5 manholes; post-project review of LS run times to check for improvement. <b>Phase II:</b> Replace 4,745 feet pipe.
Middle Point Lift Station Basin (Contributes 14% I/I to WWTP)	CIP 5	<b>Phase I:</b> Flow monitoring at Coho Resort. <b>Phase II:</b> Owners or County repair Coho Resort I/I issues if issue deemed to be located within the Resort during Phase I monitoring. <b>Phase III:</b> Repair 2 side sewers, replace 4 manholes and 120 feet new pipe between MH 13.05 and MH 13.06.
West End Lift Station Basin (Contributes 3% I/I to WWTP)	CIP 11	<b>Phase IV (Deferred Project):</b> Replace 1,580 feet pipe.
Clallam Bay WWTP Basin	CIP 4 CIP 7	<b>Phase IV (Deferred Project):</b> Replace area drain at school, replace 2 manholes.

(1) Shown in order of ranked priority, primarily based upon the estimated I/I contribution to each basin.

It should be noted that Table 1 prioritizes projects primarily based upon I/I. Should the latter phases not be constructed, the County will still need to address aging pipes in the near future. In addition, by phasing projects, the economy of scale is lost so each project



Technical Memorandum – Wastewater Alternatives  
for the Sekiu/Clallam Bay Region  
May 14, 2019

has a significant mobilization/demobilization cost associated with it. It should also be noted that expenses are presumed to increase by 3 percent each year (typical inflation assumption for construction costs), thereby causing an overall increase above the original anticipated cost of \$6.2 million should all phases of each project be constructed.

### **BENEFITS AND DISADVANTAGES OF WASTEWATER ALTERNATIVES**

A qualitative list of benefits and disadvantages of the wastewater alternatives analyzed is presented in Table 2.



**TABLE 2**

**Benefits and Disadvantages for the Clallam Bay/Sekiu Wastewater Alternatives**

Alternative	Benefits	Disadvantage/Issues
<p><b>Individual On-Site Septic System (OSS):</b> Individual septic tanks pumped to an on-site drainfield.</p>	<ul style="list-style-type: none"> <li>• Flow reduced to WWTP.</li> <li>• Eliminates need to upgrade existing conveyance pipes/lift stations.</li> </ul>	<ul style="list-style-type: none"> <li>• Questionable Feasibility: 1972 Plan noted soils were not conducive for septic systems.</li> <li>• Groundwater Concerns: USDA soil map and description indicating groundwater between 35" and 50" from surface (whereas the typical total depth of a buried drainfield is 24" to 60").</li> <li>• May require installation of mound drainfield because of soil conditions.</li> <li>• Likely insufficient space available on many properties.</li> <li>• Homeowners take on maintenance and costs (pumping tank every 3 to 5 years)</li> </ul>
<p><b>Large On-Site Sewage System (LOSS), Drainfield:</b> Individual septic tanks. Septic tank effluent pumped to community septic tank(s) with drainfield(s) via small-diameter HDPE force main.</p>	<ul style="list-style-type: none"> <li>• Flow potentially reduced to WWTP.</li> <li>• Eliminates need to upgrade existing conveyance pipes/lift stations.</li> </ul>	<ul style="list-style-type: none"> <li>• Questionable Feasibility: 1972 Plan noted soils were not conducive for septic systems.</li> <li>• Groundwater Concerns: USDA soil map and description indicating groundwater between 35" and 50" from surface (whereas the typical total depth of a buried drainfield is 24" to 60").</li> <li>• Availability of suitable large land area needed for the drainfield.</li> <li>• May require installation of mound drainfield due to soil conditions.</li> <li>• Homeowners or County to take on maintenance and costs of individual septic tanks (pumping tanks every 3 to 5 years).</li> <li>• Land acquisition cost.</li> <li>• Overall highest capital costs compared to a LOSS that is trucked or OSS.</li> </ul>



Technical Memorandum – Wastewater Alternatives  
 for the Sekiu/Clallam Bay Region  
 May 14, 2019

