Technical Memorandum

Date:	December 1, 2016		
To:	Eric Hansen, City of Stevenson		
Cc:	File		
From:	Hunter Bennett-Daggett, P.E. Cynthia L. Bratz, P.E.	***Reviewed by:***	Jim Santroch, PE
Project:	General Sewer Plan Update	***Project Number:***	135-48600-16001
Subject:	Pretreatment and Source Control Alternatives		

The purpose of this memorandum is to address Task 15 – Industrial Waste Survey (from our contract scope of work), which states:

> "This task involves identifying and characterizing major sources of high strength wastewater. It also includes a preliminary assessment of source control and pretreatment alternatives for the major sources and preliminary opinions of probable cost for implementing pretreatment improvements."

This TM provides a summary of pretreatment and source control alternatives for accommodating high strength wastewater in the City of Stevenson (the City), and to determine whether on-site pretreatment or treatment at the Stevenson Wastewater Treatment Plant (WWTP) is more cost effective.

BACKGROUND

Historically the majority of sanitary sewer flow in the City has been generated by residential users and light commercial users which typically generate lower strength wastewater comparable to residential wastewater. However, the regional growth of the beverage industry, including breweries, wineries, distilleries, cider makers, and bottlers, has brought new, high strength dischargers to the City. Beverage industries often discharge wastewater that is high in biochemical oxygen demand (BOD) due to the high sugar and/or alcohol content of the products, and depending on pretreatment and housekeeping employed by the industry may also discharge high levels of total suspended solids (TSS). As a result, these users can have a disproportionate impact on the downstream wastewater treatment plant (WWTP), and it is important to evaluate the most efficient and cost-effective method for the City to accommodate these users while maintaining compliance with their wastewater discharge permit.

HIGH STRENGTH WASTEWATER SAMPLING PROGRAM

Tetra Tech worked with the City to develop a sampling plan focusing on locations with potentially high wastewater strength discharge. This sampling plan was executed by the City between August 30th and September 30th 2016. In total, 67 samples were collected at seven different locations:

- Skamania Lodge, which is the largest single discharger to the City's wastewater system
- Fairgrounds Pump Station, one of two pump stations delivering flow to the WWTP

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- Jester & Judge Cider, which produces hard cider as well as operating as a contract production facility (as LDB Beverage) for other beverage companies without their own large-scale production facilities
- Kanaka Pump Station, which receives flow from Jester & Judge Cider
- The Waterfront Building that currently houses Backwoods Brewing Company and Skunk Brothers Spirits and which is considered a likely site for additional beverage industry expansion
- Walking Man Brewing, which operates both a brewery and an on-site brew pub serving food
- Rock Creek Pump Station, the second pump station delivering flow to the WWTP and serving the majority of the City

Figure 1 shows the City's wastewater system and identifies locations in the system that were sampled. At each location, composite samplers were set to collect samples every 15 minutes, and each composite sample was collected after 24 hours and sent to a certified laboratory for analysis. At the time the samples were collected, water temperature and pH were also recorded. In order to estimate total flow, pump run times, water meter readings, or flow meter readings were also recorded at the start and finish of each sampling period. In general, samples were collected four times each week.

Sampling data for the WWTP are collected as part of normal operations; pH and effluent flow are recorded each day, while BOD and TSS are typically sampled and recorded twice each week. For each day of the sampling program, relevant data from the WWTP were compiled along with the sampling program results for comparison purposes.

SAMPLING PROGRAM RESULTS

Sampling results in both concentration and load are described in this section.

Concentration

Table 1 summarizes the concentration sampling results for Skamania Lodge and the three beverage producer locations. For each sampling location, the minimum, maximum, and average concentration is listed; the number of data points ranged from seven (for the Waterfront Building) up to 16 (for Skamania Lodge). The results for the WWTP are included for comparison purposes. Results for the pump stations have not been included in this table or used for further analysis. Concentration data from the pump stations did not correspond well to same-day influent samples at the WWTP, possibly due to variations in sample timing.