**TABLE 2 – (continued)**

**Benefits and Disadvantages for the Clallam Bay/Sekiu Wastewater Alternatives**

Alternative	Benefits	Disadvantage/Issues
<p><b>Large Community Tank, Wastewater Trucked:</b> Individual septic tanks. Septic tank effluent pumped via a small-diameter HDPE force main to a community holding tank with truck delivery to a WWTP.</p>	<ul style="list-style-type: none"> <li>• Flow potentially reduced to WWTP.</li> <li>• Eliminates need to upgrade existing conveyance pipes/lift stations.</li> <li>• Lower capital costs than a LOSS with a drainfield or OSS.</li> </ul>	<ul style="list-style-type: none"> <li>• Cost of trucking (County may need to purchase truck and add an FTE).</li> <li>• Finding a suitable location for the community tank.</li> <li>• Homeowners or County to take on maintenance and costs of individual septic tanks (pumping tank every 3 to 5 years).</li> </ul>
<p><b>Grinder Pumps:</b> Individual grinder pumps at each house. Wastewater conveyed via a small-diameter HDPE force main to a downstream sewer basin.</p>	<ul style="list-style-type: none"> <li>• Flow potentially reduced to WWTP (if yard drains and I/I in existing collection system eliminated).</li> <li>• Eliminates need to upgrade existing conveyance pipes.</li> <li>• No need to build a drainfield.</li> <li>• May help eliminate lift stations.</li> </ul>	<ul style="list-style-type: none"> <li>• Homeowners or County to provide maintenance of pumps.</li> <li>• Extended power outages will necessitate limited staff to pump out each grinder pump basin. (Grinder pumps opposed by operations staff for this reason.)</li> <li>• Annual inspections needed (cost for County staff or service contract).</li> <li>• Electrical needs from the homeowner (junction box outside house, monthly electrical costs).</li> <li>• Will require additional staffing (additional fractional FTEs); due to very remote location, third-party vendors cannot provide this service economically.</li> </ul>



Technical Memorandum – Wastewater Alternatives  
 for the Sekiu/Clallam Bay Region  
 May 14, 2019

**TABLE 2 – (continued)**

**Benefits and Disadvantages for the Clallam Bay/Sekiu Wastewater Alternatives**

Alternative	Benefits	Disadvantage/Issues
<b>Original Conveyance CIPs, Phased</b>	<ul style="list-style-type: none"> <li>• Targets I/I, evaluating effectiveness before spending money on additional projects.</li> <li>• Lower individual burden to homeowner.</li> </ul>	<ul style="list-style-type: none"> <li>• Spot projects do not fix other aging pipes so there may be a potential for new I/I problem areas in the future.</li> <li>• Costs increased compared to doing them all at once (i.e., lose the economy of scale).</li> </ul>
<b>Original Conveyance CIPs</b>	<ul style="list-style-type: none"> <li>• Allows smaller projects to be grouped together for a more economical cost (i.e., less mobilization costs, etc.).</li> <li>• Most aging pipe is replaced (compared to spot projects which correct I/I identified now but may have more I/I problems with remaining pipes).</li> <li>• Lower individual burden to homeowner.</li> </ul>	<ul style="list-style-type: none"> <li>• High capital cost-to-ERU ratio.</li> </ul>



Technical Memorandum – Wastewater Alternatives  
for the Sekiu/Clallam Bay Region  
May 14, 2019

As noted earlier, the feasibility of on-site systems is questionable. The 1972 Comprehensive Plan noted that the Clallam Bay and Sekiu regions were generally not conducive for septic systems and hence recommended a conveyance system consisting of gravity sewer mains and lift stations. In general, the County should be concerned about the feasibility of on-site systems due to soils, groundwater tables, and availability of land. Ongoing maintenance costs associated with each of the new alternatives listed should also be considered. Staff is currently limited to only two personnel (which is insufficient to provide proactive maintenance) so additional maintenance beyond what is necessary today should be a factor in determining appropriate steps forward.

### **COST ANALYSIS**

The preliminary cost estimates for each alternative are provided in Table 3. The costs presented herein address only capital costs and do not include future maintenance costs. For the phased projects, an estimated annual 3 percent increase in construction costs was added.

As shown in Table 3, in a basin-by-basin comparison, each of the new alternatives (OSS, LOSS, community tank with trucked wastewater, and grinder pumps) is more expensive than the original CIP project. The phased CIP approach is anticipated to result in a total project cost of \$7.2 million, resulting in \$1 million more than the original cost of \$6.2 million due to an anticipated 3 percent annual increase in construction costs and the loss of an economy of scale. These projects could be slightly reduced in cost if alternative pipe rehabilitation methods such as cured-in-place pipe (CIPP) or sliplining were conducted. The feasibility of these pipe rehabilitation methods would be reviewed during the design phase. One advantage to these alternative pipe replacement methods is that they would allow for construction during all times of the year. However, consideration should be given to the effort needed to replace side sewer connections since with most trenchless pipe replacement methods, side sewer connections will need to be made via open-cut construction. It should be noted that if the Phase I projects are successful, the County may realize an immediate cost savings by deferring the additional phases to another time. However, the numerous aged pipes would remain in use and would still need to be replaced at some point in the near future.

The CIP costs in Table 3 relate only to conveyance upgrades. However, the OSS, LOSS, community tank, and grinder pump alternatives would impact the need to provide lift station upgrades. Table 4 includes future lift station upgrade costs for the Sekiu system in addition to the cost of conveyance improvements. Additional cost factors to consider are listed at the bottom of the table including future maintenance costs and qualitative impact on costs associated with upgrading/replacing the treatment plant. As seen in Table 4, it appears that with the exception of the Snob Hill and West End Lift Station



Technical Memorandum – Wastewater Alternatives  
for the Sekiu/Clallam Bay Region  
May 14, 2019

Basins, the original CIP pipe replacement costs and lift station upgrade costs are less expensive than the OSS, LOSS, trucked wastewater, or grinder pump alternatives. The costs for installing all grinder pump systems in the Snob Hill and West End Lift Station Basins is a slightly lower cost than the planned pipe replacement and lift station upgrades for these basins. However, operations staff oppose this option due to the concerns with maintenance of grinder pumps and the numerous power outages in the region, requiring an increase in staffing.

Overall, due to cost, feasibility, and/or maintenance concerns, it is recommended that the original conveyance system be replaced, whether it is in a phased approach or whether it is installed as originally intended in the Plan.