Skamania Lodge includes both a hotel and a restaurant, and its wastewater strength would typically be expected to be approximately twice that of residential wastewater; the data show that it is within this range. Of the three beverage producer sample locations, Jester & Judge Cider / LDB Beverage (J&J) produces the highest strength and volume of wastewater and also shows the highest variability in volume and strength, possibly due to its role as a contract facility handling products from other beverage companies in addition to normal variation in flow and load as part of the bottling/canning process. J&J's average concentration of BOD was more than six times higher than the levels observed at the WWTP, and its average TSS concentrations was more than four times higher. In addition, J&J wastewater showed wide swings in pH, ranging from 4.9 to 12.6. Walking Man Brewery (WMB) and the Waterfront Building both produced high strength wastewater, with concentrations three and four times higher than the WWTP influent average, respectively. In addition, both of these dischargers showed significant spikes in BOD and COD but less variability in TSS.

Table 1. High Strength Wastewater Sampling Results - Concentration

	BOD (mg/L)	COD (mg/L)	TSS (mg/L)	NH3-N (mg/L)	TP mg/L)	Total FOG (mg/L)	pH	Water Temp (°F)	Flow (gpd)
Skamania Lodge									
Minimum	251	450	88	21.3		25	5.5	68	45,972
Maximum	672	1,370	324	21.3		135	6.8	93	77,538
Average	440	808	196	21.3		63	6.3	81	61,043
Jester & Judge Cider / LDB Beverage									
Minimum	361	860	60				4.9	63	1,646
Maximum	19,600	59,600	21,200				12.6	115	17,952
Average	5,922	17,407	3,343				8.6	84	8,645
Waterfront Building / Backwoods Brewing / Skunk Brothers Spirits									
Minimum	1,200	1,970	106				7.6	66	2,178
Maximum	5,730	17,800	1,240				12.6	103	3,944
Average	3,564	6,597	545				10.3	77	2,915
Walking Man Brewery									
Minimum	726	1,390	66	3.9	5.2		4.6	62	1,623
Maximum	7,550	34,700	754	3.9	5.2		6.7	73	4,204
Average	2,903	7,288	285	3.9	5.2		5.7	68	2,582
Wastewater Treatment Plant									
Minimum	546		390				6.6		53,000
Maximum	1,753		2,180				9.1		152,000
Average	869		808				7.5		115,000
Typical Residential Wastewater[a]									
Minimum	110	250	25	12	4	50			
Maximum	350	800	85	45	12	100			
Average	190	430	210	25	7	90			

a. Based on low, average, and high strength domestic wastewater per *Wastewater Engineering, 4th Edition*, Metcalf & Eddy, 2003

Load

Table 2 shows average loading results for each sampling site and the WWTP, based on the flows observed during the sampling periods. In general, loading is a more useful metric for assessing the impact of wastewater strength at the WWTP, as it incorporates both the relative strength and volume of wastewater from a discharger.

Table 2. High Strength Wastewater Sampling Results - Loading

Sampling Location	Average BOD (ppd)	Average COD (ppd)	Average TSS (ppd)	Average NH3-N (ppd)	Average TP (ppd)	Average Total FOG (ppd)	Average Flow (gpd)
Skamania Lodge	223	411	101	9.3		33	61,043
Jester & Judge Cider / LDB Beverage	175	411	57				8,645
Waterfront Bldg / Backwoods Brewing / Skunk Brothers Spirits	73	146	12				2,915
Walking Man Brewery	60	146	6	0.1	0.2		2,582
Wastewater Treatment Plant	903		831				115,000

In the City's 1991 Wastewater Facilities Plan, Skamania Lodge's projected loading for the end of the planning period (2011) was estimated to be 92 ppd average and 132 ppd maximum month, based on a concentration of 200 mg/L. The average loading from Skamania Lodge during the sampling period was 1.69 times higher than this projected maximum month.

All three beverage producer sample locations contribute significant BOD loadings, with J&J contributing a loading more than twice as high as the Waterfront Building and WMB. However, for TSS loadings only J&J appears to be a significant contributor; its average TSS loadings are about five and 10 times higher than the Waterfront Building and WMB, respectively.

Table 3 shows the range of percent contributions of each sampling location to the total flow and loading at the WWTP, using the average loadings shown from Table 2. For each source, the percentages are calculated based on 25 percent and 75 percent of the loading range divided by the average loading at the WWTP.

Table 3. Flow and Load Contributions by Source at WWTP

Flow/Load Source	Skamania Lodge	Jester & Judge Cider / LDB Beverage	Waterfront Bldg / Backwoods Brewing / Skunk Brothers Spirits	Walking Man Brewery	All Other Sources
Flow Contribution	47 – 61%	5 – 12%	2 – 3%	2 – 3%	**21 – 44%**
BOD Load Contribution	22 – 38%	12 – 24%	6 – 10%	5 – 13%	**15 – 55%**
TSS Load Contribution	11 – 20%	9 – 26%	1 – 2%	1 – 2%	**49 – 79%**

Due to the statistically small data set, these percentages should be regarded only as a snapshot rather than as fully representative of typical contributions by these high strength dischargers to the WWTP. However, during the sampling period, Table 3 indicates the significant influence of the high strength dischargers to the WWTP. The beverage producers, in particular, are contributing a significant percentage of the BOD measured at the WWTP, especially when compared to their relatively low flow contribution.

A mass balance approach was used to validate the above sampling results, using the following equation:

WWTP Load – High Strength Dischargers Load = Load from All Other Sources

"All Other Sources" includes residential users as well as commercial users that were not included in the high strength sampling program. The City is estimated to have 489 residential Equivalent Residential Units (ERUs) and 160 non-residential ERUs in addition to the ERUs included in the sampling program. The average BOD load contributed by "All Other Sources" during the sampling period was 372 ppd, which is equivalent to 0.52 ppd per ERU and 0.24 ppd per capita. This per capita loading is close to the typical 0.2 ppd per capita BOD residential loading criteria recommended in the Department of Ecology Orange book Table G2-1, and indicates that the BOD mass balance and industrial waste monitoring BOD data are reasonably accurate.

The same calculation for TSS loading results in 0.97 ppd per ERU and 0.44 ppd per capita for "All Other Sources"; this is higher than would be expected. Further investigation is needed, but possible explanations for the apparently high TSS load from "All Other Sources" include:

- Limited number of data points
- Sampling anomalies
- Variability in the beverage producers' processes that may or may not have been captured in this sampling
- Possible TSS introduced to the system through infiltration and inflow (I/I)
- Steep sewers which convey volatile suspended solids and organic material to the WWTP quickly, so the material does not have time to decompose as it frequently does in a sewer system with shallower slopes

EFFECTS OF HIGH STRENGTH WASTEWATER AT WWTP

The Stevenson WWTP had a major upgrade in 1991. The 1991 WWTP design criteria include the following:

- Influent BOD loading
  - Dry weather average: 490 ppd
  - Maximum month average: 612 ppd *
- Influent TSS loading
  - Dry weather average: 490 ppd
  - Maximum month average: 612 ppd *
- Oxidation Ditch BOD Loading
  - Dry weather average: 12 ppd / 1,000 CF
  - Maximum month average: 15 ppd / 1,000 CF

If these design criteria are routinely exceeded it indicates that additional capacity is needed at the WWTP. In addition, criteria marked above with an asterisk (*) are included in the WWTP's National Pollutant Discharge Elimination System (NPDES) permit. When a plant reaches 85 percent of these criteria for three consecutive months or 95 percent of the criteria for a single month, it triggers the submission of a plan for maintaining capacity to the Washington Department of Ecology (DOE).

Table 4 shows the average and max month data from the Stevenson WWTP during the last three years and during the high strength wastewater sampling period and compares these data to the design criteria.