**TABLE 3**  
**Clallam Bay/Sekiú Wastewater Alternatives Costs**

Basin <sup>(1)</sup>	Original CIP ID	Original Cost	OSS Cost	Community Tank (Trucked)	LOSS (Drainfield)	Grinder Pumps	Conveyance (Phase I)	Conveyance (Phase II) <sup>(2)</sup>	Conveyance (Phase III) <sup>(2)</sup>	Conveyance (Phase IV)	Total Conveyance Cost All Phases Conducted	Conveyance Description	Difference from Original CIPs (Conveyance Only)
General Sekiú/Clallam Bay Region	CIP 1	\$152,000	—	--	--	--	\$134,000	--	--	--	\$134,000	<b>Phase I:</b> Replace 81 cleanout caps.	Moved CCTV Sekiú Airport Road to Sekiú Airport Road Basin project.
Sekiú Airport Rd Basin (Contributes 31% I/I to WWTP)	CIP 2 CIP 9	\$842,000	\$1,870,000	\$1,773,000	\$1,966,000	\$1,485,000	\$379,000	\$19,000	\$864,000		\$1,262,000	<b>Phase I:</b> Repair two side sewers, disjointed pipe, remove downspouts, post-project flow monitoring. <b>Phase II:</b> CCTV 3,475 ft on Sekiú Airport Road. <b>Phase III:</b> Fix 1,340 ft pipe.	Added post-project flow monitoring and removing downspouts to Phase I, increased later phased project costs 3% per year.
Sekiú LS Basin (Contributes 35% I/I to WWTP)	CIP 6 CIP 8	\$1,721,000	\$4,187,000	\$3,441,000	\$4,409,000	\$2,756,000	\$269,000	\$1,611,000			\$1,880,000	<b>Phase I:</b> 3 MH replacements, replace pipe between MH 7.05 and MH 7.03; post-project flow monitoring downstream at MH 7.03. <b>Phase II:</b> Fix remaining 3,020 ft pipe.	Moved replacement of pipes between MH 7.05 and MH 7.03 to Phase I, added post-project flow monitoring, increased later phased project costs 3% per year.
Snob Hill LS Basin (Contributes 16% I/I to WWTP)	CIP 3 CIP 10	\$2,575,000	\$4,475,000	\$3,723,000	\$4,761,000	\$3,020,000	\$134,000	\$2,668,000			\$2,802,000	<b>Phase I:</b> Replace 5 MHs; post-project review of LS run times to check for improvement. <b>Phase II:</b> Fix 4,745 ft pipe.	Increased later phased project costs 3% per year.
Middle Point LS Basin (Contributes 14% I/I to WWTP)	CIP 5	\$93,000	\$1,114,000	\$1,289,000	\$1,620,000	\$1,217,000	\$15,000		\$105,000		\$120,000	<b>Phase I:</b> Flow monitoring for just Coho Resort. <b>Phase II:</b> Owners repair Coho Resort. <b>Phase III:</b> Fix 2 side sewers, 4 MHs and 120 ft new pipe between MH 13.05 and MH 13.06.	Specific monitoring of just Coho Resort, increased later phased project costs 3% per year.
West End LS Basin (Contributes 3% I/I to WWTP)	CIP 11	\$719,000	\$1,097,000	\$930,000	\$1,292,000	\$777,000				\$834,000	\$834,000	<b>Phase IV (Deferred Project):</b> Fix 1,580 ft pipe.	Increased phased project costs 3% per year.
Clallam Bay WWTP Basin	CIP 4 CIP 7	\$142,000	—	--	--	--				\$166,000	\$166,000	<b>Phase IV (Deferred Project):</b> Replace area drain at school, 2 MH replacements.	Increased phased project costs 3% per year.
<b>Total</b>		<b>\$6,244,000</b>	<b>\$12,743,000</b>	<b>\$11,156,000</b>	<b>\$14,048,000</b>	<b>\$9,255,000</b>	<b>\$931,000</b>	<b>\$4,298,000</b>	<b>\$969,000</b>	<b>\$1,000,000</b>	<b>\$7,198,000</b>		

(1) Ranked in order of priority primarily based upon estimated I/I in each basin.  
(2) Yellow cells represent where costs could potentially be lower with slipline/CIPP.



Technical Memorandum – Wastewater Alternatives  
for the Sekiu/Clallam Bay Region  
May 14, 2019