Table 4. Influent Loading at WWTP Compared to Design Criteria

	Influent BOD Loading		Influent TSS Loading		Oxidation Ditch BOD Loading	
	(ppd)	Percent of Design Criteria	(ppd)	Percent of Design Criteria	(ppd/1000 CF)	Percent of Design Criteria
2014						
Dry Weather Average	385	79%	336	69%	9.6	80%
Maximum Month Average	521	85%	706	115%	13.0	87%
2015						
Dry Weather Average	786	160%	525	107%	19.7	163%
Maximum Month Average	1,027	168%	848	139%	25.7	171%
2016 (January – September)						
Dry Weather Average	865	177%	688	140%	21.6	180%
Maximum Month Average	1,218	199%	866	142%	30.5	202%
Sampling Period						
Average	903	184%	831	170%	22.6	188%
Maximum	1,828	299%	2,273	371%	45.7	304%

Both dry weather average and maximum month average loading have consistently exceeded the design criteria in 2015 and 2016. In addition, a significant increase in loading can be observed in just the last three years. In 2014, influent BOD loading exceeded the design criteria on 20 percent of sampling days; this rose to 49 percent in 2015 and 64 percent in 2016. More detailed analysis of the scale and timing of upgrades needed at the WWTP to accommodate increasing influent loads will be included in the General Sewer Plan Update; however, Table 4 shows that influent loads already exceed the design criteria of the WWTP by a significant margin.

Despite the influent loading consistently exceeding the design criteria in 2015 and 2016, the WWTP has not exceeded its permitted effluent limits for BOD. Two exceedances for TSS did occur in 2016, but these may be related to solids handling issues at the WWTP rather than strictly influent loading. Given this compliance record it is recommended that the City pursue rerating for the WWTP, increasing the oxidation ditch's design criteria to account for actual performance data. This process has been successful at similar plants in Washington, although construction of additional secondary treatment capacity in the near future is likely to be required. The performance data indicates that rerating the oxidation ditch for 150 percent to 200 percent of its current design (from 490 ppd dry weather average to 735 or 980 ppd) is a reasonable target.

ALTERNATIVES

In order to maintain consistent permit compliance at the WWTP, the City will need to reduce incoming wastewater loading or increase its capacity to treat that load. The results of the sampling program demonstrates that high strength wastewater dischargers represent a significant percent of the City's wastewater loading, and addressing the growing contribution of these dischargers should be included in the City's approach for handling wastewater loading. The approaches for handling wastewater loading include the following, which are described in this section:

- Source Control
  - Promote Best Practices
  - Implement Strength-based Sewer Fees
  - Enforce Pretreatment Requirements
- On-site Pretreatment
- Upgrades to the Wastewater Treatment Plant

Source Control

Source control is typically the first step in addressing high strength discharges. This is because addressing high strength discharge at the source often produces faster and more cost-effective results than changes to wastewater infrastructure. Even if infrastructure upgrades are also required, starting with source control allows these upgrades to be sized more efficiently. Source control focuses on providing high strength dischargers with both an incentive to reduce wastewater strength and the information on how to accomplish that reduction.

Promote Best Practices

The sampling results indicate that beverage industries within the City are significant contributors of loading to the WWTP, particularly with regard to BOD. Beverage industries typically employ a wide range of processes, many of which can be optimized.

In April 2016, Tetra Tech prepared a Brewery Wastewater Guidance Document for the City, with the intention that this document can be used as a basis for conversations with beverage industries and also distributed to these dischargers. The document recommends a water survey to quantify how, where, and when water is used, identifies processes that typically generate high strength wastewater, and lists best practices to reduce water use and wastewater strength.

If the City wishes to implement this option, the recommended approach would be to meet individually with each high strength discharger to discuss the need for source control, provide a copy of a guidance document for addressing high strength wastewater, and discuss issues specific to the discharger that are relevant to source control. This process should be repeated for new dischargers. Regular annual check-ins would also be recommended in the case that management or day-to-day operational staff at the dischargers has changed. Although this process will be relatively time-intensive for City staff, it appears that it will currently only be necessary at five or less facilities in the City.

Implement Strength-Based Sewer Fees

Many municipalities have implemented sewer fees that incorporate wastewater strength to reflect the additional cost of treating high strength wastewater. Typically this is done by tying the cost per unit (gallons or cubic feet) to a BOD range. For instance, the City of Hood River charges $2.09 /1,000 gallons for BOD less than 401 mg/L, $3.14/1000 gal for BOD less than 801 mg/L, and $4.17 /1000 gal for BOD greater than 801 mg/L. If the City used a similar metric, all of the beverage industry dischargers evaluated during the September 2016 sampling program would be charged the highest sewer rate. Alternately, the City could cap the wastewater strength allowable for discharge to the sewers, requiring high strength dischargers to implement their own pretreatment.

City Ordinance 613 5(C), 1972, 13.08.230, Prohibited discharges to public sewer prohibits discharge of “Any waters or wastes having a pH lower than 6.0 or higher than 9.0” and “Any waters or wastes containing suspended solids of such character and quantity that unusual attention or expense is required to handle such material at the sewage treatment plant.”

Every site sampled in September 2016, including Skamania Lodge, showed wastewater outside the allowable pH range. In addition, the prohibition on suspended solids could reasonably be applied to the high strength dischargers, given that the high-BOD solids they discharge to the WWTP may require upgrades to fully accommodate.

The City’s current water and sewer rate structure does not have provision for wastewater strength-based charges. However, the rate structure could be updated using the existing ordinance as a basis and neighboring cities such as Hood River and Portland as examples. Even if alternate arrangements, such as dischargers contributing to construction and operation of centralized pretreatment, are ultimately regarded to be preferable to charging strength-based sewer fees, the existence of these fees would offer the City an additional enforcement option in the future.

Enforce Pretreatment Requirements

Another option is to cap the wastewater strength allowable for discharge to the sewers, requiring high strength dischargers to implement their own pretreatment. Again, the City’s existing Code of Ordinances provides a basis for the requirements. *City Ordinance 613 5(E), 1972, 13.08.250, Pretreatment-Required when-Facilities plan approval* allows the City’s superintendent to require pretreatment for any wastewater having “(1) a BOD demand greater than three hundred milligrams per liter, or (2) containing more than three hundred fifty milligrams per liter of suspended solids or (3) having an average daily flow greater than two percent of the average daily sewage flow of the city.” Every site sampled in September 2016 met all of these conditions on at least one sampling day.

In addition, *City Ordinance 613 5(I), 1972, 13.08.290, Provisions not to prevent special agreements for industrial waste pretreatment* allows for “special agreement or arrangement between the city and any industrial concern whereby an industrial waste of unusual strength or character may be accepted by the city for treatment subject to payment therefor by the industrial concern.”

13.08.250 can potentially be used to require pretreatment for every high strength discharger in the City, this ordinance could be used to negotiate alternative arrangements with the dischargers, either in the form of strength-based sewer fees or contributions to the construction and operation of additional wastewater infrastructure.

On-Site Pretreatment

Many of the high-strength dischargers included in this sampling program are clustered in one area of the City, primarily located in buildings owned by the Port of Skamania County (the Port). Jester & Judge Cider (LDB Beverage), Backwoods Brewing, and Skunk Brothers Spirits are all located in adjacent Port buildings. Together, these dischargers represented 11 percent of the flow, 27 percent of the BOD loading, and 8 percent of the TSS loading observed during the sampling program. Pretreating wastewater from these dischargers on-site would reduce the influent loading at the WWTP, and would allow the use of treatment technologies designed specifically for treating smaller volumes of high strength wastewater.

It is assumed that site pretreatment would be provided by installing a packaged wastewater treatment system; these types of systems typically include above-ground steel tanks, equipment such are aerators, pumps, controls and site piping. The type of treatment could be based on aerobic biological treatment, comparable to what is used at the WWTP, or on anaerobic treatment that allows the use of smaller tanks and higher treatment rates.

Installation of a pretreatment facility would make the Port buildings a more desirable location for current and future beverage industry dischargers because it reduces the need for individual dischargers to implement pretreatment themselves.