**TABLE 4**

**Sekiu Wastewater Alternatives Comparison**

Basin <sup>(1)</sup>	Original Cost	Phased Original Cost (Total of All Phases)	OSS Cost	Community Tank (Trucked)	LOSS Cost (Drainfield)	Grinder Pumps
<b>Sekiu Airport Road Basin (Contributes 31% I/I to WWTP)</b>						
Conveyance	\$842,000	\$1,262,000	\$1,870,000	\$1,773,000	\$1,966,000	\$1,485,000
Lift Station	N/A	N/A	N/A	N/A	N/A	N/A
<b>Total Capital Cost</b>	<b>\$842,000</b>	<b>\$1,262,000</b>	<b>\$1,870,000</b>	<b>\$1,773,000</b>	<b>\$1,966,000</b>	<b>\$1,485,000</b>
<b>Sekiu Lift Station Basin (Contributes 35% I/I to WWTP)</b>						
Conveyance	\$1,721,000	\$1,880,000	\$4,187,000	\$3,441,000	\$4,409,000	\$2,756,000
Lift Station	\$880,000	\$880,000				
<b>Total Capital Cost</b>	<b>\$2,601,000</b>	<b>\$2,760,000</b>	<b>\$4,187,000</b>	<b>\$3,441,000</b>	<b>\$4,409,000</b>	<b>\$2,756,000</b>
<b>Snob Hill Lift Station Basin (Contributes 16% I/I to WWTP)</b>						
Conveyance	\$2,575,000	\$2,802,000	\$4,475,000	\$3,723,000	\$4,761,000	\$3,020,000
Lift Station	\$1,009,000	\$1,009,000				
<b>Total Capital Cost</b>	<b>\$3,584,000</b>	<b>\$3,811,000</b>	<b>\$4,475,000</b>	<b>\$3,723,000</b>	<b>\$4,761,000</b>	<b>\$3,020,000</b>
<b>Middle Point Lift Station Basin (Contributes 14% I/I to WWTP)</b>						
Conveyance	\$93,000	\$120,000	\$1,114,000	\$1,289,000	\$1,620,000	\$1,217,000
Lift Station	\$903,000	\$903,000				
<b>Total Capital Cost</b>	<b>\$996,000</b>	<b>\$1,023,000</b>	<b>\$1,114,000</b>	<b>\$1,289,000</b>	<b>\$1,620,000</b>	<b>\$1,217,000</b>
<b>West End Lift Station Basin (Contributes 3% I/I to WWTP)</b>						
Conveyance	\$719,000	\$834,000	\$1,097,000	\$930,000	\$1,292,000	\$777,000
Lift Station	\$947,000	\$947,000				
<b>Total Capital Cost</b>	<b>\$1,666,000</b>	<b>\$1,781,000</b>	<b>\$1,097,000</b>	<b>\$930,000</b>	<b>\$1,292,000</b>	<b>\$777,000</b>
<b>Additional Cost-Related Considerations</b>						
	<ul style="list-style-type: none"> <li>Original WWTP upgrade costs.</li> </ul>	<ul style="list-style-type: none"> <li>Original WWTP upgrade costs.</li> </ul>	<ul style="list-style-type: none"> <li>Private septic pumping costs.</li> <li>Reduced WWTP upgrade and operating costs.</li> </ul>	<ul style="list-style-type: none"> <li>Reduced WWTP upgrade and operating costs.</li> <li>Trucking/disposal costs.</li> <li>Private septic pumping costs.</li> </ul>	<ul style="list-style-type: none"> <li>Reduced WWTP upgrade and operating costs.</li> <li>Private septic pumping costs.</li> </ul>	<ul style="list-style-type: none"> <li>Reduced WWTP upgrade and operating costs.</li> <li>Annual inspection costs.</li> <li>County/homeowner maintenance costs of grinder pumps.</li> </ul>

(1) Shown in order of ranked priority primarily based upon estimated I/I in each basin.

**ATTACHMENT A**  
**CAPITAL IMPROVEMENT PROJECT LOCATIONS**



### LEGEND

-  CIP 1: Cleanout Replacements
-  CIP 5: Middle Pt LS I/I Imp. (MH Repair)
-  CIP 5: Middle Pt LS I/I Imp. (Spot Pipe Repair)
-  CIP 5: Middle Pt LS I/I Imp. (Side Sewer Repair)
-  CIP 15: Middle Point LS
-  Manhole
-  Gravity Sewer Pipe
-  Force Main
-  Parcel
-  UGA Boundary

### CLALLAM BAY/SEKIU GENERAL SEWER/WASTEWATER FACILITIES PLAN

FIGURE 8-1  
CIPS 1, 5, 15  
(MIDDLE POINT)