Upgrades to Wastewater Treatment Plant

The City's WWTP was significantly upgraded in 1993. The 2017 General Sewer Plan Update will include a capital improvement plan for future WWTP improvements required to maintain NPDES permit compliance under year 2040 flows and loading conditions. From a loading perspective, additional secondary treatment capacity will need to be installed. Rerating of the existing oxidation ditch can be pursued to bring permitted influent load capacity in line with documented treatment performance. The General Sewer Plan Update will include evaluation of secondary process improvements, including converting the oxidation ditch process to a conventional activated sludge process with selector basin. Secondary process improvements and existing permit compliance data would justify rerating the WWTP capacity.

Even if loads and concentration from high-strength dischargers were reduced using other methods discussed in the above sections, it appears that the additional secondary treatment capacity will still be required in the near future. Table 5 shows the same data as Table 4, with the loading reduced by 25 percent to account for source control and/or pretreatment.

Table 5. Pretreated Influent Loading at WWTP Compared to Design Criteria

	Influent BOD Loading		Influent TSS Loading		Oxidation Ditch BOD Loading	
	(ppd)	Percent of Permitted Design Criteria	(ppd)	Percent of Permitted Design Criteria	(ppd/1000 CF)	Percent of Permitted Design Criteria
2015						
Dry Weather Average	590	120%	394	80%	14.7	123%
Maximum Month Average	770	126%	636	104%	19.2	128%
2016 (January – September)						
Dry Weather Average	649	132%	516	105%	16.2	135%
Maximum Month Average	914	149%	650	106%	22.8	152%
Sampling Period						
Average	677	138%	623	127%	16.9	141%
Maximum	1,371	224%	1,705	279%	34.2	228%

The 25-percent reduction was selected because the combined loading contribution of Jester & Judge and the Waterfront Building during the sampling period was 27 percent (see Table 3) and the total reduction of BOD load in the pretreatment system is expected to be at least 94 percent to bring the high strength discharge concentration down to approximately residential concentration.

ESTIMATED COSTS

Preliminary cost estimates for each alternative are discussed below. The costs below are intended to be used as order-of-magnitude comparisons.

Source Control

The costs associated with source control will consist of time spent by City personnel on implementation and enforcement.

On-Site Pretreatment

Cost estimates were solicited from vendors of packaged treatment systems used at other sites for treating wastewater similar to brewery/distillery wastewater. Two systems were reviewed; each capable of treating high strength wastewater (BOD > 5,000 mg/L) to near domestic strength (BOD < 350 mg/L). One system was a sequencing batch reactor (aerobic treatment), sold by Cloacina Package Treatment Solutions, and the second system was a Gas Energy Mixing and Expanded Granular Sludge Bed (anaerobic treatment), sold by Clean Water Technology. Preliminary costs for both systems were comparable at approximately $1.0M. Other acceptable pretreatment technologies exist. Further evaluation of on-site pretreatment systems is recommended if on-site pretreatment is selected for further planning, design and construction.

The estimated total cost opinion for the pretreatment system is shown in Table 6. This cost opinion has been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. Costs are stated as order-of-magnitude estimates in 2016 dollars, and are developed from material received from the system vendors. According to the Association for the Advancement of Cost Engineering, order-of-magnitude estimates are normally expected to be accurate to within plus 80 percent to minus 50 percent of the actual cost. The final costs will depend on actual labor and material costs, competitive market conditions, final project costs, implementation schedule, and other variable factors.

Table 6. Pretreatment System Cost Estimate

Item	Estimated Cost
Pretreatment system incl. equipment, installation, construction costs	$1,000,000
Subtotal	***$1,000,000***
Contingency @ 20%	$200,000
Subtotal	***$1,200,000***
Design, Administration, CMS @ 20%	$240,000
Subtotal	***$1,440,000***
Total Capital Cost (as of November 2016)	**$1,440,000**

Upgrades to Wastewater Treatment Plant

A capital improvement plan (CIP) will be included in the General Sewer Plan Update, which will include projects needed to keep up with growth and maintain permit compliance through the year 2040. It is likely that the CIP will include additional secondary treatment capacity, solids handling capacity and other recommended improvements to accommodate the high influent loading observed during the sampling period and prior two years. For simplicity, costs included here are limited to the secondary treatment process.