**LEGEND**

- CIP 1: Cleanout Replacements
- CIP 1: I/I Repair Program (CCTV)
- CIP 6: Sekiu LS Basin I/I Imp. (MH Repair)
- CIP 6: Sekiu LS Basin I/I Imp. (Spot Pipe Repair)
- CIP 8: Sekiu LS Basin Pipe Replacements
- CIP 9: Sekiu Airport Rd Basin Pipe Replacements
- CIP 17: Sekiu LS
- Manhole
- Gravity Sewer Pipe
- Force Main
- Pump station
- Sewer Treatment Plant
- Parcel
- UGA Boundary

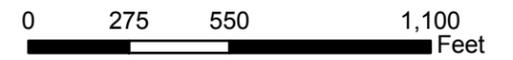
**CLALLAM BAY/SEKIU  
GENERAL SEWER/WASTEWATER  
FACILITIES PLAN**

FIGURE 8-2  
CIPS 1, 6, 8, 9, 17  
(SEKIU LS / SEKIU AIRPORT RD BASINS)

**Gray & Osborne, Inc.**  
CONSULTING ENGINEERS

Revised 5-13-19

L:\ClallamCo\18486 Clallam Bay Sekiu GSP WWFPGIS\Fig 8-2 CIPs front st.mxd



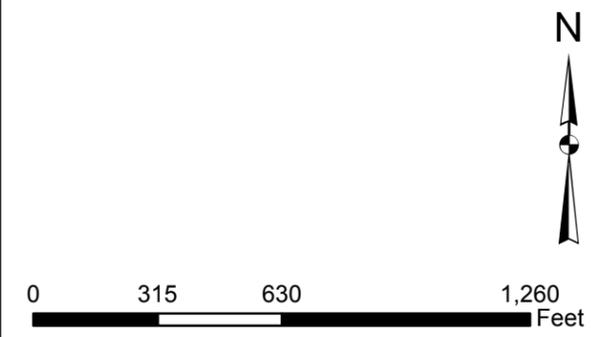
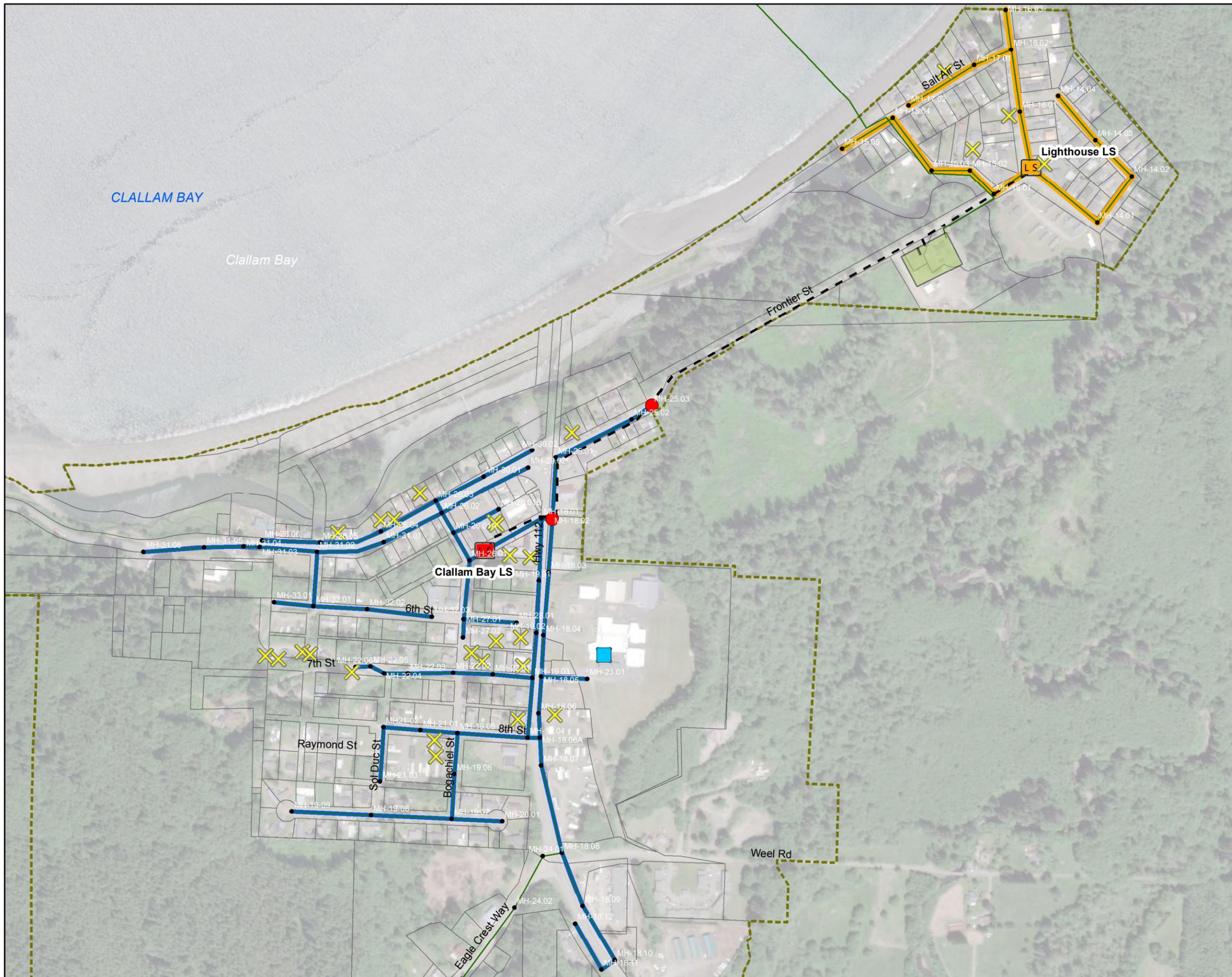
**LEGEND**