The estimated total cost opinion for a complete oxidation ditch is shown in Table 7. Other methods of providing additional secondary treatment capacity will also be considered, but for preliminary cost estimating purposes a second oxidation ditch comparable in size to the existing ditch has been used as a basis. This cost opinion has been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. Costs are stated as order-of-magnitude estimates in 2016 dollars, and are developed from past project experience and EPA fact sheets. According to the Association for the Advancement of Cost Engineering, order-of-magnitude estimates are normally expected to be accurate to within plus 80 percent to minus 50 percent of the actual cost. The final costs will depend on actual labor and material costs, competitive market conditions, final project costs, implementation schedule, and other variable factors.

Table 7. Oxidation Ditch Cost Estimate

Item	Estimated Cost
Oxidation ditch incl. equipment, installation, construction costs	$2,000,000
Subtotal	***$2,000,000***
Contingency @ 20%	$400,000
Subtotal	***$2,400,000***
Design, Administration, CMS @ 20%	$480,000
Subtotal	***$2,880,000***
Total Capital Cost (as of November 2016)	**$2,880,000**

Cost Comparisons

To roughly evaluate the cost effectiveness of on-site pretreatment and secondary treatment at the WWTP under a variety of design conditions, these capital costs were divided by the pounds of BOD removed by the proposed treatment system. The results are shown in Table 8. Comparison of these initial unit costs indicate that on-site pretreatment becomes more cost effective with larger industrial BOD loads, and that treatment at the City WWTP becomes more cost effective as its allowable loading rates (rerating) increase. The cost effectiveness will be considered in more detail in the General Sewer Plan Update including capital costs for solids handling and other facilities and operation and maintenance costs.

Table 8. Cost Comparison

Design Condition	Cost per Pound of BOD Removed
On-Site Pretreatment	
Current conditions (influent loading of 248 ppd, 94% removal by pretreatment system)	$6,200
Full capacity of treatment system (influent loading of 1,000 ppd, 94% removal)	$1,500
Additional Secondary Treatment at WWTP (oxidation ditch or comparable)	
Current design criteria for oxidation ditch (average dry weather loading of 490 ppd of BOD)	$5,900
Rerated design criteria for oxidation ditch (150% of existing, 735 ppd of BOD)	$3,900
Rerated design criteria for oxidation ditch (200% of existing, 980 ppd of BOD)	$2,900

RECOMMENDATIONS

The purpose of this memorandum is to provide a preliminary assessment of source control and pretreatment alternatives for the major sources. Recommendations for handling wastewater loading include the following:

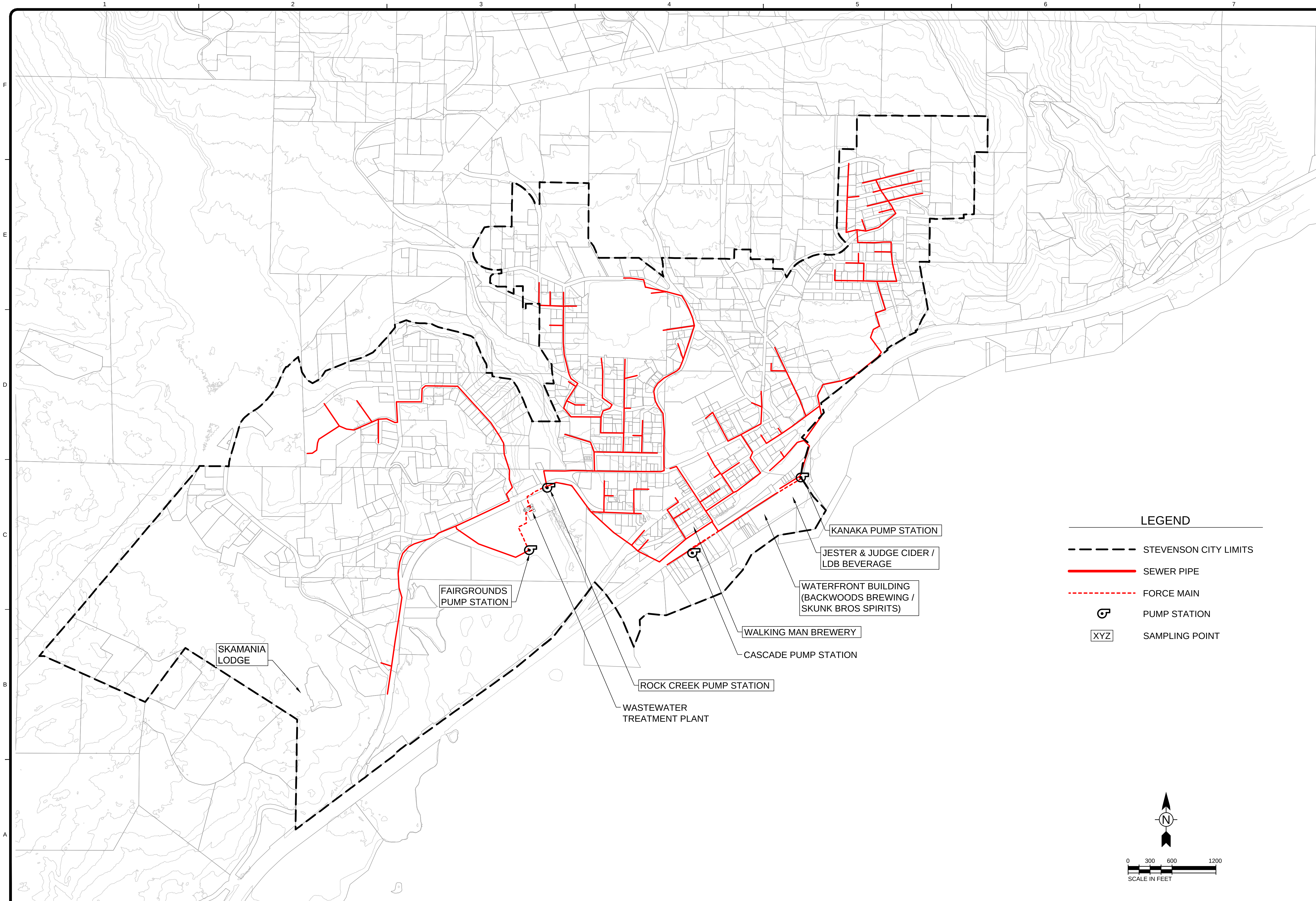
- Source Control
  - Promote Best Practices
  - Implement Strength-based Sewer Fees
  - Enforce Pretreatment Requirements
- On-site Pretreatment
- Upgrades to the Wastewater Treatment Plant

Source control and pretreatment of high strength wastewater discharges should be implemented in order to stabilize WWTP operations and maximize the operating life of current and future WWTP facilities. Source control can be implemented directly by the City without significant capital cost and should be initiated as soon as reasonable.

On-site pretreatment should also be considered, as the preliminary cost information presented in this memo indicates that pretreatment is roughly as cost effective as WWTP expansion when considering BOD load reduction under current conditions, and significantly more cost effective than WWTP expansion if beverage industries continue to grow and the pretreatment facility is operated at its design capacity. On-site pretreatment does not eliminate the need for short-term upgrades at the WWTP, but will help stabilize WWTP operations and maximize the operating life of current and future WWTP facilities. Further development of the on-site pretreatment system option at the Waterfront Building is recommended since it would be accessible to three of the beverage industry high strength dischargers, and potentially others in the future.

The Stevenson WWTP needs additional secondary treatment capacity in order to accommodate the influent loading rates observed in the last two years. The General Sewer Plan Update will include evaluation of secondary process improvements, including converting the oxidation ditch process to a conventional activated sludge process with selector basin. Secondary process improvements and existing permit compliance data would justify rerating the WWTP capacity.

Additional analysis and cost information will be included in the General Sewer Plan Update.



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CITY OF STEVENSON
GENERAL SEWER PLAN UPDATE

WASTEWATER COLLECTION SYSTEM AND SAMPLING LOCATIONS

Project No.: 135-48600-16001
Designed By:
Drawn By:
Checked By:

FIG-1

Bar Measures 1 inch

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