-  CIP 1: Cleanout Replacements
-  CIP 1: I/I Repair Program (CCTV)
-  CIP 2: Funk and Ballard Side Sewer Replacement
-  CIP 2: Funk and Ballard Pipe Repairs (Side Sewer Repair)
-  CIP 2: Funk and Ballard Pipe Repairs (Spot Pipe Repair)
-  CIP 3: Snob Hill LS Basin I/I Impvts (Ph. I - MH Repair)
-  CIP 9: Sekiu Airport Rd Basin Pipe Replacements
-  CIP 10: Snob Hill LS Basin I/I and Pipe Impvt (Ph. II)
-  CIP 11: West End LS Basin Pipe Replacements
-  CIP 14: West End LS
-  CIP 16: Snob Hill LS
-  Manhole
-  Gravity Sewer Pipe
-  Force Main
-  Parcel
-  UGA Boundary

**CLALLAM BAY/SEKIU  
GENERAL SEWER/WASTEWATER  
FACILITIES PLAN**

FIGURE 8-3  
CIPS 1, 2, 3, 9, 10, 11, 14, 16  
(SNOB HILL LS / SEKIU AIRPORT RD./  
WEST END LS BASINS)





**LEGEND**

-  CIP 1: Cleanout Replacements
-  CIP 3: Disconnect Area Drain
-  CIP 7: Clallam Bay I/I Impvt (MH Repair)
-  CIP 12: Clallam Bay LS Basin Pipe Replacements
-  CIP 13: Lighthouse LS Basin Pipe Replacements
-  CIP 19: Clallam Bay LS
-  CIP 20: Lighthouse LS
-  Manhole
-  Gravity Sewer Pipe
-  Force Main
-  Pump station
-  Sewer Treatment Plant
-  Parcel
-  UGA BOUNDARY

**CLALLAM BAY/SEKIU  
GENERAL SEWER/WASTEWATER  
FACILITIES PLAN**

FIGURE 8-4  
CIPS 1, 3, 7, 12, 13, 19, 20  
(CLALLAM BAY)



**Gray & Osborne, Inc.**  
CONSULTING ENGINEERS

L:\Clallam\Col18486 Clallam Bay Sekiu GSP WWFP\GIS\Fig 8-4 CIP clallam.mxd